AICRP on Forage Crops
Tech. Pub. Number 4 2010

September, 2010
AICRP (FC), Jhansi – 284 003 (U.P.)

Published by:

Project Coordinator
AICRP on Forage Crops
Jhansi-284003 (U.P.)
Phone: 0510-2730029
Fax: 0510-2730049
E-mail:pcforage@gmail.com ; pcfc@igfri.ernet.in

Compilation*:*
1. Crop improvement : R.V.Kumar
2. Crop Production : Sunil Kumar, Naveen Kumar, U.S.Tiwana
3. Crop Protection :K.C.Pandey, N.Sasan, R.B.Bhaskar
4. Breeder Seed Production : R.V. Kumar
5. Weather Report : R.V.Kumar

Coordination & Editing *: S.A. Faruqui*

Distribution:
AICRP (FC) Centres, Coordinating Unit, ICAR Officers at the Headquarters and selected distinguished forage scientists.

Group Meeting Organized at*:*
CSK Himachal Pradesh Krishi Vishva Vidyalaya,Palampur
Dated:Sept.30 to October 2, 2010

Credits:
All the staff of AICRP (FC) Centres, PI's, Sh. O.N. Arya (Statistical Analysis), Sh. Sushil Khare (Conduct of trials and analysis), Sh. V.K. Paliwal (Computation) Sh. Dayal and Amar Singh (Xeroxing)

PREFACE

It is a great pleasure to bring out Annual Report (2009-10), Part II – Rabi 2009-10 which embodies the research trial results in the areas of forage crop improvement, crop production and crop protection with the view to develop and test the technologies for better quality/quantity forage production in different agro climatic situations. The sincere efforts made by all contributing scientists and staff at the Coordinating Unit and AICRP Centres have resulted in successful conduct of technical programme and meeting the targets fixed for Rabi 2009-10. The forage crops tested during the period under report, included Rabi forage cereals and legumes adaptable to a wide range of agro-ecological regions of the country. Weather data has also been recorded at different Centres and the same is linked to crop growth etc. The breeder seed produced under the DAC indent is also compiled and reported.

Results have been presented in the form of chapters. The results of forage crop improvement trials is given in Chapter 1, which includes multi- locations test performance of newly developed genetic material in both single and multi-cut forage species. The findings on crop production studies are presented in Chapter-2 which includes: integrated nutrient management in food/ forage based system, optimization of S and Zn levels in forage-based cropping system, evaluation of forage production potential of maize grown for baby corn and green cob and agronomical trial for AVT-2 entries of Oats (single cut). Chapter-3 deals with different aspects of plant protection in selected forage species, viz., Oats (SC & MC), Berseem and Lucerne; and generation of technologies for pest management in the selected crops. Other chapters include details of in house breeding activities,weather details etc.

The contribution and sincere efforts made by each and every member of the team and their associates at the Centres deserve appreciation in achieving the objectives of this project. Dr. S.S. Singh, Project Director and Dr. R.P.S. Verma, PI (Barley Network) at Directorate of Wheat Research, Karnal facilitated for organization of the trials on dual-purpose barley. Their valuable contribution for AICRP on Forage Crops is gratefully acknowledged.

My colleagues at Project Coordinating unit, Dr. R.V. Kumar, Dr. D. N. Singh (Ex PS & PI Plant Breeding) and Dr. Sunil Kumar (now PS at NRCAF) and technical staff, Shri S.K. Rajpali Ex Sr T.O., Shri O.N. Arya and Shri S.K. Khare provided support in distribution of seed/planting material for the trials; conducting field trials at the Coordinating Unit, analysis and synthesis of data of trials conducted at all the locations. Forage Crop Protection trials have been conducted and coordinated by Shri K.C. Pandey, Dr. N. Hasan and Shri R.B. Bhaskar. Their sincere efforts are thankfully acknowledged.

The efforts of Shri S.K. Khare and Shri V.K. Paliwal, in computer-based work of the Report and those of Shri Dayal and Shri Amar Singh in Xeroxing and organizing this Report are sincerely acknowledged.

The administrative support and cooperation being received from Dr K.A. Singh, Director, and other colleagues at IGFRI is thankfully acknowledged.

Meeting all the targeted activities would not have been possible without the active leadership support and encouragement received from Dr. Mangala Rai, Ex Secretary DARE & DG ICAR; Dr. S. Ayyappan Secretary DARE & DG ICAR, Dr. Swapan K Dutta, DDG(CS); Dr. S.N. Shukla, Ex ADG (FFC), Dr R. P. Dua, ADG (FFC). Each and every one in the Team at AICRP on Forage Crops gratefully acknowledges this support.

Dated: September 10, 2010 ***S. A. Faruqui***
Place: Jhansi *Project Coordinator*

CONTENTS

EXECUTIVE SUMMARY

The present report describes results of the coordinated trials conducted on Crop Improvement, Crop Production and Crop Protection as well as the Breeder Seed Production of the different forage crops during Rabi 2009-10 at different locations/centres in the country placed in five Zones *viz*., Hill Zone, North-West Zone, North-East Zone, Central Zone and South Zone. Weather data are also reported to correlate the growth and yield of forage crops with weather parameters at different sites during crop period.

A. FORAGE CROP IMPROVEMENT

In Rabi 2009-10, eight breeding trials of two annuals and two perennial forage species comprising 41 entries alongwith their respective checks were conducted at 26 locations located in five zones. The forage species evaluated were Bersemm and Oat (Single and Multi cut) in annuals and Lucerne and Tall Fescue perennials. In perennial, trial on Lucerne has completed its third and final year of evaluation and other trial on Tall Fescue is continued. In addition, special breeding programme with specific aim was carried out at identified centres.

As forage crop species has diverse nature and their adaptability is varied in wide edaphic conditions, the forage trials also varied in nature. These forage trials were classified into three groups *viz*., Initial Varietal Trial (IVT), Advanced Varietal Trial Stage-1 (AVT-1) and Advanced Varietal Trial Stage-2 (AVT-2).

A perusal of the results reported on different cultivated forage species revealed that in all the four crops i.e. Berseem, Oat, Lucerne and Tall Fescue, there are some entries which has excelled their performance at zonal or national level.

The summarized results of different cultivated annual and perennial forage evaluation trials are as below**:**

BERSEEM

In Berseem, there was only one trial i.e. IVT comprising five entries along with two national checks. For the character green forage yield (q/ha), entries HFB-6-6(12.9%), HFB-30 (7.9%) and JHB-09-1 (6.8%) proved their superiority over best national check in Hill zone, entry HFB-30 (4.3%) in North-West zone, entry JHB-09-2

(2.7%) in North-East Zone and entry JBO-3-15 (2.7%) in Central zone. At national level, entry HFB-30 was at par with national check Similarly for the character dry matter yield (q/ha), entries HFB-30 (9.7%), HFB-6-6 (8.8%), JBO-3-15 (5.6%) and JHB-09-1 (4.8%) in Hill Zone, entry HFB-30 (4.8%) in North-West zone and entry JBO-3-15 (3.6%) in Central zone exhibited their superiority over best national check. At national level, performance of only one entry i.e. JBO-3-15 was at par with national check.

OAT (SINGLE CUT)

In IVT, there were twelve entries and results revealed that for the character green forage yield (q/ha), entries OS-363 (6.8%) and JHO-2009-1 (4.9%) in Hill zone, entries OS-363 (14.0%), UPO-09-2 (12.8%), NDO-609 (8.4%) and JO-03-95 (5.8%) in Central zone and entries UPO-09-1 (7.7%) and OS-374 (5.5%) in South zone registered their superiority whereas at national level entries UPO-09-2 (7.2%), UPO-09-1 (3.5%) and OS-374 (3.4%) exhibited their superiority. Similarly for dry matter yield (q/ha), entries JHO-2009-2 (13.5%), SKO-156 (12.9%), JHO-2009-1 (11.9%), OS-363 (9.9%), SKO-148 (9.7%) and SKO-163 (7.8%) in Hill Zone, entries OS-374 (3.4%), UPO-09-1 (1.8%), NDO-609 (1.2%) in North-West zone, entries UPO-09-1 (4.1%), UPO-09-2 (3.0%), OS-363 (2.6%) and JHO-2009-2 (1.7%) in North- East zone, entries SKO-156 (16.7%), OS-363 (16.6%), JO-03-95 (13.3%), JHO-2009-2 (13.1%), UPO-09-2 (10.5%) UPO-09-1 (10.4%), JHO-2009-1 (9.0%) and NDO-609-2 (8.0%) in Central zone and entries UPO-09-2 (22.1%), UPO-09-1 (11.1%) and OS-374 (4.1%) in South zone proved their superiority over respective best national or zonal check. At national level, entries UPO-09-1 (12.1%), UPO-09-2 (11.0%), JHO-2009-2 (10.1%), SKO-156 (5.4%) and NDO-609 (4.9%) were adjudged good performer.

In AVT-1, all the four entries performed better than the checks in Hill zone with 10.2 % superiority for entry JO-03-291 and 9.6% superiority for entry SKO-96 whereas in North-West zone, entries SKO-133 (10.2%), SKO-117 (4.5%) and entry JO-03-291 (8.1%) in Central zone proved their superiority but none of the entries recorded their superiority in North- East and South zone. On all India basis only one entry i.e. JO-03- 291 proved their superiority over national check.

Similarly for the character dry matter yield (q/ha), entries SKO-96 (8.6%), JO-03-291 (7.2%), SKO-133 (2.6%) and SKO-117 (1.8%) in Hill zone, entry SKO-117 (4.5%) in North-West zone, entry JO-03-291 (7.1,6.1%) in central and South zone, respectively exhibited their superiority over check. At national level entries JO-03-291 (5.6%) and SKO-117 (1.6%) were recorded for their superiority for this character.

In AVT-2 with five entries, entries JO-03-93 (19.6%), SKO-105 (16.6%), SKO-90 (12.2%) and SKO-109 (8.4%) in Hill zone, entries JO-03-93 (12.6%) and NDO-25 (9.4%) in Central zone exhibited their superiority over check for the character green forage yield (q/ha), whereas none of the entries were found better than check in North-West, North-East and South zone. At national level, entries JO-03-93 (10.5%) and NDO-25 (5.2%) were found superior than national check Kent. Similar was the condition for the character dry matter yield (q/ha) for which entries SKO-105 (13.3%), SKO-90 (10.2%), JO-03-93 (6.2%) and SKO-109 (4.6%) in Hill zone and entries JO-03-93 (7.3%) and NDO-25 (3.5%) in Central zone proved their superiority whereas none of the entries excelled their performance in North-West, North-East and South zone. At national level entries JO-03-93 (8.4%) and NDO-25 (3.3%) recorded for their superiority over national check OS-6.

In AVT-2 (Seed), none of the entries was found superior over respective checks at zonal or at the national level. Both national checks have maintained their superiority in seed yield. At national level, seed yield of OS-6 was 19.5 q/ha, which was closely followed by Kent (19.4 q/ha).

OAT (MULTI CUT)

In multi cut there was only one trial i.e. IVT with five entries. For green forage yield (q/ha) entries UPO-09-3 (15.6%), JO-03-307 (13.4%) and JHO-2009-3 (11.8%) in Hill zone. entry JO-03-307 (3.9%) in Central zone was better than national check However none of the entries performed better than national check in North-West zone. At national level, entries JO-03-307 (3.9%) and UPO-09-3 (1.7%) proved their superiority over best performing national check. Similarly for the character dry matter yield (q/ha),

entries JHO-2009-3 (26.5%), UPO-09-3 (18.9%) and JO-03-307 (16.9%) in Hill zone, entry OS-376 (2.0%) in North-West zone and JO-03-307 (0.8%) in Central zone performed better than the national check. At national level, entry JO-03-307 (4.1%) followed by UPO-09-3 (2.2%) was recorded for superiority.

LUCERNE

In varietal trial on Lucerne comprising three entries, entry BAIF Lucerne-1 ranked first in Central as well as in South zone for green forage yield (q/ha) whereas none of the entries surpassed the national check in North-West zone. Even at the national level, entry BAIF Lucerne-1 was adjudged best. Like green forage yield, result was almost same for dry matter yield (q/ha) in which entry BAIF Lucerne-1 ranked first in Central and South zone as well as at national level. When we see the pooled performance of entries during last three years over the locations, only one entry i.e. BAIF Lucerne-1 was recorded for high fodder yield (green forage and dry matter) over the best national check RL-88. For green forage yield (q/ha) superiority was 3.1 % and for dry matter yield (q/ha) superiority was 2.0 %.

TALL FESCUE

The varietal trial in Tall Fescue grass (Perennial) comprising four entries is in establishing stage. Data reported from Almora center clearly revealed that for green forage yield (q/ha) as well as for dry matter yield (q/ha), entry Hima-14 ranked first followed by entries Hima-15, Hima-1 and Hima-4.

SPECIAL BREEDING PROGRAMME

A National poly cross nursery programme in Lucerne was started during 2003 at Coimbatore with the objective of creating variability in terms of fodder yield and quality which is a long felt need of legume fodder improvement programme. The other participating centres were Anand, Rahuri, Urulikanchan and Mandya. As a result, 25 promising lines have been isolated and the collected seeds were distributed among the participating centres during Rabi 2008. Based on the pooled analysis, six elite cultures possessing high yield and quality *viz.*, ACP 1-2 (14), ACP-3-2(15), CAP 3-2(11), RRP 5-4 (17), ALP 1-1 (5) and ACP 3-1(4) have been identified.

Similarly, in National crossing programme in Bajra Napier Hybrid, a total of 224 crosses were made during 2009. Out of this 52 crosses have been sent to 12 participating centres to evaluate crosses during Kharif 2010. In National crossing programme in Hybrid Fodder Bajra, using eight A lines and 5 R lines at Anand, Rahuri and Hyderabad, hybrid seeds of 143 crosses [Anand (40), Rahuri (40, Hyderabad (26) and Coimbatore (37)] have been obtained for further evaluation during Kharif 2010.

DUAL PURPOSE BARLEY

In IVT, though several entries were good either for grain yield or forage yield, but there was no entry in first non-significant group in both cases in NWPZ. Thus as a second choice entries with relatively higher ranks in both cases were considered, but in this case also the checks RD2035 (4 GY/ 6FY) was better than rest of entries and checks. In case of NEPZ, based on zonal mean of grain and fodder yield taken together entries HUB208 (3GY/4FY) and HUB209 (5GY/1FY) were ranking higher than checks and other entries in the zone. In central zone also check RD2552 is superior in grain and forage yield then others, based on forage & grain data considered together. In AVT (Northern Hills Zone), the trial consisted of 14 entries and three checks, Entry VLB118 appeared in 1st NSG, simultaneously, for grain and forage yield, and can be considered for promotion to AVT-first year in rabi 2010-11.

B. FORAGE CROP PRODUCTION

The programme on Forage crop production was undertaken at 27 sites in different agro- climatic zones of the country. Research aspects consisted: Integrated nutrient management in food/ forage based systems; optimization of S and Zn levels in forage–based cropping system; resource conservation; evaluation of forage production potential of maize grown for baby corn and green cob; influence of macro and micro nutrients on Lucerne fodder yield and quality; seed cum fodder yield of Lucerne in relation to sowing methods and cutting management; remunerative forage based cropping systems for sustained productivity under irrigated conditions; management of sodic soil through amendment and agronomical trials for AVT-2 entries of tall fescue grass and oats.

The summary of Rabi 2009-10 results is presented briefly as under:

- In Hill zone at Almora and Palampur, application of 75% NPK through inorganic fertilizer + *Azotobacter / Rhizobium* in Setaria – white clover system realized higher net return over control (Rs. 17744/ha/yr) and 100% NPK (Rs.3159/ha/yr) after third year.
- In Central zone, use of FYM 25% N + 50% NPK + *Azotobacter / Rhizobium* in sorghum + cowpea – Lucerne realized highest B:C ratio at Rahuri (1.43) and Anand (1.38). Application of 100% NPK through inorganic fertilizer at Urulikanchan, recorded highest B:C ratio (2.12). At Jabalpur, 100% NPK through inorganic fertilizer was superior in terms of B:C ratio (2.30). At Jhansi, supplementation of FYM 50% N + 50% NPK through inorganic fertilizer to sorghum + cowpea – berseem realized 36 percent increase in net return over 100% NPK through inorganic fertilizer.
- In North East zone, at Jorhat use of green manure + 25% N FYM + 50% NPK through inorganic fertilizer+ biofertilisers to rice – oat – *Lathyrus* registered 142 and 30 percent increase in net return over control and 100% NPK, respectively. At Faizabad, supplementation of 50% N FYM + 50% NPK through inorganic fertilizer recorded maximum net return (Rs. 22822/ha/yr), which was 88.2 percent higher over 100% NPK through inorganic fertilizer. At Bhubaneswar, application of green manure + 50% N FYM + PSB + *Azolla / Rhizobium* to rice – cowpea (F) – mung(F) realized significantly higher net return (Rs.57798/ha/yr) with magnitude of increase for 17.7 percent over 100% NPK through inorganic fertilizer. At Kalyani, GM + 50% N FYM + Biofertilisers (*Azotobacter/ Rhizobium*) to rice – cowpea (F) – mung(F) realized significantly higher net return (Rs. 22270 /ha/yr) than 100% NPK through inorganic fertilizer (Rs.15266/ha/yr). At Pusa highest forage equivalent yield was recorded with GM + 25% N FYM + 50% NPK through inorganic fertilizer+ Biofertilisers (750.8 q/ha). At Ranchi, B:C ratio (3.31) was highest with 50% N FYM + 50% NPK through inorganic fertilizer in rice – berseem.
- S and Zn levels influenced forage-based system favorably when applied every year than alternate year. Application of 10 kg Zn/ha every year ($ZnSO_4$) recorded

significantly higher net return at Jabalpur (Rs.6695/ha/yr) and Faizabad (Rs. 29579/ha/yr) than rest of the treatments. The magnitude of increase over control was 270 and 267 percent at Jabalpur and Faizabad, respectively. At Bikaner, response of S and Zn treatments in pearl millet (S) + cowpea (F) – barley (S) indicated that net return was significantly higher with 10 kg Zn/ha every year ($ZnSo_4$) (Rs. 118684/ha/yr. At Hyderabad in maize (S) – cowpea (F) – Lucerne (S) sequence treatments did not exhibited any significant effect on grain yield of maize and fodder yield of Lucerne. Net return of was highest (Rs.27441/ha) when sequence was supplemented with 20 kg S/ha every year (Gypsum).

- Maize baby corn (BC) and green cob based (GC) forage sequences gave higher net return to the tune of 7 to 69 percent over NB hybrid perennial grass based forage production system in all zones.
- Maize grown for baby corn gave higher (7-30% in North East and South zone, 28-35% in North West and Central zone) net return than green cob types at all the locations.
- Influence of macro & micronutrients to Lucerne was evident at Rahuri and Urulikanchan. Application of RDF + FYM @ 10 t/ha + S + MO + B gave 13 and 70 percent increase in forage yield over RDF and control, respectively.
- At Rahuri and Urulikanchan Forage yield of Lucerne was higher with line sowing (1396.75 q/ha) than broadcast sowing (1323.8q/ha). Regular cutting for one and half years and leaving seed production in second week of February every year resulted in better seed yield of the crop.
- At Mandya Maize + cowpea (F) – sunflower – finger millet sequence resulted in highest monetary return of Rs. 73004/ha/yr. The magnitude of increase with this treatment was in order of 60.5 and 55.4 percent over ragi (G) – field beans (S) – sunflower (G) and sorghum (MC-F) – Lucerne (F), respectively.
- Under sodic soil of Faizabad application of RDF +gypsum @75% GR + FYM 10 t/ha produced 46.2 more green forge yield over recommended dose of fertiliser in rice-berseem sequence.

- In agronomy trial for AVT-2 in Tall Fescue grass, the entry EC 178184 recorded highest forage yield with a superiority of 10 percent over HIMA-1 (C). Response of nitrogen was evident linearly upto highest tested dose i.e. 120 kg N/ha.
- In agronomy trial for AVT-2 entries on oat, the entry SKO-90 out yielded and was closely followed by JO-03-93. No appreciable superiority of entries was noticed over checks. SKO-90 and JO-03- 93 recorded superiority of only 1.8 and 1.5 percent over Kent (NC), respectively. The performance of entries was variable at different locations. Response of nitrogen was evident linearly upto highest tested dose i.e. 120 kg N/ha

C. FORAGE CROP PROTECTION

The Forage Crop Protection trials included monitoring of pests and diseases, screening for disease and pest resistance in improved breeding materials and disease and pest management. These trials were conducted at Anand, Bubhneswar, Hisar, Hyderabad, Jhansi, Ludhiana,Palampur and Rahuri.

The occurrence and abundance of major insect pests and disease in berseem, Lucerne and oats at different locations alongwith their relationship with weather parameters has been worked out.

In Berseem,stem rot ((Sclerotinia trifoliorum) and root rot ((Rhizoctonia solani and Fusarium semitectum) incidences were severe when mean temperature 12.5^{o}C and mean RH 62.3% prevailed at Hisar centre. Stem rot disease was found favoured by low temperature 9-15.4^{o}C and high humidity 84.5 – 93.5% at Ludhiana. At Palampur and Jhansi stem rot incidences were recorded 30 and 24.5% respectively during January to March. Two dominating nematodes, viz., stunt nematode (Tylenchorhynchus vulgaris) and root knot nematode (Meloidogyne incognita, M. javanica) constituted 42.4 and 32.4 percent population in berseem crop pathosystem at Jhansi Centre.

In Lucerne, alfalfa mosaic, downey midew, leaf spot and rust incidence were recorded at Anand, Jhansi and Rahuri Centres. Where as aphid infestation was severe at Anand , Hyderabad and Rahuri Centres.The infestation was highest (36 aphids/Tiller) at Rahrui. Alfalfa weevil was severe (8.4 larvae/plant) at Jhansi Centre.

In oats, Powdery mildew and leaf blight incidences were 80 and 29 percent respectively at Palampur centre in the month of April. At Rahrui aphid *(Rhopalosiphum paddi*) was maximum (3 aphids/tiller) in the month of January. Sclerotium rot (<5%) was recorded at Jhansi.

The data on varietal evaluation of Lucerne perennial showed that entry Anand -22 was found comparatively least infected with powdery mildew (5.5%) and anthracnose (9.6%) at Hisar. Entry Anand -21 showed moderately resistant reaction to lesion nematode (*Pratylenchus zeae*) at Jhansi.

In single cut Oat IVT entry OS-374 shdowed minimum disease incidences (0.66 to 4.0) at all the centres except Ludhiana however all the entries showed resistant reaction against *Sclerotium* rot at Bhubaneswar and Jhansi centres. Entries NDO-603, SKO-156, SKO-163, JHO-09-1 and Palampur-1 were resistant to root ;knot nematode at Jhansi . All the entries under AVT showed minimum range of leaf blight disease incidences (0.33-4.00) at Bhubneswar, Hyderabad and Jhansi centre. Entries 0S-6 and JHO-2000-4 were found resistant to nematode *(M. Javanica*) at Jhansi.

In multicut Oat IVT entries JO-03-307 wer found resistant to leaf blight at Bhubaneswar and Ludhiana centres where as UPO-212 at Hisar and Palampur-1 at Jhansi were resistant to leaf blight.

IVT entries of berseem JBO-03-15 and HFB-30 were found resistant to stem rot at Hisar. Entry JHB-09-1 was found resisntant to root rot at Hisar and Jhansi centres under sick plot conditions.

Refinement of disease management Technology for seed production in Oat (PPT-8) Trial was conducted at Ludhiana and Palampur centres. The results revealed that T-7 combination of seed treatment with vitavax @ 2.5 g/kg seed + *Trichoderma vividae* @ 5g/kg seed with foliar spray of Propiconazole @ 0.01% brought down the powdery mildew disease up to 9.7% against 65.3% in untreated control. Seed yield was increased to 17 q/ha against 14.1 q/ha in untreated control. At Bhubneswar centre, spray of Pitcher compost @ 3% reduced root rot and increased the GFY (43.2%).

Integrated disease and insect pest management in Lucerne (PPT-10) trial was conducted at Anand, Hyderabad and Rahuri centres with 8 different treatments. Seed treatment with Neem seed powder @ 5% provided best control of insect pests in Lucerne crop. Although chemical treatment combination of seed treatment with carbendazim 2g/kg + cabofuron 1kg/ha + Mancozeb spray (0.25%) provided maximum control of diseases and pest at all the centres. Among the organics Seed treatment with *Trichoderma* 5g/kg + Neem seed powder 50 g/kg also provided considerable control of nematodes.

Assessment of yield losses due to rust in Lucerne seed crop (PPT-11) Trial was conducted at Anand , Hyderabad and Rahuri centres. It consisted 2 different treatment viz Protected and unprotected.The results reveals that at all the locations the disease intensity was reduced to a considerable level along with the increase in seed yield.

Integrated disease management in white clover (PPT-12) trials was conducted at Palampur centre as a location specific trial with 10 different treatments. The results revealed that seed treatment with Bavistin @ 2g/kg + *Trichoderma viride* 5g/kg seed + Foliar spray of Bavistin 0.1% reduced powdery mildew and clover rot diseases significantly at Palampur.

D. BREEDER SEED PRODUCTION

In Rabi 2009-10, the indent for Breeder Seed Production was received from DAC, GOI for 22 varieties in four forage crops *viz*., Oat, Berseem, Lucerne and Gobhi Sarson. The allocation for producing the indented quantity of Breeder Seed i.e. 277.59 quintal was made to ten Breeder Seed producing centers of the different SAUs/ICAR institutes. Among quantity indented for different forage crops, the maximum was for Oat (224.30q) followed by Berseem (45.25q), Lucerne (7.60q) and minimum was for Gobhi Sarson (0.44q).

In general there was no shortfall in production of any varieties except for Bundel Berseem-3 (-3.50q) and T-9 (-1.20q). When we look for overall production, as compared to indent in Oat (224.30q), the actual production was 370.50q which was 146.20q surplus. Similarly in Berseem, the actual prouction was 14.70q surplus as against indent for 45.25q. In Lucerne and Gobhi Sarson the actual production was slightly more or at par to the quantity indented. The overall Breeder Seed Production was 161.70q more or we can say that it was 58.25 percent higher as evident from seed production of 439.29q against the indent for 277.59q. We can conclude that almost all the producing centers were able to produce more than the indented quantity for different forage varieties.

ALL INDIA COORDINATED RESEARCH PROJECT ON FORAGE CROPS

ZONES & COORDINATED CENTRES & TESTING LOCATIONS

Zone	Coordinated Centre				Testing Location (Cooperating Centre)		
	Sl. No.	Location	Establishment Year	State	Sl. No.	Location	State
I. Hill State = 3 Location = 1+ 3 = 4	1.	Palampur, CSK, HPKV	1970	Himachal Pradesh	1. 2. 3.	Srinagar, SKUAT (Kashmir) Rajouri, SKUAT (Jammu) Almora, VPKAS*	Jammu & Kashmir Jammu & Kashmir Uttarankand
II. North West State = 05 Location = 4 + 6 = 10	2. 3. 4. 5.	Ludhiana, PAU Hisar, CCS HAU Pantnagar, GBPUAT Bikaner, SKRAU	1989 1970 1995 1995	Punjab Haryana Uttaranchal Rajasthan	4. 5. 6. 7. 8. 9.	Karnal IARI-RRS* Avikanagar, IGFRI-RRS* Jodhpur, CAZRI-RRS* Jalore, RAU-RRS Udaipur, MPUAT Meerut, SVBPUA&T	Haryana Rajasthan Rajasthan Rajasthan Rajasthan Uttar Pradesh
III. North East State = 10	6.	Faizabad, NDUAT	1982	Uttar Pradesh	10.	Umiam (Barapani), ICAR Res. Complex for NEH Region*	Meghalaya

Location = 5+5=10	7.	Ranchi, BAU	1970	Jharkhand	11.	Gangtok, ICAR Res. Complex for NEH Region, Sikkim Centre* & Imphal, CAU	Sikkim & Manipur
	8.	Kalyani, BCKV	1972	West Bengal	12.	Basar, ICAR Res. Complex for NEH Region, Arunachal Centre*	Arunachal Pradesh
	9.	Bhubaneswar, OUAT	1987	Orissa	13.	Pusa, RAU	Bihar
	10.	Jorhat, AAU	1970	Assam			
IV : Central State = 5 Location = 4+6=10	11.	Anand, AAU	1970	Gujarat	14.	Kanpur, CSAUAT	Uttar Pradesh
	12.	Jabalpur, JNKVV	1970	Madhya Pradesh	15.	Jhansi, IGFRI*	Uttar Pradesh
	13.	Rahuri, MPKV	1971	Maharashtra	16.	Dhari& Jamnagar,JAU	Gujarat
	14.	Urulikanchan, BAIF	1982	Maharashtra	17.	Raipur,IGKV	Chhatisgarh
					18.	Akola, PRDKVV	Maharashtra
					19.	Dapoli & Palghar, KKV	Maharashtra
V : South State=4 Location= 4 + 2=6	15.	Mandya, UAS (B)	1986	Karnataka	20.	Dharwad, IGFRI-RRS*	Karnataka
	16.	Coimbatore, TNAU	1976	Tamil Nadu	21.	Raichur, UAS (D)	Karnataka
	17.	Vellayani, KAU	1971	Kerala			
	18.	Hyderabad,ANGRAU	1970	Andhra Pradesh			

SUMMARY : Zones = 5 State = 27 Coordinated Centres = 18 Testing Locations = 21 * ICAR Institute

ENTRIES CODE FOR BREEDING TRIALS (RABI 2009-10)

Contributor	Entry name	Code name	Contributor	Entry name	Code name
1. IVT Berseem			**2. IVT Oat (Single cut)**		
Hisar	HFB-30	IB-3	Jabalpur	JO-03-95	IOS-1
Hisar	HFB-6-6	IB-4	Jhansi	JHO-2009-1	IOS-3
Jabalpur	JBO-3-15	IB-1	Jhansi	JHO-2009-2	IOS-5
Jhansi	JHB-09-1	IB-6	Faizabad	NDO-603	IOS-6
Jhansi	JHB-09-2	IB-7	Faizabad	NDO-609	IOS-8
NC	Wadran	IB-2	Hisar	OS-363	IOS-4
NC	Mescavi	IB-5	Hisar	OS-374	IOS-7
ZC-HZ	BL-22	IB-8	Srinagar	SKO-148	IOS-9
ZC-CZ, NWZ	Bundel Berseem-2	IB-9	Srinagar	SKO-156	IOS-11
ZC-NEZ	Bundel Berseem -3	IB-10	Srinagar	SKO-163	IOS-12
			Pantnagar	UPO-09-2	IOS-13
7. VT Lucerne (Perennial)-2007			Pantnagar	UPO-09-1	IOS-14
NC	Anand-2	LT-07-1	NC	Kent	IOS-2
NC	RL-88	LT-07-2	NC	OS-6	IOS-10
Urulikanchan	BAIF Lucerne-1	LT-07-3	ZC-NE & NWZ	JHO-99-2	IOS-15
Anand	Anand-21	LT-07-4	ZC-CZ	JHO-822	IOS-16
Anand	Anand-22	LT-07-5	ZC-SZ	JHO-2000-4	IOS-17
			ZC-HZ	Palampur-1	IOS-18
3. AVT Oat-1 (single cut)			**4. AVT Oat-2 (Single cut)**		
Jabalpur	JO-03-291	AOS-1-3	Jabalpur	JO-03-93	AOS-2-1
Srinagar	SKO-96	AOS-1-1	NC	OS-6	AOS-2-2
Srinagar	SKO-117	AOS-1-5	Srinagar	SKO-90	AOS-2-3
Srinagar	SKO-133	AOS-1-6	Srinagar	SKO-105	AOS-2-4
NC	Kent	AOS-1-2	NC	Kent	AOS-2-5
NC	OS-6	AOS-1-4	Srinagar	SKO-109	AOS-2-6
ZC-NEZ	JHO-99-2	AOS-1-8	Faizabad	NDO-25	AOS-2-7
ZC-NWZ	OL-125	AOS-1-9	ZC (NEZ)	JHO-99-2	AOS-2-8
ZC-CZ	JHO-822	AOS-1-7	ZC (NWZ)	OL-125	AOS-2-9
ZC-SZ	JHO-2000-4	AOS-1-10	ZC (CZ)	JHO-822	AOS-2-10
ZC-HZ	Palampur -1	AOS-1-11	ZC (HZ)	Palampur-1	AOS-2-11
			ZC(SZ)	JHO 2000-4	AOS-2-12
5. AVT Oat-2 (Single cut) Seed			**6. IVT Oat (Multi cut)**		
Jabalpur	JO-03-93	OSS-1	Jabalpur	JO-03-307	IOM-2
NC	OS-6	OSS-4	Pantnagar	UPO-09-3	IOM-4
Srinagar	SKO-90	OSS-5	Ludhiana	OL-1694	IOM-6
Srinagar	SKO-105	OSS-6	Jhansi	JHO-2009-3	IOM-7
NC	Kent	OSS-3	Hisar	OS-376	IOM-8
Srinagar	SKO-109	OSS-2	NC	Kent	IOM-1
Faizabad	NDO-25	OSS-7	NC	UPO-212	IOM-3
ZC (NEZ)	JHO-99-2	ASS-2-8	NC	RO-19	IOM-5
ZC (NWZ)	OL-125	ASS-2-9	ZC-NE& NWZ	JHO-2000-4	IOM-9
ZC (CZ)	JHO-822	ASS-2-10	ZC-CZ	JHO-822	IOM-10
ZC (HZ)	Palampur-1	ASS-2-11	ZC-HZ	Palampur-1	IOM-11
ZC(SZ)	JHO-2000-4	ASS-2-12			

ENTRIES CODE FOR AGRONOMY TRIAL (RABI 2009-10)

S.No	Contributor	Entry name	Code name
1. AST- 8.1 : AVT Oat-2 (Single cut)			
1.	Srinagar	SKO-90	AOSC-5
2.	Srinagar	SKO-105	AOSC-1
3.	Srinagar	SKO-109	AOSC-2
4.	Jabalpur	JO-03-93	AOSC-7
5.	Faizabad	NDO-25	AOSC-3
6.	NC	Kent	AOSC-4
7.	NC	OS-6	AOSC-6

CHAPTER-1

FORAGE CROP IMPROVEMENT

1. IVTB : INITIAL VARIETAL TRIAL IN BERSEEM

(Table Reference : 1.1 to 1.8)

An initial varietal trial in Berseem comprising five entries along with two national checks i.e. Wardan and Mescavi and three zonal checks for respective zones i.e. BL-22, Bundel Berseem-2 and Bundel Berseem–3 was conducted at 18 centres located in four zones *viz*., Hill Zone, North-West Zone, North-East Zone and Central Zone of the country. Data reported from different centers clearly indicated that for the character green forage yield (q/ha), entries HFB-6-6 (12.9%), HFB-30 (7.9%) and JHB-09-1 (6.8%) proved their superiority over best national check in Hill zone, entry HFB-30 (4.3%) in North-West Zone, entry JHB-09-2 (2.7%) in North-East Zone and entry JBO-3-15 (2.7%) in Central zone. At national level, entry HFB-30 was at par with national check Wardan and rest of the entries didn't show their superiority for green forage yield over best national check.

Similarly for the character dry matter yield (q/ha), entries HFB-30 (9.7%), HFB-6-6 (8.8%), JBO-3-15 (5.6%) and JHB-09-1 (4.8%) exhibited their superiority in Hill Zone, entry HFB-30 (4.8%) in North-West zone and entry JBO-3-15 (3.6%) in Central zone over best national check. Coming to the superiority at national level, performance of only one entry i.e. JBO-3-15 was at par with national check.

In forage production potential (q/ha/day), none of the entries excelled their performance either for green forage or dry matter over national check. Similar was the condition for growth parameter i.e. plant height (cm) in which national check Mescavi was recorded for highest plant height (54.2 cm).

In quality parameters like crude protein yield (q/ha), entry JBO-3-15, in crude protein content (%) entry JHB-09-1 and in leaf stem ratio, entry HFB-30 proved their superiority over national check.

Table 1.1 : IVTB - Initial Varietal Trial in Berseem : Green Forage Yield (q/ha)

Cont…

Entries	Hill Zone						North-West Zone							
	Rajo-uri	Palam-pur	Srina-gar	Aver-age	Rank	Superi-ority%	Pantn-agar	Ludh-iana	His-ar	Jal-ore	Mee-rut	Aver-age	Rank	Superi-ority%
JBO-3-15	127.3	269.2	247.4	214.6	5		757.7	603.8	844.4	469.4	809.9	697.0	6	
HFB-30	146.8	283.0	276.2	235.3	2	7.9	672.2	731.5	970.3	568.5	805.8	749.7	1	4.3
HFB-6-6	140.5	341.7	256.3	246.2	1	12.9	642.2	629.7	981.4	536.2	721.3	702.2	5	
JHB-09-1	120.6	315.2	262.2	232.7	3	6.8	702.2	661.2	681.4	577.8	901.7	704.9	3	
JHB-09-2	131.5	302.5	176.9	203.6	6		706.5	631.5	818.4	595.4	766.1	703.6	4	
Wadran (NC)	129.6	328.0	196.0	217.9	4		746.5	609.3	851.8	544.9	842.1	718.9	2	
Mescavi (NC)	137.5	265.5	180.7	194.6	7		731.0	692.6	870.3	519.6	697.5	702.2	5	
BL-22 (ZC-HZ)	132.4	253.8	171.1	185.8	8									
Bundel Berseem-2 (ZC-NWZ, CZ)							742.1	620.4	818.4	532.5	711.9	685.1	7	
Bundel Berseem-3 (ZC-NEZ)														
Mean	133.3	294.9	220.9	216.3			712.6	647.5	854.6	543.0	782.0	707.9		
CD at 5%	19.7	NS	5.7				90.2	NS	73.0	66.7	4.8			
CV%	8.5	19.5	1.5				7.3	18.9	4.8	7.0	3.2			

Table 1.1 : IVTB - Initial Varietal Trial in Berseem : Green Forage Yield (q/ha)

Cont…

Entries	North-East Zone							
	Kalyani	Ranchi	Faizabad	Bhubaneswar	Pusa	Average	Rank	Superiority%
JBO-3-15	307.8	460.7	234.4	172.2	324.0	299.8	8	
HFB-30	325.9	465.3	266.3	166.7	357.0	316.2	5	
HFB-6-6	320.4	451.4	324.1	167.8	284.0	309.5	7	
JHB-09-1	314.4	495.4	312.5	163.3	336.0	324.3	3	
JHB-09-2	364.1	490.8	286.5	155.5	388.0	337.0	1	2.7
Wadran (NC)	294.8	530.1	243.1	210.5	363.0	328.3	2	
Mescavi (NC)	345.9	495.4	318.4	157.8	298.0	323.1	4	
BL-22 (ZC-HZ)								
Bundel Berseem-2 (ZC-NWZ, CZ)								
Bundel Berseem-3 (ZC-NEZ)	362.6	467.6	251.7	150.0	322.0	310.8	6	
Mean	329.5	482.1	279.6	168.0	334.0	318.6		
CD at 5%	17.6	46.5	50.3	13.9	19.8			
CV%	3.7	5.5	10.3	6.6	10.2			

Table 1.1 : IVTB – Initial Varietal Trial in Berseem : Green Forage Yield (q/ha)

Entries	Central Zone								All India		
	Jha-nsi	Rah-uri	Jabal-pur	Urulika-nchan	Kan-pur	Aver-age	Rank	Superi-ority%	Aver-age	Rank	Superi-ority%
JBO-3-15	676.2	706.0	910.4	561.2	424.1	655.6	1	2.7	494.8	3	
HFB-30	653.3	691.5	766.4	408.5	461.1	596.2	6		500.9	1	0.11
HFB-6-6	686.8	739.5	799.8	435.1	416.7	615.6	4		493.1	6	
JHB-09-1	653.3	778.3	763.8	313.6	446.3	591.1	8		488.8	7	
JHB-09-2	671.0	694.9	802.4	465.2	439.2	614.5	5		493.7	5	
Wadran (NC)	680.6	648.1	819.8	487.2	479.6	623.1	3		500.3	2	
Mescavi (NC)	684.2	720.4	849.1	435.1	501.9	638.1	2		494.5	4	
BL-22 (ZC-HZ)											
Bundel Berseem-2 (ZC-NWZ, CZ)	728.3	703.1	765.1	371.5	390.7	591.7	7				
Bundel Berseem-3 (ZC-NEZ)											
Mean	679.2	710.2	809.6	434.7	445.0	615.7			495.2		
CD at 5%	58.0	69.1	181.2	65.9	57.2						
CV%	6.2	5.6	12.7	18.0	4.6						

Table 1.2 : IVTB - Initial Varietal Trial in Berseem : Dry Matter Yield (q/ha)

Cont…

Entries	Hill Zone						North-West Zone						
	Rajo-uri	Palam-pur	Srin-agar	Aver-age	Rank	Super-iority%	Pantn-agar	Ludhi-ana	His-ar	Mee-rut	Aver-age	Rank	Super-iority%
JBO-3-15	23.0	66.6	46.9	45.5	3	5.6	113.2	81.1	118.1	144.5	114.2	2	
HFB-30	26.5	62.7	52.8	47.3	1	9.7	94.1	108.9	137.4	138.2	119.7	1	4.8
HFB-6-6	26.5	66.5	47.8	46.9	2	8.8	90.4	87.0	139.2	121.1	109.4	4	
JHB-09-1	22.3	64.4	49.0	45.2	4	4.8	95.0	92.2	98.5	148.5	108.6	6	
JHB-09-2	24.9	59.6	32.2	38.9	6		96.8	87.0	106.7	128.8	104.8	7	
Wadran (NC)	23.5	67.9	37.8	43.1	5		109.7	81.1	121.1	145.0	114.2	2	
Mescavi (NC)	26.7	52.9	34.5	38.0	7		109.2	101.1	114.8	120.0	111.3	3	
BL-22 (ZC-HZ)	24.2	48.0	32.3	34.8	8								
Bundel Berseem-2 (ZC-NWZ, CZ)							103.8	83.0	108.1	124.7	104.9	5	
Bundel Berseem-3 (ZC-NEZ)													
Mean	24.7	61.1	41.7	42.5			101.5	90.2	118.0	133.9	110.9		
CD at 5%	4.3	NS	1.5				11.9	NS	9.8	2.2			
CV%	10.0	16.8	2.0				6.8	18.3	4.7	8.7			

Table 1.2 : IVTB - Initial Varietal Trial in Berseem : Dry Matter Yield (q/ha)

Cont…

Entries	North-East Zone							
	Kalyani	Ranchi	Faizabad	Bhubaneswar	Pusa	Average	Rank	Superiority%
JBO-3-15	60.7	79.7	39.9	33.5	55.1	53.8	7	
HFB-30	59.2	82.5	55.6	33.4	57.8	57.7	3	
HFB-6-6	57.3	72.6	49.2	33.0	46.0	51.6	8	
JHB-09-1	58.7	72.0	55.0	33.7	55.4	55.0	5	
JHB-09-2	63.8	81.1	54.4	31.1	63.6	58.8	2	
Wadran (NC)	55.2	104.0	45.1	40.5	60.6	61.1	1	
Mescavi (NC)	68.4	79.5	53.2	32.2	52.2	57.1	4	
BL-22 (ZC-HZ)								
Bundel Berseem-2 (ZC-NWZ, CZ)								
Bundel Berseem-3 (ZC-NEZ)	65.1	77.2	46.9	29.8	54.7	54.7	6	
Mean	61.1	81.1	49.9	33.4	55.7	56.2		
CD at 5%	3.9	8.1	8.0	7.4	9.3			
CV%	4.5	5.7	9.1	5.9	13.1			

Table 1.2 : IVTB - Initial Varietal Trial in Berseem : Dry Matter Yield (q/ha)

Entries	Central Zone							All India		
	Jhansi	Rahuri	Jabalpur	Urulikanchan	Average	Rank	Superiority%	Average	Rank	Superiority%
JBO-3-15	90.1	121.6	129.4	85.1	106.6	1	3.6	80.5	1	0.12
HFB-30	84.5	116.6	111.7	62.0	93.7	7		80.2	3	
HFB-6-6	93.5	122.8	115.8	65.5	99.4	3		77.1	5	
JHB-09-1	84.5	117.6	111.9	46.4	90.1	8		75.3	7	
JHB-09-2	89.2	111.8	110.7	68.3	95.0	5		75.6	6	
Wadran (NC)	93.2	99.6	130.5	71.9	98.8	4		80.4	2	
Mescavi (NC)	90.9	121.6	132.7	66.5	102.9	2		78.5	4	
BL-22 (ZC-HZ)										
Bundel Berseem-2 (ZC-NWZ, CZ)	92.9	112.9	107.3	55.3	92.1	6				
Bundel Berseem-3 (ZC-NEZ)										
Mean	89.9	115.6	118.8	65.1	97.3			78.2		
CD at 5%	7.7	12.5	25.7	9.4						
CV%	6.2	6.2	12.4	17.9						

Table 1.3 : IVTB - Initial Varietal Trial in Berseem : Green Forage Yield (q/ha/day)

Entries	Ranchi	Bhubaneswar	Kalyani	Faizabad	Ludhiana	Kanpur	Pusa	Pantnagar	Average	Rank
JBO-3-15	3.22	2.87	2.52	2.00	3.37	3.86	2.63	3.92	3.05	5
HFB-30	3.25	2.78	2.67	2.28	4.09	4.19	2.95	3.48	3.21	3
HFB-6-6	3.16	2.80	2.63	2.77	3.52	3.79	2.35	3.32	3.04	6
JHB-09-1	3.46	2.72	2.58	2.67	3.69	4.06	2.78	3.63	3.20	4
JHB-09-2	3.43	2.59	2.98	2.45	3.53	3.96	3.13	3.66	3.22	2
Wadran (NC)	3.71	3.51	2.42	2.08	3.40	4.36	2.98	3.86	3.29	1
Mescavi (NC)	3.46	2.63	2.84	2.72	3.87	4.56	2.44	3.78	3.29	1
BL-22 (ZC-HZ)										
Bundel Berseem-2 (ZC-NWZ, CZ)					3.47	3.55		3.84		
Bundel Berseem-3 (ZC-NEZ)	3.27	2.50	2.97	2.15			2.62			
Mean	3.37	2.80	2.70	2.39	3.62	4.04	2.74	3.69	3.19	

Table 1.4 : IVTB - Initial Varietal Trial in Berseem : Dry Matter Yield (q/ha/day)

Entries	Ranchi	Bhubaneswar	Kalyani	Faizabad	Ludhiana	Pusa	Pantnagar	Average	Rank
JBO-3-15	0.56	0.56	0.50	0.34	0.45	0.45	0.59	0.49	6
HFB-30	0.58	0.56	0.49	0.47	0.61	0.48	0.49	0.53	2
HFB-6-6	0.51	0.55	0.47	0.42	0.49	0.38	0.47	0.47	7
JHB-09-1	0.50	0.56	0.48	0.50	0.52	0.46	0.49	0.50	5
JHB-09-2	0.57	0.52	0.52	0.46	0.49	0.51	0.50	0.51	4
Wadran (NC)	0.73	0.68	0.45	0.38	0.45	0.50	0.57	0.54	1
Mescavi (NC)	0.56	0.54	0.56	0.45	0.56	0.43	0.56	0.52	3
BL-22 (ZC-HZ)									
Bundel Berseem-2 (ZC-NWZ, CZ)					0.46		0.54		
Bundel Berseem-3 (ZC-NEZ)	0.54	0.50	0.53	0.40		0.44			
Mean	0.57	0.56	0.50	0.43	0.50	0.46	0.53	0.51	

Table 1.5 : IVTB - Initial Varietal Trial in Berseem : Plant Height (cm)

Entries	Palam-pur	Rah-uri	Ran-chi	His-ar	Kaly-ani	Urulika-nchan	Jha-nsi	Ludh-iana	Kan-pur	Jabal-pur	Pantn-agar	Srina-gar	Aver-age	Rank
JBO-3-15	59.5	64.0	49.6	50.4	62.9	70.8	52.0	58.7	41.9	52.7	36.5	50.5	54.1	2
HFB-30	50.8	59.0	49.1	52.6	58.0	63.6	54.9	58.7	40.7	34.9	30.4	81.4	52.8	6
HFB-6-6	58.9	58.0	48.1	54.4	61.0	66.2	59.9	53.0	38.7	40.6	36.5	72.0	53.9	3
JHB-09-1	56.4	63.0	50.4	47.8	58.5	65.3	59.1	53.7	39.2	40.8	33.4	74.4	53.5	4
JHB-09-2	52.4	60.0	52.6	51.1	60.0	63.1	57.9	50.0	41.0	42.7	37.9	51.7	51.7	7
Wadran (NC)	57.2	62.0	51.2	48.6	59.8	63.4	49.4	55.0	42.7	43.4	34.7	72.5	53.3	5
Mescavi (NC)	58.5	60.0	50.2	53.0	65.8	65.6	63.6	54.0	43.4	46.6	34.2	55.2	54.2	1
BL-22 (ZC-HZ)	53.1											57.3		
Bundel Berseem-2 (ZC-NWZ, CZ)		61.0		49.1		60.3	48.9	57.3	41.8	42.8	39.3			
Bundel Berseem-3 (ZC-NEZ)			45.7		61.1									
Mean	55.9	60.9	49.6	50.9	60.9	64.8	55.7	55.1	41.2	43.1	35.4	64.4	53.4	

Table 1.6 : IVTB - Initial Varietal Trial in Berseem : Crude Protein Yield (q/ha)

Entries	Palampur	Rahuri	Ranchi	Bhubaneswar	Urulikanchan	Faizabad	Ludhiana	Jabalpur	Average	Rank
JBO-3-15	14.3	23.4	13.6	7.6	12.7	6.5	15.8	18.5	14.1	1
HFB-30	13.2	19.4	14.1	7.4	9.5	9.6	18.9	15.4	13.4	3
HFB-6-6	14.5	20.4	12.4	7.5	9.6	8.8	15.7	15.4	13.0	6
JHB-09-1	15.0	20.6	13.6	7.5	7.2	9.5	17.0	15.6	13.3	4
JHB-09-2	12.2	20.1	14.2	7.2	10.6	8.8	16.2	15.7	13.1	5
Wadran (NC)	15.8	18.3	18.2	8.7	10.8	7.6	15.2	17.7	14.0	2
Mescavi (NC)	12.2	20.8	14.3	7.5	10.0	9.5	19.0	18.6	14.0	2
BL-22 (ZC-HZ)	9.8									
Bundel Berseem-2 (ZC-NWZ, CZ)		18.3			8.9		14.1	15.0		
Bundel Berseem-3 (ZC-NEZ)			13.5	6.9		7.7				
Mean	13.4	20.2	14.2	7.5	9.9	8.5	16.5	16.5	13.6	

Table 1.7 : IVTB - Initial Varietal Trial in Berseem : Crude Protein Content (CP%)

Entries	Palampur	Rahuri	Ranchi	Bhubaneswar	Urulikanchan	Faizabad	Average	Rank
JBO-3-15	21.9	19.3	17.1	22.7	14.9	16.4	18.7	4
HFB-30	21.4	16.6	17.1	22.2	15.2	17.3	18.3	7
HFB-6-6	22.5	16.6	17.1	22.8	14.7	17.8	18.6	5
JHB-09-1	23.8	17.5	18.8	22.3	15.7	17.3	19.2	1
JHB-09-2	20.6	17.9	17.5	23.1	15.5	16.3	18.5	6
Wadran (NC)	23.8	18.4	17.5	21.6	14.9	16.9	18.9	3
Mescavi (NC)	23.4	17.1	17.9	23.4	15.1	17.8	19.1	2
BL-22 (ZC-HZ)	20.6							
Bundel Berseem-2 (ZC-NWZ, CZ)		16.2			16.1			
Bundel Berseem-3 (ZC-NEZ)			17.5	23.0		16.5		
Mean	22.3	17.5	17.6	22.6	15.3	17.0	18.8	

Table 1.8 : IVTB - Initial Varietal Trial in Berseem : Leaf Stem Ratio

Entries	Rah-uri	Ran-chi	Kaly-ani	Urulika-nchan	Faiza-bad	Ludhi-ana	Kan-pur	Jabal-pur	Palam-pur	Pusa	Pant-nagar	Aver-age	Rank
JBO-3-15	0.53	0.61	1.55	0.78	0.66	1.22	0.36	0.84	0.45	0.90	0.68	0.78	5
HFB-30	0.66	0.75	1.62	0.77	0.69	1.86	0.36	0.62	0.54	0.93	0.72	0.87	1
HFB-6-6	0.81	0.62	1.33	0.82	0.74	1.22	0.29	0.71	0.47	0.89	0.71	0.78	5
JHB-09-1	0.66	0.34	1.57	0.79	0.74	1.86	0.36	0.72	0.52	0.89	0.57	0.82	3
JHB-09-2	0.53	0.73	1.44	0.86	0.68	1.50	0.33	0.74	0.50	0.96	0.62	0.81	4
Wadran (NC)	0.66	0.54	1.34	0.83	0.63	1.86	0.37	0.76	0.51	0.92	0.58	0.82	3
Mescavi (NC)	0.81	0.84	1.45	0.80	0.73	1.50	0.36	0.83	0.49	0.88	0.73	0.86	2
BL-22 (ZC-HZ)									0.49				
Bundel Berseem-2 (ZC-NWZ, CZ)	0.81			0.88		1.50	0.32	0.68			0.64		
Bundel Berseem-3 (ZC-NEZ)		0.88	1.31		0.65					0.88			
Mean	0.68	0.66	1.45	0.82	0.69	1.57	0.34	0.74	0.50	0.91	0.66	0.82	

2. IVTO (SC) : INITIAL VARIETAL TRIAL IN OAT (SINGLE CUT)

(Table Reference : 2.1 to 2.9)

An initial varietal trial in Oat (single cut) comprising twelve testing entries along with two national checks i.e. Kent and OS-6 and four zonal checks for respective zones i.e. Palampur-1, JHO-99-2, JHO-822 and JHO-2000-4 was conducted at 24 locations distributed over five zones in the country. Results of the trial revealed that for the character green forage yield (q/ha), entries OS-363 (6.8%) and JHO-2009-1 (4.9%) in Hill zone, entries OS-363 (14.0%), UPO-09-2 (12.8%), NDO-609 (8.4%) and JO-03-95 (5.8%) in Central zone and entries UPO-09-1 (7.7%) and OS-374 (5.5%) in South zone registered their superiority over respective best check whereas at national level entries UPO-09-2 (7.2%), UPO-09-1 (3.5%) and OS-374 (3.4%) exhibited their superiority for green forage yield over best national check.

Similarly for dry matter yield (q/ha), entries JHO-2009-2 (13.5%), SKO-156 (12.9%), JHO-2009-1 (11.9%), OS-363 (9.9%), SKO-148 (9.7%) and SKO-163 (7.8%) in Hill Zone, entries OS-374 (3.4%), UPO-09-1 (1.8%), NDO-609 (1.2%) in North-West zone, entries UPO-09-1 (4.1%), UPO-09-2 (3.0%), OS-363 (2.6%) and JHO-2009-2 (1.7%) in North- East zone, entries SKO-156 (16.7%), OS-363 (16.6%), JO-03-95 (13.3%), JHO-2009-2 (13.1%), UPO-09-2 (10.5%) UPO-09-1 (10.4%), JHO-2009-1 (9.0%) and NDO-609-2 (8.0%) in Central zone and entries UPO-09-2 (22.1%) and UPO-09-1 (11.1%) and OS-374 (4.1%) in South zone proved their superiority over respective best national or zonal check in each zone. Coming to the national level, entries UPO-09-1 (12.1%), UPO-09-2 (11.0%), JHO-2009-2 (10.1%), SKO-156 (5.4%) and NDO-609 (4.9%) recorded their superiority over best national check.

In green forage production potential (q/ha/day), entries UPO-09-2 and NDO-609 maintained their superiority over national check Kent whereas entries UPO-09-2, UPO-09-1, NDO-609, OS-374, JHO-2009-2 and OS-363 registered their superiority for dry matter production potential (q/ha/day) over national check Kent. For evaluation against growth parameters i.e. plant height (cm), entries JHO-2009-2, UPO-09-2 and UPO-09-1 recorded their superiority over national check.

In quality parameters, entries UPO-09-1, UPO-09-2, OS-374, SKO-163, JHO-2009-1 and JHO-2009-2 for crude protein yield (q/ha), entries OS-374, SKO-148, UPO-09-2, UPO-09-1, SKO-163 and OS-363 for crude protein content (%) were recorded superior with respect to check. For other quality parameters like leaf stem ratio, entries SKO-148 and SKO-156 and for character IVDMD (%), entries UPO-09-2 and JO-03-95 maintained their superiority over best check.

Table 2.1 : IVTO (SC) - Initial Varietal Trial in Oat (Single cut) : Green Forage Yield (q/ha)

Cont…

Entries	Hill Zone					North-West Zone								
	Palam-pur	Srina-gar	Aver-age	Rank	Superi-ority%	Bika-ner	Jal-ore	His-ar	Ludhi-ana	Pantn-agar	Mee-rut	Aver-age	Rank	Superi ority%
JO-03-95	261.6	418.9	340.2	12		130.6	401.3	936.9	373.3	588.1	501.7	488.6	11	
JHO-2009-1	303.5	493.0	398.2	2	4.9	197.6	374.7	988.8	462.2	572.2	466.7	510.4	8	
OS-363	290.1	520.9	405.5	1	6.8	217.1	312.3	914.7	391.1	497.3	460.3	465.5	14	
JHO-2009-2	270.4	418.8	344.6	9		162.1	388.3	777.7	395.6	602.2	515.1	473.5	13	
NDO-603	301.3	458.2	379.8	4		184.7	349.6	825.8	375.6	558.1	477.8	461.9	15	
OS-374	259.0	462.3	360.7	8		209.1	547.0	970.2	386.7	563.9	558.1	539.2	1	0.52
NDO-609	311.7	421.3	366.5	6		143.6	377.7	914.7	480.0	527.2	569.2	502.1	9	
SKO-148	203.1	524.7	363.9	7		144.9	405.0	899.9	482.2	560.6	496.7	498.2	10	
SKO-156	222.2	540.7	381.4	3	0.5	171.2	462.1	944.3	497.8	583.1	530.7	531.5	3	
SKO-163	146.0	539.9	342.9	10		92.4	509.1	1007.3	486.7	572.2	505.9	528.9	4	
UPO-09-2	284.4	387.1	335.8	13		183.6	465.0	1007.3	384.4	603.9	499.8	524.0	6	
UPO-09-1	234.9	428.3	331.6	14		162.3	506.3	940.6	460.0	541.4	553.3	527.3	5	
Kent (NC)	298.4	460.7	379.6	5		129.2	405.0	1014.7	431.1	585.5	498.1	510.6	7	
OS-6 (NC)	233.6	340.7	287.2	15		131.0	341.0	918.4	400.0	572.2	509.6	478.7	12	
Palampur-1 (ZC-HZ)	262.8	421.8	342.3	11										
JHO-99-2 (ZC-NWZ, NEZ)						161.3	429.7	1062.9	455.6	580.6	528.1	536.4	2	
JHO-822 (ZC-CZ)														
JHO-2000-4 (ZC-SZ)														
Mean	258.9	455.8	357.3			161.4	418.3	941.6	430.8	567.2	511.4	505.1		
CD at 5%	51.5	37.7				40.7	31.3	43.7	6.1	54.3	32.2			
CV%	11.9	4.9				15.3	4.5	2.8	11.3	5.8	3.8			

Table 2.1 : IVTO (SC) - Initial Varietal Trial in Oat (Single cut) : Green Forage Yield (q/ha)

Cont…

Entries	North-East Zone									
	Jorhat	Kalyani	Bhubaneswar	Ranchi	Imphal	Faizabad	Pusa	Average	Rank	Superiority%
JO-03-95	297.9	277.8	307.4	502.1	326.1	159.9	401.0	324.6	14	
JHO-2009-1	364.6	417.0	244.4	573.2	252.1	198.9	419.0	352.7	9	
OS-363	372.4	416.3	296.3	488.8	336.6	505.6	379.0	399.3	3	
JHO-2009-2	329.3	315.5	333.3	577.6	347.6	506.7	443.0	407.6	1	0.54
NDO-603	304.8	440.3	244.4	542.1	293.3	250.1	384.0	351.3	10	
OS-374	321.4	369.2	355.5	546.5	267.3	277.3	361.0	356.9	8	
NDO-609	360.7	377.7	292.6	568.8	325.5	471.5	372.0	395.5	5	
SKO-148	313.5	178.1	292.6	391.0	252.6	166.9	351.0	278.0	15	
SKO-156	383.7	369.6	266.6	457.7	277.0	200.5	359.0	330.6	12	
SKO-163	266.5	354.0	344.4	497.7	285.9	207.5	319.0	325.0	13	
UPO-09-2	325.4	434.0	351.8	573.2	254.6	424.0	431.0	399.1	4	
UPO-09-1	372.3	363.7	322.2	551.0	264.8	494.4	365.0	390.5	6	
Kent (NC)	356.5	380.3	296.3	555.4	288.1	363.2	394.0	376.3	7	
OS-6 (NC)	319.6	315.5	366.6	546.5	266.1	233.6	347.0	342.1	11	
Palampur-1 (ZC-HZ)										
JHO-99-2 (ZC-NWZ, NEZ)	380.2	350.0	274.1	586.5	324.9	462.9	459.0	405.4	2	
JHO-822 (ZC-CZ)										
JHO-2000-4 (ZC-SZ)										
Mean	337.9	357.3	305.9	530.5	290.8	328.2	385.6	362.3		
CD at 5%	5.8	21.5	29.9	68.5	35.4	78.3	41.9			
CV%	4.9	4.3	4.9	7.7	7.3	14.3	12.6			

Table 2.1 : IVTO (SC) - Initial Varietal Trial in Oat (Single cut) : Green Forage Yield (q/ha)

Cont…

Entries	Central Zone								
	Jhansi	Rahuri	Urulikanchan	Kanpur	Anand	Jabalpur	Average	Rank	Superiority%
JO-03-95	507.4	445.6	383.9	681.1	693.0	590.5	550.2	4	5.8
JHO-2009-1	559.3	379.0	357.3	663.3	696.0	523.8	529.8	8	1.9
OS-363	544.4	436.9	565.3	647.8	841.0	523.8	593.2	1	14.0
JHO-2009-2	485.2	335.6	362.6	774.4	637.0	465.2	510.0	13	
NDO-603	496.3	399.3	352.0	592.2	504.0	386.5	455.0	15	
OS-374	511.1	413.8	544.0	541.1	704.0	493.2	534.5	7	2.8
NDO-609	685.2	457.2	421.3	618.9	685.0	514.5	563.7	3	8.4
SKO-148	333.3	335.6	480.0	581.1	674.0	421.2	470.9	14	
SKO-156	437.0	451.4	608.0	614.4	693.0	491.8	549.3	5	5.6
SKO-163	477.8	515.0	586.6	658.9	619.0	363.9	536.9	6	3.2
UPO-09-2	511.1	538.2	506.6	692.2	785.0	487.8	586.8	2	12.8
UPO-09-1	500.0	341.4	432.0	625.6	707.0	477.2	513.9	10	
Kent (NC)	548.1	410.9	432.0	555.6	646.0	478.5	511.8	12	
OS-6 (NC)	618.5	387.7	416.0	503.3	652.0	502.5	513.3	11	
Palampur-1 (ZC-HZ)									
JHO-99-2 (ZC-NWZ, NEZ)									
JHO-822 (ZC-CZ)	574.1	387.7	458.6	607.8	633.0	459.3	520.1	9	
JHO-2000-4 (ZC-SZ)									
Mean	519.3	415.7	460.4	623.8	677.9	478.6			
CD at 5%	60.4	83.8	23.1	112.2	76.7	113.6			
CV%	6.9	12.1	18.2	8.1	6.8	14.2			

Table 2.1 : IVTO (SC) - Initial Varietal Trial in Oat (Single cut) : Green Forage Yield (q/ha)

Entries	South Zone						All India		
	Hyderabad	Mandya	Coimbatore	Average	Rank	Superiority%	Average	Rank	Superiority%
JO-03-95	593.9	224.5	381.5	400.0	6		432.7	10	
JHO-2009-1	294.2	234.2	485.2	337.9	12		438.3	9	
OS-363	244.2	250.6	355.6	283.5	14		450.3	5	1.2
JHO-2009-2	305.3	265.4	559.3	376.7	10		440.6	8	
NDO-603	566.1	201.4	511.1	426.2	5		416.6	13	
OS-374	588.3	216.6	574.1	459.7	2	5.5	460.0	3	3.4
NDO-609	532.8	234.2	296.3	354.4	13		456.6	4	2.6
SKO-148	194.3	283.9	351.9	276.7	15		388.3	14	
SKO-156	432.9	253.2	507.4	397.8	7		448.1	6	0.74
SKO-163	455.1	248.6	381.5	361.7	11		435.0	11	
UPO-09-2	693.8	215.2	403.7	437.6	3	0.4	476.8	1	7.2
UPO-09-1	693.8	232.9	481.5	469.4	1	7.7	460.5	2	3.5
Kent (NC)	571.7	223.4	351.9	382.3	9		444.8	7	
OS-6 (NC)	543.9	202.9	425.9	390.9	8		420.6	12	
Palampur-1 (ZC-HZ)									
JHO-99-2 (ZC-NWZ, NEZ)									
JHO-822 (ZC-CZ)									
JHO-2000-4 (ZC-SZ)	704.9	161.4	440.7	435.7	4				
Mean	494.3	229.9	433.8	386.0			440.7		
CD at 5%	128.6	32.3	61.9						
CV%	15.2	8.4	8.5						

Table 2.2 : IVTO (SC) - Initial Varietal Trial in Oat (Single cut) : Dry Matter Yield (q/ha)

Cont…

Entries	Hill Zone					North West Zone							
	Palam-pur	Srina-gar	Aver-age	Rank	Superi-ority%	Bika-ner	His-ar	Ludhi-ana	Pantn-agar	Mee-rut	Aver-age	Rank	Superi-ority%
JO-03-95	56.0	102.7	79.4	13		43.4	168.7	61.6	81.6	195.4	110.1	12	
JHO-2009-1	66.4	122.0	94.2	3	11.9	61.2	177.9	87.8	99.8	156.2	116.6	7	
OS-363	51.3	133.7	92.5	4	9.9	65.6	109.8	66.5	86.0	169.6	99.5	15	
JHO-2009-2	57.9	133.2	95.6	1	13.5	37.5	139.9	69.2	111.4	211.8	114.0	10	
NDO-603	57.9	107.9	82.9	8		41.9	165.2	61.9	92.1	168.1	105.8	14	
OS-374	52.6	112.0	82.3	9		42.9	203.8	65.7	100.9	219.8	126.6	1	3.4
NDO-609	57.1	103.3	80.2	12		34.8	155.5	93.6	88.5	246.9	123.9	3	1.2
SKO-148	44.6	140.1	92.4	5	9.7	36.4	170.9	96.4	109.8	159.6	114.6	9	
SKO-156	48.2	142.0	95.1	2	12.9	45.0	122.8	99.6	113.0	153.6	106.8	13	
SKO-163	41.1	140.4	90.8	6	7.8	22.7	161.1	97.3	96.1	180.1	111.5	11	
UPO-09-2	62.9	101.2	82.0	10		39.7	201.5	65.3	97.5	172.7	115.3	8	
UPO-09-1	52.4	109.7	81.1	11		52.1	206.9	87.4	101.3	175.1	124.6	2	1.8
Kent (NC)	57.1	111.4	84.2	7		30.8	202.9	77.6	97.5	203.4	122.4	4	
OS-6 (NC)	52.0	102.1	77.0	14		34.2	165.3	69.9	108.9	216.9	119.0	5	
Palampur-1 (ZC-HZ)	65.4	103.1	84.2	7									
JHO-99-2 (ZC-NWZ, NEZ)						41.1	191.3	84.3	91.9	182.6	118.2	6	
JHO-822 (ZC-CZ)													
JHO-2000-4 (ZC-SZ)													
Mean	54.9	117.7	86.3			42.0	169.6	78.9	98.4	187.5	115.3		
CD at 5%	12.7	3.5				13.1	7.8	1.2	17.6	54.4			
CV%	13.8	1.8				18.9	2.8	11.7	10.8	17.0			

Table 2.2 : IVTO (SC) - Initial Varietal Trial in Oat (Single cut) : Dry Matter Yield (q/ha)

Cont…

Entries	North-East Zone									
	Jorhat	Kalyani	Bhubaneswar	Ranchi	Imphal	Faizabad	Pusa	Average	Rank	Superiority%
JO-03-95	56.2	56.5	61.7	103.4	51.4	44.8	68.5	63.2	14	
JHO-2009-1	71.4	72.8	48.7	155.6	32.5	53.9	75.0	72.8	9	
OS-363	74.0	86.6	58.9	119.0	68.5	118.9	64.1	84.3	3	2.6
JHO-2009-2	68.8	68.1	66.7	105.0	61.1	131.7	83.7	83.6	4	1.7
NDO-603	60.1	73.8	48.9	120.1	52.7	70.9	67.2	70.5	12	
OS-374	62.3	75.2	71.7	109.4	48.7	86.1	64.9	74.0	8	
NDO-609	64.9	56.0	58.9	117.7	59.7	116.8	66.9	77.3	6	
SKO-148	63.0	40.9	58.6	84.7	41.3	42.7	63.2	56.3	15	
SKO-156	76.7	73.9	54.5	138.9	47.0	51.2	64.8	72.4	10	
SKO-163	51.0	74.5	69.2	155.0	52.0	48.5	72.3	74.6	7	
UPO-09-2	63.8	78.4	70.4	151.6	52.2	105.6	71.1	84.7	2	3.0
UPO-09-1	68.7	70.6	65.4	146.9	53.8	127.5	66.0	85.6	1	4.1
Kent (NC)	71.1	65.5	59.3	105.7	47.1	80.8	67.2	70.9	11	
OS-6 (NC)	58.5	58.5	73.8	115.3	50.4	52.3	58.6	66.8	13	
Palampur-1 (ZC-HZ)										
JHO-99-2 (ZC-NWZ, NEZ)	72.4	66.1	55.2	112.4	72.9	114.9	81.7	82.2	5	
JHO-822 (ZC-CZ)										
JHO-2000-4 (ZC-SZ)										
Mean	65.5	67.8	61.5	122.7	52.7	83.1	69.0	74.6		
CD at 5%	5.3	5.6	8.9	18.8	8.6	19.6	11.8			
CV%	10.2	6.0	4.3	9.2	9.8	14.1	8.9			

Table 2.2 : IVTO (SC) - Initial Varietal Trial in Oat (Single cut) : Dry Matter Yield (q/ha)

Cont…

Entries	Central Zone								
	Jhansi	Rahuri	Urulikanchan	Kanpur	Anand	Jabalpur	Average	Rank	Superiority%
JO-03-95	92.0	60.6	79.7	231.1	145.2	138.6	124.5	3	13.3
JHO-2009-1	91.8	60.3	71.5	224.8	147.6	122.6	119.8	7	9.0
OS-363	90.6	67.9	121.1	219.9	147.1	122.6	128.2	2	16.6
JHO-2009-2	98.0	50.6	78.6	262.2	148.4	107.9	124.3	4	13.1
NDO-603	87.7	58.6	68.7	200.7	70.5	87.9	95.7	15	
OS-374	79.2	59.3	105.0	182.2	101.4	113.3	106.7	12	
NDO-609	131.5	68.1	77.3	208.2	105.5	121.3	118.7	8	8.0
SKO-148	80.0	57.1	104.8	196.3	110.5	95.9	107.4	11	
SKO-156	106.3	83.8	121.7	208.9	135.7	113.3	128.3	1	16.7
SKO-163	94.3	92.3	114.0	204.4	113.2	81.3	116.6	9	6.0
UPO-09-2	88.8	81.9	102.9	234.1	107.6	113.3	121.4	5	10.5
UPO-09-1	97.5	59.1	83.8	211.5	162.7	113.3	121.3	6	10.4
Kent (NC)	88.1	60.1	81.7	188.9	76.9	111.9	101.3	14	
OS-6 (NC)	98.8	60.5	84.6	170.4	92.6	117.3	104.0	13	
Palampur-1 (ZC-HZ)									
JHO-99-2 (ZC-NWZ, NEZ)									
JHO-822 (ZC-CZ)	100.2	57.5	89.3	206.7	97.8	107.9	109.9	10	
JHO-2000-4 (ZC-SZ)									
Mean	95.0	65.2	92.3	210.0	117.5	111.2	115.2		
CD at 5%	13.6	13.2	9.3	39.4	14.0	27.9			
CV%	8.6	12.4	19.4	4.9	7.1	15.1			

Table 2.2 : IVTO (SC) - Initial Varietal Trial in Oat (Single cut) : Dry Matter Yield (q/ha)

Entries	South Zone						All India		
	Hyderabad	Mandya	Coimbatore	Average	Rank	Superiority%	Average	Rank	Superiority%
JO-03-95	90.6	71.5	61.5	74.5	10		92.3	10	
JHO-2009-1	56.0	65.7	84.8	68.8	12		95.9	7	3.8
OS-363	55.9	53.3	55.5	54.9	15		95.9	7	3.8
JHO-2009-2	81.4	65.1	99.9	82.1	4	1.12	101.7	3	10.1
NDO-603	83.9	64.7	91.1	79.9	8		87.1	12	
OS-374	81.0	67.4	104.7	84.4	3	4.1	96.1	6	4.0
NDO-609	93.9	58.8	45.5	66.1	13		97.0	5	4.9
SKO-148	57.3	57.3	56.1	56.9	14		85.5	13	
SKO-156	99.2	49.9	89.8	79.6	9		97.4	4	5.4
SKO-163	102.3	80.0	61.2	81.2	5	0.12	95.8	8	3.7
UPO-09-2	111.2	116.5	69.4	99.0	1	22.1	102.6	2	11.0
UPO-09-1	107.2	78.6	84.4	90.1	2	11.1	103.6	1	12.1
Kent (NC)	84.7	100.3	56.1	80.4	7		92.4	9	
OS-6 (NC)	98.2	42.0	69.2	69.8	11		89.1	11	
Palampur-1 (ZC-HL)									
JHO-99-2 (ZC-NWZ, NEZ)									
JHO-822 (ZC-CT)									
JHO-2000-4 (ZC-SZ)	114.8	54.8	73.8	81.1	6				
Mean	87.8	68.4	73.5	76.6			95.2		
CD at 5%	18.9	15.3	11.3						
CV%	12.9	13.4	9.3						

Table 2.3 : IVTO (SC) - Initial Varietal Trial in Oat (Single cut) : Green Forage Yield (q/ha/day)

Cont…

Entries	Palampur	Ranchi	Jabalpur	Hyderabad	Hisar	Anand	Kanpur	Bikaner	Ludhiana	Faizabad	Bhubaneswar
JO-03-95	2.13	5.58	5.70	7.01	7.40	6.80	7.48	1.30	3.30	1.46	4.63
JHO-2009-1	2.46	5.97	5.00	3.30	7.80	6.80	7.06	1.80	3.60	1.95	3.74
OS-363	2.35	5.37	5.00	2.52	7.70	7.90	7.20	2.10	3.50	4.91	4.49
JHO-2009-2	2.19	6.72	4.50	3.28	6.20	6.80	8.51	1.60	3.50	4.97	4.74
NDO-603	2.55	6.61	3.90	7.48	7.10	4.90	7.22	1.80	3.40	2.55	3.76
OS-374	2.09	6.36	4.90	6.63	8.20	8.90	6.37	2.10	3.50	2.75	4.96
NDO-609	2.65	6.77	5.20	6.62	7.80	8.30	7.20	1.40	4.30	4.76	4.41
SKO-148	1.31	3.23	3.20	1.59	6.90	8.30	6.12	1.30	3.60	1.37	4.37
SKO-156	1.59	4.32	3.70	3.67	7.20	8.60	6.54	1.60	3.70	1.70	3.92
SKO-163	1.04	4.74	2.70	3.92	7.70	5.60	7.01	0.90	3.70	1.77	4.85
UPO-09-2	2.31	6.44	5.00	7.69	8.80	7.10	8.34	1.80	3.40	4.24	4.91
UPO-09-1	1.77	5.80	4.90	8.37	7.50	8.00	6.95	1.50	3.60	4.80	4.56
Kent (NC)	2.52	6.61	4.90	7.72	9.20	7.80	6.94	1.30	3.90	3.60	4.42
OS-6 (NC)	1.97	6.43	5.10	7.26	7.70	5.90	6.37	1.30	3.60	2.03	5.05
Palampur-1 (ZC-HZ)	1.99										
JHO-99-2 (ZC-NWZ, NEZ)		6.74			8.40			1.60	3.60	4.54	4.17
JHO-822 (ZC-CZ)			4.60			7.60	7.60				
JHO-2000-4 (ZC-SZ)				8.19							
Mean	2.06	5.85	4.55	5.68	7.71	7.29	7.13	1.56	3.61	3.16	4.47

Table 2.3 : IVTO (SC) - Initial Varietal Trial in Oat (Single cut) : Green Forage Yield (q/ha/day)

Entries	Kalyani	Rahuri	Jorhat	Coimbatore	Mandya	Imphal	Urulikanchan	Pusa	Jhansi	Pantnagar	Average	Rank
JO-03-95	2.81	4.28	2.92	6.36	2.69	3.14	4.13	3.89	5.29	5.44	4.46	10
JHO-2009-1	4.21	3.64	3.57	7.58	2.93	2.27	3.93	4.10	5.13	4.77	4.36	11
OS-363	4.21	4.20	3.96	5.73	3.76	3.17	6.21	3.72	5.73	4.62	4.68	5
JHO-2009-2	3.19	3.20	3.40	8.60	3.10	3.34	4.12	4.34	4.44	5.19	4.57	8
NDO-603	4.45	4.70	3.33	7.74	2.84	3.09	4.51	3.80	5.68	5.17	4.60	7
OS-374	3.73	4.65	3.41	8.32	2.69	2.53	6.63	3.65	5.52	5.23	4.91	4
NDO-609	3.82	5.44	4.24	4.23	3.07	3.43	5.33	3.61	7.82	4.88	5.01	2
SKO-148	1.80	3.00	2.46	4.89	2.59	2.18	4.71	3.48	2.62	4.92	3.52	9
SKO-156	3.73	3.83	3.48	7.81	2.26	2.33	6.08	3.52	3.71	5.39	4.22	12
SKO-163	3.58	4.48	2.42	5.96	3.19	2.40	6.11	3.80	4.22	5.35	4.07	13
UPO-09-2	4.38	5.66	3.46	5.85	2.73	2.61	6.18	4.27	5.40	5.64	5.06	1
UPO-09-1	3.67	3.28	2.95	7.64	3.16	2.38	4.97	3.54	4.63	4.37	4.68	5
Kent (NC)	3.84	4.78	3.96	5.33	2.89	3.00	5.54	3.90	6.14	5.42	4.94	3
OS-6 (NC)	3.19	4.67	3.76	6.26	3.16	2.80	5.40	3.40	6.95	5.34	4.65	6
Palampur-1 (ZC-HZ)												
JHO-99-2 (ZC-NWZ, NEZ)	3.54		4.22			3.12		4.50		5.34		
JHO-822 (ZC-CZ)		4.62					5.73		6.40			
JHO-2000-4 (ZC-SZ)				7.11	2.51							
Mean	3.61	4.30	3.44	6.63	2.90	2.79	5.31	3.83	5.31	5.14	4.55	

Table 2.4 : IVTO (SC) - Initial Varietal Trial in Oat (Single cut) : Dry Matter Yield (q/ha/day)

Cont…

Entries	Ranchi	Jabalpur	Hyderabad	Hisar	Anand	Kanpur	Bikaner	Ludhiana	Faizabad	Bhubaneswar
JO-03-95	1.15	1.33	1.05	1.33	1.42	2.54	0.43	0.55	0.41	0.93
JHO-2009-1	1.62	1.17	0.64	1.40	1.45	2.39	0.56	0.69	0.53	0.75
OS-363	1.31	1.18	0.56	0.92	1.67	2.44	0.64	0.59	1.29	0.89
JHO-2009-2	1.22	1.03	0.80	1.12	1.59	2.88	0.37	0.62	1.23	0.95
NDO-603	1.46	0.84	1.14	1.42	0.69	2.45	0.41	0.55	0.72	0.75
OS-374	1.27	1.14	0.93	1.73	1.28	2.14	0.42	0.59	0.85	1.00
NDO-609	1.40	1.22	1.21	1.33	1.27	2.42	0.34	0.84	1.18	0.89
SKO-148	0.70	0.72	0.46	0.83	1.36	1.04	0.33	0.73	0.35	0.87
SKO-156	1.31	0.85	0.88	0.93	1.68	2.22	0.41	0.75	0.43	0.80
SKO-163	1.48	0.60	0.88	1.23	1.02	2.17	0.21	0.73	0.41	0.97
UPO-09-2	1.70	1.16	1.26	1.77	0.97	2.82	0.39	0.58	1.05	0.98
UPO-09-1	1.55	1.14	1.35	1.64	1.84	2.35	0.48	0.69	1.24	0.93
Kent (NC)	1.26	1.13	1.14	1.83	0.92	2.36	0.30	0.69	0.80	0.88
OS-6 (NC)	1.36	1.18	1.27	1.39	0.84	2.16	0.34	0.62	0.45	1.02
Palampur-1 (ZC-HZ)										
JHO-99-2 (ZC-NWZ, NEZ)	1.29			1.51			0.40	0.66	1.13	0.84
JHO-822 (ZC-CZ)		1.08			1.11	2.58				
JHO-2000-4 (ZC-SZ)			1.42							
Mean	1.34	1.05	1.00	1.36	1.27	2.33	0.40	0.66	0.80	0.90

Table 2.4 : IVTO (SC) - Initial Varietal Trial in Oat (Single cut) : Dry Matter Yield (q/ha/day)

Entries	Kalyani	Jorhat	Rahuri	Coimbatore	Urulikanchan	Pusa	Jhansi	Pantnagar	Average	Rank
JO-03-95	0.57	0.55	0.58	1.02	0.86	0.67	0.96	0.76	0.95	1
JHO-2009-1	0.74	0.69	0.58	1.32	0.79	0.74	0.84	0.83	0.99	7
OS-363	0.87	0.78	0.65	0.90	1.33	0.63	0.95	0.80	1.02	5
JHO-2009-2	0.69	0.71	0.48	1.54	0.89	0.82	0.90	0.96	1.04	4
NDO-603	0.80	0.66	0.69	1.38	0.88	0.67	1.00	0.85	0.96	10
OS-374	0.76	0.66	0.67	1.52	1.28	0.66	0.85	0.94	1.04	4
NDO-609	0.61	0.76	0.81	0.65	0.98	0.65	1.50	0.82	1.05	3
SKO-148	0.36	0.49	0.51	0.78	1.03	0.63	0.63	0.96	0.71	12
SKO-156	0.75	0.69	0.71	1.38	1.22	0.64	0.90	1.04	0.98	8
SKO-163	0.70	0.46	0.80	0.96	1.19	0.70	0.83	0.89	0.90	11
UPO-09-2	0.79	0.67	0.86	1.01	1.26	0.70	0.94	0.91	1.10	1
UPO-09-1	0.71	0.54	0.57	1.34	0.96	0.64	0.90	0.82	1.09	2
Kent (NC)	0.71	0.78	0.70	0.85	1.05	0.67	0.99	0.90	1.00	6
OS-6 (NC)	0.64	0.68	0.73	1.02	1.10	0.57	1.11	1.02	0.97	9
Palampur-1 (ZC-HZ)										
JHO-99-2 (ZC-NWZ, NEZ)	0.67	0.80				0.80		0.85		
JHO-822 (ZC-CZ)			0.68		1.12		1.12			
JHO-2000-4 (ZC-SZ)				1.19						
Mean	0.69	0.66	0.67	1.12	1.06	0.68	0.96	0.89	0.99	

Table 2.5 : IVTO (SC) - Initial Varietal Trial in Oat (Single cut) : Plant Height (cm)

