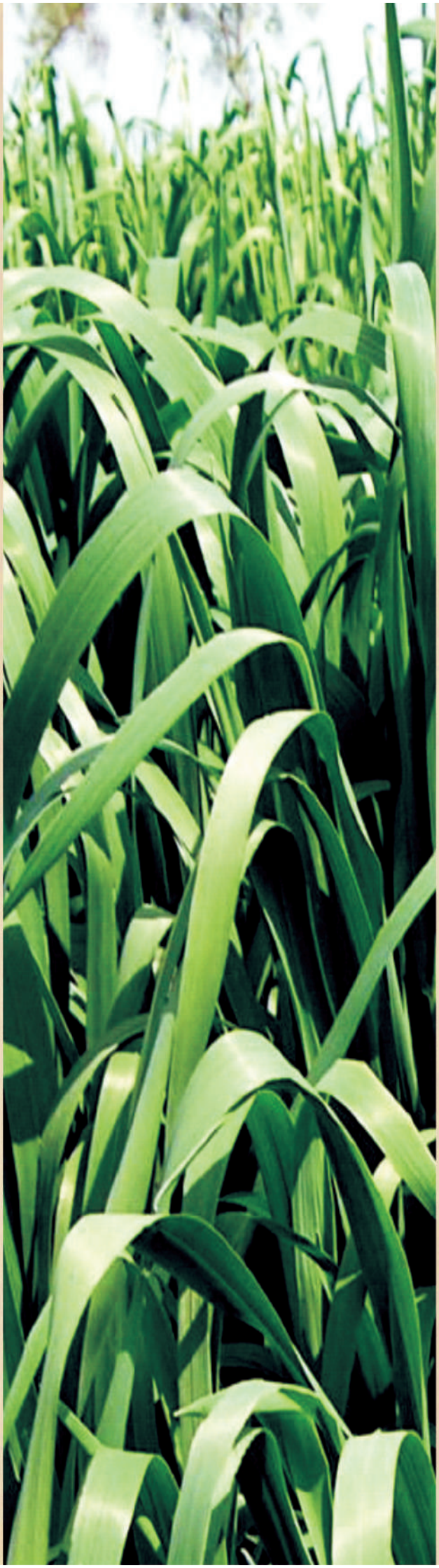

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भाकृअनुप
ICAR

ANNUAL REPORT
(2010-11)

Part-II : Rabi - 2010-11

ALL INDIA COORDINATED RESEARCH PROJECT ON FORAGE CROPS

(Indian Council of Agricultural Research)

September - 2011

Project Coordinating Unit
IGFRI, Jhansi-284 003

PREFACE

It is really a great pleasure to come with the Annual Report (2010-11), Part II – Rabi 2010-11 which embodies the research trial results in the field of Forage Crop Improvement, Crop Production and Crop Protection with the view to develop and test the technologies for enhanced quantity/quality forage production in different agro climatic situations. This report is the out come of sincere efforts made by all contributing scientists and staff at the Coordinating Unit and AICRP Centres. As a team, they have come successful in conductance of trials and activities as per the technical programme and achieving the targets fixed for Rabi 2010-11. 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 from all testing Centres and is linked with its impact on crop growth, insect-pest appearance etc. The breeder seed produced as per 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 dual-purpose forage species including test performance of perennials. The findings on crop production studies are presented in Chapter-2 which includes: seed cum fodder yield of lucerne in relation to sowing methods and cutting management; resource conservation through forages; influence of macro and micro nutrients on lucerne fodder yield and quality; remunerative forage based cropping system for sustained productivity under irrigated conditions; effect of soil amendments on productivity of rice-berseem cropping system; effect of soil amendment on fodder sorghum in saline-sodic soils; agronomical trials for AVT entries of tall fescue and oats; banana based fodder intercropping; effect of tillage and nutrient managements on productivity of rice-oats cropping system; forage crops raised through waste water under varied nutrient levels; response of fodder oats to thiourea and production potential of forage crops in rice fallows. Chapter-3 deals with different aspects of plant protection in selected Rabi forage species, viz., Berseem, oat and lucerne and generation of technologies for pest management. 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. Their valuable contribution for over all outputs of AICRP on Forage Crops is gratefully acknowledged.

My colleagues at Project Coordinating unit, Dr. R.V. Kumar, (PS & PI, Plant Breeding), Dr. S.R. Kantwa (Sr. Scientist, Agronomy) and Technical Officers, Shri O.N. Arya and Shri S.K. Khare provided support in distribution of seed 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 contributions are thankfully acknowledged.

The efforts of Shri S.K. Khare and Shri V.K. Paliwal and Shri Kamlesh 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 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 but for the active leadership support and encouragement received from Dr. S. Ayyappan, Secretary DARE & DG ICAR; Dr. Swapan K Datta, DDG(CS) and Dr R. P. Dua, ADG (FFC). Each and every one in the Team at AICRP on Forage Crops gratefully acknowledges this support.

Dated: August 29, 2011 — *S. A. Faruqui*
Place: Jhansi — *Project Coordinator*

CONTENTS

EXECUTIVE SUMMARY

The present report depicts the results of the coordinated trials conducted on Crop Improvement, Crop Production, Crop Protection as well as the Breeder Seed Production of the different forage crops during Rabi 2010-11 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. This report also contains the activities in brief regarding in house breeding programme taken by different coordinated centres during the reporting period. The report also includes results of yield trials on dual purpose barley. 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 2010-11, ten breeding trials of two annuals and two perennial forage species comprising 52 test entries alongwith their respective checks were conducted at 30 locations placed in five zones. The forage species evaluated were Bersemm and Oat (Single and Multi cut) in annuals and Lucerne and Tall Fescue in perennials. In annuals, there were two trials in Berseem, four trials in Oat (Single cut) and two trials in Oat (Multi cut). In perennial, trial on Lucerne is in first year of evaluation whereas other trial on Tall Fescue is in second year of evaluation. In addition, special breeding programme with specific objectives was carried out at different centres.

These forage trials on annuals were classified into three groups *viz*., Initial Varietal Trial (IVT), Advanced Varietal Trial Stage-1 (AVT-1) and Advanced Varietal Trial Stage-2 (AVT-2) whereas in perennials, same trial is being evaluated for three consecutive years.

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

BERSEEM

In IVT, there were five entries along with two national and three zonal checks. For the character green forage yield (q/ha), entry HFB-165-1 (3.99%) in North-West Zone, entries JHB-10-1 (8.2%) and JB-03-17 (8.0%) in North-East Zone and HFB-165-1 (5.3%) and BL-150 (4.4%) in Central Zone proved their superiority with respect to respective zonal or national check. Similarly for the character dry matter yield (q/ha), entry JB-03-17 (8.9%) in North-East Zone exhibited superiority over best check. Coming to the superiority at national level, national check Mescavi was adjudged best performer for dry matter yield.

In AVT-1, two entries namely HFB-6-6 and HFB-30 were evaluated against national checks Mescavi and Wardan and zonal check BL-22. Results revealed that for green forage and dry matter yield (q/ha), national check Mescavi maintained superiority. Here we observe that none of the testing entries exhibited their superiority for forage production yield.

OAT (SINGLE CUT)

Results of the Initial varietal trial in Oat (single cut) comprising thirteen testing entries revealed that for green forage yield (q/ha), entries SKO-188 (16.9%), JO-03-99 (8.0%), SKO-170 (7.4%) and UPO-10-1 (5.5%) in Hill Zone, entries SKO-188 (13.7%), OS-377 (9.9%), UPO-10-2 (9.5%) and JO-03-97 (4.5%) in North-West Zone, entries JO-03-99 (13.1%) and UPO-10-2 (9.1%) in North-East Zone, entries OS-377 (14.4%), JO-03-99 (7.8%), JHO-2010-1 (7.1%), JO-03-97 (6.2%), UPO-10-2 (6.1%), SKO-188 (6.0%) and UPO-10-1 (5.5%) in Central Zone and entries JHO-2010-1 (19.7%), JO-03-97 (11.9%), JHO-2010-2 (10.1%), UPO-10-1 (8.9%) and UPO-10-2 (5.7%) in South Zone registered their superiority over respective best check whereas at national level entries SKO-188 (10.6%), UPO-10-2 (9.8%), OS-377 (9.3%), JO-03-99 (9.0%), JO-03-97 (6.7%) and JHO-2010-1 (5.2%) exhibited their superiority.

Similarly for dry matter yield (q/ha), entries SKO-188 (15.5%), SKO-170 (10.6%), JO-03-99 (10.1%) and UPO-10-2 (6.8%) in Hill Zone, entries UPO-10-2 (17.3%), JO-03-99 (11.3%) and SKO-188 (11.3%) in North-East Zone, entries SKO-188 (14.2%), JHO-2010-1 (13.1%), OS-377 (9.5%), UPO-10-2 (8.2%), UPO-10-1 (8.0%), JO-03-99 (6.3%) and OL-1709 (5.7%) in Central Zone and JHO-2010-1 (20.4%), UPO-10-1 (15.5%) and JO-03-97 (6.0%) in South Zone proved their superiority over respective best national or zonal check. Coming to the national level, entries UPO-10-2 (9.2%), SKO-188 (7.9%), JHO-2010-1 (6.7%) and JO-03-99 (5.6%), recorded their superiority over best national check.

In AVT-1, there were eight entries and for green forage yield (q/ha), entry SKO-148 (5.5%) in Hill Zone, entries JHO-2009-2 (13.5%) and OS-363 (5.4%) in North-West Zone, entries JHO-2009-2 (8.8%) and JHO-2009-1 (4.8%) in North-East Zone, entry UPO-09-2 (6.9%) in Central Zone and UPO-09-1 (9.7%) in South Zone registered their superiority over respective best check whereas at national level, entries JHO-2009-2 (8.9%) and UPO-09-1 (4.0%) exhibited their superiority.

Similarly for dry matter yield (q/ha), entry JHO-2009-1 (4.5%) in Hill Zone, entries JHO-2009-2 (7.1%) and OS-363 (5.6%) in North-West Zone, entry UPO-09-1 (5.3%) in North-East Zone, entries JO-03-95 (14.9%), UPO-09-2 (9.3%), JHO-2009-1 (8.1%), UPO-09-1 (7.9%), JHO-2009-2 (5.9%) and SKO-156 (5.8%) in Central Zone and entry UPO-09-1 (5.7%) in South Zone proved their superiority over respective best national or zonal check. However at the national level, entries JHO-2009-2 (8.6%) and UPO-09-1 (7.9%) recorded their superiority.

In AVT-2, for green forage yield (q/ha) entries SKO-96 (16.1%) and SKO-133 (11.0%) in Hill Zone and JO-03-291 (5.2%) in Central Zone proved their superiority for green forage yield (q/ha).. On all India basis, entries JO-03-291 (6.0%) and SKO-133 (5.6%) recorded their superiority over best national check OS-6. Similarly for character dry matter yield (q/ha), entries SKO-96 (12.8%) and SKO-133 (5.5%) in Hill Zone, SKO-96 (4.5%) in North-West Zone and SKO-133 (6.1%) in Central Zone exhibited their superiority over best national or zonal check.

In AVT-2 (Seed), results clearly revealed that for seed yield (q/ha), none of the entries was found superior over respective checks at zonal or at the national level. At national level, seed yield of national check OS-6 was 21.7 q/ha which was followed by entry JO-03-291 (20.7q/ha).

OAT (MULTI CUT)

In IVT with six entries, for green forage as well as dry matter yield (q/ha), none of the testing entries exhibited their superiority at zonal or national level in comparison to best zonal or national check except for entry JO-03-309 (2.41%) in Central Zone for dry matter yield (q/ha). For green forage yield (q/ha), national check RO-19 ranked first in all the zones as well as at national level. Similarly for dry matter yield (q/ha), check UPO-212 in Hill Zone, JHO-2000-4 in North-West Zone, RO-19 in North-East Zone, entry JO-03-309 in Central Zone and RO-19 at national level exhibited superiority.

In AVT-1 with four entries, entries JO-03-301 (15.3%) and JO-03-307 (4.4%) in Hill Zone and UPO-09-3 (4.1%) in Central Zone expressed their superiority for green forage yield (q/ha) over best zonal or national check. Similarly for dry matter yield (q/ha), entries JO-03-301 (10.0%) and JHO-2009-3 (5.3%) in Hill Zone and UPO-09-3 (7.2%) and JHO-2009-3 (5.3%) in Central Zone recorded their superiority. Even at national level, entries JHO-2009-3 (5.9%) and UPO-09-3 (5.7%) were recorded best performer.

