



Annual Report : Kharif-2016

AICRP On Forage Crops And Utilization

वार्षिक प्रतिवेदन ANNUAL REPORT

(2016-17)

Part-I: Kharif-2016

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 AND UTILIZATION

(Indian Council of Agricultural Research)

ICAR-IGFRI

Jhansi-284003 (U.P.)

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Forage In- house Breeding Activities Kharif, 2016

AICRP (FC&U), AAU, Anand

Contribution of entry in AICRP trial

Crop	Entry	Trial
Maize	AFM-6	IVTM
	AFM-4	AVTM
Bajra	AFB-37	IVTPM

Maintenance of germplasm

SN	Crop	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
	Total	881

New Germplasm collection

Crop	Total number	Source
Sorghum	23	NDDDB, Kutchh and Saurashtra
Pearl millet	2	Sauashtra & Kutchh
Lucerne	28	Kutchh
Maize	3	NDDDB
Clitoria	1	Deesa
Total	57	

Forage Maize Improvement programme**Population improvement:** Four populations were raised for advancing and seed collection

A	B	C	D
AFM-1	AFM-5	Pratap Makka Chari	GWC-0803
AFM-2	AFM-6	GWQPM-68-3	GWC-0609
AFM-3	AFM-7	GWC-0320	Narmada Moti
AFM-4	AFM-8	GWC-0801	GWC-0400
African Tall	African Tall	African Tall	African Tall

Hybridization: 21 new crosses were made to develop tillering type with high yield.

SN	Cross combination	SN	Cross combination
1.	IC-131031 x <i>Teosinte</i>	12.	GWL-11 x <i>Teosinte</i>
2.	IC-131109 x <i>Teosinte</i>	13.	GWL-15 x <i>Teosinte</i>
3.	IC-131200 x <i>Teosinte</i>	14.	GWL-17 x <i>Teosinte</i>
4.	GDRM-2 x <i>Teosinte</i>	15.	CML-264 x <i>Teosinte</i>
5.	NP96K-5720 x <i>Teosinte</i>	16.	CML-292 x <i>Teosinte</i>
6.	Prabhat x <i>Teosinte</i>	17.	African Tall x <i>Teosinte</i>
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9.	Origin Maxico-6373 x <i>Teosinte</i>	20.	IC-130954 x <i>Teosinte</i>
10.	HYD-997-1573 x <i>Teosinte</i>	21.	Narmada Moti x <i>Teosinte</i>
11.	HYD-997-1626 x <i>Teosinte</i>		

Segregating materials

Generation	Sown	Selected/ harvested	Generation	Sown	Selected/ harvested
F ₁	25	25	F ₄	17	10 + 5 (Bulk)
F ₃	15	15	F ₆	45	45

Forage Bajra

Population improvement: Two populations were raised

A	B
AFB-3	RBC-2
Giant Bajra	AFB-32
BAIF Bajra	AFB-37
GFB-1	AFB-38
Bajra Bawal	AFB-3

Hybridization: Eight new crosses were made to develop high yielding and multicut types.

SN	Cross combination	SN	Cross combination
1.	AFB-32 x AFB-3	5.	AFB-36 x AFB-3
2.	AFB-33 x AFB-3	6.	AFB-37 x AFB-3
3.	AFB-34 x AFB-3	7.	AFB-38 x AFB-3
4.	AFB-35 x AFB-3	8.	AFB-39 x AFB-3

Thirty four bajra inbred lines were selected from JAU Jamnagar and will be collected and will be sown in summer season.

Segregating materials

Generation	Sown	Selected/ harvested	Generation	Sown	Selected/ harvested
F ₁	8	8	F ₄	18	16
F ₂	14	13	F ₅	14	8
F ₃	23	23	F ₆	4	4 (Bulk)

Forage Sorghum**Hybridization**

SN	Cross combination	Sr. No.	Cross combination
1.	GAFS-12 x Gundri	3.	GAFS-12 x AFS-52
2.	GAFS-12 x S-1049	4.	GAFS-12 x AFS-53

Segregating materials

Generation	Sown	Selected/ harvested	Generation	Sown	Selected/ harvested
F ₁	28	28	F ₃	33	16
F ₁ (MSD)	55	55	F ₄	22	12
B ₁	54	54	F ₅	24	17 + 3 (Bulk)
F ₂	18	24	F ₆	7	7 (Bulk)

AICRP (FC&U), BCKV, KALYANI**Germplasm maintained**

Crop	Total number of lines
Rice bean	250
Coix	3

Twenty (20) germplasm lines of ricebean were evaluated against two checks viz., Bidhan ricebean 1 and Bidhan ricebean 2 as Large Scale Trail (LST) on production of fodder rice bean.

Nucleus and Breeder seed production

- Rice bean (Bidhan Rice bean 1)
- Rice bean (Bidhan Rice bean 2)
- Coix (Bidhan Coix 1)

Multiplication and management of BN hybrid - CO 3 and CO 4

AICRP (FC&U), TNAU, COIMBATORE

Fodder varieties released during 2016

Fodder cowpea CO 9 – State release

- Higher green fodder and dry matter yield (22.82 and 3.85 t/ha), Higher protein content (21.56 %)
- Reduced fibre portions confer increased digestibility, palatability and intake rate
- Moderately resistant to yellow mosaic virus and resistant to major pests

Fodder cowpea TNFC 0926 – Central release

- Higher green fodder yield (25 t/ha) and dry matter content (4.94 t/ha)
- High crude protein yield with a genetic potential of 778 kg/ha
- Resistant to cowpea YMV and MR to root rot disease and major pests
- Suitable for North Eastern Zone

BN hybrids: A total of 24 new crosses were made during last crossing season (2015-16) involving elite Bajra parents collected from ICRISAT with an objective of evolving high yielding and quality BN hybrids. The crosses are under observation from *kharif*, 2016 onwards.

Fodder Pearl millet inbreds x Napier grass

SN	Cross combinations	SN	Cross combinations
1.	IP 10077 × FD 468	13.	IP 13150 × FD 453/1
2.	IP 10077 × FD 433	14.	IP 13150 × FD 468
3.	IP 10077 × FD 444	15.	IP 6140 × FD 435
4.	IP 10077 × FD 434	16.	IP 6140 × FD 440
5.	IP 10077 × FD 444	17.	IP 6140 × FD 439
6.	ICMV 05555 × FD 453/1	18.	IP 6202 × FD 465
7.	ICMV 05555 × FD 439	19.	IP 6202 × FD 444
8.	ICMV 05666 × FD 433	20.	IP 15564 × FD 479
9.	ICMV 05666 × FD 444	21.	IP 15564 × FD 440
10.	ICMV 05777 × FD 435	22.	ICMV 05222 × FD 446
11.	ICMV 05777 × FD 446	23.	ICMV 05222 × FD 465
12.	ICMV 05777 × FD 451	24.	ICMV 05222 × FD 480

Fodder cowpea: A total of 40 fresh crosses were made during *kharif*, 2015 involving high yielding released varieties as parents with an objective of evolving high yielding and quality types. The crosses are under critical evaluation from *kharif*, 2016 onwards.

List of fresh crosses made in Fodder cowpea

SN	Cross combinations	SN	Cross combinations
1.	EC 241041 × CO 9	21.	EC 240685 × CO (FC) 8
2.	EC 240687 × CO 9	22.	FC 750 × CO (FC) 8
3.	EC 240744 × CO 9	23.	FC 64 × CO (FC) 8
4.	EC 240685 × CO 9	24.	FC 895 × CO (FC) 8
5.	UPC 953 × CO 9	25.	FC 932 × CO (FC) 8
6.	UPC 334 × CO 9	26.	UPC 951 × CO (FC) 8
7.	UPC 5286 × CO 9	27.	FC 1067 × CO (FC) 8
8.	UPC 9202 × CO 9	28.	FC 1151 × CO (FC) 8
9.	UPC 341 × CO 9	29.	FC 778 × CO (FC) 8
10.	UPC 951-B × CO 9	30.	EC 95103 × CO (FC) 8
11.	CL 350 × CO 9	31.	FC 9402 × CO (FC) 8
12.	FC 271 × CO 9	32.	CL 88 × CO (FC) 8
13.	FC 4300 × CO 9	33.	FC 895 × CO (FC) 8
14.	FC 728 × CO 9	34.	960 × CO (FC) 8
15.	FC 927 × CO 9	35.	EC 240245 × CO (FC) 8
16.	FC 877 × CO 9	36.	UPC 9001 × CO (FC) 8
17.	FC 801 × CO 9	37.	CO 9 × CO (FC) 8
18.	FC 793 × CO 9	38.	CO 9 × FC 1287
19.	FC 928 × CO 9	39.	CO 9 × EC 446946
20.	FCCL 348 × CO 9	40.	CO 9 × FC 109

AICRP (FC&U), KAU, VELLAYANI

Evaluation of Guinea grass cultures - From the germplasm collection maintained at Vellayani centre, four superior cultures were identified and compared for their performance. Two cultures (Culture 1 & 2) were accepted for farm trial.

Evaluation of BN hybrid cultures: Five hybrids with superior fodder attributes from Fifty one Bajra-Napier hybrids were selected for yield trials. The materials were received from IGRI, Jhansi during Kharif 2010. The five cultures were compared with the local check (Suguna). One culture (Culture 1) was accepted for farm trial.

Induced mutagenesis for delayed flowering and high tillering in guinea grass (*Panicum maximum* Jacq.): Objective of the study is to develop high yielding guinea grass types with delayed flowering and high tillering through induced mutagenesis. The work is in progress.

Genetic analysis of yield and quality in fodder cowpea (*Vigna unguiculata* Walp.): Genetic analysis of fodder yield and quality in fodder cowpea was done and F₂ progenies were evaluated to identify superior recombinants.

Accessions collected: 32 accessions were collected.

AICRP (FC&U), NDUAT, FAIZABAD

Germplasm collection, evaluation & maintenance

Crop	Accessions			Source
	Existing	New	Total	
Forage Bajra	55	05	60	Barabanki, Lucknow and Ghajipur
Forage cowpea	10	02	12	Barabanki
N x B hybrid	19	-	19	Ambedkar Nagar

Breeding Programme in Forage Bajra

Ten new crosses were made during Kharif 2016

SN	Cross combinations	SN	Cross combinations
1	NDFB 2 x Giant Bajra	6	NDFB 11 x BAIF Bajra
2	NDFB 2 x BAIF Bajra	7	NDFB 11x AFB-4
3	NDFB 3 x BAIF Bajra	8	NDFB 5 x AFB-4
4	NDFB 3 x Giant Bajra	9	NDFB 5 x AFB-3
5	NDFB 3 x AFB-4	10	NDFB 5 x BAIF Bajra

Segregating generation

F ₁	10
F ₂	12
F ₃	05
Advance lines	12

Station trial: One station trial viz., VT Station on Forage Bajra was conducted. Fourteen genotypes were tested against two checks viz., NDFB-2 and NDFB-3.

AICRP (FC&U), OUAT, BHUBANESWAR

- Hybridization in Rice Bean to develop better fodder ideotypes using ORB-37, ORB-43, ORB-64, ORB-71, ORB-73, ORB-103, ORB-107, BFRB-15, Bidhan-1 and Bidhan-2. In Kharif 2016, 35 single line crosses have been made, which will be evaluated in Kharif 2017.

AICRP (FC&U), MPKV, RAHURI

Hybridization

- Eighteen Bajra x Napier crosses were made during Rabi-2015-16. These 18 F₁ crosses were sown during Kharif, 2016 for isolating heterotic clones of high yielding BxN hybrids for green forage yield.
- The 64 heterotic clones selected from eight BxN hybrids of Rabi-2014-15 are sown during kharif-2016 in preliminary yield trial (ABD) along with four checks for evaluating green forage yield and quality parameters.

Germplasm of different grasses maintained during 2016-17

SN	Name of grass	Nos.
1.	Napier (<i>Pennisetum purpureum</i> L)	33
2.	Guinea grass (<i>Panicum maxicum</i> L)	11
3.	Marvel (<i>Dichanthium</i> spp.)	48
4.	Madras Anjan (<i>Cenchrus</i> spp.)	44
5.	Dongari (<i>Crysopogon fulvus</i>)	13
6.	Stylo (<i>Stylosanthes</i> spp.) [<i>S. seabrana</i> : 35; <i>S. scabra</i> :5; <i>S. viscosa</i> -1; <i>S.seca</i> :1 ; <i>S. hamata</i> :2]	44
7.	Gokarn/Butterfly pea (<i>Clitoria ternatae</i>)	25
8.	Rhodes grass (<i>Choris gayana</i>)	7
9.	Dinanath (<i>Pennisetum pedicellatum</i>)	5
10.	Moshi (<i>Iseilema wightii</i>)	3
11.	Ber (<i>Ischiemum aristanum</i>)	3
	Total	236

AICRP (FC&U), JNKVV, JABALPUR

Germplasm status

Crop	existing	new collection	Total	source
Soybean	41	6	46	NRC Indore & Sehore
Rice bean	31	5	36	NBPGR, New Delhi

Generation of materials/entries/crosses made during – Kharif 2016

Crop	Cross made	Cross advanced	Selection made
Soybean	6	5F ₁	-
		4F ₂	29
		5F ₃	14
		3F ₄	05
		5F ₅	04

Single plant progenies and promising genotypes were evaluated for different 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 (FC&U), PJTSAU, HYDERABAD

Germplasm Holding

S. No	Crop	Number of Collections	Source
1.	Fodder Cowpea	40	1. NBPGR, Regional Station, Hyderabad 2. RARS, ANGRAU, Tirupathi
2.	Fodder Maize	45	Maize Research centre, PJTSAU, Hyderabad.
3.	Fodder Bajra	56	ICRISAT, Hyderabad.
4.	Napier Lines	16	TNAU, Coimbatore.

Fodder Cowpea

- Ten fresh cross combinations were developed during the season under report.
- During Kharif 2016, twenty germplasm lines obtained from NBPGR, Regional Station, Hyderabad were evaluated.

Segregating generations

S No	Filial Generation	No. of crosses studied	No. of SPS made	No. of SPS advanced	Promising SPS/ progenies
1	F2	02	32	32	40
2	F3	04	40	40	52
3	F4	02	20	20	15
4	F5	02	2.15	15	12

Fodder Maize

Development of Inbred lines in Forage Maize

Kharif 2014	<ul style="list-style-type: none"> • Inbreeding programme initiated for development of inbred lines using African tall as source population. • Ear to row planting was taken up. Selfing and sib mating was done in selected plants (selection criteria is more plant height, early duration) in each progeny. This completes the first cycle of inbreeding.
Kharif 2015	<ul style="list-style-type: none"> • Selfed and sib mated plants were raised separately in ear to row progeny. • Selfing was carried out in selected plants in selfed progenies • Sib mating was done in full sib families.
Kharif 2016	<ul style="list-style-type: none"> • 3rd cycle of inbreeding & sib mating was done during the season.

Multicut bajra

- The five uniform bulked populations of following crosses were evaluated in station yield trials during kharif 2016 against standard checks. Among five the entry TSFB 16- 10(ICMV 05 555 X Giant Bajra) was recorded increased green fodder yield of 10.8 % and dry fodder yield of 16.5 % over check variety Giant Bajra.

S. No.	Cross
1.	MRB 8 X ICMV 05 555 (TSFB 16-2)
2.	Giant bajra X MRB-8 (TSFB 16-3)
3.	Giant bajra X Jakarana (TSFB 16-6)
4.	ICMV 05 555 X Giant Bajra (TSFB 16-10)
5.	Rijco bajra X Giant bajra (TSFB 16- 12)

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, the data were recorded in all the fodder parameters during Kharif 2016.

Fodder sorghum

- Forty sweet sorghum hybrids developed through Line x Tester design along with standard checks were evaluated during kharif 2016 and the data on all the fodder quantitative traits are recorded to estimate the heterosis and combining ability for fodder yield. Estimation of fodder quality parameters is in progress.

AICRP (FC&U), BAIF, Urulikanchan

Maize

- **Evaluation of Maize crosses:** A station trial was established with eleven crosses namely BAIF 314 x BAIF 295, BAIF 299 x BAIF 295, BAIF 250 x BAIF 295, BAIF 256 x BAIF 295, BAIF 251 x BAIF 295, BAIF 242 x A.Tall, BAIF 271 x A.Tall, BAIF 303 x A.Tall, BAIF 245 x A.Tall, BAIF 282 x A.Tall, BAIF 283 x A.Tall along with national check variety African Tall to study the performance of crosses vis-à-vis the check for growth, forage yield and quality traits.
- **Population development programme:** The F₁ progeny of the promising cross BAIF 297 x A.T. was grown in *Kharif*- 2015. Among the population, 32 IPS were made for desirable characters however seeds from 20 IPS were obtained. The head to row progeny of these 20 IPS was grown in F₂ generation for further selection programme. Based on the morphological characters, progenies of five IPS were removed at tasseling stage.
- **Evaluation of Maize x Teosinte crosses:** Two reciprocal crosses of maize and Teosinte i.e. African Tall x Teosinte and Teosinte x African Tall were performed during *Kharif*- 2015. Seed obtained from both the crosses and parents were sown to study the performance for fodder characters in F₁ generation in comparison to their parents.

B x N hybrid

- **Evaluation of B x N hybrids:** Seven new hybrids of Bajra and Napier grass viz. BAIF -INC-Bajra- 24 x FD-456, BAIF-INC-Bajra-20 x FD-440, BAIF -INC-Bajra-20 x FD-479, BAIF -INC-Bajra-17 x FD-456, BAIF -INC-Bajra-25 x BRN 01, BAIF -INC-Bajra-16 x FD-479 and BAIF -INC-Bajra-16 x BRN 01 were attempted during *Kharif*- 2015. Crossed seed of each hybrid was grown separately for selection of desirable clumps after 5-6 cuttings. Five cuttings were completed and the desirable clumps under each cross were identified.

Pearl millet

- **Population development programme:** Selection of individual plant (IP) from the population of BAIF's germplasm collection (BAIF INC Bajra-09) of Pearl millet was done. The plant was characterized with high number of uniform tillers, more number of leaves, thick and tall stem, medium thick panicles with good grains and stay green fodder at maturity. The seed obtained from the IP was sown for F₁ generation study and 10 IPs were selected based on morphological characters for further study.

Sorghum

- **Population development programme:** Eighteen accessions of sorghum received from ICRISAT, Hyderabad were evaluated for fodder characters. One individual plant distinctly superior for fodder characters from accession no. (IS 720) was selected during *rabi* 2014-15 and progeny was grown through stem cuttings. Seeds were obtained from five elite plants based on phenotypic characters and mixed together. Further the seeds were grown for progeny study. Thirty nine IPS belonging to following three distinct groups for forage characters from progeny were done for further study.
- Tall plants with solid juicy stem, panicle emergence in 75-80 days, 13-14 number of leaves (18IPS)
- Tall plants with thick solid juicy stem, panicle emergence in 85-90 days, 16-17 leaves (16 IPS)
- Very thick stem, panicle emergence after 100 days, broad leaves (5 IPS)

AICRP (FC&U), BAU, RANCHI

- Local Cowpea, and Maize, germplasm lines were evaluated.
- In cowpea, 3 new crosses were attempted during Kharif 2016.
- In Bajra Napier Hybrid - 25 lines were evaluated.
- 2 entries in cowpea and 2 entries in Maize were grown for seed multiplication.
- In cowpea 5, F₃ crossing has been maintained.
- 1 local germplasm of pearl millet is grown.

AICRP (FC&U), UAS, ZRS, MANDYA

Cowpea

Advancing of segregating generation

Genotypes: 131

F5 Generation Selections: 78

The following 5 lines from F5 generations were found promising and selected

1. MFC-09-9 X IC-1071
2. MFC-09-6 X IC-1071
3. MFC-09-6 X NBC-2
4. MFC-09-10 X IC-1071
5. MFC-09-13 X IC-1071

Identification of promising and stabilized lines from the advanced generations (F6)

1. MFC-09-9 X IC-1071 – F6 generation (MFC-16-1)
2. MFC-09-9 X NBC-2 – F6 generation (MFC-16-3)
3. MFC-09-9 X EC-170578-1-1 – F6 generation (MFC-16-2)
4. MFC-09-9 X NBC-2 (MFC-16-4)

Identification of new parental lines for hybridization

- EC-170578-1-1 (2) - very good biomass and stay green
- Patrehalli local- Bold seeded, high biomass & broad leaves.
- KBC-5- Bushy growth, more leaves ((High Leaf:Stem ratio)
- Goa local- High biomass & bold seeded.

Maize

1. Generation of stabilized population (by sibbing)

- 1-42-4 (Light orange)
- 1-27-2 (Orange)
- 1-41-1 (Orange)
- African tall X (SKV-50x AT) (Orange)
- J-1006x AT white

1- (African tall x Sujay 267-1)-42-4

DOS: 08.08.2016

Genotypes: 76

Generation: F8

Selected populations: 64

Horse Gram

Germplasm evaluation: 101 genotypes of Horse gram were evaluated in 2 rows in Augmented design

Promising fodder type identified.

1. IC-71743- More biomass & viny
2. IC-202781- More biomass & late
3. IC-264704- High biomass & YMV- tolerant
4. IC-123033- Bushy & more biomass
5. TCR-1549- High biomass
6. TCR-1700- High biomass
7. TCR-1675- Viny & determinate
8. IC-71814- Very good biomass & disease free
9. TCR-1789- Very good biomass & disease free

2. Seed multiplication of YMV- tolerant promising horse gram genotypes

1. IC-264704
2. IC-45755
3. IC-139518

Dolichos bean (Lablab Bean)

- Evaluation of indeterminate and photo sensitive (sp. Lignosus types) local germplasm for fodder traits and screened 130 local Dolichos bean germplasm for fodder traits and identified 28 germplasm with desirable fodder traits. Seed multiplication of promising genotypes is in progress..

Nucleus seed production

Crop	Variety	Quantity (q)
Fodder Cowpea	MFC-08-14	0.40
Fodder Cowpea	MFC-09-1	0.40

AICRP (FC&U), GBPUAT, PANTNAGAR

Cowpea

Progenies evaluation: Total 10 F₁ progeny were planted on 24.08.16. Each line were planted in 2.0 m. long in a single row spaced 100 cm. apart from the next line. These progenies were evaluated for different characters combination as per the breeding objectives. The seed from these lines were harvested however, excessive continuous rains just after the planting lead to the damage of germinating seedling in some extent. The evaluated/planted F₁ progenies are follows:

SN	F ₁ Progeny	SN	F ₁ Progeny
1	CGP 110 x CGP 101	2	CGP 3 x CGP 120
3	CGP 118 x CGP 121	4	CGP 243 x CGP 129
5	CGP 200 x CGP 106	6	CGP 110 x CGP 122
7	UPC 622 x UPC 8705	8	UPC 618 x UPC 9202
9	UPC 626 x EC 101980	10	UPC 621 x UPC 9202

Multiplication/Maintenance of advanced generation improved lines: Multiplication/increase of 23 plots of 23 improved lines/released varieties were undertaken during the Kharif 2016 season

SN	Improved lines/Varieties	SN	Improved lines/Varieties
1	UPC 626	13	UPC 618
2	UPC 9202	14	UPC 803
3	UPC 8705	15	UPC 625
4	UPC 621	16	UPC 802
5	UPC 631	17	UPC 622
6	UPC 953	18	UPC 801
7	Vegetable selection	19	UPC 607
8	UPC 953	20	UPC 4200
9	UPC 287	21	UPC 5286
10	Pr-1	22	UPC 5287
11	UPC 805	23	UPC 628
12	UPC 804		

AICRP (FC&U), AAU, JORHAT

Germplasm collection: During Kharif 2016, 13 germplasm were collected

Crop	Number	Collected from
Ricebean	6	Karbi Anglong, Assam
Maize	5	Karbi Anglong, Assam
Lathyrus	2	Assam
Total	13	

Ricebean

- **Evaluation of Ricebean germplasm:** 77 rice bean germplasm including checks were evaluated for their earliness, productivity, quality and disease and pests resistance. Promising entries were selected.
- **National hybridization programme on Ricebean:** The performances of selected F₆s were evaluated during kharif 2016.

Maize

- **Identification of maize lines for development of composite forage maize variety:** The 27 numbers of maize germplasm were selfed. The selfed progeny will be evaluated with the check variety African Tall and J-1006 in the next season.
- **Evaluation of maize germplasm:** 27 maize germplasm were evaluated with African Tall and J-1006. Promising entries were identified.

AICRP (FC&U), CSK HPKV, PALAMPUR

Germplasm Holding

Crop	No. of collections
Setaria (<i>Setaria anceps</i>)	40
Paspalum (<i>Paspalum wetstenii</i>)	2
Maize (<i>Zea mays</i>)	20

Promising Germplasm

Crop	Entries
Setaria	
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

- Genotypes S-6, S-25, S-17, S-92, S-21, S-27, PSS-1, S-16 and S-11 exhibiting maximum diversity on the basis of D² statistic and SSR markers have been multiplied and will be planted in polycross fashion in the ensuing kharif season 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-25-1, S-4, 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.
- Land races PMG-3, PMG-18, PMG-52, PMG-62, and PMG93-1 and Local Chadhiar were statistically at par with African tall for fodder yield. Land race Local Chadhiar was superior for seed as well as stover yields as compared to African Tall.
- Twenty four genotypes are being evaluated for stover quality parameters viz., protein, fibre, ash and hemicellulose contents.

Bajra Napier hybrid

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

AICRP (FC&U), SKUAST-K, Srinagar

Germplasm Collection

Crop	No. of Collections	Source
Maize	10	CIMMYT Mexico
Cowpea	25	USDA
Sorghum	6	DSR, Hyderabad
Alfalfa (<i>Medicago falcate</i> , <i>M. sativa</i> , <i>M. varia</i>)	20	Drass, Kargil and Leh

Maize: Local collections made during 2015 were characterised for all the DUS traits to identify novelty in them. By crossing these local lines with African tall and Pratap chari-6 the fodder and nutritive value of these types will be improved. Twenty population crosses were made during *Kharif -2016*. These will be evaluated and the best performing ones will be subjected to half sib selection followed by four cycles of random mating in isolation to identify potential materials for future fodder use in the valley.

Alfalfa: Twenty landraces/populations collected from Ladakh region (Kargil and Leh districts) during August-2015 were grown and evaluated for their fodder yield and quality.

AICRP (FC&U), CCS HAU, HISAR

Fodder Cowpea

- **Evaluation of germplasm:** Forty 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.
- **Hybridization:** 8 fresh crosses in following combinations attempted

Fresh crosses attempted

1	CS 88 x Bundel Lobia – 1	5	EC 4216 x CO5
2	CS 88 x Tw 92-2	6	Tw 92-2 x EC 4216
3	Bundel Lobia-1 X EC 4216	7	EC 4216 x EC 394-1
4	CO5 x CS 88	8	CS 88 x EC 4216

Fodder Pearl millet

Maintenance of germplasm: Thirty germplasm lines of fodder pearl millet were evaluated during *kharif* 2015. The germplasm lines revealed wide range of variation for GFY (620-1020 gm/plant), DMY (95-206 gm/plant), plant height (190-285 cm), tillers/plant (4-8) leaf: stem ratio (0.31-0.52) and days to 50% flowering (63-75 days). The genotypes FB 11-7 (1020 g/plant) for GFY, FB 11-7 (206 gm/plant) for DMY, FB 15-16 (285.0 cm) for plant height, FB 15-14 (8.0) for tillers/plant, FB 15-18 (0.52) for leaf : stem ratio and FB 15-21 (75 days) for days to 50% flowering were found promising.

Table: Promising genotypes of forage pearl millet

Characters	Range	Promising genotypes
Plant height (cm)	(190-285)	FB 15-16 (285.0), FB 14-21 (272.0), FB 15-13 (266.0)
Tillers/plant	(4-8)	FB 15-14 (8), FB 15-19 (7.0), FB 11-4 (7.0)
L:S ratio	(0.31-0.52)	FB 15-18 (0.52), GFB-1 (0.50), FB 15-20 (0.49)
Days to 50% Flowering	(63-75)	FB 15-21 (75) FB 15-19 (74), FB 15-18 (73)
GFY/plant (g)	(620-1020)	FB 11-7 (1020) FB 15-16 (973), FB 15-19 (960)
DMY/plant (g)	(95-206)	FB 11-7 (206), FB 15-19 (169), FB 15-16 (167)

Teosinte

- **Evaluation of Teosinte genotypes for fodder yield and quality:** Six genotypes were evaluated against the check 'Improved Teosinte'. The genotypes ITS-3 (402.1 q/ha), ITS-4 (443.7 q/ha) and ITS-5 (366.7 q/ha) gave 13.5%, 25.3 and 3.5% respectively, higher GFY over the check Improved Teosinte (354.1 a/ha), respectively.

Table: Teosinte genotypes evaluated in Small Scale Trial (SST)

SN	Genotypes	GFY q/ha	Rank
1	ITS-1	256.2	7
2	ITS-2	304.2	6
3	ITS-3	402.1	2
4	ITS-4	443.3	1
5	ITS-5	366.7	3
6	ITS-6	324.9	5
7	Improved Teosinte (check)	354.1	4
	CD at 5%	55.8	
	CV (%)	12.4	

AICRP (FC&U), PAU, LUDHIANA

Varieties released at Central or State level (in last 3 years) :

Crop	Variety	Year of release	State/Central release
Oats	OL 10	2014	State
	OL 1802	2016	CZ
	OL 1804	2016	NEZ
Sorghum	PSC 4	2015	State
Bajra Napier Hybrid	PBN 346	2016	State

New germplasm acquired: A total of 40 new BNHs were received from TNAU, Coimbatore under the aegis of a new ad-hoc project funded by ICRISAT and CGIAR.

New crosses attempted

- **Pearl millet:** A total of 60 new crosses (forage specific) were developed using hand pollination method.
- **Cowpea:** A total of **twenty five** new crosses were synthesized by crossing lines selected on the basis of erectness, virus resistance, late flowering and high GFY.
- **Bajra x Napier hybrids:** A new line x tester programme is being attempted following five bajra lines as male and five napier grass as female lines.

Breeding material maintained/handled/generated

Pearl millet

- Maintenance and development of male sterile lines: 75
- Inbred lines (B&R) maintained: 400
- 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 (288), F₁ Crosses (25), F₂ (30), F₃ (22) F₄ (**20**), and F₅ (5) was maintained.

Local trials conducted during *Kharif* 2016

Trial	Entries	Promising entries
CGIAR-DCCG-2015; Pearl millet forage hybrid trial (A x R lines)	59 + 1	1,5,15 and 16
CGIAR-DCCG-2015; Pearl millet top cross hybrid trial	18 + 3	32, 22, 8, 20, 31, 39, 42, 43, 3
CGIAR-DCCG-2015; Bajra x napier hybrid trial (CMS lines x Napier lines and Inbreds x Napier lines) clonal selection evaluation	175	ICMV 05555 x FD453/1, ICMV 05555 x FD453/1, ICMV 05555 x FD453/1, A5/A4 x FD434, A5/A4 x FD450
Bajra x Napier hybrid station trial	12	PBN 351, PBN 361, PBN 362, PBN 346
Station trial of Maize (Summer)	11 + 1 (c)	PMH 1
Station trial Maize hybrids (<i>Kharif</i>)	11 +1 (c)	J 1006
Station trial Maize composites (<i>Kharif</i>)	26 + 1(c)	616#, 618#, 626#, 618x620#, 619x620#
Station trial Cowpea (fodder)	10+2 (c)	PFC 12, PFC 31,PFC 39, PFC 40
Station trial Clusterbean (fodder)	10+ 2 (c)	PG 3, HFG 119

Pearl Millet: None of the hybrid exhibited superiority over the national checks Giant Bajra and RBC 2. Although seven hybrids viz; PHBF 4, 5, 6, 10, 11,12 and 13 and one composite FBL 1 exhibited more than 5% superiority over the local checks FBC 16 and PHBF 1.

Bajra Napier hybrid: Two trials of NBH were continued this year too and one hundred and eighty seven Bajra Napier hybrids were evaluated in two trials. Ten hybrids viz; ICMV 05555 x FD453/1, ICMV 05555 x FD453/1, ICMV 05555 x FD453/1, A5/A4 x FD434, A5/A4 x FD450, PBN 351, PBN 361, PBN 362, PBN 346 and PBN 342 were found to be superior by more than 5% over the best local check PBN 233.

Cowpea: Twelve genotypes were tested in a local trial conducted at Ludhiana and the entries PFC 12, PFC31, PFC39 and PFC40 out-performed on the basis of green forage yield and dry matter yield by more than 5% over the best local check CL 367.

Maize: A local trial comprising 12 entries were conducted during summer 2016 and out of these PMH1 out yielded the check J1006. Two local trials were conducted during *Kharif* season. First trial consists of twelve hybrids from private sector were evaluated with J 1006.. None of the hybrids exceeded J 1006 for green fodder, dry matter and silage quality. Second trial consisted of 26 newly developed composites by PAU Ludhiana were evaluated with J 1006 and the entries 616#, 618#, 626#, 618 x 620#, 619 x 620# out yielded the check J 1006 by more than 5 per cent.

Germplasm available - Total -895

SN	Crop	No. of accessions	SN	Crop	No. of accessions
1.	Pearl millet Inbreds	400	2.	Pearl millet CMS lines	75
3.	Napier grass	31	4.	Guinea grass	20
5.	Cowpea	288	6.	Cluster bean	81

AICRP (FC&U), SKRAU, BIKANER

Germplasm maintained

SN	Crop/ species	No. of accessions	SN	Crop/ species	No. of accessions
1	<i>Lasiurus indicus</i>	330	2	<i>Cenchrus ciliaris</i>	40
3	<i>Cenchrus setigerus</i>	80	4	<i>Cymbopogon jwarancusa</i>	40
5	Pearl millet	30			

New collections: Ten germplasm of *Cenchrus ciliaris* and ten germplasm of *Cenchrus setigerus* were collected from the area of Fatehpur Shekhawati in Sikar district of Rajasthan.

Pasture grasses: Promising entries (10 of *Lasiurus indicus*, 12 of *Cenchrus setigerus*, 10 of *Cenchrus ciliaris*) of the three range grasses were evaluated in RBD. During Kharif-2016, four entries of *Cenchrus ciliaris* and two entries of *Cenchrus setigerus* contributed from Bikaner centre are in the coordinated trial.

Pearl millet: 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 done to make a better composite. Material in hybridization nursery was evaluated for selection of superior plants.

Varieties released

Crop/ variety	Variety	Year of release
Pearl millet	Raj Bajra-1	2015
Lucerne	Krishna	2016
<i>Cenchrus ciliaris</i>	Bikaneri Dhaman	2015
<i>Lasiurus indicus</i>	Jaisalmeri Sewan	2016

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 2016 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 centers 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 centers 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

During Kharif 2016, multilocation, trials were conducted in four annual and 7 perennial crops. A total of 259 multilocation trials were allocated out of which 228 trials were conducted at 40 locations. A total of 113 entries along with respective national and zonal checks were evaluated. It included 15 entries in pearl millet, 17 in maize, 13 in cowpea, 6 in rice bean, 14 in Bajra napier hybrid, and 48 in various range grasses and legumes. The annual crops included forage maize, forage Bajra, forage cowpea, forage pearl millet, forage rice bean whereas perennial crops included Bajra x napier hybrid, *Cenchrus ciliaris*, *Cenchrus setigerus*, *Dichanthium*, *Pennisetum* hybrids, *Setaria*, *Desmenthus* etc. The crops wise and trial wise report is summarized below.

(a) ANNUAL FORAGES

FORAGE MAIZE

IVTM: In IVT maize, ten entries with two national checks were evaluated at 23 locations. For GFY in South Zone, TSFM-15-2 (7.1%), TSFM-15-5 (11.2%), ADV 6737 (5.9%), IAFM-2015-38 (4.9%) showed superiority over the best check. For DMY, in NEZ, AFM-6 (10.4%), H1003 (19.8%), and in south zone ADV-6737 (25.4%), TSFM-15-5 (18.4%), IAFM-2015-38 (17.6%), TSFM-15-2 (10.4%), IAFM-2015-48 (9.0%) and at national level, ADV-6737 (6.9%) was superior against the best check. In other zones and at all India level, either national check was superior or marginally inferior. For crude protein yield (q/ha), TSFM-15-2 was best followed by J1006 and AFM-6. For crude protein content (%), national check, J 1006 was the best followed by TSFM-15-2. For IVDMD (%), test entry H 1003 (59.6%) was best performer followed by J 1006 (58%).

COMBINED AVTM-1 & AVTM-2: An advanced varietal trial Combined first and Second Advanced Varietal Trial in Forage Maize in forage maize comprising four entries [**JHM 15-1** promoted from IVT to AVT-1; **MFM-4**, **PAC-746**, **AFM-4** promoted from AVT-1 to AVT-2] and two national checks viz., African Tall and J-1006 was conducted at 17 locations in four zones viz., Hill, North West, central and north east zone. For GFY, entry PAC -746 was superior by 22.6% in hill zone and 7.6% in NWZ. In NEZ, entries AFM-4 (6.4%), JHM 15-1 (5%), were superior over the best check. For DMY, entry PAC 746 was superior by 26.4% in NWZ and by 6.1% in NEZ. For per day productivity (q/ha/day), entry PAC-746 was superior for both green and dry matter. For CPY (q/ha), national check African tall was the best. For CP (%), and L/S ratio JHM 15-1 was best.

AVTM-2 (SEED): Three entries along with two national checks were evaluated for seed production potential at 5 locations. For seed yield, entry PAC-746 was the best showing 32.2% superiority over the best check. It was followed by entry MFM-4 showing superiority of 10.2% over the best check.

FORAGE PEARL MILLET

IVTPM: Ten entries along with two national checks and two zonal checks were tested at 20 centres located in four zones viz., North-West, North-East, Central and South zone. For GFY, entries TSFB-15-4 (8.3%), NDFB -1502 (6.0%) in NWZ; entries PHBF-4 (9.5%) in NE zone and entry TSFB -15-8 (9.3%) in South zone showed superiority over the best check. For DMY, entries TSFB-15-4 (7.8%) in north-west zone, PHBF-4 (7.8%) in North east zone, entries TSFB-15-8 (14.8%), NDFB-1502 (6.1%), in south zone, were better than the best checks. At all India level, entries, NDFB-1502 and TSFB-15-8 were superior by margin of 5.4% and 3.6% respectively over the best check.

For green and dry forage production (q/ha/day), entry TSFB -15-8 was best followed by NDFB -1502. In quality parameters, for crude protein yield (q/ha), entry NDFB 1502 ranked first followed by TSFB-15-8. For crude protein content, entry RBB-8 followed by PHBF-4 were best performers.

AVTPM-1: In forage pearl millet, five entries along with two national checks were evaluated at 12 locations in three zones, northwest, north east and south zones. For GFY, in south zone, entries TSFB-13-12 (12.1%) and TSFB-14-10 (2.9%) were superior. At all India level entry TSFB-13-12 showed marginal superiority (2.6%) over the best check. For DMY, the superior entries were RBB-6 (5.7%) in NWZ, TSFB-13-12 (20.8%), TSFB -10-5 (11.6%), TSFB-14-10 (5.6%) in south zone, TSFB-13-12 (5.7%) at all India level. For green and dry per day production, entry TSFB-13-12 was superior. For CPY (q/ha), RBB-6 and TSFB-13-12 were superior.

FORAGE COWPEA

IVTC: In forage cowpea, seven entries along with two national checks and five respective zonal checks were evaluated at 28 locations across the five zones. For GFY, In NWZ entry MFC-09-23 (11.8%), in south zone three entries viz., C-215 (18.9%), MFC-09-23 (16%), TSFC-11-6 (7.6%) and at all India level, entry MFC -09-23 (7.2%) was superior over best check. For DMY, in NWZ entry MFC-09-23 (12.2%), in NEZ entry TSFC -11-6 (6.7%) and in SZ entry C-215 (12.6%) and at all India level, entries MFC-09-23 (14.8%) and C-215 (9.1%) were substantially superior over the best check. For green and dry fodder production potential (q/ha/day), entry MFC-09-23 ranked first with 4.60 q/ha/day for GFY and 0.87 q/ha/day for DMY. For CPY, entry MFC-09-23 followed by C-215 were best performers with yield of 8.5 and 8.1 q/ha respectively. For CP (%), entry UPC 1601 ranked first (16.2%) followed by entry C-215 (15.7%). For other quality parameters, like ADF (%), NDF (%), IVDMD (%), entry UPC 1601 ranked first.

AVTC-1: six entries along with two national checks and zonal were tested at 28 locations in five zones. For GFY, in central zone, entry MFC-09-13 and in south zone entry Vellyani-1 showed substantial superiority by margin of 6.1% and 8.5% respectively over the best check. For DMY, in hill zone entry MFC 09-3 (28.2%), UPC-1501 (18.5%), TSFC-12-15 (18.2%), Vellayani-1 (8.5%), MFC-09-4 (7.5%) showed superiority over best check. In central zone MFC -09-13 (23.7%), Vellayani -1 (18.1%), TSFC -12-15 (10%), MFC -09-4 (5.9%), MFC -09-3 (1.9%) showed superiority. In south zone Vellyani -1 and UPC 1501 were superior by margin of 14.3 and 6.2 % respectively. At all India level, Vellayani-1 ranked first with 14.1% superiority followed by MFC-09-4 with 7.6 % superiority over best check. TSFC-12-15, MFC-09-13 and MFC-3 were also superior by margin of 7.0%, 7.0% and 5.8% respectively. For fodder production potential (q/ha/day), Vellayani -1 with 4.01 q/ha/day and 0.82 q/ha/day for green and dry matter respectively ranked first. For crude protein yield, entry Vellyani -1 ranked first with 7.8q/ha followed jointly by MFC-01-4 and UPC 1501 with 7.6 q/ha. For crude protein percent entry MFC-09-4 ranked first with 16.5% followed by MFC-09-3 (16.2%).

FORAGE RICEBEAN

IVT RICE BEAN: An initial varietal trial in forage rice bean with three entries along with three national checks was conducted at 9 locations. For GFY, entry JRBJ 07-4 and national check Bidhan -1 ranked jointly first with yield of 282.8 q/ha. For DMY, entry JOR 16-2 ranked first with 8.5 % superiority. For fodder production potential (q/ha/day), entry JOR-16-2 ranked first with yield of 3.28 and 0.74 for green and dry forage respectively. For CPY (q/ha) entry JRBJ 07-4 and JOR 16-2 ranked first and second respectively with yield of 8.1 and 7.9 respectively. For crude protein per cent, entry JOR 16-2 performed best (14%) followed jointly by JRBJ-07-4 and JOR 16-1 at 13.7%.

AVT-1 RICE BEAN: First advanced varietal trial with three entries along with three national checks was conducted at 9 locations. For GFY and DMY, per day productivity, entry JRBJ 07-1 showed marginal superiority over the best check. For plant height, entry JRBJ-07-1 ranked first (161.7 cm) and for leaf stem ratio, national check RBL-6 ranked first (0.82).

BAJRA- NAPIER HYBRID (PERENNIAL)

VTBN - 2013 (4TH YEAR): In Bajra x Napier hybrid, a varietal evaluation trial comprising of eleven entries was established during *Kharif*-2013. In 4th year, data revealed that for GFY, entry TNCN -1076 (15.3%) in hill zone, entry PBN -342 (9.8%) in NW, entry RBN 2011-12 (4.9%) in central zone registered superiority over the check. In North east zone RBN 2011-12 followed by PBN -346 and PBN 342 showed better performance over the check by margin of 29.5%, 14.5% and 11.5% respectively.

For DMY, in hill zone, entry TNCN -1076 (14.7%), entry PBN -342 in NW zone (13.6%) gave higher yield than check. In NEZ, RBN 2011-12 (36.6%), PBN-346 (23.9%), PBN-342 (18.5%), RBN-2010-y-1 (6.3%) were good performers. At all India level, RBN 2011-12 ranked first with 8.4% higher yield than check. For forage production potential (q/ha/day), entry RBN 2004-03 ranked first for both green forage and dry matter production potential. For crude protein yield, entry RBN -2011-12 was best, for crude protein content, entry DHN -15 (8.2%) ranked first.

VTBN-2015 (2ND YEAR): The trial was established in 2015 with nine entries including the checks. Data has been reported from 18 locations spread across five zones. For GFY, VTBN-2015-3 was highest yielder in hill zone and NE zone. In NW zone VTBN-2015-4 and in south zone VTBN-2015-2 were best yielders. VTBN-2015-1 performed best in Central zone and also at all India level. For DMY, VTBN-2015-3 in hill zone, VTBN-2015-4 in NW zone, VTBN-2015-6 in NE zone, VTBN-2015-5 in central zone, VTBN-2015-1 in south zone were highest yielders. At all India level VTBN-2015-2 was best (228.9q) followed by VTBN-2015-1 (217.6q). For CPY VTBN-2015-2 (14.9q) followed by VTBN-2015-1 (13.2 q) were best performers. For CP content VTBN-2015-2 ranked first. **[The trial will continue in coded form].**

DICHANTHIUM (PERENNIAL)

VT *Dichanthium*-2013 (4th YEAR): In *Dichanthium annulatum*, seven entries along with one check was established initially in Kharif-2013. In 4th year, data was reported from eight locations. For GFY, entry JHD 13-1 followed by JHD 13-2 showed better performance by margin of 8.6% and 6.1 % respectively over the check. In central zone, entries Marvel 09-4 ranked first with 14.3% margin followed by JHD 13-2 by 8.8% margins over the check. For dry matter yield (q/ha) entry JHD 13-2 in NWZ and entry Marvel 09-4 in Central zone and Marvel 09-1 in south zone were substantially superior over the check by margin of 11.3%, 13.5% and 30.1% respectively. For fodder production potential, entry JHD 13-2 for green forage (0.95q/ha/day) and dry matter production potential (0.26 q/ha/day) ranked first. For CPY, Marvel 09-4 (7.6Q) and JHD 13-1 (7.5 q) were good performers as compared to 6.4 q in check. For crude protein content (%), JHD 13-1 (7%) and check (6.%) were best performers. Marvel 06-40 ranked first for ADF and IVDMD (%).

CENCHRUS CILIARIS (PERENNIAL)

VTCC-2013 (4th YEAR): (PERENNIAL): In *Cenchrus ciliaris*, a varietal evaluation trial comprising nine entries was established in Kharif-2013. For GFY, entry RCC -10-6, RCC CS 10-4 and RCC CS-10-5 were superior by margins of 36.1%, 19.2% and 15.4% respectively over the check in North West zone. RCC -10-6 ranked first in Central zone followed by RCC-CS-10-8 showing superiority of 19.8 and 6.7% respectively. In South zone, entries RCC-10-8, RCC-CS-10-5, RCCB -04-64 and RCC -CS-10-8 showed superiority of 29.7%, 26.3%, 5.8% and 5.2% respectively over the check. At all India level, RCC -10-6, RCC 10-8, RCC-CS-10-4, RCC CS-10-5 performed better than check by margins of 20%, 7.8%, 6.5% and 5.3% respectively. For DMY, entry RCC-10-6 showed superiority of 31.2% in NWZ, 14.9% in CZ, 6.9% in SZ and 17.9% at all India level. RCC -CS -10-4 also showed better performance than check by margin of 27.6% in NWZ and 5.6% at all India level. RCC 10-8 was better than check in NWZ (6.8%), south zone (37.3%). RCC -CS -10-8 was better in NWZ (27.6%), in SZ (9.8%). For CPY entry RCC -10-6 (9.7q/ha) followed by RCC-CS-10-8 (8.8Q/ha) ranked first. For NDF (%), ADF (%), and IVDMD (%) entry RCC-CS-10-8 ranked first.

VT *Cenchrus ciliaris*-2015 (2ND YEAR): (PERENNIAL): The trial was established in 2015 with 9 entries at 12 locations in three zones. For GFY, entry VTCC-3 ranked first in NWZ, SZ and all India level with yield of 305.3 q, 821.2 q and 429.3 q/ha respectively. Entry VTCC -6 ranked first in CZ and second in NWZ and all India level. For DMY, entry VTCC -3 ranked first in NWZ, SZ and all India showing yield of 107.2 q, 166.7 q and 121.4 q/ha respectively. VTCC -9 ranked first in CZ and second in NWZ, SZ and all India level. For CPY VTCC-6 (5.6 q) and for crude protein content VTCC -1 (7.8%) ranked first. **[The trial will continue in coded form].**

CENCHRUS SETIGERUS (PERENNIAL)

VT *Cenchrus setigerus* -2015 (2ND YEAR): The trial was established in 2015 with 9 entries which include national checks. Data in 2nd year has been reported from 9 locations in 3 zones. For GFY, VTCS-15-4 ranked first in NWZ and central zone. VTCS -15-1 ranked first in south zone and at all India level. For DMY, entries VTCS -15-8 in NWZ; entry VTCS-15-3 in central zone; entry VTCS-15-1 in south zone and entry VTCS-15-3 at all India level ranked first. For green and dry matter per day productivity, VTCS-15-3 ranked first. For CPY (q/ha) VTCS-15-1 (6.5q) and for crude protein content VTCS-15-2 (7.7%) ranked first. For quality parameters like ADF (%), NDF (%), IVDMD (%), entry VTCS-15-1 ranked first. **[The trial will continue in coded form].**

SETARIA (PERENNIAL)

VT SETARIA GRASS -2015 (2ND YEAR): The trial was established in 2015. Data reported from 4 locations indicate that entry VTSG-5 was top performer for GFY (285.9q), DMY (84.1q), CPY (8.9q). For CP (%), VTSG-1 was best with 8.1% CP. **[The trial will continue in coded form].**

PENNISETUM HYBRIDS (PERENNIAL)

VT PENNISETUM HYBRIDS – 2015 (2ND YEAR): The trial was established in 2015. Data has been reported from 7 locations. For GFY, DMY entry VTPH-5 ranked first with 251.7 q, 59.8 q respectively. For per day production potential, entry VTPH-7 was best for both green and dry matter. For crude protein yield entry VTPH-5 was best followed by VTPH-8. For CP content, entry VTPH-10 was best (8.7%). For leaf stem ration entry VTPH-7 was best (1.02) followed by VTPH-1 (0.96). Entry VTPH-10 was best for NDF and IVDMD. **[The trial will continue in coded form].**

DESMANTHUS (PERENNIAL)

VT Desmanthus - 2016 (1ST YEAR): The trial was established in 2016. First year being the establishment year, results were reported from 7 locations in 3 zones. Entry VTD-3 ranked first in NW, CZ and at all India level for green fodder yield (q/ha). In south zone VTD-6 was best yielder. For DMY, entry VTD-5 in NWZ (16.4q), VTD-3 in CZ (50.6q), VTD-6 in SZ (78.2 q) and VTD-3 at all India level (44.9 q) were best performers. For per day productivity, entry VTD-1 was best for both green and dry fodder. For crude protein yield, VTD -3 was best (6.7q) while for crude protein content entry VTD-5 was best (16.9%). **[The trial will continue in coded form].**

B. FORAGE CROP PRODUCTION

The programme on forage crop production was conducted at 20 locations. In total 17 experiments were conducted, out of which 7 in coordinated and 10 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 as well as its nutrient management, response of Congo-signal grass to planting geometry and N levels, seed rate and sowing methods for multicut sorghum and pearl millet mixture, phosphorus management in sorghum-wheat-summer fodder cropping system, 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 and resource management in rice-oat cropping system under sodic soils. Besides above, Development of climate resilient production technologies for food-fodder based cropping systems, carbon sequestration studies, intensive forage production through Agase based cropping system in south zone, Phosphorus & Zinc application for higher seed yield and quality of dual cut cowpea, use of Zinc and Boron under red and lateritic soil to improve and standardization of seed priming technique for enhancing productivity of forage maize were also studied.

K-15-AST-10 C: Intensive Forage Production through Agase based (*Sesbania grandiflora*) cropping system under protective irrigation:

The field experiment was conducted at Mandya and Vellayani with objective to study the effect of cropping system on fodder yield, quality economic parameters and soil fertility. The results indicated that on locational mean basis, Napier Bajra hybrid (2:1) proved superior to other grasses. The green fodder productivity of the system was higher in agase + napier bajra (2:1) whereas, highest dry matter productivity was noted with Agase+ setaria (2:2).

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

The experiment was conducted at three locations to evaluate the performance of BN Hybrid grass (PBN- 233) under three moisture regimes and four straw mulch quantities.

The data revealed that on locational mean basis as well as at individual centres, 1.2 IW/CPE ratio recorded maximum green, dry matter and crude protein yields (1139.83, 204.43 and 19.33 q/ha), which were 18.5, 19.0 and 27.6% higher over 0.8 IW/CPE ratio. IW/CPE ratio of 1.2 also recorded maximum plant height Leaf: stem ratio, mean net return (Rs. 89636 per ha). But higher B:C ratio (1.75) was observed with 1.0 IW/CP ratio. Applications of straw mulch @ 10 t/ha proved significantly superior to control as well as 5 t/ha.

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

The experiment was executed at two locations to evaluate the performance of Congo-signal grass (*Brachiaria ruziziensis*) under different planting geometry and N levels and. Under rainfed, conditions 3 cuts were taken whereas, under irrigated conditions 5 cuts were taken. The planting at 60 cm x 60 cm recorded higher plant height, tillers/clump, green fodder/clump at each cut as well as higher GFY (332.96q/ha/year) and DFY (75.6q/ha/year). Significant improvement in GFY and DFY was recorded upto 30 kg N/ha as basal and after each cut.

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

A field experiment was conducted at Pantnagar, Ranchi, Kalyani, and Jabalpur to find out the suitable climate resilient production technology for higher profitability of grain – fodder based cropping systems. Conventional tillage and minimum tillage single passes of cultivator + sowing with seed drill proved superior. The minimum tillage recorded 8.9 and 8.3 % higher yield over zero tillage- (All the crops) and Zero tillage- minimum tillage-zero tillage. In terms of GFY, sorghum (fodder) – berseem – maize (baby corn) proved higher productive (1305.5q/ha). Minimum tillage single pass of cultivator + sowing with seed drill & Conventional tillage proved significantly superior to other treatments and recorded net monetary return of Rs 164379 and Rs. 154429 and B: C Ratio of 2.3, respectively.

K-15-AST-13 C: Performance of multicut sorghum and pearl millet mixture at various seed rates under different methods of sowing

The trial was conducted at Ludhiana and Palampur to find out suitable method of sowing mixture of sorghum and pearl millet with optimum seed rate. The results indicated that in terms of green and dry matter yields, at Palampur and on locational mean basis 25:75 Seed rate/ratio of sorghum: pearl millet remained superior to other treatments. Sole pearl millet and 25:75 Seed rate/ratio of sorghum: pearl millet exhibited higher yields. Line sowing proved superior to broadcasting in terms of green, dry matter and crude protein yields.

K-16-AST-3: Effect of Phosphorus & Zinc application and cutting management on fodder and seed yield and quality in dual cut cowpea.

The trial was conducted at Bikaner and Mathura to study the effect of P & Zn nutrition and cutting management on yield and quality of green fodder, seed and economics. The results indicated that P & Zn application @ 40 Kg P + 10 Kg Zn/ha recorded higher green, dry and grain yield over other two treatments except DFY which was at par with 20 Kg P + 5 Kg Zn/ha P & Zn application. Among the cutting for green fodder at 50% flowering + regrowth green pod recorded significantly superior green and dry matter yield of cowpea.

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

A field experiment was started during Kharif 2016 at Urulikanchan, Anand, Jabalpur, Kalyani and Bhubaneswar to study the effect of seed priming methods on germination, yield, and economics of forage maize. The results on locational mean basis indicated that all the treatments improved the green and dry biomass yield significantly over control. The treatments seed priming with ZnSO₄ @ 0.5 % for 6 hrs, seed priming with ZnSO₄ @ 0.5 % for 12 hrs, and seed priming with KNO₃ @ 0.5% for 12 hrs, remained at par with each other but significantly superior over rest of the treatments. As regards to economics of the production, seed priming with ZnSO₄ @ 0.5 % for 12 hrs recorded the maximum net return.

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

The field experiment was conducted at Rahuri to find out the optimum fertilizer dose for various BN Hybrid genotypes and to study the economics of different treatments.

Higher plant height, leaf: stem ratio, number of tillers per tussock (52.75) and tussock girth were observed in Phule Gunwant (RBN 2011-12). The Phule Gunwant (RBN 2011-12) recorded significantly higher green forage yield (1869.07 q ha⁻¹) and dry matter yield (452.8 q ha⁻¹). Application of 150% RDF recorded the higher plant height (143.69 cm), leaf: stem ratio (1.18), number of tillers per tussock (54.0) and tussock girth (125.23 cm).

K-12-AST-4: Cropping system studies in fodder maize with legume intercropping

The experiment was conducted at Srinagar to evaluate the forage production potential of maize and legume intercropping in terms of total dry matter production and maize forage quality. The mean data of three years revealed that the green fodder yield (487.66 q/ha) and dry matter yield (148.78 q/ha) of sole maize was significantly higher but at par with mixed intercropping of soybean in terms of GFY. The maize+ soybean mixed cropping were found superior over rest of the intercropping ratios but were at par with maize+ cowpea. All the treatments except sole maize showed positive balance of available nutrients that indicates the grass-legume association improves the soil health.

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

The experiment was conducted at Srinagar to study the effect of varying seed rate of forage legumes on productivity of fodder maize. The mean data of three years experimentation revealed that sole maize recorded significantly highest GFY (482.29 q/ha) and DMY (135.23 q/ha). Among varying seed rates, maize + cowpea @ 60 kg/ha showed significant increase of both the green fodder (340.25 q/ha) and dry matter yield (64.60 q/ha) over maize + cowpea.

K-15-AST-3 L: Studies on Integrated nutrient management in fodder rice bean

The experiment was conducted at Imphal with a view to study the effect of conjoint application of organic manure and inorganic fertilizers on forage yield and economics of fodder rice bean. The application of 50% RDF for phosphorus + 2 tonne poultry manure /ha recorded highest green fodder yield (385.61 q/ha), crude protein content (13.91%). It is also fetched highest net monetary returns (Rs 52551.57/ha/yr) and benefit cost ratio (2.14).

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

The trial was initiated at Hyderabad with the objective to study the organic matter input to soil through *Leucaena* based perennial fodder cropping system and to study organic matter partitioning added through the ROTH-C in existing Subabul based cropping system. The GFY and DMY were highest in APBN-1 intercrop (428.67 q ha⁻¹) and this was on par with intercrops of APBN-1 and *Desmanthus* in 3: 1 ratio under *Stylo* ground cover (365.63 q ha⁻¹). The total CO₂ sequestered by the crops in the silvipastoral cropping system was highest with APBN-1 as intercrop. The soil C sequestration was highest in *Cenchrus* + *Desmanthes* in 3: 1 ratio under *stylo* ground cover.

K-15 AST-8-7 L: 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 results indicated that NDFB-939 was superior in all parameters green fodder, dry matter and crude protein yields as well as per day productivity.

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 conducted at 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. Among the summer fodders, maize gave significantly higher green fodder (339.6 q/ha) and dry matter yields (86.6 q/ha). The response to phosphorus application was variable among different summer fodder crops. The fodder yield of maize increased significantly up to 50% of recommended dose of fertilizer, whereas, in pearl millet the response was significant up to 25% of recommended dose of fertilizer. The economic analysis of the experiment revealed that gross returns, net returns and benefit cost ratio were significantly higher in wheat-cowpea-sorghum cropping system than wheat-maize-sorghum and wheat- pearl millet -sorghum.

K-15-AST-8C: Compatibility of *Stylosanthes hamata* with *Sewan* (*Lasiurus indicus*) and *Dhaman Grass* (*Cenchrus setigerus*) in arid conditions

The experiment was conducted at Bikaner to study the effect of *Sewan* and *Dhaman* grasses, their combinations with *Stylosanthes scabra* on pasture establishment, growth and quality of fodder. *Sewan* grass as sole or with combination recorded the higher plant height, L:S ratio, shoot weight and shoot : root ratio. It also recorded highest total GFY, DMY and CP yields.

K-16-AST-9: Seed production potentiality of fodder maize as influenced by Zinc and Boron under red and lateritic soil of West Bengal

A trial was initiated at Sriniketan, West Bengal to study the seed production potentiality, seed quality and Economics of fodder maize as influenced by Zn and B application. The highest dry weight of cob was noticed with the application of Zinc @ 5.0 kg/ha (13.10 g). The highest seed yield was achieved with the application of 5.0 kg Zinc/ha (14.71 q/ha) which was significantly higher than all other levels of Zinc. Application of 1.0 kg boron/ha showed the highest seed yield (13.22 q/ha).

C. FORAGE CROP PROTECTION

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

During *kharif* 2016, study of population dynamics of important diseases and insect pest in *kharif* forages (sorghum, maize, bajra and cowpea and napier bajra) was carried out at several location.

Ludhiana

PEARL MILLET: At Ludhiana, Leaf spots (Blast) of Pearl millet on FBC 16 started appearing in second fortnight of August. Disease progressed till third week of October with favourable temperature range of 28.5 - 30.0°C and RH of 62-78 percent with maximum disease severity of 27.17 percent. The incidence of downy mildew was less on the recommended cultivars and varied from traces to 4.44 percent. On the susceptible check 7042, the incidence was 80.0%.

SORGHUM: At Ludhiana, *Cercospora* leaf spot appeared on SL44 variety in first fortnight of August in the crop sown during first week of June. Disease progressed till last week of October with percent severity of 49.95. During this period, 27.4 to 45.2 mm rainfall and moderate temperatures of 29.9°C with mean RH of 68-78 percent favoured the disease development. The occurrence of zonate leaf spot on SL 44 variety of sorghum was very less i.e. 17.67 per cent and appeared late in the season. Anthracnose on SL44 variety appeared in the last week of August and progressed till October with maximum severity (46.25 %) during second week of October.

MAIZE: Leaf blight Disease appeared in the third week of August on J 1006 variety and progressed up to first week of October with 37.74% severity (mean RH 68-78% and mean temperature 28.5 to 30.4°C). Thereafter, disease progressed at a steady pace with maximum disease severity of 46.62 %.

COWPEA: Incidence of root rot on CL 367 was in traces and mosaic was 12.22 per cent.

Entomological observations: At Ludhiana, during *kharif* season of 2016, in sorghum, sorghum shoot fly (*Atherigona soccata*) and maize borer (*Chilo partellus*) in maize were the predominant pests, whereas, rice grasshopper (*Hieroglyphus nigrorepletus*) was observed in BxN hybrid. The sporadic attack of cowpea pod borer *Maruca vitrata* was observed.

Dharwad: Aphid *Aphis craccivora* population was active during 30th to 35th Indian Standard Week (ISW) and reached peak population of 560.2 on on 33rd ISW i.e. during second week of August. Hairy caterpillar *Spilosoma obliqua* was highest of 8.4/plant on 30th ISW i.e. during last week of July. Highest incidence of Cowpea yellow mosaic virus (24%) was noticed during 32nd ISW i.e. second week of August.

Palampur: At Palampur Wilt-root rot complex (72%) and leaf sports & blight (35%) were the major diseases of cowpea, whereas pod borer and aphids were also observed with mild intensity (7%). In Maize leaf bights (20%) and BLSB (20%) were the major diseases along with stem borer with 9% incidence. Sorghum was severely infected with zonate leaf spot having 45 percent disease severity Leaf blight caused by *Helminthosporium* was observed moderate both in Sorghum and Bajra.

Hyderabad: The disease and insect pest incidence was not observed in Bajra crop, while in maize, the incidence of stem borer was observed with maximum of 8.2% incidence during 32nd std. week. The flee beetle infestation in Cowpea reached peak infestation of 26.8% during 37th std. week. The aphid population in cowpea recorded peak population of 55.8 per plant by 36th std. week. The yellow mosaic incidence in cowpea reached to peak (6%) by 40th std. week

Rahuri: During *kharif* 2016, very meager incidence/infestation of insect-pests and diseases were noticed throughout the crop period. The incidence of stem borer was negligible on maize (< 5%). In cowpea, low to moderate level of infestation of aphids per plant (range-7.13 to 19.67/plant) was noticed. Similarly, jassids population was also observed at low level (range-2.0 to 3.00/leaf). The population of coccinellids ranged 0.67 to 2.33 /plant on cowpea during the infestation of aphids. The symptom of yellow mosaic virus was found low. In pearl millet insect-pests and diseases were not observed.

Bhubaneswar: At Bhubaneswar, in Maize and Pearl millet, incidence of foliage feeder and leaf blight; increased with increase of temperature. In ricebean the incidence of leaf defoliators, Yellow mosaic, *Cercospora* leaf spot and root rot percentage increase with increase of temperature from 32.0-33.3°C and relative humidity 82-90.5%. In cowpea the incidence of cowpea aphid, flea beetle attack, yellow mosaic virus and root rot % increased with increase of temperature and relative humidity from 2nd July to 11th September.

EVALUATION OF KHARIF BREEDING MATERIALS FOR RESISTANCE TO DISEASES UNDER NATURAL CONDITIONS: various contributed entries alongwith national and zonal checks were screened for the occurrence of diseases and insect pests under natural conditions.

IVT in Pearl Millet: At **Rahuri**, all the entries were found resistant to rust. No other insect-pests and diseases were observed on any entries of pearl millet. At **Ludhiana**, in IVTPM, all the entries gave resistant reaction to *Pyricularia* leaf spot. There was no incidence of downy mildew and ergot disease. The population of grasshopper non-significantly varied from 3-6.33 adults per plant in different entries. At **Bhubaneswar**, entries Pusa Fodder Bajra-2 moderately susceptible to root rot and PHB-3144, Pusa Fodder Bajra-1, TSFB 15-4 and Giant Bajra (NC) are moderately resistant and rest all are resistant to root rot whereas all are resistant to defoliators.

AVT in Pearl Millet: At **Ludhiana**, all the entries showed resistant reaction to *Pyricularia* leaf spot. No downy mildew was observed in any one of the entries. The population of grasshopper varied non-significantly from 4.67-5.33 adults per plant in different entries. At **Bhubaneswar**, Only TSFB-10-5 was moderately resistant to Leaf blight where all are resistant to leaf spot and leaf defoliators

IVT in cowpea: At **Rahuri**, For **Aphid**, Less susceptible entries were PFC-40, Bundel Lobia-1 (NC), UPC-5286 (NC), UPC-9202 (ZC-CZ), PFC-39, MFC-09-15, MFC-09-23 whereas **Highly susceptible entries** were C-215, UPC-1601, TSFC 11-6. For **YMV**, Less susceptible entries were PFC-40, C-215, UPC-1601, Bundel Lobia-1 (NC), PFC-39, MFC-09-15, MFC-09-23 whereas **Moderately susceptible entries** were UPC-5286 (NC), MFC-09-23. At **Hyderabad**, significantly lowest flea beetle infestation was recorded in entry TSFC-11-6 (40%), while highest infestation was recorded in entry PFC-39 (62%). All the entries were found resistant with 1-2 score for the YMV incidence. At **Palampur**, entries UPC-5286 (NC), UPC-622 (ZC-HZ), TSFC-11-6 & MFC-09-23 for wilt/ root rot complex and C-215, UPC-5286 (NC) & MFC-09-15 for leaf disease were found moderately resistant. Other entries were susceptible either to root rot /wilt complex and leaf disease or both. At **Ludhiana**, all entries showed resistant disease reaction to cowpea mosaic and root rot incidence. The population of Bihar hairy caterpillar, *Spilosoma obliquan* varied non-significantly across different entries. The population of spotted pod borer *Maruca vitrata* per 5 pods of single plant varied non-significantly (3.67-6.33) in different entries. At **Bhubaneswar**, entries UPC 1601, PFC-39 and TSFC 11-6 are moderately resistant to root rot.

AVT-1 in cowpea: at **Hyderabad**, entry MFC-09-4 recorded significantly lowest infestation of flea beetle (50%). Aphid infestation non-significantly varies in the range of 7.3 - 16 per plant. All the entries showed resistance for Yellow Mosaic Virus. At **Rahuri**, all the entries were found less susceptible to aphids. For **Yellow mosaic virus**, all the entries were found resistant to yellow mosaic virus. At **Palampur**, the entries MFC-09-3, TSFC-12-15, Bundel Lobia-1 (NC), Vellayani-1, UPC-622 & UPC-5286 (NC) and MFC-09-3, UPC-622 and UPC-5286 (NC) were found moderately resistant to root-rot/wilt complex and leaf disease respectively, whereas other entries were susceptible either to root rot /wilt complex and leaf disease or both. At **Ludhiana**, all entries showed resistant disease reaction to cowpea mosaic and no root rot incidence was observed. The population of Bihar hairy caterpillar, *Spilosoma oblique* varied non-significantly from 0.6-1.33 across different entries. The population of spotted pod borer *Maruca vitrata* was quite high and varied non-significantly across different entries. At **Bhubaneswar**, all entries are resistant to flea beetle, cow pea mosaic virus and root rot

IVT in Maize: At **Rahuri**, all the entries were found resistant to stem borer. At **Palampur**, entries IAFM-2015-38 & African Tall (NC) gave resistant reaction and IAFM-2015-12 was susceptible. Other nine entries were found moderate resistant against leaf blights. At **Hyderabad**, the stem borer infestation in different entries ranged between 0.33 to 4.0 % infested plants /plot. Low stem borer infestation was observed in all the entries. At **Ludhiana**, entries AFM-6, H 1003, TSFM-15-2, KDFM-1, TSFM-15-5, IAFM-2015-12, J-1006 (NC) and African Tall (NC) showed moderately resistant disease reaction to maydis leaf blight. Rests of entries were moderately susceptible. The population of maize stem borer varied non-significantly from 10-14.43 per cent in different entries. No entry exhibited of resistance for shoot borer infestation. At **Bhubaneswar**, H 1003, KDFM-1, IAFM-2015-38, IAFM-2015-12 and J-1006 (NC) are moderately resistant to Maydis blight and all are resistant to Turicum blight

Combined AVTM Maize trial AVTM (1&2): At Rahuri, All the entries were found less susceptible to stem borer as these entries showed less than 3 mean leaf injury score. **At Palampur,** PAC-746 & African Tall (NC) were found resistant and MFM-4 was susceptible, whereas other 3 entries were found moderately resistant. **At Ludhiana,** all the entries were moderately susceptible to maydis leaf blight. The population of maize stem borer varied non-significantly from 13.33-16.663 per cent in different entries. No entry exhibited some degree of resistance for shoot borer infestation. **At Bhubaneswar,** J-1006 (NC) and AFM-4 moderately resistant to maydis blight and all are resistant to turicum blight

AVT-2 Maize (Seed): At Palampur, only PAC-746 was found resistant & others were moderately resistant. In general the leaf blight severity remained low during the season at Palampur. **At Bhubaneswar,** Only AFM-4 moderately resistant to maydis blight and all are resistant to turicum blight.

IVT in Rice bean- At Bhubaneswar, K-1 (Bidhan-1) (NC) is moderately resistant to Mosaic virus where all are resistant to leaf spot, flea beetle and mosaic virus

AVT-1 in Rice Bean - At Bhubaneswar, Only RBL-6 (NC) moderately resistant to mosaic virus and leaf spot and all are resistant to leaf spot and flea beetle

EFFICACY OF DIFFERENT BIO PESTICIDES AGAINST APHIDS ON FORAGE SORGHUM

At MPKV, Rahuri, Infestation of aphid was not observed throughout the crops period, hence the spray treatments have not been imposed

BIOLOGICAL MANAGEMENT OF DEFOLIATORS ON COWPEA

At MPKV, Rahuri, Infestation of aphid was not observed throughout the crops period, hence the spray treatments have not been imposed. **At IGFR RRS Dharwad,** Both the biological control agents *Beauveria basiana* @ 5 g (cfu 10⁶)/lt and *Nomurae relyi* @ g (cfu 10⁶)/lt and NSE 5% were on par with each other and superior over *Pseudomonas fluorescens* @5 g (cfu 10⁶)/lt in managing the defoliator *Spilosoma obliqua*. However, all the treatments were superior over untreated check. Similar trend was reflected in obtaining green forage yield dry matter yield. There was no significant change in the population of predators like Coccinellids and *Chrysoperla carnea* before and after the spray indicates that all the biological control agents were safe to the natural enemies.

EFFICACY OF DIFFERENT BIO PESTICIDES AGAINST APHIDS ON FORAGE COWPEA

At Hyderabad, Neem Seed extract 5% proved to be the best with 86.1% reduction over control in cowpea aphid population, followed by *B. bassiana* @ 10⁸ cfu/g (7.5g/l). Number of aphids per plant at 5 days after neem seed extract spray was 2.4. Number of coccinellids was not affected due to bio pesticides spray. Significantly higher green fodder yield (154.5 q/ha) was recorded in neem sprayed plot as against controlled plot (95.6 q/ha).

VALIDATION FOR MANAGEMENT OF ROOT ROT AND FOLIAR DISEASES OF FORAGE COWPEA

The experiment was conducted to validate the management technology for the foliar diseases of cowpea. **At Ludhiana, in Variety CL 367,** the root rot and mosaic incidence was less in plots treated with seed treatment with tebuconazole 2DS @ 1g/kg seed + NSKP (50 g/kg seed) with increase in yield. Disease incidence was less on third date of sowing. **At Palampur,** the highly effective treatment 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 was validated at three dates of sowing i.e. 4/06/16, 19/06/016 & 4/07/16 for the management of foliar diseases root-rot Anthracnose and leaf blight of cowpea. It was observed that root rot incidence and leaf blight severity was maximum in late sown crop, whereas Anthracnose was maximum in early sown crop. The maximum field was obtained in the normal crop with an increase of 39.11% over control as compare to early and late sown crop. The root rot was control by 69.7% in early sown crop followed by 62.5% in normal and 55.4% in late sown crop, however it was 68.0, 76.2 & 77.4 percent in anthracnose and 77.7, 76.6 and 72.3 percent in case of leaf blight respectively, in three dates of sowing. The validated treatment was found highly effective in foliar disease control and increase in the GFY in all the dates of sowing.

INTEGRATED MANAGEMENT OF BLSB OF FORAGE MAIZE

At Palampur, seed treatment with carbendazim was found highly effective with 92% disease control and 20% increase in yield over check. This treatment was followed by seed treatment with carbendazim and one spray each of carbendazim and *P. fluorescens* providing 79.5% disease control and 15.2% increase in yield over check. Seed treatment with *T. viride* alone and in combination with two sprays of *P. fluorescens* were also effective as compared to control and gave 30.6 and 45.4% disease control and 3.9 & 6.3% increase in the GFY over check, respectively.

(PERENNIAL)INTEGRATED MANAGEMENT OF FOLIAR DISEASES OF FORAGE SORGHUM

At Palampur, the experiment was conducted with 11 treatments for the management of Zonal leaf spot disease of Sorghum using bio-agent & chemicals. Seed treatment with carbendazim followed by two sprays of propiconazole was found highly effective which gave 89.9% disease control with 25.8% increase in the yield over check. This treatment was followed by seed treatment with *T. viride* and two spray of propiconazole which gave 87.9% disease control with 23.2% increase in the yield over check. Hence, the combination of bio- agent & chemical *i.e.* seed treatment with *T. viride* with one spray each of propiconazole and Achook (bio pesticide) was found effective in controlling of zonate leaf spot and gave 71.9% disease control with 20.6% increase in the field.

At Ludhiana, All the treatments were at par in terms of percent leaf spot severity. Minimum disease severity of 41.44 % was observed in seed treatment with carbendazim @ 2g/kg seed + one spray each with neem bio-pesticide (Achook) @ 3% and propiconazole @ 1g/lt followed by Seed treatment with carbendazim @ 2g/kg seed + two foliar sprays with propiconazole @ 1g/lt and seed treatment with carbendazim @ 2g/kg seed + two foliar sprays with propiconazole @ 1g/lt with per cent disease severity of 42.55 % each as compared to control (61.795). All these treatments also similarly showed increase in yield than check.

MANAGEMENT OF DOWNY MILDEW OF PEARL MILLET USING BIO AGENTS

At Ludhiana, in variety FBC 16, Downy mildew incidence was in traces and in some plots no disease was observed. Yield was maximum in plots sprayed with two foliar sprays of Ridomil MZ @ 2.5g/lt f(3.28 q/ha) followed by seed treatment with Metalaxyl @ 2g/kg seed (265.24 q/ha) as compared to check.

D. BREEDER SEED PRODUCTION

In *Kharif*-2016, the indent for Breeder Seed Production (Indent year *Kharif* 2017) was received from DAC, GOI for 6 varieties of three forage crops *viz.*, fodder Maize, fodder Pearl millet and fodder Cowpea. The total indent for breeder seed production was 93.25q, as against the 77.84q indent in *Kharif* 2015. The indent was allocated to seven SAUs/ICAR/NGO institutes. Maximum indent was for Maize (83.15 q) followed by Cowpea (9.10 q), and minimum was for Pearl millet (1.0 q).

Overall breeder seed production was higher in forage pearl millet and forage maize whereas it failed to meet the target in forage cowpea. In Maize, in case of African Tall the production was 3.5 q surplus whereas in J 1006 it was 6.85q surplus. In case of Pratap Makka Chari -6 the data is awaited. In Pearl millet production was 4.25 q surplus. In cowpea, production in UPC 8705 was 0.15q surplus whereas in EC 4216 it was 4.13 q deficit. The overall production was 11.4% higher than the indent. Many centers have also produced breeder seed of the varieties as well as surplus seed of previous years are also available totaling 8.71 q.

FORAGE TECHNOLOGY DEMONSTRATIONS

A total of 780 FTD's were proposed to be allotted to 20 AICRP centres and co-operating centre for conductance in 19 states during *Kharif* 2016 for the crops *viz.*, BN hybrid, sorghum, rice bean, maize, Pearl millet, Pearl millet + Cowpea, Setaria and guinea grass. Out of 780 FTD's, 255 were allocated to BN Hybrid, 31 to Rice bean, 169 to Maize, 50 to Pearl millet, 115 to Cowpea, 50 to Guinea grass, 60 to perennial grasses, 10 to Pearl millet + Cowpea and 40 to forage sorghum. 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 12 centres in 11 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.

Other Activities Kharif-2016**AICRP FC&U, AAU, ANAND****Research paper in journal**

- Kapadia VN, Saiyad MR, Raiyani AM and Bhalala KC (2016). Estimation of Heterosis for Yield and its Relevant Traits in Forage Pearl millet (*Pennisetum glaucum* L.R. BR.). *International Journal of Agriculture Sciences*, 8 (54): 2829-2835.

Symposia/ conference presentation:

- Patel PM, Shroff JC, Desai DH and Parmar HP (2016). Growing environment and Nitrogen Levels Influenced on Production and Quality of BN Hybrid CO-3. In: *International Conference on "Nutraceuticals and Functional Foods – The Challenges and Opportunities"* held at Anand during December 6-8, 2016
- Shroff JC, Patel PM, Padheriya DR and Parmar HP (2016). Crude Protein Yield of Multicut Forage Sorghum Influence by Nutrient Management. In: *International Conference on "Nutraceuticals and Functional Foods – The Challenges and Opportunities"* held at Anand during December 6-8, 2016

Book Chapter

- Parmar HP, Patel PM, Shroff JC and Saiyad MR (2016). Production Technology of Different Forage Crops Under Gujarat Condition. NGM Rabi-2016-17 – Souvenir

Popular articles: One

- Parmar HP, Kher HR, Patel MR and Patel PM (2016). "Gauchar matenu bahuvershau Anjan Grass" in "Krusha Vishaw" Gujarat Samachar Paper, 7 November, 2016.

Student guided

- M.Sc. – 5 [Plant Breeding (2); Agronomy (3)]

Teaching Courses

- GP-511: Breeding for cereals, forage and sugarcane.
- GP-515 (2+1): Maintenance Breeding and concepts of variety release and seed production.
- Agron. 509 (2+1) : Agronomy of fodder and forage crops.
- Agron-502: Principles and practices of soil fertility and nutrient management.

FTD conducted

- Hybrid Napier (CO-3) - 6, Fodder Bajra (GFB-1) - 5

TV/Radio talk or on line programme: One

- Importance of micronutrient in Forage crops – Phone in Live

Externally funded project: Two

- Development of pearl millet forage hybrid and pearl millet napier (PN) hybrid for high biomass and quality suited for different agro climatic zones of India (CGIAR – Dry land cereals) (Rs.1.74 Lakh).
- "Quality Seed Production in Fodder Crops" under Fodder Development Programme-RKVY (Rs.10 Lakh)

Extension activities

- Participated in "Krusha Mahotsav-2016" for dissemination of Forage technology.
- Delivered lectures in short term training programme of women organized by the Department of R.B.R.U., A.A.U., Anand.
- Lectures in *Rabi* and *Kharif*. Pre-seasonal training under T & V programme.
- Delivered lectures in short term refreshers training course organized by the Extension Education Institute, A.A.U., Anand.

AICRP FC&U, JNKVV, JABALPUR

Research paper in journal

- Verma AK, Naidu AK, Jain PK, Gontia AS, Mehta AK, Singh RP (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, Mehta AK, Avinash HA and Kumar Vinod (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 AK, Shrivastva Arti and Raguvanshi NS (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): 61-65.
- Pratik Sinodiya and Jha AK (2014). Effect of weed management control practices on nutrient uptake n fodder maize. *JNKVV Research Journal* 47 (2): 27-30

Important Persons visit

- Board Members of Vishwa Vidyalaya.
- Honorable Agriculture Minister
- High power committee of M.P. and MLAs
- Dr J. S. Sandhu DDG, Crop Science ICAR
- Dr. A. K. Singh, Vice chancellor RVSKVV, Gwalior

Students guided: M. Sc. - 1

FTDs conducted: 15 Maize (AfricanTall), Rice bean, Bajra Napier hybrid

TV/Radio talks: Radio talks = 1

AICRP FC&U, AAU, JORHAT

Research paper in journal

- Krishna Abhishek, Ahmed Shahid, Pandey HC, Kumar Vikas, Rai SK, Sharma KK, and Kumar Ashok (2016). Assessment of genetic characteristics in different lines of Oat (*Avena sativa* L.). *Agricultural Science Research Journal* 6(6): 145 - 151

Articles in souvenir

- Sharma KK, Levish Chongloi Kh. and Neog SB (2015) Production potentiality of forage crops in rice fallows in Assam. Souvenir, National Group meet, Kharif, 2015, AICRP on Forage Crops and Utilization held at PJTSAU, Hyderabad April 17-18, 2015

Extension leaflets

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

Student(s) guided: M.Sc. (Agri.) in 3 in PBG and in Agronomy-3; Ph. D in Agronomy- 2

No. of FTDs conducted: 40

TSP activities: Adopted 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: 2

Forage crops seed/planting materials supplied (2015-16)

SN	Forage crops	Total quantity (kg)		
		Total Slips (No)	Foundation seed	TFL seed
1.	Hybrid Napier CO-3,CO-4	1.2 lakh		
2.	Setaria Kazungula,PSS-1	1.5 lakh	-	
3.	Rice bean Var. Shyamalima		30 kg	
4.	Oat Var. Kent and JHO 822			4.00 q
	Grand Total	2.7 lakh	30.00 Kg	4.00 q

AICRP FC&U, TNAU, COIMBATORE

Research paper in journal

- Ramakrishnan P, Babu C and Iyanar K. (2016). Principal Component Analysis for Evaluation of Guinea grass (*Panicum maximum* Jacq.) Germplasm Accessions. *International Journal of Environmental & Agriculture Research* 6(2): 142-146.

Book chapter (with ISBN): 6

- Babu C, Iyanar K and Revathi S. (2016). 'High green fodder yielding new forage cowpea varieties'. In: Tamil Agricultural Science Conference, Coimbatore, August, 05&06, 2016. pp. 34-38 (ISBN: 978-93-842-34-59-1).
- Iyanar K, Babu C and Pavithra N. (2016). 'Fodder sorghum CO 31-A crop suitable for multiple ratoons'. In: Tamil Agricultural Science Conference, Coimbatore, August, 05&06, 2016. pp. 30-33 (ISBN: 978-93-842-34-59-1).
- Revathi S, Pavithra N, Sivakumar SD and Babu C. (2016). 'Forage quality parameters and procedure for estimation'. In: Tamil Agricultural Science Conference, Coimbatore, August, 05&06, 2016. pp. 118-123 (ISBN: 978-93-842-34-59-1).
- Karthikeyan BJ, Pavithra N and Babu C. (2016). 'A study on identification of low HCN types among sorghum germplasm'. In: Tamil Agricultural Science Conference, Coimbatore, August, 05&06, 2016. pp. 100-104 (ISBN: 978-93-842-34-59-1).
- Ramakrishnan P, Babu C, Iyanar K and Manivannan N. (2016). Genetic diversity studies in Guinea grass for fodder yield and traits. In: Tamil Agricultural Science Conference, Coimbatore, August, 05&06, 2016. pp. 127-132 (ISBN: 978-93-842-34-59-1).

Important persons visit to AICRP FC centre

- Mr. R.G. Chandramohan, M.D and Dr. John Niezen, Specialist, Dairy – Herd Development, Hatsun Agro Product Ltd., Chennai (26.08.2016)

Student(s) guided:

M.Sc. (Agri.) in PBG – 1; Ph.D. in PBG – 1

No. of FTDs conducted: 15

Training conducted for farmers/ NGO/ Govt. officials: 12

TV/ Radio talk delivered by AICRP-FC staff/ extension activities: 1

Forage crops seed production details (2015-16)

S. No.	Forage crops	Total TFL seed quantity (kg)
1.	Multicut fodder sorghum CO (FS) 29	166
2.	Multicut fodder sorghum CO 31	143
3.	Fodder maize- African tall	632
4.	Fodder cowpea CO 9	1.65
5.	Hedge Lucerne	377
6.	Subabul	24.8
	Grand Total	1344.45

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

S. No.	Crop	Planting material (Nos.)
1.	BN hybrid CO (BN) 5	5,50,594
2.	BN hybrid CO (CN) 4	660
3.	Guinea grass CO (GG) 3	5235

Externally funded project: 1

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

AICRP FC&U, BAIF, URULIKANCHAN

Awards and Honours

- Mr. P. S. Takawale, Forage Breeder & OIC is awarded with Membership Certificate by Bioinfo Publications and honoured as valued Reviewer of International Journal of Agriculture Sciences

Research paper in journal

- Takawale PS, Jade SS and Ghorpade SD 2016. Leguminous blocks: Nutritional values and Economics, *Agric. Sci. Digest.*, 36 (2): 149-151

FTDs conducted

- Twenty Field Technology Demonstrations of Hy. Napier and Bajra + Cowpea.

TSP activities: in two villages of Nandurbar district of Maharashtra. Total no. of participants is forty.

Activities	Objective
Supply of seed & other inputs, cultivation of green fodder of Maize & Berseem	To promote new crops & varieties of fodder crops for fodder and seed production
Provide diesel pump set, PVC pipes etc.	To generate water lifting mechanism for irrigation (individual/groups of farmers)
Distribution of bucks	To improve local goat breed with Osmanabadi breed.
Medicine kit	For Goats- preventive health, vaccination, deworming etc.

Training conducted for farmers/ NGO/ Govt. officials: 35 trainings were conducted and 512 participants attended the programme on "Cattle management and Fodder development" of period ranging from 1-3 weeks and organised by BAIF for the extension workers. The lectures on Fodder production technologies and visits to fodder demonstration plots were conducted by the Scientists working in AICRP on Forage Crops.