Cont…

Entries	Palam-pur	Coimba-tore	Ran-chi	Jabal-pur	Hydera-bad	His-ar	Ana-nd	Jal-ore	Kan-pur	Bika-ner	Ludhi-ana	Faiza-bad
JO-03-95	100.0	101.0	129.5	157.9	68.2	140.6	147.0	131.7	104.7	75.5	106.7	80.5
JHO-2009-1	102.0	118.0	118.5	153.0	87.1	146.6	138.4	131.7	104.9	76.1	110.0	78.4
OS-363	109.7	82.0	129.1	150.8	77.7	134.4	133.0	131.3	97.7	81.1	113.3	147.6
JHO-2009-2	107.7	132.0	125.0	139.2	97.8	150.4	151.0	149.7	111.2	100.5	98.3	146.8
NDO-603	106.7	125.0	127.3	122.3	71.5	148.6	125.2	153.7	120.5	87.3	126.3	104.2
OS-374	108.7	140.0	124.7	144.2	77.3	148.2	137.3	130.7	82.1	95.9	109.0	110.8
NDO-609	110.3	75.0	128.3	147.5	82.5	140.1	130.2	129.0	90.0	74.5	106.7	125.6
SKO-148	64.0	80.0	80.8	135.5	55.9	100.7	124.5	85.0	79.4	49.0	84.3	60.4
SKO-156	102.7	118.0	118.6	145.8	75.6	104.3	144.8	133.0	86.0	68.7	114.7	95.7
SKO-163	108.0	105.0	121.3	112.8	77.6	101.0	128.6	146.0	94.4	56.7	114.7	132.2
UPO-09-2	104.0	110.0	129.4	148.2	88.5	151.0	137.2	168.3	98.3	91.7	126.7	146.7
UPO-09-1	100.3	115.0	120.5	146.1	91.6	139.1	144.3	165.3	107.0	73.7	116.7	145.8
Kent (NC)	97.7	86.0	127.8	144.4	83.3	150.1	106.6	151.7	120.5	77.6	105.3	139.6
OS-6 (NC)	104.0	110.0	123.5	160.7	101.2	149.0	127.3	146.6	126.6	76.2	104.0	102.8
Palampur-1 (ZC-HZ)	104.0											
JHO-99-2 (ZC-NWZ, NEZ)			116.8			150.6		144.6		89.7		135.6
JHO-822 (ZC-CZ)				136.4			136.3		103.2			
JHO-2000-4 (ZC-SZ)		110.0			102.1							
Mean	102.0	107.1	121.4	143.0	82.5	137.0	134.1	139.9	101.8	78.3	109.8	116.8

Table 2.5 : IVTO (SC) - Initial Varietal Trial in Oat (Single cut) : Plant Height (cm)

Entries	Bhuban-eswar	Rah-uri	Jor-hat	Kaly-ani	Man-dya	Imp-hal	Urulika-nchan	Jha-nsi	Pu-sa	Srin-agar	Pantn-agar	Aver-age	Rank
JO-03-95	128.7	90.0	145.8	138.3	87.5	84.6	105.2	145.6	120.0	116.5	161.3	115.9	10
JHO-2009-1	117.3	111.0	155.1	146.0	88.8	102.7	122.9	167.7	158.0	133.4	157.7	122.8	6
OS-363	125.3	100.0	179.1	156.6	67.5	101.9	115.0	156.5	154.0	131.0	159.0	123.2	5
JHO-2009-2	135.3	122.0	179.0	161.4	85.3	102.2	127.9	172.0	155.0	130.4	157.6	132.1	1
NDO-603	116.7	81.0	147.8	162.6	77.9	100.2	100.6	153.8	85.0	128.5	161.5	118.9	8
OS-374	139.7	107.0	136.0	151.3	65.7	83.9	103.1	163.7	163..0	128.4	157.0	120.2	7
NDO-609	120.3	86.0	133.9	156.1	82.1	103.0	93.9	154.2	159.0	139.4	162.3	118.7	9
SKO-148	118.7	82.0	179.5	100.1	72.7	71.5	99.2	96.7	153.0	131.9	164.3	98.7	13
SKO-156	114.0	100.0	129.7	125.0	78.2	86.0	125.7	151.2	112.0	147.9	165.7	114.9	12
SKO-163	137.7	107.0	114.9	130.0	68.7	95.5	116.1	155.1	121.0	154.9	161.6	115.7	11
UPO-09-2	139.3	109.0	168.0	166.4	82.2	96.8	113.2	174.1	168.0	146.9	163.9	131.6	2
UPO-09-1	131.3	107.0	180.5	148.3	84.9	101.1	114.6	158.2	143.0	151.7	159.7	128.1	3
Kent (NC)	126.3	91.0	152.0	141.6	79.6	99.7	97.6	154.3	149.0	126.7	159.0	120.3	7
OS-6 (NC)	141.7	105.0	142.9	147.9	81.8	106.6	117.7	166.5	164.0	146.2	160.7	126.6	4
Palampur-1 (ZC-HZ)										140.6			
JHO-99-2 (ZC-NWZ, NEZ)	118.0		164.7	168.5					136.0		162.8		
JHO-822 (ZC-CZ)		91.0					65.7	164.9					
JHO-2000-4 (ZC-SZ)					85.7								
Mean	127.4	99.3	153.9	146.7	79.2	95.4	107.9	155.6	141.2	137.0	160.9	120.6	

Table 2.6 : IVTO (SC) - Initial Varietal Trial in Oat (Single cut) : Crude Protein Yield (q/ha)

Cont…

Entries	Coimbatore	Palampur	Ranchi	Hisar	Jabalpur	Hyderabad	Anand	Ludhiana
JO-03-95	4.5	5.4	7.7	20.6	11.6	10.3	15.6	4.3
JHO-2009-1	6.5	6.4	14.3	23.2	10.0	4.0	13.8	6.6
OS-363	3.9	5.4	9.4	13.9	10.0	7.1	13.7	5.0
JHO-2009-2	7.7	5.2	10.1	18.3	8.4	5.7	12.6	6.2
NDO-603	6.9	5.1	8.9	19.5	6.6	11.5	7.5	4.0
OS-374	8.9	5.1	7.7	25.8	9.2	12.3	10.2	4.9
NDO-609	3.0	5.3	9.3	17.1	9.7	14.2	9.9	7.0
SKO-148	4.0	4.7	7.4	13.2	7.6	6.4	11.3	6.8
SKO-156	7.0	5.5	10.3	15.5	9.0	11.8	13.3	7.0
SKO-163	4.6	4.1	12.9	21.7	6.2	12.8	11.6	7.8
UPO-09-2	5.3	6.8	12.6	24.7	8.9	12.8	11.2	4.2
UPO-09-1	6.3	5.5	11.6	27.0	9.0	16.7	12.4	6.1
Kent (NC)	4.0	4.8	8.3	27.3	8.6	11.8	5.7	7.0
OS-6 (NC)	5.1	5.3	8.6	22.3	9.4	7.3	8.7	5.9
Palampur-1 (ZC-HZ)		5.9						
JHO-99-2 (ZC-NWZ, NEZ)			9.8	22.6				6.3
JHO-822 (ZC-CZ)					8.5		10.1	
JHO-2000-4 (ZC-SZ)	5.7					12.9		
Mean	5.6	5.4	9.9	20.9	8.8	10.5	11.2	5.9

Table 2.6 : IVTO (SC) - Initial Varietal Trial in Oat (Single cut) : Crude Protein Yield (q/ha)

Entries	Faizabad	Bhubaneswar	Rahuri	Jorhat	Mandya	Imphal	Urulikanchan	Average	Rank
JO-03-95	3.2	6.2	5.0	4.3	3.7	4.2	5.2	7.5	8
JHO-2009-1	4.3	4.9	4.8	7.2	3.7	1.8	5.3	7.8	5
OS-363	10.5	5.9	4.8	6.9	3.3	3.6	7.8	7.4	9
JHO-2009-2	11.7	6.7	4.4	6.1	3.2	5.0	5.2	7.8	5
NDO-603	5.5	4.9	3.6	5.6	3.0	4.1	5.2	6.8	11
OS-374	7.2	7.3	4.7	7.2	3.0	3.4	6.9	8.2	3
NDO-609	9.3	6.0	6.3	6.5	3.1	3.1	5.4	7.7	6
SKO-148	3.0	6.0	5.2	3.9	2.5	3.7	8.3	6.3	12
SKO-156	3.9	5.6	5.9	6.1	2.4	2.4	8.7	7.6	7
SKO-163	3.9	7.2	8.5	3.9	4.4	3.5	8.0	8.1	4
UPO-09-2	9.1	7.3	7.2	6.9	5.1	3.5	7.1	8.8	2
UPO-09-1	11.1	6.9	4.9	5.0	3.6	3.2	5.7	9.0	1
Kent (NC)	6.8	6.0	4.7	7.2	5.3	2.5	5.7	7.7	6
OS-6 (NC)	4.1	7.5	5.6	6.1	2.1	3.0	5.9	7.1	10
Palampur-1 (ZC-HZ)									
JHO-99-2 (ZC-NWZ, NEZ)	9.4	5.8		7.9		4.5			
JHO-822 (ZC-CZ)			5.0				6.3		
JHO-2000-4 (ZC-SZ)					3.3				
Mean	6.9	6.3	5.4	6.0	3.4	3.4	6.4	7.7	

Table 2.7 : IVTO (SC) - Initial Varietal Trial in Oat (Single cut) : Crude Protein Content (CP%)

Cont…

Entries	Palampur	Coimbatore	Ranchi	Hisar	Hyderabad	Anand	Ludhiana	Faizabad	Bhubaneswar
JO-03-95	9.6	7.3	7.4	12.2	11.4	10.8	7.0	7.2	10.0
JHO-2009-1	9.6	7.6	9.2	13.1	6.7	9.4	7.5	8.0	10.0
OS-363	10.5	7.1	7.9	12.7	13.1	9.3	9.0	8.8	10.0
JHO-2009-2	9.0	7.8	9.6	13.1	7.4	8.7	6.5	8.9	10.0
NDO-603	8.8	7.7	7.4	11.8	13.1	10.7	7.5	7.8	10.0
OS-374	9.6	8.5	7.0	12.7	15.3	10.1	7.5	8.4	10.2
NDO-609	9.3	6.7	7.9	11.0	14.9	9.5	7.0	8.0	10.2
SKO-148	10.5	7.1	8.8	12.2	11.4	10.2	8.5	7.1	10.2
SKO-156	11.4	7.8	7.4	12.7	11.4	9.8	8.0	7.7	10.3
SKO-163	9.9	7.5	8.3	13.5	12.3	10.2	6.5	8.0	10.3
UPO-09-2	10.8	7.6	8.3	12.2	12.3	10.4	7.0	8.6	10.4
UPO-09-1	10.5	7.6	7.9	13.1	15.3	7.6	7.5	8.7	10.5
Kent (NC)	8.5	7.2	7.9	13.5	13.6	7.4	9.0	8.4	10.1
OS-6 (NC)	10.2	7.3	7.4	13.5	7.9	9.5	7.0	7.8	10.1
Palampur-1 (ZC-HZ)	9.0								
JHO-99-2 (ZC-NWZ, NEZ)			8.8	11.8				8.3	10.5
JHO-822 (ZC-CZ)						10.3			
JHO-2000-4 (ZC-SZ)		7.7			11.4				
Mean	9.8	7.5	8.1	12.6	11.8	9.6	7.5	8.1	10.2

Table 2.7 : IVTO (SC) - Initial Varietal Trial in Oat (Single cut) : Crude Protein Content (CP%)

Entries	Rahuri	Jorhat	Jabalpur	Mandya	Imphal	Urulikanchan	Average	Rank
JO-03-95	8.3	7.9	8.3	5.3	8.1	6.5	8.5	4
JHO-2009-1	7.9	10.4	8.2	5.7	5.6	7.4	8.4	5
OS-363	7.0	8.8	8.2	6.1	5.2	6.4	8.7	3
JHO-2009-2	8.8	8.6	7.9	4.8	8.1	6.6	8.4	5
NDO-603	6.1	8.4	7.6	4.6	7.8	7.6	8.5	4
OS-374	7.9	10.9	8.1	4.6	7.1	6.7	9.0	1
NDO-609	9.2	8.6	8.2	5.3	5.2	7.0	8.5	4
SKO-148	9.2	8.0	8.0	4.4	8.9	8.0	8.8	2
SKO-156	7.0	8.7	8.1	4.8	5.1	7.2	8.5	4
SKO-163	9.2	8.6	7.7	5.5	6.7	7.0	8.7	3
UPO-09-2	8.8	10.3	8.0	4.4	5.9	6.9	8.8	2
UPO-09-1	8.3	9.2	8.1	4.6	5.9	6.9	8.8	2
Kent (NC)	7.9	9.1	7.8	5.3	5.3	7.0	8.5	4
OS-6 (NC)	9.2	8.9	8.1	4.8	6.0	6.9	8.3	6
Palampur-1 (ZC-HZ)								
JHO-99-2 (ZC-NWZ, NEZ)		9.8			6.2			
JHO-822 (ZC-CZ)	8.8		8.0			7.0		
JHO-2000-4 (ZC-SZ)				6.1				
Mean	8.2	9.1	8.0	5.1	6.5	7.0	8.6	

Table 2.8 : IVTO (SC) - Initial Varietal Trial in Oat (Single cut) : Leaf Stem Ratio

Cont…

Entries	Palampur	Coimbatore	Ranchi	Jabalpur	Hyderabad	Kanpur	Bikaner	Ludhaiana	Faizabad	Bhubaneswar
JO-03-95	0.53	0.56	0.31	0.72	0.86	0.38	0.29	1.00	0.59	0.87
JHO-2009-1	0.50	0.75	0.22	0.68	0.37	0.38	0.62	0.67	0.75	0.66
OS-363	0.50	0.80	0.25	0.69	0.48	0.41	0.41	0.74	0.81	0.84
JHO-2009-2	0.69	0.62	0.32	0.53	0.34	0.33	0.43	0.60	0.84	0.91
NDO-603	0.50	0.65	0.22	0.48	0.67	0.32	0.46	0.82	0.65	0.65
OS-374	0.68	0.52	0.26	0.59	0.68	0.41	0.49	1.10	0.75	1.02
NDO-609	0.61	0.60	0.26	0.67	0.58	0.39	0.49	0.54	0.70	0.83
SKO-148	0.61	0.55	0.41	0.57	1.05	0.60	1.03	0.82	0.65	0.79
SKO-156	0.53	0.75	0.35	0.61	0.60	0.47	0.74	1.00	0.69	0.69
SKO-163	0.43	0.55	0.32	0.47	0.51	0.42	0.77	0.90	0.88	0.91
UPO-09-2	0.50	0.62	0.15	0.58	0.65	0.33	0.57	0.67	0.82	0.91
UPO-09-1	0.54	0.65	0.27	0.53	0.52	0.25	0.55	0.82	0.80	0.88
Kent (NC)	0.67	0.71	0.29	0.60	0.60	0.33	0.46	0.54	0.72	0.87
OS-6 (NC)	0.61	0.72	0.30	0.63	0.58	0.35	0.64	0.60	0.68	1.03
Palampur-1 (ZC-HZ)	0.51									
JHO-99-2 (ZC-NWZ, NEZ)			0.31				0.38	0.67	0.85	0.72
JHO-822 (ZC-CZ)				0.55		0.36				
JHO-2000-4 (ZC-SZ)		0.58			0.44					
Mean	0.56	0.64	0.28	0.59	0.60	0.38	0.56	0.77	0.75	0.84

Table 2.8 : IVTO (SC) - Initial Varietal Trial in Oat (Single cut) : Leaf Stem Ratio

Entries	Kalyani	Rahuri	Jorhat	Mandya	Imphal	Urulikanchan	Jhansi	Pusa	Pantnagar	Average	Rank
JO-03-95	0.52	0.66	0.57	0.31	1.00	0.57	0.31	0.93	0.26	0.59	5
JHO-2009-1	0.73	0.57	0.35	0.39	0.49	0.59	0.31	0.97	0.42	0.55	8
OS-363	0.82	0.71	0.41	0.28	0.80	0.65	0.37	0.94	0.35	0.59	5
JHO-2009-2	0.81	0.76	0.39	0.26	0.83	0.69	0.29	0.91	0.45	0.58	6
NDO-603	0.43	0.63	0.43	0.27	0.80	0.66	0.29	0.94	0.32	0.54	8
OS-374	0.81	0.54	0.44	0.26	0.68	0.64	0.33	0.98	0.33	0.61	4
NDO-609	0.87	0.46	0.38	0.28	0.58	0.63	0.37	0.99	0.32	0.56	7
SKO-148	0.81	0.82	0.44	0.29	1.17	0.93	0.39	0.94	0.38	0.70	1
SKO-156	0.86	0.94	0.49	0.37	0.79	0.86	0.31	0.89	0.44	0.65	2
SKO-163	0.76	0.94	0.41	0.29	0.93	0.49	0.25	0.91	0.29	0.60	3
UPO-09-2	0.79	0.69	0.50	0.38	0.84	0.63	0.32	0.96	0.31	0.59	5
UPO-09-1	0.69	0.57	0.45	0.34	0.52	0.51	0.29	0.87	0.40	0.55	8
Kent (NC)	1.05	0.77	0.42	0.27	0.54	0.79	0.32	0.94	0.27	0.59	5
OS-6 (NC)	1.18	0.47	0.48	0.23	0.67	0.70	0.29	1.03	0.42	0.61	3
Palampur-1 (ZC-HZ)											
JHO-99-2 (ZC-NWZ, NEZ)	0.87		0.50		0.52			0.84	0.32		
JHO-822 (ZC-CZ)		0.61				0.56	0.36				
JHO-2000-4 (ZC-SZ)				0.19							
Mean	0.80	0.68	0.44	0.29	0.74	0.66	0.32	0.94	0.35	0.59	

Table 2.9 : IVTO (SC) - Initial Varietal Trial in Oat (Single cut) : IVDMD (%)

Entries	Hisar	Rank
JO-03-95	48.4	2
JHO-2009-1	43.6	8
OS-363	46.0	7
JHO-2009-2	41.6	10
NDO-603	43.2	9
OS-374	48.0	3
NDO-609	46.0	7
SKO-148	46.0	7
SKO-156	46.4	6
SKO-163	46.8	5
UPO-09-2	49.6	1
UPO-09-1	47.6	4
Kent (NC)	43.6	8
OS-6 (NC)	48.0	3
Palampur-1 (ZC-HZ)		
JHO-99-2 (ZC-NWZ, NEZ)	47.6	4
JHO-822 (ZC-CZ)		
JHO-2000-4 (ZC-SZ)		
Mean	46.2	

3. AVTO (SC)-1 : FIRST ADVANCED VARIETAL TRIAL IN OAT (SINGLE CUT)

(Table Reference : 3.1 to 3.10)

In Oat (single cut), four entries namely SKO-96, JO-03-291, SKO-117 and SKO-133 promoted from IVT were evaluated against two national checks i.e. Kent and OS-6 and zonal checks in respective zones i.e. Palampur-1, OL-125, JHO-99-2, JHO-822 and JHO-2000-4 at 25 locations in five different zones of the country. Results of the trial clearly indicated that for green forage yield (q/ha), all the four entries performed better than the checks in Hill zone with 10.2 % superiority for entry JO-03-291 and 9.6% superiority for entry SKO-96 whereas other two entries were slightly ahead in performance.

In North –West zone, entries SKO-133 (10.2%), SKO-117 (4.5%) and entry JO-03-291 (8.1%) in Central zone proved their superiority over respective national or zonal check for this character but none of the entries recorded their superiority in North- East and South zone. On all India basis only one entry i.e. JO-03-291 proved their superiority over national check.

Similarly for the character dry matter yield (q/ha), entries SKO-96 (8.6%), JO-03-291 (7.2%), SKO-133 (2.6%) and SKO-117 (1.8%) in Hill zone, entry SKO-117 (4.5%) in North-West zone, entry JO-03-291 (7.1,6.1%) in central and South zone, respectively exhibited their superiority over check. At national level entries JO-03-291 (5.6%) and SKO-117 (1.6%) were recorded for their superiority for this character over best national check.

Coming to the forage production potential (q/ha/day), entry JO-03-291 recorded their superiority for green forage as well as dry matter production potential and other than this, none of the entries performed better than the national check. For evaluation against plant height (cm), national check OS-6 (127.2 cm) maintained superiority over other testing entries.

In quality parameters, national check Kent proved superiority for crude protein yield (q/ha) and crude protein content (%). For other quality parameters like leaf stem ratio, all the testing entries and entry SKO-96 for IVDMD (%) proved their superiority over national check. Similarly, entries SKO-117 and SKO-96 for ADF (%) and JO-03-291 for NDF (%) exhibited superiority over national check.

Table 3.1 : AVTO (SC)-1 - First Advanced Varietal Trial in Oat (Single cut) : Green Forage Yield (q/ha)

Cont…

Entries	Hill Zone						North-West Zone								
	Palam-pur	Srina-gar	Rajo-uri	Aver-age	Rank	Super-iority%	Bika-ner	Jal-ore	His-ar	Ludhi-ana	Pantn-agar	Mee-rut	Aver-age	Rank	Super-iority%
SKO-96	152.7	568.3	152.8	291.3	2	9.6	148.6	404.0	846.9	471.7	560.6	389.0	470.1	3	1.2
JO-03-291	252.2	521.2	105.6	293.0	1	10.2	163.6	398.5	821.9	313.3	572.2	408.2	446.3	6	
SKO-117	172.2	511.1	129.2	270.8	3	1.9	195.0	412.0	991.3	401.7	580.6	330.7	485.2	2	4.5
SKO-133	133.3	516.2	158.3	269.3	4	1.3	172.5	460.7	1007.9	478.3	564.7	387.6	511.9	1	10.2
Kent (NC)	244.4	405.2	113.9	254.5	6		182.9	416.7	958.0	358.3	568.9	302.0	464.5	4	
OS-6 (NC)	207.7	393.8	100.0	233.8	7		102.2	305.0	880.2	310.0	574.7	335.9	418.0	7	
Palampur-1 (ZC-HZ)	200.0	465.7	131.7	265.8	5										
OL-125 (ZC-NWZ)							166.5	386.7	866.3	356.7	555.6	376.5	451.4	5	
JHO-99-2 (ZC-NEZ)															
JHO-822 (ZC-CZ)															
JHO-2000-4 (ZC-SZ)															
Mean	194.6	483.1	127.3	268.4			161.6	397.6	910.4	384.3	568.2	361.4	463.9		
CD at 5%	34.0	8.9	1.8				29.0	40.4	39.4	8.7	46.4	28.7			
CV%	9.8	1.0	6.5				10.1	5.7	2.4	12.5	4.6	4.5			

Table 3.1 : AVTO (SC)-1 - First Advanced Varietal Trial in Oat (Single cut) : Green Forage Yield (q/ha)

Cont…

Entries	North-East Zone									
	Jorhat	Kalyani	Bhubaneswar	Ranchi	Pusa	Faizabad	Imphal	Average	Rank	Superiority%
SKO-96	425.8	239.4	305.7	286.7	403.0	357.7	249.7	324.0	6	
JO-03-291	316.0	340.0	330.4	393.3	456.0	435.8	316.9	369.8	2	
SKO-117	370.6	351.7	311.0	333.3	384.0	245.7	277.8	324.9	5	
SKO-133	333.1	358.0	322.1	376.7	369.0	180.6	276.9	316.6	7	
Kent (NC)	336.0	319.4	283.4	376.7	439.0	391.6	283.4	347.1	3	
OS-6 (NC)	368.3	338.6	297.1	370.0	423.0	305.1	265.1	338.2	4	
Palampur-1 (ZC-HZ)										
OL-125 (ZC-NWZ)										
JHO-99-2 (ZC-NEZ)	359.2	411.1	333.2	436.7	463.0	470.1	330.1	400.5	1	
JHO-822 (ZC-CZ)										
JHO-2000-4 (ZC-SZ)										
Mean	358.4	336.9	311.8	367.6	419.6	340.9	285.7	345.9		
CD at 5%	8.7	11.7	22.7	71.0	36.3	81.4	41.3			
CV%	1.4	2.4	3.4	10.9	13.2	13.4	8.3			

Table 3.1 : AVTO (SC)-1 - First Advanced Varietal Trial in Oat (Single cut) : Green Forage Yield (q/ha)

Cont…

Entries	Central Zone								
	Jhansi	Rahuri	Urulikanchan	Kanpur	Anand	Jabalpur	Average	Rank	Superiority%
SKO-96	330.0	420.6	605.8	541.7	606.0	538.0	507.0	6	
JO-03-291	613.9	375.7	567.7	722.2	688.0	595.0	593.7	1	8.1
SKO-117	416.4	502.3	430.5	550.0	564.0	565.0	504.7	7	
SKO-133	429.6	477.8	548.6	519.4	703.0	469.0	524.6	5	
Kent (NC)	508.3	481.8	514.4	572.2	719.0	499.0	549.1	2	
OS-6 (NC)	505.6	424.7	537.2	652.8	604.0	545.0	544.9	4	
Palampur-1 (ZC-HZ)									
OL-125 (ZC-NWZ)									
JHO-99-2 (ZC-NEZ)									
JHO-822 (ZC-CZ)	613.9	387.9	499.1	600.0	629.0	544.0	545.7	3	
JHO-2000-4 (ZC-SZ)									
Mean	488.2	438.7	529.0	594.0	644.7	536.4	538.5		
CD at 5%	50.6	NS	33.0	113.6	82.6	107.6			
CV%	5.8	14.3	10.2	9.2	7.2	12.3			

Table 3.1 : AVTO (SC)-1 - First Advanced Varietal Trial in Oat (Single cut) : Green Forage Yield (q/ha)

Entries	South Zone						All India		
	Hyderabad	Mandya	Coimbatore	Average	Rank	Superiority%	Average	Rank	Superiority%
SKO-96	155.5	174.7	288.9	206.4	7		385.0	6	
JO-03-291	485.9	166.9	286.1	313.0	3		425.9	1	5.0
SKO-117	272.1	189.8	302.8	254.9	6		391.6	5	
SKO-133	333.2	181.8	277.8	264.2	5		401.4	3	
Kent (NC)	480.4	179.9	208.3	289.6	4		405.7	2	
OS-6 (NC)	472.0	181.4	300.0	317.8	2		392.0	4	
Palampur-1 (ZC-HZ)									
OL-125 (ZC-NWZ)									
JHO-99-2 (ZC-NEZ)									
JHO-822 (ZC-CZ)									
JHO-2000-4 (ZC-SZ)	552.6	166.9	308.3	342.6	1				
Mean	393.1	177.4	281.7	284.1			400.3		
CD at 5%	63.2	11.9	50.4						
CV%	9.0	3.7	10.0						

Table 3.2 : AVTO (SC)-1 - First Advanced Varietal Trial in Oat (Single cut) : Dry Matter Yield (q/ha)

Cont…

Entries	Hill Zone						North-West Zone							
	Palam-pur	Srina-gar	Rajo-uri	Aver-age	Rank	Super-iority%	Bika-ner	His-ar	Ludh-iana	Pantn-agar	Mee-rut	Aver-age	Rank	Super-iority%
SKO-96	37.4	140.1	35.2	70.9	1	8.6	41.2	144.0	94.3	108.4	113.1	100.2	5	
JO-03-291	56.8	127.5	25.7	70.0	2	7.2	53.9	115.1	58.0	106.2	121.2	90.9	6	
SKO-117	41.6	127.3	30.6	66.5	4	1.8	45.8	178.4	78.3	95.7	140.2	107.7	1	4.5
SKO-133	33.5	130.2	37.3	67.0	3	2.6	44.0	121.0	95.7	108.4	134.3	100.7	4	
Kent (NC)	51.0	109.7	28.2	63.0	6		35.5	172.4	68.1	114.0	114.0	100.8	3	
OS-6 (NC)	51.8	107.2	23.2	60.7	7		22.3	140.8	57.3	108.8	112.7	88.4	7	
Palampur-1 (ZC-HZ)	46.0	119.8	30.2	65.3	5									
OL-125 (ZC-NWZ)							51.7	155.9	67.8	104.3	135.4	103.0	2	
JHO-99-2 (ZC-NEZ)														
JHO-822 (ZC-CZ)														
JHO-2000-4 (ZC-SZ)														
Mean	45.4	123.1	30.0	66.2			42.1	146.8	74.2	106.5	124.4	98.8		
CD at 5%	11.2	5.9	4.8				8.8	6.3	1.8	12.6	28.4			
CV%	13.8	2.6	9.1				11.8	2.4	13.5	6.7	12.8			

Table 3.2 : AVTO (SC)-1 – First Advanced Varietal Trial in Oat (Single cut) : Dry Matter Yield (q/ha)

Cont…

Entries	North-East Zone									
	Jorhat	Kalyani	Bhubaneswar	Ranchi	Pusa	Faizabad	Imphal	Average	Rank	Superiority%
SKO-96	73.5	58.8	62.0	85.1	67.7	84.4	53.8	69.3	4	
JO-03-291	65.8	67.5	67.2	85.6	82.2	101.5	58.6	75.5	2	
SKO-117	64.0	81.6	62.4	90.3	73.0	58.5	49.5	68.5	5	
SKO-133	59.2	80.4	65.5	95.1	66.5	42.8	55.4	66.4	7	
Kent (NC)	66.9	67.2	57.0	75.1	74.8	89.7	56.8	69.6	3	
OS-6 (NC)	71.8	63.5	61.8	80.0	74.5	79.0	48.3	68.4	6	
Palampur-1 (ZC-HZ)										
OL-125 (ZC-NWZ)										
JHO-99-2 (ZC-NEZ)	73.7	78.9	68.9	102.2	82.9	107.0	66.6	82.9	1	
JHO-822 (ZC-CZ)										
JHO-2000-4 (ZC-SZ)										
Mean	67.8	71.1	63.6	87.6	74.5	80.4	55.6	71.5		
CD at 5%	6.2	3.2	5.2	10.8	11.3	14.3	10.8			
CV%	5.1	3.1	3.9	6.9	9.3	10.0	10.9			

Table 3.2 : AVTO (SC)-1 - First Advanced Varietal Trial in Oat (Single cut.) : Dry Matter Yield (q/ha)

Cont…

Entries	Central Zone								
	Jhansi	Rahuri	Urulikanchan	Kanpur	Anand	Jabalpur	Average	Rank	Superiority%
SKO-96	90.0	76.7	110.0	173.1	66.5	126.0	107.0	7	
JO-03-291	113.3	57.6	114.8	241.7	93.5	140.0	126.8	1	7.1
SKO-117	101.6	93.4	91.3	177.8	84.6	133.0	113.6	4	
SKO-133	89.4	89.3	108.1	162.2	133.5	108.0	115.1	3	
Kent (NC)	90.9	81.3	98.0	197.5	85.6	115.0	111.4	6	
OS-6 (NC)	92.2	77.4	112.6	218.3	81.6	128.0	118.4	2	
Palampur-1 (ZC-HZ)									
OL-125 (ZC-NWZ)									
JHO-99-2 (ZC-NEZ)									
JHO-822 (ZC-CZ)	111.7	60.1	91.0	198.0	81.2	127.0	111.5	5	
JHO-2000-4 (ZC-SZ)									
Mean	98.4	76.5	103.7	195.5	89.5	125.3	114.8		
CD at 5%	13.2	18.4	21.0	48.0	11.7	28.2			
CV%	7.5	13.5	11.4	6.6	7.2	12.7			

Table 3.2 : AVTO (SC)-1 - First Advanced Varietal Trial in Oat (Single cut) : Dry Matter Yield (q/ha)

Entries	South Zone						All India		
	Hyderabad	Mandya	Coimbatore	Average	Rank	Superiority%	Average	Rank	Superiority%
SKO-96	49.2	32.5	49.2	43.6	7		82.2	6	
JO-03-291	86.9	72.2	48.4	69.2	1	6.1	90.0	1	5.6
SKO-117	75.0	51.3	54.3	60.2	4		86.6	2	1.6
SKO-133	91.0	38.4	45.4	58.3	5		84.8	4	
Kent (NC)	86.9	76.2	32.5	65.2	2		85.2	3	
OS-6 (NC)	78.9	32.4	53.2	54.8	6		82.4	5	
Palampur-1 (ZC-HZ)									
OL-125 (ZC-NWZ)									
JHO-99-2 (ZC-NEZ)									
JHO-822 (ZC-CZ)									
JHO-2000-4 (ZC-SZ)	102.6	33.5	55.2	63.8	3				
Mean	81.5	48.1	48.3	59.3			85.2		
CD at 5%	25.0	5.3	9.3						
CV%	17.2	6.2	10.8						

Table 3.3 : AVTO (SC)-1 - First Advanced Varietal Trial in Oat (Single cut) : Green Forage Yield (q/ha/day)

Cont…

Entries	Rahuri	Kalyani	Bhubaneshwar	Palampur	Coimbatore	Ranchi	Jabalpur	Hyderabad	Hisar	Anand	Kanpur
SKO-96	3.86	2.16	4.23	1.03	4.13	2.45	4.01	1.31	6.51	5.51	5.82
JO-03-291	4.53	3.91	4.45	2.15	4.27	4.68	6.01	6.75	6.74	8.49	8.81
SKO-117	5.13	3.32	4.40	1.48	4.66	3.21	5.70	2.32	7.59	5.42	5.91
SKO-133	4.55	3.38	4.39	0.91	4.21	3.69	3.47	2.80	7.64	6.57	5.59
Kent (NC)	5.74	3.67	3.90	2.07	3.06	4.54	5.04	6.27	8.05	8.66	7.34
OS-6 (NC)	5.31	3.89	4.15	1.78	4.62	4.35	5.50	6.44	7.65	7.46	8.16
Palampur-1 (ZC-HZ)				1.72							
OL-125 (ZC-NWZ)									7.22		
JHO-99-2 (ZC-NEZ)		4.73	4.42			4.91					
JHO-822 (ZC-CZ)	4.67						4.09			7.58	7.32
JHO-2000-4 (ZC-SZ)					4.47			7.09			
Mean	4.83	3.58	4.28	1.59	4.20	3.98	4.83	4.71	7.34	7.10	6.99

Table 3.3 : AVTO (SC)-1 - First Advanced Varietal Trial in Oat (Single cut) : Green Forage Yield (q/ha/day)

Entries	Bikaner	Faizabad	Jorhat	Ludhiana	Imphal	Mandya	Urulikanchan	Pusa	Jhansi	Pantnagar	Average	Rank
SKO-96	1.36	3.11	4.54	3.55	2.21	1.53	6.51	3.95	2.60	5.12	3.60	6
JO-03-291	1.60	4.40	3.28	2.80	3.20	2.04	8.35	4.38	6.80	5.35	4.90	1
SKO-117	1.79	2.15	3.98	3.02	2.25	2.54	4.73	3.76	3.76	5.48	3.93	4
SKO-133	1.58	1.45	3.60	3.60	2.33	1.52	5.90	3.65	3.87	5.23	3.81	5
Kent (NC)	1.79	3.70	3.61	3.20	2.76	2.25	7.24	4.26	5.73	5.27	4.67	3
OS-6 (NC)	1.00	3.11	3.99	2.77	2.57	2.52	8.14	4.10	5.64	5.27	4.69	2
Palampur-1 (ZC-HZ)												
OL-125 (ZC-NWZ)	1.63			3.18						4.97		
JHO-99-2 (ZC-NEZ)		4.60			3.32			4.45				
JHO-822 (ZC-CZ)			3.89				7.34		7.06			
JHO-2000-4 (ZC-SZ)						2.19						
Mean	1.54	3.22	3.84	3.16	2.66	2.08	6.89	4.08	5.07	5.24	4.27	

Table 3.4 : AVTO (SC)-1 - First Advanced Varietal Trial in Oat (Single cut) : Dry Matter Yield (q/ha/day)

Entries	Rahuri	Kalyani	Bhubneswar	Coimbatore	Ranchi	Jabalpur	Hyderabad	Hisar	Anand	Kanpur
SKO-96	0.70	0.53	0.86	0.70	0.73	0.94	0.41	1.11	0.60	1.86
JO-03-291	0.69	0.78	0.90	0.72	1.02	1.41	1.20	0.94	1.15	2.95
SKO-117	0.95	0.77	0.88	0.83	0.87	1.34	0.64	1.37	0.81	1.91
SKO-133	0.85	0.76	0.89	0.69	0.93	0.80	0.76	0.92	1.25	1.74
Kent (NC)	0.97	0.77	0.79	0.48	0.90	1.16	1.13	1.45	1.03	2.53
OS-6 (NC)	0.97	0.73	0.86	0.82	0.94	1.29	1.08	1.22	1.07	2.73
Palampur-1 (ZC-HZ)										
OL-125 (ZC-NWZ)								1.30		
JHO-99-2 (ZC-NEZ)		0.91	0.92		1.15					
JHO-822 (ZC-CZ)	0.72					0.94			0.98	2.42
JHO-2000-4 (ZC-SZ)				0.80			1.32			
Mean	0.84	0.75	0.87	0.72	0.93	1.13	0.93	1.19	0.98	2.31

Table 3.4 : AVTO (SC)-1 : First Advanced Varietal Trial in Oat (Single cut) : Dry Matter Yield (q/ha/day)

Entries	Bikaner	Ludhiana	Faizabad	Jorhat	Urulikanchan	Pusa	Jhansi	Pantnagar	Average	Rank
SKO-96	0.38	0.71	0.73	0.78	1.18	0.66	0.71	0.99	0.81	6
JO-03-291	0.53	0.52	1.02	0.69	1.69	0.79	1.25	0.99	1.07	1
SKO-117	0.42	0.59	0.51	0.68	1.00	0.72	0.92	1.00	0.90	4
SKO-133	0.40	0.72	0.34	0.64	1.16	0.66	0.81		0.84	5
Kent (NC)	0.35	0.61	0.89	0.71	1.38	0.73	1.03	1.06	1.00	3
OS-6 (NC)	0.22	0.51	0.81	0.77	1.71	0.72	1.03	0.90	1.02	2
Palampur-1 (ZC-HZ)										
OL-125 (ZC-NWZ)	0.51	0.61								
JHO-99-2 (ZC-NEZ)			1.05			0.80		0.93		
JHO-822 (ZC-CZ)				0.79	1.34		1.28			
JHO-2000-4 (ZC-SZ)										
Mean	0.40	0.61	0.76	0.72	1.35	0.73	1.00	0.98	0.94	

Table 3.5 : AVTO (SC)-1 - First Advanced Varietal Trial in Oat (Single cut) : Crude Protein Yield (q/ha)

Cont…

Entries	Rahuri	Kalyani	Bhubaneswar	Palampur	Coimbatore	Hisar	Ranchi	Jabalpur
SKO-96	7.4	5.6	6.3	4.1	3.5	18.4	8.1	10.0
JO-03-291	5.5	4.9	6.7	6.0	3.5	13.7	6.6	11.5
SKO-117	9.0	5.7	6.3	4.0	4.2	19.8	8.2	10.8
SKO-133	7.4	7.6	6.6	3.1	3.3	14.9	6.9	8.2
Kent (NC)	7.5	5.8	5.8	5.2	2.2	22.7	5.5	9.1
OS-6 (NC)	7.1	5.5	6.2	5.2	3.9	19.1	6.6	10.3
Palampur-1 (ZC-HZ)				4.3				
OL-125 (ZC-NWZ)						18.6		
JHO-99-2 (ZC-NEZ)		6.9	6.9				8.9	
JHO-822 (ZC-CZ)	5.3							10.1
JHO-2000-4 (ZC-SZ)					4.3			
Mean	7.0	6.0	6.4	4.5	3.6	18.2	7.3	10.0

Table 3.5 : AVTO (SC)-1 : First Advanced Varietal Trial in Oat (Single cut) : Crude Protein Yield (q/ha)

Entries	Hyderabad	Anand	Ludhiana	Faizabad	Jorhat	Imphal	Mandya	Urulikanchan	Average	Rank
SKO-96	7.5	4.6	7.7	6.8	7.7	4.0	1.9	7.9	7.0	4
JO-03-291	13.3	10.1	3.6	8.8	7.5	3.9	4.4	7.7	7.4	2
SKO-117	11.5	8.2	5.6	4.4	6.8	2.9	2.9	6.4	7.3	3
SKO-133	15.2	15.7	5.9	3.2	5.9	2.8	2.4	7.6	7.3	3
Kent (NC)	13.8	8.6	4.9	7.4	7.3	4.9	5.0	5.9	7.6	1
OS-6 (NC)	14.9	9.1	3.8	6.4	6.9	3.1	1.8	7.1	7.3	3
Palampur-1 (ZC-HZ)										
OL-125 (ZC-NWZ)			4.5							
JHO-99-2 (ZC-NEZ)				9.0		3.8				
JHO-822 (ZC-CZ)		7.5			8.6			5.4		
JHO-2000-4 (ZC-SZ)	15.0						1.9			
Mean	13.0	9.1	5.1	6.6	7.2	3.6	2.9	6.8	7.3	

Table 3.6 : AVTO (SC)-1 - First Advanced Varietal Trial in Oat (Single cut) : Plant Height (cm)

Cont…

Entries	Rahuri	Bhubneswar	Palampur	Coimbatore	Rajouri	Ranchi	Jabalpur	Hyderabad	Hisar	Anand	Jalore	Kanpur
SKO-96	101.0	135.4	70.7	92.5	85.0	79.9	146.0	58.7	95.3	134.6	104.7	81.1
JO-03-291	87.0	141.5	103.7	98.0	118.3	117.3	160.1	83.9	147.3	121.3	154.7	120.5
SKO-117	100.0	135.1	105.7	125.0	116.7	117.1	147.0	89.7	115.3	137.4	140.3	108.3
SKO-133	106.0	136.1	75.3	115.6	107.7	120.2	141.3	80.0	98.7	130.2	132.3	84.9
Kent (NC)	95.0	125.6	103.7	80.6	122.0	114.7	143.6	82.2	143.9	125.6	129.7	116.7
OS-6 (NC)	107.0	129.9	101.7	110.0	134.3	120.1	146.1	90.5	158.1	133.3	140.3	134.7
Palampur-1 (ZC-HZ)			117.7		105.3							
OL-125 (ZC-NWZ)									155.5		127.7	
JHO-99-2 (ZC-NEZ)		139.0				124.7						
JHO-822 (ZC-CZ)	87.0						141.1			137.6		123.7
JHO-2000-4 (ZC-SZ)				120.0				104.0				
Mean	97.6	134.7	96.9	106.0	112.8	113.4	146.5	84.1	130.6	131.4	132.8	110.0

Table 3.6 : AVTO (SC)-1 - First Advanced Varietal Trial in Oat (Single cut) : Plant Height (cm)

Entries	Bika-ner	Ludhi-ana	Faiza-bad	Jor-hat	Kaly-ani	Imp-hal	Man-dya	Urulik-anchan	Jha-nsi	Pu-sa	Srin-agar	Pantn-agar	Aver-age	Rank
SKO-96	62.0	85.7	125.7	176.5	105.9	59.0	80.2	108.1	111.2	106.0	138.2	167.8	104.6	6
JO-03-291	83.6	100.0	142.2	183.5	126.4	82.9	64.2	111.6	148.3	157.0	144.1	159.6	123.2	3
SKO-117	74.3	112.0	105.9	183.7	137.9	81.4	66.3	132.0	163.7	152.0	148.0	171.6	123.6	2
SKO-133	70.0	92.0	85.4	181.7	131.4	79.9	75.9	121.8	152.8	135.0	150.0	157.1	115.1	5
Kent (NC)	79.7	101.7	132.3	182.3	137.5	79.3	70.7	113.3	156.7	154.0	144.1	169.8	121.0	4
OS-6 (NC)	74.5	105.0	128.7	177.5	145.1	82.2	84.5	122.1	155.7	159.0	146.4	166.5	127.2	1
Palampur-1 (ZC-HZ)											141.3			
OL-125 (ZC-NWZ)	81.7	103.3										156.9		
JHO-99-2 (ZC-NEZ)			135.7		146.1	83.8				169.0				
JHO-822 (ZC-CZ)				181.6				113.9	154.8					
JHO-2000-4 (ZC-SZ)							77.5							
Mean	75.1	100.0	122.3	181.0	132.9	78.4	74.2	117.5	149.0	147.4	144.6	164.2	119.1	

Table 3.7 : AVTO (SC)-1 - First Advanced Varietal Trial in Oat (Single cut) : Crude Protein Content (CP%)

Cont…

Entries	Rahuri	Bhubaneswar	Palampur	Coimbatore	Hisar	Ranchi	Hyderabad	Anand
SKO-96	9.6	10.1	11.8	7.2	12.8	9.2	15.3	6.9
JO-03-291	9.6	10.0	10.5	7.3	11.9	7.4	15.3	10.8
SKO-117	9.6	10.0	9.6	7.8	11.1	8.8	15.3	9.7
SKO-133	8.3	10.0	8.5	7.2	12.4	7.0	16.6	11.7
Kent (NC)	9.2	10.1	10.2	6.8	13.2	7.0	15.8	10.1
OS-6 (NC)	9.2	10.0	9.9	7.4	13.6	7.9	18.8	11.2
Palampur-1 (ZC-HZ)			9.3					
OL-125 (ZC-NWZ)					11.9			
JHO-99-2 (ZC-NEZ)		10.1				8.3		
JHO-822 (ZC-CZ)	8.8							9.3
JHO-2000-4 (ZC-SZ)				7.8			14.5	
Mean	9.2	10.1	10.0	7.3	12.4	7.9	15.9	10.0

Table 3.7 : AVTO (SC)-1 : First Advanced Varietal Trial in Oat (Single cut) : Crude Protein Content (CP%)

Entries	Ludhiana	Faizabad	Jorhat	Jabalpur	Mandya	Imphal	Urulikanchan	Average	Rank
SKO-96	8.2	8.0	10.5	8.0	5.7	7.4	7.2	9.2	1
JO-03-291	6.1	8.7	11.5	8.2	6.2	6.7	6.7	9.1	2
SKO-117	7.1	7.5	10.8	8.2	5.7	5.9	7.1	8.9	3
SKO-133	6.1	7.4	10.1	7.6	6.4	5.1	7.0	8.8	4
Kent (NC)	7.1	8.2	11.0	7.9	6.7	8.7	6.0	9.2	1
OS-6 (NC)	6.6	8.1	9.7	8.1	5.7	6.3	6.2	9.2	1
Palampur-1 (ZC-HZ)									
OL-125 (ZC-NWZ)	6.6								
JHO-99-2 (ZC-NEZ)		8.4				5.8			
JHO-822 (ZC-CZ)			11.7	8.0			5.9		
JHO-2000-4 (ZC-SZ)					5.7				
Mean	6.8	8.0	10.8	8.0	6.0	6.6	6.6	9.1	

Table 3.8 : AVTO (SC)-1 - First Advanced Varietal Trial in Oat (Single cut) : Leaf Stem Ratio

Cont…

Entries	Rahuri	Kalyani	Bhubaneswar	Palampur	Coimbatore	Ranchi	Jabalpur	Hyderabad	Anand	Kanpur
SKO-96	0.82	0.58	0.95	0.54	0.65	0.27	0.63	0.84	0.58	0.53
JO-03-291	0.87	0.89	1.07	0.50	0.85	0.30	0.78	0.44	0.55	0.39
SKO-117	0.76	0.73	0.94	0.54	0.68	0.42	0.72	0.61	0.68	0.47
SKO-133	0.82	0.95	0.97	0.50	0.66	0.33	0.55	0.63	0.66	0.49
Kent (NC)	0.57	0.84	0.85	0.52	0.52	0.31	0.60	0.38	0.79	0.32
OS-6 (NC)	0.61	0.92	0.89	0.50	0.56	0.28	0.68	0.46	0.78	0.36
Palampur-1 (ZC-HZ)				0.51						
OL-125 (ZC-NWZ)										
JHO-99-2 (ZC-NEZ)		0.69	1.04			0.32				
JHO-822 (ZC-CZ)	0.50						0.64		0.56	0.40
JHO-2000-4 (ZC-SZ)					0.74			0.29		
Mean	0.71	0.80	0.96	0.52	0.67	0.32	0.66	0.52	0.66	0.42

Table 3.8 : AVTO (SC)-1 - First Advanced Varietal Trial in Oat (Single cut) : Leaf Stem Ratio

Entries	Bikaner	Ludhiana	Faizabad	Jorhat	Mandya	Imphal	Urulikanchan	Jhansi	Pusa	Pantnagar	Average	Rank
SKO-96	0.94	1.00	0.65	0.58	0.33	1.01	0.74	0.29	0.81	0.48	0.66	1
JO-03-291	0.54	1.00	0.68	0.56	0.18	0.72	0.57	0.36	0.94	0.32	0.63	2
SKO-117	0.85	0.82	0.78	0.52	0.40	0.90	0.79	0.26	0.91	0.34	0.66	1
SKO-133	0.74	0.74	0.67	0.61	0.20	0.95	0.62	0.32	0.84	0.28	0.63	2
Kent (NC)	0.44	0.54	0.62	0.53	0.43	0.71	0.68	0.40	0.91	0.40	0.57	4
OS-6 (NC)	0.52	0.60	0.75	0.53	0.22	0.90	0.56	0.29	0.93	0.37	0.59	3
Palampur-1 (ZC-HZ)												
OL-125 (ZC-NWZ)	0.70	0.74								0.38		
JHO-99-2 (ZC-NEZ)			0.70			0.58			0.99			
JHO-822 (ZC-CZ)				0.47			0.51	0.29				
JHO-2000-4 (ZC-SZ)					0.22							
Mean	0.68	0.78	0.69	0.54	0.28	0.82	0.64	0.32	0.90	0.37	0.62	

Table 3.9 : AVTO (SC)-1 - First Advanced Varietal Trial in Oat (Single cut) : IVDMD (%)

Entries	Palampur	Hisar	Ranchi	Anand	Ludhiana	Rahuri	Average	Rank
SKO-96	59.8	48.8	67.6	56.4	58.7	65.4	59.5	1
JO-03-291	61.4	46.0	64.2	61.3	56.8	66.8	59.4	2
SKO-117	61.4	45.2	70.4	49.6	57.2	67.8	58.6	4
SKO-133	62.0	44.0	63.2	51.0	56.8	65.6	57.1	5
Kent (NC)	62.0	44.0	66.4	57.2	58.0	66.6	59.0	3
OS-6 (NC)	59.8	45.6	66.8	62.1	57.6	64.6	59.4	2
Palampur-1 (ZC-HZ)	60.0							
OL-125 (ZC-NWZ)		46.0			57.0			
JHO-99-2 (ZC-NEZ)			68.8					
JHO-822 (ZC-CZ)				54.2		66.8		
JHO-2000-4 (ZC-SZ)								
Mean	60.9	45.7	66.8	56.0	57.4	66.2	58.8	

Table 3.10 : AVTO (SC)-1 : First Advanced Varietal Trial in Oat (Single cut) : ADF (%) & NDF (%)

Entries	ADF (%)						NDF (%)						
	Palampur	Ranchi	Ludhiana	Rahuri	Average	Rank	Palampur	Ranchi	Anand	Ludhiana	Rahuri	Average	Rank
SKO-96	49.2	41.9	36.4	43.8	42.8	2	62.6	60.6	69.0	54.6	57.4	60.8	4
JO-03-291	50.0	44.3	37.0	41.6	43.2	3	61.4	62.8	59.0	55.0	56.4	58.9	1
SKO-117	48.0	41.4	35.8	42.8	42.0	1	60.4	59.8	68.0	56.0	56.8	60.2	3
SKO-133	47.2	45.7	37.0	46.9	44.2	5	59.8	63.4	69.0	55.2	61.4	61.8	6
Kent (NC)	51.4	43.2	35.5	45.6	43.9	4	63.4	61.2	64.0	55.2	60.8	60.9	5
OS-6 (NC)	48.0	43.6	36.4	44.6	43.2	3	62.0	62.2	58.0	54.6	59.8	59.3	2
Palampur-1 (ZC-HZ)	49.4						60.0						
OL-125 (ZC-NWZ)			36.4							56.6			
JHO-99-2 (ZC-NEZ)		43.7						60.4					
JHO-822 (ZC-CZ)				47.4					66.0		62.6		
JHO-2000-4 (ZC-SZ)													
Mean	49.0	43.4	36.4	44.7	43.2		61.4	61.5	64.7	55.3	59.3	60.3	

4. AVTO (SC)- 2 : SECOND ADVANCED VARIETAL TRIAL IN OAT (SINGLE CUT)

(Table Reference : 4.1 to 4.10)

Results of the second advanced varietal trial in Oat (single cut) comprising five entries namely JO-03-93, SKO-90, SKO-105, SKO-109 and NDO-25 along with two national checks i.e. Kent and OS-6 and zonal checks for respective zones i.e. Palampur-1, OL-125, JHO-99-2, JHO-822 and JHO-2000-4 conducted at 24 locations across the country clearly revealed that for the character green forage yield (q/ha), entries JO-03-93 (19.6%), SKO-105 (16.6%), SKO-90 (12.2%) and SKO-109 (8.4%) in Hill zone, entries JO-03-93 (12.6%) and NDO-25 (9.4%) in Central zone exhibited their superiority over check whereas none of the entries were found better than check in North-West, North-East and South zone. At national level, entries JO-03-93 (10.5%) and NDO-25 (5.2%) were found superior than national check Kent for this character.

Similar was the condition for the character dry matter yield (q/ha) for which entries SKO-105 (13.3%), SKO-90 (10.2%), JO-03-93 (6.2%) and SKO-109 (4.6%) in Hill zone and entries JO-03-93 (7.3%) and NDO-25 (3.5%) in Central zone proved their superiority whereas none of the entries excelled their performance in North-West, North-East and South zone. At national level entries JO-03-93 (8.4%) and NDO-25 (3.3%) recorded for their superiority over national check OS-6. For green forage as well as dry matter production potential (q/ha/day), entry JO-03-93 ranked first followed by NDO-25 over best national check OS-6. For evaluation against growth parameter i.e. plant height (cm), national check OS-6 (126.0 cm) maintained superiority over rest of the entries.

For quality parameters like crude protein yield (q/ha), only one entry i.e. JO-03-93 proved superiority whereas for crude protein content (%), national check OS-6 maintained superiority. For the character leaf stem ratio, all the testing entries exhibited their superiority over national check whereas for IVDMD%, only one entry i.e. SKO-90 was recorded superior. For ADF%, entries SKO-90, JO-03-93, NDO-25 and SKO-109 proved superiority whereas for NDF%, national check OS-6 maintained superiority over rest of the entries.

Table 4.1 : AVTO (SC)- 2 - Second Advanced Varietal Trial in Oat (Single cut) : Green Forage Yield (q/ha)

Cont…

Entries	Hill Zone						North-West Zone								
	Pala-mpur	Srin-agar	Rajo-uri	Aver-age	Rank	Super-iority%	Bik-aner	Jal-ore	His-ar	Ludh-iana	Pantn-agar	Mee-rut	Aver-age	Rank	Superi-ority%
JO-03-93	296.6	468.9	119.4	295.0	1	19.6	291.5	518.3	816.3	410.0	543.9	340.0	486.7	2	
SKO-90	152.2	525.7	152.8	276.9	3	12.2	223.0	539.0	708.1	455.0	555.6	414.7	482.6	3	
SKO-105	194.4	493.3	175.0	287.6	2	16.6	191.5	513.7	699.7	458.3	568.9	378.3	468.4	5	
SKO-109	161.1	499.5	141.7	267.4	4	8.4	188.0	529.0	630.3	491.7	580.6	330.5	458.3	6	
NDO-25	235.5	310.5	108.3	218.1	8		283.0	514.0	652.5	398.3	627.2	368.8	474.0	4	
OS-6 (NC)	247.7	373.9	106.7	242.8	6		204.2	476.7	697.0	331.7	535.6	344.7	431.6	7	
Kent (NC)	257.7	336.7	91.7	228.7	7		225.3	484.7	605.3	355.0	566.4	350.3	431.2	8	
Palampur-1 (ZC-HZ)	244.4	337.3	158.3	246.7	5										
OL-125 (ZC-NWZ)							300.5	447.0	883.0	433.3	549.7	375.3	498.1	1	
JHO-99-2 (ZC-NEZ)															
JHO-822 (ZC-CZ)															
JHO 2000-4 (ZC-SZ)															
Mean	223.7	418.2	131.7	257.9			238.4	502.8	711.5	416.7	566.0	362.8	466.4		
CD at 5%	48.0	7.9	13.2				48.4	57.5	40.4	8.7	45.6	24.2			
CV%	12.3	1.1	5.7				11.6	6.3	3.2	11.9	5.7	3.9			

Table 4.1 : AVTO (SC)- 2 - Second Advanced Varietal Trial in Oat (Single cut) : Green Forage Yield (q/ha)

Cont…

Entries	North-East Zone								
	Jorhat	Bhubaneswar	Ranchi	Pusa	Faizabad	Imphal	Average	Rank	Superiority%
JO-03-93	314.5	288.2	393.3	484.0	465.5	295.1	373.4	2	
SKO-90	348.0	281.8	250.0	405.0	147.4	303.7	289.3	7	
SKO-105	298.4	268.0	230.0	373.0	132.6	304.4	267.7	8	
SKO-109	339.1	266.6	393.3	479.0	134.4	270.3	313.8	6	
NDO-25	367.9	294.3	256.7	431.0	488.3	279.3	352.9	4	
OS-6 (NC)	341.8	272.1	383.3	457.0	488.8	299.0	373.7	1	
Kent (NC)	246.2	283.2	356.7	399.0	323.8	284.4	315.5	5	
Palampur-1 (ZC-HZ)									
OL-125 (ZC-NWZ)									
JHO-99-2 (ZC-NEZ)	373.7	252.7	376.7	389.0	457.5	317.9	361.2	3	
HO-822 (ZC-CZ)									
JHO 2000-4 (ZC-SZ)									
Mean	328.7	275.9	330.0	427.1	329.8	294.3	331.0		
CD at 5%	10.5	3.7	45.1	42.7	56.4	27.9			
CV%	11.8	3.7	7.8	12.8	9.8	5.4			

Table 4.1 : AVTO (SC)- 2 - Second Advanced Varietal Trial in Oat (Single cut) : Green Forage Yield (q/ha)

Cont…

Entries	Central Zone								
	Jhansi	Rahuri	Urulikanchan	Kanpur	Anand	Jabalpur	Average	Rank	Superiority%
JO-03-93	647.2	485.9	430.4	719.4	803.0	608.0	615.7	1	12.6
SKO-90	348.8	420.6	670.4	591.7	594.0	393.0	503.1	7	
SKO-105	334.2	367.5	582.8	575.0	664.0	349.0	478.7	8	
SKO-109	383.9	416.5	628.5	527.8	686.0	390.0	505.4	6	
NDO-25	694.4	441.0	552.3	658.3	715.0	530.0	598.5	2	9.4
OS-6 (NC)	550.0	396.1	457.1	630.6	621.0	569.0	537.3	4	
Kent (NC)	497.2	322.6	460.9	669.4	814.0	517.0	546.9	3	
Palampur-1 (ZC-HZ)									
OL-125 (ZC-NWZ)									
JHO-99-2 (ZC-NEZ)									
JHO-822 (ZC-CZ)	469.4	522.7	506.6	552.8	574.0	485.0	518.4	5	
JHO 2000-4 (ZC-SZ)									
Mean	490.6	421.6	536.1	615.6	683.9	480.1	538.0		
CD at 5%	30.7	69.5	24.5	108.8	81.0	127.9			
CV%	3.5	9.4	15.6	8.7	6.8	15.2			

Table 4.1 : AVTO (SC)- 2 - Second Advanced Varietal Trial in Oat (Single cut) : Green Forage Yield (q/ha)

Entries	South Zone						All India		
	Hyderabad	Mandya	Coimbatore	Average	Rank	Superiority%	Avarage	Rank	Superiority%
JO-03-93	485.9	250.8	422.2	386.3	3		454.1	1	10.5
SKO-90	297.1	260.4	375.0	310.8	7		392.2	5	
SKO-105	305.4	255.4	413.9	324.9	6		380.3	7	
SKO-109	149.9	251.5	461.1	287.5	8		388.8	6	
NDO-25	547.0	222.6	405.5	391.7	2		432.6	2	5.2
OS-6 (NC)	452.6	182.7	447.2	360.8	4		411.1	3	
Kent (NC)	541.5	219.9	422.2	394.6	1		401.3	4	
Palampur-1 (ZC-HZ)									
OL-125 (ZC-NWZ)									
JHO-99-2 (ZC-NEZ)									
JHO-822 (ZC-CZ)									
JHO 2000-4 (ZC-SZ)	480.4	230.4	361.1	357.3	5				
Mean	407.5	234.2	413.5	351.7			408.6		
CD at 5%	68.1	31.4	NS						
CV%	9.5	7.7	12.2						

Table 4.2 : AVTO (SC)- 2 - Second Advanced Varietal Trial in Oat (Single cut) : Dry Matter Yield (q/ha)

Cont…

Entries	Hill Zone						North-West Zone							
	Palam-pur	Srin-agar	Rajo-uri	Aver-age	Rank-	Super-iority%	Bika-ner	His-ar	Ludh-iana	Pantn-agar	Mee-rut	Aver-age	Rank	Superi ority%
JO-03-93	50.5	114.9	29.1	64.8	3	6.2	54.5	179.6	75.8	111.0	150.2	114.2	2	
SKO-90	38.8	126.9	35.8	67.2	2	10.2	43.8	92.1	88.7	105.6	163.6	98.8	5	
SKO-105	46.5	121.3	39.6	69.1	1	13.3	38.4	84.0	89.4	113.2	139.3	92.8	6	
SKO-109	36.5	122.0	32.9	63.8	4	4.6	42.5	100.9	98.3	129.9	126.1	99.5	4	
NDO-25	49.6	84.6	25.1	53.1	7		61.9	117.5	71.7	124.9	146.8	104.6	3	
OS-6 (NC)	49.3	94.8	25.2	56.5	6		43.9	83.6	58.0	104.3	151.5	88.3	8	
Kent (NC)	47.4	83.9	21.9	51.1	8		44.1	96.9	62.1	113.3	141.8	91.6	7	
Palampur-1 (ZC-HZ)	63.3	84.0	35.7	61.0	5									
OL-125 (ZC-NWZ)							85.8	176.6	82.3	109.8	149.2	120.7	1	
JHO-99-2 (ZC-NEZ)														
JHO-822 (ZC-CZ)														
JHO 2000-4 (ZC-SZ)														
Mean	47.7	104.1	30.7	60.8			51.9	116.4	78.3	114.0	146.0	101.3		
CD at 5%	12.9	3.9	4.2				16.3	7.1	1.6	10.7	39.1			
CV%	15.4	2.2	7.8				17.9	3.5	11.8	5.6	15.1			

Table 4.2 : AVTO (SC)- 2 - Second Advanced Varietal Trial in Oat (Single cut) : Dry Matter Yield (q/ha)

Cont…

Entries	North-East Zone								
	Jorhat	Bhubaneswar	Ranchi	Pusa	Faizabad	Imphal	Average	Rank	Superiority%
JO-03-93	64.3	58.8	86.7	83.4	110.5	50.6	75.7	4	
SKO-90	72.5	57.5	69.7	66.4	42.3	66.6	62.5	7	
SKO-105	57.8	54.1	62.5	66.4	29.0	65.9	55.9	8	
SKO-109	68.4	54.1	99.7	81.2	35.1	57.3	66.0	5	
NDO-25	74.1	59.1	68.0	74.6	124.6	56.4	76.1	2	
OS-6 (NC)	63.2	55.0	83.4	82.4	120.6	78.1	80.5	1	
Kent (NC)	48.7	57.6	87.9	72.1	72.8	52.7	65.3	6	
Palampur-1 (ZC-HZ)									
OL-125 (ZC-NWZ)									
JHO-99-2 (ZC-NEZ)	72.4	51.3	99.0	66.1	109.3	56.5	75.8	3	
JHO-822 (ZC-CZ)									
JHO 2000-4 (ZC-SZ)									
Mean	65.2	55.9	82.1	74.1	80.5	60.5	69.7		
CD at 5%	6.5	4.2	16.1	8.9	15.8	9.5			
CV%	16.3	4.5	11.2	11.4	11.3	8.9			

Table 4.2 : AVTO (SC)- 2 - Second Advanced Varietal Trial in Oat (Single cut) : Dry Matter Yield (q/ha)

Cont…

Entries	Central Zone								
	Jhansi	Rahuri	Urulikanchan	Kanpur	Anand	Jabalpur	Average	Rank	Superiority%
JO-03-93	116.5	70.0	80.8	244.2	147.7	142.0	133.5	1	7.3
SKO-90	83.4	63.0	127.6	201.1	110.6	90.0	112.6	7	
SKO-105	87.2	64.8	100.0	195.6	114.0	81.0	107.1	8	
SKO-109	96.7	73.1	117.8	179.4	124.9	89.0	113.5	5	
NDO-25	145.8	64.5	98.6	224.2	115.9	124.0	128.8	2	3.5
OS-6 (NC)	101.3	61.3	84.6	213.9	121.7	131.0	119.0	4	
Kent (NC)	91.3	51.6	85.7	227.8	170.9	119.0	124.4	3	
Palampur-1 (ZC-HZ)									
OL-125 (ZC-NWZ)									
JHO-99-2 (ZC-NEZ)									
JHO-822 (ZC-CZ)	94.0	87.3	88.0	188.1	110.7	111.1	113.2	6	
JHO 2000-4 (ZC-SZ)									
Mean	102.0	67.0	97.9	209.3	127.1	110.9	119.0		
CD at 5%	7.3	11.2	11.8	85.3	15.2	26.4			
CV%	4.1	9.5	17.1	5.3	6.8	13.6			

Table 4.2 : AVTO (SC)- 2 - Second Advanced Varietal Trial in Oat (Single cut) : Dry Matter Yield (q/ha)

Entries	South Zone						All India Average		
	Hyderabad	Mandya	Coimbatore	Average	Rank	Superiority%	Avarage	Rank	Superiority%
JO-03-93	88.8	46.8	75.2	70.2	4		97.0	1	8.4
SKO-90	80.6	51.3	61.2	64.4	6		84.3	6	
SKO-105	74.7	48.1	69.0	64.0	7		80.1	7	
SKO-109	49.3	49.7	83.5	60.8	8		84.7	4	
NDO-25	93.2	51.3	70.0	71.5	2		92.5	2	3.3
OS-6 (NC)	128.2	45.0	77.6	83.6	1		89.5	3	
Kent (NC)	93.2	32.3	70.6	65.4	5		84.6	5	
Palampur-1 (ZC-HZ)									
OL-125 (ZC-NWZ)									
JHO-99-2 (ZC-NEZ)									
JHO-822 (ZC-CZ)									
JHO 2000-4 (ZC-SZ)	98.1	58.0	57.4	71.2	3				
Mean	88.3	47.8	70.6	68.9			87.5		
CD at 5%	28.1	6.0	13.0						
CV%	18.2	7.2	10.5						

Table 4.3 : AVTO (SC)- 2 - Second Advanced Varietal Trial in Oat (Single cut) : Green Forage Yield (q/ha/day)

Cont…

Entries	Rah-uri	Bhuban-eswar	Ludhi-ana	Palam-pur	Coimba-tore	Ran-chi	Hydera-bad	Jabal-pur	His-ar	Ana-nd	Kan-pur	Bika-ner
JO-03-93	5.40	3.86	3.66	2.55	6.03	4.47	6.12	6.40	6.73	9.13	8.67	2.86
SKO-90	3.82	3.69	3.42	1.03	5.77	2.19	2.68	2.97	5.43	5.40	6.23	2.05
SKO-105	3.06	3.59	3.45	1.31	6.09	2.00	2.67	2.58	5.36	6.04	6.05	1.76
SKO-109	3.50	3.65	3.70	1.08	7.09	4.52	1.32	3.95	4.78	6.23	5.56	1.72
NDO-25	5.38	3.74	3.56	2.01	5.96	2.21	8.29	5.24	5.77	8.82	7.84	2.77
OS-6 (NC)	4.89	3.73	2.96	2.11	6.48	3.62	6.34	6.05	6.17	7.67	7.60	
Kent (NC)	3.80	3.73	3.17	2.21	6.03	4.20	6.78	5.44	4.82	9.25	8.37	2.21
Palampur-1 (ZC-HZ)				1.79								
OL-125 (ZC-NWZ)			3.87						7.24			2.95
JHO-99-2 (ZC-NEZ)		3.53				4.09						
JHO-822 (ZC-CZ)	6.01							4.66		7.09	7.00	
JHO 2000-4 (ZC-SZ)					5.02		6.87					
Mean	4.48	3.69	3.47	1.76	6.06	3.41	5.13	4.66	5.79	7.45	7.17	2.29

Table 4.3 : AVTO (SC)- 2 - Second Advanced Varietal Trial in Oat (Single cut) : Green Forage Yield (q/ha/day)

Entries	Faizabad	Jorhat	Mandya	Imphal	Urulikanchan	Pusa	Jhansi	Pantnagar	Average	Rank
JO-03-93	4.61	3.58	3.06	3.08	5.13	4.70	7.27	5.04	5.12	1
SKO-90	1.25	2.91	2.41	2.55	6.15	4.00	2.75	5.09	3.59	6
SKO-105	1.08	2.48	2.18	2.29	5.50	3.60	2.63	5.21	3.45	7
SKO-109	1.10	2.81	2.15	2.27	5.77	4.60	3.02	4.12	3.65	5
NDO-25	4.93	4.19	3.37	2.90	7.37	4.20	6.81	5.75	5.06	2
OS-6 (NC)	4.88	4.00	2.81	3.12	6.18	4.50	6.23	4.87	4.81	3
Kent (NC)	3.24	2.88	2.73	2.96	5.62	3.80	5.67	5.19	4.61	4
Palampur-1 (ZC-HZ)										
OL-125 (ZC-NWZ)								3.90		
JHO-99-2 (ZC-NEZ)	4.39	4.31		3.31		3.80				
JHO-822 (ZC-CZ)					6.85		5.35			
JHO 2000-4 (ZC-SZ)			3.40							
Mean	3.19	3.40	2.76	2.81	6.07	4.15	4.97	4.90	4.32	

Table 4.4 : AVTO (SC)- 2 - Second Advanced Varietal Trial in Oat (Single cut) : Dry Matter Yield (q/ha/day)

Cont…

Entries	Rah-uri	Bhuban-eswar	Ludh-iana	Coimb-atore	Ran-chi	Hydera-bad	Jabal-pur	Ludhi-ana	His-ar	Ana-nd	Kan-pur
JO-03-93	0.78	0.79	0.68	1.07	0.98	1.12	1.49	0.68	1.48	1.68	2.94
SKO-90	0.57	0.75	0.67	0.94	0.61	0.72	0.68	0.67	0.71	1.01	2.12
SKO-105	0.54	0.72	0.67	1.02	0.54	0.65	0.60	0.67	0.64	1.04	2.06
SKO-109	0.61	0.74	0.74	1.28	1.15	0.43	0.89	0.74	0.76	1.14	1.89
NDO-25	0.79	0.75	0.64	1.03	0.59	1.41	1.19	0.64	1.04	1.43	2.67
OS-6 (NC)	0.76	0.75	0.52	1.12	0.79	1.80	1.37	0.52	0.74	1.50	2.58
Kent (NC)	0.61	0.76	0.55	1.01	1.03	1.17	1.25	0.55	0.77	1.94	2.85
Palampur-1 (ZC-HZ)				0.80							
OL-125 (ZC-NWZ)			0.74					0.74	1.45		
JHO-99-2 (ZC-NEZ)		0.72			1.08						
JHO-822 (ZC-CZ)	1.00						1.06			1.37	2.38
JHO 2000-4 (ZC-SZ)						1.41					
Mean	0.71	0.75	0.65	1.03	0.85	1.09	1.07	0.65	0.95	1.39	2.44

Table 4.4 : AVTO (SC)- 2 - Second Advanced Varietal Trial in Oat (Single cut) : Dry Matter Yield (q/ha/day)

Entries	Bikaner	Faizabad	Jorhat	Urulikanchan	Pusa	Jhansi	Pantnagar	Average	Rank
JO-03-93	0.53	1.09	0.73	0.96	0.81	1.31	1.02	1.12	1
SKO-90	0.40	0.36	0.60	1.17	0.66	0.66	0.97	0.79	6
SKO-105	0.35	0.23	0.48	0.94	0.64	0.69	1.04	0.75	7
SKO-109	0.39	0.29	0.56	1.08	0.78	0.76	0.92	0.84	5
NDO-25	0.61	1.26	0.84	1.31	0.73	1.43	1.14	1.08	2
OS-6 (NC)	0.43	1.21	0.74	1.14	0.81	1.15	0.95	1.05	3
Kent (NC)	0.43	0.73	0.57	1.05	0.69	1.04	1.04	1.00	4
Palampur-1 (ZC-HZ)									
OL-125 (ZC-NW)	0.84						0.78		
JHO-99-2 (ZC-NE)		1.05	0.83		0.64				
JHO-822 (ZC-CZ)				1.19		1.07			
JHO 2000-4 (ZC-SZ)									
Mean	0.50	0.78	0.67	1.11	0.72	1.01	0.98	0.95	

Table 4.5 : AVTO (SC)- 2 - Second Advanced Varietal Trial in Oat (Single cut) : Crude Protein Yield (q/ha)

Cont…

Entries	Rahuri	Bhubaneswar	Ludhiana	Palampur	Coimbatore	Hisar	Ranchi	Jabalpur	Hyderabad
JO-03-93	5.4	6.2	6.6	5.3	5.4	16.9	6.1	11.8	11.3
SKO-90	5.8	5.9	7.7	4.5	4.4	10.1	5.8	7.1	10.6
SKO-105	5.7	5.5	5.9	4.7	5.2	8.9	4.7	6.3	10.2
SKO-109	5.1	5.5	7.0	3.9	6.4	11.5	8.7	7.1	6.7
NDO-25	5.4	6.2	5.1	4.6	5.2	14.9	5.1	10.2	10.5
OS-6 (NC)	5.1	5.8	5.3	5.2	5.5	8.9	6.9	10.8	15.6
Kent (NC)	4.3	5.8	4.4	5.3	5.3	11.9	6.9	9.8	13.1
Palampur-1 (ZC-HZ)				6.1					
OL-125 (ZC-NWZ)			6.7			19.5			
JHO-99-2 (ZC-NEZ)		5.3					7.4		
JHO-822 (ZC-CZ)	6.8							8.9	
JHO 2000-4 (ZC-SZ)					4.2				13.9
Mean	5.4	5.8	6.1	5.0	5.2	12.8	6.4	9.0	11.5

Table 4.5 : AVTO (SC)- 2 - Second Advanced Varietal Trial in Oat (Single cut) : Crude Protein Yield (q/ha)

Entries	Ludhiana	Anand	Faizabad	Jorhat	Mandya	Imphal	Urulikanchan	Average	Rank
JO-03-93	6.6	14.2	9.4	5.0	2.5	3.2	5.7	7.6	1
SKO-90	7.7	13.7	3.0	6.1	2.6	5.4	9.7	6.9	4
SKO-105	5.9	14.2	2.0	5.9	2.4	5.6	6.7	6.2	6
SKO-109	7.0	11.9	2.4	5.7	2.7	3.9	8.2	6.5	5
NDO-25	5.1	11.6	11.0	6.1	2.4	3.9	7.4	7.2	3
OS-6 (NC)	5.3	13.4	10.5	5.5	2.4	5.6	6.6	7.4	2
Kent (NC)	4.4	17.1	5.4	4.4	2.3	4.6	6.1	6.9	4
Palampur-1 (ZC-HZ)									
OL-125 (ZC-NWZ)	6.7	9.5							
JHO-99-2 (ZC-NEZ)			9.2	7.4		4.9			
JHO-822 (ZC-CZ)							6.7		
JHO 2000-4 (ZC-SZ)					3.3				
Mean	6.1	13.2	6.6	5.8	2.6	4.6	7.1	7.0	

Table 4.6 : AVTO (SC)- 2 - Second Advanced Varietal Trial in Oat (Single cut) : Plant Height (cm)

Cont…

Entries	Rah-uri	Bhuban-eswar	Ludhi-ana	Palam-pur	Coimb-atore	Ran-chi	Rajo-uri	Hydera-bad	Jabal-pur	His-ar	Ana-nd
JO-03-93	117.0	128.8	101.7	100.0	125.0	117.5	131.3	80.6	154.4	148.0	138.6
SKO-90	101.0	123.5	94.0	85.7	105.0	84.5	82.7	69.2	132.2	88.9	134.2
SKO-105	98.0	115.0	79.7	77.0	115.0	78.2	82.0	60.6	140.9	69.7	125.2
SKO-109	91.0	114.3	81.3	72.0	140.0	117.3	77.7	57.6	135.5	78.7	128.2
NDO-25	100.0	134.0	103.3	98.3	110.0	78.5	132.7	93.1	139.6	145.2	125.0
OS-6 (NC)	113.0	117.6	103.3	95.3	132.0	115.9	132.3	96.3	147.3	154.0	131.8
Kent (NC)	99.0	127.1	110.0	98.3	120.0	114.5	116.0	80.2	141.1	110.7	118.4
Palampur-1 (ZC-HZ)				125.7			115.0				
OL-125 (ZC-NWZ)			100.0							139.3	
JHO-99-2 (ZC-NEZ)		109.0				115.1					
JHO-822 (ZC-CZ)	119.0								134.6		125.1
JHO 2000-4 (ZC-SZ)					100.0			95.2			
Mean	104.8	121.2	96.7	94.0	118.4	102.7	108.7	79.1	140.7	116.8	128.3

Table 4.6 : AVTO (SC)- 2 - Second Advanced Varietal Trial in Oat (Single cut) : Plant Height (cm)

Entries	Jal-ore	Kan-pur	Bika-ner	Faiza-bad	Jor-hat	Man-dya	Imp-hal	Urulika-nchan	Jha-nsi	Pu-sa	Pant-nagar	Srina-gar	Aver-age	Rank
JO-03-93	135.7	113.2	112.7	142.4	155.1	90.1	96.9	124.0	154.0	159.0	166.5	116.7	126.5	2
SKO-90	110.0	94.7	68.0	84.5	115.1	79.9	68.6	123.3	127.0	134.0	156.9	127.1	103.9	5
SKO-105	98.0	79.0	61.7	64.6	107.3	80.7	67.2	119.1	116.3	123.0	161.1	125.2	97.6	7
SKO-109	118.0	75.7	79.7	75.8	122.3	86.3	63.4	104.3	121.0	138.0	160.5	131.8	103.1	6
NDO-25	144.7	114.1	110.1	143.7	171.3	81.0	90.7	120.9	160.0	152.0	155.1	123.3	122.9	3
OS-6 (NC)	151.0	109.0	100.5	145.6	157.1	87.7	102.5	125.3	164.3	160.0	166.9	110.9	126.9	1
Kent (NC)	130.7	105.0	97.9	101.2	137.4	86.3	88.5	110.8	162.0	149.0	164.2	126.4	117.2	4
Palampur-1 (ZC-HZ)												114.5		
OL-125 (ZC-NWZ)	143.3		98.9								153.7			
JHO-99-2 (ZC-NEZ)				125.8	177.9		86.7			151.0				
JHO-822 (ZC-CZ)		102.3						103.2	160.7					
JHO 2000-4 (ZC-SZ)						81.1								
Mean	128.9	99.1	91.2	110.5	143.0	84.1	83.1	116.4	145.7	145.8	160.6	122.0	114.0	

Table 4.7 : AVTO (SC)- 2 - Second Advanced Varietal Trial in Oat (Single cut) : Crude Protein Content (CP%)

Cont…

Entries	Rahuri	Bhubaneswar	Ludhiana	Palampur	Coimbatore	Hisar	Ranchi	Hyderabad	Ludhiana
JO-03-93	7.8	10.5	8.7	10.5	7.2	9.4	7.0	12.7	8.7
SKO-90	9.2	10.3	8.7	11.1	7.1	11.0	8.3	13.1	8.7
SKO-105	8.8	10.3	6.6	10.2	7.6	10.6	7.4	13.6	6.6
SKO-109	7.0	10.2	7.1	10.8	7.6	11.4	8.8	13.6	7.1
NDO-25	8.3	10.5	7.1	9.3	7.5	12.7	7.4	11.4	7.1
OS-6 (NC)	8.3	10.7	9.2	10.5	7.1	10.6	8.3	12.4	9.2
Kent (NC)	8.3	10.2	7.1	11.1	7.5	12.2	7.9	14.0	7.1
Palampur-1 (ZC-HZ)				9.6					
OL-125 (ZC-NWZ)	7.8		8.2			11.0			8.2
JHO-99-2 (ZC-NEZ)		10.4					7.4		
JHO-822 (ZC-CZ)									
JHO 2000-4 (ZC-SZ)					7.2			14.0	
Mean	8.2	10.4	7.8	10.4	7.4	11.1	7.8	13.1	7.8

Table 4.7 : AVTO (SC)- 2 - Second Advanced Varietal Trial in Oat (Single cut) : Crude Protein Content (CP%)

Entries	Anand	Bikaner	Faizabad	Jabalpur	Jorhat	Mandya	Imphal	Urulikanchan	Average	Rank
JO-03-93	9.6	18.7	8.5	11.8	7.8	5.3	6.4	7.0	9.3	5
SKO-90	12.4	19.6	7.2	7.1	8.4	5.0	8.1	7.6	9.6	3
SKO-105	12.3	20.1	6.8	6.3	10.2	5.0	8.5	6.7	9.3	5
SKO-109	9.5	22.6	6.9	7.1	8.4	5.5	6.7	7.0	9.3	5
NDO-25	10.0	21.9	8.8	10.2	8.3	4.6	6.5	7.5	9.4	4
OS-6 (NC)	11.0	21.5	8.7	10.8	8.8	5.3	7.0	7.8	9.8	1
Kent (NC)	10.0	19.8	7.4	9.8	9.1	7.0	8.7	7.2	9.7	2
Palampur-1 (ZC-HZ)										
OL-125 (ZC-NWZ)		28.4								
JHO-99-2 (ZC-NEZ)			8.4		10.4		8.6			
JHO-822 (ZC-CZ)	8.6			8.9				7.6		
JHO 2000-4 (ZC-SZ)						5.7				
Mean	10.4	21.6	7.8	9.0	8.9	5.4	7.6	7.3	9.5	

Table 4.8 : AVTO (SC)- 2 – Second Advanced Varietal Trial in Oat (Single cut) : Leaf Stem Ratio

Cont…

Entries	Rahuri	Bhubaneswar	Ludhiana	Palampur	Coimbatore	Ranchi	Hyderabad	Jabalpur	Ludhiana	Anand
JO-03-93	0.71	0.93	0.54	0.50	0.65	0.27	0.55	0.78	0.54	0.67
SKO-90	1.07	0.93	0.67	0.52	0.81	0.25	0.74	0.57	0.67	0.65
SKO-105	1.14	0.91	0.82	0.56	0.63	0.26	0.84	0.51	0.82	0.55
SKO-109	1.00	0.93	0.74	0.64	0.74	0.28	0.71	0.59	0.74	0.61
NDO-25	0.53	0.99	1.00	0.52	0.62	0.46	0.42	0.70	1.00	0.56
OS-6 (NC)	0.66	0.90	0.60	0.50	0.63	0.27	0.32	0.72	0.60	0.58
Kent (NC)	0.69	0.93	0.54	0.50	0.64	0.23	0.43	0.65	0.54	0.74
Palampur-1 (ZC-HZ)				0.51						
OL-125 (ZC-NWZ)			0.74						0.74	
JHO-99-2 (ZC-NEZ)		0.90				0.24				
JHO-822 (ZC-CZ)	0.53							0.64		0.62
JHO 2000-4 (ZC-SZ)					0.61		0.35			
Mean	0.79	0.93	0.71	0.53	0.67	0.28	0.55	0.65	0.71	0.62

Table 4.8 : AVTO (SC)- 2 - Second Advanced Varietal Trial in Oat (Single Cut) : Leaf Stem Ratio

Entries	Kanpur	Bikaner	Faizabad	Jorhat	Mandya	Imphal	Urulikanchan	Jhansi	Pusa	Pantnagar	Average	Rank
JO-03-93	0.39	0.53	0.86	0.65	0.32	0.71	0.57	0.38	0.99	0.38	0.60	5
SKO-90	0.50	1.04	0.63	0.73	0.31	0.75	0.86	0.31	0.85	0.34	0.66	3
SKO-105	0.50	0.99	0.69	0.63	0.25	1.00	1.05	0.33	0.82	0.41	0.69	1
SKO-109	0.60	0.97	0.87	0.67	0.31	0.92	0.73	0.29	0.84	0.40	0.68	2
NDO-25	0.32	0.50	0.84	0.48	0.22	0.66	0.88	0.33	0.89	0.46	0.62	4
OS-6 (NC)	0.31	0.51	0.81	0.55	0.17	0.47	0.81	0.27	0.99	0.35	0.55	7
Kent (NC)	0.34	0.68	0.75	0.51	0.26	0.85	0.59	0.32	0.89	0.32	0.57	6
Palampur-1 (ZC-HZ)												
OL-125 (ZC-NWZ)		0.58								0.40		
JHO-99-2 (ZC-NEZ)			0.81	0.51		0.77			0.87			
JHO-822 (ZC-CZ)	0.36						0.83	0.29				
JHO 2000-4 (ZC-SZ)					0.16							
Mean	0.42	0.73	0.78	0.59	0.25	0.77	0.79	0.32	0.89	0.38	0.62	

Table 4.9 : AVTO (SC)- 2 - Second Advanced Varietal Trial in Oat (Single cut) : IVDMD (%)

Entries	Rahuri	Ludhiana	Palampur	Hisar	Ranchi	Anand	Average	Rank
JO-03-93	64.6	59.0	58.6	51.2	63.2	48.6	57.5	5
SKO-90	68.6	58.8	59.4	52.4	68.2	57.2	60.8	1
SKO-105	67.4	56.0	60.2	50.8	69.8	51.3	59.3	3
SKO-109	62.2	57.4	59.4	53.6	64.6	54.2	58.6	4
NDO-25	68.2	57.0	59.0	51.2	66.4	48.8	58.4	6
OS-6 (NC)	68.2	60.2	58.0	49.2	60.8	55.4	58.6	4
Kent (NC)	65.6	57.0	60.4	52.4	67.2	55.0	59.6	2
Palampur-1 (ZC-HZ)			60.0					
OL-125 (ZC-NWZ)		58.5		52.4		57.6		
JHO-99-2 (ZC-NEZ)					59.8			
JHO-822 (ZC-CZ)	64.6							
JHO 2000-4 (ZC-SZ)								
Mean	66.2	58.0	59.4	51.7	65.0	53.5	59.0	

Table 4.10 : AVTO (SC)- 2 - Second Advanced Varietal Trial in Oat (Single cut) : ADF (%) & NDF (%)

Entries	ADF (%)						NDF (%)						
	Rahuri	Ludhiana	Palampur	Ranchi	Average	Rank	Rahuri	Ludhiana	Palampur	Ranchi	Anand	Average	Rank
JO-03-93	42.4	34.6	49.6	43.4	42.5	2	59.2	55.2	61.4	62.2	68.0	61.2	7
SKO-90	43.4	35.5	48.4	40.6	42.0	1	58.6	56.0	60.0	60.8	64.0	59.9	3
SKO-105	47.6	37.2	49.2	39.8	43.5	5	62.4	54.8	57.8	59.8	63.0	59.6	2
SKO-109	45.7	34.8	48.4	42.7	42.9	3	60.8	54.4	60.2	62.6	62.0	60.0	4
NDO-25	44.3	35.5	48.2	41.8	42.5	2	61.8	55.2	62.2	61.8	62.0	60.6	5
OS-6 (NC)	41.8	36.0	49.2	44.8	43.0	4	57.4	55.5	25.2	63.4	65.0	53.3	1
Kent (NC)	43.0	36.6	47.0	45.2	43.0	4	58.4	56.6	59.2	61.8	68.0	60.8	6
Palampur-1 (ZC-HZ)			48.0						60.4				
OL-125 (ZC-NWZ)		36.6						55.8					
JHO-99-2 (ZC-NEZ)				44.2						63.4			
JHO-822 (ZC-CZ)	44.2						61.2				64.0		
JHO 2000-4 (ZC-SZ)													
Mean	44.1	35.9	48.5	42.8	42.7		60.0	55.4	55.8	62.0	64.5	59.3	

5. AVTO (SC)- 2 (Seed) : ADVANCED VARIETAL TRIAL IN OAT (SINGLE CUT) FOR SEED

(Table Reference : 5)

Results of the advanced varietal trial in Oat (single cut) with five entries i.e. JO-03-93, SKO-109, SKO-90, SKO-105 and NDO-25 along with two national checks i.e. Kent and OS-6 and zonal checks for respective zones i.e. Palampur-1, OL-125, JHO-99-2, JHO-822 and JHO-2000-4 conducted at sixteen locations distributed in five zones of the country revealed that for seed yield (q/ha), none of the entries was found superior over respective checks at zonal or at the national level. Both national checks have maintained their superiority in seed yield. At national level, seed yield of OS-6 was 19.5 q/ha which was closely followed by Kent (19.4 q/ha).