LUCERNE

The varietal trial on Lucerne (Perennial) comprising nine entries along with two national checks i.e. Anand-2 and RL-88 was established during Rabi 2009-10 at 10 centres of the North-West, Central and South Zone. Results obtained from different centres clearly revealed that for green forage yield (q/ha), entry LP-10-7 ranked first in North-West Zone (323.9 q/ha), Central Zone (713.5 q/ha) as well as at all India level (439.8 q/ha). Similar was the trend for dry matter yield (q/ha) in which same entry LP-10-7 exhibited superiority in North-West Zone (96.3 q/ha), Central Zone (135.8 q/ha) and also at all India level (97.5 q/ha).

TALL FESCUE

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, Srinagar and Almora. For green forage as well as for dry matter yield (q/ha), both the test entries performed better with respect to zonal checks. Entries Hima-14 (14.8%) and Hima-15 (3.9%) exhibited their superiority for green forage yield with respect to best zonal check Hima-1. Similarly Hima-14 (14.6%) and Hima-15 (6.9%) registered their superiority for dry matter yield (q/ha) with respect to zonal check Hima-1.

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. Apart from the 25 best cultures, 13 other promising lines superior to the variety CO 1 have been selected. These advanced cultures will be evaluated further in larger plots with CO 1.

Similarly at BAIF, Urulikanchan, the trial with 25 promising lines of Lucerne was continued in the second year and so far 28 cut were taken from the trial. The cut wise and pooled data of 20 cut for yield characters and averages of 20 cut for growth observations of this trial was compiled and forwarded to TNAU. Two cultures namely ACP 3-1 (20) and ALP 1-1 (21) were identified as the best cultures in the third year of growth based on yield characters and persistence of crop. The seed production of these two cultures was taken up for contribution in coordinated trials.

Under the National Crossing Programme on fodder Maize population improvement, F_2 progenies of two G-I lots (crosses with African Tall developed at Urulikanchan and Rahuri) were grown in isolation for further selection at BAIF, Urulikanchan. Individual plants of desirable characters were selected from the F_2 progenies and seed harvested from these plants was bulked together for further improvement programme. Similarly at AAU, Anand, four population i.e. African Tall (Rahuri) - G-1, African Tall (Anand) - G-1, J-1006 (Rahuri)-G-2, J-1006 (Anand) - G-2 were grown in isolated area and superior plants were selected on the basis of morphological characters and allowed them to random mating

Poly cross nursery programme in Berseem was initiated during the year 2008-09 to create the genetic variability in berseem crop at CCSHAU, Hisar. 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. The 24 F_2 polycrosses and 25 F_1 polycrosses developed during 2009-10 were grown in single row of 3 m length with two checks *viz.,* Mescavi and HB 1 for their evaluation for fodder yield and component traits. The cut-wise and over the cuts performance of the polycrosses is given in Table 1, 2 & 3. In the F_1 the crosses PC 3-1, PC 3-2, PC 3-3 and PC 3-5 gave better green fodder yield as compared to best check *i.e.* Mescavi on over the cuts basis. Similarly, In the F_2 almost all the crosses showed better green fodder yield over the best check *i.e.* Mescavi on over the cuts basis. However, the crosses PC 1-2, PC 1-5, PC 4-2, PC 2-5 and PC 5-5 gave higher green fodder yield.

DUAL PURPOSE BARLEY

The Initial Varietal trial (NWP, NEP and Central Zones) consisted of 26 entries including four ckecks. In case of NWPZ, only K1077 (35.4 q/ha), RD2814 (33.2 q/ha) and check RD2552 (34.5 q/ha) were in first non-significant group for grain yield. In case of forage yield RD2812, RD2814 and check RD2715 were in first non-significant group, but RD2814 was only entry in first non significant group in both cases. Thus it is an automatic choice for promotion to AVT in NWPZ. In case of NEPZ, based on zonal mean of grain and forage yield taken together none of the entries was better than check RD 2035. In central zone K1077 was significantly superior for grain yield than rest of entries and checks. Similarly RD2814 and RD2715 were in first NSG for forage yield. But there was no entry, which is in first NSG simultaneously for grain and forage yield.

B. FORAGE CROP PRODUCTION

The programme on forage crop production was undertaken at 22 sites in different agro-climatic zones of the country. Research aspects consisted: seed cum fodder yield of lucerne in relation to sowing methods and cutting management; resource conservation through forages; influence of macro and micro nutrients on lucerne fodder yield and quality; remunerative forage based cropping system for sustained productivity under irrigated conditions; effects of soil amendments on productivity of rice-berseem cropping system; effect of soil amendments on fodder sorghum in saline sodic soils; agronomical trials for AVT-2 entries of tall fescue grass and oats; banana based fodder intercropping; effect of tillage and nutrient management on productivity of rice-oats cropping system; forage crops raised through waste water under varied nutrient levels; response of fodder oats to thiourea and production potential of forage crops in rice fallows.

The summary of Rabi 2010-11 results is presented briefly as under:

- At Rahuri and Urulikanchan, on location mean basis both sowing methods (broadcasting and line sowing) recorded almost equal green fodder yield of lucerne. At both the locations and mean basis regular cutting for two and half years and leaving for seed production at the end (C_3) resulted in better green fodder, dry matter and seed yields of lucerne crop over rest of the cuttings.
- In Hill zone, vegetative barrier of Napier Bajra hybrid resulted in the production of 287.93q/ha green fodder, which was 6.4 % and 20.5 % more than *Setaria* grass as vegetative barrier and no vegetative barrier, respectively. Among vegetative cover of forage species *Setaria* + Stylo (364.53q/ha) recorded significantly highest green fodder and dry matter yield over rest of the treatments.
- In North-West zone, at Pantnagar growing of sorghum under conventional tillage being at par with 2 cultivation (1 disc harrow and 1 cultivator) recorded significantly highest green fodder (2080 q/ha) over rest of the tillage practices. Whereas at Hisar growing of sorghum in conventional tillage or 2 cultivation tillage practices (1097 q/ha forage equivalent yield each) being at par with 2 cultivation (rotavator), 1 cultivation (disc harrow) and broadcasting of seed before T_5 (1 cultivation through disc harrow) recorded significantly highest forage equivalent yield over rest of the tillage practices. Similarly same tillage practices resulted in significantly highest wheat grain yield (44.0 q/ha) over rest of the treatments. At the same place, 2 cultivation (T_2) fetched maximum net monetary returns (Rs. 84940/ha) followed by conventional tillage (Rs.84440/ha). At Ludhiana, again conventional tillage recorded highest crude protein yield (9.76 q/ha) over rest of the treatments. Whereas 1 cultivation (with rotavator) fetched highest net monetary returns (Rs. 22695/ha) among all tillage practices.
- In Central zone, on location mean basis planting of grasses on ridges and furrows recorded higher green fodder (686.03 q/ha) and dry matter yields (156.03 q/ha) over flat bed. Similarly, on location mean basis *Cenchrus* + *Desmenthus* combination of grass and legume recorded highest GFY (832 q/ha) and DFY (187.1 q/ha) over rest of the combinations.
- In North-East zone at Faizabad, planting of guinea grass supplemented with soil mulch recorded highest GFY (365.75q/ha), DFY (99.71q/ha) and CPY (7.99q/ha) over rest of the combinations. Whereas guinea + live mulch (intercropping with berseem) fetched highest net monetary returns (Rs. 24250/ha). At Jorhat, planting of *Setaria* resulted in highest GFY (830.3q/ha) and DFY (177.3 q/ha) over *Brachiaria* and hybrid napier. The adoption of live or soil mulch as moisture conservation practices (being at par with each other) resulted in significantly highest GFY, DFY and CPY over control at the same place.

At Kalyani, hybrid napier recorded highest GFY (1196.3q/ha) and net monetary returns (Rs. 22144/ha/yr) over *Brachiaria* and *Setaria* grasses. In moisture conservation practices, live mulch (intercropping) recorded highest GFY, DFY, CPY and net monetary returns (Rs. 15286.4 /ha/yr) over soil and no mulch at the same place. At Bhubaneswar, planting of guinea grass supplemented with live mulch resulted in significantly highest GFY (884.17q/ha) and DFY (172.43q/ha) over rest of the combinations. At Ranchi, planting of Napier hybrid realized highest green fodder yield (1012.6q/ha) over *Brachiaria* and *Setaria* grasses. The soil or live mulch realized higher GFY and DFY over control at same place.

- In South zone (Silvipasture), on location mean basis, planting of Subabul + pearl millet + horse gram silvipasture system (T_7) resulted in highest GFY (438.6 q/ha) and DFY (90.97 q/ha) followed by Subabul + sorghum + horse gram silvipasture system.
- In South zone (Alley cropping) at Vellayani, alley cropping system cassava + BN hybrid (T_4) being at par with cassava + BN hybrid + fodder cowpea (T_2) and cassava + BN hybrid + AMF (T_3) recorded significantly highest GFY (242.7q/ha) of BN hybrid grass over rest of the alley cropping systems.
- On location mean basis (Ludhiana, Hisar and Pantnagar), application of recommended dose of fertilizers + FYM@10 t/ha + S + Mo + B resulted in highest GFY (736.6 q/ha), DFY (110.2 q/ha) and CPY (24.9 q/ha) of berseem over rest of the treatments.
- At Mandya, Maize + Cowpea (F) - Sunflower (G)-Ragi (G) cropping sequence resulted in highest net monetary returns of Rs. 83129/ha/yr. The magnitude of increase with this treatment was in order of 52.5, 85.4, 9.07 and 20.4 percent over Ragi (G)-Field bean (G)-Sunflower (G), Sorghum (F)-Lucerne, Maize (G)-Maize (F)-Groundnut(S) and BN hybrid, respectively.
- Under sodic soil of Faizabad, application of RDF + gypsum @ 75 % GR + FYM 10 t/ha produced 48.56 % more forage equivalent yield over recommended dose of fertilizers in rice-berseem cropping system. The soil amendment treatments did not bring any remarkable effect on soil properties in comparison to initial soil values.
- In agronomy trial for AVT-2 in tall fescue grass, the entry EC 178182 recorded significantly highest herbage yield with superiority of 8.8 and 13.5 % over HIMA-4 and HIMA-1 (C), respectively. Response of nitrogen was evident linearly up to highest tested dose i.e. 120 Kg N /ha.
- In agronomy trial for AVT-2 entries on oats, in North-West zone on location mean basis the testing entry SKO-133 recorded highest GFY (393.7 q/ha), DFY (72.9 q/ha) and CPY (7.7 q/ha) closely followed by national check Kent. On all India mean basis none of the testing entry surpassed the national check (Kent) for GFY and DFY. The green fodder and dry fodder yields increased consistently with increasing levels of nitrogen up to highest dose i.e. 120 kg N /ha.

- At Mandya, application of RDF + FYM 10 t/ha + $ZnSO_4$ 20 Kg/ha + gypsum 500 kg/ha to fodder sorghum being at par with RDF + FYM 10 t/ha + gypsum 500 Kg/ha and RDF + FYM 10 t/ha + elemental Sulphur 25 kg/ha (only for GFY) treatments resulted in significantly higher GFY (200.6 q/ha) and DFY (56.9 q/ha) over rest of the treatments.
- At Vellayani, planting of hybrid Napier with banana based intercropping system being at par with banana + congosignal grass intercropping system (1795 q/ha) resulted in significantly highest forage equivalent yield (1930 q/ha) over rest of the treatments. Whereas banana + cowpea intercropping system fetched highest net monetary returns (Rs. 219216 /ha).
- At Jorhat, adoption of conventional tillage being at par with minimal tillage resulted in significantly higher green fodder (367.13 q/ha), CPY (8.03 q/ha) and CP content (10.2 %) of oats over zero tillage. The application of 100 % RDF + biofertilizer being at par with 75 % RDF + biofertilizer recorded significantly highest GFY as compared to 75 % RDF and 100 % RDF at same place. At Kalyani, conventional tillage resulted in significantly highest GFY (478.6 q/ha), DFY (93.6 q/ha) and CPY (9.5 q/ha) of oats over minimal and zero tillage practices. The application of 75 % RDF + biofertilizer to the oats recorded highest GFY over rest of the treatments at the same place. Similar to Kalyani, conventional tillage again proved superiority in increasing GFY and DFY of oats at Bhubaneswar and Ranchi.
- At Hyderabad, planting of para grass recorded significantly highest GFY (804.3q/ha) and DFY (141 q/ha) over BN hybrid, guinea grass and lucerne crop raised through waste water. The application of varied recommended doses of fertilizers to forage crops did not caused significant variation in yields and soil fertility (except N) at the same place. At Coimbatore, the planting of cumbu Napier hybrid resulted in highest green fodder (3129.6q/ha), DFY (555.8q/ha) and fetched highest net monetary returns over rest of the forage crops. The application of 100 % RDF to forage crops realized highest GFY, DFY, CPY and net monetary returns and BC ratio over lower levels of RDF.
- At Udaipur, application of different irrigation schedules and spray of Thiourea could not bring remarkable improvement in yield attributes and green fodder yield of oats in comparison to control.
- At Mandya, planting of maize + cowpea intercropping system recorded highest GFY, DFY, CPY and fetched highest net monetary returns followed by pearl millet + cowpea intercropping system. Application of 100 % recommended dose of nitrogen to forage crops resulted in significantly higher GFY, DFY, CPY and net monetary returns (Rs. 13841/ha) and benefit cost ratio (2.37) as compared to lower levels of nitrogen.