TV/ Radio talk delivered by AICRP-FC staff/ extension activities: Forage Breeder attended two meetings of Agricultural Advisory Committee for Krishidarshan Programme of Doordarshan Kendra, Pune (M.S.).

Seed/ planting material sold: The production of Foundation and Truthful seed production of improved varieties of fodder crops like maize, bajra, sorghum, cowpea, oat, lucerne, berseem was taken as institutional activity and in participation with the farmers. Technical support required for seed production programme was provided by the scientific staff of the projects.

AICRP FC&U, BCKV, KALYANI

Research papers in journal

- Roy DC and Jana K (2016). Biomass production and quality of berseem fodder (*Trifolium alexandrinum* L.) as influenced by application of phosphorus and phosphate solubilizing bacteria. *Advances in Life Sciences* (ISSN 2278-3849), 5 (4), 2016: 1225-1229.

Articles in souvenir

- Jana K, Kundu CK, Puste AM, Biswas S and Bandyopadhyay P (2016). Job's tear (*Coix* spp.): An important forage crop grown in marshy areas. Souvenir, National Group Meet, *Kharif*, 2016, AICRP on Forage Crops and Utilization held at SKUAT, Shalimar, Srinagar, May 16-17, 2016: 94-103.
- Jana K, Kundu CK, Sarkar S, Banerjee J and De DK (2016). Ricebean: Nutritionally rich grain legume and grown under diverse cropping system in drought prone areas of Indian sub-continent to maintain food security. Souvenir, National Group Meet, *Rabi*, 2016-17, AICRP on Forage Crops and Utilization held at KAU, Vellayani, September 5-6, 2016: 50-59.

Popular articles: 1 (in bengali)

Student(s) guided:

- M. Sc. (Ag.) in Agronomy - 4
- Ph. D. in Agronomy- 1

Teaching: Course No. 509, Agronomy of fodder and forage crops and other courses

FTDs conducted: 40 units (*Kharif*, 2016) - BN hybrid (cv. CO 3 & CO 4)-15 units, Ricebean (cv. Bidhan Ricebean 1 & Bidhan Ricebean 2) -15 units and Maize (cv. J 1006 & African Tall)-10 units, respectively.

TSP activities: 168 tribal families of Gram Panchayet: Arrah at Chhatna block and Gram Panchayet: Mankanali at Bankura-II block & Gram Panchayet: Bivarda at Taaldangra block of Bankura district and Gram Panchayet: Rautari of Chakdaha block & Gram Panchayet: Fatepur of Haringhata block of Nadia district of West Bengal has been identified for forage demonstration under TSP programme, 2016-17. Distribution of seeds of Ricebean (cv. Bidhan ricebean 1 & 2), fodder Maize (cv. Africal tall) & hybrid maize seed (cv. Nisha), forage Sorghum, Coix (cv. Bidhan coix 1) etc., Planting materials of Bajra-Napier hybrid (cv. CO 3 & CO 4), guinea grass, grass pea (cv. Nirmal & Ratan) and mustard seeds, fertilizers, *rhizobium* culture, plant protection chemicals etc. were done among tribal families for improving their livelihoods. Forage crops condition is very good under TSP programme.

Meeting cum Training conducted for farmers: 5 (Five)

Externally Funded Project: 1 (Private Company)

Participated in seminar/farmers' meeting etc:

Farmers Meet & training on forage production technology with tribal families/farmers

- at Arrah Gram Panchayet of Chhatna block of Bankura district on 28.07.16 during *kharif*, 2016
- at Bara Chaka village of Bankura-II block of Bankura district on 29.07.16.
- Farmers Meet & training with Women Self Help Group (SHGs) on forage production technology at Bab pur village, Santoshpur, Dist.- North-24 Parganas during *kharif*, 2016.
- at Rautari Gram Panchayet of Chakdaha block of Nadia district during *rabi*, 2016.
- at Bivarda Gram Panchayet of Taaldangra block of Bankura district on 17.11.16 during *rabi*, 2016.
- Participated in 'Annadata' programme of ETV Bangla on 'Forage production programme'.

Participation in National Seminar/ meetings

- National Seminar on 'Recent advances in statistical tools for agriculture and allied sciences' at FACC BCKV, Kalyani on 3rd -5th March, 2016.
- Attend Regional Coordination Committee Meeting of Regional Fodder Station, Kalyani, Govt. of India, at Kalyani, Nadia on 12.07.2016.
- Attend & lecture delivered in short term refresher training course on 'Feed and Fodder development' on 19.10.16 at Regional Fodder Station, Kalyani, Govt. of India.

Awareness development on 'seed production' of forage crops: Seed production of rice bean (cv. Bidhan ricebean1 and Bidhan ricebean 2) and maize (cv. J 1006 & African Tall) 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.
- Distribution of Ricebean seeds to farmers for popularizing as an under canopy legume crop in nutrient enrichment and fodder production in the Orchards.
- Trainings to the farmers of different districts of West Bengal.
- Provide seeds/ planting material to different institutions
- Distributions of leaflets on forage crops among the farmers

AICRP FC&U, KAU, VELLAYANI

Research papers in journal

- Ishrath PK and Thomas Usha C (2016). Effect of different additives on quality of hybrid napier silage. Advances in life sciences 5(12); ISSN 2278-3849, 5224-5226

Articles in souvenir

- Abraham M, Thomas Usha C, Anita MR and Sudrik BP (2016). Potential of guinea grass as a promising fodder crop in Kerala. Souvenir NGM Rabi 2016, ICAR & KAU, Vellayani
- Thomas Usha C, Ishrath PK and Thampi Akhila C (2016). Hydroponics fodder production. Souvenir NGM Rabi 2016, ICAR & KAU, Vellayani
- Thomas Usha C, Thampi Akhila C and Ishrath PK (2016) Magnesium nutrition in fodder crops, Souvenir NGM Rabi 2016 ICAR & KAU, Vellayani
- Anita MR and Lakshmi S (2016). Technologies for sustainable grass-legume fodder production in Kerala. Souvenir NGM Rabi 2016 ICAR & KAU, Vellayani

Popular articles

- Thomas Usha C, 2016. Fodder cowpea (Malayalam). Karshakan .pp 74-76

Student(s) guidance

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

Teaching- Courses

Dr. Mareen Abraham

- B. Sc (Ag) courses- Principles of seed technology(1+1)
- PG courses- Breeding of major crops (3+0)

Dr. Usha C Thomas

- B. Sc (Ag) courses- Irrigation and water management (Agro1203); Introductory Agriculture (1+0)

Radio Talks- 2

Trainings/ workshops organized-

- Two day National Group Meet Rabi 2016 of AICRP on Forage Crops & Utilization was organized during September 5-6, 2016

AICRP FC&U, NDUAT, FAIZABAD

Research papers in journal

- Yadav RS, Singh Bhagwan, Singh SP and Singh AK 2016. Production potential and economics of forage based cropping systems under sodic soils. Journal of AgriSearch. (accepted)

Articles in seminar/symposia

- Yadav RS, Singh Bhagwan, Singh SP and Singh AK 2016. Response of soil amendments on productivity of rice – Berseem cropping system and changes in soil properties of sodic soil. Abstract accepted for presentation in International seminar on “Recent trends and experimental approaches in science, technology and nature” organized by Society for Science and Nature at I.I.S.R. Lucknow December 23 -24, 2016.
- Yadav RS, Singh Bhagwan, Singh SP, Singh AK and Singh RP 2016. Effect of phosphogypsum on forage production of various cultivars of oats under sodic soils. Abstract in International conference on Sustainable Natural Resource Management from Science to Practice at B.H.U., Varanasi January 12 -13, 2017.

Courses taught:

- Agron 311(H) N-UG-Organic Farming
- Agron 516 (M.Sc.Ag) –Forage and Fodder Crops
- Agron 516 (M.Sc.Ag) –Agronomic Field Experimentation

Guided student: Mr. Mohan Singh MSc. (Ag.)

FTD conducted:

Forage bajra-NDFB-2 -5

NxB hybrid -NDHN-9 -5

Radio Talks - 1

AICRP FC&U, PAU, LUDHIANA

Research paper in journal

- Kapoor Rahul (2016) Variability and character association studies in fodder maize (*Zea mays* L.) hybrids. *Acta Scientifica Int. J. Agri.* (In Press)
- Kapoor Rahul and Choudhary Khushwant (2016) Genetic diversity analysis of fodder oats (*Avena sativa* L.) Germplasm by microsatellite markers. *J Agri Sci Tech* (In Press)
- Goyal M., Tiwana US and Bhullar MS. 2015. Nutritional evaluation of sugar beet (*Beta vulgaris* L.) genotypes as fodder. *Indian J Anim Nutr* 32: 237-241
- Tiwana US, Taggar GK, Upasana Rani, Singh Ajaib and Singh Pritpal. 2015. Evaluation of sorghum genotypes for fodder under different nitrogen levels. *Progressive Research* 10: 429-433
- Kaur R, Goyal Meenakshi and Tiwana US. 2016. Influence of seasonal variation on oxalate accumulation in Napier Bajra hybrid under different nitrogen nutrition. *Range Mgmt. & Agroforestry* 37 (1): 62-68

Book Chapters

- Kapoor Rahul (2016) Oats. In: Broadening the Genetic Base of Grain Cereals. Eds. Mohar Singh et al. Springer

Extension articles

- Bhardwaj Ruchika, Tiwana US, Srivastva M and Sohu RS. 2016. Successful cultivation of pearl millet. *Uttam Kheti* 13 (July – September), 2016 pp 17-19.
- Goyal, Meenakshi and Tiwana US. 2016. Anti-nutritional components in summer fodder crops. *Uttam Kheti* 13 (July – September), 2016 pp 22-23.

Souvenir articles

- Singla Ashesha, Kumar Ravinder and Twana Udham Singh. 2016. Biological control as promising alternative against diseases of fodder crops. *Souvenir: National Group Meet, Rabi 2016-17 of AICRP on Forage Crops and Utilization*, September 5-6, 2016 held at KAU, Vellayani (pp 79-83).
- Kumar Ravinder, Singla Ashesha and Twana Udham Singh. 2016. Eco-friendly pest management approach for different lepidopteran pests in berseem (*Trifolium alexandrinum* L.). *Souvenir: National Group Meet, Rabi 2016-17 of AICRP on Forage Crops and Utilization*, September 5-6, 2016 held at KAU, Vellayani (pp 84-87).

Students guided:

- M. Sc.: 5
- Ph.D.: 2

FTDs conducted: 112

- Napier Bajra Hybrid (PBN 233) = 54

TV/Radio talks:

- TV (2)
- Radio (2)

Seed/Planting material sold to farmers:

Crop	Variety	B/S (q)	F/S (q)	C/S (q)	TL (q)	Total (q)
Cowpea	CL 367	0.20	--	--	12.00	12.20
Guinea grass	PGG 518	0.20	--	--	1.00	1.20
Maize	J 1006	32.00	213.0	404.0	2578.0	3223.0
Bajra	FBC 16	0.20	1.80	--	61.00	62.80

External funded Projects: Two ongoing - PI Dr Rahul Kapoor

Project/ Scheme	Funding Agency	Budget
Alien genes introgression in oat by developing oat maize addition lines	UGC	9.31 Lacs
Development of Pearl millet forage hybrids and Pearl millet-Napier (PN) hybrids for high biomass and quality suited for different agro climatic zones of India	DCCG-CGIAR-2015	1.73 Lacs

AICRP FC&U, PJTSAU, HYDERABAD

Book chapters

- Shashikala T- Fodder Cultivation- Recent Trends In: training Manual on Feed & Fodder Development by Telangana State Management Institute for Livestock Development, Directorate of Animal Husbandry
- Shanti M. - Fodder Conservation- by in training Manual on Feed & Fodder Development by Telangana State Management Institute for Livestock Development, Directorate of Animal Husbandry

Research paper in journal

- Srinivas B, Shanti M And Satish Kumar T. 2016 Effect of sewage waters on production and quality of various forage crops under different nitrogen levels Green Farming Vol.1(1): pp 63-68.

Popular articles

- Susheela R, Shashikala T, Shanti M, Balajiji Naaiik RVT, Anuradha M (2016). Samvatsaram podavuna pacchimetha labhyataku bahuvarshika jonna-sagu. *Sthanika palana* Febraury, 2016
- Susheela R, Shashikala T, Shanti M, Balajiji Naaiik RVT, Anuradha M (2016). Samvatsaram podavuna pacchimetha labhyataku bahuvarshika jonna-sagu (Contd) *Sthanika palana* March, 2016
- Shashikala T, Shanti M, Susheela R, , Balajiji Naaiik RVT, Anuradha M (2016). Vesavilo pachimetha korata adhikaminchadaniki suchanalu. *Vyavasaayam.*, March, 2016
- Shanti M, Anuradha M, Susheela R, Shashikala T, , Balajiji Naaiik RVT (2016). Pasugrasa koratanu adhikaminchutaku soochanalu. *Vyavasaayam* Chaitanya sedyam Apl, 2016

Radio talks

- 17.2.16: Dr. T. Shashikala gave a talk in AIR, Hyderabad on :Pacchi meta korata adhigaminchadaniki soochanalu"
- 24.1.16: Dr. M. Shanti gave an interview on All India Radio on topic "Rythulu Illallo chesuko dagga pasuvula mepu, Daanaalu" which was broadcast on 24.1.16 in Illu-vaakili programme at 7.15 pm.
- 12.7.16 : Dr M. Shanti, delivered talk on "khariflo pasu grasala sagu-rakaalu " in All India Radio, Hyderabad

TV programmes

SN	Date	Speaker	Topic	Channel
1	6.6.16	Dr. T. Shashikala	fodder scenario in state of Telangana	ETV
2	9.8.16	Dr T. Shashikala	Perennial fodder crops	ETV
3	26.9.16	Dr T. Shashikala	Silage making	DD Yadagiri
4	29.9.16	Dr T. Shashikala	Suitable fodder crops for rabi season	DD Yadagiri
5	9.8.16	Dr T. Shashikala	Perennial fodder crops.	ETV
6	19.1.16	Dr. M. Shanti	Alternative fodder crops	Recording
7	19.1.16	Dr. M. Shanti	Need of soil testing and evaluation of soil test report.	
8	20.09.16	Dr. M. Shanti	Bajra Napier hybrids	HMTV
9	24.1.16	Dr. R. Susheela	Azolla	Recording
	24.1.16	Dr. R. Susheela	Bahuvarshika jonna-COFS-29 sagu vivaralu	Recording

Resource person/guest lectures:

- **12.01.16:** Dr. M. Shanti delivered a guest lecture to Agriculture polytechnique pass outs on major and micro nutrient deficiencies and evaluation of soil test report.
- **27.7.16:** Dr. M. Shanti visited RFS, Mamidipalli to address trainees on manures and fertilizers
- **12.8.16:** Dr. T. Shashikala delivered a Lecture on fodder production and conservation was delivered to Mandal Agricultural Officers undergoing training at EEI, R'nagar
- **24.8.16:** Dr. R. Susheela and Dr. M. Shanti delivered Lecture on fodder production and conservation to Mandal Agricultural Officers undergoing training at EEI, R'nagar.
- **22.9.16:** Dr. M. Shanti & Dr. R. Susheela delivered guest lectures on Recent Trends in Fodder Production at SMILDA, Directorate of Animal Husbandry.
- **27.9.16:** Dr. M. Shanti delivered a guest lecture on Soil Health, Micronutrient deficiencies and their rectification at CED (Centre for Entrepreneurship Development) at Pragati nagar

Meetings attended

- **7.5.16:** All the scientists attended ZREAC meeting, kharif 2016 at MGU, Nalgonda
- **10.5.16:** Dr T. Shashikala attended ZREAC meeting of CTZ, kharif 2016.
- **10.5.16:** Dr T. Shashikala attended ZREAC meeting, kharif 2016 at CTZ

- **17 & 18.6.16:** Dr. M. Shanti attended Indian Society of Soil Science Council meeting at IARI, N. Delhi
- **20.6.16:** Dr T. Shashikala participated in foundation seed production meeting organized at SRTC, R'nagar
- **16.7.16:** Dr Shashikala attended technical bid committee meeting at Directorate of animal husbandry, Telangana
- **20.9.16:** Dr T. Shashikala attended ZREAC meeting at Karimnagar.
- **4.10.16:** Dr T. Shashikala has participated in ZREAC-2016 meeting of central Telangana zone at RARS, Warangal
- **24.10.16:** Dr T. Shashikala, Dr Susheela have participated in ZREAC-2016 meeting of Southern Telangana zone at ZP Hall, Mahboobnagar

FTDs – Total 100 conducted – 25 each in Cowpea, Maize, Bajra, APBN-1

Tribal sub plan (TSP)

- 10 Tribal families in Girgaon, Tamsi (mandal), Adilabad Dist. were selected and distribution of inputs viz., fertilizer, seed etc. (Maize, APBN-1, Fodder Cowpea, Hedge lucerne) was carried out

Participation in national seminar/ symposia:

- **19.10.16 to 23.10.16:** Dr. M. Shanti visited RVSKVV, Gwalior for attending 81st Annual Convention of Indian Society of Soil Science. Served as rapporteur for Soil Fertility Session-I.

Students guided: M. Sc – 4.

Teaching Activities

- Dr. R. Susheela – PG course Agro 501
- Dr. M. Shanti – PG course EST-507 Title Waste Water Management.

AICRP FC&U, CSKHPKV, PALAMPUR

Research paper in journal

- Banyal DK, Sood VK, Singh Amar and Mawar Ritu. (2016). Integrated management of oat diseases in north-western Himalaya. *Range Management & Agroforestry* 37 (1): 84-87
- Bindra Shayla, Mittal RK, Sood VK and Sharma PN. (2016). Inheritance of resistance in urdbean (*Vignamungo*) to anthracnose caused by *Colletotrichum truncatum*. *Indian Phytopathology*. 69 (3): 311-313
- Chaudhary Jaya, Banyal DK and Sharma PN. (2015). Variability in *Phytophthora nicotianae* var. *Nicotianae* causing leaf blight and fruit rot on sweet pepper (*Capsicum annuum*) in North-western Himalayas. *Indian Phytopathology*. 68:172-178
- Sharma GD, Singh Jagmohan, Rana MC, Sankhyani NK, Kumar Naveen and Kumar Ashish (2015). Effect of plastic mulching, planting methods and fertility levels on growth and productivity of potato (*Solanum tuberosum* L.). 31 (1&2) : 35-40
- Katoch Rajan, Tripathi Ankur and Thakur Nisha (2016). Current perspective of plant protection strategies with the use of inhibitory proteins against insects. *Indian Journal of Agril. Biochemistry* (In Press).
- Katoch Rajan, Kumar Naveen, Tripathi Ankur and Singh Sunil Kumar (2016). Effect of seasonal variation in biochemical composition of fodder trees prevalent in the mid-hill region of Himachal Pradesh. *Range Management and Agroforestry*. (Submitted- MS-1601).
- Kumar Naveen, Sood B R and Kumar Sunil (2015). Performance of improved forage species under dry temperate conditions of North western Himalayas. *Haryana journal of Agronomy* 31 (1&2) 63-66
- Kumar Sunil and Kumar Naveen (2016). Study on the performance of vegetative barriers and improved forage species on productivity of degraded grasslands. *Journal of Agronomy and Soil*. JAC-05-2016-0228

Articles in souvenir

- Kumar Naveen and Guleria Gunjan (2015). Strategies for the management of grasslands in Himachal Pradesh. *Souvenir*, National Group Meet *Kharif* 2016 held at SKUAST Srinagar, May, 16-18, 2016
- Kumar Naveen, Sood VK, Banyal DK and Katoch Rajan. (2016). Pasture and grassland in Indian Himalayas- present status, improvement strategies, constraints and future prospects. *Souvenir- AICRP (FC &U) National Group Meet - Rabi* 2016 held at KAU, Vellayani, 5-6th September, 2016

Book Chapter

- Katna Gopal and Sood VK (2015). Plant genetic resources, traditional knowledge and their use in crop improvement. Springer Science-Business Media Singapore 2015. R.K. Salgotra and B.B. Gupta (eds.) Plant Genetic Resources and Traditional Knowledge for Food Security. DOI 10.1007/978-981-10-006-7-2
- Katoch Rajan and Singh Sunil Kumar (2016). Biotechnological interventions for improvement of plant nutritional value: From mechanism to application. *In* Phytonutritional improvement of crops, Nouredine Benkeblia eds. Wiley press, Southern Gate, Chichester, West Sussex (In press)

Manuals

- Agroclimatic Atlas of Himachal Pradesh (2016). Department of Agronomy Forage and Grassland management, CSK HPKV Palampur and Central Research Institute for Dryland Agriculture Hyderabad (Naveen Kumar - Contributed in the preparation of Atlas)

Courses taught

Course Number	Course Title	Credit hours
Agron 510	Agrostology and Agro-forestry	2+1
Biochem.351	Biochemistry	2+1=3
Biochem602	Advanced Molecular Biology	3+0=3
GP 509	Biotechnology for Crop Improvement	2+1
GP 607	Breeding Designer Crops	1 + 1
LPM 121	Fodder Production and Grassland Management	1+1
PI Path 518	Epidemiology and Forecasting of Plant Diseases	2+1=3
PI Path 605	Principles and Procedures of certification	1+0=1

Students guidance

- 12 (as major advisor) ; 22 (Member advisory committee)

Forage technology consultations - 8

Lectures delivered to farmers and development officers – 3

Tribal Sub plan: Seed/seedling, agrochemicals supplied to 40 families' selected in Baijnath block . About one ha community land infested with Lantana and Eupatorium has been made free of weeds in the village

Linkages

- CORD–“Chinmaya Organisation of Rural Development”, Tapovan, Dharamshala
- Society for Environmental & Rural Awakening (ERA), Khudian, Distt Kangra
- IVRI Regional Research Station Palampur
- AICRP (IFS)
- AICRP (Agroforestry)

Association in Adhoc Projects

- Scientists associated in 4 Ad hoc projects
- Two new project proposal submitted

Resource generation (Mega Seed Project- Forage)

- Rs.4,32,000/- (April 2016 to October 2016)

Participation in seminars and symposiums /trainings

- Two days seminar on *Krishi Anusandhan and Takniki Shabdabali*, organized by GOI, HRD ministry at Palampur on 19-20th May 2016

AICRP FC&U, GBPUAT, PANTNAGAR

Research paper in journal

- Pal MS and Meena D 2016. Productivity, economics and quality of baby corn (*Zea mays* L.) under different planting geometries and nutrient management practices in Indo-Gangetic plains of India. *Indian Journal of Plant & Soil* 3(2): 57-59.
- Bhatnagar A, Pal MS and Singh G 2016. Influence of weed management on growth and productivity of maize (*Zea mays* L.) and residual effect on succeeding wheat (*Triticum aestivum* L.). *International Journal of Basic & Applied Agricultural Research* 14(2): 152-157.
- Prasad Birendra, Kumar Amrendra, Singh Ajay Veer and Kumar Amarjeet 2016. plant growth and seed yield attributes as influenced by bacterial isolates under glass house. *Progressive Research* : 2573-2576.

Books edited

- Prasad Birendra and Kumar Udit. 2016. Innovative Agriculture Techniques and Practices. BioTech Books, New Delhi, pp 417, ISBN 978-81-7622-382-9.
- Shukla, PS and Prasad Birendra. 2016. National Conference Souvenir Aadhunik Krishi vigyan avam prodhougiki ke samgatisil vikas par jalwayu parivartan ka prabhav. PP69, held at College of Agriculture, GBPUAT, Pantnagar during December 16-17,2016.

Book Chapters in : Prasad, B., Kumar, U. ed. Innovative Agriculture: Techniques and practices, pp-ISBN 978-81-7622-382-9. BioTech Books, New Delhi

- Singh Mithilesh Kumar, Kumar Amarjeet, Prasad Birendra and Kumar Anil. 2016. B Chromosome: Makes the plant different. I, pp 55-64.
- Singh Mithilesh Kumar, Kumar Amarjeet, and Prasad Birendra. 2016. Significance of Cytoplasmic DNA in Plant Breeding. pp 65-73.
- Kumar Amarjeet, Prasad Birendra, Singh Mithilesh Kumar and Kumar Anil. 2016. Flor's Hypothesis : Implications in Disease Resistance Breeding. pp 107-118.
- Kamat DN, Prasad Birendra, and Kumar Amarendra. 2016. Molecular Approaches in breeding for abiotic stress tolerance. pp 119-146.
- Kumar Amarjeet, Singh Mithilesh Kumar and Prasad Birendra. 2016. Enhancing Crop Gene Pool Using Wild Relatives. pp 147-170.
- Shah Shachi, VenkatRamanan and Prasad Birendra. 2016. Organic Agriculture for sustainability Food security under resilience changing climate. pp 171-184.
- Chandra Girish, Prasad Birendra and Kumar Udit. 2016. Allelopathy: Boon or curse for agricultural crops.. pp 321-332.
- Gunjan Adhikari, Hussain Mustaffa and Prasad Birendra. 2016. Agri-preneurship appraisal issue and challenges. pp 399-408.

Presentations in Conferences/ Symposia etc.

- Pal MS 2016. Present Status and Sustainable Management of Grasslands in Indian Himalayas. 10th *International Rangeland Congress* held on 17-22 July 2016 at Saskatoon, Canada.
- Pal MS 2016. Productivity and quality of range grasses and traditional forage crops in Tarai region of Indian Himalayas. 10th *International Rangeland Congress* 17-22 July 2016 at Saskatoon, Canada

Popular Articles

- Pal MS and Jain SK. 2016. Increase milk production from green fodder of berseem. *Kisan Bharti* 49 (1): 38-41.

Abstracts

- Prasad Birendra, Kumar Amrendra, Singh AV and Kumar Amarjeet. (2016). Seed germination and Seedling vigour as influenced by bacterial isolates seed inoculation. Published in National Conference Souvenir Aadhunik Krishi vigyan avam prodhougiki ke samgatisil vikas par jalwayu parivartan ka prabhav. PP51, held at College of Agriculture, GBPUAT, Pantnagar during December 16-17,2016.

Radio Talks =07

- M S Pal (03) J S Verma (03) B Prasad (01)

Seminar organized =01

- National Conference conducted as Co- organizer on Aadhunik Krishi vigyan avam prodhougiki ke samgatisil vikas par jalwayu parivartan ka prabhav. held at College of Agriculture, GBPUAT, Pantnagar during December 16-17,2016.

Course Taught

Scientist	Courses taught
Dr M S Pal	1. Irrigation Water management (UG) Course No. APA-317 2. Seminar (APA 600 M Sc), (APA 788 & 789-Ph.D)
Dr J S Verma	1. Hybrid Seed Production (AGP/AST-701) 2(1-0-3) 2. Advances in Seed Science Research (AST-705) 1(1-0-0)
Dr B Prasad	3. Hybrid Seed Production (AGP/AST-701) 2(1-0-3) 2. Advances in Seed Science Research (AST-705) 1(1-0-0) 3. RAWA (BSc Ag) (ARE-390) 4. Seed Production, Plant Breeders' and Farmers' Right (AGP-356, 2-0-1)

Lectures delivered = 07 on 'Forage Production' in farmers' organized by Directorate of Extension

Important Visitors

- Dr P. S Negi, Scientist, DRDO, Pithoragarh,
- Dr. Harish Guleria, Officer In charge, Haldwaini Range, WWF,
- Co. M K Bhatnagar, Officer In charge, NCC, GBPUAT, Pantnagar,
- Dr. T. L. Singh, Progressive farmers, Uttarakhand.

AICRP FC&U, IGKV, RAIPUR**RESEARCH GUIDANCE**

- PG Number of student registered 2 (as major advisor) and 2 (as committee member)

Other Projects, Activities, other than AICRP Programme

SN	Title	PI	Funding	Budget (Rs.)
1	Round the year fodder availability cropping modules for 19 KVK's	SK Jha	VV fund	50000
2.	Hydroponics fodder production, evaluation, standardization and demonstration under Chhattisgarh condition.	SK Jha	VV fund	500000
3.	Exploration, Maintenance, evaluation and storage of forage germplasm of Chhattisgarh	Mayuri Sahu	VV fund	40000
4.	Evaluation of ago-techniques for casiatora production in up and waste land	SK Jha	VV fund	20000
	Total			6.1 lakhs

TV/ Radio talk delivered by AICRP-FC staff/ extension activities:

- Lecture delivered to farmers and developmental officers
- 1 Radio talk

Participate in registration committee in State level Alsi Diwas & Prashikhan Sah Sangosthi on 11/03/2015

Seed Production

- Perennial sorghum COFS-29- 40 Kg (TL)

AICRP FC&U, UAS, ZRS, MANDYA

Research paper in journal

- Shekara BG, Lohithaswa HC, Chikkarugi Nagesh, Krishnappa MR and Manasa N. (2016) Enhancing Productivity of Fodder Sorghum under Saline-Alkali Soils in Cauvery Command Area. *Environment & Ecology* 34 (1A): 388-390.
- Shekara BG, Lohithaswa HC, Chikkarugi NM and Manasa N. (2016) Intensive Forage Production through Silvi-Pasture System under Rainfed ecosystem. *Environment & Ecology* 34 (4D): 2617-2620.
- Shekara BG, Lohithaswa HC, Chikkarugi NM and Manasa N. (2016) Fodder production potential of maize grown for baby corn and green cob. *Research Journal of Agricultural Sciences* 7(2): 425-427.

Extension Folders in Kannada:2

- Lohithaswa HC, Shekara BG, Mahadevu P, Chikkarugi Nagesh and Manasa N (2016) Paustidayak Mevin Bele Alasande.
- Shekara, Mahadevayya, Dinakar HP, Mahadevu P, Chikkarugi Nagesh and Manasa N (2016) Sangrahana BG Vidhanagalu hagu ona mevu paustikaran.

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

Important persons visit

- Dr. H. Shivanna, Honorable, Vice Chancellor UAS, GKVK, Bengaluru.
- Dr. N. R. Gangadharappa, Director of Research, UAS, GKVK, Bengaluru
- Dr. K. Jagadeeshwara, Director of Extension, UAS, Bengaluru.
- Dr. D. P. Kumar, Director of Education and Registrar, UAS, Bengaluru
- Team of Accreditation.

Student(s) guided: Ph.D. (Agri.) in Agronomy- 1

No. of FTDs conducted: 46

S. No.	Crop	Variety	Numbers
1	Guinea grass	JHGG-08-1	6
2	Fodder Cowpea	MFC-08-14	10
3	Fodder Maize	African tall	10
4	Bajra	BAIF Bajra	10
5	Napier X Hybrid Bajra	Co-3	10

Training conducted for farmers/ NGO/ Govt. officials:

- 3-Training programme & 9-Field days

Training attended

- Dr. P Mahadevu, attended winter school on "Integration of conventional and biotechnological approaches for improvement of dual purpose crops and grasses", January 28 to February 17, 2016, at IGFRI, Jhansi

TV/ Radio talk delivered by AICRP-FC staff/ extension activities: 25

seed/ planting material sold

S. No.	Forage crops	Planting Material Sold (In Lakhs)
1.	Napier Bajra Hybrid (Co-3)	0.60
2	Guinea grass (JHGG-08-1)	0.25
3	Rhodes grass (Selection)	0.15
4	Signal grass (Selection)	0.10

Externally funded projects:

GOK projects - Maintenance breeding of Fodder cowpea varieties (KBC-2, MFC-08-14, MFC-09-1).

RKVY projects - Augmenting Fodder Production and establishing fodder seed bank at University of Agricultural Sciences, Bangalore (2013-14) (RKVY project) with budget outlay of 100 lakhs.

- Enhancing quality seed production in important fodder crops and demonstration of production technologies and low cost forage equipments to accelerate fodder production in Karnataka with budget outlay of 50 lakhs.

AICRP FC&U, CCS HAU, HISAR

Research papers in journals

- Jindal Y, Phogat DS, Joshi UN and Mall AK (2016). Forage maize genotypes performance for fodder yield and its attributes with quality parameters at Hisar and all-India level. *Forage Res.*, 41 (4): 208-211.
- Jindal Yogesh, Arora RN, Phogat DS, Pahuja SK, Midha LK, Gandhi SK and Joshi UN (2016). OS 377– A new forage single-cut oat variety for the central zone of India. *Forage Res.*, 41 (4): 242-245.
- Jindal Y and Joshi UN (2016). Sustainable utilization of forage resources for animal and human nutritional security” in Haryana. Paper published in Souvenir during “National Group Meet” (Kharif 2015) of AICRP (Forage Crops) at SKUAST, Srinagar held from 16-18th May, 2016 pp 76-88.
- Godara AS, Satpal, Joshi UN and Jindal Y (2016). Response of berseem (*Trifolium alexandrinum* L.) genotypes to different phosphorous levels. *Forage Res.*, 42 (1): 40-43.

Popular Articles

- Sheoran RS, Satpal and Jindal Yogesh (2016): Makchhari: der tk hara chara dene wali fasal (मकचरी: देर तक हरा चारा देने वाली फसल) in Haryana Kheti: 49 (5): 29
- Jindal Yogesh and SK Pahuja (2016): Shushk evm ardh shushk kshetro ke liye – Anjan Ghaas (शुष्क एवं अर्ध शुष्क क्षेत्रों के लिए - अंजन घास) in Haryana Kheti: 49 (5): 30
- Jindal Yogesh and Pahuja SK (2016): Napier Bajra sankar ghaas (नेपियर बाजरा संकर घास) in Haryana Kheti: 49 (5): 32

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: M.Sc.

Name of Student	Research Title	Guide
Tanvi Kumari	Evaluation and Characterization of Oat genotypes (<i>Avena</i> sp.) for morphological, fodder and grain yield traits	Dr Y Jindal
Priyanka	Chemical weed control studies in Egyptian clover	Dr RS Sheoran

Research projects sanctioned during 2014-15: One Project approved for two years.

Title of the project	PI	Budget	Funding Agency	Status
Farmers' trainings on scientific cultivation of forage crops to ensure quality seed production	Dr. S.K. Pahuja Co-PI: Dr. Yogesh Jindal	52.00 Lakhs	RKVY	Farmers Trainings in 20 districts

Research projects sanctioned during 2016-17: One

Title of the project	Principal Investigator	Budget	Funding Agency	Status
Development of oat (<i>Avena</i> sp.) genotypes with higher yield and nutritive value	Yogesh Jindal (GPB) & Jayanti Tokas (Bio-chemist)	10.00 Lakhs	CCS HAU Ad-hoc Project	applied

Extension activities - *kisan mela*, farm darshan, T & V training system on monthly basis and farmers visits

Trainings conducted:

- ❖ **Three day certificate Programme on feed & fodder development** (from 21 to 23 September, 2016) 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

Date	Topic	Speaker
21.9. 2016	Importance and production of high yielding and multicut fodder crops for higher fodder production	Dr. S.K. Pahuja
	Mitigation of climate change related to feed and fodder	Dr. Satpal
	Nutritional quality of different fodder crops and their toxic constituents	Dr. U.N. Joshi
	Efficient utilization of crop residues	Dr. Yogesh Jindal
22.9. 2016	Scenario of fodder resources in India, constraints in forage/fodder seed production and future thrust areas	Dr. R.S. Sheoran
	Importance of intercropping of legumes in cereal fodder crops/grasses	Dr. Ravish Panchata
	Stage of harvesting of fodder crops with maximum fodder yield with best nutritive value and less toxicity	Dr. Satyawana Arya
23.9. 2016	Seed production of high yielding and multicut fodder crops/grasses	Dr. D.S. Phogat
	Crop rotations for round the year green fodder availability	Dr. Pummy Kumari
	Grassland improvement and its management	Dr. R.S. Sheoran
	Silvi-pastoral systems for gochar and waste lands to get maximum fodder per unit area	Dr. Satpal

RKVY Project

Title of the project: **"Farmers' trainings on scientific cultivation of forage crops to ensure quality seed production" for Two years (2015-16 and 2016-17)**

Activities during 2016-17: During 2016-17 also, twenty farmers trainings were organized in twenty districts of Haryana and 1200 farmers were benefited from these trainings.

Publications from RKVY Project:

Seven different pamphlets (in Hindi) were published which were distributed to the farmers:

1. Pahuja SK, Arya Satyawana, Kumari Pummy and Satpal (2016). *Jawar ki unnat kisamon ki samagr sifarisen*. TB/2015-16/FC/01.
2. Khatri RS, Panchata Ravish, Satpal and Pahuja SK (2016). *Guar: Barani kheti ka sona*. TB/2015-16/FC/02.
3. Sheoran RS, Satpal, Kumari Pummy and Pahuja SK (2016). *Pashuon ko pura saal hara chara uplabdh karwane hetu fasal chakar*. TB/2015-16/FC/03.
4. Phogat DS, Jindal Yogesh, Panchata Ravish and Pahuja SK (2016). *Lobia: Garmi ke mausam ka hara sona*. TB/2015-16/FC/04
5. Jindal Yogesh, Phogat DS, Sheoran RS and Pahuja SK (2016). *Berseem: sardiyan ka behatreen hara chara*. TB/2015-16/FC/05.
6. Phogat DS, Jindal Yogesh, Sheoran RS and Pahuja SK (2016). *Jai: Sardiyan ka badhiya hara chara*. TB/2015-16/FC/06.
7. Sheoran RS, Sihag Sajjan, Kumari Pummy, Satpal and Pahuja SK (2016). *Hare chare se 'silage' evam 'hey' banana*. TB/2015-16/FC/07.

Two booklets were also published and distributed to the farmers:

1. Pahuja SK, Khatri RS, Phogat DS, Sheoran RS, Jindal Yogesh, Arya Satyawana, Kumari Pummy, Satpal, Panchata Ravish and Tokas Jayanti (2016). *Chaara fasllon ki Unnat Prodyogikiyan*. 36p. TB No. 08/2015-16.
2. Pahuja SK, Khatri RS, Phogat DS, Sheoran RS, Jindal Yogesh, Arya Satyawana, Kumari Pummy, Satpal and Panchata Ravish (2016). *Chaara fasllon ki Unnat Kismein/Improved varieties of fodder crops*. 32p. TB No. 09/2015-16.

AICRP FC&U, MPKV, RAHURI

Research papers in journals

- Damame SV, Naik RM, Chimote VP and Munjal SV 2016. Molecular analysis of rabi sorghum genotypes differing in osmolytes accumulation under water stress. Intl. J bio Resco. Stress Magn. 7(5): 1120-1127. DOI: 5958/0976-4038.2016.00197.4
- Damame SV, Gore SB and Sonone AH 2016. Nutritional composition of common foder leaves from Maharashtra state. Biofolet 13:394-397
- Gore SB, Damame SV and Deokar DK. 2016. Palatability and nutritional composition of some cereal forage varieties grown in Maharashtra. Biofolet 13: 90-91

Popular articles

- Damame SV, Gore SB Tambe AB, Sonone AH 2016. Trees as source of fodder for livestock in Maharashtra. AICRP- Forage Crops NGM- Kharif -2016 Souvenir: pp-89-93
- Damame SV, Gore SB, and Sonone AH 2016, ' Phule Gunwant (RBN-2011- 12): A new nutritionally superior hybrid napier cultivar for Maharashtra. AICRP- Forage Crops NGM- Rabi -2016, Souvenir: pp-42-43

Visits of important persons:

- Dr. K. P. Viswanatha, Hon. Vice Chancellor, Mr. Eknath Daule, Divisional Commissioner, Nashik, Mr. Anil Kawade, Collector, Ahmednagar, Mr. Shailesh Nawal, CEO, Z.P., Ahmednagar, Dr. K. D. Kokate, DEE & DR and Dr. B. R. Ulmek, Dean, F/A, MPKV, Rahuri visited the project on 01-04-2016.
- Dr. K. P. Viswanatha, Hon. Vice Chancellor, Dr. K. D. Kokate, DEE & DR, Dr. B. R. Ulmek, Dean, F/A and Head, Department of Botany, MPKV, Rahuri visited the project on 01-07-2016

Courses taught:

Prof. A. H. Sonone

Principles of Genetics

$$2+1=3$$

Students guided:

1. Plant Breeding	:	Prof. A. H. Sonone	02
2. Plant Breeding	:	Prof. P. P. Surana	02
3. Agril. Entomology	:	Dr. A. B. Tambe	01
4. Agril. Biochemistry	:	Dr. S.V. Damame	01
5. Agronomy	:	Dr. B.T Sinare	02

TSP activity: The tribal sub plan was implemented at village Dhulipada, Post Dhanrat, Taluka Navapur, District Nandurbar on 27-07-2016 as below. Stylo seed (80 kg), BN hybrid var. Phule Jaywant rooted slips (40000), Laxmi sickle (40), Maize sheller (40) were distributed to 40 beneficiaries along with literature and methodology.

Lectures/trainings to farmers/NGO's/Govt. officials: 7

Seed production

Sr. No.	Crop	Variety	Stage	Area (ha)	Raw yield (Q)
1	Maize	African Tall	Breeder	3.10	Approx. 20.00
2	Bajra	Giant Bajra	Nucleus	0.10	0.02
3	Bajra	Giant Bajra	Breeder	0.10	0.10
4	Bajra	Giant Bajra	Truthful	0.40	1.25
5	Cowpea	Shweta	Nucleus	0.05	0.02
6	Cowpea	Shweta	Breeder	0.05	0.03
7	Cowpea	Shweta	Truthful	0.20	0.00
8	B x N Hybrid	Phule Jaywant	Truthful	1.00	1,30,250 sets
9	B x N Hybrid	Phule Gunwant	Truthful	0.20	New plantation

Externally funded projects/ Product testing:

SN	Name of company	Parameter	crop	product	Season	Fees Rs.
1	Bisco Bioscience, Hyderabad	Fodder Quality	Maize	12 Hybrids	Summer 2016	24000/-
2	Syngenta India Ltd., Pune	Fodder Quality	Sorghum	12 Hybrids	Kharif 2016	21000/-
3	Green Pride PVT. Ltd., Aurangabad	Varietal testing	Sorghum	1 Hybrid at 3 locations	Kharif 2016	1,50,000/-
4	Ajit Seeds, Aurangabad	Fodder Quality	Sorghum	34 samples	Kharif 2016	17000/-

AICRP FC&U, SKRAU, BIKANER

Research papers in Journal

- Kumawat, SM, Arif M, Singh Dushyant, Rathore PS and Shekhawat SS (2016). Effect of growth regulators on growth, yield and quality of sewan grass (*Lasiurus indicus* Henr.). *Range Mgmt. & Agroforestry*, **37** (1): 39-43.

Souvenir/ Books/book chapters

- Shekhawat SS and Kumawat SM (2016). Kharif me bajra avam chanwala se hara chara utpadan. Centre for Forage management, ARS, SKRAU, Bikaner.
- Shekhawat SS and Kumawat SM (2016). Innovative technologies for sustainable fodder production in Rajasthan. In: Souvenir, edited by U. C. Thomas and M. Abraham, Kerala Agricultural University, Thiruvananthapuram.

Seminar/Symposium

- Dr. S. M. Kumawat Participated in National Conference International Agronomy Congress, New Delhi

Student (s) guided and teaching work

- Dr. S. S. Shekhawat guided one M. Sc. (Ag.) and two Ph.D. students as Major Adviser and member of Advisory Committee of two Ph. D. students of PB&G. Teaching PBG-532: Heterosis Breeding.
- Dr. S. M. Kumawat: Students guiding --- Ph.D (01); Teaching M. Sc (01) Agron 531

FTDs conducted: 25 fodder demonstrations were conducted under AICRP on Forage Crops and Utilization during Kharif-2016, which included cluster bean, sorghum, hybrid bajra napier and guinea grass.

Training conducted for farmers/ NGO/Govt. Officials

- Farmers training for green fodder production during Kharif season on July 04, 2016.
- Delivered lecture on the topic "Seed technology for forage crops and grasses" in a training on "Fodder seed production/ marketing" organised by Rajasthan Cooperative Dairy Federation Seed Processing Plant, Bikaner during August 4 and 5, 2016. Visit of the dairy officers was also organised at the experimental field of AICRP on Forage crops and Utilization on August 05, 2016.
- One National Training on "Forage Resource Management for Sustainable and Economic Livestock Production" was organised during November 29 to December 08, 2016 at SKRAU, Bikaner under collaboration of AICRP on Forage Crops and Utilization and Directorate of Human Resource Development of the University. Both scientists of the project worked as coordinators for the training.
- Lecture delivered to forage farmers/ scientist- Two by Dr. S. M. Kumawat

Seed/ planting material sold - Green fodder sale – 168.81 q @ Rs. 150 per q = Rs. 25321/-

Other activities

- Dr. S. S. Shekhawat is a member of Academic Council of SKRAU, Bikaner.
- Dr. S. S. Shekhawat is a member of Board of Studies of Faculty of Agriculture of SKRAU, Bikaner.
- Dr. S. S. Shekhawat is having additional charge of University Head of Department of Plant Breeding and Genetics since August 20, 2016.

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

Zone	Coordinated Centers				Testing Locations		
	S. N.	Location	Establishment Year	State	S. N.	Location	State/Union Territory
I. Hill States = 3 Locations = 3	1.	Palampur, CSKHPKV	1970	Himachal Pradesh	1.	Almora, ICAR-VPKAS*	Uttarakhand
	2.	Srinagar, SKUAS&T-K	2010	Jammu & Kashmir	2.	Rajouri, SKUAST-J	J & K
					3.	Bajoura (Kullu)	H P
II. North West States = 5 Locations = 13	3.	Ludhiana, PAU	1989	Punjab	4.	Meerut, SVBPUA&T	Uttar Pradesh
					5.	Ballawal Sankhari	Punjab
	4.	Hisar, CCS HAU	1970	Haryana	6.	Avikanagar, IGFR-RRS*	Rajasthan
	5.	Pantnagar, GBPUAT	1995	Uttarakhand	7.	Jodhpur, ICAR-CAZRI*	Rajasthan
	6.	Bikaner, SKRAU	1995	Rajasthan	8.	DFRS, Arjla, Bhilwara	Rajasthan
					9.	Udaipur, MPUAT	Rajasthan
					10.	Pali-Marwar, ICAR-CAZRI-RRS*	Rajasthan
					11.	Jaisalmer, ICAR-CAZRI-RRS*	Rajasthan
					12.	Fatehpur Shekhawati/ARS Sikar	Rajasthan
III. North East States = 8 Locations = 9	7.	Faizabad, NDUAT	1982	Uttar Pradesh	13.	Umiam (Barapani), ICAR Res. Complex for NEH Region*	Meghalaya
	8.	Ranchi, BAU	1970	Jharkhand	14.	Visva Bharti, Shantiniketan Sriniketan	West Bengal
	9.	Kalyani, BCKV	1972	West Bengal	15.	Medziphema	Nagaland
	10.	Bhubaneswar, OUAT	1987	Orissa			
	11.	Jorhat, AAU	1970	Assam			
	12.	Imphal, CAU	2010	Manipur			
	13.	Pusa, RAU	2015	Bihar			
			(Approved)				

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

Summary: Zone = 5, States = 24, Coordinating Centres = 21, Testing Locations = 26

*ICAR Institute

WEATHER REPORT FOR KHARIF -2016

The weather report of the AICRP Forage Crops coordinating, cooperating and voluntary centers across different zones of the country during Kharif 2016 has been presented in this section. The weather parameters from 26th Standard Meteorological Week (June 25, 2016) to 44th Standard Meteorological Week (November 04, 2016) were taken into consideration, which covers the *Kharif* 2016 season for all the testing locations for trial conduction [Table MET- M1 to M14]. During the reporting period, weather variations are clearly visible in maximum and minimum temperature, rainfall, rainy days, relative humidity and sunshine hours in different agro-climatic zones, which demonstrated varied impact on establishment, growth, yield and quality of different forage crops, varieties and cropping systems. The weather parameters have also shown close correlation with the incidence and surveillance of insect-pest and diseases of forage crops.

Temperature

In Hill zone, meteorological data from Srinagar, Palampur and Almora are compiled and presented. On seasonal mean basis, Srinagar remained the coolest, recording mean minimum temperature of 12.5⁰C followed by Almora. Almora recorded highest mean maximum temperature (28.9⁰C). Almora also witnessed the coolest week with low temperature of 5.1⁰C during 44th SMW. At Srinagar, maximum temperature was recorded (29.8⁰C) during 30th SMW. In North-East zone, Faizabad recorded the lowest minimum temperature (14.1⁰C) during 44th SMW. On the basis of mean minimum temperature on the season, Ranchi was coolest whereas, Faizabad, Kalyani, Jorhat and Bhubaneswar recorded nearly equal mean Maximum temperature. Maximum day temperature was recorded at Faizabad (36.8⁰C) during 26th SMW. Least variation for minimum and maximum temperature over the season was observed at Kalyani followed by Bhubaneswar. In North-West zone, Pantnagar recorded lowest minimum temperature (12.2⁰C) during 44th SMW followed by Hisar (13.2⁰C) during same week. Maximum temperature was recorded at Bikaner (40.8⁰C) during 38th SMW. The highest mean min (24.8⁰C) was recorded at Jodhpur where as mean max temperature was recorded at Bikaner (36.9⁰C), respectively.

In Central zone, Jabalpur recorded the lowest minimum temperature (12.3⁰C) during 44th SMW followed by Jhansi (13.1⁰C) in the same week. The maximum temperature during 26nd SMW was recorded at Jhansi (38.0⁰C) followed by Anand (36.3⁰C). Rahuri recorded lower mean minimum temperature (21.8⁰C) over the season as compared to rest of the locations. Jhansi recorded higher mean maximum temperature 33.2⁰C during the season. The least difference in minimum and maximum temperature over the season was at Urulikanchan. In South zone, the lowest minimum temperature was recorded at Hyderabad (14.6⁰C) during 42nd SMW followed by Mandya (15.2⁰C) during 43rd SMW. The maximum temperature was recorded at Mandya centre viz., 36.5⁰C during 42nd SMW. On the seasonal mean basis, Mandya experienced higher maximum temperature 32.7⁰C 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

India, being vast country with diverse agro-climate condition witnessed wide variation in total rainfall of season *kharif* 2016, ranging from 7.3 mm at Srinagar to 1768.3 mm at Palampur. In Hill zone, Palampur received highest rainfall (1768.3 mm) followed by Almora (660.9 mm in 35 rainy days). In North East zone, Kalyani received highest rainfall (1339.0 mm) followed by Ranchi (1099.6 mm) and lowest being at Faizabad (613.0 mm in 40 rainy days). The maximum number of rainy days were recorded at Imphal (89 rainy days) followed by Bhubaneswar and Kalyani (79 rainy days) and lowest being at Faizabad (40 rainy days).

In North-West zone, Pantnagar received highest rainfall (703.5 mm) followed by Jodhpur (615.8 mm) and lowest being at Bikaner (339.5 mm). In Central zone, maximum rainfall (1569.4 mm) was received at Jabalpur followed by Raipur (1029.4 mm) and lowest being with Rahuri (181.4 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 mean morning RH was highest at Almora and Palampur (87.4 %). Srinagar recorded minimum morning as well as evening RH on mean seasonal basis. In North-East zone relatively higher RH was recorded at all centres. Higher mean RH of 95.8 and 95% were noted at Kalyani and Jorhat, respectively. Minimum RH during morning and afternoon hours was recorded at Ranchi. (83.3% and 58.5%), respectively. In North-West zone, RH ranged from 22.8 to 87.8 % in morning hours and between 22.8 to 45.9% in afternoon. The lowest mean RH during morning as well as evening hours was recorded at Hisar (22.8% each time). Highest mean RH during morning as well as evening hours was recorded at Pantnagar (87.8% and 61.4%), respectively. In Central zone, maximum mean RH in morning hours (96.4%) was recorded at Urulikanchan and lowest RH at Rahuri (70.4%). As regards to mean RH during evening hours, no remarkable variation was observed among the centres, except Rahuri, which recorded much lower RH (47.8%). In South zone, maximum mean RH in morning hours (91.5%) was recorded at Vellayani and lowest RH at Mandya (87.1%), whereas, in evening hours maximum mean RH was recorded at Vellayani and lowest RH at Mandya (59.0%).

Morning RH was recorded higher throughout the crop season at Almora in comparison to Palampur

Sunshine hours

In Hill zone, higher average sunshine hours were recorded at Srinagar (7.2 h/day) followed by Almora (5.9 h/day). In North-West zone, more sunshine hours were recorded at Bikaner (8.1 h/day) followed by Jodhpur. Shortest days were observed at Pantnagar. In North-East zone, on seasonal mean basis maximum average sunshine hours were recorded at Ranchi (5.4 h) followed by Kalyani (5.0 h) and Bhubaneswar (5.0 h) and lowest being with Jorhat (1.5 h).

In Central zone, on mean basis, the maximum sunshine hours was recorded at Jabalpur (5.4 h) followed by Jhansi (5.0 h) and lowest being with Raipur (4.5 h). In South zone, on mean basis, Coimbatore recorded maximum sunshine hours (6.1 h) followed by Mandya (4.8 h) and lowest being at Hyderabad (4.7 h). In, general lesser sunshine hours were noted at all centres across the country, than previous year.

Met. Week		Met. Week	
26	June 25-July 01, 2016	36	Sep. 03-Sep. 09, 2016
27	July 02-July 08, 2016	37	Sep. 10-Sep. 16, 2016
28	July 09-July 15, 2016	38	Sep. 17-Sep. 23, 2016
29	July 16-July 22, 2016	39	Sep. 24-Sep. 30 2016
30	July 23-July 29, 2016	40	Oct. 01-Oct. 07, 2016
31	July 30-Aug. 05, 2016	41	Oct. 08-Oct. 14, 2016
32	Aug. 06-Aug 12, 2016	42	Oct.15-Oct. 21, 2016
33	Aug. 13-Aug. 19, 2016	43	Oct. 22-Oct.28, 2016
34	Aug. 20-Aug. 26, 2016	44	Oct. 29-Nov. 04, 2016
35	Aug. 27-Sep. 02, 2016		

Table M 1: Meteorological data in Hill zone during crop growth period of Kharif-2016

Std. Week No.	PALAMPUR						ALMORA						
	Temperature (C)		Humidity (%)		Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2			Max.	Min.	RH1	RH2			
26	29.5	19.4	80.3	-	2.5	5.5	30.9	23.1	84.9	64.7	3	123.5	6.7
27	28.0	18.4	89.0	-	266.2	4.0	27.5	20.5	88.7	76.6	3	42.0	4.4
28	27.6	19.5	89.4	-	222.8	2.5	29.4	21.9	85.7	69.6	4	48.0	4.9
29	26.4	18.3	88.1	-	117.4	2.7	26.2	21.0	94.5	85.3	4	146.0	2.8
30	26.6	18.2	89.5	-	259.0	3.0	27.2	21.5	91.3	78.0	-	32.0	4.2
31	27.3	18.9	85.6	-	315.6	4.3	28.3	20.8	86.4	75.4	5	31.5	4.1
32	24.6	18.7	95.6	-	283.8	1.9	28.8	20.9	94.1	78.7	1	68.0	3.2
33	26.7	18.3	86.3	-	60.0	4.1	28.4	20.6	96.1	65.7	5	94.5	4.1
34	26.7	18.8	87.7	-	38.4	4.4	31.1	20.6	85.9	64.2	1	15.0	7.2
35	26.5	18.4	90.6	-	73.6	4.5	29.9	19.8	88.4	64.1	3	20.0	5.7
36	26.7	17.4	89.4	-	24.6	6.7	31.6	20.1	83.3	59.9	1	7.5	8.5
37	26.4	17.5	85.4	-	69.4	5.9	29.2	19.3	87.3	67.3	1	2.5	6.4
38	27.3	16.8	85.2	-	30.6	6.2	29.6	18.9	91.6	67.6	2	13.1	6.0
39	26.2	15.7	82.0	-	4.2	7.3	29.8	17.8	83.1	62.0	1	13.8	7.4
40	-	-	-	-	-	-	29.6	18.1	85.3	64.7	1	3.5	5.1
41	-	-	-	-	-	-	29.7	11.0	78.9	59.6	-	-	8.5
42	-	-	-	-	-	-	28.6	08.9	79.1	44.0	-	-	6.3
43	-	-	-	-	-	-	27.3	06.1	91.2	37.9	-	-	8.8
44	-	-	-	-	-	-	26.7	05.1	84.9	45.3	-	-	8.1

Table M 2: Meteorological data in Hill zone during crop growth period of Kharif-2016

Std. Week No.	SRINAGAR					
	Temperature (C)		Humidity (%)		Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2		
26	27.2	12.2	67.7	35.9	2.2	8.5
27	28.3	13.6	71.9	33.0	-	7.8
28	28.1	13.8	71.9	38.1	-	8.3
29	29.2	15.0	70.9	39.8	-	7.6
30	29.8	13.5	71.4	41.6	-	7.5
31	28.1	13.4	72.3	36.7	-	8.5
32	29.2	12.9	72.6	33.5	-	9.2
33	27.1	11.3	72.9	41.6	5.1	7.6
34	26.4	13.4	75.5	42.9	-	7.3
35	25.7	12.9	73.3	41.3	-	6.9
36	25.4	12.5	73.6	43.9	-	6.1
37	23.6	12.4	75.5	45.2	-	5.1
38	22.5	12.3	75.8	46.2	-	6.6
39	22.3	12.4	77.2	46.1	-	6.8
40	20.8	10.6	77.6	45.2	-	6.1
41	20.6	10.7	79.1	47.8	-	6.5
42	19.3	10.4	79.0	45.6	-	6.1
43	-	-	-	-	-	-
44	-	-	-	-	-	-

Table M 3: Meteorological data in North West zone during crop growth period of Kharif-2016

Std. Week No.	HISAR						BIKANER						
	Temperature (C)		Humidity (%)		Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2			Max.	Min.	RH1	RH2			
26	38.1	28.2	25.5	24.7	13.0	6.4	40.0	28.7	83.0	44.4	2	46.6	7.8
27	34.6	26.4	25.8	27.3	93.5	5.9	39.4	30.0	68.4	48.1	1	9.2	7.8
28	36.1	26.9	27.8	26.9	19.0	6.9	39.2	28.2	73.9	49.4	1	4.0	5.5
29	34.1	25.2	25.4	27.1	58.3	5.2	38.6	28.4	81.1	46.4	1	13.8	7.8
30	35.7	25.7	27.7	26.3	74.0	6.7	38.6	26.9	84.7	47.0	3	80.8	6.9
31	33.0	25.4	26.5	27.3	4.3	5.5	35.7	26.4	86.7	60.6	2	31.2	4.5
32	33.8	25.9	27.5	27.6	0.8	4.8	35.2	26.1	87.0	64.3	4	62.4	7.1
33	35.2	25.0	24.2	24.9	5.3	6.7	35.2	26.3	83.9	56.6	1	7.9	8.1
34	34.2	26.3	25.9	23.9	6.8	6.3	34.4	26.2	86.0	61.6	1	16.0	6.2
35	32.7	25.2	25.7	25.5	63.2	5.4	34.4	25.1	88.1	65.0	3	39.2	6.3
36	34.6	23.5	21.5	23.6	-	9.7	34.8	24.5	79.4	51.9	-	-	10.0
37	35.7	23.6	21.9	22.3	-	9.5	37.3	24.3	75.3	42.0	-	-	10.2
38	36.0	25.1	24.0	23.1	-	8.5	40.8	24.7	72.1	29.3	-	-	10.3
39	35.4	24.4	22.2	20.8	2.8	8.1	39.4	23.7	71.9	32.6	-	-	10.0
40	35.0	24.5	23.7	21.8	12.0	5.4	36.3	23.5	84.7	47.9	1	24.2	6.6
41	35.2	19.4	17.4	15.0	-	8.8	37.1	21.2	69.3	41.7	1	4.2	9.8
42	35.1	16.2	14.0	14.3	-	9.4	36.3	19.7	69.0	26.1	-	-	9.9
43	33.7	15.8	13.6	15.5	-	8.1	35.3	19.3	68.0	26.4	-	-	9.8
44	30.8	13.2	12.6	16.1	-	3.5	34.9	16.3	71.0	30.9	-	-	8.5

Table M 4: Meteorological data in North West zone during crop growth period of Kharif-2016

Std. Week No.	JODHPUR							PANTNAGAR						
	Temperature (C)		Humidity (%)		No. of Rainy Days	Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy Days	Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2				Max.	Min.	RH1	RH2			
26	38.8	28.2	76.0	48.0	1	80.9	5.3	32.6	26.5	86.3	68.6	5	7.8	3.6
27	37.4	28.3	72.0	47.0	1	35.6	7.0	31.2	25.9	91.1	74.9	5	13.7	2.4
28	36.1	27.6	79.0	58.0	1	7.4	4.5	32.9	26.3	88.9	17.6	1	5.9	4.1
29	35.7	27.9	73.0	46.0	1	3.0	5.0	32.4	25.8	84.7	66.7	4	12.2	5.6
30	36.8	27.5	77.0	50.0	1	3.8	5.3	30.8	25.0	89.0	76.0	6	144.7	3.9
31	33.0	25.8	92.0	69.0	6	96.1	3.6	32.6	25.9	86.5	68.2	3	207.6	4.0
32	31.0	25.0	94.0	82.0	6	270.8	2.3	32.6	26.3	88.9	70.3	4	40.2	6.0
33	32.7	25.6	81.0	58.0	-	-	7.4	33.0	25.9	90.3	69.4	6	102.0	3.7
34	32.8	25.7	88.0	69.0	3	33.0	3.0	33.3	26.2	87.0	66.9	1	1.0	8.1
35	33.5	25.8	91.0	64.0	2	40.9	5.9	33.7	25.5	89.1	64.9	3	26.6	5.9
36	32.6	24.1	82.0	50.0	-	-	9.1	32.7	25.2	90.0	68.4	1	2.4	5.9
37	34.8	24.4	73.0	42.0	-	-	10.0	32.3	24.5	89.0	71.4	1	59.4	4.8
38	38.7	25.5	77.0	35.0	-	-	10.3	32.5	23.9	89.1	66.1	1	76.6	6.4
39	37.7	25.1	73.0	37.0	-	-	10.0	32.7	23.7	86.4	62.3	1	3.4	8.8
40	35.0	25.3	83.0	56.0	1	44.3	6.5	32.5	24.7	88.6	65.1	-	-	3.1
41	35.5	23.7	78.0	34.0	-	-	9.6	33.1	19.2	88.9	66.9	-	-	6.3
42	35.6	19.3	69.0	24.0	-	-	9.9	31.4	16.5	80.3	45.7	-	-	7.6
43	34.3	19.7	67.0	26.0	-	-	9.9	31.1	14.1	86.4	39.7	-	-	7.8
44	34.3	16.1	66.0	18.0	-	-	9.1	30.3	12.9	88.0	38.0	-	-	8.0

Table M 5: Meteorological data in North West zone during crop growth period of Kharif-2016

Std. Week No.	LUDHIANA						
	Temperature (C)		Humidity (%)		No. of Rainy Days	Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2			
26	36.2	29.2	69.0	60.0	2	152.4	5.2
27	33.6	26.1	85.0	64.0	2	48.8	6.1
28	33.4	28.4	85.0	67.0	2	54.8	5.8
29	34.9	27.6	84.0	61.0	2	31.5	7.3
30	32.3	27.0	86.0	73.0	3	77.8	4.5
31	34.5	27.3	81.0	59.0	2	1.4	6.7
32	32.2	26.9	83.0	67.0	1	8.0	3.3
33	34.4	26.4	85.0	60.0	2	27.4	6.9
34	33.1	24.9	87.0	67.0	3	45.2	6.2
35	32.2	24.8	88.0	67.0	1	6.0	6.2
36	34.3	26.1	87.0	56.0	-	-	9.6
37	34.4	25.4	84.0	53.0	-	-	9.7
38	34.2	25.7	85.0	53.0	1	2.4	4.2
39	33.4	24.7	88.0	58.0	1	12.6	1.1
40	34.0	24.8	91.0	55.0	-	-	3.3
41	33.3	19.7	89.0	35.0	-	-	9.1
42	33.4	17.2	85.0	31.0	-	-	8.1
43	31.6	16.1	89.0	29.0	-	-	6.2
44	29.2	14.7	90.0	39.0	-	-	0.9

Table M 6: Meteorological data in Central zone during crop growth period of Kharif-2016

Std. Week No.	URULIKANCHAN						JHANSI						
	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sun shine (hours)
	Max.	Min.	RH1	RH2			Max.	Min.	RH1	RH2			
26	28.8	26.2	98.4	79.6	1	10.2	38.0	28.6	80.0	54.0	2	80.1	8.8
27	30.0	26.7	93.8	66.4	4	68.8	32.5	25.6	90.0	84.0	5	131.2	2.4
28	27.8	25.4	96.7	76.9	3	17.0	32.5	26.5	93.0	79.0	4	26.4	3.5
29	27.1	24.8	98.6	84.6	-	-	31.1	25.8	92.0	74.0	3	28.4	3.0
30	27.1	24.9	98.3	85.0	-	-	32.7	25.7	93.0	80.0	3	171.6	4.6
31	27.7	25.2	97.3	80.4	3	52.6	32.5	25.2	91.0	76.0	4	90.2	3.6
32	28.8	25.8	96.0	68.9	1	6.0	32.2	25.4	90.0	77.0	2	51.6	4.1
33	30.3	26.3	95.3	61.9	-	-	31.0	25.0	91.0	80.0	2	59.0	0.8
34	29.1	25.7	91.1	60.7	-	-	30.3	23.7	93.0	81.0	3	34.4	3.0
35	31.2	26.3	98.1	51.7	-	-	33.1	25.4	92.0	71.0	3	32.6	7.0
36	31.8	26.8	94.6	50.4	-	-	33.7	24.2	85.0	64.0	-	-	8.4
37	32.6	26.6	98.4	77.0	3	61.0	34.1	24.0	87.0	60.0	-	-	8.8
38	30.2	26.1	95.0	72.6	1	25.6	33.6	24.6	89.0	68.0	1	10.4	5.3
39	30.9	25.9	98.0	87.1	2	27.6	33.5	23.0	90.0	59.0	1	2.6	8.7
40	31.9	27.7	99.7	89.7	1	30.8	34.5	24.6	90.0	60.0	1	3.0	-
41	33.1	27.1	95.6	84.7	-	-	34.9	21.1	86.0	46.0	-	-	-
42	33.3	27.3	96.4	57.0	-	-	35.0	16.3	78.0	43.0	-	-	-
43	32.5	27.5	94.4	42.7	-	-	34.4	16.5	78.0	46.0	-	-	-
44	32.4	26.5	97.3	43.1	-	-	31.5	13.1	79.0	42.0	-	-	-

Table M 7: Meteorological data in Central zone during crop growth period of Kharif-2016

Std. Week No.	ANAND							RAHURI					
	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)
	Max.	Min.	RH1	RH2				Max.	Min.	RH1	RH2		
26	36.3	26.2	89.4	61.4	1	38.4	6.4	-	-	-	-	-	-
27	34.4	26.0	89.0	69.7	2	13.2	3.2	34.7	23.3	66.0	43.0	-	-
28	33.4	26.2	91.1	71.4	2	30.4	2.4	34.5	23.4	68.0	41.0	-	-
29	32.2	25.6	88.1	74.3	2	17.8	2.3	32.5	23.7	74.0	57.0	1	17.4
30	33.5	25.6	91.4	72.1	2	19.2	2.3	30.8	23.5	71.0	60.0	1	8.4
31	31.5	25.2	97.4	79.4	3	73.2	1.8	30.8	22.4	77.0	59.0	1	7.4
32	30.0	24.5	95.6	85.0	5	96.8	1.0	30.4	22.2	76.0	60.0	1	4.0
33	32.5	24.7	92.1	66.1	1	2.8	5.6	31.8	23.1	71.0	49.0	-	-
34	29.5	24.9	94.7	90.1	4	49.6	1.1	33.0	21.9	69.0	49.0	-	-
35	31.7	25.4	97.4	77.7	4	19.6	2.7	33.1	21.4	71.0	47.0	-	-
36	32.4	23.7	94.6	60.4	2	8.2	8.8	33.3	23.9	81.0	55.0	2	20.6
37	34.5	24.9	90.7	54.1	0-	-	8.7	31.8	22.9	79.0	58.0	3	48.4
38	32.3	23.7	93.6	76.9	4	159.6	4.1	30.2	22.3	79.0	50.0	3	54.6
39	33.3	24.2	93.6	64.9	-	-	9.1	33.5	19.7	68.0	40.0	-	-
40	32.1	24.0	98.3	79.9	2	44.2	3.6	32.8	21.0	76.0	50.0	3	20.6
41	32.6	23.5	95.0	61.4	-	-	5.3	34.2	20.9	71.0	39.0	-	-
42	35.0	19.6	102.3	35.4	-	-	9.0	35.0	19.1	56.0	30.0	-	-
43	34.1	18.9	76.4	35.0	-	-	9.3	34.7	20.3	57.0	36.0	-	-
44	34.4	15.1	89.3	28.3	-	-	9.3	32.2	17.4	57.0	37.0	-	-

Table M 8: Meteorological data in Central zone during crop growth period of Kharif-2016

Std. Week No.	JABALPUR							RAIPUR						
	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2				Max.	Min.	RH1	RH2			
26	35.8	24.9	87.0	55.0	3	60.6	6.6	35.0	26.2	88.0	59.0	2	32.4	8.0
27	29.5	23.1	94.0	81.0	7	373.3	2.6	31.0	24.5	95.0	83.0	5	107.6	1.9
28	31.1	24.5	93.0	79.0	5	83.6	3.0	29.3	25.1	91.0	80.0	5	59.0	1.5
29	30.4	24.0	91.0	69.0	3	63.6	3.9	30.6	24.5	94.0	79.0	5	207.0	0.9
30	31.7	24.0	91.0	67.0	3	61.8	4.7	31.9	25.4	91.0	69.0	3	56.2	5.8
31	31.0	23.3	91.0	77.0	5	196.4	2.9	30.7	25.3	92.0	81.0	1	28.0	2.9
32	28.6	23.6	91.0	82.0	4	132.8	1.3	32.3	28.6	91.0	77.0	4	22.0	1.6
33	27.0	23.0	93.0	91.0	7	182.9	-	28.7	21.6	89.0	77.0	2	11.6	1.3
34	28.8	22.1	93.0	76.0	6	263.2	6.1	31.9	25.6	90.0	70.0	1	4.2	5.2
35	32.2	23.7	90.0	70.0	4	35.2	6.1	32.2	26.0	90.0	67.0	1	22.2	4.8
36	30.6	23.0	90.0	63.0	2	17.6	4.5	30.7	25.3	87.0	68.0	2	62.8	1.4
37	31.7	23.6	87.0	65.0	1	18.0	1.9	31.1	24.3	95.0	80.0	5	132.8	3.3
38	33.0	23.9	89.0	64.0	-	3.8	6.7	32.2	24.9	94.0	69.0	3	91.6	6.2
39	29.9	23.5	92.0	83.0	3	52.4	4.6	30.0	24.5	97.0	89.0	6	134.6	3.4
40	31.9	23.9	94.0	64.0	2	24.2	7.3	26.5	24.8	95.0	72.0	5	48.2	4.5
41	31.5	21.3	93.0	51.0	-	-	8.0	31.5	22.9	94.0	50.0	1	9.2	5.6
42	31.5	15.4	88.0	32.0	-	-	9.3	31.6	19.0	90.0	35.0	-	-	10.0
43	31.7	15.6	91.0	29.0	-	-	8.8	31.5	18.1	89.0	36.0	-	-	9.5
44	29.7	12.3	82.0	34.0	-	-	8.7	30.6	19.8	85.0	51.0	-	-	8.0

Table M 9: Meteorological data in North East zone during crop growth period of Kharif-2016

Std. Week No.	JORHAT							RANCHI					
	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2				Max.	Min.	RH 1	RH2		
26	33.5	26.1	96.0	78.0	3	69.4	2.8	33.4	24.9	79.9	61.9	29.8	7.5
27	32.5	25.1	96.0	74.0	4	100.0	3.3	30.3	20.3	82.0	57.9	138.4	2.0
28	33.6	25.9	94.0	80.0	3	134.6	3.2	29.5	20.7	82.3	71.7	203.4	3.9
29	30.6	25.7	96.0	82.0	2	29.3	-	28.7	20.9	82.0	70.1	94.8	0.8
30	29.4	24.6	94.0	87.0	6	78.2	0.3	30.6	22.3	83.9	71.6	9.0	4.2
31	34.7	25.5	92.0	69.0	3	49.1	4.5	30.5	22.6	84.1	71.3	76.8	4.5
32	33.4	25.5	92.0	72.0	3	61.4	4.3	29.0	20.9	82.6	67.6	115.0	1.9
33	34.3	26.8	94.0	75.0	3	29.9	3.0	29.9	21.5	85.1	70.6	99.0	3.9
34	34.3	26.7	90.0	70.0	-	1.5	4.2	30.6	21.1	81.7	70.3	60.6	5.1
35	33.9	25.3	94.0	76.0	4	61.0	2.1	33.0	23.1	81.9	50.7	6.0	8.5
36	32.7	25.4	97.0	79.0	5	120.6	2.6	27.9	21.3	85.1	65.0	85.2	1.0
37	31.8	25.4	95.0	78.0	3	25.6	1.5	29.8	21.3	83.3	70.9	21.3	3.7
38	31.8	24.9	97.0	81.0	5	52.0	1.7	30.9	22.1	80.0	60.6	10.4	7.2
39	32.4	24.9	97.0	77.0	1	29.2	2.5	29.9	21.0	84.3	68.1	130.6	5.7
40	34.3	25.7	97.0	71.0	-	2.3	4.5	30.0	20.7	83.7	69.4	-	8.3
41	30.1	23.7	97.0	79.0	4	75.0	1.1	28.7	19.0	82.4	28.7	19.3	6.8
42	32.6	21.8	96.0	69.0	-	-	6.2	28.2	14.6	85.4	28.2	-	9.4
43	30.6	20.6	95.0	68.0	-	1.2	3.8	28.6	14.5	87.3	28.6	-	9.0
44	31.3	19.5	96.0	62.0	-	-	5.9	28.1	14.6	85.9	28.1	-	8.7

Table M 10: Meteorological data in North East zone during crop growth period of Kharif-2016

Std. Week No.	IMPHAL							FAIZABAD						
	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2				Max.	Min.	RH1	RH2			
26	32.2	22.3	92.0	81.1	6	97.7	4.2	36.8	27.3	80.4	58.8	-	-	5.1
27	31.5	22.5	95.6	88.0	7	85.4	2.5	32.2	25.7	91.8	78.1	6	168.5	2.8
28	30.9	23.0	91.4	73.3	5	79.3	3.6	31.5	27.2	89.0	70.4	1	5.0	3.9
29	29.3	22.2	88.6	72.4	7	37.7	0.7	31.3	24.9	90.5	81.8	6	114.8	-
30	29.7	21.6	93.6	81.4	7	94.1	2.6	31.5	26.0	90.2	78.2	4	27.6	0.4
31	31.0	22.3	85.0	71.7	1	11.6	3.4	32.2	25.8	89.0	70.1	2	62.6	2.8
32	31.2	22.3	90.3	75.4	5	14.5	3.8	32.7	25.9	86.5	78.8	3	21.8	2.5
33	31.5	23.0	89.3	70.7	3	5.8	5.8	32.2	25.9	92.1	78.8	5	71.8	2.5
34	30.4	22.3	86.7	72.7	4	39.8	5.2	32.8	26.3	89.4	70.5	1	3.2	4.8
35	29.5	22.0	93.9	78.1	7	75.3	4.8	34.9	26.9	87.1	69.4	3	15.0	5.9
36	28.3	22.4	89.4	77.0	5	20.9	3.2	34.4	26.5	87.2	64.0	2	2.2	7.5
37	30.1	21.8	89.6	72.3	3	45.4	5.0	32.8	26.0	92.2	77.2	2	9.2	0.1
38	29.0	21.6	95.0	76.1	7	48.9	3.9	32.8	25.7	92.1	69.2	-	-	1.5
39	30.9	21.6	94.4	68.6	6	85.7	6.4	30.5	24.2	95.7	75.1	3	76.2	1.0
40	30.5	21.3	91.3	67.4	3	35.4	5.9	34.0	25.7	89.8	63.8	1	9.8	5.1
41	27.7	20.5	95.4	77.1	6	96.8	2.8	32.7	21.8	92.2	56.8	1	25.3	5.1
42	30.4	18.2	91.0	60.0	-	-	8.8	32.8	17.9	93.1	43.1	-	-	5.9
43	25.5	17.9	91.4	80.4	4	58.5	3.4	32.4	16.3	92.0	37.8	-	-	3.0
44	26.6	17.9	93.7	73.4	3	11.9	5.9	31.0	14.1	96.4	34.5	-	-	2.6

Table M 11: Meteorological data in North East zone during crop growth period of Kharif-2016

Std. Week No.	KALYANI							BHUBANESWAR						
	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2				Max.	Min.	RH1	RH2			
26	34.6	27.5	92.6	77.6	5	18.7	8.2	33.4	26.5	89.0	80.0	6	99.2	5.8
27	31.5	26.4	98.1	89.7	6	88.5	1.3	32.0	25.8	92.0	82.0	4	83.8	3.4
28	32.7	26.2	96.7	84.4	5	89.8	5.1	30.9	25.8	90.0	80.0	4	39.0	5.2
29	31.6	26.3	97.3	86.4	5	70.5	0.6	33.4	25.7	90.0	74.0	1	16.0	5.6
30	31.4	25.4	97.0	87.3	5	103.4	3.6	31.9	25.5	94.0	78.0	5	67.6	5.8
31	30.6	26.5	96.4	84.0	6	47.5	4.1	31.7	25.1	94.0	87.0	6	119.5	4.1
32	29.9	25.7	98.3	91.6	7	141.9	1.4	29.6	25.2	97.0	85.0	6	41.0	0.7
33	32.7	26.5	96.3	85.1	5	89.0	4.3	31.7	25.3	94.0	73.0	4	36.7	4.7
34	31.5	25.3	98.0	87.7	6	178.3	4.6	33.3	25.9	92.0	77.0	4	36.2	5.5
35	34.1	26.9	84.3	93.0	3	15.9	6.6	32.9	26.1	90.0	77.0	5	39.1	6.1
36	32.5	26.5	97.3	78.4	5	127.8	4.1	29.2	25.5	94.0	83.0	6	58.1	0.5
37	33.7	26.8	93.7	71.1	2	12.0	7.1	32.4	25.8	93.0	74.0	4	42.4	6.5
38	33.9	26.0	96.3	76.9	5	22.5	5.5	33.2	26.1	90.0	75.0	5	31.2	6.5
39	32.4	25.9	97.9	87.7	5	32.0	3.1	31.0	24.9	95.0	86.0	7	98.0	2.6
40	34.6	25.9	95.6	73.9	2	26.0	7.0	32.1	24.9	94.0	75.0	5	39.8	5.9
41	32.1	25.0	98.7	85.4	5	61.0	5.0	31.6	23.9	92.0	68.0	4	76.2	5.0
42	33.7	22.5	94.7	56.0	-	-	9.7	32.8	21.3	84.0	65.0	-	-	8.3
43	32.5	22.4	94.6	61.9	1	11.2	6.8	32.4	20.4	87.0	64.0	2	16.8	5.1
44	32.1	24.0	95.7	69.6	1	3.0	6.5	32.2	22.6	88.0	66.0	1	8.6	7.3

Table M 12: Meteorological data in South zone during crop growth period of Kharif-2016

Std. Week No.	HYDERABAD							VELLAYANI					
	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)
	Max.	Min.	RH1	RH2				Max.	Min.	RH1	RH2		
26	30.2	22.1	88.6	69.1	4	47.0	2.4	31.3	24.2	92.6	82.3	3	43.9
27	30.4	23.2	84.6	63.6	1	4.0	2.4	32.4	25.0	91.0	78.1	3	27.9
28	29.3	22.6	88.0	68.0	2	15.6	3.5	31.3	24.3	94.6	79.9	5	59.7
29	31.1	23.0	85.3	62.9	2	19.0	2.9	31.8	24.7	91.4	79.3	-	-
30	30.5	22.8	94.9	72.7	3	53.6	2.7	31.1	24.6	95.0	80.3	3	38.9
31	28.4	22.4	91.7	77.6	5	66.7	0.8	31.2	24.9	91.9	76.7	1	6.0
32	30.8	22.9	85.0	62.9	-	-	6.4	32.3	25.2	88.7	75.3	-	1.0
33	30.9	22.3	83.3	58.3	-	2.2	7.8	31.8	24.5	92.1	77.4	2	9.6
34	32.3	23.1	83.3	55.7	1	13.8	8.1	31.8	25.0	91.0	76.0	2	20.8
35	29.5	23.0	95.3	79.9	4	208.4	3.8	31.7	24.5	91.0	77.4	-	2.0
36	30.1	21.6	90.1	59.1	2	19.2	7.2	31.5	24.4	92.3	76.6	-	0.2
37	27.7	22.1	93.1	81.9	6	128.2	0.9	31.9	24.5	91.3	74.9	-	-
38	28.6	21.6	94.1	85.1	4	105.4	2.5	32.0	24.7	92.2	76.8	1	2.6
39	27.9	22.0	97.0	78.9	3	70.6	2.1	31.9	24.7	91.1	74.3	-	-
40	30.1	21.9	90.3	65.9	1	4.4	5.7	31.7	24.3	90.9	74.1	-	-
41	29.9	20.8	94.4	50.9	3	27.8	5.3	31.6	24.3	90.3	76.3	-	-
42	30.6	14.6	92.7	34.1	-	-	9.2	32.1	24.3	88.0	74.0	1	12.0
43	30.2	15.1	91.9	38.3	-	-	8.8	31.5	24.1	91.4	75.7	-	-
44	30.9	19.9	84.0	47.1	-	-	7.0	31.9	24.4	92.4	80.4	2	30.0

Table M 13: Meteorological data in South Zone during crop growth period of Kharif-2016

Std. Week No.	COIMBATORE					MANDYA						
	Temperature (C)		No. of Rainy days	Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs
	Max.	Min.				Max.	Min.	RH1	RH2			
26	29.7	24.0	1	8.9	1.4	31.7	19.6	89.0	79.0	2	15.6	3.3
27	31.3	24.5	-	3.1	5.1	29.7	20.8	91.0	73.0	2	10.3	3.5
28	31.0	23.5	1	7.6	5.8	30.4	20.4	86.0	60.0	1	3.7	5.8
29	31.6	23.4	-	2.0	4.4	31.9	21.0	82.0	57.0	1	3.6	4.8
30	31.7	23.3	2	11.0	4.6	32.1	20.6	88.0	56.0	2	42.1	4.2
31	31.2	24.5	-	0.2	5.7	29.7	20.0	90.0	65.0	-	4.1	3.5
32	32.8	23.8	-	-	8.1	30.9	19.9	94.0	54.0	-	1.0	7.6
33	32.8	23.3	-	-	8.3	33.1	19.6	91.0	56.0	-	-	6.2
34	33.2	23.4	-	-	8.3	33.4	20.7	92.0	48.0	1	37.4	6.1
35	31.4	23.2	1	5.5	3.7	33.2	21.1	94.0	61.0	2	65.7	1.8
36	31.8	21.8	-	-	5.9	33.4	18.9	91.0	59.0	1	-	3.1
37	32.6	22.5	-	-	6.9	33.3	18.4	91.0	61.0	2	62.2	1.9
38	32.6	22.2	-	-	7.9	33.2	20.1	93.0	63.0	-	-	1.0
39	32.6	22.9	1	4.8	6.9	33.3	18.6	93.0	60.0	1	6.0	3.9
40	33.4	21.5	-	-	9.9	33.5	18.3	91.0	52.0	-	-	7.3
41	32.7	22.3	1	19.5	7.8	33.3	19.0	90.0	61.0	2	65.0	4.9
42	31.9	23.3	-	-	4.3	36.5	16.6	79.0	50.0	-	-	6.0
43	31.9	22.8	-	1.0	4.6	34.7	15.2	91.0	53.0	-	-	7.9
44	31.3	22.9	2	67.7	5.7	33.9	18.8	77.0	53.0	1	4.4	8.2

Table M 14: Meteorological data in South Zone during crop growth period of Kharif-2016

Std. Week No.	DHARWAD					
	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)
	Max.	Min.	RH1	RH2		
26	26.5	21.4	92.0	78.0	3	23.4
27	26.4	21.5	94.0	81.0	6	36.4
28	25.9	21.1	92.0	80.0	5	61.0
29	26.7	20.6	92.0	81.0	4	27.2
30	26.6	20.8	91.0	76.0	3	21.6
31	24.7	20.4	93.0	84.0	3	37.4
32	26.1	20.9	94.0	80.0	4	26.0
33	26.6	20.7	91.0	74.0	2	15.8
34	27.0	20.3	91.0	75.0	1	9.2
35	27.5	20.5	93.0	72.0	1	28.2
36	27.4	19.7	87.0	63.0	-	0.4
37	27.2	19.9	90.0	71.0	2	14.8
38	25.6	20.0	91.0	78.0	3	11.8
39	27.7	20.5	92.0	78.0	1	44.0
40	27.4	19.5	91.0	67.0	1	6.2
41	28.9	20.2	92.0	59.0	1	38.6
42	30.8	16.7	60.0	31.0	-	-
43	31.1	18.5	67.0	29.0	-	-
44	31.5	18.4	63.0	43.0	-	0.4

Fig MET 1: Average minimum and maximum temperature ($^{\circ}\text{C}$) at different AICRP centres