Table 5 : AVTO (SC)- 2 (Seed) - Advanced Varietal Trial in Oat (Single cut) for Seed : Seed Yield (q/ha)

Cont…

Entries	Hill Zone					North-West Zone						
	Palampur	Srinagar	Average	Rank	Superiority%	Bikaner	Hisar	Ludhiana	Pantnagar	Average	Rank	Superiority%
JO-03-93	30.6	24.4	27.5	3		19.8	41.7	6.1	13.6	20.3	2	
SKO-109	18.3	34.0	26.2	4		1.3	25.0	5.6	14.4	11.6	8	
SKO-90	16.0	39.3	27.6	2		1.7	27.8	10.4	12.7	13.1	6	
SKO-105	15.7	36.3	26.0	5		1.3	33.3	7.2	9.8	12.9	7	
NDO-25	15.9	29.2	22.6	6		12.2	27.8	9.4	6.8	14.0	5	
Kent (NC)	17.8	26.7	22.2	7		17.4	41.7	13.6	11.7	21.1	1	
OS-6 (NC)	28.4	30.2	29.3	1		14.9	27.8	7.1	12.3	15.5	3	
Palampur-1 (ZC-HZ)	14.9	24.2	19.5	8								
OL-125 (ZC-NWZ)						6.5	27.8	10.6	15.2	15.0	4	
JHO-99-2 (ZC-NEZ)												
JHO-822 (ZC-CZ)												
JHO-2000-4 (ZC-SZ)												
Mean	19.7	30.5	25.1			9.4	31.6	8.8	12.1	15.4		
CD at 5%	3.6	2.8				3.0	6.1	0.3	1.6			
CV%	10.5	5.3				18.4	10.9	17.3	9.0			

Table 5 : AVTO (SC)- 2 (Seed) - Advanced Varietal Trial in Oat (Single cut) for Seed : Seed Yield (q/ha)

Cont…

Entries	North-East Zone						Central Zone							
	Ran-chi	Jor-hat	Bhuban-eswar	Aver-age	Rank	Superi-ority%	Jha-nsi	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Aver-age	Ra-nk	Superi-ority%
JO-03-93	25.3	13.0	12.5	16.9	4		17.6	16.5	8.5	11.2	29.1	16.6	5	
SKO-109	24.7	13.3	12.3	16.8	5		6.3	1.1	9.4	4.8	25.8	9.5	7	
SKO-90	28.3	13.0	13.6	18.3	3		8.8	1.8	12.1	4.9	21.8	9.8	6	
SKO-105	26.3	14.8	15.1	18.7	2		4.5	3.7	8.4	4.3	15.9	7.4	8	
NDO-25	22.0	12.7	12.7	15.8	7		17.9	28.2	9.0	21.6	18.0	18.9	4	
Kent (NC)	23.3	13.0	13.4	16.6	6		24.6	28.0	13.8	22.2	32.3	24.2	2	
OS-6 (NC)	30.3	14.2	14.7	19.7	1		26.9	25.4	11.2	27.1	31.3	24.4	1	
Palampur-1 (ZC-HZ)														
OL-125 (ZC-NWZ)														
JHO-99-2 (ZC-NEZ)	20.0	11.0	13.7	14.9	8									
JHO-822 (ZC-CZ)							27.5	23.2	10.9	18.2	33.3	22.6	3	
JHO-2000-4 (ZC-SZ)														
Mean	25.0	13.1	13.5	17.2			16.8	16.0	10.4	14.3	25.9	16.7		
CD at 5%	4.7	1.0	0.2				2.8	4.7	1.3	2.2	6.1			
CV%	10.8	5.8	4.9				9.3	16.9	18.1	8.7	13.4			

Table 5 : AVTO (SC)- 2 (Seed) - Advanced Varietal Trial in Oat (Single cut) for Seed : Seed Yield (q/ha)

Entries	South Zone					All India		
	Hyderabad	Mandya	Average	Rank	Superiority%	Average	Rank	Superiority%
JO-03-93	2.9	7.6	5.3	2		17.5	3	
SKO-109	2.3	1.5	1.9	7		12.5	5	
SKO-90	1.9	3.4	2.7	6		13.6	7	
SKO-105	1.3	1.8	1.6	8		12.5	6	
NDO-25	4.6	4.3	4.5	5		15.8	4	
Kent (NC)	4.2	6.8	5.5	1		19.4	2	
OS-6 (NC)	4.0	6.1	5.1	3		19.5	1	
Palampur-1 (ZC-HZ)								
OL-125 (ZC-NWZ)								
JHO-99-2 (ZC-NEZ)								
JHO-822 (ZC-CZ)								
JHO-2000-4 (ZC-SZ)	3.9	5.5	4.7	4				
Mean	3.1	4.6	3.9			15.8		
CD at 5%	0.6	0.7						
CV%	10.7	8.8						

6. IVTO (MC) : INITIAL VARIETAL TRIAL IN OAT (MULTI CUT)

(Table Reference : 6.1 to 6.9)

An initial varietal trial in oat (Multi cut) comprising five entries along with three national checks i.e. Kent, UPO-212 and RO-19 and three zonal checks for respective zones i.e. Palampur-1, JHO-2000-4 and JHO-822 was conducted at 16 centers located in four zones *viz*, Hill zone, North-West zone, North-East zone and Central zone. Results of the trial clearly indicated that for green forage yield (q/ha) entries UPO-09-3 (15.6%), JO-03-307 (13.4%) and JHO-2009-3 (11.8%) proved their superiority over national check in Hill zone. However none of the entries performed better than national check in North-West zone, in North-East zone entry OS-376 (0.9%) was at par with national check and in Central zone entry JO-03-307 (3.9%) was better than national check whereas entry UPO-09-3 (0.5%) was at par with national check. Coming to the national level, entries JO-03-307 (3.9%) and UPO-09-3 (1.7%) proved their superiority over best performing national check.

Similarly for the character dry matter yield (q/ha), entries JHO-2009-3 (26.5%), UPO-09-3 (18.9%) and JO-03-307 (16.9%) in Hill zone, entry OS-376 (2.0%) in North-West zone and JO-03-307 (0.8%) in Central zone performed better than the national check. In North-East zone, none of the entries performed better than the national check. At national level, entry JO-03-307 (4.1%) followed by UPO-09-3 (2.2%) was recorded for superiority over national check.

For the character forage production potential (q/ha/day), entries JO-03-307, UPO-09-3 and JHO-2009-3 for green forage and entries UPO-09-03 and OS-376 for dry matter was recorded good performer with respect to national check. For evaluation against growth parameter i.e. plant height (cm), national check RO-19 (100.8 cm) maintained superiority over other testing entries.

In quality parameters, entry JO-03-307 was adjudged best performer for crude protein yield (q/ha), OL-169 for leaf stem ratio whereas national check Kent surpassed all the entries for the character crude protein content (%) and IVDMD (%).

Table 6.1 : IVTO (MC) - Initial Varietal Trial in Oat (Multi cut) : Green Forage Yield (q/ha)

Cont…

Entries	Hill Zone					North-West Zone						
	Palam-pur	Srin-agar	Aver-age	Rank	Super-iority%	Pantn-agar	His-ar	Jal-ore	Ludh-iana	Aver-age	Rank	Super-iority%
JO-03-307	300.9	445.1	373.0	2	13.4	464.8	1007.3	626.8	681.5	695.1	3	
UPO-09-3	241.2	520.0	380.6	1	15.6	494.8	933.2	599.0	663.0	672.5	6	
OL-1694	220.3	317.1	268.7	9		455.6	959.2	617.0	672.3	676.0	5	
JHO-2009-3	273.6	462.2	367.9	3	11.8	480.6	962.9	641.2	594.5	669.8	7	
OS-376	237.4	369.6	303.5	7		488.9	940.7	659.3	631.5	680.1	4	
Kent (NC)	269.8	370.8	320.3	5		616.6	848.1	550.2	657.5	668.1	8	
UPO-212 (NC)	295.8	331.4	313.6	6		456.4	807.3	609.0	631.5	626.1	9	
RO-19 (NC)	249.5	408.6	329.0	4		474.8	1092.5	737.7	648.2	738.3	1	
Palampur-1 (ZC-HZ)	240.5	377.7	309.1	8								
HO-2000-4 (ZC-NWZ, NEZ)						443.9	962.9	662.9	735.2	701.2	2	
JHO-822 (ZC-CZ)												
Mean	258.8	400.3	329.5			486.3	946.0	633.7	657.2	680.8		
CD at 5%	41.0	7.6				69.9	23.1	59.2	NS			
CV%	9.2	1.1				6.5	1.4	5.4	11.1			

Table 6.1 : IVTO (MC) - Initial Varietal Trial in Oat (Multi cut) : Green Forage Yield (q/ha)

Cont…

Entries	North-East Zone							
	Ranchi	Pusa	Faizabad	Jorhat	Bhubaneswar	Average	Rank	Superiority%
JO-03-307	537.6	424.0	382.9	514.1	374.0	446.5	3	
UPO-09-3	444.3	402.0	457.6	584.8	327.8	443.3	4	
OL-1694	448.8	309.0	462.9	552.7	315.9	417.9	5	
JHO-2009-3	457.7	359.0	365.3	515.5	383.3	416.2	6	
OS-376	431.0	403.0	489.6	552.7	399.2	455.1	1	0.9
Kent (NC)	462.1	309.0	367.5	568.5	344.4	410.3	8	
UPO-212 (NC)	462.1	417.0	461.9	517.4	397.0	451.1	2	
RO-19 (NC)	471.0	409.0	212.8	533.1	306.6	386.5	9	
Palampur-1 (ZC-HZ)								
JHO-2000-4 (ZC-NWZ, NEZ)	453.2	412.0	320.6	490.0	379.2	411.0	7	
JHO-822 (ZC-CZ)								
Mean	463.1	382.7	391.2	536.5	358.6	426.4		
CD at 5%	55.5	27.4	76.7	6.9	39.0			
CV%	6.9	11.6	11.3	5.7	3.0			

Table 6.1 : IVTO (MC) - Initial Varietal Trial in Oat (Multi cut) : Green Forage Yield (q/ha)

Entries	Central Zone								All India		
	Jhansi	Anand	Jabalpur	Rahuri	Urulikanchan	Average	Rank	Superiority%	Average	Rank	Superiority%
JO-03-307	496.1	667.0	639.8	639.4	627.2	613.9	1	3.9	551.8	1	3.9
UPO-09-3	478.1	661.0	683.8	517.9	627.2	593.6	2	0.5	539.7	2	1.7
OL-1694	498.3	680.0	622.4	471.6	650.6	584.6	6		515.9	5	
JHO-2009-3	511.1	555.0	602.4	578.7	548.2	559.1	7		518.2	6	
OS-376	431.7	479.0	505.1	503.4	519.4	487.7	9		502.6	7	
Kent (NC)	443.1	634.0	621.1	436.9	574.9	542.0	8		504.7	8	
UPO-212 (NC)	469.4	571.0	743.8	483.2	664.5	586.4	5		519.9	4	
RO-19 (NC)	499.1	638.0	706.5	436.9	670.9	590.3	3		530.9	3	
Palampur-1 (ZC-HZ)											
JHO-2000-4 (ZC-NWZ, NEZ)											
JHO-822 (ZC-CZ)	431.5	672.0	658.5	549.7	631.4	588.6	4				
Mean	473.2	617.4	642.6	513.1	612.7	571.8			523.0		
CD at 5%	48.5	78.6	135.8	111.3	82.7						
CV%	5.8	7.3	12.1	12.5	9.7						

Table 6.2 : IVTO (MC) – Initial Varietal Trial in Oat (Multi cut) : Dry Matter Yield (q/ha)

Cont…

Entries	Hill Zone					North-West Zone					
	Palampur	Srinagar	Average	Rank	Superiority%	Pantnagar	Hisar	Ludhiana	Average	Rank	Superiority%
JO-03-307	62.6	115.9	89.2	3	16.9	114.6	154.1	115.6	128.1	2	
UPO-09-3	52.2	129.1	90.7	2	18.9	125.5	123.0	106.9	118.5	4	
OL-1694	46.8	86.1	66.4	9		115.2	126.0	113.9	118.4	5	
JHO-2009-3	76.1	117.2	96.6	1	26.5	116.8	100.2	91.3	102.8	8	
OS-376	49.6	90.9	70.3	7		117.5	176.3	98.2	130.7	1	2.0
Kent (NC)	65.8	93.6	79.7	4	4.4	107.8	98.1	103.1	103.0	7	
UPO-212 (NC)	62.8	89.7	76.3	5		110.5	133.5	97.9	114.0	6	
RO-19 (NC)	45.3	100.3	72.8	6		118.8	163.7	101.7	128.1	2	
Palampur-1 (ZC-HZ)	42.5	92.2	67.4	8							
JHO-2000-4 (ZC-NEZ, NWZ)						101.1	142.3	120.1	121.2	3	
JHO-822 (ZC-CZ)											
Mean	56.0	101.7	78.8			114.2	135.2	105.4	118.3		
CD at 5%	15.0	1.9				10.8	2.9	NS			
CV%	15.5	3.2				7.3	1.2	11.2			

Table 6.2 : IVTO (MC) - Initial Varietal Trial in Oat (Multi cut) : Dry Matter Yield (q/ha)

Cont…

Entries	North-East Zone							
	Ranchi	Pusa	Faizabad	Jorhat	Bhubaneswar	Average	Rank	Superiority%
JO-03-307	99.8	77.0	89.7	96.2	78.8	88.3	4	
UPO-09-3	92.9	73.9	106.0	111.5	69.3	90.7	2	
OL-1694	96.3	51.7	120.2	110.2	66.2	88.9	3	
JHO-2009-3	100.4	69.7	88.6	99.0	81.1	87.7	6	
OS-376	80.6	64.5	107.0	106.3	81.3	87.9	5	
Kent (NC)	89.8	59.9	95.8	109.3	74.6	85.9	7	
UPO-212 (NC)	85.3	75.5	113.8	98.5	82.6	91.1	1	
RO-19 (NC)	96.9	69.3	73.0	103.9	71.0	82.8	8	
Palampur-1 (ZC-HZ)								
JHO-2000-4 (ZC-NWZ, NEZ)	108.2	78.3	68.6	99.0	78.0	86.4	6	
JHO-822 (ZC-CZ)								
Mean	94.5	68.9	95.9	103.8	75.9	87.8		
CD at 5%	15.0	9.6	23.5	5.9	7.3			
CV%	9.3	10.4	14.2	11.3	3.2			

Table 6.2 : IVTO (MC) – Initial Varietal Trial in Oat (Multi cut) : Dry Matter Yield (q/ha)

Entries	Central Zone								All India		
	Jhansi	Anand	Jabalpur	Rahuri	Urulikanchan	Average	Rank	Superiority%	Average	Rank	Superiority%
JO-03-307	77.1	88.2	149.3	105.3	72.6	98.5	1	0.8	99.8	1	4.1
UPO-09-3	72.8	83.1	161.2	81.6	81.1	96.0	3		98.0	2	2.2
OL-1694	73.3	86.9	147.9	71.4	74.2	90.7	7		92.4	6	
JHO-2009-3	83.5	81.9	137.3	85.7	66.2	90.9	6		93.0	5	
OS-376	67.6	74.1	126.6	74.5	60.2	80.6	9		91.7	7	
Kent (NC)	72.0	96.5	145.2	68.1	69.0	90.2	8		89.9	8	
UPO-212 (NC)	72.2	80.4	175.9	77.8	82.2	97.7	2		95.9	3	
RO-19 (NC)	66.3	90.5	163.9	61.8	77.3	92.0	5		93.6	4	
Palampur-1 (ZC-HZ)											
JHO-2000-4 (ZC-NWZ, NEZ)											
JHO-822 (ZC-CZ)	70.1	91.5	153.3	79.2	81.3	95.1	4				
Mean	72.8	85.9	151.2	78.4	73.8	92.4			94.3		
CD at 5%	9.6	11.5	32.6	18.1	14.7						
CV%	7.4	7.7	12.6	13.3	12.4						

Table 6.3 : IVTO (MC) – Initial Varietal Trial in Oat (Multi cut) : Green Forage Yield (q/ha/day)

Entries	Bhubaneswar	Ranchi	Hisar	Anand	Ludhiana	Faizabad	Pusa	Jhansi	Pantnagar	Average	Rank
JO-03-307	4.82	5.84	7.95	5.96	4.70	3.87	4.37	3.91	3.94	5.04	1
UPO-09-3	4.18	4.78	7.31	6.48	4.57	4.57	3.86	3.76	4.22	4.86	2
OL-1694	4.10	4.63	7.36	6.07	4.64	4.25	3.12	3.92	3.89	4.66	4
JHO-2009-3	4.83	4.97	7.44	5.34	4.10	3.69	3.55	4.02	4.07	4.67	3
OS-376	5.00	4.74	7.29	4.09	4.36	4.85	3.91	3.40	4.14	4.64	5
Kent (NC)	4.45	5.13	6.68	5.66	4.53	3.57	3.06	3.49	5.21	4.64	5
UPO-212 (NC)	4.98	5.08	6.36	4.88	4.36	4.53	4.17	3.70	3.84	4.66	4
RO-19 (NC)	4.00	4.81	8.30	6.25	4.47	2.07	4.05	3.93	3.46	4.59	6
Palampur-1 (ZC-HZ)											
JHO-2000-4 (ZC-NWZ, NEZ)	4.80	4.72	7.24		5.07	3.05	4.08		3.79		
JHO-822 (ZC-CZ)				6.00				3.40			
Mean	4.57	4.97	7.33	5.64	4.53	3.83	3.80	3.73	4.06	4.72	

Table 6.4 : IVTO (MC) – Initial Varietal Trial in Oat (Multi cut) : Dry Matter Yield (q/ha/day)

Entries	Bhubaneswar	Ranchi	Hisar	Anand	Ludhiana	Faizabad	Pusa	Jhansi	Pantnagar	Average	Rank
JO-03-307	0.04	1.08	1.22	0.79	0.80	0.91	0.78	0.61	0.97	0.80	5
UPO-09-3	0.89	1.00	0.96	0.81	0.74	1.06	0.73	0.57	1.07	0.87	1
OL-1694	0.86	0.99	0.97	0.78	0.79	1.10	0.52	0.58	0.98	0.84	3
JHO-2009-3	1.02	1.09	0.77	0.79	0.63	0.89	0.68	0.66	0.99	0.84	3
OS-376	1.01	0.89	1.37	0.64	0.68	1.06	0.63	0.53	0.99	0.87	1
Kent (NC)	0.97	1.00	0.77	0.86	0.71	0.93	0.59	0.57	0.91	0.81	4
UPO-212 (NC)	1.04	0.94	1.05	0.69	0.68	1.11	0.73	0.57	0.94	0.86	2
RO-19 (NC)	0.93	0.99	1.24	0.89	0.70	0.71	0.69	0.52	0.87	0.84	3
Palampur-1 (ZC-HZ)											
JHO-2000-4 (ZC-NWZ, NEZ)	1.00	1.16	1.07		0.83	0.65	0.78		0.86		
JHO-822 (ZC-CZ)				0.82				0.55			
Mean	0.86	1.02	1.05	0.79	0.73	0.94	0.68	0.57	0.95	0.84	

Table 6.5 : IVTO (MC) – Initial Varietal Trial in Oat (Multi cut) : Crude Protein Yield (q/ha)

Entries	Bhuban-eswar	Rah-uri	Pala-mpur	His-ar	Faiza-bad	Ludh-iana	Ana-nd	Jaba-lpur	Ran-chi	Jor-hat	Urulika-nchan	Aver-age	Rank
JO-03-307	8.4	9.2	6.6	23.4	7.1	9.6	13.1	11.3	7.9	7.9	6.9	10.1	1
UPO-09-3	6.9	6.1	4.7	18.7	8.8	8.9	11.8	12.5	6.5	9.8	7.4	9.3	4
OL-1694	7.1	5.9	4.5	15.3	10.5	11.0	12.7	11.3	7.6	9.7	7.7	9.4	3
JHO-2009-3	8.4	6.8	6.7	14.6	7.5	8.4	9.8	10.4	8.3	9.1	6.9	8.8	7
OS-376	8.4	5.5	5.2	23.3	9.5	9.5	10.4	8.5	6.0	8.6	5.9	9.2	5
Kent (NC)	7.6	6.0	7.3	15.3	7.7	9.5	13.3	11.2	6.3	10.2	7.0	9.2	5
UPO-212 (NC)	8.4	7.2	6.4	19.1	9.7	7.7	10.7	13.4	6.3	7.7	7.8	9.5	2
RO-19 (NC)	6.8	4.9	4.5	21.0	5.0	8.9	13.0	13.4	7.2	8.4	6.9	9.1	6
Palampur-1 (ZC-HZ)			3.8										
JHO-2000-4 (ZC-NWZ, NEZ)	8.2			19.7	6.0	9.4			8.5	9.0			
JHO-822 (ZC-CZ)		6.6					12.5	11.6			7.7		
Mean	7.8	6.5	5.5	18.9	8.0	9.2	11.9	11.5	7.2	8.9	7.1	9.3	

Table 6.6 : IVTO (MC) – Initial Varietal Trial in Oat (Multi cut) : Plant Height (cm)

Cont…

Entries	Bhubaneswar	Rahuri	Palampur	Ranchi	Jabalpur	Anand	Ludhiana	Faizabad
JO-03-307	121.8	79.0	82.2	77.3	105.0	100.3	74.0	127.9
UPO-09-3	121.1	80.0	80.3	75.7	107.0	105.1	81.7	132.2
OL-1694	121.8	78.0	74.8	75.6	93.3	96.8	61.7	138.2
JHO-2009-3	125.6	68.0	71.3	77.9	98.3	90.9	73.3	115.4
OS-376	126.8	85.0	75.2	75.5	99.7	87.4	71.7	135.8
Kent (NC)	121.4	76.0	81.8	76.2	79.1	94.0	77.3	125.8
UPO-212 (NC)	129.9	81.0	81.7	86.1	83.0	95.0	68.3	137.8
RO-19 (NC)	117.8	89.0	78.3	82.2	114.1	105.2	84.0	100.5
Palampur-1 (ZC-HZ)			69.9			99.1		
JHO-2000-4 (ZC-NWZ, NEZ)	125.6			77.5			78.3	120.6
JHO-822 (ZC-CZ)		80.0			93.8			
Mean	123.5	79.6	77.3	78.2	97.0	97.1	74.5	126.0

Table 6.6 : IVTO (MC) - Initial Varietal Trial in Oat (Multi cut) : Plant Height (cm)

Entries	Jorhat	Hisar	Urulikanchan	Jhansi	Jalore	Pusa	Srinagar	Average	Rank
JO-03-307	91.5	95.3	55.4	98.0	120.7	86.0	119.8	95.6	4
UPO-09-3	97.3	105.1	59.9	103.0	118.3	103.0	113.9	98.9	2
OL-1694	88.9	93.4	55.1	98.0	127.3	101.0	113.8	94.5	5
JHO-2009-3	82.0	93.4	57.3	88.0	104.3	92.0	132.5	91.3	7
OS-376	99.2	100.3	61.0	105.0	114.3	95.0	120.4	96.8	3
Kent (NC)	93.8	88.6	59.6	94.0	105.7	92.0	115.9	92.1	6
UPO-212 (NC)	94.5	100.8	59.1	100.0	107.0	95.0	115.3	95.6	4
RO-19 (NC)	103.7	106.3	75.7	107.0	129.0	99.0	120.7	100.8	1
Palampur-1 (ZC-HZ)									
JHO-2000-4 (ZC-NWZ, NEZ)	98.8	103.3			117.7	87.0	120.5		
JHO-822 (ZC-CZ)			61.3	96.0					
Mean	94.4	98.5	60.5	98.8	116.0	94.4	119.2	95.7	

Table 6.7 : IVTO (MC) - Initial Varietal Trial in Oat (Multi cut) : Leaf Stem Ratio

Entries	Bhuban-eswar	Rah-uri	Pala-mpur	Ran-chi	Jaba-lpur	Ludh-iana	Faiza-bad	Jor-hat	Urulika-nchan	Jha-nsi	Pu-sa	Pantn-agar	Aver-age	Ra-nk
JO-03-307	0.98	1.36	0.50	0.28	0.77	1.22	0.65	0.62	1.24	0.35	0.82	0.40	0.77	5
UPO-09-3	0.98	0.54	0.48	0.25	0.82	1.50	0.71	0.66	1.17	0.34	0.93	0.51	0.74	6
OL-1694	0.97	0.82	0.49	0.34	0.81	1.86	0.78	0.51	1.55	0.41	0.92	0.45	0.83	1
JHO-2009-3	1.00	0.87	0.52	0.24	0.78	1.50	0.79	0.70	1.30	0.37	0.84	0.42	0.78	4
OS-376	1.03	0.59	0.47	0.22	0.73	1.22	0.80	0.33	1.31	0.28	0.86	0.33	0.68	8
Kent (NC)	0.96	0.84	0.47	0.24	0.76	1.00	0.61	0.74	1.37	0.36	0.85	0.46	0.72	7
UPO-212 (NC)	1.04	0.83	0.48	0.31	0.97	1.50	0.68	0.80	1.49	0.43	0.87	0.46	0.82	2
RO-19 (NC)	0.95	0.67	0.51	0.35	0.89	1.86	0.75	0.56	1.32	0.45	0.92	0.45	0.81	3
Palampur-1 (ZC-HZ)			0.48											
JHO-2000-4 (ZC-NWZ, NEZ)	0.97			0.29		1.50	0.72	0.49			0.81	0.42		
JHO-822 (ZC-CZ)		0.90			0.83				1.26	0.30				
Mean	0.99	0.82	0.49	0.28	0.82	1.46	0.72	0.60	1.33	0.37	0.87	0.43	0.77	

Table 6.8 : IVTO (MC) - Initial Varietal Trial in Oat (Multi cut) : Crude Protein Content (CP%)

Entries	Bhuban-eswar	Rah-uri	Palam-pur	His-ar	Faiza-bad	Ludhi-ana	Ana-nd	Ran-chi	Jor-hat	Urulika-nchan	Aver-age	Rank
JO-03-307	10.8	8.8	10.5	17.6	7.9	8.3	14.7	7.9	8.1	9.7	10.4	2
UPO-09-3	9.9	7.4	9.0	16.3	8.3	8.3	14.4	7.0	8.4	9.1	9.8	6
OL-1694	10.7	8.3	9.6	14.7	8.7	9.7	15.1	7.9	8.3	10.4	10.3	3
JHO-2009-3	10.4	7.9	8.8	15.7	8.5	9.2	12.2	8.3	9.0	10.4	10.0	5
OS-376	10.4	7.4	10.5	15.5	8.9	9.7	14.7	7.4	8.1	9.8	10.2	4
Kent (NC)	10.1	8.8	11.1	18.0	7.8	9.2	14.9	7.0	8.9	10.2	10.6	1
UPO-212 (NC)	10.1	9.2	10.2	15.7	8.5	7.8	13.4	7.4	8.1	9.5	10.0	5
RO-19 (NC)	9.6	7.8	9.9	14.3	6.8	8.7	14.1	7.4	7.9	9.0	9.6	7
Palampur-1 (ZC-HZ)			8.8									
JHO-2000-4 (ZC-NWZ, NEZ)	10.5			15.9	8.8	7.8		7.9	9.2			
JHO-822 (ZC-CZ)		8.3					14.0			9.6		
Mean	10.3	8.2	9.8	16.0	8.2	8.7	14.1	7.6	8.4	9.7	10.1	

Table 6.9 : IVTO (MC) - Initial Varietal Trial in Oat (Multi cut) : IVDMD (%)

Entries	Ludhiana	Hisar	Average	Rank
JO-03-307	59.2	53.0	56.1	5
UPO-09-3	58.4	52.2	55.3	7
OL-1694	59.0	53.4	56.2	4
JHO-2009-3	58.8	52.8	55.8	6
OS-376	59.2	54.2	56.7	3
Kent (NC)	60.6	56.0	58.3	1
UPO-212 (NC)	57.6	56.4	57.0	2
RO-19 (NC)	58.6	53.6	56.1	5
Palampur-1 (ZC-HZ)				
JHO-2000-4 (ZC-NWZ, NEZ)	56.6	53.4	55.0	8
JHO-822 (ZC-CZ)				
Mean	58.7	53.9	56.3	

7. VTL (P) -2007 : VARIETAL EVALUATION TRIAL IN LUCERNE (PERENNIAL) - 3rd YEAR

(Table Reference : 7.1 to 7.11)

The varietal trial on Lucerne (Perennial) comprising three entries *viz*. BAIF Lucerne-1, Anand-21 and Anand-22 along with two national checks i.e. Anand-2 and RL-88 was established during Rabi-2007 at ten centers of the North-West, Central and South zone but this year data has been received from seven centers. This is being the third and final year of evaluation hence all the entries are decoded. Results obtained from testing locations clearly revealed that for green forage yield (q/ha) entry BAIF Lucerne-1 ranked first in Central as well as in South zone whereas none of the entries surpassed the national check in North-West zone. Even at the national level, entry BAIF Lucerne-1 was adjudged best. Like green forage yield, result was almost same for dry matter yield (q/ha) in which entry BAIF Lucerne-1 ranked first in Central and South zone as well as at national level. For the forage production potential (q/ha/day), none of the entries was found better in performance over national check. For the character plant height (cm), entry BAIF Lucerne-1 (64.0 cm) was ranked first.

For evaluation against quality parameters, entry BAIF Lucerne-1 proved superiority for crude protein yield (q/ha), Anand-22 and Anand-21 for crude protein content (%), all the testing entries for leaf stem ratio and BAIF Lucerne-1 for DDM (q/ha). National check Anand-2 adjudged best for quality parameter IVDMD (%).

When we see the pooled performance of entries during last three years over the locations, only one entry i.e. BAIF Lucerne-1 was recorded for high fodder yield (green forage and dry matter) over the best national check RL-88. For green forage yield (q/ha) superiority was 3.1 % and for dry matter yield (q/ha) superiority was 2.0 %.

Table 7.1 : VTL (P) - 2007 - Varietal Trial in Lucerne (Perennial) -3rd Year : Green Forage Yield (q/ha)

Entries	North-West Zone					Central Zone			South Zone				All India	
	Ludh-iana	Bika-ner	His-ar	Aver-age	Rank	*Urulikan-chan	Rah-uri	Rank	Coimb-atore	Man-dya	Aver-age	Rank	Aver-age	Rank
BAIF Lucerne-1	640.6	701.5	620.6	654.2	2	800.7	1355.7	1	1049.8	460.8	755.3	1	804.8	1
Anand-21	184.4	552.7	289.5	342.2	5	184.1	410.1	5	1041.6	316.9	679.2	3	465.9	5
Anand-22	151.0	635.2	347.8	378.0	4	329.6	532.0	4	1013.5	252.3	632.9	5	488.6	4
Anand-2 (NC)	92.7	793.6	335.3	407.2	3	223.3	676.8	3	1060.7	253.2	656.9	4	535.4	3
RL-88 (NC)	599.0	809.3	622.7	677.0	1	699.0	1256.0	2	1047.3	440.3	743.8	2	795.7	2
Mean	333.5	698.5	443.2	491.7		447.3	846.1		1042.6	344.7	693.6		618.1	
CD at 5%	29.0	126.3	29.7			88.6	123.0		NS	35.1				
CV%	5.6	11.7	4.3			58.6	9.4		2.8	6.6				

*** not included in Zonal and all India average due to CV≥ 30**

Table 7.2 : VTL (P) - 2007 - Varietal Trial in Lucerne (Perennial) -3rd Year : Dry Matter Yield (q/ha)

Entries	North West Zone					Central Zone			South Zone				All India	
	Ludh-iana	Bika-ner	His-ar	Aver-age	Rank	*Urulika-nchan	Rah-uri	Rank	Coimb-atore	Man-dya	Aver-age	Rank	Aver-age	Rank
BAIF Lucerne-1	109.2	197.8	139.7	148.9	2	153.9	280.6	1	201.6	75.6	138.6	1	167.4	1
Anand-21	29.8	138.4	64.6	77.6	5	37.0	90.9	5	206.0	44.6	125.3	3	95.7	5
Anand-22	23.3	182.3	80.7	95.4	4	67.0	114.7	4	195.8	33.4	114.6	5	105.0	4
Anand-2 (NC)	14.2	219.2	74.3	102.6	3	45.7	139.0	3	206.5	39.5	123.0	4	115.4	3
RL-88 (NC)	96.7	226.6	137.7	153.7	1	144.4	267.0	2	206.5	69.1	137.8	2	167.2	2
Mean	54.6	192.8	99.4	115.6		89.6	178.4		203.3	52.4	127.8		130.1	
CD at 5%	13.9	40.1	6.7			14.5	25.8		NS	6.1				
CV%	16.5	13.5	4.3			57.2	9.4		2.6	7.5				

*** not included in zonal in all India average due to CV≥30**

Table 7.3 : VTL (P) - 2007 - Varietal Trial in Lucerne (Perennial) -3rd Year : Green Forage Yield (q/ha/day)

Entries	Hisar	Bikaner	Ludhiana	Average	Rank
BAIF Lucerne-1	2.53	1.37	3.00	2.30	2
Anand-21	1.18	1.08	0.90	1.05	5
Anand-22	1.42	1.24	0.70	1.12	3
Anand-2 (NC)	1.37	1.55	0.40	1.11	4
RL-88 (NC)	2.54	1.58	2.80	2.31	1
Mean	1.81	1.36	1.56	1.58	

Table 7.4 : VTL (P) - 2007 - Varietal Trial in Lucerne (Perennial) -3rd Year : Dry Matter Yield (q/ha/day)

Entries	Bikaner	Ludhiana	Average	Rank
BAIF Lucerne-1	0.39	0.51	0.45	2
Anand-21	0.27	0.14	0.21	4
Anand-22	0.36	0.11	0.24	3
Anand-2 (NC)	0.43	0.87	0.65	1
RL-88 (NC)	0.44	0.45	0.45	2
Mean	0.38	0.42	0.40	

Table 7.5 : VTL (P) - 2007 - Varietal Trial in Lucerne (Perennial) -3rd Year : Crude Protein Yield (q/ha)

Entries	Rahuri	Mandya	Hisar	Ludhiana	Urulikanchan	Coimbatore	Average	Rank
BAIF Lucerne-1	55.3	10.9	28.9	23.5	29.6	37.5	30.9	1
Anand-21	17.1	7.4	13.3	6.2	6.8	38.9	15.0	5
Anand-22	22.1	6.5	16.6	4.6	12.9	36.3	16.5	3
Anand-2 (NC)	23.7	6.4	15.6	3.1	8.6	38.3	15.9	4
RL-88 (NC)	46.7	11.3	28.3	20.3	27.8	38.4	28.8	2
Mean	33.0	8.5	20.5	11.5	17.1	37.9	21.4	

Table 7.6 : VTL (P) - 2007 - Varietal Trial in Lucerne (Perennial) -3rd Year : Plant Height (cm)

Entries	Rahuri	Mandya	Hisar	Bikaner	Ludhiana	Urulikanchan	Average	Rank
BAIF Lucerne-1	62.0	55.9	55.5	58.4	70.6	81.4	64.0	1
Anand-21	57.0	51.3	56.5	53.1	63.3	60.6	56.9	5
Anand-22	63.0	47.8	56.2	54.1	59.4	66.7	57.9	3
Anand-2 (NC)	64.0	49.1	57.1	60.6	55.1	60.3	57.7	4
RL-88 (NC)	60.0	50.6	54.9	61.2	64.9	74.8	61.1	2
Mean	61.2	50.9	56.0	57.5	62.7	68.8	59.5	

Table 7.7 :VTL (P) - 2007 - Varietal Trial in Lucerne (Perennial) -3rd Year : Leaf Stem Ratio

Entries	Rahuri	Mandya	Hisar	Bikaner	Ludhiana	Urulikanchan	Average	Rank
BAIF Lucerne-1	0.75	0.70	0.75	0.97	1.00	1.17	0.89	2
Anand-21	0.66	0.65	0.76	0.92	1.00	1.45	0.91	1
Anand-22	0.72	0.64	0.77	0.80	1.00	1.22	0.86	3
Anand-2 (NC)	0.63	0.57	0.77	0.92	0.82	1.16	0.81	5
RL-88 (NC)	0.75	0.63	0.74	0.99	0.67	1.24	0.84	4
Mean	0.70	0.64	0.76	0.92	0.90	1.25	0.86	

Table 7.8 : VTL (P)-2007 - Varietal Trial in Lucerne (Perennial) -3rd Year : Crude Protein Content (CP%)

Entries	Rahuri	Mandya	Hisar	Ludhiana	Urulikanchan	Average	Rank
BAIF Lucerne-1	19.7	13.2	20.5	21.5	19.3	18.8	5
Anand-21	18.8	18.6	20.7	20.7	18.7	19.5	2
Anand-22	19.3	20.9	20.5	19.8	19.4	20.0	1
Anand-2 (NC)	17.1	16.2	20.7	21.6	18.8	18.9	4
RL-88 (NC)	17.5	18.0	20.6	21.0	19.3	19.3	3
Mean	18.5	17.4	20.6	20.9	19.1	19.3	

Table 7.9 : VTL (P) - 2007 - Varietal Trial in Lucerne (Perennial) -3rd Year : IVDMD (%)

Entries	Hisar	Ludhiana	Average	Rank
BAIF Lucerne-1	58.8	75.8	67.3	3
Anand-21	58.2	74.6	66.4	4
Anand-22	58.4	74.0	66.2	5
Anand-2 (NC)	59.5	76.4	68.0	1
RL-88 (NC)	59.3	76.0	67.7	2
Mean	58.8	75.4	67.1	

Table 7.10 : VTL (P)-2007 - Varietal Trial in Lucerne (Perennial) -3rd Year : DDM (q/ha)

Entries	Hisar	Rank
BAIF Lucerne-1	81.5	1
Anand-21	37.8	5
Anand-22	46.7	3
Anand-2 (NC)	43.9	4
RL-88 (NC)	80.5	2
Mean	58.1	

Table 7.11 : VTL(P)- 2007 - Varietal Trial in Lucerne (Perennial) : Pooled performance of entries during the different years

Entries	Green Forage Yield (q/ha)						Dry Matter Yield (q/ha)					
	2007-08	2008-09	2009-10	Average	Rank	Superi-ority%	2007-08	2008-09	2009-10	Average	Rank	Superi-ority%
BAIF Lucerne-1	447.2	1097.2	804.8	783.1	1	3.1	97.6	223.1	167.4	162.7	1	2.0
Anand-21	457.5	846.6	465.9	590.0	5		97.8	170.9	95.7	121.5	5	
Anand-22	460.4	900.6	488.6	616.5	4		98.7	186.0	105.0	129.9	4	
Anand-2 (NC)	460.9	904.1	535.4	633.5	3		100.8	184.6	115.4	133.6	3	
RL-88 (NC)	415.5	1068.3	795.7	759.8	2		93.1	218.2	167.2	159.5	2	
Mean	448.3	963.4	618.1	676.6			97.6	196.6	130.1	141.4		

8. VTTF (P)- 2009 : VARIETAL TRIAL IN TALL FESCUE GRASS (PERENNIAL) IN SUB-TEMPERATE AND TEMPERATE HIMALAYAN HILL REGION (1st YEAR)

(Table Reference : 8)

The varietal trial in Tall Fescue grass (Perennial) comprising four entries including two checks was initiated during Rabi 2009-10 at sub temperate and temperate Himalayan hill region at Palampur, Almora and Srinagar. This year data has been reported only from Almora center whereas at Palampur and Srinagar, the trial is in establishing stage. Data reported from Almora center clearly revealed that for green forage yield (q/ha) as well as for dry matter yield (q/ha), entry Hima-14 ranked first followed by entries Hima-15, Hima-1 and Hima-4.

Table 8.1 : VTTF (P)-2009 : Varietal Trial in Tall Fescue Grass (Perennial) under Sub Temperate and Temperate Himalayan Range lands(1st Year)

Entries	Green Forage Yield (q/ha)		Dry Matter Yield (q/ha)	
	Almora	Rank	Almora	Rank
Hima-1	140.2	3	31.2	3
Hima-4	128.6	4	30.8	4
Hima-14	152.1	1	36.5	1
Hima-15	142.5	2	34.4	2
Mean	140.9		33.2	
CD at 5%	NS		NS	
CV%	14.8		14.8	

CHAPTER-2

FORAGE CROP PRODUCTION

(A) ON GOING TRIALS

(a) COORDINATED

AST – 1: INTEGRATED NUTRIENT MANAGEMENT IN FORAGES

AST – 1.1: Integrated nutrient management in food forage/forage based system

Locations:

Hill zone - Palampur and Almora

North West Zone - Pantnagar, Hisar, Ludhiana and Bikaner

Central Zone - Jhansi,Jabalpur, Rahuri, Anand, Urulikanchan, Faizabad

North East Zone - Jorhat, Kalyani, Bhubaneswar, Ranchi, Pune and

South Zone - Hyderabad, Mandya, Coimbatore and Vellayani

This was fifth year of experimentation at all the locations expect in hill zone. The experiment was conducted with similar treatments to those of previous year at the fixed site. The data of Hill, Central and North East zone is reported during Rabi season and rest of zones viz. North West and South Zone is reported during Kharif. During the current Rabi 09-10, the data of 14 centers from Hill, Central and North East Zone has been included in this Annual Report.

In Hill Zone, this was forth year of experimentation at Palampur and Almora. Inference of data indicated that supplementation 75 % NPK through inorganic fertilizers + *Azotobacter* / *Rhizobium* to setaria – white clover recorded highest mean green fodder yield (550.03 q/ha/yr) closely followed by 100 % NPK through inorganic fertilizers (524.33 q/ha/yr). Yield levels of green fodder were higher (404 -598 q/ha/yr) at Almora for entire sequence than Palampur (166 -526 q/ha/yr. Variation in crude protein yield was lesser at Almora than Palampur. With regard to net return, 100 % NPK through inorganic fertilizer (Rs. 34966/ha/yr) and 75 % NPK through inorganic fertilizers + *Azotobacter* / *Rhizobium* (Rs. 37405/ha/yr) were superior over other treatments. However, B: C ratio was higher for both the locations (Palampur 1.73, Almora 1.75) with bio-fertilizer inoculation alone. Resource use efficiency was highest with T_6& T_7. Uptake of NPK showed the similar trend of other parameters (yield and quality in response to INM treatments to setaria + white clover). After forth year, soil fertility status particularly of N and K was improved by best INM treatment (T_6) over initial status at Palampur. There was slight improvement in CEC and OC content at both the locations with INM system.

In Central Zone, application of FYM 25% N + 50 % NPK through inorganic fertilizer + biofertilisers (*Azotobacter / Rhizobium*) to sorghum + cowpea – lucerne sequence recorded highest net return over two locations i.e, Rahuri and Anand. The magnitude of increase over 100 % NPK through inorganic fertilizer was 29.5 and 3.2 per cent at Rahuri and Anand, respectively. At both the locations T_6 and T_3 were at par. Benefit cost ratio was higher (>1.0) at Rahuri due to INM treatments at both the location except in control al Anand registered highest B: C ratio at both the locations. The trend of biomass (green and dry) yield was in the order of net return. CP yield followed the similar trend to that of dry matter yield. At Anand there was higher uptake of N by entire system (366-412 kg N and 143-156 kg K/ha) with INM treatments than T_1 but P uptake by higher with T_6 and T_2. The uptake on N, P and K was higher approximately by 5, 7 and 2 times, respectively in lucerne than Ssorghum + Cowpea. Uptake of K by lucerne was slightly higher than sorghum + cowpea. At Rahuri NPK uptake by entire system was higher (739, 71.3, 702.9 kg NPK/ha) with T6 with respect to N uptake T6 remained at par with T_3 and T_4; with respect to P uptake T6 was at par with T_2, T_3, T_4 and with respect to K uptake T_6 was at par with T_3. In another location of central zone at Urulikanchan, application of INM in maize – berseem – sorghum exhibited superiority of FYM 25 % N and 75 % NPK through inorganic fertilizer over 100 % NPK through inorganic fertilizer by Rs. 35903/ha/year. However, B : C ratio was almost equal with T_2 (2.12), T_3 (2.10) and T_7 (2.03). Maize fodder equivalent was higher with T_3. Next best treatment was T2. Uptake of all three crops in the sequence was higher than P and K. highest N uptake (458.8 kg/ha) was recorded by entire system when supplemented with T_3 and PK uptake with T_4. After fifth year of experimentation, N & K status was improved in INM treatments as compared to initial status. At Jabalpur, application of 100 % NPK through inorganic fertilizer to sorghum + cowpea – berseem realized significantly higher net return (Rs. 51902/ha/year) than other treatments. Second best treatment with INM input was T_4 (FYM 25 % N and 75 % NPK through inorganic fertilizer) realizing net return of Rs. 49874/ha/year. Yield levels of forage legumes were equal with T_4 and T_2. The difference in cereal forage (sorghum) registered superiority of T_4 and T_2.

CP yield was equal with T_2, T_3 and T_4. Uptake of NPK was highest with T_4 closely followed by T_2. At Jhansi, application of FYM 50 %, N + 50 % NPK inorganic fertilizer recorded significantly higher net return (Rs. 27527/ha/year) followed by T_3 (Rs.24796/ha/year). Berseem equivalent yield of T_4 was 101 % more over T_1. T_2 closely followed by T_7 with respect to NPK uptake and with T_6 for K uptake.

In North East zone, the performance of INM treatments in food forage based system was quite variable. At Jorhat application of green manure + 25 % N FYM + 50 % NPK through inorganic fertilizer + biofertilisers (T_6) in rice- oat + *Lathyrus* sequence significantly higher rice Lequivalent yield (77.0q/ha/year) than rest of the treatments, but remains at par with green manure + 50 % FYM + PSB + biofertilisers (T_7), 50% N FYM + 50% NPK through inorganic fertilizer (T_3) and 25% N FYM + 50% NPK through inorganic fertilizer + Green manuring (GM) (T_4). The net return was also higher (Rs. 50789/ha/yr) with the same treatment (T_7) and magnitude of increase was 30.2 per cent and 143 percent over T_2 (100 % NPK through inorganic fertilizer) and over T_1 (control), respectively. Uptake of NPK was higher with INM treatments in the sequence than T_1 and T_2. NPK uptake shows a trend of dry matter yield. higher N uptake was in T_6 in all the crops and this treatment maintained its superiority w.r.t P and K uptake also. At Faizabad, use of 50 % N FYM + 50 % NPK through inorganic fertilizer (T3) to rice- berseem sequence registered increase of 20.9 per cent in berseem forage equivalent yield over 100 % NPK through inorganic fertilizer. Higher biomass yield brought about maximum increase in net return (Rs. 22822/ha/yr) with this treatment registering an increase of 88.3 per cent over T_2. Lowest berseem forage equivalent yield was recorded with control (T_1). With regard to uptake of NPK by complete sequence, T_3 was superior to rest of the treatments. The uptake of P and K was highest with T_3 followed by T_5. Uptake of N with T_2 was lower than other INM treatments whereas lowest P and K was noticed in T_6. At Bhubaneswar, supplementation of nutrients through T_7 (GM + 50 % N FYM + PSB *Azolla*/*Rhizobium*) to rice – cowpea (F)-mung (G) registered highest net return (Rs. 57798/ha/yr). The percentage increase over T_2 was T_7 and T_1 was 913. The yield levels of cowpea and mung forage components were higher with T_7 leading to higher net return of the complete sequence. The grain yield was higher with T_5 but was at par with T_2, T_6 and T_7.

At Kalyani, application of GM + 25 % N FYM + 50 %NPK through inorganic fertilizer + biofertilisers to ricebean – oat – mung (F) realized significantly higher oats fodder equivalent yield (955q/ha/yr) than rest of the treatment. It was followed by T_7. Incase in net return, T_5 (GM + 50 % N FYM + *Azotobacter*/*Rhizobium*) recorded significantly higher net return (Rs. 22270/ha/yr) which was higher by 45 per cent over T_2. The treatments with nutrients level T_5 and T_6 remained at par. CP yield followed the trends of dry matter yield of forage crop in the sequence. At Pusa T_6 (GM + 25% N FYM + 50% NPK through inorganic fertilizer+ Biofertilizer) resulted in highest berseem forage equivalent yield (750.8q/ha/yr). This treatment produced 9.57 percent more green forage equivalent yield than T_2. T_2 and T_3 were close to each other. At Ranchi, supplementation of nutrients through GM + 25 % N FYM + 50 %NPK through inorganic fertilizer+ biofertilisers to rice – berseem sequence recorded significantly higher forage equivalent yield (797.9q/ha/yr) than other treatments.T_3 remained at par with T_6 for forage equivalent yield. With regard to net return, T_6 remained as best treatment registering an increase of Rs. 35997/ha/yr over 100 % NPK through inorganic source. However, B: C ratio (3.2) was slightly less than T_3 (3.3). Uptake of NPK was highest with T_6 and T_3. Nutrient use efficiency was highest with T_2 for N, with T_7 for P and T_6 for K. The INM resulted in improvement of NPK status of the soil over the years. Sole inorganic and control treatments resulted in decrease in soil pH and organic carbon content.

Hill Zone

AST1.1 (a-1) Forage yield of Setaria-white clover sequence under the influence of INM in Hill zone

Treatment	Green and Dry Fodder Yield (q/ha)								
	Setaria			White clover			Setaria+ White clover		
	Palampur	Almora	Mean	Palampur	Almora	Mean	Palampur	Almora	Mean
T_1	109.31 (25.98)*	300.20 (55.57)	204.76 (40.78)	57.24 (8.59)	104.53 (16.90)	80.89 (12.75)	166.56 (34.57)	404.73 (72.47)	285.65 (40.86)
T_2	162.58 (37.32)	341.62 (64.80)	252.10 (51.06)	89.31 (12.50)	114.52 (21.89)	101.92 (17.20)	251.90 (49.83)	456.14 (86.69)	354.02 (50.15)
T_3	206.49 (43.96)	348.93 (65.40)	277.71 (54.68)	102.24 (14.82)	127.68 (24.51)	114.96 (19.67)	308.73 (58.78)	476.61 (89.91)	392.67 (59.15)
T_4	263.16 (58.18)	358.43 (67.27)	310.80 (62.73)	136.48 (21.84)	116.96 (18.53)	126.72 (20.19)	399.64 (80.01)	475.39 (85.80)	437.52 (74.35)
T_5	276.40 (61.10)	376.47 (68.51)	326.44 (64.81)	153.94 (24.01)	124.46 (21.51)	139.20 (22.76)	430.34 (85.12)	500.93 (90.02)	465.64 (77.42)
T_6	350.30 (76.47)	430.51 (77.44)	390.41 (76.96)	150.82 (24.13)	168.42 (28.64)	159.62 (26.39)	501.12 (100.60)	598.93 (106.08)	550.03 (88.82)
T_7	368.67 (78.52)	395.23 (72.98)	381.95 (75.75)	158.06 (26.40)	126.71 (21.75)	142.39 (24.08)	526.73 (104.91)	521.93 (94.73)	524.33 (89.26)
SEm+	5.26 (2.01)	15.05 (3.18)		3.38 (0.54)			10.10 (2.11)	20.78 (2.84)	
CD5%	27.15 (6.22)	46.35 (9.79)		10.42 (1.67)			30.82 (6.49)	64.00 (8.75)	
CV%	8.15 (8.41)	7.2 (8.2)		6.83 (4.96)			6.69 (5.97)	7.7 (7.3)	

* Figures in parentheses indicate dry matter yield (q/ha)

T_1	Control	T_5	75% NPK through inorganic fertilizer
T_2	Biofertiliser (*Azotobacter*/ *Rhizobium*)	T_6	Biofertilizer (*Azotobacter* /*Rhizobium*) + 75% NPK through inorganic fertilizer
T_3	50% NPK through inorganic fertilizer	T_7	100% NPK through inorganic fertilizer
T_4	Biofertilizer (*Azotobacter*/ *Rhizobium*) + 50% NPK through inorganic fertilizer		

Table 1.1 (a-2) Crude protein and crude fibre yields of Setaria-white clover sequence under the influence of INM in Hill zone

Treatment	Crude protein yield (q/ha)						Crude fibre yield (q/ha)					
	Setaria			White clover			Setaria			White clover		
	Palampur	Almora	Mean	Palampur	Almora	Mean	Palampur	Almora	Mean	Palampur	Almora	Mean
T_1	1.74 (6.7)*	3.4(6.0)	2.57 (6.4)	1.27 (14.8)	2.5(15.0)	1.91 (14.9)	8.21(31.6)**	17.60	12.9	1.46 (16.9)	3.0	2.23
T_2	2.97 (8.0)	5.1(7.8)	4.02 (7.9)	2.03 (15.1)	3.4(15.1)	2.66 (15.6)	11.26 (30.2)	19.73	15.5	2.21 (17.7)	3.7	2.96
T_3	3.77 (8.6)	5.4(8.3)	4.60 (8.4)	2.49 (16.8)	4.1(16.8)	3.30 (16.8)	12.70 (29.0)	17.45	15.1	2.51 (16.9)	4.2	3.36
T_4	4.85 (8.3)	5.4(8.1)	5.15 (8.2)	3.72 (17.0)	2.9(15.4)	3.29 (16.2)	17.52 (30.1)	19.60	18.6	3.41 (15.6)	3.1	3.26
T_5	5.42 (8.8)	6.0(8.8)	5.73 (8.8)	3.80 (15.8)	3.3(15.5)	3.57 (15.6)	18.22 (29.9)	17.98	18.1	3.75 (15.6)	3.6	3.68
T_6	6.64(8.7)	6.9(9.0)	6.79 (8.8)	3.96 (16.4)	4.7(16.3)	4.32 (16.40	20.15 (26.2)	20.31	20.2	3.70 (15.3)	4.4	4.05
T_7	6.53 (8.3)	6.4(8.7)	6.45 (8.5)	4.35 (16.5)	3.6(16.6)	3.99 (16.6)	20.53 (26.1)	19.09	19.8	3.80 (14.4)	3.1	3.45
SEm+	0.21 (0.17)	0.4(0.4)		0.16 (0.44)	0.3(0.5)		0.96 (1.75)	1.37		0.14	0.3	
CD5%	0.65 (0.54)	1.1(1.2)		0.51 (NS)	0.8(1.7)		2.91 (NS)	4.22		0.44	0.8	
CV%	8.01 (3.67)	11.7(8.1)		9.32 (4.76)	12.4(5.9)		10.55 (10.42)	12.6		8.31	12.7	

* Figures in parentheses are mean CP content (%) ** Figures in parentheses are crude fibre content (%)

Table 1.1(a-3) Net monetary returns, benefit cost ratio and resource use efficiency of Setaria-white clover sequence under the influence of INM in Hill zone

Treatment	Complete crop sequence (Setaria-White clover)								
	Net monetary returns (Rs/ha/yr)			Benefit cost ratio			Resource use efficiency		
	Palampur	Almora	Mean	Palampur	Almora	Mean	Palampur	Almora	Mean
T_1	9784	29537	19661	1.22	1.67	1.45	-	-	-
T_2	17091	33807	25449	1.73	1.76	1.75	51.23	11.70	31.5
T_3	18703	32243	25473	1.32	1.38	1.35	85.36	19.20	52.3
T_4	26490	31802	29146	1.63	1.36	1.50	139.94	15.65	77.8
T_5	26668	32941	29805	1.37	1.31	1.34	158.37	22.65	90.5
T_6	32284	42526	37405	1.55	1.50	1.53	200.86	55.25	128.1
T_7	35034	33457	34246	1.66	1.24	1.45	216.24	26.90	121.6

T_1	Control	T_5	75% NPK through inorganic fertilizer
T_2	Biofertiliser (*Azotobacter*/ *Rhizobium*)	T_6	Biofertilizer (*Azotobacter* /*Rhizobium*) + 75% NPK through inorganic fertilizer
T_3	50% NPK through inorganic fertilizer	T_7	100% NPK through inorganic fertilizer
T_4	Biofertilizer (*Azotobacter*/ *Rhizobium*) + 50% NPK through inorganic fertilizer		

Table 1.1 (a-4) : Uptake of N by forage based sequence Setaria – White clover as influenced by INM in Hill zone

Treatment	N uptake (kg/ha)								
	Setaria			White clover			Seteria + White clover		
	Palampur	Almora	Mean	Palampur	Almora	Mean	Palampur	Almora	Mean
T_1	27.9	54.4	41.2	20.76	40.6	30.7	48.62	62.4	55.51
T_2	47.5	80.9	64.2	32.73	52.6	42.7	80.27	77.1	78.69
T_3	60.4	86.9	73.7	40.21	65.8	53.0	100.57	100.4	100.49
T_4	77.6	87.1	82.4	58.34	45.6	52.0	135.94	110.5	123.22
T_5	86.7	96.6	91.7	60.26	53.5	56.9	146.92	121.2	134.06
T_6	106.3	111.0	108.7	64.89	74.7	69.8	171.16	137.2	154.18
T_7	104.5	101.7	103.1	69.11	58.0	63.6	173.63	129.9	151.77
SEm±	3.37	6.0	41.2	2.54	4.0	30.7	4.60	4.4	
CD at 5%	10.40	18.4	64.2	7.83	12.4	42.7	14.16	13.6	
CV%	10.55	11.7	73.7	8.90	12.5	53.0	6.50	7.3	

T_1	Control	T_5	75% NPK through inorganic fertilizer
T_2	Biofertiliser (*Azotobacter*/ *Rhizobium*)	T_6	Biofertilizer (*Azotobacter* /*Rhizobium*) + 75% NPK through inorganic fertilizer
T_3	50% NPK through inorganic fertilizer	T_7	100% NPK through inorganic fertilizer
T_4	Biofertilizer (*Azotobacter*/ *Rhizobium*) + 50% NPK through inorganic fertilizer		

Table 1.1 (a-5) : Uptake of P by forage based sequence Setaria – White clover as influenced by INM in Hill zone

Treatment	P uptake (kg/ha)								
	Setaria			White clover			Seteria + White clover		
	Palampur	Almora	Mean	Palampur	Almora	Mean	Palampur	Almora	Mean
T_1	1.8	6.6	4.2	2.4	8.4	5.4	7.4	4.2	5.8
T_2	4.0	8.7	6.4	9.5	8.8	9.2	13.6	5.6	9.6
T_3	5.0	7.1	6.1	16.0	14.7	15.4	21.0	7.2	14.1
T_4	6.3	9.5	7.9	26.3	20.1	23.2	32.6	9.9	21.2
T_5	7.0	6.8	6.9	31.0	29.1	30.0	38.0	7.9	22.9
T_6	9.0	11.3	10.2	32.5	32.4	32.5	41.6	9.4	25.5
T_7	10.9	8.8	9.9	39.1	29.8	34.4	50.0	9.4	29.7
SEm±	0.34	1.6		1.01	2.1		1.10	0.8	
CD at 5%	1.46	4.9		3.13	6.6		3.40	2.4	
CV%	13.00	33.0		7.85	18.1		6.56	17.8	

T_1 = Control
T_2 = Biofertilizer (*Azotobacter/Rhizobium*)
T_3 = 50% NPK through inorganic fertilizer
T_4 = Biofertilizer (*Azotobacter/Rhizobium*) + 50% NPK through inorganic fertilizer
T_5 = 75% NPK through inorganic fertilizer
T_6 = Biofertilizer (*Azotobacter /Rhizobium*) + 75% NPK through inorganic fertilizer
T_7 = 100 % NPK through inorganic fertilizer

Table 1.1 (a-6) : Uptake of K by forage based sequence Setaria – White clover as influenced by INM in Hill zone

Treatment	K uptake (kg/ha)								
	Setaria			White clover			Seteria + White clover		
	Palampur	Almora	Mean	Palampur	Almora	Mean	Palampur	Almora	Mean
T_1	18.1	45.7	31.9	8.26	17.8	13.0	26.4	38.9	32.6
T_2	29.6	55.0	42.3	13.59	24.3	18.9	43.2	45.4	44.3
T_3	41.7	61.5	51.6	17.20	25.4	21.3	58.9	56.9	57.9
T_4	58.2	71.4	64.8	22.55	19.9	21.2	80.8	70.2	75.5
T_5	64.5	72.0	68.3	27.45	23.1	25.3	92.0	73.9	83.0
T_6	89.8	88.2	89.0	26.80	27.7	27.3	116.6	85.5	101.0
T_7	91.2	79.2	85.2	31.42	21.0	26.2	122.6	78.1	100.3
SEm±	2.66	3.7		0.90	3.1		2.56	4.0	
CD at 5%	8.22	11.5		2.78	9.6		7.91	12.2	
CV%	8.14	9.6		7.43	23.6		5.76	10.7	

Table 1.1 (a-7): Soil properties after completion of the sequence (Setaria- White clover i.e. after Rabi 2009-10)

Treatment	Soil properties											
	Palampur						Almora					
	pH	CEC Cmol(P^+) kg^{-1}	OC%	Available nutrients (Kg/ha)			pH	CEC Cmol(P^+) kg^{-1}	OC%	Available nutrients (Kg/ha)		
				N	P	K				N	P	K
T_1	5.6	8	0.59	145	4	212	5.6	6	0.48	186	5	222
T_2	5.6	10	0.67	224	5	232	5.6	10	0.52	212	6	271
T_3	5.6	11	0.68	235	9	254	5.5	10	0.58	222	9	272
T_4	5.6	13	0.68	218	9	262	5.7	12	0.59	224	9	275
T_5	5.5	14	0.71	288	11	285	5.7	12	0.58	312	13	316
T_6	5.5	13	0.70	306	13	321	5.6	13	0.57	311	15	331
T_7	5.4	13	0.71	324	15	352	5.5	14	0.60	332	16	341

T_1	Control	T_5	75% NPK through inorganic fertilizer
T_2	Biofertiliser (*Azotobacter*/ *Rhizobium*)	T_6	Biofertilizer (*Azotobacter* /*Rhizobium*) + 75% NPK through inorganic fertilizer
T_3	50% NPK through inorganic fertilizer	T_7	100% NPK through inorganic fertilizer
T_4	Biofertilizer (*Azotobacter*/ *Rhizobium*) + 50% NPK through inorganic fertilizer		

Central Zone

Table 1.1 (b-1) : Forage yield of Sorghum + Cowpea – Lucerne sequence as influenced by integrated nutrient management at Rahuri and Anand

Treatments	Green fodder yield (q/ha)								
	Sorghum			Cowpea			Lucerne		
	Rahuri	Anand	Mean	Rahuri	Anand	Mean	Rahuri (6 cuts)	Anand (5 cuts)	Mean
T_1	234.9	171.0	203.0	232.3	58.0	145.2	410.3	479.0	444.7
T_2	491.7	279.0	385.4	266.4	80.0	173.2	677.2	566.0	621.6
T_3	529.7	263.0	396.4	277.9	84.0	180.9	733.5	557.0	645.3
T_4	505.2	257.0	381.4	269.8	89.0	179.4	713.9	565.0	639.5
T_5	393.8	210.0	301.9	240.4	81.0	160.7	597.5	572.0	584.8
T_6	549.0	222.0	385.5	300.5	91.0	195.8	760.8	604.0	682.4
T_7	414.6	247.0	330.8	250.5	66.0	158.3	638.5	539.0	588.8
SEm±	23.8	14.8		12.6	4.9		21.7	15.6	
CD at 5%	70.6	45.9		NS	15.2		64.4	48.1	
CV%	10.7	11.0		9.6	10.9		6.7	4.9	

T_1 = Control	T_5 = 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)
T_2 = 100% NPK through inorganic fertilizer	T_6 = FYM 25% N + 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter / Rhizobium*)
T_3 = FYM 25% N + 75% NPK through inorganic fertilizer	
T_4 = FYM 50% N + 50% NPK through inorganic fertilizer	T_7 = 75% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)

- Selling rates (Rs/q) : Green fodder

Rahuri		Anand	
Sorghum		Sorghum	75
Cowpea		Cowpea	100
Lucerne	110	Lucerne	125

Table 1.1 (b-2) : Forage yield of Sorghum + Cowpea – Lucerne sequence as influenced by integrated nutrient management at Rahuri and Anand

Treatments	Dry matter yield (q/ha)								
	Sorghum			Cowpea			Lucerne		
	Rahuri	Anand	Mean	Rahuri	Anand	Mean	Rahuri (6 cuts)	Anand (5 cuts)	Mean
T_1	35.1	30.5	32.8	27.6	6.2	16.9	83.4	96.2	89.8
T_2	84.3	63.6	73.9	36.7	9.8	23.3	140.3	111.1	125.7
T_3	94.2	60.5	77.3	38.6	9.8	24.2	154.0	115.5	134.8
T_4	87.6	59.2	73.4	37.5	10.1	23.8	148.5	111.0	129.8
T_5	61.6	47.2	54.4	30.6	9.7	20.2	122.6	115.6	119.1
T_6	101.8	49.0	75.4	45.0	10.8	27.9	160.7	124.4	142.6
T_7	69.1	53.2	61.2	34.0	7.9	20.9	131.3	110.1	120.7
SEm±	7.7	3.3		2.6	0.6		6.8	3.1	
CD at 5%	22.8	10.2		7.7	1.8		20.1	9.7	
CV%	20.1	11.3		14.4	10.8		10.1	4.9	

T_1 = Control	T_5 = 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)
T_2 = 100% NPK through inorganic fertilizer	T_6 = FYM 25% N + 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter / Rhizobium*)
T_3 = FYM 25% N + 75% NPK through inorganic fertilizer	
T_4 = FYM 50% N + 50% NPK through inorganic fertilizer	T_7 = 75% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)

Table 1.1 (b-3) : Crude protein yield of Sorghum + Cowpea - Lucerne sequence as influenced by integrated nutrient management at Rahuri & Anand

Treatment	Crude protein yield (q/ha)								
	Sorghum			Cowpea			Lucerne		
	Rahuri	Anand	Mean	Rahuri	Anand	Mean	Rahuri	Anand	Mean
T_1	2.4	2.9	2.6	4.1	0.7	2.4	15.2	23.5	19.3
T_2	6.7	5.7	6.2	6.5	1.2	3.9	26.1	27.5	26.8
T_3	7.7	5.1	6.4	7.0	1.2	4.1	27.9	28.8	28.4
T_4	6.8	5.7	6.3	6.3	1.1	3.7	27.7	26.2	26.9
T_5	4.6	4.4	4.5	5.1	1.4	3.2	22.6	28.8	25.7
T_6	8.6	4.3	4.5	8.7	1.3	5.0	29.6	30.0	29.8
T_7	5.5	4.8	6.4	5.8	1.0	3.4	23.8	26.9	25.3
SEm±	0. 7	0.3		0.6	0.1		1.4	0.8	
CD at 5%	2.0	0.9		1.8	0.2		4.2	2.4	
CV%	22.2	10.8		18.4	10.5		11.4	4.8	

T_1 = Control	T_5 = 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)
T_2 = 100% NPK through inorganic fertilizer	T_6 = FYM 25% N + 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter / Rhizobium*)
T_3 = FYM 25% N + 75% NPK through inorganic fertilizer	
T_4 = FYM 50% N + 50% NPK through inorganic fertilizer	T_7 = 75% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)

Table 1.1 (b-4) : Crude protein content of Sorghum + Cowpea - Lucerne sequence as influenced by integrated nutrient management at Rahuri and Anand

Treatment	Crude protein (%)								
	Sorghum			Cowpea			Lucerne		
	Rahuri	Anand	Mean	Rahuri	Anand	Mean	Rahuri	Anand	Mean
T_1	6.9	9.5	8.2	14.8	11.8	13.3	18.1	24.9	21.5
T_2	7.9	8.9	8.4	17.6	12.0	14.8	18.6	25.2	21.9
T_3	8.1	8.4	8.3	18.2	11.7	14.9	18.1	25.2	21.7
T_4	7.8	9.6	8.7	16.8	10.9	13.9	18.6	24.0	21.3
T_5	7.5	9.2	8.4	16.6	11.9	14.2	18.4	25.1	21.8
T_6	8.5	8.7	8.6	19.2	11.5	15.4	18.4	24.6	21.5
T_7	7.9	9.1	8.5	17.3	13.0	15.2	18.1	24.4	21.3
SEm±	0.3			0.5			0.2		
CD at 5%	NS			1.5			NS		
CV%	8.03			5.8			2.6		

T_1 = Control	T_5 = 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)
T_2 = 100% NPK through inorganic fertilizer	T_6 = FYM 25% N + 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter / Rhizobium*)
T_3 = FYM 25% N + 75% NPK through inorganic fertilizer	
T_4 = FYM 50% N + 50% NPK through inorganic fertilizer	T_7 = 75% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)

Table 1.1 (b-5) : Crude fibre yield of Sorghum + Cowpea - Lucerne sequence as influenced by integrated nutrient management at Rahuri & Anand

Treatment	Crude fibre yield (q/ha)								
	Sorghum			Cowpea			Lucerne		
	Rahuri	Anand	Mean	Rahuri	Anand	Mean	Rahuri	Anand	Mean
T_1	15.7	15.4	15.6	10.5	2.6	6.6	20.6	27.7	24.2
T_2	35.0	27.0	31.0	12.8	3.1	8.0	34.0	25.8	29.9
T_3	36.2	23.6	29.9	13.9	3.4	8.7	37.8	27.6	32.7
T_4	36.9	25.8	31.4	12.9	3.5	8.2	35.0	29.8	32.4
T_5	26.1	21.5	23.8	11.0	3.5	7.3	29.9	31.3	30.6
T_6	40.4	20.3	30.4	16.3	4.2	10.3	38.5	29.6	34.1
T_7	27.8	24.7	26.3	11.4	2.6	7.0	32.0	24.1	28.1
SEm±	3.2	1.4		0.8	0.2		1.8	0.8	
CD at 5%	9.5	4.4		2.5	0.6		5.5	2.4	
CV%	20.6	11.0		13.2	10.6		11.3	4.8	

T_1 = Control	T_5 = 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)
T_2 = 100% NPK through inorganic fertilizer	T_6 = FYM 25% N + 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter / Rhizobium*)
T_3 = FYM 25% N + 75% NPK through inorganic fertilizer	
T_4 = FYM 50% N + 50% NPK through inorganic fertilizer	T_7 = 75% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)

Table 1.1 (b-6) : Crude fibre content of Sorghum + Cowpea - Lucerne sequence as influenced by integrated nutrient management at Rahuri and Anand

Treatment	Crude fibre (%)								
	Sorghum			Cowpea			Lucerne		
	Rahuri	Anand	Mean	Rahuri	Anand	Mean	Rahuri	Anand	Mean
T_1	45.2	50.5	47.9	38.2	40.8	39.5	24.7	28.8	26.8
T_2	41.8	42.5	42.2	35.0	31.3	33.2	24.2	23.2	23.5
T_3	38.2	39.0	38.6	35.9	34.6	35.3	24.6	23.9	24.3
T_4	42.3	43.5	42.9	34.3	34.8	34.6	23.6	26.8	25.2
T_5	42.2	45.5	43.9	36.3	36.7	36.5	24.4	27.1	25.8
T_6	39.7	41.5	40.6	36.9	38.4	37.7	23.9	23.8	23.9
T_7	40.3	46.5	43.4	33.9	32.6	33.3	24.4	21.9	23.2
SEm±	1.5			0.1			0.5		
CD at 5%	NS			NS			NS		
CV%	7.3			5.6			3.7		

T_1 = Control	T_5 = 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)
T_2 = 100% NPK through inorganic fertilizer	T_6 = FYM 25% N + 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter / Rhizobium*)
T_3 = FYM 25% N + 75% NPK through inorganic fertilizer	
T_4 = FYM 50% N + 50% NPK through inorganic fertilizer	T_7 = 75% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)

Table 1.1 (b-7) : Leaf stem ratio of Sorghum + Cowpea - Lucerne sequence as influenced by integrated nutrient management at Rahuri and Anand

Treatment	Leaf stem ratio								
	Sorghum			Cowpea			Lucerne		
	Rahuri	Anand	Mean	Rahuri	Anand	Mean	Rahuri	Anand	Mean
T_1	0.22	0.33	0.28	0.22	0.45	0.34	0.57	1.48	1.03
T_2	0.45	0.46	0.46	0.44	0.47	0.45	0.65	1.54	1.10
T_3	0.46	0.46	0.46	0.46	0.49	0.48	0.71	1.51	1.11
T_4	0.28	0.42	0.35	0.28	0.54	0.41	0.68	1.53	1.11
T_5	0.35	0.33	0.34	0.33	0.48	0.41	0.58	1.59	1.09
T_6	0.45	0.33	0.39	0.46	0.56	0.51	0.76	1.67	1.22
T_7	0.36	0.40	0.38	0.37	0.45	0.41	0.64	1.50	1.07
SEm±	0.01			0.01			0.08		
CD at 5%	0.03			0.03			NS		
CV%	5.71			0.07			24.86		

T_1 = Control	T_5 = 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)
T_2 = 100% NPK through inorganic fertilizer	T_6 = FYM 25% N + 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter / Rhizobium*)
T_3 = FYM 25% N + 75% NPK through inorganic fertilizer	
T_4 = FYM 50% N + 50% NPK through inorganic fertilizer	T_7 = 75% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)

Table 1.1 (b-8) : Plant height of Sorghum + Cowpea - Lucerne sequence as influenced by integrated nutrient management at Rahuri and Anand

Treatment	Plant height (cm)								
	Sorghum			Cowpea			Lucerne		
	Rahuri	Anand	Mean	Rahuri	Anand	Mean	Rahuri	Anand	Mean
T_1	185.6	156.0	170.8	125.7	69.0	97.3	65.8	71.8	68.8
T_2	213.2	191.0	202.1	130.6	89.0	109.8	72.2	74.2	73.2
T_3	214.1	189.0	201.6	127.1	93.0	110.1	74.8	73.8	74.3
T_4	206.1	187.0	196.6	132.7	95.0	113.8	72.2	74.0	73.1
T_5	210.4	176.0	193.2	134.2	92.0	113.1	68.8	74.4	71.6
T_6	214.5	181.0	197.7	146.0	97.0	121.5	77.2	74.8	76.0
T_7	199.6	185.0	192.3	139.7	85.0	112.3	70.6	72.2	71.4
SEm±	5.1			3.4			2.3		
CD at 5%	15.0			10.2			NS		
CV%	4.9			5.1			6.4		

T_1 = Control	T_5 = 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)
T_2 = 100% NPK through inorganic fertilizer	T_6 = FYM 25% N + 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter / Rhizobium*)
T_3 = FYM 25% N + 75% NPK through inorganic fertilizer	
T_4 = FYM 50% N + 50% NPK through inorganic fertilizer	T_7 = 75% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)

Table 1.1 (b-9) : Equivalent yield and economics of Sorghum + Cowpea – Lucerne as influenced by INM at Rahuri and Anand

Treatment	Forage equivalent yield (q/ha/yr)*		Net monetary return (Rs/ha/yr)			Benefit cost ratio of the sequence		
	Rahuri	Anand	Rahuri	Anand	Mean	Rahuri	Anand	Mean
T_1	980.1	627	13959	38500	26229.5	1.22	0.96	1.09
T_2	1604.5	797	45536	56817	51176.5	1.53	1.33	1.43
T_3	1724.4	782	51808	54912	53360.0	1.60	1.28	1.44
T_4	1667.4	791	47222	55875	51548.5	1.55	1.30	1.43
T_5	1381.0	763	32483	53830	43156.5	1.42	1.30	1.36
T_6	1800.5	810	58969	58639	58804.0	1.69	1.38	1.54
T_7	1463.3	740	35438	50257	42847.5	1.43	1.19	1.31
SEm±	59.3		4745			0.06		
CD at 5%	176.2		14092			0.17		
CV%	7.8		23.3			7.79		

* Rahuri – Sorghum equivalent yield (q/ha), Anand – Lucerne equivalent yield (q/ha)

T_1 = Control	T_5 = 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)
T_2 = 100% NPK through inorganic fertilizer	T_6 = FYM 25% N + 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter / Rhizobium*)
T_3 = FYM 25% N + 75% NPK through inorganic fertilizer	
T_4 = FYM 50% N + 50% NPK through inorganic fertilizer	T_7 = 75% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)

Table 1.1 (b-10) : Soil fertility status of forage based system after harvest under the influence of INM at Anand

Treatment	Soil fertility status after harvest					
	EC	pH	OC %	Avail. N (kg/ha)	Avail. P (kg/ha)	Avail. K (kg/ha)
T_1	0.2	8.3	0.7	227.4	95.3	268.5
T_2	0.3	7.8	0.7	235.2	112.9	254.9
T_3	0.2	7.7	1.0	266.6	178.7	265.7
T_4	0.2	7.6	1.1	258.7	189.4	291.3
T_5	0.2	7.7	1.0	274.4	127.6	285.6
T_6	0.2	7.8	1.1	282.2	113.7	265.4
T_7	0.3	7.9	1.0	258.7	129.3	281.6

T_1 = Control	T_5 = 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)
T_2 = 100% NPK through inorganic fertilizer	T_6 = FYM 25% N + 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter / Rhizobium*)
T_3 = FYM 25% N + 75% NPK through inorganic fertilizer	
T_4 = FYM 50% N + 50% NPK through inorganic fertilizer	T_7 = 75% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)

Table 1.1 (b-11) : Nutrient use efficiency of forage based system after harvest under the influence of INM at Anand

Treatment	Nutrient use efficiency (%)							
	Sorghum		Cowpea		Lucerne		Entire system	
	N	P	N	P	N	P	N	P
T_1								
T_2	66.2	82.8	18.0	9.0	74.5	29.8	158.7	121.6
T_3	60.0	100.0	18.0	12.0	96.5	51.5	174.5	163.5
T_4	57.4	143.5	19.5	19.5	74.0	59.2	150.9	222.2
T_5	66.8	83.5	35.0	17.5	194.0	77.6	295.8	178.6
T_6	49.3	92.5	30.7	23.0	188.0	112.8	268.0	228.3
T_7	60.5	75.7	11.3	5.7	92.7	37.1	164.5	118.4

T_1 = Control	T_5 = 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)
T_2 = 100% NPK through inorganic fertilizer	T_6 = FYM 25% N + 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter / Rhizobium*)
T_3 = FYM 25% N + 75% NPK through inorganic fertilizer	
T_4 = FYM 50% N + 50% NPK through inorganic fertilizer	T_7 = 75% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)

Table 1.1 (b-12) : Influence of INM on NPK uptake by each crop of forage based sequence at Anand

Treatment	N uptake (kg/ha)		P uptake (kg/ha)		K uptake (kg/ha)		NPK uptake of entire system (Kharif + Rabi) (kg/ha)		
	Sorghum + Cowpea	Lucerne	Sorghum + Cowpea	Lucerne	Sorghum + Cowpea	Lucerne	N	P	K
T_1	39.1	260.8	6.8	73.1	31.4	85.7	294.9	79.9	117.0
T_2	56.3	309.9	14.7	90.0	71.1	85.52	366.1	104.6	156.6
T_3	59.8	306.2	10.5	82.0	51.1	105.1	366.0	92.5	156.2
T_4	69.7	317.5	11.2	75.5	53.4	103.3	387.2	86.7	156.6
T_5	53.0	337.5	10.9	84.4	52.2	95.9	390.5	95.3	148.1
T_6	63.2	349.6	10.8	99.5	46.3	97.3	412.8	110.4	143.6
T_7	58.8	318.3	11.1	76.0	52.8	96.9	377.1	87.0	149.8
SEm±		8.8		2.3		2.8			
CD at 5%		27.1		7.0		8.5			
CV%		4.9		4.8		5.0			

T_1 = Control	T_5 = 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)
T_2 = 100% NPK through inorganic fertilizer	T_6 = FYM 25% N + 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter / Rhizobium*)
T_3 = FYM 25% N + 75% NPK through inorganic fertilizer	
T_4 = FYM 50% N + 50% NPK through inorganic fertilizer	T_7 = 75% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)

Table 1.1 (b-13) : Influence of INM on NPK uptake by each crop of forage based sequence at Rahuri

Treatment	N uptake (kg/ha)		P uptake (kg/ha)		K uptake (kg/ha)		NPK uptake of entire system (Kharif+Rabi) (kg/ha)			Nutrient use efficiency of the system		
	Sorghum + Cowpea	Lucerne	Sorghum + Cowpea	Lucerne	Sorghum + Cowpea	Lucerne	N	P	K	N	P	K
T_1	103.6	242.4	14.1	20.6	96.1	225.4	346.0	34.7	321.4	0.0	0.0	0.0
T_2	209.5	417.1	26.4	35.1	202.3	383.3	626.6	61.5	585.5	260.7	258.8	221.6
T_3	229.8	446.3	27.9	35.4	208.9	449.2	676.1	63.3	658.1	277.5	284.5	245.3
T_4	203.2	442.5	27.2	36.2	217.5	423.1	645.7	63.4	640.6	272.6	271.2	233.2
T_5	149.3	361.1	21.3	31.3	142.6	353.0	510.4	52.6	495.6	211.3	212.3	181.2
T_6	265.9	473.1	32.0	39.4	262.9	440.0	739.0	71.3	702.9	307.2	305.1	259.6
T_7	177.6	380.9	21.0	31.5	156.2	387.6	558.6	52.4	543.9	231.7	231.9	197.4
SEm±	14.4	22.5	2.1	2.0	17.1	21.4	35.1	3.8	36.3	9.4	14.5	13.4
CD at 5%	42.8	66.7	6.1	5.9	50.8	63.5	104.3	11.3	107.9	27.9	43.1	39.7
CV%	15.1	11.4	16.9	12.0	18.6	11.3	12.0	13.3	12.9	8.4	13.0	14.0

T_1 = Control	T_5 = 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)
T_2 = 100% NPK through inorganic fertilizer	T_6 = FYM 25% N + 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter / Rhizobium*)
T_3 = FYM 25% N + 75% NPK through inorganic fertilizer	
T_4 = FYM 50% N + 50% NPK through inorganic fertilizer	T_7 = 75% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)