C. FORAGE CROP PROTECTION

The major objective of the forage crop protection trial was to understand the occurrence and abundance of major pests and diseases, evaluation or improved breeding materials of berseem, lucerne and oat for resistance to pest and diseases and pest management. These trials were conducted at Anand, Bhubaneswar, Hisar, Hyderabad, Jhansi, Ludhiana, Palampur and Rahuri. The occurrence and abundance data from different locations and their relationship with weather parameters have been worked out and summarized as followed.

In berseem, the root rot disease incidences started at Bhubaneswar in the last week of January (1.8%) and progressed up to last week of February (9.8%). At Ludhiana, development and progression of stem rot on berseem variety BL-42 was recorded in the first week of January when mean temperature and humidity ranged 10.2-17.8^{0}c and 74-83% and the disease progressed rapidly (64.84%DI) under 14.4-16.6^{0}C and 81-83% mean temperature and humidity respectively. At Palampur, root rot appeared in the first week of March and progressed up to second week. At Jhansi, stem rot disease was at peak (16.2%) in second week of February. At Hyderabad, maximum population of Galerucid beetle was recorded as 5 beetles/m^2.

In Lucerne, thrips, jassids, white fly and Aphid were found associated with the crop at Anand. Maximum population 182 aphids/100 plants occurred in mid of February. Maximum severity (2.6 and 2.8) of leaf spot and alfalfa mosaic was recorded at Bhubaneswar in the month of February. At Jhansi, maximum disease severity (46.4%) occurred in the first week of April. At Rahuri, three types of aphids (cowpea aphid, Pea aphid and spotted alfalfa aphid) were recorded in different period of crop season.

In Oats, leaf light and sclerotium rot incidences (2.6 and 12.6%DI) were recorded at Bhubaneswar. At Ludhiana disease progression was maximum (67.70%) in the month of April when mean temperature and humidity ranged 17.3-25.3^{0}C and 63-75% respectively.

Evaluation of breeding trials for resistance to diseases and insect pest revealed that IVT entries of Lucerne CAP-3-2 and ACP-3-1 were found resistant to anthracnose at Jhansi. Oat single cut IVT entry UPO-10-2 showed minimum leaf blight incidence (0-1.6 score) at all the centres except Ludhiana where all the entries were found highly susceptible. Entries UPO-10-2, JO-03-99, JHO-2010-1, ANDO-3, UPO-10-1 and JHO-99-2 showed resistant reactions (<10 DI) against sclerotium rot at Jhansi. AVT entry SKO-156 was found highly resistant to leaf blight at Hisar. Entry UPO-09-2 was found least infested with aphids at Jhansi and Rahuri. AVT (SC –2) entry SKO-96 showed resistance to leaf light at Bhubaneswar, Hyderabad and Jhansi.

Entries SKO-96 and Palampur-1 were found resistant to powdery mildew at Palampur. Oat multi cut entry UPO-10-3 was resistant to powdery mildew at Palampur where as UPO-212 and JO-03-309 were resistant to sclerotium rot at Jhansi. AVT multi cut entries UPO-09-3 and JHO-2009-2 were found resistant to powdery mildew at Palampur.

IVT and AVT entries of Berseem were screened for resistance to stem and root rot diseases at Jhansi and Hisar under sick plot conditions. Entries JHB-1-1 and BB-3 were resistant to stem rot at Jhansi and Hisar. Entries HFB-165-1, JHB-10-1, JHB-10-2, JB-03-17 and BL-22 showed resistance to root rot at Jhansi. Among AVT entries HFB-6-6 was found resistant to root rot at Jhansi and Palampur.

Bio intensive pest and disease management in Lucerne trial was conducted at Anand, Hyderabad and Rahuri. The results revealed that recommended chemical treatment prooved highly effective among all the treatments. However, application of botanicals i.e. seed treatment with neem seed powder 50 g/kg seed followed by foliar spray of NSKE @ 5% two week after each cut also gave considerable reduction (50%) in pest and diseases.

The assessment of losses due to rust in lucerne seed crop trial conducted at Anand, Hyderabad and Rahuri showed that there was significant reduction in disease intensity and increase in seed yield (41.76%) under protected treatment at all locations.

Integrated disease management in white clover trial was conducted at Palampur as a location specific trial with 10 different treatments. The results revealed that seed treatment with bavistin 2 g/kg + *Trichoderma viride* 5g/kg seed + folior spray of bavistin 0.1% gave significant reduction in powdery mildew (89%) and clover rot (80.7%) diseases and increase in green fodder yield.

Validation of recommended treatment for disease management in oat trial was conducted at Ludhiana, Palampur and Bhubaneswar under large field ($100m^2$). There was significant decrease in disease incidences (94%) and increase in green fodder and seed yield (14.3%) at all the locations. Effect of foliar diseases on oat varieties (kent, PPL-1, OL-9, OL-125 and OS-6 protected and unprotected) showed that there was significant reduction in diseases and antiquality characters and increase in yield and quality characters under protected treatment.

D. BREEDER SEED PRODUCTION

In Rabi 2010-11, the indent for Breeder Seed Production was received from DAC, GOI for 24 varieties in four forage crops *viz*., Oat (8), Berseem (8), Lucerne (5) and Gobhi Sarson (3). The allocation for producing the indented quantity of Breeder Seed i.e. 277.74 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 (202.10q) followed by Berseem (68.80q), Lucerne (6.40q) and minimum was for Gobhi Sarson (0.44q). When we talk of overall production, as compared to indent in Oat (202.10.30q), the actual production was 305.33q, which was 103.23q in surplus. But in Berseem, against the indent of 68.80 q, the actual prouction was 50.00q which was deficit by 18.80 q. In Lucerne too, against the indent of 6.40q, the actual production was 6.38q i.e. 0.02q deficit. In Gobhi Sarson the actual production was 0.96q more against indent of 0.44 q i.e. production was 1.40q.

The overall Breeder Seed Production was 85.37q more or we can say that it was 30.74 percent higher as evident from seed production of 363.11q against the indent for 277.74q.

ALL INDIA CCOORDINATED RESEARCH PROJECT ON FORAGE CROPS
ZONES & COORDINATED CENTERS & TESTING LOCATIONS

Zone	Coordinated Centers				Testing Location (Coordinating Centers)		
	Sl. No.	Location	Establishment Year	State	Sl. No.	Location	State
I. Hill States = 03 Locations = 2+2 = 4	1.	Palampur, CSK, HPKV	1970	Himachal Pradesh	1.	Rajouri, SKUAT (Jammu)	Jammu & Kashmir
	2.	Srinagar, SKUAT	2010	Jammu & Kashmir	2.	Almora, VPKAS*	Uttarakhand
II. North West States = 05 Locations = 4+5 = 9	3.	Ludhiana, PAU	1989	Punjab	3.	Avikanagar, IGFRI-RRS*	Rajasthan
	4.	Hisar, CCS HAU	1970	Haryana	4.	Jodhpur, CAZRI-RRS*	Rajasthan
	5.	Pantnagar, GBPUAT	1995	Uttarakhand	5.	Jalore, RAU-RRS	Rajasthan
	6.	Bikaner, SKRAU	1995	Rajasthan	6.	Udaipur MPUAT	Rajasthan
					7.	Meerut, SVBPUA&T	Uttar Pradesh
III. North East States = 8 Locations = 6+2= 8	7.	Faizabad, NDUAT	1982	Uttar Pradesh	8.	Umiam (Barapani), ICAR Res. Complex for NEH Region*	Meghalaya
	8.	Ranchi, BAU	1970	Jharkhand	9.	Pusa, RAU	Bihar
	9.	Kalyani, BCKV	1972	West Bengal			
	10.	Bhubaneswar,OUAT	1987	Orissa			
	11.	Jorhat, AAU	1970	Assam			
	12.	Imphal, CAU	2010	Manipur			

Zone	Coordinated Centers				Testing Location (Coordinating Center)		
	Sl. No.	Location	Establishment Year	State	Sl. No	Location	State
IV. Central States = 5 Locations = 5+5 =10	13.	Anand, AAU	1970	Gujarat	10.	Kanpur, CSAU&T	Uttar Pradesh
	14.	Jabalpur, JNKVV	1970	Madhya Pradesh	11.	Jhansi, IGFRI*	Uttar Pradesh
	15.	Rahuri, MPKV	1971	Maharashtra	12.	Dhari & Jamnagar, GAU	Gujrat
	16.	Urulikanchan, BAIF	1982	Maharashtra	13.	Akola, PRDKVV	Maharashtra
	17.	Raipur, IGKV	2010	Chhattisgarh	14.	Dapoli & Palighar, KKV	Maharashtra
V. South States =5 Locations = 4+3 = 7	18.	Mandya, UAS (B)	1986	Karnataka	15.	Dharwad, IGFRI-RRS*	Karnataka
	19.	Coimbatore, TNAU	1976	Tamil Nadu	16.	Raichur, UAS (D)	Karnataka
	20.	Vellayani, KAU	1971	Kerala	17.	Pondicherry, PJLNCA & RI, Karaikal	Pondicherry
	21.	Hyderabad, ANGRAU	1970	Andhra Pradesh			

Summary: Zone = 5, States = 26, Coordinating Centres = 21, Testing Locations = 17

*ICAR Institute

ENTRIES CODE FOR BREEDING TRIALS (RABI 2010-11)

S.No	Contributor	Entry name	Entry code name
Trial No. 1: IVTB: (Crop-Berseem)			
1.	Hisar	HFB- 165-1	IB-2
2.	Ludhiana	BL -150	IB-7
3.	Jabalpur	JB-03-17	IB-9
4.	Jhansi	JHB-10-1	IB-4
5.	Jhansi	JHB-10-2	IB-8
6.	NC	Wardan	IB-5
7.	NC	Mescavi	IB-1
8.	ZC-HZ	BL-22	IB-10
9.	ZC-CZ, NWZ	Bundel Berseem-2	IB-3
10	ZC-NEZ	Bundel Berseem -3	IB-6
Trial No. 2: AVTB-1 (Crop- Berseem)			
1.	Hisar	HFB 6-6	AB-1-3
2.	Hisar	HFB-30	AB-1-5
3.	NC	Wardan	AB-1-1
4.	NC	Mescavi	AB-1-4
5.	ZC-HZ	BL-22	AB-1-2
Trial No.3: IVTO (Single cut): (Crop-Oat)			
1.	Faizabad	NDO-712	IOS-4
2.	Faizabad	NDO-729	IOS-9
3.	Jhansi	JHO-2010-1	IOS-13
4.	Jhansi	JHO-2010-2	IOS-2
5.	Pantnagar	UPO-10-1	IOS-17
6.	Pantnagar	UPO-10-2	IOS-7
7.	Srinagar	SKO-188	IOS-14
8.	Srinagar	SKO-170	IOS-10
9.	Jabalpur	JO-03-97	IOS-18
10.	Jabalpur	JO-03-99	IOS-8
11.	Anand	ANDO-3	IOS-15
12.	Hisar	OS-377	IOS-19
13.	Ludhiana	OL-1709	IOS-1
14.	NC	Kent	IOS-5
15.	NC	OS-6	IOS-12
16.	ZC-HZ	Palampur-1	IOS-16
17.	ZC-NWZ	OL-125	IOS-6
18.	ZC- NEZ	JHO-99-2	IOS-20
19.	ZC-CZ	JHO-822	IOS-11
20.	ZC-SZ	JHO-2000-4	IOS-3