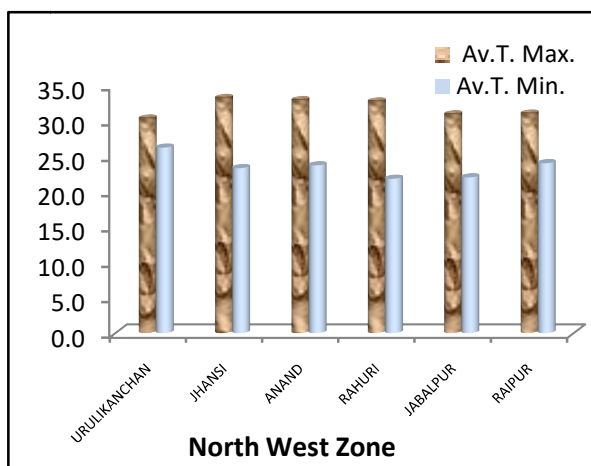
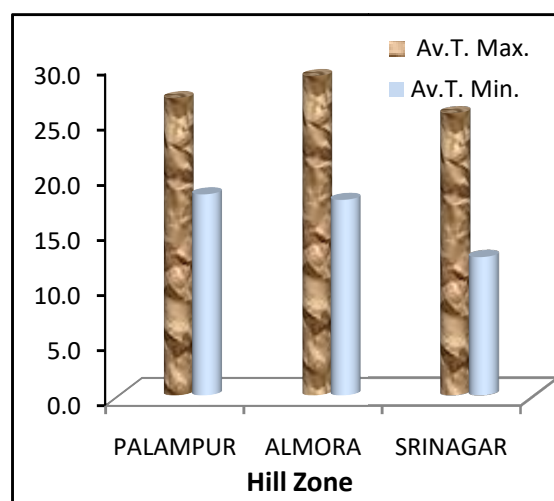
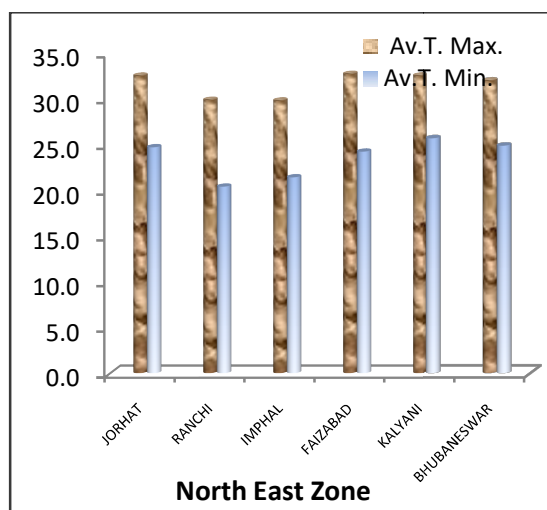
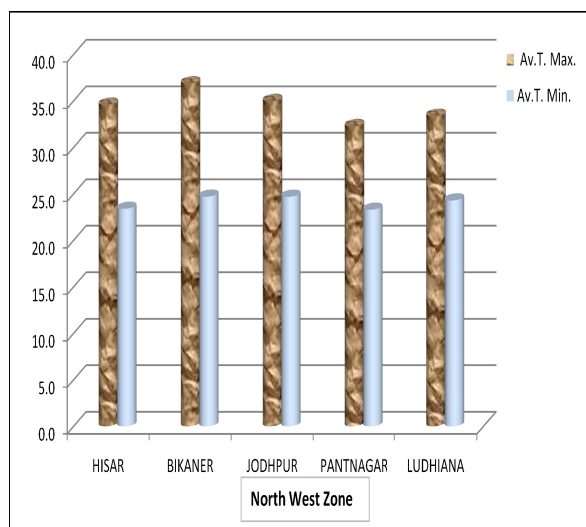
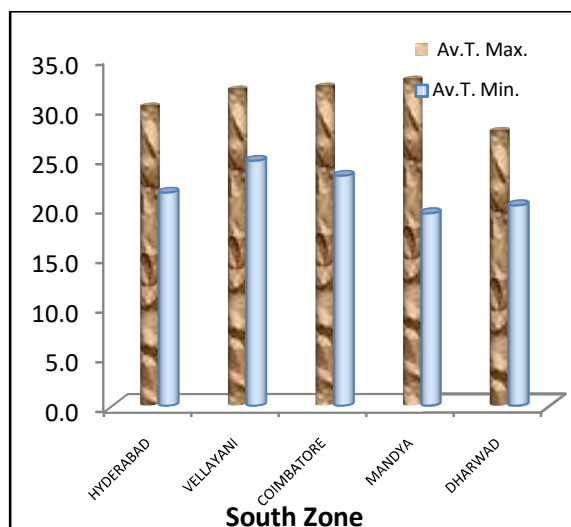
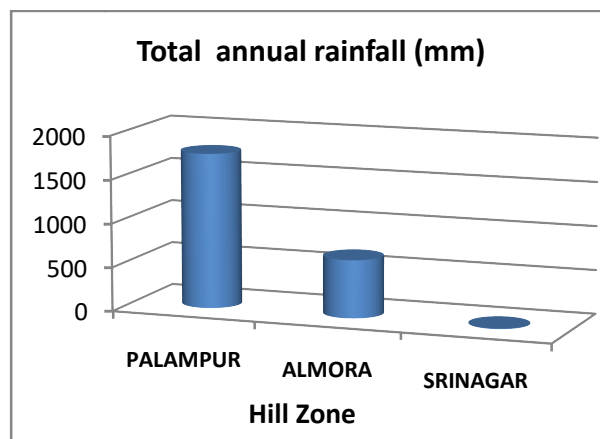
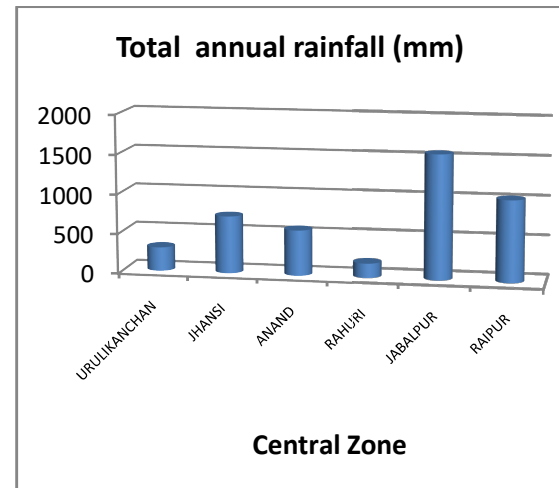
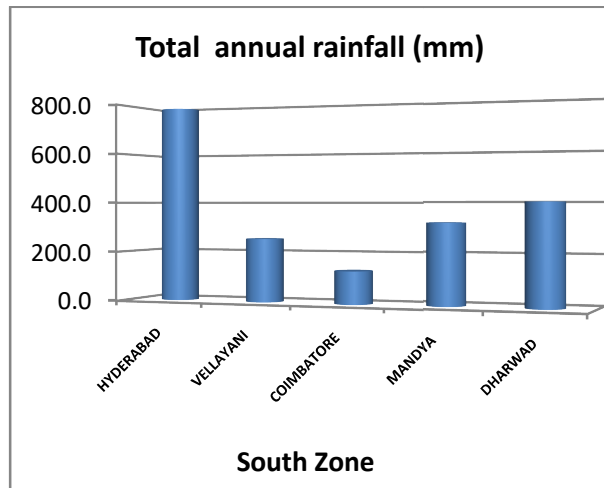
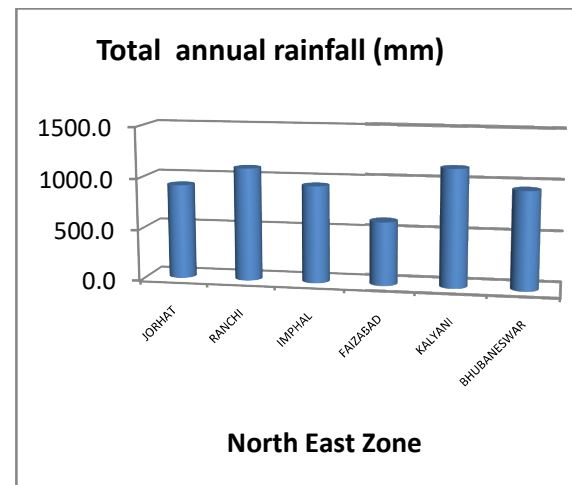
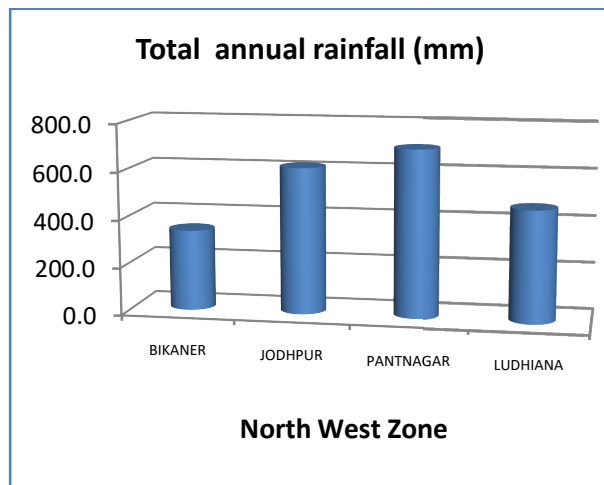


Fig MET 2: Rainfall scenario (mm) of at different centres



APPENDIX-IV: FORAGE CROPS BREEDING TRIALS AT A GLANCE: (KHARIF-2016)

Locations/Trial		Tr-1 IVTM	Tr-2 Combined AVTM-1 & AVTM-2	Tr-3 AVTM-2 (Seed)	Tr-4 IVTPM (New)	Tr-5 AVTPM-1	Tr-6 IVTC	Tr-7 AVTC-1	Tr-8 IVT Rice bean	Tr-9 AVT-1 Rice bean	Tr-10 VTBN- 2013 (4 th Year) (pere.)	Tr-11 VT Dicha.- 2013 (4 th Year) (Pere.)	Tr-12 VT Cen. Cili.- 2013 (4 th Year) (Pere.)	Tr-13 VT Cen. Cili.- 2015 (2 nd Year) (pere.)	Tr-14 VT Cen. setig.- 2015 (2 nd Year) (Pere.)	Tr-15 VTBN- 2015 (2 nd Year) (Pere.)	Tr-16 VT Seta. grass- 2015 (2 nd Year) (Pere.)	Tr-17 VT Pennise. hybrids- 2015 (2 nd Year) (Perennial)	Tr-18 VT Desmen- 2016 (1 st Year)	Total
Zone	Location																			
1 (HZ)	Palampur	DR	DR	DR			DR	DR			DR					DR	DR	DR		9/9
2	Srinagar	DR	DR	DR			DR	DR												5/5
3	Almora		DR				DR	DR								TF	DR			4/5
4	Bajaura																DR			1/1
5	Mukteshwar																TF			0/1
6	Rajouri	DR					DR													2/2
7 (NWZ)	Bikaner				DR	DR	DR	DR			DR	TF	DR	TF	TF	TF			DR	7/11
8	Jalore	DR	DR		DR	DNR	DR	DR							DNR					5/7
9	Pali														DNR					0/1
10	Hisar	TF	TF	TF	DR	DR	DR	DR			DR			DR		DR		DR		8/11
11	Ludhiana	DR	DR	DR	DR	DR	DR	DR				DR	DR	DR		DR		DR	DR	13/13
12	Avikanagar													DR	DR					2/2
13	Jodhpur													DR	DR					2/2
14	Pantnagar	DR	DR	TF			DR	DR											DNR	4/6
15	Udipur	DR	DR	TF			DR	DR											TF	4/6
16	Meerut				DR	DR	DR	DR												4/4
17 (NEZ)	Jorhat	DR	DR	DR			DR	DR	DR	DR	DR					DR	DR	DR	TF	11/12
18	Kalyani						DR	DR	DR	DR								DR	DNR	5/6
19	Bhubaneswar	DR	DR	DR	DR	DR	DR	DR	DR	DR						DR		DNR	DNR	10/12
20	Ranchi	DR	DR	DR	DR	DR	DR	DR	DR	DR						DR				10/10
21	Pusa				DR	DR			DR	DR										4/4
22	Faizabad	DR	DR		DR	DR	DR	DR												6/6
23	CAU Imphal	DR					DR	DR	DR	DR										5/5
24 (CZ)	Jhansi	DR	DR		DR		DR	DR			DNR	DR	DR	DR	DR	DR		DNR	DNR	10/13
25	Rahuri	DR	DR		DR		DR	DR			DR	DR	DR	DR	DR	DR		DR	DR	13/13
26	Urulikanchan	DR	DR		DR		DR	DR			DR	DR	DR	DR		DR		DR	DR	12/12
27	Dhari				DR										DR					2/2
28	Anand	DR	DR		DR		DR	DR			DR	DR	DR	DR	DR	DR		DR	DR	13/13
29	Jabalpur	DR	DR		DR				DR	DR		DR		DR		DR		DNR		8/9
30	Raipur	DR	DR				DR	DR								DR				5/5
31	Mathura						DNR													0/1
32	Kanpur							DR												1/1
33	Dapoli								DR	DR	DR					DR				4/4
34 (SZ)	Hyderabad	DR			DR	DR	DR	DR			DNR			DR	DR	DR			DNR	8/10
35	Mandya	DR			DR	DR	DR	DR			DR			DR	DR	DR			DR	10/10
36	Coimbatore	DR			DR	DR	DR	DR			DR	DR	DR	DR	DR	DR			DR	12/12
37	Dharwad						DR	DR			DR			DNR		DR				4/5
38	Vellayani	DR			DR		DR	DR	DR	DR						DR			DNR	7/8
39	Raichur				DR	DR	DR	DR												4/4
40	Karaikkal	DR						TF							DNR					1/3
Total Location		23/24	17/18	6/9	20/20	12/13	28/29	28/29	9/9	9/9	13/15	7/8	7/7	12/14	9/13	18/20	4/5	8/11	7/15	228/259

DR=Data Reported, DNR=Data not reported, TF-Trial Failed, Data Report (%) =88.03

APPENDIX V: FORAGE CROP PRODUCTION TRIALS AT A GLANCE: (KHARIF-2016)

Location/ Trial	K-15 AST-10 C	PS-14- AST-1	PS-14 AST-3	CS-15- AST-4	K-15- AST-13 C	K-16- AST-3	K-16- AST-2	K-15- AST-6L	K-16- AST-8	K-12- AST-4	AST-12- (AST-5)	K-15- AST-3L	K-15- AST-5L	K-15- AST-8-7L	C-13- AST-4	K-15- AST-8C	K-16- AST-9	Total
HILL ZONE																		
Palampur					DR													1/1
Srinagar										DR	DR							2/2
NORTH WEST ZONE																		
Hisar																		-
Ludhiana		DR			DR										DR			3/3
Bikaner		DR				DR										DR		3/3
Pantnagar				DR														1/1
NORTH EAST ZONE																		
Faizabad									DR					DR				2/2
Ranchi				DR														1/1
Kalyani				DR			DR											2/2
Bhubaneswar							DR											1/1
Jorhat																		
Imphal												DR						1/1
Sriniketan W.B.																	DR	1/1
CENTRAL ZONE																		
Jabalpur				DR			DR											2/2
Rahuri								DR										1/1
Urulikanchan							DR											1/1
Anand							DR											1/1
Raipur		DR																1/1
Mathura						DR												1/1
SOUTH ZONE																		
Hyderabad													DR					1/1
Mandya	DR		DR															2/2
Coimbatore																		
Vellayani	DR																	1/1
Dharwad			DR															1/1
Total (DR & TC)/ Allotted	2/2	3/3	2/2	4/4	2/2	2/2	5/5	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	30/30

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 (%)** = 100%

APPENDIX-VI: FORAGE CROP PROTECTION TRIALS AT A GLANCE (KHARIF-2016)

Locations /Trial	PPT-1	PPT-2	PPT-16	PPT-17	PPT-19	PPT-20	PPT-21	PPT-22	PPT-23	Total	Success index (%)
Bhubaneswar	A (DR)	A (DR)								2/2	100%
Hyderabad	A (DR)	A (DR)			A (DR)					3/3	100%
Karaikal		A (DNR)								0/1	00%
Palampur	A (DR)	A (DR)				A (DR)	A (DR)	A (DR)		4/4	100%
Rahuri	A (DR)	A (DR)	A (DR)	A (DR)						5/5	100%
Ludhiana	A (DR)	A (DR)				A (DR)		A (DR)	A (DR)	5/5	100%
Dharwad	A (DR)	A (DR)		A (DR)						3/3	100%
Total	6/6	6/7	1/1	2/2	1/1	2/2	1/1	2/2	1/1	22/23	

DR=Data reported, **DNR**=Data not reported, **Data Report (%)** = 95.65%

Entries Code for Kharif-2016

1. IVTM				4.IVTPM			
S.N.	Contributor	Entry name	Code name	S.N.	Contributor	Entry name	Code name
1	ZRS UAS, Mandya	MFM-2	IVTM- 3	1	NDUAT, Faizabad	NDFB-1502	IVTPM- 2
2	AAU, Anand	AFM-6	IVTM-1	2	AAU, Anand	AFB-37	IVTPM-6
3	PJTSAU, Hyderabad	TSFM-15-5	IVTM-6	3	SKRAU, Bikaner	RBB-8	IVTPM-5
4	PJTSAU, Hyderabad	TSFM-15-2	IVTM-4	4	PAU, Ludhiana	PHBF-4	IVTPM-1
5	SKUA&T, Srinagar	KDFM-1	IVTM-5	5	PAU, Ludhiana	PHBF-6	IVTPM-3
6	JNKVV Chhindwara	H 1003	IVTM-2	6	PAU, Ludhiana	PHB-3144	IVTPM-7
7	IGKV Ambikapur	IAFM-2015-38	IVTM-8	7	IARI	Pusa Fodder Bajra -2	IVTPM-8
8	IGKV Ambikapur	IAFM-2015-12	IVTM-10	8	IARI	Pusa Fodder Bajra -1	IVTPM-9
9	IGKV Ambikapur	IAFM-2015-48	IVTM- 9	9	PJTSAU, Hyderabad	TSFB 15-4	IVTPM-10
10	Advanta	ADV 6737	IVTM-7	10	PJTSAU, Hyderabad	TSFB 15-8	IVTPM-11
11	(NC)	African Tall	IVTM-12	11	NC	Raj Bajra Chari-2	IVTPM-4
12	(NC)	J-1006	IVTM-11	12	NC	Giant Bajra	IVTPM-12
				13	ZC (CZ)	BAIF Bajra 1	IVTPM-13
2. CAVTM 1 & 2				14	ZC (NWZ)	AFB-3	IVTPM-14
S.N.	Contributor	Entry name	Code name	15	ZC (NEZ)	APFB-9-1	IVTPM-15
1	IGFRI Jhansi	JHM 15-1	CAVTM- 2	5. AVTPM-1			
2	ZRSUAS, Mandya	MFM-4	CAVTM-1	S.N.	Contributor	Entry name	Code name
3	Advanta	PAC-746	CAVTM-3	1	SKRAU, Bikaner	RBB-6	AVTPM- 1
4	AAU, Anand	AFM-4	CAVTM-5	2	PJTSAU, Hyderabad	TSFB-14-10	AVTPM-3
5	NC	African Tall	CAVTM-6	3	SKRAU, Bikaner	RBB-7	AVTPM-4
6	NC	J-1006	CAVTM-4	4	PJTSAU, Hyderabad	TSFB-10-5	AVTPM-7
3. AVTM-2 (seed)				5	PJTSAU, Hyderabad	TSFB-13-12	AVTPM-6
S.N.	Contributor	Entry name	Code name	6	NC	Raj Bajra Chari-2	AVTPM-5
1	ZRSUAS, Mandya	MFM-4	AVTM-2-S- 1	7	NC	Giant Bajra	AVTPM-11
2	Advanta	PAC-746	AVTM-2-S- 2	8	ZC (CZ)	BAIF Bajra 1	AVTPM-9
3	AAU, Anand	AFM-4	AVTM-2-S- 4	9	ZC (NWZ)	AFB-3	AVTPM- 10
4	NC	African Tall	AVTM-2-S- 5	10	ZC (NEZ)	APFB-9-1	AVTPM-8
5	NC	J-1006	AVTM-2-S- 3				

6. IVTC				9. AVT-1: Rice bean			
S.N.	Contributor	Entry name	Code name	S.N.	Contributor	Entry name	Code name
1	ZRSUAS, Mandya	MFC-09-23	IVTC- 14	1	AAU, Jorhat	JOR-15-1	AVTRB- 6
2	ZRSUAS, Mandya	MFC-09-15	IVTC-13	2	AAU, Jorhat	JOR-15-5	AVTRB-2
3	PJTSAU, Hyderabad	TSFC 11-6	IVTC-12	3	JNKVV, Jabalpur	JRBJ-07-1	AVTRB-5
4	PAU, Ludhiana	PFC-39	IVTC-11	4	(NC)	K-1 (Bidhan-1)	AVTRB-4
5	PAU, Ludhiana	PFC-40	IVTC-1	5	(NC)	Bidhan-2	AVTRB-1
6	IGFRI RRS Dharwad	C-215	IVTC-2	6	(NC)	RBL-6	AVTRB-3
7	GBPUAT, Pantnagar	UPC 1601	IVTC-3				
8	NC	Bundel Lobia-1	IVTC-4	10. VTBN-2013 (4 th Year): (Perennial)			
9	NC	UPC-5286	IVTC-5	S.N.	Contributor	Entry name	Code name
10	ZC (HZ)	UPC-622	IVTC-6	1	MPKV, Rahuri	RBN-2011-12	VTBN-2013-1
11	ZC (NWZ)	Bundel Lobia-2	IVTC-7	2	TNAU, Coimbatore	TNCN-1076	VTBN-2013-2
12	ZC (NEZ)	UPC-628	IVTC-8	3	PAU, Ludhiana	PBN-346	VTBN-2013-3
13	ZC (CZ)	UPC-9202	IVTC-9	4	(NC)	CO-3	VTBN-2013-4
14	ZC (SZ)	MFC-8-14	IVTC-10	5	(NC)	PBN-233	VTBN-2013-5
				6	MPKV, Rahuri	RBN-2004-03	VTBN-2013-6
7. AVTC-1				7	TNAU, Coimbatore	TNCN-1078	VTBN-2013-7
S.N.	Contributor	Entry name	Code name	8	PAU, Ludhiana	PBN-342	VTBN-2013-8
1	PJTSAU, Hyderabad	TSFC-12-15	AVTC-1- 2	9	MPKV, Rahuri	RBN-2010-Y-1	VTBN-2013-9
2	ZRSUAS, Mandya	MFC-09-3	AVTC-1-1	10	Dharwad	DHN-15	VTBN-2013-10
3	ZRSUAS, Mandya	MFC-09-13	AVTC-1-3	11	(NC)	NB-21	VTBN-2013-11
4	GBPUAT, Pantnagar	UPC-1501	AVTC-1-4	11. VT Dichanthium:-2013 (4 th Year: (Perennial)			
5	ZRSUAS, Mandya	MFC-09-4	AVTC-1-5	1	(NC)	Marvel 8	VTD-1
6	Vellyani	Vellayani-1	AVTC-1-7	2	IGFRI Jhansi	JHD-13-3	VTD-2
7	NC	Bundel Lobia-1	AVTC-1-6	3	AAU Anand	Marvel 09-4	VTD-3
8	NC	UPC-5286	AVTC-1-10	4	AAU Anand	Marvel 06-40	VTD-4
9	ZC (HZ)	UPC-622	AVTC-1-8	5	AAU Anand	Marvel 09-1	VTD-5
10	ZC (NWZ)	Bundel Lobia-2	AVTC-1-9	6	IGFRI Jhansi	JHD-13-2	VTD-6
11	ZC (NEZ)	UPC-628	AVTC-1-13	7	IGFRI Jhansi	JHD-13-1	VTD-7
12	ZC (CZ)	UPC-9202	AVTC-1- 12	8	AAU Anand	Marvel 09-3	VTD-8
13	ZC (SZ)	MFC-8-14	AVTC-1-11				
8. IVT Rice bean				12. VT Cenchrus Ciliaris-2013 (4 th Year): (Perennial)			
S.N.	Contributor	Entry name	Code name	1	SKRAU, Bikaner	RCCB-04-64	VTCC-1
1	AAU, Jorhat	JOR-16-1	IVTRB- 5	2	MPKV, Rahuri	RCC-CS-10-8	VTCC-2
2	AAU, Jorhat	JOR-16-2	IVTRB-2	3	MPKV, Rahuri	RCC-10-8	VTCC-4
3	JNKVV, Jabalpur	JRBJ 07-4	IVTRB-3	4	SKRAU, Bikaner	RCCB-03-23	VTCC-5
4	(NC)	K-1 (Bidhan-1)	IVTRB-4	5	(NC)	IGFRI-3108	VTCC-6
5	(NC)	Bidhan-2	IVTRB-1	6	MPKV, Rahuri	RCC-CS-10-5	VTCC-7
6	(NC)	RBL-6	IVTRB-6	7	MPKV, Rahuri	RCC-CS-10-4	VTCC-8
				8	MPKV, Rahuri	RCC-10-6	VTCC-9

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Breeder Seed Production in Forage Crops (*Kharif-2016*)

[Indent year *kharif 2017*]

(Table Reference: Tables BSP 1, BSP 2 & BSP 3)

In *Kharif-2016*, the indent for Breeder Seed Production (Indent year *Kharif 2017*) was received from DAC, GOI for 6 varieties of three forage crops viz., fodder Maize, fodder Pearl millet and fodder Cowpea. The total indent for breeder seed production was 93.25q as against the 77.84q indent in *Kharif 2015*. Thus the indent for *Kharif 2016* was 15.41 Q higher or 16.53% higher than *Kharif 2015* indent. The indent was allocated to seven SAUs/ICAR/NGO institutes. Among the quantity allocated for different forage crops, the maximum was for Maize (83.15 q) followed by Cowpea (9.10 q), and minimum was for Pearl millet (1.0 q). The indent was significantly higher in case of pearl millet (1.0q as against 0.1 q) and also in cowpea 9.10q as against 1.95q as compared to *Kharif 2015* indent.

The final Breeder Seed Production Report (BSP-IV) received from different seed producing centers revealed that the overall breeder seed production was higher in forage pearl millet and forage maize whereas it failed to meet the target in forage cowpea. Coming to the crop wise scenario, as compared to allocation in Maize, the final production is still awaited as one of the varieties was slated for *rabi 2016* production. In case of African Tall the production was 3.5 q surplus whereas in J 1006 it was 6.85q surplus. In case of Pratap Makka Chari -6 the data is awaited as crop was sown in *Rabi* season and will be harvested in April, 2017. In Pearl millet production was 4.25 q surplus. In cowpea, production in UPC 8705 was 0.15q surplus whereas in EC 4216 it was 4.13 q deficit. The overall production was 11.4% higher than the indent.

Many of the centers have also produced breeder seed of the varieties as well as surplus seed of previous years are also available totaling 8.71 q (details given in table BSP 3)

Table BSP 1: Centre wise Breeder Seed Production (q) during *Kharif-2016*

[Indent *Kharif 2017*]

S. N.	Producing centre/ State	Variety	Crop	DAC indent	Actual Allocation	Actual Production	Production Surplus (+)/ Deficit (-)
Maharashtra							
1.	BAIF, Urulikanchan	African Tall	Maize	44.00	14.00	17.50	(+) 3.50
2.	MPKV, Rahuri	African Tall	Maize		30.00	30.00	-
3.	BAIF, Urulikanchan	BAIF Bajra 1	Pearl millet	1.00	1.00	5.25	(+) 4.25
Punjab							
4.	PAU, Ludhiana	J-1006	Maize	38.15	38.15	45.00	(+) 6.85
Rajasthan							
5.	MPUAT, Udaipur	Pratap Makka Chari-6	Maize	1.00	1.00	Awaited	-
Uttarakhand							
6.	GBPUAT, Pantnagar	UPC-8705	Cowpea	1.35	1.35	1.50	(+) 0.15
Uttar Pradesh							
7.	ICAR-IGFRI, Jhansi	EC-4216	Cowpea	1.75	1.75	1.75	-
New Delhi							
8.	ICAR-IARI, New Delhi	EC-4216	Cowpea	6.0	6.0	1.87	(-) 4.13
Total				93.25	93.25	102.87*	(+) 10.62

Production of Pratap Makka Chari -6 is awaited.

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

[Indent Kharif 2016]

Crop	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	44.00	44.00	47.50	(+) 3.50
	2	J-1006	PAU, Ludhiana	1992	38.15	38.15	45.00	(+) 6.85
	3	Pratap Makka Chari-6	MPUAT, Udaipur	2009	1.00	1.00	awaited	
		Total			83.15	83.15	92.5*	(+)10.35**
Forage Pearl Millet	4	BAIF Bajra 1	BAIF, Urulikanchan	2010	1.0	1.0	5.25	(+) 4.25
		Total			1.0	1.0	5.25	(+) 4.25
Forage Cowpea	5	EC-4216	ICAR-IARI and ICAR-IGFRI	1978	7.75	7.75	3.62	(-) 4.13
	6	UPC-8705	GBPUA&T, Pantnagar	1996	1.35	1.35	1.50	(+) 0.15
		Total			9.10	9.10	5.12	(-) 3.98
Grand Total					93.25	93.25	102.87*	(+)10.62

Table BSP 3: Additional seed produced –Breeder seed of forage crops

Location	Crop	Name of the variety	DAC Indent (q)	Quantity produced (q)
MPKV, Rahuri	Forage pearl millet	Giant Bajra	0	0.06
MPKV, Rahuri	Stylo	Phule Kranti	0	0.10
ICAR-IGFRI, Jhansi	Cowpea	Bundel Lobia 1	0	1.00
	Cowpea	Bundel Lobia 2	0	0.30
	Cowpea	Kohinoor	0	1.00
	Cowpea	Bundel Lobia 4	0	0.20
	Maize	African Tall	0	2.00
	Sorghum	MP Chari	0	1.75 [1.31 (K-2016) + 0.44 (K-2015)]
	Guar	Bundel Guar 1	0	1.00
PAU, Ludhiana	Guar	HG 365	0	1.0
	Guinea grass	PGG 518	0	0.30
Total				8.71

1. IVTM: INITIAL VARIETAL TRIAL IN FORAGE MAIZE

(Reference Tables: 1.1 to 1.9)

An initial varietal trial in forage maize comprising of ten entries with two national checks viz., African Tall and J-1006 was conducted at 23 locations in five zones of the country.

For green forage yield (q/ha), entry IAFM -2015-38 (2.4 %) in Hill Zone, entry AFM-6 (1.6%) in NWZ and entry H 1003 in NEZ (1.1%) showed marginal superiority. In central zone, none of the entries could perform better than the national check African Tall. In South Zone, TSFM-15-2 (7.1%), TSFM-15-5 (11.2%), ADV 6737 (5.9%), IAFM-2015-38 (4.9%), IAFM-2015-48 (2.5%) showed superiority over the best check. At all India level, National check J 1006 performed best followed by another national check African tall.

For dry matter yield (q/ha), in Hill zone national checks were superior. In NWZ, AFM-6 (2.2%) and in central zone, ADV-6737 (2.9%) was marginally superior. In NEZ, AFM-6 (10.4%), H1003 (19.8%), ADV-6737 (1.6%) and in south zone ADV-6737 (25.4%), TSFM-15-5 (18.4%), IAFM-2015-38 (17.6%), TSFM-15-2 (10.4%), IAFM-2015-48 (9.0%) were superior against the best checks. At national level, ADV-6737 (6.9%), TSFM-15-5 (2.9%), AFM-6 (1.4%) were superior against the best check.

For per day productivity (q/ha/day), National check J1006 for green forage yield and ADV 6737 for dry matter production potential were superior respectively.

For crude protein yield (q/ha), TSFM-15-2 was best followed by J1006 and AFM-6. For crude protein content (%), national check, J 1006 was the best followed by TSFM-15-2.

For the character plant height, national check African Tall (196.5 cm) was adjudged best performer. For other quality parameters, national check African Tall for leaf stem ratio, KDFM -1 for ADF (8%) and H 1003 for NDF (%) ranked first, whereas for IVDMD (%) test entry H 1003 (59.6%) was best performer followed by J 1006 (58%).

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

Entries	Hill Zone						North West Zone							North East Zone							
	Palam-pur	Sri-nagar	Raj-ouri	Average	Rank	Superiority%	Ludh-iana	Udai-pur	**Jalore	Pant-nagar	Average	Rank	Superiority%	Bhubaneswar	Ranchi	Jorhat	Faizabad	Imphal	Average	Rank	Superiority%
AFM-6	384.5	362.7	188.6	311.9	4	2.4	390.7	377.1	113.0	486.9	418.2	1	1.6	307.2	444.4	238.7	351.3	465.5	361.4	6	1.1
H 1003	312.9	329.3	166.7	269.6	12		240.3	239.2	138.3	270.2	249.9	11		289.5	527.8	284.5	416.7	437.7	391.2	1	
MFM-2	340.1	348.7	175.3	288.0	9		198.7	194.3	29.0	223.2	205.4	12		313.5	333.3	260.6	335.0	334.1	315.3	12	
TSFM-15-2	389.5	372.1	158.8	306.8	6		414.8	321.6	71.7	319.4	351.9	5		361.1	388.9	228.8	408.5	523.7	382.2	4	
KDFM-1	364.8	347.4	120.4	277.5	10		284.3	268.3	105.0	343.5	298.7	8		283.3	500.0	314.3	347.2	309.5	350.9	7	
TSFM-15-5	449.9	314.4	163.4	309.3	5		427.3	349.3	125.7	325.0	367.2	4		320.8	481.4	217.3	322.7	516.2	371.7	5	
ADV 6737	424.0	308.1	138.3	290.1	8		352.8	453.4	258.7	374.2	393.5	3		304.1	370.3	185.5	379.9	492.8	346.5	8	
IAFM-2015-38	461.1	373.9	161.6	332.2	1		313.9	291.5	201.3	250.5	285.3	10		279.1	518.6	201.4	408.5	276.2	336.8	10	
IAFM-2015-48	393.8	355.7	144.6	298.0	7		275.5	333.1	119.7	281.5	296.7	9		342.3	472.2	247.2	396.2	247.2	341.0	9	
IAFM-2015-12	334.5	303.9	170.9	269.8	11		293.5	319.2	94.7	296.8	303.2	7		260.4	546.4	293.4	371.7	206.5	335.7	11	
J-1006 (NC)	440.1	368.1	164.7	324.3	2		451.4	397.9	145.7	385.2	411.5	2		296.8	444.4	272.5	379.9	529.9	384.7	3	
African Tall (NC)	483.3	324.9	155.6	321.3	3		345.8	367.8	113.3	294.5	336.0	6		351.0	444.4	301.4	343.1	494.0	386.8	2	
Mean	398.2	342.4	159.1	299.9			332.4	326.1	126.3	320.9	326.5			309.1	456.0	253.8	371.7	402.8	358.7		
CD at 5%	56.8	12.1	1.3				29.6	75.8	36.6	15.0				39.9	86.9	9.1	99.6	68.3			
CV%	8.4	5.4	13.2				10.1	13.7	17.1	2.8				7.6	11.2	9.8	15.8	10.0			

Note: ** Data abnormally low hence not considered in zonal and all India average

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

Entries	Central Zone								South Zone							All India Average			
	Ana-nd	Rai-pur	Jabal-pur	Rah-uri	Urulikan-chan	*Jha-nsi	Average	Rank	Hyderabad	Coimbatore	Mandya	**Vellayani	**Karikal	Average	Rank	Superiority%	Average	Rank	
AFM-6	392.0	318.1	310.3	286.6	849.7	396.0	431.3	5	305.8	342.6	575.5	140.3	154.3	408.0	9	7.0	388.3	5	
H 1003	239.0	409.5	258.2	286.0	763.9	374.8	391.3	10	324.3	393.5	520.6	65.7	196.8	412.8	8		353.1	9	
MFM-2	209.0	293.6	268.7	113.6	821.1	246.8	341.2	12	259.5	388.9	485.2	67.3	69.4	377.9	11		310.3	12	
TSFM-15-2	285.0	414.3	233.3	284.9	861.9	48.5	415.9	6	417.0	527.8	414.5	140.7	162.0	453.1	2		385.6	6	
KDFM-1	280.0	300.6	200.0	283.6	686.3	330.8	350.1	11	296.5	351.9	444.8	159.7	196.8	364.4	12		333.0	11	
TSFM-15-5	294.0	405.0	262.4	321.7	902.8	391.6	437.2	4	463.3	430.6	518.7	168.3	150.5	470.9	1		11.2	394.0	3
ADV 6737	346.0	432.6	312.0	419.4	812.9	530.8	464.6	2	329.0	532.4	484.1	59.0	123.5	448.5	3		5.9	392.2	4
IAFM-2015-38	387.0	389.4	274.9	241.5	682.2	441.1	395.0	9	315.1	467.6	550.6	122.0	158.2	444.4	4		4.9	360.2	7
IAFM-2015-48	306.0	322.4	208.0	307.2	870.1	317.5	402.7	8	305.8	402.8	593.4	108.3	223.8	434.0	5		2.5	358.2	8
IAFM-2015-12	260.0	394.6	266.6	295.8	857.9	315.2	415.0	7	287.3	370.4	512.6	48.3	196.8	390.1	10			349.6	10
J-1006 (NC)	454.0	381.0	247.8	292.9	878.3	442.0	450.8	3	379.9	416.7	468.5	149.7	135.0	421.7	7			402.6	1
African Tall (NC)	403.0	404.6	322.8	427.2	853.8	345.5	482.3	1	375.3	425.9	469.1	145.7	162.0	423.4	6			399.3	2
Mean	321.3	372.1	263.8	296.7	820.1	348.4	414.8		338.2	420.9	503.1	114.6	160.8	420.8			368.9		
CD at 5%	51.0	38.3	72.6	32.9	113.2	213.4			37.2	34.2	67.6	17.3	21.2						
CV%	9.0	6.0	16.2	6.6	8.1	33.4			6.5	4.7	7.9	2.2	7.8						

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

Note: ** Data abnormally low hence not considered in zonal and all India average

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

Entries	Hill Zone					North West Zone					North East Zone							
	Palam-pur	Sri-nagar	Raj-ouri	Aver-age	Ra-nk	Ludh-iana	Pant-nagar	Aver-age	Ra-nk	Superi-osity%	Bhuban-eswar	Ran-chi	Jor-hat	Faiza-bad	Imp-hal	Aver-age	Ra-nk	Superi-osity%
AFM-6	74.0	72.6	38.5	61.7	5	90.7	98.0	94.4	1	2.2	63.9	106.7	47.3	85.8	99.5	80.6	2	10.4
H 1003	61.6	71.6	32.5	55.2	10	57.7	65.0	61.3	11		61.1	145.3	56.2	98.0	77.0	87.5	1	19.8
MFM-2	68.2	74.1	34.8	59.0	7	46.3	51.0	48.6	12		65.5	81.7	51.5	76.0	64.9	67.9	8	
TSFM-15-2	77.7	75.2	33.7	62.2	4	100.8	66.7	83.7	5		76.2	64.4	46.4	80.9	94.8	72.5	6	
KDFM-1	72.5	69.5	26.1	56.0	9	64.6	78.9	71.8	6		58.8	82.8	62.4	76.8	47.7	65.7	9	
TSFM-15-5	88.7	66.2	33.5	62.8	3	107.7	73.7	90.7	3		67.6	87.2	37.8	73.5	98.0	72.8	5	
ADV 6737	82.2	65.0	28.9	58.7	8	81.8	87.0	84.4	4		64.6	90.3	34.6	83.3	98.2	74.2	3	1.6
IAFM-2015-38	88.1	74.8	35.4	66.1	1	72.8	57.6	65.2	10		58.7	73.9	37.2	86.6	46.7	60.6	11	
IAFM-2015-48	75.9	72.2	30.4	59.5	6	66.1	66.7	66.4	9		72.4	66.4	49.1	83.3	36.0	61.4	10	
IAFM-2015-12	66.5	59.4	33.1	53.0	11	70.4	67.5	69.0	8		55.7	86.7	52.7	74.3	33.9	60.7	12	
J-1006 (NC)	86.9	73.6	33.2	64.6	2	108.3	76.5	92.4	2		62.3	83.3	47.8	68.6	95.7	71.5	7	
African Tall (NC)	96.0	71.6	30.7	66.1	1	83.0	60.0	71.5	7		74.1	76.1	60.2	65.4	89.1	73.0	4	
Mean	78.2	70.5	32.6	60.4		79.2	70.7	74.9			65.1	87.1	48.6	79.4	73.5	70.7		
CD at 5%	11.4	4.2	0.3			10.2	5.6				8.3	28.3	4.1	10.7	16.0			
CV%	8.6	3.1	13.5			15.8	4.7				7.5	19.2	10.1	8.0	12.9			

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

Entries	Central Zone									South Zone							All India Average			
	Ana- nd	Rai- pur	Jabal- pur	Rah- uri	Urulikan- chan	*Jha- nsi	Aver- age	Ran- k	Superi- ority%	Hydera- bad	Coimb- atore	Man- dya	**Vella- yani	**Kara- ikal	Aver- age	Ran- k	Superi- ority%	Aver- age	Ran- k	Superi- ority%
AFM-6	64.7	103.6	65.8	53.9	169.5	152.5	91.5	3	2.9	47.7	61.6	105.1	23.4	57.2	71.5	11		80.5	3	1.4
H 1003	42.4	96.4	54.3	62.7	143.4	141.5	79.9	10		48.2	74.0	96.9	10.8	57.7	73.1	9		74.7	7	
MFM-2	43.0	85.6	56.6	20.3	140.3	96.1	69.2	12		41.9	74.8	82.7	11.3	39.9	66.5	12		64.4	12	
TSFM-15-2	63.0	114.4	49.5	52.2	170.5	168.7	89.9	5		66.7	119.9	74.4	23.8	72.4	87.0	4	10.4	79.3	5	
KDFM-1	52.1	106.8	40.2	39.8	139.1	146.5	75.6	11		50.1	60.0	106.9	23.9	80.5	72.4	10		68.6	11	
TSFM-15-5	69.8	103.8	53.3	61.0	169.3	163.5	91.4	4		78.1	88.7	112.5	26.9	67.6	93.1	2	18.1	81.7	2	2.9
ADV 6737	62.3	127.8	67.7	91.7	166.3	193.2	103.1	1		53.6	122.2	120.5	10.6	56.3	98.8	1	25.4	84.9	1	6.9
IAFM-2015-38	65.8	126.7	58.3	31.2	143.1	166.1	85.0	8		52.1	87.4	138.7	21.6	60.5	92.7	3	17.6	74.2	8	
IAFM-2015-48	49.5	125.4	43.3	42.6	171.9	142.4	86.6	7		48.2	73.9	135.6	17.6	83.6	85.9	5	9.0	72.7	9	
IAFM-2015-12	51.2	97.2	55.0	42.1	177.1	123.9	84.5	9		48.5	67.0	121.6	8.0	74.4	79.0	6	0.3	70.0	10	
J-1006 (NC)	79.9	91.2	51.6	52.4	164.9	172.8	88.0	6	61.9	83.3	91.3	23.9	48.6	78.8	7		78.5	6		
African Tall (NC)	85.1	108.4	69.5	68.5	169.6	139.4	100.2	2	60.2	88.2	73.7	21.8	64.2	74.0	8		79.4	4		
Mean	60.7	107.3	55.4	51.5	160.4	150.6	87.1			54.8	83.4	105.0	18.6	63.6	81.1			75.7		
CD at 5%	10.2	19.0	15.6	5.5	22.1	51.7				8.0	15.2	16.2	3.3	15.9						
CV%	9.4	10.4	16.6	6.3	8.1	32.1				8.7	9.1	9.1	2.6	14.8						

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

Note: ** Data abnormally low hence not considered in zonal and all India average

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

Entries	Palam-pur	Sri-nagar	Raj-ouri	Ludh-iana	Pant-nagar	Rai-pur	Ran-chi	Faiza-bad	Bhuban-eswar	Ana-nd	Jor-hat	Jaba-lpur	Rah-uri	Urulikan-ghan	Coimb-atore	Man-dya	Hydera-bad	**Vella-yani	**Karai-kkal	Aver-age	Ra-nk
AFM-6	5.66	4.82	2.89	5.40	7.68	5.68	6.84	6.16	4.80	7.26	3.79	3.52	4.78	13.70	5.71	10.42	4.83	2.55	1.89	6.11	3
H 1003	4.57	4.42	2.62	3.30	4.21	6.61	8.65	7.18	4.32	4.60	4.52	2.86	4.85	11.75	6.78	9.65	5.41	1.46	2.39	5.66	11
MFM-2	5.15	4.66	2.72	2.80	3.48	4.52	5.29	5.15	4.48	3.60	4.09	2.95	1.89	13.46	5.98	8.88	4.14	1.54	0.94	4.90	12
TSFM-15-2	5.66	4.83	2.55	5.80	4.99	6.47	6.27	5.83	5.09	4.75	3.81	2.74	4.83	13.26	7.65	7.43	6.32	2.56	2.20	5.78	9
KDFM-1	6.22	4.62	1.94	3.90	5.39	5.78	9.09	5.69	4.72	6.36	4.99	2.15	5.91	10.09	7.82	8.44	5.00	2.90	2.54	5.77	10
TSFM-15-5	6.49	4.20	2.51	5.90	5.07	7.36	8.03	5.12	4.28	5.07	3.40	3.12	5.36	12.20	6.83	9.32	7.72	3.06	1.88	6.00	6
ADV 6737	6.17	4.12	2.22	4.90	6.07	7.09	5.88	5.84	5.07	7.36	2.94	3.62	6.66	13.33	8.45	8.81	5.55	1.31	1.56	6.12	2
IAFM-2015-38	7.18	5.00	2.58	4.40	3.95	6.28	10.17	6.69	4.50	8.06	3.15	3.05	4.24	9.47	8.99	10.74	5.08	2.71	2.08	6.09	4
IAFM-2015-48	6.66	4.74	2.40	3.80	4.51	6.08	8.58	6.49	5.43	6.38	3.92	2.41	5.30	12.80	8.06	10.61	4.93	2.40	2.75	6.06	5
IAFM-2015-12	5.15	4.06	2.59	4.10	4.86	7.45	9.76	6.19	3.95	5.53	4.25	3.13	5.28	11.59	8.23	9.39	4.96	1.07	2.44	5.91	7
J-1006 (NC)	6.33	4.88	2.60	6.30	6.01	7.19	6.73	5.58	4.30	8.41	4.40	2.81	4.88	14.17	6.72	8.85	5.76	2.72	1.67	6.23	1
African Tall (NC)	5.66	4.34	2.48	4.80	4.60	7.63	6.94	5.12	4.81	6.50	4.50	3.71	6.28	12.37	6.17	8.69	5.69	2.65	2.05	5.90	8
Mean	5.91	4.56	2.51	4.62	5.07	6.51	7.69	5.92	4.65	6.16	3.98	3.01	5.02	12.35	7.28	9.27	5.45	2.24	2.03	5.88	

Note: ** Data abnormally low hence not considered in zonal and all India average

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

Entries	Sri-nagar	Raj-ouri	Ludh-iana	Pant-nagar	Rai-pur	Ran-chi	Faiza-bad	Bhuban-eswar	Ana-nd	Jor-hat	Jabal-pur	Rah-uri	Urulikan-ghan	Coimb-atore	Man-dya	Hydera-bad	**Kara-ikkal	Aver-age	Ra-nk
AFM-6	0.93	0.59	1.30	1.55	1.85	1.64	1.50	1.00	1.20	0.75	0.74	0.90	2.73	1.03	1.90	0.75	0.70	1.27	2
H 1003	0.95	0.51	0.80	1.01	1.56	2.38	1.69	0.91	0.82	0.89	0.60	1.06	2.21	1.28	1.80	0.80	0.70	1.20	6
MFM-2	0.98	0.54	0.60	0.79	1.32	1.30	1.16	0.94	0.74	0.81	0.62	0.34	2.30	1.15	1.51	0.67	0.54	0.99	9
TSFM-15-2	0.96	0.54	1.40	1.04	1.79	1.04	1.15	1.07	1.05	0.77	0.58	0.89	2.62	1.74	1.33	1.01	0.98	1.19	7
KDFM-1	0.91	0.42	0.90	1.23	2.05	1.50	1.25	0.98	1.18	0.99	0.43	0.83	2.05	1.33	2.04	0.85	1.04	1.18	8
TSFM-15-5	0.86	0.51	1.50	1.15	1.89	1.45	1.16	0.90	1.20	0.59	0.63	1.02	2.29	1.41	2.02	1.30	0.84	1.24	3
ADV 6737	0.86	0.46	1.10	1.40	2.09	1.43	1.28	1.08	1.33	0.55	0.78	1.45	2.73	1.94	2.20	0.90	0.71	1.35	1
IAFM-2015-38	0.99	0.56	1.00	0.91	2.04	1.45	1.39	0.95	1.37	0.58	0.64	0.55	1.99	1.68	2.70	0.84	0.80	1.23	4
IAFM-2015-48	0.93	0.50	0.90	1.07	2.37	1.21	1.36	1.15	1.03	0.78	0.50	0.74	2.53	1.48	2.42	0.78	1.03	1.23	4
IAFM-2015-12	0.80	0.50	1.00	1.10	1.83	1.55	1.23	0.84	1.09	0.76	0.64	0.75	2.39	1.49	2.23	0.84	0.92	1.19	7
J-1006 (NC)	0.96	0.52	1.50	1.19	1.72	1.26	1.01	0.90	1.48	0.77	0.58	0.87	2.66	1.34	1.73	0.94	0.60	1.22	5
African Tall (NC)	0.92	0.49	1.20	0.93	2.04	1.19	0.97	1.02	1.37	0.90	0.79	1.01	2.46	1.28	1.36	0.91	0.81	1.18	8
Mean	0.92	0.51	1.10	1.11	1.88	1.45	1.26	0.98	1.16	0.76	0.63	0.87	2.41	1.43	1.94	0.88	0.81	1.21	

Note: ** Data abnormally low hence not considered in zonal and all India average

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

Entries	Palam-pur	Ludh-iana	Rai-pur	Faiza-bad	Bhuban-eswar	Ana-nd	Jor-hat	Imp-hal	Jabal-pur	Rah-uri	Urulikan-cha	Coimba-tore	Man-dya	Hydera-bad	Aver-age	Ra-nk
AFM-6	6.5	12.4	7.6	6.4	5.1	4.0	4.4	6.4	5.2	3.4	16.1	7.6	8.7	2.5	6.9	2
H 1003	5.2	5.1	7.9	7.6	4.8	2.7	4.9	5.6	4.2	3.9	14.0	6.8	9.3	1.9	6.0	7
MFM-2	5.1	3.1	6.1	6.0	5.2	2.6	5.0	4.0	4.4	1.4	13.8	8.5	7.3	1.3	5.3	10
TSFM-15-2	7.0	7.4	9.0	6.6	5.9	3.8	4.5	5.5	3.7	3.1	17.6	14.7	5.8	4.7	7.1	1
KDFM-1	6.3	5.4	7.3	5.5	4.9	3.1	5.8	3.1	2.9	2.4	14.1	4.8	10.4	2.6	5.6	9
TSFM-15-5	8.3	7.6	7.4	5.1	5.2	4.4	3.6	6.5	4.2	4.5	16.2	7.0	9.8	4.1	6.7	3
ADV 6737	8.1	6.0	8.6	5.7	5.1	4.2	3.5	6.5	5.4	6.0	15.7	9.1	11.6	1.9	6.9	2
IAFM-2015-38	8.2	4.9	10.4	6.5	4.6	4.2	3.2	2.8	4.6	2.0	13.8	6.9	11.5	2.7	6.2	5
IAFM-2015-48	6.4	4.2	9.2	6.5	5.6	4.1	4.3	2.1	3.1	2.8	16.0	5.5	13.1	3.0	6.1	6
IAFM-2015-12	5.6	5.0	7.1	5.9	4.6	3.2	4.8	2.1	4.2	3.6	18.6	5.8	7.5	2.1	5.7	8
J-1006 (NC)	7.6	9.2	7.3	5.6	4.9	5.8	4.4	5.8	4.0	4.1	16.5	9.8	8.0	4.3	6.9	2
African Tall (NC)	9.5	6.1	7.3	5.4	5.7	4.8	5.2	5.5	5.6	4.5	15.8	6.2	5.8	2.6	6.4	4
Mean	7.0	6.4	7.9	6.0	5.1	3.9	4.5	4.7	4.3	3.5	15.7	7.7	9.1	2.8	6.3	

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

Entries	Palamp-ur	Ludh-iana	Rai-pur	Faiza-bad	Bhuba-neswar	Ana-nd	Jor-hat	Imp-hal	Rah-uri	Urulikan-cha	Jabal-pur	Coimb-atore	Man-dya	Hydera-bad	Aver-age	Ra-nk
AFM-6	8.8	7.3	7.3	7.5	7.9	6.2	9.5	6.4	6.3	9.5	8.0	12.3	8.3	5.3	7.9	3
H 1003	8.4	9.0	8.2	7.8	7.8	6.4	8.8	7.3	6.3	9.8	8.0	9.2	9.6	3.9	7.9	3
MFM-2	7.5	6.8	7.1	7.9	7.9	6.1	9.8	6.1	7.2	9.8	8.0	11.4	8.8	3.1	7.7	4
TSFM-15-2	9.0	7.3	7.9	8.1	7.8	6.0	9.7	5.9	6.0	10.3	7.7	12.3	7.9	7.0	8.1	2
KDFM-1	8.8	8.4	6.8	7.1	8.2	6.0	9.4	6.6	6.1	10.1	7.5	7.9	9.6	5.3	7.7	4
TSFM-15-5	9.3	7.1	7.1	6.9	7.7	6.3	9.7	6.6	7.4	9.6	7.9	7.9	8.7	5.3	7.7	4
ADV 6737	9.9	7.3	6.8	6.8	7.8	6.7	10.2	6.6	6.6	9.4	8.0	7.4	9.6	3.5	7.6	5
IAFM-2015-38	9.3	6.8	8.2	7.5	7.9	6.4	8.8	6.0	6.3	9.6	8.0	7.9	8.3	5.3	7.6	5
IAFM-2015-48	8.4	6.3	7.3	7.8	7.8	8.3	8.8	5.9	6.6	9.3	7.6	7.4	9.6	6.1	7.7	4
IAFM-2015-12	8.4	7.1	7.3	7.9	8.2	6.2	9.3	6.3	8.6	10.5	7.9	8.7	6.1	4.4	7.6	5
J-1006 (NC)	8.8	8.5	8.0	8.1	7.9	7.3	9.3	6.0	7.7	10.0	7.9	11.8	8.7	7.0	8.4	1
African Tall (NC)	9.9	7.3	6.7	8.2	7.8	5.7	8.7	6.1	6.6	9.3	8.0	7.0	7.9	4.4	7.4	6
Mean	8.9	7.4	7.4	7.6	7.9	6.5	9.3	6.3	6.8	9.8	7.9	9.3	8.6	5.1	7.8	

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

Entries	Palam-pur	Sri-nagar	Raj-ouri	Ludh-iana	Jal-ore	Pant-nagar	Udai-pur	Ran-chi	Faiza-bad	Bhuban-eswar	Ana-and	Jor-hat	Imp-hal
AFM-6	187.3	155.4	188.4	178.8	143.6	191.4	173.9	179.0	197.2	185.6	194.4	164.2	242.3
H 1003	214.3	142.1	179.6	171.1	153.8	158.4	182.1	176.0	253.2	170.6	175.0	209.3	247.1
MFM-2	246.7	147.6	185.3	167.3	138.2	186.0	172.1	153.0	172.3	188.7	186.8	178.1	218.2
TSFM-15-2	252.0	153.2	177.5	194.9	121.2	185.7	169.3	178.0	151.0	204.6	204.9	195.9	304.0
KDFM-1	211.7	148.6	175.3	172.3	146.3	152.5	188.5	172.0	185.5	164.3	192.4	183.7	202.4
TSFM-15-5	270.0	133.9	186.3	172.3	131.7	190.0	164.3	160.0	167.5	191.9	202.0	224.5	260.0
ADV 6737	203.7	135.1	178.2	141.8	159.6	168.8	157.1	173.0	181.5	180.2	181.3	195.9	203.2
IAFM-2015-38	285.0	158.1	180.7	167.3	142.0	144.8	159.6	191.0	164.3	155.8	208.3	201.8	214.1
IAFM-2015-48	269.3	164.8	179.4	135.4	116.6	171.7	197.3	201.0	184.2	194.7	204.6	189.8	202.2
IAFM-2015-12	244.7	140.2	183.7	161.5	142.0	164.2	182.6	211.0	158.4	149.3	195.7	131.8	195.2
J-1006 (NC)	231.7	153.4	181.3	163.5	190.6	189.2	171.6	165.0	205.2	175.3	211.1	109.7	240.8
African Tall (NC)	245.7	146.9	183.3	197.8	163.4	166.8	193.2	171.0	154.5	200.2	206.5	136.9	274.4
Mean	238.5	148.3	181.6	168.7	145.7	172.5	176.0	177.5	181.2	180.1	196.9	176.8	233.7

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

Entries	Jabal-pur	Rai-pur	Urulikan-chan	Rah-uri	Jha-nsi	Coimb-atore	Man-dya	Hydera-bad	Vella-yani	Kara-ikkal	Aver-age	Ra-nk
AFM-6	162.4	213.8	237.8	159.9	217.9	215.3	157.4	152.1	101.3	174.3	181.5	7
H 1003	146.4	219.6	248.7	143.7	198.3	209.5	158.1	137.3	149.0	174.8	183.4	5
MFM-2	156.1	248.3	257.3	142.6	198.6	231.7	178.7	155.7	142.7	105.7	180.8	8
TSFM-15-2	141.5	258.1	251.8	149.9	262.7	247.3	181.2	200.1	160.7	145.8	195.3	2
KDFM-1	113.8	174.3	223.8	145.3	193.8	207.5	161.8	113.5	152.0	161.8	171.4	11
TSFM-15-5	149.0	221.1	262.8	159.9	204.9	228.4	159.9	186.8	151.7	162.6	188.8	3
ADV 6737	165.5	175.5	217.3	122.4	172.9	197.9	174.7	107.3	125.3	146.3	168.0	12
IAFM-2015-38	164.4	201.7	242.3	123.7	219.7	238.1	161.0	150.1	125.3	155.3	180.6	9
IAFM-2015-48	140.3	209.0	243.7	141.0	211.7	210.3	177.1	138.7	140.0	168.5	182.2	6
IAFM-2015-12	151.9	193.5	235.0	148.0	197.1	204.0	162.1	126.8	135.3	152.1	172.4	10
J-1006 (NC)	143.7	214.3	267.8	172.2	201.9	232.1	162.2	176.1	153.3	169.8	186.2	4
African Tall (NC)	169.0	269.9	264.7	156.6	261.4	264.6	171.5	192.8	171.0	158.2	196.5	1
Mean	150.3	216.6	246.1	147.1	211.7	223.9	167.1	153.1	142.3	156.3	182.3	

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

Entries	Palam-pur	Sri-nagar	Raj-ouri	Ludh-iana	Pant-nagar	Rai-pur	Ran-chi	Faiza-bad	Bhuban-eswar	Ana-nd	Jor-hat	Imp-hal	Jabal-pur	Rah-uri	Urulikan-chan	Coimb-atore	Man-dya	Hydera-bad	**Vella-yani	**Kara-ikkal	Aver-age	Ra-nk
AFM-6	0.39	0.40	0.43	0.85	0.28	0.57	0.50	0.48	0.95	1.24	1.09	0.75	0.53	0.55	0.90	0.37	0.47	0.45	0.55	0.31	0.62	3
H 1003	0.43	0.37	0.41	0.48	0.35	0.61	0.41	0.52	0.84	0.76	0.89	0.99	0.43	0.41	0.94	0.39	0.46	0.46	0.44	0.34	0.56	7
MFM-2	0.27	0.39	0.39	0.62	0.27	0.65	0.51	0.61	1.03	0.93	0.77	0.91	0.40	0.43	0.91	0.38	0.38	0.38	0.66	0.19	0.57	6
TSFM-15-2	0.43	0.36	0.44	0.48	0.35	0.52	0.72	0.65	1.25	0.81	0.65	0.81	0.39	0.38	0.74	0.39	0.42	1.35	0.61	0.22	0.62	3
KDFM-1	0.37	0.33	0.44	0.42	0.37	0.50	0.59	0.51	0.79	1.65	0.98	0.86	0.30	0.38	0.76	0.32	0.35	0.56	0.70	0.33	0.58	5
TSFM-15-5	0.40	0.41	0.41	0.66	0.37	0.53	0.53	0.61	1.09	0.77	1.04	1.02	0.41	0.39	1.11	0.37	0.55	0.47	1.26	0.26	0.62	3
ADV 6737	0.54	0.38	0.38	0.29	0.33	0.60	0.50	0.56	0.91	1.73	0.91	0.70	0.49	0.45	0.82	0.37	0.38	0.55	0.83	0.29	0.61	4
IAFM-2015-38	0.31	0.35	0.41	0.66	0.32	0.55	0.62	0.49	0.75	1.10	0.78	0.96	0.45	0.39	0.97	0.40	0.36	0.45	0.62	0.23	0.57	6
IAFM-2015-48	0.33	0.41	0.43	0.47	0.27	0.58	0.63	0.53	1.15	1.63	0.66	1.28	0.30	0.35	0.98	0.35	0.50	0.46	1.46	0.32	0.63	2
IAFM-2015-12	0.33	0.39	0.37	0.85	0.29	0.48	0.67	0.63	0.71	1.50	1.11	1.06	0.41	0.42	0.75	0.40	0.45	0.41	0.63	0.31	0.62	3
J-1006 (NC)	0.36	0.41	0.42	0.66	0.35	0.45	0.71	0.58	0.87	1.00	1.39	1.30	0.48	0.37	0.76	0.40	0.46	0.40	0.44	0.35	0.63	2
African Tall (NC)	0.36	0.38	0.41	0.66	0.49	0.51	0.87	0.62	1.19	1.08	0.81	1.25	0.53	0.40	1.12	0.39	0.55	0.27	0.39	0.26	0.66	1
Mean	0.38	0.38	0.41	0.59	0.34	0.55	0.61	0.57	0.96	1.18	0.92	0.99	0.43	0.41	0.90	0.38	0.44	0.52	0.72	0.28	0.61	

Note: ** Data abnormally low hence not considered in zonal and all India average

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

Entries	ADF (%)		NDF (%)		IVDMD (%)	
	Ludhiana	Rank	Ludhiana	Rank	Ludhiana	Rank
AFM-6	45.0	4	75.0	10	56.3	6
H 1003	42.8	2	70.4	1	59.6	1
MFM-2	49.4	10	74.6	8	55.4	8
TSFM-15-2	45.6	5	73.8	5	57.3	3
KDFM-1	42.1	1	72.8	3	58.0	2
TSFM-15-5	47.1	6	73.4	4	56.9	4
ADV 6737	48.3	7	74.3	6	55.8	7
IAFM-2015-38	49.8	11	75.8	12	54.9	9
IAFM-2015-48	50.3	12	75.6	11	54.1	10
IAFM-2015-12	49.3	9	74.8	9	51.9	11
J-1006 (NC)	44.4	3	71.8	2	58.0	2
African Tall (NC)	48.4	8	74.4	7	56.8	5
Mean	46.9		73.9		56.3	

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

(Reference Tables: 2.1 to 2.9)

An advanced varietal trial **Combined first and Second Advanced Varietal Trial in Forage Maize** in forage maize comprising four entries [**JHM 15-1** promoted from IVT to AVT-1; **MFM-4**, **PAC-746**, **AFM-4** promoted from AVT-1 to AVT-2] and two national checks viz., African Tall and J-1006 was conducted at 17 locations distributed in four zones viz., Hill, North West, central and north east zone.

For green forage yield (q/ha), entry PAC -746 was superior to national check by a margin of 22.6% in hill zone and 7.6% in NWZ. In NEZ, entries AFM-4 (6.4%), JHM 15-1 (5%), PAC- 746 (2.7%), MFM-4 (2.3%) were superior over the best check. In central zone none of the entries could surpass national checks. At all India level, PAC-746 showed marginal superiority over the best check by a margin of 0.9%.

For dry matter yield (q/ha), entry PAC 746 showed marginal superiority over best check by margin of 4.6% in hill zone, and 2.4% at all India level. In NWZ, entry PAC 746 was superior by 26.4% over best check. In NEZ, entries PAC 746 (6.1%), JHM 15-1 (3.9%), HFM-4 (0.5%) were superior over best check. In central zone, none of the entries could surpass national checks.

For per day productivity forage production potential (q/ha/day), entry PAC-746 was superior for both green and dry matter production followed by national checks.

For crude protein yield (q/ha), national check African tall was the best followed by J 1006. For crude protein content (%), JHM 15-1 was best. For the character leafiness (L/S ratio), entry JHM 15-1 was best. For plant height, African Tall was adjudged best performer. For other quality parameters, for other quality parameters ADF, NDF and IVDMD, national check African Tall was the best.

3. AVTM-2 (SEED): SECOND ADVANCED VARIETAL TRIAL IN FORAGE MAIZE (SEED)

(Reference Tables: 3.1)

Three entries along with two national checks were evaluated for seed production potential at 5 locations. For seed yield, entry PAC-746 was the best showing 32.2% superiority over the best check. It was followed by entry MFM-4 showing superiority of 10.2% over the best check.

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

Entries	Hill Zone						North West Zone						
	Palam-pur	Sri-nagar	Alm-ora	Aver-age	Ra-nk	Super-iority%	Ludh-iana	Udai-pur	Pant-nagar	Jal-ore	Aver-age	Ra-nk	Superi-ority%
MFM-4	167.5	334.6	180.6	227.5	4	22.6	239.4	174.9	273.3	104.8	198.1	5	7.6
JHM 15-1	190.2	313.4	166.7	223.4	5		342.7	242.0	366.7	163.5	278.7	3	
PAC-746	309.7	355.4	350.0	338.3	1		460.8	325.9	450.0	167.5	351.1	1	
AFM-4	134.7	308.0	88.0	176.9	6		209.6	122.9	188.3	111.0	158.0	6	
African Tall (NC)	274.0	346.4	207.4	275.9	2		251.3	199.9	253.3	105.5	202.5	4	
J-1006 (NC)	250.9	324.1	210.7	261.9	3		393.3	318.6	380.0	212.8	326.2	2	
Mean	221.2	330.3	200.5	250.7			316.2	230.7	318.6	144.2	252.4		
CD at 5%	50.2	13.5	24.8				108.4	52.6	26.1	15.5			
CV%	15.1	6.1	8.0				15.8	15.1	5.5	7.1			

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

Entries	North East Zone							Central Zone							All India Average			
	Bhuban- eswar	**Ran- chi	Jor- hat	Faiza- bad	Aver- age	Ra- nk	Superi- ority%	Ana- nd	Rai- pur	Jabal- pur	Rah- uri	Urulikan- chan	*Jha- nsi	Aver- age	Ra- nk	Aver- age	Ra- nk	Superi- ority%
MFM-4	348.8	78.1	190.3	292.6	277.2	4	2.3	204.0	398.7	181.1	228.9	527.0	243.0	307.9	5	256.4	5	0.9
JHM 15-1	354.2	143.3	219.4	280.3	284.6	2	5.0	338.0	409.8	169.6	349.4	764.5	406.5	406.3	3	311.4	4	
PAC-746	365.6	72.9	197.3	272.7	278.5	3	2.7	410.0	396.5	260.2	385.1	485.6	386.4	387.5	4	346.1	1	
AFM-4	296.5	104.2	210.3	358.5	288.4	1	6.4	143.0	405.5	157.2	198.4	537.7	395.7	288.4	6	231.3	6	
African Tall (NC)	314.7	75.5	221.4	277.3	271.1	5		330.0	408.1	331.0	383.9	871.7	344.7	464.9	1	318.4	3	
J-1006 (NC)	276.1	114.6	192.3	326.3	264.9	6		374.0	428.5	256.0	381.1	819.6	399.4	451.8	2	342.9	2	
Mean	326.0	98.1	205.2	301.3	277.5			299.8	407.8	225.9	321.1	667.7	362.6	384.5		301.1		
CD at 5%	22.2	14.9	5.4	34.7				45.2	42.1	51.1	20.2	76.7	169.2					
CV%	4.5	10.0	10.3	7.6				10.1	6.1	15.0	4.2	7.6	30.9					

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

Note: ** Data abnormally low hence not considered in zonal and all India average

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

Entries	Hill Zone						North West Zone				
	Palam-pur	Sri-nagar	*Alm-ora	Aver-age	Ra-nk	Superi- ority%	Ludh- iana	Pant-nagar	Aver-age	Ra-nk	Superi- ority%
MFM-4	32.9	67.0	43.0	50.0	4	4.6	55.5	54.7	55.1	4	26.4
JHM 15-1	37.1	62.8	45.9	50.0	4		82.3	74.6	78.4	3	
PAC-746	60.5	71.4	75.4	65.9	1		107.4	107.3	107.3	1	
AFM-4	26.5	61.0	24.5	43.7	5		47.6	38.9	43.3	6	
African Tall (NC)	54.5	71.5	77.6	63.0	2		63.3	42.6	53.0	5	
J-1006 (NC)	48.8	65.6	61.2	57.2	3		95.6	74.2	84.9	2	
Mean	43.4	66.5	54.6	55.0			75.3	65.4	70.3		
CD at 5%	10.6	3.5	24.5				48.6	9.4			
CV%	16.3	6.1	29.0				16.3	9.5			

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

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

Entries	North East Zone							Central Zone							All India Average			
	Bhuban- eswar	Jor- hat	Faiza- bad	*Ran- chi	Aver- age	Ran- k	Superi- ority%	Ana- nd	Rai- pur	Jabal- pur	Rah- uri	Urulikan- chan	*Jha- nsi	Aver- age	Ran- k	Aver- age	Ran- k	Superi- ority%
MFM-4	76.1	36.7	65.0	18.9	59.2	3	0.5	29.7	118.8	38.2	40.2	100.9	103.2	65.6	5	59.6	5	2.4
JHM 15-1	76.7	43.3	63.7	32.8	61.2	2	3.9	41.6	105.0	35.7	53.7	141.0	132.8	75.4	4	68.1	4	
PAC-746	79.9	39.6	68.0	20.9	62.5	1	6.1	66.4	119.6	55.5	71.3	88.3	152.7	80.2	3	77.9	1	
AFM-4	65.0	41.1	66.5	26.9	57.5	5		23.7	101.6	33.0	29.9	99.8	150.4	57.6	6	52.9	6	
African Tall (NC)	68.1	43.2	65.6	16.0	58.9	4		65.7	129.4	71.6	71.6	159.5	128.5	99.6	1	75.5	3	
J-1006 (NC)	60.5	34.3	69.2	22.9	54.7	6		61.0	125.6	54.6	71.9	151.9	184.5	93.0	2	76.1	2	
Mean	71.1	39.7	66.3	23.1	59.0			48.0	116.7	48.1	56.4	123.6	142.0	78.6		68.4		
CD at 5%	5.3	2.6	6.5	7.1				7.9	20.7	11.0	3.4	14.2	65.1					
CV%	5.0	11.2	6.5	20.2				10.7	10.4	15.1	4.0	7.6	31.3					

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

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

Entries	Palam-pur	Sri-nagar	Ludh-iana	Pant-nagar	Faiza-bad	Ran-chi	Jor-hat	Bhuban-eswar	Ana-nd	Rai-pur	Jabal-pur	Rah-uri	Urulikan-cha	Aver-age	Ra-nk
MFM-4	2.54	4.57	2.50	4.33	5.13	1.24	2.84	5.29	3.92	6.87	2.00	4.16	9.41	4.22	5
JHM 15-1	2.81	4.31	3.60	5.72	4.83	2.38	3.27	5.64	7.04	7.45	1.80	5.82	13.9	5.28	3
PAC-746	4.77	4.82	4.90	7.25	4.39	1.26	3.13	5.38	8.72	7.34	3.00	6.76	9.34	5.47	1
AFM-4	1.95	4.24	2.20	2.94	5.43	1.63	3.14	4.24	3.33	7.51	1.74	3.54	10.15	4.00	6
African Tall (NC)	4.11	4.70	2.70	3.95	4.47	1.16	3.51	4.43	6.60	6.48	3.76	5.33	15.29	5.12	4
J-1006 (NC)	3.63	4.36	4.20	5.93	4.79	1.85	2.87	3.81	7.19	7.65	2.81	6.35	13.66	5.32	2
Mean	3.30	4.50	3.35	5.02	4.84	1.59	3.13	4.80	6.13	7.22	2.52	5.33	11.96	4.90	

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

Entries	Sri-nagar	Ludh-iana	Pant-nagar	Faiza-bad	Ran-chi	Jor-hat	Bhuban-eswar	Ana-nd	Rai-pur	Jabal-pur	Rah-uri	Urulikan-cha	Aver-age	Ra-nk
MFM-4	0.94	0.60	0.87	1.13	0.30	0.55	1.15	0.57	1.58	0.42	0.73	1.80	0.89	5
JHM 15-1	0.88	0.90	1.16	1.10	0.55	0.65	1.22	0.87	1.46	0.38	0.89	2.56	1.05	4
PAC-746	0.97	1.10	1.72	1.09	0.36	0.63	1.18	1.41	1.57	0.63	1.25	1.70	1.13	1
AFM-4	0.86	0.50	0.61	1.00	0.42	0.61	0.93	0.55	1.45	0.36	0.53	1.88	0.81	6
African Tall (NC)	0.98	0.70	0.66	0.91	0.25	0.68	0.96	1.31	2.05	0.81	0.99	2.80	1.09	2
J-1006 (NC)	0.91	1.00	1.15	1.02	0.37	0.51	0.84	1.17	1.70	0.60	1.20	2.53	1.08	3
Mean	0.92	0.80	1.03	1.04	0.38	0.61	1.05	0.98	1.64	0.53	0.93	2.21	1.01	

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

Entries	Palam-pur	Ludh-iana	Faiza-bad	Jor-hat	Bhuban-eswar	Ana-nd	Rai-pur	Jabal-pur	Rah-uri	Urulikan-cha	Aver-age	Ra-nk
MFM-4	3.1	0.3	5.3	3.5	6.0	2.1	8.3	3.0	3.2	9.7	4.4	5
JHM 15-1	3.8	0.7	5.0	4.5	6.2	3.4	6.5	2.7	4.8	13.7	5.1	4
PAC-746	6.0	1.2	5.3	3.9	6.3	5.0	8.5	4.4	6.0	7.6	5.4	3
AFM-4	2.6	0.2	5.1	3.8	5.2	2.0	7.8	2.4	2.2	8.8	4.0	6
African Tall (NC)	6.1	0.4	5.4	4.0	5.4	4.6	8.6	5.6	6.8	13.2	6.0	1
J-1006 (NC)	5.1	1.0	5.3	3.6	4.9	4.1	9.3	4.3	5.8	14.4	5.8	2
Mean	4.5	0.6	5.2	3.9	5.7	3.5	8.2	3.7	4.8	11.2	5.1	

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

Entries	Palam-pur	Ludh-iana	Pant-nagar	Faiza-bad	Jor-hat	Bhuban-eswar	Ana-nd	Rai-pur	Rah-uri	Urulikan-cha	Jabal-pur	Aver-age	Ra-nk
MFM-4	9.6	8.9	9.6	8.1	9.6	7.9	6.9	7.0	7.9	9.6	7.8	8.4	2
JHM 15-1	10.5	8.8	10.5	7.9	10.6	8.1	8.1	6.2	8.9	9.7	7.9	8.8	1
PAC-746	9.3	8.6	8.8	7.8	9.9	7.9	7.5	7.1	8.5	8.6	8.0	8.4	2
AFM-4	9.3	7.4	9.6	7.6	9.4	8.0	8.5	7.7	7.4	8.8	7.4	8.3	3
African Tall (NC)	10.5	7.8	8.8	8.2	9.5	8.0	7.0	6.6	9.5	8.3	8.0	8.4	2
J-1006 (NC)	9.9	8.6	7.9	7.7	10.7	8.1	6.7	7.4	8.0	9.5	7.9	8.4	2
Mean	9.9	8.4	9.2	7.9	10.0	8.0	7.4	7.0	8.4	9.1	7.8	8.5	

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

Entries	Palam-pur	Sri-nagar	Ludh-iana	Jal-ore	Pant-nagar	Udai-pur	Faiza-bad	Ran-chi	Jor-hat	Bhuban-eswar	Ana-nd	Rai-pur	Jabal-pur	Rah-uri	Urulikan-cha	Jha-nsi	Aver-age	Ra-nk
MFM-4	175.0	150.6	160.4	122.7	164.5	140.9	174.5	107.0	121.1	187.5	247.2	149.4	154.2	145.0	221.8	228.8	165.7	6
JHM 15-1	163.8	130.7	186.6	142.7	186.0	149.3	164.2	187.0	136.1	191.7	253.2	187.4	137.9	146.7	217.9	253.4	177.2	2
PAC-746	165.3	157.8	174.6	133.2	192.7	174.8	151.3	142.0	126.8	198.4	260.6	160.4	181.9	153.6	214.4	244.7	177.0	3
AFM-4	152.5	139.8	173.1	115.7	185.0	141.6	177.2	192.0	144.2	179.6	229.7	148.0	112.9	149.1	236.6	223.5	168.8	5
African Tall (NC)	178.5	144.8	214.0	124.6	198.3	138.3	152.3	126.0	121.1	184.3	269.2	197.1	189.2	230.2	211.6	248.2	183.0	1
J-1006 (NC)	174.8	131.7	189.0	166.0	185.0	191.5	171.2	139.0	123.3	174.3	206.3	174.6	177.4	174.5	213.9	238.3	176.9	4
Mean	168.3	142.6	183.0	134.1	185.2	156.1	165.1	148.8	128.8	185.9	244.4	169.5	158.9	166.5	219.4	239.5	174.8	

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

Entries	Palam-pur	Sri-nagar	Ludh-iana	Pant-nagar	Faiza-bad	Ran-chi	Jor-hat	Bhuban-eswar	Ana-nd	Rai-pur	Jabal-pur	Rah-uri	Urulikan-cha	Aver-age	Ra-nk
MFM-4	0.33	0.39	0.75	0.20	0.53	0.49	0.90	1.09	1.07	0.64	0.44	0.41	0.93	0.63	3
JHM 15-1	0.36	0.41	0.68	0.25	0.58	0.57	0.86	1.18	1.39	0.58	0.42	0.39	0.86	0.66	2
PAC-746	0.32	0.36	0.85	0.21	0.57	0.44	0.86	1.24	1.56	0.42	0.52	0.39	0.92	0.67	1
AFM-4	0.28	0.41	0.62	0.26	0.60	0.38	1.08	0.91	1.15	0.44	0.31	0.36	0.72	0.58	6
African Tall (NC)	0.36	0.38	0.66	0.27	0.55	0.51	1.00	0.98	1.15	0.59	0.61	0.36	0.65	0.62	4
J-1006 (NC)	0.33	0.37	0.57	0.25	0.52	0.53	0.96	0.84	1.14	0.68	0.53	0.39	0.71	0.60	5
Mean	0.33	0.39	0.69	0.24	0.56	0.49	0.94	1.04	1.24	0.56	0.47	0.38	0.80	0.63	

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

Entries	ADF (%)						NDF (%)						IVDMD (%)			
	Palam-pur	Ludh-iana	Pant-nagar	Rah-uri	Aver-age	Ra-nk	Ludh-iana	Pant-nagar	Palam-pur	Rah-uri	Aver-age	Ra-nk	Ludh-iana	Rah-uri	Aver-age	Ra-nk
MFM-4	50.2	44.9	54.0	45.5	48.7	3	73.5	66.2	69.4	64.4	68.4	3	63.2	52.3	57.8	2
JHM 15-1	49.4	45.9	55.0	47.6	49.5	6	74.6	64.6	70.2	62.2	67.9	2	63.0	50.6	56.8	3
PAC-746	51.8	45.6	52.2	47.0	49.2	4	76.0	67.8	69.2	64.9	69.5	5	62.4	51.1	56.8	3
AFM-4	50.0	49.0	52.6	45.5	49.3	5	78.0	63.4	68.6	63.4	68.4	3	61.2	52.3	56.8	3
African Tall (NC)	49.8	48.9	51.4	41.0	47.8	1	75.0	64.2	66.0	61.3	66.6	1	60.4	55.8	58.1	1
J-1006 (NC)	49.2	46.0	51.8	45.3	48.1	2	75.2	64.2	72.2	65.0	69.2	4	63.1	52.5	57.8	2
Mean	50.1	46.7	52.8	45.3	48.7		75.4	65.1	69.3	63.5	68.3		62.2	52.4	57.3	

Table 3.1: AVTM-2 (Seed): Second Advanced Varietal Trial in Forage Maize (Seed): Seed Yield (q/ha)

Entries	Palampur	Ludhiana	Bhubaneswar	Jorhat	*Ranchi	Average	Rank	Superiority%
MFM-4	26.0	18.3	14.9	31.0	39.1	22.6	2	10.2
PAC-746	32.7	33.7	13.0	29.1	109.4	27.1	1	32.2
AFM-4	26.4	12.1	11.5	27.4	46.9	19.3	4	
African Tall (NC)	31.9	10.9	14.1	25.0	43.8	20.5	3	
J-1006 (NC)	17.7	11.5	16.2	28.4	88.5	18.4	5	
Mean	26.9	17.3	13.9	28.2	65.5	21.6		
CD at 5 %	4.8	12.8	2.1	1.6	23.6			
CV (%)	11.6	9.6	4.0	7.9	23.1			

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

4. IVTPM: INITIAL VARIETAL TRIAL IN FORAGE PEARL MILLET (Reference Tables: 4.1 to 4.9)

An initial varietal trial in forage Pearl millet comprising of ten entries along with two national checks *i.e.* Giant Bajra and Raj Bajra Chari-2 and two zonal checks was conducted at 20 centres located in four zones *viz.*, North-West, North-East, Central and South zone of the country.

For green forage yield (q/ha), entries TSFB-15-4 (8.3%), NDFB -1502 (6.0%), TSFB-15-8 (2.5%) in NWZ; entries PHBF-4 (9.5%) and NDFB-1502 (2.9%); in South zone entry TSFB -15-8 (9.3%) showed superiority over the best check. In Central zone, zonal check BAIF Bajra 1 was the best. At national level, three entries TSFB-15-8, TSFB-15-4, NDFB-1502 showed marginal superiority of 3.5%, 1.3% and 2.3% respectively.

For dry matter yield (q/ha), entries TSFB-15-4 (7.8%) and NDFB-1502 (1.3%) were superior over the best checks in north-west zone. In North east zone, PHBF-4 (7.8%), NDFB-1502 (4.2%), RBB-8 (1.4%) and in central zone, TSFB-15-8 (2.9%), NDFB -1502 (0.7%); in south zone, entries TSFB-15-8 (14.8%), NDFB-1502 (6.1%), TSFB-15-4 (2.1%) were better than the best checks. At all India level, entries, NDFB-1502 and TSFB-15-8 were superior by margin of 5.4% and 3.6% respectively over the best check.

For green and dry forage production potential (q/ha/day), entry TSFB -15-8 was best followed by NDFB -1502. In growth parameter, entry NDFB 1502 and TSFB-15-8 were best performers. For leaf stem ratio, entry TSFB -15-4 was the best.

In quality parameters, for crude protein yield (q/ha), entry NDFB 1502 ranked first followed by TSFB-15-8. For crude protein content, entry RBB-8 followed by PHBF-4 were best performers. For other quality parameters, entry PHBF-4 for ADF (%), zonal check AFB-3 for NDF (%) and entry AFB-37 for IVDMD (%) recorded their superiority.

5. AVTPM-1: ADVANCED VARIETAL TRIAL -1 IN FORAGE PEARL MILLET (Reference Tables: 5.1 to 5.9)

In forage pearl millet, five entries along with two national checks *i.e.* Raj Bajra Chari-2 (RBC-2) and Giant Bajra was evaluated in first advanced varietal trial conducted at 12 locations situated in three zones, northwest, north east and south zones.

For green forage yield (q/ha), national check Giant Bajra excelled in performance in NWZ, whereas zonal check APFB-9-1 excelled in NEZ. In south zone, entries TSFB-13-12 (12.1%) and TSFB-14-10 (2.9%) were superior. At all India level entry TSFB-13-12 showed marginal superiority of 2.6% over the best check.

For dry matter yield (q/ha), entry RBB-6 was superior by margin of 5.7% in NWZ. Similarly entries TSFB-13-12, TSFB -10-5, TSFB-14-10 were superior by margin of 20.8%, 11.6% and 5.6% respectively in south zone. In central zone, zonal check was best. At all India level, entry TSFB-13-12 was superior by a margin of 5.7%.

For green and dry per day production potential (q/ha/day), entry TSFB-13-12 was superior. For CPY (q/ha), RBB-6 and TSFB-13-12 were superior. For plant height and leaf stem ratio, TSFB-14-10 ranked first. For crude protein content (%), check Raj Bajra Chari-2 ranked first. For other quality parameters like ADF (%), NDF (%), IVDMD (%), national or zonal checks were superior.