Table 1.1 (b-14) : Soil fertility status of forage based system after fourth year under the influence of INM at Rahuri

Treatment	Soil status after harvest											
	Kharif						Rabi					
	pH	EC (dsm^{-1})	OC (%)	Avail. N (kg/ha)	Avail. P (kg/ha)	Avail. K (kg/ha)	pH	EC (dsm^{-1})	OC (%)	Avail. N (kg/ha)	Avail. P (kg/ha)	Avail. K (kg/ha)
T_1	8.01	0.36	0.31	207.5	12.9	246.2	7.87	0.36	0.31	217.4	13.7	250.0
T_2	8.02	0.36	0.32	212.8	15.5	264.0	8.00	0.36	0.32	222.9	16.8	263.5
T_3	8.02	0.36	0.33	221.7	16.1	264.7	7.94	0.35	0.34	239.9	17.0	268.4
T_4	7.94	0.32	0.35	230.3	17.0	275.0	7.93	0.33	0.36	241.5	18.7	278.6
T_5	7.93	0.36	0.34	232.0	18.0	271.1	7.95	0.35	0.35	238.3	18.3	280.6
T_6	8.00	0.33	0.32	220.9	15.2	265.6	7.95	0.33	0.33	226.2	17.1	267.6
T_7	8.02	0.33	0.30	218.0	13.7	261.0	7.94	0.33	0.32	222.8	14.7	263.8
SEm±	0.03	0.002	0.01	3.3	0.3	0.8	0.04	0.001	0.003	1.0	0.3	0.8
CD at 5%	NS	0.006	0.02	9.7	0.9	2.3	NS	0.004	0.009	3.0	0.8	2.4
CV%	0.68	1.19	4.15	3.0	3.9	0.6	0.96	0.80	1.87	0.9	3.4	0.6

T_1 = Control	T_5 = 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)
T_2 = 100% NPK through inorganic fertilizer	T_6 = FYM 25% N + 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter / Rhizobium*)
T_3 = FYM 25% N + 75% NPK through inorganic fertilizer	
T_4 = FYM 50% N + 50% NPK through inorganic fertilizer	T_7 = 75% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)

Table 1.1 (b-15) : Forage yield, quality and economics of forage based sequence as influenced by integrated nutrient management at Urulikanchan

Treatment	Maize		Berseem		Sorghum		Maize fodder equivalent yield (q/ha/yr)	Net monetary return (Rs/ha/yr)	Benefit cost ratio of the sequence
	Green fodder yield (q/ha)	Crude protein yield (q/ha)	Green fodder yield (q/ha)	Crude protein yield (q/ha)	Green fodder yield (q/ha)	Crude protein yield (q/ha)			
T_1	312..6 (51.9)*	3.3 (14.3)**	252..2(37.3)	5.9 (8.7)	424.6(113.4)	8.3 (26.5)	463.2	39368.6	1.75
T_2	477.3 (94.5)	7.0 (27.0)	395.8 (58.0)	8.7 (13.7)	559.6(152.3)	11.7(40.3)	832.2	70733.3	2.12
T_3	491.4 (90.3)	6.4 (26.0)	433.8 (66.3)	9.9 (15.6)	609.8(174.9)	12.2(43.3)	885.6	75271.4	2.10
T_4	545.5 (107.7)	6.9 (30.4)	380.4 (58.1)	8.9 (14.4)	558.3(164.1)	11.5(44.5)	772.5	65664.7	1.91
T_5	423.3 (78.3)	5.3 (22.0)	309.4 (45.2)	6.8 (10.7)	482.4(137.5)	11.5(38.2)	649.7	55225.7	1.96
T_6	445.1 (77.7)	5.1 (21.1)	352.1 (54.7)	8.0 (12.2)	550.6(155.4)	11.1(41.7)	711.5	60478.7	1.93
T_7	455.4 (82.1)	5.6 (23.1)	325.9 (47.4)	7.0 (11.9)	531.3(142.9)	11.0(37.9)	723.2	61474.6	2.03
SEm±	2.8 (1.3)	0.2 (0.5)	6.4 (0.9)	0.2 (0.3)	3.3(4.1)	0.4(1.6)	10.3	873.6	
CD at 5%	11.8 (5.3)	0.6 (2.0)	27.0 (3.6)	0.9 (1.4)	14.0(17.3)	1.7(6.6)	43.4	3695.3	
CV%	15.2 (19.0)	19.0 (19.0)	16.5 (17.8)	17.6(18.3)	10.8(13.3)	11.8(15.7)	18.3	18.3	

* Figures in parantheses indicate dry matter yield
** Figures in parantheses indicate crude fibre yield
Selling rates (Rs/q) : Fodder – Maize and Sorghum – 85, Berseem - 115

T_1 = Control	T_5 = 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)
T_2 = 100% NPK through inorganic fertilizer	T_6 = FYM 25% N + 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter / Rhizobium*)
T_3 = FYM 25% N + 75% NPK through inorganic fertilizer	
T_4 = FYM 50% N + 50% NPK through inorganic fertilizer	T_7 = 75% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)

Table 1.1 (b-16) : Growth parameters of forage based crops sequences as influenced by INM at Urulikanchan

Treatment	Plant population/m^2			Plant height (cm)			Leaf stem ratio		
	Maize	Berseem	Sorghum	Maize	Berseem	Sorghum	Maize	Berseem	Sorghum
T_1	31.3	260.0	111.3	179.3	47.2	223.9	0.66	0.84	0.36
T_2	34.3	274.3	114.0	267.1	52.7	243.3	0.73	0.93	0.41
T_3	36.0	285.3	111.3	247.7	54.9	247.8	0.86	0.89	0.43
T_4	31.0	273.0	115.3	260.4	54.7	244.4	0.80	0.89	0.43
T_5	30.0	282.0	112.3	238.9	52.2	244.1	0.73	0.87	0.37
T_6	35.0	264.3	110.3	246.7	53.3	243.5	0.83	0.87	0.38
T_7	29.3	272.3	115.0	259.9	53.1	243.4	0.81	0.90	0.37
SEm±	0.6	2.3	1.0	1.9	0.6	1.4	0.01	0.01	0.01
CD at 5%	2.3	9.9	4.0	8.0	2.6	5.9	0.04	0.04	0.04
CV%	8.0		2.0	11.7		3.2	8.80		8.12

T_1 = Control	T_5 = 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)
T_2 = 100% NPK through inorganic fertilizer	T_6 = FYM 25% N + 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter / Rhizobium*)
T_3 = FYM 25% N + 75% NPK through inorganic fertilizer	
T_4 = FYM 50% N + 50% NPK through inorganic fertilizer	T_7 = 75% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)

Table 1.1 (b-17) : Influence of integrated nutrient management on NPK uptake of Maize-Berseem-Sorghum sequence at Urulikanchan

Treatment	Nutrient uptake (kg/ha)											
	Maize			Berseem			Sorghum			Entire system		
	N	P	K	N	P	K	N	P	K	N	P	K
T_1	50.83	19.71	24.90	89.54	15.67	23.13	116.82	27.22	56.71	257.20	62.60	104.74
T_2	97.37	38.76	48.21	140.37	25.52	38.28	179.71	39.60	85.29	417.45	103.88	171.74
T_3	101.09	36.10	45.13	158.35	29.81	43.07	199.34	43.72	111.91	458.78	109.63	200.11
T_4	108.83	43.10	54.96	142.36	24.41	37.77	188.69	49.22	85.32	439.89	116.73	178.05
T_5	79.11	32.11	39.94	108.43	20.78	28.46	160.82	38.49	76.97	348.35	91.38	145.38
T_6	79.21	31.84	40.38	132.41	26.26	35.02	178.66	41.95	90.11	390.28	100.05	165.50
T_7	86.18	32.01	41.86	111.84	21.33	30.80	167.20	40.01	77.17	365.22	93.35	149.83

T_1 = Control	T_5 = 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)
T_2 = 100% NPK through inorganic fertilizer	T_6 = FYM 25% N + 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter / Rhizobium*)
T_3 = FYM 25% N + 75% NPK through inorganic fertilizer	
T_4 = FYM 50% N + 50% NPK through inorganic fertilizer	T_7 = 75% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)

Table 1.1 (b-18) : Influence of integrated nutrient management on nutrient use ifficiency of Maize-Berseem-Sorghum sequence at Urulikanchan

Treatment	Nutrient use ifficiency											
	Maize			Berseem			Sorghum			Entire system		
	N	P	K	N	P	K	N	P	K	N	P	K
T_1	Control	Control	Control	Control	Control	Control	Control	Control	Control	Control	Control	Control
T_2	42.66	85.32	85.32	137.93	22.98	68.97	38.88	77.76	97.20	219.47	186.06	251.49
T_3	38.39	101.02	101.02	192.93	42.55	125.82	61.44	161.68	204.80	292.76	305.25	431.64
T_4	55.89	223.56	223.56	138.67	30.58	138.67	50.66	202.64	253.30	245.22	456.78	615.53
T_5	52.90	105.80	105.80	98.37	17.48	52.47	48.06	96.12	120.15	199.33	219.40	278.42
T_6	34.37	103.12	103.12	158.27	38.68	116.07	55.92	167.76	209.70	248.56	309.56	428.89
T_7	40.28	79.50	79.50	91.64	14.82	43.83	39.31	77.58	98.27	171.23	171.90	221.60

T_1 = Control	T_5 = 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)
T_2 = 100% NPK through inorganic fertilizer	T_6 = FYM 25% N + 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter / Rhizobium*)
T_3 = FYM 25% N + 75% NPK through inorganic fertilizer	
T_4 = FYM 50% N + 50% NPK through inorganic fertilizer	T_7 = 75% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)

Table 1.1 (b-19) : Yield of forage based sequence (Sorghum + Cowpea – Berseem) as influenced by INM at Jabalpur

Treatment	Green fodder yield (q/ha)			Dry matter yield (q/ha)			Crude protein yield (q/ha)			Net monetary return (Rs/ha/yr)
	Sorghum	Cowpea	Berseem	Sorghum	Cowpea	Berseem	Sorghum	Cowpea	Berseem	
T_1	229.9	53.0	448.1	51.6	9.4	62.4	3.9	1.2	8.9	11438
T_2	444.3	110.2	981.2	107.7	20.3	151.6	8.6	2.7	22.7	51902
T_3	424.8	106.6	933.8	101.9	19.5	142.4	8.1	2.6	21.0	41614
T_4	464.8	121.9	1002.1	113.3	22.6	155.7	9.1	3.0	23.6	49874
T_5	341.5	79.4	706.4	80.2	14.3	106.6	6.2	1.8	15.5	29823
T_6	412.3	102.5	803.8	98.0	18.7	122.4	7.7	2.5	17.9	35793
T_7	389.0	89.4	887.1	92.2	16.2	134.9	7.2	2.1	19.8	43923
SEm±	4.5	6.5	15.7	1.1	1.2	1.9	0.1	0.2	0.3	724.9
CD at 5%	13.9	20.0	48.7	3.3	3.7	5.8	0.3	0.5	0.8	2233.9
CV%	19.7	11.8	9.2	15.6	11.9	8.7	22.9	12.2	5.6	6.3

T_1 = Control	T_5 = 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)
T_2 = 100% NPK through inorganic fertilizer	T_6 = FYM 25% N + 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter / Rhizobium*)
T_3 = FYM 25% N + 75% NPK through inorganic fertilizer	
T_4 = FYM 50% N + 50% NPK through inorganic fertilizer	T_7 = 75% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)

Table 1.1 (b-20) : Crude fibre yield, content and benefit cost ratio of forage based sequence (Sorghum + Cowpea – Berseem) as influenced by INM at Jabalpur

Treatment	Crude fibre yield (q/ha)			Crude fiber %			Crude protein %	Forage equivalent yield (q/ha)	Benefit cost ratio
	Sorghum	Cowpea	Berseem	Sorghum	Cowpea	Berseem	Berseem		
T_1	11.1	1.4	11.1	21.6	15.1	17.8	14.3	283.0	1.4
T_2	33.5	4.0	37.3	31.1	19.8	24.6	15.0	354.6	2.3
T_3	30.6	3.7	33.4	30.0	18.9	23.5	14.8	531.6	2.1
T_4	37.3	4.6	38.7	32.9	20.2	24.9	15.2	586.8	2.1
T_5	21.9	2.4	19.2	27.2	16.9	18.0	14.6	420.9	1.8
T_6	28.8	3.4	28.4	29.3	18.2	23.2	14.7	514.9	1.8
T_7	26.5	2.9	31.0	28.8	17.9	23.0	14.7	478.5	2.2
SEm±	2.0	0.3	2.8					5.2	
CD at 5%	6.3	0.8	8.3					15.9	

T_1 = Control	T_5 = 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)
T_2 = 100% NPK through inorganic fertilizer	T_6 = FYM 25% N + 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter / Rhizobium*)
T_3 = FYM 25% N + 75% NPK through inorganic fertilizer	
T_4 = FYM 50% N + 50% NPK through inorganic fertilizer	T_7 = 75% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)

Table 1.1 (b-21) : Growth parameters of Sorghum+Cowpea-Berseem sequence as influenced by INM at Jabalpur

Treatment	Plant population/ m row length			Plant height (cm)			Leaf stem ratio		
	Sorghum	Cowpea	Berseem*	Sorghum	Cowpea	Berseem	Sorghum	Cowpea	Berseem
T_1	8.1	6.7	375.4	110.7	96.1	35.5	0.49	0.44	0.57
T_2	8.4	8.0	391.0	249.5	162.1	50.1	0.72	0.64	0.80
T_3	8.9	8.8	393.4	245.4	157.5	46.9	0.68	0.64	0.76
T_4	9.9	8.4	400.1	254.5	164.7	52.7	0.73	0.68	0.84
T_5	8.1	7.7	388.5	221.3	141.2	44.2	0.52	0.51	0.68
T_6	9.2	8.0	385.7	233.2	154.8	46.6	0.65	0.56	0.71
T_7	8.5	8.9	386.4	232.3	147.3	46.0	0.58	0.53	0.74
SEm±	0.5	0.4	NS	21.2	2.1	1.0	0.01	0.02	0.02
CD at 5%	NS	1.2	NS	65.3	6.5	3.0	0.04	0.05	0.06
CV%	10.8	11.8	4.7	11.0	15.5	6.7	15.01	15.01	5.69

*Plant population in berseem measured as per m^2

T_1 = Control	T_5 = 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)
T_2 = 100% NPK through inorganic fertilizer	T_6 = FYM 25% N + 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter / Rhizobium*)
T_3 = FYM 25% N + 75% NPK through inorganic fertilizer	
T_4 = FYM 50% N + 50% NPK through inorganic fertilizer	T_7 = 75% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)

Table 1.1 (b-22) : Soil fertility status of forage based system after fourth year under the influence of INM at Jabalpur

Treatment	Soil status after harvest											
	Kharif						Rabi					
	pH	EC (dsm^{-1})	OC (%)	Avail. N (kg/ha)	Avail. P (kg/ha)	Avail. K (kg/ha)	pH	EC (dsm^{-1})	OC (%)	Avail. N (kg/ha)	Avail. P (kg/ha)	Avail. K (kg/ha)
T_1	7.6	0.52	0.54	257.3	16.0	392.5	7.7	0.53	0.45	248.2	15.1	380.5
T_2	7.4	0.45	0.61	265.4	16.6	410.5	7.5	0.50	0.58	262.3	16.5	408.5
T_3	7.3	0.45	0.63	268.5	16.8	412.6	7.4	0.49	0.60	268.2	16.8	412.5
T_4	7.2	0.48	0.72	282.5	18.1	425.5	7.4	0.48	0.62	286.5	18.2	430.5
T_5	7.4	0.46	0.60	264.6	16.3	407.0	7.5	0.49	0.49	250.6	16.0	405.0
T_6	7.5	0.47	0.62	267.6	16.8	410.0	7.6	0.51	0.58	260.4	16.8	410.5
T_7	7.5	0.47	0.62	268.2	16.9	408.5	7.6	0.51	0.49	252.5	16.6	406.2
SEm±												
CD at 5%												
CV%												

T_1 = Control	T_5 = 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)
T_2 = 100% NPK through inorganic fertilizer	T_6 = FYM 25% N + 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter / Rhizobium*)
T_3 = FYM 25% N + 75% NPK through inorganic fertilizer	
T_4 = FYM 50% N + 50% NPK through inorganic fertilizer	T_7 = 75% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)

Table 1.1 (b-23) : Influence of integrated nutrient management on NPK uptake of Sorghum+Cowpea-Berseem sequence at Jabalpur

Treatment	Nutrient uptake (kg/ha)											
	Sorghum			cowpea			Berseem			Nutrient use efficiency of Entire sequence (%)		
	N	P	K	N	P	K	N	P	K	N	P	K
T_1	63.4	7.2	72.2	19.0	1.7	11.0	140.5	17.4	104.8			
T_2	137.4	20.4	178.2	43.6	4.9	39.6	369.5	65.1	275.9	188.5	112.3	116.5
T_3	130.0	18.2	164.6	41.5	4.3	36.4	348.6	61.2	263.4	176.6	105.0	109.1
T_4	146.0	26.0	229.8	48.8	6.3	44.7	381.1	73.1	295.8	189.2	131.9	132.5
T_5	99.0	11.9	114.2	29.6	2.7	19.8	252.3	38.3	187.6	130.4	66.7	76.1
T_6	123.8	17.2	147.4	39.8	4.1	31.2	293.7	47.7	220.3	155.3	87.1	94.2
T_7	116.4	16.1	134.9	34.1	3.4	28.8	325.9	53.9	244.1	162.0	90.2	96.3

T_1 = Control	T_5 = 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)
T_2 = 100% NPK through inorganic fertilizer	T_6 = FYM 25% N + 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter / Rhizobium*)
T_3 = FYM 25% N + 75% NPK through inorganic fertilizer	
T_4 = FYM 50% N + 50% NPK through inorganic fertilizer	T_7 = 75% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)

Table 1.1 (b-24) : Performance of Sorghum + Cowpea – Berseem sequence as influenced by INM at Jhansi

Treatment	Yield (q/ha)						Berseem equivalent yield (q/ha/yr)	Net monetary return (Rs/ha/yr)
	Sorghum + Cowpea			Berseem (5 cuts)				
	Green fodder yield	Dry matter yield	Crude protein	Green fodder yield	Dry matter yield	Crude protein		
T_1	122.5(20.6) *	24.6 (3.9)	1.5(0.6)	380.7	78.9	11.9	482.7	7690.4
T_2	229.0(30.5)	50.9(6.0)	3.8(0.9)	650.5	103.2	19.2	841.3	20191.2
T_3	261.7(32.1)	48.5(6.0)	2.9(0.9)	690.2	120.7	22.5	908.3	24796.6
T_4	282.5(40.2)	60.1(6.9)	4.2(1.4)	735.6	128.6	23.0	971.0	27527.9
T_5	240.1(25.6)	49.0(4.9)	3.1(0.9)	550.5	90.5	16.9	750.6	15762.6
T_6	260.5(32.9)	57.8(6.8)	3.3(1.1)	649.0	110.0	22.5	866.1	22293.4
T_7	245.0(34.2)	52.1(6.4)	3.9(1.0)	575.0	102.7	22.0	779.2	15997.0
T_8	275.0(32.9)	58.5(5.5)	4.1(1.2)	720.7	118.7	23.5	949.9	24260.5
SEm±	9.9(2.0)	3.1(0.5)	0.3(0.1)	10.3	3.1	1.2	15.6	265.2
CD at 5%	29.0 (5.9)	9.1(1.5)	0.9(0.3)	30.3	9.1	3.5	45.9	780.3
CV%	5.9	6.5	5.6	9.5	8.6	2.9	7.5	9.8

* Figures in parentheses indicate values for cowpea

T_1 = Control	T_5 = 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)
T_2 = 100% NPK through inorganic fertilizer	T_6 = FYM 25% N + 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter / Rhizobium*)
T_3 = FYM 25% N + 75% NPK through inorganic fertilizer	
T_4 = FYM 50% N + 50% NPK through inorganic fertilizer	T_7 = 75% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)

Table 1.1 (b-25) : Nutrient uptake and nutrient use efficiency of Kharif crops as influenced by INM at Jhansi

Treatment	Nutrient uptake (q/ha)								
	Sorghum + Cowpea			Berseem			Complete sequence		
	N	P	K	N	P	K	N	P	K
T_1	17.2(8.5)*	1.3(0.3)	9.0(1.0)	158.5	26.6	38.5	175.7	27.9	47.5
T_2	60.5(16.5)	7.3(0.7)	17.5(1.4)	361.9	38.7	66.5	422.4	46.0	84.0
T_3	52.7(17.2)	6.5(0.8)	15.6(1.7)	383.5	51.7	76.7	436.2	58.2	92.3
T_4	65.8(20.5)	6.9(0.8)	22.5(1.9)	372.0	54.5	71.9	437.8	61.4	34.4
T_5	50.5(13.5)	6.2(0.6)	15.6(1.3)	240.5	41.8	55.6	291.0	48.0	71.2
T_6	66.6(16.2)	6.0(0.8)	19.5(1.9)	284.6	40.5	75.8	351.2	46.5	95.3
T_7	60.9(7.9)	6.8(0.9)	18.7(1.9)	279.5	46.7	69.5	340.4	53.5	88.2
T_8	66.3(19.2)	7.4(1.0)	21.9(2.0)	400.5	59.5	87.6	466.8	66.9	109.5
SEm±	2.4(0.8)	0.5(0.2)	1.3(0.2)	9.5	3.6	2.6			
CD at 5%	7.1(2.4)	1.5(0.6)	3.8(0.6)	27.9	10.6	7.6			
CV%	5.9	6.5	8.0	6.6	4.9	6.5			

* Figures in parentheses indicate uptake by cowpea

T_1 = Control	T_5 = 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)
T_2 = 100% NPK through inorganic fertilizer	T_6 = FYM 25% N + 50% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter / Rhizobium*)
T_3 = FYM 25% N + 75% NPK through inorganic fertilizer	
T_4 = FYM 50% N + 50% NPK through inorganic fertilizer	T_7 = 75% NPK through inorganic fertilizer + Biofertilizer (*Azotobacter /Rhizobium*)

NEZ

Table 1.1 (c-1): Performance of Rice – Oat + Lathyrus sequence as influenced by INM at Jorhat

Treatment	Rice			Oat + Lathyrus					Rice equivalent yield (q/ha/yr)	Net monetary return (Rs/ha/yr)
	Grain yield (q/ha)	Straw yield (q/ha)	Harvest index(%)	Green fodder yield (q/ha)			Crude protein yield (q/ha)			
				Oat	Lathyrus	Total	Oat	Lathyrus		
T_1	28.3	56.7	33.4	56.7 (12.5)	24.1 (5.1)	80.8 (17.6)	0.7	0.5	37.5	20943.2
T_2	44.4	63.8	40.9	150.0 (33.0)	43.6 (9.2)	193.6 (42.3)	2.2	1.1	61.5	39019.2
T_3	49.5	70.5	41.2	196.7 (43.3)	47.8 (10.0)	244.5 (53.4)	3.0	1.2	70.5	45383.0
T_4	49.7	70.2	41.4	186.7 (41.1)	56.1 (11.8)	242.7 (53.0)	2.8	1.4	70.5	45885.5
T_5	49.2	74.2	39.9	185.3 (40.8)	51.9 (10.9)	237.2 (51.9)	2.9	1.3	69.9	44977.8
T_6	51.0	73.1	41.2	260.0 (57.2)	57.2 (12.0)	317.2 (69.4)	4.1	1.4	77.0	50789.5
T_7	49.7	72.1	40.8	218.3 (48.0)	53.7 (11.3)	272.0 (59.5)	3.4	1.3	72.7	47166.5
SEm+	1.6	2.5	1.1	16.9 (3.7)	(0.3)	17.0 (3.8)	0.3	0.04	2.4	1823.9
CD at 5%	5.0	7.6	3.4	52.1 (11.5)	(1.0)	52.3 (11.6)	0.8	0.11	7.5	5620.6
CV%	8.7	8.9	0.01	2.3 (0.02)	(0.01)	0.02 (0.02)	0.02	0.01	0.01	0.01

* Figures in parentheses indicate dry matter yield (q/ha)

T_1 = Control	T_5 = GM + 50% N FYM + Biofertilizer (*Azotobacter/ Rhizobium*)
T_2 = 100% NPK through inorganic fertilizer	T_6 = GM + 25% N FYM + 50% NPK through inorganic fertilizer+ Biofertilizer
T_3 = 50% N FYM + 50% NPK through inorganic fertilizer	T_7= GM + 50% N FYM + Phosphobacteria (PSB) + Biofertilizer (*Azotobacter/Rhizobium*)
T_4 = 25% N FYM + 50% NPK through inorganic fertilizer + Green manuring (GM)	

Table 1.1 (c-2) : Uptake of NPK by forage based sequence as influenced by INM at Jorhat

Treatment	N uptake (kg/ha)			P uptake (kg/ha)			K uptake (kg/ha)		
	Rice	Oat	Lathyrus	Rice	Oat	Lathyrus	Rice	Oat	Lathyrus
T_1	18.9	11.8	8.0	9.2	4.83	2.5	7.2	14.6	8.1
T_2	31.7	35.8	16.9	14.9	15.7	4.7	12.5	42.4	16.7
T_3	38.5	48.3	19.0	17.5	20.5	5.2	14.5	59.0	18.8
T_4	42.4	45.5	22.5	18.4	20.6	6.2	15.4	58.2	21.9
T_5	43.1	46.4	20.4	18.7	20.4	5.8	16.4	57.9	20.7
T_6	45.3	64.9	23.1	19.8	29.3	6.3	18.3	82.0	22.8
T_7	44.6	55.0	21.5	19.0	24.6	5.9	17.2	69.1	21.3
SEm±	1.2	4.1	0.6	0.6	1.8	0.2	0.5	5.5	0.6
CD at 5%	3.8	12.6	1.8	1.8	5.7	0.5	1.6	16.8	1.7
CV%	0.01	0.02	0.01	0.01	0.02	0.01	0.01	0.03	0.01

T_1 = Control T_2 = 100% NPK through inorganic fertilizer T_3 = 50% N FYM + 50% NPK through inorganic fertilizer T_4 = 25% N FYM + 50% NPK through inorganic fertilizer + Green manuring (GM)	T_5 = GM + 50% N FYM + Biofertilizer (*Azotobacter/ Rhizobium*) T_6 = GM + 25% N FYM + 50% NPK through inorganic fertilizer+ Biofertilizer T_7= GM + 50% N FYM + Phosphobacteria (PSB) + Biofertilizer (*Azotobacter/Rhizobium*)

Table 1.1 (c-3): Growth parameters of Rice – Oat + Lathyrus as influenced by INM at Jorhat

Treatment	Plant height (cm)			No. of Tillers/m
	Rice	Oat	Lathyrus	Rice
T_1	113.5	77.3	41.3	9.3
T_2	123.4	119.2	48.3	11.8
T_3	126.8	134.4	58.4	11.7
T_4	125.0	153.6	66.3	12.6
T_5	129.3	146.5	60.7	11.6
T_6	127.4	155.8	68.5	12.4
T_7	131.0	152.0	61.9	13.0
SEm±	1.3	10.7	1.6	0.9
CD at 5%	3.9	33.1	4.9	2.6
CV%	0.3	2.0	0.7	1.8

T_1 = Control	T_5 = GM + 50% N FYM + Biofertilizer (*Azotobacter/ Rhizobium*)
T_2 = 100% NPK through inorganic fertilizer	T_6 = GM + 25% N FYM + 50% NPK through inorganic fertilizer+ Biofertilizer
T_3 = 50% N FYM + 50% NPK through inorganic fertilizer	T_7 = GM + 50% N FYM + Phosphobacteria (PSB) + Biofertilizer (*Azotobacter/ Rhizobium*)
T_4 = 25% N FYM + 50% NPK through inorganic fertilizer + Green manuring (GM)	

Table 1.1 (c-4) : Yield and net monetary return of Rice - Berseem as influenced by INM at Faizabad

Treatment	Rice			Berseem			Berseem forage equivalent yield (q/ha/yr)	Net monetary return (Rs/ha/yr)
	Grain yield (q/ha)	Straw yield (q/ha)	Harvest index (%)	Green fodder yield (q/ha)	Dry matter yield (q/ha)	Crude protein yield (q/ha)		
T_1	10.9	18.3	37.1	323.8	58.0	9.41	425.1	-3905.3
T_2	29.0	44.2	39.6	387.5	70.0	13.6	658.3	12122.0
T_3	30.5	45.0	40.4	511.9	91.9	17.9	796.8	22822.0
T_4	27.2	42.5	39.0	424.4	74.3	14.2	677.9	11463.3
T_5	24.0	37.9	38.8	500.6	90.5	17.5	724.7	15183.5
T_6	27.5	41.5	39.8	433.7	77.6	15.0	690.3	11909.3
T_7	25.3	41.3	38.1	504.4	90.2	17..5	740.7	16240.5
SEm±	1.3	2.3	0.6	17.3	3.9	0.8	20.0	
CD at 5%	3.9	6.7	1.8	51.4	11.7	2.3	59.5	
CV%	10.4	11.7	3.1	7.8	10.0	10.2	6.0	

Selling rate (Rs/q) : Rice grain- 700, Rice straw -75 ,Berseem forage-75

T_1 = Control	T_5 = GM + 50% N FYM + Biofertilizer (*Azotobacter/ Rhizobium*)
T_2 = 100% NPK through inorganic fertilizer	T_6 = GM + 25% N FYM + 50% NPK through inorganic fertilizer+ Biofertilizer
T_3 = 50% N FYM + 50% NPK through inorganic fertilizer	T_7 = GM + 50% N FYM + Phosphobacteria (PSB) + Biofertilizer (*Azotobacter/ Rhizobium*)
T_4 = 25% N FYM + 50% NPK through inorganic fertilizer + Green manuring (GM)	

Table 1.1 (c-5) : Uptake of NPK by forage based sequence as influenced by INM at Faizabad

Treatment	N uptake (kg/ha)		P uptake (kg/ha)		K uptake (kg/ha)		Uptake by rice-berseem system(kg/ha)		
	Rice	Berseem	Rice	Berseem	Rice	Berseem	N	P	K
T_1	19.6	150.6	4.4	22.5	18.8	39.4	170.2	26.8	58.3
T_2	60.4	216.8	14.0	36.5	59.4	54.8	277.2	50.6	114.2
T_3	62.0	286.4	13.8	46.5	57.0	77.4	348.4	60.3	134.3
T_4	54.1	228.0	12.4	36.4	50.6	59.8	282.1	48.8	110.4
T_5	49.0	279.6	10.0	40.6	43.1	73.2	328.7	50.6	116.3
T_6	55.9	240.4	12.5	36.7	50.2	62.3	296.4	49.1	112.5
T_7	51.3	279.2	11.3	41.5	45.7	73.2	330.5	52.8	118.9
SEm±	2.9	12.2	0.9	2.0	2.8	3.4			
CD at 5%	8.5	36.3	2.6	5.9	8.2	10.0			
CV%	11.4	10.2	15.4	10.7	11.9	10.7			

T_1 = Control	T_5 = GM + 50% N FYM + Biofertilizer (*Azolla/ Rhizobium*)
T_2 = 100% NPK through inorganic fertilizer	T_6 = GM + 25% N FYM + 50% NPK through inorganic fertilizer+ Biofertilizer
T_3 = 50% N FYM + 50% NPK through inorganic fertilizer	T_7 = GM + 50% N FYM + Phosphobacteria (PSB) + Biofertilizer (*Azolla/ Rhizobium*)
T_4 = 25% N FYM + 50% NPK through inorganic fertilizer + Green manuring (GM)	

Table 1.1 (c-6) : Soil fertility status after completion of sequence as influenced by INM at Faizabad

Treatment	Soil fertility status after five cycles					
	EC	**pH**	**OC %**	**Avail.N (kg/ha)**	**Avail. P (kg/ha)**	**Avail. K (kg/ha)**
T_1	1.09	8.27	0.26	133.4	12.8	280.2
T_2	0.98	8.21	0.30	186.5	16.3	291.0
T_3	0.85	8.12	0.33	207.0	19.1	314.6
T_4	0.76	8.06	0.3	192.0	18.7	306.5
T_5	0.69	8.03	0.36	211.5	19.0	298.0
T_6	0.74	8.09	0.35	203.2	18.4	309.0
T_7	0.62	8.01	0.36	209.0	19.7	302.4
Initial fertility	**1.48**	**8.40**	**0.23**	**144.5**	**16.2**	**285.8**

T_1 = Control	T_6 = GM + 25% N FYM + 50% NPK through inorganic fertilizer+ Biofertilizer
T_2 = 100% NPK through inorganic fertilizer	
T_3 = 50% N FYM + 50% NPK through inorganic fertilizer	T_7 = GM + 50% N FYM + Phosphobacteria (PSB) + Biofertilizer (*Azolla/ Rhizobium*)
T_4 = 25% N FYM + 50% NPK through inorganic fertilizer + Green manuring (GM)	

Table 1.1 (c-7) : Effect of integrated nutrient management on Rice – Cowpea (F) – Mung (G) at Bhubaneswar

Treatment	Yield (q/ha)							Net monetary return (Rs/ha/Yr)
	Rice			Cowpea (F)		Mung		
	Grain	Straw	Harvest index (%)	Green fodder	Dry matter yield	Grain	Haulm	
T_1	16.6	34.2	32.7	60.3	3.6	1.5	1.1	5704
T_2	44.0	85.9	33.9	221.2	13.3	4.9	5.9	49077
T_3	37.4	75.7	33.1	230.6	13.3	5.4	5.8	42385
T_4	41.9	83.5	33.4	246.3	15.4	5.3	7.4	50910
T_5	48.5	97.5	33.2	244.1	14.8	5.0	8.6	56142
T_6	44.3	89.1	33.2	261.0	15.7	5.9	8.6	55665
T_7	44.1	87.6	33.5	282.1	16.9	6.5	9.8	57798
SEm±	1.6	3.0	0.3	8.2	0.6	0.1	0.2	1921.3
CD at 5%	5.0	9.4	0.8	25.3	1.7	0.4	0.6	5919.7
CV%	7.2	6.7	1.4	6.4	7.3	4.1	5.2	7.3

Selling rates (Rs/q): Rice(grain) – 950 ,Rice(straw) – 70 , Cowpea(fodder) –80 , Mung(grain) –,2760 , Mung(Haulm) –40 .

T_1 = Control	T_5 = GM + 50% N FYM + Biofertilizer (*Azolla/ Rhizobium*)
T_2 = 100% NPK through inorganic fertilizer	T_6 = GM + 25% N FYM + 50% NPK through inorganic fertilizer+ Biofertilizer
T_3 = 50% N FYM + 50% NPK through inorganic fertilizer	T_7 = GM + 50% N FYM + Phosphobacteria (PSB) + Biofertilizer (*Azolla/ Rhizobium*)
T_4 = 25% N FYM + 50% NPK through inorganic fertilizer + Green manuring (GM)	

Table 1.1(c-8) : Effect of INM on growth parameters of Rice – Cowpea (F) – Mung (G) at Bhubaneswar

Treatment	No.of tillers/ clump	Plant Population/m^2		Plant height (cm)			L : S ratio
	Rice	Cowpea	Mung	Rice	Cowpea	Mung	Cowpea
T_1	4.0	24.0	32	58.5	42.5	33.1	0.73
T_2	9.3	26.7	31	90.7	106.5	42.2	1.05
T_3	9.0	28.0	31	93.4	110.3	43.0	1.07
T_4	9.0	28.7	30	94.9	102.5	41.3	1.04
T_5	11.7	28.3	31	98.1	104.3	42.9	1.13
T_6	8.3	28.7	30	94.7	104.3	44.3	1.14
T_7	8.3	28.7	32	93.8	103.2	47.4	1.21
SEm+	0.5	0.8	0.6	2.7	2.7	0.7	0.01
CD at 5%	1.6	2.6	1.8	8.3	8.2	2.2	0.04
CV%	10.4	5.3	3.2	5.2	4.8	3.0	2.33

T_1 = Control

T_2 = 100% NPK through inorganic fertilizer

T_3 = 50% N FYM + 50% NPK through inorganic fertilizer

T_4 = 25% N FYM + 50% NPK through inorganic fertilizer + Green manuring (GM)

T_5 = GM + 50% N FYM + Biofertilizer (*Azolla/ Rhizobium*)

T_6 = GM + 25% N FYM + 50% NPK through inorganic fertilizer+ Biofertilizer

T_7 = GM + 50% N FYM + Phosphobacteria (PSB) + Biofertilizer (*Azolla/ Rhizobium*)

Table 1.1 (C-9) : Performance of forage based crop sequence under the influence of INM at Kalyani

Treatment	Green fodder yield (q/ha)			Dry matter yield (q/ha)			Crude protein yield (q/ha)			Oat fodder equivalent yield (q/ha/yr)	Net monetary return (Rs/ha/yr)
	Ricebean	Oat	Summer Mung (F)	Ricebean	Oat	Summer Mung (F)	Ricebean	Oat	Summer Mung (F)		
T_1	183.5	287.0	69.7	25.5	50.8	12.8	2.5 (9.8)*	3.3 (6.4)	1.8 (13.1)	732.1	10926.7
T_2	205.9	314.0	82.0	29.3	58.0	15.7	3.3 (10.5)	4.1 (7.0)	2.2 (14.3)	821.1	15266.7
T_3	227.7	333.5	85.3	32.9	62.0	16.3	3.8 (11.5)	4.4(7.1)	2.5 (15.5)	883.7	18523.3
T_4	236.3	355.2	86.7	35.5	65.9	16.8	4.8 (13.4)	5.2 (7.9)	2.7 (15.9)	922.3	20336.7
T_5	260.1	377.2	88.0	41.0	70.6	17.0	6.8 (16.3)	6.8 (9.6)	3.0 (17.8)	862.8	22270.0
T_6	252.3	363.5	85.7	39.1	69.3	16.5	5.9 (15.0)	6.1 (8.8)	2.7 (16.3)	955.3	21650.0
T_7	247.5	355.2	87.3	39.1	66.9	16.8	6.0(15.4)	6.3 (9.4)	2.9 (17.0)	942.3	21036.7
SEm±	2.1	1.7	2.4	2.2	1.9	2.6	-	-	-	3.3	9.94
CD at 5%	6.7	4.1	5.0	5.9	5.1	6.4	6.5 (0.2)	5.3 (0.2)	6.4 (0.1)	17.2	1066.3
CV%	16.9	12.2	6.1	3.0	4.7	1.5	0.4	0.4	0.2	43.2	2686.8

* Figures in parentheses indicates crude protein (%)

T_1 = Control	T_5 = GM + 50% N FYM + Biofertilizer (*Azotobacter/ Rhizobium*)
T_2 = 100% NPK through inorganic fertilizer	T_6 = GM + 25% N FYM + 50% NPK through inorganic fertilizer+ Biofertilizer
T_3 = 50% N FYM + 50% NPK through inorganic fertilizer	T_7 = GM + 50% N FYM + Phosphobacteria (PSB) + Biofertilizer (*Azotobacter/Rhizobium*)
T_4 = 25% N FYM + 50% NPK through inorganic fertilizer + Green manuring (GM)	

Table 1.1 (c-10) : Performance of forage based crop sequence under the influence of INM at Kalyani

Treatment	Plant population/m^2			Plant height (cm)			Leaf stem ratio		
	Ricebean	Oat	Summer Mung	Ricebean	Oat	Summer Mung	Ricebean	Oat	Summer Mung
T_1	30.7	114.0	31.7	83.1	127.2	40.5	0.49	0.50	1.11
T_2	31.7	121.7	34.0	89.4	137.5	41.5	0.33	0.58	1.16
T_3	32.0	124.0	35.3	90.6	141.9	42.1	0.60	0.66	1.18
T_4	32.7	123.0	35.7	94.6	136.1	41.7	0.62	0.72	1.21
T_5	33.3	125.3	36.3	94.7	145.5	42.6	0.73	0.78	1.36
T_6	33.3	123.0	35.3	100.6	142.1	41.5	0.64	0.75	1.25
T_7	34.0	122.0	36.0	98.4	137.1	41.9	0.69	0.75	1.28
SEm±	0.4	1.7	2.0	0.9	1.1	0.6			
CD at 5%	1.0	5.2	4.9	2.4	3.3	1. 7			
CV%	2.6	3.0	2.5	3.3	6.7	1.0			

T_1 = Control

T_2 = 100% NPK through inorganic fertilizer

T_3 = 50% N FYM + 50% NPK through inorganic fertilizer

T_4 = 25% N FYM + 50% NPK through inorganic fertilizer + Green manuring (GM)

T_5 = GM + 50% N FYM + Biofertilizer (*Azotobacter/ Rhizobium*)

T_6 = GM + 25% N FYM + 50% NPK through inorganic fertilizer+ Biofertilizer

T_7 = GM + 50% N FYM + Phosphobacteria (PSB) + Biofertilizer (*Azotobacter/ Rhizobium*)

Table 1.1 (c-11) : Yield, growth characters and net monetary return of forage based system as influenced by INM at Pusa

Treatment	Rice			Berseem (4 cuts)		Berseem forage equivalent yield (q/ha)
	Grain yield (q/ha)	Straw yield (q/ha)	Harvest index (%)	Green fodder yield (q/ha)	Dry matter yield (q/ha)	
T_1	26.7	41.7	39.1	289.3	44.3	383.7
T_2	56.3	86.4	39.5	398.6	59.4	685.2
T_3	45.6	78.7	36.7	475.2	70.3	682.4
T_4	48.3	74.4	39.4	429.6	63.6	648.4
T_5	42.4	65.6	39.3	368.7	55.7	544.8
T_6	57.5	90.2	38.9	463.2	68.4	750.8
T_7	43.9	68.2	39.2	392.9	59.7	579.8
SEm±	1.0	1.1		19.8	3.2	
CD at 5%	2.9	3.2		57.3	9.3	
CV%	8.4	8.7		8.4	9.6	

Selling rate Rs/q : Rice grain – 600 , Straw – 60, Berseem – 100

T_1 = Control	T_5 = GM + 50% N FYM + Biofertilizer (*BGA/ Rhizobium*)
T_2 = 100% NPK through inorganic fertilizer	T_6 = GM + 25% N FYM + 50% NPK through inorganic fertilizer+ Biofertilizer
T_3 = 50% N FYM + 50% NPK through inorganic fertilizer	T_7 = GM + 50% N FYM + Phosphobacteria (PSB) + Biofertilizer (*BGA/ Rhizobium*)
T_4 = 25% N FYM + 50% NPK through inorganic fertilizer + Green manuring (GM)	

Table 1.1 (c-12) : Yield, growth characters and net monetary return of forage based system as influenced by INM at Ranchi

Treatment	Rice		Berseem (4 cuts)		Forage equivalent yield (q/ha/yr)	Net monetary Return (Rs/ha/yr)	B : C ratio
	Grain yield (q/ha)	Straw yield (q/ha)	Green fodder yield (q/ha)	Dry matter yield (q/ha)			
T_1	19.7	29.8	257.6	32.3	327.1	49821	1.56
T_2	41.9	65.0	477.9	57.9	626.5	116445	2.90
T_3	42.2	63.5	628.1	78.2	776.8	149145	3.31
T_4	43.2	66.1	537.8	62.6	690.4	128257	2.89
T_5	37.2	54.1	453.9	52.6	584.1	98600	2.08
T_6	44.4	69.8	640.1	79.3	797.9	152442	3.24
T_7	39.1	57.8	513.1	60.6	650.3	114824	2.41
SEm±	1.8	4.8	-	-	-	-	-
CD at 5%	5.7	14.9	83.0	10.1	95.6	23905	
CV%	10.3	14.4	10.3	9.4	8.4	11.6	

T_1 = Control

T_2 = 100% NPK through inorganic fertilizer

T_3 = 50% N FYM + 50% NPK through inorganic fertilizer

T_4 = 25% N FYM + 50% NPK through inorganic fertilizer + Green manuring (GM)

T_5 = GM + 50% N FYM + Biofertilizer (*BGA/ Rhizobium*)

T_6 = GM + 25% N FYM + 50% NPK through inorganic fertilizer+ Biofertilizer

T_7 = GM + 50% N FYM + Phosphobacteria (PSB) + Biofertilizer (*BGA/ Rhizobium*)

Table 1.1 (c-13) : Effect of INM on nutrient uptake and soil fertility status in Rice-Berseem at Ranchi

Treatment	Uptake by system(kg/ha)			Nutrient use efficiency of the system		
	N	P	K	N	P	K
T_1	112.5	13.4	45.2			
T_2	224.9	33.8	101.1	93.6	15.8	111.9
T_3	282.6	39.0	121.9	141.8	26.1	80.2
T_4	242.5	34.4	109.8	76.0	20.9	77.4
T_5	202.9	29.0	87.8	64.1	29.6	43.5
T_6	294.4	41.9	129.6	106.4	28.2	101.1
T_7	230.0	35.9	95.4	83.3	42.8	51.2
SEm±						
CD at 5%	34.3	5.0	17.4			
CV	8.5	8.7	9.9			

T_1 = Control	T_5 = GM + 50% N FYM + Biofertilizer (*BGA/ Rhizobium*)
T_2 = 100% NPK through inorganic fertilizer	T_6 = GM + 25% N FYM + 50% NPK through inorganic fertilizer+ Biofertilizer
T_3 = 50% N FYM + 50% NPK through inorganic fertilizer	T_7 = GM + 50% N FYM + Phosphobacteria (PSB) + Biofertilizer (*BGA/ Rhizobium*
T_4 = 25% N FYM + 50% NPK through inorganic fertilizer + Green manuring (GM)	

Table 1.1 (c-14) : Effect of INM on nutrient uptake and soil fertility status in Rice-Berseem at Ranchi

Treatment	Soil fertility status				
	pH	**OC%**	**Avail.N (kg/ha)**	**Avail.P (kg/ha)**	**Avail.K (kg/ha)**
T_1	5.8	0.43	241.3	17.2	142.1
T_2	5.7	0.51	257.9	38.3	152.4
T_3	6.3	0.67	303.7	44.4	165.8
T_4	6.0	0.65	314.1	39.4	170.0
T_5	6.2	0.66	297.4	37.3	162.7
T_6	6.1	0.70	324.5	43.4	177.2
T_7	6.4	0.68	309.9	40.4	166.9
Initial fertility	**6.2**	**0.32**	**200.0**	**20.0**	**154.0**

T_1 = Control	T_5 = GM + 50% N FYM + Biofertilizer (*BGA/ Rhizobium*)
T_2 = 100% NPK through inorganic fertilizer	T_6 = GM + 25% N FYM + 50% NPK through inorganic fertilizer+ Biofertilizer
T_3 = 50% N FYM + 50% NPK through inorganic fertilizer	T_7 = GM + 50% N FYM + Phosphobacteria (PSB) + Biofertilizer (*BGA/ Rhizobium*
T_4 = 25% N FYM + 50% NPK through inorganic fertilizer + Green manuring (GM)	

Table 1.1 (c-15) : Effect of INM on nutrient uptake and soil fertility status in Rice-Berseem at Ranchi

Treatment	Nutrient uptake (kg/ha)								
	Berseem			Rice			Nutrient Use efficiency		
	N	P	K	N	P	K	N	P	K
T_1	80.3	5.2	20.3	29.2	6.9	27.2			
T_2	148.3	12.8	38.2	72.5	16.8	68.7	42.6	21.3	85.1
T_3	204.8	17.2	56.3	76.4	18.0	73.2	44.2	23.5	27.3
T_4	163.3	13.1	44.4	79.0	17.7	73.6	43.4	25.2	37.1
T_5	138.3	12.1	37.9	65.9	14.5	59.9	40.6	19.1	19.4
T_6	210.9	18.2	57.9	82.7	19.5	78.5	46.1	26.8	39.5
T_7	160.0	14.5	43.0	70.9	17.9	61.0	45.2	21.3	21.6
CD	26.6	2.3	7.3	9.4	2.2	8.3			
CV	9.5	9.6	9.6	10.8	10.7	11.2			

T_1 = Control	T_5 = GM + 50% N FYM + Biofertilizer (*BGA/ Rhizobium*)
T_2 = 100% NPK through inorganic fertilizer	T_6 = GM + 25% N FYM + 50% NPK through inorganic fertilizer+ Biofertilizer
T_3 = 50% N FYM + 50% NPK through inorganic fertilizer	T_7 = GM + 50% N FYM + Phosphobacteria (PSB) + Biofertilizer (*BGA/ Rhizobium*
T_4 = 25% N FYM + 50% NPK through inorganic fertilizer + Green manuring (GM)	

AST-2: OPTIMIZATION OF S AND ZN LEVELS IN FORAGE BASED CROPPING SYSTEM

AST-2.1: Optimization of Sulphur and Zinc levels for enhancement of seed production of forage – based cropping system

(Location: Jabalpur, Faizabad, Bikaner and Hyderabad)

This was sixth year of experimentation at fixed site at all the four locations. It is evident from Table 2.1 (a) that at Jabalpur and Faizabad application of Zn through $ZnSO_4$ recorded significantly higher seed yield of component crops in maize (S) + cowpea (F) – berseem (S) sequence than other sources. Forage yield of cowpea and seed yield of berseem was significantly highest with the application of 10 kg Zn/ha every year ($ZnSO_4$) at Jabalpur and Faizabad. Net return also followed the trend of forage and seed yield at both the locations. Application of 10 kg Zn/ha every year ($ZnSO_4$) recorded significantly higher net return at Jabalpur (Rs.6695/ha/yr) and Faizabad (Rs. 29579/ha/yr) than rest of the treatments. The magnitude of increase over control was 270 and 267 percent at Jabalpur and Faizabad, respectively. Nutrient uptake was also higher with T_{10}, T_{11}, T_{12} and T_{13}. Crop wise maximum uptake was in the order of berseem > cowpea >maize at Faizabad. Soil fertility status was gradually improving over the years as compared to initial level for all nutrients except P, for which the magnitude of increase was marginal after five year of experimentation.

At Bikaner, response of S and Zn treatments in pearl millet (S) + cowpea (F) – barley (S) exhibited superiority of 10 kg Zn/ha every year ($ZnSO_4$) in terms of yield. On mean basis, net return was significantly higher with T_{12} (Rs.118684/ha/yr), next best treatments in terms of net return were T_{10}, T_4, T_2 and T_8. In general, application of S and Zn favorably affected growth and yield of the crop in the sequence.

At Hyderabad, treatments did not exhibited any significant effect on grain yield of maize and fodder yield of Lucerne. In general numerically S and Zn application had favorable effect on yield of these crops. However, treatments exhibited significant effect on fodder yield of cowpea. Application of 10 kg Zn/ha every year ($ZnSO_4$) produced higher cowpea forage yield and remained at par with T_8 and T_{11}.

Supplementation of 20 kg S/ha every year (Gypsum) recorded significantly superior seed yield (1.8 q/ha) of Lucerne and was at par with T_{12}. Net return of maize (S) – cowpea (F) – Lucerne (S) sequence was highest (Rs.27441/ha) when supplemented with 20 kg S/ha every year (Gypsum). Treatments T_{10} and T_{12} exhibited similar response in terms of net return. Crude protein yield of crop followed the trend of dry matter yield.

Table 2.1 (a) : Effect of S and Zn levels on the yield of individual crops in Maize (S) + Cowpea(F) – Berseem (S) sequence

Treatment	Yield (q/ha)								
	Maize (Seed)			Cowpea (Green fodder)			Berseem (Seed)		
	Jabalpur	Faizabad	Mean	Jabalpur	Faizabad	Mean	Jabalpur	Faizabad	Mean
T_1	1.3	8.0	4.7	43.3	99.4	71.4	2.4(502.9)	0.8(302.3)	1.6(402.6)
T_2	1.8	10.2	6.0	66.6	117.8	92.2	4.3(610.9)	1.2(423.6)	2.8(517.3)
T_3	1.8	10.0	5.9	61.2	108.8	85.0	4.6(588.6)	1.1(383.0)	2.8(485.8)
T_4	1.4	10.6	6.0	73.8	121.9	97.9	5.0(668.3)	1.3(442.6)	3.2(555.5)
T_5	2.0	10.2	6.1	73.4	121.4	97.4	5.5(640.6)	1.2(432.4)	3.3(536.5)
T_6	2.0	10.1	6.1	63.2	109.7	86.5	3.7(529.9)	1.0(314.3)	2.4(422.1)
T_7	2.4	9.6	6.0	63.2	108.7	86.0	3.6(506.3)	1.1(313.7)	2.3(410.0)
T_8	2.2	10.0	6.1	76.5	116.6	96.6	4.0(554.2)	1.0(334.7)	2.5(444.5)
T_9	1.8	9.9	5.8	78.5	120.7	99.6	3.6(523.8)	1.0(320.7)	2.3(422.3)
T_{10}	2.5	11.7	7.1	88.0	128.0	108.0	5.3(652.1)	1.4(482.9)	3.4(567.5)
T_{11}	2.6	11.5	7.1	91.1	119.6	105.4	5.8(631.1)	1.3(425.1)	3.6(528.1)
T_{12}	2.7	12.4	7.6	91.8	130.4	111.1	6.3(716.2)	1.5(486.4)	3.9(601.3)
T_{13}	2.9	12.0	7.5	86.2	126.6	106.4	5.5(705.4)	1.3(442.3)	3.4(573.9)
SEm±	0.7	0.4		2.0	2.5		0.02(12.0)	0.05(10.6)	
CD at 5%	1.9	1.1		5.9	7.4		0.07(35.1)	0.2(30.9)	
CV%	15.0	6.3		15.2	3.7		8.7(13.5)	8.7(4.6)	

*Figures in parantheses indicate green fodder yield (q/ha) of berseem

T_1 = Control	T_6 = 5 kg Zn/ha every year ($ZnCl_2$)	T_{11} = 5 kg Zn/ha alternate year ($ZnSo_4$)
T_2 = 10 kg S/ha every year (Gypsum)	T_7 = 5 kg Zn/ha alternate year ($ZnCl_2$)	T_{12} = 10 kg Zn/ha every year ($ZnSo_4$)
T_3 = 10 kg S/ha alternate year (Gypsum)	T_8 = 10 kg Zn/ha every year ($ZnCl_2$)	T_{13} = 10 kg Zn/ha alternate year ($ZnSo_4$)
T_4 = 20 kg S/ha every year (Gypsum)	T_9 = 10 kg Zn/ha alternate year ($ZnCl_2$)	
T_5 = 20 kg S/ha alternate year (Gypsum)	T_{10} = 5 kg Zn/ha every year ($ZnSo_4$)	

Table 2.1 (b) : Effect of S and Zn levels on the yield of individual crops in Maize (S) + Cowpea(F) – Berseem (S) sequence

Treatment	Yield (q/ha)								
	Maize (Stover)			Cowpea (Dry matter)			Berseem (Straw)		
	Jabalpur	Faizabad	Mean	Jabalpur	Faizabad	Mean	Jabalpur	Faizabad	Mean
T_1	29.8	22.4	26.1	8.0	25.9	16.9	36.0	46.9	41.5
T_2	36.5	29.7	33.1	12.4	29.2	20.8	54.7	66.6	60.6
T_3	37.1	28.4	32.7	11.3	28.4	19.8	59.7	60.2	59.9
T_4	39.8	37.5	38.6	13.9	38.3	26.1	62.0	69.4	65.7
T_5	37.8	35.8	36.8	13.5	33.9	23.7	54.4	68.0	61.2
T_6	30.3	29.8	30.1	11.5	33.0	22.3	49.8	49.4	49.6
T_7	32.5	35.1	33.8	11.6	26.9	19.2	48.3	49.3	48.8
T_8	31.0	28.9	29.9	14.5	31.6	23.1	63.3	52.6	58.0
T_9	32.2	28.5	30.4	14.8	29.0	21.9	57.4	50.4	53.9
T_{10}	33.5	36.1	34.8	16.8	36.8	26.8	76.8	75.3	76.0
T_{11}	40.5	35.4	38.0	17.6	36.8	27.2	58.1	66.8	62.4
T_{12}	38.8	41.0	39.9	17.7	39.2	28.4	83.5	76.5	80.0
T_{13}	41.6	36.8	39.2	16.8	36.4	26.6	72.4	69.5	71.0
SEm±	7.4	1.5		0.4	1.5		2.8	1.7	
CD at 5%	21.3	4.4		1.1	4.3		8.0	4.8	
CV%	12.2	8.0		20.8	7.7		8.0	4.7	

T_1 = Control	T_6 = 5 kg Zn/ha every year ($ZnCl_2$)	T_{11} = 5 kg Zn/ha alternate year ($ZnSo_4$)
T_2 = 10 kg S/ha every year (Gypsum)	T_7 = 5 kg Zn/ha alternate year ($ZnCl_2$)	T_{12} = 10 kg Zn/ha every year ($ZnSo_4$)
T_3 = 10 kg S/ha alternate year (Gypsum)	T_8 = 10 kg Zn/ha every year ($ZnCl_2$)	T_{13} = 10 kg Zn/ha alternate year ($ZnSo_4$)
T_4 = 20 kg S/ha every year (Gypsum)	T_9 = 10 kg Zn/ha alternate year ($ZnCl_2$)	
T_5 = 20 kg S/ha alternate year (Gypsum)	T_{10} = 5 kg Zn/ha every year ($ZnSo_4$)	

Table 2.1 (c) : Effect of S and Zn levels on plant height of individual crops in Maize (S) + Cowpea(F) – Berseem (S) sequence

Treatment	Plant height (cm)								
	Maize (Seed)			Cowpea (Green fodder)			Berseem (Seed)		
	Jabalpur	Faizabad	Mean	Jabalpur	Faizabad	Mean	Jabalpur	Faizabad	Mean
T_1	239.7	133.3	186.5	129.0	52.7	90.9	43.4	75.0	59.2
T_2	249.3	151.0	200.2	159.7	67.7	113.7	44.7	84.7	64.7
T_3	266.7	150.0	208.3	161.7	69.3	115.5	46.0	79.3	62.7
T_4	264.9	153.3	209.1	170.3	71.0	120.7	44.8	80.3	62.6
T_5	243.2	153.3	198.3	168.6	72.3	120.5	44.3	78.3	61.3
T_6	259.4	151.0	205.2	169.5	71.0	120.2	43.1	65.0	54.1
T_7	254.3	146.7	200.5	162.7	72.3	117.6	43.7	66.0	54.9
T_8	263.1	148.3	205.7	169.0	74.0	121.5	49.5	68.0	58.8
T_9	262.4	150.0	206.2	162.7	68.7	115.7	43.3	64.3	53.8
T_{10}	258.4	158.3	208.4	190.0	72.3	131.1	47.9	87.0	67.5
T_{11}	255.6	158.3	207.0	186.3	76.0	131.1	47.8	85.0	66.4
T_{12}	254.8	166.7	210.8	187.2	75.3	131.3	46.3	88.20	67.2
T_{13}	254.1	161.7	207.9	181.1	75.3	128.2	44.8	85.0	64.9
SEm±	30.7	4.3		2.6	3.4		1.47	3.9	
CD at 5%	89.7	12.7		7.5	9.9		4.31	11.3	
CV%	3.9	4.9		9.4	8.3		5.6	8.7	

T_1 = Control	T_6 = 5 kg Zn/ha every year ($ZnCl_2$)	T_{11} = 5 kg Zn/ha alternate year ($ZnSo_4$)
T_2 = 10 kg S/ha every year (Gypsum)	T_7 = 5 kg Zn/ha alternate year ($ZnCl_2$)	T_{12} = 10 kg Zn/ha every year ($ZnSo_4$)
T_3 = 10 kg S/ha alternate year (Gypsum)	T_8 = 10 kg Zn/ha every year ($ZnCl_2$)	T_{13} = 10 kg Zn/ha alternate year ($ZnSo_4$)
T_4 = 20 kg S/ha every year (Gypsum)	T_9 = 10 kg Zn/ha alternate year ($ZnCl_2$)	
T_5 = 20 kg S/ha alternate year (Gypsum)	T_{10} = 5 kg Zn/ha every year ($ZnSo_4$)	

Table 2.1 (d) : Effect of S and Zn levels on leaf stem ratio of individual crops in Maize (S) + Cowpea(F) – Berseem (S) sequence

Treatment	Leaf stem ratio						
	Maize (Seed)	Cowpea (Green fodder)			Berseem (Seed)		
	Faizabad	Jabalpur	Faizabad	Mean	Jabalpur	Faizabad	Mean
T_1	0.58	0.61	0.51	0.6	0.58	0.53	0.54
T_2	0.64	0.64	0.60	0.6	0.66	0.59	0.63
T_3	0.66	0.64	0.63	0.6	0.59	0.58	0.59
T_4	0.65	0.64	0.69	0.7	0.72	0.67	0.69
T_5	0.63	0.65	0.64	0.7	0.71	0.64	0.68
T_6	0.62	0.73	0.55	0.6	0.64	0.67	0.66
T_7	0.62	0.59	0.55	0.6	0.75	0.64	0.69
T_8	0.66	0.75	0.57	0.7	0.68	0.63	0.66
T_9	0.65	0.80	0.58	0.7	0.74	0.62	0.68
T_{10}	0.66	0.74	0.67	0.7	0.78	0.69	0.74
T_{11}	0.67	0.79	0.67	0.7	0.79	0.66	0.73
T_{12}	0.68	0.77	0.64	0.7	0.78	0.68	0.73
T_{13}	0.67	0.76	0.67	0.7	0.76	0.67	0.72
SEm±	0.008	0.03	0.03		0.05	0.02	
CD at 5%	0.024	0.07	0.09		1.60	0.06	
CV%	2.25	11.54	9.14		12.00	6.24	

T_1 = Control	T_6 = 5 kg Zn/ha every year ($ZnCl_2$)	T_{11} = 5 kg Zn/ha alternate year ($ZnSo_4$)
T_2 = 10 kg S/ha every year (Gypsum)	T_7 = 5 kg Zn/ha alternate year ($ZnCl_2$)	T_{12} = 10 kg Zn/ha every year ($ZnSo_4$)
T_3 = 10 kg S/ha alternate year (Gypsum)	T_8 = 10 kg Zn/ha every year ($ZnCl_2$)	T_{13} = 10 kg Zn/ha alternate year ($ZnSo_4$)
T_4 = 20 kg S/ha every year (Gypsum)	T_9 = 10 kg Zn/ha alternate year ($ZnCl_2$)	
T_5 = 20 kg S/ha alternate year (Gypsum)	T_{10} = 5 kg Zn/ha every year ($ZnSo_4$)	

Table 2.1 (e): Effect of S and Zn levels on 1000 grain weight of seed crop and number of grain/cob (Maize) in Maize (S) + Cowpea (F) – Berseem (S) sequence

Treatment	1000 grain weight (g)						Number of grains/cob		
	Maize			Berseem			Maize		
	Faizabad	Jabalpur	Mean	Faizabad	Jabalpur	Mean	Faizabad	Jabalpur	Mean
T_1	127.3	264.3	195.8	2.03	2.40	2.2	182.6	267.3	225.0
T_2	175.6	317.0	246.3	2.27	3.20	2.7	213.6	321.3	267.5
T_3	168.3	299.3	233.8	2.80	2.19	2.5	214.3	339.3	276.0
T_4	212.6	336.7	274.7	2.96	3.69	3.3	226.0	329.7	277.9
T_5	207.0	323.3	265.2	2.93	3.33	3.1	223.0	336.9	280.0
T_6	215.3	286.3	250.8	2.40	2.96	2.7	191.0	307.2	249.1
T_7	208.0	293.0	250.5	2.23	2.66	2.5	191.3	312.8	252.0
T_8	209.0	312.7	260.9	2.50	2.82	2.7	193.3	304.4	248.9
T_9	211.3	315.0	263.2	2.40	3.02	2.7	193.0	309.5	251.3
T_{10}	217.6	339.3	278.5	2.83	4.09	3.5	215.6	334.3	275.0
T_{11}	222.6	341.7	282.2	2.40	4.18	3.3	214.0	336.6	275.3
T_{12}	217.6	342.0	279.8	2.66	4.81	3.7	236.3	347.4	392.0
T_{13}	217.3	343.0	280.2	2.60	4.50	3.6	234.6	343.0	288.8
SEm±	3.70	3.20		0.11	0.14		5.53	4.4	
CD at 5%	10.80	9.30		0.32	0.41		16.16	12.7	
CV%	3.20	8.00		6.54	7.20		4.57	6.9	

T_1 = Control	T_6 = 5 kg Zn/ha every year ($ZnCl_2$)	T_{11} = 5 kg Zn/ha alternate year ($ZnSo_4$)
T_2 = 10 kg S/ha every year (Gypsum)	T_7 = 5 kg Zn/ha alternate year ($ZnCl_2$)	T_{12} = 10 kg Zn/ha every year ($ZnSo_4$)
T_3 = 10 kg S/ha alternate year (Gypsum)	T_8 = 10 kg Zn/ha every year ($ZnCl_2$)	T_{13} = 10 kg Zn/ha alternate year ($ZnSo_4$)
T_4 = 20 kg S/ha every year (Gypsum)	T_9 = 10 kg Zn/ha alternate year ($ZnCl_2$)	
T_5 = 20 kg S/ha alternate year (Gypsum)	T_{10} = 5 kg Zn/ha every year ($ZnSo_4$)	

Table 2.1 (f) : Effect of S and Zn levels on quality of fodder and yield attributes of berseem seed in Maize (S) + Cowpea (F) – Berseem (S) sequence

Treatment	Crude protein yield (q/ha)			No. of capsules/plant			No. of grains/ capsule
	Cowpea			Berseem(Seed)			Berseem(Seed)
	Jabalpur	Faizabad	Mean	Jabalpur	Faizabad	Mean	Faizabad
T_1	1.03	4.11	2.6	7.73	5.33	6.5	26.6
T_2	1.62	4.71	3.2	12.68	6.66	9.7	32.6
T_3	1.53	4.51	3.0	13.98	7.66	10.8	31.0
T_4	1.91	6.26	4.1	15.35	8.33	11.8	35.6
T_5	1.80	5.42	3.6	12.86	8.00	10.4	32.6
T_6	1.53	5.32	3.4	9.56	8.33	9.0	33.6
T_7	1.51	4.29	2.9	8.13	8.33	8.2	30.6
T_8	1.96	4.69	3.3	11.49	7.66	9.6	35.0
T_9	2.00	4.56	3.3	10.32	7.00	8.7	22.7
T_{10}	2.32	6.12	4.2	14.90	8.00	11.5	39.0
T_{11}	2.43	6.08	4.3	16.46	8.33	12.4	36.3
T_{12}	2.50	6.52	4.5	16.56	8.33	12.5	42.3
T_{13}	2.38	5.99	4.2	15.86	8.33	12.1	39.6
SEm±	0.05	0.20		0.56	0.79		2.0
CD at 5%	0.14	0.58		1.63	NS		6.0
CV%	14.2	6.6		7.6	17.8		9.9

T_1 = Control	T_6 = 5 kg Zn/ha every year ($ZnCl_2$)	T_{11} = 5 kg Zn/ha alternate year ($ZnSo_4$)
T_2 = 10 kg S/ha every year (Gypsum)	T_7 = 5 kg Zn/ha alternate year ($ZnCl_2$)	T_{12} = 10 kg Zn/ha every year ($ZnSo_4$)
T_3 = 10 kg S/ha alternate year (Gypsum)	T_8 = 10 kg Zn/ha every year ($ZnCl_2$)	T_{13} = 10 kg Zn/ha alternate year ($ZnSo_4$)
T_4 = 20 kg S/ha every year (Gypsum)	T_9 = 10 kg Zn/ha alternate year ($ZnCl_2$)	
T_5 = 20 kg S/ha alternate year (Gypsum)	T_{10} = 5 kg Zn/ha every year ($ZnSo_4$)	

Table 2.1 (g) : Effect of S and Zn levels on quality of fodder, yield attributes and economics of berseem seed in Maize (S) + Cowpea (F) – Berseem (S) sequence

Treatment	Jabalpur				Faizabad		
	Plant population/ m row length		Gross monetary return (Rs./ha/yr)	Net monetary return (Rs./ha/yr)	Crude protein (%)	Plant population	Net monetary return (Rs./ha/year)
	Maize	Cowpea			Cowpea	Berseem	
T_1	5.1	6.7	64334	18055	15.9	273	8056
T_2	6.0	7.1	87821	40572	16.1	317	21153
T_3	6.1	6.6	91549	44501	15.9	317	17362
T_4	5.9	6.9	93342	45124	16.4	318	23859
T_5	5.3	7.0	98280	50462	16.0	308	22288
T_6	5.5	7.4	79484	32186	16.1	312	11739
T_7	6.0	6.2	81009	33962	16.0	313	12399
T_8	5.8	8.0	85356	36928	16.1	312	12452
T_9	6.1	8.8	78626	30698	16.4	315	11608
T_{10}	6.2	7.5	103052	55877	16.6	326	27952
T_{11}	6.3	9.0	106194	59420	16.5	313	23030
T_{12}	6.3	9.8	115019	66951	16.7	331	29579
T_{13}	5.6	8.1	112266	64997	16.3	323	24703
SEm±	2.4	0.4	1768.70	1768.7	0.2	10.0	762
CD at 5%	NS	NS	5162.4	5162.6	0.6	NS	2224
CV%	10.9	15.1	6.32	6.8	2.0	5.5	7.0

T_1 = Control	T_6 = 5 kg Zn/ha every year ($ZnCl_2$)	T_{11} = 5 kg Zn/ha alternate year ($ZnSo_4$)
T_2 = 10 kg S/ha every year (Gypsum)	T_7 = 5 kg Zn/ha alternate year ($ZnCl_2$)	T_{12} = 10 kg Zn/ha every year ($ZnSo_4$)
T_3 = 10 kg S/ha alternate year (Gypsum)	T_8 = 10 kg Zn/ha every year ($ZnCl_2$)	T_{13} = 10 kg Zn/ha alternate year ($ZnSo_4$)
T_4 = 20 kg S/ha every year (Gypsum)	T_9 = 10 kg Zn/ha alternate year ($ZnCl_2$)	
T_5 = 20 kg S/ha alternate year (Gypsum)	T_{10} = 5 kg Zn/ha every year ($ZnSo_4$)	

Table 2.1 (h): Nutrient uptake of Maize (F) + Cowpea (F) – Berseem (S) sequence as influenced by S and Zn levels at Faizabad

Treatment	Uptake of nutrients (kg/ha)														
	N			P			K			Zn (ppm)			S (ppm)		
	Maize	Cowpea	Berseem	Maize	Cowpea	Berseem	Maize	Cowpea	Berseem	Maize	Cowpea	Berseem	Maize	Cowpea	Berseem
T_1	18.9	62.1	126.0	6.4	11.6	21.5	8.7	10.4	19.0	3.8	5.2	8.1	5.0	7.8	16.7
T_2	23.6	70.2	179.0	8.7	13.2	30.5	11.7	11.7	27.1	5.0	5.8	11.6	6.5	8.8	23.1
T_3	22.9	68.0	161.9	7.8	12.8	27.6	10.7	11.2	24.5	4.8	5.7	10.6	6.3	8.5	20.9
T_4	26.9	91.9	186.9	9.1	17.2	31.8	12.8	15.3	28.5	5.9	7.7	12.1	7.5	11.5	24.1
T_5	25.8	79.7	182.6	8.7	15.3	31.1	12.3	13.6	27.7	5.6	6.8	11.8	7.2	10.2	23.5
T_6	23.6	77.6	133.1	8.0	14.9	22.7	11.0	13.2	20.2	5.0	6.6	8.6	6.5	9.9	17.2
T_7	23.7	62.2	134.1	8.3	12.1	22.7	11.8	10.8	20.2	5.4	5.4	8.6	6.8	8.1	17.2
T_8	23.1	68.7	141.5	7.9	13.2	24.1	10.8	11.7	21.5	4.9	5.8	9.1	6.4	8.8	18.3
T_9	22.8	68.0	136.0	7.8	13.0	23.1	10.6	11.6	20.6	4.8	5.8	8.8	6.3	8.7	17.5
T_{10}	27.8	86.6	202.4	9.4	16.6	34.5	13.0	14.7	30.7	5.9	7.4	13.3	7.7	11.1	26.9
T_{11}	27.3	85.0	179.9	9.2	16.3	30.7	12.8	14.5	27.3	5.8	7.2	11.6	7.6	10.9	23.2
T_{12}	30.5	92.0	205.9	10.3	17.6	30.1	14.4	15.7	31.2	6.6	7.8	13.3	8.4	11.8	26.6
T_{13}	28.4	86.3	187.1	9.7	16.5	31.9	13.4	14.7	28.4	6.1	7.3	12.1	7.9	11.0	24.1

T_1 = Control	T_6 = 5 kg Zn/ha every year ($ZnCl_2$)	T_{11} = 5 kg Zn/ha alternate year ($ZnSo_4$)
T_2 = 10 kg S/ha every year (Gypsum)	T_7 = 5 kg Zn/ha alternate year ($ZnCl_2$)	T_{12} = 10 kg Zn/ha every year ($ZnSo_4$)
T_3 = 10 kg S/ha alternate year (Gypsum)	T_8 = 10 kg Zn/ha every year ($ZnCl_2$)	T_{13} = 10 kg Zn/ha alternate year ($ZnSo_4$)
T_4 = 20 kg S/ha every year (Gypsum)	T_9 = 10 kg Zn/ha alternate year ($ZnCl_2$)	
T_5 = 20 kg S/ha alternate year (Gypsum)	T_{10} = 5 kg Zn/ha every year ($ZnSo_4$)	

Table 2.1 (i) : Nutrient uptake of Maize (F) + Cowpea (F) – Berseem (S) sequence as influenced by S and Zn levels at Faizabad

Treatment	Total uptake (kg/ha)				
	N	P	K	S	Zn
T_1	207.0	39.5	38.1	29.5	17.1
T_2	272.7	52.3	50.4	38.4	22.4
T_3	252.8	48.2	46.4	35.7	21.1
T_4	305.7	58.1	56.6	43.0	25.6
T_5	288.1	55.1	53.5	40.9	24.2
T_6	234.3	45.5	44.3	33.6	20.2
T_7	219.9	43.1	42.7	32.1	19.4
T_8	233.3	45.2	43.9	33.4	19.9
T_9	226.8	43.9	42.7	32.5	19.4
T_{10}	316.8	60.5	58.4	45.6	26.4
T_{11}	292.2	56.2	54.5	41.6	24.7
T_{12}	328.5	58.0	61.3	46.7	27.7
T_{13}	301.8	58.1	56.4	43.0	25.5

T_1 = Control	T_6 = 5 kg Zn/ha every year ($ZnCl_2$)	T_{11} = 5 kg Zn/ha alternate year ($ZnSo_4$)
T_2 = 10 kg S/ha every year (Gypsum)	T_7 = 5 kg Zn/ha alternate year ($ZnCl_2$)	T_{12} = 10 kg Zn/ha every year ($ZnSo_4$)
T_3 = 10 kg S/ha alternate year (Gypsum)	T_8 = 10 kg Zn/ha every year ($ZnCl_2$)	T_{13} = 10 kg Zn/ha alternate year ($ZnSo_4$)
T_4 = 20 kg S/ha every year (Gypsum)	T_9 = 10 kg Zn/ha alternate year ($ZnCl_2$)	
T_5 = 20 kg S/ha alternate year (Gypsum)	T_{10} = 5 kg Zn/ha every year ($ZnSo_4$)	

Table 2.1 (j) : Soil fertility status of Maize (F) + Cowpea (F) – Berseem (S) after completion of sequence as influenced by S and Zn levels at Faizabad

Treatment	pH	EC (dSm^{-1})	OC (%)	N (kg/ha)	P (kg/ha)	K (kg/ha)	Zn (ppm)	S (ppm)
T_1	8.3	1.3	0.4	125.4	11.9	270	0.4	0.6
T_2	8.2	1.2	0.4	131.6	12.0	278	0.4	0.6
T_3	8.2	1.3	0.4	129.5	12.1	275	0.4	0.6
T_4	8.1	1.2	0.4	137.5	12.2	279	0.4	0.7
T_5	8.3	1.2	0.4	136.5	11.7	280	0.4	0.7
T_6	8.3	1.2	0.3	132.2	11.8	277	0.4	0.6
T_7	8.2	1.3	0.4	129.7	11.5	270	0.4	0.6
T_8	8.3	1.2	0.4	130.6	11.4	278	0.4	0.6
T_9	8.3	1.3	0.3	120.2	11.9	277	0.4	0.6
T_{10}	8.2	1.2	0.4	138.5	11.7	284	0.4	0.6
T_{11}	8.2	1.2	0.4	138.0	11.6	280	0.4	0.7
T_{12}	8.2	1.2	0.4	140.2	12.2	284	0.4	0.6
T_{13}	8.2	1.2	0.4	140.1	11.8	280	0.4	0.6
Initial value	**8.6**	**1.3**	**0.2**	**114.0**	**10.2**	**270**	**0.4**	**0.5**

T_1 = Control	T_6 = 5 kg Zn/ha every year ($ZnCl_2$)	T_{11} = 5 kg Zn/ha alternate year ($ZnSo_4$)
T_2 = 10 kg S/ha every year (Gypsum)	T_7 = 5 kg Zn/ha alternate year ($ZnCl_2$)	T_{12} = 10 kg Zn/ha every year ($ZnSo_4$)
T_3 = 10 kg S/ha alternate year (Gypsum)	T_8 = 10 kg Zn/ha every year ($ZnCl_2$)	T_{13} = 10 kg Zn/ha alternate year ($ZnSo_4$)
T_4 = 20 kg S/ha every year (Gypsum)	T_9 = 10 kg Zn/ha alternate year ($ZnCl_2$)	
T_5 = 20 kg S/ha alternate year (Gypsum)	T_{10} = 5 kg Zn/ha every year ($ZnSo_4$)	

Table 2.1 (k) : Effect of S and Zn levels on yield and growth characters of individual crops in pearl millet (s) + cowpea (F) – barley (seed) sequence at Bikaner

Treatment	Kharif 2009						Rabi 2009-10					Net monetary return of system (Rs/ha/yr)
	Cowpea (Fodder)		Pearl millet (Grain)			Net monetary return (Rs/ha)	Barley (Seed)*				Net monetary return (Rs/ha)	
	Green fodder yield (q/ha)	Dry matter yield (q/ha)	Seed yield (q/ha)	Plant height (cm)	Leaf stem ratio		Seed yield (q/ha)	Straw yield (q/ha)	Plant height (cm)	Harvest index		
T_1	63.4	14.9	5.4(93.5)*	210.7	0.29	37173	17.2	62.4	82.9	21.6	25509	62682
T_2	88.7	18.0	7.9(108.5)	229.4	0.34	52547	23.3	88.3	89.7	21.0	40287	92835
T_3	81.5	17.0	6.0(104.0)	224.7	0.32	46628	22.0	79.0	83.5	23.1	36165	82793
T_4	92.3	17.8	8.3(116.8)	231.0	0.35	56098	24.5	83.2	93.7	23.2	40679	96777
T_5	75.6	16.1	7.7(102.6)	230.2	0.31	46009	23.4	77.0	92.2	23.2	37635	83644
T_6	72.4	14.8	5.9(125.2)	225.1	0.33	48101	20.4	86.3	96.3	19.3	35871	83972
T_7	66.4	14.0	5.7(108.0)	222.3	0.30	41469	19.4	80.1	92.3	19.5	33001	74470
T_8	79.8	17.6	8.0(127.2)	222.5	0.35	52880	21.4	95.2	96.1	18.7	39474	92354
T_9	71.9	14.2	7.4(137.4)	226.4	0.32	52022	19.3	89.3	93.1	17.8	35103	87124
T_{10}	96.0	19.6	9.1(123.9)	227.9	0.34	59658	23.1	87.1	94.4	21.2	39645	99304
T_{11}	78.6	17.5	8.6(126.6)	228.4	0.33	53679	18.9	81.3	91.3	19.0	32563	86242
T_{12}	103.4	20.0	12.4(135.9)	241.2	0.41	68320	29.9	93.1	102.1	24.4	50365	118684
T_{13}	64.2	13.3	10.7(133.0)	239.7	0.34	51847	19.4	80.2	93.9	19.3	33002	84849
SEm±	6.0	1.3	0.5(6.7)	9.9	0.01	2585	2.1	6.8	4.6	2.7	2908	4236
CD at 5%	17.3	4.0	1.5(19.4)	28.6	0.04	7448	5.9	19.7	13.4	7.7	8377	12202
CV%	13.8	15.3	12.2(10.3)	7.6	6.40	9.37	16.8	15.1	8.9	21.3	14.0	9.0

*Figures in parantheses are stover yield(q/ha)

T_1 = Control	T_7 = 5 kg Zn/ha alternate year ($ZnCl_2$)	T_{13} = 10 kg Zn/ha alternate year ($ZnSo_4$)
T_2 = 10 kg S/ha every year (Gypsum)	T_8 = 10 kg Zn/ha every year ($ZnCl_2$)	
T_3 = 10 kg S/ha alternate year (Gypsum)	T_9 = 10 kg Zn/ha alternate year ($ZnCl_2$)	
T_4 = 20 kg S/ha every year (Gypsum)	T_{10} = 5 kg Zn/ha every year ($ZnSo_4$)	
T_5 = 20 kg S/ha alternate year (Gypsum)	T_{11} = 5 kg Zn/ha alternate year ($ZnSo_4$)	
T_6 = 5 kg Zn/ha every year ($ZnCl_2$)	T_{12} = 10 kg Zn/ha every year ($ZnSo_4$)	

Table 2.1 (l) : Effect of S and Zn levels on yield of individual crop in Maize(S) +Cowpea (F) –Lucerne (S) sequence at Hyderabad

Treatment	Maize			Cowpea			Lucerne			
	Grain yield (q/ha)	Dry matter yield (q/ha)	Crude Protein yield(q/ha)	Green fodder yield(q/ha)	Dry fodder yield(q/ha)	Crude Protein yield(q/ha)	Green fodder yield(q/ha)	Dry fodder yield(q/ha)	Crude Protein yield(q/ha)	Seed yield(q/ha)
T_1	7.1	170.7	11.2	68.0	10.4	1.5	116.7	30.2	4.3	0.7
T_2	9.6	194.0	12.7	68.8	14.9	2.0	145.0	36.9	4.9	1.4
T_3	7.8	197.5	15.6	77.0	18.5	2.4	130.0	34.6	5.5	1.1
T_4	13.9	193.7	15.2	81.3	18.5	2.5	145.0	37.5	5.2	1.8
T_5	10.2	188.2	18.4	88.3	17.6	1.9	138.3	37.3	4.9	1.2
T_6	10.8	175.2	11.5	83.8	19.8	2.2	141.7	37.7	5.1	1.6
T_7	12.3	198.2	13.0	79.2	17.0	2.2	140.0	36.7	5.3	1.5
T_8	13.9	181.0	13.8	92.2	18.4	2.2	145.0	39.5	5.6	1.6
T_9	10.9	196.0	11.4	86.8	21.1	2.3	136.7	36.6	4.9	1.5
T_{10}	13.3	207.0	13.5	86.8	20.3	3.1	148.3	39.5	5.4	1.6
T_{11}	10.6	198.8	10.6	90.8	21.1	3.0	135.0	37.3	4.9	1.3
T_{12}	12.8	180.7	9.5	94.5	22.7	3.4	145.0	40.1	4.9	1.7
T_{13}	9.7	192.2	12.7	84.7	20.5	3.5	135.0	36.7	5.8	1.5
SEm+_	1.6	13.6	1.8	2.9	1.0	0.2	8.9	2.0	0.4	0.2
CD at 5%	NS	NS	NS	8.5	3.0	0.6	NS	5.8	1.0	0.5
CV%	24.8	12.5	23.3	6.0	9.3	13.0	10.9	9.1	11.8	18.1

T_1 = Control	T_6 = 5 kg Zn/ha every year ($ZnCl_2$)	T_{11} = 5 kg Zn/ha alternate year ($ZnSo_4$)
T_2 = 10 kg S/ha every year (Gypsum)	T_7 = 5 kg Zn/ha alternate year ($ZnCl_2$)	T_{12} = 10 kg Zn/ha every year ($ZnSo_4$)
T_3 = 10 kg S/ha alternate year (Gypsum)	T_8 = 10 kg Zn/ha every year ($ZnCl_2$)	T_{13} = 10 kg Zn/ha alternate year ($ZnSo_4$)
T_4 = 20 kg S/ha every year (Gypsum)	T_9 = 10 kg Zn/ha alternate year ($ZnCl_2$)	
T_5 = 20 kg S/ha alternate year (Gypsum)	T_{10} = 5 kg Zn/ha every year ($ZnSo_4$)	

Table 2.1 (m) : Effect of S and Zn levels on growth characters and yield attributes of individual crops in Maize(S) + Cowpea(F)-Lucerne(S) sequence at Hyderabad

Treatment	Crude protein (%)		Leaf stem ratio		Plant height (cm)			Plant population/ m row length		1000 grain weight (gm)	No. of capsule/ plant
	Maize	Cowpea	Maize	Cowpea	Maize	Cowpea	Lucerne	Maize	cowpea	Maize	Lucerne
T_1	6.6	14.0	0.12	0.37	208.6	99.2	56.6	7.3	6.3	207.8	9.7
T_2	6.6	13.6	0.15	0.38	230.4	107.3	61.8	6.8	6.0	220.8	14.0
T_3	7.9	12.9	0.13	0.41	219.2	125.9	58.9	7.3	7.0	208.4	13.7
T_4	7.9	13.3	0.14	0.37	233.7	124.3	63.0	6.7	6.3	211.5	18.7
T_5	9.6	10.6	0.14	0.38	220.6	108.8	60.9	8.0	7.0	233.6	15.0
T_6	6.6	10.8	0.14	0.40	205.2	123.4	63.2	8.3	7.0	206.9	16.0
T_7	6.6	12.9	0.16	0.41	215.2	104.4	61.6	6.7	7.0	216.9	15.3
T_8	7.7	11.8	0.16	0.43	200.4	106.1	60.6	7.3	6.0	214.9	16.0
T_9	5.9	10.9	0.15	0.42	195.9	132.9	60.4	7.0	5.7	232.2	14.7
T_{10}	6.6	15.3	0.14	0.46	217.1	125.6	56.1	7.0	6.0	234.9	16.7
T_{11}	5.3	14.2	0.15	0.43	202.0	110.8	56.9	6.3	6.3	214.7	15.3
T_{12}	5.3	15.3	0.16	0.42	2173	112.8	60.2	7.3	6.0	204.0	17.7
T_{13}	6.6	17.1	0.15	0.39	204.3	121.2	57.5	6.7	6.3	210.3	16.0
SEm $\pm$	0.8	0.8	0.02	0.03	12.8	10.7	4.6	0.5	0.5	10.0	1.4
CD at 5%	2.3	2.4	NS	NS	NS	NS	NS	NS	NS	NS	4.1
CV%	19.5	10.3	20.0	10.6	10.4	16.1	13.4	12.7	12.7	18.0	15.5

T_1 = Control	T_6 = 5 kg Zn/ha every year ($ZnCl_2$)	T_{11} = 5 kg Zn/ha alternate year ($ZnSo_4$)
T_2 = 10 kg S/ha every year (Gypsum)	T_7 = 5 kg Zn/ha alternate year ($ZnCl_2$)	T_{12} = 10 kg Zn/ha every year ($ZnSo_4$)
T_3 = 10 kg S/ha alternate year (Gypsum)	T_8 = 10 kg Zn/ha every year ($ZnCl_2$)	T_{13} = 10 kg Zn/ha alternate year ($ZnSo_4$)
T_4 = 20 kg S/ha every year (Gypsum)	T_9 = 10 kg Zn/ha alternate year ($ZnCl_2$)	
T_5 = 20 kg S/ha alternate year (Gypsum)	T_{10} = 5 kg Zn/ha every year ($ZnSo_4$)	

Table 2.1 (n) : Effect of S and Zn levels on economics of individual crop in Maize(S) +Cowpea (F) –Lucerne (S) sequence at Hyderabad

Treatment	Cost of cultivation (Rs/ha/year)	Gross monetary return (Rs/ha/year)	Net monetry return (Rs/ha/year)	Benefit cost ratio
T_1	28000	33335	5335	1.19
T_2	29200	48693	19493	1.67
T_3	29040	41374	12334	1.42
T_4	29360	56801	27441	1.93
T_5	29040	45977	16937	1.58
T_6	29590	52459	22869	1.77
T_7	29040	50911	21871	1.75
T_8	30140	54961	24821	1.82
T_9	29040	50698	21658	1.75
T_{10}	29165	54942	25777	1.88
T_{11}	29040	46955	17915	1.62
T_{12}	29290	54999	25709	1.88
T_{13}	29040	49095	20055	1.69

T_1 = Control	T_6 = 5 kg Zn/ha every year ($ZnCl_2$)	T_{11} = 5 kg Zn/ha alternate year ($ZnSo_4$)
T_2 = 10 kg S/ha every year (Gypsum)	T_7 = 5 kg Zn/ha alternate year ($ZnCl_2$)	T_{12} = 10 kg Zn/ha every year ($ZnSo_4$)
T_3 = 10 kg S/ha alternate year (Gypsum)	T_8 = 10 kg Zn/ha every year ($ZnCl_2$)	T_{13} = 10 kg Zn/ha alternate year ($ZnSo_4$)
T_4 = 20 kg S/ha every year (Gypsum)	T_9 = 10 kg Zn/ha alternate year ($ZnCl_2$)	
T_5 = 20 kg S/ha alternate year (Gypsum)	T_{10} = 5 kg Zn/ha every year ($ZnSo_4$)	

Table 2.1 (o): Effect of S and Zn content (%) in Maize(S) +Cowpea (F) –Lucerne (S) sequence at Hyderabad

Treatment	Maize					Cowpea				
	N	P	K	S	Zn	N	P	K	S	Zn
T_1	1.1	0.1	0.6	0.02	56	2.2	0.1	0.2	0.3	32
T_2	1.1	0.1	0.9	0.02	60	2.2	0.1	0.2	0.3	33
T_3	1.2	0.1	0.7	0.02	52	2.0	0.1	0.2	0.3	33
T_4	1.3	1.2	1.0	0.02	64	2.1	0.1	0.2	0.4	35
T_5	1.5	0.1	1.0	0.02	56	1.5	0.1	0.2	0.5	34
T_6	1.1	0.1	1.0	0.01	72	1.6	0.1	0.2	0.4	40
T_7	1.1	0.1	1.1	0.02	72	2.1	0.1	0.2	0.3	36
T_8	1.2	0.1	0.9	0.02	64	1.9	0.1	0.2	0.3	45
T_9	1.0	0.1	0.7	0.01	56	1.8	0.1	0.3	0.3	49
T_{10}	1.1	0.1	1.1	0.02	56	2.5	0.3	0.2	0.3	43
T_{11}	0.8	0.1	1.0	0.02	64	2.3	0.1	0.2	0.4	46
T_{12}	0.8	0.1	0.8	0.01	64	2.5	0.1	0.2	0.4	49
T_{13}	1.1	0.1	1.0	0.02	72	2.7	0.1	0.2	0.4	45

T_1 = Control	T_6 = 5 kg Zn/ha every year ($ZnCl_2$)	T_{11} = 5 kg Zn/ha alternate year ($ZnSo_4$)
T_2 = 10 kg S/ha every year (Gypsum)	T_7 = 5 kg Zn/ha alternate year ($ZnCl_2$)	T_{12} = 10 kg Zn/ha every year ($ZnSo_4$)
T_3 = 10 kg S/ha alternate year (Gypsum)	T_8 = 10 kg Zn/ha every year ($ZnCl_2$)	T_{13} = 10 kg Zn/ha alternate year ($ZnSo_4$)
T_4 = 20 kg S/ha every year (Gypsum)	T_9 = 10 kg Zn/ha alternate year ($ZnCl_2$)	
T_5 = 20 kg S/ha alternate year (Gypsum)	T_{10} = 5 kg Zn/ha every year ($ZnSo_4$)	

AST – 3: ENHANCING FORAGE PRODUCTION THROUGH MAIZE (BABY CORN)

AST – 3.1: Evaluation of forage production potential of maize grown for baby corn and green cob

North West Zone	**-**	**Pantnagar and Meerut**
Central Zone	**-**	**Jabalpur**
North East Zone	**-**	**Ranchi, Bhubaneswar, Raipur, Jorhat, Kalyani, Pusa**
South Zone	**-**	**Hyderabad, Coimbatore, and Mandya**

This was second year of experimentation with the treatments to those of previous year. In North West zone, experiment was conducted at both the locations i.e. Pantnagar. The result of Meerut will be reported after Kharif 2010. At Pantnagar, baby corn and green cob yield ranged from 19.0-25.5 q/ha and 34.5 – 51.0 q/ha, respectively. Contribution of cob yield in the system influenced the green forage equivalent yield in different seasons. Highest green forage equivalent yield was obtained by growing of baby corn in each season (T_2). The fodder equivalent yield was less in all the treatments comprised of green cob than baby corn based treatments. Treatment T_3 resulted in highest crude protein yield. Crude protein yield was higher in the treatments comprised of forage legumes as sole or intercrop. In case of net return, maize (baby corn) + cowpea – maize (baby corn) - maize (baby corn) + cowpea realized significantly higher net return (Rs. 366216/ha/yr) and B: C ratio (5.5) than other sequences.