Trial No. 4: AVTO-1 (SC): (Crop-Oat)			
1.	Pantnagar	UPO-09-1	AOS-1-9
2.	Pantnagar	UPO-09-2	AOS-1-5
3.	Jhansi	JHO-2009-1	AOS-1-12
4.	Jhansi	JHO-2009-2	AOS-1-15
5.	Srinagar	SKO-156	AOS-1-2
6.	Srinagar	SKO-148	AOS-1-14
7.	Hisar	OS-363	AOS-1-7
8.	Jabalpur	JO-03-95	AOS-1-4
9.	NC	Kent	AOS-1-11
10.	NC	OS-6	AOS-1-1
11.	ZC-HZ	Palampur-1	AOS-1-13
12.	ZC-NWZ	OL-125	AOS-1-8
13.	ZC-NEZ	JHO-99-2	AOS-1-10
14.	ZC-CZ	JHO-822	AOS-1-6
15.	ZC-SZ	JHO-2000-4	AOS-1-3
Trial No. 5: AVTO-2 (SC) (Crop-Oat)			
1.	Jabalpur	JO-03-291	AOS-2-4
2.	Srinagar	SKO-133	AOS-2-7
3.	Srinagar	SKO-96	AOS-2-1
4.	NC	Kent	AOS-2-10
5.	NC	OS-6	AOS-2-8
6.	ZC-HZ	Palampur-1	AOS-2-3
7.	ZC-NWZ	OL-125	AOS-2-5
8.	ZC-NEZ	JHO-99-2	AOS-2-9
9.	ZC-CZ	JHO-822	AOS-2-6
10.	ZC-SZ	JHO-2000-4	AOS-2-2
Trial No. 6: AVTO -2 (Single cut -Seed): (Crop-Oat)			
1.	Jabalpur	JO-03-291	AOSS-2-4
2.	Srinagar	SKO-133	AOSS-2-6
3.	Srinagar	SKO-96	AOSS-2-2
4.	NC	Kent	AOSS-2-9
5.	NC	OS-6	AOSS-2-7
6.	ZC-HZ	Palampur-1	AOSS-2-10
7.	ZC-NWZ	OL-125	AOSS-2-1
8.	ZC-NEZ	JHO-99-2	AOSS-2-8
9.	ZC-CZ	JHO-822	AOSS-2-5
10.	ZC-SZ	JHO-2000-4	AOSS-2-3

Trial No. 7: IVTO (Multi-cut) (Crop-Oat)			
1.	Jhansi	JHO-2010-3	IOM-7
2.	Jhansi	JHO-2010-4	IOM-4
3.	Ludhiana	OL-1690	IOM-8
4.	Pantnagar	UPO-10-3	IOM-1
5.	Jabalpur	JO-03-309	IOM-11
6.	Hisar	OS-367	IOM-9
7.	NC	Kent	IOM-12
8.	NC	UPO-212	IOM-5
9.	NC	RO-19	IOM-10
10.	ZC-HZ	Palampur-1	IOM-2
11.	ZC-NW & NEZ	JHO-2000-4	IOM-6
12.	ZC-CZ	JHO-822	IOM-3
Trial No. 8: AVTO-1 (Multi-cut) (Crop-Oat)			
1.	Jabalpur	JO-03-307	AOM-1-5
2.	Jabalpur	JO-03-301	AOM-1-3
3.	Jhansi	JHO-2009-3	AOM-1-9
4.	Pantnagar	UPO-09-3	AOM-1-2
5.	NC	Kent	AOM-1-4
6.	NC	UPO-212	AOM-1-8
7.	NC	RO-19	AOM-1-6
8.	ZC-HZ	Palampur-1	AOM-1-1
9.	ZC-CZ	JHO-822	AOM-1-7
Trial No. 9: VTL-2010 (P) -1st year (Crop- Lucerne)			
1.	Rahuri	RRP-5-4	LP-10-10
2.	Rahuri	CAP-3-2	LP-10-2
3.	Rahuri	RLH-4	LP-10-8
4.	Rahuri	RLH-5	LP-10-1
5.	Anand	Anand-23	LP-10-9
6.	Anand	ALP-1-1	LP-10-3
7.	Anand	ACP-3-1	LP-10-5
8.	Coimbatore	ACP-1-2	LP-10-11
9.	Bikaner	BRB-07-1	LP-10-7
10.	NC	Anand-2	LP-10-4
11.	NC	RL-88	LP-10-6
Trial No. 10: VTTF- 2009 (P) (Crop-Tall Fescue)			
1.	Palampur	Hima-14	
2.	Palampur	Hima-15	
5.	ZC	Hima-1	
6.	ZC	Hima-4	

Trial No. 6-A: AVTO -2 (Single cut -Agronomy): (Crop-Oat)			
1.	Jabalpur	JO-03-291	AOSA-2-6
2.	Srinagar	SKO-133	AOSA-2-2
3.	Srinagar	SKO-96	AOSA-2-4
4.	NC	Kent	AOSA-2-1
5.	NC	OS-6	AOSA-2-5
6.	ZC-HZ	Palampur-1	AOSA-2-7
7.	ZC-NWZ	OL-125	AOSA-2-3

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Dr. R.V. Kumar
Principal Scientist & PI (Plant Breeding)
AICRP on Forage Crops

No. CPF/PI/PB/Rabi-2010-11
Date : 09.08.2010

Sub : Decoded list of the entries tested in Breeding & Agronomy Trial Rabi 2010-11-reg.

Dear Sir/Madam,

With reference to above, the decoded list of the entries tested in Breeding & Agronomy Trial Rabi 2010-11 is being sent for your kind perusal.
With thanks,

Yours faithfully,

(R. V. Kumar)

Mob. 09415505742, 09125934018

CHAPTER-1

FORAGE CROP IMPROVEMENT

1. IVTB: INITIAL VARIETAL TRIAL IN BERSEEM

(Table Reference: 1.1 to 1.10)

An initial varietal trial in Berseem comprising five entries along with two national checks i.e. Mescavi and Wardan 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, North-West, North-East and Central Zone of the country. Data reported from different centres clearly revealed that for the character green forage yield (q/ha), entries HFB-165-1 (3.99%) and JHB-10-2 (0.24%) in North-West Zone, entries JHB-10-1 (8.2%), JB-03-17 (8.0%) and BL-150 (2.5%) in North-East Zone and HFB-165-1 (5.3%), BL-150 (4.4%) and JHB-10-2 (0.7%) in Central Zone proved their superiority with respect to respective zonal or national check. At national level, entry HFB-165-1 (2.3%) was adjudged best performer.

Similarly for the character dry matter yield (q/ha), entry JHB-10-2 (1.9%) in North-West Zone, JB-03-17 (8.9%) in North-East Zone and BL-150 (2.7%) in Central Zone exhibited superiority over best check. Coming to the superiority at national level, national check Mescavi was adjudged best performer.

In forage production potential (q/ha/day), entry JB-03-17 (2.97 q/ha/day) ranked first for green forage yield whereas national check Mescavi (0.60 q/ha/day) was adjudged best performer for dry matter yield potential. In growth parameter, entry JB-03-17 (53.1cm) ranked first followed by JHB-10-2 (52.0cm). In quality parameters, entry HFB-165-1 (14.6 q/ha) for crude protein yield and JHB-10-1 (19.4%) for crude protein content was recorded best performer. For other quality parameters like NDF, ADF, IVDMD (%) and DDM (q/ha), entry JB-03-17 recorded their overall superiority with respect to best zonal or national check.

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

Cont…

Entries	Hill Zone					North-West Zone								
	Palam-pur	Sri-nagar	Ave-rage	Rank	Superi-ority%	Pant-nagar	Ludhi-ana	Hisar	Jalore	Meerut	Udaipur	Ave-rage	Rank	Superi-ority%
HFB-165-1	198.8	228.4	213.6	7		656.6	438.9	1077.7	197.4	786.7	692.2	641.6	1	3.99
JHB-10-1	207.6	224.6	216.1	5		604.4	407.4	896.2	203.8	764.4	574.0	575.0	6	
BL-150	199.2	232.1	215.7	6		658.4	381.5	862.9	144.6	698.1	611.0	559.4	8	
JHB-10-2	203.7	215.6	209.7	8		652.5	383.3	925.8	169.9	857.3	722.1	618.5	2	0.24
JB-03-17	234.2	217.8	226.0	3		681.0	424.1	892.5	173.3	684.4	640.7	582.7	5	
Mescavi (NC)	249.3	236.4	242.9	1		581.1	435.2	981.4	174.8	811.1	718.4	617.0	3	
Wardan (NC)	194.8	242.5	218.7	4		613.6	377.8	877.7	176.0	735.1	611.1	565.2	7	
BL-22 (ZC-HZ)	235.9	240.0	238.0	2										
Bundel Berseem-2 (ZC-CZ, NWZ)						676.6	383.3	970.3	195.4	855.1	614.8	615.9	4	
Bundel Berseem-3 (ZC-NEZ)														
Mean	215.4	229.7	222.6			640.5	403.9	935.6	179.4	774.0	648.0	596.9		
CD at 5%	NS	8.8				81.1	NS	86.6	31.8	93.3	112.3			
CV%	14.0	2.2				7.3	17.7	5.5	10.1	7.1	9.9			

Note:

-Trial data not reported from Rajouri centre

-Trial was not established at Bhubneswar centre

-Data on DMY not reported from Jalore center

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

Entries	North-East Zone							Central Zone									All India		
	Kal-yani	Ran-chi	Faiza-bad	Pusa	Ave-rage	Rank	Superi-ority%	Jhansi	Ra-huri	Jabal-pur	Uruli-kanchan	Kan-pur	Kar-jat	Ave-rage	Rank	Superi-ority%	Ave-rage	Rank	Superi-ority%
HFB-165-1	235.2	569.5	240.2	326.0	342.7	6		304.2	804.4	687.0	448.4	575.9	82.0	483.7	1	5.3	475.0	1	2.3
JHB-10-1	268.5	569.5	335.6	341.0	378.7	1	8.2	325.8	738.9	648.2	391.1	518.5	128.0	458.4	5		452.6	5	
BL-150	255.2	497.7	312.5	369.0	358.6	3	2.5	207.4	691.5	881.3	396.0	533.3	168.0	479.6	2	4.4	450.0	6	
JHB-10-2	299.1	525.5	119.2	350.0	323.5	7		262.3	685.7	802.3	302.0	559.3	163.0	462.4	3	0.7	455.5	3	
JB-03-17	235.7	613.5	350.1	313.0	378.1	2	8.0	314.8	714.7	742.5	266.2	540.7	151.0	455.0	6		455.0	4	
Mescavi (NC)	238.8	567.2	298.0	310.0	353.5	5		254.7	633.6	860.5	293.9	544.4	168.0	459.2	4		464.3	2	
Wardan (NC)	267.1	539.4	260.4	333.0	350.0	4		312.5	581.6	709.2	312.4	596.3	157.0	444.8	7		438.8	7	
BL-22 (ZC-HZ)																			
Bundel Berseem-2 (ZC-CZ, NWZ)								298.8	561.9	775.9	331.0	464.8	145.0	429.6	8				
Bundel Berseem-3 (ZC-NEZ)	235.9	544.0	170.7	315.0	316.4	8													
Mean	254.4	553.3	260.8	332.1	350.2			285.1	676.5	763.4	342.6	541.7	145.3	459.1			455.9		
CD at 5%	13.5	53.8	56.3	27.4				62.6	79.1	152.4	48.7	51.8	43.6						
CV%	3.7	5.6	12.3	8.5				12.5	6.7	11.5	18.2	5.5	18.0						

Table 1.2 IVT Berseem: Initial Varietal Trial in Berseem: Dry matter Yield (q/ha)