Table 4.1: IVTPM: Initial Varietal Trial in Forage Pearl millet (New): Green Forage Yield (q/ha)

Entries	North West Zone								North East Zone						
	Ludh-iana	His-ar	Bika-ner	**Jal-ore	Mee-rut	Aver-age	Ran-k	Superi-riority%	Faiza-bad	Pu-sa	Bhuban-eswar	Ran-chi	Aver-age	Ran-k	Superi-riority%
PHBF-4	478.7	351.1	423.3	82.0	431.9	421.3	11	6.0	420.1	461.0	362.4	444.4	422.0	1	9.5
NDFB-1502	712.5	795.8	440.4	71.0	548.6	624.3	2		379.9	443.0	411.8	351.9	396.6	2	2.9
PHBF-6	501.3	343.5	363.5	69.0	481.9	422.6	10		367.6	419.0	320.8	398.1	376.4	4	
RBB-8	565.3	442.2	499.0	63.0	494.4	500.2	7		416.7	423.0	314.5	250.0	351.0	8	
AFB-37	719.9	481.1	436.5	100.0	586.9	556.1	5		335.0	387.0	334.3	314.7	342.7	9	
PHB-3144	412.7	229.3	191.6	91.0	531.9	341.4	12		326.8	394.0	302.0	342.5	341.3	10	
Pusa Fodder Bajra-2	633.3	350.5	369.6	85.0	574.9	482.1	9		355.4	379.0	246.8	333.3	328.6	11	
Pusa Fodder Bajra-1	568.5	397.0	413.0	101.0	613.9	498.1	8		347.2	384.0	308.3	370.3	352.4	7	
TSFB 15-4	916.7	560.7	390.2	85.0	683.3	637.7	1	8.3	265.5	369.0	254.1	333.3	305.5	13	
TSFB 15-8	835	552.2	401.1	111.0	626.4	603.7	3	2.5	347.2	355.0	371.9	342.5	354.1	6	
Raj Bajra Chari-2 (NC)	97.7	161.9		78.0		129.8	13		347.2	434.0	343.7	305.6	357.6	5	
Giant Bajra (NC)	675.6	647.0	429.2	200.0	602.8	588.7	4		302.3	407.0	284.3	314.7	327.1	12	
AFB-3 (ZC-NWZ)	575.9	400.4	344.6	133.0	761.1	520.5	6								
APFB-9-1 (ZC-NEZ)									367.6	401.0	392.7	379.7	385.3	3	
Mean	591.8	439.4	391.8	97.6	578.2	486.6			352.2	404.3	326.7	344.7	357.0		
CD at 5%	41.4	125.9	125.6	38.2	56.9				80.8	33.1	48.9	84.2			
CV%	8.0	16.9	18.5	13.4	5.8				13.6	9.4	8.9	14.4			

Note: ** Data abnormally low hence not considered in zonal and all India average

Table 4.1: IVTPM: Initial Varietal Trial in Forage Pearl millet (New): Green Forage Yield (q/ha)

Entries	Central Zone								South Zone							All India			
	Ana-nd	Jabal-pur	Rah-uri	Urulikan-ghan	Jha-nsi	*Dha-ri	Aver-age	Ra-nk	Coimb-atore	Hydera-bad	Man-dya	Rai-chur	*Vella-yani	Aver-age	Ra-nk	Superi-riority%	Aver-age	Ra-nk	Superi-riority%
PHBF-4	639.0	208.3	341.5	494.3	654.3	157.0	467.5	6	347.2	236.3	392.4	189.8	60.3	291.4	8		404.5	7	
NDFB-1502	848.0	218.7	399.3	580.1	627.3	211.0	534.7	5	425.9	291.9	489.9	208.3	102.0	354.0	4		480.8	2	2.3
PHBF-6	601.0	281.2	380.6	518.8	503.7	186.0	457.1	7	361.1	287.3	343.5	162.0	65.0	288.5	9		390.3	9	
RBB-8	643.0	299.9	378.8	400.3	561.7	147.0	456.8	8	300.9	278.0	335.2	97.2	42.0	252.8	11		394.1	8	
AFB-37	699.0	235.3	368.1	388.1	553.3	174.0	448.7	10	365.7	273.4	455.9	97.2	69.3	298.1	7		413.6	5	
PHB-3144	469.0	308.2	276.3	249.2	591.3	137.0	378.8	12	282.4	222.4	314.0	208.3	53.3	256.8	10		332.5	11	
Pusa Fodder Bajra-2	598.0	222.8	343.3	400.3	492.7	174.0	411.4	11	384.3	291.9	420.3	171.3	92.7	316.9	5		386.3	10	
Pusa Fodder Bajra-1	592.0	245.8	346.7	433.0	645.3	204.0	452.6	9	356.5	310.4	394.2	185.2	71.7	311.6	6		406.5	6	
TSFB 15-4	870.0	200.0	413.2	669.9	588.7	122.0	548.4	2	449.1	444.8	395.6	291.7	88.0	395.3	3		476.2	3	1.3
TSFB 15-8	747.0	262.4	587.6	555.6	547.7	234.0	540.0	4	481.5	472.6	545.9	240.7	111.3	435.2	1	9.3	486.6	1	3.5
Raj Bajra Chari-2 (NC)	125.0	169.2	119.8		593.7	76.0	251.9	13			23.2	69.4	23.3	46.3	12		232.5	12	
Giant Bajra (NC)	717.0	262.4	552.2	731.2	471.0	222.0	546.8	3	500.0	417.0	398.5	277.8	83.0	398.3	2		470.0	4	
BAIF Bajra 1 (ZC-CZ)	873.0	310.3	609.7	776.2	523.3	205.0	618.5	1									404.5	7	
Mean	647.8	248.0	393.6	516.4	565.7	173.0	470.2		386.8	320.5	375.7	183.3	71.8	303.8			406.2		
CD at 5%	96.8	64.2	40.6	71.6	23.5	4.7			32.2	52.1	43.0	48.9							
CV%	8.9	14.8	6.1	8.1	2.5	22.4			5.3	9.5	6.8	15.8							

Note: * Not included in Zonal and All India average due to CV ≥ 20

Table 4.2: IVTPM: Initial Varietal Trial in Forage Pearl millet (New): Dry Matter Yield (q/ha)

Entries	North West Zone							North East Zone						
	Ludh-iana	His-ar	Bika-ner	Mee-rut	Aver-age	Ra-nk	Superi-osity%	Faiza-bad	Pu-sa	Bhuban-eswar	*Ran-chi	Aver-age	Ra-nk	Superi-osity%
PHBF-4	84.7	85.6	140.7	86.1	99.3	10		89.9	105.1	76.0	80.6	90.3	1	7.8
NDFB-1502	122.6	197.4	103.8	120.8	136.2	2	1.3	76.0	100.2	85.8	58.1	87.3	2	4.2
PHBF-6	85.2	84.7	102.0	105.5	94.4	11		78.4	93.7	70.1	63.6	80.8	5	
RBB-8	90.4	118.9	161.8	84.7	114.0	9		90.7	97.5	66.8	35.6	85.0	3	1.4
AFB-37	115.2	112.4	132.3	169.4	132.3	4		77.6	87.6	72.3	50.8	79.2	7	
PHB-3144	70.2	54.0	56.8	186.1	91.8	12		81.7	90.6	67.1	46.4	79.8	6	
Pusa Fodder Bajra-2	107.7	86.9	112.3	184.7	122.9	8		66.2	86.5	53.4	37.5	68.7	12	
Pusa Fodder Bajra-1	96.6	97.8	105.7	204.2	126.1	7		56.4	87.3	68.7	62.8	70.8	11	
TSFB 15-4	155.8	137.8	79.1	206.9	144.9	1	7.8	64.5	82.6	56.7	43.3	67.9	13	
TSFB 15-8	141.9	135.0	98.6	134.7	127.6	6		70.3	80.3	78.8	44.7	76.4	9	
Raj Bajra Chari-2 (NC)	17.1	42.8			30.0	13		80.1	98.6	72.9	43.9	83.8	4	
Giant Bajra (NC)	114.8	158.7	118.3	120.8	128.1	5		76.0	93.6	60.1	48.1	76.5	8	
AFB-3 (ZC-NWZ)	97.9	98.2	117.7	223.6	134.4	3								
APFB-9-1 (ZC-NEZ)								81.7	91.6	83.0	36.1	73.1	10	
Mean	100.0	108.5	110.8	152.3	114.0			76.1	91.9	70.1	50.1	78.4		
CD at 5%	29.4	30.4	34.2	15.1				13.4	9.4	10.2	16.9			
CV%	16.7	16.5	17.8	5.9				10.5	11.7	8.6	20.2			

Note: * Not included in Zonal and All India average due to CV \geq 20

Table 4.2: IVTPM: Initial Varietal Trial in Forage Pearl millet (New): Dry Matter Yield (q/ha)

Entries	Central Zone										South Zone							All India		
	Ana-nd	Jabal-pur	Rah-uri	Urulikan-chan	Jha-nsi	*Dha-ri	Aver-age	Ra-nk	Superi-osity%		Coimb-atore	Hydera-bad	Vella-yani	Man-dya	Aver-age	Ra-nk	Superi-osity%	Aver-age	Ra-nk	Superi-osity%
PHBF-4	86.3	42.5	63.5	139.4	193.1	13.0	105.0	6			81.6	49.7	10.9	69.0	52.8	7		87.7	7	
NDFB-1502	168.8	44.3	92.9	124.4	194.2	44.0	124.9	2	0.7		96.0	65.0	24.4	97.7	70.8	2	6.1	107.1	1	5.4
PHBF-6	86.6	66.4	71.0	131.1	167.4	14.0	104.5	7			77.6	52.2	12.4	50.6	48.2	9		83.4	8	
RBB-8	94.5	66.2	60.8	78.0	143.7	14.0	88.6	10			47.2	59.5	6.7	64.6	44.5	10		83.2	9	
AFB-37	101.9	49.7	74.6	82.9	137.3	13.0	89.3	9			62.2	57.3	13.9	77.3	52.7	8		89.0	6	
PHB-3144	85.7	68.5	49.3	62.1	132.2	9.0	79.6	12			44.5	48.8	9.8	56.5	39.9	11		72.7	11	
Pusa Fodder Bajra-2	95.0	46.2	60.1	100.3	117.7	17.0	83.9	11			62.8	57.1	21.3	71.5	53.2	6		83.1	10	
Pusa Fodder Bajra-1	91.1	53.1	65.1	115.6	186.8	12.0	102.3	8			55.2	66.9	15.1	86.1	55.8	5		90.7	5	
TSFB 15-4	116.6	40.6	69.0	180.4	134.0	21.0	108.1	5			76.7	108.2	20.3	67.3	68.1	3	2.1	99.8	4	
TSFB 15-8	151.7	80.8	142.9	134.0	128.7	53.0	127.6	1	2.9		88.3	104.1	26.7	87.2	76.6	1	14.8	105.3	2	3.6
Raj Bajra Chari-2 (NC)	18.3	34.2	23.3	-	149.1	6.0	56.2	13					3.9	4.2	4.0	12		49.5	12	
Giant Bajra (NC)	134.7	57.2	142.6	164.2	117.8	54.0	123.3	4			96.7	91.5	18.3	60.2	66.7	4		101.6	3	
BAIF Bajra 1 (ZC-CZ)	147.6	68.9	125.9	164.5	112.9	47.0	124.0	3										87.7	7	
Mean	106.1	55.3	80.1	123.1	147.3	24.4	101.3				71.7	69.1	15.3	66.0	52.8			87.8		
CD at 5%	14.4	14.1	9.1	17.1	11.0	NS					16.7	15.0	3.3	17.8						
CV%	8.1	15.1	6.7	8.1	4.4	39.2					15.4	12.8	3.1	15.9						

Note: * Not included in Zonal and All India average due to CV \geq 20

Table 4.3: IVTPM: Initial Varietal Trial in Forage Pearl millet (New): Green Forage Yield (q/ha/day)

Entries	Ludh-iana	His-ar	Bika-ner	Faiza-bad	Pu-sa	Bhuban-eswar	Ran-chi	Ana-nd	Dha-ri	Jabal-pur	Rah-uri	Urulikan-cha	Coimb-atore	Hydera-bad	Vella-yani	Man-dya	Ave-age	Ra-nk
PHBF-4	7.70	4.44	6.61	7.00	7.20	6.04	12.70	15.59	2.95	2.40	7.42	8.52	8.47	4.82	1.40	9.75	7.06	3
NDFB-1502	11.50	10.07	6.88	6.54	6.80	5.72	8.38	13.68	2.77	2.57	7.01	8.06	8.35	4.71	1.88	10.52	7.21	2
PHBF-6	8.10	4.35	5.68	6.23	6.60	5.17	8.84	13.66	3.57	3.26	8.46	7.01	8.81	6.70	1.51	8.66	6.66	7
RBB-8	9.10	5.60	7.80	6.72	6.50	4.70	5.21	15.31	2.70	3.57	7.73	6.67	6.54	5.73	0.97	8.19	6.44	10
AFB-37	11.60	6.09	6.82	5.15	6.05	5.31	6.29	15.53	3.10	2.83	7.67	5.88	8.13	5.75	1.61	10.76	6.79	5
PHB-3144	6.70	2.90	2.99	4.66	6.10	3.97	6.71	12.03	2.64	3.50	6.14	4.98	6.72	6.12	1.24	7.43	5.30	11
Pusa Fodder Bajra-2	10.20	4.44	5.77	5.82	6.00	3.53	6.06	14.59	3.29	2.71	7.63	5.89	8.73	7.81	2.15	10.12	6.55	9
Pusa Fodder Bajra-1	9.20	5.03	6.45	5.88	6.10	4.11	7.88	14.10	3.94	2.85	7.54	6.1	7.75	8.20	1.32	9.00	6.59	8
TSFB 15-4	13.90	7.10	6.10	4.42	5.80	3.48	6.28	14.03	1.57	2.27	7.12	9.71	8.64	7.67	1.63	8.26	6.75	6
TSFB 15-8	12.70	6.99	6.27	5.34	5.60	4.96	6.71	12.88	3.08	4.26	10.68	7.82	9.63	7.89	2.06	12.33	7.45	1
Raj Bajra Chari-2 (NC)	1.60	2.05		5.69	6.70	5.37	7.10	2.84	1.29	1.92	2.30				0.43	0.51	3.15	12
Giant Bajra (NC)	10.20	8.19	5.23	4.79	6.50	3.84	5.82	13.04	2.91	2.98	10.42	9.62	9.62	6.73	1.54	8.43	6.87	4
AFB-3 (ZC-NWZ)	9.30	5.07	5.38															
APFB-9-1 (ZC-NEZ)				5.74	6.30	6.04	6.66											
BAIF Bajra 1 (ZC-CZ)								16.79	2.70	3.60	11.09	10.49						
Mean	9.37	5.56	6.00	5.69	6.33	4.79	7.28	13.39	2.81	2.98	7.79	7.56	8.31	6.56	1.48	8.66	6.40	

Table 4.4: IVTPM: Initial Varietal Trial in Forage Pearl millet (New): Dry Matter Yield (q/ha/day)

Entries	Ludh-iana	His-ar	Bika-ner	Faiza-bad	Pu-sa	Bhuban-eswar	Ran-chi	Ana-nd	Dha-ri	Jabal-pur	Rah-uri	Urulikan-cha	Coimb-atore	Hydera-bad	Man-dya	Aver-age	Ra-nk
PHBF-4	1.40	1.08	2.20	1.49	1.60	1.27	2.30	2.10	0.25	0.48	1.38	2.40	1.99	1.01	1.71	1.51	4
NDFB-1502	2.00	2.50	1.62	1.31	1.50	1.19	1.38	2.72	0.58	0.52	1.63	1.73	1.88	1.05	2.11	1.58	2
PHBF-6	1.40	1.07	1.59	1.32	1.50	1.13	1.41	1.97	0.28	0.77	1.58	1.77	1.89	1.22	1.28	1.35	7
RBB-8	1.50	1.51	2.53	1.46	1.50	1.00	0.74	2.25	0.25	0.78	1.24	1.30	1.03	1.22	1.57	1.32	9
AFB-37	1.90	1.42	2.07	1.19	1.40	1.15	1.02	2.26	0.23	0.60	1.55	1.26	1.38	1.21	1.82	1.36	6
PHB-3144	1.10	0.68	0.89	1.16	1.40	0.88	0.91	2.20	0.17	0.77	1.10	1.24	1.06	1.34	1.34	1.08	11
Pusa Fodder Bajra-2	1.70	1.10	1.76	1.08	1.40	0.76	0.68	2.32	0.31	0.56	1.33	1.47	1.43	1.53	1.73	1.28	10
Pusa Fodder Bajra-1	1.60	1.24	1.65	0.95	1.40	0.92	1.33	2.17	0.24	0.61	1.41	1.63	1.20	1.78	1.98	1.34	8
TSFB 15-4	2.40	1.74	1.24	1.07	1.30	0.78	0.82	1.88	0.28	0.46	1.19	2.61	1.48	1.87	1.41	1.37	5
TSFB 15-8	2.20	1.71	1.54	1.08	1.30	1.05	0.88	2.62	0.70	0.95	2.60	1.89	1.77	1.74	1.97	1.60	1
Raj Bajra Chari-2 (NC)	0.30	0.54		1.31	1.50	1.14	1.02	0.42	0.10	0.39	0.45				0.09	0.66	12
Giant Bajra (NC)	1.70	2.01	1.44	1.20	1.50	0.81	0.89	2.45	0.71	0.65	2.69	2.16	1.86	1.48	1.27	1.52	3
AFB-3 (ZC-NWZ)	1.60	1.24	1.84														
APFB-9-1 (ZC-NEZ)				1.27	1.40	1.28	0.63										
BAIF Bajra 1 (ZC-CZ)								2.84	0.61	0.80	2.29	2.22					
Mean	1.60	1.37	1.70	1.22	1.44	1.03	1.08	2.17	0.36	0.64	1.57	1.81	1.54	1.40	1.52	1.33	

Table 4.5: IVTPM: Initial Varietal Trial in Forage Pearl millet (New): Crude Protein Yield (q/ha)

Entries	Ludh- iana	His- ar	Bika- ner	Faiza- bad	Bhuban- eswar	Ana- nd	Jabal- pur	Rah- uri	Urulikan- chan	Coimb- atore	Hydera- bad	Man- dya	Aver- age	Ra- nk
PHBF-4	4.8	8.8	10.1	7.8	5.7	11.6	2.9	4.0	12.9	10.4	2.8	7.9	7.5	5
NDFB-1502	9.6	20.3	9.3	6.1	6.4	16.7	3.1	6.2	11.0	13.0	3.7	10.3	9.6	1
PHBF-6	5.8	7.6	6.9	6.4	5.0	11.0	5.2	4.2	11.9	6.1	4.1	5.7	6.7	8
RBB-8	6.3	11.7	12.9	7.9	5.1	11.1	5.2	4.4	7.1	5.6	4.4	7.3	7.4	6
AFB-37	10.1	12.1	8.7	6.8	5.4	9.9	3.5	4.6	7.3	6.8	4.2	8.1	7.3	7
PHB-3144	5.5	5.9	4.5	6.9	4.9	8.4	5.4	4.0	5.7	4.7	3.0	4.9	5.3	10
Pusa Fodder Bajra-2	7.3	9.1	8.9	5.2	4.1	10.3	3.3	3.8	8.8	7.4	3.5	6.3	6.5	9
Pusa Fodder Bajra-1	5.4	8.8	9.0	4.4	5.3	8.5	4.0	4.7	10.6	6.1	5.8	7.5	6.7	8
TSFB 15-4	8.9	13.3	4.9	5.1	4.2	14.8	2.7	6.0	17.1	8.8	6.6	6.5	8.2	4
TSFB 15-8	10.6	13.3	8.3	5.7	5.8	14.9	6.5	9.2	12.3	9.3	9.1	8.8	9.5	2
Raj Bajra Chari-2 (NC)	1.0	3.8		6.6	5.5	2.0	2.3	1.6				0.4	2.9	11
Giant Bajra (NC)	7.2	17.0	6.2	6.2	4.6	12.3	4.4	10.2	14.8	11.4	8.8	6.1	9.1	3
AFB-3 (ZC-NWZ)	8.2	10.1	10.7											
APFB-9-1 (ZC-NEZ)				6.8	6.1									
BAIF Bajra 1 (ZC-CZ)						14.6	5.4	7.7	14.7					
Mean	7.0	10.9	8.4	6.3	5.2	11.2	4.1	5.4	11.2	8.1	5.1	6.6	7.2	

Table 4.6: IVTPM: Initial Varietal Trial in Forage Pearl millet (New): Crude Protein (%)

Entries	Ludh- iana	His- ar	Bika- ner	Faiza- bad	Bhuban- eswar	Ana- nd	Rah- uri	Urulikan- chan	Jabal- pur	Coimb- atore	Hydera- bad	Man- dya	Aver- age	Ra- nk
PHBF-4	5.7	10.3	7.2	8.7	7.5	13.4	6.3	9.3	7.12	12.7	5.7	11.4	8.8	2
NDFB-1502	7.8	10.3	8.9	8.0	7.4	9.9	6.7	8.9	7.05	13.6	5.7	10.5	8.7	3
PHBF-6	6.8	9.0	6.7	8.1	7.2	12.7	6.0	9.1	7.84	7.9	7.9	11.4	8.4	6
RBB-8	7.0	9.9	8.0	8.7	7.6	11.7	7.3	9.1	7.88	11.8	7.4	11.4	9.0	1
AFB-37	8.8	10.7	6.6	8.7	7.4	9.7	6.1	8.8	7.39	10.9	7.4	10.5	8.6	4
PHB-3144	7.8	10.9	8.0	8.5	7.3	9.8	8.0	9.2	7.95	10.5	6.1	8.7	8.6	4
Pusa Fodder Bajra-2	6.8	10.5	8.0	7.9	7.7	10.9	6.3	8.8	7.4	11.8	6.1	8.8	8.4	6
Pusa Fodder Bajra-1	5.6	9.0	8.5	7.8	7.6	9.4	7.2	9.2	7.65	10.9	8.8	8.7	8.4	6
TSFB 15-4	5.7	9.6	6.2	7.9	7.3	12.7	8.8	9.5	7.08	11.4	6.1	9.6	8.5	5
TSFB 15-8	7.5	9.9	8.4	8.1	7.3	9.8	6.4	9.2	7.96	10.5	8.8	10.1	8.7	3
Raj Bajra Chari-2 (NC)	6.1	9.0		8.2	7.6	11.2	6.7		7.05		6.1	9.6	7.9	7
Giant Bajra (NC)	6.3	10.7	5.3	8.2	7.7	9.1	7.2	9.0	7.8	11.8	9.6	10.1	8.6	4
AFB-3 (ZC-NWZ)	8.4	10.3	9.1											
APFB-9-1 (ZC-NEZ)				8.3	7.4									
BAIF Bajra 1 (ZC-CZ)						9.9	6.1	8.9	7.95					
Mean	6.9	10.0	7.6	8.2	7.5	10.8	6.8	9.1	7.5	11.3	7.1	10.1	8.5	

Table 4.7: IVTPM: Initial Varietal Trial in Forage Pearl millet (New): Plant Height (cm)

Entries	Ludh- iana	His- ar	Bika- ner	Jal- ore	Faiza- bad	Bhuban- eswar	Ran- chi	Pu- sa	Ana- nd	Dha- ri
PHBF-4	228.3	279.1	190.0	177.0	187.2	223.2	168.0	177.0	215.0	154.3
NDFB-1502	187.8	274.6	150.0	178.7	177.3	230.6	165.0	178.7	268.3	159.9
PHBF-6	208.8	229.2	120.0	161.0	164.0	204.3	173.0	161.0	213.5	165.4
RBB-8	228.9	273.1	200.0	155.7	141.2	197.3	175.0	155.7	222.1	164.8
AFB-37	227.8	253.3	227.0	161.7	164.2	208.2	164.0	161.7	214.5	155.3
PHB-3144	197.2	197.2	180.0	147.3	171.5	164.2	172.0	174.3	210.4	149.3
Pusa Fodder Bajra-2	221	233.1	170.0	179.3	189.7	184.3	166.0	179.3	213.1	160.2
Pusa Fodder Bajra-1	223.3	250.0	135.0	185.3	171.5	189.2	174.0	185.3	215.1	155.3
TSFB 15-4	197.2	240.4	165.0	191.3	143.7	179.3	168.0	191.3	234.1	143.6
TSFB 15-8	234.8	270.0	178.0	192.3	151.2	226.2	166.0	192.3	271.5	142.7
Raj Bajra Chari-2 (NC)	202.0	226.1		195.7	144.3	219.9	178.0	195.7	215.5	172.3
Giant Bajra (NC)	230.0	281.4	186.0	211.0	166.5	173.5	163.0	211.0	236.8	143.7
AFB-3 (ZC-NWZ)	227.6	263.3	188.0	226.0						
APFB-9-1 (ZC-NEZ)					172.5	228.6	160.0	226.0		
BAIF Bajra 1 (ZC-CZ)									254.9	142.9
Mean	216.5	251.6	174.1	181.7	165.0	202.2	168.6	183.8	229.6	154.6

Table 4.7: IVTPM: Initial Varietal Trial in Forage Pearl millet (New): Plant Height (cm)

Entries	Jabal- pur	Urulikan- chan	Rah- uri	Jha- nsi	Coimb- atore	Hyder- abad	Vella- yani	Man- dya	Rai- chur	Aver- age	Ra- nk
PHBF-4	136.3	180.7	182.3	278.5	194.6	137.0	99.3	172.4	117.0	184.1	5
NDFB-1502	148.6	254.0	275.9	277.2	193.8	184.7	191.0	192.7	136.0	201.3	1
PHBF-6	167.3	179.8	166.6	213.5	180.9	145.7	121.7	151.5	130.0	171.4	11
RBB-8	171.4	182.3	171.3	290.5	185.9	156.3	146.0	178.7	128.0	185.5	4
AFB-37	144.5	187.5	173.2	244.5	180.9	152.0	127.0	157.5	125.0	180.5	8
PHB-3144	180.7	159.0	154.0	234.5	171.7	154.0	93.7	152.5	108.0	166.9	12
Pusa Fodder Bajra-2	139.1	200.2	165.0	211.5	189.7	151.3	126.7	170.8	121.0	177.4	10
Pusa Fodder Bajra-1	144.4	179.8	166.5	302.4	189.3	160.3	127.7	178.7	112.0	181.3	6
TSFB 15-4	118.4	214.8	165.0	218.2	211.2	236.0	92.0	167.7	131.0	179.4	9
TSFB 15-8	186.2	226.3	221.5	232.5	184.1	217.3	159.0	188.5	123.0	198.1	2
Raj Bajra Chari-2 (NC)	119.0		177.7	289.2			108.7	156.1	113.0	180.9	7
Giant Bajra (NC)	159.6	211.8	213.2	243.5	199.7	205.0	133.0	187.3	163.0	195.7	3
AFB-3 (ZC-NWZ)											
APFB-9-1 (ZC-NEZ)											
BAIF Bajra 1 (ZC-CZ)	179.7	267.8	254.2	233.5							
Mean	153.5	203.7	191.3	251.5	189.3	172.7	127.1	171.2	125.6	183.5	

Table 4.8: IVTPM: Initial Varietal Trial in Forage Pearl millet (New): Leaf Stem Ratio

Entries	Ludh- iana	His- ar	Bika- ner	Faiza- bad	Pu- sa	Bhuban- eswar	Ran- chi	Ana- nd	Dha- ri	Jabal- pur
PHBF-4	0.36	0.41	0.18	0.56	0.99	1.10	0.45	0.54	0.45	0.60
NDFB-1502	0.48	0.43	0.39	0.67	0.99	1.21	0.41	1.34	0.48	0.57
PHBF-6	0.29	0.33	0.54	0.59	0.98	0.98	0.53	0.60	0.67	0.61
RBB-8	0.53	0.30	0.17	0.65	0.98	0.88	0.66	0.93	0.62	0.42
AFB-37	0.54	0.32	0.36	0.75	0.97	0.95	0.46	0.94	0.54	0.35
PHB-3144	0.59	0.32	0.15	0.71	0.97	0.79	0.58	0.59	0.43	0.69
Pusa Fodder Bajra-2	0.59	0.37	0.21	0.79	0.97	0.71	0.82	0.86	0.69	0.53
Pusa Fodder Bajra-1	0.29	0.32	0.48	0.75	0.98	0.84	0.47	0.67	0.51	0.59
TSFB 15-4	0.88	0.75	0.54	0.71	0.99	0.73	0.56	0.94	0.63	0.52
TSFB 15-8	0.53	0.27	0.24	0.75	0.98	1.07	0.64	0.69	0.54	0.70
Raj Bajra Chari-2 (NC)	0.56	0.39		0.70	1.01	1.02	0.55	0.50	0.58	0.49
Giant Bajra (NC)	0.53	0.40	0.34	0.70	1.01	0.76	0.63	1.27	0.40	0.56
AFB-3 (ZC-NWZ)	0.25	0.47	0.22							
APFB-9-1 (ZC-NEZ)				0.73	0.99	1.16	0.71			
BAIF Bajra 1 (ZC-CZ)								1.33	0.42	0.64
Mean	0.49	0.39	0.32	0.70	0.99	0.94	0.57	0.86	0.54	0.56

Table 4.8: IVTPM: Initial Varietal Trial in Forage Pearl millet (New): Leaf Stem Ratio

Entries	Rah- uri	Urulikan- chan	Jha- nsi	Coimb- atore	Hydera- bad	Vella- yani	Man- dya	Aver- age	Ra- nk
PHBF-4	0.24	0.55	0.55	0.33	0.28	0.55	0.24	0.49	9
NDFB-1502	0.22	0.45	0.62	0.32	0.27	0.44	0.26	0.56	3
PHBF-6	0.24	0.46	0.48	0.31	0.26	0.63	0.23	0.51	7
RBB-8	0.29	0.54	0.35	0.37	0.29	0.75	0.25	0.53	6
AFB-37	0.28	0.52	0.29	0.32	0.26	1.14	0.30	0.55	4
PHB-3144	0.26	0.48	0.38	0.36	0.24	0.71	0.30	0.50	8
Pusa Fodder Bajra-2	0.22	0.58	0.52	0.29	0.30	0.75	0.26	0.56	3
Pusa Fodder Bajra-1	0.24	0.55	0.44	0.33	0.31	1.46	0.29	0.56	3
TSFB 15-4	0.22	0.48	0.36	0.35	0.26	0.63	0.28	0.58	1
TSFB 15-8	0.24	0.57	0.39	0.35	0.33	0.44	0.25	0.53	6
Raj Bajra Chari-2 (NC)	0.26		0.53			0.61	0.26	0.57	2
Giant Bajra (NC)	0.20	0.58	0.51	0.32	0.23	0.39	0.30	0.54	5
AFB-3 (ZC-NWZ)									
APFB-9-1 (ZC-NEZ)									
BAIF Bajra 1 (ZC-CZ)	0.21	0.45	0.39						
Mean	0.24	0.52	0.45	0.33	0.28	0.71	0.27	0.54	

Table 4.9: IVTPM: Initial Varietal Trial in Forage Pearl millet (New): ADF (%), NDF (%) & IVDMD (%)

Entries	ADF (%)		NDF (%)		IVDMD (%)	
	Ludhiana	Rank	Ludhiana	Rank	Ludhiana	Rank
PHBF-4	40.1	1	75.8	8	58.2	8
NDFB-1502	43.1	6	71.4	3	61.9	3
PHBF-6	42.4	5	75.3	7	58.9	7
RBB-8	43.6	8	74.8	6	59.9	6
AFB-37	44.5	10	70.6	2	64.3	1
PHB-3144	42.4	5	73.2	4	60.7	4
Pusa Fodder Bajra-2	43.4	7	75.9	9	57.9	10
Pusa Fodder Bajra-1	40.1	1	77.1	13	56.4	12
TSFB 15-4	40.8	2	76.9	12	57.3	11
TSFB 15-8	43.4	7	73.8	5	60.0	5
Raj Bajra Chari-2 (NC)	41.8	3	76.2	10	58.0	9
Giant Bajra (NC)	41.9	4	76.4	11	57.9	10
AFB-3 (ZC-NWZ)	44.1	9	69.2	1	63.4	2
Mean	42.4		74.4		59.6	

Table 5.1: AVTPM-1: First Advnaced Varietal Trial in Forage Pearl millet: Green Forage Yield (q/ha)

Entries	North West Zone						North East Zone					
	Ludhiana	Hisar	Bikaner	Meerut	Average	Rank	Faizabad	Pusa	Bhubaneswar	Ranchi	Average	Rank
RBB-6	480.8	482.5	463.3	458.3	471.2	6	349.3	383.0	338.1	288.2	339.7	5
TSFB-14-10	539.7	611.7	368.5	586.7	526.6	3	302.3	437.0	274.6	357.6	342.9	4
RBB-7	534.7	461.9	409.1	632.5	509.5	5	335.0	376.0	318.4	298.6	332.0	6
TSFB-13-12	503.6	655.8	425.9	529.9	528.8	2	292.1	453.0	408.1	388.9	385.5	2
TSFB-10-5	485.8	464.2	457.7	461.7	467.3	7	304.3	382.0	251.1	253.4	297.7	7
Giant Bajra (NC)	640.8	684.7	453.1	511.7	572.6	1	318.5	411.0	369.2	305.5	351.0	3
Raj Bajra Chari-2 (NC)	83.6	130.6	37.6		83.9	8	210.4	391.0	298.0	187.5	271.7	8
AFB-3 (ZC-NWZ)	570.0	511.4	387.6	574.2	510.8	4						
APFB-9-1 (ZC-NEZ)							290.0	469.0	377.0	423.6	389.9	1
Mean	479.9	500.4	375.3	536.4	458.9		300.2	412.8	329.3	312.9	338.8	
CD at 5(%)	140.9	98.2	102.7	67.9			51.8	24.7	24.3	51.0		
CV (%)	11.6	11.6	15.6	7.1			9.9	9.1	4.2	9.2		

Table 5.1: AVTPM-1: First Advanced Varietal Trial in Forage Pearl millet: Green Forage Yield (q/ha)

Entries	South Zone							All India		
	Coimbatore	Hyderabad	Mandya	Raichur	Average	Rank	Superiority%	Average	Rank	Superiority%
RBB-6	308.3	272.1	324.9	241.0	286.6	5		365.8	4	
TSFB-14-10	511.1	202.7	414.5	310.0	359.6	2	2.9	409.7	3	
RBB-7	322.2	291.6	228.2	181.0	255.8	6		365.8	4	
TSFB-13-12	497.2	366.5	397.5	306.0	391.8	1	12.1	435.4	1	2.6
TSFB-10-5	522.2	184.6	441.5	162.0	327.6	4		364.2	5	
Giant Bajra (NC)	516.7	224.9	337.2	319.0	349.4	3		424.4	2	
Raj Bajra Chari-2 (NC)			18.2	155.0	86.6	7		168.0	6	
Mean	446.3	257.1	308.9	239.1	293.9			361.9		
CD at 5(%)	16.7	22.0	57.0	34.8						
CV (%)	2.4	4.8	10.4	8.18						

Table 5.2: AVTPM-1: First Advanced Varietal Trial in Forage Pearl millet: Dry Matter Yield (q/ha)

Entries	North West Zone							North East Zone					
	Ludhiana	Hisar	Bikaner	Meerut	Average	Rank	Superiority%	Faizabad	Pusa	Bhubaneswar	Ranchi	Average	Rank
RBB-6	82.7	113.8	154.9	141.7	123.3	1	5.7	69.4	85.7	71.2	62.4	72.2	5
TSFB-14-10	86.4	151.2	77.5	140.8	114.0	3		63.3	98.9	57.3	68.5	72.0	6
RBB-7	86.6	113.9	134.2	115.0	112.4	5		68.6	85.7	67.3	68.1	72.4	4
TSFB-13-12	80.6	160.9	103.7	109.2	113.6	4		48.6	102.3	86.1	99.1	84.0	2
TSFB-10-5	77.7	114.4	116.5	87.5	99.0	7		56.0	86.4	54.4	50.1	61.7	8
Giant Bajra (NC)	108.9	168.9	94.6	94.2	116.6	2		55.6	94.3	78.9	80.3	77.3	3
Raj Bajra Chari-2 (NC)	14.6	32.4	10.9		19.3	8		42.5	88.5	63.3	54.7	62.2	7
AFB-3 (ZC-NWZ)	96.9	125.6	124.9	98.3	111.4	6							
APFB-9-1 (ZC-NEZ)								51.5	104.9	82.6	149.4	97.1	1
Mean	79.3	122.6	102.1	112.4	101.2			56.9	93.3	70.1	79.1	74.9	
CD at 5(%)	39.6	20.9	31.1	11.3				6.3	7.4	6.6	14.3		
CV (%)	13.4	10.0	17.4	5.7				6.4	10.3	5.4	10.2		

Table 5.2: AVTPM-1: First Advanced Varietal Trial in Forage Pearl millet: Dry Matter Yield (q/ha)

Entries	South Zone						All India		
	Coimbatore	Hyderabad	Mandya	Average	Rank	Superiority%	Average	Rank	Superiority%
RBB-6	49.2	64.6	67.7	60.5	5		87.6	3	
TSFB-14-10	87.0	44.3	72.8	68.0	3	5.6	86.2	4	
RBB-7	51.1	67.2	45.6	54.7	6		82.1	5	
TSFB-13-12	90.1	84.4	58.9	77.8	1	20.8	93.1	1	5.7
TSFB-10-5	99.1	42.8	74.0	71.9	2	11.6	78.1	6	
Giant Bajra (NC)	95.9	53.2	44.1	64.4	4		88.1	2	
Raj Bajra Chari-2 (NC)			4.3	4.3	7		38.9	7	
Mean	78.7	59.4	52.5	57.4			79.1		
CD at 5(%)	4.2	7.7	11.5						
CV (%)	3.9	7.3	12.3						

Table 5.3: AVTPM-1: First Advanced Varietal Trial in Forage Pearl millet: Green Forage Yield (q/ha/day)

Entries	Ludhiana	Hisar	Bikaner	Faizabad	Pusa	Bhubaneswar	Ranchi	Coimbatore	Hyderabad	Mandya	Average	Rank
RBB-6	7.80	6.11	7.24	5.45	6.08	5.05	6.86	7.52	5.31	8.27	6.57	4
TSFB-14-10	8.70	7.74	5.76	4.31	6.83	4.22	7.45	10.65	3.56	8.59	6.78	3
RBB-7	8.60	5.85	6.39	4.92	5.88	4.75	7.86	7.86	4.92	5.66	6.27	5
TSFB-13-12	8.10	8.30	6.65	4.11	7.19	5.37	8.84	10.81	6.11	9.11	7.46	1
TSFB-10-5	7.80	5.88	5.58	4.47	5.97	3.59	5.51	9.16	3.19	8.54	5.97	6
Giant Bajra (NC)	9.70	8.67	7.08	5.31	6.42	5.06	6.23	10.13	3.63	6.66	6.89	2
Raj Bajra Chari-2 (NC)	1.30	1.65	0.59	3.13	6.21	4.66	4.17			0.40	2.76	7
AFB-3 (ZC-NWZ)	9.20	6.47	6.06									
APFB-9-1 (ZC-NEZ)				4.32	7.44	4.83	8.82					
Mean	7.65	6.33	5.67	4.50	6.50	4.69	6.97	9.35	4.45	6.75	6.10	

Table 5.4: AVTPM-1: First Advanced Varietal Trial in Forage Pearl millet: Dry Matter Yield (q/ha/day)

Entries	Ludhiana	Hisar	Bikaner	Faizabad	Pusa	Bhubaneswar	Ranchi	Coimbatore	Hyderabad	Mandya	Average	Rank
RBB-6	1.30	1.44	2.42	1.08	1.40	1.06	1.48	1.20	1.26	1.72	1.44	2
TSFB-14-10	1.40	1.91	1.21	0.90	1.50	0.88	1.43	1.81	0.78	1.51	1.33	5
RBB-7	1.40	1.44	2.10	1.01	1.30	1.01	1.79	1.25	1.13	1.13	1.36	4
TSFB-13-12	1.30	2.04	1.62	0.68	1.60	1.13	2.25	1.96	1.40	1.35	1.53	1
TSFB-10-5	1.30	1.45	1.42	0.82	1.40	0.78	1.09	1.74	0.74	1.43	1.22	6
Giant Bajra (NC)	1.70	2.14	1.48	0.92	1.50	1.08	1.64	1.88	0.86	0.87	1.41	3
Raj Bajra Chari-2 (NC)	0.20	0.41	0.17	0.63	1.40	0.99	1.21			0.09	0.64	7
AFB-3 (ZC-NWZ)	1.60	1.59	1.95									
APFB-9-1 (ZC-NEZ)				0.67	1.70	1.06	3.11					
Mean	1.28	1.55	1.55	0.84	1.48	1.00	1.75	1.64	1.03	1.16	1.27	

Table 5.5: AVTPM-1: First Advanced Varietal Trial in Forage Pearl millet: Crude Protein Yield (q/ha)

Entries	Ludhiana	Hisar	Bikaner	Faizabad	Bhubaneswar	Coimbatore	Hyderabad	Mandya	Average	Rank
RBB-6	5.3	11.0	10.4	6.1	5.6	6.7	4.2	5.9	6.9	1
TSFB-14-10	5.1	14.9	5.2	5.5	4.6	4.3	3.7	5.1	6.1	4
RBB-7	4.9	11.0	9.6	5.9	5.0	3.9	3.6	3.6	5.9	5
TSFB-13-12	4.0	17.6	8.3	3.9	6.5	6.6	5.2	3.3	6.9	1
TSFB-10-5	4.2	11.5	11.7	4.5	4.1	8.3	2.3	4.2	6.4	3
Giant Bajra (NC)	6.9	17.4	6.0	4.3	5.8	7.5	3.0	2.7	6.7	2
Raj Bajra Chari-2 (NC)	0.8	9.9	1.6	3.4	4.8			0.3	3.5	6
AFB-3 (ZC-NWZ)	6.2	11.8	12.0							
APFB-9-1 (ZC-NEZ)				3.7	5.9					
Mean	4.7	13.1	8.1	4.7	5.3	6.2	3.7	3.6	6.1	

Table 5.6 AVTPM-1: First Advanced Varietal Trial in Forage Pearl millet: Crude Protein (%)

Entries	Ludhiana	Hisar	Bikaner	Faizabad	Bhubaneswar	Coimbatore	Hyderabad	Mandya	Average	Rank
RBB-6	6.4	9.6	6.7	8.7	7.9	13.6	6.6	8.8	8.5	1
TSFB-14-10	5.9	9.9	6.7	8.7	8.0	8.3	8.3	7.0	7.8	6
RBB-7	5.7	9.6	7.2	8.6	7.5	12.7	5.3	7.9	8.1	3
TSFB-13-12	5.0	10.9	8.0	8.1	7.6	12.3	6.1	5.7	8.0	4
TSFB-10-5	5.4	10.1	10.1	8.1	7.5	14.0	5.3	5.7	8.3	2
Giant Bajra (NC)	6.3	10.3	6.3	7.8	7.4	13.1	5.7	6.1	7.9	5
Raj Bajra Chari-2 (NC)	5.7	9.0	9.5	8.0	7.6		7.9	7.4	7.9	5
AFB-3 (ZC-NWZ)	6.4	9.4	9.6							
APFB-9-1 (ZC-NEZ)				7.2	7.2					
Mean	5.9	9.8	8.0	8.2	7.6	12.3	6.5	6.9	8.1	

Table 5.7: AVTPM-1: First Advanced Varietal Trial in Forage Pearl millet: Plant Height (cm)

Entries	Ludhiana	Hisar	Bikaner	Faizabad	Bhubaneswar	Ranchi	Coimbatore	Hyderabad	Mandya	Raichur	Average	Rank
RBB-6	229.8	229.4	223.0	205.0	215.3	267.0	200.7	183.0	160.5	116.0	203.0	3
TSFB-14-10	196.6	223.2	110.0	198.3	194.6	272.0	227.7	187.7	190.7	128.0	192.9	6
RBB-7	226.1	253.1	241.0	201.5	204.0	276.0	193.0	191.3	184.6	148.0	211.9	1
TSFB-13-12	249.9	246.2	210.0	164.5	235.7	261.0	201.5	193.7	180.6	143.0	208.6	2
TSFB-10-5	196.7	206.9	120.0	169.5	186.3	180.0	218.7	168.3	201.6	124.0	177.2	7
Giant Bajra (NC)	231.1	259.4	160.0	177.5	221.4	244.0	227.7	154.3	178.3	148.0	200.2	4
Raj Bajra Chari-2 (NC)	233.3	252.3	217.0	160.5	199.8	204.0			150.1	133.0	193.8	5
AFB-3 (ZC-NWZ)	217.6	269.7	196.0									
APFB-9-1 (ZC-NEZ)				171.5	229.6	257.0						
Mean	222.6	242.5	184.6	181.0	210.8	245.1	211.6	179.7	178.1	134.3	198.2	

Table 5.8: AVTPM-1: First Advanced Varietal Trial in Forage Pearl millet: Leaf Stem Ratio

Entries	Ludhiana	Hisar	Bikaner	Faizabad	Pusa	Bhubaneswar	Ranchi	Coimbatore	Hyderabad	Mandya	Average	Rank
RBB-6	0.45	0.33	0.21	0.75	0.98	0.98	0.32	0.32	0.29	0.33	0.50	6
TSFB-14-10	0.52	0.48	0.72	0.70	0.98	0.79	0.85	0.37	0.25	0.41	0.61	1
RBB-7	0.43	0.39	0.19	0.69	0.99	0.90	0.57	0.30	0.27	0.33	0.51	5
TSFB-13-12	0.55	0.48	0.25	0.65	0.99	1.24	0.31	0.31	0.28	0.26	0.53	4
TSFB-10-5	0.33	0.38	0.65	0.68	0.99	0.73	0.43	0.39	0.24	0.46	0.53	4
Giant Bajra (NC)	0.92	0.41	0.42	0.58	0.98	1.06	0.41	0.35	0.24	0.25	0.56	2
Raj Bajra Chari-2 (NC)	0.73	0.42	0.12	0.61	1.02	0.84	0.24			0.35	0.54	3
AFB-3 (ZC-NWZ)	0.53	0.39	0.19									
APFB-9-1 (ZC-NEZ)				0.61	1.01	1.19	0.28					
Mean	0.56	0.41	0.34	0.66	0.99	0.97	0.43	0.34	0.26	0.34	0.54	

Table 5.9: AVTPM-1: First Advanced Varietal Trial in Forage Pearl millet: ADF (%), NDF (%) & IVDMD (%)

Entries	ADF (%)		NDF (%)		IVDMD (%)	
	Ludhiana	Rank	Ludhiana	Rank	Ludhiana	Rank
RBB-6	43.7	2	68.5	3	54.1	2
TSFB-14-10	44.6	4	69.4	5	51.3	5
RBB-7	45.4	6	69.8	6	50.3	7
TSFB-13-12	46.2	8	69.4	5	50.4	6
TSFB-10-5	44.4	3	68.8	4	53.1	3
Giant Bajra (NC)	43.1	1	67.5	2	52.1	4
Raj Bajra Chari-2 (NC)	45.9	7	70.3	7	52.1	4
AFB-3 (ZC-NWZ)	45.2	5	67.1	1	54.4	1
Mean	44.8		68.9		52.2	

6. IVTC: INITIAL VARIETAL TRIAL IN FORAGE COWPEA

(Reference Tables: 6.1 to 6.9)

In forage cowpea, seven 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 28 locations across the five zones.

For green forage yield (q/ha), entries MFC -09-15 in hill zone, TSFC -11-6 in NEZ, showed marginal superiority over best check by margins of 1.9 % and 2.5% respectively. In NWZ entry MFC-09-23 was superior by margin of 11.8% over best check. Entries PFC-39, C-215 also showed marginal superiority over checks. In central zone, zonal check UPC 9202 was the best. In south zone three entries viz., C-215, MFC-09-23, TSFC-11-6 showed substantial superiority by margin of 18.9%, 16% and 7.6% respectively. At all India level, entry MFC -09-23 was superior by margin of 7.2% whereas C-215 and TSFC -11-6 also showed marginal superiority over best check.

For dry matter yield (q/ha), in hill zone, zonal check UPC 622 was the best performer. In NWZ entry MFC -09-23, in NEZ entry TSFC -11-6 and in SZ entry C-215 were substantially superior over the best checks by margin of 12.2%, 6.7% and 12.6% respectively over the best check. Marginal superiority was observed in case of UPC 1601 (2.7%) in NWZ, PFC-40 (2.8%) and C-215 (1.7%) in central zone, MFC-09-23 (4%) over the best check. At all India level, entries MFC-09-23 (14.8%) and C-215 (9.1%) showed significant superiority over best check. Other entries such as MFC-09-15 (2.6%), TSFC-11-6 (2.6%), UPC 1601 (1.4%) showed marginal superiority.

For green and dry fodder production potential (q/ha/day), entry MFC-09-23 ranked first with 4.60 q/ha/day for GFY and 0.87 q/ha/day for DMY. Entry C-215 for DMY was also best performer with 0.87 q/ha.

For crude protein yield (q/ha), entry MFC-09-23 followed by C-215 were best performers with yield of 8.5 and 8.1 q/ha respectively. For plant height, entry C-215 (129.2 cm) and for leafiness (L/S ratio), entry PFC-40 (0.79) followed by C-215 (0.76) were best performers. For crude protein content (%), entry UPC 1601 ranked first (16.2%) followed by entry C-215 (15.7%). For other quality parameters, like ADF (%), NDF (%), IVDMD (%), entry UPC 1601 ranked first.

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

Entries	Hill Zone							North West Zone									
	Palam-pur	Sri-nagar	Alm-ora	Raj-ouri	Average	Rank	Superiority%	Ludh-iana	His-ar	Pant-nagar	Bika-ner	Udai-pur	Jal-ore	Mee-rut	Average	Rank	Superiority%
PFC-40	98.7	172.1	146.6	314.4	182.9	10	1.9	344.9	225.2	268.9	213.2	266.0	103.7	456.9	268.4	9	1.8
C-215	141.9	193.0	228.4	424.1	246.9	4		306.9	299.3	262.5	230.9	300.7	169.0	440.3	287.1	3	
UPC 1601	127.1	178.8	262.4	428.7	249.2	3		341.0	270.4	218.5	162.4	192.0	154.0	490.3	261.2	10	
PFC-39	53.7	167.9	95.7	526.9	211.0	9		326.2	232.6	210.2	351.5	273.0	169.7	486.1	292.8	2	3.7
TSFC 11-6	100.0	171.7	195.7	509.3	244.2	5		278.2	248.5	194.0	297.6	291.5	161.0	462.5	276.2	7	
MFC-09-15	125.3	181.2	232.7	514.8	263.5	1		177.5	238.9	239.6	259.3	312.3	161.7	576.4	280.8	6	11.8
MFC-09-23	131.4	157.4	188.3	450.9	232.0	7		350.9	305.9	225.2	291.4	298.4	165.7	570.8	315.5	1	
Bundel Lobia -1 (NC)	127.8	147.9	188.3	426.9	222.7	8		304.4	227.0	228.4	251.7	240.6	172.7	474.9	271.4	8	
UPC-5286 (NC)	166.0	138.7	191.4	472.2	242.1	6		305.1	257.0	202.5	212.9	247.5	168.3	579.2	281.8	5	
UPC-622 (ZC-HZ)	111.7	173.4	209.9	538.9	258.5	2											
Bundel Lobia-2 (ZC-NWZ)								360.6	261.5	224.1	221.3	270.7	149.3	487.5	282.1	4	
Mean	118.4	168.2	193.9	460.7	235.3			309.6	256.6	227.4	249.2	269.3	157.5	502.5	281.7		
CD at 5%	34.9	11.6	26.3	63.6				38.7	77.7	22.8	59.5	46.0	27.2	68.2			
CV%	17.2	6.2	8.0	8.5				14.0	17.8	5.8	13.8	10.0	10.1	7.9			

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

Entries	North East Zone									Central Zone						
	Faiza- bad	Kal- yani	Bhuban- eswar	Jor- hat	Ran- chi	Imp- hal	Aver- age	Ran- k	Superi- ority%	Ana- nd	Rai- pur	Rah- uri	Urulikan- chan	*Jha- nsi	Aver- age	Ran- k
PFC-40	281.9	273.6	317.7	182.5	277.8	290.7	270.7	9	2.5	190.0	325.0	257.2	425.9	342.6	299.5	4
C-215	253.7	276.3	244.8	188.0	324.2	346.2	272.2	8		216.0	324.8	219.6	381.9	342.6	285.6	7
UPC 1601	335.0	281.4	227.1	200.0	333.3	240.4	269.5	10		202.0	363.0	137.1	386.5	384.3	272.1	8
PFC-39	273.7	257.4	241.6	281.7	351.9	250.0	276.1	6		179.0	321.7	246.7	414.3	393.5	290.4	6
TSFC 11-6	220.6	351.3	237.5	262.0	453.6	353.2	313.0	1		166.0	303.2	248.5	314.8	361.1	258.1	10
MFC-09-15	335.0	319.4	285.4	233.9	277.8	274.2	287.6	5		177.0	314.7	245.0	460.6	324.1	299.3	5
MFC-09-23	326.8	320.8	275.0	226.4	351.9	269.5	295.1	4		219.0	327.5	267.3	421.2	336.6	308.8	2
Bundel Lobia-1 (NC)	353.7	258.3	308.3	255.4	314.7	341.4	305.3	2		219.0	258.2	324.8	430.5	365.7	308.1	3
UPC-5286 (NC)	269.6	273.6	262.5	292.7	305.6	245.8	274.9	7		244.0	227.9	204.0	398.1	287.0	268.5	9
UPC-628 (ZC-NEZ)	261.4	278.2	259.3	278.8	324.2	370.6	295.4	3								
UPC-9202 (ZC-CZ)										313.0	256.3	300.9	467.5	328.7	334.4	1
Mean	291.1	289.0	265.9	240.1	331.5	298.2	286.0			212.5	302.2	245.1	410.1	346.6	292.5	
CD at 5%	65.1	10.6	28.7	6.1	93.6	45.5				28.4	32.2	31.5	44.0	12.7		
CV%	12.6	5.2	6.3	7.3	16.4	8.9				8.1	6.2	7.5	6.2	21.3		

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

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

Entries	South Zone									All India		
	Coimbatore	Mandya	Hyderabad	Dharwad	Raichur	Vellayani	Average	Rank	Superiority%	Average	Rank	Superiority%
PFC-40	259.3	138.8	162.2	185.2	162.0	231.3	189.8	6		243.4	8	
C-215	361.1	263.9	213.1	319.4	108.8	231.3	249.6	1	18.9	269.3	2	2.5
UPC 1601	213.0	149.6	139.0	213.0	138.9	152.7	167.7	10		242.1	9	
PFC-39	305.6	36.2	176.1	166.7	180.6	231.7	182.8	9		252.2	6	
TSFC 11-6	273.1	220.7	250.2	192.1	118.1	300.7	225.8	3	7.6	265.8	3	1.1
MFC-09-15	287.0	167.6	185.3	219.9	107.9	150.7	186.4	8		261.5	5	
MFC-09-23	296.3	236.1	240.9	256.9	171.3	259.3	243.5	2	16.0	281.6	1	7.2
Bundel Lobia-1 (NC)	296.3	189.1	180.7	222.2	157.4	194.3	206.7	5		262.8	4	
UPC-5286 (NC)	189.8	181.8	203.9	213.0	104.2	245.0	189.6	7		251.9	7	
UPC-8-14 (ZC-SZ)	338.0	244.3	157.5	171.3	101.9	245.7	209.8	4				
Mean	281.9	182.8	190.9	216.0	135.1	224.3	205.2			258.9		
CD at 5%	19.3	45.3	28.9	38.2	19.5	16.4						
CV%	4.0	10.5	8.9	10.3	8.4	1.0						

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

Entries	Hill Zone						North West Zone							
	Palampur	Srinagar	Almora	Rajouri	Average	Rank	Ludhiana	Hisar	Pantnagar	Bikaner	Meerut	Average	Rank	Superiority%
PFC-40	17.9	31.1	44.1	21.0	28.5	10	59.3	48.4	34.9	35.9	106.2	56.9	9	
C-215	26.6	33.1	105.3	28.4	48.3	2	50.6	61.6	32.2	37.7	122.4	60.9	8	
UPC 1601	23.7	30.6	102.8	26.0	45.8	3	60.7	61.7	26.2	26.0	164.3	67.8	2	2.7
PFC-39	9.5	28.7	39.9	38.7	29.2	9	58.1	50.3	27.8	61.2	113.9	62.3	5	
TSFC 11-6	18.2	29.4	64.9	31.2	35.9	7	49.5	63.3	24.4	44.3	125.0	61.3	7	
MFC-09-15	23.4	30.7	76.3	32.9	40.8	6	31.6	59.2	31.5	44.5	154.2	64.2	4	
MFC-09-23	25.1	28.2	79.5	35.7	42.1	5	62.5	72.3	30.0	44.7	161.1	74.1	1	12.2
Bundel Lobia-1 (NC)	23.9	25.2	58.4	32.6	35.0	8	49.6	51.1	32.0	37.9	90.3	52.2	10	
UPC-5286 (NC)	31.3	24.9	89.0	31.0	44.1	4	51.9	63.4	24.5	32.6	136.1	61.7	6	
UPC-622 (ZC-HZ)	20.6	31.0	101.9	41.3	48.7	1								
Bundel Lobia-2 (ZC-NWZ)							62.2	58.7	28.0	38.2	143.1	66.0	3	
Mean	22.0	29.3	76.2	31.9	39.9		53.6	59.0	29.2	40.3	131.7	62.7		
CD at 5%	6.7	2.7	15.2	7.9			18.5	16.9	4.3	10.9	17.9			
CV%	17.7	4.5	12.0	14.1			11.8	16.9	8.5	15.6	7.9			

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

Entries	North East Zone									Central Zone							
	Faiza-bad	Kal-yani	Bhuban-eswar	Jor-hat	Ran-chi	Imp-hal	Aver-age	Ra-nk	Superi- ority%	Ana-nd	Urulikan- chan	Rai-pur	Rah-uri	*Jha- nsi	Aver-age	Ra-nk	Super- iority%
PFC-40	67.8	49.1	71.5	28.9	51.1	49.6	53.0	9	6.7	32.8	72.9	80.0	37.4	136.4	55.8	1	2.8
C-215	73.5	49.7	55.9	35.4	63.9	55.2	55.6	6		38.7	62.4	82.4	37.5	127.8	55.2	2	1.7
UPC 1601	80.9	50.6	52.9	34.4	54.7	58.8	55.4	7		33.2	55.8	87.8	21.7	134.4	49.6	6	
PFC-39	70.3	46.0	54.8	49.9	65.8	44.6	55.2	8		25.8	65.2	54.5	26.8	101.8	43.1	9	
TSFC 11-6	71.9	62.5	50.4	45.6	92.8	56.6	63.3	1		26.8	40.1	51.3	43.3	127.4	40.4	10	
MFC-09-15	74.3	57.4	67.5	39.6	56.1	54.5	58.2	3		29.6	67.2	72.9	34.6	105.4	51.1	5	
MFC-09-23	90.7	57.7	65.4	39.4	73.1	53.4	63.3	1		34.3	61.1	68.5	46.0	101.7	52.5	4	
Bundel Lobia -1 (NC)	68.5	46.2	72.6	43.9	58.9	55.9	57.7	5		34.0	62.9	61.1	37.9	118.4	49.0	7	
UPC-5286 (NC)	75.2	49.1	60.1	46.7	60.6	55.0	57.8	4		40.2	52.6	48.7	33.5	76.2	43.8	8	
UPC-628 (ZC-NEZ)	69.4	50.0	59.2	49.0	51.9	76.3	59.3	2									
UPC-9202 (ZC-CZ)										51.7	67.7	46.9	51.1	75.4	54.3	3	
Mean	74.2	51.8	61.0	41.3	62.9	56.0	57.9			34.7	60.8	65.4	37.0	110.5	49.5		
CD at 5%	7.5	3.5	6.9	3.0	20.6	15.5				4.8	6.4	13.6	4.9	4.6			
CV%	5.9	6.1	6.6	8.7	19.0	16.1				8.3	6.1	12.2	7.7	24.3			

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

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

Entries	South Zone								All India		
	Coimb- atore	Man- dya	Hydera- bad	Dhar- wad	Vella- yani	Aver- age	Ra- nk	Superi- ority%	Aver- age	Ra- nk	Superi- ority%
PFC-40	44.9	39.3	24.0	39.2	42.5	38.0	8	12.6	47.1	7	9.1
C-215	67.7	59.7	36.8	62.6	41.6	53.7	1		55.0	2	
UPC 1601	32.9	32.6	26.8	46.2	25.4	32.8	9		50.7	4	
PFC-39	51.9	9.0	27.6	35.6	38.8	32.6	10		45.6	8	
TSFC 11-6	48.5	50.3	48.4	40.7	51.1	47.8	3	4.0	51.3	3	2.6
MFC-09-15	45.2	39.0	36.0	45.6	28.0	38.8	6		51.3	3	
MFC-09-23	53.5	47.4	47.0	57.7	42.3	49.6	2		57.4	1	
Bundel Lobia -1 (NC)	51.9	51.7	26.1	47.0	33.0	42.0	5		48.0	6	
UPC-5286 (NC)	31.3	40.0	38.2	43.4	40.0	38.6	7		50.0	5	
MFC-8-14 (ZC-SZ)	69.2	60.6	30.2	36.1	42.5	47.7	4				
Mean	49.7	42.9	34.1	45.4	38.5	42.1			50.7		
CD at 5%	7.1	14.8	5.6	9.2	7.0						
CV%	8.4	14.7	9.7	11.9	2.6						

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

Entries	Sri-nagar	Raj-ouri	Ludh-iana	His-ar	Pant-nagar	Bika-ner	Faiza-bad	Kal-yani	Bhuban-eswar	Jor-hat	Ran-chi	Ana-nd	Jha-nsi
PFC-40	2.18	4.60	3.60	3.22	4.13	2.70	3.81	5.16	4.47	2.81	5.55	3.33	5.25
C-215	2.49	6.36	3.20	4.28	4.03	2.92	3.33	5.21	3.55	2.89	6.35	3.86	5.67
UPC 1601	2.19	6.37	3.60	3.86	3.36	2.06	4.46	5.31	3.11	3.23	6.29	3.81	5.75
PFC-39	2.15	8.07	3.40	3.32	3.23	4.45	3.55	4.86	3.61	4.40	5.86	3.20	6.21
TSFC 11-6	2.13	7.76	2.90	3.55	2.98	3.77	2.42	6.63	3.60	4.23	7.32	2.37	5.99
MFC-09-15	2.35	8.13	1.90	3.41	3.68	3.28	3.68	6.03	3.86	3.60	4.27	2.53	5.21
MFC-09-23	2.02	6.54	3.70	4.37	3.46	3.69	4.13	6.05	3.77	3.59	5.78	3.65	5.43
Bundel Lobia -1 (NC)	1.84	6.53	3.20	3.24	3.51	3.19	4.21	4.87	4.60	3.81	5.72	3.78	5.58
UPC-5286 (NC)	1.79	7.27	3.20	3.67	3.11	2.69	3.59	5.12	3.55	4.57	5.27	3.94	4.17
UPC-622 (ZC-HZ)	2.19	7.93											
Bundel Lobia-2 (ZC-NWZ)			3.80	3.74	3.44	2.80							
UPC-628 (ZC-NEZ)							3.26	5.25	3.99	4.42	6.00		
UPC-9202 (ZC-CZ)												4.89	5.17
MFC-8-14 (ZC-SZ)													
Mean	2.13	6.96	3.25	3.67	3.49	3.16	3.64	5.45	3.81	3.76	5.84	3.54	5.44

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

Entries	Rah-uri	Urulikan- chan	Rai- pur	Coimb- atore	Man- dya	Hydera- bad	Dhar- wad	Vella- yani	Ave- rage	Ra- nk
PFC-40	4.43	6.55	5.80	4.89	2.78	2.82	3.19	4.36	4.08	7
C-215	3.49	6.06	5.24	6.94	5.04	3.51	5.51	4.36	4.49	2
UPC 1601	2.21	6.66	5.58	4.10	2.95	2.52	3.67	2.88	4.00	9
PFC-39	4.41	7.40	5.27	5.66	0.71	3.26	2.87	4.37	4.30	4
TSFC 11-6	3.88	5.52	4.89	5.15	4.52	4.54	3.31	5.67	4.43	3
MFC-09-15	3.89	7.94	5.94	5.63	3.33	3.03	3.79	2.84	4.21	6
MFC-09-23	4.18	6.79	6.18	5.49	4.84	3.70	4.43	4.89	4.60	1
Bundel Lobia-1 (NC)	5.08	6.33	4.03	5.59	3.79	3.33	3.83	3.67	4.27	5
UPC-5286 (NC)	3.14	6.53	4.38	3.80	3.53	3.38	3.67	4.62	4.05	8
UPC-622 (ZC-HZ)										
Bundel Lobia-2 (ZC-NWZ)										
UPC-628 (ZC-NEZ)										
UPC-9202 (ZC-CZ)	4.56	7.31	4.66							
MFC-8-14 (ZC-SZ)				6.26	4.73	2.81	2.95	4.63		
Mean	3.93	6.71	5.20	5.35	3.62	3.29	3.72	4.23	4.27	

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

Entries	Srinagar	Rajouri	Ludhiana	Hisar	Pantnagar	Bikaner	Faizabad	Kalyani	Bhubaneswar	Jorhat	Ranchi
PFC-40	0.40	0.31	0.60	0.69	0.54	0.45	0.92	0.93	1.01	0.44	1.02
C-215	0.41	0.34	0.50	0.88	0.49	0.48	0.96	0.94	0.81	0.54	1.25
UPC 1601	0.39	0.39	0.60	0.88	0.40	0.33	1.07	0.95	0.72	0.55	1.03
PFC-39	0.37	0.69	0.60	0.72	0.43	0.78	0.91	0.87	0.82	0.78	1.10
TSFC 11-6	0.38	0.40	0.50	0.90	0.38	0.56	0.80	1.18	0.76	0.74	1.50
MFC-09-15	0.39	0.42	0.30	0.85	0.48	0.56	0.81	1.08	0.91	0.61	0.86
MFC-09-23	0.37	0.52	0.70	1.03	0.46	0.57	1.14	1.09	0.90	0.62	1.20
Bundel Lobia -1 (NC)	0.34	0.63	0.50	0.73	0.49	0.48	0.81	0.87	1.08	0.65	1.07
UPC-5286 (NC)	0.33	0.48	0.50	0.91	0.38	0.41	1.00	0.93	0.81	0.73	1.04
UPC-622 (ZC-HZ)	0.42	0.77									
Bundel Lobia-2 (ZC-NWZ)			0.70	0.84	0.43	0.48					
UPC-628 (ZC-NEZ)							0.86	0.94	0.91	0.78	0.96
UPC-9202 (ZC-CZ)											
MFC-8-14 (ZC-SZ)											
Mean	0.38	0.50	0.55	0.84	0.45	0.51	0.93	0.98	0.87	0.65	1.10

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

Entries	Anand	Jhansi	Rahuri	Urulikanchan	Raipur	Coimbatore	Mandya	Hyderabad	Dharwad	Average	Rank
PFC-40	0.58	2.09	0.65	1.12	1.43	0.85	0.79	0.42	0.68	0.80	3
C-215	0.69	2.11	0.59	0.99	1.33	1.30	1.14	0.61	1.08	0.87	1
UPC 1601	0.63	2.01	0.35	0.96	1.35	0.63	0.64	0.49	0.80	0.76	6
PFC-39	0.46	1.61	0.48	1.16	0.89	0.96	0.18	0.51	0.61	0.75	7
TSFC 11-6	0.38	2.11	0.68	0.70	0.83	0.92	1.03	0.88	0.70	0.82	2
MFC-09-15	0.42	1.70	0.55	1.16	1.37	0.89	0.77	0.59	0.79	0.78	5
MFC-09-23	0.57	1.64	0.72	0.99	1.29	0.99	0.96	0.72	0.99	0.87	1
Bundel Lobia -1 (NC)	0.59	1.80	0.59	0.92	0.95	0.98	1.03	0.48	0.81	0.79	4
UPC-5286 (NC)	0.65	1.11	0.52	0.86	0.94	0.63	0.77	0.63	0.75	0.72	8
UPC-622 (ZC-HZ)											
Bundel Lobia-2 (ZC-NWZ)											
UPC-628 (ZC-NEZ)											
UPC-9202 (ZC-CZ)	0.81	1.19	0.77	1.06	0.85						
MFC-8-14 (ZC-SZ)						1.28	1.17	0.54	0.62		
Mean	0.58	1.74	0.59	0.99	1.12	0.94	0.85	0.59	0.78	0.79	

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

Entries	Palampur	Ludhiana	Bikaner	Hisar	Faizabad	Kalyani	Bhubaneswar	Jorhat	Imphal
PFC-40	2.9	10.4	5.4	7.6	11.1	5.2	11.3	3.9	6.3
C-215	4.4	7.9	5.6	10.0	12.5	5.6	8.7	4.9	6.4
UPC 1601	4.2	12.1	4.0	10.3	14.7	4.9	8.0	4.4	6.9
PFC-39	1.5	10.2	8.5	8.6	12.9	5.2	8.6	6.2	6.2
TSFC 11-6	2.9	6.9	6.9	10.5	12.5	5.8	7.9	6.2	7.4
MFC-09-15	3.8	5.6	6.5	9.9	12.8	5.5	10.1	5.0	6.1
MFC-09-23	4.5	11.0	6.9	12.0	17.2	4.6	9.7	5.2	6.8
Bundel Lobia -1 (NC)	4.2	7.4	5.8	8.5	10.4	5.3	10.9	6.2	7.5
UPC-5286 (NC)	5.8	8.1	4.8	10.6	13.2	4.6	9.3	6.3	7.6
UPC-622 (ZC-HZ)	3.3								
Bundel Lobia-2 (ZC-NWZ)		10.2	5.5	9.8					
UPC-628 (ZC-NEZ)					11.1	4.3	9.2	6.2	8.7
UPC-9202 (ZC-CZ)									
MFC-8-14 (ZC-SZ)									
Mean	3.7	9.0	6.0	9.8	12.8	5.1	9.4	5.5	7.0

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

Entries	Anand	Rahuri	Urulikanchan	Raipur	Coimbatore	Mandya	Hyderabad	Average	Rank
PFC-40	4.8	4.9	12.6	12.7	7.3	7.9	3.2	7.3	4
C-215	5.7	4.9	11.4	12.8	12.1	12.0	5.4	8.1	2
UPC 1601	4.6	3.1	10.4	13.0	6.9	7.1	4.3	7.4	3
PFC-39	3.8	3.9	12.2	7.1	9.3	1.3	4.1	6.9	5
TSFC 11-6	3.7	7.5	7.5	7.3	9.1	7.9	7.9	7.4	3
MFC-09-15	4.0	6.0	12.4	10.0	9.3	6.5	5.4	7.4	3
MFC-09-23	4.9	6.9	10.9	11.1	9.8	8.2	6.5	8.5	1
Bundel Lobia -1 (NC)	4.9	5.6	11.3	9.0	7.3	11.3	3.2	7.4	3
UPC-5286 (NC)	5.7	4.9	9.3	6.5	6.0	8.2	6.0	7.3	4
UPC-622 (ZC-HZ)									
Bundel Lobia-2 (ZC-NWZ)									
UPC-628 (ZC-NEZ)									
UPC-9202 (ZC-CZ)	7.3	8.8	12.5	6.3					
MFC-8-14 (ZC-SZ)					11.2	9.8	4.2		
Mean	4.9	5.6	11.1	9.6	8.8	8.0	5.0	7.5	

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

Entries	Palam-pur	Ludh-iana	Bika-ner	His-ar	Faiza-bad	Bhuban-eswar	Jor-hat	Imp-hal	Kal-yani	Ana-and	Rah-uri	Urulikan-cha	Rai-pur	Coimb-atore	Man-dya	Hydera-bad	Aver-age	Ra-nk
PFC-40	16.3	17.5	15.0	15.8	16.4	15.7	13.6	12.7	10.5	14.6	13.1	17.3	15.9	16.2	20.1	13.2	15.2	6
C-215	16.3	15.7	14.8	16.2	17.0	15.5	14.3	11.6	11.2	14.6	13.1	18.3	15.5	17.9	20.1	14.7	15.4	4
UPC 1601	17.8	20.0	15.3	16.6	18.2	15.2	13.0	11.9	9.7	13.8	14.5	18.6	14.8	21.0	21.9	16.1	16.2	1
PFC-39	15.9	17.5	13.9	17.1	18.4	15.6	12.6	14.0	11.4	14.7	14.4	18.8	13.1	17.9	14.9	15.1	15.3	5
TSFC 11-6	15.9	14.0	15.6	16.6	17.4	15.7	13.8	13.1	9.2	13.8	17.4	18.8	14.3	18.8	15.8	16.4	15.4	4
MFC-09-15	16.1	17.8	14.7	16.6	17.2	15.0	12.9	11.2	9.6	13.5	17.3	18.4	13.7	20.6	16.6	14.9	15.4	4
MFC-09-23	17.8	17.6	15.3	16.6	19.0	14.9	13.4	12.8	7.9	14.4	15.0	17.9	16.3	18.4	17.5	13.8	15.5	3
Bundel Lobia -1 (NC)	17.5	15.0	15.3	16.6	15.2	15.0	14.3	13.4	11.4	14.3	14.8	17.9	14.8	14.0	21.9	12.1	15.2	6
UPC-5286 (NC)	18.4	15.7	14.6	16.6	17.6	15.4	13.6	13.8	9.4	14.3	14.7	17.6	13.3	19.3	20.6	15.6	15.7	2
UPC-622 (ZC-HZ)	16.1																	
Bundel Lobia-2 (ZC-NWZ)		16.4	14.4	16.6														
UPC-628 (ZC-NEZ)					16.0	15.5	12.8	11.3	8.0									
UPC-9202 (ZC-CZ)										14.1	17.2	18.5	13.3					
MFC-8-14 (ZC-SZ)														16.2	16.2	13.8		
Mean	16.8	16.7	14.9	16.5	17.2	15.4	13.4	12.6	9.8	14.2	15.1	18.2	14.5	18.0	18.6	14.6	15.5	

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

Entries	Palam-pur	Sri-nagar	Raj-ouri	Ludh-iana	His-ar	Pant-nagar	Bika-ner	Udai-pur	Faiza-bad	Kal-yani	Bhuban-eswar	Jor-hat	Ran-chi	Imp-hal
PFC-40	47.7	114.6	185.4	102.8	190.9	133.2	78.0	118.2	159.2	132.2	235.7	120.2	101.0	190.4
C-215	62.7	118.5	160.7	87.8	180.0	137.5	95.0	88.6	160.5	134.8	209.2	124.5	101.0	197.7
UPC 1601	56.3	112.3	142.4	118.9	212.7	154.3	92.0	93.6	139.3	134.6	189.6	128.9	98.0	116.7
PFC-39	52.3	98.9	275.3	92.9	214.4	112.7	98.0	92.0	146.7	128.5	200.8	132.1	95.0	117.8
TSFC 11-6	70.7	117.6	145.7	90.1	156.4	140.0	70.0	99.1	150.1	136.4	194.7	194.6	90.0	143.3
MFC-09-15	74.7	119.4	168.7	65.6	193.2	139.7	87.0	111.2	157.5	133.1	224.2	125.5	104.0	114.8
MFC-09-23	64.7	106.9	178.3	112.3	190.9	150.8	80.0	96.3	152.0	135.3	219.5	132.1	101.0	160.8
Bundel Lobia -1 (NC)	72.3	109.4	189.3	103.5	218.6	138.3	93.0	92.2	179.2	127.6	230.1	146.3	107.0	176.3
UPC-5286 (NC)	80.3	111.8	168.4	90.2	185.1	156.0	101.0	96.3	146.6	132.2	215.1	153.4	101.0	116.8
UPC-622 (ZC-HZ)	77.7	102.0	231.4											
Bundel Lobia-2 (ZC-NWZ)				115.4	222.0	151.7	131.0	88.3						
UPC-628 (ZC-NEZ)									149.4	135.9	211.3	188.9	106.0	143.1
UPC-9202 (ZC-CZ)														
MFC-8-14 (ZC-SZ)														
Mean	65.9	111.1	184.5	98.0	196.4	141.4	92.5	97.6	154.1	133.1	213.0	144.6	100.4	147.8

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

Entries	Anand	Jhansi	Rahuri	Urulikanchan	Raipur	Coimbatore	Mandya	Hyderabad	Raichur	Vellayani	Average	Rank
PFC-40	115.4	138.9	126.4	160.8	125.6	79.2	67.5	65.6	47.0	166.0	125.1	6
C-215	122.3	217.2	143.4	151.5	122.6	88.8	87.2	131.4	42.0	137.0	129.2	1
UPC 1601	121.9	180.0	135.6	168.5	123.4	82.4	69.9	130.9	41.0	133.7	124.0	8
PFC-39	102.4	152.8	79.3	179.5	83.1	80.8	43.4	52.7	42.0	125.0	116.6	9
TSFC 11-6	103.8	180.0	152.0	160.7	105.7	78.8	84.7	154.7	40.0	136.3	124.8	7
MFC-09-15	123.5	158.9	141.7	171.7	131.5	86.2	74.1	144.3	51.0	118.7	125.8	5
MFC-09-23	114.8	150.0	142.4	164.3	124.4	77.1	89.3	157.0	40.0	135.3	128.1	2
Bundel Lobia -1 (NC)	116.5	171.1	121.3	179.8	120.0	80.0	73.5	70.8	45.0	111.3	128.0	3
UPC-5286 (NC)	109.1	167.8	149.6	167.8	111.0	79.2	87.7	159.3	42.0	132.0	127.5	4
UPC-622 (ZC-HZ)												
Bundel Lobia-2 (ZC-NWZ)												
UPC-628 (ZC-NEZ)												
UPC-9202 (ZC-CZ)	117.1	191.1	156.2	150.7	93.3							
MFC-8-14 (ZC-SZ)						84.1	84.6	117.0	44.0	136.7		
Mean	114.7	170.8	134.8	165.5	114.0	81.7	76.2	118.4	43.4	133.2	125.5	

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

Entries	Palampur	Ludhiana	Hisar	Pantnagar	Bikaner	Faizabad	Kalyani	Bhubaneswar	Jorhat	Ranchi	Imphal
PFC-40	0.46	0.82	0.56	0.97	0.98	0.50	1.00	1.35	1.09	0.85	0.57
C-215	0.48	0.52	0.66	1.03	0.99	0.58	0.93	1.09	1.52	0.82	0.65
UPC 1601	0.44	0.67	0.53	0.96	1.37	0.53	0.93	0.79	0.94	0.49	0.72
PFC-39	0.41	0.60	0.47	1.02	0.88	0.60	0.82	0.89	0.84	0.69	0.73
TSFC 11-6	0.45	0.60	0.45	1.14	0.95	0.62	0.84	0.84	0.69	0.81	0.59
MFC-09-15	0.43	0.45	0.77	1.02	1.54	0.49	1.00	1.11	0.75	0.71	0.53
MFC-09-23	0.58	0.82	0.87	1.12	1.03	0.48	0.85	1.17	0.69	0.86	0.56
Bundel Lobia -1 (NC)	0.56	0.82	0.66	0.94	0.99	0.61	0.88	1.29	0.94	0.54	0.72
UPC-5286 (NC)	0.34	0.67	0.43	1.08	1.10	0.51	0.81	0.93	1.01	0.64	0.77
UPC-622 (ZC-HZ)	0.54										
Bundel Lobia-2 (ZC-NWZ)		0.90	0.49	1.00	0.90						
UPC-628 (ZC-NEZ)						0.55	0.83	0.98	0.80	0.69	0.55
Mean	0.47	0.69	0.59	1.03	1.07	0.55	0.89	1.04	0.93	0.71	0.64

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

Entries	Jhansi	Rahuri	Urulikanchan	Raipur	Coimbatore	Mandya	Hyderabad	Vellayani	Average	Rank
PFC-40	0.25	0.50	1.33	0.84	0.44	0.59	1.24	0.61	0.79	1
C-215	0.50	0.51	1.29	0.75	0.43	0.50	0.46	0.68	0.76	2
UPC 1601	0.44	0.58	0.70	0.67	0.42	0.65	0.75	0.70	0.70	6
PFC-39	0.30	0.55	1.30	0.69	0.43	0.50	0.96	0.62	0.70	6
TSFC 11-6	0.40	0.36	1.07	0.68	0.45	0.51	0.59	0.80	0.68	7
MFC-09-15	0.33	0.50	0.98	0.59	0.43	0.58	0.51	0.74	0.71	5
MFC-09-23	0.25	0.37	1.43	0.58	0.45	0.58	0.62	0.70	0.74	3
Bundel Lobia -1 (NC)	0.37	0.40	0.86	0.70	0.47	0.60	0.92	0.80	0.74	3
UPC-5286 (NC)	0.35	0.59	1.67	0.81	0.42	0.61	0.45	0.67	0.73	4
UPC-9202 (ZC-CZ)	0.27	0.65	1.18	0.59						
MFC-8-14 (ZC-SZ)					0.46	0.56	0.44	0.82		
Mean	0.35	0.50	1.18	0.69	0.44	0.57	0.69	0.71	0.73	

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

Entries	ADF (%)		NDF (%)		IVDMD (%)	
	Ludhiana	Rank	Ludhiana	Rank	Ludhiana	Rank
PFC-40	37.9	3	59.1	5	62.9	3
C-215	39.1	6	60.2	7	56.1	7
UPC 1601	35.8	1	56.2	1	63.8	1
PFC-39	38.2	4	58.1	4	58.7	5
TSFC 11-6	40.1	8	61.4	10	54.0	10
MFC-09-15	37.9	3	58.0	3	62.6	4
MFC-09-23	38.8	5	57.5	2	63.0	2
Bundel Lobia -1 (NC)	39.9	7	60.4	8	55.6	8
UPC-5286 (NC)	38.8	5	60.9	9	54.9	9
Bundel Lobia-2 (ZC-NWZ)	37.2	2	59.4	6	58.4	6
Mean	38.4		59.1		59.0	

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

(Reference Tables: 7.1 to 7.9)

In first advanced varietal trial in forage cowpea, six entries along with two national checks namely Bundel Lobia-1 (BL-1) and UPC-5286 and zonal was tested at 28 locations in five zones.

For green forage yield (q/ha), zonal checks ranked first in hill and NWZ. Only marginal superiority of UPC 1501 (2.9%), TSFC -09-3 (0.9%), MFC -09-4 (0.8%) was observed in NEZ. In central zone, entry MFC-09-13 and in south zone entry Vellyani-1 showed substantial superiority by margin of 6.1% and 8.5% respectively over the best check. At all India level, entries such as Vellyani -1 (4.4%), MFC-09-13 (2.4%), TSFC -12-15 (2.3%) and MFC -09-3 (1.9%) showed marginal superiority over the best check.

For dry matter yield (q/ha), in hill zone entry MFC 09-3 (28.2%), UPC-1501 (18.5%), TSFC-12-15 (18.2%), Vellayani-1 (8.5%), MFC-09-4 (7.5%) showed superiority over best check. In central zone MFC -09-13 (23.7%), Vellayani -1 (18.1%), TSFC -12-15 (10%), MFC -09-4 (5.9%), MFC -09-3 (1.9%) showed superiority over the best check. In south zone Vellyani -1 and UPC 1501 were superior by margin of 14.3 and 6.2 % respectively. At all India level, Vellayani-1 ranked first with 14.1% superiority followed by MFC-09-4 with 7.6 % superiority over best check. TSFC-12-15, MFC-09-13 and MFC-3 were also superior by margin of 7.0%, 7.0% and 5.8% respectively.

For fodder production potential (q/ha/day), entry Vellayani -1 with 4.01 q/ha/day followed by TSFC -12-15 (3.96 q/ha/day) were best performer for green forage. Similarly for dry matter also, Vellyani -1 ranked first with 0.82 q/ha/day followed by MFC -09-13 (0.79 q/ha/day).

For crude protein yield, entry Vellyani -1 ranked first with 7.8q/ha followed jointly by MFC-01-4 and UPC 1501 with 7.6 q/ha. For crude protein percent entry MFC-09-4 ranked first with 16.5% followed by MFC-09-3 (16.2%). For plant height, national check UPC 5286 (135.3 cm) ranked first whereas for leafiness, national check Bundle lobia-1 and MFC -09-4 were jointly ranked first with value of 0.75. For other quality parameters, Check Bundel Lobia -1 for ADF% and IVDMD% whereas entry MFC -09-4 for NDF% ranked first.