In Central zone, at Jabalpur, cob yield was higher during Kharif than summer but forage yield was higher during summer in treatment T_3 to T_9. Performance of complete sequence was superior for cob yield with T_7, green fodder yield with T_6 and dry matter yield with T_4. Crude protein yield of entire sequence was higher with T_5. Maize (baby corn) + cowpea- berseem- maize (baby corn) + cowpea realized significantly higher net return (Rs. 88007/ha/yr) and fodder equivalent yield (2425q/ha/yr) than rest of the sequence. The magnitude of increase in net return of T_4 was 62 percent over round the year forage production system (NB hybrid + cowpea/berseem/cowpea).

In South zone, experiment was conducted during third year at Hyderabad, Coimbatore and Mandya. Highest green cob yield (142q/ha) was realized with maize (green cob) + cowpea - maize (green cob) - maize (green cob) + cowpea sequence. Similarly, green forage yield of the complete sequence was highest with NB hybrid + cowpea – Lucerne at all the locations and on mean basis. Dry matter followed the similar trend to that of green fodder yield. Crude protein yield of maize grown for green cob and baby corn indicated that on mean basis maize (baby corn) + cowpea - maize (baby corn) - maize (baby corn) + cowpea (T_2) realized highest net return (Rs 91607/ha/yr). Location wise, T_2 ranked first at Coimbatore (Rs. 47419/ha/yr) and Mandya (Rs. 135794/ha/yr), B: C ratio however was highest (2.13) with T_5 (maize (baby corn) + cowpea – oat – maize (F) + cowpea) at Coimbatore.

In North East zone, cob yield was higher at Kalyani. On mean basis, baby corn yield was maximum with T_2 [maize (baby corn) + cowpea - maize (baby corn) - maize (baby corn) + cowpea]. The trend for the individual location was also same. With respect to mean green cob yield of the sequence higher green cob yield was produced by T_7 sequence. This was followed by T_8 sequence. The green forage yield of the complete sequence was highest with round the year forage production system (NB hybrid + cowpea – berseem/ricebean – cowpea). Green forage yield of T_3, T_4, T_5 and T_6 was almost equal of the mean basis. Forage production potential of maize as fodder was very high at Ranchi (389-541q/ha/yr). Maize forage yield was lowest at Kalyani ranging from 253-334 q/ha/yr. On mean basis sequences T_1, T_3 and T_8 realized higher crude protein yield. In case of net return, maize (green cob) based production system realized higher return on mean basis. T_5 at Ranchi, T_2 at Bhubaneswar, T_2 at Kalyani, T_7 at Raipur and T_7 at Pusa recorded maximum net return from complete sequence.

Table-3.1(a-1): Cob yield and green fodder equivalent yield of maize (q/ha) grown for baby corn and green cob at Pantnagar in North West zone

Treatment	Baby corn yield (q/ha)				Green fodder equivalant yield (q/ha)			
	Kharif	Rabi	Summer	Complete sequence	Kharif	Rabi	Summer	Complete sequence
T_1					700	797.0	512	2008.7
T_2	22.5	20.7	21.2	66.9	3164	2249.3	2359	7772.7
T_3	22.0		23.0	45.2	2833	618.0	2451	59.2.3
T_4	19.0		21.9	43.6	2757	373.0	2346	5475.3
T_5	25.5			23.7	2997	641.0	498	4136.0
T_6	22.0			20.3	2612	356.7	488	3456.0
T_7	51.0	43.0	34.5	129.0	668	550.7	631	1849.7
T_8	48.5		35.0	83.2	258	641.7	655	1921.0
T_9	41.0		38.2	85.2	631	367.3	684	1682.7
T_{10}	50.0			45.2	627	615.3	447	1689.3
T_{11}	41.5			40.3	555	377.3	384	1309.0
T_{12}	48.0	42.5			801	914.0	558	2272.7
SEm±					140	28.4	58.2	
CD at 5%					410	83.4	170.7	

T_1 = NB hybrid + cowpea – berseem – maize(F) + cowpea	T_7 = Maize (green cob) + cowpea – maize (green cob) – maize (green cob) + cowpea
T_2 = Maize (baby corn) + cowpea – maize (baby corn) – maize (baby corn) + cowpea	T_8 = Maize (green cob) + cowpea – berseem – maize (green cob) + cowpea
T_3 = Maize (baby corn) + cowpea – berseem – maize (baby corn) + cowpea	T_9 = Maize (green cob) + cowpea – oat – maize (green cob) + cowpea
T_4 = Maize (baby corn) + cowpea – oat – maize (baby corn) + cowpea	T_{10} = Maize (green cob) + cowpea – berseem – maize (F) + cowpea
T_5 = Maize (baby corn) + cowpea – berseem – maize(F) + cowpea	T_{11} = Maize (green cob) + cowpea – oat – maize (F) + cowpea
T_6 = Maize (baby corn) + cowpea – oat – maize(F) + cowpea	T_{12} = Remunerative food – forage based system of the location

Table-3.1(a-2) : Dry matter yield crude protein yield of maize (q/ha) grown for baby corn and green cob at Pantnagar in North West zone

Treatment	Dry matter yield (q/ha)				Crude protein yield (q/ha)			
	Kharif	Rabi	Summer	Complete sequence	Kharif	Rabi	Summer	Complete sequence
T_1	135.5	146.1	81.9	363.5	51.5	20.1	7.3	78.9
T_2	50.6	42.2	31.2	124.0	35.2	4.0	3.3	42.6
T_3	55.0	81.8	25.6	162.4	38.4	50.1	2.7	91.3
T_4	49.5	50.6	26.5	126.6	34.6	25.1	2.8	62.4
T_5	51.2	112.5	94.7	258.4	36.4	21.8	9.7	67.8
T_6	50.4	66.1	92.7	212.5	37.0	5.1	9.5	51.5
T_7	51.1	27.6	59.7	138.8	35.8	2.6	6.9	45.3
T_8	58.9	92.0	56.9	207.7	41.3	21.7	6.3	69.3
T_9	52.9	68.0	63.4	184.3	36.1	5.2	7.1	48.4
T_{10}	56.7	106.2	93.8	256.8	39.1	20.5	10.3	70.0
T_{11}	51.4	70.0	80.6	202.0	36.3	5.4	8.9	50.6
T_{12}	88.8	75.5	106.0	270.3	8.0	7.2	10.6	25.6
SEm±	3.1	13.0	3.3	13.2	1.7	9.7	0.4	25.8
CD at 5%	9.0	38.2	9.8	38.8	5.0	NS	1.0	9.8

T_1 = NB hybrid + cowpea – berseem – maize(F) + cowpea	T_7 = Maize (green cob) + cowpea – maize (green cob) – maize (green cob) + cowpea
T_2 = Maize (baby corn) + cowpea – maize (baby corn) – maize (baby corn) + cowpea	T_8 = Maize (green cob) + cowpea – berseem – maize (green cob) + cowpea
T_3 = Maize (baby corn) + cowpea – berseem – maize (baby corn) + cowpea	T_9 = Maize (green cob) + cowpea – oat – maize (green cob) + cowpea
T_4 = Maize (baby corn) + cowpea – oat – maize (baby corn) + cowpea	T_{10} = Maize (green cob) + cowpea – berseem – maize (F) + cowpea
T_5 = Maize (baby corn) + cowpea – berseem – maize(F) + cowpea	T_{11} = Maize (green cob) + cowpea – oat – maize (F) + cowpea
T_6 = Maize (baby corn) + cowpea – oat – maize(F) + cowpea	T_{12} = Remunerative food – forage based system of the location

Table-3.1(a-3) : Economics of maize grown for baby corn and green cob at Pantnagar in North West zone

Treatment	B : C ratio				Net monetary return (Rs./ha/yr)			
	Kharif	Rabi	Summer	Complete sequence	Kharif	Rabi	Summer	Complete sequence
T_1	3.11	2.98	2.41	2.78	26000	35820	21700	83520.0
T_2	6.19	6.13	5.29	5.55	136200	113627	116390	366216.7
T_3	5.44	1.96	5.69	4.94	119667	24560	125050	269276.7
T_4	5.27	1.13	5.39	4.52	115833	11880	118750	246463.3
T_5	5.81	2.07	1.49	3.69	127833	25960	17900	171693.3
T_6	4.92	1.82	1.44	3.25	108250	19160	17260	144670.0
T_7	0.97	0.83	1.44	1.11	16417	15040	25840	57296.7
T_8	0.94	2.08	1.40	1.39	15900	26000	25280	67180.0
T_9	0.86	2.03	2.42	1.40	14567	21360	29040	64966.7
T_{10}	0.85	1.96	1.23	1.26	14367	24420	14800	53586.7
T_{11}	0.63	1.12	0.92	0.74	10733	8233	11020	29986.7
T_{12}	1.37	2.05	1.79	1.74	23383	36848	21480	81711.7
SEm±	0.3	0.22	0.18	0.16	6989	2787.1	3722.4	9276.7
CD at 5%	1.0	0.65	0.53	0.48	20497	8174.2	10917.4	27207.3

T_1 = NB hybrid + cowpea – berseem – maize(F) + cowpea
T_2 = Maize (baby corn) + cowpea – maize (baby corn) – maize (baby corn) + cowpea
T_3 = Maize (baby corn) + cowpea – berseem – maize (baby corn) + cowpea
T_4 = Maize (baby corn) + cowpea – oat – maize (baby corn) + cowpea
T_5 = Maize (baby corn) + cowpea – berseem – maize(F) + cowpea
T_6 = Maize (baby corn) + cowpea – oat – maize(F) + cowpea
T_7 = Maize (green cob) + cowpea – maize (green cob) – maize (green cob) + cowpea
T_8 = Maize (green cob) + cowpea – berseem – maize (green cob) + cowpea
T_9 = Maize (green cob) + cowpea – oat – maize (green cob) + cowpea
T_{10} = Maize (green cob) + cowpea – berseem – maize (F) + cowpea
T_{11} = Maize (green cob) + cowpea – oat – maize (F) + cowpea
T_{12} = Remunerative food – forage based system of the location

Table-3.1(b-1): Yield of maize (q/ha) grown for baby corn and green cob in Central zone at Jabalpur

Treatment	Kharif				Rabi			Summer			
	Green fodder	Dry matter	Crude protein	Cob yield	Green fodder	Dry matter	Crude protein	Green fodder	Dry matter	Crude protein	Cob yield
T_1	393.1	71.2	6.5		634.7	104.6	12.6	323.9	60.4	5.4	
T_2	336.3	61.4	5.8	23.9	910.4	138.5	20.8	330.4	60.8	10.4	9.5
T_3	312.6	56.8	5.4	21.3	581.1	134.9	30.4	314.8	57.9	5.0	9.3
T_4	339.6	62.1	5.9	25.5	899.6	137.4	20.1	505.6	114.9	9.9	
T_5	304.9	55.2	5.2	23.8	584.7	136.6	31.9	502.2	114.2	9.8	
T_6	236.3	43.7	4.4	90.7	888.1	134.1	19.6	339.0	66.2	5.8	27.0
T_7	201.3	36.7	3.6	99.1	571.4	131.6	30.7	343.0	67.3	5.9	27.9
T_8	218.8	39.9	3.9	99.1	895.4	134.9	20.0	504.7	117.5	9.9	
T_9	221.8	41.0	3.9	94.1	573.1	134.9	31.4	502.2	114.1	9.9	
T_{10}					881.1			5.91			

T_1 = NB hybrid + cowpea / berseem / cowpea*	T_6 = Maize (green cob) + cowpea – berseem – maize (green cob) + cowpea
T_2 = Maize (baby corn) + cowpea – berseem – maize (baby corn) + cowpea	T_7 = Maize (green cob) + cowpea – oat – maize (green cob) + cowpea
T_3 = Maize (baby corn) + cowpea – oat – maize (baby corn) + cowpea	T_8 = Maize (green cob) + cowpea – berseem – maize (F) + cowpea
T_4 = Maize (baby corn) + cowpea – berseem – maize(F) + cowpea	T_9 = Maize (green cob) + cowpea – oat – maize (F) + cowpea
T_5 = Maize (baby corn) + cowpea – oat – maize(F) + cowpea	T_{10} = Sorghum + cowpea – berseem – moong **

Table-3.1(b-2) : Yield and net return of maize (q/ha) grown for baby corn and green cob in Central zone at Jabalpur

Treatment	Complete sequence		
	Fodder equivalent yield (q/ha)	Gross monetary return (Rs./ha/yr)	Net monetary return (Rs./ha/yr)
T_1	1352.7	81166	54166
T_2	2218.1	148328	87328
T_3	1801.0	121973	74473
T_4	2425.1	145507	88007
T_5	2030.0	121806	77806
T_6	2073.3	135227	76727
T_7	1778.9	117906	74906
T_8	2282.5	135733	79733
T_9	1925.8	115551	73051
T_{10}	1882.1	112920	60420
SEm±	47.1	3128.16	3020.08
CD at 5%	139.8	9294.20	8973.13
CV%	6.1	7.9	7.00

T_1 = NB hybrid + cowpea / berseem / cowpea	T_6 = Maize (green cob) + cowpea – berseem – maize (green cob) + cowpea
T_2 = Maize (baby corn) + cowpea – berseem – maize (baby corn) + cowpea	T_7 = Maize (green cob) + cowpea – oat – maize (green cob) + cowpea
T_3 = Maize (baby corn) + cowpea – oat – maize (baby corn) + cowpea	T_8 = Maize (green cob) + cowpea – berseem – maize (F) + cowpea
T_4 = Maize (baby corn) + cowpea – berseem – maize(F) + cowpea	T_9 = Maize (green cob) + cowpea – oat – maize (F) + cowpea
T_5 = Maize (baby corn) + cowpea – oat – maize(F) + cowpea	T_{10} = Sorghum + cowpea – berseem – moong

Table-3.1 (c-1): Cob yield of maize (q/ha) grown for baby corn and green cob in South zone

Treatment	Kharif				Rabi			
	Hyderabad	Coimbatore	Mandya	Mean	Hyderabad	Coimbatore	Mandya	Mean
T_1								
T_2	33.1	14.1	43.5	30.2	50.7	19.4	38.4	36.2
T_3	32.9	17.4	49.7	33.3				
T_4	34.0	14.3	40.2	29.5				
T_5	34.0	15.4	45.3	31.6				
T_6	33.7	35.9	89.7	55.6	66.7	44.9	78.1	63.2
T_7	34.2	36.4	98.3	56.3				
T_8	33.2	41.6	90.1	55.0				
T_9	39.8	39.9	92.4	57.4				
T_{10}	33.7	31.2	19.4	28.1			16.9	16.9

T_1 = NB hybrid + cowpea -Lucerne

T_2 = Maize (baby corn) + cowpea – maize (baby corn) –maize(baby corn) + cowpea

T_3 = Maize (baby corn) + cowpea – Lucerne

T_4 = Maize (baby corn) + cowpea – Oat– maize(baby corn) + cowpea

T_5 = Maize (baby corn) + cowpea – oat – maize(F) + cowpea

T_6 = Maize (green cob) + cowpea – maize (green cob) – maize (green cob) + cowpea

T_7 = Maize (green cob) + cowpea – Lucerne

T_8 = Maize (green cob) + cowpea –Oat – maize (green cob) + cowpea

T_9 = Maize (green cob) + cowpea – oat – maize (F) + cowpea

T_{10} =Remunerative food –forge based system of the location

Table-3.1 (c-2): Cob yield of maize (q/ha) grown for baby corn and green cob in South zone

Treatment	Summer				Complete sequence			
	Hyderabad	Coimbatore	Mandya	Mean	Hyderabad	Coimbatore	Mandya	Mean
T_1								
T_2	36.3	16.0	40.2	30.8	120.1	16.0	122.0	86.0
T_3					32.9		49.7	41.3
T_4	41.5	17.5	39.3	32.8	75.5	17.5	79.5	57.5
T_5	0.0				34.0		45.3	39.7
T_6	44.0	48.5	81.7	58.1	144.4	48.5	249.5	147.5
T_7	0.0				34.2		98.3	66.3
T_8	44.0	49.1	86.6	59.9	77.2	49.1	176.8	101.0
T_9	0.0				39.8		92.4	66.1
T_{10}	0.0	23.1		23.1	33.7	23.1	36.3	31.0
SEm±	0.8							
CD at 5%	2.4							
CV%	8.2							

T_1 = NB hybrid + cowpea -Lucerne

T_2 = Maize (baby corn) + cowpea – maize (baby corn) –maize(baby corn) + cowpea

T_3 = Maize (baby corn) + cowpea – Lucerne

T_4 = Maize (baby corn) + cowpea – Oat– maize(baby corn) + cowpea

T_5 = Maize (baby corn) + cowpea – oat – maize(F) + cowpea

T_6 = Maize (green cob) + cowpea – maize (green cob) – maize (green cob) + cowpea

T_7 = Maize (green cob) + cowpea – Lucerne

T_8 = Maize (green cob) + cowpea –Oat – maize (green cob) + cowpea

T_9 = Maize (green cob) + cowpea – oat – maize (F) + cowpea

T_{10} =Remunerative food –forge based system of the location

Table-3.1 (c-3): Green fodder yield of maize (q/ha) grown for baby corn and green cob in South zone

Treatment	Kharif				Rabi			
	Hyderabad	Coimbatore	Mandya	Mean	Hyderabad	Coimbatore	Mandya	Mean
T_1	400.8	439.8	538.8	459.8	448.3	111.9	386.2	315.5
T_2	149.5	162.8	304.0	205.4	155.0	179.5	216.9	183.8
T_3	151.0	170.2	264.1	195.1	131.7	119.5	240.3	163.8
T_4	157.2	169.9	283.8	203.6	366.7	300.2	175.0	280.6
T_5	152.8	176.1	269.1	199.3	385.0	307.0	196.8	296.3
T_6	136.3	157.4	197.8	163.8	170.0	166.2	165.6	167.3
T_7	151.2	160.6	213.3	175.0	110.0	127.9	288.4	175.4
T_8	134.0	157.5	206.2	165.9	333.3	310.6	196.2	280.0
T_9	173.3	162.1	193.8	176.4	340.0	306.9	191.1	279.3
T_{10}	178.8			178.8	120.0	372.0	107.8	199.9
SEm±		4.5			22.2	5.9		
CD at 5%		9.5			66.0	12.5		
CV%		2.8			15.0	3.2		

T_1 = NB hybrid + cowpea -Lucerne

T_2 = Maize (baby corn) + cowpea – maize (baby corn) –maize(baby corn) + cowpea

T_3 = Maize (baby corn) + cowpea – Lucerne

T_4 = Maize (baby corn) + cowpea – Oat– maize(baby corn) + cowpea

T_5 = Maize (baby corn) + cowpea – oat – maize(F) + cowpea

T_6 = Maize (green cob) + cowpea – maize (green cob) – maize (green cob) + cowpea

T_7 = Maize (green cob) + cowpea – Lucerne

T_8 = Maize (green cob) + cowpea –Oat – maize (green cob) + cowpea

T_9 = Maize (green cob) + cowpea – oat – maize (F) + cowpea

T_{10} =Remunerative food –forge based system of the location

Table-3.1 (c-4): Green fodder yield of maize (q/ha) grown for baby corn and green cob in South zone

Treatment	Summer				Complete sequence			
	Hyderabad	Coimbatore	Mandya	Mean	Hyderabad	Coimbatore	Mandya	Mean
T_1	595.0	292.1	522.80	470.0	1444.1	843.8	1447.7	1245.2
T_2	91.7	264.6	266.4	207.6	396.2	602.9	787.2	595.4
T_3		291.1	382.0	336.6	282.7	580.8	850.4	571.3
T_4	106.7	274.8	267.2	216.2	630.6	744.9	726.0	700.5
T_5	150.0	327.9	646.8	374.9	687.8	811.0	1112.7	870.5
T_6	111.7	241.9	197.7	183.8	418.0	565.5	561.0	514.8
T_7		271.7	375.4	323.6	261.2	560.2	877.0	566.1
T_8	126.7	229.7	193.7	183.4	594.0	697.8	596.0	629.3
T_9	170.0	327.2	599.5	365.6	683.3	796.2	984.5	821.3
T_{10}			628.5	628.5	298.8	372.0	736.3	469.0
SEm±	8.7	10.5						
CD at 5%	25.9	22.2						
CV%	11.2	4.6						

T_1 = NB hybrid + cowpea -Lucerne

T_2 = Maize (baby corn) + cowpea – maize (baby corn) –maize(baby corn) + cowpea

T_3 = Maize (baby corn) + cowpea – Lucerne

T_4 = Maize (baby corn) + cowpea – Oat– maize(baby corn) + cowpea

T_5 = Maize (baby corn) + cowpea – oat – maize(F) + cowpea

T_6 = Maize (green cob) + cowpea – maize (green cob) – maize (green cob) + cowpea

T_7 = Maize (green cob) + cowpea – Lucerne

T_8 = Maize (green cob) + cowpea –Oat – maize (green cob) + cowpea

T_9 = Maize (green cob) + cowpea – oat – maize (F) + cowpea

T_{10} =Remunerative food –forge based system of the location

Table-3.1 (c-5): Dry matter yield of maize (q/ha) grown for baby corn and green cob in South zone

Treatment	Kharif				Rabi			
	Hyderabad	Coimbatore	Mandya	Mean	Hyderabad	Coimbatore	Mandya	Mean
T_1	87.7	67.0	114.7	89.6	96.2	21.5	81.7	66.5
T_2	14.2	22.0	66.2	34.1	28.3	19.1	46.1	31.2
T_3	14.4	22.5	60.3	32.4	24.9	23.6	48.4	32.3
T_4	15.3	23.1	59.5	32.6	64.9	52.0	38.1	51.7
T_5	13.8	23.7	58.5	32.0	79.7	55.5	42.3	59.2
T_6	13.0	21.8	35.9	23.6	32.9	21.5	31.5	28.6
T_7	15.3	22.8	39.9	26.0	21.9	24.0	67.6	37.8
T_8	13.4	21.6	38.5	24.5	69.6	49.5	41.2	53.4
T_9	20.1	22.3	34.9	25.8	71.3	45.6	40.1	52.3
T_{10}	21.1				23.3	67.2	26.9	39.1
SEm±	2.2	1.1			5.1	2.3		
CD at 5%	6.5	2.3			15.0	7.8		
CV%	16.7	4.9			17.1	7.4		

T_1 = NB hybrid + cowpea -Lucerne

T_2 = Maize (baby corn) + cowpea – maize (baby corn) –maize(baby corn) + cowpea

T_3 = Maize (baby corn) + cowpea – Lucerne

T_4 = Maize (baby corn) + cowpea – Oat– maize(baby corn) + cowpea

T_5 = Maize (baby corn) + cowpea – oat – maize(F) + cowpea

T_6 = Maize (green cob) + cowpea – maize (green cob) – maize (green cob) + cowpea

T_7 = Maize (green cob) + cowpea – Lucerne

T_8 = Maize (green cob) + cowpea –Oat – maize (green cob) + cowpea

T_9 = Maize (green cob) + cowpea – oat – maize (F) + cowpea

T_{10} =Remunerative food –forge based system of the location

Table-3.1 (c-6): Dry matter yield of maize (q/ha) grown for baby corn and green cob in South zone

Treatment	Summer				Complete sequence			
	Hyderabad	Coimbatore	Mandya	Mean	Hyderabad	Coimbatore	Mandya	Mean
T_1	130.2	52.2	104.8	95.7	314.1	140.7	301.3	252.0
T_2	16.3	37.2	51.8	35.1	58.8	78.3	164.1	100.4
T_3	69.2	55.7	82.6	69.2	108.5	101.8	191.2	133.8
T_4	17.7	39.1	51.7	36.2	97.9	75.5	149.2	107.5
T_5	30.8	51.4	154.6	78.9	124.3	130.6	255.3	170.1
T_6	21.6	35.2	40.2	32.3	67.5	78.5	107.6	84.5
T_7	73.0	47.4	87.0	69.1	110.2	94.2	194.5	133.0
T_8	24.1	32.9	38.3	31.8	107.1	104.0	118.0	109.7
T_9	34.1	46.3	127.8	69.4	94.5	114.2	202.8	137.2
T_{10}	65.1		137.8	101.5	109.5	67.2	164.7	113.8
SEm±	3.3	2.1						
CD at 5%	9.9	4.4						
CV%	12.0	5.7						

T_1 = NB hybrid + cowpea -Lucerne

T_2 = Maize (baby corn) + cowpea – maize (baby corn) –maize(baby corn) + cowpea

T_3 = Maize (baby corn) + cowpea – Lucerne

T_4 = Maize (baby corn) + cowpea – Oat– maize(baby corn) + cowpea

T_5 = Maize (baby corn) + cowpea – oat – maize(F) + cowpea

T_6 = Maize (green cob) + cowpea – maize (green cob) – maize (green cob) + cowpea

T_7 = Maize (green cob) + cowpea – Lucerne

T_8 = Maize (green cob) + cowpea –Oat – maize (green cob) + cowpea

T_9 = Maize (green cob) + cowpea – oat – maize (F) + cowpea

T_{10} =Remunerative food –forge based system of the location

Table-3.1 (c-7) : Crude protein yield of maize (q/ha) grown for baby corn and green cob in South zone

Treatment	Kharif				Rabi			
	Hyderabad	Coimbatore	Mandya	Mean	Hyderabad	Coimbatore	Mandya	Mean
T_1	5.7	6.5	10.1	7.4	10.9	4.1	7.3	7.4
T_2	0.8	2.6	6.1	3.2	1.8	1.5	4.1	2.5
T_3	1.0	2.7	4.8	2.8	2.1	4.5	9.0	5.2
T_4	1.1	2.7	4.7	2.8	7.3	4.8	3.2	5.1
T_5	0.9	2.8	5.0	2.9	5.6	5.0	3.7	4.8
T_6	0.8	2.6	2.7	2.2	2.7	1.6	2.9	2.4
T_7	1.2	2.6	2.9	2.1	2.8	4.6	13.0	6.8
T_8	1.0	2.5	2.9	2.1	6.0	4.4	3.6	4.7
T_9	1.5	2.6	2.6	2.2	4.1	4.3	3.5	4.0
T_{10}	1.6			1.6	2.6	8.8	4.9	5.4
SEm±	0.1	0.2			0.5	0.2		
CD at 5%	0.4	0.4			1.4	0.5		
CV%	15.8	6.6			17.6	6.1		

T_1 = NB hybrid + cowpea -Lucerne

T_2 = Maize (baby corn) + cowpea – maize (baby corn) –maize(baby corn) + cowpea

T_3 = Maize (baby corn) + cowpea – Lucerne

T_4 = Maize (baby corn) + cowpea – Oat– maize(baby corn) + cowpea

T_5 = Maize (baby corn) + cowpea – oat – maize(F) + cowpea

T_6 = Maize (green cob) + cowpea – maize (green cob) – maize (green cob) + cowpea

T_7 = Maize (green cob) + cowpea – Lucerne

T_8 = Maize (green cob) + cowpea –Oat – maize (green cob) + cowpea

T_9 = Maize (green cob) + cowpea – oat – maize (F) + cowpea

T_{10} =Remunerative food –forge based system of the location

Table-3.1 (c-8): Crude protein yield of maize (q/ha) grown for baby corn and green cob in South zone

Treatment	Summer				Complete sequence			
	Hyderabad	Coimbatore	Mandya	Mean	Hyderabad	Coimbatore	Mandya	Mean
T_1	10.7	9.8	9.0	9.8	27.3	20.4	26.4	24.7
T_2	1.2	4.7	4.7	3.5	3.8	8.8	15.0	9.2
T_3	8.2	10.0	16.8	11.7	11.3	17.2	30.6	19.7
T_4	1.8	4.7	4.8	3.8	10.2	12.2	12.7	11.7
T_5	2.8	6.0	13.9	7.6	9.3	13.8	22.6	15.2
T_6	1.6	4.4	3.6	3.2	5.1	8.6	9.2	7.6
T_7	9.6	8.9	19.2	12.6	13.6	16.1	35.1	21.6
T_8	2.2	4.0	3.4	3.2	9.2	10.9	10.0	10.0
T_9	2.5	5.5	15.3	7.7	8.1	12.4	21.4	14.0
T_{10}	7.1		18.4	12.8	11.3	8.8	23.2	14.4
SEm±	0.7	0.5						
CD at 5%	2.0	1.0						
CV%	24.1	9.2						

T_1 = NB hybrid + cowpea -Lucerne

T_2 = Maize (baby corn) + cowpea – maize (baby corn) –maize(baby corn) + cowpea

T_3 = Maize (baby corn) + cowpea – Lucerne

T_4 = Maize (baby corn) + cowpea – Oat– maize(baby corn) + cowpea

T_5 = Maize (baby corn) + cowpea – oat – maize(F) + cowpea

T_6 = Maize (green cob) + cowpea – maize (green cob) – maize (green cob) + cowpea

T_7 = Maize (green cob) + cowpea – Lucerne

T_8 = Maize (green cob) + cowpea –Oat – maize (green cob) + cowpea

T_9 = Maize (green cob) + cowpea – oat – maize (F) + cowpea

T_{10} =Remunerative food –forge based system of the location

Table-3.1 (c-9): Net monetary return (Rs./ha/yr) of maize (q/ha) grown for baby corn and green cob in South zone

Treatment	Kharif				Rabi			
	Hyderabad	Coimbatore	Mandya	Mean	Hyderabad	Coimbatore	Mandya	Mean
T_1	17464	3779	21902	14381.7	24140	-	11162	17651
T_2	22527	16048	41378	26651.0	29070	21040	32398	27502.7
T_3	22364	20578	45603	29515.0	5305	1045	10974	5774.7
T_4	23924	17170	37039	26044.0	17056	13140	3450	11215.3
T_5	23624	19133	41457	28071.3	18245	18910	4539	13898.0
T_6	8567	8511	61470	26182.7	32845	12896	49616	31785.7
T_7	9831	8965	69149	29315.0	3135	2650	17278	7687.7
T_8	8116	9799	62274	26729.7	14885	13720	4509	11038.0
T_9	14668	9911	63464	29347.7	15320	19680	4256	13085.3
T_{10}	7549	7654	27725	14309.3	4135	38560	37313	26669.3

T_1 = NB hybrid + cowpea -Lucerne

T_2 = Maize (baby corn) + cowpea – maize (baby corn) –maize(baby corn) + cowpea

T_3 = Maize (baby corn) + cowpea – Lucerne

T_4 = Maize (baby corn) + cowpea – Oat– maize(baby corn) + cowpea

T_5 = Maize (baby corn) + cowpea – oat – maize(F) + cowpea

T_6 = Maize (green cob) + cowpea – maize (green cob) – maize (green cob) + cowpea

T_7 = Maize (green cob) + cowpea – Lucerne

T_8 = Maize (green cob) + cowpea –Oat – maize (green cob) + cowpea

T_9 = Maize (green cob) + cowpea – oat – maize (F) + cowpea

T_{10} =Remunerative food –forge based system of the location

Table-3.1 (c-10): Net monetary return (Rs./ha/yr) of maize (q/ha) grown for baby corn and green cob in South zone

Treatment	Summer				Complete sequence			
	Hyderabad	Coimbatore	Mandya	Mean	Hyderabad	Coimbatore	Mandya	Mean
T_1	31175.0	40365	17650	29730.0	72779	43614	50714	55702.3
T_2	28938.0	31010	37315	32421.0	80535	68098	111091	86574.7
T_3	11885.0	40215	23656	25252.0	39554	61838	80233	60541.7
T_4	35739.0	33535	36497	35257.0	76719	63854	76986	72519.7
T_5	609.0	27665	24198	17490.7	42478	65708	70194	59460.0
T_6	21517.0	21823	55050	32796.7	62929	43230	166136	90765.0
T_7	10835.0	37305	23160	23766.7	23801	48920	109587	60769.0
T_8	22902.0	27190	58818	36303.3	55903	50709	125601	77404.3
T_9	3177.0	28270	21837	17761.3	33165	57861	89557	60194.3
T_{10}	11885.0	1810	23287	12327.3	23569	480234	88325	197376.0

T_1 = NB hybrid + cowpea -Lucerne

T_2 = Maize (baby corn) + cowpea – maize (baby corn) –maize(baby corn) + cowpea

T_3 = Maize (baby corn) + cowpea – Lucerne

T_4 = Maize (baby corn) + cowpea – Oat– maize(baby corn) + cowpea

T_5 = Maize (baby corn) + cowpea – oat – maize(F) + cowpea

T_6 = Maize (green cob) + cowpea – maize (green cob) – maize (green cob) + cowpea

T_7 = Maize (green cob) + cowpea – Lucerne

T_8 = Maize (green cob) + cowpea –Oat – maize (green cob) + cowpea

T_9 = Maize (green cob) + cowpea – oat – maize (F) + cowpea

T_{10} =Remunerative food –forge based system of the location

Table-3.1 (c-11): Benefit cost ratio of maize (q/ha) grown for baby corn and green cob in South zone

Treatment	Kharif				Rabi			
	Hyderabad	Coimbatore	Mandya	Mean	Hyderabad	Coimbatore	Mandya	Mean
T_1	3.03	1.09	2.68	2.3	5.83	0.97	1.37	2.7
T_2	2.11	1.95	2.39	2.2	2.32	2.28	1.92	2.2
T_3	2.10	2.22	2.63	2.3	1.67	1.06	2.52	1.8
T_4	2.18	2.02	2.14	2.1	3.52	2.36	0.65	2.2
T_5	2.16	2.13	2.39	2.2	3.69	2.96	0.86	2.5
T_6	1.42	1.50	3.04	2.0	2.80	1.77	2.34	2.3
T_7	1.48	1.52	3.42	2.1	1.40	1.15	3.97	2.2
T_8	1.40	1.57	3.08	2.0	3.20	2.42	0.85	2.1
T_9	1.72	1.58	3.14	2.2	3.26	3.04	0.80	2.4
T_{10}	1.41	1.54	2.50	1.8	1.53	4.98	3.62	3.4

T_1 = NB hybrid + cowpea -Lucerne

T_2 = Maize (baby corn) + cowpea – maize (baby corn) –maize(baby corn) + cowpea

T_3 = Maize (baby corn) + cowpea – Lucerne

T_4 = Maize (baby corn) + cowpea – Oat– maize(baby corn) + cowpea

T_5 = Maize (baby corn) + cowpea – oat – maize(F) + cowpea

T_6 = Maize (green cob) + cowpea – maize (green cob) – maize (green cob) + cowpea

T_7 = Maize (green cob) + cowpea – Lucerne

T_8 = Maize (green cob) + cowpea –Oat – maize (green cob) + cowpea

T_9 = Maize (green cob) + cowpea – oat – maize (F) + cowpea

T_{10} =Remunerative food –forge based system of the location

Table-3.1 (c-12): Benefit cost ratio of maize (q/ha) grown for baby corn and green cob in South zone

Treatment	Summer				Complete sequence			
	Hyderabad	Coimbatore	Mandya	Mean	Hyderabad	Coimbatore	Mandya	Mean
T_1	5.16	12.70	2.01	6.7	4.67	1.69	2.04	2.80
T_2	2.42	2.84	2.30	2.5	2.28	2.63	2.02	2.37
T_3	2.73	12.66	4.73	6.7	2.17	2.65	3.29	2.70
T_4	2.76	2.99	2.25	2.7	2.82	2.47	1.68	2.32
T_5	1.04	3.85	2.97	2.7	2.30	3.56	2.07	2.64
T_6	2.05	2.28	2.72	2.4	2.09	1.85	2070	2.20
T_7	2.58	11.81	4.63	6.3	1.82	2.30	4.01	2.71
T_8	2.12	3.80	2.91	2.9	2.24	2.39	2.28	2.30
T_9	1.19	3.91	2.68	2.6	2.06	2.59	2.21	2.29
T_{10}	2.73	1.15	2.86	2.3	1.89	2.34	2.99	2.41

T_1 = NB hybrid + cowpea -Lucerne

T_2 = Maize (baby corn) + cowpea – maize (baby corn) –maize(baby corn) + cowpea

T_3 = Maize (baby corn) + cowpea – Lucerne

T_4 = Maize (baby corn) + cowpea – Oat– maize(baby corn) + cowpea

T_5 = Maize (baby corn) + cowpea – oat – maize(F) + cowpea

T_6 = Maize (green cob) + cowpea – maize (green cob) – maize (green cob) + cowpea

T_7 = Maize (green cob) + cowpea – Lucerne

T_8 = Maize (green cob) + cowpea –Oat – maize (green cob) + cowpea

T_9 = Maize (green cob) + cowpea – oat – maize (F) + cowpea

T_{10} =Remunerative food –forge based system of the location

Table-3.1 (d-1): Cob yield of maize (q/ha) grown for baby corn and green cob in North East zone

Treatment	Kharif					Rabi					
	Ranchi	Bhuba-neswar	Kalyani	Pusa	Mean	Bhuba-neswar	Raipur	Ranchi	Kalyani	Pusa	Mean
T_1											
T_2	27.8	22.9	90.7	12.6	38.5	19.7	21.5	30.8	45.0	33.9	30.2
T_3	28.3	20.2	84.0	11.2	35.9						
T_4	25.8	21.1	79.3	12.4	34.7						
T_5	32.2	21.6	92.0	12.2	39.5						
T_6	25.8	19.9	105.3	11.1	40.5						
T_7	57.5	28.1	68.0	40.7	48.6	21.2	26.2	64.2	70.0	76.1	51.5
T_8	65.5	26.4	58.7	41.6	48.1						
T_9	58.5	27.6	44.0	42.4	43.1						
T_{10}	69.4	27.1	75.3	45.1	54.2						
T_{11}	53.6	27.4	100.0	43.3	56.1						
T_{12}	26.9		26.0		26.5						
SEm±			2.0								
CD at 5%			4.9								
CV%			13.8								

T_1 = NB hybrid + cowpea – berseem or ricebean – cowpea	T_7 = Maize (green cob) + cowpea – maize (green cob) – maize (green cob) + cowpea
T_2 = Maize (baby corn) + cowpea – maize (baby corn) – maize (baby corn) + cowpea	T_8 = Maize (green cob) + cowpea – berseem or lathyrus – maize (green cob) + cowpea
T_3 = Maize (baby corn) + cowpea – berseem or lathyrus – maize (baby corn) + cowpea	T_9 = Maize (green cob) + cowpea – oat – maize (green cob) + cowpea
T_4 = Maize (baby corn) + cowpea – oat – maize (baby corn) + cowpea	T_{10} = Maize (green cob) + cowpea – berseem or lathyrus – maize (F) + cowpea
T_5 = Maize (baby corn) + cowpea – berseem or lathyrus – maize(F) + cowpea	T_{11} = Maize (green cob) + cowpea – oat – maize (F) + cowpea
T_6 = Maize (baby corn) + cowpea – oat – maize(F) + cowpea	T_{12} = Remunerative food – forage based system of the location*

Table-3.1 (d-2): Cob yield of maize (q/ha) grown for baby corn and green cob in North East zone

Treatment	Summer						Complete sequence					
	Raipur	Bhuba-neswar	Kalyani	Ranchi	Pusa	Mean	Ranchi	Bhuba-neswar	Raipur*	Kalyani	Pusa	Mean**
T_1												
T_2	14.4	28.0	47.0	24.8	27.5	28.3	83.4	70.6	35.9	182.7	74.0	102.7
T_3	13.3	26.3	60.3	27.5	31.9	31.9	55.8	46.5	13.3	144.3	43.1	72.4
T_4	13.9	26.5	60.0	26.2	28.3	31.0	52.0	47.6	13.9	139.3	40.7	69.9
T_5							32.2	21.6		92.0	12.2	39.5
T_6							25.8	19.9		105.3	11.1	40.5
T_7	21.4	37.9	56.7	18.4	75.3	41.9	140.1	87.2	47.6	194.7	192.1	153.5
T_8	19.7	36.9	64.0	22.6	88.9	46.4	88.1	63.3	19.7	122.7	130.5	101.2
T_9	20.2	36.2	71.3	21.2	79.2	45.6	79.7	63.8	20.2	115.3	121.6	95.1
T_{10}							69.4	27.1		75.3	45.1	54.2
T_{11}							53.6	27.4		100.0	43.3	56.0
T_{12}			14.0				26.9			40.0		33.5
SEm±	0.9											
CD at 5%	3.0											
CV%	9.5											

Note-* At Raipur Kharif crop were not grown ** Mean excluding Raipur.

T_1 = NB hybrid + cowpea – berseem or ricebean – cowpea	T_7 = Maize (green cob) + cowpea – maize (green cob) – maize (green cob) + cowpea
T_2 = Maize (baby corn) + cowpea – maize (baby corn) – maize (baby corn) + cowpea	T_8 = Maize (green cob) + cowpea – berseem or lathyrus – maize (green cob) + cowpea
T_3 = Maize (baby corn) + cowpea – berseem or lathyrus – maize (baby corn) + cowpea	T_9 = Maize (green cob) + cowpea – oat – maize (green cob) + cowpea
T_4 = Maize (baby corn) + cowpea – oat – maize (baby corn) + cowpea	T_{10} = Maize (green cob) + cowpea – berseem or lathyrus – maize (F) + cowpea
T_5 = Maize (baby corn) + cowpea – berseem or lathyrus – maize(F) + cowpea	T_{11} = Maize (green cob) + cowpea – oat – maize (F) + cowpea
T_6 = Maize (baby corn) + cowpea – oat – maize(F) + cowpea	T_{12} = Remunerative food – forage based system of the location

Table-4.1 (d-3): Green fodder yield of maize (q/ha) grown for baby corn and green cob in North East zone

Treatment	Kharif					Rabi					
	Ranchi	Bhuba-neswar	Kalyani	Pusa	Mean	Ranchi	Bhuba-neswar	Raipur	Kalyani	Pusa	Mean
T_1	676.2	932.9	550.6	171.4	582.8	176.9	122.5	909.4	214.3	499.8	384.6
T_2	252.4	323.1	330.7	198.6	276.2	277.8	245.4	188.4	131.7	181.2	204.9
T_3	247.6	299.0	349.4	287.3	295.8	479.7	84.4	418.8	104.0	709.1	359.2
T_4	247.6	264.3	359.4	198.4	267.4	466.7	339.4	125.6	334.0	398.1	332.8
T_5	269.1	355.2	341.3	204.2	292.5	443.9	83.0	443.7	105.0	690.4	333.2
T_6	250.0	410.5	385.6	187.5	308.4	422.2	365.1	127.5	325.0	410.5	330.1
T_7	283.3	295.9	346.7	243.2	292.3	380.6	226.5	448.0	132.3	341.7	305.8
T_8	288.1	344.8	333.0	233.2	299.8	413.3	76.9	425.1	96.7	640.3	330.5
T_9	276.1	347.3	320.6	231.4	293.9	416.7	389.9	136.8	335.3	390.4	333.8
T_{10}	309.5	355.9	343.7	255.6	316.2	380.0	98.5	455.7	98.0	733.7	353.2
T_{11}	266.6	332.0	367.0	235.7	300.3	355.6	384.3	135.3	341.3	388.6	321.0
T_{12}		505.1			505.1	503.3	320.8	470.4	325.7	773.4	478.7
SEm±	5.6	12.8	8.7				18.2	11.7	9.9		
CD at 5%	16.5	39.4	21.1				56.0	34.3	24.1		
CV%	8.1	5.6	10.5				8.1	5.7	8.1		

T_1 = NB hybrid + cowpea – berseem or ricebean – cowpea
T_2 = Maize (baby corn) + cowpea – maize (baby corn) – maize (baby corn) + cowpea
T_3 = Maize (baby corn) + cowpea – berseem or lathyrus – maize (baby corn) + cowpea
T_4 = Maize (baby corn) + cowpea – oat – maize (baby corn) + cowpea
T_5 = Maize (baby corn) + cowpea – berseem or lathyrus – maize(F) + cowpea
T_6 = Maize (baby corn) + cowpea – oat – maize(F) + cowpea
T_7 = Maize (green cob) + cowpea – maize (green cob) – maize (green cob) + cowpea
T_8 = Maize (green cob) + cowpea – berseem or lathyrus – maize (green cob) + cowpea
T_9 = Maize (green cob) + cowpea – oat – maize (green cob) + cowpea
T_{10} = Maize (green cob) + cowpea – berseem or lathyrus – maize (F) + cowpea
T_{11} = Maize (green cob) + cowpea – oat – maize (F) + cowpea
T_{12} = Remunerative food – forage based system of the location

Table-3.1 (d-4): Green fodder yield of maize (q/ha) grown for baby corn and green cob in North East zone

Treatment	Summer						Complete sequence					
	Ranchi	Bhuba-neswar	Raipur	Kalyani	Pusa	Mean	Ranchi	Bhuba-neswar	Raipur*	Kalyani	Pusa	Mean**
T_1	440.6	925.9	906.5	479.3	439.1	638.3	1293.7	1981.3	1815.9	1244.2	1110.3	1407.4
T_2	389.9	229.1	252.9	293.3	383.4	309.7	920.1	797.6	441.3	755.7	763.2	809.2
T_3	468.6	256.1	225.7	303.0	455.4	341.8	1195.9	640.0	644.5	756.4	1451.8	1011.2
T_4	443.1	263.1	256.8	331.4	423.5	343.6	1157.4	866.8	382.4	1024.8	1020.0	1017.3
T_5	497.3	234.6	290.1	287.3	582.3	378.3	1210.3	672.8	733.8	733.6	1476.9	1023.4
T_6	463.4	272.2	341.7	269.0	567.8	382.8	1135.6	1047.8	469.2	979.6	1165.8	1082.2
T_7	417.6	300.4	503.1	326.6	457.6	401.1	1081.5	822.8	951.1	805.6	1042.5	938.1
T_8	541.3	274.0	512.6	296.0	532.2	431.2	870.7	695.7	937.7	725.7	1405.7	924.5
T_9	338.1	285.4	605.8	253.4	485.6	393.7	1030.9	1022.6	742.6	909.3	1107.4	1017.6
T_{10}	506.2	300.4	655.9	334.3	575.7	474.5	1159.2	754.8	1111.6	776.0	1565.0	1063.8
T_{11}	437.0	283.3	590.8	266.4	352.5	386.0	1059.2	999.6	726.1	974.7	976.8	1002.6
T_{12}	412.8	238.3	416.5			355.8	915.8	1064.0	886.9	325.7	773.4	769.7
SEm±		14.9	14.6	5.5								
CD at 5%	31.1	46.0	42.7	13.4								
CV%	9.6	8.0	5.4	7.3								

Note- * At Raipur Kharif crop were not grown ** Mean excluding Raipur.

T_1 = NB hybrid + cowpea – berseem or ricebean – cowpea	T_7 = Maize (green cob) + cowpea – maize (green cob) – maize (green cob) + cowpea
T_2 = Maize (baby corn) + cowpea – maize (baby corn) – maize (baby corn) + cowpea	T_8 = Maize (green cob) + cowpea – berseem or lathyrus – maize (green cob) + cowpea
T_3 = Maize (baby corn) + cowpea – berseem or lathyrus – maize (baby corn) + cowpea	T_9 = Maize (green cob) + cowpea – oat – maize (green cob) + cowpea
T_4 = Maize (baby corn) + cowpea – oat – maize (baby corn) + cowpea	T_{10} = Maize (green cob) + cowpea – berseem or lathyrus – maize (F) + cowpea
T_5 = Maize (baby corn) + cowpea – berseem or lathyrus – maize(F) + cowpea	T_{11} = Maize (green cob) + cowpea – oat – maize (F) + cowpea
T_6 = Maize (baby corn) + cowpea – oat – maize(F) + cowpea	T_{12} = Remunerative food – forage based system of the location

Table-3.1 (d-5): Dry matter yield of maize (q/ha) grown for baby corn and green cob in North East zone

Treatment	Kharif				Rabi					
	Bhuba-neswar	Kalyani	Pusa	Mean	Pusa	Ranchi	Bhuba-neswar	Raipur	Kalyani	Mean
T_1	201.8	76.4	27.9	102.0	74.6	59.2	17.5	48.2	35.4	47.0
T_2	67.4	53.3	42.6	54.4	33.9	79.2	42.1	13.1	10.8	35.8
T_3	65.9	52.6	43.6	54.0	94.9	62.8	11.6	24.6	19.6	42.7
T_4	54.6	59.5	41.4	51.8	79.8	82.1	68.3	8.2	53.0	58.3
T_5	73.8	51.1	44.7	56.5	93.4	56.8	12.3	22.2	19.6	40.9
T_6	88.4	58.6	38.7	61.9	79.8	73.0	70.3	8.5	50.5	56.4
T_7	64.3	55.3	53.8	57.8	113.9	127.9	44.4	25.5	10.2	64.4
T_8	70.3	54.9	52.4	59.2	86.4	54.6	14.3	23.5	18.2	39.4
T_9	71.3	50.4	51.3	57.7	72.4	72.5	67.2	9.1	55.1	55.3
T_{10}	74.3	58.5	56.2	62.9	95.4	48.3	17.2	21.2	17.9	40.0
T_{11}	68.5	65.7	51.4	61.9	67.6	64.4	58.6	8.3	55.3	50.8
T_{12}	109.7		67.2	88.5	99.7	65.9	60.1	21.9	49.8	59.5
SEm±		2.5					1.1	1.7	1.6	
CD at 5%		6.0				8.8	3.4	5.0	3.9	
CV%		19.2				10.1	2.8	15.0	8.5	

T_1 = NB hybrid + cowpea – berseem or ricebean – cowpea
T_2 = Maize (baby corn) + cowpea – maize (baby corn) – maize (baby corn) + cowpea
T_3 = Maize (baby corn) + cowpea – berseem or lathyrus – maize (baby corn) + cowpea
T_4 = Maize (baby corn) + cowpea – oat – maize (baby corn) + cowpea
T_5 = Maize (baby corn) + cowpea – berseem or lathyrus – maize(F) + cowpea
T_6 = Maize (baby corn) + cowpea – oat – maize(F) + cowpea
T_7 = Maize (green cob) + cowpea – maize (green cob) – maize (green cob) + cowpea
T_8 = Maize (green cob) + cowpea – berseem or lathyrus – maize (green cob) + cowpea
T_9 = Maize (green cob) + cowpea – oat – maize (green cob) + cowpea
T_{10} = Maize (green cob) + cowpea – berseem or lathyrus – maize (F) + cowpea
T_{11} = Maize (green cob) + cowpea – oat – maize (F) + cowpea
T_{12} = Remunerative food – forage based system of the location

Table-3.1 (d-6): Dry matter yield of maize (q/ha) grown for baby corn and greencob in North East zone

Treatment	Summer						Complete sequence					
	Ranchi	Raipur	Bhuban-eswar	Kalyani	Pusa	Mean	Ranchi*	Bhuban-eswar	Raipur*	Kalyani	Pusa	Mean**
T_1	91.3	108.2	182.6	75.2	83.7	108.2	150.5	401.9	156.4	187.0	186.2	258.4
T_2	80.2	31.5	45.3	45.1	55.2	51.5	159.4	154.8	44.6	109.2	131.7	131.9
T_3	98.9	14.6	51.2	46.4	70.4	56.3	161.7	128.7	39.2	118.6	208.9	152.1
T_4	88.5	32.9	52.5	54.6	60.3	57.8	170.6	175.4	41.1	167.5	181.5	174.8
T_5	84.2	15.3	46.9	47.6	87.8	56.4	141.0	133.0	37.5	118.3	225.9	159.1
T_6	75.8	18.4	53.1	43.2	80.3	54.2	148.8	211.8	26.9	152.3	198.8	187.6
T_7	109.8	18.0	59.2	50.4	76.2	62.9	237.7	166.9	43.5	115.9	243.9	175.6
T_8	137.0	18.3	55.0	45.6	96.5	70.5	191.6	139.6	41.8	118.7	235.3	164.5
T_9	126.5	24.5	57.4	56.6	84.4	69.9	199.0	195.9	33.6	162.1	208.1	188.7
T_{10}	73.5	23.6	59.1	52.3	83.9	58.5	121.8	150.6	44.8	128.7	235.5	171.6
T_{11}	66.1	25.9	55.8	41.7	76.3	53.2	130.5	182.9	34.2	162.7	195.3	180.3
T_{12}		22.1	47.8			35.0	65.9	217.6	44.0	49.8	166.9	144.8
Em±		2.4	2.3	1.2								
CD at 5%	8.7	7.0	7.0	2.8								
CV%	11.7	14.0	6.1	8.4								

Note- At Ranchi and Raipur Kharif was not grown *,** Mean excluding Raipur & Ranchi.

T_1 = NB hybrid + cowpea – berseem or ricebean – cowpea
T_2 = Maize (baby corn) + cowpea – maize (baby corn) – maize (baby corn) + cowpea
T_3 = Maize (baby corn) + cowpea – berseem or lathyrus – maize (baby corn) + cowpea
T_4 = Maize (baby corn) + cowpea – oat – maize (baby corn) + cowpea
T_5 = Maize (baby corn) + cowpea – berseem or lathyrus – maize(F) + cowpea
T_6 = Maize (baby corn) + cowpea – oat – maize(F) + cowpea
T_7 = Maize (green cob) + cowpea – maize (green cob) – maize (green cob) + cowpea
T_8 = Maize (green cob) + cowpea – berseem or lathyrus – maize (green cob) + cowpea
T_9 = Maize (green cob) + cowpea – oat – maize (green cob) + cowpea
T_{10} = Maize (green cob) + cowpea – berseem or lathyrus – maize (F) + cowpea
T_{11} = Maize (green cob) + cowpea – oat – maize (F) + cowpea
T_{12} = Remunerative food – forage based system of the location

Table-3.1 (d-7) : Crude protein yield of maize (q/ha) grown for baby corn and greencob in North East zone

Treatment	Kharif			Rabi			Summer			Complete sequence		
	Ranchi	Kalyani	Mean	Ranchi	Kalyani	Mean	Ranchi	Kalyani	Mean	Ranchi	Kalyani	Mean
T_1	11.3	8.0	9.7	6.8	3.1	5.0	7.0	8.0	7.5	25.2	19.1	22.2
T_2	5.3	7.1	6.2	5.4	0.9	3.2	7.5	5.5	6.5	18.2	13.5	15.9
T_3	6.0	7.0	6.5	12.7	2.6	7.7	9.3	5.3	7.3	27.9	14.9	21.4
T_4	5.7	8.0	6.9	5.5	4.0	4.8	8.2	8.0	8.1	19.4	20.0	19.7
T_5	6.2	6.8	6.5	11.5	3.0	7.3	7.9	5.7	6.8	25.5	15.5	20.5
T_6	5.5	7.9	6.7	4.9	3.6	4.3	7.0	5.3	6.2	17.4	16.8	17.1
T_7	6.6	7.4	7.0	7.5	0.9	4.2	7.5	7.1	7.3	21.6	15.4	18.5
T_8	6.7	7.3	7.0	11.0	2.5	6.8	10.0	6.8	8.4	27.7	16.6	22.2
T_9	6.5	6.7	6.6	4.9	3.9	4.4	9.2	6.9	8.1	20.6	17.5	19.1
T_{10}	7.2	7.4	7.3	9.7	2.8	6.3	6.8	5.8	6.3	23.7	16.0	19.9
T_{11}	6.3	8.2	7.3	4.3	4.0	4.2	6.1	5.1	5.6	16.8	17.3	17.1
T_{12}	1.5		1.5	13.3	3.5	8.4	0.7		0.7	14.8	3.5	9.2
SEm±		0.2			0.2			0.1				
CD at 5%	0.8	0.6		1.1	0.4		9.0	0.2		1.5		
CV%	7.9	19.2		8.1	8.8		7.0	7.7		8.4		

T_1 = NB hybrid + cowpea – berseem or ricebean – cowpea
T_2 = Maize (baby corn) + cowpea – maize (baby corn) – maize (baby corn) + cowpea
T_3 = Maize (baby corn) + cowpea – berseem or lathyrus – maize (baby corn) + cowpea
T_4 = Maize (baby corn) + cowpea – oat – maize (baby corn) + cowpea
T_5 = Maize (baby corn) + cowpea – berseem or lathyrus – maize(F) + cowpea
T_6 = Maize (baby corn) + cowpea – oat – maize(F) + cowpea
T_7 = Maize (green cob) + cowpea – maize (green cob) – maize (green cob) + cowpea
T_8 = Maize (green cob) + cowpea – berseem or lathyrus – maize (green cob) + cowpea
T_9 = Maize (green cob) + cowpea – oat – maize (green cob) + cowpea
T_{10} = Maize (green cob) + cowpea – berseem or lathyrus – maize (F) + cowpea
T_{11} = Maize (green cob) + cowpea – oat – maize (F) + cowpea
T_{12} = Remunerative food – forage based system of the location

Table-3.1 (d-8): Economics of maize grown for baby corn and green cob in North East zone

Treatment	Complete sequence									
	Net return (Rs./ha/yr)						B : C ratio			
	Ranchi	Bhuban-eswar	Kalyani	Raipur	Pusa	Mean	Ranchi	Bhuban-eswar	Raipur	Mean
T_1	166716	48688	39746.7	78951	69948	80810	2.09	0.69	2.63	1.80
T_2	217465	30280	84593.3	28593	185457	109277	2.30	1.72	1.07	1.69
T_3	231297	19803	6246.7	22673	203140	96632	2.33	1.07	0.85	1.41
T_4	208051	35644	67106.7	7424	145860	92817	2.39	2.17	0.28	1.61
T_5	234518	21745	68240.0	17428	152028	98791	2.77	1.17	0.66	1.53
T_6	192433	45309	80260.0	1552	93200	82550	2.39	2.58	0.10	1.69
T_7	94980	29868	67953.3	59057	152132	80798	1.11	1.53	2.22	1.62
T_8	177769	21217	42306.7	41502	185460	93651	1.90	1.03	1.56	1.49
T_9	161685	41712	41400.0	30097	133947	81768	2.00	2.12	1.13	1.75
T_{10}	183803	25499	51266.7	40094	162760	92684	2.25	1.29	1.51	1.68
T_{11}	146730	40345	59766.7	16965	81008	68963	1.89	2.06	0.64	1.53
T_{12}	108167	44897	26600.0	26613	91307	59516	2.59	2.37	1.00	1.98
SEm±			3257.9							
CD at 5%	18883		7909.6							
CV%	9.6		9.8							

T_1 = NB hybrid + cowpea – berseem or ricebean – cowpea
T_2 = Maize (baby corn) + cowpea – maize (baby corn) – maize (baby corn) + cowpea
T_3 = Maize (baby corn) + cowpea – berseem or lathyrus – maize (baby corn) + cowpea
T_4 = Maize (baby corn) + cowpea – oat – maize (baby corn) + cowpea
T_5 = Maize (baby corn) + cowpea – berseem or lathyrus – maize(F) + cowpea
T_6 = Maize (baby corn) + cowpea – oat – maize(F) + cowpea
T_7 = Maize (green cob) + cowpea – maize (green cob) – maize (green cob) + cowpea
T_8 = Maize (green cob) + cowpea – berseem or lathyrus – maize (green cob) + cowpea
T_9 = Maize (green cob) + cowpea – oat – maize (green cob) + cowpea
T_{10} = Maize (green cob) + cowpea – berseem or lathyrus – maize (F) + cowpea
T_{11} = Maize (green cob) + cowpea – oat – maize (F) + cowpea
T_{12} = Remunerative food – forage based system of the location

AST 4: SECONDARY AND MICRO NUTRIENT USE IN FORAGES

AST 4.1: Influence of nutrients (macro and micro) on forage production and Quality of Lucerne in Central zone

(Location: Rahuri and Urulilkanchan)

This was the third year of experimentation at the same site with previous year treatments at two locations of central zone. The treatments of S, Mo and B were imposed based on test values as the soils were deficient for these nutrients. The results of eleven treatments indicated superiority of T_{11} (RDF + FYM @ 10 t/ha + S + Mo + B) for green fodder yield (1594q/ha) and dry matter (347q/ha) on mean basis. The forage yield of T_{11} (RDF + FYM @ 5 t/ha + S + Mo + B) was at par with T_{10} (RDF + FYM @) 5 tonnes/ha + S + Mo + B). Crude protein yield showed similar trend to dry matter yield. Due to higher yield potential of dry matter at Rahuri, CP yield was more compared to Urulikanchan. Crude fibre yield was significantly higher with T_{11} at both the locations and was at par with T_{10}. Treatments did not exhibit any significant effect on crude protein content and crude fibre content. At Urulikanchan, uptake of N by Lucerne was quite high (372-529kg/ha) as compared to P (72-98kg/ha) and K (80-115kg/ha). The treatments consisting of FYM @ 5 and 10 t/ha +S + Mo + B resulted in more nutrient uptake from the soil at both the locations.

Table 4.1 (a) : Influence of nutrients (Macro & Micro) on yield of Lucerne in Central Zone

Treatment	Green fodder yield (q/ha)*			Dry matter yield (q/ha)		
	Rahuri	Urulikanchan	Mean	Rahuri	Urulikanchan	Mean
T_1 – Absolute control	1225.2	658.6	941.9	241.7	139.1	190.4
T_2 – Recommended dose of fertilizers (RDF)	1985.5	846.1	1415.8	414.0	175.4	294.7
T_3 – FYM @ 5 tones/ha	1635.9	850.0	1242.95	334.4	180.4	257.4
T_4 – FYM @ 10 tones/ha	1735.5	847.0	1291.25	353.4	178.2	265.8
T_5 – RDF + FYM @ 5 tones/ha	2095.5	843.1	1469.3	440.7	177.3	309.0
T_6 – RDF + FYM @ 10 tones/ha	2191.3	861.7	1526.5	464.4	186.4	325.4
T_7 – RDF + S + Mo + B	1961.1	741.2	1351.15	409.5	156.7	283.1
T_8 - FYM @ 5 tones/ha + S + Mo + B	1570.2	777.5	1173.85	318.5	172.6	245.55
T_9 - FYM @ 10 tones/ha + S + Mo + B	1710.5	824.5	1267.5	349.5	170.1	259.8
T_{10} - RDF + FYM @ 5 tones/ha + S + Mo + B	2235.8	869.2	1552.5	482.0	182.6	332.3
T_{11} - RDF + FYM @ 10 tones/ha + S + Mo + B	2296.5	899.6	1598.1	498.6	195.8	347.2
CD at 5%	264.3	37.2		84.9	17.2	
CV %	8.6	8.9		13.2	9.6	

* No. of cut at Rahuri – 16, Urulikanchan - 14

Table 4.1 (b) : Influence of nutrients (Macro & Micro) on quality of Lucerne in Central Zone

Treatment	Crude protein yield (q/ha)			Crude protein content (%)		
	Rahuri	Urulikanchan	Mean	Rahuri	Urulikanchan	Mean
T_1 – Absolute control	42.6	26.2	34.4	17.7	18.8	18.3
T_2 – Recommended dose of fertilizers (RDF)	76.4	31.7	54.05	18.5	18	18.3
T_3 – FYM @ 5 tones/ha	61.3	33.6	47.45	18.4	18.6	18.5
T_4 – FYM @ 10 tones/ha	63.3	31.3	47.3	17.9	17.6	17.8
T_5 – RDF + FYM @ 5 tones/ha	81.2	31.8	56.5	18.4	17.9	18.2
T_6 – RDF + FYM @ 10 tones/ha	83.9	33.0	58.45	18.1	17.7	17.9
T_7 – RDF + S + Mo + B	74.8	27.0	50.9	18.3	17.3	17.8
T_8 - FYM @ 5 tones/ha + S + Mo + B	58.6	29.7	44.15	18.4	17.3	17.9
T_9 - FYM @ 10 tones/ha + S + Mo + B	62.7	30.7	46.7	18	18.2	18.1
T_{10} - RDF + FYM @ 5 tones/ha + S + Mo + B	88.5	33.0	60.75	18.4	18.1	18.3
T_{11} - RDF + FYM @ 10 tones/ha + S + Mo + B	93.2	34.3	63.75	18.6	17.5	18.1
CD at 5%	14.8	3.6		NS		
CV %	12.6	9.6		2.5		

Table 4.1 (c): Influence of nutrients (Macro & Micro) on quality of Lucerne in Central Zone

Treatment	Crude fibre yield (q/ha)			Crude fibre content (%)		
	Rahuri	Urulikanchan	Mean	Rahuri	Urulikanchan	Mean
T_1 – Absolute control	69.9	32.6	51.3	24.1	23.5	23.8
T_2 – Recommended dose of fertilizers (RDF)	122.7	40.1	81.4	24.6	22.8	23.7
T_3 – FYM @ 5 tones/ha	100.3	40.6	70.5	25.3	22.5	23.9
T_4 – FYM @ 10 tones/ha	103.2	41.7	72.5	24.3	23.3	23.8
T_5 – RDF + FYM @ 5 tones/ha	131.3	40.9	86.1	24.9	23.1	24.0
T_6 – RDF + FYM @ 10 tones/ha	138.5	41.9	90.2	25.1	22.5	23.8
T_7 – RDF + S + Mo + B	120.9	35.0	78.0	24.8	22.3	23.6
T_8 - FYM @ 5 tones/ha + S + Mo + B	91.4	40.3	65.9	24.5	23.2	23.9
T_9 - FYM @ 10 tones/ha + S + Mo + B	101.5	39.5	70.5	24.7	23.2	24.0
T_{10} - RDF + FYM @ 5 tones/ha + S + Mo + B	143.7	42.3	93.0	25.2	23.2	24.2
T_{11} - RDF + FYM @ 10 tones/ha + S + Mo + B	149.8	42.2	96.0	25.4	22.7	24.1
CD at 5%	22.1	5.3		NS		
CV %	11.6	10.7		2.7		

Table 4.1 (d): Influence of nutrients (Macro & Micro) on plant height and leaf stem ratio of Lucerne in Central Zone

Treatment	Plant height (cm)			Leaf stem ratio		
	Rahuri	Urulikanchan	Mean	Rahuri	Urulikanchan	Mean
T_1 – Absolute control	74.8	78.7	76.8	0.66	1.16	0.91
T_2 – Recommended dose of fertilizers (RDF)	79.8	86.3	83.1	0.76	1.1	0.93
T_3 – FYM @ 5 tones/ha	74.5	82.2	78.4	0.69	1.11	0.90
T_4 – FYM @ 10 tones/ha	76	85.3	80.7	0.7	1.14	0.92
T_5 – RDF + FYM @ 5 tones/ha	81	81.1	81.1	0.8	1.17	0.99
T_6 – RDF + FYM @ 10 tones/ha	84.8	88.3	86.6	0.82	1.16	0.99
T_7 – RDF + S + Mo + B	81.6	80.7	81.2	0.76	1.18	0.97
T_8 - FYM @ 5 tones/ha + S + Mo + B	78.3	82.6	80.5	0.71	1.11	0.91
T_9 - FYM @ 10 tones/ha + S + Mo + B	80	81.5	80.8	0.72	1.12	0.92
T_{10} - RDF + FYM @ 5 tones/ha + S + Mo + B	85.2	86.7	86.0	0.86	1.19	1.03
T_{11} - RDF + FYM @ 10 tones/ha + S + Mo + B	87	85.8	86.4	0.85	1.15	0.91
CD at 5%	NS	2.7		0.07	NS	
CV %	13.1	3.9		5.42	4.02	

Table 4.1 (e) : Influence of nutrients (Macro & Micro) on nutrient% and uptake of Lucerne at Urulikanchan in Central Zone

Treatment	Nutrient % in plant			Nutrient uptake (kg/ha)		
	N	P	K	N	P	K
T_1 – Absolute control	2.68	0.52	0.58	372.7	72.3	80.7
T_2 – Recommended dose of fertilizers (RDF)	2.74	0.53	0.59	480.5	92.9	103.5
T_3 – FYM @ 5 tones/ha	2.98	0.53	0.61	537.4	95.6	110.0
T_4 – FYM @ 10 tones/ha	2.81	0.52	0.59	500.7	92.7	105.1
T_5 – RDF + FYM @ 5 tones/ha	2.86	0.53	0.63	507.0	94.0	111.7
T_6 – RDF + FYM @ 10 tones/ha	2.84	0.52	0.62	529.3	96.9	115.5
T_7 – RDF + S + Mo + B	2.77	0.54	0.61	434.2	84.6	95.6
T_8 - FYM @ 5 tones/ha + S + Mo + B	2.76	0.54	0.61	476.5	93.2	105.3
T_9 - FYM @ 10 tones/ha + S + Mo + B	2.90	0.52	0.61	493.3	88.5	103.8
T_{10} - RDF + FYM @ 5 tones/ha + S + Mo + B	2.90	0.54	0.63	529.6	98.6	115.1
T_{11} - RDF + FYM @ 10 tones/ha + S + Mo + B	2.69	0.53	0.61	530.1	104.5	120.2

AST 5: ENHANCING SEED PRODUCTION OF LUCERNE

AST 5.1: Effect of sowing method and cutting management on green fodder and Seed yield in Lucerne

(Location: Urulikanchan and Rahuri)

This was the second year of experimentation at two Lucerne growing locations in central zone. Objective of the experiment was to enhance the seed production of Lucerne by adopting proper cutting management for perennial Lucerne under different methods of sowing. The treatment consisted of two sowing method (S_1- broadcasting and S_2 -line sowing) and cutting management (C_1 - regular cutting at 25 days interval and leaving for seed production in second week of February every year; C_2 -regular cutting for one and half years and leaving seed production in second week of February every year and C_3 -regular cutting for two and half years and leaving seed production at the end). Crop was grown as per recommended practices. Uniform doses of FYM @ 10 t/ha and 15:80:40 kg NPK/ha forage yield was significantly higher with line sowing at both the locations. Among cutting management, C_3 system recorded highest forage yield due to continuous cutting and was followed by C_2 cutting management system. Broadcast sowing and C_2 cutting management resulted in better seed production. Dry matter and crude protein yield followed the similar trend to that of green fodder yield at Rahuri, whereas dry matter and crude protein yield were better under C_2 cutting management system at Urulikanchan.

AST -5.1 (a) : Effect of sowing methods and cutting management on yield and growth parameters of Lucerne

Treatment	Green fodder yield (q/ha)			Dry matter yield (q/ha)			Seed yield (q/ha)		
	Rahuri	Urulikanchan	Mean	Rahuri	Urulikanchan	Mean	Rahuri	Urulikanchan	Mean
(A) Sowing Method									
S_1	1519.0	1128.6	1323.8	299.3	200.1	249.7	2.77	1.81	2.29
S_2	1585.2	1208.3	1396.75	331.3	209.2	270.3	3.01	1.75	2.38
SEm±	-	11.7			3.1				
CD at 5%	53.1	47.7		16.5	NS				
(B) Cutting Management									
C_1	1261.7	1137.8	1199.75	238.0	210.8	224.4	4.14	1.84	2.99
C_2	1405.8	1171.2	1288.5	282.2	205.1	243.7	4.54	1.73	3.13
C_3	1988.9	1196.4	1592.65	425.7	198.1	311.9	-	-	-
SEm±		14.3			3.8				
CD at 5%	NS	58.3		NS	NS				
(C) Interaction S X C									
SEm±		20.2							
CD at 5%	NS	NS		NS	NS				
CV%	3.1			1.5	5.4				

S_1 : Broad casting, S_2 : Line sowing (30cm apart)
C_1 : Regular cutting for fodder at 25 days interval and leaving for seed production in second week of February every year
C_2 : Regular cutting for fodder for one and half year and leaving for seed production in second week of February every year
C_3 : Regular cutting for fodder for two and half year and leaving for seed production at the end

AST -5.1 (b) : Effect of sowing methods and cutting management on quality and growth parameters of Lucerne

Treatment	Crude protein yield (q/ha)			Rrahuri			
	Rahuri	Urulikanchan	Mean	Crude protein content (%)	No. of tillers/ m row length	Plant height (cm)	Leaf stem ratio
(A) Sowing Method							
S_1	57.2	35.4	46.3	18.1	92.9	85.2	0.77
S_2	60.7	36.7	48.7	18.0	96.1	86.6	0.80
SEm±		0.7					
CD at 5%	3.0	NS		0.3	2.5	1.8	0.04
(B) Cutting Management							
C_1	46.2	37.1	41.7	18.0	88.0	86.1	0.71
C_2	52.7	36.5	44.6	17.9	93.8	87.7	0.78
C_3	77.8	34.6	56.2	18.3	101.8	84.0	0.86
SEm±		0.8					
CD at 5%	NS	NS		NS	1.0	0.9	0.03
(C) Interaction S X C							
SEm±		1.2					
CD at 5%	NS	NS		NS	NS	NS	NS
CV%	4.7	37.1		1.5	2.5	1.9	4.44

AST 6 : RESOURCE CONSERVATION THROUGH FORAGES

AST – 6.1: Influence of resource conservation techniques on forage production and physicochemical status of soil

Location:

Hill Zone	**-**	**Palampur**
North West Zone	**-**	**Irrigated - Ludhiana, Hisar, Pantnagar** **Rainfed - Bikaner & Jalore**
Central Zone	**-**	**Rahuri, Jabalpur, Anand, and Urulikanchan**
North East Zone	**-**	**Jorhat, Faizabad, Ranchi, Bhubaneswar, Kalyani**
South Zone	**-**	**Silvipasture - Hyderabad, Coimbatore, and Mandya** **Alley farming – Vellayani**

A field experiment was initiated in Kharif 2009 at 19 locations to enhance the forage productivity with emphasis on soil moisture conservation under rainfed situation. This was considered as establishment year, so data of complete sequence for the first year (2010-11) would be reported in Kharif 2011.

(B) LOCATION SPECIFIC TRIALS

Location: Mandya

AST – 7.1: Remunerative forage based cropping system for sustained Productivity under irrigated conditions

The experiment was conducted in fifth year at fixed site to evaluate most remunerative forage based cropping system for the region. It is clear from the data (Table 7.1(a)) that round the forage production system i.e. NB hybrid (perennial) recorded net monetary return of Rs. 48571/ha/yr. Maize + cowpea (F) – sunflower – finger millet sequence resulted in highest monetary return of Rs. 73004/ha/yr. The magnitude of increase with best treatment was in order of 60.5 and 55.4 percent over ragi (G) – field beans (S) – sunflower (G) and sorghum (MC-F) – Lucerne (F), respectively.

AST-7.1 (a) : Remunerative forage based cropping system for sustained productivity under irrigated ecosystem at Mandya

Treatment			Yield (q/ha)			Net monetary return (Rs/ha/yr)
Cropping system			Kharif	Rabi	Summer	
Kharif	Rabi	Summer				
Finger millet	Field bean	Sunflower	41.65	7.52	20.45	45480
Sorghum (F)	Lucerne (F)	-	985.10	189.63		46957
Maize + Cowpea(F)	Sunflower	Finger millet	667.3	19.18	3967	73004
Maize(S)	Maize + Cowpea(F)	Groundnut	46.63	593.67	20.19	68669
Sunflower	Cowpea(S)	Maize + Cowpea(F)	18.31	14.96	615.32	67713
Napier hybrid (perennial)			386.19	411.32	456.11	48511

Selling rate (Rs./q): Field bean – 800, Sunflower – 1500, Cowpea (seed) – 2200, Finger millet – 900, Groundnut – 2000, Maize (seed) – 600, Lucerne (fodder) – 75, Fodder – 50

Location: Ludhiana

AST – 7.2: Optimization of nitron for sorghum in different cropping systems

A new experiment was initiated at Ludhiana during Rabi 2009-10 to find out optimum levels of nitrogen to sorghum in different cropping system under agronoclimatic situation of Punjab. This was the first year of experimentation and data will be reported in Kharif 2011 upon completion of the sequence.

Location: Ludhiana

AST – 7.2: Optimization of nitron for sorghum in different cropping systems

A new experiment was initiated at Ludhiana during Rabi 2009-10 to find out optimum levels of nitrogen to sorghum in different cropping system under agronoclimatic situation of Punjab. This was the first year of experimentation and data will be reported in Kharif 2011 upon completion of the sequence.

AST 7.3: Effect of nitrogen levels on promising entries of tall fescue grass based on AVT-2

Location: Palampur

A field trial on tall fescue grass entries was conducted to find the response of N levels on growth and yield of the crop at Palampur in the hill zone. The treatments consisted of three entries (Hima-1, Hima-4 and EC-178182) and four nitrogen levels (0, 40, 80 and 120 kg N/ha). Among entries no effect was noticed on plant height, leaf stem ratio and crude protein content. The entries i.e. Hima-4 and EC-178182 produced significantly more shoot numbers/m^2. Entry EC-178182 maintained its significant superiority over other varieties by producing higher green forage, dry fodder and crude protein yields. The growth parameters, yield and quality increased consistently with increasing levels of nitrogen up to 120kg N/ha.