Cont…

Entries	Hill Zone					North-West Zone							
	Palam-pur	Sri-nagar	Average	Rank	Superi-ority%	Pant-nagar	Ludhi-ana	Hisar	Meerut	Udaipur	Average	Rank	Superi-ority%
HFB-165-1	29.2	72.7	51.0	3		83.4	67.9	112.1	96.3	226.3	117.2	5	
JHB-10-1	30.7	74.4	52.6	2		80.3	60.5	139.2	117.9	223.1	124.2	2	
BL-150	29.0	56.9	43.0	8		79.8	55.4	98.5	96.6	235.3	113.1	7	
JHB-10-2	29.7	62.0	45.9	6		87.2	56.3	106.7	104.0	278.7	126.6	1	1.9
JB-03-17	37.9	52.7	45.3	7		90.6	63.2	108.1	102.0	236.5	120.1	3	
Mescavi (NC)	41.9	54.5	48.2	4		67.2	65.5	118.1	92.0	278.1	124.2	2	
Wardan (NC)	26.1	79.8	53.0	1		78.8	53.6	114.8	109.7	211.7	113.7	6	
BL-22 (ZC-HZ)	37.3	57.7	47.5	5									
Bundel Berseem-2 (ZC-CZ, NWZ)						84.2	54.6	137.4	102.8	219.0	119.6	4	
Bundel Berseem-3 (ZC-NEZ)													
Mean	32.7	63.8	48.3			81.4	59.6	116.9	102.7	238.6	119.8		
CD at 5%	NS	5.6				7.1	NS	8.0	6.5	71.4			
CV%	19.9	5.9				6.6	17.1	3.9	3.7	17.0			

Table 1.2 IVT Berseem: Initial Varietal Trial in Berseem: Dry matter Yield (q/ha)

Entries	North-East Zone							Central Zone									All India		
	Kal-yani	Ran-chi	Faiza-bad	Pusa	Ave-rage	Rank	Superi-ority%	Jhansi	Ra-huri	Jabal-pur	Uruli-kanchan	Kan-pur	Kar-jat	Ave-rage	Rank	Superi-ority%	Ave-rage	Rank	Superi-ority%
HFB-165-1	29.8	86.3	33.6	58.0	51.9	8		52.2	91.6	98.1	64.0	106.3	46.0	76.4	4		79.6	7	
JHB-10-1	36.7	77.4	60.8	59.7	58.7	2	0.2	51.2	80.3	92.8	57.0	84.1	79.0	74.1	7		82.7	2	
BL-150	30.4	83.2	55.0	62.4	57.8	4		36.1	79.7	131.4	58.6	90.7	105.0	83.6	1	2.7	81.4	5	
JHB-10-2	39.3	86.0	24.9	60.2	52.6	7		42.7	69.5	119.0	43.9	87.2	98.0	76.7	3		82.1	4	
JB-03-17	31.7	100.2	67.7	55.7	63.8	1	8.9	52.8	75.2	108.5	41.0	81.6	92.0	75.2	5		82.2	3	
Mescavi (NC)	27.9	94.7	54.4	53.9	57.7	5		44.9	72.0	127.4	45.1	87.8	111.0	81.4	2		84.5	1	
Wardan (NC)	31.5	91.2	52.7	58.8	58.6	3		52.4	66.1	102.5	48.0	83.2	98.0	75.0	6		79.9	6	
BL-22 (ZC-HZ)																			
Bundel Berseem-2 (ZC-CZ, NWZ)								48.6	62.9	113.4	49.0	76.5	92.0	73.7	8				
Bundel Berseem-3 (ZC-NEZ)	32.2	91.3	31.3	56.1	52.7	6													
	32.4	88.8	47.6	58.1	56.7			47.6	74.7	111.6	50.8	87.2	90.1	77.0			81.8		
Mean	2.0	11.5	6.0	4.7				8.2	9.0	24.0	7.3	6.5	27.2						
CD at 5%	4.3.	7.4	7.3	7.3				9.8	6.9	12.2	16.2	9.0	18.1						
CV%																			

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

Entries	Ranchi	Kalyani	Faizabad	Ludhiana	Kanpur	Pusa	Pantnagar	Kajrat	Srinagar	Average	Rank
HFB-165-1	3.56	1.99	2.05	2.80	5.24	2.72	4.10	1.30	1.34	2.79	5
JHB-10-1	3.47	2.28	2.87	2.60	4.71	2.77	3.78	2.06	1.36	2.88	4
BL-150	3.11	2.16	2.67	2.50	4.85	2.91	4.12	2.55	1.34	2.91	2
JHB-10-2	3.20	2.53	1.09	2.50	5.08	2.80	3.91	2.17	1.25	2.73	6
JB-03-17	3.74	2.00	2.99	2.80	4.92	2.54	4.26	2.22	1.25	2.97	1
Mescavi (NC)	3.54	2.02	2.54	2.80	4.95	2.54	3.63	2.59	1.37	2.89	3
Wardan (NC)	3.29	2.26	2.22	2.50	5.42	2.66	3.83	2.45	1.38	2.89	3
BL-22 (ZC-HZ)									1.41		
Bundel Berseem-2 (ZC-CZ, NWZ)				2.50	4.23		4.22	2.34			
Bundel Berseem-3 (ZC-NEZ)	3.32	2.00	1.45			2.56					
Mean	3.40	2.16	2.24	2.63	4.93	2.69	3.98	2.21	1.34	2.84	

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

Entries	Ranchi	Kalyani	Faizabad	Ludhiana	Kanpur	Pusa	Pantnagar	Karjat	Srinagar	Average	Rank
HFB-165-1	0.54	0.25	0.29	0.44	0.97	0.48	0.52	0.73	0.44	0.52	6
JHB-10-1	0.47	0.31	0.52	0.39	0.76	0.49	0.50	1.28	0.45	0.57	3
BL-150	0.52	0.26	0.47	0.36	0.82	0.49	0.50	1.60	0.32	0.59	2
JHB-10-2	0.52	0.33	0.21	0.37	0.79	0.48	0.55	1.31	0.36	0.55	5
JB-03-17	0.61	0.27	0.58	0.41	0.74	0.45	0.57	1.35	0.30	0.59	2
Mescavi (NC)	0.59	0.24	0.46	0.43	0.80	0.44	0.42	1.70	0.31	0.60	1
Wardan (NC)	0.56	0.27	0.45	0.35	0.76	0.47	0.49	1.53	0.15	0.56	4
BL-22 (ZC-HZ)									0.33		
Bundel Berseem-2 (ZC-CZ, NWZ)				0.35	0.70		0.53	1.48			
Bundel Berseem-3 (ZC-NEZ)	0.56	0.27	0.28			0.46					
Mean	0.55	0.28	0.41	0.39	0.79	0.47	0.51	1.37	0.33	0.57	

Table 1.5 IVT Berseem: Initial Varietal Trial in Berseem: Crude Protein Yield (q/ha)

Entries	Palampur	Rahuri	Ranchi	Hisar	Urulikanchan	Faizabad	Ludhiana	Jabalpur	Average	Rank
HFB-165-1	6.7	16.2	15.5	35.1	12.0	5.3	12.5	13.7	14.6	1
JHB-10-1	7.0	14.0	13.2	29.0	10.9	10.8	12.2	13.6	13.8	5
BL-150	5.8	14.4	15.7	26.7	10.9	9.1	10.7	18.8	14.0	4
JHB-10-2	6.4	12.3	15.8	29.0	8.2	4.2	10.8	16.9	12.9	7
JB-03-17	7.7	12.9	17.5	27.0	7.6	12.0	13.1	15.4	14.2	3
Mescavi (NC)	9.2	12.9	17.0	28.9	8.3	9.0	11.7	17.7	14.3	2
Wardan (NC)	7.0	11.3	16.0	28.9	8.8	8.5	10.4	14.1	13.1	6
BL-22 (ZC-HZ)	7.7									
Bundel Berseem-2 (ZC-CZ, NWZ)		11.1		32.5	9.3		11.2	15.9		
Bundel Berseem-3 (ZC-NEZ)			16.4			5.0				
Mean	7.2	13.1	15.9	29.6	9.5	8.0	11.6	15.8	13.8	

Table 1.6 IVT Berseem: Initial Varietal Trial in Berseem: Crude Protein (%)

Entries	Palampur	Rahuri	Ranchi	Hisar	Ludhiana	Jabalpur	Urulikanchan	Faizabad	Average	Rank
HFB-165-1	22.9	17.7	17.9	23.5	18.4	14.5	18.7	15.8	18.7	5
JHB-10-1	22.9	17.4	17.1	26.2	20.2	14.3	19.2	17.8	19.4	1
BL-150	20.1	18.1	18.8	25.2	19.4	14.6	18.6	16.5	18.9	4
JHB-10-2	21.6	17.7	18.4	25.3	19.2	14.6	18.5	16.9	19.0	3
JB-03-17	20.4	17.7	17.5	24.6	20.8	14.7	18.6	17.7	19.0	3
Mescavi (NC)	22.0	17.9	17.9	24.1	17.8	14.5	18.3	16.6	18.6	6
Wardan (NC)	24.2	17.1	17.5	25.5	19.4	14.4	18.7	16.2	19.1	2
BL-22 (ZC-HZ)	22.8									
Bundel Berseem-2 (ZC-CZ, NWZ)		17.7		24.9	20.6	14.6	18.8			
Bundel Berseem-3 (ZC-NEZ)			17.9					15.9		
Mean	22.1	17.6	17.9	24.9	19.5	14.5	18.7	16.7	19.0	

Table 1.7 IVT Berseem: Initial Varietal Trial in Berseem: Plant Height (cm)

Entries	Rahuri	Ranchi	Kal-yani	Uruli-kanchan	Faiza-bad	Hisar	Kan-pur	Jabal-pur	Palam-pur	Udai-pur	Pant-nagar	Ludhi-ana	Jhansi	Kar-jat	Sri-nagar	Aver-age	Rank
HFB-165-1	53.0	45.8	53.0	52.0	63.2	48.5	38.7	40.0	42.3	65.7	31.1	62.7	54.7	59.0	43.3	50.2	5
JHB-10-1	53.0	46.1	51.4	47.7	69.5	45.6	40.0	37.7	40.8	67.9	27.3	59.3	62.2	58.4	41.9	49.9	7
BL-150	52.0	42.8	53.5	49.2	55.2	44.3	37.7	48.1	37.4	62.9	50.2	61.7	51.2	61.9	42.0	50.0	6
JHB-10-2	51.0	45.5	54.3	49.6	53.5	46.1	40.7	42.5	44.5	68.8	58.1	58.0	63.5	59.3	44.3	52.0	2
JB-03-17	58.0	48.6	56.3	52.7	71.2	47.7	46.7	39.0	49.7	68.6	44.1	59.7	57.5	55.7	41.6	53.1	1
Mescavi (NC)	53.0	44.9	55.8	47.7	57.8	47.9	40.0	45.7	47.2	66.4	37.3	65.7	57.4	53.7	44.9	51.0	4
Wardan (NC)	51.0	44.5	52.6	51.1	61.6	45.8	39.0	43.7	44.1	69.4	37.1	63.3	60.8	55.0	49.2	51.2	3
BL-22 (ZC-HZ)									43.4						45.3		
Bundel Berseem-2 (ZC-CZ, NWZ)	52.0			48.5		47.6	37.6	42.0		65.2	38.5	61.3	61.9	52.6			
Bundel Berseem-3 (ZC-NEZ)		45.9	54.0		59.8												
Mean	52.9	45.5	53.9	49.8	61.5	46.7	40.1	42.3	43.7	66.9	40.5	61.5	58.7	57.0	44.1	51.0	

Table 1.8 IVT Berseem: Initial Varietal Trial in Berseem: Leaf Stem Ratio

Entries	Rahuri	Ranchi	Kal-yani	Uruli-kanchan	Faiza-bad	Kanpur	Jabal-pur	Palam-pur	Udai-pur	Ludhi-ana	Karjat	Average	Rank
HFB-165-1	0.66	0.71	1.29	0.72	0.69	0.61	0.57	0.72	0.70	0.82	0.65	0.74	1
JHB-10-1	0.81	0.65	1.26	0.79	0.70	0.53	0.52	0.76	0.62	0.67	0.72	0.73	2
BL-150	0.66	0.68	1.44	0.77	0.75	0.51	0.72	0.66	0.63	0.67	0.58	0.73	2
JHB-10-2	0.53	0.71	1.14	0.77	0.69	0.59	0.68	0.69	0.62	0.67	0.59	0.70	3
JB-03-17	0.81	0.55	1.03	0.70	0.75	0.47	0.59	0.66	0.56	0.82	0.75	0.70	3
Mescavi (NC)	0.53	0.71	1.11	0.73	0.65	0.44	0.72	0.72	0.68	1.00	0.77	0.73	2
Wardan (NC)	0.81	0.66	1.32	0.77	0.68	0.47	0.61	0.71	0.58	0.82	0.65	0.73	2
BL-22 (ZC-HZ)								0.69					
Bundel Berseem-2 (ZC-CZ, NWZ)	0.66			0.75		0.50	0.69		0.80	1.00	0.58.		
Bundel Berseem-3 (ZC-NEZ)		0.66	1.11		0.71								
Mean	0.68	0.67	1.21	0.75	0.70	0.52	0.64	0.70	0.65	0.81	0.67	0.73	