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

Entries	Hill Zone					North West Zone								
	Palam-pur	Sri-nagar	Alm-ora	Aver-age	Ra-nk	Ludh-iana	His-ar	Pant-nagar	Bika-ner	Udai-pur	Jal-ore	Mee-rut	Aver-age	Ra-nk
MFC-09-3	231.8	154.3	155.1	180.4	2	274.7	233.1	278.3	229.7	173.5	189.3	495.0	267.7	6
TSFC-12-15	220.0	129.5	155.6	168.3	5	243.2	253.9	252.8	294.8	213.8	166.3	511.7	276.6	4
MFC-09-13	157.7	146.3	138.9	147.7	8	286.9	250.0	249.7	270.7	236.0	205.7	453.3	278.9	3
UPC-1501	179.9	174.3	157.4	170.5	4	298.3	307.8	230.6	206.3	112.7	153.0	476.7	255.0	8
MFC-09-4	184.4	160.1	155.1	166.5	6	346.1	210.0	227.5	98.0	162.4	195.7	493.3	247.6	9
Vellayani-1	198.5	164.0	129.6	164.0	7	383.3	278.6	292.8	265.3	206.9	167.3	452.5	292.4	2
Bundel Lobia-1 (NC)	205.1	132.8	97.2	145.1	9	341.4	262.2	273.3	246.9	165.2	116.7	499.2	272.1	5
UPC-5286 (NC)	244.4	153.0	133.3	176.9	3	348.6	282.8	210.4	234.4	172.2	111.3	480.8	262.9	7
UPC-622 (ZC-HZ)	239.2	115.6	226.9	193.9	1									
Bundel Lobia-2 (ZC-NWZ)						462.5	305.8	225.3	310.7	198.5	171.7	502.5	311.0	1
Mean	206.8	147.8	149.9	168.1		331.7	264.9	249.0	239.6	182.4	164.1	485.0	273.8	
CD at 5%	40.6	9.0	30.7			60.4	73.0	10.3	65.5	37.9	38.6	49.9		
CV%	11.4	6.5	11.0			7.3	16.2	2.4	15.8	12.2	13.6	5.9		

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

Entries	North East Zone									Central Zone								
	Faiza-bad	Bhuban-eswar	Ran-chi	Jor-hat	Kal-yani	Imp-hal	Aver-age	Ra-nk	Superi-osity	Ana-nd	Rah-uri	Urulikan-chan	Jha-nsi	Kan-pur	Rai-pur	Aver-age	Ra-nk	Superi-osity
MFC-09-3	187.9	253.2	135.3	221.6	275.8	361.9	239.3	6		197.0	279.7	252.8	252.8	374.9	405.5	293.8	4	
TSFC-12-15	171.6	233.4	218.8	222.8	284.4	339.1	245.0	2	0.9	234.0	259.6	176.4	286.1	388.7	396.3	290.2	5	
MFC-09-13	161.4	240.7	152.8	216.1	297.7	371.5	240.0	5		248.0	248.4	336.1	272.2	402.6	389.4	316.1	1	6.1
UPC-1501	122.5	274.6	173.6	204.2	334.1	389.0	249.7	1	2.9	158.0	143.3	132.0	277.8	363.7	391.1	244.3	9	
MFC-09-4	167.5	287.6	125.0	206.0	310.5	371.8	244.7	3	0.8	238.0	243.0	284.8	260.9	352.6	331.5	285.1	6	
Vellayani-1	118.5	237.4	194.5	233.8	253.6	250.1	214.6	8		228.0	294.0	244.5	269.4	349.9	381.7	294.6	3	
Bundel Lobia-1 (NC)	145.0	207.4	187.5	196.4	273.8	269.9	213.3	9		287.0	236.5	262.5	277.8	327.7	394.7	297.7	2	
UPC-5286 (NC)	175.7	227.7	197.9	217.3	265.0	256.9	223.4	7		261.0	255.4	257.0	200.0	338.8	361.1	278.9	7	
UPC-628 (ZC-NEZ)	151.1	312.1	149.3	237.8	287.2	318.5	242.7	4										
UPC-9202 (ZC-CZ)										227.0	211.5	250.0	247.2	358.2	278.8	262.1	8	
Mean	155.7	252.7	170.5	217.3	286.9	325.4	234.8			230.9	241.3	244.0	260.5	361.9	370.0	284.8		
CD at 5%	35.4	19.1	28.3	5.6	12.4	99.7				30.9	30.6	37.1	5.0	38.3	56.2			
CV%	12.8	4.4	9.5	7.4	6.4	17.7				8.0	7.3	8.7	11.2	6.1	8.9			

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

Entries	South Zone									All India		
	Coimbatore	Vellayani	Mandya	Hyderabad	Dharwad	Raichur	Average	Rank	Superiority	Average	Rank	Superiority
MFC-09-3	222.2	166.7	195.4	205.5	348.6	115.0	208.9	4		245.2	4	1.9
TSFC-12-15	202.8	178.0	238.9	163.8	326.4	129.0	206.5	5		246.1	3	2.3
MFC-09-13	205.6	197.0	164.3	158.3	330.6	112.5	194.7	7		246.4	2	2.4
UPC-1501	205.6	219.3	198.1	155.5	329.2	97.5	200.9	6		230.9	8	
MFC-09-4	261.1	161.3	174.9	138.8	298.6	107.5	190.4	9		234.1	6	
Vellayani-1	280.6	238.7	196.5	213.8	323.6	187.5	240.1	1	8.5	251.2	1	4.4
Bundel Lobia-1 (NC)	247.2	186.0	190.2	238.8	322.2	142.5	221.2	3		240.5	5	
UPC-5286 (NC)	211.1	153.0	189.4	152.7	276.4	172.5	192.5	8		233.6	7	
MFC-8-14 (ZC-SZ)	288.9	183.3	208.0	144.4	345.8	157.5	221.3	2				
Mean	236.1	187.0	195.1	174.6	322.4	135.7	208.5			241.0		
CD at 5%	41.9	23.7	13.9	21.4	NS	20.7						
CV%	4.5	1.8	4.1	7.1	14.4	8.8						

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

Entries	Hill Zone						North West Zone						
	Palam-pur	Sri-nagar	Alm-ora	Average	Rank	Superiority	Ludh-iana	His-ar	Pant-nagar	Bika-ner	Mee-rut	Average	Rank
MFC-09-3	43.7	28.0	67.5	46.4	1	28.2	48.10	50.3	34.5	37.9	110.8	56.3	8
TSFC-12-15	41.4	26.0	60.9	42.8	3	18.2	40.10	52.8	29.6	49.5	120.8	58.6	4
MFC-09-13	30.5	23.4	33.4	29.1	9		48.80	56.9	29.4	41.9	97.1	54.8	9
UPC-1501	34.8	29.6	64.3	42.9	2	18.5	53.10	70.1	27.5	29.5	106.7	57.4	6
MFC-09-4	35.0	28.4	53.2	38.9	5	7.5	58.10	51.7	29.0	14.8	135.8	57.9	5
Vellayani-1	37.8	27.5	52.6	39.3	4	8.5	67.10	60.3	39.8	43.4	108.3	63.8	2
Bundel Lobia-1 (NC)	38.8	25.0	33.9	32.6	8		56.30	58.8	36.3	43.8	90.8	57.2	7
UPC-5286 (NC)	45.4	27.6	32.8	35.2	7		59.30	69.8	24.5	35.8	110.8	60.0	3
UPC-622 (ZC-HZ)	46.5	22.5	39.6	36.2	6								
Bundel Lobia-2 (ZC-NWZ)							80.50	77.6	26.5	50.4	119.9	71.0	1
Mean	39.3	26.4	48.7	38.1			56.8	60.9	30.8	38.6	111.2	59.7	
CD at 5%	8.7	3.0	18.4				22.4	17.9	2.5	11.0	12.9		
CV%	12.8	5.5	15.4				14.8	17.3	4.6	16.4	6.8		

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

Entries	North East Zone								Central Zone								
	Faiza-bad	Bhuban-eswar	Ran-chi	Jor-hat	Kal-yani	Imp-hal	Aver-age	Ra-nk	Ana-nd	Rah-uri	Urulikan-chan	Jha-nsi	Kan-pur	Rai-pur	Aver-age	Ra-nk	Superi- ority
MFC-09-3	38.4	57.0	24.7	39.6	49.3	62.7	45.3	5	33.0	31.2	26.8	76.8	92.5	121.1	63.6	5	1.9
TSFC-12-15	34.7	53.4	35.9	40.5	50.6	53.0	44.7	6	45.1	31.9	20.1	86.3	95.8	133.1	68.7	3	10.0
MFC-09-13	31.9	55.1	31.0	38.9	52.6	63.4	45.5	4	46.8	42.2	37.7	109.6	99.9	127.0	77.2	1	23.7
UPC-1501	32.7	60.9	28.6	36.1	60.4	70.4	48.2	3	30.2	23.7	13.1	78.4	90.5	131.3	61.2	7	
MFC-09-4	28.2	64.7	18.9	38.6	55.8	87.2	48.9	2	40.9	41.1	32.3	86.5	86.4	109.2	66.1	4	5.9
Vellayani-1	25.7	55.5	28.2	38.0	45.3	55.8	41.4	8	41.0	48.2	28.1	106.0	85.8	133.2	73.7	2	18.1
Bundel Lobia-1 (NC)	28.6	47.8	27.4	36.0	49.2	40.9	38.3	9	52.6	29.2	30.1	93.1	81.6	87.7	62.4	6	
UPC-5286 (NC)	29.8	51.4	30.6	37.7	47.1	54.2	41.8	7	45.9	39.1	26.5	62.2	83.9	102.5	60.0	8	
UPC-628 (ZC-NEZ)	33.1	72.2	22.7	42.7	52.2	70.9	49.0	1									
UPC-9202 (ZC-CZ)									36.6	34.1	26.0	61.8	88.6	86.2	55.6	9	
Mean	31.5	57.6	27.6	38.7	51.4	62.0	44.8		41.3	35.6	26.7	84.5	89.4	114.6	65.4		
CD at 5%	4.9	4.9	6.0	3.0	3.7	16.8			5.7	4.8	4.1	2.6	8.6	14.8			
CV%	9.0	5.1	12.7	9.2	4.2	15.7			8.3	7.7	8.8	17.7	5.6	7.6			

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

Entries	South Zone								All India		
	Coimb- atore	Vella- yani	Man- dya	Hydera- bad	Dhar- wad	Aver- age	Ra- nk	Superi- ority%	Aver- age	Ra- nk	Superi- ority%
MFC-09-3	37.4	27.8	24.5	32.9	78.0	40.1	6		51.0	5	5.8
TSFC-12-15	33.9	29.7	39.5	22.7	63.2	37.8	8		51.6	4	7.0
MFC-09-13	35.0	32.4	27.4	28.9	70.1	38.8	7		51.6	4	7.0
UPC-1501	34.0	37.2	58.7	28.9	70.0	45.8	2	6.2	52.0	2	0.8
MFC-09-4	55.6	24.2	28.9	27.4	65.4	40.3	5		51.9	3	7.6
Vellayani-1	56.9	43.1	33.4	42.1	71.0	49.3	1	14.3	55.0	1	14.1
Bundel Lobia-1 (NC)	45.7	29.7	39.8	30.7	67.8	42.8	4		48.1	7	
UPC-5286 (NC)	37.2	27.6	31.8	29.5	61.2	37.5	9		48.2	6	
UPC-622 (ZC-HZ)											
Bundel Lobia-2 (ZC-NWZ)											
UPC-628 (ZC-NEZ)											
UPC-9202 (ZC-CZ)											
MFC-8-14 (ZC-SZ)	47.5	29.9	42.9	27.8	67.4	43.1	3				
Mean	42.6	31.3	36.3	30.1	68.2	41.7			51.2		
CD at 5%	37.9	7.2	8.4	5.6	NS						
CV%	6.6	3.2	13.4	10.7	15.4						

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

Entries	Srinagar	Ludhiana	Hisar	Pantnagar	Bikaner	Faizabad	Bhubaneswar	Ranchi	Jorhat	Kalyani
MFC-09-3	1.93	2.90	3.33	4.28	2.91	2.98	3.42	2.18	3.44	4.93
TSFC-12-15	1.72	2.60	3.63	3.89	3.73	2.76	3.43	4.29	3.48	5.08
MFC-09-13	1.88	3.00	3.57	3.84	3.43	2.68	3.30	2.28	3.34	5.32
UPC-1501	2.17	3.10	4.40	3.54	2.61	2.04	4.22	2.41	3.17	5.97
MFC-09-4	2.09	3.60	3.00	3.50	1.24	2.93	4.17	1.71	3.19	5.54
Vellayani-1	2.14	4.00	3.98	4.50	3.36	1.85	3.60	2.95	3.46	4.53
Bundel Lobia-1 (NC)	1.77	3.60	3.75	4.20	3.13	2.23	3.24	2.88	2.81	4.89
UPC-5286 (NC)	2.06	3.70	4.04	3.24	2.97	2.70	3.40	2.87	3.24	4.73
UPC-622 (ZC-HZ)	1.56									
Bundel Lobia-2 (ZC-NWZ)		4.90	4.37	3.47	3.93					
UPC-628 (ZC-NEZ)						2.29	4.95	2.13	3.50	5.13
Mean	1.92	3.49	3.79	3.83	3.03	2.50	3.75	2.63	3.29	5.12

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

Entries	Ana-nd	Rah-uri	Urulikan- chan	Jha- nsi	Kan- pur	Rai- pur	Coimb- atore	Vella- yani	Man- dya	Hydera- bad	Dhar- wad	Aver- age	Ra- nk
MFC-09-3	3.52	5.00	4.01	3.99	5.13	6.99	4.27	2.08	3.60	3.41	5.81	3.82	5
TSFC-12-15	4.98	4.48	2.59	4.59	5.72	7.21	3.90	2.96	4.25	2.46	5.44	3.96	2
MFC-09-13	4.59	3.88	5.51	4.42	6.10	7.21	3.81	2.81	3.16	2.72	5.51	3.92	4
UPC-1501	2.43	2.35	2.13	4.34	4.79	6.98	3.67	3.65	3.68	2.40	5.49	3.60	8
MFC-09-4	3.55	3.92	4.91	4.15	4.64	6.14	4.66	2.69	3.27	2.24	4.98	3.62	7
Vellayani-1	3.93	4.90	4.37	4.29	4.54	6.82	5.29	3.41	3.70	3.21	5.39	4.01	1
Bundel Lobia-1 (NC)	5.74	4.22	4.61	4.52	4.82	6.27	4.58	2.65	3.63	3.62	5.37	3.93	3
UPC-5286 (NC)	3.95	4.33	4.14	3.19	4.70	6.23	3.91	1.91	3.51	2.83	4.61	3.63	6
UPC-622 (ZC-HZ)													
Bundel Lobia-2 (ZC-NWZ)													
UPC-628 (ZC-NEZ)													
UPC-9202 (ZC-CZ)	3.39	3.47	4.63	3.95	4.71	4.81							
MFC-8-14 (ZC-SZ)							5.16	2.29	3.92	2.26	5.76		
Mean	4.01	4.06	4.10	4.16	5.02	6.52	4.36	2.72	3.64	2.79	5.37	3.81	

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

Entries	Srinagar	Ludhiana	Hisar	Pantnagar	Bikaner	Faizabad	Bhubaneswar	Ranchi	Jorhat	Kalyani
MFC-09-3	0.36	0.50	0.72	0.53	0.48	0.61	0.77	0.40	0.62	0.88
TSFC-12-15	0.33	0.40	0.75	0.46	0.63	0.56	0.79	0.70	0.63	0.90
MFC-09-13	0.30	0.50	0.81	0.45	0.53	0.53	0.76	0.46	0.60	0.94
UPC-1501	0.37	0.60	1.00	0.42	0.37	0.57	0.94	0.39	0.56	1.08
MFC-09-4	0.36	0.60	0.74	0.45	0.19	0.43	0.94	0.26	0.60	0.99
Vellayani-1	0.35	0.70	0.86	0.61	0.55	0.39	0.84	0.43	0.56	0.81
Bundel Lobia-1 (NC)	0.33	0.60	0.84	0.56	0.55	0.44	0.75	0.42	0.51	0.88
UPC-5286 (NC)	0.34	0.60	1.00	0.38	0.45	0.45	0.77	0.44	0.57	0.84
UPC-622 (ZC-HZ)	0.29									
Bundel Lobia-2 (ZC-NWZ)		0.80	1.11	0.41	0.64					
UPC-628 (ZC-NEZ)						0.49	1.15	0.32	0.63	0.93
Mean	0.34	0.59	0.87	0.47	0.49	0.50	0.85	0.42	0.59	0.92

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

Entries	Ana-nd	Rah-uri	Urulikan- chan	Jha- nsi	Kan- pur	Rai- pur	Coimb- atore	Man- dya	Hydera- bad	Dhar- wad	Aver- age	Ra- nk
MFC-09-3	0.59	0.56	0.43	1.21	1.27	1.61	0.72	0.45	0.55	1.30	0.73	6
TSFC-12-15	0.96	0.55	0.30	1.38	1.41	1.85	0.65	0.70	0.34	1.05	0.77	3
MFC-09-13	0.87	0.66	0.62	1.78	1.51	1.67	0.65	0.53	0.50	1.17	0.79	2
UPC-1501	0.46	0.39	0.21	1.22	1.19	1.77	0.61	1.09	0.45	1.17	0.74	5
MFC-09-4	0.61	0.66	0.56	1.38	1.14	1.56	0.99	0.54	0.44	1.09	0.73	6
Vellayani-1	0.71	0.80	0.50	1.69	1.11	1.90	1.07	0.63	0.63	1.18	0.82	1
Bundel Lobia-1 (NC)	1.05	0.52	0.53	1.52	1.2	1.39	0.85	0.76	0.47	1.13	0.76	4
UPC-5286 (NC)	0.70	0.66	0.43	0.99	1.16	1.46	0.69	0.59	0.55	1.02	0.70	7
UPC-628 (ZC-NEZ)												
UPC-9202 (ZC-CZ)	0.55	0.56	0.48	0.99	1.17	1.23						
MFC-8-14 (ZC-SZ)							0.85	0.81	0.43	1.12		
Mean	0.72	0.60	0.45	1.35	1.24	1.60	0.79	0.68	0.48	1.14	0.76	

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

Entries	Palam-pur	Ludh-iana	Bika-ner	His-ar	Faiza-bad	Bhuban-eswar	Jor-hat	Kal-yani	Imp-hal	Ana-nd	Rah-uri	Urulikan-chan	Rai-pur	Coimb-atore	Man-dya	Hydera-bad	Ave-rage	Ra-nk
MFC-09-3	7.8	6.6	5.3	7.3	6.6	9.1	5.1	5.8	8.3	6.5	4.9	5.2	19.1	7.5	4.6	5.2	7.2	5
TSFC-12-15	7.5	6.0	7.6	8.1	5.8	8.5	5.2	6.3	7.4	7.2	5.1	3.7	21.8	7.3	6.6	3.6	7.4	3
MFC-09-13	5.5	7.4	6.5	8.7	5.1	8.4	5.0	5.1	8.0	7.1	7.8	7.2	20.2	6.3	4.8	4.0	7.3	4
UPC-1501	6.4	7.9	4.1	10.7	6.1	9.4	4.4	7.2	9.2	5.2	3.3	2.4	23.4	6.7	10.3	4.4	7.6	2
MFC-09-4	6.7	7.5	2.3	8.2	5.4	10.3	5.5	6.3	10.7	6.6	8.2	6.2	17.0	11.5	5.6	4.3	7.6	2
Vellayani-1	6.6	8.0	7.0	9.1	4.5	8.8	5.3	3.9	7.2	5.7	5.9	5.6	23.2	11.7	5.8	6.4	7.8	1
Bundel Lobia-1 (NC)	7.1	10.3	6.4	9.7	5.5	7.7	4.8	3.2	5.5	8.0	4.7	5.8	14.6	7.8	7.0	4.0	7.0	6
UPC-5286 (NC)	8.5	8.5	5.1	10.5	5.9	8.1	4.7	4.1	7.4	6.2	5.7	4.8	15.2	6.9	5.6	4.2	7.0	6
UPC-622 (ZC-HZ)	8.6																	
Bundel Lobia-2 (ZC-NWZ)		11.1	7.4	11.9														
UPC-628 (ZC-NEZ)					5.4	11.4												
UPC-9202 (ZC-CZ)							5.7	4.6	9.1	6.0	5.5	5.0	13.3					
MFC-8-14 (ZC-SZ)														7.5	6.4	3.7		
Mean	7.2	8.1	5.7	9.3	5.6	9.1	5.1	5.1	8.1	6.5	5.7	5.1	18.6	8.1	6.3	4.4	7.3	

Table 7.6: AVTC-1: First Advanced Varietal Trial in Cowpea: Crude Protein (%)

Entries	Palam-pur	Ludh-iana	Pant-nagar	Bika-ner	His-ar	Faiza-bad	Bhuban-eswar	Jor-hat	Imp-hal	Kal-yani	Ana-nd	Rah-uri	Urulikan-chan	Rai-pur	Coimb-atore	Man-dya	Hydera-bad	Ave-rage	Ra-nk
MFC-09-3	17.8	13.8	18.4	14.1	14.4	17.2	16.0	13.1	13.2	11.7	19.7	15.8	19.3	15.8	20.1	18.8	15.8	16.2	2
TSFC-12-15	18.1	15.0	17.5	15.4	15.3	16.8	16.0	13.1	13.9	12.4	15.9	15.9	18.6	16.3	21.4	16.6	16.1	16.1	3
MFC-09-13	18.1	15.2	16.3	15.5	15.3	16.0	15.2	13.1	12.6	9.6	15.1	18.4	19.1	15.9	17.9	17.5	13.9	15.6	5
UPC-1501	18.4	14.8	19.3	13.9	15.3	18.8	15.4	12.3	13.0	11.9	17.2	14.2	18.7	17.8	19.7	17.5	15.1	16.1	3
MFC-09-4	19.3	12.9	18.4	15.2	15.8	19.0	15.9	14.5	12.3	11.4	16.0	20.0	19.1	15.5	20.6	19.3	15.6	16.5	1
Vellayani-1	17.5	11.9	19.3	16.1	15.1	17.5	15.8	13.9	12.9	8.6	13.9	12.3	19.8	17.4	20.6	17.5	15.2	15.6	5
Bundel Lobia-1 (NC)	18.4	18.2	17.5	14.6	16.4	19.2	16.0	13.5	13.4	6.4	15.1	16.2	19.2	16.6	17.1	17.5	13.1	15.8	4
UPC-5286 (NC)	18.7	14.3	17.5	14.2	15.1	16.8	15.8	12.5	13.6	8.6	13.6	14.4	17.9	14.9	18.4	17.5	14.2	15.2	6
UPC-622 (ZC-HZ)	18.3																		
Bundel Lobia-2 (ZC-NWZ)		13.8	16.3	14.6	15.3														
UPC-628 (ZC-NEZ)						16.2	15.8	13.7	12.8	8.7									
UPC-9202 (ZC-CZ)											16.4	16.8	19.4	15.4					
MFC-8-14 (ZC-SZ)															15.8	14.9	13.4		
Mean	18.3	14.4	17.8	14.8	15.3	17.5	15.8	13.3	13.1	9.9	15.9	16.0	19.0	16.2	19.1	17.5	14.7	15.9	

Table 7.7: AVTC-1: First Advanced Varietal Trial in Cowpea: Plant Height (cm)

Entries	Palam-pur	Sri-nagar	Ludh-iana	His-ar	Pant-nagar	Bika-ner	Udai-pur	Faiza-bad	Bhuban-eswar	Ran-chi	Jor-hat	Kal-yani	Imp-hal
MFC-09-3	96.7	106.5	82.8	165.9	145.2	66.0	109.6	148.3	211.7	103.0	163.1	140.9	118.3
TSFC-12-15	152.3	92.4	90.8	194.6	147.5	155.0	98.6	151.5	198.8	138.0	129.7	135.4	171.6
MFC-09-13	146.0	101.3	98.6	171.9	165.7	64.0	100.1	146.5	206.9	99.0	176.2	143.7	153.1
UPC-1501	97.3	119.3	100.1	189.1	155.7	99.0	80.3	143.7	219.7	95.0	114.3	145.1	125.3
MFC-09-4	139.7	110.2	112.4	162.8	159.1	115.0	110.0	128.6	223.9	99.0	143.6	141.9	120.2
Vellayani-1	148.0	117.5	117.4	180.8	187.7	155.0	102.7	134.2	201.4	121.0	109.6	135.1	121.2
Bundel Lobia-1 (NC)	115.7	113.9	105.6	208.1	159.9	198.0	89.0	137.2	189.4	108.0	106.5	134.7	127.3
UPC-5286 (NC)	148.0	106.8	107.2	207.3	143.4	145.0	87.2	153.7	195.4	116.0	128.1	135.9	135.9
UPC-622 (ZC-HZ)	114.0	96.4											
Bundel Lobia-2 (ZC-NWZ)			120.2	216.4	177.7	213.0	98.3						
UPC-628 (ZC-NEZ)								128.0	229.9	97.0	120.3	135.4	139.2
UPC-9202 (ZC-CZ)													
MFC-8-14 (ZC-SZ)													
Mean	128.6	107.1	103.9	188.5	160.2	134.4	97.3	141.3	208.5	108.4	132.4	138.7	134.7

Table 7.7: AVTC-1: First Advanced Varietal Trial in Cowpea: Plant Height (cm)

Entries	Ana-nd	Rah-uri	Urulikan-chan	Jha-nsi	Kan-pur	Rai-pur	Coimb-atore	Vella-yani	Man-dya	Hydera-bad	Rai-chur	Aver-age	Ran-k
MFC-09-3	134.8	101.0	152.2	119.6	191.1	72.7	67.7	59.3	75.4	129.9	41.7	116.8	8
TSFC-12-15	136.1	121.8	176.0	140.1	167.7	84.3	73.8	103.0	86.4	102.1	37.3	128.5	7
MFC-09-13	134.1	146.8	182.0	120.9	186.6	115.9	77.1	106.0	52.6	151.0	41.3	128.6	6
UPC-1501	129.3	163.3	176.3	154.9	191.3	122.6	85.3	112.3	85.1	149.8	42.3	129.0	5
MFC-09-4	145.1	145.6	155.5	130.3	194.8	125.2	64.7	101.0	73.9	156.8	40.7	129.2	3
Vellayani-1	133.9	132.4	183.8	173.8	189.9	100.0	75.8	105.7	74.7	131.6	38.7	132.2	2
Bundel Lobia-1 (NC)	131.9	101.1	147.2	200.3	184.4	89.7	80.6	109.7	81.8	134.0	43.7	129.1	4
UPC-5286 (NC)	130.8	144.6	176.8	207.4	206.9	148.9	75.0	104.3	75.1	128.6	39.7	135.3	1
UPC-622 (ZC-HZ)													
Bundel Lobia-2 (ZC-NWZ)													
UPC-628 (ZC-NEZ)													
UPC-9202 (ZC-CZ)	146.1	135.2	181.8	193.6	191.4	129.6							
MFC-8-14 (ZC-SZ)							87.6	116.3	81.1	126.2	41.0		
Mean	135.8	132.4	170.2	160.1	189.3	109.9	76.4	102.0	76.2	134.4	40.7	128.6	

Table 7.8: AVTC-1: First Advanced Varietal Trial in Cowpea: Leaf Stem Ratio

Entries	Palampur	Ludhiana	Hisar	Pantnagar	Bikaner	Faizabad	Bhubaneswar	Ranchi	Jorhat	Kalyani	Imphal
MFC-09-3	0.57	0.55	0.66	1.23	1.06	0.81	1.14	0.77	0.51	0.91	0.76
TSFC-12-15	0.54	0.52	0.95	1.07	0.99	0.72	0.79	0.59	0.77	0.82	0.87
MFC-09-13	0.62	0.60	0.79	1.17	0.93	0.85	1.07	0.67	0.72	0.83	0.72
UPC-1501	0.58	0.72	0.82	1.56	1.13	0.88	1.20	0.85	0.80	0.94	0.52
MFC-09-4	0.52	0.80	0.61	1.14	0.81	0.92	1.24	0.64	0.88	0.89	0.79
Vellayani-1	0.52	0.90	0.89	1.12	1.00	0.86	0.96	0.58	0.89	1.00	0.53
Bundel Lobia-1 (NC)	0.56	0.88	0.78	1.16	1.06	0.90	0.91	0.83	0.89	0.85	0.72
UPC-5286 (NC)	0.66	0.80	0.56	1.39	0.86	0.70	0.84	0.58	0.90	0.82	0.93
UPC-622 (ZC-HZ)	0.57										
Bundel Lobia-2 (ZC-NWZ)		0.88	0.74	1.06	0.60						
UPC-628 (ZC-NEZ)						0.78	1.31	0.81	0.83	0.85	0.72
UPC-9202 (ZC-CZ)											
MFC-8-14 (ZC-SZ)											
Mean	0.57	0.74	0.76	1.21	0.94	0.82	1.05	0.70	0.80	0.88	0.73

Table 7.8: AVTC-1: First Advanced Varietal Trial in Cowpea: Leaf Stem Ratio

Entries	Rahuri	Urulikanchan	Jhansi	Kanpur	Raipur	Coimbatore	Vellayani	Mandya	Hyderabad	Average	Rank
MFC-09-3	0.70	1.33	0.39	0.47	0.58	0.46	0.79	0.53	0.36	0.73	3
TSFC-12-15	0.52	1.27	0.65	0.53	0.53	0.39	0.66	0.61	0.71	0.72	4
MFC-09-13	0.47	0.70	0.45	0.53	0.33	0.44	0.58	0.82	0.32	0.68	6
UPC-1501	0.65	0.86	0.48	0.46	0.48	0.46	0.58	0.60	0.31	0.74	2
MFC-09-4	0.55	1.67	0.60	0.46	0.40	0.47	0.69	0.59	0.34	0.75	1
Vellayani-1	0.38	1.30	0.46	0.55	0.53	0.46	1.18	0.47	0.30	0.74	2
Bundel Lobia-1 (NC)	0.57	1.18	0.42	0.47	0.46	0.47	0.69	0.51	0.62	0.75	1
UPC-5286 (NC)	0.52	1.07	0.25	0.52	0.52	0.49	0.73	0.61	0.46	0.71	5
UPC-622 (ZC-HZ)											
Bundel Lobia-2 (ZC-NWZ)											
UPC-628 (ZC-NEZ)											
UPC-9202 (ZC-CZ)	0.56	1.06	0.37	0.44	0.51						
MFC-8-14 (ZC-SZ)						0.47	1.18	0.44	0.34		
Mean	0.55	1.16	0.45	0.49	0.48	0.46	0.79	0.58	0.42	0.73	

Table 7.9: AVTC-1: First Advanced Varietal Trial in Cowpea: ADF (%), NDF (%) & IVDMD (%)

Entries	ADF (%)						NDF (%)						IVDMD (%)			
	Palam-pur	Ludh-iana	Pant-nagar	Rah-uri	Aver-age	Ra-nk	Palam-pur	Ludh-iana	Pant-nagar	Rah-uri	Aver-age	Ra-nk	Ludh-iana	Rah-uri	Aver-age	Ra-nk
MFC-09-3	49.2	43.9	50.6	42.8	46.6	7	61.8	66.3	62.2	50.4	60.2	6	60.2	54.4	57.3	6
TSFC-12-15	50.0	41.4	51.8	38.7	45.5	3	62.2	65.4	64.6	45.4	59.4	4	61.9	57.7	59.8	3
MFC-09-13	52.2	41.2	49.4	37.1	45.0	2	61.2	65.0	63.4	43.6	58.3	3	62.0	58.9	60.5	2
UPC-1501	48.4	42.7	52.6	42.1	46.5	6	63.6	66.3	65.8	44.2	60.0	5	60.1	55.0	57.6	5
MFC-09-4	49.2	44.4	52.2	37.0	45.7	4	62.6	66.4	61.8	39.7	57.6	1	57.6	59.0	58.3	4
Vellayani-1	51.8	45.6	51.0	47.2	48.9	8	61.8	67.9	62.6	55.5	62.0	8	59.6	51.0	55.3	8
Bundel Lobia-1 (NC)	50.6	39.1	50.6	37.4	44.4	1	60.6	63.4	63.0	44.2	57.8	2	62.4	58.7	60.6	1
UPC-5286 (NC)	47.8	43.4	49.8	44.5	46.4	5	63.4	65.8	64.0	52.1	61.3	7	60.6	53.1	56.9	7
UPC-622 (ZC-HZ)	49.8						62.2									
Bundel Lobia-2 (ZC-NWZ)		44.8	52.0					65.4	63.8				59.4			
UPC-628 (ZC-NEZ)																
UPC-9202 (ZC-CZ)				43.9						48.0				53.5		
MFC-8-14 (ZC-SZ)																
Mean	49.9	42.9	51.1	41.2	46.1		62.2	65.8	63.5	47.0	59.6		60.4	55.7	58.3	

8. IVT RICE BEAN: INITIAL VARIETAL TRIAL IN FORAGE RICE BEAN

(Reference Tables: 8.1 to 8.6)

An initial varietal trial in forage rice bean with three 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 yield (q/ha), entry JRBJ 07-4 and national check Bidhan -1 ranked jointly first with yield of 282.8 q/ha. For dry matter yield (q/ha), entry JOR 16-2 ranked first with 8.5 % superiority over the best check.

For fodder production potential (q/ha/day), entry JOR-16-2 ranked first with yield of 3.28 and 0.74 for green and dry forage respectively. National check Bidhan-1 ranked second with yield of 3.12 and 0.69 for green and dry forage respectively.

For crude protein yield (q/ha) entry JRBJ 07-4 and JOR 16-2 ranked first and second respectively with yield of 8.1 and 7.9 respectively. Best check Bidhan 2 yielded 7.6 q/ha. For crude protein per cent, entry JOR 16-2 performed best (14%) followed jointly by JRBJ-07-4 and JOR 16-1 at 13.7%.

For plant height and leaf stem ration, national checks Bidhan -2 and RBL-6 ranked first respectively.

9. AVT-1 RICE BEAN: ADVANCED VARIETAL TRIAL -1 IN RICE BEAN

(Reference Tables: 9.1 to 9.5)

First advanced varietal trial in forage rice bean with three 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 yield (q/ha), entry JRBJ 07-1 ranked first showing marginal superiority over the best check Bidhan-1 by margin of 0.2%. For dry matter yield (q/ha), entry JRBJ 07-1 yielded 54.5 q/ha and ranked first showing marginal superiority over the best check Bidhan -1 by margin of 2.3%.

For green and dry fodder production potentials (q/ha/day), entry JRBJ-07-1 ranked first followed by National check Bidhan-1.

For plant height, entry JRBJ-07-1 ranked first (161.7 cm) followed by JOR-15-5 (155.3 cm) and Bidhan-2 national check (151.3 cm) and for leaf stem ratio, national check RBL-6 ranked first (0.82).

Table 8.1: IVT (Rice bean): Initial Varietal Trial in Rice bean: Green Forage Yield (q/ha)

Entries	Kalyani	Pusa	Jorhat	Imphal	Bhubaneswar	Jabalpur	Palghar	**Vellayani	*Ranchi	Average	Rank
JOR-16-2	210.0	283.0	304.8	304.3	218.7	379.1	247.9	94.0	500.0	278.3	2
JRBJ 07-4	214.7	231.0	256.2	392.1	247.9	456.1	181.3	90.3	368.1	282.8	1
JOR-16-1	205.8	250.0	304.7	319.8	263.5	293.7	189.6	90.0	270.8	261.0	5
RBL-6 (NC)	241.9	259.0	228.1	245.3	281.2	370.7	214.6	79.5	381.9	263.0	4
Bidhan-2 (NC)	231.8	243.0	214.2	372.9	307.2	385.5	225.0	97.0	354.2	282.8	1
K-1 (Bidhan-1) (NC)	244.4	267.0	275.5	293.5	226.0	400.0	206.3	90.3	437.5	273.2	3
Mean	224.8	255.5	263.9	321.3	257.4	380.9	210.8	90.2	385.4	273.5	
CD at 5%	9.7	17.3	5.6	74.0	27.1	78.9	41.7	12.5	117.2		
CV%	4.3	9.1	9.4	13.2	7.0	13.2	13.0	1.7	20.0		

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

Note: ** Data abnormally low hence not considered in zonal and all India average

Table 8.2 IVT (Rice bean): Initial Varietal Trial in Rice bean: Dry Matter Yield (q/ha)

Entries	Kalyani	Ranchi	Pusa	Imphal	Bhubaneswar	Jabalpur	**Vellayani	Palghar	Jorhat	Average	Rank	Superiority%
JOR-16-2	37.8	128.1	59.3	62.9	48.1	75.2	13.1	49.6	59.5	65.1	1	8.5
JRBJ 07-4	38.2	75.8	48.4	58.0	54.6	91.6	11.7	36.3	47.4	56.3	3	
JOR-16-1	37.0	71.1	52.0	69.1	54.4	56.0	11.4	37.9	54.8	54.0	6	
RBL-6 (NC)	43.0	78.1	54.0	48.8	62.2	73.5	10.3	42.9	39.0	55.2	5	
Bidhan-2 (NC)	41.4	59.2	50.6	65.2	68.1	77.6	12.6	45.0	35.5	55.3	4	
K-1 (Bidhan-1) (NC)	43.9	108.9	55.7	49.9	50.5	79.3	13.1	41.3	50.4	60.0	2	
Mean	40.2	86.9	53.3	59.0	56.3	75.5	12.1	42.2	47.8	57.6		
CD at 5%	3.4	25.0	4.6	15.3	6.2	15.4	2.5	8.3	3.0			
CV%	5.8	19.0	8.7	14.9	7.3	13.5	2.5	13.0	11.9			

Note: ** Data abnormally low hence not considered in zonal and all India average

Table 8.3: IVT (Rice bean): Initial Varietal Trial in Rice bean: Green Forage Yield (q/ha/day) & Dry Forage Yield (q/ha/day)

Entries	GFY (q/ha/day)										DMY (q/ha/day)									
	Ran-chi	Pal-ghar	Pu-sa	Kal-yani	Jabal-pur	Jor-hat	Vella-yani	Bhuban-eswar	Aver-age	Ran-k	Ran-chi	Jor-hat	Kal-yani	Jabal-pur	Pal-ghar	Pu-sa	Bhuban-eswar	Aver-age	Ran-k	
JOR-16-2	4.17	3.47	3.5	3.00	3.90	3.76	1.56	2.88	3.28	1	1.07	0.73	0.54	0.77	0.69	0.72	0.63	0.74	1	
JRBJ 07-4	2.92	2.54	2.9	2.68	4.95	3.16	1.50	3.18	2.98	4	0.60	0.59	0.48	0.99	0.51	0.60	0.70	0.64	3	
JOR-16-1	2.48	2.65	3.1	2.94	3.00	3.76	1.50	3.66	2.89	5	0.65	0.68	0.53	0.57	0.53	0.65	0.76	0.62	5	
RBL-6 (NC)	3.50	3.00	3.1	4.17	3.78	2.82	1.89	4.02	3.28	1	0.72	0.48	0.74	0.75	0.60	0.65	0.89	0.69	2	
Bidhan-2 (NC)	2.97	3.15	3.0	2.89	4.28	2.64	1.61	3.79	3.04	3	0.50	0.44	0.52	0.86	0.63	0.63	0.84	0.63	4	
K-1 (Bidhan-1) (NC)	3.56	2.89	3.3	3.06	4.16	3.40	1.50	3.05	3.12	2	0.88	0.62	0.55	0.82	0.58	0.70	0.68	0.69	2	
Mean	3.27	2.95	3.15	3.12	4.01	3.26	1.59	3.43	3.10		0.74	0.59	0.56	0.79	0.59	0.66	0.75	0.67		

Table 8.4: IVT (Rice bean): Initial Varietal Trial in Rice bean: Crude Protein Yield (q/ha) & Crude Protein (%)

Entries	CPY (q/ha)							CP (%)						
	Kal-yani	Jor-hat	Jabal-pur	Bhuban-eswar	Imp-hal	Aver-age	Ra-nk	Jor-hat	Imp-hal	Jabal-pur	Bhuban-eswar	Kal-yani	Aver-age	Ra-nk
JOR-16-2	4.8	8.4	11.0	7.5	8.0	7.9	2	14.3	12.7	14.8	15.5	12.6	14.0	1
JRBJ 07-4	4.3	6.4	13.7	8.9	7.1	8.1	1	13.6	12.2	15.1	16.3	11.3	13.7	2
JOR-16-1	4.3	7.6	7.7	9.0	8.5	7.4	4	13.9	12.3	14.1	16.5	11.6	13.7	2
RBL-6 (NC)	5.7	5.4	10.6	9.2	5.5	7.3	5	14.0	11.1	14.6	14.7	13.3	13.6	3
Bidhan-2 (NC)	3.8	4.3	11.6	10.5	7.9	7.6	3	12.2	12.1	15.1	15.4	9.1	12.8	4
K-1 (Bidhan-1) (NC)	3.9	6.6	11.8	7.7	5.8	7.2	6	13.2	11.5	15.1	15.2	8.8	12.8	4
Mean	4.5	6.5	11.1	8.8	7.1	7.6		13.5	12.0	14.8	15.6	11.1	13.4	

Table 8.5: IVT (Rice bean): Initial Varietal Trial in Rice bean: Plant Height (cm)

Entries	Plant Height (cm)									
	Kalyani	Ranchi	Jorhat	Imphal	Jabalpur	Palghar	Vellayani	Bhubaneswar	Average	Rank
JOR-16-2	134.6	121.0	153.5	160.4	160.1	190.3	119.0	170.2	151.1	2
JRBJ 07-4	132.0	122.0	114.9	160.2	169.3	176.1	98.3	185.4	144.8	6
JOR-16-1	131.9	114.0	158.6	154.4	148.6	181.8	93.8	197.2	147.5	5
RBL-6 (NC)	131.0	134.0	109.9	153.3	161.6	199.7	108.5	202.5	150.1	4
Bidhan-2 (NC)	134.7	212.0	146.2	162.0	151.8	182.7	80.0	208.1	159.7	1
K-1 (Bidhan-1) (NC)	140.8	155.0	138.3	166.8	165.2	169.0	88.3	179.6	150.4	3
Mean	134.2	143.0	136.9	159.5	159.4	183.3	98.0	190.5	150.6	

Table 8.6: IVT (Rice bean): Initial Varietal Trial in Rice bean: Leaf Stem Ratio

Entries	Leaf Stem Ratio										
	Kalyani	Ranchi	Jorhat	Imphal	Jabalpur	Palghar	Vellayani	Bhubaneswar	Pusa	Average	Rank
JOR-16-2	0.91	0.57	0.85	0.39	0.52	0.81	0.49	0.81	1.02	0.71	5
JRBJ 07-4	0.81	0.64	1.08	0.48	0.62	0.83	0.51	0.97	0.98	0.77	3
JOR-16-1	0.80	0.43	0.94	0.40	0.57	0.79	0.52	1.08	0.99	0.72	4
RBL-6 (NC)	0.84	0.47	1.01	0.79	0.66	0.90	0.57	1.15	0.99	0.82	1
Bidhan-2 (NC)	0.82	0.53	0.91	0.38	0.58	0.84	0.75	1.19	0.99	0.78	2
K-1 (Bidhan-1) (NC)	0.83	0.51	0.78	0.51	0.57	0.77	0.56	0.89	1.01	0.71	5
Mean	0.84	0.53	0.93	0.49	0.59	0.82	0.57	1.02	1.00	0.75	

Table 9.1: AVT-1 (Rice bean): Advanced Varietal Trial in Rice bean: Green Forage Yield (q/ha)

Entries	Kalyani	Ranchi	Pusa	Jorhat	Imphal	Bhubaneswar	Jabalpur	Palghar	**Vellayani	Average	Rank	Superiority%
JOR-15-5	195.9	104.2	247.0	262.4	355.5	246.4	370.6	256.3	45.8	254.8	4	0.2
JRBJ-07-1	277.7	122.4	260.0	306.8	284.2	264.7	448.6	227.1	66.5	273.9	1	
JOR-15-1	268.6	88.5	229.0	217.5	282.7	230.3	383.0	218.8	50.0	239.8	5	
Bidhan-2 (NC)	210.2	122.4	231.0	255.5	398.1	311.6	380.0	212.5	43.8	265.2	3	
RBL-6 (NC)	195.5	80.7	224.0	300.0	245.0	223.0	255.0	218.8	79.3	217.8	6	
K-1 (Bidhan-1) (NC)	286.1	145.8	274.0	239.8	369.9	286.6	406.0	179.2	37.8	273.4	2	
Mean	239.0	110.7	244.2	263.7	322.6	260.4	373.9	218.8	53.8	254.1		
CD at 5%	10.3	28.6	19.7	6.4	40.9	28.1	67.6	43.2	5.4			
CV%	6.2	17.0	9.3	10.7	7.3	7.3	12.0	13.0	1.2			

Note: ** Data abnormally low hence not considered in zonal and all India average

Table 9.2: AVT-1 (Rice bean): Advanced Varietal Trial in Rice bean: Dry Matter Yield (q/ha)

Entries	Kalyani	Ranchi	Pusa	Imphal	Bhubaneswar	Jorhat	Jabalpur	Palghar	**Vellayani	Average	Rank	Superiority%
JOR-15-5	35.0	25.4	51.6	70.8	55.2	46.5	72.2	51.3	6.5	51.0	4	2.3
JRBJ-07-1	49.9	29.5	55.1	52.8	57.3	55.5	90.6	45.4	9.6	54.5	1	
JOR-15-1	48.3	21.4	48.4	55.7	50.6	37.9	76.8	43.8	6.6	47.9	5	
Bidhan-2 (NC)	37.6	27.9	48.0	67.9	68.5	45.5	75.0	42.5	5.7	51.6	3	
RBL-6 (NC)	35.1	18.8	46.4	47.2	48.8	55.5	49.4	43.8	10.3	43.1	6	
K-1(Bidhan-1) (NC)	50.9	34.1	56.6	61.9	62.0	43.4	81.8	35.8	4.8	53.3	2	
Mean	42.8	26.2	51.0	59.4	57.0	47.4	74.3	43.8	7.2	50.2		
CD at 5%	4.6	7.3	3.9	7.9	6.2	2.6	13.4	8.6	1.2			
CV%	5.2	18.3	10.4	7.7	7.4	10.4	12.0	13.0	1.9			

Note: ** Data abnormally low hence not considered in zonal and all India average

Table 9.3: AVT-1 (Rice bean): Advanced Varietal Trial in Rice bean: Green Forage Yield (q/ha/day) & Dry Forage Yield (q/ha/day)

Entries	GFY (q/ha/day)										DMY (q/ha/day)								
	Ran-chi	Kal-yani	Jor-hat	Jabal-pur	Pal-ghar	Vella-yani	Bhuban-eswar	Pu-sa	Aver-age	Ran-k	Ran-chi	Kal-yani	Jor-hat	Jabal-pur	Pal-ghar	Bhuban-eswar	Pu-sa	Aver-age	Ran-k
JOR-15-5	0.87	3.49	3.09	3.90	3.59	0.92	3.16	3.10	2.76	3	0.21	0.60	0.55	0.76	0.72	0.71	0.64	0.60	3
JRBJ-07-1	1.11	3.47	3.61	4.92	3.18	1.33	3.48	3.20	3.04	1	0.27	0.62	0.65	0.99	0.64	0.75	0.68	0.66	1
JOR-15-1	0.81	3.36	2.56	4.03	3.06	1.00	3.07	2.80	2.59	5	0.19	0.60	0.45	0.80	0.61	0.68	0.60	0.56	5
Bidhan-2 (NC)	1.03	2.63	3.01	3.95	2.98	0.88	3.67	2.90	2.63	4	0.23	0.47	0.54	0.78	0.60	0.81	0.59	0.57	4
RBL-6 (NC)	0.65	2.44	3.53	2.60	3.06	1.84	2.72	2.70	2.44	6	0.15	0.44	0.65	0.50	0.61	0.60	0.56	0.50	6
K-1(Bidhan-1) (NC)	1.18	3.58	2.82	4.46	2.51	0.76	3.77	3.30	2.80	2	0.28	0.64	0.51	0.89	0.50	0.82	0.67	0.62	2
Mean	0.94	3.16	3.10	3.98	3.06	1.12	3.31	3.00	2.71		0.22	0.56	0.56	0.79	0.61	0.73	0.62	0.58	

Table 9.4: AVT-1 (Rice bean): Advanced Varietal Trial in Rice bean: Crude Protein Yield (q/ha) & Crude Protein (%)

Entries	CPY (q/ha)							CP (%)						
	Kal-yani	Jor-hat	Jabal-pur	Bhuban-eswar	Imp-hal	Aver-age	Ra-nk	Jor-hat	Imp-hal	Jabal-pur	Bhuban-eswar	Kal-yani	Aver-age	Ra-nk
JOR-15-5	4.5	6.4	10.8	8.4	8.5	7.7	4	13.9	11.9	15.1	15.2	12.8	13.8	2
JRBJ-07-1	4.4	7.4	13.6	9.3	7.2	8.4	2	13.4	13.6	15.2	16.1	8.8	13.4	3
JOR-15-1	3.7	5.2	11.5	8.1	6.9	7.1	5	13.8	12.4	15.1	16.0	7.6	13.0	5
Bidhan-2 (NC)	4.0	6.1	11.2	10.6	8.5	8.1	3	13.7	12.6	15.1	15.5	12.0	13.8	2
RBL-6 (NC)	3.3	7.3	7.1	7.6	6.2	6.3	6	13.2	13.2	14.7	15.6	9.4	13.2	4
K-1 (Bidhan-1) (NC)	5.8	5.9	12.3	9.8	8.6	8.5	1	13.9	13.9	15.2	15.8	11.4	14.0	1
Mean	4.3	6.4	11.1	9.0	7.7	7.7		13.6	12.9	15.0	15.7	10.3	13.5	

Table 9.5 AVT-1 (Rice bean): Advanced Varietal Trial in Rice bean: Plant Height (cm) & Leaf Stem Ratio

Entries	Plant Height (cm)										Leaf Stem Ratio										
	Kal-yani	Ran-chi	Jor-hat	Imp-hal	Jabal-pur	Pal-ghar	Vella-yani	Bhuban-eswar	Aver-age	Ra-nk	Kal-yani	Ran-chi	Jor-hat	Imp-hal	Jabal-pur	Pal-ghar	Vella-yani	Bhuban-eswar	Pu-sa	Aver-age	Ra-nk
JOR-15-5	132.1	114.0	173.6	157.3	159.8	203.7	114.3	187.3	155.3	2	0.76	0.57	0.76	0.43	0.52	0.85	0.62	0.98	1.01	0.72	4
JRBJ-07-1	132.0	187.0	183.2	135.6	180.3	185.8	94.3	195.6	161.7	1	0.84	0.56	0.79	0.52	0.68	0.83	0.64	1.04	0.99	0.77	2
JOR-15-1	133.2	121.0	132.0	156.8	162.6	194.3	95.3	181.2	147.1	4	0.78	0.58	0.81	0.57	0.57	0.91	0.80	0.91	0.99	0.77	2
Bidhan-2 (NC)	121.6	136.0	162.5	159.3	161.2	186.7	79.8	203.2	151.3	3	0.81	0.61	0.77	0.40	0.55	0.88	0.71	1.17	0.99	0.77	2
RBL-6 (NC)	132.8	155.0	174.6	123.6	144.3	180.1	69.0	175.6	144.4	6	1.00	0.73	0.66	0.80	0.48	0.87	1.00	0.84	0.99	0.82	1
K-1(Bidhan-1) (NC)	133.6	122.0	147.7	150.4	165.9	173.0	71.8	198.7	145.4	5	0.82	0.66	0.59	0.54	0.63	0.81	0.72	1.09	1.02	0.76	3
Mean	130.9	139.2	162.3	147.2	162.4	187.3	87.4	190.3	150.8		0.84	0.62	0.73	0.54	0.57	0.86	0.75	1.01	1.00	0.77	

10. VTBN - 2013 (4TH YEAR): VARIETAL TRIAL IN BAJRA NAPIER HYBRID (PERENNIAL)

(Reference Tables: 10.1 to 10.10)

In Bajra x Napier hybrid, a varietal evaluation trial comprising of eleven entries was established during *Kharif*-2013.

For green forage yield (q/ha), entry TNCN -1076 in hill zone registered superiority of 15.3% over the check. In NW and South zone entry PBN -342 registered superiority by margin of 9.8% and 4.1 % respectively over the check. In North east zone RBN 2011-12 followed by PBN -346 and PBN 342 showed better performance over the check by margin of 29.5%, 14.5% and 11.5% respectively. In central zone entry RBN 2011-12 ranked first with 4.9% superiority. At All India level, entry RBN 2011-12 ranked first with 3.5% superiority over the best check.

For dry matter yield (q/ha), in hill zone, entry TNCN -1076 ranked first with 14.7% higher yield than check. Entry PBN -342 ranked first in NW zone with 13.6% higher yield than check. In NEZ four entries showed substantial higher yield than check. RBN 2011-12 (36.6%), PBN-346 (23.9%), PBN-342 (18.5%), RBN-2010-y-1 (6.3%) were good performers. In central and south zone RBN 2011-12 (4.6%) and PBN 342 (7.3%) respectively showed better yield than check. At all India level, RBN 2011-12 ranked first with 8.4% higher yield than check.

For forage production potential (q/ha/day), entry RBN 2004-03 ranked first for both green forage and dry matter production potential.

For crude protein yield, entry RBN -2011-12 was best followed by check. For crude protein content, entry DHN -15 (8.2%) ranked first. Entries RBN-2010-Y-1 for plant height and TNCN -1078 for leafiness were adjudged best performer. For other quality parameters, entry RBN 2011-12 for ADF (%), and IVDMD (%) was adjudged best performer. For NDF (%), National check was superior.

Table 10.1: VTBN-2013 (4th Year): Varietal Trial in Bajra Napier Hybrid (Perennial): Green Forage Yield (q/ha)

Entries	Hill Zone			North West Zone						North East Zone		
	Palam-pur	Ra-nk	Superi- ority%	Ludh- iana	His- ar	Bika- ner	Aver- age	Ra- nk	Superi- ority%	Jor- hat	Ra- nk	Superi- ority%
RBN-2011-12				1474.8	610.8	1189.0	1091.5	6		811.7	1	29.5
TNCN-1076	585.3	1	15.3	1430.9	706.0	1206.7	1114.5	4		475.5	10	
PBN-346	358.6	6		1451.6	639.9	1202.5	1098.0	5		717.8	2	14.5
RBN-2004-03				1499.1	743.0		1121.1	3		573.8	6	
TNCN-1078	428.0	4		1332.4	638.6		985.5	8		548.8	8	
PBN-342	456.4	3		1766.2	828.0	1220.2	1271.5	1	9.8	699.1	3	11.5
RBN-2010-Y-1				1472.6	586.1	797.0	951.9	9		597.9	5	
DHN-15	387.1	5		1284.9	713.7	855.1	951.2	10		557.4	7	
NB-21 (NC)	507.5	2		1336.5	434.5		885.5	11		626.7	4	
CO-3 (NC)				1504.7	648.7	1322.1	1158.5	2		498.8	9	
PBN-233 (NC)				1505.5	976.1	744.6	1075.4	7		442.8	11	
Mean	453.8			1459.9	684.1	1067.1	1064.1			595.5		
CD at 5%	98.8			112.4	55.2	244.3				9.1		
CV%	12.0			9.2	14.3	13.1				6.6		

Table 10.1: VTBN-2013 (4th Year): Varietal Trial in Bajra Napier Hybrid (Perennial): Green Forage Yield (q/ha)

Entries	Central Zone									South Zone						All India		
	Ana- nd	Rah- uri	Urulikan- chan	Pal- ghar	Jabal- pur	Aver- age	Ra- nk	Superi- ority%		Coimb- atore	Man- dya	Dhar- wad	Aver- age	Ra- nk	Superi- ority%	Aver- age	Ra- nk	Superi- ority
RBN-2011-12	2172.0	878.8	3490.2	1510.7	859.6	1782.3	1	4.9		1151.3	2119.3	434.7	1235.1	5		1391.9	1	3.5
TNCN-1076	1903.0	713.8	3847.5	1198.5	601.1	1652.8	4			1638.8	1643.9	410.6	1231.1	6		1258.6	6	
PBN-346	2448.0	640.4	3716.9	1095.9	758.1	1731.8	2	1.9		1287.4	1443.9	403.4	1044.9	11		1243.4	7	
RBN-2004-03	1776.0	708.3	3574.7	1037.2	911.9	1601.6	6			1263.8	1702.9	487.3	1151.3	8		1298.0	4	
TNCN-1078	1615.0	477.6	3383.6	1010.8	932.5	1483.9	9			1683.3	1742.0	415.3	1280.2	4		1184.0	9	
PBN-342	1526.0	801.1	3353.4	978.3	720.4	1475.8	10			1463.8	2201.5	421.3	1362.2	1	4.1	1264.3	5	
RBN-2010-Y-1	1751.0	1004.2	3242.2	1014.4	844.5	1571.3	7			1230.5	1690.9	441.0	1120.8	10		1222.7	8	
DHN-15	1352.0	811.5	3890.5	1023.1	765.2	1568.5	8			1294.4	1605.9	526.8	1142.4	9		1159.0	10	
NB-21 (NC)	1284.0	423.0	2946.8	1405.6	915.9	1395.0	11			1355.5	2181.7	356.4	1297.9	3		1147.8	11	
CO-3 (NC)	1791.0	1011.4	3676.6	1175.6	837.4	1698.4	3			1361.1	1819.0	488.9	1223.0	7		1344.6	2	
PBN-233 (NC)	2098.0	760.8	3317.7	1206.4	670.8	1610.8	5			1302.7	2162.2	459.7	1308.2	2		1303.9	3	
Mean	1792.4	748.3	3494.5	1150.6	801.6	1597.5				1366.6	1846.6	440.5	1217.9			1256.2		
CD at 5%	261.6	111.8	171.2	57.1	151.7					86.0	241.6	41.4						
CV%	8.8	8.8	2.85	2.9	11.2					3.7	7.7	4.1						

Table 10.2: VTBN-2013 (4th Year): Varietal Trial in Bajra Napier Hybrid (Perennial): Dry Matter Yield (q/ha)

Entries	Hill Zone			North West Zone						North East Zone		
	Palam-pur	Ra-nk	Superi- ority%	Ludh- iana	His- ar	Bika- ner	Aver- age	Ra- nk	Superi- ority%	Jor- hat	Ra- nk	Superi- ority%
RBN-2011-12				345.1	177.1	307.2	276.5	2	3.4	194.5	1	36.6
TNCN-1076	113.4	1	14.7	326.3	183.6	285.8	265.2	4		117.0	10	
PBN-346	70.1	6		316.5	160.0	271.2	249.2	5		176.5	2	23.9
RBN-2004-03				308.8	178.3		243.6	7		130.8	8	
TNCN-1078	84.6	4		298.5	146.9		222.7	9		138.1	7	
PBN-342	89.1	3		420.4	207.0	284.5	304.0	1	13.6	168.8	3	18.5
RBN-2010-Y-1				354.9	158.2	184.1	232.4	8		151.3	4	6.3
DHN-15	77.0	5		303.2	185.6	172.0	220.3	10		142.6	5	0.1
NB-21 (NC)	98.9	2		314.1	108.6		211.4	11		142.4	6	
CO-3 (NC)				340.1	155.7	306.7	267.5	3		126.8	9	
PBN-233 (NC)				317.7	244.0	172.6	244.8	6		108.1	11	
Mean	88.8			331.4	173.2	248.0	248.9			145.2		
CD at 5%	21.5			62.3	28.6	52.5				7.7		
CV%	13.3			15.4	13.4	12.1				11.4		

Table 10.2: VTBN-2013 (4th Year): Varietal Trial in Bajra Napier Hybrid (Perennial): Dry Matter Yield (q/ha)

Entries	Central Zone								South Zone						All India		
	Ana- nd	Rah- uri	Urulikan- chan	Jabal- pur	Pal- ghar	Aver- age	Ra- nk	Superi- ority%	Coimb- atore	Man- dya	Dhar- wad	Aver- age	Ra- nk	Superi- ority%	Aver- age	Ra- nk	Superi- ority%
RBN-2011-12	471.8	212.9	652.8	161.6	283.9	356.6	1	4.6	175.8	368.3	125.9	223.4	4		289.7	1	8.4
TNCN-1076	386.3	160.5	735.9	110.2	222.8	323.1	4		271.5	226.4	138.4	212.1	6		252.2	6	
PBN-346	478.0	153.8	719.4	140.7	208.1	340.0	3		206.1	225.0	145.6	192.2	10		251.6	7	
RBN-2004-03	345.2	163.3	663.7	174.8	191.2	307.6	6		203.8	236.6	168.6	203.0	8		251.4	8	
TNCN-1078	326.3	94.0	664.7	179.5	189.4	290.8	10		292.4	265.4	141.0	232.9	3		235.1	9	
PBN-342	287.0	202.1	653.3	133.2	185.0	292.1	9		231.1	418.9	143.6	264.5	1	7.3	263.4	3	
RBN-2010-Y-1	361.7	252.0	627.4	158.3	192.3	318.4	5		210.8	253.7	140.7	201.7	9		253.8	5	
DHN-15	251.4	190.1	756.4	142.7	193.2	306.8	7		212.6	235.3	175.6	207.8	7		233.7	10	
NB-21 (NC)	275.4	102.2	587.4	175.8	283.9	284.9	11		219.9	311.0	122.6	217.8	5		228.5	11	
CO-3 (NC)	349.7	248.8	725.2	156.0	224.6	340.8	2		208.9	203.2	162.1	191.4	11		267.3	2	
PBN-233 (NC)	393.1	170.7	602.6	123.6	228.9	303.8	8		204.7	380.3	154.8	246.6	2		258.4	4	
Mean	356.9	177.3	671.7	150.6	218.5	315.0			221.6	284.0	147.2	217.6			253.2		
CD at 5%	52.8	26.6	33.3	30.3	3.6				16.0	53.6	11.5						
CV%	8.9	8.8	2.9	11.8	1.0				4.9	11.1	4.6						

Table 10.3: VTBN-2013 (4th Year): Varietal Trial in Bajra Napier Hybrid (Perennial): Green Forage Yield (q/ha/day) & Dry Matter Yield (q/ha/day)

Entries	GFY (q/ha/day)							DMY (q/ha/day)						
	Ludh-iana	Bika-ner	Ana-nd	Jabal-pur	Dhar-wad	Aver-age	Ra-nk	Ludh-iana	Bika-ner	Ana-nd	Jabal-pur	Dhar-wad	Aver-age	Ra-nk
RBN-2011-12	8.20	3.67	5.87	2.35	7.25	5.47	3	1.90	0.95	1.28	0.44	2.10	1.33	6
TNCN-1076	7.90	3.72	5.14	1.64	6.84	5.05	8	1.80	0.88	1.04	0.30	2.31	1.27	7
PBN-346	8.10	3.71	6.62	2.07	6.72	5.44	4	1.80	0.84	1.29	0.38	2.43	1.35	4
RBN-2004-03	8.30		4.80	2.49	8.12	5.93	1	1.70		0.93	0.47	2.81	1.48	1
TNCN-1078	7.40		4.36	2.55	6.92	5.31	6	1.70		0.88	0.49	2.35	1.36	3
PBN-342	9.80	3.77	4.12	1.97	7.02	5.34	5	2.30	0.88	0.78	0.36	2.39	1.34	5
RBN-2010-Y-1	8.20	2.46	4.73	2.31	7.35	5.01	9	2.00	0.57	0.98	0.43	2.35	1.27	7
DHN-15	7.10	2.64	3.65	2.09	8.78	4.85	10	1.70	0.53	0.68	0.39	2.93	1.25	9
NB-21 (NC)	7.40		3.47	2.50	5.94	4.83	11	1.70		0.74	0.48	2.04	1.24	10
CO-3 (NC)	8.40	4.08	4.84	2.29	8.15	5.55	2	1.90	0.95	0.95	0.42	2.70	1.38	2
PBN-233 (NC)	8.40	2.30	5.67	1.83	7.66	5.17	7	1.80	0.53	1.06	0.33	2.58	1.26	8
Mean	8.11	3.29	4.84	2.19	7.34	5.27		1.85	0.77	0.96	0.41	2.45	1.32	

Table 10.4: VTBN-2013 (4th Year): Varietal Trial in Bajra Napier Hybrid (Perennial): Crude Protein Yield (q/ha)

Entries	Crude Protein Yield (q/ha)											
	Palampur	Bikaner	Ludhiana	Jorhat	Anand	Rahuri	Urulikanchan	Jabalpur	Palghar	Mandya	Average	Rank
RBN-2011-12		23.9	24.5	14.5	53.3	20.5	46.6	12.8	19.7	16.1	25.8	1
TNCN-1076	8.7	26.0	21.5	7.5	42.9	14.7	56.4	8.1	15.5	9.9	21.1	4
PBN-346	5.9	22.8	16.5	10.8	55.4	14.8	53.9	10.9	14.2	7.9	21.3	3
RBN-2004-03			19.1	9.8	38.0	15.0	48.5	13.9	14.0	10.3	21.1	4
TNCN-1078	7.1		15.8	9.7	37.3	9.2	49.1	14.3	13.4	11.6	18.6	8
PBN-342	7.3	29.1	20.6	10.6	31.2	14.7	48.1	10.2	13.5	18.2	20.4	5
RBN-2010-Y-1		16.4	18.5	10.0	39.8	23.5	48.2	12.5	11.7	8.9	21.1	4
DHN-15	6.1	17.0	16.4	11.0	28.4	18.9	57.2	11.1	13.3	9.3	18.9	7
NB-21 (NC)	8.0		17.0	11.2	29.6	9.8	43.0	14.0	18.1	12.2	18.1	9
CO-3 (NC)		19.3	21.1	8.1	41.1	24.4	55.6	12.3	14.6	8.9	22.8	2
PBN-233 (NC)		9.4	15.9	8.6	42.3	15.7	43.8	9.4	15.8	20.0	20.1	6
Mean	7.2	20.5	18.8	10.2	39.9	16.5	50.0	11.8	14.9	12.1	20.8	

Table 10.5: VTBN-2013 (4th Year): Varietal Trial in Bajra Napier Hybrid (Perennial): Crude Protein (%)

Entries	Crude Protein (%)											
	Palampur	Ludhiana	Bikaner	Hisar	Jorhat	Anand	Rahuri	Urulikanchan	Jabalpur	Mandya	Average	Rank
RBN-2011-12		7.1	7.8	10.3	7.2	11.7	9.6	7.1	8.0	4.4	8.1	2
TNCN-1076	7.7	6.6	9.1	9.6	6.2	11.7	9.2	7.7	7.4	4.4	8.0	3
PBN-346	8.4	5.2	8.4	11.4	5.9	12.0	9.6	7.5	7.8	3.5	8.0	3
RBN-2004-03		6.2		10.7	7.3	11.3	9.2	7.3	8.0	4.4	8.0	3
TNCN-1078	8.4	5.3		10.9	6.2	12.2	9.8	7.4	8.0	4.4	8.1	2
PBN-342	8.2	4.9	10.2	10.3	6.3	11.8	7.3	7.4	7.8	4.4	7.8	5
RBN-2010-Y-1		5.2	8.9	10.5	6.1	11.7	9.3	7.7	8.0	3.5	7.9	4
DHN-15	8.0	5.4	9.9	9.6	7.1	12.4	10.0	7.6	7.8	3.9	8.2	1
NB-21 (NC)	8.0	5.4		10.3	7.5	11.6	9.6	7.3	8.0	3.9	8.0	3
CO-3 (NC)		6.2	6.3	9.6	6.1	12.0	9.8	7.7	8.0	4.4	7.8	5
PBN-233 (NC)		5.0	5.4	10.7	7.9	11.2	9.2	7.3	7.7	5.3	7.7	6
Mean	8.1	5.7	8.3	10.4	6.7	11.8	9.3	7.4	7.9	4.2	8.0	

Table 10.6: VTBN-2013 (4th Year): Varietal Trial in Bajra Napier Hybrid (Perennial): Plant Height (cm)

Entries	Palampur	Ludhiana	Hisar	Bikaner	Anand	Rahuri	Urulikanchan	Jabalpur	Palghar	Jorhat	Mandya	Average	Rank
RBN-2011-12		101.4	136.8	142.0	177.8	144.1	119.4	73.8	119.2	186.8	175.4	137.7	5
TNCN-1076	110.2	112.8	146.2	145.0	181.2	139.8	124.7	60.8	87.3	171.4	148.6	129.8	10
PBN-346	96.4	116.4	138.4	169.7	182.4	139.1	120.8	71.2	125.5	191.8	128.5	134.6	7
RBN-2004-03		101.1	164.5		181.9	156.6	126.3	78.3	103.0	168.4	168.7	138.8	4
TNCN-1078	112.5	100.0	132.3		174.5	148.3	135.0	84.8	94.8	165.2	174.5	132.2	9
PBN-342	115.0	160.0	154.5	139.0	176.9	167.8	128.0	69.0	113.8	185.2	176.5	144.2	2
RBN-2010-Y-1		120.5	139.3	142.0	176.9	167.0	136.5	73.0	109.3	215.7	170.0	145.0	1
DHN-15	101.0	127.4	155.0	135.7	177.2	165.9	126.6	70.1	84.5	148.2	168.1	132.7	8
NB-21 (NC)	104.5	119.8	123.4		168.3	108.3	118.9	83.1	118.1	185.1	121.0	125.0	11
CO-3 (NC)		125.8	154.9	171.7	175.9	159.3	135.0	74.7	114.9	174.9	136.5	142.4	3
PBN-233 (NC)		120.0	167.4	129.0	182.2	165.4	126.5	60.3	78.3	166.9	170.7	136.7	6
Mean	106.6	118.7	146.6	146.8	177.7	151.1	127.1	72.6	104.4	178.1	158.0	136.3	

Table 10.7: VTBN-2013 (4th Year): Varietal Trial in Bajra Napier Hybrid (Perennial): Leaf Stem Ratio

Entries	Palampur	Ludhiana	Hisar	Bikaner	Jorhat	Rahuri	Urulikanchan	Jabalpur	Palghar	Mandya	Average	Rank
RBN-2011-12		0.75	0.84	0.46	0.92	1.27	0.54	0.73	0.78	0.81	0.79	6
TNCN-1076	1.29	0.82	0.55	0.39	0.90	0.67	0.50	0.52	0.75	0.81	0.72	9
PBN-346	1.25	1.10	1.11	0.30	0.84	1.01	0.64	0.61	0.59	0.83	0.83	4
RBN-2004-03		1.10	0.94		0.89	0.54	0.61	0.77	0.60	0.71	0.77	7
TNCN-1078	1.97	1.00	0.88		0.94	1.32	0.47	0.81	0.55	0.80	0.97	1
PBN-342	1.27	0.90	0.98	0.42	0.81	0.92	0.49	0.58	0.62	0.61	0.76	8
RBN-2010-Y-1		0.75	0.69	0.31	0.90	1.02	0.48	0.70	0.71	0.75	0.70	11
DHN-15	1.69	1.10	1.23	0.32	0.88	0.94	0.46	0.65	0.68	0.81	0.88	3
NB-21 (NC)	1.34	1.10	0.35		0.89	1.61	0.60	0.79	0.74	0.70	0.90	2
CO-3 (NC)		0.80	0.67	0.26	0.89	1.17	0.48	0.69	0.73	0.72	0.71	10
PBN-233 (NC)		0.92	0.76	0.38	0.88	1.86	0.47	0.55	0.57	0.77	0.80	5
Mean	1.47	0.94	0.82	0.36	0.89	1.12	0.52	0.67	0.67	0.76	0.80	

Table 10.8: VTBN-2014 (4th Year): Varietal Trial in Bajra Napier Hybrid (Perennial): ADF (%), NDF (%) & IVDMD (%)

Entries	ADF (%)					NDF (%)					IVDMD (%)				
	Ludh-iana	Rah-uri	Palam-pur	Aver-age	Ra-nk	Ludh-iana	Rah-uri	Palam-pur	Aver-age	Ra-nk	Rah-uri	Ludh-iana	His-ar	Aver-age	Ra-nk
RBN-2011-12	37.5	51.2		44.4	1	65.4	73.3		69.3	4	47.8	55.2	54.6	52.5	1
TNCN-1076	38.7	54.3	52.6	48.5	4	66.7	79.1	69.8	71.9	10	45.3	54.6	56.2	52.0	2
PBN-346	39.4	53.5	54.2	49.0	5	67.4	72.9	72.4	70.9	6	46.0	52.8	53.0	50.6	4
RBN-2004-03	38.7	53.4		46.1	2	66.8	70.6		68.7	2	46.0	54.2	52.0	50.7	3
TNCN-1078	40.1	64.5	54.6	53.1	11	67.8	77.4	68.6	71.3	8	37.3	50.8	51.4	46.5	10
PBN-342	42.1	62.5	54.0	52.9	9	68.3	75.8	71.4	71.8	9	38.9	50.1	53.0	47.3	8
RBN-2010-Y-1	40.6	63.2		51.9	6	67.1	75.2		71.1	7	38.3	52.2	56.8	49.1	5
DHN-15	41.2	62.5	55.4	53.0	10	68.2	77.4	70.6	72.1	11	38.9	52.8	53.8	48.5	6
NB-21 (NC)	39.8	61.6	54.6	52.0	7	69.1	73.7	69.4	70.7	5	39.6	51.9	52.8	48.1	7
CO-3 (NC)	39.0	56.0		47.5	3	67.2	67.6		67.4	1	44.1	53.9	54.2	50.7	3
PBN-233 (NC)	40.2	63.9		52.1	8	68.3	70.0		69.1	3	37.8	51.4	51.8	47.0	9
Mean	39.8	58.8	54.2	50.0		67.5	73.9	70.4	70.4		41.8	52.7	53.6	49.4	

Table 10.9 VTBN-2013 (4th Year): Varietal Trial in Bajra Napier Hybrid (Perennial): Overall Performance of entries over the years (2014-2016)

Entries	GFY (q/ha)					DMY (q/ha)				
	2014	2015	2016	Average	Rank	2014	2015	2016	Average	Rank
RBN-2011-12	795.9	1511.3	1391.9	1233.0	2	162.2	311.4	289.7	254.4	2
TNCN-1076	785.4	1597.7	1258.6	1213.9	3	137.8	326.8	252.2	238.9	4
PBN-346	779.7	1479.3	1243.4	1167.5	6	155.7	298.5	251.6	235.3	6
RBN-2004-03	771.3	1465.1	1298.0	1178.1	4	153.3	291.4	251.4	232.0	8
TNCN-1078	719.6	1373.5	1184.0	1092.4	10	137.3	273.7	235.1	215.4	10
PBN-342	723.9	1493.6	1264.3	1160.6	7	147.7	311.2	263.4	240.8	3
RBN-2010-Y-1	761.4	1435.8	1222.7	1140.0	8	160.2	301.2	253.8	238.4	5
DHN-15	713.8	1479.5	1159.0	1117.4	9	148.3	308.3	233.7	230.1	9
NB-21 (NC)	634.2	1287.7	1147.8	1023.2	11	128.9	262.9	228.5	206.8	11
CO-3 (NC)	820.4	1600.1	1344.6	1255.0	1	168.4	337.5	267.3	257.7	1
PBN-233 (NC)	760.3	1452.0	1303.9	1172.1	5	148.5	290.5	258.4	232.5	7
Mean	751.4	1470.5	1256.2	1159.4		149.8	301.2	253.2	234.7	

Table 10.10 VTBN-2013 (4th Year): Varietal Trial in Bajra Napier Hybrid (Perennial): Overall Performance of entries over the years (2014-2016)

Entries	CPY (q/ha)					CP (%)				
	2014	2015	2016	Average	Rank	2014	2015	2016	Average	Rank
RBN-2011-12	8.5	28.1	25.8	20.8	2	8.0	8.7	8.1	8.3	1
TNCN-1076	11.1	29.0	21.1	20.4	3	8.3	8.7	8.0	8.3	1
PBN-346	11.2	27.8	21.3	20.1	4	8.1	8.4	8.0	8.2	2
RBN-2004-03	11.1	27.6	21.1	19.9	5	8.1	8.8	8.0	8.3	1
TNCN-1078	9.4	23.0	18.6	17.0	10	7.9	8.4	8.1	8.1	3
PBN-342	10.8	25.6	20.4	18.9	7	7.7	8.1	7.8	7.9	5
RBN-2010-Y-1	9.5	26.7	21.1	19.1	6	7.8	8.0	7.9	7.9	5
DHN-15	11.2	26.6	18.9	18.9	7	8.2	8.2	8.2	8.2	2
NB-21 (NC)	9.8	23.7	18.1	17.2	9	8.3	8.6	8.0	8.3	1
CO-3 (NC)	10.8	31.7	22.8	21.8	1	8.0	8.9	7.8	8.2	2
PBN-233 (NC)	11.8	24.1	20.1	18.7	8	8.1	8.2	7.7	8.0	4
Mean	10.5	26.7	20.8	19.3		8.0	8.5	8.0	8.2	

11. VT *Dichanthium*–2013 (4th YEAR): VARIETAL TRIAL IN *Dichanthium annulatum* (PERENNIAL) (Reference Table: 11.1 to 11.8)

In *Dichanthium annulatum*, a varietal evaluation trial comprising of seven entries along with one check was established initially in *Kharif*-2013 at fifteen locations of the country. The trial was finally established at eight locations of the country.

For green forage yield (q/ha), entry JHD 13-1 followed by JHD 13-2 showed better performance by margin of 8.6% and 6.1 % respectively over the check. In central zone, entries Marvel 09-4 ranked first with 14.3% margin followed by JHD 13-2 by 8.8% margins over the check. JHD 13-1 and Marvel 09-1 were also superior to check by 4.9% and 3.8% respectively. In south zone, Marvel 09-1 was marginally superior. At all India level also four entries showed marginal superiority over the check. For dry matter yield (q/ha) entry JHD 13-2 in NWZ and entry Marvel 09-4 in Central zone and Marvel 09-1 in south zone were substantially superior over the check by margin of 11.3%, 13.5% and 30.1% respectively. At all India level, three entries showed marginal superiority over the check.

For fodder production potential, entry JHD 13-2 for green forage (0.95q/ha/day) and dry matter production potential (0.26 q/ha/day) ranked first.

For crude protein yield (q/ha, Marvel 09-4 (7.6Q) and JHD 13-1 (7.5 q) were good performers as compared to 6.4 q in check. For crude protein content (%), JHD 13-1 (7%) and check (6.%) were best performers. For plant height (cm) Marvel 09-4 (108.9 cm) and for leafiness, entry JHD 13-2 (0.74) were best performers. For other quality parameters, entry Marvel 06-40 ranked first for ADF (%), and IVDMD (%). For NDF (%) entry JHD 13-2 ranked first.

12. VTCC-2013 (4th YEAR): VARIETAL TRIAL in *Cenchrus ciliaris* (PERENNIAL) (Reference Table: 12.1 to 12.8)

In *Cenchrus ciliaris*, a varietal evaluation trial comprising nine entries was established in *Kharif*-2013. For green forage yield (q/ha), entry RCC -10-6, RCC CS 10-4 and RCC CS-10-5 were superior by margins of 36.1%, 19.2% and 15.4% respectively over the check in North West zone.

RCC -10-6 ranked first in Central zone followed by RCC–CS-10-8 showing superiority of 19.8 and 6.7% respectively. In South zone, entries RCC-10-8, RCC-CS-10-5, RCCB -04-64 and RCC –CS-10-8 showed superiority of 29.7%, 26.3%, 5.8% and 5.2% respectively over the check. At all India level, RCC -10-6, RCC 10-8, RCC-CS-10-4, RCC CS-10-5 performed better than check by margins of 20%, 7.8%, 6.5% and 5.3% respectively. For dry matter yield, entry RCC-10-6 performed well showing superiority margin of 31.2% in NWZ, 14.9% in CZ, 6.9% in SZ and 17.9% at all India level. RCC –CS -10-4 also showed better performance than check by margin of 27.6% in NWZ and 5.6% at all India level. RCC 10-8 was better than check in NWZ (6.8%), south zone (37.3%). RCC –CS -10-8 was better in NWZ (27.6%), in SZ (9.8%).

For forage production potential (q/ha/day), entry RCC -10-6 (0.88 q/ha/day) for green forage whereas check for dry matter production potential (0.52 q/ha/day) were best performers. For crude protein yield, entry RCC -10-6 (9.7q/ha) followed by RCC-CS-10-8 (8.8Q/ha ranked first, whereas for crude protein percent national check ranked first with 6.7% crude protein. For plant height, entry RCC-10-6 (105.3 cm) and for leafiness, entry RCC-CS-10-8 (1.11) ranked first. For NDF (%), ADF (%), and IVDMD (%) entry RCC-CS-10-8 ranked first.

Table 11.1: VT *Dichanthium*-2013 (4th Year): Varietal Trial in *Dichanthium* (Perennial): Green Forage Yield (q/ha)

Entries	North West Zone			Central Zone								South Zone			All India		
	Ludh-iana	Ra-nk	Superi- ority%	**Ana- nd	Jha- nsi	Jabal- pur	Rah- uri	Urulikan- chan	Aver- age	Ra- nk	Superi- ority%	Coimb- atore	Ra- nk	Superi- ority%	Aver- age	Ra- nk	Superi- ority%
JHD-13-3	469.0	8		8.0	243.8	331.5	190.2	584.4	337.5	7		618.0	8		406.1	8	
Marvel 09-4	518.0	7		133.0	237.9	510.6	243.9	598.2	397.7	1	14.3	738.9	3		474.6	2	3.8
Marvel 06-40	542.0	6		11.0	267.0	379.0	209.5	522.9	344.6	6		661.1	6		430.3	6	
Marvel 09-1	594.0	4		171.0	177.2	469.8	221.4	576.1	361.1	4	3.8	812.5	1	1.2	475.2	1	3.9
JHD-13-2	641.0	2	6.1	274.0	229.9	436.5	281.3	566.8	378.6	2	8.8	666.6	5		470.3	3	2.9
JHD-13-1	656.0	1	8.6	176.0	210.6	490.6	223.2	535.0	364.9	3	4.9	693.0	4		468.1	4	2.4
Marvel 09-3	585.0	5		279.0	214.0	362.3	200.3	521.8	324.6	8		658.3	7		423.6	7	
Marvel 8 (NC)	604.0	3		45.0	255.0	354.0	159.0	624.0	348.0	5		747.5	2		457.2	5	
Mean	576.1			137.1	229.4	416.8	216.1	566.1	357.1			699.5			450.7		
CD at 5%	99.9			17.2	21.5	87.9	40.8	N.S.				44.0					
CV%	9.9			6.9	12.3	12.0	11.1	6.9				3.6					

Note: ** Data abnormally low hence not considered in zonal and all India average

Table 11.2: VT *Dichanthium*-2013 (4th Year): Varietal Trial in *Dichanthium* (Perennial): Dry Matter Yield (q/ha)

Entries	North West Zone			Central Zone								South Zone			All India		
	Ludh-iana	Ra-nk	Superi- ority %	**Ana- nd	Jha- nsi	Jabal- pur	Rah- uri	Urulikan- chan	Aver- age	Ra- nk	Superi- ority %	Coimb- atore	Ra- nk	Superi- ority %	Aver- age	Ra- nk	Superi- ority%
JHD-13-3	143.0	8		3.4	66.9	63.8	56.1	122.6	77.3	7		79.5	7		88.6	8	
Marvel 09-4	173.0	7		57.1	68.5	100.8	87.1	136.7	98.3	1	13.5	79.5	7		107.6	5	
Marvel 06-40	180.0	6		4.4	68.9	73.3	66.3	107.9	79.1	6		102.9	5		99.9	7	
Marvel 09-1	182.0	5		68.7	56.3	92.2	74.2	125.7	87.1	4	0.6	146.5	1	30.1	112.8	2	2.4
JHD-13-2	225.0	1	11.3	109.5	59.8	85.3	93.7	121.6	90.1	2	4.0	106.7	4		115.3	1	4.6
JHD-13-1	206.0	2	2.0	76.5	64.8	96.5	73.8	121.0	89.0	3	2.8	109.1	3		111.9	3	1.5
Marvel 09-3	201.0	4		113.5	58.0	70.0	67.3	108.8	76.0	8		101.5	6		101.1	6	
Marvel 8 (NC)	202.0	3		20.1	87.3	68.4	51.9	138.9	86.6	5		112.6	2		110.2	4	
Mean	189.0			56.7	66.3	81.3	71.3	122.9	85.4			104.8			105.9		
CD at 5%	43.2			7.1	18.0	17.3	13.7	14.8				6.4					
CV%	13.1			6.7	10.3	12.1	11.3	6.8				3.3					

Note: ** Data abnormally low hence not considered in zonal and all India average

Table 11.3: VT *Dichanthium*-2013 (4th Year): Varietal Trial in *Dichanthium* (Perennial): Green Forage Yield (q/ha/day) & Dry Matter Yield (q/ha/day)

Entries	GFY (q/ha/day)				DMY (q/ha/day)			
	Anand	Jabalpur	Average	Rank	Anand	Jabalpur	Average	Rank
JHD-13-3	0.02	0.90	0.46	8	0.01	0.17	0.09	8
Marvel 09-4	0.34	1.40	0.87	3	0.15	0.27	0.21	5
Marvel 06-40	0.03	1.03	0.53	7	0.01	0.20	0.11	7
Marvel 09-1	0.44	1.28	0.86	4	0.18	0.25	0.22	4
JHD-13-2	0.70	1.19	0.95	1	0.28	0.23	0.26	1
JHD-13-1	0.45	1.34	0.90	2	0.20	0.26	0.23	3
Marvel 09-3	0.71	0.99	0.85	5	0.29	0.19	0.24	2
Marvel 8 (NC)	0.11	0.96	0.54	6	0.05	0.18	0.12	6
Mean	0.35	1.14	0.74		0.15	0.22	0.18	

Table 11.4: VT *Dichanthium*-2013 (4th Year): Varietal Trial in *Dichanthium* (Perennial): Crude Protein Yield (q/ha) & Crude Protein (%)

Entries	CPY (q/ha)						CP (%)					
	**Anand	Jabalpur	Rahuri	Urulikanchan	Average	Rank	Anand	Jabalpur	Rahuri	Urulikanchan	Average	Rank
JHD-13-3	0.2	4.4	4.2	9.9	6.1	6	4.7	6.9	7.4	8.0	6.8	3
Marvel 09-4	2.6	7.1	5.5	10.3	7.6	1	4.6	7.1	6.3	7.5	6.4	5
Marvel 06-40	0.2	5.0	5.1	8.9	6.4	5	4.3	6.9	7.7	8.3	6.8	3
Marvel 09-1	3.1	6.4	5.6	9.4	7.2	4	4.5	7.1	7.6	7.5	6.7	4
JHD-13-2	5.3	5.9	7.4	8.8	7.4	3	4.5	7.0	7.9	7.2	6.7	4
JHD-13-1	3.7	6.7	5.8	9.9	7.5	2	5.0	7.1	7.9	8.1	7.0	1
Marvel 09-3	6.6	4.8	5.1	7.9	5.9	7	5.4	6.9	7.6	7.3	6.8	3
Marvel 8 (NC)	1.0	4.7	3.9	10.4	6.4	5	5.6	7.0	7.6	7.5	6.9	2
Mean	2.8	5.6	5.3	9.4	6.8		4.8	7.0	7.5	7.7	6.7	

Note: ** Data abnormally low hence not considered in zonal and all India average

Table 11.5: VT *Dichanthium*-2013 (4th Year): Varietal Trial in *Dichanthium* (Perennial): Plant Height (cm) & Leaf Stem Ratio

Entries	Plant Height (cm)							Leaf Stem Ratio					
	Ludh-iana	Ana-nd	Jabal-pur	Rah-uri	Urulikan-cha	Aver-age	Rank	**Ana-nd	Jabal-pur	Rah-uri	Urulikan-cha	Aver-age	Rank
JHD-13-3	135.0	80.4	87.6	84.4	74.7	92.4	8	1.14	0.50	0.56	0.73	0.60	5
Marvel 09-4	160.0	104.2	117.3	85.0	78.2	108.9	1	0.89	0.58	0.66	0.63	0.62	3
Marvel 06-40	151.0	82.4	96.7	94.3	68.1	98.5	4	0.97	0.44	0.75	0.64	0.61	4
Marvel 09-1	164.0	97.8	106.4	78.2	65.8	102.4	3	0.74	0.47	0.97	0.56	0.67	2
JHD-13-2	155.0	111.8	103.6	89.9	69.3	105.9	2	0.75	0.49	1.08	0.65	0.74	1
JHD-13-1	130.0	95.7	113.5	72.6	67.9	95.9	6	0.88	0.55	0.66	0.62	0.61	4
Marvel 09-3	149.0	107.5	92.3	77.1	65.7	98.3	5	1.12	0.48	0.62	0.59	0.56	7
Marvel 8 (NC)	117.0	94.6	96.3	82.8	76.7	93.5	7	1.12	0.41	0.73	0.63	0.59	6
Mean	145.1	96.8	101.7	83.0	70.8	99.5		0.95	0.49	0.75	0.63	0.63	

Note: ** Data abnormally low hence not considered in zonal and all India average

Table 11.6: VT *Dichanthium*-2013 (4th Year): Varietal Trial in *Dichanthium* (Perennial): ADF (%), NDF (%) & IVDMD (%)

Entries	ADF (%)		NDF (%)		IVDMD (%)	
	Rahuri	Rank	Rahuri	Rank	Rahuri	Rank
JHD-13-3	57.1	3	74.3	2	43.1	3
Marvel 09-4	59.7	7	75.6	6	41.1	7
Marvel 06-40	50.6	1	75.7	5	48.3	1
Marvel 09-1	63.2	8	76.8	6	38.3	8
JHD-13-2	58.7	6	71.7	1	41.9	6
JHD-13-1	58.0	4	75.4	3	42.5	4
Marvel 09-3	58.1	5	71.7	1	42.3	5
Marvel 8 (NC)	55.9	2	78.2	7	44.1	2
Mean	57.7		74.9		42.7	

Table 11.7 VT *Dichanthium*-2013 (4th Year): Varietal Trial in *Dichanthium* (Perennial): Overall Performance of entries over the years (2014-2016)

Entries	GFY (q/ha)						DMY (q/ha)					
	2014	2015	2016	Average	Rank	Sup. %	2014	2015	2016	Average	Rank	Sup. %
JHD-13-3	322.1	341.5	406.1	356.6	8		74.9	79.8	88.6	81.1	8	
Marvel 09-4	354.4	407.0	474.6	412.0	2	4.0	93.4	105.0	107.6	102.0	3	1.7
Marvel 06-40	431.6	367.6	430.3	409.8	3	3.4	106.0	86.2	99.9	97.4	7	
Marvel 09-1	377.7	395.5	475.2	416.1	1	5.0	97.4	85.5	112.8	98.6	6	
JHD-13-2	356.3	392.2	470.3	406.3	4	2.5	99.1	102.9	115.3	105.8	2	5.5
JHD-13-1	342.9	400.3	468.1	403.8	5	1.9	98.0	108.1	111.9	106.0	1	5.7
Marvel 09-3	322.9	376.0	423.6	374.2	7		93.3	103.5	101.1	99.3	5	
Marvel 8 (NC)	336.6	395.0	457.2	396.3	6		87.9	102.7	110.2	100.3	4	
Mean	355.6	384.4	450.7	396.9			93.8	96.7	105.9	98.8		

Table 11.8 VT *Dichanthium*-2013 (4th Year): Varietal Trial in *Dichanthium* (Perennial): Overall Performance of entries over the years (2014-2016)

Entries	CPY (q/ha)					CP (%)				
	2014	2015	2016	Average	Rank	2014	2015	2016	Average	Rank
JHD-13-3	2.0	3.8	4.7	3.5	7	6.8	6.9	6.8	6.8	2
Marvel 09-4	2.6	4.8	6.4	4.6	3	6.4	7.1	6.4	6.6	4
Marvel 06-40	3.0	3.7	4.8	3.8	6	6.7	7.1	6.8	6.9	1
Marvel 09-1	2.6	4	6.1	4.2	4	6.6	6.9	6.7	6.7	3
JHD-13-2	3	4.5	6.8	4.8	1	6.2	6.6	6.7	6.5	5
JHD-13-1	2.9	4.9	6.5	4.8	1	6.6	6.9	7.0	6.8	2
Marvel 09-3	3.2	4.9	6.1	4.7	2	6.0	7.0	6.8	6.6	4
Marvel 8 (NC)	2.5	4.2	5.0	3.9	5	6.6	7.3	6.9	6.9	1
Mean	2.7	4.4	5.8	4.3		6.5	7.0	6.7	6.7	

Table 12.1: VT *Cenchrus ciliaris*-2013 (4th Year): Varietal Trial in *Cenchrus ciliaris* (Perennial): Green Forage Yield (q/ha)

Entries	North West Zone					Central Zone							South Zone			All India		
	Ludh-iana	Bika-ner	Aver-age	Ra-nk	Superi- ority%	Ana-nd	Rah-uri	Urulikan- chan	Jha- nsi	Aver-age	Ra-nk	Superi- ority	Coimb- atore	Ra-nk	Superi- ority	Aver-age	Ra-nk	Superi- ority%
RCCB-04-64	358.0	170.3	264.1	7		232.0	362.7	556.3	309.4	365.1	8		606.1	3	5.8	370.7	8	
RCC-CS-10-8	308.0	184.9	246.5	8		421.0	542.0	541.8	551.0	514.0	2	6.7	602.8	4	5.2	450.2	5	2.5
RCC-10-8	408.0	194.0	301.0	4	4.8	377.0	489.6	545.7	556.4	492.2	4	2.2	743.0	1	29.7	473.4	2	7.8
RCCB-03-23	400.0	200.3	300.1	5	4.5	340.0	446.8	477.3	389.4	413.4	7		565.3	8		402.7	7	
RCC-CS-10-5	483.0	179.3	331.2	3	15.4	311.0	546.5	539.2	452.7	462.4	6		723.6	2	26.3	462.2	4	5.3
RCC-CS-10-4	488.0	196.6	342.3	2	19.2	383.0	479.7	584.9	562.4	502.5	3	4.3	577.8	6	0.9	467.5	3	6.5
RCC-10-6	583.0	198.9	390.9	1	36.1	488.0	576.9	634.8	608.5	577.0	1	19.8	600.0	5	4.7	527.1	1	20.0
IGFRI 3108 (NC)	425.0	149.2	287.1	6		501.0	404.0	524.6	497.2	481.7	5		572.8	7		439.1	6	
Mean	431.6	184.2	307.9			381.6	481.0	550.6	490.9	476.0			623.9	4.5		449.1		
CD at 5%	103.9	NS				36.4	101.9	41.8	22.2				37.8					
CV%	13.7	12.8				5.5	12.1	4.3	12.7				3.5					

Table 12.2: VT *Cenchrus ciliaris*-2013 (4th Year): Varietal Trial in *Cenchrus ciliaris* (Perennial): Dry Matter Yield (q/ha)

Entries	North West Zone					Central Zone							South Zone			All India		
	Ludh-iana	Bika-ner	Aver-age	Ra-nk	Superi- ority %	Ana-nd	Rah-uri	Urulikan- chan	Jha- nsi	Aver-age	Ra-nk	Superi- ority %	Coimb- atore	Ra-nk	Superi- ority	Aver-age	Ra-nk	Superi- ority%
RCCB-04-64	108.0	51.6	79.8	8		106.1	117.5	118.8	32.3	93.7	8		79.2	6	4.1	87.6	8	
RCC-CS-10-8	102.0	71.0	86.5	7		174.5	185.9	119.1	68.6	137.0	2	2.6	83.6	3	9.8	115.0	4	1.1
RCC-10-8	141.0	57.4	99.2	4	6.8	151.3	165.5	114.1	82.8	128.4	5		104.5	2	37.3	116.7	3	2.6
RCCB-03-23	124.0	69.9	96.9	5	4.3	142.2	157.7	103.0	48.9	112.9	7		75.2	8		103.0	7	
RCC-CS-10-5	141.0	69.1	105.1	3	13.1	116.1	185.3	118.8	56.1	119.1	6		104.8	1	37.7	113.0	6	
RCC-CS-10-4	172.0	65.0	118.5	2	27.6	150.1	169.8	133.3	70.8	131.0	4		79.7	5	4.7	120.1	2	5.6
RCC-10-6	188.0	55.8	121.9	1	31.2	202.8	188.1	138.0	84.6	153.4	1	14.9	81.4	4	6.9	134.1	1	17.9
IGFRI 3108 (NC)	140.0	45.8	92.9	6		210.4	139.8	108.4	75.5	133.5	3		76.1	7		113.7	5	
Mean	139.5	60.7	100.1			156.7	163.7	119.2	64.9	126.1			85.6			112.9		
CD at 5%	53.9	NS				15.0	34.6	9.1	4.2				7.8					
CV%	22.1	19.5				5.5	12.1	4.3	2.4				5.2					

Table 12.3: VT *Cenchrus ciliaris*-2013 (4th Year): Varietal Trial in *Cenchrus ciliaris* (Perennial): Green Forage Yield (q/ha/day) & Dry Matter Yield (q/ha/day)

Entries	GFY (q/ha/day)				DMY(q/ha/day)			
	Bikaner	Anand	Average	Rank	Anand	Bikaner	Average	Rank
RCCB-04-64	0.47	0.58	0.53	8	0.26	0.14	0.26	8
RCC-CS-10-8	0.51	1.04	0.78	3	0.43	0.19	0.43	3
RCC-10-8	0.53	0.94	0.74	5	0.38	0.16	0.38	4
RCCB-03-23	0.55	0.84	0.70	6	0.35	0.19	0.35	6
RCC-CS-10-5	0.49	0.77	0.63	7	0.29	0.19	0.29	7
RCC-CS-10-4	0.54	0.95	0.75	4	0.37	0.18	0.37	5
RCC-10-6	0.54	1.21	0.88	1	0.50	0.15	0.50	2
IGFRI 3108 (NC)	0.41	1.24	0.83	2	0.52	0.13	0.52	1
Mean	0.51	0.95	0.73		0.39	0.17	0.39	

Table 12.4: VT *Cenchrus ciliaris*-2013 (4th Year): Varietal Trial in *Cenchrus ciliaris* (Perennial): Crude Protein yield (q/ha) & Crude Protein (%)

Entries	Crude Protein Yield (q/ha)						Crude Protein (%)					
	Anand	Rahuri	Urulikanchan	Bikaner	Average	Rank	Anand	Urulikanchan	Bikaner	Rahuri	Average	Rank
RCCB-04-64	5.6	7.7	9.6	2.9	6.5	8	5.3	8.1	5.6	6.6	6.4	2
RCC-CS-10-8	8.9	14.4	9.5	2.2	8.8	2	5.0	8.0	3.2	7.7	5.9	6
RCC-10-8	7.0	11.6	9.2	2.5	7.6	7	4.8	8.0	4.3	7.0	6.0	5
RCCB-03-23	8.1	10.8	8.3	3.4	7.7	6	5.8	8.1	4.9	6.9	6.4	2
RCC-CS-10-5	6.1	14.3	9.5	2.6	8.1	5	5.2	8.0	3.8	7.7	6.2	4
RCC-CS-10-4	7.4	12.4	10.6	2.7	8.3	4	4.8	7.9	4.1	7.3	6.0	5
RCC-10-6	10.4	14.8	11.0	2.4	9.7	1	4.8	8.0	4.4	7.9	6.3	3
IGFRI 3108 (NC)	11.8	10.4	8.6	2.8	8.4	3	5.3	7.9	6.1	7.4	6.7	1
Mean	8.2	12.0	9.5	2.7	8.1		5.1	8.0	4.5	7.3	6.2	

Table 12.5: VT *Cenchrus ciliaris*-2013 (4th Year): Varietal Trial in *Cenchrus ciliaris* (Perennial): Plant Height cm & Leaf Stem Ratio

Entries	Plant Height (cm)							Leaf Stem Ratio						
	Ludh-iana	Bika-ner	Ana-nd	Rah-uri	Urulikan-cha	Aver-age	Ra-nk	Ludh-iana	Bika-ner	Ana-nd	Urulikan-cha	Rah-uri	Aver-age	Ra-nk
RCCB-04-64	114.0	82.0	100.3	70.8	82.3	89.9	8	0.76	1.17	1.22	0.67	0.76	0.92	4
RCC-CS-10-8	132.0	67.0	118.5	98.8	73.7	98.0	3	0.83	1.18	2.00	0.71	0.83	1.11	1
RCC-10-8	132.0	75.0	124.2	99.1	74.1	100.9	2	0.96	0.47	1.78	0.67	0.96	0.97	3
RCCB-03-23	105.0	77.0	120.9	89.6	83.3	95.2	7	0.61	0.78	1.11	0.70	0.61	0.76	8
RCC-CS-10-5	127.0	70.0	116.9	98.4	76.0	97.7	4	0.67	0.97	1.20	0.73	0.67	0.85	7
RCC-CS-10-4	133.0	60.0	125.2	90.8	69.0	95.6	6	0.75	1.12	2.00	0.66	0.75	1.06	2
RCC-10-6	143.0	70.0	124.7	106.0	82.6	105.3	1	0.69	0.43	2.17	0.57	0.69	0.91	5
IGFRI 3108 (NC)	109.0	88.0	128.9	78.0	83.2	97.4	5	0.59	0.90	1.70	0.66	0.59	0.89	6
Mean	124.4	73.6	120.0	91.4	78.0	97.5		0.73	0.88	1.65	0.67	0.73	0.93	

Table 12.6: VT *Cenchrus ciliaris*-2013 (4th Year): Varietal Trial in *Cenchrus ciliaris* (Perennial): ADF (%), NDF (%) & IVDMD (%)

Entries	ADF (%)		NDF (%)		IVDMD (%)	
	Rahuri	Rank	Rahuri	Rank	Rahuri	Rank
RCCB-04-64	55.3	3	68.6	2	44.7	3
RCC-CS-10-8	52.8	1	63.4	1	46.6	1
RCC-10-8	55.0	2	70.4	4	44.9	2
RCCB-03-23	57.9	6	73.2	8	42.6	6
RCC-CS-10-5	55.6	4	70.6	5	44.4	4
RCC-CS-10-4	55.0	2	70.1	3	44.9	3
RCC-10-6	57.4	5	71.7	6	43.0	5
IGFRI 3108 (NC)	60.1	7	72.4	7	40.9	7
Mean	56.1		70.1		44.0	

Table 12.7 VT *Cenchrus ciliaris*-2013 (4th Year): Varietal Trial in *Cenchrus ciliaris* (Perennial): Overall Performance over the year (2014-2016)

Entries	GFY (q/ha)						DMY (q/ha)					
	2014	2015	2016	Average	Rank	Sup%	2014	2015	2016	Average	Rank	Sup%
RCCB-04-64	266.7	332.0	370.7	323.1	8		58.2	85.4	87.6	77.1	7	
RCC-CS-10-8	262.0	374.6	450.2	362.3	6		60.1	100.6	115.0	91.9	5	
RCC-10-8	260.6	416.7	473.4	383.6	4	4.0	69.9	105.4	116.7	97.3	3	5.9
RCCB-03-23	265.1	354.3	402.7	340.7	7		56.6	96.1	103.0	85.2	6	
RCC-CS-10-5	319.8	371.6	462.2	384.5	3	4.2	76.9	100.6	113.0	96.8	4	5.3
RCC-CS-10-4	307.1	409.4	467.5	394.7	2	6.9	82.3	109.1	120.1	103.8	2	12.9
RCC-10-6	257.7	416.6	527.1	400.5	1	8.5	68.6	110.3	134.1	104.3	1	13.5
IGFRI 3108 (NC)	300.4	367.4	439.1	369.0	5		68.8	93.3	113.7	91.9	5	
Mean	279.9	380.3	449.1	369.8			67.7	100.1	112.9	93.6		

Table 12.8 VT *Cenchrus ciliaris*-2013 (4th Year): Varietal Trial in *Cenchrus ciliaris* (Perennial): Overall Performance over the year (2014-2016)

Entries	CPY (q/ha)					CP (%)				
	2014	2015	2016	Average	Rank	2014	2015	2016	Average	Rank
RCCB-04-64	4.5	6.2	6.5	5.7	8	7.2	7.0	6.4	6.9	2
RCC-CS-10-8	5.6	7.4	8.8	7.3	3	7.6	6.5	5.9	6.7	4
RCC-10-8	4.8	7.5	7.6	6.6	6	7.7	6.8	6.0	6.8	3
RCCB-03-23	4.5	6.4	7.7	6.2	7	7.7	6.8	6.4	7.0	1
RCC-CS-10-5	5.8	7.5	8.1	7.1	4	7.3	7.0	6.2	6.8	3
RCC-CS-10-4	6.9	7.3	8.3	7.5	2	6.8	6.3	6.0	6.4	5
RCC-10-6	6.5	7.7	9.7	8.0	1	7.6	6.5	6.3	6.8	3
IGFRI 3108 (NC)	6.0	6.7	8.4	7.0	5	7.2	6.8	6.7	6.9	2
Mean	5.6	7.1	8.1	6.9		7.4	6.7	6.2	6.8	

13. VT *Cenchrus ciliaris*-2015 (2ND YEAR): VARIETAL TRIAL IN *Cenchrus ciliaris* (PERENNIAL)

(Reference Table: 13.1 to 13.9)

The trial was established in 2015 with 9 entries at 12 locations in three zones. Data in second year has been obtained from 12 centres. For green fodder yield, entry VTCC-3 ranked first in NWZ, SZ and all India level with yield of 305.3 q, 821.2 q and 429.3 q/ha respectively. Entry VTCC -6 ranked first in CZ and second in NWZ and all India level with yield of 316.5q, 282.6q and 410.5 q/ha respectively. VTCC -9 ranked second in CZ and SZ.