AST 7.3 (a): Effect of nitrogen levels on the performance of promising entries of tall fescue grass (AVT-2)

Treatments	Plant height (cm)	Shoot number (m^2)	L:S	Green fodder yield (q/ha)	Dry fodder yield (q/ha)	CP content (%)	CP yield (q/ha)
Entries							
EC-178182	68.7	201	0.61	176.32	41.15	9.92	4.10
HIMA-1	68.1	184	0.61	161.32	35.94	9.91	3.58
HIMA-4	70.7	209	0.62	162.00	38.10	9.93	3.82
SEm±	3.6	4.13	0.01	2.45	0.60	0.05	0.06
CD5%	NS	12.14	NS	7.18	1.76	NS	0.18
Nitrogen levels							
N_0	55.5	139	0.51	78.27	19.43	9.70	1.88
N_{40}	58.2	181	0.58	120.82	26.18	9.79	2.56
N_{80}	75.9	217	0.63	217.23	51.03	9.91	5.05
N_{120}	87.2	255	0.70	249.87	56.95	10.27	5.85
SEm±	4.15	4,78	0.02	2.82	0.69	0.06	0,07
CD5%	12.81	14.01	0.05	8.29	2.03	0.17	0.21
Interaction	NS	NS	NS	NS	-	NS	Sig

AST 7.4 Effect of soil amendments on productivity of rice – berseem and changes in soil properties of sodic soil

Location: Faizabad

The experiment was initiated during Kharif 2009 with a view to study the effect of amendments on productivity of sodic soils. The initial pH of soil was 9.2 with EC of 0.98 ds/m and exchangeable sodium 33.2 (%). During Kharif T_7 (RDF +gypsum @75% GR + FYM 10 t/ha) recorded highest grain yield of rice (22.09q/ha) and was at par with T_3, T_8 and T_9. During Rabi season also this treatment (T_7) maintained its significant superiority over rest of the treatments in term of berseem fodder yield. Crude protein yield follow the trend of dry matter yield on the basis of berseem forage equivalent yield. T_7 again maintained its significant superiority by producing 46.22 percent higher yield over RDF. Uptake of N and P was recorded more with berseem than rice. Total nutrient by the sequence follows the trend of dry matter yield. Treatments did not bring any appreciable effect on soil properties in comparison to initial soil value.

Table 7.4 (a): Effect of soil amendment on yield in rice-berseem system at Faizabad

Treatment	Rice			Berseem (3 cuts)			Berseem forage equivalent yield (q/ha)
	Grain yield (q/ha)	Straw yield (q/ha)	Harvest Index (%)	Green Fodder Yield (q/ha)	Dry Matter Yield (q/ha)	Crude protein yield	
T_1	12.75	20.58	38.23	195.87	35.33	5.75	314.87
T_2	15.66	24.24	39.24	226.43	41.35	7.04	372.56
T_3	20.08	31.94	38.61	213.93	38.80	6.20	401.32
T_4	17.80	29.16	37.86	212.54	38.24	6.34	378.70
T_5	18.30	29.67	38.17	206.99	37.24	6.45	377.82
T_6	16.16	23.23	41.16	201.43	36.28	5.81	352.26
T_7	22.09	34.97	38.70	254.22	45.51	7.87	460.42
T_8	20.71	31.82	39.43	243.10	43.49	7.29	436.37
T_9	21.46	33.58	39.02	241.72	43.21	7.02	442.01
T_{10}	18.94	30.05	38.61	230.60	41.19	6.51	407.35
Sem±	0.90	1.38	0.72	8.52	1.74	0.35	12.69
CD at 5%	2.67	4.09	NS	25.30	5.16	1.05	37.70
CV%	8.47	8.24	3.20	6.62	7.51	9.22	5.57

T_1 = RDF
T_2 = RDF + FYM 10 t/ha
T_3 = RDF +gypsum @75 % GR
T_4 = RDF +gypsum @50 % GR
T_5 = RDF +pressmud @75% GR
T_6 = RDF + pressmud@ 50 % GR
T_7 = RDF +gypsum @75% GR + FYM 10 t/ha
T_8 = RDF +gypsum @ 50 % GR +FYM10 t/ha
T_9 = RDF + pressmud@ 75 % GR +FYM 10 t/ha
T_{10} = RDF + pressmud@ 50 % GR +FYM 10t/ha

Table 7.4 (b): Effect of soil amendment on N, P and K uptake in rice-berseem system at Faizabad

Treatment	Uptake (kg/ha)						Uptake (kg/ha) by rice-berseem system		
	N		P		K				
	Rice	Berseem	Rice	Berseem	Rice	Berseem	N	P	K
T_1	23.65	91.98	5.41	13.82	22.59	25.14	115.63	19.23	47.73
T_2	29.11	112.67	6.72	17.62	32.11	30.78	141.78	24.34	62.89
T_3	37.32	99.25	8.06	16.80	38.49	27.54	136.57	24.86	66.03
T_4	33.43	101.57	7.18	16.54	34.71	26.49	135.00	23.72	61.20
T_5	34.57	103.30	7.87	17.23	33.80	25.63	137.87	25.10	59.43
T_6	28.62	92.96	6.90	16.79	27.99	25.29	121.58	23.69	53.28
T_7	42.98	125.92	10.40	20.84	44.11	33.50	168.90	31.24	77.61
T_8	38.92	116.59	8.74	19.52	38.20	33.73	155.51	28.26	68.93
T_9	40.60	112.11	9.08	19.92	39.41	31.51	152.71	29.00	70.92
T_{10}	34.96	104.11	7.65	19.18	35.03	30.75	139.07	26.83	65.78
Sem±	1.67	5.63	0.43	1.15	2.06	1.90			
CD at 5%	4.97	16.73	1.27	3.41	6.12	5.65			
CV%	8.42	9.20	9.47	11.14	10.29	11.46			

T_1 = RDF
T_2 = RDF + FYM 10 t/ha
T_3 = RDF +gypsum @75 % GR
T_4 = RDF +gypsum @50 % GR
T_5 = RDF +pressmud @75% GR
T_6 = RDF + pressmud@ 50 % GR
T_7 = RDF +gypsum @75% GR + FYM 10 t/ha
T_8 = RDF +gypsum @ 50 % GR +FYM10 t/ha
T_9 = RDF + pressmud@ 75 % GR +FYM 10 t/ha
T_{10} = RDF + pressmud@ 50 % GR +FYM 10t/ha

Table 7.4 (c) : Effect of soil amendment on soil fertility status and available nutrients in rice-berseem system at Faizabad

Treatment	pH	EC (dS/m)	Exchangable Na (%)	Organic Carbon (%)	Avaiable nutrients (kg/ha)		
					N	P	K
T_1	9.1	0.97	32.4	0.23	93.8	13.5	279.0
T_2	9.1	0.94	32.1	0.24	95.2	14.0	281.2
T_3	9.0	0.96	27.2	0.23	93.6	13.7	279.6
T_4	9.0	0.97	28.7	0.23	93.3	13.8	280.4
T_5	9.1	0.97	29.6	0.25	93.6	14.1	280.8
T_6	9.1	0.96	30.1	0.24	94.0	13.8	281.3
T_7	9.0	0.94	26.4	0.24	95.0	13.9	282.6
T_8	9.0	0.95	26.8	0.23	95.3	14.0	281.3
T_9	9.1	0.96	2838	0.26	94.9	14.4	283.0
T_{10}	9.1	0.96	29.3	0.25	94.7	14.2	281.7
Initial value	9.2	0.98	33.2	0.22	92.0	13.1	288.0

T_1 = RDF
T_2 = RDF + FYM 10 t/ha
T_3 = RDF +gypsum @75 % GR
T_4 = RDF +gypsum @50 % GR
T_5 = RDF +pressmud @75% GR
T_6 = RDF + pressmud@ 50 % GR
T_7 = RDF +gypsum @75% GR + FYM 10 t/ha
T_8 = RDF +gypsum @ 50 % GR +FYM10 t/ha
T_9 = RDF + pressmud@ 75 % GR +FYM 10 t/ha
T_{10} = RDF + pressmud@ 50 % GR +FYM 10t/ha

C. AVT-2 BASED AGRONOMY TRIALS

AST – 8.1: Effect of nitrogen levels on forage yield of promising entries of Oats (AVT – 2) single cut

(Location: Anand, Hisar, Pantnagar, Ludhiana, Jabalpur, Rahuri, Jhansi, Raipur, Pusa, Imphal, Mandya, Srinagar and Shillong)

A field trial on oats (AVT -2) entries was conducted to find out the response of N levels on growth and yield of the oat at thirteen locations of the country. The treatments consisted of seven entries (5 entries + 2 national checks) and four nitrogen levels (0, 40, 80 and 120 kg N/ha). The results indicated that SKO-90 out yielded on mean basis in terms of green forage and dry matter yield and was closely followed by JO-03-93. Location wise, performance of the entries was variable (Table 8.1 a & b). The response of N was gradual with increasing level up to 120 kg N/ha. Interaction of entries and N levels was evident at Pussa, Raipur, Imphal, Ludhiana, Pantnagar and Srinagar. Crude protein yield (7.9 q/ha) was highest with SKO-109 and was at par with Kent (7.9 q/ha) on location mean basis, however no appreciable variation was observed among entries for crude protein yield. The crude protein yield increased consistently with increasing levels of nitrogen on location mean basis.

AST-8.1(a) : Effect of nitrogen levels on green fodder yield of promising entries of Oat (AVT-2)

Treatment	Green fodder yield (q/ha)													
	Rahuri	Pusa	Raipur	Imphal	Anand	Hisar	Jabalpur	Ludh-iana	Pant-nagar	Mandya	Shri-nagar	Jhansi	Shillong	Mean
A. Entry														
SKO-90	426.4	464.0	275.9	248.5	558.0	491.1	380.5	391.7	492.9	143.5	451.0	329.6	300.2	381.0
SKO-105	408.8	360.0	135.3	230.0	443.0	443.3	339.8	409.7	484.8	146.5	481.4	322.1	279.0	344.9
SKO-109	467.2	376.0	313.2	222.5	536.0	425.3	341.2	379.2	505.0	137.0	462.9	338.4	394.8	376.8
JO-03-93	528.0	357.0	143.2	262.8	529.0	508.0	482.8	405.6	454.1	165.2	383.0	361.3	357.4	379.8
NDO-25	461.0	354.0	296.1	228.6	509.0	512.8	494.7	331.3	457.0	152.4	382.0	339.2	289.2	369.8
Kent (NC)	497.0	368.0	136.8	236.7	499.0	509.9	501.4	379.9	451.0	155.3	411.4	391.3	329.2	374.4
OS-6 (NC)	409.0	345.0	248.6	222.6	473.0	549.6	497.8	326.0	427.8	155.7	418.6	340.0	331.6	365.0
SEm±	7.5	8.6	1.9		11.1	16.2	7.9	7.8	7.9	4.7		6.8		
CD at 5%	23.2	24.9	5.9	9.1	34.3	50.6	24.4	24.0	22.4	13.3	6.4	20.0	21.0	
B. Nitrogen level (kg/ha)														
0	284.0	204.0	99.0	156.5	455.0	385.2	322.0	199.2	376.9	88.3	310.5	331.7	241.1	265.6
40	443.7	344.0	230.1	228.9	482.0	488.8	417.6	364.7	475.4	140.8	425.4	341.0	321.9	361.9
80	541.5	450.0	268.7	271.0	531.0	541.8	470.6	435.3	499.8	172.9	470.8	345.5	346.6	411.2
120	557.9	500.0	287.4	287.1	559.0	549.6	524.3	499.8	517.9	201.2	502.0	365.7	337.3	437.6
SEm±	7.9	6.7	2.1		7.6	6.8	12.1	6.9	6.0	3.6		4.3		
CD at 5%	22.4	18.7	5.9	9.5	21.8	19.4	35.5	19.8	17.0	10.1	4.9	12.6	13.5	
C.Interaction Entry X N levels														
SEm±	20.8	16.4	5.5		20.2			18.4	15.8	9.4		7.2		
CD at 5%	NS	47.0	15.7	23.6	NS		NS	52.4	44.7	NS	12.9	NS		
CV%	7.9		4.3	4.4	6.9		12.8	8.5			1.8			

AST-8.1(a-1) : Interaction effect of nitrogen levels and AVT-2 entries of Oat (SC) on green fodder yield at Pusa

Entries/ Nitrogen levels	Green fodder yield (q/ha)				
	0	**40**	**80**	**120**	**Mean**
SKO-90	243	429	579	606	464
SKO-105	184	325	433	499	360
SKO-109	213	342	445	506	376
JO-03-93	203	332	428	466	357
NDO-25	183	322	424	490	354
Kent(NC)	219	342	439	472	368
OS-6(NC)	189	321	407	463	345
Mean	205	345	451	500	
	Entry	**N levels**	**Entry X N levels**		
SEm±	8.6	6.7	16.4		
CD at 5%	24.9	18.7	47.0		
CV%					

AST-8.1(a-2) : Interaction effect of nitrogen levels and AVT-2 entries of Oat (SC) on green fodder yield at Raipur

Entries/ Nitrogen levels	Green fodder yield (q/ha)				
	0	**40**	**80**	**120**	**Mean**
SKO-90	102.46	285.90	349.00	366.03	275.85
SKO-105	86.43	132.46	153.06	169.13	135.27
SKO-109	122.50	334.73	382.63	412.80	313.18
JO-03-93	90.36	141.73	165.46	175.20	143.19
NDO-25	105.50	319.90	372.63	386.53	296.14
Kent(NC)	87.03	133.63	155.36	171.13	136.79
OS-6(NC)	98.56	262.06	302.70	331.00	248.58
Mean	98.98	230.11	268.69	287.41	
	Entry	**N levels**	**Entry X N levels**		
SEm±	1.93	2.07	5.49		
CD at 5%	5.94	5.92	15.66		
CV%	4.29				

AST-8.1(a-3) : Interaction effect of nitrogen levels and AVT-2 entries of Oat (SC) on green fodder yield at Imphal

Entries/ Nitrogen levels	Green fodder yield (q/ha)				
	0	**40**	**80**	**120**	**Mean**
SKO-90	152.36	237.38	269.90	334.26	248.47
SKO-105	124.06	181.24	268.64	345.96	229.98
SKO-109	118.73	198.20	288.27	284.63	222.46
JO-03-93	224.42	252.20	301.08	273.31	262.75
NDO-25	157.76	231.53	281.45	243.60	228.58
Kent(NC)	144.80	256.64	264.42	281.04	236.72
OS-6(NC)	173.32	244.98	223.48	247.20	222.24
Mean	156.49	228.88	271.03	287.14	
	Entry	**N levels**	**Entry X N levels**		
SEm±	4.19	4.71	11.58		
CD at 5%	9.14	9.51	23.61		
CV%	4.35				

AST-8.1(a-4) : Interaction effect of nitrogen levels and AVT-2 entries of Oat (SC) on green fodder yield at Ludhiana

Entries/ Nitrogen levels	Green fodder yield (q/ha)				
	0	**40**	**80**	**120**	**Mean**
SKO-90	195.8	347.2	458.3	565.3	391.7
SKO-105	263.9	388.9	444.4	541.7	409.7
SKO-109	208.3	344.4	463.9	500.0	379.2
JO-03-93	225.0	416.7	463.9	516.7	405.6
NDO-25	138.9	322.2	413.9	450.0	331.3
Kent(NC)	194.4	400.0	455.6	469.4	379.9
OS-6(NC)	168.1	333.3	347.2	455.6	326.0
Mean	199.2	364.7	435.3	499.8	
	Entry	**N levels**	**Entry X N levels**		
SEm±	7.79	6.94	18.37		
CD at 5%	24.0	19.8	52.4		
CV%			8.49		

AST-8.1(a-5) : Interaction effect of nitrogen levels and AVT-2 entries of Oat (SC) on green fodder yield at Pantnagar

Entries/ Nitrogen levels	Green fodder yield (q/ha)				
	0	**40**	**80**	**120**	**Mean**
SKO-90	388.7	500.0	534.7	548.3	492.9
SKO-105	392.3	492.3	513.7	540.7	484.8
SKO-109	375.0	527.3	555.7	562.0	505.0
JO-03-93	362.3	458.0	527.3	468.7	454.1
NDO-25	398.0	437.3	458.3	534.3	457.0
Kent(NC)	381.7	479.0	457.7	485.7	451.0
OS-6(NC)	340.3	434.0	451.0	485.7	427.8
Mean	376.9	475.4	499.8	517.9	
	Entry	**N levels**	**Entry X N levels**		
SEm±	7.88	5.96	15.77		
CD at 5%	22.35	16.90	44.70		
CV%					

AST-8.1(a-6) : Interaction effect of nitrogen levels and AVT-2 entries of Oat (SC) on green fodder yield at Shrinagar

Entries/ Nitrogen levels	Green fodder yield (q/ha)				
	0	**40**	**80**	**120**	**Mean**
SKO-90	328.03	439.33	502.20	534.30	450.96
SKO-105	353.63	487.53	521.06	563.40	481.40
SKO-109	345.60	448.16	514.83	542.90	462.87
JO-03-93	285.0	393.83	416.86	436.23	382.98
NDO-25	280.66	373.83	417.20	456.36	382.01
Kent(NC)	291.06	416.16	452.30	485.86	411.35
OS-6(NC)	289.56	418.70	471.16	494.93	418.59
Mean	310.5	425.36	470.80	502.00	
	Entry	**N levels**	**Entry X N levels**		
SEm±					
CD at 5%	6.4	4.9	12.89		
CV%			1.8		

AST-8.1(b) : Effect of nitrogen levels on dry matter yield of promising entries of Oat (AVT-2)

Treatment	Dry matter yield (q/ha)													
	Rahuri	Pusa	Raipur	Imphal	Anand	Hisar	Jabalpur	Ludh-iana	Pant-nagar	Mandya	Shri-Nagar	Jhansi	Shilong	Mean
A. Entry														
SKO-90	83.5	88.2	87.7	46.2	105.7	108.5	83.1	87.2	99.4	31.7	95.2	70.2	64.6	80.9
SKO-105	82.3	68.9	52.2	42.6	74.8	98.0	73.4	90.8	97.2	33.0	107.4	67.4	56.4	72.6
SKO-109	83.8	71.6	97.6	41.0	82.1	93.2	74.0	85.2	101.7	30.0	104.8	66.3	59.5	76.2
JO-03-93	99.4	68.2	57.9	51.3	105.2	111.4	104.1	89.7	92.2	36.5	87.1	68.7	73.6	80.4
NDO-25	75.9	69.4	94.1	45.1	95.6	114.5	105.8	74.5	89.3	33.7	87.1	67.1	60.7	77.9
Kent (NC)	97.1	71.5	53.0	46.7	95.9	112.2	108.3	85.4	89.6	34.9	90.8	73.2	69.0	79.0
OS-6(NC)	81.3	68.7	86.2	41.8	92.7	120.7	101.9	70.6	85.0	35.8	93.4	68.7	68.7	78.1
SEm±		2.1	1.2		1.9	3.6	2.8	1.8	1.4	1.2		1.4		
CD at 5%	NS	5.9	3.5	2.3	6.1	11.3	8.9	5.5	4.0	3.5	0.8	3.9	4.9	
B. Nitrogen level (kg/ha)														
0	48.4	43.0	50.9	30.5	81.7	83.1	72.6	45.6	75.1	17.7	69.1	64.5	46.1	56.0
40	81.3	67.4	67.5	45.3	92.4	106.2	90.7	81.9	94.6	30.1	91.3	66.3	65.9	75.5
80	104.5	86.4	84.6	51.7	93.8	121.5	101.6	96.3	101.6	38.9	104.2	66.7	76.0	86.8
120	110.5	92.6	99.2	52.2	104.8	122.5	106.6	109.6	102.6	48.0	115.9	69.5	70.5	92.7
SEm±		1.7	0.8		1.4	1.5	4.3	1.2	1.1	0.9		1.2		
CD at 5%	NS	4.8	2.3	1.9	4.1	4.1	12.3	3.5	3.0	2.6	0.6	3.7	5.1	
C.Interaction Entry X N levels														
SEm±		4.3	2.1		3.8			3.3	2.8	2.5		1.5		
CD at 5%	NS	NS	6.0	4.8	10.8		NS	9.4	8.0	NS	1.6	NS		
CV%			4.8	5.7	7.1		14.3	6.8			1.0		64.6	

AST-8.1(b-1) : Interaction effect of nitrogen levels and AVT-2 entries of Oat (SC) on dry matter yield at Raipur

Entries/ Nitrogen levels	Dry matter yield (q/ha)				
	0	**40**	**80**	**120**	**Mean**
SKO-90	62.66	73.50	101.90	112.73	87.70
SKO-105	29.96	47.36	60.90	70.66	52.22
SKO-109	71.46	89.70	97.66	131.73	97.64
JO-03-93	35.06	53.26	65.83	77.43	57.90
NDO-25	67.16	79.13	112.13	118.03	94.11
Kent(NC)	30.43	48.03	61.43	72.26	53.04
OS-6(NC)	59.36	81.46	92.56	111.31	86.17
Mean	50.87	67.49	84.63	99.16	
	Entry	**N levels**	**Entry X N levels**		
SEm±	1.15	0.78	2.09		
CD at 5%	3.54	2.25	5.95		
CV%			4.78		

AST-8.1(b-2) : Interaction effect of nitrogen levels and AVT-2 entries of Oat (SC) on dry matter yield at Imphal

Entries/ Nitrogen levels	Dry matter yield (q/ha)				
	0	**40**	**80**	**120**	**Mean**
SKO-90	29.58	46.07	51.51	57.74	46.22
SKO-105	24.77	37.09	47.88	60.56	42.57
SKO-109	25.02	38.24	53.26	47.31	40.96
JO-03-93	41.84	49.33	59.94	54.18	51.32
NDO-25	33.82	45.24	53.35	48.05	45.11
Kent(NC)	28.90	50.39	55.15	52.38	46.70
OS-6(NC)	29.49	50.90	41.17	45.43	41.75
Mean	30.49	45.32	51.67	52.24	
	Entry	**N levels**	**Entry X N levels**		
SEm±	1.04	0.92	2.35		
CD at 5%	2.27	1.86	4.83		
CV%	5.69				

AST-8.1(b-3) : Interaction effect of nitrogen levels and AVT-2 entries of Oat (SC) on dry matter yield at Anand

Entries/ Nitrogen levels	Dry matter yield (q/ha)				
	0	**40**	**80**	**120**	**Mean**
SKO-90	95.8	99.2	112.0	115.8	105.7
SKO-105	61.9	71.8	79.1	86.5	74.8
SKO-109	68.6	82.2	78.3	99.3	82.1
JO-03-93	92.8	105.7	100.7	121.8	105.2
NDO-25	91.1	96.8	94.8	99.7	95.6
Kent(NC)	82.0	102.4	88.9	110.4	95.9
OS-6(NC)	79.5	88.3	102.9	100.3	92.7
Mean	81.7	92.4	93.8	104.8	
	Entry	**N levels**	**Entry X N levels**		
SEm±	1.9	1.4	3.8		
CD at 5%	6.1	4.1	10.8		
CV%			7.1		

AST-8.1(b-4) : Interaction effect of nitrogen levels and AVT-2 entries of Oat (SC) on dry matter yield at Ludhiana

Entries/ Nitrogen levels	Dry matter yield (q/ha)				
	0	**40**	**80**	**120**	**Mean**
SKO-90	45.1	77.1	101.8	124.6	87.2
SKO-105	58.6	86.6	98.4	119.6	90.8
SKO-109	47.1	79.6	103.1	111.0	85.2
JO-03-93	51.1	92.5	100.4	115.0	89.7
NDO-25	32.5	73.2	92.6	99.9	74.5
Kent(NC)	45.1	90.5	101.9	104.2	85.4
OS-6(NC)	39.5	74.0	76.2	92.8	70.6
Mean	45.6	81.9	96.3	109.6	
	Entry	**N levels**	**Entry X N levels**		
SEm±	1.77	1.24	3.28		
CD at 5%	5.45	3.54	9.36		
CV%			6.82		

AST-8.1(b-5) : Interaction effect of nitrogen levels and AVT-2 entries of Oat (SC) on Dry fodder yield at Shrinagar

Entries/ Nitrogen levels	Dry matter yield				
	0	**40**	**80**	**120**	**Mean**
SKO-90	72.3	78.6	108.6	121.3	95.2
SKO-105	80.2	105.0	114.5	130.0	107.4
SKO-109	79.5	98.1	113.1	128.6	104.8
JO-03-93	62.8	87.8	92.9	104.9	87.1
NDO-25	62.2	85.0	95.8	105.2	87.1
Kent(NC)	63.9	92.6	99.4	107.2	90.8
OS-6(NC)	62.6	91.9	105.2	114.0	93.4
Mean	69.1	91.3	104.2	115.9	
	Entry	**N levels**	**Entry X N levels**		
SEm±					
CD at 5%	0.8	0.6	1.6		
CV%			1.0		

AST-8.1(b-6) : Interaction effect of nitrogen levels and AVT-2 entries of Oat (SC) on dry matter yield at Pantnagar

Entries/ Nitrogen levels	Dry matter yield (q/ha)				
	0	**40**	**80**	**120**	**Mean**
SKO-90	77.7	100.3	110.5	109.0	99.4
SKO-105	82.4	97.4	103.6	105.4	97.2
SKO-109	75.0	105.5	116.7	109.6	101.7
JO-03-93	70.6	93.9	109.6	94.7	92.2
NDO-25	75.6	83.1	91.8	106.8	89.3
Kent(NC)	76.3	95.8	90.5	95.8	89.6
OS-6(NC)	68.1	86.1	88.7	97.1	85.0
Mean	75.1	94.6	101.6	102.6	
	Entry	**N levels**	**Entry X N levels**		
SEm±	1.41	1.06	2.81		
CD at 5%	3.99	3.02	7.98		
CV%					

AST-8.1(c) : Effect of nitrogen levels on crude protein yield of promising entries of Oat (AVT-2)

Treatment	Crude protein yield (q/ha)									
	Rahuri	Imphal	Anand	Hisar	Jabalpur	Ludhiana	Pantnagar	Mandya	Jhansi	Mean
A. Entry										
SKO-90	7.7	2.8	10.9	14.2	7.0	6.7	11.2	2.0	6.7	7.7
SKO-105	7.6	2.4	9.6	12.6	6.0	6.4	10.3	2.1	6.3	7.0
SKO-109	7.7	2.3	9.9	12.1	6.5	6.2	11.8	1.5	6.4	7.2
JO-03-93	9.4	3.5	10.0	14.6	8.6	6.4	10.1	2.1	6.5	7.9
NDO-25	7.2	2.5	10.9	15.8	8.7	6.1	9.9	1.9	6.2	7.7
Kent (NC)	9.2	2.7	9.7	15.3	9.3	6.3	10.0	1.9	6.9	7.9
OS-6(NC)	7.6	2.9	8.4	15.2	8.8	5.1	10.1	1.9	6.5	7.4
SEm±			0.2		0.4		0.2	0.1	0.1	
CD at 5%	NS	0.3	0.7		1.2		0.4	0.3	0.3	
B. Nitrogen level (kg/ha)										
0	4.2	1.9	8.7	10.1	5.0	2.7	7.7	1.0	5.8	5.2
40	7.4	2.6	9.4	13.7	7.4	5.6	10.0	1.7	6.2	7.1
80	9.8	3.1	9.5	16.2	8.8	7.4	12.1	2.2	6.0	8.3
120	10.9	3.3	11.8	17.0	9.8	8.9	12.2	2.8	6.4	9.2
SEm±			0.2		0.4		0.1	0.1	0.3	
CD at 5%	NS	0.2	0.4		1.2		0.3	0.2	0.3	
C.Interaction Entry X N levels										
SEm±			0.4				0.3	0.2	0.2	
CD at 5%	NS	0.44	1.1		NS		0.9	NS	NS	
CV%		10.5	6.7		14.7					

AST-8.1(c-1) : Interaction effect of nitrogen levels and AVT-2 entries of Oat (SC) on crude protein yield at Imphal

Entries/ Nitrogen levels	Crude protein yield (q/ha)				
	0	**40**	**80**	**120**	**Mean**
SKO-90	1.59	2.61	3.24	3.72	2.79
SKO-105	1.33	1.68	2.85	3.74	2.40
SKO-109	1.22	1.91	2.75	3.33	2.30
JO-03-93	3.05	3.81	3.51	3.53	3.47
NDO-25	1.73	2.39	2.88	3.04	2.51
Kent(NC)	1.57	2.76	3.23	3.20	2.69
OS-6(NC)	3.06	2.80	3.22	2.41	2.87
Mean	1.93	2.56	3.10	3.28	
	Entry	**N levels**	**Entry X N levels**		
SEm±	0.11	0.08	0.21		
CD at 5%	0.25	0.16	0.44		
CV%			10.54		

AST-8.1(c-2) : Interaction effect of nitrogen levels and AVT-2 entries of Oat (SC) on crude protein yield at Anand

Entries/ Nitrogen levels	Crude protein yield (q/ha)				
	0	**40**	**80**	**120**	**Mean**
SKO-90	8.71	9.90	11.66	13.27	10.88
SKO-105	8.12	8.10	9.06	10.97	9.06
SKO-109	9.06	8.55	8.59	13.2	9.85
JO-03-93	8.73	10.07	9.16	12.04	10.0
NDO-25	12.12	11.17	9.53	10.81	10.91
Kent(NC)	7.24	9.42	8.63	13.42	9.68
OS-6(NC)	6.74	8.28	9.72	9.03	8.44
Mean	8.67	9.35	9.48	11.82	
	Entry	**N levels**	**Entry X N levels**		
SEm±	0.21	0.15	0.39		
CD at 5%	0.67	0.42	1.09		
CV%	7.6		6.7		

AST-8.1(c-3) : Interaction effect of nitrogen levels and AVT-2 entries of Oat (SC) on crude protein yield at Pantnagar

Entries/ Nitrogen levels	Crude protein yield (q/ha)				
	0	**40**	**80**	**120**	**Mean**
SKO-90	8.16	10.53	13.63	12.39	11.18
SKO-105	7.92	8.52	11.77	13.00	10.30
SKO-109	7.87	10.81	15.30	13.42	11.85
JO-03-93	8.03	9.83	12.05	10.61	10.13
NDO-25	6.61	9.44	10.56	13.08	9.92
Kent(NC)	7.82	10.89	10.29	10.95	9.99
OS-6(NC)	7.73	9.79	10.86	11.89	10.07
Mean	7.73	9.97	12.06	12.19	
	Entry	**N levels**	**Entry X N levels**		
SEm±	0.15	0.12	0.31		
CD at 5%	0.44	0.33	0.87		
CV%					

AST-8.1(d) : Effect of nitrogen levels on plant height of promising entries of Oat (AVT-2)

Treatment	Plant height (cm)												
	Rahuri	Pusa	Raipur	Imphal	Anand	Hisar	Jabalpur	Ludh-iana	Pant-nagar	Mandya	Jhansi	Shillong	Mean
A. Entry													
SKO-90	125.5	104.0	113.0	59.7	132.0	110.0	127.4	87.2	134.4	73.7	114.7	110.6	107.7
SKO-105	102.0	96.0	100.5	55.2	112.0	97.4	119.0	76.9	131.2	79.3	96.4	65.3	94.3
SKO-109	112.9	95.0	126.9	52.2	124.0	105.3	116.6	82.8	140.9	75.5	105.8	68.3	100.5
JO-03-93	133.4	117.0	105.7	101.2	141.0	113.0	133.5	104.5	155.8	83.1	146.5	118.1	121.1
NDO-25	105.7	108.0	117.7	76.5	125.0	118.2	141.7	86.8	140.8	79.4	109.1	89.0	108.2
Kent (NC)	125.3	108.0	101.1	98.8	134.0	120.6	144.2	83.9	150.7	83.0	120.7	96.6	113.9
OS-6(NC)	116.4	116.0	110.6	94.0	150.0	126.8	144.1	98.1	152.8	80.5	131.4	101.0	118.5
SEm±	2.4		0.61	3.6	2.2	1.9	3.9	1.0	2.5	1.4	4.5		
CD at 5%	7.5		1.9	7.8	6.6	6.0	11.9	2.9	7.2	4.6	13.2	10.6	
B. Nitrogen level (kg/ha)													
0	98.5	78.0	92.7	64.3	123.0	96.6	117.5	58.3	123.5	50.4	115.6	80.3	91.6
40	115.9	106.0	107.9	76.4	130.0	110.5	127.2	91.8	143.9	74.8	116.2	92.1	107.7
80	125.6	118.0	118.2	80.7	134.0	121.9	139.9	102.5	150.4	85.7	119.2	99.6	116.3
120	129.3	112.2	124.2	85.9	138.0	123.1	145.0	107.0	157.4	96.0	120.1	98.8	119.8
SEm±	2.3		1.0	2.3	1.3	0.9	3.5	1.0	1.9	1.1	2.9		
CD at 5%	6.6		2.9	4.6	3.6	2.7	10.0	2.9	5.4	3.2	8.5	14.3	
C.Interaction Entry X N levels													
SEm±	6.1		2.7	6.3	3.3			2.7	5.1	3.0	5.1		
CD at 5%	17.3		7.6	13.1	NS		NS	7.6	NS	NS	NS		
CV%	9.0		4.2	11.4	4.4		12.1	5.1					

AST-8.1(d-1) : Interaction effect of nitrogen levels and AVT-2 entries of Oat (SC) on Plant height at Rahuri

Entries/ Nitrogen levels	Plant height (cm)				
	0	**40**	**80**	**120**	**Mean**
SKO-90	98.53	119.67	137.20	146.47	125.47
SKO-105	65.13	97.47	118.40	127.13	102.03
SKO-109	91.07	114.40	119.73	126.47	112.92
JO-03-93	126.47	135.07	136.53	135.67	133.43
NDO-25	90.93	108.67	112.60	110.53	105.68
Kent(NC)	120.20	125.33	126.83	128.98	125.33
OS-6(NC)	96.93	110.33	128.13	130.00	116.35
Mean	98.47	115.85	125.63	129.31	
	Entry	**N levels**	**Entry X N levels**		
SEm±	2.42	2.30	6.08		
CD at 5%	7.45	6.55	17.34		
CV%			8.97		

AST-8.1(d-2) : Interaction effect of nitrogen levels and AVT-2 entries of Oat (SC) on Plant height at Raipur

Entries/ Nitrogen levels	Plant height (cm)				
	0	**40**	**80**	**120**	**Mean**
SKO-90	89.83	104.03	125.73	132.46	113.01
SKO-105	88.0	98.66	105.93	109.23	100.45
SKO-109	102.46	125.56	136.90	142.50	126.85
JO-03-93	93.73	104.06	110.60	114.26	105.66
NDO-25	96.16	117.00	123.93	133.50	117.65
Kent(NC)	89.10	99.00	106.13	110.23	101.11
OS-6(NC)	89.70	107.20	118.30	127.33	110.63
Mean	92.71	107.93	118.21	124.21	
	Entry	**N levels**	**Entry X N levels**		
SEm±	0.61	0.01	2.67		
CD at 5%	1.90	2.88	7.64		
CV%			4.18		

AST-8.1(d-3) : Interaction effect of nitrogen levels and AVT-2 entries of Oat (SC) on Plant height at Imphal

Entries/ Nitrogen levels	Plant height (cm)				
	0	**40**	**80**	**120**	**Mean**
SKO-90	52.06	57.82	56.86	72.08	59.70
SKO-105	41.16	47.45	61.47	70.88	55.24
SKO-109	39.29	47.25	61.83	60.25	52.15
JO-03-93	98.88	101.18	97.00	107.67	101.18
NDO-25	64.05	80.85	84.83	76.29	76.50
Kent(NC)	84.23	101.63	104.20	105.27	98.83
OS-6(NC)	70.26	98.3	98.72	108.65	93.98
Mean	64.28	76.35	80.70	85.87	
	Entry	**N levels**	**Entry X N levels**		
SEm±	3.58	2.28	6.34		
CD at 5%	7.8	4.6	13.12		
CV%			11.41		

AST-8.1(d-4) : Interaction effect of nitrogen levels and AVT-2 entries of Oat (SC) on Plant height at Ludhiana

Entries/ Nitrogen levels	Plant height (cm)				
	0	**40**	**80**	**120**	**Mean**
SKO-90	51.0	87.1	98.8	111.7	87.2
SKO-105	52.9	72.4	85.0	96.2	76.9
SKO-109	49.1	78.0	99.6	104.2	82.8
JO-03-93	78.2	108.2	113.4	116.0	104.5
NDO-25	51.2	89.4	101.4	105.0	86.8
Kent(NC)	60.8	100.3	106.9	107.4	83.9
OS-6(NC)	63.8	107.5	112.4	108.6	98.1
Mean	58.3	91.8	102.5	107.0	
	Entry	**N levels**	**Entry X N levels**		
SEm±	0.95	1.00	2.65		
CD at 5%	2.93	2.86	7.55		
CV%	3.66	5.09	5.09		

AST-8.1(e) : Effect of nitrogen levels on leaf stem ratio of promising entries of Oat (AVT-2)

Treatment	Leaf stem ratio										
	Rahuri	Pusa	Raipur	Imphal	Anand	Jabalpur	Ludhiana	Pantnagar	Mandya	Jhansi	Mean
A. Entry											
SKO-90	1.39	0.83	0.46	0.61	1.23	1.12	0.81	0.44	0.35	0.57	0.78
SKO-105	1.47	0.76	0.42	0.75	1.94	1.15	1.04	0.51	0.36	0.54	0.89
SKO-109	1.54	0.73	0.56	0.82	1.72	1.10	1.19	0.42	0.34	0.53	0.90
JO-03-93	0.71	0.91	0.47	0.55	1.30	0.97	1.06	0.53	0.42	0.56	0.75
NDO-25	0.54	0.80	0.51	0.60	1.25	1.01	1.25	0.46	0.39	0.59	0.74
Kent (NC)	0.54	0.82	0.42	0.49	1.74	0.99	1.09	0.45	0.41	0.62	0.76
OS-6(NC)	0.67	0.87	0.48	0.63	0.96	1.00	1.05	0.52	0.40	0.61	0.72
SEm±	0.10		0.01			0.15		0.03	0.01	0.02	
CD at 5%	0.30		0.03	0.09		0.47		NS	0.03	0.06	
B. Nitrogen level (kg/ha)											
0	0.86	0.77	0.42	0.54	1.26	1.15	0.96	0.47	0.25	0.53	0.72
40	0.95	0.82	0.47	0.58	1.35	1.13	1.00	0.47	0.34	0.56	0.77
80	1.03	0.83	0.48	0.62	1.55	1.01	1.09	0.50	0.43	0.59	0.81
120	1.08	0.85	0.53	0.81	1.63	0.90	1.22	0.47	0.49	0.62	0.86
SEm±	0.08		0.005			0.18		0.02	0.01	0.01	
CD at 5%	NS		0.015	0.06		0.52		NS	0.03	0.03	
C.Interaction Entry X N levels											
SEm±	0.21		0.014					0.06	0.02	0.03	
CD at 5%	NS		0.04	0.16		NS		NS	0.06	NS	
CV%	18.27		4.9	16.4		16.0					

AST-8.1(e-1) : Interaction effect of nitrogen levels and AVT-2 entries of Oat (SC) on leaf stem ratio at Raipur

Entries/ Nitrogen levels	Leaf stem ratio				
	0	**40**	**80**	**120**	**Mean**
SKO-90	0.40	0.43	0.52	0.52	0.46
SKO-105	0.40	0.43	0.41	0.43	0.42
SKO-109	0.41	0.56	0.58	0.70	0.56
JO-03-93	0.45	0.49	0.46	0.48	0.47
NDO-25	0.44	0.47	0.50	0.65	0.51
Kent(NC)	0.40	0.44	0.41	0.43	0.42
OS-6(NC)	0.45	0.47	0.47	0.52	0.48
Mean	0.42	0.47	0.48	0.53	
	Entry	**N levels**	**Entry X N levels**		
SEm±	0.0085	0.0051	0.0136		
CD at 5%	0.0262	0.014732	0.038976		
CV%			4.93		

AST-8.1(e-2) : Interaction effect of nitrogen levels and AVT-2 entries of Oat (SC) on leaf stem ratio at Imphal

Entries/ Nitrogen levels	Leaf stem ratio				
	0	**40**	**80**	**120**	**Mean**
SKO-90	0.51	0.50	0.60	0.83	0.61
SKO-105	0.57	0.55	0.74	1.14	0.75
SKO-109	0.81	0.73	0.70	1.06	0.82
JO-03-93	0.51	0.49	0.43	0.76	0.55
NDO-25	0.45	0.62	0.83	0.51	0.60
Kent(NC)	0.46	0.60	0.44	0.48	0.49
OS-6(NC)	0.48	0.57	0.60	0.87	0.63
Mean	0.54	0.58	0.62	0.81	
	Entry	**N levels**	**Entry X N levels**		
SEm±	0.04	0.03	0.08		
CD at 5%	0.09	0.06	0.16		
CV%			16.43		

AST-8.1(e-3) : Interaction effect of nitrogen levels and AVT-2 entries of Oat (SC) on leaf stem ratio at Mandya

Entries/ Nitrogen levels	Leaf stem ratio				
	0	**40**	**80**	**120**	**Mean**
SKO-90	0.21	0.30	0.42	0.47	0.35
SKO-105	0.24	0.35	0.43	0.43	0.36
SKO-109	0.20	0.28	0.37	0.52	0.34
JO-03-93	0.28	0.37	0.46	0.55	0.42
NDO-25	0.28	0.39	0.44	0.45	0.39
Kent(NC)	0.27	0.38	0.45	0.53	0.41
OS-6(NC)	0.30	0.33	0.45	0.51	0.40
Mean	0.25	0.34	0.43	0.49	
	Entry	**N levels**	**Entry X N levels**		
SEm±	0.01	0.01	0.02		
CD at 5%	0.03	0.03	0.06		
CV%					

AST-8.1(f) : Effect of nitrogen levels on crude protein content of promising entries of Oat (AVT-2)

Treatment	Crude protein (%)				
	Rahuri	Imphal	Hisar	Ludhiana	Mean
A. Entry					
SKO-90	9.0	5.9	13.1	7.4	8.9
SKO-105	9.2	5.7	12.8	6.8	8.6
SKO-109	9.1	5.4	13.1	7.0	8.6
JO-03-93	9.4	6.2	13.1	6.9	8.9
NDO-25	9.4	5.5	13.3	7.8	9.0
Kent(NC)	9.4	5.7	13.7	7.1	8.9
OS-6(NC)	9.2	6.8	12.6	7.0	8.9
SEm±	0.1				
CD at 5%	NS	0.4			
B. Nitrogen level (kg/ha)					
0	8.7	5.4	12.2	5.9	8.1
40	9.1	5.6	12.9	6.9	8.6
80	9.3	5.9	13.4	7.7	9.1
120	9.8	6.4	13.9	8.1	9.6
SEm±	0.1				
CD at 5%	0.22	0.2			
C.Interaction Entry X N levels					
SEm±	0.2				
CD at 5%	NS	0.6			
CV%	3.8	7.5			

AST-8.1(f-1) : Interaction effect of nitrogen levels and AVT-2 entries of Oat (SC) on crude protein content at Imphal

Entries/ Nitrogen levels	Crude protein (%)				
	0	**40**	**80**	**120**	**Mean**
SKO-90	5.38	5.70	5.93	6.44	5.86
SKO-105	5.35	5.40	5.58	6.28	5.65
SKO-109	4.85	5.03	5.18	6.33	5.35
JO-03-93	5.75	6.18	6.35	6.45	6.18
NDO-25	5.13	5.28	5.43	6.33	5.54
Kent(NC)	5.43	5.48	5.83	6.10	5.71
OS-6(NC)	5.93	6.10	6.80	7.08	6.78
Mean	5.40	5.60	5.87	6.43	
	Entry	**N levels**	**Entry X N levels**		
SEm±	0.18	0.11	0.31		
CD at 5%	0.39	0.22	0.64		
CV%			7.47		

D. NEW RESEARCH TRIALS

AST 1.1 (NT) : Influence of nutrients (micro & macro) on yield and quality of berseem in North West Zone

Locations: Ludhiana, Hisar, Pantnagar

The experiment was initiated in North East Zone with a view to study the integrated effect of micro and macro nutrients on yield and quality of berseem. The experiment was conducted at Ludhiana and Pantnagar during *Rabi* 2010. The effect of treatments was variable at both the locations. At Ludhiana, RDF + 10 t FYM/ha + S + Mo + B produced significantly highest green forage yield. This treatment produced 18.7 % more green fodder yield over RDF. At Pantnagar, RDF maintained its superiority over rest of the treatments. On mean basis, RDF FYM 5 t/ha produced highest green forage yield. The dry matter yield almost followed the same trend as that of green fodder yield. Crude protein yield also followed the trend to dry matter yield. On mean basis, RDF + FYM 10 t /ha + S + Mo + B produced higher green fodder yield which was closely followed by RDF + FYM 5 t/ha and RDF + FYM 10 t/ha.

Table 1.1(NT) (a) : Influence of nutrients (Macro & Micro) on yield and quality of berseem in North West Zone

Treatment	Green fodder yield (q/ha)			Dry matter yield (q/ha)			Plant height (Cm)			Leaf stem ratio
	Ludhiana	Pantnagar	Mean	Pantnagar	Pantnagar	Mean	Ludhiana	Pantnagar	Mean	
Absolute control	550.4	536.0	543.2	1.39	84.1	83.6	52.5	53.5	53.0	1.39
Recommended dose of fertilizers (RDF)	652.2	660.0	651.1	1.43	101.9	99.1	57.2	51.7	54.5	1.43
FYM @ 5 tones/ha	564.9	626.0	595.5	1.33	97.9	91.0	53.9	53.2	53.6	1.33
FYM @ 10 tones/ha	618.3	618.7	618.5	1.46	94.9	92.9	55.4	55.2	55.3	1.46
RDF + FYM @ 5 tones/ha	727.9	637.3	682.6	1.33	98.5	102.5	57.7	54.6	56.2	1.33
RDF + FYM @ 10 tones/ha	750.0	537.3	643.7	1.49	84.8	97.1	59.4	53.5	56.5	1.49
RDF + S + Mo + B	671.6	536.0	603.8	1.49	84.6	92.6	57.2	52.4	54.8	1.49
FYM @ 5 tones/ha + S + Mo + B	592.7	520.7	556.7	1.28	81.9	84.6	54.2	53.6	53.9	1.28
FYM @ 10 tones/ha + S + Mo + B	643.8	616.7	630.3	1.34	96.5	95.7	55.8	50.9	53.3	1.34
RDF + FYM @ 5 tones/ha + S + Mo + B	733.9	544.7	639.3	1.54	85.5	96.3	59.3	53.6	56.6	1.54
RDF + FYM @ 10 tones/ha + S + Mo + B	774.0	568.0	671.0	1.36	88.1	100.8	60.8	52.3	56.6	1.36
SEm ±	68.3	38.7		0.08	5.79		7.0	1.14		0.08
CD at 5%	23.2	NS		3.7	NS		2.4	NS		NS
CV %	6.07			6.9			7.2			

Table 1.1(NT) (b) : Influence of nutrients (Macro & Micro) on yield and quality of berseem in North West Zone

Treatment	Crude protein yield (q/ha)			Crude fibre yield (q/ha)
	Ludhiana	Pantnagar	Mean	Ludhiana
Absolute control	14.3	8.5	11.4	20.4
Recommended dose of fertilizers (RDF)	18.6	8.0	13.3	22.3
FYM @ 5 tones/ha	15.4	9.1	12.3	19.9
FYM @ 10 tones/ha	17.1	8.9	13.0	20.7
RDF + FYM @ 5 tones/ha	20.9	9.2	15.1	24.5
RDF + FYM @ 10 tones/ha	22.0	8.7	15.2	23.9
RDF + S + Mo + B	19.7	7.6	13.7	22.8
FYM @ 5 tones/ha + S + Mo + B	16.3	7.5	11.9	19.9
FYM @ 10 tones/ha + S + Mo + B	18.1	8.8	13.5	21.3
RDF + FYM @ 5 tones/ha + S + Mo + B	21.4	7.7	14.6	23.3
RDF + FYM @ 10 tones/ha + S + Mo + B	23.3	8.3	15.8	24.3
SEm ±		0.62		
CD at 5%		NS		
CV %				

AST 1.2 (NT) : Optimization of nitrogen for maize in different forage based cropping system

Locations: Shillong and Imphal

A field experiment was initiated in Rabi 2009-10 at two locations of North Eastern region i.e. Shilong and Imphal to find out suitable N requirement for maize based cropping system. The data of complete sequence will be reported in Kharif 2011.

AST 1.3 (NT) : Effect of soil amendments on productivity of rice based cropping system in acidic soil

Location: Shillong

A new field experiment was also started at Shillong in Rabi 2009-10 under acidic condition in rice based cropping sequence using different soil amendments. The data of complete sequence will be reported in Kharif 2011.

AST 1.2 (NT) : Optimization of nitrogen for maize in different forage based cropping system

Locations: Shillong and Imphal

A field experiment was initiated in Rabi 2009-10 at two locations of North Eastern region i.e. Shilong and Imphal to find out suitable N requirement for maize based cropping system. The data of complete sequence will be reported in Kharif 2011.

AST 1.3 (NT) : Effect of soil amendments on productivity of rice based cropping system in acidic soil

Location: Shillong

A new field experiment was also started at Shillong in Rabi 2009-10 under acidic condition in rice based cropping sequence using different soil amendments. The data of complete sequence will be reported in Kharif 2011.

CHAPTER-3

FORAGE CROP PROTECTION

PPT-1. SURVEY AND SURVEILLANCE OF DISEASES AND INSECT-PESTS IN BERSEEM, LUCERNE AND OATS.

(Location: Anand, Bhubaneswar, Hisar, Hyderabad, Jhansi, Ludhiana, Palampur and Rahuri)

The major objective of this study was to understand the occurrence and abundance of major insect pest and diseases in berseem, lucerne and oats at different locations and their relationship with weather parameters. The crop-wise occurrence of insect pest and diseases and their abundance at different centers was recorded and summarized as follows.

BERSEEM

At, Hisar incidence of stem rot (*Sclerotinia trifoliorum*) and root rot (*Rhizoctonia solani* and *Fusarium semitectum*) was assessed on natural inoculum basis at Forage Research Area, H.A.U., Hisar. Observations on disease incidence were recorded starting from initiation of diseases on susceptible variety Mescavi by monitoring weekly disease increments. Stem rot started appearing in the fourth week of December 2009, when mean temperature was 12.5^{o}C and mean RH was 62.3%. The disease remained severe from second week to last week of January, 2010 when the mean temperature of that period was 13.5 ^{o}C and mean RH was 67.1%. Root rot incidences started appearing in the second week of February, when the mean temperature was 16.4 ^{o}C and mean RH was 69.2%. There was increase in root rot incidences from second week of February to third week of March, when mean temperature was 25.8 ^{o}C and mean RH was 51.7% with no rainfall.

At Ludhiana, stem rot (*S. trifoliorum*) appeared in the last week of December on variety BL-42. The disease progressed steadily from second week of January till mid February when mean RH (84.5-93.5) and mean temperature range was 9.15-15.4 ^{o}C. Maximum stem rot disease incidence (42.46%) was recorded during this period.

At Palampur, root rot *(R.solani*) appeared in the first week of March and disease progressed up to second week. Maximum disease severity (30%) was recorded during these days. The leaf spot disease incidences also started(4%) in the second week of March and progressed up to last week of April (15% DS). Defoliating insect infestation started from last week of March and reached at maximum level (30%) in the last week of April.

At Jhansi, the incidences of stem rot (*S. trifoliorum*) started appearing from fourth week of December and it was at peak (24.2%) in the last week of January. The root rot disease incidence started appearing in the second week of March and reached at maximum severity (32.4%) in third week of April. Two dominating nematodes viz**.** stunt nematode (*Tylechorhynchus vulgaris*) which constituted 42.4 percent population and root knot *(Meloidogyne incognita,, M. javanica)* which constituted 32.4 percent of the total nematode population. Other nematode species like *Helicotylenchus,*, *Pratylenchus* and *Tylenchus spp*. constituted 15,8 and 2.2 percent of the total population. No major insect pest incidence occurred, however minor infestation of American boll-worm *(Helicoverpa armigera)* was recorded.

At hyderabad, Galerucid beetles infestation was maximum (15 beetles/m^2 sq) in the first week of January. The leaf minor infestation was higher (12 minors/m^2) during third week of January. Jassid population occurred from first week of January to first week of April with the peak 6.5 jassids/m^2 during second week of February.

LUCERNE

At Anand, alfalfa mosaic appeared in the third week of February. Disease progression continued up to April reaching maximum disease severity 7.18 on 1-9 scale. Leaf spot were also recorded during same time with the maximum severity 4.94 on 1-5 scale in the last week of April. Maximum root rot disease intensity 6.4% and rust 10.96% was also recorded during the same period. Downy mildew appeared in the third week of January and reached at maximum intensity (1.24) in the first week of March.

At Palampur, leaf spot disease incidences started from fourth week of March. Disease progression reached to 10% severity in the last week of April. At Hyderabad, incidences of rust started appearing in the third week of December and disease progression was continued up to last week of May with the disease score 3 on 0-5 scale. At Jhansi, leaf spot (*Cercospora medicaginis* and *Stemphylium botryosum*) and rust (*Uromyces striatus*) incidences occurred during January to April. Maximum severity (62.4%) of rust incidences was recorded in third week of April. Moderate to high population densities (125-985/250g soil) of two major nematodes viz., *Pratylenchus zeae* and *M.incognita* was observed. Both of these nematodes attained an annual peak population during March-April.

At Anand, aphid infestation was first recorded in the second week of January with a population load 0.58 aphids/plant. Highest population 6.18 aphid/plant was recorded in the third week of February. Jassid and Thrips were found associated with the crop through out the season. Minor infestation of semilooper, heliothis and white flies were also recorded.

At Rahuri, the population of pea aphid (*Acyrthosiphon pisum*) started buildup (3 aphid/tiller) and reached maximum during first week of Fabruary (36 aphid/tiller). There after population started declining and showed lowest population (0.3 aphid/tiller). Similarly spotted aphid (*Therioaphis maculata*) started appearing during last week of Desember 2009 (3.6 aphids/tiller) and reached the peak level (20.0 aphids/tiller) during third week of January. The cowpea aphid (*Aphis craccivora*) on Lucerne was found at a very low level (2.5-2.8 aphid/tiller) during second and third week of January. The population of ladybird beetles was found moderate to high level whereas, Chrysopa and Syrphid fly larvae were at low- moderate level during the period of aphid infestation.

The larval population of *Heliothis armigera* appeared during third week of March (0.2/m^2) and reached at its maximum level (1.6/m^2) during fourth week of March. Larvae of *Spodoptera litura* was found feeding on leaves during third week of March (0.4 larvae/m^2) and reached at maximum level (2.0 larvae/m^2) during first week of April, 2010. Alfalfa mosaic virus and leaf spot disease was observed at moderate to high level (35-50% leaf area covered) in the month of March.

At Hyderabad, pea aphid (*Acyrthosiphum pisum*) started appearing in the first week of January and remained associated with the crop till last April. Maximum population (66 aphids/10 plants) occurred during third week of March. Spotted alfalfa aphid (*Therioaphis maculata*) occurred during last week of December to fourth week of April. The maximum population (22 aphids/10 plants) was recorded during last week of March. Weevil infestation was in traces. At Palampur, defoliating beetles associated with the crop during the entire cropping season. The maximum severity was 40% in the last week of April.

At Jhansi, heavy infestation (8.4 larvae/plant) of alfalfa weevil was recorded in the month of February. The spotted alfalfa aphid appeared during third week of February in traces.

OATS

At Rahuri, aphid (*Rhopalosiphum paddi*) was noticed during third week of January (2.4 aphids/tiller) and reached maximum level (3 aphids/tiller) during fourth week of January. At Ludhiana, Leaf blight (*Helminthosporium avenae*) disease incidence appeared on var. Kent during the last week of February and progressed steadily till second week of March. During this period mean RH 72-80% and mean temperature 18-25^{o}C prevailed. With increase in temperature and maturity of the plant the disease intensity became stable with highest level 36.8%.

At Palampur, powdery mildew and leaf blight disease incidences started in the first week of March and disease progress continued till last week of April with 80 and 29% disease severity of powdery mildew and leaf blight respectively. Loose smut incidences were also appeared in mild form. Aphid infestation was severe (7%) during the first week of April. Minor incidences (<5%) of *Sclerotium* rot was recorded at Jhansi after 25 days of sowing. Leaf blight incidences were severe (22%) in the third week of March in var. Kent.

2 A. EVALUATION OF VARIETAL TRIALS FOR RESISTANCE TO DISEASES, INSECT-PESTS AND NEMATODES

(Location: Anand, Hisar, Jhansi, Rahuri, Hyderabad, Bhubaneswar and Palampur)

(B) LUCERNE

The insect-pest reactions among entries of Lucerne (VTL-2009) are presented in Table PPT 2A.1. At Jhansi the population of Lucerne weevil was non-significant among the entries. The population of cowpea aphids at Rahuri ranged 10.50-14.75 per plant.

Table PPT 2A.1. Insect-pests population in Lucerne VTL- 2009

Entry	Cow Pea aphid/plant (Rahuri)
Anand-2	13.05
RL-88	12.05
BAIF -1	10.50
Anand-21	12.00
Anand-22	14.75

The disease incidence in VTL-2009 trial is presented in table PPT 2A 2. Entry Anand-22 was found comparatively least infected with downy mildew (5.5%) and anthracnose (9.6%) at Hisar. At Jhansi entry Anand-21 showed moderately resistant reaction to lesion nematode, P. zeae (Rf=2.4),also least infected with anthracnose (9.6%).

Table PPT 2A.2. Disease incidence in Lucerne VTL- 2009

Entry	Downy mildew (%)		Rust (0-5)	Anthracnose		*P. zeae* at Jhansi	
	Hisar	Jhansi	Jhansi	Hisar	Jhansi	Rf	Reaction
Anand-2	9.8	0.00	32.3	34.0	22.4	4.0	MS
RL-88	20.7	0.00	46.2	12.3	21.2	4.0	MS
BAIF-1	10.7	0.00	28.4	17.7	32.0	3.8	MS
Anand-21	8.6	0.00	8.5	10.2	9.6	2.4	MR
Anad-22	5.5	0.00	8.5	9.6	12.4	3.5	MS

OATS (Single cut)

Leaf blight disease reaction among the entries of initial varietal trial is presented in Table PPT 2A.3. Entry 0S-374 showed minimum disease incidences (0.66-4.6) at all the centers except Ludhiana.

Table PPT 2A.3. Reaction of IVT entries of Oats (single cut) to leaf blight.

Entries	Hisar	Jhansi	Ludhiana	Bhubaneswar	Hyderabad
JO-03-95	9.3	1.00	30.4	1.2	1.0
Kent	10.9	1.33	26.66	1.8	1.33
JHO-2009-1	14.0	3.66	39.73	1.2	1.00
OS-363	6.7	1.33	30.93	2.6	1.33
JHO-2009-2	8.2	1.00	54.73	1.4	1.00
NBO-603	11.8	1.66	28.0	2.4	1.33
OS-374	4.6	0.66	39.73	1.4	1.00
NDO-609	11.8	1.66	37.8	2.8	1.00
SKO-148	12.0	2.00	20.8	1.8	1.33
OS-6	11.3	2.33	27.73	2.8	1.00
SKO-156	6.8	1.33	22.63	1.4	1.67
SKO-163	12.1		16.8	1.2	1.00
UPO-09-2	5.0	0.66	25.33	3.6	1.33
JHO-09-1	18.4	2.66	20.00	1.4	1.00
JH0-99-2	40.7	4.33	48.0	1.2	-
JHO-822	-	3.00	-	-	-
JHO-2000-4	-	2.33	-	-	1.33
Palampur-1	-	1.66	-	-	-

Scored on a 1-5 scale: 1= Highly resistant (No symptom); 2= Resistant (Up to 10 % disease incidence); 3= Moderately resistant (11-25%); 4= Susceptible (26-50%); 5=Highly susceptible (> 50%)

Results of reaction of entries of initial varietal trial to other diseases and nematodes are presented in Table PPT 2A.4. All the entries showed resistant reaction (<10% DI) against sclerotium rot at Bhubaneswar and Jhansi centers except NDO-603, OS-6 and UPO-090-2. At Palampur entries, OS-6, SKO-148, SKO-156, SKO-163 and Palampur-1 were resistant to powdery mildew. Entries NDO-603, SKO-156, SKO-163, JHO-09-1 and Palampur-1 were resistant to root knot nematode.

Table PPT 2A.4. Reaction of IVT entries to diseases and nematode

Entries	Sclerotium root rot* (%)		Aphids/tiller	Powdery mildew* (%)	*M.javanica* Jhansi	
	Jhansi	Bhubneshwar	Jhansi	Palampur	RKI*	Reaction
JO-03-95	4.20	2.33	-	21.3	3.5	MS
Kent	3.66	5.66	10.5	37.0	3.5	MS
JHO-2009-1	0.66	3.33	-	29.0	2.5	MR
OS-363	8.42	11.66	18.0	25.0	4.0	MS
JHO-2009-2	6.20	5.99	8.5	22.3	2.3	MR
NDO-603	16.50	14.33	-	21.0	1.3	R
OS-374	2.66	3.66	12.6	20.3	3.5	MS
NDO-609	8.62	13.99	-	16.3	2.5	MR
SKO-148	6.72	5.33	-	6.0	3.5	MS
OS-6	18.12	15.99	20.0	3.7	3.5	MS
SKO-156	7.23	4.99	6.5	2,3	1.5	R
SKO-163	3.66	5.33	5.4	2.3	1.3	R
UPO-09-2	21.61	17.99	10.2	10.0	2.5	MR
JHO-09-1	4.20	3.66	5.6	10.7	1.5	R
JH0-99-2	6.92	4.99	8.5	-	2.5	MR
JHO-822	4.60	-	12.2	-	3.5	MS
JHO-2000-4	6.42	-	-	-	2.2	MR
Palampur-1	1.66	-	-	5.7	1.5	R

Highly resistant (No symptom); Resistant (Up to 10 % disease incidence) Moderately resistant (11-25%); Susceptible (26-50%);Highly susceptible (>50%).
*RKI (Root knot index): 1= 0 Number of galls; 2= 1-10 Number of galls; 3= 11-30 Number of galls; 4=31-100 Number of galls; 5= > 100 Number of galls

Results of reaction of advance varietal trial entries for leaf blight are presented in Table- PPT 2A.5. All the entries showed minimum range of leaf blight disease incidence (0.33-4.00) at Bhubneshwar Hyderabad and Jhansi centers. Whereas at Hisar OS-6 and at Ludhiana SKO-133 were found resistant to leaf blight .

The results of disease and pest reaction for AVT entries are presented in Table PPT 2A.6. Entry OL-125 was found least infested with aphids at Jhansi. Entry JHO-99-2 showed minimum Sclerotium rot incidence at Bhubneshwar. Whereas at Palampur entries, SKO-96 and SKO-117 were found resistant to powdery mildew. At Jhansi centers. OS-6 and JHO-2000-4 were found resistant to nematode (*M .javanica*) .

Table PPT 2A.5. Reaction of AVT (SC-1) entries of Oats (single cut) to leaf blight

Entry	Hisar	Jhansi	Bhubaneswar	Hyderabad	Ludhiana
SKO-96	44.2	4.00	1.2	1.33	21.60
Kent	11.6	1.66	2.8	1.33	24.60
JO-03-291	18.6	2.33	1.4	1.00	23.20
OS-6	5.3	0.66	2.6	1.33	22.66
SKO-117	14.6	1.33	1.2	1.67	22.13
SKO-133	38.6	3.33	1.4	1.00	15.46
JHO-822	-	1.33	-	-	-
JHO-99-2	-	1.66	1.2	-	-
OL-125	1.66	0.33	-	-	20.26
JHO-2000-4	-	1.00	-	1.00	-
Palampur-1	-	1.00	-	-	-
Scored on a 1-5 scale: 1= Highly resistant (No symptom); 2= Resistant (Up to 10 % disease incidence); 3= Moderately resistant (11-25%); 4= Susceptible (26-50%); 5=Highly susceptible (> 50%).					

Table PPT 2A.6. Reaction of AVT (SC-1) entries of Oats (single cut) to pests and nematode

Entry	Aphids/tiller		Sclerotium root rot	Powdery mildew	*M. javanica* at Jhansi	
	Rahuri	Jhansi	Bhubaneswar	Palampur	RKI	Reaction
SKO-96	-	6.4	5.66	6.0	3.5	MS
Kent	-	14.2	15.49	10.3	2.5	MR
JO-03-291	-	12.1	4.99	13.3	3.5	MS
OS-6	-	14.2	11.99	38.0	1.5	R
SKO-117	-	8.4	5.33	3.0	2.5	MR
SKO-133	-	8.6	4.66	19.0	2.3	MR
JHO-822	-	10.2	-	-	3.5	MR
JHO-99-2	-	12.1	2.66	-	2.3	MR
OL-125	-	6.2	-	-	2.5	MR
JHO-2000-4	-	8.1	-	-	1.5	R
Palampur-1	-	0.0	-	15.7	2.5	MR
Scored on a 1-5 scale: 1= Highly resistant (No symptom); 2= Resistant (Up to 10 % disease incidence); 3= Moderately resistant (11-25%); 4= Susceptible (26-50%); 5=Highly susceptible (> 50%).						

Reaction of leaf blight and other pests in AVT (SC-2) entries of oat are presented in Table PPT-2A.7 and 8. Results revealed that entry SKO-105 was resistant to leaf blight at Hisar, Hyderabad and Jhansi centers. Whereas entries JO-09-93 at Ludhiana and JHO-99-2 at Bhubaneswar showed minimum disease incidence. Entry JHO-99-2 was found resistant to pests and diseases at all the centers.

Table PPT 2A7. Reaction of AVT (SC-2) entries of Oats (single cut) to leaf blight

Entry	Jhansi	Hyderabad	Hisar	Ludhiana	Bhubaneswar
JO-03-93	3.66	1.33	40.5	7.46	2.6
OS-6	1.66	1.00	12.4	32.55	2.8
SKO-90	1.00	1.67	8.9	31.33	2.4
SKO-105	0.66	1.00	5.9	18.44	2.8
KENT	1.33	1.33	9.5	29.83	3.2
SKO-109	3.33	1.33	36.2	18.66	2.8
NDO-25	1.66	1.33	11.6	17.06	1.8
JHO-99-2	1.33	-	-	-	1.6
OL-125	2.66	-	11.9	30.66	-
JHO-822	1.00	-	-	-	-
Palampur-1	2.00	-	-	-	-
JHO-2000-4	1.66	1.33	-	-	-

Table PPT 2A.8. Reaction of AVT (SC-2) entries of Oats (single cut) to diseases and nematode

Entry	Sclerotium root rot (%)		Aphids/tiller	Powdery mildew (%)	*M.javanica* (Jhansi)	
	Bhubaneswar	JhansiI	Jhansi	Palampur	RKI*	Reaction
JO-03-93	14.44	4.46	12.6	63.0	3.5	MS
OS-6	16.66	8.66	9.2	55.3	3.5	MS
SKO-90	18.66	9.12	6.4	6.7	4.0	MS
SKO-105	20.33	12.33	11.8	8.0	2.5	MR
KENT	17.44	7.46	12.8	16.7	2.5	MR
SKO-109	14.99	6.92	0.0	6.7	3.5	MS
NDO-25	4.66	0.0	6.5	48.0	1.5	R
JHO-99-2	3.99	0.0	4.6	-	1.5	R
OL-125	-	8.25	7.5	-	2.5	MR
JHO-822	-	6.23	5.0	11.0	3.5	MS
Palampur-1	-	0.0	0.0	-	2.2	MR
JHO-2000-4	-	0.0	4.65	-	3.5	MS

Highly resistant (No symptom); Resistant (Up to 10 % disease incidence) Moderately resistant (11-25%); Susceptible (26-50%);Highly susceptible (>50%).
*RKI (Root knot index): 1= 0 Number of galls; 2= 1-10 Number of galls; 3= 11-30 Number of galls; 4=31-100 Number of galls; 5= > 100 Number of galls
**no./10 plants

(D) OATS (Multi cut)

The results of IVT trial are presented in Table PPT 2A.9. For leaf blight entries JO-03-307 at Bhubaneswar, and Ludhiana centers whereas UPO-212 at Hisar and entry Palampur-1 at Jhansi were found resistant. For powdery mildew at Palampur entry, OS-376, showed minimum incidence. At Jhansi entries UPO-212 and JHO-822 were found resistant to nematodes.

Table PPT 2A.9. Reaction of IVTO (multi cut) to pests

Entry	Leaf Blight*				Powdery mildew	Sclerotium rot	*Meloidogune javanica* (Jhansi)	
	Hisar	Jhansi	Bhubanes.	Ludhiana	Palampur	Jhansi	RKI	Reaction
Kent	9.2	1.6	1.2	25.33	3.0	6.2	3.5	MS
JO-03-307	36.9	3.6	1.2	24.26	5.3	4.1	3.3	MS
UPO-212	8.5	1.0	1.4	36.46	6.3	0.0	1.5	R
UPO-09-3	12.1	1.3	1.2	28.80	4.3	0.0	3.3	MS
RO-19	39.0	3.3	1.4	36.26	13.7	0.0	3.1	MS
OL-1694	16.4	2.6	1.6	38.33	7.0	8.4	3.5	MS
JHO-2009-3	10.4	1.3	1.8	34.73	3.0	4.2	3.1	MS
OS-376	9.4	0.6	1.8	40.60	2.3	12.6	3.3	MS
JHO-2000-4	38.5	1.0	1.6	39.00	-	6.6	3.3	MS
JHO-822	-	1.3	-	-	-	5.6	1.5	R
Palampur-1	-	0.3	-	-	6.0	0.0	4.2	S

For leaf blight, 1=Highly resistant (No symptom), 2=Resis-tant (Up to 10 % disease incidence), 3=Moderately resistant (11-25%), 4= Susceptible (26-50%), 5= Highly susceptible (>50%).
*RKI (Root knot index): 1= 0 Number of galls; 2= 1-10 Number of galls; 3= 11-30 Number of galls; 4=31-100 Number of galls; 5= > 100 Number of galls
**no./10 plants

PPT- 2 B. EVALUATION OF BERSEEM ENTRIES FOR RESISTANCE TO ROOT AND STEM ROT DISEASES UNDER SICK PLOT

(Location: Hisar and Jhansi)

Berseem frequently suffers heavy damages due to various kinds of rot diseases caused by either a complex of fungal pathogens viz. *Rhizoctonia solani*, *Fusarium semitactum, Sclerotium rolfsii* and *Sclerotonia trifoliorum* or in association with a nematode, *Tylenchorhynchus vulgaris*. Berseem entries of the initial and advance trials were tested for these diseases in the permanent stem rot and root rot sick plots. The entries were tested at Jhansi only for reaction under artificially nematode inoculated pots. Each pot was inoculated with 1000-second stage larvae of root knot nematode when the plants were three weeks old. Results of the reaction of initial varietal trial are presented in Table PPT 2B.1.

Table PPT 2A.9. Reaction of IVTO (multi cut) to pests

Entry	Leaf Blight*				Powdery mildew	Sclerotium rot	*Meloidogune javanica* (Jhansi)	
	Hisar	Jhansi	Bhubanes.	Ludhiana	Palampur	Jhansi	RKI	Reaction
Kent	9.2	1.6	1.2	25.33	3.0	6.2	3.5	MS
JO-03-307	36.9	3.6	1.2	24.26	5.3	4.1	3.3	MS
UPO-212	8.5	1.0	1.4	36.46	6.3	0.0	1.5	R
UPO-09-3	12.1	1.3	1.2	28.80	4.3	0.0	3.3	MS
RO-19	39.0	3.3	1.4	36.26	13.7	0.0	3.1	MS
OL-1694	16.4	2.6	1.6	38.33	7.0	8.4	3.5	MS
JHO-2009-3	10.4	1.3	1.8	34.73	3.0	4.2	3.1	MS
OS-376	9.4	0.6	1.8	40.60	2.3	12.6	3.3	MS
JHO-2000-4	38.5	1.0	1.6	39.00	-	6.6	3.3	MS
JHO-822	-	1.3	-	-	-	5.6	1.5	R
Palampur-1	-	0.3	-	-	6.0	0.0	4.2	S

For leaf blight, 1=Highly resistant (No symptom), 2=Resis-tant (Up to 10 % disease incidence), 3=Moderately resistant (11-25%), 4= Susceptible (26-50%), 5= Highly susceptible (>50%).
*RKI (Root knot index): 1= 0 Number of galls; 2= 1-10 Number of galls; 3= 11-30 Number of galls; 4=31-100 Number of galls; 5= > 100 Number of galls
**no./10 plants

PPT- 2 B. EVALUATION OF BERSEEM ENTRIES FOR RESISTANCE TO ROOT AND STEM ROT DISEASES UNDER SICK PLOT

(Location: Hisar and Jhansi)

Berseem frequently suffers heavy damages due to various kinds of rot diseases caused by either a complex of fungal pathogens viz. *Rhizoctonia solani*, *Fusarium semitactum, Sclerotium rolfsii* and *Sclerotonia trifoliorum* or in association with a nematode, *Tylenchorhynchus vulgaris*. Berseem entries of the initial and advance trials were tested for these diseases in the permanent stem rot and root rot sick plots. The entries were tested at Jhansi only for reaction under artificially nematode inoculated pots. Each pot was inoculated with 1000-second stage larvae of root knot nematode when the plants were three weeks old. Results of the reaction of initial varietal trial are presented in Table PPT 2B.1.

Table PPT 2B.1. Reaction of berseem entries in IVT to diseases and nematode

Entry	Stem rot % Incidence			Root rot % incidence		*M.incognita* (RKI)	*T.vulgaris*	
	Hisar	Jhansi	Ludhiana	Jhansi	Hisar	Jhansi	Rf	Reaction
JB0-3-15	7.5	9.4	6.66	12.8	5.6	3.5	3.5	MS
Wardan	14.8	16.2	6.66	12.0	9.0	2.3	2.5	MR
HFB-30	8.3	7.6	8.33	22.4	9.6	2.5	2.3	MR
HFB-6-6	16.2	12.0	13.33	27.3	13.6	2.5	2.2	MR
Mescavi	15.5	14.6	16.66	12.4	7.5	2.5	2.2	MR
JHB-09-1	12.2	16.2	5.66	11.3	6.0	1.5	1.0	R
JHB-09-2	12.7	18.1	10.66	14.6	12.6	1.5	1.5	R
BL-22	17.2	32.0	-	12.6	8.2	3.5	3.5	MR
Bundel Berseem-2	-	8.6	15.00	8.2	-	2.5	1.5	R
Bundel Berseem-3	-	6.2	-	6.6	-	2.0	1.5	R

Disease reaction categories: 1-5 % infected plants=Resistant; 6-10 % infected plants= Moderately resistant; 11-15 % infected plants= Moderately susceptible; 16-20 % infected plants= Susceptible; > 20 % infected plants= Highly susceptible

Root knot index (RKI)

1	=	Number of galls	0	- Highly resistant
2	=	"	1 – 10	- Resistant
3	=	"	11 – 30	- Moderately Resistant
4	=	"	31 – 100	- Moderately susceptible
5	=	"	> 100	- Susceptible

Entries JBO-3-15 and HFB-30 were found resistant to stem rot disease at Hisar, Jhansi and Ludhiana. Entry JHB-09-1 was resistant to root rot at Hisar and Jhansi centers. This entry was found resistant to nematodes also at Jhansi center.

PPT 8. REFINEMENT OF DISEASE MANAGEMENT TECHNOLOGY FOR SEED PRODUCTION IN OAT

(Location: Palampur and Ludhiana)

This is the second year of the trial on seed production in oat, consisting of following treatments,

1. Seed treatment with Vitavex @ 2.5/kg seed
2. Seed treatment with *Trichoderma viridae* @ 5g/kg
3. Foliar spray of Propiconazole @ 0.01% at appearance of disease
4. 1 + 2
5. 1 + 3
6. 2 + 3
7. 1 + 2 + 3
8. Untreated control

The results of disease incidence are presented in Table PPT 8.1. The mean incidence of powdery mildew were lowest in T7 (combination of seed treatment with Vitavex @ 2.5/kg seed and *Trichoderma viridae* @ 5g/kg with foliar spray of Propiconazole @ 0.01%) at Palampur. Whereas the incidence of leaf blight was lowest in T7at Ludhiana and in T5 at Palampur. The loose smut incidence was also recorded at Palampur. Where all the treatments significantly reduced the disease incidence, however the effect was non-significant among the treatment.

PPT 8.1. Disease incidence in oat under different treatments

Treatment	Powdery mildew	Leaf blight		Loose Smut
	Palampur	Palampur	Ludhiana	Palampur
T_1	54.0	17.5	30.93	0.0
T_2	60.7	15.9	29.07	1.3
T_3	11.0	7.0	24.27	1.3
T_4	44.7	12.2	28.00	0.0
T_5	17.7	6.0	27.20	0.0
T_6	11.3	6,7	23.46	1.3
T_7	9.7	6.4	18.93	0.0
T_8	65.3	20.2	37.07	2.3
CD (5%)	2.58	1.885	2.68	0.23
CV %	4.28	6.76	5.60	10.09

T_1=Seed treatment with Vitavex @ 2.5/kg seed, T_2= Seed treatment with *Trichoderma viridae* @ 5g/kg, T_3= Foliar spray of Propiconazole @ 0.01% at appearance of disease, T_4= T_1+ T_2, T_5= T_1+ T_3, T_6= T_2+ T_3, T_7= T_1+ T_2+T_3

.

The results of yield are presented in Table PPT 8.2. Maximum seed yield was obtained in T_7 at both Palampur and Ludiana centers. The straw yield was also maximum (62.6 q/ha) in this treatment at Palampur.

PPT 8.2. Yield (q/ha) of oat under different treatments

Treatment	Palampur		Ludhiana
	Seed	Straw	Grain
T_1	14.8	52.2	13.27
T_2	14.9	51.2	14.11
T_3	16.1	58.4	17.45
T_4	15.6	54.4	15.58
T_5	16.3	59.3	17.23
T_6	16.0	60.2	18.08
T_7	17.0	62.6	21.04
T_8	14.1	50.6	13.54
CD (5%)	0.25	2.93	1.90
CV %	0.92	2.99	6.65

PPT 9. MANAGEMENT OF ROOT ROT DISEASE OF OAT THROUGH ORGANIC AMENDMENTS

(Location: Bhubaneswar)

Root rot disease in Oats is a region specific diseases and is of common occurrence at Bhubaneswar. It was envisaged to manage this disease through organic amendments this year. The treatments consisted of,

1. T_1= Soil application of neem cake @ 200 kg/ha
2. T_2= Soil application of karanj cake @ 200 kg /ha
3. T_3= Soil application of mahua cake @ 200 kg /ha
4. T_4= Soil application of castor cake @ 200 kg /ha
5. T_5= Soil application of rape seed cake @ 200 kg /ha
6. T_6= Soil application of sesamum cake @ 200 kg /ha
7. T_7= Soil application of coconut cake @ 200 kg /ha
8. T_8= Soil application of linseed cake @ 200 kg /ha
9. T_9= Foliar application of Pitcher compost @ 3%
10. T_{10}= Untreated control

The Pitcher compost was prepared by Adding 1 kg cow dung + 1 l cow urine + 1 kg neem leaves + 1 kg karanj leaves + 1 kg calotropis leaves + 50 gm jaggery. This was fermented for 7-10 days and stained through muslin cloth and diluted to 3%.

The percent plants affected due to the disease and green forage yield (q/ha) is depicted in Table PPT 9.1. All the treatments except T_7 and T_8 (application of coconut and linseed cake respectively) provided significant control of the disease.

The root rot incidence was lowest (22.70%) in soil treatment with neem cake and in foliar application of pitchure compost and these treatments were at par with soil application of karanj, mahua, castor, sesamum and rape seed cake.

The green fodder yield was highest (401.61 q/ha) in foliar application of pitcher compost @ 3%. Soil application of neem and mahua cake@ 200kg/ha, also provided significantly higher green fodder yield as compared to untreated control. The yield difference in rest of the treatments were however non- significant.

Table PPT 9.1. Root rot incidence and green fodder yield (q/ha) in different treatments.

Treatment	Root rot (% affected plants)	% decrese in disease	Green fodder yield	% increase in yield
T_1	22.70	36.32	392.06	39.80
T_2	24.24	32.0	310.99	10.89
T_3	24.75	30.5	382.07	10.0
T_4	28.14	21.0	305.43	8.9
T_5	25.40	28.7	313.76	11.88
T_6	28.12	21.1	293.21	4.55
T_7	29.73	16.6	330.42	17.82
T_8	31.54	11.5	315.43	12.47
T_9	24.16	32.2	401.61	43.2
T_{10}	35.65	-	280.44	-
CD (5%)	5.20		55.60	
CV	11.05		9.7	

T_1=Soil application of neem cake @ 200 q/ha, T_2= Soil application of karanj cake @ 200 q/ha, T_3= Soil application of mahua cake @ 200 q/ha, T_4= Soil application of castor cake @ 200 q/ha, T_5= Soil application of rape seed cake @ 200 q/ha, T_6= Soil application of sesamum cake @ 200 q/ha, T_7= Soil application of coconut cake @ 200 q/ha, T_8= Soil application of linseed cake @ 200 q/ha, T_9= Foliar application of Pitchure compost @ 3%, T_{10}= Untreated control

PPT-10: INTEGRATED DISEASE AND INSECT-PEST MANAGEMENT IN LUCERNE

(Locations- Anand, Hyderabad, Jhansi and Rahuri)

This is the first year of the trial on bio-intensive pest management in lucerne, consisting of following treatments,

1. T_1 = Seed treatment with *Trichoderma* 5g/kg
2. T_2 = Seed treatment with Neem seed powder 50g/kg
3. T_3 = Neem seed kernal spray 5%
4. $T_4 = T_1 + T_2$
5. $T_5 = T_1 + T_3$
6. $T_6 = T_2 + T_3$
7. T_7 = Seed treatment carbendazim 2g/kg + carbofuran 1 kg/ha + manozeb 0.25% spray
8. T_{10} = Untreated control

The insect-pest incidence at different locations under various treatments is presented in Table 10.1. The treatment T_6 , combination of seed treatment with Neem seed powder 50g/kg and Neem seed kernal spray 5% provided best control of insect-pests in Lucerne crop. Aphid population was lowest in T_6 at Hyderabad and Rahuri. Whereas the population of weevil at Jhansi; Jassids at Hyderabad and defoliators at Rahuri was lowest (PPT-10.1).

Table PPT 10.1. Insect-pest incidence in different treatments

Treatment	Aphid/plant			Weevil/tiller	Jassid/plant	Defoliators
	Anand	Hyderabad	Rahuri	Jhansi	Hyderabad	Rahuri
T_1	0	20.00	39.87	4.82	6.00	2.87
T_2	0	15.33	41.47	4.23	5.00	3.20
T_3	0	14.67	14.33	1.20	6.33	1.13
T_4	0	15.33	40.40	4.65	6.67	3.67
T_5	0	18.67	16.20	3.24	7.33	1.20
T_6	0	10.00	15.73	0.82	4.67	1.07
T_7	0	11.00	40.13	0.93	5.67	3.47
T_8	0	32.33	43.53	3.86	10.00	4.00
CD (5%)	-	2.93	0.165	0.82	1.79	0.160

T_1 = Seed treatment with *Trichoderma* 5g/kg; T_2 = Seed treatment with Neem seed powder 50g/kg; T_3 = Neem seed kernal spray 5%; $T_4 = T_1 + T_2$; $T_5 = T_1 + T_3$; $T_6 = T_2 + T_3$; T_7 = Seed treatment carbendazim 2g/kg + carbofuran 1 kg/ha + manozeb 0.25% spray; T_8 = Untreated control

The results obtained are presented in Table 10.2. The chemical treatment combination of seed treatment carbendazim 2g/kg + carbofuran 1 kg/ha + manozeb 0.25% spray (T7) provided maximum control of diseases at almost all the locations.

However among various organics neem seed kernal spray and its combination with others provided maximum control of rust, leaf spots and mosaic disease. The maximum control of plant parasitic nematodes was recorded in treatment combination of seed treatment with carbendazim 2g/kg + carbofuran 1 kg/ha + manozeb 0.25% spray. Among organics T_4 (Seed treatment with *Trichoderma* 5g/kg + Seed treatment with Neem seed powder 50g/kg) also provided considerable control of nematodes.