Table 1.9 IVT Berseem: Initial Varietal Trial in Berseem: IVDMD (%) & DDM (q/ha)

Entries	IVDMD (%)				DDM (q/ha)	
	Hisar	Ludhiana	Avarage	Rank	Hisar	Rank
HFB-165-1	69.9	63.0	66.5	3	103.2	1
JHB-10-1	66.8	64.8	65.8	5	73.9	7
BL-150	67.3	63.6	65.5	6	70.6	8
JHB-10-2	67.8	63.2	65.5	6	78.4	4
JB-03-17	69.9	65.6	67.8	1	78.7	3
Mescavi (NC)	66.1	62.8	64.5	8	77.3	5
Wardan (NC)	69.1	63.6	66.4	4	76.6	6
BL-22 (ZC-HZ)						
Bundel Berseem-2 (ZC-CZ, NWZ)	69.5	65.0	67.3	2	85.3	2
Bundel Berseem-3 (ZC-NEZ)						
Mean	68.3	64.0	66.1		80.5	

Table 1.10 IVT Berseem: Initial Varietal Trial in Berseem: ADF (%) & NDF (%)

Entries	ADF (%)		NDF (%)	
	Ludhiana	Rank	Ludhiana	Rank
HFB-165-1	24.8	5	44.9	5
JHB-10-1	23.6	3	44.0	2
BL-150	25.3	6	44.7	4
JHB-10-2	23.3	1	46.4	8
JB-03-17	23.5	2	43.1	1
Mescavi (NC)	25.6	7	45.5	6
Wardan (NC)	24.6	4	45.9	7
BL-22 (ZC-HZ)	23.5	2		
Bundel Berseem-2 (ZC-CZ, NWZ)	23.5	2	44.6	3
Bundel Berseem-3 (ZC-NEZ)				
Mean	24.3		44.9	

2. AVTB-1: FIRST ADVANCED VARIETAL TRIAL IN BERSEEM

(Table Reference: 2.1 to 2.6)

In Berseem, two entries namely HFB-6-6 and HFB-30 promoted from IVT were evaluated against two national checks Mescavi and Wardan and zonal check BL-22 at Palampur and Srinagar centre of Hill Zone. Results of the trial clearly indicated that for green forage and dry matter yield (q/ha), national check Mescavi maintained superiority with 222.5 and 40.8 q/ha, respectively. Similarly, for forage production potential (q/ha/day), national check Mescavi was ranked first with 1.49 and 0.27 q/ha/day, respectively for green forage and dry matter production potential (q/ha/day). Here we observe that none of the testing entries exhibited their superiority for forage production yield with respect to national check. For evaluation against growth parameter, national check Mescavi ranked first for plant height (48.4cm) whereas entry HFB-30 ranked first for the character leaf stem ratio (0.70).

In quality parameters too, national check Mescavi proved superiority for crude protein yield (7.7q/ha) and crude protein content (25.2%). For other quality parameters like NDF, ADF and IVDMD (%), HFB-6-6 (56.6%), Wardan (19.6%) and HFB-6-6 (60.0%) performed better than rest of the entries.

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

Entries	Hill Zone			
	Palampur	Srinagar	Average	Rank
HFB 6-6	152.7	248.5	200.6	4
HFB-30	154.3	246.0	200.2	5
Mescavi (NC)	189.1	255.9	222.5	1
Wardan (NC)	156.5	251.3	203.9	3
BL-22 (ZC-HZ)	148.6	260.0	204.3	2
Mean	165.4	250.1	207.8	
CD at 5%	NS	8.1		
CV%	12.0	1.8		

Table 2.2 AVT-1 Berseem: First Advanced Varietal Trial in Berseem: Dry Matter Yield (q/ha)

Entries	Hill Zone			
	Palampur	Srinagar	Average	Rank
HFB 6-6	24.8	47.4	36.1	4
HFB-30	24.4	49.8	37.1	2
Mescavi (NC)	30.7	50.8	40.8	1
Wardan (NC)	24.5	47.5	36.0	5
BL-22 (ZC-HZ)	23.6	49.1	36.4	3
Mean	26.6	49.3	38.0	
CD at 5%	NS	8.8		
CV%	17.5	9.6		

Note: -Trial data not reported from Rajouri centre

Table 2.3 AVT-1 Berseem: First Advanced Varietal Trial in Berseem: Green Forage Yield (q/ha/day) & Dry Matter Yield (q/ha/day)

Entries	GFY (q/ha/day)		DMY (q/ha/day)	
	Srinagar	Rank	Srinagar	Rank
HFB 6-6	1.44	4	0.24	4
HFB-30	1.41	5	0.27	1
Mescavi (NC)	1.49	1	0.27	1
Wardan (NC)	1.47	3	0.25	3
BL-22 (ZC-HZ)	1.48	2	0.26	2
Mean	1.45		0.26	

Table 2.4 AVT-1 Berseem: First Advanced Varietal Trial in Berseem: Crude Protein Yield (q/ha) & Crude Protein (%)

Entries	Crude Protein Yield (q/ha)		Crude Protein (%)	
	Palampur	Rank	Palampur	Rank
HFB 6-6	6.1	2	24.5	2
HFB-30	5.7	5	22.8	4
Mescavi (NC)	7.7	1	25.2	1
Wardan (NC)	5.8	4	23.4	3
BL-22 (ZC-HZ)	5.8	3	24.5	2
Mean	6.5		24.2	

Table 2.5 AVT-1 Berseem: First Advanced Varietal Trial in Berseem: Plant Height (cm) & Leaf Stem Ratio

Entries	Plant Height (cm)				Leaf Stem Ratio	
	Palampur	Srinagar	Average	Rank	Palampur	Rank
HFB 6-6	30.1	52.4	41.3	4	0.65	3
HFB-30	32.5	58.7	45.6	3	0.70	1
Mescavi (NC)	38.7	58.0	48.4	1	0.66	2
Wardan (NC)	39.7	52.7	46.2	2	0.66	2
BL-22 (ZC-HZ)	34.8	56.4	45.6	3	0.61	4
Mean	33.8	56.4	45.1		0.67	

Table 2.6 AVT-1 Berseem: First Advanced Varietal Trial in Berseem: NDF (%), ADF (%) & IVDMD (%)

Entries	NDF (%)		ADF (%)		IVDMD (%)	
	Palampur	Rank	Palampur	Rank	Palampur	Rank
HFB 6-6	56.6	1	47.4	2	60.0	1
HFB-30	60.4	5	51.8	5	58.2	4
Mescavi (NC)	59.8	2	48.0	3	59.4	2
Wardan (NC)	60.0	4	19.6	1	57.8	5
BL-22 (ZC-HZ)	59.6	3	48.4	4	58.6	3
Mean	58.9		49.1		59.2	

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

(Table Reference: 3.1 to 3.9)

An initial varietal trial in Oat (single cut) comprising thirteen testing entries along with two national checks i.e. Kent and OS-6 and five zonal checks for respective zones i.e. Palampur-1, OL-125, JHO-99-2, JHO-822 and JHO-2000-4 was conducted at 27 centres distributed over five zones in the country. Results reported from different centres clearly revealed that for green forage yield (q/ha), entries SKO-188 (16.9%), JO-03-99 (8.0%), SKO-170 (7.4%) and UPO-10-1 (5.5%) in Hill Zone, entries SKO-188 (13.7%), OS-377 (9.9%), UPO-10-2 (9.5%) and JO-03-97 (4.5%) in North-West Zone, entries JO-03-99 (13.1%) and UPO-10-2 (9.1%) in North-East Zone, entries OS-377 (14.4%), JO-03-99 (7.8%), JHO-2010-1 (7.1%), JO-03-97 (6.2%), UPO-10-2 (6.1%), SKO-188 (6.0%) and UPO-10-1 (5.5%) in Central Zone and entries JHO-2010-1 (19.7%), JO-03-97 (11.9%), JHO-2010-2 (10.1%), UPO-10-1 (8.9%) and UPO-10-2 (5.7%) in South Zone registered their superiority over respective best check whereas at national level entries SKO-188 (10.6%), UPO-10-2 (9.8%), OS-377 (9.3%), JO-03-99 (9.0%), JO-03-97 (6.7%) and JHO-2010-1 (5.2%) exhibited their superiority for green forage yield over best national check.

Similarly for dry matter yield (q/ha), entries SKO-188 (15.5%), SKO-170 (10.6%), JO-03-99 (10.1%) and UPO-10-2 (6.8%) in Hill Zone, entries UPO-10-2 (17.3%), JO-03-99 (11.3%) and SKO-188 (11.3%) in North-East Zone, entries SKO-188 (14.2%), JHO-2010-1 (13.1%), OS-377 (9.5%), UPO-10-2 (8.2%), UPO-10-1 (8.0%), JO-03-99 (6.3%), OL-1709 (5.7%) and ANDO-3 (4.5%) in Central Zone and JHO-2010-1 (20.4%), UPO-10-1 (15.5%) and JO-03-97 (6.0%) in South Zone proved their superiority over respective best national or zonal check in each zone. Coming to the national level, entries UPO-10-2 (9.2%), SKO-188 (7.9%), JHO-2010-1 (6.7%) and JO-03-99 (5.6%), recorded their superiority over best national check.

In green forage production potential (q/ha/day), entries UPO-10-2, JHO-2010-1, JO-03-97, JO-03-99, OS-377 and ANDO-3 registered their superiority over national check Kent whereas entries OL-1709, UPO-10-2 and JO-03-97 maintained their superiority for dry matter production potential (q/ha/day) over national check OS-6. For evaluation against growth parameter i.e. plant height (cm), entries UPO-10-2, JO-03-99 and UPO-10-1 recorded their superiority over national check. For the character leaf stem ratio, entries SKO-170, JO-03-99 and UPO-10-2 registered their superiority.

In quality parameters, entries UPO-10-2, JO-03-99 and JHO-2010-1 for crude protein yield (q/ha), entries JO-03-99 and NDO-729 for crude protein content (%) were recoded superior with respect to check. For other quality parameters like, IVDMD (%), entries SKO-188 and NDO-729, for DDM (q/ha), entries UPO-10-2 and JHO-2010-1, for ADF (%), entries JHO-2010-2, NDO-729 and NDO-712 and for NDF (%), entries NDO-712, JO-03-99 and JHO-2010-1 maintained their superiority over best check

Table 3.1 IVT Oat (SC): Initial Varietal Trial in Oat (Single cut): Green Forage Yield (q/ha)

Cont…

Entries	Hill Zone					North-West Zone									
	Palampur	Srinagar	Average	Rank	Superiority%	Bikaner	Jalore	Hisar	Ludhiana	Pantnagar	Meerut	Udaipur	Average	Rank	Superiority%
OL-1709	204.4	437.7	321.0	10		159.5	546.0	511.1	600.0	427.7	644.4	407.5	470.9	8	
JHO-2010-2	147.0	454.7	300.9	15		136.6	590.0	518.5	574.8	347.7	562.9	344.4	439.3	12	
NDO-712	208.1	471.5	339.8	5	3.7	134.2	569.3	448.1	470.4	338.9	666.7	337.0	423.5	14	
UPO-10-2	208.1	467.4	337.7	6	3.1	169.8	665.7	692.5	759.3	340.0	548.1	462.9	519.8	3	9.5
JO-03-99	199.1	508.8	353.9	2	8.0	161.8	611.3	618.5	611.1	384.4	596.2	429.6	487.6	5	2.7
NDO-729	118.9	431.6	275.3	16		146.9	511.7	496.3	405.6	359.2	559.2	333.3	401.7	16	
SKO-170	273.3	430.7	352.0	3	7.4	105.5	596.3	537.0	522.2	441.1	548.1	433.3	454.8	10	
JHO-2010-1	197.0	439.2	318.1	12		144.4	577.0	559.2	592.6	368.5	640.7	485.1	481.1	6	1.3
SKO-188	267.4	498.5	383.0	1	16.9	149.2	892.7	614.8	600.0	398.5	648.1	548.1	550.2	1	13.7
ANDO-3	163.6	479.9	321.8	9		144.1	458.3	507.4	451.9	331.4	722.2	351.9	423.9	13	
UPO-10-1	211.8	479.7	345.7	4	5.5	128.7	559.0	585.1	537.0	380.7	529.6	462.9	454.7	11	
JO-03-97	211.3	451.6	331.5	7	1.2	179.3	604.7	555.5	670.4	383.3	681.4	399.9	496.4	4	4.5
OS-377	182.9	442.7	312.8	13		180.4	746.7	651.8	574.1	422.2	644.4	433.3	521.8	2	9.9
Kent (NC)	175.5	428.0	301.8	14		169.9	488.7	529.6	570.4	398.1	692.6	359.2	458.4	9	
OS-6 (NC)	189.6	465.8	327.7	8		147.0	499.3	466.6	475.9	341.4	562.9	407.4	414.4	15	
Palampur-1 (ZC-HZ)	206.6	430.5	318.5	11											
OL-125 (ZC-NWZ)						139.9	514.3	540.7	600.0	388.1	722.2	418.5	474.8	7	
JHO-99-2 (ZC-NEZ)															
JHO-822 (ZC-CZ)															
JHO-2000-4 (ZC-SZ)															
Mean	197.8	457.4	327.6			149.8	589.4	552.0	563.5	378.2	623.1	413.4	467.1		
CD at 5%	41.1	2.7				37.3	48.1	37.4	25.0	33.3	60.2	137.6			
CV%	12.3	0.3				14.9	4.9	4.1	13.3	5.3	5.9	19.9			