Similarly for dry matter yield, entry VTCC -3 ranked first in NWZ, SZ and all India showing yield of 107.2 q, 166.7 q and 121.4 q/ha respectively. VTCC -9 ranked first in CZ and second in NWZ, SZ and all India level showing yield of 117.8 q, 101.3 q, 118.6 q q, and 119.6 q/ha respectively.

For per day productivity potential, VTCC -3 ranked first (2.82 q/ha/day) followed by VTCC-9 (2.72 q/ha/day) whereas for dry matter VTCC-9 ranked first (1.11 q/ha/day) followed by VTCC-3 (1.09 q/ha/day). For crude protein yield VTCC-6 (5.6 q) and for crude protein content VTCC -1 (7.8%) ranked first. For plant height VTCC -3 (93.5 cm) and for leafiness (VTCC-6 (1.14) ranked first. For ADF and NDF, VTCC-1 ranked first whereas for IVDMD, VTCC -4 ranked first (54.4%) followed by VTCC -1 (53%).

[The trial will continue in coded form].

14. VT *Cenchrus setigerus* -2015 (2ND YEAR): VARIETAL TRIAL IN *Cenchrus setigerus* (PERENNIAL)

(Reference Table: 14.1 to 14.6)

The trial was established in 2015 with 9 entries which include national checks. Data in 2nd year has been reported from 9 locations in 3 zones, viz., North West, Central and south zones.

For green fodder yield (q/ha), VTCS-15-4 ranked first in NWZ and central zone with yield of 133.6 q and 363.7 q respectively followed by VTCS-15-8 (130.7q) in NWZ and VTCS-15-3 (360.8) in central zone. VTCS -15-1 ranked first in south zone and at all India level with yield of 825.6q and 442.5 q respectively whereas VTCS -3 ranked second in both cases with yield of 731.2 q and 437.6 q respectively.

For dry matter yield (q/ha), entries VTCS -15-8 (25.7q) in NWZ; entry VTCS-15-3 (154.8q) in central zone; entry VTCS-15-1 (167.4 q) in south zone and entry VTCS-15-3 (117.8q) at all India level ranked first in each case. At all India level, VTCS-15-1 ranked 2nd (110.7q).

For green and dry matter per day productivity, VTCS-15-3 ranked first with yield of 1.66q/ha/day and 0.81q/ha/day respectively. For crude protein yield (q/ha) VTCS-15-1 (6.5q) and for crude protein content VTCS-15-2 (7.7%) ranked first. For plant height VTCS-15-8 and for leafiness VTCS -15-4 were best performers. For other quality parameters like ADF (%), NDF (%), IVDMD (%), entry VTCS-15-1 ranked first.

[The trial will continue in coded form].

Table 13.1: VT *Cenchrus ciliaris*-2015 (2nd Year): Varietal Trial in *Cenchrus ciliaris* (Perennial): Green Forage Yield (q/ha)

Entries	North West Zone						Central Zone							South Zone					All India	
	Ludh-iana	Jodh-pur	His-ar	Avika-nagar	Aver-age	Ra-nk	Ana-nd	Rah-uri	Urulikan-chan	Jabal-pur	Jha-nsi	Aver-age	Ra-nk	Coimb-atore	Man-dya	Hydera-bad	Aver-age	Ra-nk	Aver-age	Ra-nk
VTCC-1	306.0	151.9	51.7	56.5	141.5	9	382.0	171.7	102.2	63.3	144.4	172.7	9	1705.5	155.0	88.9	649.8	4	281.6	7
VTCC-2	318.0	216.1	253.3	87.9	218.8	6	505.0	249.2	111.3	102.4	177.8	229.1	7	1561.0	130.4	86.1	592.5	6	316.5	5
VTCC-3	430.0	210.4	500.6	80.0	305.3	1	659.0	260.8	106.8	123.2	316.7	293.3	3	2083.3	266.5	113.8	821.2	1	429.3	1
VTCC-4	398.0	213.2	363.6	76.2	262.7	4	670.0	225.2	95.0	71.6	222.2	256.8	4	1580.5	212.1	123.6	638.7	5	354.3	4
VTCC-5	305.0	194.3	153.6	49.6	175.6	7	523.0	186.9	118.1	72.4	305.6	241.2	5	1200.0	166.9	83.3	483.4	8	279.9	8
VTCC-6	476.0	126.3	438.1	89.8	282.6	2	655.0	313.9	113.2	89.1	411.1	316.5	1	1713.8	333.3	166.6	737.9	3	410.5	2
VTCC-7			165.0		165.0	8				74.1	333.3	203.7	8						190.8	9
VTCC-8	372.0	210.4	284.2	50.5	229.3	5	418.0	237.4	104.7	114.9	300.0	235.0	6	1255.5	212.9	100.0	522.8	7	305.0	6
VTCC-9	442.0	129.4	441.9	73.3	271.6	3	594.0	245.8	126.5	81.6	500.0	309.6	2	1772.2	390.0	127.7	763.3	2	410.4	3
Mean	380.9	181.5	294.7	70.4	228.0		550.8	236.4	109.7	88.1	301.2	250.9		1609.0	233.4	111.3	651.2		330.9	
CD at 5%	93.9	67.0	56.2	13.2			55.7	40.4	15.2	20.2	9.5			69.7	18.2	19.0				
CV%	14.1	21.1	11.2	10.9			5.8	9.8	7.9	13.2	18.2			2.7	7.7	9.8				

Table 13.2: VT *Cenchrus ciliaris*-2015 (2nd Year): Varietal Trial in *Cenchrus ciliaris* (Perennial): Dry Matter Yield (q/ha)

Entries	North West Zone					Central Zone							South Zone					All India	
	Ludh-iana	His-ar	Avika-nagar	Aver-age	Ra-nk	Ana-nd	Rah-uri	Urulikan-chan	Jabal-pur	Jha-nsi	Aver-age	Ra-nk	Coimba-tore	Man-dya	Hydera-bad	Aver-age	Ra-nk	Aver-age	Ra-nk
VTCC-1	84.0	15.3	11.1	36.8	9	116.3	56.3	22.7	11.3	58.7	53.1	9	285.7	48.3	18.6	117.5	4	66.2	9
VTCC-2	93.0	85.0	19.3	65.8	6	184.6	76.8	26.2	18.7	86.4	78.5	6	237.1	39.9	18.9	98.6	6	80.5	5
VTCC-3	129.0	176.3	16.4	107.2	1	239.6	91.6	22.9	2.9	157.1	102.8	3	395.1	79.3	25.6	166.7	1	121.4	1
VTCC-4	121.0	135.8	14.5	90.4	4	223.9	65.9	21.3	12.9	107.3	86.3	4	235.7	69.1	27.3	110.7	5	94.1	4
VTCC-5	83.0	51.9	9.8	48.3	8	147.6	58.5	26.1	13.1	167.5	82.6	5	178.7	51.8	18.4	83.0	8	73.3	7
VTCC-6	140.0	144.1	17.0	100.4	3	220.4	97.7	25.8	16.2	202.9	112.6	2	290.0	95.9	34.9	140.3	3	116.8	3
VTCC-7		60.7		60.7	7				13.4	132.1	72.8	8						68.7	8
VTCC-8	99.0	96.0	11.7	68.9	5	133.1	73.4	23.5	21.1	130.2	76.3	7	186.1	66.9	20.4	91.1	7	78.3	6
VTCC-9	133.0	155.0	16.0	101.3	2	237.8	78.0	29.3	14.8	229.2	117.8	1	314.1	83.5	24.8	140.8	2	119.6	2
Mean	110.3	102.2	14.5	75.5		187.9	74.8	24.7	13.8	141.3	87.0		265.3	66.9	23.6	118.6		91.0	
CD at 5%	31.7	20.5	2.8			19.3	12.6	3.5	3.7	7.1			13.1	10.3	5.4				
CV%	16.4	11.8	11.1			5.9	9.6	8.0	13.2	28.9			3.1	15.3	13.0				

Table 13.3: VT *Cenchrus ciliaris*-2015 (2nd Year): Varietal Trial in *Cenchrus ciliaris* (Perennial): Green Forage Yield (q/ha/day)

Entries	Jodhpur	Hisar	Avikanagar	Anand	Jabalpur	Jhansi	Hyderabad	Average	Rank
VTCC-1	1.60	0.97	0.96	1.00	0.17	1.45	0.71	0.98	9
VTCC-2	2.27	5.01	1.44	1.32	0.28	1.80	0.69	1.83	7
VTCC-3	2.11	10.07	1.43	1.73	0.33	3.16	0.91	2.82	1
VTCC-4	2.24	7.59	1.17	1.75	0.19	2.24	0.99	2.31	5
VTCC-5	2.05	3.27	0.90	1.37	0.19	2.94	0.67	1.63	8
VTCC-6	1.14	8.84	1.45	1.71	0.24	3.92	1.33	2.66	3
VTCC-7		3.40			0.20	3.41		2.34	4
VTCC-8	2.21	5.64	0.90	1.09	0.31	2.97	0.80	1.99	6
VTCC-9	1.24	8.88	1.14	1.55	0.22	4.95	1.02	2.71	2
Mean	1.86	5.96	1.17	1.44	0.24	2.98	0.89	2.14	

Table 13.4: VT *Cenchrus ciliaris*-2015 (2nd Year): Varietal Trial in *Cenchrus ciliaris* (Perennial): Dry Matter Yield (q/ha/day)

Entries	Hisar	Avikanagar	Anand	Jabalpur	Jhansi	Hyderabad	Average	Rank
VTCC-1	0.30	0.19	0.30	0.03	0.59	0.15	0.26	9
VTCC-2	1.77	0.32	0.48	0.05	0.88	0.15	0.61	7
VTCC-3	3.77	0.29	0.63	0.06	1.57	0.20	1.09	2
VTCC-4	3.00	0.22	0.59	0.04	1.08	0.22	0.86	5
VTCC-5	1.17	0.18	0.39	0.04	1.62	0.15	0.59	8
VTCC-6	3.01	0.27	0.58	0.04	1.92	0.28	1.02	3
VTCC-7	1.33			0.04	1.35		0.91	4
VTCC-8	1.98	0.21	0.35	0.06	1.29	0.16	0.67	6
VTCC-9	3.26	0.25	0.62	0.04	2.27	0.20	1.11	1
Mean	2.18	0.24	0.49	0.04	1.40	0.19	0.79	

Table 13.5: VT *Cenchrus ciliaris*-2015 (2nd Year): Varietal Trial in *Cenchrus ciliaris* (Perennial): Crude Protein Yield (q/ha)

Entries	Anand	Rahuri	Urulikanchan	Jabalpur	Mandya	Hyderabad	Average	Rank
VTCC-1	8.3	4.4	1.8	0.7	2.1	1.6	3.1	8
VTCC-2	14.2	6.2	2.1	1.3	2.5	1.3	4.6	5
VTCC-3	15.7	5.2	1.8	1.7	4.2	1.9	5.1	2
VTCC-4	16.1	5.0	1.7	0.9	2.4	2.2	4.7	4
VTCC-5	10.6	4.4	2.1	0.9	2.3	1.5	3.6	6
VTCC-6	16.9	5.6	2.0	1.0	5.1	2.9	5.6	1
VTCC-7				0.8			0.8	9
VTCC-8	8.5	5.1	1.9	1.5	2.9	1.3	3.5	7
VTCC-9	15.3	5.3	2.3	1.0	3.7	2.2	5.0	3
Mean	13.2	5.1	2.0	1.1	3.1	1.9	4.0	

Table 13.6: VT *Cenchrus ciliaris*-2015 (2nd Year): Varietal Trial in *Cenchrus ciliaris* (Perennial): Crude Protein (%)

Entries	Hisar	Anand	Rahuri	Urulikanchan	Jabalpur	Mandya	Hyderabad	Coimbatore	Average	Rank
VTCC-1	9.5	6.9	7.7	8.1	6.5	4.4	8.6	10.9	7.8	2
VTCC-2	9.5	6.9	8.1	7.8	6.6	6.1	6.7	7.9	7.5	4
VTCC-3	10.1	5.9	5.7	8.0	7.3	5.3	7.4	7.9	7.2	6
VTCC-4	10.2	6.6	7.6	7.9	7.2	3.5	8.1	8.8	7.5	4
VTCC-5	10.0	7.0	7.5	8.0	7.1	4.4	8.2	10.1	7.8	2
VTCC-6	9.8	7.1	5.7	7.8	6.7	5.3	8.3	8.3	7.4	5
VTCC-7	10.1				6.8				8.4	1
VTCC-8	10.1	6.1	7.0	8.1	7.4	4.4	6.4	6.6	7.0	8
VTCC-9	9.4	6.2	6.8	7.8	7.1	4.4	9.0	10.5	7.6	3
Mean	9.8	6.6	7.0	7.9	6.9	4.7	7.8	8.9	7.6	

Table 13.7: VT *Cenchrus ciliaris*-2015 (2nd Year): Varietal Trial in *Cenchrus Ciliaris* (Perennial): Plant Height (cm)

Entries	Ludh-iana	Jodh-pur	His-ar	Avika-nagar	Ana-and	Rah-uri	Urulikan-ghan	Jabal-pur	Jha-nsi	Man-dya	Hydera-bad	Aver-age	Ra-nk
VTCC-1	115.0	93.4	67.1	95.1	87.8	66.5	68.1	50.6	83.3	54.9	70.0	77.4	8
VTCC-2	130.0	112.2	82.8	99.7	97.3	81.2	63.1	58.3	115.3	59.9	69.3	88.1	4
VTCC-3	139.0	101.7	96.7	106.9	108.6	108.2	64.4	65.2	102.3	71.9	63.8	93.5	1
VTCC-4	118.0	101.4	99.8	96.1	104.6	76.0	69.9	55.8	88.7	61.4	77.0	86.2	6
VTCC-5	112.0	82.7	73.4	105.9	86.2	56.0	73.9	52.0	83.0	63.1	70.0	78.0	7
VTCC-6	145.0	85.0	90.6	97.6	109.7	110.3	70.9	53.9	100.0	68.5	83.1	92.2	3
VTCC-7			81.0	-				60.4	92.7			78.0	7
VTCC-8	125.0	107.6	97.6	95.9	90.0	85.0	62.7	61.0	94.3	69.5	78.7	87.9	5
VTCC-9	153.0	91.1	88.4	99.0	114.7	107.3	65.0	56.4	95.0	79.9	76.7	93.3	2
Mean	129.6	96.9	86.4	99.5	99.9	86.3	67.2	57.1	95.0	66.1	73.6	86.1	

Table 13.8: VT *Cenchrus ciliaris*-2015 (2nd Year): Varietal Trial in *Cenchrus ciliaris* (Perennial): Leaf Stem Ratio

Entries	Hisar	Avikanagar	Anand	Rahuri	Urulikanchan	Jabalpur	Mandya	Hyderabad	Average	Rank
VTCC-1	1.31	1.02	1.08	1.25	0.70	0.61	0.68	0.73	0.92	5
VTCC-2	1.01	1.32	1.06	0.97	0.77	0.49	0.71	0.67	0.88	7
VTCC-3	1.21	1.20	1.32	1.22	0.76	0.65	0.77	0.62	0.97	4
VTCC-4	1.08	1.54	1.18	0.71	0.72	0.55	0.63	0.58	0.87	8
VTCC-5	2.17	1.01	1.21	1.53	0.68	0.60	0.61	0.72	1.07	3
VTCC-6	1.29	2.13	1.21	1.72	0.78	0.52	0.62	0.88	1.14	1
VTCC-7	1.09	-				0.48			0.79	9
VTCC-8	1.04	1.36	1.07	1.15	0.66	0.58	0.58	0.81	0.91	6
VTCC-9	1.41	2.37	1.14	1.31	0.65	0.50	0.72	0.73	1.10	2
Mean	1.29	1.49	1.16	1.23	0.72	0.55	0.67	0.72	0.96	

Table 13.9: VT *Cenchrus ciliaris*-2015 (2nd Year): Varietal Trial in *Cenchrus ciliaris* (Perennial): ADF (%), NDF (%) & IVDMD (%)

Entries	ADF (%)		NDF (%)		IVDMD (%)			
	Rahuri	Rank	Rahuri	Rank	Rahuri	Hisar	Average	Rank
VTCC-1	41.4	1	60.1	1	55.6	50.4	53.0	2
VTCC-2	47.8	7	64.2	6	50.6	50.7	50.7	8
VTCC-3	49.0	8	66.8	7	49.6	52.7	51.2	7
VTCC-4	44.1	5	62.8	3	53.5	55.2	54.4	1
VTCC-5	42.1	2	60.7	2	55.1	48.9	52.0	5
VTCC-6	43.0	3	63.4	4	54.4	50.2	52.3	4
VTCC-7						51.9	51.9	6
VTCC-8	44.8	6	63.4	4	52.9	50.8	51.9	6
VTCC-9	44.0	4	63.5	5	53.6	51.7	52.7	3
Mean	44.5		63.1		53.2	51.4	52.2	

Table 14.1: VT *Cenchrus setigerus*-2015 (2nd Year): Varietal Trial in *Cenchrus setigerus* (Perennial): Green Forage Yield (q/ha)

Entries	North West Zone				Central Zone						South Zone					All India	
	Jodhpur	Avikanagar	Average	Rank	Anand	Rahuri	**Dhari	Jhansi	Average	Rank	Coimbatore	Mandya	Hyderabad	Average	Rank	Average	Rank
VTCS-15-1	107.1	73.7	90.4	7	581.0	171.2	48.3	130.6	294.2	6	1969.4	336.9	170.5	825.6	1	442.5	1
VTCS-15-2	130.3	53.4	91.8	6	315.0	165.4	18.7	66.7	182.4	9	1247.2	142.4	108.3	499.3	9	278.6	9
VTCS-15-3	126.3	98.7	112.5	4	564.0	140.6	52.4	377.8	360.8	2	1798.5	272.3	122.7	731.2	2	437.6	2
VTCS-15-4	152.2	115.0	133.6	1	601.0	256.7	41.4	233.3	363.7	1	1497.2	306.2	188.8	664.1	4	418.8	3
VTCS-15-5	135.7	45.2	90.4	7	555.0	214.6	50.2	261.1	343.6	3	1686.0	213.6	163.8	687.8	3	409.4	4
VTCS-15-6	104.0	73.2	88.6	8	380.0	143.7	24.9	244.4	256.0	7	1599.9	60.2	125.0	595.0	5	341.3	7
VTCS-15-7	156.5	93.8	125.2	3	480.0	211.0	32.3	274.2	321.7	4	1308.3	178.9	88.9	525.4	8	349.0	6
VTCS-15-8	153.7	107.6	130.7	2	649.0	149.9	68.9	122.2	307.0	5	1419.4	220.3	97.2	579.0	7	364.9	5
VTCS-15-9	124.6	59.7	92.2	5	385.0	234.2	20.1	122.2	247.1	8	1549.9	51.6	152.7	584.7	6	335.0	8
Mean	132.2	80.0	106.1		501.1	187.5	39.7	203.6	297.4		1564.0	198.0	135.3	632.4		375.2	
CD at 5%	NS	17.6			98.7	41.0	7.1	1.5			147.2	17.4	18.6				
CV%	17.8	12.7			11.3	12.6	10.4	4.4			5.5	5.1	7.9				

Note: ** Data abnormally low hence not considered in zonal and all India average

Table 14.2: VT *Cenchrus setigerus*-2015 (2nd Year): Varietal Trial in *Cenchrus setigerus* (Perennial): Dry Matter Yield (q/ha)

Entries	North West Zone		Central Zone						South Zone					All India	
	Avikanagar	Rank	Anand	Rahuri	**Dhari	Jhansi	Average	Rank	Coimbatore	Mandya	Hyderabad	Average	Rank	Average	Rank
VTCS-15-1	16.1	5	209.6	59.4	39.2	58.6	109.2	6	370.1	88.5	43.7	167.4	1	110.7	2
VTCS-15-2	10.6	8	95.7	46.9	12.1	34.0	58.9	9	183.2	39.4	26.8	83.1	9	56.1	9
VTCS-15-3	19.7	4	197.7	42.7	38.4	224.1	154.8	1	325.5	63.3	31.2	140.0	2	117.8	1
VTCS-15-4	22.9	2	217.4	85.3	25.5	90.3	131.0	2	211.0	80.0	46.3	112.4	4	97.3	4
VTCS-15-5	9.9	9	169.5	70.6	33.9	132.6	124.2	3	270.1	68.0	41.4	126.5	3	99.5	3
VTCS-15-6	15.1	6	126.8	45.0	20.2	136.6	102.8	7	237.6	17.2	27.3	94.0	6	78.2	7
VTCS-15-7	22.4	3	170.4	65.6	21.0	94.3	110.1	5	189.3	46.5	19.7	85.2	8	78.6	6
VTCS-15-8	25.7	1	233.7	48.7	44.5	51.8	111.4	4	203.3	59.9	25.0	96.1	5	86.6	5
VTCS-15-9	12.8	7	122.5	68.7	11.8	48.9	80.0	8	235.2	13.2	32.1	93.5	7	68.1	8
Mean	17.2		171.5	59.2	27.4	96.8	109.2		247.3	52.9	32.6	110.9		88.1	
CD at 5%	3.9		35.1	13.0	7.2	0.9			22.7	12.5	5.6				
CV%	12.9		11.7	12.7	15.2	5.6			5.2	13.6	9.9				

Note: ** Data abnormally low hence not considered in zonal and all India average

Table 14.3: VT *Cenchrus setigerus*-2015 (2nd Year): Varietal Trial in *Cenchrus setigerus* (Perennial): GFY (q/ha/day) & DMY (q/ha/day)

Entries	GFY (q/ha/day)								DMY (q/ha/day)						
	Jodhpur	Avikanagar	Anand	Dhatri	Jhansi	Hyderabad	Average	Rank	Avikanagar	Anand	Dhatri	Jhansi	Hyderabad	Average	Rank
VTCS-15-1	0.95	1.26	1.49	0.58	1.32	1.22	1.14	6	0.27	0.54	0.47	0.59	0.31	0.44	7
VTCS-15-2	1.16	0.98	0.81	0.26	0.68	0.77	0.78	8	0.20	0.25	0.17	0.35	0.19	0.23	9
VTCS-15-3	1.13	1.62	1.45	0.59	4.30	0.88	1.66	1	0.32	0.51	0.43	2.57	0.22	0.81	1
VTCS-15-4	1.35	2.09	1.54	0.47	2.48	1.35	1.55	2	0.42	0.56	0.29	0.96	0.33	0.51	3
VTCS-15-5	1.21	0.70	1.42	0.58	2.67	1.17	1.29	4	0.15	0.43	0.39	1.35	0.30	0.52	2
VTCS-15-6	0.93	1.18	0.97	0.37	2.57	0.89	1.15	5	0.24	0.33	0.3	1.44	0.19	0.50	4
VTCS-15-7	1.39	1.64	1.23	0.48	2.58	0.63	1.32	3	0.39	0.44	0.31	0.98	0.14	0.45	6
VTCS-15-8	1.37	1.92	1.66	0.77	1.36	0.69	1.29	4	0.46	0.60	0.5	0.58	0.18	0.46	5
VTCS-15-9	1.11	0.97	0.99	0.29	1.35	1.09	0.97	7	0.21	0.31	0.17	0.54	0.23	0.29	8
Mean	1.18	1.37	1.28	0.49	2.15	0.97	1.24		0.30	0.44	0.34	1.04	0.23	0.47	

Table 14.4: VT *Cenchrus setigerus*-2015 (2nd Year): Varietal Trial in *Cenchrus setigerus* (Perennial): Crude Protein Yield (q/ha) & Crude Protein (%)

Entries	Crude Protein Yield (q/ha)						Crude Protein (%)						
	Anand	Rahuri	Mandya	Hyderabad	Average	Rank	Anand	Rahuri	Mandya	Hyderabad	Coimbatore	Average	Rank
VTCS-15-1	13.4	4.4	4.7	3.5	6.5	1	6.4	7.4	5.3	7.9	9.6	7.3	2
VTCS-15-2	6.8	3.4	1.7	2.3	3.5	6	6.9	7.2	4.4	8.4	11.8	7.7	1
VTCS-15-3	12.3	2.6	4.4	2.4	5.4	2	6.4	6.1	7.0	7.6	9.2	7.3	2
VTCS-15-4	13.5	5.6	3.5	3.6	6.5	1	5.9	6.5	4.4	7.8	8.3	6.6	5
VTCS-15-5	10.8	5.4	2.7	2.7	5.4	2	6.2	7.7	3.9	6.5	8.3	6.5	6
VTCS-15-6	7.8	3.5	0.8	1.8	3.5	6	6.1	7.9	4.8	6.6	7.9	6.7	4
VTCS-15-7	10.1	5.0	2.9	1.3	4.8	4	5.8	7.7	6.1	6.6	7	6.6	5
VTCS-15-8	13.5	3.2	2.3	1.6	5.1	3	5.8	6.5	3.9	6.3	6.6	5.8	7
VTCS-15-9	8.0	5.6	0.5	2.4	4.1	5	6.5	8.1	3.9	7.6	8.3	6.9	3
Mean	10.7	4.3	2.6	2.4	5.0		6.2	7.2	4.9	7.3	8.6	6.8	

Table 14.5: VT *Cenchrus setigerus*-2015 (2nd Year): Varietal Trial in *Cenchrus setigerus* (Perennial): Plant Height (cm) & Leaf Stem Ratio

Entries	Plant Height (cm)										Leaf Stem Ratio							
	Jodhpur	Avikanagar	Anand	Rahuri	Dhatri	Jhansi	Mandya	Hyderabad	Average	Rank	Avikanagar	Anand	Rahuri	Dhatri	Mandya	Hyderabad	Average	Rank
VTCS-15-1	72.9	77.7	91.6	73.5	96.7	85.7	36.7	94.1	78.6	6	1.83	1.44	1.21	0.90	0.56	0.68	1.10	3
VTCS-15-2	67.4	63.5	64.4	46.0	62.6	96.3	38.3	73.3	64.0	8	0.93	1.40	1.22	0.78	0.52	0.85	0.95	6
VTCS-15-3	79.5	62.2	94.6	87.0	108.9	96.0	52.3	84.9	83.2	5	1.93	1.29	1.43	0.85	0.49	0.66	1.11	2
VTCS-15-4	83.8	102.4	98.7	103.3	111.1	78.3	47.4	97.8	90.4	2	2.23	1.31	1.22	0.87	0.50	0.72	1.14	1
VTCS-15-5	80.8	45.3	95.5	103.0	117.3	87.0	62.4	101.3	86.6	3	1.60	1.31	1.53	0.83	0.64	0.63	1.09	4
VTCS-15-6	76.6	55.4	68.3	48.0	66.1	91.0	24.1	76.9	63.3	9	1.10	1.30	0.86	0.92	0.45	0.79	0.90	8
VTCS-15-7	82.5	98.5	90.9	87.3	107.5	84.7	55.7	72.2	84.9	4	1.87	1.09	1.46	0.81	0.59	0.74	1.09	4
VTCS-15-8	86.0	97.4	96.1	93.2	123.6	92.7	57.9	99.8	93.3	1	1.40	1.44	1.22	0.82	0.62	0.69	1.03	5
VTCS-15-9	88.0	56.5	67.1	38.7	78.6	85.0	32.7	75.1	65.2	7	1.13	1.42	0.91	0.74	0.57	0.88	0.94	7
Mean	79.7	73.2	85.2	75.6	96.9	88.5	45.3	86.2	78.8		1.56	1.33	1.23	0.84	0.55	0.74	1.04	

Table 14.6: VT *Cenchrus setigerus*-2015 (2nd Year): Varietal Trial in *Cenchrus setigerus* (Perennial): ADF (%), NDF (%) & IVDMD (%)

Entries	ADF (%)		NDF (%)		IVDMD (%)	
	Rahuri	Rank	Rahuri	Rank	Rahuri	Rank
VTCS-15-1	38.7	1	53.7	1	57.8	1
VTCS-15-2	43.6	8	62.5	7	53.9	8
VTCS-15-3	46.0	9	65.8	9	52.0	9
VTCS-15-4	42.2	4	62.4	6	55.0	4
VTCS-15-5	42.9	6	63.0	8	54.4	6
VTCS-15-6	39.1	2	58.2	2	57.4	2
VTCS-15-7	39.9	3	59.4	3	56.8	3
VTCS-15-8	42.8	5	61.5	5	54.5	5
VTCS-15-9	43.3	7	61.1	4	54.1	7
Mean	42.1		60.8		55.1	

15. VTBN-2015 (2ND YEAR): VARIETAL TRIAL IN BAJRA NAPIER HYBRID (PERENNIAL)

(Reference Table: 15.1 to 15.8)

The trial was established in 2015 with nine entries including the checks. Data has been reported from 18 locations spread across five zones of the country.

For green fodder yield (q/ha) VTBN-2015-3 was highest yielder in hill zone and NE zone yielding 512 q and 615.5 q respectively. IN NW zone VTBN-2015-4 (1194 q) and in south zone VTBN-2015-2 (1009.2 q) were best yielders. VTBN-2015-1 performed best in Central zone (1391 q) and also at all India level (1002.8q). VTBN-2015-2 was second best at all India level producing 986.6 q.

For dry matter yield (q/ha), VTBN-2015-3 (96.2q) in hill zone, VTBN-2015-4 (299.5q) in NW zone, VTBN-2015-6 (161.6 q) in NE zone, VTBN-2015-5 (289.5q) in central zone, VTBN-2015-1 (229 q) in south zone were highest yielders. AT all India level VTBN-2015-2 was best (228.9q) followed by VTBN-2015-1 (217.6q).

For green and dry forage per day productivity (q/ha/day) VTBN-2015-8 was best performer with yield of 5.16q/ha/day and 1.26 q/ha/day respectively. Entry VTBN-2015-2 was second best with green fodder yield of 4.88 q/ha/day and dry fodder yield of 1.20 q/ha/day.

For crude protein yield VTBN-2015-2 (14.9q) followed by VTBN-2015-1 (13.2 q) were best performers. For crude protein content VTBN-2015-2 ranked first (14.9%) followed by VTBN-2015-6 (8.4%). For plant height, ADF%, NDF%, IVDMD%, VTBN-2015-6 was best performer. For leafiness, entry VTBN-2015-7 (0.83) ranked first.

[The trial will continue in coded form].

16. VT *SETARIA* GRASS -2015 (2ND YEAR): VARIETAL TRIAL IN *SETARIA ANCEPS* UNDER COOL SUB- TROPICAL AND SUB-TEMPERATE HIMALAYAN RANGE LANDS (PERENNIAL)

(Reference Table: 16.1 to 16.4)

The trial was established in 2015. Data has been reported for 6 entries including checks from 4 locations. Entry VTSG-5 was top performer for green fodder yield (285.9q), dry fodder yield (84.1q), crude protein yield (8.9q). Entry VTSG-1 ranked second for green fodder yield (274.3q), dry fodder yield (72.7q), crude protein yield (7.0q).

For crude protein content CVTSG-1 was best with 8.1%CP which was followed by VTSG-5 (7.9%CP). For plant height VTSG-1 was best with 109.2 cm, followed by VTSG-5 with 102.3 cm height. For leafiness, VTSG-1 and VTSG-5 ranked joint first with value of 0.8. For other quality parameters, VTSG-3 and VTSG-1 were best for ADF and NDF respectively.

[The trial will continue in coded form].

Table 15.1: VTBN-2015 (2nd Year): Varietal Trial in Bajra Napier Hybrid (Perennial): Green Forage Yield (q/ha)

Entries	Hill Zone		North West Zone				North East Zone				
	Palam-pur	Rank	Ludh-iana	His-ar	Aver-age	Rank	Bhuban-eswar	Jor-hat	Ran-chi	Aver-age	Rank
VTBN-2015-1	438.7	3	1355.3	576.2	965.8	6	444.5	768.0	513.9	575.5	2
VTBN-2015-2	398.7	4	1509.5	782.2	1145.9	2	337.5	779.5	537.1	551.4	4
VTBN-2015-3	512.0	1	952.4	643.8	798.1	9	540.3	727.5	578.8	615.5	1
VTBN-2015-4	386.0	6	1624.8	763.1	1194.0	1	300.0	811.7	430.6	514.1	8
VTBN-2015-5	346.0	8	1191.9	819.2	1005.6	5	419.5	746.5	546.3	570.7	3
VTBN-2015-6	388.7	5	1102.5	784.3	943.4	8	315.3	700.5	560.1	525.3	6
VTBN-2015-7	237.3	9	1301.7	718.1	1009.9	4	473.7	656.0	425.8	518.5	7
VTBN-2015-8	502.7	2	1401.6	876.5	1139.1	3	352.8	739.0	541.7	544.5	5
VTBN-2015-9	365.3	7	1309.8	611.5	960.7	7	376.4	548.8	574.0	499.7	9
Mean	397.3		1305.5	730.5	1018.0		395.6	719.7	523.1	557.6	
CD at 5%	86.4		172.1	55.8			14.7	21.4	82.6		
CV%	12.6		9.6	12.9			2.5	15.4	9.1		

Table 15.1: VTBN-2015 (2nd Year): Varietal Trial in Bajra Napier Hybrid (Perennial): Green Forage Yield (q/ha)

Entries	Central Zone									South Zone							All India	
	Ana-and	Rah-uri	**Jabal-pur	**Rai-pur	Urulikan-chan	Pal-gar	Jha-nsi	Aver-age	Rank	Coimb-atore	Man-dya	Vella-yani	Hydera-bad	Dhar-wad	Aver-age	Rank	Aver-age	Rank
VTBN-2015-1	2341.0	1031.4	124.9	126.5	790.1	1553.5	1238.9	1391.0	1	2269.4	469.4	1237.3	405.4	611.6	998.6	2	1002.8	1
VTBN-2015-2	2272.0	997.5	138.2	107.7	605.0	1208.9	1311.1	1278.9	2	1911.0	525.7	1205.8	771.9	631.5	1009.2	1	986.6	2
VTBN-2015-3	1845.0	899.1	168.2	119.8	746.9	1232.4	1654.0	1275.5	3	1880.5	471.0	1050.2	538.7	639.8	916.0	5	932.0	5
VTBN-2015-4	1872.0	774.3	154.1	113.0	796.3	1126.9	1413.8	1196.7	6	1894.4	373.6	1280.9	322.1	712.0	916.6	4	930.2	6
VTBN-2015-5	1768.0	920.7	227.4	123.3	975.3	1240.6	1438.9	1268.7	4	1755.5	347.8	1055.0	710.8	666.7	907.1	6	934.3	4
VTBN-2015-6	2186.0	694.4	91.6	143.6	691.4	1066.5	1050.0	1137.7	8	1688.8	371.6	1133.9	405.4	625.0	844.9	7	860.3	7
VTBN-2015-7	1253.0	468.0	128.2	181.5	623.5	1006.0	1105.6	891.2	9	1999.9	395.1	691.4	388.7	661.1	827.2	8	775.3	9
VTBN-2015-8	2338.0	909.9	105.8	206.3	660.5	1039.4	1316.7	1252.9	5	1902.7	400.3	1263.4	455.4	773.1	959.0	3	967.1	3
VTBN-2015-9	1906.0	877.3	111.6	115.2	740.8	1043.1	1322.2	1177.9	7	1599.9	486.4	935.1	355.4	702.8	815.9	9	859.7	8
Mean	1975.7	841.4	138.9	137.4	736.6	1168.6	1316.8	1207.8		1878.0	426.8	1094.8	483.8	669.3	910.5		916.5	
CD at 5%	195.9	96.3	30.1	34.7	73.1	64.6	139.7			120.5	52.4	47.6	46.5	62.6				
CV%	5.9	6.6	12.6	14.8	5.7	3.2	6.1			3.7	7.1	2.5	5.6	5.4				

Note: ** Data abnormally low hence not considered in zonal and all India average

Table 15.2: VTBN-2015 (2nd Year): Varietal Trial in Bajra Napier Hybrid (Perennial): Dry Matter Yield (q/ha)

Entries	Hill Zone		North West Zone				North East Zone			
	Palampur	Rank	Ludhiana	Hisar	Average	Rank	Jorhat	Ranchi	Average	Rank
VTBN-2015-1	82.5	3	281.9	194.4	238.2	5	175.2	114.2	144.7	3
VTBN-2015-2	74.9	4	335.1	243.0	289.1	2	187.0	115.7	151.4	2
VTBN-2015-3	96.2	1	209.5	185.7	197.6	9	167.3	116.5	141.9	4
VTBN-2015-4	74.7	5	360.7	238.4	299.5	1	189.0	93.9	141.4	5
VTBN-2015-5	66.1	8	256.2	231.0	243.6	4	170.3	110.0	140.1	6
VTBN-2015-6	73.3	6	224.9	191.0	207.9	8	168.3	154.9	161.6	1
VTBN-2015-7	45.1	9	261.7	167.8	214.8	7	145.8	97.4	121.6	9
VTBN-2015-8	94.7	2	294.3	225.2	259.7	3	172.0	106.8	139.4	7
VTBN-2015-9	70.6	7	280.3	162.6	221.4	6	137.7	112.6	125.2	8
Mean	75.3		278.3	204.3	241.3		168.1	113.5	140.8	
CD at 5%	16.5		82.5	28.7			8.4	22.6		
CV%	12.7		16.8	14.6			12.6			

Table 15.2: VTBN-2015 (2nd Year): Varietal Trial in Bajra Napier Hybrid (Perennial): Dry Matter Yield (q/ha)

Entries	Central Zone									South Zone							All India	
	Ana- nd	Rah- uri	**Jabal- pur	**Rai- pur	Urulikan- chan	Pal- ghar	Jha- nsi	Aver- age	Ra- nk	Coimb- atore	Man- dya	Vella- yani	Hydera- bad	Dhar- wad	Aver- age	Ra- nk	Aver- age	Ra- nk
VTBN-2015-1	323.4	267.7	21.5	40.0	147.6	289.3	242.9	254.2	5	511.1	78.0	303.2	75.5	177.3	229.0	1	217.6	2
VTBN-2015-2	394.7	256.3	24.0	29.8	115.9	227.0	365.3	271.8	3	336.2	121.6	298.1	150.4	213.1	223.9	2	228.9	1
VTBN-2015-3	303.5	196.9	29.6	29.1	148.1	228.8	482.4	272.0	2	360.7	96.3	257.1	109.2	231.0	210.9	3	212.6	4
VTBN-2015-4	290.9	209.1	26.9	28.1	158.1	212.1	341.9	242.4	6	314.3	74.3	313.7	64.4	235.9	200.5	5	211.4	5
VTBN-2015-5	310.1	203.8	40.0	38.6	179.0	233.2	521.4	289.5	1	284.5	64.7	260.9	134.1	230.9	195.0	6	217.1	3
VTBN-2015-6	305.9	147.7	14.7	47.5	131.3	196.0	415.0	239.2	8	278.6	76.4	278.2	74.3	211.9	183.9	8	195.2	8
VTBN-2015-7	230.0	125.2	22.2	43.8	126.0	188.5	347.6	203.5	9	411.3	79.2	170.7	77.4	225.4	192.8	7	179.9	9
VTBN-2015-8	341.6	200.5	18.2	51.3	130.6	192.9	346.0	242.3	7	315.6	72.4	312.9	90.4	257.6	209.8	4	210.2	6
VTBN-2015-9	325.4	221.4	19.2	22.9	143.6	194.8	386.8	254.4	4	276.3	88.2	231.2	64.7	242.0	180.5	9	195.9	7
Mean	313.9	203.2	24.0	36.8	142.2	218.1	383.3	252.1		343.2	83.5	269.6	93.4	225.0	202.9		207.7	
CD at 5%	29.5	23.0	5.2	17.4	14.0	3.5	73.7			23.2	21.5	7.2	12.1	24.8				
CV%	5.6	6.5	12.5	10.9	5.6	0.9	11.1			3.8	14.9	1.5	7.5	6.4				

Note: ** Data abnormally low hence not considered in zonal and all India average

Table 15.3: VTBN-2015 (2nd Year) Varietal Trial in Bajra Napier Hybrid (Perennial): GFY (q/ha/day) & DMY (q/ha/day)

Entries	GFY (q/ha/day)									DMY (q/ha/day)								
	Ludh-iana	Ran-chi	Ana-nd	Jabal-pur	Rai-pur	Hydera-bad	Dhar-wad	Aver-age	Ra-nk	Ludh-iana	Ran-chi	Ana-nd	Jabal-pur	Rai-pur	Hydera-bad	Dhar-wad	Aver-age	Ra-nk
VTBN-2015-1	7.30	1.40	7.83	0.34	2.26	2.70	10.19	4.57	4	1.50	0.31	1.08	0.05	0.71	0.50	2.95	1.01	9
VTBN-2015-2	8.20	1.47	7.60	0.37	1.74	4.29	10.52	4.88	2	1.80	0.31	1.32	0.06	0.48	0.88	3.55	1.20	2
VTBN-2015-3	5.10	1.58	6.17	0.46	1.84	3.17	10.66	4.14	8	1.10	0.31	1.02	0.08	0.45	0.64	3.85	1.06	8
VTBN-2015-4	8.80	1.17	6.26	0.42	1.77	2.01	11.87	4.61	3	1.90	0.25	0.97	0.07	0.44	0.43	3.93	1.14	4
VTBN-2015-5	6.40	1.49	5.91	0.62	2.37	4.18	11.11	4.58	4	1.40	0.30	1.04	0.10	0.74	0.77	3.85	1.17	3
VTBN-2015-6	6.00	1.53	7.31	0.25	2.61	2.53	10.42	4.38	6	1.20	0.42	1.02	0.04	0.86	0.46	3.53	1.08	7
VTBN-2015-7	7.00	1.16	4.19	0.35	2.98	2.36	11.02	4.15	7	1.40	0.26	0.77	0.06	0.72	0.46	3.76	1.06	6
VTBN-2015-8	7.60	1.48	7.82	0.29	3.33	2.68	12.89	5.16	1	1.60	0.29	1.14	0.05	0.83	0.60	4.29	1.26	1
VTBN-2015-9	7.10	1.57	6.37	0.30	2.17	2.09	11.71	4.47	5	1.50	0.30	1.09	0.05	0.43	0.43	4.03	1.12	5
Mean	14.11	2.86	13.21	0.76	4.68	5.78	22.31	9.10		1.49	0.31	1.05	0.06	0.63	0.57	3.75	1.12	

Table 15.4: VTBN-2015 (2nd Year) Varietal Trial in Bajra Napier Hybrid (Perennial): Crude Protein Yield (q/ha)

Entries	Palampur	Ludhiana	Jorhat	Anand	Rahuri	Urulikanchan	Jabalpur	Raipur	Palghar	Mandya	Hyderabad	Average	Rank
VTBN-2015-1	7.0	29.9	10.9	27.6	22.3	10.4	1.7	2.9	19.9	4.4	7.7	13.2	2
VTBN-2015-2	6.6	35.9	13.5	35.7	22.2	8.8	1.9	2.3	14.7	4.8	17.4	14.9	1
VTBN-2015-3	7.4	18.4	12.9	26.4	17.9	11.2	2.4	2.0	15.6	6.7	10.7	12.0	6
VTBN-2015-4	5.4	33.2	13.8	26.3	17.9	11.9	2.2	2.1	14.3	3.3	6.5	12.4	3
VTBN-2015-5	5.3	21.8	12.8	24.7	16.7	12.8	3.2	2.9	16.0	2.9	14.8	12.2	4
VTBN-2015-6	5.9	27.4	10.4	28.6	12.3	9.4	1.2	3.4	14.2	4.1	6.8	11.2	8
VTBN-2015-7	3.8	22.2	8.8	20.7	10.8	9.1	1.7	2.9	11.8	4.8	6.7	9.4	9
VTBN-2015-8	7.3	24.4	10.4	31.7	16.7	9.5	1.4	3.6	13.5	3.8	8.0	11.9	7
VTBN-2015-9	5.2	31.7	10.6	28.5	20.1	10.9	1.5	1.4	13.7	4.3	5.8	12.1	5
Mean	6.0	27.2	11.6	27.8	17.4	10.4	1.9	2.6	14.8	4.3	9.4	12.1	

Table 15.5: VTBN-2015 (2nd Year): Varietal Trial in Bajra Napier Hybrid (Perennial): Crude Protein (%)

Entries	Palam-pur	Ludh-iana	His-ar	Jor-hat	Ana-nd	Rah-uri	Urulikan-chan	Jabal-pur	Rai-pur	Pal-ghar	Man-dya	Hydera-bad	Coimba-tore	Aver-age	Ra-nk
VTBN-2015-1	8.4	10.6	9.6	6.1	8.6	8.3	7.0	8.1	7.4	6.8	5.7	10.2	11.4	8.3	3
VTBN-2015-2	8.8	10.7	9.9	7.2	9.5	8.7	7.6	8.1	7.8	6.5	3.9	11.6	11.8	8.6	1
VTBN-2015-3	7.7	8.8	9.4	7.6	9.2	9.1	7.5	8.2	6.9	6.8	7.0	9.8	9.2	8.2	4
VTBN-2015-4	7.2	9.2	9.8	7.2	9.5	8.6	7.5	8.2	7.8	6.7	4.4	10.0	10.9	8.2	4
VTBN-2015-5	8.2	8.5	9.2	7.3	8.7	8.2	7.2	8.2	7.7	6.8	4.4	11.0	10.9	8.2	4
VTBN-2015-6	8.0	12.2	11.1	6.5	9.9	8.3	7.2	8.1	7.2	7.2	5.3	9.2	9.6	8.4	2
VTBN-2015-7	8.3	8.5	10.2	6.3	9.2	8.7	7.2	8.1	6.5	6.3	6.1	8.7	8.3	7.9	5
VTBN-2015-8	7.6	8.3	10.9	6.2	9.6	8.3	7.3	8.1	7.0	6.9	5.3	8.8	8.8	7.9	5
VTBN-2015-9	7.5	11.3	11.5	7.2	9.6	9.1	7.6	8.1	6.2	7.0	4.8	9.0	9.2	8.3	3
Mean	8.0	9.8	10.2	6.8	9.3	8.6	7.3	8.1	7.2	6.8	5.2	9.8	10.0	8.2	

Table 15.6: VTBN-2015 (2nd Year) Varietal Trial in Bajra Napier hybrid (Perennial): Plant Height (cm)

Entries	Palam-pur	Ludh-iana	His-ar	Jor-hat	Ran-chi	Ana-nd	Rah-uri	Urulikan-chan	Jabal-pur	Rai-pur	Pal-ghar	Jha-nsi	Man-dya	Vella-yani	Hydera-bad	Aver-age	Ra-nk
VTBN-2015-1	219.7	111.0	130.7	233.0	96.0	173.7	234.2	120.0	36.0	187.7	122.0	180.2	106.5	194.0	112.7	150.5	6
VTBN-2015-2	196.3	135.4	160.5	150.0	95.0	189.9	229.2	134.2	41.9	183.1	110.6	143.5	87.0	223.0	270.0	156.6	2
VTBN-2015-3	204.0	96.0	136.3	198.9	97.0	172.5	207.3	109.3	46.8	209.7	111.7	300.1	40.1	199.0	198.0	155.1	3
VTBN-2015-4	214.7	155.1	146.7	221.8	94.0	177.2	217.7	148.0	44.8	151.2	106.3	227.1	56.3	200.0	165.7	155.1	3
VTBN-2015-5	185.7	125.4	169.6	166.9	95.0	176.8	212.3	133.0	50.6	171.9	115.9	138.4	56.7	223.0	241.3	150.8	5
VTBN-2015-6	194.0	118.7	166.2	184.4	94.0	181.5	231.7	124.3	35.9	297.9	100.2	148.5	104.5	227.0	165.0	158.3	1
VTBN-2015-7	131.7	127.4	136.3	154.5	100.0	159.5	126.2	140.7	35.9	230.0	76.1	221.1	26.9	157.0	169.3	132.8	8
VTBN-2015-8	207.3	140.0	156.7	138.2	98.0	181.2	236.8	127.0	33.4	249.2	84.9	215.0	60.2	257.0	92.7	151.8	4
VTBN-2015-9	186.7	128.7	143.6	161.4	97.0	162.0	209.5	160.3	31.4	126.8	92.2	185.5	120.5	169.0	167.3	142.8	7
Mean	193.3	126.4	149.6	178.8	96.2	174.9	211.6	133.0	39.6	200.8	102.2	195.5	73.2	205.4	175.8	150.4	

Table 15.7: VTBN-2015 (2nd Year): Varietal Trial in Bajra Napier Hybrid (Perennial): Leaf Stem Ratio

Entries	Palam-pur	Ludh-iana	His-ar	Jor-hat	Ran-chi	Rah-uri	Urulikan-chan	Jabal-pur	Rai-pur	Pal-ghar	Jha-nsi	Man-dya	Vella-yani	Hydera-bad	Aver-age	Ra-nk
VTBN-2015-1	0.58	0.82	0.73	0.89	0.62	0.94	0.53	0.73	1.03	0.80	0.36	0.69	0.71	0.70	0.72	7
VTBN-2015-2	0.57	0.75	1.12	0.88	0.60	0.71	0.52	0.77	0.86	0.72	0.40	0.85	0.87	0.87	0.75	5
VTBN-2015-3	0.70	0.65	1.09	0.88	0.62	0.72	0.68	0.82	0.83	0.74	0.36	0.82	1.04	0.73	0.76	4
VTBN-2015-4	0.60	0.90	1.09	0.89	0.69	0.56	0.49	0.76	1.03	0.64	0.36	0.71	0.73	0.67	0.72	6
VTBN-2015-5	0.63	0.75	0.68	0.89	0.65	0.91	0.47	0.84	0.81	0.76	0.42	0.70	1.3	1.00	0.77	3
VTBN-2015-6	0.48	0.67	1.29	0.88	0.70	0.46	0.63	0.77	1.00	0.61	0.53	0.60	0.55	0.84	0.72	7
VTBN-2015-7	0.57	0.70	0.87	0.88	0.59	1.66	0.45	0.72	0.86	0.56	0.50	0.71	1.54	0.97	0.83	1
VTBN-2015-8	0.41	0.90	1.05	0.89	0.72	0.53	0.52	0.77	1.03	0.58	0.51	0.76	0.65	0.94	0.73	6
VTBN-2015-9	0.62	0.80	0.53	0.95	0.54	1.13	0.49	0.75	1.07	0.60	0.46	0.83	1.61	0.83	0.80	2
Mean	0.57	0.77	0.94	0.89	0.64	0.85	0.53	0.77	0.95	0.67	0.43	0.74	1.00	0.84	0.76	

Table 15.8: VTBN-2015 (2nd Year): Varietal Trial in Bajra Napier Hybrid (Perennial): ADF (%), NDF (%) & IVDMD (%)

Entries	ADF (%)					NDF (%)					IVDMD (%)				
	Palam-pur	Rah-uri	Ludh-iana	Aver-age	Ra-nk	Palam-pur	Rah-uri	Ludh-iana	Aver-age	Ra-nk	Ludh-iana	Rah-uri	His-ar	Aver-age	Ra-nk
VTBN-2015-1	56.2	44.4	41.7	47.4	6	72.2	61.3	60.2	64.6	7	55.1	53.3	55.1	54.5	3
VTBN-2015-2	54.6	43.7	41.2	46.5	3	70.4	62.6	56.8	63.3	3	53.4	53.8	55.8	54.3	4
VTBN-2015-3	58.0	45.1	42.3	48.5	9	74.0	60.9	59.6	64.8	8	53.4	52.7	54.8	53.6	7
VTBN-2015-4	56.2	44.4	41.8	47.5	7	72.8	60.5	60.3	64.5	6	53.9	53.2	55.2	54.1	5
VTBN-2015-5	56.4	45.3	42.5	48.1	8	71.8	62.6	60.7	65.0	9	50.4	52.5	51.8	51.6	8
VTBN-2015-6	52.6	42.6	40.5	45.2	1	69.2	58.0	54.9	60.7	1	55.6	54.7	56.1	55.5	1
VTBN-2015-7	54.6	45.4	41.0	47.0	5	69.8	63.4	58.9	64.0	5	53.8	52.4	55.0	53.7	6
VTBN-2015-8	54.2	41.3	43.5	46.3	2	71.4	55.6	61.4	62.8	2	54.1	55.7	56.2	55.3	2
VTBN-2015-9	55.4	43.6	40.7	46.6	4	72.2	63.2	55.3	63.6	4	55.1	53.9	53.8	54.3	4
Mean	55.4	44.0	41.7	47.0		71.5	60.9	58.7	63.7		53.9	53.6	54.9	54.1	

Table 16.1: VT setaria grass-2015 (2nd Year): Varietal Trial in *Seteria ancep* (Perennial): GFY (q/ha) & DMY (q/ha)

Entries	GFY (q/ha)						DMY (q/ha)				
	Palampur	Bajaura	Almora	Jorhat	Average	Rank	Palampur	Bajaura	Jorhat	Average	Rank
VTSG-1	224.5	90.4	127.9	654.5	274.3	2	43.6	21.1	153.3	72.7	2
VTSG-2	136.4	30.6	82.6	529.6	194.8	6	27.2	6.6	128.2	54.0	6
VTSG-3	193.7	103.0	98.2	605.4	250.1	3	38.2	24.4	146.0	69.5	3
VTSG-4	185.9	67.0	107.1	600.0	240.0	4	37.0	16.0	147.1	66.7	4
VTSG-5	288.5	93.5	74.7	686.7	285.9	1	57.2	22.3	172.7	84.1	1
VTSG-6	256.8	96.5	64.3	506.3	231.0	5	51.3	23.1	120.1	64.8	5
Mean	214.3	80.1	92.5	597.1	246.0		42.4	18.9	144.6	68.6	
CD at 5%	39.3	10.3	25.0	7.8			8.0	2.4	6.0		
CV%	12.2	8.5	14.9	8.7			12.6	8.6	13.5		

Table 16.2: VT setaria grass-2015 (2nd Year): Varietal trial in *Seteria ancep* (Perennial): Crude Protein Yield (q/ha) & Crude Protein (%)

Entries	CPY (q/ha)				CP (%)			
	Palampur	Jorhat	Average	Rank	Palampur	Jorhat	Average	Rank
VTSG-1	3.2	10.8	7.0	2	7.2	7.1	7.2	5
VTSG-2	1.8	9.6	5.7	5	7.5	7.6	7.5	3
VTSG-3	2.6	9.0	5.8	4	6.9	6.3	6.6	6
VTSG-4	2.7	10.4	6.5	3	7.6	7.1	7.3	4
VTSG-5	4.3	13.5	8.9	1	7.8	7.9	7.9	2
VTSG-6	4.3	9.7	7.0	2	8.0	8.2	8.1	1
Mean	3.2	10.5	6.8		7.5	7.4	7.4	

Table 16.3: VT setaria grass-2015 (2nd Year): Varietal Trial in *Seteria ancep* (Perennial): Plant Height (cm) & Leaf Stem Ratio

Entries	Plant Height (cm)					Leaf Stem Ratio			
	Palampur	Bajaura	Jorhat	Average	Rank	Palampur	Jorhat	Average	Rank
VTSG-1	124.0	74.2	129.5	109.2	1	0.72	0.89	0.81	1
VTSG-2	88.5	68.5	98.2	85.1	6	0.63	0.90	0.77	3
VTSG-3	101.3	78.3	119.2	99.6	3	0.67	0.88	0.78	2
VTSG-4	111.3	65.0	121.0	99.1	4	0.62	0.88	0.75	4
VTSG-5	113.8	67.9	125.1	102.3	2	0.74	0.87	0.81	1
VTSG-6	124.8	78.4	65.1	89.4	5	0.49	0.87	0.68	5
Mean	110.6	72.1	109.7	97.5		0.65	0.88	0.76	

Table 16.4: VT setaria grass-2015 (2nd Year): Varietal Trial in *Seteria ancep* (Perennial): ADF (%), NDF (%)

Entries	ADF (%)		NDF (%)	
	Palampur	Rank	Palampur	Rank
VTSG-1	49.6	6	64.6	1
VTSG-2	48.6	4	67.8	4
VTSG-3	47.8	1	66.0	2
VTSG-4	48.0	2	68.2	5
VTSG-5	49.2	5	69.8	6
VTSG-6	48.2	3	67.4	3
Mean	48.6		67.3	

17. VT PENNISETUM HYBRIDS – 2015 (2ND YEAR): (*P. gluacum* x *P. squamulatum*) (PERENNIAL)

(Reference Table: 17.1 to 17.6)

The trial was established in 2015. Data has been reported for 10 entries including check from 7 locations. For green and dry fodder yield entry VTPH-5 ranked first with 251.7 q and 59.8 q respectively. Entry VTPH-2 ranked second with yield of 219.3q for green and 51.3 q for dry fodder.

For per day production potential, entry VTPH-7 was best for both green (6.22 q/ha/day) and dry matter (1.92 q/ha/day). For crude protein yield entry VTPH-5 was best followed by VTPH-8. For crude protein content, entry VTPH-10 was best (8.7%) followed closely by VTPH-4 (8.6%). For plant height, entries VTPH-9 and VTPH-8 ranked first and second with value of 133.9 cm and 128.6 cm respectively.

For leaf stem ration entry VTPH-7 was best (1.02) followed by VTPH-1 (0.96). For other quality parameters, entry VTPH-4 was best for ADF whereas entry VTPH-10 was best for NDF and IVDMD.

[The trial will continue in coded form].

18. VT *Desmanthus* - 2016 (1ST YEAR): VARIETAL TRIAL IN *DESMANTHUS* (PERENNIAL)

(Reference Tables: 18.1 to 18.6)

The trial was established in 2016. First year being the establishment year, results were reported from 7 locations in 3 zones for 6 entries.

Entry VTD-3 ranked first in NW, CZ and at all India level for green fodder yield (q/ha) producing 60.5 q, 174.1 q and 158.5 q respectively. In south zone VTD-6 was best yielder with 260.1 q. Entry VTD-5 was second at NW zone (50q), CZ (150.9q) whereas VTD -3 was second at SZ (233.1 q) Entry VTD -6 ranked second at all India level with yield of 151q.

For dry matter yield (q/ha), entry VTD-5 in NWZ (16.4q), VTD-3 in CZ (50.6q), VTD-6 in SZ (78.2 q) and VTD-3 at all India level (44.9 q) were best performers. Second best entries in different zones include VTD-3 in NWZ and SZ, VTD-6 in CZ and all India level.

For per day productivity, entry VTD-1 was best for green fodder (0.89q/ha/day) and dry fodder (0.24 q/ha/day). For crude protein yield, VTD -3 was best (6.7q) while for crude protein content entry VTD-5 was best (16.9%). For plant height VTD-3 (11.4 cm) and for leafiness entry VTD-2 (1.20) was best. For ADF and IVDMD entry VTD-3 ranked first whereas for NDF entry VTD-4 was best.

[The trial will continue in coded form].

Table 17.1: VT Pennisetum hybrids- 2015 (2nd Year): (*P. glaucum* x *P. squamulatum*) (Perennial): Green Forage Yield (q/ha)

Entries	Green Forage Yield (q/ha)								
	Ludhiana	Hisar	Anand	Rahuri	Urulikanchan	Palampur	Jorhat	Average	Rank
VTPH-1	39.0	344.4	41.0	119.9	24.7	107.7	409.0	155.1	8
VTPH-2	191.9	358.6	422.0	137.8	36.4	50.5	338.0	219.3	2
VTPH-3	157.4	427.5	101.0	63.4	35.2	86.6	463.0	190.6	4
VTPH-4	100.3	445.8	8.0	23.3	23.2	69.4	479.5	164.2	7
VTPH-5			343.0	189.4	38.5		436.0	251.7	1
VTPH-6		279.2		33.6	33.1	106.6	511.7	192.8	3
VTPH-7		320.0		30.9	25.1	86.6	398.4	172.2	5
VTPH-8		83.6	140.0		19.8		434.9	169.6	6
VTPH-9	116.9	266.7	14.0	24.0	38.8	108.9	319.2	126.9	10
VTPH-10	53.9	236.1	80.0	84.2	48.1	116.6	314.4	133.3	9
Mean	109.9	306.9	143.6	78.5	32.3	91.6	410.4	177.6	
CD at 5%	155.2	61.8	35.4	23.8	6.9	20.9	14.5		
CV%	19.5	11.8	14.1	20.8	12.3	13.0	13.2		

Table 17.2: VT Pennisetum hybrids- 2015 (2nd Year): (*P. glaucum* x *P. squamulatum*) (Perennial): Dry Matter Yield (q/ha)

Entries	Dry Matter Yield (q/ha)								
	Ludhiana	Hisar	Anand	Rahuri	Urulikanchan	Palampur	Jorhat	Average	Rank
VTPH-1	7.1	89.1	8.6	23.4	5.5	20.8	93.1	35.4	8
VTPH-2	36.1	116.4	85.6	26.3	8.4	9.6	76.9	51.3	2
VTPH-3	30.4	114.2	22.0	19.6	7.7	16.6	111.0	45.9	4
VTPH-4	19.9	122.6	1.7	5.9	5.1	13.3	110.4	39.8	7
VTPH-5			68.2	61.5	8.2		101.4	59.8	1
VTPH-6		77.7		7.0	7.5	20.2	128.5	48.2	3
VTPH-7		94.8		6.1	5.5	16.7	96.4	43.9	6
VTPH-8		24.3	38.9		4.5		109.8	44.4	5
VTPH-9	20.8	80.0	2.9	4.9	8.2	20.6	81.5	31.3	10
VTPH-10	9.7	68.9	18.2	18.8	10.6	22.1	71.6	31.4	9
Mean	20.7	87.6	30.8	19.3	7.1	17.5	98.1	43.1	
CD at 5%	22.6	20.8	8.1	5.6	1.5	4.3	5.4		
CV%	18.9	14.0	15.1	20.0	12.3	13.9	10.1		

Table 17.3: VT Pennisetum hybrids-2015 (2nd Year): (*P. glaucum* x *P. squamulatum*) (Perennial): Green Forage Yield (q/ha/day) & Dry Matter Yield (q/ha/day)

Entries	GFY (q/ha/day)					DMY (q/ha/day)				
	Ludhiana	Hisar	Anand	Average	Rank	Ludhiana	Hisar	Anand	Average	Rank
VTPH-1	0.20	6.88	0.27	2.45	6	0.04	1.88	0.06	0.66	6
VTPH-2	1.10	7.07	2.81	3.66	3	0.20	2.39	0.57	1.05	3
VTPH-3	0.90	8.41	0.67	3.33	4	0.17	2.38	0.15	0.90	4
VTPH-4	0.60	8.59	0.05	3.08	5	0.11	2.52	0.01	0.88	5
VTPH-5			2.29	2.29	7			0.45	0.45	9
VTPH-6		5.64		5.64	2		1.61		1.61	2
VTPH-7		6.22		6.22	1		1.92		1.92	1
VTPH-8		2.00	0.93	1.47	10		0.58	0.26	0.42	10
VTPH-9	0.60	5.50	0.09	2.06	8	0.11	1.71	0.02	0.61	7
VTPH-10	0.30	4.85	0.53	1.89	9	0.05	1.47	0.12	0.55	8
Mean	0.62	6.13	0.96	3.21		0.11	1.83	0.21	0.91	

Table 17.4: VT Pennisetum hybrids- 2015 (2nd Year): (*P. glaucum* x *P. squamulatum*) (Perennial): Crude Protein Yield (q/ha) & Crude Protein (%)

Entries	CPY (q/ha)								CP (%)								
	Ludh-iana	Ana-nd	Rah-uri	Urulikan-cha	Palam-pur	Jor-hat	Aver-age	Rank	Ludh-iana	His-ar	Rah-uri	Urulikan-cha	Ana-nd	Palam-pur	Jor-hat	Aver-age	Rank
VTPH-1	0.5	0.8	1.4	0.4	1.6	5.3	1.7	8	6.9	10.2	5.9	8.0	9.4	7.9	5.8	7.7	7
VTPH-2	2.5	7.6	2.1	0.7	0.8	4.0	2.9	3	6.8	10.2	7.8	7.7	8.8	8.0	5.4	7.8	6
VTPH-3	2.3	2.1	1.3	0.6	1.3	5.8	2.2	5	7.6	10.2	6.8	8.0	9	7.6	5.3	7.8	6
VTPH-4	1.7	0.2	0.5	0.4	1.0	7.3	1.8	7	8.8	10.5	8.3	7.9	10.4	7.7	6.7	8.6	2
VTPH-5		8.5	3.5	0.7		7.2	5.0	1			5.7	7.9	11.9		7.2	8.2	4
VTPH-6			0.4	0.6	1.5	8.3	2.7	4		10.5	6.3	7.9		7.2	6.5	7.7	7
VTPH-7			0.4	0.4	1.4	5.0	1.8	7		11.5	6.1	8.0		8.4	5.3	7.8	6
VTPH-8		3.8		0.3		5.9	3.3	2		10.2		7.6	9.4		5.4	8.1	5
VTPH-9	2.1	0.3	0.4	0.7	1.7	4.0	1.5	9	9.9	10.5	7.7	8.0	9.2	8.4	5.0	8.4	3
VTPH-10	0.9	2.1	1.3	0.8	2.0	5.3	2.1	6	8.8	9.8	7.0	7.8	10.8	9.0	7.5	8.7	1
Mean	1.7	3.2	1.3	0.6	1.4	5.8	2.5		8.1	10.4	6.8	7.9	9.9	8.0	6.0	8.1	

Table 17.5: VT Pennisetum hybrids- 2015 (2nd Year): (*P. glaucum* x *P. squamulatum*) (Perennial): Plant Height (cm) & Leaf Stem Ratio

Entries	Plant Height (cm)									Leaf Stem Ratio							
	Ludh-iana	His-ar	Ana-and	Rah-uri	Urulikan-chan	Palam-pur	Jor-hat	Aver-age	Ra-nk	Ludh-iana	His-ar	Rah-uri	Urulikan-chan	Palam-pur	Jor-hat	Aver-age	Ra-nk
VTPH-1	102.3	125.5	107.6	96.6	41.7	143.7	195.9	116.2	5	1.10	0.87	1.66	0.53	0.77	0.83	0.96	2
VTPH-2	118.2	112.7	127.2	69.6	61.0	144.0	144.5	111.0	6	0.92	1.06	1.13	0.65	0.64	0.89	0.88	4
VTPH-3	113.1	135.8	117.5	97.0	60.7	140.7	161.8	118.1	4	1.00	0.84	0.89	0.61	0.74	0.79	0.81	8
VTPH-4	81.1	123.9	87.1	83.8	35.3	137.7	174.5	103.3	9	0.85	0.74	1.55	0.73	0.74	0.88	0.92	3
VTPH-5			124.9	93.3	59.3		153.9	107.8	7			0.47	0.61		0.89	0.66	10
VTPH-6		106.1		75.3	48.7	144.3	148.1	104.5	8		0.64	0.86	0.68	0.81	0.95	0.79	9
VTPH-7		116.9		58.8	49.3	132.7	129.8	97.5	10		0.83	2.16	0.59	0.68	0.82	1.02	1
VTPH-8		95.0	124.8		99.3		195.4	128.6	2		1.06		0.60		0.90	0.85	5
VTPH-9	115.0	147.4	114.4	99.9	66.3	200.0	194.1	133.9	1	0.90	1.19	0.72	0.67	0.71	0.87	0.84	6
VTPH-10	105.0	136.0	130.7	103.4	64.3	177.0	144.9	123.0	3	1.00	1.17	0.63	0.64	0.56	0.89	0.82	7
Mean	105.8	122.1	116.8	86.4	58.6	152.5	164.3	114.4		0.96	0.93	1.12	0.63	0.71	0.87	0.85	

Table 17.6: VT Pennisetum hybrids- 2015 (2nd Year): (*P. glaucum* x *P. squamulatum*) (Perennial): ADF (%), NDF (%) & IVDMD (%)

Entries	ADF (%)					NDF (%)					IVDMD (%)				
	Ludh-iana	Palam-pur	Rah-uri	Aver-age	Ra-nk	Ludh-iana	Palam-pur	Rah-uri	Aver-age	Ra-nk	Ludh-iana	Rah-uri	His-ar	Aver-age	Ra-nk
VTPH-1	42.6	52.4	49.5	48.2	5	71.3	66.6	62.8	66.9	8	48.4	49.2	49.9	49.2	6
VTPH-2	43.6	52.2	52.7	49.5	7	70.6	68.2	66.7	68.5	9	47.6	46.7	47.9	47.4	9
VTPH-3	41.3	51.8	47.8	47.0	3	69.4	67.0	60.0	65.5	7	48.0	50.6	48.4	49.0	7
VTPH-4	36.4	49.2	46.6	44.1	1	62.3	68.6	60.1	63.7	5	50.6	51.5	48.3	50.1	3
VTPH-5			50.7	50.7	8			62.5	62.5	3		48.3		48.3	8
VTPH-6		49.8	55.2	52.5	9		69.4	59.9	64.7	6		44.7	48.6	46.7	10
VTPH-7		52.6	45.1	48.9	6		66.0	58.1	62.1	2		52.7	46.5	49.6	4
VTPH-8													49.5	49.5	5
VTPH-9	35.4	53.0	53.7	47.4	4	58.8	67.8	64.2	63.6	4	55.8	45.9	49.0	50.2	2
VTPH-10	38.3	51.8	42.8	44.3	2	60.3	68.0	57.2	61.8	1	55.0	54.5	50.5	53.3	1
Mean	39.6	51.6	49.3	48.0		65.5	67.7	61.3	64.4		50.9	49.3	48.7	49.3	

Table 18.1: VT Desmanthus-2016 (1st Year): Varietal Trial in Desmanthus (Perennial): Green Forage Yield (q/ha)

Entries	North West Zone				Central Zone					South Zone				All India	
	Ludh-iana	Bika-ner	Aver-age	Ra-nk	Rah-uri	Urulikan-cha	Ana-nd	Aver-age	Ra-nk	Coimb-atore	Man-dya	Aver-age	Ra-nk	Aver-age	Ra-nk
VTD-1	24.3	11.9	18.1	6	62.6	107.1	124.0	97.9	6	350.0	42.0	196.0	6	103.1	6
VTD-2	56.5	28.1	42.3	3	120.9	132.5	122.0	125.1	5	360.4	77.2	218.8	3	128.2	5
VTD-3	74.6	46.3	60.5	1	162.0	165.4	195.0	174.1	1	329.2	137.1	233.1	2	158.5	1
VTD-4	45.3	33.2	39.3	5	113.5	128.3	149.0	130.3	3	373.9	57.8	215.9	5	128.7	4
VTD-5	41.5	58.4	50.0	2	118.3	119.2	153.0	130.1	4	360.4	71.7	216.1	4	131.8	3
VTD-6	45.8	38.4	42.1	4	129.3	130.4	193.0	150.9	2	407.3	112.9	260.1	1	151.0	2
Mean	48.0	36.1	42.0		117.7	130.5	156.0	134.7		363.5	83.1	223.3		133.6	
CD at 5%	32.8	10.7			23.4	22.1	16.7			13.2	7.3				
CV (%)	13.6	19.6			13.2	11.1	7.1			2.4	5.8				

Table 18.2 VT Desmanthus-2016 (1st Year): Varietal Trial in Desmanthus (Perennial): Dry Matter Yield (q/ha)

Entries	North West Zone				Central Zone					South Zone				All India	
	Ludh-iana	Bika-ner	Aver-age	Ra-nk	Rah-uri	Urulikan-cha	Ana-nd	Aver-age	Ra-nk	Coimb-atore	Man-dya	Aver-age	Ra-nk	Aver-age	Ra-nk
VTD-1	3.6	4.8	4.2	6	20.4	23.3	32.5	25.4	6	93.9	11.7	52.8	6	27.2	6
VTD-2	8.6	11.8	10.2	5	43.8	31.3	33.9	36.4	3	98.3	24.5	61.4	4	36.0	4
VTD-3	10.5	19.9	15.2	2	56.3	35.7	59.9	50.6	1	95.7	36.6	66.1	2	44.9	1
VTD-4	7.2	14.2	10.7	3	34.4	26.7	42.3	34.5	5	103.1	18.1	60.6	5	35.1	5
VTD-5	6.4	26.4	16.4	1	37.3	22.7	44.9	34.9	4	106.6	20.0	63.3	3	37.8	3
VTD-6	6.8	14.1	10.5	4	38.3	25.5	51.6	38.5	2	123.3	33.1	78.2	1	41.8	2
Mean	7.2	15.2	11.2		38.4	27.5	44.2	36.7		103.5	24.0	63.7		37.1	
CD at 5%	4.8	4.2			7.6	4.5	4.9			6.6	4.4				
CV (%)	11.1	18.4			13.2	10.6	7.4			4.2	12.1				

Table 18.3: VT Desmanthus-2016 (1st Year): Varietal Trial in Desmanthus (Perennial): GFY (q/ha/day) & DMY (q/ha/day)

Entries	GFY (q/ha/day)					DMY (q/ha/day)				
	Bikaner	Ludhiana	Anand	Average	Rank	Ludhiana	Bikaner	Anand	Average	Rank
VTD-1	0.11	0.30	0.84	0.42	6	0.04	0.04	0.22	0.10	6
VTD-2	0.26	0.70	0.83	0.60	5	0.11	0.11	0.23	0.15	5
VTD-3	0.43	0.90	1.33	0.89	1	0.13	0.19	0.41	0.24	1
VTD-4	0.31	0.60	1.01	0.64	4	0.09	0.13	0.29	0.17	4
VTD-5	0.55	0.50	1.04	0.70	3	0.08	0.25	0.31	0.21	2
VTD-6	0.36	0.60	1.31	0.76	2	0.08	0.13	0.35	0.19	3
Mean	0.34	0.60	1.06	0.67		0.09	0.14	0.30	0.18	

Table 18.4: VT Desmanthus-2016 (1st Year): Varietal Trial in Desmanthus (Perennial): Crude Protein Yield (q/ha) & Crude Protein (%)

Entries	CPY (q/ha)									CP (%)								
	Ludh-iana	Bika-ner	Rah-uri	Urulikan-chan	Ana-nd	Coimba-tore	Man-dya	Aver-age	Ra-nk	Ludh-iana	Bika-ner	Rah-uri	Urulikan-chan	Ana-nd	Coimb-atore	Man-dya	Aver-age	Ra-nk
VTD-1	0.3	0.6	3.1	4.5	6.8	7.6	1.7	3.5	6	7.9	13.3	15.3	19.3	20.9	15.8	14.5	15.3	6
VTD-2	0.7	1.5	6.9	5.8	6.9	8.1	4.5	4.9	4	7.8	12.9	15.8	18.6	20.1	16.2	18.4	15.7	5
VTD-3	0.8	3.2	9.0	6.8	10.6	9.0	7.4	6.7	1	7.9	16.3	16.0	19.1	17.9	17.5	20.1	16.4	3
VTD-4	0.5	2.8	5.3	5.0	7.3	8.3	3.4	4.6	5	7.0	19.3	15.3	18.7	17.1	15.8	18.8	16.0	4
VTD-5	0.5	4.8	5.4	4.3	8.6	8.4	4.7	5.2	3	8.3	18.1	14.4	19.1	19.3	15.8	23.2	16.9	1
VTD-6	0.5	2.4	6.0	4.9	10.2	11.3	6.6	6.0	2	7.6	17.2	15.5	19.2	19.7	18.4	20.1	16.8	2
Mean	0.6	2.6	5.9	5.2	8.4	8.8	4.7	5.2		7.8	16.2	15.4	19.0	19.2	16.6	19.2	16.2	

Table 18.5: VT Desmanthus-2016 (1st Year): Varietal Trial in Desmanthus (Perennial): Plant Height (cm) & Leaf Stem Ratio

Entries	Plant Height (cm)								Leaf Stem Ratio							
	Ludh-iana	Bika-ner	Rah-uri	Urulikan-chan	Ana-nd	Man-dya	Aver-age	Ra-nk	Ludh-iana	Bika-ner	Rah-uri	Urulikan-chan	Ana-nd	Man-dya	Aver-age	Ra-nk
VTD-1	38.6	98.0	72.8	119.5	137.2	76.4	90.4	6	0.81	0.83	2.0	0.71	1.22	0.72	1.05	3
VTD-2	54.3	110.0	68.5	117.3	133.1	80.0	93.9	5	0.66	1.00	2.5	0.80	1.48	0.72	1.20	1
VTD-3	65.3	103.0	84.1	135.5	152.1	128.2	111.4	1	0.75	0.76	1.9	0.74	0.76	0.84	0.96	5
VTD-4	48.6	111.0	80.4	141.0	145.0	101.0	104.5	2	0.78	0.64	1.7	0.74	1.08	0.78	0.95	6
VTD-5	45.1	120.0	76.0	126.8	149.4	92.8	101.7	3	0.92	0.92	2.1	0.65	0.93	0.78	1.04	4
VTD-6	50.1	96.0	78.6	110.0	141.9	116.2	98.8	4	0.88	0.93	1.5	0.78	1.79	0.76	1.10	2
Mean	50.3	106.3	76.7	125.0	143.1	99.1	100.1		0.80	0.85	1.95	0.74	1.21	0.77	1.05	

Table 18.6: VT Desmanthus-2016 (1st Year): Varietal Trial in Desmanthus (Perennial): ADF (%), NDF (%) & IVDMD (%)

Entries	ADF (%)				NDF (%)				IVDMD (%)			
	Ludh-iana	Rah-uri	Aver-age	Ra-nk	Ludh-iana	Rah-uri	Aver-age	Ra-nk	Ludh-iana	Rah-uri	Aver-age	Ra-nk
VTD-1	33.4	29.9	31.7	3	46.4	38.8	42.6	4	53.6	64.7	59.2	3
VTD-2	33.6	33.5	33.6	6	45.3	40.3	42.8	5	52.1	61.9	57.0	6
VTD-3	34.1	27.6	30.9	1	45.9	36.4	41.2	2	54.3	66.5	60.4	1
VTD-4	35.0	28.6	31.8	4	42.4	37.5	40.0	1	51.4	65.7	58.6	4
VTD-5	32.4	30.7	31.6	2	45.4	39.6	42.5	3	55.8	64.1	60.0	2
VTD-6	34.6	32.3	33.5	5	46.3	40.8	43.6	6	53.4	62.8	58.1	5
Mean	33.9	30.4	32.1		45.3	38.9	42.1		53.4	64.3	58.9	

FORAGE CROP PRODUCTION

The programme on forage crop production was conducted at 20 locations. In total 17 experiments were conducted, out of which 7 in coordinated and 10 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 as well as its nutrient management, response of Congo-signal grass to planting geometry and N levels, seed rate and sowing methods for multicut sorghum and pearl millet mixture, phosphorus management in sorghum-wheat–summer fodder cropping system, 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 and resource management in rice-oat cropping system under sodic soils. Besides above, Development of climate resilient production technologies for food-fodder based cropping systems, carbon sequestration studies, intensive forage production through Agase based cropping system in south zone, Phosphorus & Zinc application for higher seed yield and quality of dual cut cowpea, use of Zinc and Boron under red and lateritic soil to improve and standardization of seed priming technique for enhancing productivity of forage maize were also studied. From the trials, relevant technologies have been identified and relevant database generated is presented hereunder

A. ON GOING COORDINATED TRIALS

K-15-AST-10 C: Intensive forage production through Agase based (*Sesbania grandiflora*) cropping system under protective irrigation

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

Locations: Mandya and Vellayani

A field experiment was started during kharif, 2015 (establishment year) at three locations i.e., Mandya, Vellayani & Raichur with objective to study the effect of cropping system on fodder yield, quality economic parameters and & soil fertility. However Raichur (voluntary centre) did not execute the trial. The treatments consisted of seven agase based cropping systems i.e., **T₁**- Agase + Congo Signal grass (2:4), **T₂**- Agase + Rhodes grass (2:3), **T₃**- Agase + Guinea grass (2:3), **T₄**- Agase + Napier Bajra hybrid (2:2), **T₅**- Agase + Paragrass (2:4), **T₆**- Agase + Perennial fodder Sorghum (2:6) and **T₇**- Agase (Sole). The treatments were replicated thrice in randomised block design. Agase were raised in the paired row method (row to row 2m and plant to plant 1 m). The results indicated that on locational mean basis among the grasses that Napier Bajra hybrid (2:1) proved superior to other grasses. However the abase in combination with Rhodes grass (2:2) gave the higher productivity. As regards to total productivity of the system, **T₄**. Agase+ Napier Bajra (2:1) recorded higher green fodder whereas, highest dry matter productivity was noted with **T₅**. Agase+ setaria (2:2).