Table PPT 10.2. Disease incidence in different treatments

Treatment	Anand			Hyderabad	Jhansi		
	Mosaic	Leaf spot	Rust	Rust	Rust	RKI	Total Parasitic nematodes/250 g soil*
T_1	6.55	3.42	5.46	3.00	11.42	2.0	680
T_2	6.56	3.41	5.46	3.33	26.39	2.5	640
T_3	6.03	2.77	5.38	3.33	28.40	2.0	720
T_4	6.56	3.41	5.46	2.00	31.36	2.5	660
T_5	5.98	2.77	5.36	2.67	22.82	3.0	700
T_6	5.97	2.77	5.41	1.33	14.63	3.0	720
T_7	4.55	1.99	2.64	1.33	18.27	1.8	620
T_8	6.57	3.42	5.50	4.00	39.69	4.0	1660
CD (5%)	0.87	0.96	0.36	1.00	6.62	0.210	-

* Initial nematode population 536/250 g soil

Table PPT 10.3. Green forage yield (q/ha) in different treatments

Treatment	Anand	Jhansi	Hyderabad	Rahuri
Cuts	5	6	3	17
T_1	821.0	360.80	299.9	1150
T_2	887.0	361.25	305.4	1193
T_3	864.0	353.80	338.9	1307
T_4	814.0	360.95	344.2	1107
T_5	857.0	372.20	305.5	1337
T_6	840.0	355.10	388.9	1310
T_7	870.0	376.25	410.8	1127
T_8	715.0	271.10	172.2	1113
CD (5%)	17.240	9.72	10.05	140.1
CVv (%)	9.2	7.10	14.9	46.20 (SE)

The green fodder yield at different locations under various treatments is presented in Table 10.3. All the treatments recorded significantly higher yield than untreated control. At Anand, Jhansi and Hyderabad treatment $T_{6,}$ combination of seed treatment with Neem seed powder 50g/kg and Neem seed kernal spray 5% recorded highest yield. At Rahuri treatment T5 (seed treatment with Trichoderma + foliar spray of NSKE provided maximum green fodder yield.

PPT-11: Assessment of yield losses due to rust in Lucerne seed crop

(Locations : Anand, Hyderabad and Rahuri)

This was the first year of the trial for assessment of yield losses due to diseases in Lucerne seed crop. It consisted two different treatments i.e. protected with spray of mancozeb @ 2.5g/l and tebuconazol @ 0.5ml/l alternately at 15 days interval and untreated control. The result reveals that at all the locations the disease intensity was reduced to a considerable level along with the increase in seed yield (Table PPT-11.1).

Table PPT-11.1: Effect of treatments on disease intensity and seed yield

Treatments	Disease intensity			Seed yield (q/ha)		
	Anand	Hyderabad	Rahuri	Anand	Hyderabad	Rahuri
Protected	21.80	2.00	5.3	4.55	1.05	4.09
Unprotected	32.67	5.00	45.5	3.59	0.55	3.25

PPT-12: Integrated disease management in White Clover

(Location: Palampur)

This is the first year of trail on integrated disease management on white clover, consisting of ten treatments as given in table, PPT- 12.1. The disease incidence under various treatments is presented in the table. Treatment T9 was found to be most effective in both bringing down the disease incidence and increase in the yield.

The green fodder yield at different locations under various treatments is presented in Table 10.3. All the treatments recorded significantly higher yield than untreated control. At Anand, Jhansi and Hyderabad treatment $T_{6,}$ combination of seed treatment with Neem seed powder 50g/kg and Neem seed kernal spray 5% recorded highest yield. At Rahuri treatment T5 (seed treatment with Trichoderma + foliar spray of NSKE provided maximum green fodder yield.

PPT-11: Assessment of yield losses due to rust in Lucerne seed crop

(Locations : Anand, Hyderabad and Rahuri)

This was the first year of the trial for assessment of yield losses due to diseases in Lucerne seed crop. It consisted two different treatments i.e. protected with spray of mancozeb @ 2.5g/l and tebuconazol @ 0.5ml/l alternately at 15 days interval and untreated control. The result reveals that at all the locations the disease intensity was reduced to a considerable level along with the increase in seed yield (Table PPT-11.1).

Table PPT-11.1: Effect of treatments on disease intensity and seed yield

Treatments	Disease intensity			Seed yield (q/ha)		
	Anand	Hyderabad	Rahuri	Anand	Hyderabad	Rahuri
Protected	21.80	2.00	5.3	4.55	1.05	4.09
Unprotected	32.67	5.00	45.5	3.59	0.55	3.25

PPT-12: Integrated disease management in White Clover

(Location: Palampur)

This is the first year of trail on integrated disease management on white clover, consisting of ten treatments as given in table, PPT- 12.1. The disease incidence under various treatments is presented in the table. Treatment T9 was found to be most effective in both bringing down the disease incidence and increase in the yield.

Table PPT-12.1: Disease incidence and GFY (q/HA)

Treatments	Disease Intensity		GFY (q/ha)
	Powdery mildew	Clover Rot	
T_1	37.5	1.3	2.6
T_2	40.8	2.9	2.3
T_3	21.9	0.7	2.2
T_4	28.5	2.3	3.0
T_5	10.4	1.1	3.1
T_6	9.5	3.6	2.7
T_7	6.3	1.1	3.2
T_8	6.3	3.6	3.1
T_9	4.2	1.1	3.5
T_{10}	46.6	4.3	2.2
CD	0.87	0.36	0.20
CV	1.99	9.59	4.22

T1= Seed treatment with Bavistin @ 2g/kg seed; T2= Seed treatment with *Trichoderma viridae* @ 5 g/kg seed; T3= T1+ foliar spray of Bavistin @ 0.5 %; T4= T2+ foliar spray of Bavistin @ 0.5 %; T5= T1+ foliar spray of Contaf @ 0.4 %; T6= T2+ foliar spray of Contaf @ 0.4 %; T1= T1+ foliar spray of Bavistin followed by contaf; T8= T2+ foliar spray of Bavistin followed by contaf; T9= T1+T2+ foliar spray of Bavistin followed by contaf; T10= Untreated control.

CHAPTER-4

BREEDER SEED PRODUCTION

BREEDER SEED PRODUCTION IN FORAGE CROPS (RABI 2009-10)

(Table Reference : 1 & 2)

In Rabi 2009-10, the indent for Breeder Seed Production was received from DAC, GOI for 22 varieties in four forage crops *viz*., Oat, Berseem, Lucerne and Gobhi Sarson. The allocation for producing the indented quantity of Breeder Seed i.e. 277.59 quintal was made to ten Breeder Seed producing centers of the different SAUs/ICAR institutes. Among quantity indented for different forage crops, the maximum was for Oat (224.30q) followed by Berseem (45.25q), Lucerne (7.60q) and minimum was for Gobhi Sarson (0.44q) which clearly indicates that among several forage crop species, substantial demand was for Oat followed by Berseem at national perspective.

The final Breeder Seed Production Report (BSP-IV) received from different seed producing centers revealed that in general there was no shortfall in production of any varieties except for Bundel Berseem-3 (-3.50q) and T-9 (-1.20q). When we talk of overall production, as compared to indent in Oat (224.30q), the actual production was 370.50q, which was 146.20q surplus, similarly in Berseem, the actual prouction was 14.70q surplus as against indent for 45.25q. In Lucerne and Gobhi Sarson the actual production was slightly more or at par to the quantity indented. The overall Breeder Seed Production was 161.70q more or we can say that it was 58.25 percent higher as evident from seed production of 439.29q against the indent for 277.59q.

In general we can conclude that almost all the producing centers were able to produce more than the indented quantity for different forage varieties.

Table 1: Centre –wise Breeder Seed Production

(q)

Sl. No.	Name of Producing Centre /State	Name of Variety	DAC Indent	Actual allocation as per BSP-1 target	Actual production	Production Surplus (+) Deficit (-) Over BSP-1 target
1.	GAU, Anand	Kent	18.00	18.00	18.00	-
		Anand-2 (GAUL-1)	4.00	4.00	4.00	-
		AL-3	1.00	1.00	1.00	-
2.	IGFRI, Jhansi	Kent	30.80	30.80	90.00	(+) 59.20
		JHO-822	28.00	28.00	55.00	(+) 27.00
		JHO-851	5.00	5.00	20.00	(+) 15.00
		JHO-99-2	5.00	5.00	8.00	(+) 3.00
		Wardan	0.90	0.90	3.00	(+) 2.10
		Bundel Berseem-3	8.00	8.00	3.00 + 1.50*	(-) 3.50
3.	PAU, Ludhiana	Kent	50.00	50.00	60.00	(+) 10.00
		BL-1	3.15	3.15	4.00	(+) 0.85
		BL-10	8.70	8.70	9.00	(+) 0.30
		BL-42	2.70	2.70	3.25	(+) 0.55
		BL-22	1.00	1.00	2.00	(+) 1.00
		GSL-1	0.11	0.11	0.11	-
		GSC-5	0.03	0.03	0.03	-
4.	CCS HAU, Hisar	HJ-8	10.00	10.00	5.50 + 5.00*	(+) 0.50
		Mescavi	6.20	6.20	6.20	-
		T-9	1.60	1.60	0.40	(-) 1.20
5.	JNKVV, Jabalpur	Kent	20.00	20.00	15.00	(-) 5.00
		JB-1	14.60	14.60	28.00	(+) 13.40
6.	GBPUAT, Pantnagar	UPO-212	3.50	3.50	10.00	(+) 6.50
7.	RAU, Bikaner	Kent	10.00	10.00	34.00	(+) 24.00
8.	SKUAST, Srinagar	Sabzar	44.00	44.00	50.00	(+) 6.00
9.	MPKV, Rahuri	RL-88	1.00	1.00	3.00	(+) 2.00
10.	CSK HPKV, Palampur	HPN-1(Sheetal)	0.30	0.30	0.30	-

Remarks: * - Carry over seed

Table 2: Variety -wise Breeder Seed Production

(q)

Sl. No.	Varieties	Actual allocation as per BSP-1	Actual Production	Production Surplus (+)/ Deficit (-) Over BSP-1
1.	Oat - Kent	128.80	217.00	(+) 88.20
	HJ-8	10.00	10.50	(+) 0.50
	UPO-212	3.50	10.00	(+) 6.50
	SABZAR	44.00	50.00	(+) 6.00
	JHO-822	28.00	55.00	(+) 27.00
	JHO-851	5.00	20.00	(+) 15.00
	JHO-99-2	5.00	8.00	(+) 3.00
2.	Berseem - JB-1	14.60	28.00	(+) 13.40
	Wardan	0.90	3.00	(+) 2.10
	Bundel Berseem-3	8.00	4.50	(-) 3.50
	Mescavi	6.20	6.20	-
	BL-1	3.15	4.00	(+) 0.85
	BL-10	8.70	9.00	(+) 0.30
	BL-42	2.70	3.25	(+) 0.55
	BL-22	1.00	2.00	(+) 1.00
3.	Lucerne - T-9	1.60	0.40	(-) 1.20
	RL-88	1.00	3.00	(+) 2.00
	Anand-2	4.00	4.00	-
	AL-3	1.00	1.00	-
4.	Gobhi Sarson - HPN-1 (Sheetal)	0.30	0.30	-
	GSL-1	0.11	0.11	-
	GSC-5	0.03	0.03	-
	Total	**277.59**	**439.29**	**(+)161.70**

WEATHER REPORT FOR RABI- 2009-10

The weather report of the centres across the different zones during Rabi 2009-10 programme has been presented in this section. The weather parameters from 40th weak (Oct. 01- Oct. 07, 2009) to 21st week (May 21- May 27, 2010) were taken into consideration, which covers the Rabi 2009-10 season for all the testing locations under AICRP on forage crop [Table MET-1.1 (a) to 1.4 (b)]. During the reporting period, weather variations are clearly visible in maximum and minimum temperature and day length in different zones, which has wide impact on growth and yield of different forage crop and varieties. The weather parameters have also shown close correlation with the incidence and surveillance of insect pest and diseases. Weather parameters influenced the growth and yield performance of different anuual and perennial forage crop varieties.

Temperature

Minimum temperature was recorded in Hill zone irrespective of locations. Within Hill zone Almora remained the coolest location recording -1.6 to -2.1^{0}C from 51st to 52nd meteorological week. Overall temperature between 51st to 5th week was below 0^{0}C. Among Hill zone locations, maximum average temperature was also highest at Almora i.e. 33.7^{0}C during 15th week. In North-West zone, Hisar recorded lowest minimum temperature (2.0^{0}C) during 52nd meteorological week. Maximum temperature was highest (46.2^{0}C) at Bikaner followed by Hisar (45.2^{0}C). In North- East zone, Ranchi recorded the lowest temperature i.e. 4.0^{0}C during 1st meteorological week followed by Faizabad (4.8^{0}C) during 52nd meteorological week. In this zone, maximum temperature was recorded at Bhubneshwar (40.5^{0}C) during 15th week followed by Ranchi (40.0^{0}C) and Kalyani (38.3^{0}C). In Central zone, Jhansi recorded the lowest temperature (4.9^{0}C) during 1st to 4th meteorological week followed by Rahuri (8.1^{0}C) and Anand (11.1^{0}C) during the 4th and 1st meteorological week, respectively. In this zone, maximum temperature was recorded at Jhansi (45.7^{0}C) during 21st meteorological week followed by Anand (44.2^{0}C) and Rahuri (44.2^{0}C) during the same meteorological week. In South zone, Hyderabad recorded the minimum temperature (11.8^{0}C) during 4th meteorological week followed by Mandya (13.8^{0}C) and Coimbatore (18.5^{0}C).

Likewise maximum temperature was recorded at Hyderabad (41.3^0C) in 19^{th} meteorological week followed by Coimbatore (37.0^0C) and Mandya (35.6^0C).

Rainfall

In general rainfall received during the reporting period was sparse as being reflected in the data on rainfall.

In Hill zone, Palampur received more rainfall in comparison to Almora. In Palampur maximum rainfall (106.0 mm) was received during 6^{th} week followed by 51.6 mm during 46^{th} meteorological week . Almora received maximum rainfall (93.5 mm) in 3 rainy days in 40^{th} meterological week followed by 64.0 mm during 2 rainy days in 6^{th} meteorological week. In North-West zone, Ludhiana and Pantnagar received good amount of rainfall in comparison to Hisar and Bikaner. The amont of rainfall received by Bikaner was almost negligible amount. In North-East zone, good amount of rainfall was received in Jorhat during 15^{th} to 21^{st} meteorological week. Kalyani and Bhubneshwar too received the ample amount during these weeks. In Central zone, maximum rainfall (78.2 mm) in 4 rainy days was received at Urulikanchan followed by 64.5 mm rainfall in 3 rainy days at Rahuri centre. At Anand, rainfall received was very less. In South zone, Vellayani received maximum rainfall (285.8 mm) in 7 rainy days during 45^{th} meteorological week followed by Coimbatore (158.2 mm) in same week and Hyderabad (82.5 mm) during 40^{th} meteorological week.

Relative Humidity

In Hill zone, Relative Humidity (RH) was higher (100.0%) in morning at Almora in 49^{th} and 4^{th} meteorological week as compared to Palampur (89.0%) in 40^{th} and 46^{th} meteorological week. In North-West zone, RH ranged from 27.0 to 100.0% in morning hours but in afternoon ranged between 8.0 to 90.0%. Lowest RH was recorded at Bikaner in morning (27.0%) and in afternoon (8.0%). In North- East zone maximum RH (98.7%) in morning was recorded at Jorhat followed by Kalyani (97.7%) whereas minimum (71.3.7%) was recorded at Ranchi.

In afternoon, RH was minimum (26.4%) at Ranchi and maximum (86.4%) at Jorhat. Average RH was also highest at Jorhat center (91.4%).

In Central zone, minimum RH (41.0%) was recorded in morning at Jhansi and maximum (100.0%) was recorded at Urulikanchan followed by Jhansi and Rahuri (94.0%). In South zone, RH at Vellayani and Mandya location was very high in the morning. RH in the afternoon was also very high at Coimbatore.

Sunshine hours

Sunshine hours were recorded at different locations in different zone. In Hill zone, sunshine hours were maximum (10.4h) in Palampur zone in comparison to Almora (10.0h). In North-West zone sunshine hours were maximum in Ludhiana (11.1 h) followed by Pantnagar (10.6h) and Hisar and Bikaner (9.6h). Ranchi recorded maximum sunshine hours (10.2h) in North- East zone. In Central zone sunshine hours were more or less same at Anand and Jhansi centre. In South zone maximum sunshine (10.1 h) was recorded at Hyderabad, whereas sunshine hours recorded at Coimbatore and Mandya were at par.

Table MET-1.1(a) : Temperature (^{0}C) at AICRP-FC trial locations during crop growth period, Rabi 2009-10

Met. Week & Month	Hill Zone				North-West Zone							
	Almora		Palampur		Ludhiana		Hisar		Bikaner		Pantnagar	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
01-Oct. 07, 2009	26.0	16.2	27.1	15.6	32.9	22.3	34.6	22.5	38.1	25.4	30.1	22.6
41-Oct. 08-Oct. 14, 2009	27.1	11.5	26.2	11.8	32.8	18.3	34.7	16.4	37.3	24.1	30.8	16.6
42-Oct. 15-Oct 21, 2009	27.4	7.2	25.2	10.9	31.7	15.3	33.2	14.9	35.7	22.4	30.8	13.8
43-Oct. 22-Oct. 28, 2009	26.5	5.7	24.1	8.7	30.3	11.3	32.1	10.3	34.9	17.7	29.7	11.6
44-Oct. 29-Nov. 04, 2009	26.6	5.6	24.8	9.9	30.3	13.6	31.7	13.6	35.3	18.9	30.1	13.8
45-Nov. 05-Nov. 11, 2009	25.0	3.1	22.3	8.8	26.3	12.5	29.7	11.7	32.1	16.8	29.4	12.3
46-Nov. 12-Nov. 18, 2009	21.2	8.8	19.2	8.2	23.8	11.8	25.0	11.6	25.7	145.0	26.0	14.7
47-Nov.19-Nov. 25, 2009	22.1	2.4	19.7	5.1	23.7	7.1	25.5	5.7	28.7	12.7	24.7	8.8
48-Nov. 26-Dec. 02, 2009	22.5	2.2	19.9	6.7	25.1	10.6	25.5	6.3	27.5	11.3	25.1	9.5
49-Dec. 03-Dec. 09, 2009	21.5	2.6	19.9	6.7	23.4	8.0	25.5	6.7	26.8	12.2	24.8	8.1
50-Dec. 10-Dec. 16, 2009	19.1	2.2	20.4	6.3	21.6	8.8	23.1	7.8	24.7	13.0	23.9	9.2
51-Dec. 17-Dec. 23, 2009	20.2	-1.6	18.0	7.6	20.5	5.2	21.9	3.0	23.7	8.5	23.4	5.8
52-Dec. 24-Dec.31, 2009	18.8	-2.1	17.1	3.5	18.9	3.8	21.6	2.0	25.5	9.7	20.3	4.0
1-Jan. 01-Jan 07, 2010	19.8	0.7	17.4	3.6	14.2	7.1	16.0	5.5	22.7	9.2	15.0	8.3
2-Jan. 08-Jan. 14, 2010	20.0	-1.2	17.2	3.9	11.9	6.4	13.5	5.9	15.4	3.6	15.5	6.4
3-Jan. 15-Jan 21, 2010	21.4	0.4	19.5	5.2	14.8	5.5	16.4	3.6	22.0	4.9	13.5	8.2
4-Jan. 22-Jan. 28, 2010	21.3	-0.9	19.1	6.0	19.5	6.5	19.3	7.7	25.6	11.4	18.9	5.1
5-Jan. 29-Feb-04, 2010	20.1	-0.9	17.4	5.0	21.1	7.0	25.1	5.9	26.7	12.2	22.8	5.2
6-Feb. 05-Feb-11, 2010	19.6	1.6	15.3	5.9	20.7	10.1	24.5	8.2	26.9	12.3	22.5	9.7
7-Feb. 12-Feb.-18, 2010	19.9	1.1	17.4	4.8	21.5	7.2	24.3	5.5	24.2	9.4	23.6	8.3
8-Feb. 19-Feb. 25 2010	22.5	4.9	20.8	7.7	24.3	10.0	26.7	8.4	27.9	13.2	25.3	10.1
9-Feb. 26-Mar. 04, 2010	25.1	6.4	21.5	11.1	26.9	13.5	32.8	13.4	33.7	19.2	24.6	11.8
10-Mar. 05-Mar. 11, 2010	25.4	4.8	22.4	8.4	26.2	10.9	29.6	12.7	30.6	16.6	28.5	12.5
11-Mar.12-Mar. 18, 2010	26.0	7.0	25.7	11.6	30.5	14.3	34.2	17.3	36.6	20.9	30.9	13.2
12-Mar. 19-Mar. 25, 2010	30.5	10.1	29.4	15.9	34.8	17.1	38.8	19.4	39.8	23.1	34.2	16.2
13-Mar. 26-Apr. 01, 2010	29.8	8.4	28.5	14.7	35.4	17.5	38.6	19.0	39.6	23.4	30.9	13.7
14-Apr. 02-Apr. 08, 2010	30.6	8.4	28.9	13.9	36.4	16.5	38.0	16.5	39.2	23.2	37.8	15.0
15-Apr. 09-Apr.-15, 2010	33.7	9.6	31.4	16.0	39.8	19.1	41.8	19.3	42.1	25.3	40.8	17.2
16-Apr. 16-Apr. 22, 2010	32.6	11.9	30.7	16.5	40.2	24.1	43.3	24.0	42.6	29.1	39.2	23.7
17-Apr. 23-Apr.29, 2010	32.2	11.6	30.1	16.7	38.7	21.2	41.6	21.5	41.7	27.4	39.1	19.0
18-Apr. 30-May. 06, 2010	29.9	13.9	31.8	18.7	39.0	25.3	42.1	23.9	41.4	26.3	36.3	23.2
19-May 07-May.13, 2010			28.9	16.6	38.0	23.0	40.1	22.9	40.3	27.5	36.8	19.8
20-May. 14-May20, 2010					40.9	24.5	44.9	24.5	44.1	29.3	40.6	24.1
21-May. 21-May. 27 2010							45.2	24.6	46.2	31.5	38.7	25.8

Table MET-1.1 (b) : Temperature (^{0}C) at AICRP-FC trial locations during crop growth period, Rabi 2009-10

Met. Week & Month	North-East Zone											
	Faizabad		Ranchi		Bhubaneswar		Jorhat		Raipur		Kalyani	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min	Max.	Min.
40-Oct. 01-Oct. 07, 2009	32.8	25.2	27.8	21.8	30.6	25.1	32.2	25.5			31.8	25.1
41-Oct. 08-Oct. 14, 2009	32.2	21.4	28.6	16.6	33.2	23.7	30.4	23.5			33.1	23.8
42-Oct. 15-Oct 21, 2009	31.5	17.2	28.8	14.9	33.3	22.1	30.4	23.3			32.8	22.7
43-Oct. 22-Oct. 28, 2009	30.9	12.3	27.3	9.7	32.5	17.9	30.8	20.6			32.0	18.3
44-Oct. 29-Nov. 04, 2009	30.6	13.3	27.2	12.3	32.4	19.7	18.6	30.2			32.1	19.5
45-Nov. 05-Nov. 11, 2009	30.3	14.4	28.2	15.4	32.3	22.4	18.0	29.2			32.1	28.8
46-Nov. 12-Nov. 18, 2009	26.8	18.9	27.3	17.2	34.0	23.7	18.2	25.2			32.0	21.9
47-Nov.19-Nov. 25, 2009	25.5	7.9	22.4	7.8	28.3	18.5	14.0	25.8			27.6	15.0
48-Nov. 26-Dec. 02, 2009	26.6	7.9	23.5	7.2	28.9	13.7	13.1	26.5	26.9	10.8	28.3	13.1
49-Dec. 03-Dec. 09, 2009	26.1	7.9	24.2	7.0	29.7	15.5	14.9	24.4	28.6	13.1	28.1	13.6
50-Dec. 10-Dec. 16, 2009	25.7	8.5	24.6	8.1	30.0	15.8	12.8	23.0	29.5	14.9	27.1	12.4
51-Dec. 17-Dec. 23, 2009	24.7	8.7	23.6	7.9	30.1	17.5	12.2	23.6	26.1	13.5	27.3	13.6
52-Dec. 24-Dec.31, 2009	24.8	4.8	21.1	4.8	27.9	12.9	9.3	22.7	26.1	11.6	24.6	7.3
1-Jan. 01-Jan 07, 2010	15.9	7.8	19.4	4.0	27.7	12.7	8.8	23.1	25.6	8.6	22.0	8.4
2-Jan. 08-Jan. 14, 2010	15.6	7.6	22.4	6.4	28.7	17.3	9.6	23.3	26.6	14.7	22.5	9.7
3-Jan. 15-Jan 21, 2010	15.3	7.7	21.7	5.7	27.3	14.9	10.1	19.0	25.7	9.3	21.5	10.8
4-Jan. 22-Jan. 28, 2010	17.6	5.4	24.6	4.4	29.0	12.0	9.4	25.9	27.8	8.7	26.3	8.1
5-Jan. 29-Feb-04, 2010	25.0	7.1	24.1	5.9	30.3	14.0	10.0	26.4	28.5	11.1	27.4	8.4
6-Feb. 05-Feb-11, 2010	25.0	9.5	26.2	8.7	32.0	15.4	10.3	26.1	28.6	13.2	28.5	12.9
7-Feb. 12-Feb.-18, 2010	23.8	11.8	27.3	12.3	34.5	19.5	12.1	27.0	31.7	17.4	29.0	16.9
8-Feb. 19-Feb. 25 2010	25.9	9.3	26.6	9.4	33.5	21.9	13.1	26.7	32.1	15.0	30.8	15.2
9-Feb. 26-Mar. 04, 2010	29.2	12.5	30.5	11.9	37.5	20.4	15.4	24.6	34.4	16.7	34.7	19.1
10-Mar. 05-Mar. 11, 2010	30.7	13.1	32.5	13.2	36.3	17.6	15.5	27.6	36.0	20.2	34.3	21.2
11-Mar.12-Mar. 18, 2010	32.1	13.4	33.1	14.6	37.5	23.7	15.4	28.2	36.3	19.3	35.0	21.3
12-Mar. 19-Mar. 25, 2010	34.4	16.4	35.4	15.5	38.7	24.3	18.0	29.2	39.7	20.4	37.7	23.6
13-Mar. 26-Apr. 01, 2010	39.2	17.0	36.9	18.7	36.4	26.1	17.8	24.1	40.4	24.8	36.5	25.9
14-Apr. 02-Apr. 08, 2010	39.7	16.2	37.3	17.8	39.2	26.4	20.3	26.7	41.3	22.5	37.5	26.6
15-Apr. 09-Apr.-15, 2010	41.8	19.2	39.0	19.0	40.5	27.0	21.5	27.4	43.3	24.3	38.3	27.3
16-Apr. 16-Apr. 22, 2010	42.5	23.6	40.0	21.5	39.1	26.9	20.5	26.5	43.4	26.3	38.0	27.4
17-Apr. 23-Apr.29, 2010	41.4	23.2	39.5	22.6	38.6	26.8	19.6	24.3	43.1	26.8	36.7	23.9
18-Apr. 30-May. 06, 2010			35.7	21.0	38.8	25.5	22.5	29.9	40.0	25.5	35.7	25.0
19-May 07-May.13, 2010			36.1	21.6	37.4	27.3	22.3	27.2			35.0	26.6
20-May. 14-May20, 2010			39.2	24.3	36.8	28.0	22.3	28.6			35.9	27.1
21-May. 21-May. 27 2010			35.9	24.2	35.1	26.0	23.6	29.8			33.7	25.4

Table MET-1.1 (c) : Temperature (^{0}C) at AICRP-FC trial locations during crop growth period, Rabi 2009-10

Met. Week & Month	Central Zone							
	Jhansi		Rahuri		Urulikanchan		Anand	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
40-Oct. 01-Oct. 07, 2009	30.2	23.2	31.8	22.0	30.0	21.6	36.3	25.5
41-Oct. 08-Oct. 14, 2009	33.7	20.6	31.6	20.2	31.3	18.8	34.4	23.3
42-Oct. 15-Oct 21, 2009	34.2	16.1	32.9	19.2	33.8	17.5	36.6	19.8
43-Oct. 22-Oct. 28, 2009	33.3	10.7	32.0	14.0	33.0	13.6	36.0	16.0
44-Oct. 29-Nov. 04, 2009	33.0	11.2	31.9	10.7	32.8	11.1	35.9	16.8
45-Nov. 05-Nov. 11, 2009	31.6	13.4	29.1	17.5	28.7	18.6	34.2	18.4
46-Nov. 12-Nov. 18, 2009	26.2	17.3	26.4	19.5	29.6	19.8	28.5	18.9
47-Nov.19-Nov. 25, 2009	25.9	6.5	28.7	13.5	31.9	14.0	30.3	14.8
48-Nov. 26-Dec. 02, 2009	27.6	7.9	28.8	12.1	30.9	12.1	31.4	14.1
49-Dec. 03-Dec. 09, 2009	27.5	9.7	30.1	11.9	32.5	12.9	30.3	14.1
50-Dec. 10-Dec. 16, 2009	26.0	10.6	29.7	12.6	31.2	12.4	31.6	17.0
51-Dec. 17-Dec. 23, 2009	22.2	8.0	28.4	12.9	29.6	13.6	31.4	17.8
52-Dec. 24-Dec.31, 2009	22.4	7.1	28.0	8.7	30.7	10.3	31.8	17.5
1-Jan. 01-Jan 07, 2010	20.4	4.9	28.0	11.7	31.5	13.8	27.5	11.1
2-Jan. 08-Jan. 14, 2010	14.4	5.9	28.6	11.9	30.9	13.3	27.8	12.5
3-Jan. 15-Jan 21, 2010	17.1	4.9	28.1	9.8	31.2	11.8	28.1	11.6
4-Jan. 22-Jan. 28, 2010	24.2	4.9	28.1	8.1	31.4	8.7	30.7	11.8
5-Jan. 29-Feb-04, 2010	25.9	7.4	29.7	11.9	32.9	12.1	29.9	13.3
6-Feb. 05-Feb-11, 2010	27.2	10.2	29.9	14.3	32.9	13.6	31.0	16.2
7-Feb. 12-Feb.-18, 2010	24.5	11.1	31.2	13.9	36.1	14.1	30.2	12.5
8-Feb. 19-Feb. 25 2010	27.2	9.4	32.8	13.6	37.1	12.6	32.5	14.8
9-Feb. 26-Mar. 04, 2010	32.6	12.8	33.6	13.9	37.8	14.3	34.9	16.6
10-Mar. 05-Mar. 11, 2010	31.8	12.7	34.3	14.5	37.7	16.1	34.4	18.5
11-Mar.12-Mar. 18, 2010	35.3	14.1	35.4	16.2	38.5	17.1	38.1	17.3
12-Mar. 19-Mar. 25, 2010	38.9	17.0	37.8	17.2	39.9	18.7	39.8	19.3
13-Mar. 26-Apr. 01, 2010	40.2	18.2	37.7	17.3	39.4	18.6	37.2	20.8
14-Apr. 02-Apr. 08, 2010	39.6	17.9	38.1	18.2			38.6	21.6
15-Apr. 09-Apr.-15, 2010	41.9	21.3	39.5	21.0			39.5	22.9
16-Apr. 16-Apr. 22, 2010	43.8	23.0	40.5	22.3			40.8	24.6
17-Apr. 23-Apr.29, 2010	12.5	21.6	40.3	21.2			41.1	23.1
18-Apr. 30-May. 06, 2010	40.7	23.7	37.2	21.2			40.9	25.5
19-May 07-May.13, 2010	42.4	23.5	40.6	20.3			42.0	26.4
20-May. 14-May20, 2010	45.1	26.1	41.2	22.1			42.2	27.3
21-May. 21-May. 27 2010	45.7	26.8	41.2	24.6			44.2	27.9

Table MET-1.1 (d) : Temperature (^{0}C) at AICRP-FC trial locations during crop growth period, Rabi 2009-10

Met. Week & Month	South Zone							
	Hyderabad		Coimbatore		Mandya		Vellayani	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
40-Oct. 01-Oct. 07, 2009	28.6	22.8	29.3	22.4	28.6	19.4	29.6	24.3
41-Oct. 08-Oct. 14, 2009	31.3	22.1	32.1	21.8	29.8	19.5	29.9	24.4
42-Oct. 15-Oct 21, 2009	32.6	18.7	32.7	21.5	30.4	19.2	30.3	24.1
43-Oct. 22-Oct. 28, 2009	31.6	14.9	32.7	21.1	30.9	18.8	31.2	23.9
44-Oct. 29-Nov. 04, 2009	31.1	15.2	30.3	22.4	32.0	18.5	30.0	26.6
45-Nov. 05-Nov. 11, 2009	28.8	21.1	27.6	22.4	30.3	19.3	29.3	23.5
46-Nov. 12-Nov. 18, 2009	30.4	21.7	29.5	22.3	30.2	19.7	30.8	23.9
47-Nov.19-Nov. 25, 2009	29.1	17.8	29.7	22.4	30.7	19.7	29.2	23.5
48-Nov. 26-Dec. 02, 2009	28.5	12.4	29.5	22.2	32.6	17.1	28.4	23.6
49-Dec. 03-Dec. 09, 2009	29.1	14.0	29.3	20.9	31.4	17.3	29.4	23.6
50-Dec. 10-Dec. 16, 2009	28.8	14.4	29.7	20.3	31.0	16.9	30.6	23.5
51-Dec. 17-Dec. 23, 2009	28.5	15.6	29.0	22.5	30.4	17.4	30.9	23.9
52-Dec. 24-Dec.31, 2009	27.7	12.9	28.3	20.9	28.9	17.8	30.8	23.7
1-Jan. 01-Jan 07, 2010	28.8	12.1	30.6	18.8	29.5	16.6	31.2	23.2
2-Jan. 08-Jan. 14, 2010	27.7	17.8	30.8	22.6	29.7	17.1	30.9	22.9
3-Jan. 15-Jan 21, 2010	28.0	13.6	30.4	20.8	29.9	16.9	31.3	
4-Jan. 22-Jan. 28, 2010	28.0	11.8	30.1	18.7	30.0	13.8	31.5	22.9
5-Jan. 29-Feb-04, 2010	29.4	13.7	30.9	19.2	30.5	14.5	31.6	23.7
6-Feb. 05-Feb-11, 2010	31.0	15.1	30.9	18.5	30.8	14.5	31.7	24.3
7-Feb. 12-Feb.-18, 2010	33.5	17.7	33.4	21.5	31.4	15.1	31.9	23.7
8-Feb. 19-Feb. 25 2010	35.3	20.2	34.5	21.4	34.1	18.9	32.6	23.9
9-Feb. 26-Mar. 04, 2010	31.4	15.8	35.0	20.9	35.0	20.4	33.5	24.2
10-Mar. 05-Mar. 11, 2010	37.0	20.7	35.6	23.0	35.0	19.8	33.7	24.3
11-Mar.12-Mar. 18, 2010	35.9	19.3	35.3	23.3	35.2	19.4	33.8	24.5
12-Mar. 19-Mar. 25, 2010	38.1	19.8	36.2	20.3	35.6	18.6	33.9	24.4
13-Mar. 26-Apr. 01, 2010	38.3	22.1	35.7	24.1	35.0	22.6	33.6	24.5
14-Apr. 02-Apr. 08, 2010	39.8	21.0	37.0	25.6	35.5	21.3	34.1	25.0
15-Apr. 09-Apr.-15, 2010	40.6	24.0	36.9	24.9	35.6	21.5	34.8	25.6
16-Apr. 16-Apr. 22, 2010	40.8	25.7	35.9	25.2	35.0	22.0	34.5	25.8
17-Apr. 23-Apr.29, 2010	40.3	26.5	36.6	25.3	34.4	21.4	34.4	35.7
18-Apr. 30-May. 06, 2010	37.2	23.8	34.8	24.5	34.2	21.9	34.5	25.9
19-May 07-May.13, 2010	41.3	27.1		25.4	34.3	22.0	33.7	25.7
20-May. 14-May20, 2010	40.4	26.2	35.0	24.9	34.3	22.4	33.2	25.5
21-May. 21-May. 27 2010	37.6	25.2	34.9	25.0	31.9	22.5	30.9	24.2

Table MET-1.2 (a) : Rainfall (RF,mm and Rainy days (RD,No.) at AICRP-FC trial locations during crop growth period, Rabi 2009-10

Met. Week & Month	Hill Zone			North-West Zone							
	Almora		Palampur	Ludhiana		Hisar		Bikaner		Pantnagar	
	RF	RD	RF	RF	RD	RF	RD	RF	RD	RF	RD
40-Oct. 01-Oct. 07, 2009	93.5	3	33.9	26.2	1	0.0	0	0.0	0	29.8	5
41-Oct. 08-Oct. 14, 2009	0.0	0	0.0	0.0	0	0.0	0	0.0	0	0.0	0
42-Oct. 15-Oct 21, 2009	0.0	0	0.0	0.0	0	0.0	0	0.0	0	0.0	0
43-Oct. 22-Oct. 28, 2009	0.0	0	0.0	0.0	0	0.0	0	0.0	0	0.0	0
44-Oct. 29-Nov. 04, 2009	0.0	0	0.0	0.0	0	0.0	0	0.0	0	0.0	0
45-Nov. 05-Nov. 11, 2009	0.0	0	17.8	1.0	0	0.0	0	0.0	0	0.0	0
46-Nov. 12-Nov. 18, 2009	12.5	2	51.6	4.1	0	0.0	0	0.0	0	20.6	2
47-Nov.19-Nov. 25, 2009	0.0	0	0.0	0.0	0	0.0	0	0.0	0	0.0	0
48-Nov. 26-Dec. 02, 2009	0.0	0	0.0	5.1	1	0.0	0	0.0	0	0.0	0
49-Dec. 03-Dec. 09, 2009	0.0	0	0.0	0.0	0	0.0	0	0.0	0	0.0	0
50-Dec. 10-Dec. 16, 2009	0.0	0	0.0	0.0	0	0.0	0	1.0	0	0.0	0
51-Dec. 17-Dec. 23, 2009	0.0	0	0.2	0.0	0	0.0	0	0.0	0	0.0	0
52-Dec. 24-Dec.31, 2009	0.0	0	0.0	0.0	0	0.0	0	0.0	0	0.0	0
1-Jan. 01-Jan 07, 2010	4.5	1	17.4	18.4	0	10.5	1	1.0	0	1.2	1
2-Jan. 08-Jan. 14, 2010	12.0	2	5.6	0.0	0	1.0	0	0.0	0	2.6	1
3-Jan. 15-Jan 21, 2010	0.0	0	0.0	0.0	0	0.0	0	0.0	0	0.0	0
4-Jan. 22-Jan. 28, 2010	0.0	0	0.0	0.0	0	0.0	0	0.0	0	0.0	0
5-Jan. 29-Feb-04, 2010	0.0	0	2.2	0.0	0	0.0	0	0.0	0	0.0	0
6-Feb. 05-Feb-11, 2010	64.0	2	106.0	25.0	0	7.6	1	0.0	0	32.2	2
7-Feb. 12-Feb.-18, 2010	0.0	0	0.0	0.0	0	0.0	0	0.0	0	0.0	0
8-Feb. 19-Feb. 25 2010	3.0	1	14.6	0.0	0	0.0	0	0.5	0	0.0	0
9-Feb. 26-Mar. 04, 2010	0.0	0	1.0	1.0	0	0.0	0	0.0	0	0.0	0
10-Mar. 05-Mar. 11, 2010	0.0	0	14.6	0.0	0	2.5	1	0.0	0	0.2	0
11-Mar.12-Mar. 18, 2010	0.0	0	0.0	0.0	0	0.0	0	0.0	0	0.0	0
12-Mar. 19-Mar. 25, 2010	0.0	0	0.0	0.0	0	0.0	0	0.0	0	0.0	0
13-Mar. 26-Apr. 01, 2010	0.0	0	10.2	0.0	0	0.0	0	0.0	0	0.0	0
14-Apr. 02-Apr. 08, 2010	0.0	0	0.0	0.0	0	0.0	0	0.0	0	0.0	0
15-Apr. 09-Apr.-15, 2010	0.0	0	0.1	0.0	0	0.0	0	0.0	0	0.0	0
16-Apr. 16-Apr. 22, 2010	13.0	1	24.6	4.4	0	0.0	0	0.0	0		0
17-Apr. 23-Apr.29, 2010	0.0	0	3.2	0.0	0	0.0	0	0.0	0		0
18-Apr. 30-May. 06, 2010	41.0	3	3.0	0.0	0	1.3	0	3.5	1	7.0	1
19-May 07-May.13, 2010			20.8	0.0	0	0.6	0	0.0	0	43.8	1
20-May. 14-May20, 2010				0.0	0	0.0	0	0.0	0	0.0	0
21-May. 21-May. 27 2010					0	0	0	0		10.4	1

Table MET-1.2 (b) : Rainfall (RF,mm and Rainy days (RD,No.) AICRP-FC trial locations during crop growth period, Rabi 2009-10

Met. Week & Month	North-East Zone										
	Faizabad		Ranchi	Bhubaneswar		Jorhat		Raipur		Kalyani	
	RF	RD	RF	RF	RD	RF	RD	RF	RD	RF	RD
40-Oct. 01-Oct. 07, 2009	132.8	3	28.6	135.0	7	19.0	4			66.8	6
41-Oct. 08-Oct. 14, 2009	0.4	1	21.2			39.6	4			0.0	
42-Oct. 15-Oct 21, 2009	0.0		13.7			6.1	2			14.3	1
43-Oct. 22-Oct. 28, 2009	0.0		11.9			0.0	0.0			0.0	
44-Oct. 29-Nov. 04, 2009	0.0		7.7	0.0	0	0.3	1			0.0	
45-Nov. 05-Nov. 11, 2009	0.0		3.6	0.0	0	0.4	1			0.0	
46-Nov. 12-Nov. 18, 2009	3.2	1	2.0	4.3	2	2.8	4			4.0	3
47-Nov.19-Nov. 25, 2009	0.0		2.2	28.5	1	0.0	0.0			0.0	
48-Nov. 26-Dec. 02, 2009	0.0		3.3	0.0	0	0.0	0.0	0.0	0	0.0	
49-Dec. 03-Dec. 09, 2009	0.0		0.7	0.0	0	0.3	1	0.0	0	0.0	
50-Dec. 10-Dec. 16, 2009	0.0		1.7	0.0	0	0.0	0.0	0.0	0	0.0	
51-Dec. 17-Dec. 23, 2009	0.0		0.5		1	0.1	1	19.2	1	0.0	
52-Dec. 24-Dec.31, 2009	6.6	2	5.1	0.0	0	0.8	2	0.1	0	0.0	
1-Jan. 01-Jan 07, 2010	0.0			0.0	0	0.4	1	0.0	0	0.0	
2-Jan. 08-Jan. 14, 2010	5.4	1		5.6	1	0.0	0.0	15.4	2	0.0	
3-Jan. 15-Jan 21, 2010	0.0			0.0	0	0.0	0.0	0.0	0	0.0	
4-Jan. 22-Jan. 28, 2010	0.0			0.0	0	0.0	0.0	0.0	0	0.0	
5-Jan. 29-Feb-04, 2010	0.0			0.0	0	0.0	0.0	0.0	0	0.0	
6-Feb. 05-Feb-11, 2010	9.7	2		0.0	0	0.0	0.0	1.4	0	0.0	
7-Feb. 12-Feb.-18, 2010	15.4	1		0.0	0	1.4	1	0.0	0	1.4	1
8-Feb. 19-Feb. 25 2010	0.4	1			1	0.1	1	5.6	1	5.8	1
9-Feb. 26-Mar. 04, 2010	0.0			0.0	0	2.8	2	0.0	0	0.0	
10-Mar. 05-Mar. 11, 2010	0.0			4.1	1	0.3	1	0.0	0	0.0	
11-Mar.12-Mar. 18, 2010	0.0			1.3	1	0.1	1	0.8	0	0.2	1
12-Mar. 19-Mar. 25, 2010	0.0			0.0	0	0.1	1	0.0	0	0.0	
13-Mar. 26-Apr. 01, 2010	0.0			0.0	0	11.3	3	0.0	0	0.3	1
14-Apr. 02-Apr. 08, 2010	0.0			0.0	0	22.3	3	0.0	0	0.0	
15-Apr. 09-Apr.-15, 2010	0.0			0.0	0	73.1	6	0.0	0	0.0	
16-Apr. 16-Apr. 22, 2010	0.0			0.0	0	141.6	6	0.0	0	0.0	
17-Apr. 23-Apr.29, 2010	0.0			0.0	0	18.0	5	0.0	0	37.5	2
18-Apr. 30-May. 06, 2010				78.8	2	50.8	5	4.8	1	34.6	3
19-May 07-May.13, 2010				9.4	1	129.4	5			10.2	1
20-May. 14-May20, 2010				2.5	2	69.0	7			33.2	1
21-May. 21-May. 27 2010				101.9	5	62.4	5			19.9	4

Table MET-1.2 (c) : Rainfall (RF,mm) and Rainy days (RD,No.) at AICRP-FC trial locations during crop growth period, Rabi 2009-10

Met. Week & Month	Central Zone							
	Jhansi		Rahuri		Urulikanchan		Anand	
	RF	RD	RF	RD	RF	RD	RF	RD
40-Oct. 01-Oct. 07, 2009	54.8	4	57.6	2	46.8	3	3.6	1
41-Oct. 08-Oct. 14, 2009	0.0		7.2	1			0.0	0
42-Oct. 15-Oct 21, 2009	0.0						0.0	0
43-Oct. 22-Oct. 28, 2009	0.0						0.0	0
44-Oct. 29-Nov. 04, 2009	0.0						0.0	0
45-Nov. 05-Nov. 11, 2009	0.0		64.5	3	60.4	1	0.4	0
46-Nov. 12-Nov. 18, 2009	10.6	2	63.3	4	78.2	4	4.2	1
47-Nov.19-Nov. 25, 2009	0.0						0.0	0
48-Nov. 26-Dec. 02, 2009	0.0						0.0	0
49-Dec. 03-Dec. 09, 2009	0.0						0.0	0
50-Dec. 10-Dec. 16, 2009	0.0						0.0	0
51-Dec. 17-Dec. 23, 2009	13.8	2					0.0	0
52-Dec. 24-Dec.31, 2009	0.0						0.0	0
1-Jan. 01-Jan 07, 2010	0.0						0.0	0
2-Jan. 08-Jan. 14, 2010	1.8						0.0	0
3-Jan. 15-Jan 21, 2010	0.0						0.0	0
4-Jan. 22-Jan. 28, 2010	0.0						0.0	0
5-Jan. 29-Feb-04, 2010	0.0						0.0	0
6-Feb. 05-Feb-11, 2010	2.2						0.0	0
7-Feb. 12-Feb.-18, 2010	10.2	1					0.0	0
8-Feb. 19-Feb. 25 2010	0.0						0.0	0
9-Feb. 26-Mar. 04, 2010	0.0						0.0	0
10-Mar. 05-Mar. 11, 2010	0.0						0.0	0
11-Mar.12-Mar. 18, 2010	0.0		20.2	1			0.0	0
12-Mar. 19-Mar. 25, 2010	0.0						0.0	0
13-Mar. 26-Apr. 01, 2010	0.0						0.0	0
14-Apr. 02-Apr. 08, 2010	0.0						0.0	0
15-Apr. 09-Apr.-15, 2010	0.0						0.0	0
16-Apr. 16-Apr. 22, 2010	0.0						0.0	0
17-Apr. 23-Apr.29, 2010	1.4						0.0	0
18-Apr. 30-May. 06, 2010	0.0		6.4	1			0.0	0
19-May 07-May.13, 2010	1.6						0.0	0
20-May. 14-May20, 2010	0.0						0.0	0
21-May. 21-May. 27 2010	0.0							

Table MET-1.2 (d) : Rainfall (RF,mm) and Rainy days (RD,No.) at AICRP-FC trial locations during crop growth period, Rabi 2009-10

Met. Week & Month	South Zone						
	Hyderabad		Coimbatore		Mandya	Vellayani	
	RF	RD	RF	RD	RF	RF	RD
40-Oct. 01-Oct. 07, 2009	82.5	4	23.8	2	0.0	70.8	3
41-Oct. 08-Oct. 14, 2009	51.0	2	6.8	1	32.4		
42-Oct. 15-Oct 21, 2009	0.0	0	1.7		0.0	22.1	1
43-Oct. 22-Oct. 28, 2009	0.0	0	62.4	1	15.2		
44-Oct. 29-Nov. 04, 2009	0.0	0	27.5	2	16.8	20.1	6
45-Nov. 05-Nov. 11, 2009	6.6	1	158.2	6	38.2	285.8	7
46-Nov. 12-Nov. 18, 2009	22.4	1	61.3	2	7.0	130.6	2
47-Nov.19-Nov. 25, 2009	1.2	0	9.8	2	0.0	50.9	3
48-Nov. 26-Dec. 02, 2009	0.0	0	0.5		13.6		
49-Dec. 03-Dec. 09, 2009	0.0	0	1.2		0.0	44.2	1
50-Dec. 10-Dec. 16, 2009	0.0	0	0.2		0.0	7.4	1
51-Dec. 17-Dec. 23, 2009	0.0	0	0.9		0.0		
52-Dec. 24-Dec.31, 2009	5.0	1			13.2		
1-Jan. 01-Jan 07, 2010	0.0	0			0.0	4.0	1
2-Jan. 08-Jan. 14, 2010	9.6	1	0.2		0.0	25.2	3
3-Jan. 15-Jan 21, 2010	0.0	0			0.0		
4-Jan. 22-Jan. 28, 2010	0.0	0			0.0		
5-Jan. 29-Feb-04, 2010	0.0	0			0.0		
6-Feb. 05-Feb-11, 2010	0.0	0			0.0		
7-Feb. 12-Feb.-18, 2010	0.0	0			0.0		
8-Feb. 19-Feb. 25 2010	0.0	0			0.0		
9-Feb. 26-Mar. 04, 2010	0.0	0			0.0		
10-Mar. 05-Mar. 11, 2010	0.0	0			0.0		
11-Mar.12-Mar. 18, 2010	2.0	0			0.0		
12-Mar. 19-Mar. 25, 2010	0.0	0			0.0		
13-Mar. 26-Apr. 01, 2010	3.6	1			7.8		
14-Apr. 02-Apr. 08, 2010	0.0	0			0.0	9.0	1
15-Apr. 09-Apr.-15, 2010	0.0	0	8.0	1	8.8		
16-Apr. 16-Apr. 22, 2010	0.0	0	6.2	1	11.2	22.8	1
17-Apr. 23-Apr.29, 2010	0.0	0	0.8		76.2	29.2	2
18-Apr. 30-May. 06, 2010	4.2	1	71.0	2	7.2	10.6	2
19-May 07-May.13, 2010	4.0	1	21.4	1	19.8	67.1	3
20-May. 14-May20, 2010	13.2	1	7.5	1	76.0	21.8	3
21-May. 21-May. 27 2010	16.6	2			0.8	137.6	7

Table MET-1.3 (a) : Relative humadity (M=Morning, AN= Afternoon, AV=Average; at AICRP-FC trial locations during crop growth period, Rabi 2009-10

Met. Week & Month	Hill Zone					
	Almora			Palampur		
	M	AN	AV	M	AN	AV
40-Oct. 01-Oct. 07, 2009	97.2	68.2	82.7	89.0	75.0	82.0
41-Oct. 08-Oct. 14, 2009	96.8	33.0	64.9	74.0	42.0	58.0
42-Oct. 15-Oct 21, 2009	91.4	33.4	62.4	72.0	41.0	56.5
43-Oct. 22-Oct. 28, 2009	95.1	34.1	64.6	83.0	34.0	58.5
44-Oct. 29-Nov. 04, 2009	94.0	30.4	62.2	86.0	45.0	65.5
45-Nov. 05-Nov. 11, 2009	87.1	33.9	60.5	84.0	60.0	72.0
46-Nov. 12-Nov. 18, 2009	99.0	50.4	74.7	89.0	63.0	76.0
47-Nov.19-Nov. 25, 2009	95.8	42.9	69.4	71.0	46.0	58.5
48-Nov. 26-Dec. 02, 2009	96.7	38.0	67.4	78.0	55.0	66.5
49-Dec. 03-Dec. 09, 2009	100.0	40.9	70.5	67.0	52.0	59.5
50-Dec. 10-Dec. 16, 2009	93.4	44.9	69.2	58.0	45.0	51.5
51-Dec. 17-Dec. 23, 2009	94.3	34.9	64.6	67.0	54.0	60.5
52-Dec. 24-Dec.31, 2009	96.3	40.5	68.4	64.0	58.0	61.0
1-Jan. 01-Jan 07, 2010	97.4	43.0	70.2	70.0	54.0	62.0
2-Jan. 08-Jan. 14, 2010	97.9	45.0	71.5	61.0	58.0	59.5
3-Jan. 15-Jan 21, 2010	98.6	33.6	66.1	59.0	54.0	56.5
4-Jan. 22-Jan. 28, 2010	100.0	42.4	71.2	57.0	45.0	51.0
5-Jan. 29-Feb-04, 2010	97.4	46.1	71.8	65.0	54.0	59.5
6-Feb. 05-Feb-11, 2010	94.1	49.4	71.8	82.0	76.0	79.0
7-Feb. 12-Feb.-18, 2010	95.6	37.0	66.3	78.0	68.0	73.0
8-Feb. 19-Feb. 25 2010	98.9	45.4	72.2	72.0	66.0	69.0
9-Feb. 26-Mar. 04, 2010	94.2	36.0	65.1	58.0	51.0	54.5
10-Mar. 05-Mar. 11, 2010	92.1	35.4	63.8	58.0	48.0	53.0
11-Mar.12-Mar. 18, 2010	93.1	34.9	64.0	53.0	45.0	49.0
12-Mar. 19-Mar. 25, 2010	90.6	31.0	60.8	41.0	38.0	39.5
13-Mar. 26-Apr. 01, 2010	80.8	30.9	55.9	40.0	36.0	38.0
14-Apr. 02-Apr. 08, 2010	81.9	35.9	58.9	35.0	32.0	33.5
15-Apr. 09-Apr.-15, 2010	80.9	34.3	57.6	37.0	34.0	35.5
16-Apr. 16-Apr. 22, 2010	83.1	34.9	59.0	45.0	38.0	41.5
17-Apr. 23-Apr.29, 2010	69.3	35.3	52.3	39.0	32.0	35.5
18-Apr. 30-May. 06, 2010	82.4	47.7	65.1	50.0	41.0	45.5
19-May 07-May.13, 2010				51.0	39.0	45.0
20-May. 14-May20, 2010						
21-May. 21-May. 27 2010						

Table MET-1.3 (b) : Relative humadity (M=Morning, AN= Afternoon, AV=Average; %) at AICRP-FC trial locations during crop growth period, Rabi 2009-10

Met. Week & Month	North-West Zone											
	Ludhiana			Hisar			Bikaner			Pantnagar		
	M	AN	AV	M	AN	AV	M	AN	AV	M	AN	AV
40-Oct. 01-Oct. 07, 2009	93.0	62.0	77.5	85.3	44.1	64.7	64.0	28.0	46.0	89.0	75.0	82.0
41-Oct. 08-Oct. 14, 2009	91.0	62.0	76.5	81.0	25.1	53.1	49.0	19.0	34.0	91.0	56.0	73.5
42-Oct. 15-Oct 21, 2009	89.0	39.0	64.0	83.3	25.9	54.6	42.0	29.0	35.5	84.0	48.0	66.0
43-Oct. 22-Oct. 28, 2009	89.0	21.0	55.0	87.6	22.0	54.8	34.0	12.0	23.0	87.0	40.0	63.5
44-Oct. 29-Nov. 04, 2009	90.0	34.0	62.0	81.1	35.7	58.4	51.0	13.0	32.0	85.0	39.0	62.0
45-Nov. 05-Nov. 11, 2009	93.0	45.0	69.0	90.6	40.0	65.3	71.0	18.0	44.5	87.0	36.0	61.5
46-Nov. 12-Nov. 18, 2009	95.0	61.0	78.0	95.1	54.6	74.9	74.0	38.0	56.0	87.0	53.0	70.0
47-Nov.19-Nov. 25, 2009	93.0	63.0	78.0	91.3	35.6	63.5	42.0	11.0	26.5	90.0	44.0	67.0
48-Nov. 26-Dec. 02, 2009	93.0	67.0	80.0	92.6	32.7	62.7	60.0	20.0	40.0	90.0	43.0	66.5
49-Dec. 03-Dec. 09, 2009	94.0	67.0	80.5	88.0	35.7	61.9	67.0	20.0	43.5	91.0	44.0	67.5
50-Dec. 10-Dec. 16, 2009	92.0	67.0	79.5	89.4	39.3	64.4	71.0	29.0	50.0	91.0	47.0	69.0
51-Dec. 17-Dec. 23, 2009	97.0	72.0	84.5	91.1	33.4	62.3	73.0	20.0	46.5	93.0	45.0	69.0
52-Dec. 24-Dec.31, 2009	91.0	72.0	81.5	90.1	38.5	64.3	62.0	22.0	42.0	94.0	54.0	74.0
1-Jan. 01-Jan 07, 2010	96.0	89.0	92.5	99.1	79.3	89.2	85.0	42.0	63.5	94.0	74.0	84.0
2-Jan. 08-Jan. 14, 2010	100.0	90.0	95.0	96.3	74.3	85.3	97.0	62.0	79.5	93.0	72.0	82.5
3-Jan. 15-Jan 21, 2010	100.0	87.0	93.5	100.0	70.9	85.5	94.0	30.0	62.0	94.0	87.0	90.5
4-Jan. 22-Jan. 28, 2010	99.0	81.0	90.0	99.0	67.1	83.1	77.0	24.0	50.5	94.0	59.0	76.5
5-Jan. 29-Feb-04, 2010	95.0	74.0	84.5	92.7	41.0	66.9	68.0	18.0	43.0	91.0	46.0	68.5
6-Feb. 05-Feb-11, 2010	94.0	75.0	84.5	86.0	52.4	69.2	53.0	12.0	32.5	91.0	58.0	74.5
7-Feb. 12-Feb.-18, 2010	95.0	71.0	83.0	95.0	42.0	68.5	64.0	17.0	40.5	90.0	54.0	72.0
8-Feb. 19-Feb. 25 2010	91.0	69.0	80.0	87.7	44.4	66.1	63.0	22.0	42.5	88.0	47.0	67.5
9-Feb. 26-Mar. 04, 2010	90.0	68.0	79.0	91.3	39.3	65.3	56.0	19.0	37.5	86.0	48.0	67.0
10-Mar. 05-Mar. 11, 2010	96.0	70.0	83.0	82.9	35.6	59.3	64.0	21.0	42.5	87.0	42.0	64.5
11-Mar.12-Mar. 18, 2010	94.0	67.0	80.5	70.7	32.7	51.7	50.0	12.0	31.0	86.0	36.0	61.0
12-Mar. 19-Mar. 25, 2010	93.0	65.0	79.0	71.6	23.9	47.8	35.0	9.0	22.0	88.0	33.0	60.5
13-Mar. 26-Apr. 01, 2010	85.0	54.0	69.5	78.3	23.6	51.0	32.0	10.0	21.0	71.0	19.0	45.0
14-Apr. 02-Apr. 08, 2010	77.0	49.0	63.0	64.1	19.7	41.9	34.0	8.0	21.0	76.0	20.0	48.0
15-Apr. 09-Apr.-15, 2010	63.0	43.0	53.0	54.9	17.9	36.4	27.0	9.0	18.0	69.0	13.0	41.0
16-Apr. 16-Apr. 22, 2010	55.0	43.0	49.0	39.9	17.1	28.5	37.0	12.0	24.5	57.0	24.0	40.5
17-Apr. 23-Apr.29, 2010	55.0	45.0	50.0	43.3	15.6	29.5	42.0	11.0	26.5	54.0	21.0	37.5
18-Apr. 30-May. 06, 2010	63.0	54.0	58.5	53.0	24.2	38.6	48.0	17.0	32.5	63.0	35.0	49.0
19-May 07-May.13, 2010	63.0	51.0	57.0	54.6	18.1	36.4	46.0	13.0	29.5	73.0	39.0	56.0
20-May. 14-May20, 2010	41.0	30.0	35.5	40.7	14.1	27.4	39.0	9.0	24.0	57.0	24.0	40.5
21-May. 21-May. 27 2010				40.6	15.7	28.2	32.0	10.0	21.0	55.0	32.0	43.5

Table MET-1.3(c) : Relative humadity (M=Morning, AN= Afternoon, AV=Average; %) at AICRP-FC trial locations during crop growth period, Rabi 2009-10

Met. Week & Month	North-East Zone												
	Faizabad	Ranchi			Bhubaneswar			Jorhat			Kalyani		
	M	M	AN	AV	M	AN	AV	M	AN	AV	M	AN	AV
40-Oct. 01-Oct. 07, 2009	82.2	90.4	80.1	85.3	97.0	83.0	90.0	93.2	73.6	83.4	97.6	82.0	89.8
41-Oct. 08-Oct. 14, 2009	78.1	86.4	68.1	77.3	89.0	54.0	71.0	94.6	77.0	85.8	94.6	64.6	79.6
42-Oct. 15-Oct 21, 2009	70.5	85.1	48.6	66.9	91.0	48.0	69.0	93.4	75.7	84.6	94.3	62.7	78.5
43-Oct. 22-Oct. 28, 2009	62.4	85.9	49.1	67.5	86.0	37.0	61.0	94.3	60.1	77.2	93.1	50.3	71.7
44-Oct. 29-Nov. 04, 2009	64.1	87.0	60.0	73.5	88.0	48.0	68.0	95.7	59.4	77.6	94.4	56.0	75.2
45-Nov. 05-Nov. 11, 2009	68.4	88.7	58.0	73.4	91.0	50.0	71.0	96.0	73.7	84.9	92.1	55.6	73.9
46-Nov. 12-Nov. 18, 2009	76.6	89.6	59.7	74.7	93.0	67.0	80.0	98.6	84.1	91.4	92.8	61.6	77.2
47-Nov.19-Nov. 25, 2009	57.2	87.3	73.0	80.2	84.0	48.0	66.0	96.7	63.7	80.2	93.9	50.7	72.3
48-Nov. 26-Dec. 02, 2009	59.3	87.1	73.1	80.1	91.0	36.0	64.0	96.3	60.3	78.3	93.9	49.3	71.6
49-Dec. 03-Dec. 09, 2009	66.2	86.7	63.4	75.1	95.0	44.0	70.0	97.1	72.0	84.6	94.3	49.9	72.1
50-Dec. 10-Dec. 16, 2009	71.3	87.6	53.4	70.5	95.0	41.0	68.0	97.9	68.6	83.2	95.7	55.1	75.4
51-Dec. 17-Dec. 23, 2009	64.5	87.0	65.0	76.0	93.0	44.0	69.0	98.0	71.3	84.7	93.7	50.3	72.0
52-Dec. 24-Dec.31, 2009	72.1	87.8	53.5	70.7	90.0	32.0	61.0	87.0	66.8	76.9	92.1	41.6	66.9
1-Jan. 01-Jan 07, 2010	82.3	89.3	54.0	71.7	83.0	34.0	59.0	98.7	50.9	74.8	97.7	59.0	78.4
2-Jan. 08-Jan. 14, 2010	77.3	89.3	51.0	70.2	86.0	48.0	68.0	97.7	70.0	83.9	94.4	49.6	72.0
3-Jan. 15-Jan 21, 2010	82.6	88.4	56.4	72.4	92.0	44.0	68.0	97.7	69.0	83.4	97.7	63.1	80.4
4-Jan. 22-Jan. 28, 2010	78.8	87.1	37.0	62.1	89.0	32.0	61.0	95.1	49.6	72.4	93.1	39.3	66.2
5-Jan. 29-Feb-04, 2010	65.5	87.6	47.7	67.7	93.0	30.0	62.0	94.7	49.6	72.1	93.3	34.6	63.9
6-Feb. 05-Feb-11, 2010	70.9	87.3	49.9	68.6	96.0	30.0	63.0	93.0	50.3	71.7	92.4	43.1	67.8
7-Feb. 12-Feb.-18, 2010	69.5	88.0	51.1	69.6	93.0	33.0	63.0	91.0	50.1	70.6	92.4	49.4	70.9
8-Feb. 19-Feb. 25 2010	69.7	86.7	52.4	69.6	93.0	41.0	67.0	93.1	52.6	72.9	91.1	42.1	66.6
9-Feb. 26-Mar. 04, 2010	56.5	86.4	45.0	65.7	92.0	28.0	60.0	95.0	66.0	80.5	92.7	31.3	62.0
10-Mar. 05-Mar. 11, 2010	54.1	85.7	41.6	63.7	95.0	56.0	76.0	90.3	54.1	72.2	88.1	41.9	65.0
11-Mar.12-Mar. 18, 2010	55.6	85.7	43.3	64.5	92.0	48.0	70.0	80.0	53.7	66.9	90.6	41.0	65.8
12-Mar. 19-Mar. 25, 2010	46.6	86.4	37.0	61.7	92.0	42.0	67.0	91.1	64.1	77.6	88.7	34.3	61.5
13-Mar. 26-Apr. 01, 2010	33.2	83.1	28.6	55.9	90.0	54.0	72.0	95.7	76.6	86.1	88.6	51.7	70.1
14-Apr. 02-Apr. 08, 2010	35.0	81.1	26.6	53.9	90.0	47.0	69.0	94.6	71.5	83.0	91.1	50.1	70.6
15-Apr. 09-Apr.-15, 2010	40.5	76.0	26.4	51.2	90.0	47.0	69.0	96.0	73.2	84.6	84.6	42.9	63.7
16-Apr. 16-Apr. 22, 2010	46.5	71.3	29.4	50.4	87.0	47.0	67.0	97.1	82.3	89.7	89.1	49.7	69.4
17-Apr. 23-Apr.29, 2010	42.3	72.3	36.6	54.5	87.0	49.0	68.0	96.1	78.2	87.1	85.4	49.6	67.5
18-Apr. 30-May. 06, 2010		76.4	47.0	61.7	85.0	49.0	67.0	94.7	86.4	90.5	88.0	55.2	71.6
19-May 07-May.13, 2010		76.3	39.6	58.0	87.0	55.0	71.0	95.4	83.1	89.2	89.0	60.0	74.5
20-May. 14-May20, 2010		78.3	43.4	60.9	86.0	60.0	73.0	95.7	77.8	86.7	88.3	62.0	75.1
21-May. 21-May. 27 2010		82.0	53.9	68.0	91.0	75.0	83.0	95.1	79.2	87.1	92.4	69.6	81.0

Table MET-1.3 (d) : Relative humadity (M=Morning, AN= Afternoon, AV=Average; %) at AICRP-FC trial locations during crop growth period, Rabi 2009-10

Met. Week & Month	Central Zone											
	Jhansi			Rahuri			Urulikanchan			Anand		
	M	AN	AV	M	AN	AV	M	AN	AV	M	AN	AV
40-Oct. 01-Oct. 07, 2009	94.0	70.0	82.0	94.0	62.0	78.0	100.0	78.4	89.2	82.4	49.1	65.8
41-Oct. 08-Oct. 14, 2009	88.0	43.0	65.5	92.0	48.0	70.0	100.0	60.3	80.1	83.6	39.3	61.5
42-Oct. 15-Oct 21, 2009	87.0	31.0	59.0	90.0	39.0	64.5	100.0	44.0	72.0	74.0	28.1	51.1
43-Oct. 22-Oct. 28, 2009	89.0	24.0	56.5	91.0	31.0	61.0	100.0	37.1	68.6	72.7	25.9	49.3
44-Oct. 29-Nov. 04, 2009	87.0	27.0	57.0	89.0	27.0	58.0	100.0	32.7	66.4	80.4	22.6	51.5
45-Nov. 05-Nov. 11, 2009	88.0	38.0	63.0	92.0	58.0	75.0	99.4	69.0	84.2	76.3	42.4	59.4
46-Nov. 12-Nov. 18, 2009	90.0	75.0	82.5	94.0	71.0	82.5	100.0	74.3	87.1	91.9	55.0	73.5
47-Nov.19-Nov. 25, 2009	89.0	33.0	61.0	89.0	46.0	67.5	100.0	50.9	75.4	78.6	35.6	57.1
48-Nov. 26-Dec. 02, 2009	91.0	36.0	63.5	90.0	36.0	63.0	100.0	45.7	72.9	86.1	32.0	59.1
49-Dec. 03-Dec. 09, 2009	90.0	42.0	66.0	87.0	35.0	61.0	100.0	46.0	73.0	89.9	34.4	62.2
50-Dec. 10-Dec. 16, 2009	90.0	62.0	76.0	90.0	39.0	64.5	100.0	47.4	73.7	85.9	40.6	63.3
51-Dec. 17-Dec. 23, 2009	89.0	54.0	71.5	90.0	46.0	68.0	100.0	53.9	76.9	84.4	40.1	62.3
52-Dec. 24-Dec.31, 2009	91.0	56.0	73.5	91.0	38.0	64.5	99.9	41.1	70.5	84.9	40.5	62.7
1-Jan. 01-Jan 07, 2010	93.0	60.0	76.5	90.0	46.0	68.0	100.0	47.6	73.8	81.4	50.0	65.7
2-Jan. 08-Jan. 14, 2010	94.0	86.0	90.0	91.0	39.0	65.0	99.7	43.7	71.7	76.0	40.4	58.2
3-Jan. 15-Jan 21, 2010	94.0	69.0	81.5	91.0	38.0	64.5	100.0	39.3	69.6	80.9	37.1	59.0
4-Jan. 22-Jan. 28, 2010	92.0	43.0	67.5	90.0	34.0	62.0	99.9	31.0	65.4	80.6	33.6	57.1
5-Jan. 29-Feb-04, 2010	90.0	40.0	65.0	89.0	37.0	63.0	100.0	34.3	67.1	82.7	37.3	60.0
6-Feb. 05-Feb-11, 2010	90.0	47.0	68.5	89.0	44.0	66.5	99.6	36.3	67.9	80.0	37.6	58.8
7-Feb. 12-Feb.-18, 2010	91.0	56.0	73.5	91.0	41.0	66.0	94.0	28.1	61.1	70.6	29.1	49.9
8-Feb. 19-Feb. 25 2010	90.0	42.0	66.0	89.0	33.0	61.0	96.0	22.7	59.4	67.7	27.1	47.4
9-Feb. 26-Mar. 04, 2010	85.0	29.0	57.0	88.0	31.0	59.5	87.4	21.0	54.2	74.1	24.9	49.5
10-Mar. 05-Mar. 11, 2010	80.0	30.0	55.0	88.0	32.0	60.0	86.4	23.0	54.7	62.4	26.7	44.6
11-Mar.12-Mar. 18, 2010	79.0	23.0	51.0	89.0	29.0	59.0	85.1	18.9	52.0	70.7	16.6	43.7
12-Mar. 19-Mar. 25, 2010	62.0	16.0	39.0	88.0	23.0	55.5	72.1	14.4	43.3	73.4	18.3	45.9
13-Mar. 26-Apr. 01, 2010	57.0	20.0	38.5	87.0	22.0	54.5	77.7	15.7	46.7	78.6	25.1	51.9
14-Apr. 02-Apr. 08, 2010	60.0	23.0	41.5	86.0	21.0	53.5				68.6	18.0	43.3
15-Apr. 09-Apr.-15, 2010	53.0	23.0	38.0	90.0	19.0	54.5				80.6	29.1	54.9
16-Apr. 16-Apr. 22, 2010	41.0	25.0	33.0	87.0	17.0	52.0				83.0	27.9	55.5
17-Apr. 23-Apr.29, 2010	47.0	32.0	39.5	86.0	16.0	51.0				58.6	21.1	39.9
18-Apr. 30-May. 06, 2010	55.0	28.0	41.5	87.0	27.0	57.0				64.4	25.3	44.9
19-May 07-May.13, 2010	50.0	18.0	34.0	87.0	22.0	54.5				66.9	23.4	45.2
20-May. 14-May20, 2010	43.0	20.0	31.5	88.0	23.0	55.5				70.4	22.6	46.5
21-May. 21-May. 27 2010	44.0	24.0	34.0	89.0	26.0	57.5				64.6	25.0	44.8

Table MET-1.3 (e) : Relative humadity (M=Morning, AN= Afternoon, AV=Average; %) at AICRP-FC trial locations during crop growth period, Rabi 2009-10

Met. Week & Month	South Zone									
	Hyderabad			Coimbatore	Mandya			Vellayani		
	M	AN	AV	AN	M	AN	AV	M	AN	AV
40-Oct. 01-Oct. 07, 2009	93.0	79.1	86.1	80.0	91.0	58.1	74.6	90.1	85.0	87.6
41-Oct. 08-Oct. 14, 2009	87.9	56.4	72.2	93.0	91.1	52.9	72.0	90.7	86.4	88.6
42-Oct. 15-Oct 21, 2009	85.6	39.0	62.3	89.0	91.0	50.7	70.9	90.9	86.9	88.9
43-Oct. 22-Oct. 28, 2009	71.6	31.0	51.3	85.0	91.0	49.2	70.1	89.6	81.9	85.8
44-Oct. 29-Nov. 04, 2009	79.1	34.6	56.9	88.0	91.0	48.9	70.0	86.5	83.7	85.1
45-Nov. 05-Nov. 11, 2009	86.1	67.0	76.6	95.0	91.1	56.9	74.0	91.7	80.9	86.3
46-Nov. 12-Nov. 18, 2009	88.6	62.9	75.8	95.0	91.1	54.3	72.7	90.0	88.9	89.5
47-Nov.19-Nov. 25, 2009	82.7	67.9	75.3	95.0	91.1	51.1	71.1	90.7	84.9	87.8
48-Nov. 26-Dec. 02, 2009	79.3	74.0	76.7	90.0	91.0	50.2	70.6	91.3	85.4	88.4
49-Dec. 03-Dec. 09, 2009	84.1	39.4	61.8	91.0	91.1	47.1	69.1	89.6	88.9	89.3
50-Dec. 10-Dec. 16, 2009	87.4	40.0	63.7	88.0	91.1	46.7	68.9	89.4	82.6	86.0
51-Dec. 17-Dec. 23, 2009	88.0	44.7	66.4	86.0	91.1	48.2	69.7	90.9	85.4	88.2
52-Dec. 24-Dec.31, 2009	86.8	44.4	65.6	87.0	91.0	47.9	69.5	91.0	86.9	89.0
1-Jan. 01-Jan 07, 2010	79.3	35.9	57.6	90.0	90.3	44.0	67.2	90.0	85.0	87.5
2-Jan. 08-Jan. 14, 2010	85.3	60.1	72.7	87.0	90.6	44.2	67.4	89.4	85.1	87.3
3-Jan. 15-Jan 21, 2010	86.6	36.7	61.7	88.0	90.5	44.2	67.4	90.1	85.0	87.6
4-Jan. 22-Jan. 28, 2010	85.4	35.1	60.3	85.0	90.2	42.9	66.6	88.4	79.7	84.1
5-Jan. 29-Feb-04, 2010	81.9	33.6	57.8	87.0	90.3	42.0	66.2	91.0	82.4	86.7
6-Feb. 05-Feb-11, 2010	76.3	31.0	53.7	83.0	89.4	35.4	62.4	96.5	80.6	88.6
7-Feb. 12-Feb.-18, 2010	78.1	28.6	53.4	87.0	90.2	33.1	61.7	90.7	79.4	85.1
8-Feb. 19-Feb. 25 2010	81.4	29.4	55.4	86.0	90.4	33.8	62.1	89.9	77.0	83.5
9-Feb. 26-Mar. 04, 2010	65.9	42.3	54.1	79.0	90.5	34.6	62.6	88.3	73.9	81.1
10-Mar. 05-Mar. 11, 2010	74.3	33.7	54.0	84.0	90.0	33.6	61.8	86.3	73.5	79.9
11-Mar.12-Mar. 18, 2010	76.6	39.3	58.0	75.0	90.5	33.4	62.0	89.3	77.4	83.4
12-Mar. 19-Mar. 25, 2010	66.0	40.7	53.4	81.0	90.6	32.9	61.8	89.1	78.2	83.7
13-Mar. 26-Apr. 01, 2010	71.9	49.4	60.7	82.0	90.8	34.0	62.4	88.3	76.5	82.4
14-Apr. 02-Apr. 08, 2010	64.9	25.3	45.1	85.0	91.9	38.7	65.3	89.7	78.3	84.0
15-Apr. 09-Apr.-15, 2010	68.9	37.9	53.4	87.0	91.9	39.2	65.6	84.6	78.2	81.4
16-Apr. 16-Apr. 22, 2010	67.1	29.7	48.4	86.0	91.6	38.5	65.1	85.0	74.3	79.7
17-Apr. 23-Apr.29, 2010	67.9	39.0	53.5	85.0	91.5	38.4	65.0	84.9	73.9	79.4
18-Apr. 30-May. 06, 2010	71.9	38.7	55.3	88.0	91.4	38.1	64.8	83.1	73.8	78.5
19-May 07-May.13, 2010	59.4	32.6	46.0	89.0	91.1	36.3	63.7	84.6	74.2	79.4
20-May. 14-May20, 2010	72.4	47.9	60.2	83.0	91.1	38.0	64.6	87.4	76.8	82.1
21-May. 21-May. 27 2010	75.3	38.1	56.7	85.0	91.1	39.7	65.4	90.3	82.2	86.3

Table MET-1.4 (a) : Sun Shine (hr) at AICRP-FC trial locations during crop growth period, Rabi 2009-10

Met. Week & Month	Hill Zone		North West Zone			
	Almora	Palampur	Ludhiana	Hisar	Bikaner	Pantnagar
40-Oct. 01-Oct. 07, 2009	3.9	7.7	8.3	8.6	8.7	5.0
41-Oct. 08-Oct. 14, 2009	8.9	9.7	9.3	8.8	8.6	8.9
42-Oct. 15-Oct 21, 2009	9.2	9.7	8.0	7.9	8.7	9.7
43-Oct. 22-Oct. 28, 2009	8.8	9.8	9.1	8.3	7.7	9.6
44-Oct. 29-Nov. 04, 2009	8.7	9.0	5.6	6.7	7.7	8.7
45-Nov. 05-Nov. 11, 2009	8.6	7.1	2.4	2.1	7.6	7.8
46-Nov. 12-Nov. 18, 2009	4.4	5.4	4.7	3.7	5.5	3.9
47-Nov.19-Nov. 25, 2009	6.9	8.4	7.1	6.9	8.8	8.0
48-Nov. 26-Dec. 02, 2009	6.8	6.7	4.7	6.7	7.7	7.6
49-Dec. 03-Dec. 09, 2009	7.9	6.7	5.1	6.9	8.4	7.6
50-Dec. 10-Dec. 16, 2009	6.1	8.0	5.1	4.5	3.2	5.3
51-Dec. 17-Dec. 23, 2009	7.8	1.9	6.1	7.0	8.9	7.4
52-Dec. 24-Dec.31, 2009	7.5	6.1	5.5	6.9	8.9	6.9
1-Jan. 01-Jan 07, 2010	6.0	7.0	1.4	3.2	6.8	2.0
2-Jan. 08-Jan. 14, 2010	7.5	8.4	1.2	2.0	4.5	2.8
3-Jan. 15-Jan 21, 2010	8.0	6.7	2.7	5.0	6.8	1.1
4-Jan. 22-Jan. 28, 2010	8.0	6.5	4.2	3.8	7.4	4.9
5-Jan. 29-Feb-04, 2010	8.1	3.6	7.7	7.6	8.4	6.8
6-Feb. 05-Feb-11, 2010	6.0	6.2	3.8	5.7	5.9	5.8
7-Feb. 12-Feb.-18, 2010	7.3	7.6	8.7	7.9	9.6	7.3
8-Feb. 19-Feb. 25 2010	7.0	5.1	7.9	8.3	8.7	8.8
9-Feb. 26-Mar. 04, 2010	7.1	8.3	7.9	8.2	7.8	7.3
10-Mar. 05-Mar. 11, 2010	9.1	10.0	9.7	9.3	8.6	9.3
11-Mar.12-Mar. 18, 2010	8.9	8.9	10.2	9.2	9.3	9.2
12-Mar. 19-Mar. 25, 2010	8.3	8.9	9.1	9.2	8.8	8.2
13-Mar. 26-Apr. 01, 2010	10.0	10.4	10.3	7.6	7.5	7.9
14-Apr. 02-Apr. 08, 2010	8.9	9.5	11.1	8.3	4.0	9.8
15-Apr. 09-Apr.-15, 2010	9.3	5.1	10.1	9.2	6.7	10.1
16-Apr. 16-Apr. 22, 2010	8.1	7.5	6.0	5.9	5.4	6.5
17-Apr. 23-Apr.29, 2010	9.8	7.0	7.9	8.4	7.4	10.3
18-Apr. 30-May. 06, 2010	5.2	8.7	3.6	6.5	3.5	7.1
19-May 07-May.13, 2010			9.5	8.7	8.2	10.6
20-May. 14-May20, 2010			7.5	8.2	7.8	8.9
21-May. 21-May. 27 2010				9.6	6.8	10.4

Table MET-1.4 (b) : Sun Shine (hr) at AICRP-FC trial locations during crop growth period, Rabi 2009-10

Met. Week & Month	North East Zone					Central Zone		South Zone		
	Faizabad	Bhubaneswar	Ranchi	Jorhat	Kalyani	Anand	Jhansi	Coimbatore	Hyderabad	Mandya
40-Oct. 01-Oct. 07, 2009	2.8	2.1	3.9	3.7	3.5	7.8	4.2	5.3	6.8	6.3
41-Oct. 08-Oct. 14, 2009	7.5	8.1	8.2	4.5	8.2	9.4	8.1	8.4	8.7	7.1
42-Oct. 15-Oct 21, 2009	7.2	9.4	9.0	4.5	9.1	10.0	9	7.6	9.6	7.6
43-Oct. 22-Oct. 28, 2009	8.2	9.6	10.2	8.6	9.8	10.0	9.6	7.8	8.7	8.0
44-Oct. 29-Nov. 04, 2009	7.6	8.3	8.2	7.5	8.0	9.7	9.2	5.2	4.7	7.7
45-Nov. 05-Nov. 11, 2009	6.2	5.8	6.8	5.6	7.7	7.8	7.7	1.9	6.9	6.1
46-Nov. 12-Nov. 18, 2009	1.8	8.0	5.5	2.5	6.3	3.7	1.6	4.7	6.9	5.7
47-Nov.19-Nov. 25, 2009	6.6	7.5	8.8	18.6	8.8	9.6	9.0	5.7	8.9	6.0
48-Nov. 26-Dec. 02, 2009	6.8	9.1	9.3	6.6	8.6	9.6	8.1	7.6	8.2	6.4
49-Dec. 03-Dec. 09, 2009	6.8	7.3	8.9	2.0	7.1	8.6	8.5	5.3	8.0	8.6
50-Dec. 10-Dec. 16, 2009	5.6	8.0	8.6	3.6	6.5	8.5	6.8	7.0	7.5	6.9
51-Dec. 17-Dec. 23, 2009	6.5	7.6	7.6	3.2	7.6	8.7	6.6	3.8	5.3	5.8
52-Dec. 24-Dec.31, 2009	7.6	8.5	10.0	5.5	8.8	8.6	7.1	2.3	8.9	6.5
1-Jan. 01-Jan 07, 2010	2.7	8.4	8.3	7.9	7.4	7.0	7.7	7.8	4.4	8.0
2-Jan. 08-Jan. 14, 2010	3.5	6.9	7.4	5.6	7.0	9.0	1.7	5.6	6.1	6.3
3-Jan. 15-Jan 21, 2010	0.9	5.8	7.2	4.3	5.0	9.6	4.6	7.3	8.9	8.7
4-Jan. 22-Jan. 28, 2010	3.2	9.5	9.8	8.6	9.1	9.9	8.6	8.2	8.6	8.2
5-Jan. 29-Feb-04, 2010	6.7	8.7	9.7	8.2	9.0	9.0	9.1	7.9	9.1	9.0
6-Feb. 05-Feb-11, 2010	4.7	9.0	7.2	8.4	7.3	7.6	6.7	9.1	8.8	8.6
7-Feb. 12-Feb.-18, 2010	5.5	8.2	6.3	7.8	7.3	9.8	5.7	8.4	8.4	7.8
8-Feb. 19-Feb. 25 2010	7.5	7.3	9.7	6.3	7.8	9.1	9.3	8.9	7.8	8.8
9-Feb. 26-Mar. 04, 2010	7.2	9.8	10.1	5.1	9.4	9.6	9.8	8.9	8.2	8.4
10-Mar. 05-Mar. 11, 2010	7.1	8.0	9.7	7.0	9.3	8.8	9.9	9.9	6.7	9.1
11-Mar.12-Mar. 18, 2010	7.9	8.0	8.4	5.8	8.2	9.6	9.9	9.3	8.0	9.1
12-Mar. 19-Mar. 25, 2010	7.1	9.1	9.9	3.3	9.5	9.2	10.1	10.0	6.9	8.3
13-Mar. 26-Apr. 01, 2010	7.5	8.3	8.2	2.2	8.4	9.4	10.1	7.6	9.0	8.3
14-Apr. 02-Apr. 08, 2010	7.2	8.4	9.6	5.9	8.5	9.6	10.2	9.1	7.1	6.9
15-Apr. 09-Apr.-15, 2010	8.2	8.4	9.2	3.8	8.9	7.2	9.0	8.3	9.4	7.6
16-Apr. 16-Apr. 22, 2010	6.2	8.7	10.2	1.2	8.9	10.2	10.4	7.3	8.9	8.2
17-Apr. 23-Apr.29, 2010	7.8	8.6	9.4	1.8	9.0	11.1	10.3	8.1	6.4	7.4
18-Apr. 30-May. 06, 2010		7.8	6.9	5.2	7.5	11.0	7.0	7.6	10.1	7.6
19-May 07-May.13, 2010		9.2	9.7	1.9	9.4	11.1	9.9	8.0	7.6	9.7
20-May. 14-May20, 2010		7.6	8.7	3.3	8.1	11.0	9.0	6.7	6.5	9.0
21-May. 21-May. 27 2010		3.8	6.7	3.2	4.9	10.3	8.6	5.6		9.2

APPENDICES

APPENDIX -I : FORAGE CROP BREEDING TRIALS AT A GLANCE (*Rabi :* 2009-10)

S. No.	Name of centre/ location	Berseem	Oat (Single cut)				Oat (Multi cut)	Lucerne (P)	Tall Fescue	Total
		IVTB	IVTO (SC)	AVTO (SC-1)	AVTO (SC-2)	AVTO (SC-2 Seed	IVTO (MC)	VTL (P) 2007	VTTF (P) 2009	
	Trial No.	**1.**	**2**	**3.**	**4.**	**5.**	**6.**	**7.**	**8.**	
1.**NEZ**	Jorhat		DR	DR	DR	DR	DR			5
2.	Kalyani	DR	DR	DR						3
3.	Bhubaneswar	DR	DR	DR	DR	DR	DR			6
4.	Ranchi	DR	DR	DR	DR	DR	DR			6
5.	Pusa	DR	DR	DR	DR		DR			5
6.	Imphal		DR	DR	DR					3
7.	Faizabad	DR	DR	DR	DR		DR			5
8. **CTZ**	Kanpur	DR	DR	DR	DR					4
9.	Jhansi (IGFRI)	DR	DR	DR	DR	DR	DR			6
10.	Anand		DR	DR	DR	DR	DR			5
11.	Jabalpur	DR	DR	DR	DR	DR	DR			6
12.	Rahuri	DR	DR	DR	DR	DR	DR	DR		7
13.	Urulikanchan	DR	DR	DR	DR	DR	DR	DR		7
14.**NWZ**	Meerut	DR	DR	DR	DR					4
15.	Pantnagar	DR	DR	DR	DR	DR	DR			6
16.	Ludhiana	DR	DR	DR	DR	DR	DR	DR		7
17.	Hisar	DR	DR	DR	DR	DR	DR	DR		7
18.	Bikaner		DR	DR	DR	DR		DR		5
19.	Jalore	DR	DR	DR	DR		DR			5
20.**SOZ**	Hyderabad		DR	DR	DR	DR				4
21.	Coimbatore. (Ooty)		DR	DR	DR			DR		4
22.	Mandya		DR	DR	DR	DR		DR		5
23.**HLZ**	Srinagar	DR	DR	DR	DR	DR	DR		TF	6
24.	Rajouri	DR	DR	TNC	DR		TNC			3
25.	Almora								DR	1
26.	Palampur	DR	DR	DR	DR	DR	DR		TF	6
	Total (A)	**18/18**	**24/25**	**25/25**	**24/24**	**16/16**	**16/17**	**7/10**	**1/3**	**131**

Abbreviations: DR= Trial conducted and data reported; TF= Trial conducted but failed; TNC: Trial not conducted

APPENDIX II : FORAGE CROP PRODUCTION TRIALS AT A GLANCE : (*Rabi :* 2009-10)

Location/ Trial	AST-1.1	AST-2.1	AST-3.1	AST-4.1	AST-5.1	AST-6.1	AST-7.1	AST-7.2	AST-7.3	AST-7.4	AST-8.1	AST-1.1 (NT)	AST-1.2 (NT)	AST-1.3 (NT)	TOTAL (DR & TC	Success Index (%)
HILL ZONE																
Palampur	DR					TC			DR						3	100
Almora	DR														1	100
Srinagar	TNC										DR				1	50
NORTH WEST ZONE																
Hisar						TC					DR	TNC			2	67
Pantnagar			DR			TC					DR	DR			4	100
Bikaner		DR				TC									2	100
Ludhiana						TC		TC			DR	DR			4	100
Meerut			TNC												-	00
Jalore						TC									1	100
NORTH EAST ZONE																
Faizabad	DR	DR				TC				DR					4	100
Ranchi	DR		DR			TC									3	100
Kalyani	DR		DR			TC									3	100
Bhubaneswar	DR		DR			TC									3	100
Jorhat	DR		TC			TC									3	100
Raipur			DR								DR				2	100
Pusa	DR		DR								DR				3	100
Imphal											DR		TC		2	100
Shillong											DR		TC	TC	3	100
CENTRAL ZONE																
Jhansi	DR										DR				2	100
Jabalpur	DR	DR	DR			TC					DR				5	100
Rahuri	DR			DR	DR	TC					DR				5	100
Urulikanchan	DR			DR	DR	TC									4	100
Anand	DR					TC					DR				3	100
SOUTH ZONE																
Hyderabad		DR	DR			TC									3	100
Mandya			DR			TC	DR				DR				4	100
Coimbatore			DR			TC									2	100
Vellayani						TC									1	100
Total (DR& TC)	13	4	11	2	2	19	1	1	1	1	13	2	2	1	73	96
Success Index (%)	93	100	91	100	100	100	100	100	100	100	100	67	100	100	96	

Abbreviations: DR = Data reported, TC = Trial continued and data to be reported after completion of the sequence, TNC = Trial not conducted

APPENDIX -III : FORAGE CROP PROTECTION TRIALS AT A GLANCE (*Rabi :* 2009-10)

Locations /Trials	PPT-1	PPT-2A	PPT-2B	PPT-8	PPT-9	PPT-10	PPT-11	PPT-12	Total
Anand	A	A				A	A		4
	DR	DR				DR	DR		4
Bhubaneswar	A	A			A				3
	DR	DR			DR				3
Hisar	A	A	A						3
	DR	DR	DR						3
Hyderabad	A	A				A	A		4
	DR	DR				DR	DR		4
Jhansi	A	A	A			A			4
	DR	DR	DR			DR			4
Ludhiana	A	A		A					3
	DR	DR		DR					3
Palampur	A	A		A				A	4
	DR	DR		DR				DR	4
Rahuri	A	A				A	A		4
	DR	DR				DR	DR		4

Abbreviations: A= Trial allotted; DR= Trial conducted and data reported

APPENDIX IV : FORAGE BREEDING ACTIVITIES AT AICRPFC DURING RABI 2009-10

A. HILL ZONE

B. NORTH WEST ZONE

1. PAU, LUDHIANA

I. Oat

1. Two local trials consisting of eight entries and three replications each were conducted to evaluate for high green fodder and dry matter yield along with other quality attributes under multi cut conditions.