Note: *Data reported from Pusa centre not included in zonal and all India average due to less entries reported in trial

**Not included in zonal and all India average due to C≥20%, -Trial data not reported from Rajouri center

Table 3.1 IVT Oat (SC): Initial Varietal Trial in Oat (Single cut): Green Forage Yield (q/ha)

Cont…

Entries	North-East Zone										Central Zone									
	Jor-hat	Kal-yani	Bhuba-neswar	Ran-chi	Im-phal	Faiza-bad	Pusa*	Ave-rage	Rank	Superi-ority%	Jhan-si	Ra-huri	Uruli-kanchan	Kan-pur	Anand	Jabal-pur	Rai-pur	Kar-jat	Ave-rage	Rank	Superi-ority%
OL-1709	288.2	594.0	249.3	479.9	107.3	429.9	616.0	358.1	8		458.2	303.8	458.6	807.4	854.0	410.1	260.4	329.0	485.2	8	
JHO-2010-2	283.1	554.8	323.9	475.4	148.1	429.3	583.0	369.1	4	0.4	391.8	381.9	602.6	674.1	836.0	329.2	270.3	280.0	470.7	10	
NDO-712	327.1	454.4	273.3	368.8	99.5	432.0	599.0	325.9	13		391.2	286.4	453.3	640.7	635.0	523.8	268.5	242.0	430.1	14	
UPO-10-2	300.8	655.5	321.3	448.8	242.3	437.3	566.0	401.0	2	9.1	450.9	381.6	687.9	674.1	863.0	477.2	270.3	280.0	510.6	5	6.1
JO-03-99	370.6	649.9	342.2	435.5	183.5	512.0	533.0	415.6	1	13.1	479.3	402.2	602.6	718.5	868.0	569.1	264.1	250.0	519.2	2	7.8
NDO-729	314.1	498.1	326.6	484.3	104.8	458.7	616.0	364.4	7		371.8	300.9	639.9	648.2	674.0	327.9	260.4	214.0	429.6	15	
SKO-170	320.8	522.9	267.9	444.3	118.7	163.2	633.0	306.3	16		271.6	271.9	517.3	725.9	729.0	451.8	328.4	210.0	438.2	13	
JHO-2010-1	319.2	511.1	245.3	502.1	104.1	393.1	583.0	345.8	10		451.5	332.7	703.9	674.1	830.0	473.2	264.1	396.0	515.7	3	7.1
SKO-188	323.5	574.0	235.3	559.9	173.4	385.6	616.0	375.3	3	2.1	311.0	324.1	805.3	770.4	824.0	459.8	323.7	263.0	510.2	6	6.0
ANDO-3	321.6	548.8	243.1	457.7	153.5	225.1	583.0	325.0	14		399.2	300.9	655.9	663.0	766.0	515.8	257.9	323.0	485.2	8	0.8
UPO-10-1	327.1	535.1	261.9	275.5	180.1	316.6		316.1	15		427.1	358.8	693.3	711.1	812.0	505.2	257.9	299.0	508.1	7	5.5
JO-03-97	325.1	594.0	253.3	506.5	100.6	427.2	583.0	367.8	5	0.1	443.4	341.4	714.6	881.1	783.0	419.9	260.4	247.0	511.4	4	6.2
OS-377	337.6	614.8	324.6	471.0	166.1	208.4	633.0	353.8	9		479.8	387.7	799.9	792.6	997.0	350.5	305.6	294.0	550.9	1	14.4
Kent (NC)	328.6	518.9	244.3	551.0	116.8	445.3	549.0	367.5	6		435.9	324.0	559.9	711.1	781.0	417.2	257.9	364.0	481.4	9	
OS-6 (NC)	266.7	574.8	246.6	435.5	132.8	330.7	616.0	331.2	12		429.2	274.9	682.6	755.6	766.0	259.9	268.5	270.0	463.3	11	
Palampur-1 (ZC-HZ)																					
OL-125 (ZC-NWZ)																					
JHO-99-2 (ZC-NEZ)	347.1	624.8	261.9	431.0	177.2	230.4	633.0	345.4	11												
JHO-822 (ZC-CZ)											417.1	324.1	597.3	688.9	697.0	306.6	270.3	372.0	459.2	12	
JHO-2000-4 (ZC-SZ)																					
Mean	318.8	564.1	276.3	458.0	144.3	364.1	596.1	354.3			412.8	331.5	638.5	723.2	801.2	432.7	274.6	284.1	487.3		
CD at 5%	15.6	20.6	26.4	85.4	22.1	70.1	41.3				32.7	36.2	20.5	87.1	67.0	97.1	21.2	30.8			
CV%	13.1	2.6	7.7	11.2	8.3	11.5	8.7				19.4	6.6	16.1	7.2	5.1	13.8		6.4			

Table 3.1 IVT Oat (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%
OL-1709	177.8	237.5	388.9	268.1	13		414.3	7	1.1
JHO-2010-2	238.9	247.9	444.4	310.4	3	10.1	407.2	10	
NDO-712	207.4	236.0	351.9	265.1	15		378.3	15	
UPO-10-2	222.2	295.2	374.1	297.2	5	5.7	449.9	2	9.8
JO-03-99	194.4	296.1	359.3	283.3	8	0.7	446.8	4	9.0
NDO-729	238.9	186.4	455.6	293.6	6	4.4	379.5	14	
SKO-170	218.5	222.8	355.6	265.6	14		385.7	13	
JHO-2010-1	253.7	330.2	425.9	336.6	1	19.7	431.3	6	5.2
SKO-188	211.1	261.6	362.9	278.5	11		453.3	1	10.6
ANDO-3	262.9	215.3	388.9	289.0	7	2.8	396.5	11	
UPO-10-1	238.9	301.6	377.8	306.1	4	8.9	413.6	8	0.9
JO-03-97	203.7	314.2	425.9	314.6	2	11.9	437.6	5	6.7
OS-377	196.3	216.0	433.3	281.9	9	0.8	448.2	3	9.3
Kent (NC)	196.3	230.0	362.9	263.1	16		409.9	9	
OS-6 (NC)	166.7	247.3	418.5	277.5	12		387.8	12	
Palampur-1 (ZC-HZ)									
OL-125 (ZC-NWZ)									
JHO-99-2 (ZC-NEZ)									
JHO-822 (ZC-CZ)									
JHO-2000-4 (ZC-SZ)	206.6	261.0	377.8	281.8	10				
Mean	215.2	255.9	395.1	288.7			413.7		
CD at 5%	30.7	33.2	45.5						
CV%	8.6	7.8	6.9						

Table 3.2 IVT Oat (SC): Initial Varietal Trial in Oat (Single cut): Dry matter Yield (q/ha)

Cont…

Entries	Hill Zone					North-West Zone								
	Palam-pur	Sri-nagar	Ave-rage	Rank	Superi-ority%	Bika-ner	Hisar	Ludhi-ana	Pant-nagar	Meerut	Udai-pur**	Ave-rage	Rank	Superi-ority%
OL-1709	54.1	107.4	80.8	9		48.6	107.3	114.0	72.0	225.6	237.0	113.5	1	2.3
JHO-2010-2	50.4	110.2	80.3	11		36.3	103.7	106.5	54.7	135.7	200.7	87.4	14	
NDO-712	54.7	115.6	85.1	5	4.0	33.7	98.6	82.3	64.9	192.1	185.4	94.3	12	
UPO-10-2	62.1	112.7	87.4	4	6.8	39.8	138.5	151.9	56.9	156.4	249.9	108.7	3	
JO-03-99	53.5	126.7	90.1	3	10.1	37.6	136.1	116.1	68.8	168.7	270.5	105.5	7	
NDO-729	52.6	111.8	82.2	6	0.5	40.6	104.2	70.9	47.4	164.9	181.5	85.6	15	
SKO-170	71.4	109.6	90.5	2	10.6	32.3	96.7	94.0	82.9	144.8	216.3	90.1	13	
JHO-2010-1	46.9	109.6	78.2	12		35.2	139.8	112.6	60.2	156.5	234.6	100.9	9	
SKO-188	66.9	122.0	94.5	1	15.5	42.4	98.4	114.0	80.9	155.9	259.6	98.3	10	
ANDO-3	46.5	115.3	80.9	8		47.0	116.7	79.0	57.9	188.8	172.2	97.9	11	
UPO-10-1	44.3	117.0	80.6	10		42.9	146.3	97.0	79.0	145.3	241.6	102.1	8	
JO-03-97	52.6	110.9	81.8	7		44.6	122.2	130.7	59.2	182.8	218.3	107.9	4	
OS-377	44.9	110.7	77.8	13		39.8	123.8	106.2	82.1	177.8	245.2	105.9	6	
Kent (NC)	43.7	106.4	75.1	15		42.8	127.1	105.5	61.3	197.1	196.3	106.8	5	
OS-6 (NC)	49.0	114.5	81.8	7		42.4	121.3	83.3	62.5	146.0	226.8	91.1	13	
Palampur-1 (ZC-HZ)	47.4	106.8	77.1	14										
OL-125 (ZC-NWZ)						36.1	113.5	114.0	68.7	222.6	252.4	111.0	2	
JHO-99-2 (ZC-NEZ)														
JHO-822 (ZC-CZ)														
JHO-2000-4 (ZC-SZ)														
Mean	52.6	112.9	82.8			40.1	118.4	104.9	66.2	172.6	224.3	100.4		
CD at 5%	12.2	2.5				10.6	8.2	23.3	12.2	17.2	89.9			
CV%	13.9	4.7				15.9	4.1	13.3	11.3	6.0	24.0			

Table 3.2 IVT Oat (SC): Initial Varietal Trial in Oat (Single cut): Dry matter Yield (q/ha)