Table K-15-AST-10 C (a): Productivity of grass and Agase in Agase based (*Sesbania grandiflora*) cropping system under Protective Irrigation

Treatments	Grass yield (q/ha)						Agase yield (q/ha)					
	Green fodder			Dry matter			Green fodder			Dry matter		
	Vellayani	Mandya	Mean	Vellayani	Mandya	Mean	Vellayani	Mandya	Mean	Vellayani	Mandya	Mean
T ₁ -Agase+ Congo signal (2:2)	250.7	109.7	180.2	61.09	16.54	38.8	50.24	193.02	121.6	11.99	24.3	18.1
T ₂ . Agase + Rhodes grass (2:2)	99.4	160.2	129.8	23.79	25.9	24.8	154.24	210.1	182.2	36.62	27.55	32.1
T ₃ . Agase+ guinea grass (2:2)	205.6	178.3	191.9	49.48	25.81	37.6	95.13	215.27	155.2	23.17	26.62	24.9
T ₄ . Agase+ Napier Bajra (2:1)	213.3	294.9	254.1	51.89	39.22	45.6	136.32	221.29	178.8	33.15	23.87	28.5
T ₅ . Agase+ setaria (2:2)	298.4	169.1	233.8	72.81	23.71	48.3	122.31	221.91	172.1	29.6	26.83	28.2
T ₆ . Agase+ perennial fodder sorghum (2:5)	153.5	329.2	241.4	37.93	69.69	53.8	100.31	200.42	150.4	24.5	25.86	25.2
T ₇ .Agase sole							52.55	177.58	115.1	12.72	20.99	16.9
SEm±	4.92			1.30			3.59	10.8		0.80	1.86	
CD (P=0.05)	15.157			3.984			11.06	33.28		2.476	5.74	

Table K-15-AST-10 C (b): Growth, total yield and quality in Agase based cropping system

Treatments	Total productivity of the system (q/ha)						CPY (q/ha)			Plant height of grasses (cm)	Plant Height of Agase (cm)
	Green fodder			Dry matter			Agase	Grass	Total		
	Vellayani	Mandya	Mean	Vellayani	Mandya	Mean	Mandya	Mandya	Mandya	Vellayani	Vellayani
T ₁ -Agase+ Congo signal (2:2)	300.91	302.74	301.83	73.08	41.91	57.5	5.3	1.06	6.37	87.67	177
T ₂ . Agase + Rhodes grass (2:2)	253.6	370.25	311.93	60.41	54.21	57.31	5.8	1.47	7.28	132	190
T ₃ . Agase+ guinea grass (2:2)	300.72	393.56	347.14	72.65	52.69	62.67	5.6	1.12	6.73	151.67	179
T ₄ . Agase+ Napier Bajra (2:1)	349.64	516.21	432.93	85.04	62.13	73.59	5	2.05	7.08	173.67	191.33
T ₅ . Agase+setaria (2:2)	420.73	391.05	405.89	102.41	50.93	76.67	5.7	1.45	7.16	132.67	179.67
T ₆ . Agase+ perennial fodder sorghum (2:5)	253.81	529.61	391.71	62.43	90.51	76.47	4.9	2.26	7.2	179.67	157.33
T ₇ .Agase sole	52.55	177.58	115.07	12.72	10.5	11.61		-	-		171
SEm±		15.85			3.65		0.4	-	-	2.96	5.81
CD (P=0.05)		48.84			11.24		1.3	-	-	9.13	17.89

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(f)]

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 2016 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 on locational mean basis as well as at individual centres, 1.2 IW/CP ratio recorded maximum green, dry matter and crude protein yields (1139.83, 204.43 and 19.33 q/ha), which were 18.5, 19.0 and 27.6% higher over 0.8 IW/CPE ratio on mean basis in terms of green, dry matter and crude protein, 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. 89636 per ha). But higher B:C ratio (1.75) was observed with 1.0 IW/CP ratio. However, 1.2 IW/CP ratio also recorded higher weed population and weed dry weight. As regards to straw mulch, applications of mulch @ 10 t/ha proved significantly superior to control as well as 5 t/ha. It was at par with 7.5t mulch per ha in GFY, DMY and CP content. In monitory terms, mulch @ 10 t and 7.5t /ha proved more remunerative and economical over 5 and control.

Table PS-14-AST-1(a): Effect of straw mulch and moisture regimes on productivity of B N Hybrid

Treatments	Green Fodder Yield (q/ha)				Dry Matter yield (q/ha)			
	Ludh-iana	Bika-ner	Rai-pur	Mean	Ludh-iana	Bika-ner	Rai-pur	Mean
A. I W/CPE Ratio								
I ₁ - 0.8	1317.3	678.0	889.2	961.5	235.9	109.3	170.3	171.83
I ₂ - 1.0	1526.9	761.4	1016.1	1101.47	281.7	117.6	192.3	197.20
I ₃ - 1.2	1560.1	780.0	1079.4	1139.83	289.6	119.3	204.4	204.43
SEm±	17.92	9.5	24.92		3.28	2.4	3.89	
CD (p=0.05)	70	37.2	97.82		12.86	9.4	15.31	
B. Straw mulch (t/ha)								
M ₁ - Control	1159.5	646.9	903.2	903.2	208.8	99.1	164.54	157.48
M ₂ - 5.0	1445.7	718.6	962.8	1042.37	265.1	112.5	182.0	186.53
M ₃ - 7.5	1603.8	792.6	1032.5	1142.97	297	124.3	198.4	206.57
M ₄ - 10	1663.4	801.1	1081.2	1181.9	305.3	125.6	211.0	213.97
SEm±	42.7	14.4	18.66		7.43	2.0	4.71	
CD (P=0.05)	NS	42.9	55.43		NS	5.8	14.0	
Interaction	8.14		NS		8.24		NS	

Table PS-14-AST-1(b): Effect of straw mulch and moisture regimes on growth of B N Hybrid

Treatments	Plant Height (cm)				Leaf stem ratio			No. of tillers/plant
	Ludhiana	Bikaner	Raipur	Mean	Bikaner	Raipur	Mean	Ludhiana
I ₁ 0.8 IW/CPE	93.5	114.97	114.60	107.7	1.60	1.16	1.38	24.7
I ₂ 1.0 IW/CPE	103.2	119.98	122.79	115.3	1.63	1.23	1.43	29.3
I ₃ 1.2 IW/CPE	105.8	119.01	129.34	118.1	1.62	1.28	1.45	30.0
SEm±		0.50	1.49		0.04	0.01		
CD (P=0.05)		1.98	5.9		0.17	0.05		
M ₁ Control	88.7	115.54	111.89	105.4	1.55	1.18	1.37	24.8
M ₂ 5.0	100.2	117.37	120.92	112.8	1.62	1.20	1.41	28.1
M ₃ 7.5	106.2	119.09	128.65	118.0	1.70	1.22	1.46	29.3
M ₄ 10	108.4	119.94	127.50	118.6	1.60	1.29	1.45	29.6
SEm±		0.43	1.50		0.02	0.03		
CD (P=0.05)		1.28	4.5		0.06	0.08		
CD (P=0.05)			NS			NS		

Table PS-14-AST-1(c): Effect of straw mulch and moisture regimes on quality of B N Hybrid

Treatments	CP Yield (q/ha)				CP (%)			
	Raipur	Ludhiana	Bikaner	Mean	Raipur	Ludhiana	Bikaner	Mean
A. I W/CPE Ratio								
I ₁ 0.8 IW/CPE	16.09	19.63	9.0	14.91	9.44	8.25	8.2	8.63
I ₂ 1.0 IW/CPE	19.08	26.62	9.1	18.27	9.91	9.38	7.7	9.00
I ₃ 1.2 IW/CPE	20.65	28.43	8.9	19.33	10.05	9.72	7.5	9.09
SEm±	0.35	0.38	0.3		0.09	0.11	0.1	
CD (P=0.05)	1.37	1.14	NS		0.36	0.33	0.4	
B. Nutrient Management								
M ₁ Control	15.32	17.19	7.6	13.37	9.31	8.17	7.7	8.39
M ₂ 5.0	17.93	24.01	8.6	16.85	9.83	9.03	7.7	8.85
M ₃ 7.5	19.90	28.69	10.1	19.56	10.00	9.59	8.1	9.23
M ₄ 10	21.27	29.68	9.7	20.22	10.05	9.67	7.7	9.14
SEm±	0.50	0.97	0.2		0.08	0.28	0.2	
CD (P=0.05)	1.50	3.42	0.7		0.22	1.00	NS	
Interaction								
CD (P=0.05)	NS	NS			S	NS		
SEm±		1.68						

Table PS-14-AST-1(d): Effect of straw mulch and moisture regimes on economics of B N Hybrid

Treatments	Net Return				B:C Ratio			
	Ludhiana	Raipur	Bikaner	Mean	Ludhiana	Raipur	Bikaner	Mean
A. I W/CPE Ratio								
I ₁ 0.8 IW/CPE	50586	89145	69694	69808	0.47	2.01	2.2	1.56
I ₂ 1.0 IW/CPE	75382	106925	78207	86838	0.70	2.35	2.2	1.75
I ₃ 1.2 IW/CPE	78846	111062	79001	89636	0.72	2.18	2.1	1.67
SEm±		3737	1421			0.08	0.0	
CD (P=0.05)	5171	14672	5580		0.05	0.31	NS	
B. Nutrient Management								
M ₁ Control	33885	91792	61695	62457	0.32	2.09	1.7	1.37
M ₂ 5.0	65876	98134	72458	78823	0.61	2.12	2.0	1.58
M ₃ 7.5	83670	107290	83557	91506	0.77	2.26	2.4	1.81
M ₄ 10	89654	112293	84825	95591	0.82	2.25	2.4	1.82
SEm±		2798	2165			0.06	0.1	
CD (P=0.05)	8580	8315	6433		0.08	0.19	0.2	
Interaction								
CD (P=0.05)	NS	NS			NS	NS		
CV (%)	8.68				8.70			

Table PS-14-AST-1(e): Effect of straw mulch and moisture regimes on WUE and economics of B N Hybrid

Treatments	WUE (kg/ha/mm)				Cost of cultivation (Rs./ha)		Gross Return Rs.	
	Ludhiana	Raipur	Bikaner	Mean	Raipur	Ludhiana	Raipur	Ludhiana
A. I W/CPE Ratio								
I ₁ 0.8 IW/CPE	1.16	11.67	6.8	6.54	97152	107488	133375	158074
I ₂ 1.0 IW/CPE	1.51	11.95	5.3	6.25	111881	107841	152415	183222
I ₃ 1.2 IW/CPE	1.77	10.70	4.3	5.59	67805	108370	16192	187216
SEm±	1.87	0.23	0.1				3737	
CD (P=0.05)	0.07	0.89	0.4				14672	5171
B. Nutrient Management								
M ₁ Control	1.64	9.93	4.5	5.36	91538	105251	135474	139136
M ₂ 5.0	1.56	11.03	5.3	5.96	105968	107605	144415	173482
M ₃ 7.5	1.54	12.03	5.7	6.42	115777	108782	154872	192453
M ₄ 10	0.05	12.76	5.8	6.20	120598	109960	162175	199613
SEm±	NS	0.28	0.1				2798	
CD (P=0.05)	6.09	0.84	0.3				8314	8578
Interaction								
CD (P=0.05)		NS					NS	NS
CV (%)							8.68	7.14

Table PS-14-AST-1 (f): Effect of straw mulch and moisture regimes on weed dynamics of B N Hybrid

Treatments	Weed population/m ²			Weed dry weight (g/m ²)			Weed control efficiency (%)	Total CU (mm)
	Bikaner	Raipur	Mean	Bikaner	Raipur	Mean	Raipur	Ludhiana
A. I W/CPE Ratio								
I ₁ 0.8 IW/CPE	10.33	12.26	11.30	1.65	17.81	9.73	-	808.9
I ₂ 1.0 IW/CPE	10.77	14.38	12.58	1.75	19.19	10.47	29.04	990.6
I ₃ 1.2 IW/CPE	10.93	15.61	13.27	2.27	20.84	11.56	42.93	1021.9
SEm±	0.45	0.59		0.10	0.30		-	
CD (P=0.05)	1.78	2.32		0.41	1.17		-	
B. Nutrient Management								
M ₁ Control	16.87	20.19	18.53	2.95	29.22	16.09	-	1004.4
M ₂ 5.0	12.81	14.86	13.84	2.37	19.77	11.07	30.30	960.7
M ₃ 7.5	8.26	12.65	10.46	1.04	16.25	8.65	42.07	906.8
M ₄ 10	4.77	8.62	6.70	0.64	11.87	6.26	60.05	890.0
SEm±	0.46	0.33		0.12	0.62		-	
CD (P=0.05)	1.37	0.99		0.35	1.83		-	
Interaction		S			S		-	
CD (P=0.05)								
CV (%)								

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 3(b))]

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 –split plot design.

The results recorded during the year 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 (332.96q/ha/year) and DFY (75.6q/ha/year). The respected verities were 76.77 cm, 159.8, 0.41 kg/clump. Significant improvement in GFY and DFY was recorded upto 30 kg N/ha as basal and after each cut. The grass production under Irrigated conditions recorded 352.63 q green and 77.50 q dry matter/ha in comparison to 307.61 q green and 68.99q dry matter/ha.

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

Treatment	Plant height (cm)			Leaf Stem Ratio	Tillers/clump
	Dharwad	Mandya	Mean	Mandya	Mandya
Growing systems (2)					
Rainfed (G1)	113.84	77.56	95.70	0.68	144.47
Irrigated (G2)	133.30	72.28	102.79	0.61	156.83
SEm±	0.34	1.46		0.01	0.95
CD at 5%	2.04	NS		0.05	5.79
Planting geometry (2)					
45 cm x 45 cm (P1)	120.75	73.07	96.91	0.63	141.52
60 cm x 60 cm (P2)	126.39	76.77	101.58	0.66	159.78
SEm±	1.37	1.37		0.04	1.64
CD at 5%	5.38	NS		NS	6.44
Nitrogen levels (4)					
0 kg N/ha as basal & after each cut (N1)	97.32	48.81	73.07	0.47	121.31
10 kg N/ha as basal & after each cut (N2)	117.92	75.41	96.67	0.62	147.67
20 kg N/ha as basal & after each cut (N3)	133.30	82.28	107.79	0.69	160.46
30 kg N/ha as basal & after each cut (N4)	145.72	93.20	119.46	0.79	173.15
SEm±	1.70	2.03		0.02	1.68
CD at 5%	4.95	5.91		0.07	4.91

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

Treatment	GFY (q/ha /year)			GFY yield /clump (kg)	DFY(q /ha/Year)		
	Mandya	Dharwad	Mean	Dharwad	Dharwad	Mandya	Mean
Growing systems (2)							
Rainfed (G1)	256.98	358.24	307.61	0.336	82.40	55.58	68.99
Irrigated (G2)	187.61	517.65	352.63	0.296	114.40	40.61	77.50
SEm±	2.88	3.47		0.002	0.78	0.94	
CD at 5%	17.49	21.11		0.012	4.78	5.73	
Planting geometry (2)							
45 cm x 45 cm (P1)	229.50	425.05	327.27	0.220	95.54	46.26	70.9
60 cm x 60 cm (P2)	215.08	450.84	332.96	0.412	101.25	49.94	75.59
SEm±	4.53	2.24		0.001	0.50	1.16	
CD at 5%	NS	8.81		0.003	1.95	NS	
Nitrogen levels (4)							
0 kg N/ha as basal & after each cut (N1)	115.13	381.58	248.35	0.277	85.78	21.14	53.46
10 kg N/ha as basal & after each cut (N2)	202.07	428.84	315.45	0.311	96.38	42.54	69.46
20 kg N/ha as basal & after each cut (N3)	274.25	465.98	370.11	0.335	104.66	60.05	82.35
30 kg N/ha as basal & after each cut(N4)	297.74	475.38	386.56	0.342	106.77	68.66	87.71
SEm±	4.81	3.77		0.003	0.86	1.44	
CD at 5%	14.04	11.01		0.007	2.50	4.21	

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

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

Locations: Pantnagar, Ranchi, Kalyani, Jabalpur

A field experiment was started during Kharif 2015 at Pantnagar, Ranchi, Kalyani, and Jabalpur to find out the suitable climate resilient production technology for higher profitability of grain – fodder based cropping systems. The treatments included four Climate Resilient technologies namely Zero tillage- (All the crops)- CRT₁, Minimum tillage single pass of cultivator + sowing with seed drill- CRT₂, Conventional tillage – CRT₃ and Zero tillage- minimum tillage- Zero tillage- CRT₄ and four Cropping systems namely Rice (upland) – Berseem - Maize + Cowpea- CS₁, Maize (Baby corn) – Berseem – Sorghum (Fodder)- CS₂, Maize (Baby corn) – Wheat – Rice bean (Fodder) CS₃ and Sorghum (Fodder) – Berseem – Maize (Baby Corn)- CS₄. The trial was conducted in randomized Split Plot Design with three replications.

The results indicated that in terms of green forage yield, That among four climate resilient technologies, Conventional tillage and minimum tillage single passes of cultivator + sowing with seed drill proved superior over other two treatments. The minimum tillage recorded 8-9 and 8.3 % higher yield over zero tillage- (All the crops) and Zero tillage- minimum tillage- zero tillage. Similar trend was observed in terms of DFY also. The Minimum tillage recorded 13.0 and 14.7 % higher yield over zero tillage- (all the crops) and Zero tillage- minimum tillage- Zero tillage. Among the four cropping systems, sorghum (fodder) – berseem – maize (baby corn) proved higher productive (1305.5q/ha) than the rest of the treatment. It recorded 12.9, 2.2 and 12.9% higher green fodder yield over CS₁, CS₂ and CS₃ cropping systems, respectively. However in terms of dry matter productivity Maize (Baby corn) – Wheat – Rice bean (Fodder) proved superior (283.3q/ha)

In economic terms on location mean basis, minimum tillage single pass of cultivator + sowing with seed drill &, Conventional tillage remained at par with each other but proved significantly to other treatments. These treatments recorded net monetary return of Rs 164379 and Rs. 154429 and B: C Ratio of 2.19 and 2.3, respectively. Among the four cropping systems, sorghum (fodder) – berseem – maize (baby corn)- CS₄ recorded highest net monetary return of Rs 176391 and B: C Ratio of 2.57. Among the different centres higher yields were observed at Ranchi Centre.

Table CS-15-AST-4 (a): Effect of climate resilient production technologies on productivity of food-fodder based cropping systems

Cropping systems										
Treatments	GFY (q/ha)				Mean	DMY (q/ha)				Mean
	Pant-nagar	Kal-yani	Ran-chi	Jabal-pur		Pant-nagar	Kal-yani	Ran-chi	Jabal-pur	
Climate Resilient technology										
CRT ₁	1144.6	448.6	1273.0	1873.0	1184.8	273.3	84.5	274.0	498.5	282.6
CRT ₂	1224.6	508.6	1460.0	1967.6	1290.2	279.0	96.7	303.0	598.8	319.3
CRT ₃	1196.9	531.7	1654.0	1829.6	1303.0	271.7	101.8	341.0	551.4	316.4
CRT ₄	1124.0	510.8	1408.0	1719.8	1190.6	252.4	94.7	288.0	478.6	278.4
SEm (±)	15.7	6.2	10.0	15.9		7.1	2.1	3.4	5.6	
CD (0.05)	45.1	18.6	35.4	46.8		NS	6.3	11.7	15.7	
Cropping systems										
CS ₁ -	1240.8	336.2	1432.0	1616.4	1156.3	286.0	54.9	330.0	332.7	250.9
CS ₂	1167.4	483.1	1558.0	1900.5	1277.2	200.1	93.3	303.0	436.8	258.3
CS ₃	986.9	298.5	1189.0	2151.6	1156.5	354.7	58.6	252.0	467.9	283.3
CS ₄	1295.1	588.7	1617.0	1721.4	1305.5	235.6	122.3	321.0	389.0	266.9
SEm (±)	15.7	7.2	8.0			7.1	4.5	2.3		
CD (0.05)	45.1	21.6	23.7			20.5	13.5	6.7		
CV (%)	NS	6.8				NS	4.8			

Zero tillage- (All the crops)- CRT₁, Minimum tillage single pass of cultivator + sowing with seed drill- CRT₂, Conventional tillage - CRT₃ and Zero tillage- minimum tillage- Zero tillage- CRT₄ ;

Rice (upland) – Berseem - Maize + Cowpea- CS₁, Maize (Baby corn) – Berseem – Sorghum (Fodder)- CS₂, Maize (Baby corn) – Wheat – Rice bean (Fodder) CS₃ and Sorghum (Fodder) – Berseem – Maize (Baby Corn)- CS₄

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

Treatments	Plant height (Av. over the seasons)		Mean	L:S ratio		Mean	CPY (q/ha)
	Kalyani	Pantnagar		Kalyani	Jabalpur		Kalyani
Climate Resilient technology							
CRT ₁	158.3	175.0	166.65	0.92	11.5	6.21	9.83
CRT ₂	154.9	170.0	162.45	0.82	8.96	4.89	11.66
CRT ₃	148.5	171.0	159.75	0.87	22.9	11.89	11.66
CRT ₄	157.9	171.0	164.45	0.93	14.89	7.91	11.17
SEm (±)	1.2	1.5		--	0.06		0.42
CD (0.05)	3.1	NS		--	0.18		1.26
Cropping systems							
CS ₁ -	150.85	84.0	84.0	0.89	5.74	3.32	7.35
CS ₂	186.1	171.0	178.55	0.80	10.98	5.89	10.04
CS ₃	113.6	169.0	141.3	0.94	16.89	8.92	7.04
CS ₄	173.1	262.0	217.55	0.91	12.89	6.9	13.43
SEm (±)	2.4	1.5		--	0.07		0.52
CD (0.05)	6.2	4		--	0.18		1.56
CV (%)	5.2	S		--	8.9		6.7

CS-15-AST-4 (c): Effect of climate resilient production technologies on economic parameters of food-fodder based cropping systems

Treatments	Cost of cultivation	GMR (Rs./ha)			NMR (Rs./ha)			B:C ratio		
	Pantnagar	Pantnagar	Ranchi	Mean	Pantnagar	Ranchi	Mean	Ranchi	Pantnagar	Mean
Climate Resilient technology										
CRT ₁	93000	228932	186358	207645	135932	132608	134270	2.47	1.46	1.97
CRT ₂	94750	244932	215425	230179	150182	158675	154429	2.8	1.58	2.19
CRT ₃	96301	239391	245418	242405	143090	185668	164379	3.11	1.49	2.3
CRT ₄	93750	224812	210451	217632	131812	155701	143757	2.85	1.41	2.13
SEm (±)		3257	1082		3257	1082		0.02	0.03	
CD (0.05)		9022	3737		9022	3737		0.07	0.1	
Cropping systems										
CS ₁ -	100250	254839	196041	225440	147911	140041	143976	2.49	1.48	1.99
CS ₂	97934	230837	233158	231998	136306	178258	157282	3.2	1.4	2.30
CS ₃	86309	183256	185300	184278	111071	127300	119186	2.19	1.29	1.74
CS ₄	93309	230317	242554	236436	165727	187054	176391	3.36	1.78	2.57
SEm (±)		3257	1347		3257	1347		0.02	0.03	
CD (0.05)		9022	3934		9022	3934		0.07	0.1	
CV (%)		S			S				S	

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) to 13 (b)]

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. Two cuts were taken at both the centres. The results indicated that in terms of green and dry matter yields, at Palampur and on locational mean basis 25:75 Seed rate/ratio of Sorghum: Pearl millet remained superior to other treatments whereas at Ludhiana sole sorghum was superior. The crude protein yield varied significantly at both the centres. Sole pearl millet and 25:75 Seed rate/ratio of Sorghum: Pearl millet exhibited higher yields. As regards to method of sowing, line sowing proved superior to broadcasting in terms of green, dry matter and crude protein yields. The highest Net Returns (Rs./ha) was noted in 25:75 Seed rate/ratio of Sorghum: Pearl millet, whereas sole sorghum fetched maximum B: C Ratio.

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

Treatments	Green fodder yield (q/ha)			Dry matter yield (q/ha)			Crude protein content (%)		
	Ludh-iana	Pala-mpur	Mean	Ludh-iana	Pala-mpur	Mean	Ludh-iana	Palam-pur	Mean
Seed rate/ratio of Sorghum: Pearl millet									
100:00	851.4	248.99	550.2	145.6	59.22	102.4	8.75	8.81	8.78
75:25	823.7	312.06	567.9	138.1	71.11	104.6	7.85	9.09	8.47
50:50	795.4	311.61	553.5	136	69.83	102.9	7.33	9.33	8.33
25:75	763	402.47	582.7	129.4	90.37	109.9	6.95	9.51	8.23
0:100	725.5	373.47	549.5	120.6	83.46	102.0	6.73	10.1	8.42
SE(m)	23.47	5.57		4.21	1.41		0.2	0.11	
C.D.	70.26	16.56		12.61	4.02		0.61	0.36	
Method of sowing									
Line sowing	865	358.7	611.9	146.2	80.23	113.2 2	7.58	9.41	8.50
Broadcast	718.5	300.74	509.6	121.7	68.36	95.03	7.46	9.34	8.40
SE(m)	14.84	3.52		2.66	0.89		0.13	0.07	
C.D.	44.44	10.47		7.97	2.54		NS	NS	
Interaction									
SE(m)	33.19	7.87		5.96	2		0.29	0.16	
C.D.	NS	NS		NS	NS		NS	NS	

Table K-15-AST-13 (b): Quality and economic parameters of multicut sorghum and pearl millet mixture under varying seed rates and methods of sowing

Treatments	Crude Protein Yield (q/ha)			Net Returns (Rs./ha)			Gross Returns (Rs./ha)	B:C Ratio
	Ludhiana	Palampur	Mean	Ludhiana	Palampur	Mean	Ludhiana	Ludhiana
Seed rate/ratio of Sorghum: Pearl millet								
100:00	12.7	5.23	8.97	37927	52886	45406.5	59597	2.75
75:25	12.7	6.47	9.59	35876	71003	53439.5	57659	2.67
50:50	12.7	6.51	9.61	34256	71148	52702	55676	2.6
25:75	12.7	8.6	10.65	31706	96404	64055	53407	2.48
0:100	12.7	8.43	10.57	29714	88700	59207	50782	2.41
SE(m)	0.31	0.16		1643	1672		1039	
C.D.	0.94	0.48		4918	4968		4918	
Method of sowing								
Line sowing	11.11	7.68	9.40	39234	83897	61565.5	60553	2.84
Broadcast	9.13	6.14	7.64	28557	68154	48355.5	50296	2.32
SE(m)	0.2	0.11		1039	1058		1643	0.05
C.D.	0.59	0.3		3111	3142		3111	0.15
Interaction								
SE(m)	0.44	0.23		2323			2323	0.11
C.D.	NS	NS		NS	NS		NS	NS

K-16-AST-3: Effect of Phosphorus & Zinc application and cutting management on fodder and seed yield and quality in dual cut cowpea.

[(Table Reference: K-16-AST-3 (a) to 3(b))]

Locations (2): Bikaner and DUVASU, Mathura

The trial was initiated at SKRAU, Bikaner and DUVASU, Mathura to study the effect of P & Zn nutrition and cutting management on yield and quality of green fodder and seed and economics. The treatments included three levels of P & Zn i.e., Control (No P & Zn application), 20 Kg P + 5 Kg Zn/ha and 40 Kg P + 10 Kg Zn/ha and five Cutting Management schedules i.e., C1= harvest for green fodder at 50% flowering, C2= grain harvesting, C3= green pod + green fodder harvesting, C4= C1+ re-growth green pod+ green fodder harvesting and C5= C1+ re-growth grain harvest. 10 Kg N/ha was applied after cut in C4 and C5 beside uniform application recommended N dose at sowing. The treatments were replicated thrice in factorial RBD. The results indicated that P & Zn application @ 40 Kg P + 10 Kg Zn/ha recorded higher green, dry and grain yield over other two treatments except DFY which was at par with 20 Kg P + 5 Kg Zn/ha P & Zn application. Among the Cutting management schedules harvest for green fodder at 50% flowering + re-growth green pod+ green fodder harvesting recorded significantly superior green and dry matter yield of cowpea.

Table K-16-AST-3 (a): Effect of Phosphorus treatments on yield and quality in dual cut cowpea

Treatment	Total GFY (q/ha)		Mean	Total DFY (q/ha)		Mean	Grain yield (q/ha)		Mean	L:S ratio		Mean
	Bika-ner	Math-ura		Bika-ner	Math-ura		Bika-ner	Math-ura		Bika-ner	Math-ura	
F1	290.8	247.1	269.0	58.00	18.30	38.1	0.68	1.66	1.17	1.04	1.60	1.32
F2	359.4	279.8	319.6	66.20	21.50	43.8	0.81	1.93	1.37	1.16	1.72	1.44
F3	347.2	331.5	339.4	63.40	20.90	42.1	0.75	2.57	1.66	1.08	1.59	1.34
S.Em.±	6.80	6.20		0.90	0.41		0.03	0.18		0.01	0.02	
C.D. (0.05)	19.60	17.90		2.60	1.17		0.09	0.53		0.04	0.07	
Cutting management												
C1	276.1	294.4	285.3	39.00	11.90	25.4	0.00	0.00	0.00	1.15	1.63	1.39
C2	0.00	0.00	0.00	65.10	19.80	42.4	2.12	5.44	3.78	0.85	1.57	1.21
C3	407.8	256.9	332.4	45.30	18.50	31.9	0.00	0.00	0.00	1.25	1.91	1.58
C4	534.6	459.9	497.3	84.50	26.40	55.4	0.00	0.00	0.00	1.10	1.52	1.31
C5	443.7	419.4	431.6	78.90	24.70	51.8	1.61	4.81	3.21	1.10	1.55	1.33
S.Em.±	26.20	23.90		3.50	1.57		0.13	0.71		0.05	0.09	
C.D. (0.05)	76.00	69.20		10.20	4.55		0.46	NS		0.15	0.27	

Table K-16-AST-3 (b): Effect of Phosphorus & Zinc application and cutting management on fodder and seed yield and quality in dual cut cowpea

Treatment	Population/m ²	Branch /plant	Days to 50% Flowering	CP (%)	CPY (q/ha)	Leaves/pl.	Green pod yield q/ha			Plant height (cm)		
P & Zn dose	Bikaner	Bikaner	Bikaner	Bikaner	Bikaner	Bikaner	Bikaner	Mathura	Mean	Bikaner	Mathura	Mean
F1	27.50	8.00	67.00	18.10	1.30	128.70	2.17	8.15	5.16	121.50	219.00	170.25
F2	27.50	8.20	69.00	20.30	1.60	135.10	2.38	11.95	7.17	123.40	236.40	179.90
F3	26.10	7.80	68.00	19.70	1.50	146.70	4.00	15.89	9.95	124.40	260.80	192.60
S.Em.±	0.20	0.10	0.20	0.40	0.00	6.10	0.41	1.75		0.60	8.40	
C.D. (0.05)	0.70	0.40	0.60	1.30	0.10	17.60	1.19	5.07		1.60	24.30	
Cutting management												
C1	26.20	7.80	67.00	20.70	1.00	139.00	0.00	0.00	0.0	124.00	223.00	173.50
C2	26.10	8.70	68.00	18.70	1.50	127.10	0.00	0.00	0.0	122.00	232.20	177.10
C3	26.40	8.00	68.00	20.10	1.10	122.80	8.51	42.38	25.4	128.00	244.90	186.45
C4	28.00	7.90	67.00	19.20	2.00	153.80	5.74	17.61	11.7	121.30	236.40	178.85
C5	28.40	7.70	68.00	18.10	1.70	141.40	0.00	0.00	0.0	120.20	257.10	188.65
S.Em.±	0.90	0.50	0.70	1.70	0.10	23.60	1.59	6.78		2.10	32.40	
C.D. (0.05)	2.60	1.50	2.20	5.00	0.30	NS	NS	NS		NS	NS	

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

[(Table Reference: K-16-AST-2 (a) to 2(f)]

Locations: Urulikanchan, Anand, Jabalpur, Kalyani, Bhubaneswar

A field experiment was started during Kharif 2016 at Urulikanchan, Anand, Jabalpur, Kalyani and Bhubaneswar to study the effects of seed priming methods on germination, yield, and economics of forage maize. The treatments consisted of nine seed priming methods; T₁- Seed priming with water for 6 hrs, T₂- Seed priming with water for 12 hrs, T₃- Seed priming with ZnSO₄ @ 0.5 % for 6 hrs, T₄- Seed priming with ZnSO₄ @ 0.5 % for 12 hrs, T₅- Seed priming with KNO₃ @ 0.5% for 6 hrs, T₆- Seed priming with KNO₃ @ 0.5% for 12 hrs, T₇- Seed priming with KH₂PO₄ @ 0.5% for 6 hrs, T₈- Seed priming with KH₂PO₄ @ 0.5% for 12 hrs, T₉- Control (no priming). The treatments were replicated thrice in randomised block design. The maize was sown in 30 cm apart lines using 75kg seed /ha.

The results on locational mean basis indicated that all the treatments improved the green and dry biomass yield significantly over control. The treatments T₃, T₄ and T₆ remained at par with each other but significantly superior over rest of the treatments. No significant difference was observed in crude protein content. However, treatments T₃, T₄ and T₆ recorded significantly higher CP yields over rest of the treatments primarily because of higher dry biomass yields. As regards to economics of the production, T₄ recorded the maximum net return whereas; highest return per rupee was noted in treatment T₂

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

Treatment	Green Forage Yield (q/ha)						Dry Matter Yield (q/ha)					
	NEZ		CZ			Mean	NEZ		CZ			Mean
	Kal-yani	Bhubaneswar	Urulikan- chan	Ana- nd	Jabal- pur		Kal-yani	Bhubaneswar	Urulikan- chan	Ana- nd	Jabal- pur	
T ₁	280.2	307.8	586.20	706.7	645.42	505.26	65.5	67.4	118.74	149.1	138.32	107.81
T ₂	292.1	295.3	612.75	796.6	735.29	546.41	70.4	65.3	124.08	168.9	168.14	119.36
T ₃	321.3	327.3	667.90	837.4	776.14	586.01	76.5	68.8	134.71	175.0	166.58	124.32
T ₄	253.6	322.7	702.62	882.4	792.48	590.76	62.4	68.5	140.31	203.8	180.92	131.19
T ₅	282.7	345.8	631.13	808.8	747.55	563.20	68.7	71.5	126.02	173.9	172.43	122.51
T ₆	421.2	338.7	643.39	821.1	759.80	596.84	98.9	70.8	131.55	168.3	185.42	130.99
T ₇	330.4	342.5	622.96	653.6	592.32	508.36	77.2	71.0	132.94	139.2	154.86	115.04
T ₈	305.2	319.7	635.22	702.6	641.34	520.81	71.1	68.2	133.63	162.3	158.54	118.75
T ₉	280.1	299.5	518.80	600.5	539.22	447.62	65.5	65.4	112.16	133.9	139.71	103.33
SEm±	4.52	4.11	25.66	30.81	20.10		1.73	3.63	5.21	6.57	4.57	
CD at 5%	13.56	11.51	77.61	92.38	60.30		5.19	NS	15.77	19.71	12.71	
C.V. %	8.15	2.21	7.11	7.05	9.10		7.24	9.17	7.04	6.95	6.78	

T ₁	Seed priming with water for 6 hrs
T ₂	Seed priming with water for 12 hrs
T ₃	Seed priming with ZnSO ₄ @ 0.5 % for 6 hrs
T ₄	Seed priming with ZnSO ₄ @ 0.5 % for 12 hrs
T ₅	Seed priming with KNO ₃ @ 0.5% for 6 hrs
T ₆	Seed priming with KNO ₃ @ 0.5% for 12 hrs
T ₇	Seed priming with KH ₂ PO ₄ @ 0.5% for 6 hrs
T ₈	Seed priming with KH ₂ PO ₄ @ 0.5% for 12 hrs
T ₉	Control (no priming)

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

Treatment	Crude Protein Yield (q/ha)						CP (%)				Plant height (cm)						
	NEZ		CZ			Mean	NEZ		CZ		Mean	NEZ		CZ			Mean
	Kal-yani	Bhuban-eswar	Urulikan- chan	Ana- nd	Jabal- pur		Bhuba- neswar	Kal- yani	Urulikan- chan	Mean		Kal- yani	Bhuban- eswar	Urulikan- chan	Ana- nd	Jaba- lpur	
T ₁	5.81	5.4	9.51	10.1	9.23	8.01	8.0	8.87	8.01	8.29	218.4	200.2	234.83	236.3	231.33	224.21	
T ₂	5.40	5.2	9.76	11.5	10.33	8.44	8.1	7.68	7.86	7.88	236.2	198.0	240.00	242.7	239.67	231.31	
T ₃	7.26	5.5	11.43	14.9	12.79	10.38	7.9	9.50	8.49	8.63	242.1	205.5	244.67	245.0	242.00	235.85	
T ₄	6.47	5.5	11.85	16.9	13.52	10.85	8.0	10.37	8.45	8.94	221.8	203.8	248.83	248.0	245.00	233.49	
T ₅	5.15	5.8	10.69	11.3	10.05	8.60	8.1	7.50	8.48	8.03	235.4	213.8	228.33	243.1	240.13	232.15	
T ₆	13.15	5.6	11.55	11.2	9.97	10.29	7.9	13.30	8.78	9.99	231.1	207.7	223.67	246.0	243.00	230.29	
T ₇	4.72	5.8	11.13	9.8	8.54	8.00	8.1	6.12	8.37	7.53	226.9	210.5	264.00	238.0	235.00	234.88	
T ₈	6.93	5.4	11.29	12.1	10.87	9.32	7.9	9.75	8.45	8.70	231.3	202.5	290.50	242.3	239.33	241.19	
T ₉	7.89	5.4	9.49	8.1	8.82	7.94	8.2	12.06	8.46	9.57	240.8	199.7	256.50	215.3	212.33	224.93	
SEm±	0.37	0.27	0.43	0.46	0.32		0.23	0.8			1.41	2.60		5.15	4.15		
CD at 5%	1.12	NS	1.32	1.36	0.98		0.65	2.4			4.23	7.27		15.44	12.44		
C.V. %	4.58	8.62	7.08	6.71	5.87		5.01	3.82			6.42	2.20		3.72	3.72		

Table K-16-AST-2(c): Effect of different techniques of seed priming on productivity of forage Maize

Treatments	Leaf Stem Ratio				No. of Leaves/ Plant	
	Kalyani	Bhubaneswar	Urulikanchan	Mean	Bhubaneswar	
T ₁	0.66	0.79	0.94	0.80	9.3	
T ₂	0.69	0.72	0.83	0.75	8.0	
T ₃	0.83	0.92	0.96	0.90	10.0	
T ₄	0.77	0.87	0.71	0.78	9.7	
T ₅	0.73	1.02	0.69	0.81	11.3	
T ₆	0.86	0.96	0.68	0.83	10.7	
T ₇	0.74	0.96	0.90	0.87	11.3	
T ₈	0.87	0.83	0.75	0.82	9.7	
T ₉	0.77	0.72	0.77	0.75	8.3	
SEm±		0.05			0.45	
CD at 5%		0.14			1.25	
C.V. %		10.06			7.88	

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

Treatments	pH	EC (dSm ⁻¹)	N	P	K	OC (%)
T ₁	7.20	0.59	177	32	220	0.43
T ₂	7.30	0.63	169	30	228	0.43
T ₃	7.32	0.58	165	37	240	0.42
T ₄	7.28	0.75	169	35	251	0.39
T ₅	7.19	0.70	174	42	241	0.36
T ₆	7.33	0.63	166	34	224	0.48
T ₇	7.35	0.55	155	35	225	0.43
T ₈	7.32	0.62	165	36	217	0.40
T ₉	7.28	0.63	165	32	236	0.38
Initial	7.53	0.41	115	31	279	0.35

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

Treatments	Net return (Rs/ha)					B:C ratio					
	Bhubaneswar	Anand	Urulikanchan	Jabalpur	Mean	Bhubaneswar	Kalyani	Anand	Urulikanchan	Jabalpur	Mean
T ₁	19780	50309	66399	37666	43539	2.8	1.3	2.47	1.83	2.4	2.16
T ₂	18530	59296	72963	44962	48938	2.7	1.38	2.91	1.91	2.57	2.29
T ₃	20730	42239	75574	37113	43914	2.7	1.45	1.02	1.83	1.92	1.78
T ₄	20270	46732	84180	38747	47482	2.7	0.92	1.13	1.92	1.96	1.73
T ₅	22580	41464	71633	36339	43004	2.9	1.18	1.05	1.83	1.95	1.78
T ₆	21870	42690	74622	37564	44187	2.8	2.26	1.08	1.87	1.98	2.00
T ₇	22250	27526	67791	22401	34992	2.9	1.57	0.73	1.77	1.61	1.72
T ₈	19970	32428	70779	27303	37620	2.7	1.34	0.86	1.80	1.74	1.69
T ₉	18950	39688	49699	28455	34198	2.7	1.33	1.95	1.62	2.12	1.94
SE(m) _±		411.08	6417			0.04			0.07		
CD at 5%		1150.9	N.S.			0.1			N.S.		
CV %		3.47	15.78			2.26			6.86		

Table K-16-AST-2(f): Economics of different techniques of seed priming on productivity of forage Maize

Treatments	Gross return (Rs/ha)					Total cost of cultivation (Rs/ha)					
	Kalyani	Anand	Urulikanchan	Jabalpur	Mean	Kalyani	Anand	Urulikanchan	Jabalpur	Kalyani	Mean
T ₁	42030	70670	146549	70670	82480	18250	20361	80150	26876	23780	33883
T ₂	43515	79657	153188	79657	89004	18250	20361	80225	28567	25265	34534
T ₃	48045	83742	166974	83742	95626	19560	41503	91400	40501	28485	44290
T ₄	37590	88235	175655	88235	97429	19560	41503	91475	40501	18030	42214
T ₅	42105	80882	157783	80882	90413	19350	39418	86150	38416	22755	41218
T ₆	63030	82108	160847	82108	97023	19350	39418	86225	38416	43680	45418
T ₇	49560	65359	155741	65359	84005	19250	37833	87950	36831	30310	42435
T ₈	45030	70261	158804	70261	86089	19250	37833	88025	36831	25780	41544
T ₉	42015	60049	129699	60049	72953	18000	20361	80000	25467	24015	33569

B. Location Specific Trials

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

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

Location: Rahuri

The field experiment was initiated during *Kharif* 2015 to find out the optimum fertilizer dose for various B x Napier Hybrid genotypes and to study the economics of different treatments. The treatments included two varieties namely RBN 2011-12 (V_1) and Phule Jaywant (V_2) under four fertilizer levels i.e. F_1 -75 % RDF (112.5: 37.5:30 Kg NPK ha^{-1}), F_2 -100 % RDF (150:50:40 Kg NPK ha^{-1}), F_3 -125 % RDF (187.5:62.5:50 Kg NPK ha^{-1}) and F_4 -150 % RDF (225:75:60 Kg NPK ha^{-1}). Before commencement of rains, 10 t FYM ha^{-1} year⁻¹ was applied in July. Treatments were replicated thrice in factorial randomized block design. The results indicated the plant height and leaf: stem ratio of genotypes of B x N hybrid remained unaffected due to the fertilizer levels. However, the plant height, leaf: stem ratio and number of tillers per tussock (52.75) and tussock girth were observed higher in the genotype Phule Gunwant (RBN 2011-12). As, regards fertilizer levels, 150 % RDF recorded the higher plant height (143.69 cm), leaf: stem ratio (1.18), number of tillers per tussock (54.0) and tussock girth (125.23 cm). The Phule Gunwant (RBN 2011-12) recorded significantly higher green forage yield (1869.07 q ha^{-1}) and dry matter yield (452.8 q ha^{-1}) than Phule Jaywant. Similarly, the 150% fertilizer level recorded significantly higher green forage yield (1913.85 q ha^{-1}) and dry matter yield (472.52 q ha^{-1}).

The crude protein yield (36.23 q ha^{-1}) yield was recorded significantly higher in Phule Gunwant (RBN 2011-12) than Phule Jaywant. The ADF (44.23 %) and NDF (64.72 %) were recorded significantly lower in Phule Gunwant. While, IVDMD value (53.30%) was significantly higher in the Phule Gunwant. As regards to fertilizer level, the crude protein yield (43.79 q ha^{-1}) and crude fibre yield (156.05 q ha^{-1}) were significantly higher with the application of 150% RDF. The ADF (46.88%) and NDF (68.67 %) were recorded significantly higher in 75 % RDF.

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

Treatment	GFY (q/ha)	DMY (q/ha)	Plant height (cm)	Leaf Stem Ratio	No. of tillers/ tussock	Tussock girth (perimeter)
Varieties						
V_1	1869.07	452.88	142.92	1.10	52.75	3.86
V_2	1544.98	365.62	139.79	1.08	49.58	3.33
CD at 5%	138.69	36.28	NS	NS	3.08	0.23
SEm±	46.70	12.22	1.39	0.036	1.04	0.08
Fertilizer levels						
F_1	1501.98	345.27	139.14	1.00	47.83	2.80
F_2	1669.66	395.27	140.39	1.06	49.83	3.48
F_3	1742.61	423.94	142.19	1.12	53.00	3.93
F_4	1913.85	472.52	143.69	1.18	54.00	4.17
CD at 5%	196.13	51.31	NS	NS	4.36	0.32
SEm±	66.04	17.28	1.97	0.05	1.47	0.11
V X F						
CD at 5%	NS	NS	NS	NS	NS	0.46
SE ±	93.40	24.44	2.78	0.07	2.08	0.15
CV%	9.48	10.34	3.41	11.32	7.03	7.45

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

Treatment	Crude Protein (%)	Crude Protein Yield (q/ha)	Crude fibre content (%)	Crude fibre yield (q ha^{-1})	ADF (%)	NDF (%)	IVDMD (%)
Varieties							
V_1	7.87	36.23	34.93	157.10	44.23	64.72	53.30
V_2	7.71	28.65	35.51	129.25	45.06	68.09	52.65
CD at 5%	NS	3.43	0.55	12.60	0.79	1.04	0.62
SEm±	0.12	1.15	0.18	4.24	0.26	0.35	0.21
Fertilizer levels							
F_1	6.27	21.67	36.78	126.52	46.88	68.67	51.21
F_2	7.37	29.04	35.72	140.85	45.87	67.03	52.01
F_3	8.31	35.29	35.28	149.29	43.90	66.53	53.57
F_4	9.23	43.79	33.09	156.05	41.93	63.38	55.11
CD at 5%	0.52	4.85	0.78	17.83	1.11	1.48	0.88
SEm±	0.18	1.63	0.26	6.00	0.37	0.50	0.30
V X F							
CD at 5%	NS	NS	NS	NS	NS	NS	NS
SE ±	0.25	2.31	0.37	8.49	0.53	0.70	0.42
CV%	5.54	12.32	1.82	10.27	2.05	1.83	1.36

K16-AST-8: Resource management in rice-oat cropping system under sodic soils.

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

Location: Faizabad

The field experiment was initiated during *Kharif* 2016 at Faizabad centre to study the resource management in rice-oat cropping system under sodic soils. The treatments comprised of eight treatments viz.; control, RDF (120N:60P₂O₅:40K₂O kg/ha), combination of 75% RDF and 50% RDF with 25% N and 50% N substitution through pressmud, dhaincha and crop residue, respectively. The experiment was laid out in Randomized Block Design and replicated thrice. The soil of experimental field was sodic and poor in fertility (pH-9.1, E.C.-0.97dSm⁻¹, ESP-32.7%, organic carbon-0.23%, available N- 115.4 kg, P₂O₅ –15.6 kg and K₂O-240.0 kg/ha), silty loam in texture and saline in reaction. The paddy var.Sarjoo-52 was transplanted on July 29, 2016 and fertilized as per treatments. The results revealed that the grain and straw yields of paddy, plant height and number of tillers were significantly higher with RDF and being *at par* with 75% RDF+25% N through pressmud. The lowest value was observed with control for all the growth and yield parameters. Observations recorded on physico-chemical properties of soil after harvest of the crop during first year of experimentation showed no significant effect for available nitrogen, phosphorous and potash as well as for pH, EC, ESP and Organic Carbon (%) over its initial values.

Table K16-AST-8 (a): Effect of integrated nutrients management on growth, yield and yield attributes of rice.

Treatment	Grain yield (q/ha)	Straw yield (q/ha)	Harvest index (%)	Plant height (cm)	No. of tillers/m row length
Control	19.37	28.13	40.78	90.1	58
RDF(120N:60P ₂ O ₅ :40K ₂ O kg/ha)	40.45	53.76	42.94	107.7	92
75% RDF+25% N through pressmud	36.23	48.89	42.56	105.5	83
75% RDF+25% N through dhaincha	33.67	46.64	41.92	103.2	78
75% RDF+25% N through crop residue	32.13	45.95	41.15	101.5	75
50% RDF+50% N through pressmud	32.55	46.42	41.22	101.7	75
50% RDF+50% N through dhaincha	31.21	44.66	41.14	100.8	72
50% RDF+50% N through crop residue	29.75	43.43	40.65	110.2	70
SEm ±	2.03	2.39	2.40	6.7	6.60
CD at 5%	4.26	5.12	NS	14.4	14.20
CV%	7.80	6.53	7.07	8.1	10.75

Table K16-AST-8 (b): Effect of integrated nutrients management on physico-chemical properties of soil after harvest of the crop

Treatment	Available nutrients (kg/ha)			pH value	EC dSm ⁻¹	Exchang. sodium (%)	O.C. (%)
	N	P ₂ O ₅	K ₂ O				
Control	116.7	15.7	242	9.1	0.96	31.8	0.23
RDF(120N:60P ₂ O ₅ :40K ₂ O kg/ha)	121.4	16.4	251	9.0	0.94	31.5	0.24
75% RDF+25% N through pressmud	124.6	16.9	255	8.9	0.92	30.4	0.25
75% RDF+25% N through dhaincha	122.3	16.6	253	9.0	0.93	31.2	0.24
75% RDF+25% N through crop residue	121.8	16.5	252	9.0	0.93	31.3	0.24
50% RDF+50% N through pressmud	122.5	16.7	253	8.9	0.92	30.3	0.25
50% RDF+50% N through dhaincha	121.7	16.5	251	9.0	0.93	31.0	0.24
50% RDF+50% N through crop residue	120.6	16.2	249	9.0	0.93	31.2	0.24
Initial value	115.4	15.6	240	9.1	0.97	32.7	0.23
SEm ±	4.56	0.64	8.8	-	-	-	-
CD at 5%	NS	NS	NS	-	-	-	-
CV%	4.6	4.8	4.3	-	-	-	-

C. Concluded Trials

K-12-AST-4: Cropping system studies in fodder maize with legume intercropping

[(Table Reference: K-12-AST-4 (a) to 4 (c)]

Location: Srinagar

The experiment was initiated 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 four replications and nine treatments. The treatments consisted of sole maize (30cm spacing), sole cowpea (30cm spacing), sole soybean (30cm 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 seed rate applied for sole crops were 80kg/ha for maize, 40kg/ha for cowpea and 60kg/ha for soybean and for mixed cropping 50% less seed rate were applied for both the crops and after completion of three years data the results has been reported in following tables.

The mean data of three years experimentation revealed that the green fodder yield (487.66 q/ha) and dry matter yield (148.78 q/ha) of sole maize was significantly higher than both sole legumes as well as different intercropping ratios. However, it remained at par with mixed intercropping of soybean in terms of GFY. In respect of different intercropping ratios, the maize+ soybean mixed cropping were found superior over rest of the intercropping ratios but were at par with maize+ cowpea. Among the different treatments tested, sole cowpea was recorded maximum crude protein content (17.80 %). It was also observed that maize with soybean mixed cropping had maximum crude protein yield (13.26 q/ha) than rest of the treatments. Highest maize fodder equivalent yield (499.63 q/ha) and B: C ratio (2.04) was recorded in maize + soybean mixed cropping system over rest of the treatments. All the treatments except sole maize showed positive balance of available nutrients that indicates the grass-legume association improves the soil health.

Table K-12-AST-4 (a): Yield and quality of forage crops as influenced different legume intercropping system

Treatment	Yield (q/ha)				Plant height (cm)	Crude protein content (%)	Nitrogen uptake (kg/ha)
	Green Fodder	Dry Fodder	Crude Protein	Maize Fodder Equivalent			
						2016	2016
T ₁ - Sole maize	495.13	153.23	13.33	495.32	242.20	8.7	213.30
T ₂ - Sole cowpea	201.64	36.40	6.26	306.50	78.52	17.2	100.17
T ₃ - Sole soybean	218.32	43.25	6.31	312.50	81.20	14.6	101.03
T ₄ - Maize + cowpea (1:1)	302.54	68.50	7.40	348.25	240.65	10.8	118.37
T ₅ - Maize + cowpea (2:1)	358.23	107.60	9.90	474.50	242.30	9.2	158.39
T ₆ - Maize + soybean (1:1)	312.52	71.25	7.70	356.20	230.52	10.8	123.12
T ₇ - Maize + soybean (2:1)	392.50	98.50	8.47	398.60	224.80	8.6	128.66
T ₈ - Maize + cowpea mixed cropping	438.20	95.26	11.43	485.30	243.50	12.0	182.90
T ₉ -Maize+ soybean mixed cropping	466.32	115.20	13.78	504.25	241.50	11.4	210.12
SEm ±	11.83	4.22	0.51	10.88	4.20	0.37	4.53
CD at 5%	35.26	12.58	1.52	32.56	12.56	1.12	13.52

Table K-12-AST-4 (b): Yield and quality of forage crops as influenced different legume intercropping system (Pooled over three years)

Treatment	Yield (q/ha)				B:C Ratio	Plant height (cm)	Crude protein content (%)
	Green Fodder	Dry Fodder	Crude Protein	Maize Fodder Equivalent			
T ₁ - Sole maize	487.66	148.78	12.80	487.66	1.86	239.99	8.60
T ₂ - Sole cowpea	194.89	34.18	5.97	295.75	1.42	76.76	17.50
T ₃ - Sole soybean	209.36	42.63	6.14	285.25	1.38	79.60	14.40
T ₄ - Maize + cowpea (1:1)	305.72	69.67	7.31	354.13	1.48	241.83	10.50
T ₅ - Maize + cowpea (2:1)	395.51	107.80	9.81	479.75	1.56	241.15	9.10
T ₆ - Maize + soybean (1:1)	316.26	74.03	7.84	363.10	1.52	232.76	10.60
T ₇ - Maize + soybean (2:1)	385.50	96.62	8.48	404.30	1.64	226.40	8.75
T ₈ - Maize + cowpea mixed cropping	439.69	96.14	11.68	487.65	1.98	242.25	12.15
T ₉ -Maize+ soybean mixed cropping	458.49	113.85	13.56	499.63	2.04	243.25	11.65
SEm ±	11.50	3.54	0.52	9.60	-	4.85	0.39
CD at 5%	34.28	10.56	1.58	28.63	-	14.50	1.16

Table K-12-AST-4 (c): Nutrient content and soil fertility status of forage crops as influenced by fodder maize with different legume intercropping system (after three years of trial)

Treatment	Organic carbon (%)	pH	Available N (kg/ha)	Available P (kg/ha)	Available K (kg/ha)
T ₁ - Sole maize	0.73	6.4	203.3	11.8	324.52
T ₂ - Sole cowpea	0.75	7.1	243.5	16.4	338.50
T ₃ - Sole soybean	0.75	6.8	248.3	15.6	332.25
T ₄ - Maize + cowpea (1:1)	0.76	6.8	227.4	15.2	328.20
T ₅ - Maize + cowpea (2:1)	0.75	6.9	234.5	14.8	331.20
T ₆ - Maize + soybean (1:1)	0.78	6.8	232.6	14.9	334.25
T ₇ - Maize + soybean (2:1)	0.74	6.9	244.5	15.0	332.50
T ₈ - Maize + cowpea mixed cropping	0.76	6.9	236.6	16.0	335.60
T ₉ -Maize+ soybean mixed cropping	-	6.9	240.8	15.8	338.50
SEm ±	-	-	2.85	0.74	2.20
CD at 5%	12.60	-	8.52	2.21	6.58
Initial values	0.72	6.6	218.56	14.50	320.43

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

[(Table Reference: AST-12- (a) to 12 (c)]

Location: Srinagar

The experiment was conducted to study the effect of varying seed rate of forage legumes on productivity of fodder maize. The experiment was laid out in RBD with four 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, maize + soybean @ 40 kg/ha, maize + soybean @ 60 kg/ha and maize + soybean @ 80 kg/ha. The recommended seed rate of maize is 80kg/ha. However, the seed rate of maize was adjusted as per the row proportion i.e. being replacement series the seed rate was 40kg/ha.

The mean data of three years experimentation revealed that sole maize recorded significantly highest GFY (482.29 q/ha) and DMY (135.23 q/ha) over rest of the intercropping systems including both sole cowpea and sole soybean. In respect of varying seed rate of forage legumes tested, the maize + cowpea @ 60 kg/ha showed significant increase of both the green fodder yield (340.25 q/ha) and dry matter yield (64.60 q/ha) over maize + cowpea @ 20 kg/ha and the percent increase was 17.86% and 18.09% respectively, however, it remained at par with maize + cowpea @ 40 kg/ha. Same is the trend with maize + soybean intercropping where seed rates of soybean @ 80 kg/ha and 60 kg/ha remained at par with each other but significantly increase over 40 kg/ha. Also it was found that sole cowpea recorded significantly highest crude protein content (15.75%) over rest of the treatments. Being a replacement series, the productivity of sole maize was maximum than different intercrops. It was also observed that with increasing seed rate of both the legumes, the quality of the crop as well as the nutrient status of the soil showed positive increase.

Table AST – 12 (a): Yield and quality as influenced with fodder maize and forage legume under varying seed rates of intercrops

Treatment	Yield (q/ha)			Plant population/m ²	Plant height (cm)	Crude protein content (%)
	Green Fodder	Dry Fodder	Crude Protein			
	2016	2016	2016			
T ₁ -Sole maize (30cm spacing)	474.25	133.25	11.06	27.66	228.23	8.3
T ₂ -Sole cowpea (30cm spacing)	189.65	33.66	5.25	33.33	77.12	15.6
T ₃ -Sole soybean (30cm spacing)	196.24	45.33	6.48	36.25	81.33	14.3
T ₄ -Maize + cowpea @ 20kg/ha	284.50	54.25	4.99	19.82	221.66	9.2
T ₅ -Maize + cowpea @ 40kg/ha	343.62	65.83	5.92	33.66	232.25	9.0
T ₆ -Maize + cowpea @ 60kg/ha	347.50	66.33	6.37	34.33	224.50	9.6
T ₇ -Maize + soybean @ 40kg/ha	263.58	59.25	5.45	24.83	228.32	9.2
T ₈ -Maize + soybean @ 60kg/ha	321.40	78.66	7.39	35.50	227.23	9.4
T ₉ -Maize + soybean @ 80kg/ha	318.45	77.20	7.57	32.45	221.66	9.8
SEm ±	4.15	2.38	0.28	0.78	2.85	0.32
CD at 5%	12.36	7.12	0.86	2.34	8.52	0.98

Table AST – 12 (b): Yield and quality as influenced with fodder maize and forage legume under varying seed rates of intercrops (Pooled over three years)

Treatment	Mean yield (q/ha)			Plant population /m ²	B:C Ratio	Plant height (cm)	Crude protein content (%)
	Green Fodder	Dry Fodder	Crude Protein				
T ₁ -Sole maize (30cm spacing)	482.29	135.23	11.29	27.00	1.78	231.90	8.35
T ₂ -Sole cowpea (30cm spacing)	184.95	32.13	5.06	32.28	1.38	76.51	15.75
T ₃ -Sole soybean (30cm spacing)	190.96	43.94	6.22	35.68	1.40	79.57	14.15
T ₄ -Maize + cowpea @ 20kg/ha	291.25	55.44	5.05	19.98	1.52	223.08	9.10
T ₅ -Maize + cowpea @ 40kg/ha	339.54	64.74	5.89	32.88	1.94	231.25	9.10
T ₆ -Maize + cowpea @ 60kg/ha	343.88	65.47	6.34	33.77	1.85	226.45	9.70
T ₇ -Maize + soybean @ 40kg/ha	267.17	59.83	5.41	23.64	1.60	227.22	9.05
T ₈ -Maize + soybean @ 60kg/ha	318.65	77.13	7.30	34.81	1.98	225.77	9.45
T ₉ -Maize + soybean @ 80kg/ha	320.03	78.73	7.69	33.08	1.88	226.13	9.75
SEm ±	5.13	2.87	0.27	0.85	-	2.79	0.34
CD at 5%	15.30	8.56	0.82	2.56	-	8.32	1.02

Table AST – 12 (c): Nutrient content and soil fertility status as influenced with fodder maize and forage legume under varying seed rates of intercrops (After Kharif 2016)

Treatment	Avail. N	Avail. P	Avail. K	Nitrogen uptake (2016)	Organic carbon (%)	pH
	(kg/ha)					
T ₁ -Sole maize (30cm spacing)	195.65	11.2	316.52	176.96	0.76	6.3
T ₂ -Sole cowpea (30cm spacing)	248.50	16.8	342.56	84.02	0.79	6.9
T ₃ -Sole soybean (30cm spacing)	256.21	16.5	348.25	103.72	0.78	6.8
T ₄ -Maize + cowpea @ 20kg/ha	216.25	14.2	332.56	79.86	0.75	6.9
T ₅ -Maize + cowpea @ 40kg/ha	228.32	14.9	338.33	94.80	0.76	6.9
T ₆ -Maize + cowpea @ 60kg/ha	232.65	15.2	340.50	101.88	0.78	6.7
T ₇ -Maize + soybean @ 40kg/ha	225.23	13.8	332.50	87.22	0.74	6.8
T ₈ -Maize + soybean @ 60kg/ha	238.50	15.8	338.20	118.30	0.77	6.9
T ₉ -Maize + soybean @ 80kg/ha	242.30	16.6	342.50	121.05	0.78	6.8
SEm ±	2.11	0.66	1.81	3.85	-	-
CD at 5%	6.30	1.98	5.40	11.50	-	-
Initial values	219.86	14.25	318.56		0.72	6.6

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 with a view to study the effect of conjoint application of organic manure and inorganic fertilizers on forage yield and economics of fodder rice bean [*Vigna umbellata* (Thumb) Ohwi and Ohashi] at Imphal. The treatment consisted of T₁ = 100% RDF, T₂ = 75% RDF for phosphorus + 1 tonne Poultry Manure, T₃ = 75% RDF for phosphorus + 2 tonne Poultry Manure, T₄ = 50% RDF for phosphorus + 1 tonne poultry manure, T₅ = 50% RDF for phosphorus + 2 tonne Poultry Manure, T₆ = 25% RDF for phosphorus + 1 tonne poultry manure, T₇ = 25% RDF for phosphorus + 2 tonne poultry manure, laid out in randomized block design and replicated three times. The results revealed that application of 50% RDF for phosphorus + 2 tonne poultry manure /ha recorded highest green fodder yield (385.61 q/ha), crude protein content (13.91%). It is also fetched highest net monetary returns (Rs 52551.57/ha/yr) and benefit cost ratio (2.14) over rest of the treatments and lowest being with 50% RDF for phosphorus + 1 tonne poultry manure (Rs 45428.04/ha/yr and 1.89), respectively.

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

Treatment	Green fodder yield (q/ha)	Dry matter yield (q/ha)	Crude protein yield (q/ha)	Crude protein (%)	Plant height (cm)	Leaf stem ratio	Net return (Rs./ha)	Benefit cost ratio
T ₁	347.49	52.07	6.55	12.58	177.22	0.36	45508	1.90
T ₂	365.84	61.77	7.28	11.79	169.67	0.32	48789	2.00
T ₃	368.82	57.45	7.25	12.62	192.78	0.33	48985	1.98
T ₄	347.49	52.50	6.77	12.90	170.00	0.36	45428	1.89
T ₅	385.61	57.44	7.98	13.91	182.89	0.32	52552	2.14
T ₆	353.73	62.98	8.30	13.17	178.67	0.43	46885	1.97
T ₇	382.67	62.91	7.59	12.07	169.67	0.40	52173	2.14
SEm±	7.04	1.87	0.30	0.27	2.98	0.02	1408.69	0.06
CD at 5%	21.70	5.77	0.91	0.83	9.17	0.05	4340.58	0.18

T₁ = 100% RDF

T₂ = 75% RDF for phosphorus + 1 tonne poultry manure

T₃ = 75% RDF for phosphorus + 2 tonne poultry manure

T₄ = 50% RDF for phosphorus + 1 tonne poultry manure

T₅ = 50% RDF for phosphorus + 2 tonne poultry manure

T₆ = 25% RDF for phosphorus + 1 tonne poultry manure

T₇ = 25% RDF for phosphorus + 2 tonne poultry manure

K-15-AST-5 L: Studies on carbon sequestration in subabul (*Leucaena leucocephala*) based silvi-pastoral cropping system under rain fed agriculture
 [(Table Reference: K-15-AST-5 (a) to 5 (d)]

Location (1): Hyderabad

The trial was initiated with the objective in 2015 to study the organic matter input to soil through *Leucaena* based perennial fodder cropping system and to study organic matter partitioning added through the ROTH-C in existing Subabul based Cropping system. The treatments included T₁- Subabul (Sole crop), T₂- Subabul + B N Hybrid (APBN-1) as intercrop, T₃- Subabul + B N Hybrid (APBN-1) + *Desmanthus* in 3:1 ratio, T₄- Subabul + B N Hybrid (APBN-1) + *Desmanthus* (3:1) in stylo (*Stylosanthes hamata*) ground cover, T₅- Subabul + *Cenchrus ciliaris*, T₆- Subabul + *Cenchrus ciliaris* + *Desmanthus* intercrop (3:1 ratio) in Stylo ground cover, T₇- Subabul + *Cenchrus ciliaris* + *Desmanthus* intercrop (3:1 ratio) and T₈- Subabul + *Desmanthus* as intercrop. The trial was conducted in Randomised Block design with three replications. The green fodder yields during the first year of experimentation were highest in T₂ i.e., APBN-1 intercrop (428.67 q ha⁻¹) and this was on par with T₄ i.e., intercrops of APBN-1 and *Desmanthus* in 3 : 1 ratio under *Stylo* ground cover (365.63 q ha⁻¹). This was more than that of subabul sole crop by 256% and 203%, respectively. The DFY followed similar trends as that of GFY. The DFY of intercrops APBN-1 (88.47 q ha⁻¹) > APBN-1 + *Desmanthes* in 3:1 ratio in stylo ground cover (37.6 q ha⁻¹) > APBN-1 and *Desmanthes* in 3: 1 ratio (58.77 q ha⁻¹). The crude protein yield was highest APBN-1 intercrop (10.61 q ha⁻¹) and this was on par with that of APBN-1 + *Desmanthus* 3:1 ratio in *Stylo* ground cover (8.78 q ha⁻¹).

CARBON SEQUESTRATION

Carbon SEQUESTRATION IN CROP BIOMASS (above + below ground crop biomass)

The total CO₂ sequestered by the crops in the silvipastoral cropping system was highest when APBN-1 was the intercrop i.e., 33.06 t ha⁻¹. However, this was on par with the intercrop of APBN-1 + *Desmanthus* in 3:1 ratio under *stylo* ground cover (30.35 t ha⁻¹).

SOIL CARBON SEQUESTRATION

The soil C sequestration was found to be highest in *Cenchrus* + *Desmanthes* in 3: 1 ratio under *stylo* ground cover i.e., 1.82 t ha⁻¹ followed by *Desmanthes* intercrop (1.8 t ha⁻¹). However, the Soil C sequestration did not differ with the various cropping systems studied during this first year of experimentation.

Table K-15-AST-5 (a): Total GFY, Total DFY and total CPY of all crops in silvipastoral system during first year

Treatments	Total GFY all crops (q/ha)	Total DFY all crops (q/ha)	Total CPY of all crops (q/ha)
T ₁	120.37	13.2	2.23
T ₂	428.67	88.47	10.61
T ₃	307.23	58.77	7.61
T ₄	365.63	67.60	8.78
T ₅	141.93	18.47	2.68
T ₆	153.30	19.20	2.80
T ₇	172.27	22.10	3.48
T ₈	150.90	16.83	2.48
SEm±	30.74	6.33	0.76
CD (P=0.05)	93.25	19.19	2.30

Table K-15-AST-5 (b): Total biomass carbondioxide sequestered by crops in subabul based silvipastoral system during year under report in t/ha

Treatments	BN Hybrid (APBN-1)	APBN-1	<i>Cenchrus</i>	<i>Desmanthus</i>	<i>Stylo</i>	Total C sequestered
T ₁	16.42	-	-	-	-	16.42
T ₂	15.51	17.55	-	-	-	33.06
T ₃	16.45	10.25	-	0.61	-	27.32
T ₄	17.37	11.59	-	0.63	0.76	30.35
T ₅	16.21	-	1.94	-	-	18.15
T ₆	16.00	-	1.76	0.52	-	18.28
T ₇	16.32	-	1.49	0.64	0.93	19.38
T ₈	16.09	-	-	1.49	-	17.58
SEm±						1.53
CD (P=0.05)						4.64

Table K-15-AST-5 (c): Status of bulk density at end of 2016 in 0-30 cm, OC % month wise from Aug to Dec, 2016 and C stocks in soil in t/ha

Treatments	Bulk density (g/cc)	OC (%)					C stocks in soil (t/ha)
		Aug, 2016	Sept, 2016	Oct, 2016	Nov, 2016	Dec, 2016	
T ₁	1.52	0.37	0.37	0.37	0.33	0.39	1.75
T ₂	1.52	0.30	0.34	0.39	0.35	0.33	1.50
T ₃	1.53	0.40	0.38	0.39	0.30	0.35	1.61
T ₄	1.56	0.41	0.35	0.37	0.30	0.34	1.63
T ₅	1.53	0.45	0.37	0.36	0.29	0.30	1.38
T ₆	1.51	0.40	0.38	0.39	0.37	0.33	1.51
T ₇	1.57	0.44	0.39	0.31	0.36	0.39	1.82
T ₈	1.52	0.42	0.35	0.37	0.40	0.40	1.80
SEm±	0.049	0.042	0.031	0.040	0.03	0.028	0.118
CD (P=0.05)	NS	NS	NS	NS	NS	NS	NS

Table K-15-AST-5 (d): Total biomass Carbodioxide sequestered, retained (mitigated) and removed (emitted) by crops and soils Carbon (t/ha)

Treatments	Total biomass C retained (mitigated) A	Total biomass C removed in form of cuts (emitted) B	Total biomass C Sequestered A + B	C stocks in soil (t/ha)	Total C Sequestered Crop + soil
T ₁	15.83	0.60	16.42	1.75	18.17
T ₂	19.77	13.30	33.06	1.50	34.56
T ₃	19.23	8.08	27.31	1.61	28.92
T ₄	21.15	9.19	30.35	1.63	31.98
T ₅	17.33	0.83	18.16	1.38	19.54
T ₆	17.41	0.87	18.28	1.51	19.79
T ₇	18.39	1.00	19.38	1.82	21.2
T ₈	16.82	0.76	17.58	1.80	19.38
SEm±	0.8	1.05	1.53	1.53	2.2
CD (P=0.05)	2.428	3.17	4.64	4.64	6.68

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

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

Location: Faizabad

The field experiment was conducted during *Kharif* 2015 and 2016 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 – 9.0, E.C.- 0.96dsm⁻¹, Organic Carbon-0.26%, Available N- 116.5kg/ha, P₂O₅ –18.2 kg/ha and K₂O -158.5 kg/ha), silty loam in texture and saline in reaction. The mean results indicated that among all the entries, NDFB-939 was found superior in all parameters green fodder, dry matter and crude protein yields as well as per day productivity. This was closely followed by NDFB-936.

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

Genotype	GFY (q/ha)			DMY (q/ha)			CPY (q/ha)		
	2015	2016	Mean	2015	2016	Mean	2015	2016	Mean
NDFB-936	394.5	408.4	401.45	112.1	115.9	114.00	9.1	9.3	9.20
NDFB-904	305.7	321.8	313.75	93.3	90.4	91.85	7.1	6.9	7.00
NDFB-939	410.3	431.6	420.95	129.9	127.3	128.60	11.3	10.9	11.10
NDFB-914	340.6	363.7	352.15	99.1	101.5	100.30	7.1	7.4	7.25
NDFB-926	360.5	373.3	366.90	100.6	101.5	101.05	7.8	7.8	7.80
NDFB-12	370.4	384.5	377.45	109.6	109.6	109.60	8.2	8.3	8.25
NDFB-2(check)	381.8	386.8	384.30	115.7	111.8	113.75	9.7	9.2	9.45
NDFB-3(check)	375.2	381.2	378.20	108.1	106.4	107.25	8.6	8.4	8.50
CD at 5%	55.9	60.8	58.40	17.70	16.70	17.21	1.2	1.2	1.20

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

Genotype	GFY (q/ha/day)			DMY (q/ha/day)		
	2015	2016	Mean	2015	2016	Mean
NDFB-936	5.56	5.92	5.74	1.58	1.68	1.63
NDFB-904	4.31	4.66	4.49	1.31	1.31	1.31
NDFB-939	5.78	6.26	6.02	1.80	1.84	1.82
NDFB-914	4.80	5.27	5.04	1.40	1.47	1.44
NDFB-926	5.08	5.41	5.25	1.42	1.47	1.45
NDFB-12	5.22	5.57	5.40	1.54	1.59	1.57
NDFB-2(check)	5.38	5.61	5.50	1.63	1.61	1.62
NDFB-3(check)	5.28	5.52	5.40	1.52	1.54	1.53
CD at 5%	-	-	-	-	-	-

CS-13-AST-4: Residual effect of P applied to wheat on the succeeding summer fodders in sorghum-wheat-summer fodders cropping system

[(Table Reference: CS-13-AST-4 (a) to 4 (d)]

Location (1): 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 pearl millet) 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 namely; maize, pearl millet or 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 yields (86.6 q/ha) over pearl millet (322.8 and 72.2 q/ha, respectively) and cowpea (287.2 and 45.2 q/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 pearl millet 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 pearl millet 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 pearl millet 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- pearl millet -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 wheat-cowpea-sorghum cropping system than wheat-maize-sorghum and wheat- pearl millet -sorghum.

Table CS-13-AST-4 (a): Fodder and grain yields (q/ha) in wheat-summer fodder-sorghum cropping system

Treatments	Wheat	Wheat	Summer fodder		Sorghum	
	Grain	Straw	Green fodder	Dry matter	Green fodder	Dry matter
Cropping system						
Wheat-maize-sorghum	51.3	66.5	437.8	107.3	342.9	68.2
Wheat-bajra-sorghum	51.2	67.5	398.8	81.4	309.7	62.3
Wheat-cowpea-sorghum	52.9	66.7	222.0	32.1	385.8	77.9
CD (5%)	NS	NS	22.19	5.04	10.34	3.11
SEm±	0.55	1.50	7.62	1.73	3.55	1.07
P-applied to summer fodder (% of recommended P)						
0	51.3	66.5	295.9	58.5	305.4	61.9
25	51.6	66.3	337.3	69.2	335.9	67.2
50	51.7	67.9	358.9	75.9	354.9	70.4
75	52.1	66.4	380.6	80.8	365.1	73.2
100	52.2	67.4	391.4	83.7	369.4	74.6
CD (5%)	NS	NS	28.64	6.51	13.35	4.02
SEm±	0.73	1.94	9.84	2.23	4.58	1.38
Interaction						
CD (5%)	NS	NS	49.61	11.27	NS	NS
SEm±	1.24	3.35	17.04	3.87	7.94	2.39
CV (%)	4.13	8.68	8.36	9.11	6.97	8.96

Table CS-13-AST-4 (b): Growth parameters of different crops in wheat-summer fodder-sorghum Cropping system

Treatments	Plant height (cm)			Leaf Stem ratio		Tillers or plants per m row length			1000 grain weight of wheat
	Wheat	Summer fodder	Sorghum	Summer fodder	Sorghum	Wheat	Summer fodder	Sorghum	
Cropping system									
Wheat-maize-sorghum	91.1	168.4	154.0	0.60	0.46	91.9	15.0	14.9	42.0
Wheat-bajra-sorghum	91.8	151.5	153.1	0.83	0.45	92.3	65.6	14.5	41.9
Wheat-cowpea-sorghum	91.5	152.5	167.8	0.32	0.46	92.1	13.3	18.2	42.2
CD (5%)	NS	6.66	4.45	0.03	NS	NS	2.63	0.46	NS
SEm±	0.22	2.29	1.53	0.01	0.01	0.56	0.90	0.16	0.14
P-applied to summer fodder (% of recommended P)									
0	91.4	137.5	144.1	0.61	0.47	91.6	28.9	14.6	42.1
25	91.4	150.9	156.3	0.59	0.46	92.7	31.3	15.7	42.0
50	91.5	160.9	161.5	0.58	0.45	92.4	31.9	16.0	42.0
75	91.4	167.2	164.3	0.57	0.46	92.6	32.1	16.4	42.0
100	91.6	170.8	165.4	0.60	0.45	91.2	32.2	16.6	42.2
CD (5%)	NS	8.60	5.74	NS	NS	NS	NS	0.60	NS
SEm±	0.28	2.95	1.97	0.01	0.01	0.73	1.16	0.21	0.18
Interaction									
CD (5%)	NS	NS	NS	0.07	NS	NS	NS	NS	NS
SEm±	0.49	5.11	3.41	0.02	0.02	1.26	2.02	0.36	0.31
CV (%)	4.92	5.62	6.73	6.56	8.58	2.36	11.17	6.89	2.28

Table CS-13-AST-4 (c): Quality parameters in wheat-summer fodder-sorghum cropping system

Treatments	Summer fodder			Sorghum			Grains per ear of wheat
	CP (%)	CP yield (q/ha)	Nitrogen uptake	CP (%)	CP yield (q/ha)	Nitrogen uptake	
Cropping system							
Wheat-maize-sorghum	9.51	10.35	165.5	7.54	5.16	82.5	51.1
Wheat-bajra-sorghum	8.69	7.17	114.7	7.55	4.72	75.4	51.4
Wheat-cowpea-sorghum	14.39	4.63	74.1	8.67	6.76	108.2	51.3
CD (5%)	0.20	0.49	7.85	0.20	0.25	4.05	NS
SEm±	0.07	0.17	2.70	0.07	0.09	1.39	0.27
P-applied to summer fodder (% of recommended P)							
0	9.22	4.88	78.0	7.34	4.58	73.3	51.3
25	10.46	6.57	105.2	7.79	5.27	84.3	51.1
50	11.18	7.76	124.2	8.01	5.66	90.5	51.1
75	11.59	8.61	137.7	8.17	6.01	96.2	51.5
100	11.88	9.10	145.5	8.29	6.21	99.4	51.2
CD (5%)	0.26	0.63	10.13	0.26	0.33	5.23	NS
SEm±	0.09	0.22	3.48	0.09	0.11	1.80	0.34
Interaction							
CD (5%)	NS	1.10	17.55	NS	NS	NS	NS
SEm±	0.15	0.38	6.03	0.15	0.19	3.11	0.60
CV (%)	4.44	8.84	8.84	5.32	6.07	6.07	4.01

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	2140.7	171256	97621	2.33
Wheat-bajra-sorghum	1933.9	154710	88990	2.35
Wheat-cowpea-sorghum	1890.0	151196	87358	2.37
CD (5%)	41.62	3329.4	3329.3	NS
SEm _±	14.29	1143.4	1143.4	0.02
P-applied to summer fodder (% of recommended P)				
0	1875.0	149998	82601	2.23
25	1956.1	156488	88923	2.32
50	2004.4	160353	92622	2.37
75	2041.7	163337	95439	2.41
100	2063.7	165094	97030	2.42
CD (5%)	53.73	4298.2	4298.2	0.06
SEm _±	18.45	1476.1	1476.1	0.02
Interaction				
CD (5%)	93.06	7444.7	7444.6	0.11
SEm _±	31.96	2556.7	2556.7	0.04
CV (%)	5.78	5.78	6.85	3.76

K-15-AST-8C: Compatibility of *Stylosanthes hamata* with *Sewan* (*Lasiurus indicus*) and *Dhaman* Grass (*Cenchrus setigerus*) in arid conditions

[(Table Reference: K-15-AST-8 C (a) to 8 (b)]

Location: Bikaner

The experiment was conducted at Bikaner to study the effect of *Sewan* and *Dhaman* grasses, their combinations with *Stylosanthes scabra* on pasture establishment, growth and quality of fodder. The sowing was done during *Kharif*, 2015. The trial with 8 treatments viz, *Sewan* 100% (T₁), *Dhaman* 100 % (T₂), *Stylosanthes* 100% seed (T₃), T₄-*Sewan* + *Stylosanthes* (row & seed ratio 3:1) T₅- *Dhaman* + *Stylosanthes* (row & seed ratio 3:1), T₆- *Sewan* + *Stylosanthes* (row & seed ratio2:2), T₇- *Dhaman* + *Stylosanthes* (row & seed ratio 2:2) and T₈- *Sewan* + *Dhaman* + *Stylosanthes* (row& seed ratio1:1:1) was laid out in RBD with three replications. Observations for growth, grass yield and quality parameters were recorded twice and shoot, root study was recorded at second harvest stage (Mid December). Total/mean data for various parameters are statistically analysed. The result (Table-K-15-AST-8C-1)) revealed that among different treatments, *Sewan* grass as sole or with combination recorded the higher plant height, L:S ratio, shoot weight and shoot : root ratio while number of tillers/clump, and root weight was higher under *Dhaman* as sole or with combination treatment, in comparison to sole *Stylosanthes hamata* (except S/R ratio). Further, total GFY, DMY, and CP yield recorded the highest value in sole *Sewan* grass which showed statistically significant superiority over rest treatments. The highest CP content was noted in *Stylosanthes hamata* and was significantly higher over rest treatments.