2. Another local trial consisting of eight entries and three replications each was conducted to evaluate the entries for high seed yield.

3. Interspecific crosses of cultivated oat (*Avena sativa*) with wild oat species like *Avena sterilis, Avena fatua* etc. have been attempted to introgress the useful traits from wild species to cultivated oat.

4. More than hundred new crosses have been attempted involving Kent, OL 9, OL 1684, OS 342 and many other promising genotypes.

5. Breeding material consisting of F_1 = 100, F_2 = 28 progenies, F_3 = 234 progenies F_6 = 07 progenies, F_7 = 58 progenies, was handled following standard breeding methods and procedures.

6. Germplasm consisting of 100 lines has been evaluated on the basis of morphological traits as per oat germplasm catalogue developed by IGFRI, Jhansi.

II. Berseem

1. Two local trials consisting of eight entries and three replications each were conducted to evaluate the entries for high green fodder yield and dry matter yield along with other quality attributes.

2. Poly cross consisting of five entries with 20 lines each has been sown consecutively second year with an objective to generate genetic variability that could be utilized later on.
3. Germplasm evaluation has been initiated.

III. Lucerne

One local trial consisting of four entries and five replications was conducted and entries were evaluated for green fodder yield, dry matter yield and other quality parameters.

IV. Shaftal

Maintenance breeding is being continued.

PGR status (evaluated/maintained) of different forage crops

S. No.	Crop	Number of Accessions
1	Oat	155
2	Berseem	458
3	Shaftal	177
4	Lucerne	02 populations (LLC3 & LLC 5) 02 entries (CLT 07 & JSL 1)
5	Senji	02 varieties YSL 106 & SS 76
6	Rye grass	01 (PBRG 1)

2. CCS HAU, HISAR

A. Berseem

1. Collection, maintenance and evaluation of germplasm

Two diverse lines collected from Pantnagar were added to the present genetic stock. As the Berseem gerrmplasm is grown in alternate years for its maintenance therefore, during this year the same was not grown. However, we are maintaining 225 lines of indigenous sources and 27 of exotic origin.

2. Evaluation of varietal trials for fodder yield and its components

Three station trials *viz*., LST, SST and PRT on berseem were conducted.

a. Large scale Trial (LST)

In Large Scale Trial (LST), 9 genotype were evaluated for fodder yield against three checks *viz*., Mescavi, Wardan and HB1. The genotype *viz*., HFB 6-6 followed by HFB 700, HFB 4-14 and HFB 165-1 were observed to be superior to all the checks for both green fodder and dry matter yield based upon the overall performance.

b. Small Scale Trial (SST)

In Small Scale Trial (SST), 9 genotypes were tested against three checks *viz.*, Mescavi, Wardan and HB 1. The genotypes HFB 36 and HFB 8-17 were adjudged to be superior to the best check for both green fodder and dry matter yield.

c. Progeny Row Trial (PRT)

In Progeny Row Trial (PRT), 7 genotypes were tested against two checks *viz.,* Mescavi and HB1. The genotype viz., HFB 9-6, HFB 9-5, HFB 9-7 and HFB 9-4were found superior to the checks for both green and dry matter yield.

3. Mutation breeding in Berseem – Creation of genetic variability for morphological characters in berseem using physical and chemical mutagens.

i) M_1 generation

In this experiment, three doses (70, 90 and 100 kR) of gamma rays, EMS (0.5, 0.7 and 1.0%) and DES (0.3, 0.5 and 0.7%) were given to dry seeds of HB1. Treated and untreated seeds (300 in each treatment) were sown immediately in the field in three rows of five-meter length each to raise the M_1 generation. Germination was recorded 10 days after sowing. Maximum germination (84%) was observed with 70 kR gamma rays whereas, minimum germination (9%) was observed with DES 0.7%. A total of 88 single plants in different treatments survived and were harvested and threshed individually which will be grown as separate progenies in M_2 generation next year.

ii) Selection of superior / desirable plants in different generations

On the basis of variation for different traits, a total of 84 superior mutation plants were selected from different generations of different treatments. These plants were harvested and threshed individually and these will be grown in single rows with the repeated rows of checks in coming year for their evaluation for fodder yield.

iii) Selection of superior plant progenies in different generations

On the basis of their evaluation against checks (on three cut basis), 24 superior progenies were selected from M_3 and M_4 generations of different treatments, which will be evaluated, for fodder yield in PRT next year.

4. Poly cross nursery – Special breeding programme in berseem

Poly cross-nursery programme was initiated during the year 2008-09 to create the genetic variability in berseem crop. The five genetically diverse varieties *viz.*, Wardan, BL-42, Mescavi, UPB 110 and JB 1 were used in this experiment. Single seed/ hill of each of these varieties was sown in five rows in per block in all possible combinations as per the sowing layout discussed in Group Meeting held at ANGRAU, Hyderabad. The distance between each row and each hill was kept at 40 cm.

Evaluation of polycrosses : The 25 polycrosses were grown in single rows of 3 m length with two checks viz., Mescavi and HB 1 for their evaluation for fodder yield and component traits. All the polycrosses differed significantly in all the cuts (except leaf breadth in first cut) and over the cuts basis. Based on the overall performance, PC 4-5 was found superior for no. of tillers, no. of leaves and leaf breadth whereas PC 5-4 was superior with respect to plant height, leaf length and green fodder yield.

B. Oats

1. Germplasm collection, evaluation and conservation

Four new germplasm accessions acquired from Bulgaria through NBPGR, New Delhi were multiplied. The Forage Section at present is maintaining a collection of 568 germplasm accessions of oat. These were grown during rabi 2009-10 for maintenance only. In addition to above, 15 species of Avena has been evaluated and characterized for various morphological traits.

2. Special Hybridization Programme

In all 81 fresh single crosses in oat were made. Out of these, 28 were of Inter-varietal origin (i.e. *Avena sativa x Avena sativa*), and 53 crosses were of Inter-specific origin (i.e. *Avena sativa* x *Avena sterilis* **or** *Avena sterilis* x *Avena sativa*).

In addition to above 34 F_1's, 36 F_2's, 19 F_3's, 9 F_4's, 2 F_5's and 4 F_6 of various crosses were grown and promising single plants of oat from various filial generations (F_1 to F_6) were selected and promising progenies were bulked.

2. Station Trials

In all seven station trials were conducted. Two Large Scale Trials [LST (SC) and LST (MC)], two Small Scale Trials [SST (SC) and SST (MC)] and three Progeny Row Trails [PRT-1 (SC), PRT- 2a 9MC) and PRT-2b (MC)], were conducted to evaluate the performance of promising entries developed and selected from germplasm or breeding material during previous seasons.

The Following genotypes were found promising on the basis of their high mean performance for GFY and DMY (q/ha). These were OS 335, OS 363, OS 374, OS 377, OS 350, OS 337, OS 385, OS 350, OS 389, OS 391, OS 392, OS 394, OS 396, OS 401, and OS 403, HFO 24, HFO 34, HFO 691, HFO 796, HFO 831, PRT 1-9, PRT 7-9 and PRT 8-9.

3. Seed Multiplication of test Entries

Above 50-60 genotypes, which were tested under various trials, were also grown separately for seed multiplication.

C. Nucleus, Breeder and TFL Seed Production

During Rabi Season, 356 kg nucleus seed of 5 varities of oat, 12 kg of Lucerne variety T9, 8kg of Chinese cabbage; 35kg of senji (Melitous spp.) were produced. 20.50 quintals Breeder seed of various varieties oats, berseem and Lucerne was produced.

Additionally, 415kg TFL seed of Oat and 850 kg TFL seed of Berseem varieties was also produced. About 1300 single plant of various varieties of oat, 15 SP's of Lucerne varieties T9, 15 SP's of Chinese cabbage and 50 SP's of senji were also taken to maintain the genetic purity of various varieties for Nucleus seed production during Rabi 2010-11.

B. NORTH EAST ZONE

1. NDUAT, FAIZABAD

I. National Breeding Programme in Forage Oat

S. N.	Cross Combination	S.N.	Cross Combination
1	NDO-1 x *Avena sterilis*	13	NDO-1 x *Avena fatua*
2	NDO-2 x *Avena sterilis*	14	NDO-2 x *Avena fatua*
3	NDO-3 x *Avena sterilis*	15	NDO-3 x *Avena fatua*
4	NDO-55 x *Avena sterilis*	16	NDO-55 x *Avena fatua*
5	JHO-822 x *Avena sterilis*	17	JHO-822 x *Avena fatua*
6	JHO-851 x *Avena sterilis*	18	JHO-851 x *Avena fatua*
7	JHO-99-2 x *Avena sterilis*	19	JHO-99-2 x *Avena fatua*
8	OS-6 x *Avena sterilis*	20	OS-6 x *Avena fatua*
9	UPO-212 x *Avena sterilis*	21	UPO-212 x *Avena sterilis*
10	Sabzer x *Avena sterilis*	22	Sabzer x *Avena fatua*
11	Kent x *Avena sterilis*	23	Kent x *Avena fatua*
12	RO-19 x *Avena sterilis*	24	RO-19 x *Avena fatua*

2. AAU, ORHAT

1. **Germplasm Collection:** During Rabi 2009-10 a total of 87 germplasm were collected from NE region of India. Details of the germplasm are listed below.

Crop	Total no. Collected	Collected from
Ricebean	19	Manipur
Maize	42	Manipur
Cowpea	20	Manipur
Lablab	6	Manipur

2. Evaluation of Forage Rice bean Germplasm:

The trial was initiated in 2008 with 38 rice bean germplasm. In 2009 sowing was done in the month of November. Harvesting was done in the month of May. The performance of the promising entries is given below.

S. No.	Entry	GFY (q/ha)	DMY (q/ha)	50% Flowering	Plant Height (cm)
1	JCR-08-49	347.00	52.74	No Flowering	249.00
2	JCR-08-30	366.66	57.68	No Flowering	146.00
3	JCR-08-17	453.33	48.61	No Flowering	160.00
4	JCR-08-53	321.33	41.88	No Flowering	292.00
5	JCR-08-50	320.00	58.43	No Flowering	246.00
6	JCR-08-55	285.30	52.21	No Flowering	165.00

3. Evaluation of Lathyrus germplasm:

In Rabi-2009-10, 18 entries of Lathyrus were tested against the check variety Nirmal. Out of 18 entries JCL 6 was found to best with regards of green forage and dry matter yield (290.00 q/ha and 46.00 q/ha).

S.No.	Entry	GFY (q/ha)	DMY (q/ha)	Plant height (cm)
1	Bail-212	275.85	44.45	56.00
2	Bior-219	272.30	43.25	58.50
3	Iply-98-6	270.85	42.30	52.00
4	JCL-6	290.00	46.70	60.00
5	Nirmal (C)	265.00	39.90	48.00

C. CENTRAL ZONE

1. AAU, ANAND

Poly cross breeding materials generated during Rabi-2009-10 at Anand Centre.

Sl.No	Centre	Generation	No.of Plant Progenies	IPS	Bulk
1.	Coimbatore	F_3	28	27	--
		F_4	45	7	14
		F_5	67	--	15
2.	Rahuri	F_3	15	30	--
		F_4	65	43	--
		F_5	15	3	5
3.	Urulikanchan	F_2	2	6	--
		F_3	3	9	--
		F_4	3	5	--
4.	Anand/ Station	F_4	66	21	8
		F_5 Poly cross	52	10	3
		Augmented	22	23	6

2. JNKVV, JABALPUR

1. **Germplasm holding**

Corp	**No. of collection**
a. Oat	129
b. Berseem	196

2**. Berseem**

- To create variability, poly cross nursery programme has been started taking five diverse parents *viz.*, Wardan, BL-42, Mescavi, UPB-110, and JB-1. Tripping has been done to ensure cross-pollination in all possible combination. Selection will be made for fodder traits in coming generation.

- Variety JB-1 has been treated with different doses (six) of gamma rays. Single plant selection and row bulks were done treatment wise to rise the M_2 generation.

- In Wardan, four superior bulks were selected from M_4 population.

3. **Oat**

- Under National Crossing Programme, a few seeds of *Avena sterilis* have been received from Pantnagar centre and were multiplied. In the next season, it will be utilized in crossing programme.
- 64 advanced lines were evaluated for different fodder traits.
- No. of crosses made – 13
- Segregating material advanced / handled – 43
  (F_2 onwards)
- Advance breeding lines - 64

3. MPKV, RAHURI

A. CROP: OAT

F_3 Generation: Rabi-2009-10

Crosses	IPS made	Crosses	IPS made
RO-19 x JRO-05	06	Kent x JRO-09	11
RO-19 x JRO-09	04	JHO-04 x JRO-05	08
JHO-09 x JRO-05	16	JHO-04 x JRO-06	06
Kent x JRO-05	09	JHO-04 x JRO-09	06
Kent x JRO-06	06	JHO-05 x JRO-09	07

The plant to row progenies of above IPS will be grown during rabi 2010-11 along with checks.

B. CROP: LUCERNE

During Rabi-2008-09, 140 superior plants were selected from segregating generations and polycross trial is given below.

S.No.	Segregation	No. of IPS
1	F_2	15
2	F_3	21
3	F_4	44
4	Polycross trial	60

The OP progeny rows of 140-selected plant were grown during Rabi-2009-10. The superior plants will be identified on the basis of progeny performance for GFY, DMY & CPY for further population improvement programme.

4. BAIF, URULIKANCHAN, PUNE

1. Germplasm collection

- Germplasm maintenance and evaluation:

Status of the Plant Genetic Resources (PGR) at the center is as under.

Sr. No.	Crop	No. of Accessions
1	Maize	166
2	Napier	12
3	Pearl millet	3
4	Lucerne	10
5	Stylosanthes	20
6	Range grasses & legumes	20
7	Sugarcane (Fodder type)	5

2. Breeding Programme

- **Maize:** Development of Composite for high per day productivity through selection from base population of BAIF Maize-1is being done. Twenty-one individual selections were made from the population. Following criteria was used for selection.
  - Flowering at 60-62 DAS
  - Tallness
  - Broad and long leaves
  - Stem thickness

- **Lucerne Polycross Nussery :**

  The programme was initiated at the centre during the year 2008-09. Seeds of indentical population of Lucerne (9 collections) were collected by the centre from Aurangabad district- the traditional Lucerne area in Maharashtra.
  The seeds of these collectons were distributes among all the five participating centers i.e. Anand, Rahuri, Coimbatore, Mandya (bangalore) and Urulikanchan. Following field programme was implemented at the centre during rabi-2009-10.

a Green Fodder Yield trial of Twenty five best cultures (TNAU, Coimbatore)

The trial was established in Randomized Block Design with three replications and 28 treatments (25 cultures + 3 checks) and was continued at the centre in the year 2009-10. Total seventeen cuttings were completed for green fodder. The cut

Wise and pooled data of eleven cuts for yield and growth characters was submitted to Nodal Officer for compilation. Based on the pooled data of five locations for green fodder yield, six best cultures *viz*. ACP 1-2 (14), ACP 3-2 (15), CAP 3-2 (11), RRP 5-4 (17), ALP 1-1 (5) and ACP 3-1 (4) were identified and were left for seed production after fifth cut. At Urulikanchan centre, the cultures *viz*. ACP 1-2 (14), RRP 5-4 (17) and CCP 1-1 (2) ranked $1^{st,}$ 2^{nd}, 3^{rd} in total green fodder yield (Q/ha) data for fourteen cuts.

b Green Fodder Yield trial of six cultures (MPKV, Rahuri)

Row yield trial was established in Randomized Block Design with four replications and ten treatments (6 cultures +3 checks + local check) were continued in second year i.e. 2009-2010. In all, seventeen cuts were taken from this trial.

c Evaluation of F_2, F_3 and F_4 progenies and local germplasm

The local selection made by Rahuri, Urulikanchan and 66 single plant selections made in F_2 (16), F_3 (23) and F_4 (27) at Coimbatore were grown in single row along with three national checks i.e. RL-88, Anand-2 and CO-1 during rabi 2008-09 for evaluation and further selection. After three cuts eight individual plant selections were made in F_2 (2), F_3 (3) and F_4 (3) and the seeds obtained from the selections were contributed to Lucerne PCN centers for further purification. Twelve selections were made from these progenies. Seeds of selections made at Rahuri (80), Urulikanchan (8) and Anand (34) centers during Rabi 2008-09 in above segregating progenies were grown separately for further evaluation.

d Seed Multiplication Programme

Seeds of Following six cultures obtained during Rabi-2008-09 season from twenty five cultures trial were supplied to TNAU, Coimbatore for further multiplication programme.

Sr. No.	Cultures	Seed qty. (gm)
1.	ACP 1-2 (14)	67
2.	ACP 3-2 (15)	37
3.	CAP-3-2 (11)	55
4.	RRP 5-4 (17)	85
5.	ALP 1-1 (5)	90
6.	ACP 3-1 (4)	48

Simultaneously, the ACP 3-2 (15) culture was grown in isolation for multiplication of seed and after two cuts the crop stand was left for seed production.

- **Comprative study of Sugarcane germplasm with Hybrid Napier:**

  A Station trial was established in June 2008 and continued for comparative study of forage sugarcane with Hybrid Napier for yield and quality characters under multicut system in Rabi 2009-10. Five genotypes of sugarcane and Yashwant variety of Hybrid Napier were grown in RBD with four replications. Over all, 10 cuts in Hybrid Napier and 4 cuts in sugarcane were taken.

E. SOUTH ZONE

1. TNAU, COIMBATORE

A. National Crossing Programmes:

The following National breeding programmes are initiated at Coimbatore as lead centre under All India Co-ordinated Research project on Forage Crops.

I. National Polycross Nursery programme in Lucerne

A National poly cross nursery programme in Lucerne was started during 2003 at this centre with the objective of creating variability in terms of fodder yield and quality which is a long felt need of legume fodder improvement programme. The other participating centres are Anand, Rahuri, Urulikanchan and Mandya. As a result, 25 promising lines have been isolated and the collected seeds were distributed among the participating centres during Rabi 2008. The lines which have performed consistently better in terms of fodder yield and quality in all the five centres have been identified.
Based on the pooled analysis, six elite cultures possessing high yield and quality *viz.*, ACP 1-2 (14), ACP-3-2(15), CAP 3-2(11), RRP 5-4 (17), ALP 1-1 (5) and ACP 3-1(4) have been identified.

The following participating centres have been assigned with the task of multiplying the six elite cultures as mentioned below.

Sl. No.	Culture name	Centre responsible for multiplication of purified seeds
1.	ACP 1-2 (14)	Coimbatore
2.	ALP 1-1 (5) and ACP 3-1 (4)	Anand
3.	ACP 3-2 (15)	Urulikanchan
4.	CAP 3-2 (11) and RRP 5-4 (17)	Rahuri

Since the Coimbatore centre was assigned with the multiplication of ACP 1-2(14), the seeds of the same were received from Anand, Urulikanchan and Rahuri and sown on 18.12.2009 for further purification and seed multiplication. A quantity of 1.2 kg of purified seed of ACP 1-2 (14) is ready to be proposed for testing under All India Coordinated Varietal Trial during Rabi 2010-11. Similarly the other designated centres (Anand, Urulikanchan and Rahuri) will also produce the purified seeds of the their assigned cultured and excepted to propose for testing.

II. National Crossing Programme in Bajra Napier Hybrid

The Coimbatore centre had initiated the crossing programme and effected 224 cross combinations during 2009. Out of this 52 crosses have been sent to Project Coordinator unit for onward transmission to 12 otherparticipating centres on 31.05.2010 to enable the centres to evaluate the BN Hybrid during Kharif 2010.

III. National Crossing Programme in Hybrid Fodder Bajra

Eight A lines and 5 R lines have been dispatched separately from this centre on 17.06.2009 for initiating hybridization at Anand, Rahuri and Hyderabad.
Hybrid seeds of 143 crosses [Anand (40), Rahuri (40, Hyderabad (26) and Coimbatore (37)] obtained from the participating centres have been distributed to the above mentioned centres on 31.05.2010 for further evaluation during Kharif 2010.

IV. Crossing Programme in Fodder Cowpea

A total of 21 parental seeds of fodder cowpea was received from the PC unit during second fortnight of June 2009. Using these seeds, this centre synthesized 81 crosses and was sown on 11.03.2010. The F_1 seeds harvested from the same set of crosses were sown on 28.07.2010 for further evaluation.

V. National Off Season Nursery in Fodder Cowpea

The F_1 seeds received from the four centres (Ranchi (6), Faizabad (10), Pantnagar (5) and Coimbatore (81)] were raised at Coimbatore as an off season nursery and the bulked seeds of F_2 have been dispatched on 14.07.2010 to the above mentioned designated centres.

APPENDIX IV–A : YIELD TRIALS ON DUAL PURPOSE BARLEY

Coordinated trials on dual-purpose barley were proposed for rabi 2008-09, in all zones in plains as well in northern hills zone under the collaborative programme with AICRP-FC, Jhansi. The technical programme was formulated in the AICW&BIP annual meet at IARI, New Delhi in August 2009. Additional locations at AICRP centres were included and observations to be recorded were also decided during the AICRP-FC, rabi group meeting at Bangalore. This time the Advanced Varietal trial (AVT) could not be constituted in NWP Zone, Central zone and NEP Zone while the IVT was proposed under irrigated conditions in NWPZ, NEPZ and Central zones. Similarly one trial was proposed for rainfed conditions of Northern Hills Zone.

The objective of the trials was to evaluate the barley genotypes for their green forage yield (at about 55 days stage in irrigated conditions of plains and at 70-75 days or first node stage under rained conditions in NH Zone) and then for the grain yield from the regenerated crop after the cut.

Initial Varietal Trial (NWP, NEP and Central Zones)

The IVT (common set of new entries) was proposed in NWPZ (five), NEPZ (four) and central zones (seven) at 16 locations. The data were not received from Bilaspur. After analysis data of both grain and forage yield from Udaipur (high CV) were rejected. In case of grain yield Jhansi (High CV) and Anand (low site mean) data were also not considered for pooled zonal analysis for central Zone. In NEPZ and NWPZ data from all centres were considered for zonal means. Amongst the entries K944 and K958 were reported as segregating, while BH933 had few off-types, which needs purification.

In case of NWPZ, yellow rust was reported at Durgapura in the trial. Moderate to heavy leaf blight incidence was reported in NEPZ (Varanasi location). In case of central zone no serious disease and pest incidence was reported. The forage quality analysis was taken up at PAU Ludhiana on the set of varieties in IVT. The crude protein (CP %) and in vitro dry matter digestibility

(IVDMD %) has been analysed (Table 1), which indicates that varieties HUB209 and JB 186 has highest (17.6%) crude protein content followed by check RD2552 (17.05%). Similarly for IVDMD these three varieties were having high values though there are total six entries with more than 70% IVDMD. In case of leaf: stem ratio checks RD2552 and RD2715 and entries JB188 and PL851 were having highest value (2.33), indicating more foliage in comparison to rest of the entries.

Varieties RD2788 and RD2790 were having highest dry matter yield reported from Ludhiana centre.

Table 1. Forage quality traits on IVT dual purpose analysed at PAU Ludhiana

Varieties	DM (Q/Ha)			LS Ratio	CP%	IVDMD %
	Yield	Rk	G			
BH932	22.33	20	0	1.86	13.75	66.8
BH933	35.00	6	0	1.22	15.95	67.6
HUB208	37.90	4	0	1.86	15.40	67.0
HUB209	29.90	12	0	1.50	17.60	72.2
HUB210	32.60	10	0	1.00	15.40	66.8
JB186	29.13	13	0	1.86	17.60	72.2
JB187	28.33	15	0	1.22	16.50	71.0
JB188	32.40	11	0	2.33	14.30	65.8
K944	39.77	3	1	1.50	16.50	71.8
K958	32.80	9	0	1.22	13.75	65.7
RD2788	45.27	1	1	1.50	14.85	66.0
RD2789	33.20	8	0	1.22	13.20	66.2
RD2790	45.27	1	1	1.00	12.10	65.3
RD2791	37.90	4	0	1.00	11.55	65.0
NDB1490	34.40	7	0	1.50	14.85	66.0
NDB1494	19.73	21	0	1.86	12.65	65.4
PL851	22.53	19	0	2.33	14.85	66.0
PL852	19.07	22	0	1.22	13.20	65.30
RD2035(C)	24.37	17	0	1.50	14.85	65.8
RD2552(C)	24.37	17	0	2.33	17.05	72.0
AZAD(C)	28.77	14	0	1.50	14.85	65.2
RD2715(C)	27.50	16	0	2.33	16.50	71.4
G.M.	**31.02**			**1.52**	**14.23**	**64.63**
S.E.(M)	1.98					
C.D.	5.61					
C.V.	12.79					

Grain and forage yield

In case of NWPZ, though several entries were good either for grain yield or forage yield, but there was no entry in first non-significant group in both cases. Thus as a second choice entries with relatively higher ranks in both cases were considered, but in this case also the checks RD2035 (4 GY/ 6FY) was better than rest of entries and checks. In case of NEPZ, based on zonal mean of grain and fodder yield taken together entries HUB208 (3GY/4FY) and HUB209 (5GY/1FY) were ranking higher than checks and other entries in the zone. In central zone also check RD2552 is superior in grain and forage yield then others, based on forage & grain data considered together

.

RAINFED TRIALS

AVT (Northern Hills Zone):

The trial consisted of 14 entries and three checks, out of which BHS380 was included as latest indentified variety, which later on has been notified by CVRC for NH Zone. Entry HBL704 was in AVT first year, while rest were fresh entries. The trial under rainfed conditions was proposed at five locations (Almora, Bajaura, Shimla, Palampur, and Majhera) in the NH Zone.

The results were received from all centres and after analysis data from all centres were included in zonal mean. Because of the dry season experienced during winters in the Uttrakhand and H.P. hills, the grain and forage yield levels are comparatively low as the trial was under rainfed conditions. Yellow rust incidence on few entries was recorded at Bajaura centre. Entry VLB118 appeared in 1st NSG, simultaneously, for grain and forage yield, and can be considered for promotion to AVT-first year in rabi 2010-11.

AVT-RF-DUAL-NHZ
Location wise& Zonal means (Grain Yield in q/ha)

Varieties	NHZ			NHZ			NHZ			NHZ			NHZ			NHZ		
	Almora			Majhera			Bajaura			Palampur			Shimla			Mean		
	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BHS392	19.58	2	0	13.51	12	0	21.97	3	1	9.74	2	0	22.55	1	1	17.5	2	0
BHS393	7.19	11	0	8.39	16	0	17.80	12	0	5.43	14	0	19.02	8	0	11.6	15	0
BHS394	12.03	10	0	12.58	14	0	18.80	8	0	8.15	6	0	21.74	2	1	14.7	8	0
BHS395	2.71	17	0	14.13	9	0	16.08	14	0	4.80	17	0	21.01	3	1	11.7	14	0
HBL704@	4.36	14	0	15.30	7	0	20.97	4	1	6.34	11	0	17.30	15	0	12.9	12	0
HBL706	15.09	6	0	13.35	13	0	22.87	1	1	8.83	5	0	18.12	11	0	15.7	5	0
HBL707	3.30	16	0	16.61	4	0	18.80	10	0	7.25	8	0	18.48	10	0	12.9	11	0
UPB1011	12.38	8	0	18.79	3	0	18.80	8	0	5.39	15	0	20.56	4	1	15.2	7	0
UPB1012	14.50	7	0	25.00	1	1	19.93	7	0	6.11	12	0	17.57	14	0	16.6	3	0
VLB118	22.88	1	1	22.59	2	1	22.42	2	1	9.06	4	0	19.57	7	1	19.3	1	1
VLB119	3.77	15	0	16.07	5	0	16.08	14	0	7.47	7	0	16.94	16	0	12.1	13	0
VLB120	6.84	12	0	8.77	15	0	17.21	13	0	6.79	10	0	17.93	12	0	11.5	16	0
VLB121	6.84	12	0	13.90	10	0	12.91	17	0	5.23	16	0	17.75	13	0	11.3	17	0
VLB122	12.26	9	0	15.53	6	0	14.49	16	0	5.66	13	0	19.75	6	1	13.5	10	0
HBL276(C)	16.16	4	0	6.91	17	0	17.89	11	0	9.28	3	0	18.75	9	0	13.8	9	0
BHS169(C)	16.86	3	0	13.59	11	0	20.83	5	1	12.23	1	1	16.85	17	0	16.1	4	0
BHS380(C)	15.68	5	0	14.83	8	0	20.15	6	0	7.25	8	0	20.11	5	1	15.6	6	0
G.M.	11.32			14.70			18.70			7.35			19.06			14.2		
S.E.(M)	1.06			1.36			0.83			0.40			1.13			0.52		
C.D.	3.02			3.87			2.36			1.13			3.23			1.45		
C.V.	18.73			18.49			8.87			10.75			11.91			14.20		
DOS	26.10.09			5.11.09			6.11.09			7.11.09			30.10.09					

@ -AVT 1st year entry

IVT-DUAL- IR-TS-NWPZ
Location wise & Zonal means (Grain Yield in q/ha)

Varieties	NWPZ			NWPZ			NWPZ			NWPZ			NWPZ			NWPZ		
	Durgapura			Ludhiana			Bikaner			Modipuram			Hisar			Mean		
	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BH932	27.78	6	0	40.83	4	1	8.48	13	0	11.96	19	0	33.21	4	1	24.5	3	0
BH933	27.78	6	0	43.50	1	1	9.44	9	0	18.18	7	1	35.43	3	1	26.9	1	1
HUB208	24.15	17	0	41.08	3	1	8.86	11	0	16.38	10	0	36.43	1	1	25.4	2	0
HUB209	28.68	5	1	34.50	6	0	8.12	17	0	10.24	22	0	28.18	6	0	21.9	8	0
HUB210	24.46	16	0	28.00	9	0	6.07	21	0	13.29	14	0	25.97	9	0	19.6	11	0
JB186	23.85	19	0	22.00	13	0	5.46	22	0	12.44	17	0	25.16	10	0	17.8	16	0
JB187	23.55	20	0	12.42	21	0	8.85	12	0	18.67	5	1	23.47	13	0	17.4	20	0
JB188	16.91	22	0	13.17	20	0	7.45	18	0	12.88	16	0	21.46	17	0	14.4	22	0
K944	26.27	12	0	42.00	2	1	8.41	15	0	11.84	20	0	26.17	8	0	22.9	6	0
K958	25.97	13	0	32.33	7	0	10.02	8	0	19.16	4	1	23.15	14	0	22.1	7	0
RD2788	28.99	4	1	14.67	15	0	7.41	19	0	15.39	11	0	20.73	19	0	17.4	19	0
RD2789	33.82	1	1	14.50	16	0	12.20	2	1	20.27	2	1	21.94	15	0	20.5	10	0
RD2790	27.17	9	0	13.33	19	0	10.11	7	1	16.67	9	0	15.30	22	0	16.5	21	0
RD2791	26.57	10	0	14.33	17	0	9.00	10	0	19.60	3	1	18.52	21	0	17.6	18	0
NDB1490	26.57	10	0	11.00	22	0	8.33	16	0	13.27	15	0	35.83	2	1	19.0	13	0
NDB1494	24.15	17	0	25.67	10	0	10.22	6	1	11.96	18	0	24.76	12	0	19.4	12	0
PL851	25.97	13	0	31.67	8	0	8.45	14	0	17.62	8	0	20.93	18	0	20.9	9	0
PL852	19.93	21	0	24.83	12	0	6.81	20	0	15.14	12	0	21.82	16	0	17.7	17	0
RD2035(C)	31.40	3	1	25.17	11	0	12.45	1	1	20.79	1	1	28.99	5	0	23.8	4	0
RD2552(C)	32.00	2	1	36.33	5	0	10.97	5	1	10.43	21	0	26.97	7	0	23.3	5	0
AZAD(C)	25.97	13	0	15.33	14	0	11.08	4	1	14.41	13	0	24.96	11	0	18.4	14	0
RD2715(C)	27.48	8	0	14.00	18	0	11.85	3	1	18.52	6	1	18.72	20	0	18.1	15	0
G.M.	**26.34**			**25.03**			**9.09**			**15.41**			**25.37**			**20.2**		
S.E.(M)	2.07			1.39			0.85			0.97			1.78			0.17		
C.D.	5.85			3.92			2.41			2.76			5.08			0.46		
C.V.	15.70			11.09			18.71			10.86			12.15			14.67		
DOS	24.11.09			23.10.09			26.11.09			1.12.09			12.11.09					

IVT-DUAL- IR-TS-NEPZ
Location wise & Zonal means (Grain Yield in q/ha)

Varieties	NEPZ			NEPZ			NEPZ			NEPZ			NEPZ		
	Kanpur			Varanasi			Faizabad			Rewa			Mean		
	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BH932	18.12	15	0	10.27	12	0	28.20	20	0	39.30	8	1	24.0	19	0
BH933	30.19	1	1	10.27	12	0	28.02	21	0	40.10	4	1	27.1	10	0
HUB208	25.97	4	0	25.36	5	0	33.57	4	0	38.89	15	0	30.9	3	0
HUB209	18.12	15	0	32.61	2	1	30.37	18	0	39.00	14	0	30.0	5	0
HUB210	18.72	13	0	13.29	8	0	33.51	5	0	40.60	3	1	26.5	11	0
JB186	15.10	22	0	9.66	17	0	31.04	15	0	39.20	10	0	23.8	22	0
JB187	18.12	15	0	10.27	12	0	31.10	13	0	40.81	1	1	25.1	14	0
JB188	21.74	9	0	13.89	7	0	35.21	2	1	40.80	2	1	27.9	7	0
K944	28.99	2	1	9.66	17	0	32.00	10	0	39.81	7	1	27.6	8	0
K958	27.17	3	0	12.08	10	0	33.82	3	0	38.89	15	0	28.0	6	0
RD2788	20.83	11	0	10.27	12	0	25.97	22	0	39.20	10	0	24.1	18	0
RD2789	17.81	19	0	11.47	11	0	28.74	19	0	37.80	21	0	24.0	20	0
RD2790	21.14	10	0	8.45	20	0	30.56	17	0	38.89	15	0	24.8	16	0
RD2791	19.63	12	0	7.85	21	0	32.49	8	0	39.11	13	0	24.8	15	0
NDB1490	18.12	15	0	13.29	8	0	31.04	14	0	40.10	4	1	25.6	13	0
NDB1494	24.15	7	0	33.21	1	1	36.35	1	1	39.30	8	1	33.3	1	1
PL851	17.51	20	0	19.93	6	0	32.49	8	0	38.70	18	0	27.2	9	0
PL852	18.42	14	0	10.27	12	0	31.04	15	0	39.20	10	0	24.7	17	0
RD2035(C)	25.36	5	0	9.66	17	0	31.10	12	0	38.41	20	0	26.1	12	0
RD2552(C)	25.06	6	0	28.99	3	0	33.45	6	0	39.81	6	1	31.8	2	0
AZAD(C)	23.55	8	0	28.38	4	0	31.52	11	0	38.70	18	0	30.5	4	0
RD2715(C)	16.91	21	0	7.85	21	0	33.09	7	0	37.61	22	0	23.9	21	0
G.M.	**21.40**			**15.32**			**31.58**			**39.28**			**26.9**		
S.E.(M)	0.55			1.03			0.59			0.57			0.41		
C.D.	1.55			2.92			1.66			1.60			1.14		
C.V.	5.13			13.50			3.72			2.89			5.31		
DOS	18.11.09			20.11.09			24.11.09			20.11.09					

IVT-DUAL- IR-TS-CZ
Location wise & Zonal means (Grain Yield in q/ha)

Varieties	CZ			CZ			CZ			CZ		
	Jabalpur			Kota			Jalore			Mean		
	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BH932	10.38	21	0	49.70	8	0	6.83	17	0	16.7	13	0
BH933	18.40	14	0	36.47	16	0	8.33	14	0	15.8	15	0
HUB208	18.48	13	0	66.49	1	1	12.53	6	0	24.4	3	1
HUB209	25.77	7	1	51.75	7	0	17.67	3	1	23.8	5	0
HUB210	8.26	22	0	19.69	21	0	4.13	21	0	8.0	22	0
JB186	17.77	16	0	43.54	11	0	4.33	20	0	16.4	14	0
JB187	27.88	4	1	20.65	20	0	4.87	19	0	13.3	18	0
JB188	12.12	20	0	59.84	4	1	7.80	15	0	19.9	10	0
K944	14.84	17	0	40.22	15	0	6.00	18	0	15.3	16	0
K958	28.01	3	1	65.46	2	1	10.33	10	0	25.9	2	1
RD2788	20.33	11	0	28.32	17	0	3.47	22	0	13.0	19	0
RD2789	23.91	8	1	15.10	22	0	7.27	16	0	11.6	20	0
RD2790	21.09	10	0	23.19	18	0	9.27	12	0	13.4	17	0
RD2791	19.24	12	0	41.49	13	0	11.47	8	0	18.0	11	0
NDB1490	28.59	2	1	41.67	12	0	20.53	1	1	22.7	6	0
NDB1494	26.75	6	1	64.49	3	1	20.33	2	1	27.9	1	1
PL851	13.10	19	0	44.93	10	0	10.33	10	0	17.1	12	0
PL852	14.84	17	0	22.04	19	0	8.73	13	0	11.4	21	0
RD2035(C)	17.83	15	0	46.86	9	0	15.53	4	0	20.1	8	0
RD2552(C)	29.89	1	1	53.56	5	0	13.13	5	0	24.1	4	0
AZAD(C)	27.84	5	1	40.40	14	0	11.60	7	0	20.0	9	0
RD2715(C)	21.79	9	0	52.54	6	0	11.28	9	0	21.4	7	0
G.M.	**20.32**			**42.20**			**10.11**			**18.2**		
S.E.(M)	2.21			2.49			1.05			1.34		
C.D.	6.26			7.04			3.00			3.73		
C.V.	21.78			11.80			18.02			22.22		
DOS	28.11.09			26.11.09			12.11.09					

Data from Udaipur, Anand and Jhansi (all HCV) not considered for CZ mean

AVT-RF-DUAL-NHZ
Location wise& Zonal means (Forage Yield in q/ha)

Varieties	NHZ			NHZ			NHZ			NHZ			NHZ			NHZ		
	Almora			Shimla			Majhera			Bajaura			Palampur			Mean		
	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BHS392	18.04	2	0	47.05	11	0	10.42	16	0	19.25	1	1	92.39	9	1	37.4	9	0
BHS393	16.63	5	0	51.40	8	0	9.74	17	0	16.53	12	1	111.41	3	1	41.1	4	1
BHS394	12.15	10	0	51.86	6	0	13.36	14	0	16.76	9	1	105.07	5	1	39.8	6	0
BHS395	8.02	14	0	40.30	15	0	13.81	13	0	16.76	9	1	53.44	17	0	26.5	17	0
HBL704@	10.38	12	0	44.49	12	0	18.12	6	0	17.66	4	1	100.54	7	1	38.2	8	0
HBL706	13.68	8	0	55.20	2	0	15.40	11	0	16.30	14	1	103.26	6	1	40.8	5	1
HBL707	11.67	11	0	55.05	3	0	15.17	12	0	17.66	3	1	78.80	15	0	35.7	10	0
UPB1011	17.69	3	0	39.75	16	0	17.21	8	0	16.30	14	1	84.24	11	0	35.0	12	0
UPB1012	20.99	1	1	43.32	13	0	23.10	2	1	17.21	6	1	93.30	8	1	39.6	7	0
VLB118	13.09	9	0	53.57	5	0	15.85	10	0	17.21	5	1	108.70	4	1	41.7	3	1
VLB119	7.43	16	0	47.90	9	0	11.32	15	0	16.98	8	1	83.33	12	0	33.4	13	0
VLB120	8.61	13	0	47.67	10	0	18.12	6	0	16.76	9	1	84.24	10	0	35.1	11	0
VLB121	7.90	15	0	37.73	17	0	20.38	5	1	14.49	17	0	82.43	13	0	32.6	15	0
VLB122	6.01	17	0	40.92	14	0	16.30	9	0	18.12	2	1	80.62	14	0	32.4	16	0
HBL276(C)	17.10	4	0	54.19	4	0	25.14	1	1	16.53	12	1	112.32	2	1	45.1	2	1
BHS169(C)	15.09	6	0	51.63	7	0	21.51	3	1	17.21	6	1	57.97	16	0	32.7	14	0
BHS380(C)	14.86	7	0	66.23	1	1	20.38	4	1	15.85	16	1	115.04	1	1	46.5	1	1
G.M.	12.90			48.72			16.78			16.92			91.01			37.3		
S.E.(M)	0.88			2.52			2.36			1.35			8.22			2.09		
C.D.	2.51			7.16			6.73			3.85			23.41			5.80		
C.V.	13.67			10.33			23.15			16.00			18.07			21.75		
DOS	26.10.09			5.11.09			6.11.09			7.11.09			30.10.09					

@ -AVT 1st year entry

IVT-DUAL- IR-TS-NWPZ
Location wise & Zonal means (Forage Yield in q/ha)

Varieties	NWPZ			NWPZ			NWPZ			NWPZ			NWPZ			NWPZ			DM (Q/Ha)		
	Modipuram			Hisar			Durgapura			Ludhiana			Bikaner			Mean			Ludhiana		
	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BH932	80.52	12	0	57.81	22	0	187.20	14	0	203.33	20	0	42.20	17	0	114.2	20	0	22.33	20	0
BH933	81.32	11	0	76.33	18	0	210.75	11	0	291.67	6	0	65.59	9	0	145.1	11	0	35.00	6	0
HUB208	101.45	2	1	96.30	5	0	138.29	22	0	303.33	4	1	58.47	14	0	139.6	14	0	37.90	4	0
HUB209	60.39	21	0	90.82	7	0	207.13	12	0	260.00	12	0	30.89	21	0	129.8	17	0	29.90	12	0
HUB210	91.79	4	0	96.14	6	0	187.20	13	0	271.67	10	0	71.06	8	0	143.6	12	0	32.60	10	0
JB186	90.18	5	0	83.57	15	0	289.86	5	0	253.33	13	0	35.51	19	0	150.5	7	0	29.13	13	0
JB187	67.63	19	0	87.28	11	0	181.16	16	0	246.67	15	0	59.17	13	0	128.4	18	0	28.33	15	0
JB188	84.54	8	0	86.96	12	0	179.95	17	0	270.00	11	0	53.21	15	0	134.9	15	0	32.40	11	0
K944	82.93	9	0	71.66	20	0	162.44	20	0	318.33	3	1	96.01	2	0	146.3	9	0	39.77	3	1
K958	78.90	14	0	88.24	10	0	216.79	10	0	273.33	9	0	46.28	16	0	140.7	13	0	32.80	9	0
RD2788	82.93	9	0	97.58	4	0	273.55	6	0	348.33	1	1	91.43	4	0	178.8	2	1	45.27	1	1
RD2789	76.49	16	0	90.82	7	0	320.05	3	1	276.67	8	0	117.78	1	1	176.4	3	0	33.20	8	0
RD2790	100.64	3	1	110.31	2	1	336.96	1	1	348.33	2	1	60.66	11	0	191.4	1	1	45.27	1	1
RD2791	56.36	22	0	115.94	1	1	321.86	2	1	303.33	4	1	63.56	10	0	172.2	4	0	37.90	4	0
NDB1490	106.28	1	1	61.35	21	0	240.94	9	0	286.67	7	0	35.08	20	0	146.1	10	0	34.40	7	0
NDB1494	78.90	14	0	82.05	16	0	152.78	21	0	188.33	21	0	36.88	18	0	107.8	22	0	19.73	21	0
PL851	72.46	18	0	81.16	17	0	166.06	19	0	205.00	19	0	28.44	22	0	110.6	21	0	22.53	19	0
PL852	73.27	17	0	84.06	14	0	185.39	15	0	181.67	22	0	60.18	12	0	116.9	19	0	19.07	22	0
RD2035(C)	87.76	7	0	105.80	3	1	253.62	8	0	221.67	18	0	86.50	5	0	151.1	6	0	24.37	17	0
RD2552(C)	80.52	12	0	84.22	13	0	175.72	18	0	221.67	17	0	93.22	3	0	131.1	16	0	24.37	17	0
AZAD(C)	64.41	20	0	88.89	9	0	263.89	7	0	250.00	14	0	75.82	6	0	148.6	8	0	28.77	14	0
RD2715(C)	89.37	6	0	74.40	19	0	295.29	4	0	236.67	16	0	72.05	7	0	153.6	5	0	27.50	16	0
G.M.	**81.32**			**86.89**			**224.86**			**261.82**			**62.73**			**143.5**			**31.02**		
S.E.(M)	3.91			5.41			11.84			16.94			6.00			5.20			1.98		
C.D.	11.17			15.45			33.49			47.91			16.96			14.42			5.61		
C.V.	8.33			10.78			10.53			12.94			19.12			14.04			12.79		
DOS	1.12.09			12.11.09			24.11.09			23.10.09			26.11.09						23.10.09		

IVT-DUAL- IR-TS-NEPZ
Location wise & Zonal means (Forage Yield in q/ha)

Varieties	NEPZ Kanpur			NEPZ Varanasi			NEPZ Faizabad			NEPZ Rewa			NEPZ Mean		
	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BH932	115.34	7	0	113.53	21	0	170.89	14	0	44.81	10	0	111.1	20	0
BH933	118.06	6	0	150.36	13	0	165.46	16	0	48.09	1	1	120.5	15	0
HUB208	108.70	14	0	202.29	1	1	160.63	20	0	43.89	15	0	128.9	4	0
HUB209	109.60	12	0	199.28	2	1	217.39	1	1	45.19	9	0	142.9	1	1
HUB210	111.41	10	0	158.21	11	1	165.46	16	0	46.59	4	1	120.4	16	0
JB186	111.11	11	0	178.74	6	1	185.39	7	0	44.01	13	0	129.8	3	1
JB187	111.71	9	0	135.27	18	0	181.76	8	0	46.81	3	1	118.9	18	0
JB188	108.09	15	0	179.35	5	1	153.99	22	0	45.89	6	1	121.8	11	0
K944	121.07	2	0	179.95	4	1	162.44	19	0	44.01	12	0	126.9	6	0
K958	119.57	4	0	120.77	20	0	197.46	2	0	42.10	22	0	120.0	17	0
RD2788	123.49	1	1	146.74	15	0	166.67	15	0	45.51	7	0	120.6	13	0
RD2789	121.07	2	0	146.14	16	0	170.89	13	0	44.01	13	0	120.5	14	0
RD2790	118.66	5	0	145.53	17	0	188.41	6	0	42.80	19	0	123.8	8	0
RD2791	114.73	8	0	176.93	7	1	190.22	5	0	43.70	16	0	131.4	2	1
NDB1490	109.30	13	0	112.92	22	0	172.10	12	0	46.50	5	1	110.2	21	0
NDB1494	106.88	16	0	147.34	14	0	195.65	4	0	45.29	8	0	123.8	9	0
PL851	103.26	19	0	131.64	19	0	157.61	21	0	42.61	21	0	108.8	22	0
PL852	102.05	21	0	182.37	3	1	181.76	9	0	43.09	18	0	127.3	5	0
RD2035(C)	101.75	22	0	160.02	10	1	164.25	18	0	43.70	16	0	117.4	19	0
RD2552(C)	105.68	17	0	152.17	12	0	196.86	3	0	44.20	11	0	124.7	7	0
AZAD(C)	105.68	17	0	163.65	9	1	178.74	10	0	47.10	2	1	123.8	9	0
RD2715(C)	103.26	19	0	164.25	8	1	176.33	11	0	42.71	20	0	121.6	12	0
G.M.	**111.39**			**156.70**			**177.29**			**44.66**			**122.5**		
S.E.(M)	0.78			15.93			3.55			0.84			4.72		
C.D.	2.20			45.06			10.04			2.36			13.09		
C.V.	1.40			20.33			4.00			3.74			13.35		
DOS	18.11.09			20.11.09			24.11.09			20.11.09					

IVT-DUAL- IR-TS-CZ
Location wise & Zonal means (Forage Yield in q/ha)

Varieties	CZ			CZ			CZ			CZ			CZ			CZ		
	Jalore			Jabalpur			Kota			Jhansi			Anand			Mean		
	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BH932	211.80	17	0	54.35	22	0	166.06	11	0	78.50	17	0	200.4831	9	0	142.2	18	0
BH933	221.87	15	0	78.80	16	0	162.44	12	0	86.55	13	0	99.03382	22	0	129.7	22	0
HUB208	203.80	18	0	86.96	12	0	150.36	16	0	80.52	16	0	158.6151	15	0	136.0	20	0
HUB209	195.20	19	0	88.04	10	0	175.72	7	1	76.49	18	0	214.1707	5	1	149.9	14	0
HUB210	190.53	21	0	116.85	3	0	176.93	6	1	92.59	11	0	259.2593	1	1	167.2	6	0
JB186	192.90	20	0	90.22	9	0	173.31	10	1	86.55	13	0	210.9501	7	0	150.8	12	0
JB187	168.27	22	0	93.48	7	0	155.19	13	0	54.35	22	0	205.314	8	0	135.3	21	0
JB188	270.27	11	0	130.43	2	1	154.59	15	0	102.66	3	1	218.1965	4	1	175.2	3	1
K944	227.80	13	0	109.24	4	0	149.15	17	0	100.24	4	0	182.7697	13	0	153.8	10	0
K958	226.27	14	0	70.65	19	0	147.34	19	0	94.61	6	0	194.847	11	0	146.7	17	0
RD2788	242.13	12	0	86.96	12	0	182.97	1	1	92.59	12	0	225.4428	2	1	166.0	7	0
RD2789	309.40	4	0	76.63	17	0	174.52	9	1	98.63	5	0	193.2367	12	0	170.5	4	0
RD2790	355.80	1	1	82.07	15	0	178.74	3	1	122.79	1	1	151.3688	17	0	178.2	2	1
RD2791	337.53	2	1	97.83	5	0	177.54	5	1	108.70	2	1	219.8068	3	1	188.3	1	1
NDB1490	276.87	9	0	82.61	14	0	134.06	20	0	82.53	15	0	165.8615	14	0	148.4	16	0
NDB1494	296.07	6	0	92.39	8	0	126.81	22	0	69.24	19	0	157.81	16	0	148.5	15	0
PL851	221.83	16	0	66.85	20	0	131.04	21	0	64.41	21	0	211.7552	6	0	139.2	19	0
PL852	289.67	7	0	59.78	21	0	147.95	18	0	68.44	20	0	197.2625	10	0	152.6	11	0
RD2035(C)	286.90	8	0	149.46	1	1	179.35	2	1	94.61	6	0	136.876	19	0	169.4	5	0
RD2552(C)	302.53	5	0	87.50	11	0	178.74	3	1	94.61	9	0	133.6554	20	0	159.4	8	0
AZAD(C)	328.00	3	0	96.74	6	0	155.19	13	0	94.61	6	0	117.5523	21	0	158.4	9	0
RD2715(C)	271.67	10	0	71.74	18	0	175.72	7	1	94.61	9	0	138.4863	18	0	150.4	13	0
G.M.	**255.78**			**89.53**			**161.53**			**88.13**			**181.4888**			**155.3**		
S.E.(M)	8.35			8.80			3.69			7.49			19.26932			5.60		
C.D.	23.84			24.90			10.45			21.19			45.89056			15.53		
C.V.	5.65			19.67			4.57			17.00			18.3898			13.97		
DOS	12.11.09			28.11.09			26.11.09			31.10.09			5.11.09					

Data from Udaipur (High CV) not considered for CZ mean

APPENDIX V : DIRECTORY OF SCIENTIFIC STAFF : AICRP ON FORAGE CROPS CENTRES

Name	Designation & Discipline	Tel. Office	Tel. Residence	Fax	E-mail
University of Agril. Sciences(Bangalore) Zonal Agri. Res. Station, VC Farm, Mandya –571 405(Karnataka)					
Dr. H.C. Lohithaswa	Senior Scientist (Plant Breeding) and OIC	08232-277921	09900115093 (M)	08232-277392	lohithhc@rediffmail.com
Dr. B.G. Shekara	Scientist (Agronomy)	08232-277921	09900618898 (M)		shekara_gundanaik@rediffmail.com
Dr. K.T. Pandurange Gowda	Associate Director of Research	08232-277147	09449866917 (M)		
Dr. Shivanna	Director (Research)	080-23330206	09449866903 (M)	080-23330206	dr@uasbangalore.edu.in
Orissa University of Agril. & Tech. Bhubaneswar 751 003 (Orissa)					
Dr. B.K.Sahoo	Senior Agronomist & OIC	0674-2391692	09437466685 (M)	0674-2397700 0674-2397424	bks-agro@yahoo.com
Dr.G. B. Dash	Plant Breeder		09437133180 (M)		gokulbdash@ gmail.com
Dr.S.S. Mahapatra	Plant Pathologist		09337510065 (M)		shyamamahapatra@ yahoo.com
Dr. M. M. Panda	Dean, Research	0674-2397692	09437504414 (M)	0674-2397091 0674-2397046	deanresearch_03@hotmail;.com mmp_madan@ yahoo.co.in
Anand Agril. University, Anand Campus, Anand 388 110 (Gujarat)					
Dr. H.R. Kher	Principal Scientist (Forage Breeding) & OIC	02692- 264179	02692- 260002 09427610938 (M)	(02692) – 261520/2-261057	haribhai_kher@yahoo.com
Dr. C.C. Patel	Scientist (Entomology)	02692- 264179	02692- 261140 09879428419 (M)		ccpatel@yahoo.com
Dr. P.M. Patel	Scientist (Agronomy)	02692- 264179	09925711200 (M)		piyus5@yahoo.co.in piyus5@aau.inn

Name	Designation & Discipline	Tel. Office	Tel. Residence	Fax	E-mail
Mr. R.M. Patel	Scientist (Biochem.)	02692- 264179	02699- 235341		
Mr. N.N. Patel	Scientist (PI. Pathology)	02692- 264179	02718- 233098 09824912188 (M)		
Dr. A.M. Shakh	Director (Research) & Dean P. G. Studies	02692- 263600	02692- 262159 09998009968 (M)	02692- 263600	dr@aau.in
	BAIF Development Research Foundation, Urulikanchan, Pune 412 202 (Maharashtra)				
Mr. P.S. Takawale	Forage Breeder & OIC	020- 26926248 020- 26926265	020- 26926347 09881369750 (M)	020- 26926347	crs@pn2.vsnl.net.in takawalep@yahoo.in
Mr. V.K. Kauthale	Sr. Scientist (Agronomy)	020- 26926448 020- 26926265	09960536631 (M)		crs@pn2.vsnl.net.in vkkauthale@gmail.com
Dr. A.B. Pande	Vice President	020- 26926248 020- 26926265	020- 24345052 09325010213 (M)	020- 26926347	crs@pn2.vsnl.net.in ashokbpande@yahoo.co.in
	C.S.K. Himachal Pradesh Krishi Vishwavidyalaya, Palampur 176 062 (Himachal Pradesh)				
Dr. Naveen Kumar	Sr. Agronomist & OIC	01894-230392	09418149173 (M)	01894-230511	fpgmc@yahoo.com nkumar@hillagric.ernet.in
Dr. V. K. Sood	Plant Breeder	01894-230391	09817244630 (M)		vkspbg23@rediffmail.com
Dr. D. K. Banyal	Plant Pathologist	01894-230326	09418111480 (M)		dkbanyal@gmail.com
Dr. Rajan Katoch	Asstt. Analytical Chemist (Biochemistry)	01894-230391	09418121870 (M)		rajankatoch@yahoo.com
Dr. B. C. Sood	Head (CI)	01894-230391	09318589423 (M)		bcsood@hillagric.ernet.in

Name	Designation & Discipline	Tel. Office	Tel. Residence	Fax	E-mail
Dr. J. C. Bhandari	Incharge (Forage Unit)	01894-230391	09418017599 (M)		jcb_52@rediffmail.com
Dr. B. C. Sood	Director (Research)	01894-230406	09318589423 (M)	01894-230511	bcsood@hillagric.ernet.in
		G.B. Pant University of Agril & Tech., Pantnagar 263145 (Uttarranchal)			
Dr. Y. P. Joshi	Professor (Agronomy) & OIC	05944-234448	234145/9411160018	05944 -233473	ypjoshi@ymail.com
Dr. J. S. Verma	Professor (PBG)	05944-234448	234407/9720895558		
Dr. Indra Deo	Sr. Scientist (PBG)	05944-234448	235279/9358756157		idpandey2005@rediffmail.com
Dr. S. K. Saini	Head (Agronomy) & Director Experiment Station	05944-233075 05944-233363	233461/9412929400		head_agronomy@yahoo.com
		Birsa Agricultural University, Kanke, Ranchi 834 006 (Jharkhand)			
Dr. S. Karmakar	Sr. Scientist (Agronomy & OIC	0651-2450608	09431929915 (M)	0651-2451011	skarmakar07@gmail.com sambhunath.k@rediffmail.com
Dr. Surya Prakash	Jr. Scientist (PBG)	0651-2450625	09430393412 (M)		suryapbg@gmail.com
Dr. B.N. Singh	Director (Research)	0651-2450610	09431958566 (M)	0651-2451011	dr_bau@rediffmail.com
		Rajasthan Agricultural University, Bikaner 334 002 (Rajasthan)			
Dr. N.S. Yadav	Associate Prof. (Agronomy) & OIC	0151 – 2111406	09352736259 (M)	0151 – 2250576 0151 – 2250570	dearnagendra@yahoo.com dearnagendrasingh@rediffmail.com
Dr. S.S. Shekhawat	Assistant Prof. (PBG)	0151 – 2111406	0151 – 2205740 09828282082 (M)	0151 – 2250576 0151 – 2250570	srn_shekhawat@yahoo.co.in
Dr. P.S. Rathore	Professor (Agronomy) & Zonal Director Research	0151 – 2250570	0151 – 2250811 09460657371 (M)	0151 – 2250570	praveen11rathore@rediffmail.com

Name	Designation & Discipline	Tel. Office	Tel. Residence	Fax	E-mail
Dr. M.P. Sahu	Professor (Agronomy) & Director Research	0151 – 2250199 0151 – 2250576	0151 – 2250549 0151 – 2251256	0151 – 2250576	mpsdr@rediffmail.com dor@raubikaner.org
Kerala Agricultural University, Vellayani 669 522, Thiruvananthapuram (Kerala)					
Dr. D I. Sumabai	Professor (PB) & OIC	0471-2381002	0471-2352535 09447658080 (M)		sumabai@yahoo.com
Smt.S.R. Sharu	Assistant Prof.(Agron.)	0471-2381002	0471-2446540 09447419588 (M)	0471-2382239	sharusv@gmail.com
Dr. D. Alexander	Professor (Agronomy) & DR	0487-2371302	0487-2370347 0944601718 (M)	0487-2370019	dr@kau.in
Acharya N.G. Ranga Agril University (ANGRAU) Livestock Research Institute, Rajendra Nagar, Hyderabad 500 030 (Andhra Pradesh)					
Dr.Ch.Chiranjeevi	Principal Scientist (Ento.) & OIC	040-24001706	040-24070509 09866074764 (M)	040-24001706	chiranjeevich@ rediffmail.com
Dr.T. Shashikala	Sr.Scientist (PB)	040-24001706	09849152482		shashikala69@yahoo.com
Dr.V. Chandrika	Sr.Scientist (Agronomy)		040-24031656 09849834220 (M)		vchandrika2@rediffmail.com
Dr.M. Shanti	Scientist (Soil Science & Agril. Chem.)		040-27224229 09848940225 (M)		shantigoka@yahoo.com
Dr. T. V. K. Singh	PS (Ento.)	08540-228646	09440891779 (M)	08540-221177	adr_palem@rediffmail.com
Dr. G. L. Reddy	Director (Research)	040-24015078	09989625219 (M)	040-24017453	drangrau@ap.nic.in
Bidhan Chandra Krishi Vishwavidyalaya, Kalyani 741 235, Distt. Nadia (West Bengal)					
Dr. C. K. Kundu	Agronomist & OIC	033-25823948	09433754218 (M)	033-25823948	champakbckv@gmail.com

Name	Designation & Discipline	Tel. Office	Tel. Residence	Fax	E-mail
Prof. D. K. De	Sr. Forage Breeder (PB)	033-25828407	09474363157 (M)	033-25828407	dilip.bidhan@gmail.com
Prof. S. K. Sanyal	Director (Research)	033-25828407	09830247072 (M)	033-25828407 033-25823948	sarojsanyal@yahoo.co.in
Tamil Nadu Agricultural University, Coimbatore 641 003 (Tamil Nadu)					
Dr.K.Velayudam	Professor (Agronomy)	0422 -6611228	0422-2434575 09442738572 (M)		velakum@gmail.com
Dr. C. Babu	Associate Professor (PBG)	0422 -6611228			
Dr.M. Paramathma	Director (Research)	0422-6611447	0422-6611309 0422-2456462 09443505843 (M)	0422-6611454	drres@tnau.ac.in
C.C.S. Haryana Agricultural University, Hisar 125 004 (Haryana)					
Dr. R.N. Arora	Sr. Forage Breeder (PB) & OIC	01662-289270	01662-243407 09813104097 (M)	01662-234952 (VC) 01662-284340(DR)	arora15@rediffmail.com forages@hau.ernet.in
Dr. P.P. Gupta	Sr. Scientist (PB)	01662- 289270	01662-243048 09896107355 (M)	01662-234952 01662-284340(DR)	forages@hau.ernet.in
Dr. D.S. Rana	Sr. Scientist (Agronomy)	01662- 289270	01662-243594 09416044705 (M)	01662-234952	forages@hau.ernet.in
Dr. U.N. Joshi	Sr. Scientist (Biochemistry)	01662- 289270	01662-249227	01662-234952	forages@hau.ernet.in
Dr. D.S. Phogat	Sr. Scientist (PB)	01662- 289270	01662-240613	01662-234952	forages@hau.ernet.in

Name	Designation & Discipline	Tel. Office	Tel. Residence	Fax	E-mail
Dr.V.P. Sangwan	Sr.Scientist (Seed Sci. & Tech.)	01662- 284336	09254437796 (M) 01662-244318 09416796346 (M)		forages@hau.ernet.in
Dr. R.P.Narwal	Director of Research	01662-289210	01662-235040 09416241395 (M)	01662-284340	dr@hau.ernet.in
		N.D. University of Agril. & Tech., Kumarganj, Faizabad 224 221 (Uttar Pradesh)			
Dr. D.N. Vishwakarma	Forage Breeder & OIC	05270-262051	09452671711 (M)	05270-262051	nduatforage@gmail.com
Mr. M.L. Maurya	Jr. Soil Scientist	05270-262051	09415716845 (M)		Chhabi123@india.com
Dr. C.N. Ram	Jr. Breeder	05270-262051	09451205686 (M)		nduatforage@gmail.com
Dr. Sushant	Jr. Agronomist	05270-262051	09451290258 (M)		agronomy_nduat@india.com
Dr. H.P.Tripathi	Director (Research)	05270-262072	05270-262031/ 09415717279 (M)	05270-26209 (V.C.)	hpt@india.com
		Punjab Agril. University, Ludhiana 141 004 (Punjab)			
Dr U S Tiwana	Senior Agronomist & OIC	0161-2401960	09814702076 (M)	0161-2400945 0161-2409891	utiwana@yahoo.co.in ustiwana@pau.edu
Dr (Mrs) Upasna Rani	Asstt. Plant Pathologist	0161-2401960	09463753509 (M)		upasana.rani@gmail.com
Dr Rahul Kapoor	Asstt. Forage Breeder	0161-2401960	09815585599 (M)		rahulkapoor@pau.edu
Dr R K Bajaj	Senior Breeder	0161-2401960	09815500996 (M)		drbajajrk@rediffmail.com

Name	Designation & Discipline	Tel. Office	Tel. Residence	Fax	E-mail
Dr P S Minhas	Director (Research)	0161-2401221 0161-2401960	0161-2771845	0161-2407309 0161-2400945	drpau@pau.edu
	Jawaharlal Nehru Krishi Vishwavidyalaya, Jabalpur 482 004 (Madhya Pradesh)				
Dr. A.K. Mehta	Pr. Scientist (PB) & OIC	0761-2681773PBX-308	0761-2343854 09424307262 (M)	0761-2681074	anoop.mehta@yahoo.co.in
Dr. S.K. Bilaiya	Sr. Scientist (PB)	0761-2681773PBX-308	0761-2652178 09425165543 (M)		s_bilaiya@yahoo.co.in
Mr. N.S. Raghuwanshi	TA Agronomy		0761 4030950 9827644045 (M)		
Mrs. Arti Shirivastava	TA Agronomy		09300974717 (M)		
Dr. J.K. Sharma	TA Agronomy		09993156930 (M)		
Dr. Girish Jha	Professor & Head (Agronomy)	0761-2681773PBX-308	09425186360 (M)	0761-2681074	girishagcrewa@rediffmail
Dr.S.S.Tomar	Director (Research)	0761-2681200 0761-2681074	0761-2681614	0761-2681074	tomarssindore@yahoo.com
	Assam Agril. University, Jorhat 785 013 (Assam)				
Dr K.K.Sharma	Pr. Scientist (Agronomy) & OIC	0376-2340044	09435352157 (M)	0376-2310831	kksharma6@yahoo.com
Dr (Mrs) S.Bora Neog	Principal Scientist (PB)	0376-2340044	09435091670 (M)		seuji boraneog @yahoo.com
Dr N.N.Sarmah	Director (Research)	0376-2340044	09435051811 (M)	0376-2310831	dr_agri@aau.ac.in

Name	Designation & Discipline	Tel. Office	Tel. Residence	Fax	E-mail
Mahatma Phule Krishi Vidyapeeth, Rahuri 413 722 (Maharashtra)					
Prof. A. H. Sonane	Forage Breeder & OIC	02426-243256	09422727814 (M) 02426-243401	02426-243223	ajitsonone@gmail.com
Prof. S.H. Pathan	Scientist-1(Agronomy)	02426-243256	09730928180 (M)		
Dr. A.B. Tambe	Scientist-1 (Entomology)	02426-243256	09890890195 (M) 02426-243123		abtambe@gmail.com
Prof. S.V. Damame	Scientist-1 (Biochemistry)	02426-243256	09011234900 (M) 02426-243802		shivaji_damame@rediffmail.com
Dr. J.V. Patil	HOD (Botany)	02426-243249	09850868035 (M)		
Dr S.S. Mehetre	Director (Research)	02426-243261	09860529571 (M) 02426-243214	02426-243223	subhash mehetre@rediffmail.com dor.mpkv@nic.in
S.K. University of Agril. Sciences & Technology, Srinagar 190 121, Kashmir (J & K)					
Dr. S.A. Wani	Assoc. Director (Research)	09419085998 (M)	0194-2400561	0194-2462160	shafiq_gpb@123india.com
Dr. N.A. Zerakh	Prof. & Head (PBG)	0194-2462967			
Dr. Gul Zafar	Sr. Scientist (PB)	09419072588			
Central Agricultural University, Post Box No.23, Imphal – 795004 (Manipur)					
Dr. Ph. Ranjit Sharma	Deputy Director of Research	0385-2410427	0385-2244022	0385-2410427	phranjitsharma@rediffmail.com
Dr. Edvin Luikham	Assoc. Prof. (Agronomy)	0385-2410427	0385-2413839		
Indira Gandhi Krishi Vishwavidyalaya, Raipur (Chattisgarh) – 492 006					
Dr. D.K. Chandrakar	Scientist (Agronomy)	0771-2443035/2442228	0771-2426965 09826177967 (M)	0771-2444062	
Dr. G.S. Tomar	Sr. Scientist (Agronomy)	0771-2442177	09752022125(M) 09826112321(M)		

Name	Designation & Discipline	Tel. Office	Tel. Residence	Fax	E-mail
Dr. S. K. Patil	Director (Research)	0771-2443035		0771-2442131 0771-2443035	spatil_igau@yahoo.com drs_igkvr@yahoo.com
	Dr. B.S. Konkan Krishi Vidyapeeth, Agricultural Research Station (Dapoli), Palghar – 417 712, District Thane (Maharashtra)				
Sh. M.P. Gawai	Jr. Agrostologist	02148-223254/222035	09423454447		mahendra_gawai@yahoo.com
Dr. L.S. Chavan	Agronomist				
Dr. Amol V Dahiphale	Jr. Agrotologist	02525-241048	09421987974		
	Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Krishi Nagar, Akola 444 104 (Maharashtra)				
Dr. R.B. Ulemale	Jr. Agronomist & OIC Forage Research Unit A.H. & D	0724-258200/ 2258467	0724-2451631		
	Chandra Shekhar Azad University of Agriculture & Technology, Kanpur – 208002 (Uttar Pradesh)				
Dr. K.C. Arya	I/C Sorghum Project PBG				
Dr. Lalta Prasad	Sr. Sorghum Breeder (PBG)		09450129505(M)		
	Sardar Vallabh Bhai Patel University of Agriculture and Technology, Meerut – 250 110 (UP)				
Dr. S.A. Kerkhi	Professor (PB)	0121-2411504	09319820296(M)	0121-2411505	
Dr. Rajvir Singh	Assoc. Prof. (Agronomy)		09411260581(M)		
Dr. S.K. Singh	Assoc. Prof. (PB)	0121-2951600			
	Rajendra Agricultural University, Pusa, Samastipur , 848125 (Bihar)				
Dr. S.K. Choudhary	Sr. Scientist (Agronomy)	09431834082 (M)	06274-2430394	06274-240255	
	Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora 263 601 (Uttaranchal)				
Dr. J. C. Bhatt	Director	05962-230208/230060	05962-230139	05962-231539	
Dr. J.K. Bisht	Sr. Scientist (Agronomy) & OIC Forage Research	05962-230208/ 230060	05962-233177/ 232551 09412436120 (M)	05962-231539	bishtjk@hotmail.com

Name	Designation & Discipline	Tel. Office	Tel. Residence	Fax	E-mail
S.K. University of Agril. Sciences & Technology, Regional Research Station, Rajouri B.P.O. Tandwal 185 131 (Jammu)					
Dr. A. K. Sharma	Assoc. Director (Res.)	01962-263202 0191-2434883 (VC)	01962-2466015 09419145510(M)	01962-263202	aswanikumar-sharma@rediffmail.com
Dr. S .B. Singh	Jr. Scientist (Plant Breeding)		09419289916(M)		singhsb1971@rediffmail. com.
Dr. A. Kohli	Jr. Scientist(Soil Science)		094191-72535(M)		anshumankohli@gmail.com.
Dr. S.K. Mishra	Jr. Scientist(Agronomy)		09419170186(M)		
Central Arid Zone Research Institute, Jodhpur 342 003 (Rajasthan)					
Dr. M.P. Rajora	Sr. Sci. (Plant Breeding)	0291-27 86483	0291-2727063	0291-2788706	mahavirrajaora@yahoo.co.in mprajora@cazri.res.in
Agricultural Research Station (RAU Bikaner,Rajasthan)					
Dr. N.K. Sharma	Assoc. Dir. Research Keshwana, Jalore– 343 001 (Raj.)	02973-265844 09414275222 (M)	02973-222988		ars_jal@raj.nic.in
Dr. N. Shreemali	OIC-Barley Programme, ARS, Durgapura	09414229187			
ICAR Research Complex for NEH Region, Umroi Road (Umiam) Barapani 793 103 (Meghalaya)					
Dr. S.B. Ngachan	Director	0364-2570257	0364-2570302	0364-2570288/ 2570501/ 2570257	director@icarneh.ernet.in
Dr. A.S.Panwar	Pr. Scientist (Agronomy)	0364-2570026	03642570128 09436731850 (M)		draspanwar@gmail.com
Directorate of Seed Research, P.B. No. 11, Village : Kushmaur (P.O. Kaithauli), Mau – 275 101 (U.P.)					
Dr. Asit B. Mandal	Project Director	0547-2530325/26		0547-2530325	pd_dsr2005@yahoo.co.in
Dr. S. Natrajan	Sr. Scientist (Seed Tech.)		09415412587 (M)		
National Dairy Development Board, Anand-388001 (Guj.)					
Dr. A.K. Garg	Sr. Manager (PS-AH)	02692-226246 (O)	09426389619 02692-226517(R)		akgarg@nddb.coop

Name	Designation & Discipline	Tel. Office	Tel. Residence	Fax	E-mail
Regional Research Station (University of Agricultural Sciences, Dharwad), P.B. No. 24, Raichur – 548 101 (Karnataka)					
Dr. B.S. Golasangi	Sr. Scientist (PB)	08532- 220193		08532-220193	svkrcr@rediffmail.com
Directorate of Maize Research, IARI, New Delhi- 110012					
Dr. Sain Das	Project Director	011-25841805	011-32461314	011-25848195	pdmaize@gmail.com
Maharana Pratap University of Agriculture & Technology, Udaipur 313 001 (Rajasthan)					
Dr. S.L. Godawat	Prof & Sr. Maize Breeder	0294-2423119	0294-2465061 09414850711 (M)	0294-2420447	slgodawat@rediffmail.com
Pandit Jawahar Lal Nehru College of Agril. & Research Institute, Karaikal – 609 603 (Pondicherry)					
Dr. S. Mala	Asstt. Prof.(Agronomy)	04368-261372(O)			
Dr. S. Saravanan	Asstt. Prof.(PB) & Genetics				
IARI Regional Research Station, Karnal -132 001 (Haryana)					
Dr. S.S. Atwal	Head	0184-2267169	0184-2267365	0184-2266672	
Directorate of Wheat Research, P.B. No. 158, Karnal – 132 001 (Haryana)					
Dr. S.S. Singh	Project Director	0184-2267490	0184-2267559 09416209218	0184-2267390	pdwheat@dwr.in
Dr. R.P.S. Verma	PS & PI, Barley Network	0184-2267490/ 2265632/2267495	09416468414	0184-2267390	
International Crop Research Institute for Semi Arid and Tropics (ICRISAT), Hyderabad					
Dr. K.N. Rai	Pr. Scientist (Millet Breed.)	040-23296161	098490-78400 (M)	040-23241239	icrisat@cgiar.org
All India Coordinated Research Project on Plant Parasitic Nematode, Div. of Nematology, IARI, New Delhi- 110012					
Dr. R.K.Jain	Project Coordinator	011-25846400	011-27550355	011-25846400	rameshjain1952@yahoo. co.in rkjain-nem@iari.res.in
All India Coordinated Research Network on Underutilized crops, NBPGR, IARI Pusa Campus, New Delhi- 110012					
Dr. D.C. Bhandari	Network Coordinator	011-25841835		011-25841835	bhandaridc@nbpgr.ernet.in

Name	Designation & Discipline	Tel. Office	Tel. Residence	Fax	E-mail
All India Coordinated Pearl Millet Improvement Project, Agricultural Research Station, Mandor, Jodhpur 342 304 (Rajasthan)					
Dr. I.S. Khairwal	Project Coordinator	0291-2571408	0291-2571909	0291-2571909	pcunit@sify.com
National Bureau of Plant Genetic Resources, New Delhi -110012					
Dr. D.C. Bhandari	Director	011-25843697	011-25841177	011-25842495	director@nbpgr.ernet.in
National Research Centre for Agroforestry Jhansi-284003					
Dr. S.K. Dhyani	Director	0510-2730213	09451658346	0510-2730364	shivkdhyani@gmail.com
Dr. Sunil Kumar	Pr. Scientist (Agronomy)		0510-2730240 09451719637 (M)		sktiwari98@mail.com
Directorate of Sorghum Research, Rajendranagar, Hyderabad- 500030, AP					
Dr. J. V. Patil	Project Director	040-20020077	040-24017087	240-24016378	jvp@sorghum.res.in
Indian Grassland and Fodder Research Institute, Jhansi 284 003 (U.P.)					
Dr. K.A. Singh	Director	0510-2730666	0510-2730333	0510-2730833	kasingh@igfri.ernet.in
Mr. K.C. Pandey	Pr. Sci. (Entomology)	0510-2730446	0510-5521251 09935895539 (M)	0510-2730833	kc_pandey@igfri.ernet.in
Dr. N. Hasan	Pr. Sci. (Nematology)	0510-2730446	0510-2730427	0510-2730833	
Mr. R.B. Bhaskar	Sr. Sci. (Plant Pathology)	0510-2730446	9415942195 (M)	0510-270833	
Dr. M.G. Gupta	Nodal Officer, IGFRI-AICRP(FC) & AICRP(FC)		09415375212		
Dr. R.K. Jain	Incharge, IGFRI RRS, CSWRI Campus, Avikanagar	01437-220170/ 220243	0141-2271359	01437-220170	jain_rk_2005@yahoo.co.in
Dr. Nagaratana Biradar	Incharge, IGFRI RRS, UAS (D) Campus, Dharwad	0836-2447150	0836-2743459 09448376368 (M)	0836-2743459	nagaratana123@rediffmail.com
Dr. K. Sridhar	Sr. Scientist (Plant Breeding) IGFRI RRS, UAS (D), Dharwad	0836-2447150	09448277150	0836-2743459	s_kandlakunta@rediffmail.com ksridhar2412@rediffmail.com
Dr. S. Radotra	Incharge, IGFRI RRS, CSKHPKV Campus, Palampur	01894-233676	01894-233547 09418053231	01894-233676	inderdev@india.com

Name	Designation & Discipline	Tel. Office	Tel. Residence	Fax	E-mail
AICRP on Forage Crops, Project Coordinating Unit, IGFRI, Jhansi 284 003 (U.P.)					
Dr. S.A. Faruqui	Project Coordinator	0510-2730029	0510-2730639 09415113109 (M)	0510-2730049/ 2730833	pcfc@igfri.ernet.in pcforage@gmail.com
Dr. R.V. Kumar	Principal Scientist & PI (Plant Breeding)	0510-2730029	09415505742 (M)	0510-2730049	rvkumar4@rediffmail.com rvkumar@igfri.ernet.in
ICAR HQ , New Delhi					
Dr. Swapan K.Datta	Deputy Director General (CS)	011-25842068 /23382545	011-25842508 0124-246166	011-23097003	ddgcs.icar@nic.in
Dr. R.P. Dua	Asstt. Director General (FFC)	011-23381753	09868896266 (M)	011-23381753	rpdua.icar@nic.in
Dr. A.K. Sharma	Principal Scientist (FFC)	011-23381887		011-23387293	aksharma.icar@nic.in