K-15-AST-8 C (a): Compatibility of *Stylosanthes hamata* with *Sewan* and *Dhaman* grass pastures

Treatment	Plant height (cm)		Tillers/clump		L:S ratio		Shoot wt. g/plant	Root wt. g/plant	S:R ratio
	I	II	I	II	I	II			
T ₁	134.7	40.3	71.7	83.0	1.3	1.9	450.3	181.0	2.49
T ₂	125.3	29.7	52.0	89.7	1.1	2.0	392.3	205.0	1.92
T ₃	0.0	18.3	0.0	8.0	0.0	0.8	208.3	84.3	2.47
T ₄	129.0	47.7	78.0	75.7	1.4	2.1	480.0	169.3	2.84
T ₅	119.7	38.0	62.0	84.3	1.0	2.0	409.0	177.7	2.31
T ₆	133.3	52.0	86.3	81.3	1.4	1.8	400.0	140.3	2.85
T ₇	127.7	37.7	84.7	89.3	1.0	1.7	371.7	157.0	2.37
T ₈	125.7	35.3	68.3	82.0	1.1	1.7	350.0	153.3	2.28
SEm±	3.49	3.49	6.25	3.45	0.03	0.07	1.37	1.69	0.03
CD at 5%	10.60	10.58	18.97	10.47	0.11	0.20	4.15	5.12	0.08

K-15-AST-8 C (b): Compatibility of *Stylosanthes hamata* with *Sewan* and *Dhaman* grass pastures

Treatment	GFY q/ha			DMY q/ha			CP %	CPY q/ha
	I	II	Total	I	II	Total		
T ₁	161.68	168.07	329.75	16.31	17.61	33.92	7.01	2.37
T ₂	137.79	145.85	283.63	13.53	14.32	27.85	6.08	1.69
T ₃	0.00	104.87	104.87	0.00	11.81	11.81	10.51	1.25
T ₄	117.65	170.85	288.50	11.04	18.99	30.03	6.84	2.06
T ₅	104.87	107.79	212.66	9.89	11.42	21.31	6.52	1.39
T ₆	119.32	152.23	271.55	10.99	17.14	28.13	6.27	1.76
T ₇	95.98	134.73	230.71	8.53	16.11	24.64	6.31	1.56
T ₈	109.18	120.15	229.32	8.92	14.17	23.09	6.62	1.52
SEm±	5.20	6.53	8.38	0.36	1.21	1.29	0.42	0.13
CD at 5%	15.79	19.82	25.41	1.08	3.66	3.92	1.28	0.41

T₁- *Sewan* grass , T₂-*Dhaman* grass, T₃-*Stylosanthes hamata*, T₄- T₁+T₃ (3:1), T₅- T₂+T₃(3:1), T₆-T₁+T₃ (2:2), T₇- T₁+T₃ (2:2) and T₈-T₁+T₂+T₃ (1:1:1) seed ratio &row arrangement separately sowing of individual grass/legume seed using recommended SR &Package of practices .

K-16-AST-9: Seed production potentiality of fodder maize as influenced by Zinc and Boron under red and lateritic soil of West Bengal

[(Table Reference: K-16-AST-9 (a)]

Location: Sriniketan, West Bengal

A trial was initiated at Sriniketan, West Bengal to study the seed production potentiality, seed quality and Economics of fodder maize as influenced by Zn and B application. The experimental soil was Sandy loam in texture, well drained with low level of organic carbon, available nitrogen and potassium (K_2O) content and medium in available phosphorus (P_2O_5). The soil is slightly acidic (pH 5.66) in reaction and deficient in zinc and boron. Treatments included of Zinc i.e., control (No Zinc), 2.5, 5.0 or 7.5 Kg/ha and four Levels of Boron i.e., control (No Boron), 0.5, 1.0 or 1.5 Kg/ha. The treatments were replicated thrice in factorial randomised block design. Standard package of practices except treatments were followed for raising the crop. The results indicated that The highest plant height of maize was observed at 60 DAS when Zn was applied @ 5 kg/ha. With respect to boron application the highest plant height was measured with 1.5 kg B/ha though this was at par with 1.0 kg boron/ha and significantly higher than 0.5 kg/ha boron level. The highest dry weight of cob was noticed with the application of Zinc @ 5.0 kg/ha (13.10 g) which was significantly higher than other levels of zinc and a decreasing trend was found at 7.5 kg Zinc/ha. The zinc and boron application at various levels significantly influenced the seed yield of forage maize at harvest. The highest seed yield was achieved with the application of 5.0 kg Zinc/ha (14.71 q/ha) which was significantly higher than all other levels of Zinc. With respect to boron, application of 1.0 kg boron/ha showed the highest seed yield (13.22 q/ha). This was significantly higher than all other boron levels. Similarly, highest stover yield was achieved with the use of 5.0 kg zinc/ha (36.77 q/ha) which was significantly higher than other levels of zinc. Application of boron @ 1.0 kg/ha also showed significantly highest stover yield (32.64 q/ha) among different boron levels.

Table K-16-AST-9 (a): Effect of Zinc and Boron on seed production potentiality of forage maize in red and lateritic soil

Treatment	Plant height(cm)		Dry weight of cob(g)	No. of seeds /corn	Test weight (g)	Seed yield (q/ha)	Stover yield (q/ha)
	30 DAS	60 DAS					
Zinc level (kg/ha)							
0	71.31	106.40	8.30	16.23	197.35	7.17	17.94
2.5	73.44	118.23	10.03	19.95	201.50	11.44	28.61
5.0	77.26	121.08	13.10	28.60	204.53	14.71	36.77
7.5	75.47	119.45	11.28	23.93	200.85	12.63	31.15
S.Em (±)	0.99	1.39	0.27	0.79	0.56	0.22	0.56
CD (P= 0.05)	2.85	4.02	0.79	2.28	1.61	0.63	1.63
Boron level (kg/ha)							
0	69.43	100.85	7.38	18.33	197.63	9.26	23.15
0.5	73.45	117.33	10.45	22.25	201.23	11.09	27.71
1.0	76.04	121.80	12.43	25.53	202.48	13.22	32.64
1.5	78.54	125.18	12.48	22.60	202.85	12.38	30.96
S.Em (±)	0.99	1.39	0.27	0.79	0.56	0.22	0.56
CD (P= 0.05)	2.85	4.02	0.79	2.28	1.61	0.63	1.63
Interaction (Zn × B)							
S.Em (±)	1.98	2.78	0.54	1.57	1.11	0.44	1.13
CD (P= 0.05)	NS	NS	NS	4.56	NS	1.26	3.26

FORAGE CROP PROTECTION

KHARIF 2016

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

During *kharif* 2016, study of population dynamics of important diseases and insect pest in *kharif* forages (sorghum, maize, bajra and cowpea and napier bajra) was carried out at several location. Location and crop wise observations are given below.

Location - Ludhiana

PEARL MILLET

Leaf Blast of Pearl Millet: At Ludhiana, Leaf spots (Blast) of Pearl millet on FBC 16 started appearing in second fortnight of August (Table Ludhiana PPT 1a). 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 favourable temperature range of 28.5 -30.0°C and RH of 62-78 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 27.17 percent.

Downy mildew of pearl millet: At Ludhiana, the incidence was less on the recommended cultivars and varied from traces to 4.44 percent. On the susceptible check, 7042, the incidence was 80.0%.

SORGHUM

Cercospora leaf spot of Sorghum: At Ludhiana, *Cercospora* leaf spot of sorghum appeared on SL44 variety in first fortnight of August in the crop sown during first week of June. Disease progressed slowly till first week of September and then at alarming rate upto first week of October with 39.96 percent disease severity. During this period, 27.4 to 45.2 mm rainfall and moderate temperatures of 29.9°C with mean RH of 68-78 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 49.95. 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. 17.67 per cent and more over it appeared late in the season.

Anthrachnose: Anthracnose of sorghum on SL44 variety was observed in the last week of August (Table Ludhiana PPT 1a). Disease progressed slowly till first week of September and further progressed at rapid rate upto first week of October. Maximum disease severity of anthracnose (46.25 %) was recorded during second week of October. During this period, 45.2 mm of rainfall with moderate temperatures and mean RH of 26.5 to 30.4°C and 62-77 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.

MAIZE

Leaf blight of Maize: Disease appeared in the third week of August on J 1006 variety and progressed slowly up to first week of September with 12.6 mm rainfall during second fortnight of August and no rainfall up to October. Thereafter disease showed rapid increase up to first week of October with 37.74% severity (mean RH 68-78% and mean temperature 28.5 to 30.4°C). Thereafter, as the crop reached physiological maturity, the disease development slowed down and disease progressed at a steady pace with maximum disease severity of 46.62 percent (Table Ludhiana PPT 1a).

COWPEA

Incidence of root rot on CL 367 was in traces and mosaic was 12.22 per cent.

Table: Ludhiana PPT 1a: Monitoring of diseases, insect pests and nematodes in maize, pearl millet and sorghum ecosystem.

Disease	Crop/ variety	DOO (Date of observation)									
		14/8/15	21/8/15	28/8/15	4/9/15	11/9/15	18/9/15	25/9/15	2/10/15	9/10/15	16/10/15
Blast	Bajra/ FBC 16	2.22*	5.56	8.89	10.00	12.23	15.00	19.13	22.50	24.00	27.17
Grey leaf spots	Sorghum/ SL 44	5.56*	11.47	18.87	25.53	29.97	32.19	36.52	39.96	44.40	49.95
Anthracnose				9.67*	15.54	23.20	31.08	37.74	43.29	46.25	-
Leaf blight	Maize/ J 1006		3.06*	9.50	15.54	23.31	29.97	32.50	37.74	42.18	46.62

*DOA: Date of appearance

Entomological observations: At Ludhiana, during *kharif* season of 2016, study of population dynamics of important insect pest in *kharif* forages (sorghum, maize, bajra and cowpea and napier bajra) was carried out. In sorghum, sorghum shoot fly (*Atherigona soccata*) and maize borer (*Chilo partellus*) in maize were the predominant pests, whereas, rice grasshopper (*Hieroglyphus nigrorepletus*) was observed in bajra and Napier bajra. The sporadic attack of cowpea pod borer *Maruca vitrata* was observed in different entries of cowpea. (Table Ludhiana PPT 1b).

Table Ludhiana PPT 1b: Monitoring of diseases, insect pests and nematodes in maize, pearl millet and sorghum ecosystem. - Incidence of different insect pest

Insect-pest	Crop	Observation (Standard Meteorological week)									
		25	26	27	28	29	30	31	32	33	34
Shoot fly (% dead hearts)	Sorghum	11%	17%	19%	26%	32%	18%	18%	10%	10%	4%
Maize borer (% dead hearts)	Sorghum	10%	12%	17%	16%	15%	19%	14%	15%	12%	5%
Maize borer (% dead hearts)	Maize	16%	17%	19%	18%	12%	13%	14%	12%	15%	10%
Std Met. Week		30	31	32	33	34	35	36	37	38	-
Grasshopper (adults/plant)	Pearl millet	4	6	6	5	6	6	6	5	6	5
Grasshopper (adults/plant)	Napier bajra	7	8	8	8	10	12	7	6	8	5
Hairy caterpillar (larvae/plant)	Cowpea	1	2	2	2	2	15	16	16	19	24
Std Met. Week		34	35	36	37	38	39	40	41		
Spotted pod borer (<i>Maruca</i> (larvae/ 5 pod)	cowpea	0	1	2	2	3	3	1	1	0	0

The pest population in different *kharif* forages was recorded at the time of pest appearance (Table Ludhiana PPT 1b). The population of sorghum shoot fly started appearing in the month of June (25th SMW) and it was recorded on young seedlings of sorghum entries. The attack of this pest starts after one week of sowing and was reported to be at peak during end June. Though high temp is not conducive for its development but some degree of attack was recorded during the observation period. The stem borer population also started appearing in the month of June and peak population was observed in the month of June-July in both maize and sorghum. The attack of rice grasshopper in pearl millet and napier bajra was recorded in the month of July and no specific peak population was observed during observation period. The sporadic attack of spotted pod borer, *Maruca vitrata* in cowpea was observed in different entries of cowpea. It was reported in the month of September.

Location- Dharwad

Seasonal incidence of insect pest indicated that aphid *Aphis craccivora* population was active during 30th to 35th Indian Standard Week (ISW) and reached peak population of 560.2 on 33rd ISW i.e. during second week of August. Hairy caterpillar *Spilosoma obliqua* was highest of 8.4/plant on 30th ISW i.e. during last week of July. Highest incidence of Cowpea yellow mosaic virus (24%) was noticed during 32nd ISW i.e. second week of August (Table Dharwad PPT 1).

Table Dharwad PPT 1. Monitoring of important insect pests and diseases in Kharif cowpea

Indian Standard Week	Period	Cowpea Aphid <i>Aphis craccivora</i> (No/plant)	Hairy caterpillar (No/plant) <i>Spilosoma obliqua</i>	Cowpea yellow mosaic virus (%)
27	02 Jul –08 Jul	0.0	0.0	0.0
28	09 Jul – 15 Jul	0.0	0.0	0.0
29	16 Jul – 22 Jul	0.0	4.4	4.6
30	23 Jul – 29 Jul	17.2	8.4	12.2
31	30 Jul – 05 Aug	264.4	5.6	23.8
32	06 Aug – 12 Aug	432.6	1.4	24.0
33	13 Aug – 19 Aug	560.2	0.6	10.6
34	20 Aug – 26 Aug	318.4	0.0	3.4
35	27 Aug – 02 Sep	52.2	0.0	0.0
36	03 Sep – 09 Sep	0.0	0.0	0.0

Location- Palampur

At Palampur during Kharif 2016, Wilt-root rot complex (72%) and leaf spots & blight (35%) were the major diseases of cowpea, whereas pod borer and aphids were also observed with mild intensity (7%). In Maize leaf bights (20%) and BLSB (20%) were the major diseases along with stem borer with 9% incidence. Sorghum was severely infected with zonate leaf spot having 45 percent disease severity Leaf blight caused by *Helminthosporium* was observed moderate both in Sorghum and Bajra (Table Palampur PPT1).

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

Crop	Diseases and insect pest	Severity /incidence(%) recorded on different dates									Maximum
		8/7/16	15/7/16	22/7/16	29/7/16	6/8/16	13/8/16	20/8/16	27/8/16	3/9/16	
Cowpea	Wilt/ root rot	20	40	60	72	-	-	-	-	-	72
	Leaf spot, Anthracnose, blight	-	5	7	10	20	25	30	32	35	35
	Phytophthora Blight	-	7	10	15	20	-	-	-	-	20
	CMV	-	-	-	-	-	-	5	7	10	10
	Pod borer	-	-	-	-	-	-	-	3	7	7
	Aphids	-	-	-	-	-	-	2	5	7	7
Maize	Blight	-	-	-	-	-	3	7	10	20	20
	Banded leaf & sheath blight	-	-	-	-	5	7	15	20	20	20
	Maize stem borer	-	-	-	-	3	5	6	8	9	9
Sorghum	leaf blight (-	-	-	-	10	12	14	15	16	16
	Zonate leaf spot	-	-	-	-	5	15	20	30	45	45
Bajra	leaf blight	-	-	-	-	-	10	150	20	25	25

Cowpea: Wilt/ root rot (*Fusarium*, *Rhizoctonia*); Leaf spot, Anthracnose, blight (*Ascochyta*, *Colletotrichum* and *Phyllosticta*)

Maize: Blight (*Helminthosporium maydis* and *H. Tercecium*); Banded leaf & sheath blight (*Rhizoctonia*)

Sorghum: leaf blight (*Helminthosporium*); Zonate leaf spot (*Gloeocercospora sorghi*)

Bajra: leaf blight (*Helminthosporium*)

At Hyderabad during Kharif 2016, the disease and insect pest incidence was not observed in Bajra crop, while in maize, the incidence of stem borer was observed from 31st to 34th standard week with maximum of 8.2% incidence during 32nd std. week. The flea beetle infestation in Cowpea was observed from 31st standard week (2.8%) with a peak infestation of 26.8% during 37th std. week and continued upto 39th std. week. The aphid population in cowpea started during 31st standard week and recorded peak population of 55.8 per plant by 36th std. week and the infestation was washed away after 37th std. week due to heavy rain fall received during that period. The yellow mosaic incidence in cowpea started with low incidence (1.4%) during 35th standard week and reached to peak (6%) by 40th std. week (Table Hyderabad PPT-1).

Table Hyderabad PPT-1: Monitoring of disease and insect pests Kharif Forage crop

Std Week		Maize			Bajra		Cow pea		
		SF	SB	MW	SB	MW	FB (%infestation)	Aphids (population /plant)	Mosaic (% incidence)
31	30-05 AUG	-	6	-	-	-	2.8	10.6	-
32	06-12	-	8.2	-	-	-	6.6	15.8	-
33	13-19	-	5.6	-	-	-	16.8	18.6	-
34	20-26	-	6.0	-	-	-	20.4	25.4	-
35	27-02 SEP	-	-	-	-	-	25.4	30.5	1.4
36	03-09	-	-	-	-	-	26.4	55.8	1.0
37	10-16	-	-	-	-	-	26.8	10.9	1.8
38	17-23	-	-	-	-	-	23.6	5.2	1.6
39	24-30	-	-	-	-	-	20.2		5.0
40	01-07 OCT	-	-	-	-	-	-		6.0
41	08-14	-	-	-	-	-	-		-

Location – Rahuri

During *kharif* 2016, very meager incidence/infestation of insect-pests and diseases were noticed throughout the crop period on kharif forage crops at MPKV, Rahuri, Maharashtra. The incidence of stem borer was negligible on maize (< 5%). In cowpea, low to moderate level of infestation of aphids per plant (range-7.13 to 19.67/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 0.67 to 2.33 /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 Rahuri PPT 1)

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

Date	Maize		Bajra	Cowpea				Coccinellid Predators
	Stem borer Score	% Leaf spot	% Stem fly damage	Aphids/ plant	Jassids / plant	Defoliators/ m ²	YMV score	
11/8/2016	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
18/8/2016	0.00	0.00	0.00	12.67	0.00	0.00	1.00	0.00
25/8/2016	1.00	0.00	0.00	15.00	2.00	0.00	2.00	1.67
01/9/2016	1.00	0.00	0.00	19.67	3.00	0.00	2.00	2.33
10/9/2016	1.33	0.00	0.00	7.13	0.00	0.00	2.00	1.67
17/09/2016	2.00	0.00	0.00	0.00	0.00	0.00	2.00	0.67

Location: Bhubaneswar

Four cultivated forage crops viz. Maize, pearl millet, Ricebean and cow pea were screened under field condition to observe the occurrence and incidences of major diseases and insect-pests.

During kharif-2016 in Maize the foliage feeder increased from 1.2-3.2 nos. per 10 plant with increase of temperature. Similarly incidence of Leaf blight also increased 1.2-2.8 scale with increase of temperature from 9th August to 11th September. In Pearl millet the number of foliage feeder (range 1.0-2.4 number per 10 plants) increased with increase of temperature. Similarly *Helminthosporium* leaf blight increased (range 1.0-2.2 scale) with increase of temperature (Table Bhubaneswar PPT 1).

In ricebean the incidence of leaf defoliators (range 1.0-2.4nos./10plants), Yellow mosaic (range 1.0-2.2 scale), *Cercospora* leaf spot (range 1.2-2.4 scale) and root rot percentage (range 5.0-42.5%) increase with increase of temperature from 32.0-33.3°C and relative humidity 82-90.5%. In cowpea the incidence of cowpea aphid (range 22.0-160.0 nos./top leaf with 10cm petiole), flea beetle attack 8.2-50.8 no. Of hole per plant, yellow mosaic virus (range 1.0-3.2 scale) and root rot % (range 5.0-32.5%) increased with increase of temperature and relative humidity from 2nd July to 11th September.

Table Bhubaneswar PPT 1: Monitoring of diseases, insect-pests and nematodes in Sorghum, Pearl millet, Maize and Cowpea ecosystems

Crop & Variety	Diseases/ Insect Pests	Unit	19- 25 th July	26 July- 1 st Aug	2 July - 8 th Aug	9-15 th Aug	16- 22 Aug	23- 29 th Aug	29 th Aug-4 th Sept	5-11 th Sept
Maize (African Tall)	Foliage feeders	No. /10 plants	-	-	-	1.2	1.6	1.8	1.6	3.2
	<i>Turicum</i> Leaf blight	1-5 scale	-	-	-	1.2	1.4	1.8	2.0	2.8
	<i>Maydis</i> Leaf blight	1-5 scale				1.4	1.8	2.0	2.2	2.6
Pearl millet (Giant bajra)	Foliage feeders	No/10 plants	-	-	-	-	1.0	1.4	1.8	2.4
	Leaf spot and blight <i>Helminthosporium</i> sp.	1-5 scale	-	-	-	-	1.0	1.4	1.6	2.2
Ricebean (Bidhan-2)	Leaf defoliators	No/10 plants	-	-	1.0	1.4	1.6	1.8	2.0	2.4
	Yellow mosaic Virus	1-5 scale	-	-	1.0	1.4	1.4	1.8	2.0	2.2
	Leaf spot (<i>Cercospora</i> sp.)	1-5 scale	-	-	-	1.2	1.6	1.8	2.0	2.4
	Root rot	%	-	-	5.0	12.6	20.4	28.5	38.7	42.5
Cowpea (Bundel Lobia-1)	Cowpea aphid	No/top leaf with 10cm petiole	-	-	22.0	40.5	68.6	95.2	128.0	160.0
	Flea beetle	No of holes/ plant	-	-	8.2	18.4	20.5	22.0	37.5	50.8
	Leaf defoliators	No/10 plants	-	-	1.0	1.4	1.6	1.8	2.0	2.4
	Yellow mosaic Virus	1-5 scale	-	-	1.0	1.4	1.8	2.0	2.5	3.2
	Leaf spot (<i>Cercospora</i> sp.)	1-5 scale	-	-	-	1.2	1.6	1.8	2.0	2.4
	Root rot	%	-	-	5.0	12.6	20.4	22.5	28.7	32.5
		Plant Parasitic Nematodes (Count/250 gm soil sample)	Before Planting					At Harvest		
		Root knot nematode <i>Hoplolaimus indicus</i> <i>Helicotylenchus dihystra</i> <i>Caloosia exilis</i> <i>Dorylaimus</i> sp.	Absent					Absent		
		Total	141					559		
Predators/Parasites/Pollinators			19-25 th July	26 July- 1 st Aug	2July- 8 th Aug	9-15 th Aug	16-22 Aug	23-29 th Aug	29 th Aug- 4 th Sept	5-11 th Sept
Epilachna beetle (Nos./10 plants)			-	-	-	1.6	2.6	3.8	4.4	3.6
Black ant (Nos./10 plants)			-	-	4.6	9.2	12.4	16.6	24.0	28.6
Butter fly (Nos./10 plants)			-	-	-	-	-	1.4	2.6	4.4
Spider (Nos./10 plants)			-	-	-	1.2	2.0	3.2	4.8	5.2

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

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

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

At Rahuri, in IVTPM, all the entries were found resistant to rust. No other insect-pests were noticed on pearl millet throughout the crop period. Insect-pests and diseases were not observed on any entries of pearl millet.

At Ludhiana, in IVTPM, all the entries gave resistant reaction to Pyricularia leaf spot. There was no incidence of downy mildew and ergot disease. The population of grasshopper non-significantly varied from 3-6.33 adults per plant in different entries. Low grasshopper population was recorded in AFB-3 and highest (6.33) in AFB-37.

At Bhubaneswar, entries Pusa Fodder Bajra-2 moderately susceptible to root rot and PHB-3144, Pusa Fodder Bajra-1, TSFB 15-4 and Giant Bajra (NC) are moderately resistant and rest all are resistant to root rot where all are resistant to defoliators.

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

At Ludhiana, in AVTPM, all the entries showed resistant reaction to Pyricularia leaf spot. No downy mildew was observed in any one of the entries. The population of grasshopper varied non-significantly from 4.67-5.33 adults per plant in different entries. The low population (4.67) was recorded in TSFB-13-12 and TSFB-10-5 and highest (5.33) in RBB-6, TSFB-14-10, Giant Bajra (NC).

At Bhubaneswar, Only TSFB-10-5 was moderately resistant to Leaf blight where all are resistant to leaf spot and leaf defoliators

Table: Disease –pest tolerance in IVT Pearl Millet trial

S. N.	Entries	Ludhiana				Rahuri	Bhubaneswar			
		Downy mildew incidence (%)	Pyricularia leaf spot intensity (%)	Disease reaction	Grasshopper <i>Hieroglyphus nigrorepletus</i> population / 5 plants	Rust (<i>Puccinea purpurea</i>) Mean score values/plant	Leaf Defoliators (No./ 10 plants)	Disease reaction	Leaf spot & blight (<i>Helminthosporium</i> sp.) (1-5 scale)	Disease reaction
1	PHBF-4	0.0	2.59	R	4.33	0.00	1.8	R	1.0	R
2	NDFB-1502	0.0	0.35	R	4.67	0.00	1.0	R	1.0	R
3	PHBF-6	0.0	5.55	R	5.00	0.00	2.0	R	1.0	R
4	RBB-8	0.0	2.57	R	6.00	0.00	0.8	R	1.6	R
5	AFB-37	0.0	2.96	R	6.33	0.00	2.0	R	1.2	R
6	PHB-3144	0.0	1.85	R	4.67	0.00	2.3	R	2.3	MR
7	Pusa Fodder Bajra-2	0.0	4.50	R	5.00	0.00	3.0	R	3.3	MS
8	Pusa Fodder Bajra-1	0.0	3.33	R	4.33	0.00	2.3	R	2.6	MR
9	TSFB 15-4	0.0	3.33	R	5.67	0.00	2.8	R	3.0	MR
10	TSFB 15-8	0.0	2.57	R	6.00	0.00	1.2	R	1.3	R
11	Giant Bajra (NC)	0.0	1.48	R	4.67	0.00	2.8	R	2.8	MR
12	Raj Bajra Chari-2 (NC)	0.0	1.48	R	5.00	0.00	1.8	R	1.4	R
13	AFB-3 (ZC-NWZ)	0.0	5.53	R	3.00	0.00				
14	APFB-9-1 (ZC-NEZ)						1.0	R	1.0	R
CD (p=0.05)					NS					
CV					9.49					

Table: Disease –pest tolerance in AVT Pearl Millet trial

S. N.	Entries	Ludhiana				Bhubaneswar			
		Downy mildew incidence (%)	Pyricularia leaf spot intensity (%)	Disease reaction	Grasshopper population per five plants	Leaf Defoliators (No./ 10 plants)	Disease reaction	Leaf spot & blight (<i>Helminthosporium</i> sp.) (1-5 scale)	Disease reaction
1	RBB-6	0.0	3.70	R	5.33	1.4	R	1.6	R
2	TSFB-14-10	0.0	4.67	R	5.33	1.8	R	1.9	R
3	RBB-7	0.0	5.55	R	4.67	1.4	R	1.6	R
4	TSFB-13-12	0.0	5.33	R	4.67	1.0	R	1.0	R
5	TSFB-10-5	0.0	5.33	R	4.67	2.0	R	2.2	MR
6	APFB-9-1 (ZC-NEZ)					1.3	R	1.3	R
7	AFB-3 (ZC-NWZ)	0.0	5.00	R	5.00				
8	Giant Bajra (NC)	0.0	4.67	R	5.33	1.3	R	1.6	R
9	Raj Bajra Chari-2 (NC)	0.0	3.33	R	4.67	1.4	R	1.4	R
CD (p=0.05)					NS				
CV					7.80				

IVTC – IVT in cowpea

At Rahuri, in IVTC, All the entries showed significant differences in survival population of aphids/plant. However, entry PFC-39 showed 1.84 aphids/plant, which was significantly lower than the other entries except MFC-09-23 (3.61), MFC-09-15 (3.78), PFC-40 (4.22) and Bundel Lobia-1 (NC) (4.55). These entries were found at par with each other. The highest population of aphid was recorded in TSFC-11-6 (19.89 aphids/plant). For Yellow mosaic virus, all the entries were found resistant except UPC-5286 (NC) and Bundel Lobia-1 (NC) which were moderately susceptible to YMV. Resistant entries showed less than 2.

Aphid

- **Less susceptible entries:** PFC-40, Bundel Lobia-1 (NC), UPC-5286 (NC), UPC-9202 (ZC-CZ), PFC-39, MFC-09-15, MFC-09-23
- **Highly susceptible entries-** C-215, UPC-1601, TSFC 11-6

YMV

- **Less susceptible entries:** PFC-40, C-215, UPC-1601, Bundel Lobia-1 (NC), PFC-39, MFC-09-15, MFC-09-23
- **Moderately susceptible-** UPC-5286 (NC), MFC-09-23

Score for YMV:

- No symptom-Immune
- 2 to 5 % leaf area covered – **Resistant**
- 6 to 25 % leaf area covered- **Moderately resistant**
- 26 to 40 % leaf area covered – **Susceptible**
- Above 40 % leaf area covered – **Highly susceptible**

At Hyderabad, in IVTC, Screening of insect and disease incidence in IVTC, Kharif 2016 trial revealed that the significantly lowest flea beetle infestation was recorded in the entry TSFC-11-6 (40%), while highest flea beetle infestation was recorded in the entry PFC-39 (62%). The aphid population in different entries varied between 6.3 to 19 / plant and significantly lowest no. of aphids was recorded in the entry TSFC-11-6. The natural incidence of Yellow Mosaic Virus was very low and non significant difference among the entries for incidence was observed. All the entries were found to be resistant with 1-2 score for the YMV incidence.

At Palampur, in IVTC, 10 entries of cowpea were evaluated for root rot/ wilt complex and leaf diseases. It was observed that the entries UPC-5286 (NC), UPC-622 (ZC-HZ), TSFC-11-6 & MFC-09-23 for wilt/ root rot complex and C-215, UPC-5286 (NC) & MFC-09-15 for leaf disease were found moderately resistant. Other entries were susceptible either to root rot /wilt complex and leaf disease or both.

At Ludhiana in IVTC, all entries showed resistant disease reaction to cowpea mosaic and no root rot incidence was observed in any one of the entries. The population of Bihar hairy caterpillar, *Spilosoma obliqua* varied non-significantly from 0.33-1.33 across different entries. The population of spotted pod borer *Maruca vitrata* was also reported in IVTC during this period. The population of spotted pod borer per 5 pods of single plant was recorded and it was observed to vary non-significantly (3.67-6.33) in different entries.

At Bhubaneswar, in IVTC, entries UPC 1601, PFC-39 and TSFC 11-6 are moderately resistant to root rot.

Table: Disease –pest tolerance in IVT Cowpea trial

Entries	Ludhiana			Palampur						Bhubaneswar			
	%root rot/ Damping-off incidence	Percent mosaic incidence	Disease reaction	Root rot/ wilt/ collar rot complex			Leaf diseases			Mosaic (1-5 scale)	Disease reaction	Root rot (%)	Disease reaction
				Incidence (%)	Disease Rating	Disease Reaction	Severity (%)	Disease Rating	Disease Reaction				
PFC-40	0.0	3.33	R	40	4	S	35	4	S	1.8	R	10.0	R
C-215	0.0	5.93	R	35	4	S	22	3	MR	1.0	R	12.5	R
UPC-1601	0.0	3.79	R	35	4	S	29	4	S	1.8	R	25.0	MR
PFC-39	0.0	4.07	R	96	5	HS	50	4	S	1.6	R	25.0	MR
TSFC-11-6	0.0	2.84	R	24	3	MR	35	4	S	1.6	R	25.0	MR
MFC-09-15	0.0	3.79	R	47	4	S	24	3	MR	1.4	R	18.0	R
MFC-09-23	0.0	4.07	R	14	3	MR	39	4	S	1.4	R	20.0	R
Bundel Lobia -1 (NC)	0.0	2.60	R	32	4	S	32	4	S	1.2	R	15.0	R
UPC-5286 (NC)	0.0	2.60	R	12	3	MR	20	3	MR	1.0	R	24.0	R
UPC-622 (ZC-HZ)				22	3	MR	30	4	S				
Bundel Lobia-2 (ZC-NWZ)	0.0	5.19	R										
UPC-628 (ZC-NEZ)										1.8	R	22.0	R

Table: Disease –pest tolerance in IVT Cowpea trial

Entries	Ludhiana	Rahuri		Hyderabad				Bhubaneswar					
	Bihar hairy caterpillar <i>Spilosoma oblique</i> per 5 plants	Av. No. of aphids/plant	Score rating of YMV	% incidence of flee beetle (No of Aphids / plant	Per cent YMV affected plants.	YMV incidence 1-9 score	Cowpea aphid (No./Top leaf with 10 cm petiole)	Disease reaction	Leaf defoliators (No./10 plants)	Disease reaction	Flea beetle (No. of holes/ plant)	Disease reaction
PFC-40	0.33	4.22 (2.17)	1.33	51 (45.5)	11.7	1.2 (6.16)	2	08.6	R	1.2	R	12.5	R
C-215	1.0	27.33 (5.28)	1.67	54 (47.48)	12.0	1.2 (6.16)	2	15.3	R	2.2	R	20.9	R
UPC 1601	0.66	19.19 (4.44)	1.67	52 (46.13)	13.3	1.7 (7.39)	2	18.0	R	2.8	R	24.0	R
PFC-39	0.33	2.89 (1.84)	2.11	62 (51.92)	17.0	1.7 (7.28)	2	16.4	R	2.4	R	18.0	R
TSFC 11-6	1.0	19.89 (4.52)	2.89	40 (39.00)	6.3	1.0 (5.73)	1	17.0	R	2.6	R	20.6	R
MFC-09-15	1.0	3.78 (2.07)	2.11	57 (49.20)	19.0	1.8 (7.71)	2	12.5	R	1.6	R	14.2	R
MFC-09-23	0.66	3.61 (2.03)	4.00	60 (50.96)	11.0	1.7 (7.39)	2	12.8	R	2.0	R	15.6	R
Bundel Lobia-1 (NC)	1.33	4.55 (2.25)	1.89	61 (51.16)	8.7	1.5 (6.96)	2	10.5	R	1.4	R	12.8	R
UPC-5286 (NC)	1.0	8.22 (2.95)	3.67	55 (48.05)	13.3	1.2 (6.16)	2	14.6	R	1.8	R	18.0	R
Bundel Lobia-2 (ZC-NWZ)	1.0												
UPC-628 (ZC-NEZ)								14.8	R	2.4	R	16.4	R
UPC-9202 (ZC-CZ)		6.11 (2.57)	2.33										
MFC-8-14 (ZC-SZ)				58 (49.40)	8.0	1.5 (6.96)	2						
CD (p= 0.05)	NS	0.19		4.5	4.2	NS		0.80				0.68	
CV%	10.51	0.56		5.5	20.2	13.7		3.27				2.25	
SE m				1.5	1.4	0.54		0.27				0.23	

AVTC cowpea trial

At Hyderabad in AVTC-1, Screening of entries for insect and disease incidence indicated that the entry MFC-09-4 recorded significantly lowest infestation of flea beetle (50%), while the entry UPC-1501 recorded infestation of flea beetle. Aphid infestation was in the range of 7.3 - 16 per plant and the entries were did not differ in the infestation. All the entries showed resistance for Yellow Mosaic Virus.

At Rahuri, in AVTC-1, All the entries were found less susceptible to aphids and YMV. All the entries showed significant differences in survival population of aphids/plant. However, entry UPC-9202 (ZC-CZ) showed 6.67 aphids/plant, which was numerically lower than the other entries. For **Yellow mosaic virus**, all the entries were found resistant to yellow mosaic virus. Resistant entries showed less than 2 score.

Score for YMV: 1. No symptom-Immune
2. 2 to 5 % leaf area covered – Resistant
3. 6 to 25 % leaf area covered- Moderately resistant
4. 26 to 40 % leaf area covered – Susceptible
5. Above 40 % leaf area covered – Highly susceptible

At Palampur, In AVTC trial, the entries MFC-09-3, TSFC-12-15, Bundel Lobia-1 (NC), Vellayani-1, UPC-622 & UPC-5286 (NC) and MFC-09-3, UPC-622 and UPC-5286 (NC) were found moderately resistant to root-rot/wilt complex and leaf disease respectively, whereas other entries were susceptible either to root rot /wilt complex and leaf disease or both.

At Ludhiana, in AVTC -1 trial, all entries showed resistant disease reaction to cowpea mosaic and no root rot incidence was observed. The population of Bihar hairy caterpillar, *Spilosoma oblique* varied non significantly from 0.6-1.33 across different entries. The population of spotted pod borer *Maruca vitrata* was quite high during this period. The population of spotted pod borer per 5 plods of single plant was recorded to vary non-significantly across different entries.

At Bhubaneswar, all entries are resistant to flea beetle, cow pea mosaic virus and root rot

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

S.N.	Entries	Ludhiana			Palampur						Bhubaneswar	
		% root rot/ Damping-off	% mosaic incidence	Disease reaction	Root rot/ wilt/ collar rot complex			Leaf diseases			Root Rot %	Disease reaction
					Incidence (%)	Disease Rating	Disease Reaction	Severity (%)	Disease Rating	Disease Reaction		
1	MFC-09-3	0.0	5.19	R	12	3	MR	22	3	MR	13.0	R
2	TSFC-12-15	0.0	3.33	R	17	3	MR	30	4	S	15.0	R
3	MFC-09-13	0.0	4.44	R	30	4	S	42	4	S	14.0	R
4	UPC-1501	0.0	5.56	R	27	4	S	40	4	S	13.0	R
5	MFC-09-4	0.0	5.93	R	26	4	S	35	4	S	12.5	R
6	Vellayani-1	0.0	4.00	R	14	3	MR	45	4	S	14.5	R
7	Bundel Lobia-1 (NC)	0.0	3.70	R	15	3	MR	28	4	S	15.0	R
8	UPC-5286 (NC)	0.0	3.67	R	13	3	MR	20	3	MR	14.5	R
9	UPC-622 (ZC-HZ)				12	3	MR	22	3	MR		
10	Bundel Lobia-2 (ZC-NWZ)	0.0	4.33	R	-	-	-	-				
11	UPC-628 (ZC-NEZ)										12.0	R

Table: Disease –pest tolerance in AVT -1 Cowpea trial– contd.

Entries	Ludhiana	Rahuri		Hyderabad				Bhubaneswar			
	Bihar hairy caterpillar <i>Spilosoma oblique</i> per 5 plants	Av. No. of aphids/plant	Score rating of YMV	% incidence of flea beetle (mean)	No. of aphids/plant	Per cent YMV infested plants/plot	Score 1-9 scale	Flea beetle (No. of holes/plant)	Disease reaction	Cowpea mosaic (Virus) (1-5 scale)	Disease reaction
MFC-09-3	1.0	6.56 (2.65)	1.22	60 (50.79)	11.7	3.0 (9.94)	2	14.6	R	1.2	R
TSFC-12-15	1.0	7.56 (2.83)	1.55	56 (48.30)	7.3	4.5 (12.23)	2	15.0	R	1.2	R
MFC-09-13	1.3	8.00 (2.91)	1.22	68 (55.40)	10.7	2.5 (9.06)	2	16.4	R	1.4	R
UPC-1501	0.6	7.00 (2.73)	1.67	78 (62.53)	10.0	6.0 (14.16)	2	12.8	R	1.6	R
MFC-09-4	0.6	8.11 (2.93)	1.78	50 (45.99)	14.7	4.5 (12.12)	2	12.1	R	1.4	R
Vellayani-1	1.0	7.00 (2.72)	1.44	64 (53.21)	16.0	5.0 (12.84)	2	14.6	R	1.4	R
Bundel Lobia-1 (NC)	1.33	6.89 (2.71)	2.00	64 (53.14)	10.0	1.5 (6.96)	2	17.5	R	1.8	R
UPC-5286 (NC)	1.0	7.11 (2.76)	1.11	69 (56.03)	9.7	6.5 (14.75)	2	16.6	R	1.8	R
Bundel Lobia-2 (ZC-NWZ)	0.6										
UPC-628 (ZC-NEZ)								10.8	R	1.4	R
UPC-9202 (ZC-CZ)		6.67 (2.67)	1.67								
MFC-8-14 (ZC-SZ)				56 (48.24)	13.0	6.5 (14.75)	2				
CD (p=0.05)	NS	N.S.		7.24	NS	1.8					
CV	19.41			7.9	25.6	8.6					
		SE±0.13	Sem (+)	2.4	1.7	0.6					

IVTM – IVT in Maize

At Rahuri, in IVTM, All the entries were found less susceptible to stem borer as these entries showed less than 3 mean leaf injury score. All the entries were found resistant to stem borer

Score categorization: < 3: Least susceptible: 3 to 6: Moderately susceptible: > 6 Highly susceptible

At Palampur in IVTM, 12 entries were evaluated against leaf blight. IAFM-2015-38 & African Tall (NC) gave resistant reaction and IAFM-2015-12 was susceptible. Other nine entries were found moderate resistant against leaf blights.

At Hyderabad in IVTM, the stem borer infestation in different entries ranged between 0.33 to 4.0 % infested plants /plot. Low stem borer infestation was observed in all the entries.

At Ludhiana, in IVTM, entries AFM-6, H 1003, TSFM-15-2, KDFM-1, TSFM-15-5, IAFM-2015-12, J-1006 (NC) and African Tall (NC) showed moderately resistant disease reaction to maydis leaf blight. Rests of entries were moderately susceptible. The population of maize stem borer varied non-significantly from 10-14.43 per cent in different entries. No entry exhibited of resistance for shoot borer infestation

At Bhubaneswar, H 1003, KDFM-1, IAFM-2015-38, IAFM-2015-12 and J-1006 (NC) are moderately resistant to Maydis blight and all are resistant to Turcicum blight

AVTM Maize trial AVTM (1&2)

At Rahuri, in AVTM (1&2), All the entries were found less susceptible to stem borer as these entries showed less than 3 mean leaf injury score.

Score categorization: < 3: Least susceptible: 3 to 6: Moderately susceptible: > 6 Highly susceptible

At Palampur, in AVTM (1&2), 6 entries were evaluated and PAC-746 & African Tall (NC) were found resistant and MFM-4 was susceptible, whereas other 3 entries were found moderately resistant.

At Ludhiana, in AVTM (1&2), all the entries were moderately susceptible to maydis leaf blight. The population of maize stem borer varied non-significantly from 13.33-16.663 per cent in different entries. No entry exhibited some degree of resistance for shoot borer infestation.

At Bhubaneswar, in AVTM (1&2), J-1006 (NC) and AFM-4 moderately resistant to maydis blight and all are resistant to turcicum blight

Table: Disease –pest tolerance in IVT Maize trial

Entries	Ludhiana			Palampur			Rahuri	Hyderabad	Bhubaneswar			
	Maydis leaf blight intensity (%)	Disease reaction	Maize Stem borer <i>Chilo partellus</i> inflicted deadheats	Leaf blight severity (%)	Disease Rating	Disease Reaction	Leaf injury score maize stem borer	Percent stem borer infested plants/ plot	Turcicum leaf blight (1-5 scale)	Disease reaction	Maydis leaf blight (1-5 scale)	Disease reaction
AFM-6	24.60	MR	11.10	12	3	MR	1.00	1.67 (7.33)	1.6	R	2.0	R
H 1003	22.20	MR	12.23	15	3	MR	1.33	1.66 (7.15)	1.8	R	2.8	MR
MFM-2	27.72	MS	12.23	20	3	MR	1.00	1.33 (5.42)	1.0	R	1.8	R
TSFM-15-2	17.20	MR	14.43	14	3	MR	1.00	2.67 (8.74)	1.0	R	1.0	R
KDFM-1	22.40	MR	13.33	12	3	MR	1.00	1.0 (5.74)	1.6	R	2.8	MR
TSFM-15-5	18.50	MR	12.22	12	3	MR	1.00	2.00 (7.95)	1.4	R	1.6	R
ADV 6737	27.38	MS	13.33	11	3	MR	1.00	0.33 (1.91)	1.4	R	2.4	R
IAFM-2015-38	25.51	MS	10	9	2	R	1.00	4.0 (9.36)	2.2	R	3.0	MR
IAFM-2015-48	26.64	MS	10	12	3	MR	1.00	1.67 (7.15)	1.2	R	1.4	R
IAFM-2015-12	23.31	MR	11.1	25	4	S	1.00	0.67 (3.82)	2.4	R	3.0	MR
J-1006 (NC)	25.00	MR	12.23	14	3	MR	1.33	0.67 (2.71)	2.0	R	2.6	MR
African Tall (NC)	20.33	MR	11.10	9	2	R	1.00	0.66 (3.82)	1.2	R	1.2	R
CD (p=0.05)			NS					4.7				
CV			11.06					SEM (±) 1.6				

Table: Disease –pest tolerance in AVT 1&2 combined Maize trial

Entries	Ludhiana			Palampur			Rahuri	Bhubaneswar			
	Maydis leaf blight intensity (%)	Disease reaction	Maize Stem borer <i>Chilo partellus</i> % dead hearts	Leaf blight severity (%)	Disease Rating	Disease Reaction	maize stem borer Mean leaf injury score/ plant	Turcicum leaf blight (1-5 scale)	Disease reaction	Maydis leaf blight (1-5 scale)	Disease reaction
MFM-4	29.97	MS	15.56	27	4	S	1.00	1.8	R	1.6	R
JHM 15-1	35.52	MS	15.56	14	3	MR	1.00	1.6	R	1.3	R
PAC-746	31.08	MS	16.66	8	2	R	1.00	1.0	R	1.0	R
AFM-4	32.18	MS	13.33	15	3	MR	1.00	2.3	R	2.6	MR
African Tall (NC)	36.63	MS	13.33	9	2	R	1.00	2.0	R	2.3	R
J-1006 (NC)	28.85	MS	14.43	14	3	MR	1.00	2.3	R	2.6	MR
CD (p=0.05)			NS								
CV			9.68								

*Disease data compiled on 1-5 scale at Ludhiana

AVTM-2 – AVT -2 Maize (Seed)

At Palampur, In AVTM -2 (Seed) trial, 5 entries were evaluated and only PAC-746 was found resistant & others were moderately resistant. In general the leaf blight severity remained low during the season at Palampur.

At Bhubaneswar, Only AFM-4 moderately resistant to maydis blight and all are resistant turicum blight

Table: Disease –pest tolerance in AVT-2 Maize (seed trial)

Entries	Palampur			Bhubaneswar			
	Leaf blight severity (%)	Disease Rating	Disease Reaction	Turicum leaf blight (1-5 scale)	Disease reaction	Maydis leaf blight (1-5 scale)	Disease reaction
MFM-4	17	3	MR	1.3	R	1.3	R
PAC-746	8	2	R	1.8	R	2.3	R
AFM-4	15	3	MR	2.0	R	2.6	MR
African Tall (NC)	11	3	MR	1.6	R	1.6	R
J-1006 (NC)	20	3	MR	1.0	R	1.0	R

Initial Varietal Trial on Rice bean- At Bhubaneswar, K-1 (Bidhan-1) (NC) is moderately resistant to Mosaic virus where all are resistant to leaf spot, flea beetle and mosaic virus

Table: Disease –pest tolerance in IVT Rice bean trial

S.N.	Entries	Leaf spot & blight (1-5 scale)	Disease reaction	Flea beetle (No. of holes/plant)	Disease reaction	Mosaic (1-5 scale)	Disease reaction
1	JOR-16-1	1.8	R	14.2	R	1.3	R
2	JOR-16-2	2.5	MR	21.3	MR	2.8	MR
3	JRBJ 07-4	2.5	MR	16.5	R	1.8	R
4	K-1 (Bidhan-1) (NC)	2.0	R	18.8	R	2.2	MR
5	Bidhan-2 (NC)	1.0	R	9.5	R	1.0	R
6	RBL-6 (NC)	1.8	R	11.4	R	1.3	R

First Advanced Varietal Trial in Rice Bean - At Bhubaneswar, Only RBL-6 (NC) moderately resistant to mosaic virus and leaf spot and all are resistant to leaf spot and flea beetle

Table: Disease –pest tolerance in AVT-1 Rice bean trial

S.N.	Entries	Leaf spot & blight (1-5 scale)	Disease reaction	Flea beetle (No. of holes/plant)	Disease reaction	Mosaic (1-5 scale)	Disease reaction
1	JRBJ-07-1	1.3	R	14.4	R	1.8	R
2	JOR-15-1	1.8	R	12.7	R	2.3	R
3	JOR-15-5	1.8	R	20.1	R	1.8	R
4	RBL-6 (NC)	2.6	R	15.6	R	2.8	MR
5	K-1 (Bidhan-1) (NC)	1.3	R	17.8	R	1.2	R
6	Bidhan-2 (NC)	1.0	R	10.4	R	1.2	R

VTCC-2013 (4th Year) VT in *Cenchrus ciliaris*: At Rahuri, scoring for leaf blight shows that entry RCC -10-8 were moderately resistant whereas other entries including check showed resistant reaction. Sucking pests and defoliators not observed throughout the year

S.N.	Entries	Score rating of leaf blight	Reaction
1	RCCB-04-64	1.67	R
2	RCC-CS-10-8	1.00	R
3	RCC-10-8	2.33	MR
4	RCCB-03-23	1.67	R
5	RCC-CS-10-5	1.00	R
6	RCC-CS-10-4	1.00	R
7	RCC-10-6	1.00	R
8	IGFRI 3108 (NC)	1.33	R

VTD-2013 (4th Year): VT in *Dichanthium*: At Rahuri, evaluation for leaf blight showed that entry JHD 13-2 showed moderately resistant reaction, whereas other entries were resistant. Sucking pests and defoliators not observed throughout the year

S.N.	Entries	Score rating of leaf blight	Reaction
1	JHD-13-3	2.00	R
2	Marvel 09-4	1.00	R
3	Marvel 06-40	1.67	R
4	Marvel 09-1	2.00	R
5	JHD-13-2	2.33	MR
6	JHD-13-1	2.00	R
7	Marvel 09-3	1.33	R
8	Marvel 8 (NC)	1.00	R

VTBN-2013 (4th year) VT in Bajra x Napier hybrids: At Rahuri, screening for leaf blight revealed that entries TNCN-1076, RBN-2004-03, TNCN-1078 and PBN – 233 (NC) were moderately resistant whereas other entries were resistant. Sucking pests and defoliators not observed throughout the year

S.N.	Coded	Score rating of leaf blight	Mean
1	RBN-2011-12	1.67	R
2	TNCN-1076	2.33	MR
3	PBN-346	2.00	R
4	RBN-2004-03	2.33	MR
5	TNCN-1078	3.00	MR
6	PBN-342	2.00	R
7	RBN-2010-Y-1	2.00	R
8	DHN-15	2.00	R
9	NB-21 (NC)	2.00	R
10	CO-3 (NC)	2.00	R
11	PBN-233 (NC)	2.33	MR

VTCC-2015 (II Year): VT in *Cenchrus ciliaris*: At Rahuri, All the entries showed resistant reaction to leaf blight. Sucking pests and defoliators not observed throughout the year

S.N.	Entries	Score rating of leaf blight	Reaction
1	VTCC-15-1	2.00	R
2	VTCC-15-2	2.00	R
3	VTCC-15-3	1.67	R
4	VTCC-15-4	1.00	R
5	VTCC-15-5	1.33	R
6	VTCC-15-6	2.00	R
8	VTCC-15-8	2.00	R
9	VTCC-15-9	2.00	R

VTCS-2015 (2nd Year) VT in *Cenchrus setigerus*: At Rahuri, All the entries showed resistant reaction to leaf blight. Sucking pests and defoliators not observed throughout the year

S.N.	Entries	Score rating of leaf blight	Reaction
1	VTCS-15-1	1.00	R
2	VTCS-15-2	2.00	R
3	VTCS-15-3	2.00	R
4	VTCS-15-4	2.00	R
5	VTCS-15-5	2.00	R
6	VTCS-15-6	2.00	R
7	VTCS-15-7	1.00	R
8	VTCS-15-8	1.33	R
9	VTCS-15-9	1.67	R

VTPH-2015 (II year) VT in *Pennisetum hybrids*-2015 At Rahuri, All the entries showed resistant reaction to leaf blight. Sucking pests and defoliators not observed throughout the year.

S.N.	Coded	Score rating of leaf blight	Reaction
1	VTPH-15-1	2.00	R
2	VTPH-15-2	2.75	MR
3	VTPH-15-3	2.50	MR
4	VTPH-15-4	2.25	MR
5	VTPH-15-5	1.00	R
6	VTPH-15-6	1.50	R
7	VTPH-15-7	1.25	R
8	VTPH-15-8	1.75	R
9	VTPH-15-9	1.00	R
10	VTPH-15-10	1.50	R

VTBN-2015 (2nd Year): VT in B x N hybrids-2015 At Rahuri, entries VTBN-15-2, VTBN-15-7, VTBN-15-8, and VTBN-15-9 were moderately resistant to leaf blight whereas other entries were resistant. Sucking pests and defoliators not observed throughout the year

S.N.	Coded	Score rating of leaf blight	Reaction
1	VTBN-15-1	2.00	R
2	VTBN-15-2	2.67	MR
3	VTBN-15-3	1.33	R
4	VTBN-15-4	1.00	R
5	VTBN-15-5	1.67	R
6	VTBN-15-6	2.00	R
7	VTBN-15-7	2.33	MR
8	VTBN-15-8	3.00	MR
9	VTBN-15-9	2.33	MR

VTD-2015 (2nd Year) VT in *Desmanthus*-2015: At Rahuri, all the entries showed resistant reaction to leaf blight. Sucking pests and defoliators not observed throughout the year

S.N.	Entries	Score rating of leaf blight	Reaction
	VTD-15-1	1.00	R
2	VTD-15-2	1.00	R
3	VTD-15-3	1.67	R
4	VTD-15-4	2.00	R
5	VTD-15-5	1.67	R
6	VTD-15-6	1.33	R

1= No Symptom

2=Resistant (upto 10 % intensity)

3= Moderately Resistant (11-25 % intensity)

4= Susceptible (26-50 % intensity)

5= Highly susceptible (above 50 % intensity)

PPT16: EFFICACY OF DIFFERENT BIO PESTICIDES AGAINST APHIDS ON FORAGE SORGHUM

Location: MPKV, Rahuri

Design: RBD

Replications: 03

Variety: Ruchira

Treatments: 08

Plot size: Gross 3.40 X 4.40 m² Net- 3.0X 4.0 m²

Date of sowing: 07/07/2016

Treatment details

1. Foliar application of *V. lecanii* @ 10⁸cfu/g (5g/lit)
2. Foliar application of *V. lecanii* @ 10⁸cfu/g (7.5g/lit)
3. Foliar application of *B. bassiana* @ 10⁸cfu/g (5g/lit)
4. Foliar application of *B. bassiana* @ 10⁸cfu/g (7.5g/lit)
5. Foliar application of *M. anisopliae* @ 10⁸cfu/g (5g/lit)
6. Foliar application of *M. anisopliae* @ 10⁸cfu/g (7.5g/lit)
7. NSE 5 %
8. Untreated Control

Observations: Infestation of aphid was not observed throughout the crops period, hence the spray treatments have not been imposed

PPT 17: BIOLOGICAL MANAGEMENT OF DEFOLIATORS ON COWPEA.

Replication: 4

Design: RBD

Plot size: 3 x 4 cm²

Locations: Dharwad and Rahuri

Treatments:

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

Note: Bio-pesticides to be supplied by Rahuri center.

Observations:

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

Location: MPKV, Rahuri

Design: RBD

Replications: 04

Variety: Sweta

Treatments: 05

Plot size: Gross 3.40 X 3.60 m²

Net- 3.00X3.20 m²

Date of sowing: 07/07/2016

Observation: Infestation of aphid was not observed throughout the crops period, hence the spray treatments have not been imposed

Location: IGFR I RRS Dharwad

Replication: 4

Design: RBD

Plot size: 3 x 4 cm²

Results

Both the biological control agents *Beauveria basiana* @ 5 g (cfu 10⁶)/lt and *Nomurae relyi* @ g (cfu 10⁶)/lt and NSE 5% were on par with each other and superior over *Pseudomonas fluorescence* @5 g (cfu 10⁶)/lt in managing the defoliator *Spilosoma obliqua*. However, all the treatments were superior over untreated check. Similar trend was reflected in obtaining green forage yield dry matter yield (Table PPT 17 Dharwad). There was no significant change in the population of predators like Coccinellids and *Chrysoperla carnea* before and after the spray indicates that all the biological control agents were safe to the natural enemies.

Table PPT 17 Dharwad - Evaluation of biological agents against defoliator *Spilosoma obliqua*

Tr. No	Treatment details	No. of defoliators before spray	5 DAT*	7 DAT	No. of predators before spray	5 DAT	7 DAT	Green forage (q/ha)	Dry matter yield (q/ha)
T ₁	<i>Beauveria basiana</i> @ 5 g(cfu 10 ⁶)/lt	6.4	2.4	0.6	8.8	8.0	8.2	146.4	36.4
T ₂	<i>Nomurae relyi</i> @ 5 g(cfu 10 ⁶)/lt	7.0	2.0	0.4	8.6	7.8	7.6	140.6	34.8
T ₃	NSE 5%	6.2	1.8	0.8	9.0	8.2	8.4	142.2	35.2
T ₄	<i>Pseudomonas fluorescense</i> @5 g(cfu 10 ⁶)/lt	6.8	6.2	4.0	8.8	8.0	8.2	128.0	31.4
T ₅	Untreated control	7.0	7.0	6.2	8.4	8.4	8.0	96.4	25.2
CV		-	3.2	4.0	-	-	-	9.60	7.2
CD at 5%		NS**	0.56	0.66	NS	NS	NS	10.12	6.4
SEM±		-	1.14	1.52	-	-	-	3.23	2.4

*DAT=Days after Treatment

NS**= Non Significant

PPT19: EFFICACY OF DIFFERENT BIO PESTICIDES AGAINST APHIDS ON FORAGE COWPEA

Location: PJTSAU, Hyderabad

Efficacy of three bioagents at two different dosages and two neem formulations were studied against aphids in forage cowpea over control in three replications. Neem Seed extract 5% proved to be the best with 86.1% reduction over control in cowpea aphid population, followed by *B. bassiana*@ 10⁸ cfu/g(7.5g/l). Number of aphids per plant at 5 days after neem seed extract spray was 2.4. Number of coccinellids was not affected due to bio pesticides spray. Significantly higher green fodder yield (154.5 q/ha) was recorded in neem sprayed plot as against controlled plot (95.6 q/ha).

DOS: 20.7.2016, **variety:** BL-2; **Plot size:** 3x4m: **Replications:** 3

S.N.	Treatment details	No. Aphids/sq.cm				No. coccinellids/ plant		GFY (Q/ha)
		Pre treatment	5 days after spray	Per cent reduction over control	7 days after spray	Pre treatment	5 days after spray	
T ₁	<i>L. lecani</i> @ 10 ⁸ cfu/g(5g/l)	24.5	6.8	60.7	1.8	2.8	7.4	122.4
T ₂	<i>L. lecani</i> @ 10 ⁸ cfu/g(7.5g/l)	15.6	3.9	77.4	0.7	2.0	10.2	110.2
T ₃	<i>B. bassiana</i> @ 10 ⁸ cfu/g(5g/l)	19.2	7.5	56.6	1.5	1.9	6.2	120
T ₄	<i>B. bassiana</i> @ 10 ⁸ cfu/g(7.5g/l)	18.5	3.4	80.3	0.0	1.1	5.0	130
T ₅	<i>M. anisopliae</i> @10 ⁸ cfu/g(5g/l)	15.9	5.4	68.8	2.0	2.3	10.6	105.6
T ₆	<i>M. anisopliae</i> @10 ⁸ cfu/g(7.5g/l)	11.3	4.5	74.0	0.0	2.2	9.3	128.4
T ₇	NSE @ 5%	14.0	2.4	86.1	0.0	1.3	5.8	154.5
T ₈	Azadirachtin @ 0.03%	19.9	9.4	45.7	2.5	2.3	7.5	101.4
T ₉	Untreated control	17.3	19.3		13.7	2.7	8.8	95.6
	GM							118.7
	Sem (+)	1.4	1.0		0.4	0.2	0.58	30.1
	C.D (0.05)	4.2	2.9		1.3	0.5	1.76	9.9
	CV	13.9	24.4		30.3	15.2	12.8	14.5

PPT-20: VALIDATION FOR MANAGEMENT OF ROOT ROT AND FOLIAR DISEASES OF FORAGE COWPEA

Locations: Palampur and Ludhiana

Location: PAU, Ludhiana

Variety: CL 367

Plot size: Main plots- 20 x 15 m²

Sub plots – 20 x 7.5 m²

Treatments Main plots: Date of sowings

• DOS I: 08/ 07/2016

DOS II: 22/07/2016

DOS III: 08/08/2016

Subplots:

• T₁: Seed treatment with tebuconazole 2DS @ 1g/kg seed + NSKP (50 g/kg seed)

• T₂: No treatment

Observations: The root rot and mosaic incidence was less in plots treated with seed treatment with tebuconazole 2DS @ 1g/kg seed + NSKP (50 g/kg seed) with increase in yield. Disease incidence was less on third date of sowing.

Treatments	Treatments	Root rot incidence (%)	Mosaic incidence (%)	Green fodder yield (q/ha)	Dry matter yield (q/ha)
DOS I	T ₁	11.11	0.00	662.70	112.70
	T ₂	18.87	8.89	546.04	92.86
DOS II	T ₁	9.99	0.00		
	T ₂	15.54	5.56	528.69	89.91
DOS III	T ₁	6.67	0.00	270.00	45.92
	T ₂	10.00	3.70	243.34	41.38

HPKV, Palampur

Target Diseases:

- Root rot/wilt (*Fusarium/Rhizoctonia/Phytophthora*)
- Anthrachnose (*Colletotrichum*)
- Leaf blight (*Cercospora/Phomopsis* etc.)
- Nematodes

The experiment was conducted to validate the management technology for the foliar diseases of cowpea. The highly effective treatment 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 was validated at three dates of sowing i.e. 4/06/16, 19/06/016 & 4/07/16 for the management of foliar diseases e.i. root- rot Anthracnose and leaf blight of cowpea. It was observed that root rot incidence and leaf blight severity was maximum in late sown crop, whereas Anthracnose was maximum in early sown crop. The maximum field was obtained in the normal crop with an increase of 39.11% over control as compare to early and late sown crop. The root rot was control by 69.7% in early sown crop followed by 62.5% in normal and 55.4% in late sown crop, however it was 68.0, 76.2 & 77.4 percent in anthracnose and 77.7, 76.6 and 72.3 percent in case of leaf blight respectively, in three dates of sowing. The validated treatment was found highly effective in foliar disease control and increase in the GFY in all the dates of sowing.

Treatment		Severity / incidence of Diseases and nematodes						Yield (q/ha)	
Main (DOS)	Sub	Root rot		Anthracnose		Leaf blight		GFY	
		Incidence (%)	% Control	Severity (%)	% Control	Severity (%)	% Control	Yield	% Increase
04.06.16	T ₁	3.56 (10.82)	69.7	7.56	68.0	4.83	77.7	91.96	17.7
	T ₂	11.73 (20.01)	-	23.60	-	21.67	-	78.10	-
19.06.16	T ₁	8.36 (16.79)	62.3	7.83	76.2	6.50	76.6	98.67	39.1
	T ₂	22.20 (28.09)	-	32.93	-	27.80	-	70.93	-
04.07.16	T ₁	17.90 (25.01)	55.4	2.96	77.4	3.80	72.3	73.50	17.5
	T ₂	40.13 (39.29)	-	13.10	-	13.73	-	60.67	-
CD		1.65	-	0.90	-	1.39	-	4.84	-

PPT 21: INTEGRATED MANAGEMENT OF BLSB OF FORAGE MAIZE

Location: Palampur

Design: RBD

Replication: 3

Plot size: 3 x 2 m²

Target Disease: 1. Banded leaf and sheath blight (BLSB)

The experiment was conducted with nine treatments having three replication in RBD during *Kharif* 2016 for the management of BLSB at Palampur. It was observed that seed treatment with carbendazim was found highly effective with 92% disease control and 20% increase in yield over check. This treatment was followed by seed treatment with carbendazim and one spray each of carbendazim and *P. fluorescens* providing 79.5% disease control and 15.2% increase in yield over check. Seed treatment with *T. viride* alone and in combination with two sprays of *P. fluorescens* were also effective as compared to control and gave 30.6 and 45.4% disease control and 3.9 & 6.3% increase in the GFY over check, respectively.

Treatment	Treatment details	BLSB		GFY	
		Incidence (%)	Control (%)	(q/h)	Increase over check (%)
T ₁	Seed treatment with <i>T. viride</i> @ 5g/kg	12.2	30.6	275.3	3.9
T ₂	Seed treatment with carbendazim @ 2 g/kg seed	6.5	63.1	285.7	7.8
T ₃	T ₁ +Two spray of carbendazim @ 1g/l	4.5	74.4	295.7	11.5
T ₄	T ₁ +Two foliar sprays with <i>P. fluorescens</i> @ 5g (CFU 10 ⁷) /l	9.6	45.4	281.7	6.3
T ₅	T ₂ +Two spray of carbendazim @ 1g/l	1.4	92.0	318.0	20
T ₆	T ₂ +Two foliar sprays with <i>P. fluorescens</i> @ 5g (CFU 10 ⁷) /l	5.7	67.6	281.7	6.3
T ₇	T ₁ +One spray each of carbendazim @ 1g/l and <i>P. fluorescens</i> @ 5g (CFU 10 ⁷) /l	4.6	73.9	297.7	12.3
T ₈	T ₂ +One spray each of carbendazim @ 1g/l and <i>P. fluorescens</i> @ 5g (CFU 10 ⁷) /l	3.6	79.5	305.3	15.2
T ₉	Control	17.6	0	265.0	0
CD		1.04		8.7	

PPT 22: INTEGRATED MANAGEMENT OF FOLIAR DISEASES OF FORAGE SORGHUM

Locations: Palampur and Ludhiana

Design: RBD

Replication: 3

Plot size: 2 x 2 m²

Target Diseases:

1. Anthracnose (*Collectotrichum graminicola*)
2. Zonate leaf spot (*Gloeopercospora sorghi*)
3. Grey leaf spot (*Cercospora sorghi*)

Location: Palampur

The experiment was conducted with 11 treatments having 3 replication in RBD at Palampur for the management of Zonal leaf spot disease of Sorghum using bio-agent & chemicals. Among all the treatments the seed treatment with carbendazim followed by two sprays of propiconazole was found highly effective which gave 89.9% disease control with 25.8% increase in the yield over check.

This treatment was followed by seed treatment with *T. viride* and two spray of propiconazole which gave 87.9% disease control with 23.2% increase in the yield over check. Two spray of propiconazole or one spray each of propiconazole and Achook (bio pesticide) were also found effective. The two sprays of Achook (biopesticide) only gave 55.9% disease control with 13.3% increase in the yield over check. Hence, the combination of bio- agent & chemical i.e. seed treatment with *T. viride* with one spray each of propiconazole and Achook (bio pesticide) was found effective in controlling of zonate leaf spot and gave 71.9% disease control with 20.6% increase in the field.

Table Palampur PPT-22. Integrated disease management of foliar diseases of forage sorghum

Treatment	Treatment details	Zonate leaf spot		GFY	
		Disease severity (%)	Control (%)	(q/h)	Increase over check (%)
T ₁	Seed treatment with <i>Trichoderma viride</i> @ 5g/kg	51.8 (45.99)	20.7	253.3	4.2
T ₂	Seed treatment with carbendazim @ 2 g/kg seed	41.9 (40.32)	35.9	254.3	4.6
T ₃	Two foliar sprays with neem bio-pesticide (Achook) @ 3%	33.8 (35.51)	48.3	260.7	7.2
T ₄	Two foliar sprays with propiconazole @ 1g/l	10.4 (18.82)	84.1	293.7	20.8
T ₅	T ₁ + Two foliar sprays with neem bio-pesticide (Achook) @ 3%	28.8 (32.46)	55.9	275.3	13.3
T ₆	T ₁ + Two foliar sprays with propiconazole @ 1g/l	7.9 (16.37)	87.9	299.3	23.2
T ₇	T ₂ + Two foliar sprays with neem bio-pesticide (Achook) @ 3%	24.6 (29.64)	62.4	275.7	13.5
T ₈	T ₂ + Two foliar sprays with propiconazole @ 1g/l	6.6 (14.82)	89.9	305.7	25.8
T ₉	T ₁ + One spray each of neem bio-pesticide (Achook) @ 3% and propiconazole @ 1g/l	18.4 (25.41)	71.9	293.0	20.6
T ₁₀	T ₂ + One spray each of neem bio-pesticide (Achook) @ 3% and propiconazole @ 1g/l	14.6 (22.42)	77.7	288.0	18.5
T ₁₁	Control	65.4 (53.96)	0	243.0	0
CD		2.32		7.09	

Location- Ludhiana:

All the treatments were at par in terms of percent leaf spot severity. Minimum disease severity of 41.44 % was observed in seed treatment with carbendazim @ 2g/kg seed + one spray each with neem bio-pesticide (Achook) @ 3% and propiconazole @ 1g/l followed by Seed treatment with carbendazim @ 2g/kg seed + two foliar sprays with propiconazole @ 1g/l and seed treatment with carbendazim @ 2g/kg seed + two foliar sprays with propiconazole @ 1g/l with per cent disease severity of 42.55 % each as compared to control (61.795). All these treatments also similarly showed increase in yield than check.

Variety: Dugar chari

Plot size: 3 x 3 m²

Treatments		Grey leaf spot severity (%)	Green fodder yield (q/ha)
T ₁	Seed treatment with <i>Trichoderma viride</i> @ 5g/kg	46.62	411.07
T ₂	Seed treatment with carbendazim @ 2 g/kg seed	43.66	429.59
T ₃	Two foliar sprays with neem bio-pesticide (Achook) @ 3%	46.62	407.37
T ₄	Two foliar sprays with propiconazole @ 1g/l	44.40	418.48
T ₅	T ₁ + Two foliar sprays with neem bio-pesticide (Achook) @ 3%	46.99	377.74
T ₆	T ₁ + Two foliar sprays with propiconazole @ 1g/l	44.40	422.18
T ₇	T ₂ + Two foliar sprays with neem bio-pesticide (Achook) @ 3%	43.66	433.29
T ₈	T ₂ + Two foliar sprays with propiconazole @ 1g/l	42.55	433.29
T ₉	T ₁ + One spray each of neem bio-pesticide (Achook) @ 3% and propiconazole @ 1g/l	42.55	448.10
T ₁₀	T ₂ + One spray each of neem bio-pesticide (Achook) @ 3% and propiconazole @ 1g/l	41.44	474.03
T ₁₁	Control	61.79	322.19
CD (p=0.05)		9.13	68.77
CV		11.69	9.70

PPT 23: MANAGEMENT OF DOWNY MILDEW OF PEARL MILLET USING BIO AGENTS

Locations: Ludhiana

Design: RBD Replication: 3 Plot size: 2x2 m²

Target diseases: Downy mildew (*Scleropthora graminicola*)

Variety: FBC 16 **Plot size:** 3.35 x 2.85 m²

Observations: Downy mildew incidence was in traces and in some plots no disease was observed. Yield was maximum in plots sprayed with two foliar sprays of Ridomil MZ @ 2.5g/lit f(3.28 q/ha) followed by seed treatment with Metalaxyl @ 2g/kg seed (265.24 q/ha) as compared to check.

Treatments	Treatment details	Downy mildew incidence (%)	Green fodder yield (q/ha)
T ₁	Seed treatment with <i>Trichoderma viride</i> @ 5 g/kg seed	0.0	237.32
T ₂	Seed treatment with <i>Pseudomonas fluorescens</i> @ 5g/kg seed	Tr	216.38
T ₃	Seed treatment with <i>Bacillus subtilis</i> @ 5g/kg seed	0.0	223.36
T ₄	Seed treatment with Metalaxyl @ 2g/kg seed	Tr	265.24
T ₅	T ₁ + two foliar spray of <i>Trichoderma viride</i> @ 5g/l	Tr	244.30
T ₆	T ₂ + two foliar spray of <i>Pseudomonas fluorescence</i> @ 5g/l	Tr	247.79
T ₇	T ₃ + two foliar spray of <i>Bacillus subtilis</i> @ 5g/l	0.0	258.26
T ₈	Two foliar spray of Ridomil MZ @ 2.5g/l	Tr	328.06
T ₉	Control	Tr	181.48
	CD (p=0.05)	-	36.40
	CV	-	8.60

Tr means traces (only one or two plants were observed)

FORAGE TECHNOLOGY DEMONSTRATIONS

To popularize the forage production technologies and make the farmers aware about various new fodder crop varieties, a total of 780 FTD's were allotted to AICRP centres and co-operating centre during *Kharif* 2016 for the crops viz., BN hybrid, sorghum, rice bean, maize, Pearl millet, Pearl millet + Cowpea, Setaria and guinea grass. Out of 780 FTD's, 255 were allocated to BN Hybrid, 31 to Rice bean, 169 to Maize, 50 to Pearl millet, 115 to Cowpea, 50 to Guinea grass, 60 to perennial grasses, 10 to Pearl millet + Cowpea and 40 to forage sorghum. The centers are using the resources of their respective institutions for carrying out the activities. FTDs are being conducted in the new villages every year so that the technologies can be spread in large areas

FTD Allocation for Kharif 2016												
Centre	BN hybrid	Rice bean	Maize	Bajra	Cowpea	Sorghum	Bajra+ Cowpea	Guinea grass	Para grass	Congo signal grass	Setaria grass	Total
Jorhat	15		20						10	15	20	80
Bhubaneswar	20		10		10							40
Kalyani	15	15	10									40
Ranchi	20		15		20			20				75
Faizabad	5			5								10
Jabalpur	5	6	4									15
Anand	5			5								10
BAIF	5						10					15
Bikaner				15	10							25
Ludhiana	70											70
Hyderabad	25		25	25	25							100
Mandya	20		20		40	10		20				110
Rahuri	10											10
Palampur	15										15	30
Srinagar			20									20
Imphal	10	10	10									30
Raipur			10									10
Vellayani	10							10				20
Pantnagar			20		10	30						60
Karaikal	5		5									10
Total	255	31	169	50	115	40	10	50	10	15	35	780

Monitoring Details of Kharif-2016 of AICRP (FC&U) Trials

S. N.	Name of Centre	Monitoring Team	Date of Monitoring
1	AAU, Jorhat	Dr. Kalyan Jana and Sutanu Sarkar	26 Sept, 2016
2	OUAT, Bhubaneswar	Dr. A.K. Mehta	22 Sept, 2016
3	BCKV, Kalyani	Dr. A. K. Mehta	20 Sept, 2016
4	BAU, Ranchi	Dr. Amit Jha	28 Sept, 2016
5	NDUAT, Faizabad	Dr. P.S. Takawale and B.T. Sinare	29 Sept, 2016
6	JNKVV, Jabalpur	Dr. A.H. Sonone and A.B. Tambe	16-17 Sept, 2016
7	AAU, Anand	Dr. A. H. Sonone and A. B. Tambe	18-19 Sept, 2016
8	BAIF, Urulikanchan	Dr. M.S. Pal	30 Sept-1 Oct, 2016
9	MPKV, Rahuri	Dr. M.S. Pal	3-4 Oct, 2016
10	RAU, Bikaner	Dr. U. S. Tiwana, Rahul Kapoor and Ravinder Kumar	26 Sept, 2016
11	PAU, Ludhiana	Dr. S.S. Shekhawat and R.S. Sheoran	15 Sept, 2016
12	CCS HAU, Hisar	Dr. V.K. Sood	23 Sept, 2016
13	GBPUA&T, Pantnagar	Dr. D. K. Banyal and V.K. Sood	17-18 Oct, 2016
14	TNAU, Coimbatore	Dr. Mareen Abraham and Usha Thomas	16 Sept, 2016
15	ANGRAU, Hyderabad	Dr. R. K. Agarwal and A. K. Mehta	16 Aug, 2016
16	UAS, B (ZRS, Mandya)	Dr. C Babu and S D Sivakumar	18 Oct, 2016
17	CSK HPKV, Palampur	Dr. U.S. Tiwana, Rahul Kapoor and Ravinder Kumar	13 Sept, 2016
18	KAU, Vellayani	Dr. A. K. Roy and Rajiv Agrawal	4 Sept, 2016
19	IGKV, Raipur	Dr. H.P. Parmar and P.M. Patel	19 Sept, 2016
20	CAU, Imphal	Dr. Kalyan Jana and Sutanu Sarkar	28 Sept, 2016

TRIBAL –SUB- PLAN ACTIVITIES

Kerala Agricultural University, Vellayani: Beneficiaries included 21 tribal families belonging to Njaruneeli tribal area of Ilanchiyam panchayath, Thiruvananthapuram district. Kid goats and fodder planting materials were distributed to farmers. The center is planning to extend the programme to tribal colonies in Kollam district in Kerala with aim to give support to improve the living standards of tribal farmers in Kerala State.

Central Agricultural University, Imphal: TSP programme was conducted under the theme “Improvement of Animal Products through Green Fodder”, on 27th, 29th August and 21st and 22nd November 2016. Village chief and renowned union tribal leaders were also present as special invitee. Two TSP programme were conducted at Senapati district of Manipur. Under this programme, 180 families from 6 different villages of Senapati district of Manipur, viz. (Purum likli, Makokching, Maibung, thajong, kharam and kharam thadoi) were benefited. Fertilizers, Knapsack sprayer, plant protection chemicals, Napier hybrid cutting, fodder seeds (rice bean, Maize, seedling, etc as inputs were distributed to the beneficiaries. “Improvement of Animal Products through Green Fodder” in Hilly Areas of Manipur was also discussed under this programme. 90 nos. of families from 3 different villages of Ukhrul District, Manipur were benefited. Farmers were given Fodder rice bean seed, Fodder maize seed, Napier hybrid cuttings, plant protection chemicals, Fertilizers, Knapsack sprayer along with package of practice.

IGKV, Raipur: For the benefit of tribal farmers of Chhattisgarh different activates like demonstrations on fodder production, distribution of farm implements and publication of fodder production related literature were carried out. In Rabi 2016-17 total 30 demonstrations are conducted out comprising of 15 on Oat and 15 on Berseem to demonstrate the fodder production technology among the tribal farmers of Kanker, Garyband and Koriya districts of Chhattisgarh. Small implement like hand hoe (105) and improved sickle (105) were procured for distribution to small and marginal farmers of Kanker, Gariyaband, Narayanpur districts of Chhattisgarh. For the awareness of improved and scientific fodder production technology round the year in the state, 1000 copy of extension bulletin on fodder production technology चारा फसल उत्पादन की उन्नत तकनीक are published for the distribution through KVK's in the state.

SKUAST-K, Srinagar: TSP interventions were implemented at Upper hills of Budgam, Ganderbal and Ananthnag districts of Kashmir region, Drass and Kargil of Ladkh region. Agricultural, Livestock and fodder related interventions were demonstrated to uplift the socio-economic condition of tribal farmers.

A Tribal Forage Day was organised at Mattayn village of Drass Kargil on 3rd of June, 2016 to aware tribal farmers of latest technological innovations for a sustainable venture. More than 60 tribal families involved in fodder cultivation participated. Farm implements viz Tangroo, Spade, Serrated sickles etc and organic fertilizers (vermicompost) were distributed among selected tribal families. All the selected beneficiaries were distributed fodder maize (African tall) and Oats seed (Sabzaar & SKO-90). This helped in increasing the productivity of milk health of animals and the tribals as well.

Ninety (90) farmers from three villages namely Ackhamal, Lobar and Minji of district Kargil were benefitted by distributing Oats seed along with organic fertilizers. Three Training-cum- awareness programmes on “Production technology of fodder crops under cold arid regions of Ladakh” were conducted on three consecutive days during 5th, 6th and 7th November, 2016 at the respective villages in collaboration with KVK-Kargil.

Forage technology demonstrations: Oats var. SKO-90 and SKO-96 seeds were provided to forty (40) tribal farmers of Budgam and Ganderbal districts. Selected farmers were also provided with inorganic fertilizers as per recommender dose.

Introduction of Perennial fodders (Alfalfa and Red clover): Twenty (20) tribal families of Langanbal and Aroo villages of sub-alpine areas of Pahalgam of district Ananthnag were selected in upper hills of Pahalgam and were provided with the perennial fodders (Alfalfa and Red clover) along with organic fertilizers (vermicompost)).

Trainings /Awareness/Demonstrations Conducted

- Importance of perrenial fodder crops and their management at Langanbal and Aroo (Pahalgam Ananthnag) on 18-March, 2017. Beneficiaries -20
- Production technology of fodder crops under cold arid regions of Ladakh at Ackhamal, Lobar and Pandrass (Kargil) on 05-07-November, 2016 Beneficiaries -90
- Cultivation of summer Oats under cold arid regions of Ladakh at Mattayn, Drass-(Kargil) on 03-June, 2016 beneficiaries – 30

BAIF, Urulikanchan: 30 farmers in 5 groups were selected from 2 villages of Nandurbar District of Maharashtra. Demonstration of fodder cultivation technologies in non-traditional area during winter was organized at 30 farmer's field in 2 villages which covered 12 ha area under maize and berseem crops. Goat improvement programme was carried out through distribution of bucks, first aid kit etc. 5 bucks of Osmanabadi breed & 5 first aid kit received to 5 groups of farmers. Water resource development for irrigation facilities Diesel pump sets, PVC pipes and other materials were distributed to 5 user groups. Water availability for irrigation to 30 farmer's field was enhanced.

JNKVV, Jabalpur: Forty (40) Farmers families were adopted to conduct forage demonstration at kanhisang, Ghana ghah and Dhanuasagar village (Dindori). They were provided improved varieties of Maize (African Tall), rice bean (JRB05-2) Hybrid Napier (IGFRI-7), Berseem (JB 5) and Oat (Jawahar oat 1) alongwith package of practices. The productivity of Maize (African Tall) forage is about 315 q/ha, is much higher than the local varieties. Rice bean yield was 215q/ha which is a good lean period fodder and pods were used as vegetables and are good source of protein. Berseem had GFY of 495q/ha. Oat gave the fodder yield of 330q/ha. This crop grows well even under low water availability conditions and is tolerant to frost. Higher benefits incurred with use of improve variety and fertilizers. It helped in increasing the productivity of milk and health of animals and tribals. Kisan sangosthi were organized at Regional research station, Dindori on 17th March 2016

BCKV, Kalyani: 168 tribal farmers of Chhatna, Bankura-II and Taaldangra block under Bankura district and Chakdaha and Haringhata block of Nadia district of West Bengal were benefitted by different field activities. Agricultural, livestock and fodder & forage cum food related interventions were demonstrated for socio-economic condition uplift of tribal farmers/families under adopted villages of TSP programme. Maize (cv. African Tall), Sorghum (Single cut & multi cut varieties), Rice bean (cv. Bidhan Ricebean-1 and Bidhan rice bean-2), Hybrid maize (cv. Nisha 3503), Coix (cv. Bidhan Coix-1), Lathyrus (cv. Nirmal & Ratan), Toria (cv. B-54), Oats (cv. Kent & OS-6), Berseem (cv. Warden & Mescavi) seeds, planting materials (cuttings) of Bajra-Napier Hybrid & Guinea grass along with inorganic fertilizers (Urea, 10:26:26), *rhizobium* culture, insecticides and fungicides were distributed among selected tribal farmers. 5 numbers tribal farmers' training programme were organized in selected tribal villages i.e. Arrah, Rautari, Kalikapur, Barachaka and Panch Kahania. The fodder maize (African Tall), Oats (cv. Kent & OS-6), Berseem (cv. Warden & Mescavi) has been introduced at Chhatna Bankura-II and Taaldangra block of Bankura district under red and laterite zone (western part) of West Bengal.

Assam Agricultural University, Jorhat: 103 beneficiaries in 10 villages of two districts Karbi Anglong and Dhemaji districts were selected. Karbi Anglong falls under Hill zone and Dhemaji districts falls under North Bank Plain Zone. The later is dominated by Missing tribe and Karbi Anglong districts are dominated by Karbi hill tribe. Farmers were trained for scientific fodder production and proper health care of the domestic animals. Poor and marginal farmers of the two tribal districts were benefitted by capacity building through training and counseling for commercial agriculture with regards to rearing cattle and other domestic animal, crop intensification for more production and profit. Availability of green and nutritious fodder by growing both annual and perennial fodder makes them confident enough to feed animal at lower cost. Establishment of fodder nurseries makes them aware of producing sufficient numbers of planting materials of perennial grasses for their own requirement as well as cater to the need of nearby farmers and relatives.

Four training programs were organized on Scientific Fodder Production along with Animal health camp cum field day. Seeds of improved varieties of Perennial Grasses like Setaria, Hybrid Napier, Para grass and Congo signal grass were distributed. Annual cultivated fodder crops like Oat, Maize and Teosinte were also introduced. Bonraja Breed of Poultry which is a dual type i.e. both for meat and egg and sprayers were distributed. Permanent Fodder plots were created in 10 villages covering 2 districts. Advisory service for growing other important crops like rice and vegetables in rice growing areas were emerged to be very beneficial non monetary input for many fold increase of crop production and animal productivity.

MPKV, Rahuri: 40 tribal farmers of village Dudhipada, Taluka Navapur, District Nandurbar, Maharashtra were selected after survey. The farmers were provided with knowledge of improved technologies in fodder production and were provided with the B x N rooted slips, Stylosanthes seeds. Farm implements like Cycle hoe, Laxmi sickle and literature were also provided to them.

CSK HPKV, Palampur: 49 farmers' families selected in Deol Fatahar / Jhikhli Bheth villages in Baijnath block and were apprised of various fodder production technologies, supplied with Seedling of Setaria grass, Tall fescue grass and Kikuyu grass in July 2016 and the effect of technologies on herbage production was demonstrated. About one hectare area infested with Lantana and Eupatorium has been made free of weeds and planted with improved species of grasses using various means. 50 families in Gont village (Nanahar) in Baijnath block selected and Inputs like UMM Bricks, mineral mixture for livestock, seedlings of setaria grass, NB hybrid, mulberry trees, lemon trees and implements like sickles have also been procured. These interventions have resulted in Increase in herbage yield to the tune of about 60q/ha over existing system accompanied by better animal health and productivity and improvement in family income.

PJTSAU, Hyderabad: Ten Tribal farmers were selected as beneficiaries in Budidagattu Thanda, Pedda adicherlapally mandal, Nalgonda district, Telangana. Field day was conducted to train the farmers about fodder production. Farmers were provided with improved seeds and package of practices for enhancing fodder production. The improved varieties include APBN-1 cuttings in Hybrid Napier, Hedge Lucerne etc. This helped in round the year green fodder availability there by increasing the productivity of milk, meat and health of animals and the tribals as well. Literature related to forage production technology were distributed and created awareness about importance of growing fodder crops and its utilization. Sheep were distributed to the identified beneficiaries so that their income levels will be increased by rearing sheep with feeding of perennial fodders