Cont…

Entries	North-East Zone										Central Zone										
	Jor-hat	Kal-yani	Bhuba-neswar	Ran-chi	Im-phal	Faiza-bad	Pusa*	Ave-rage	Rank	Superi-ority%	Jhansi	Rahuri	Uruli-kanchan	Kan-pur	Anand	Jabal-pur	Rai-pur	Kar-jat	Ave-rage	Rank	Superi-ority%
OL-1709	54.4	96.5	50.2	91.9	23.0	94.9	128.7	68.5	13		72.3	63.8	87.3	285.9	115.4	88.6	61.6	151.0	115.7	7	5.7
JHO-2010-2	44.1	98.2	65.7	120.6	35.9	95.5	116.0	76.7	5	0.8	70.4	81.1	110.9	219.3	132.1	73.8	63.9	151.0	112.8	9	3.1
NDO-712	56.0	74.4	55.5	96.3	22.5	123.7	124.6	71.4	9		65.0	51.3	79.4	207.8	78.1	117.9	63.5	75.0	92.3	16	
UPO-10-2	56.9	130.4	62.7	124.9	50.7	110.1	122.8	89.3	1	17.3	73.4	79.1	136.9	220.0	157.1	107.8	63.9	109.0	118.4	4	8.2
JO-03-99	57.5	117.1	69.7	97.9	41.8	124.3	113.3	84.7	2	11.3	82.0	82.5	117.7	246.7	134.6	122.4	62.5	82.0	116.3	6	6.3
NDO-729	59.8	89.2	64.2	112.0	20.3	101.3	128.6	74.5	7		60.2	52.2	115.3	205.2	109.2	72.7	61.6	83.0	94.9	14	
SKO-170	56.9	107.3	54.6	126.5	34.1	42.7	132.7	70.4	10		62.7	62.9	92.2	250.4	117.4	98.5	69.8	101.0	106.9	13	
JHO-2010-1	59.1	90.6	49.5	117.9	24.8	92.6	122.3	72.4	8		70.5	75.0	143.6	217.0	136.1	106.5	62.5	178.0	123.7	2	13.1
SKO-188	62.8	106.7	46.0	153.8	45.5	93.6	133.7	84.7	3	11.3	67.8	73.4	150.6	254.8	153.3	103.4	69.8	126.0	124.9	1	14.2
ANDO-3	63.4	95.1	51.0	99.9	48.7	57.9	124.1	69.3	12		62.4	64.0	115.5	215.9	105.7	111.8	61.0	178.0	114.3	8	4.5
UPO-10-1	50.9	105.7	51.2	69.5	39.8	89.9		67.8	14		78.7	69.7	132.6	251.1	101.5	112.6	61.0	138.0	118.2	5	8.0
JO-03-97	65.3	124.7	52.4	101.2	23.6	100.8	124.6	78.0	4	2.4	76.2	65.0	119.9	258.5	108.0	81.0	61.6	99.0	108.7	12	
OS-377	55.9	110.7	64.3	120.6	29.3	47.5	130.8	71.4	9		77.3	89.2	144.0	285.2	128.6	75.3	67.9	91.0	119.8	3	9.5
Kent (NC)	64.3	92.3	49.0	111.9	27.3	112.0	113.6	76.1	6		72.7	58.1	93.5	237.0	121.0	91.0	61.0	135.0	108.7	12	
OS-6 (NC)	52.6	106.3	49.9	104.4	33.4	72.0	128.6	69.8	11		73.2	46.1	133.6	258.5	121.0	55.3	63.5	124.0	109.4	10	
Palampur-1 (ZC-HZ)																					
OL-125 (ZC-NWZ)																					
JHO-99-2 (ZC-NEZ)	66.2	100.9	51.5	109.8	39.5	54.4	132.3	70.4	10												
JHO-822 (ZC-CZ)											68.7	57.1	112.9	227.4	113.0	67.1	63.9	160.0	108.8	11	
JHO-2000-4 (ZC-SZ)																					
Mean	57.9	102.9	55.5	109.9	33.8	88.3	125.1	74.7			71.0	67.6	118.2	240.9	121.3	94.6	63.7	121.4	112.3		
CD at 5%	6.6	5.9	5.7	24.9	4.9	17.9	8.9				9.1	7.4	8.1	31.2	10.0	23.2	5.0	13.4			
CV%	13.1	4.1	8.2	13.6	7.8	12.1	7.3				5.4	6.6	18.3	7.8	5.0	15.0	4.9	6.5			

Table 3.2 IVT Oat (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%
OL-1709	45.0	99.5	80.4	75.0	6		95.4	5	
JHO-2010-2	57.3	78.0	95.1	76.8	4	0.4	91.3	9	
NDO-712	45.3	84.0	66.3	65.2	13		83.5	14	
UPO-10-2	63.8	84.7	67.3	71.9	8		100.7	1	9.2
JO-03-99	48.0	79.4	63.7	63.7	14		97.4	4	5.6
NDO-729	75.3	51.5	84.0	70.3	9		83.7	13	
SKO-170	73.6	40.8	66.7	60.4	15		87.1	12	
JHO-2010-1	70.7	114.2	91.3	92.1	1	20.4	98.4	3	6.7
SKO-188	73.1	57.7	70.3	67.0	12		99.5	2	7.9
ANDO-3	63.5	66.7	71.9	67.4	11		91.0	10	
UPO-10-1	64.3	131.9	68.9	88.4	2	15.5	95.4	5	3.4
JO-03-97	55.5	113.0	74.7	81.1	3	6.0	95.1	6	3.1
OS-377	47.3	52.0	73.9	57.7	16		93.6	7	1.5
Kent (NC)	55.5	79.3	67.8	67.5	10		92.2	8	
OS-6 (NC)	49.1	94.3	86.1	76.5	5		89.3	11	
Palampur-1 (ZC-HZ)									
OL-125 (ZC-NWZ)									
JHO-99-2 (ZC-NEZ)									
JHO-822 (ZC-CZ)									
JHO-2000-4 (ZC-SZ)	48.8	102.1	71.6	74.2	7				
Mean	59.2	81.8	75.2	72.1			92.9		
CD at 5%	17.1	18.5	10.2						
CV%	17.5	13.4	8.2						

Table 3.3 IVT Oat (SC): Initial Varietal Trial in Oat (Single cut): Green Forage Yield (q/ha/day)

Cont…

Entries	Palam-pur	Ranchi	Jabal-pur	Hydera-bad	Hisar	Anand	Kanpur	Bikaner	Ludhi-ana	Faiza-bad	Bhuba-neswar	Kalyani	Rahuri	Jorhat
OL-1709	1.56	5.52	4.32	2.69	5.06	11.70	9.61	1.64	5.08	4.88	2.97	6.19	3.80	4.96
JHO-2010-2	1.49	5.28	3.22	3.91	4.92	10.90	7.25	1.41	4.87	4.38	3.60	5.78	4.20	4.50
NDO-712	1.74	4.14	5.45	2.88	4.19	7.90	7.63	1.33	3.99	4.59	3.14	4.73	3.26	5.63
UPO-10-2	1.77	4.72	4.77	2.85.	6.86	10.40	7.25	1.75	6.43	4.45	3.61	6.36	4.15	4.78
JO-03-99	1.50	4.63	5.80	2.50	5.80	10.50	7.73	1.67	5.18	5.17	3.80	6.77	4.37	6.09
NDO-729	1.44	5.26	3.31	3.11	4.61	8.20	7.72	1.51	3.44	4.58	3.98	5.19	3.38	5.41
SKO-170	1.92	3.67	4.42	1.95	4.44	6.90	6.42	0.85	4.43	1.48	3.15	4.55	2.34	3.86
JHO-2010-1	1.59.	5.52	4.98	3.25	5.61	10.40	7.25	1.49	5.02	4.18	2.79	5.32	3.62	5.41
SKO-188	1.24	4.55	4.84	1.85	5.15	7.90	7.34	0.79	5.08	3.56	2.67	4.99	2.79	3.89
ANDO-3	1.55	4.58	5.73	4.05	5.49	10.90	8.39	1.49	3.83	2.64	3.08	6.46	3.19	6.69
UPO-10-1	1.59	2.87	5.15	3.32	5.74	9.80	7.65	0.83	4.55	3.84	3.05	5.57	4.17	5.20
JO-03-97	1.61	5.76	4.28	2.92	5.27	9.43	10.25	1.85	5.68	4.59	2.85	6.19	3.79	5.60
OS-377	1.37	4.86	3.50	2.52	6.07	12.01	8.52	1.86	4.87	2.21	3.57	5.96	3.96	5.19
Kent (NC)	1.33	6.41	4.34	2.80	5.14	10.10	8.47	1.75	4.83	4.68	2.78	5.34	3.68	5.66
OS-6 (NC)	1.49	4.68	2.73	2.41	4.70	10.00	8.79	1.52	4.03	3.55	2.94	5.98	3.35	4.59
Palampur-1 (ZC-HZ)														
OL-125 (ZC-NWZ)					5.46			1.44	5.08					
JHO-99-2 (ZC-NEZ)										2.47	3.32	6.51		5.94
JHO-822 (ZC-CZ)	1.44		3.22			9.30	8.20						3.68	
JHO-2000-4 (ZC-SZ)				2.69										
Mean	1.54	4.83	4.46	2.87	5.28	9.80	8.02	1.45	4.77	3.83	3.21	5.74	3.60	5.21

Table 3.3 IVT Oat (SC): Initial Varietal Trial in Oat (Single cut): Green Forage Yield (q/ha/day)

Entries	Coimbatore	Mandya	Imphal	Urulikanchan	Pantnagar	Raipur	Karjat	Srinagar	Jhansi	Pusa*	Average	Rank
OL-1709	5.98	3.33	1.25	6.12	4.11	4.20	4.11	2.33	5.59	6.55	4.65	6
JHO-2010-2	6.54	3.43	1.74	7.53	3.12	4.36	3.46	2.45	4.66	6.41	4.48	8
NDO-712	5.03	3.28	1.17	5.74	3.30	4.33	2.91	2.50	4.66	6.58	4.07	12
UPO-10-2	5.27	4.08	2.76	8.29	3.73	4.36	3.11	2.49	5.37	6.22	4.85	1
JO-03-99	5.07	4.06	2.16	7.53	3.27	4.26	3.08	2.71	5.71	5.86	4.75	4
NDO-729	6.51	2.57	1.25	8.00	3.67	4.20	2.61	2.31	4.43	6.55	4.20	11
SKO-170	4.56	2.52	1.12	5.62	3.42	4.76	2.26	2.31	2.61	6.66	3.46	14
JHO-2010-1	6.00	4.57	1.19	8.69	3.54	4.26	4.96	2.35	5.37	6.34	4.81	2
SKO-188	5.58	2.87	1.65	8.57	3.10	4.76	2.72	2.60	2.99	6.62	3.98	13
ANDO-3	4.92	3.15	1.81	9.24	3.49	4.16	4.15	2.54	5.32	6.34	4.65	6
UPO-10-1	5.81	4.21	2.12	8.67	3.27	4.16	4.04	2.45	4.85		4.47	9
JO-03-97	6.55	4.35	1.16	9.05	3.78	4.20	2.60	2.33	5.28	6.35	4.76	3
OS-377	5.94	2.83	1.95	8.99	3.67	4.63	3.54		5.45	6.73	4.70	5
Kent (NC)	5.58	3.24	1.37	7.00	4.10	4.16	4.67	2.30	5.19	5.77	4.56	7
OS-6 (NC)	6.54	3.62	1.56	8.87	3.29	4.33	3.41	2.47	5.11	6.55	4.35	10
Palampur-1 (ZC-HZ)								2.30				
OL-125 (ZC-NWZ)												
JHO-99-2 (ZC-NEZ)			2.08							6.73		
JHO-822 (ZC-CZ)				7.56		4.36	4.54		4.96			
JHO-2000-4 (ZC-SZ)	5.40	3.66										
Mean	5.73	3.47	1.65	7.86	3.52	4.34	3.44	2.43	4.84	6.42	4.43	

Table 3.4 IVT Oat (SC): Initial Varietal Trial in Oat (Single cut): Dry Matter Yield (q/ha/day)

Cont…

Entries	Ranchi	Jabal-pur	Hydera-bad	Hisar	Anand	Kanpur	Bika-ner	Ludhi-ana	Faiza-bad	Bhuba-neswar	Kalyani	Jorhat	Rahuri	Coimba-tore
OL-1709	1.06	0.93	0.68	1.06	1.58	3.40	0.50	0.97	1.08	0.60	0.97	0.93	0.80	1.24
JHO-2010-2	1.34	0.72	0.94	0.98	1.72	2.36	0.37	0.90	0.97	0.73	1.07	0.70	0.89	1.40
NDO-712	1.08	1.22	0.63	0.92	0.98	2.47	0.35	0.70	1.32	0.64	0.75	0.96	0.58	0.95
UPO-10-2	1.31	1.07	0.82	1.37	1.89	2.37	0.41	1.29	1.12	0.70	1.32	0.90	0.86	0.95
JO-03-99	1.04	1.30	0.62	1.28	1.62	2.65	0.39	0.98	1.25	0.77	1.27	0.94	0.90	0.90
NDO-729	1.22	0.73	1.02	0.97	1.33	2.44	0.42	0.60	1.01	0.78	0.90	1.03	0.59	1.20
SKO-170	0.94	0.96	0.66	0.80	1.12	2.22	0.26	0.80	0.39	0.64	1.17	0.68	0.54	0.85
JHO-2010-1	1.30	0.58	0.91	1.40	1.70	2.33	0.36	0.95	0.98	0.56	0.98	1.00	0.81	1.29
SKO-188	1.25	1.12	0.64	0.82	1.46	2.43	0.22	0.97	0.87	0.52	1.08	0.75	0.63	1.08
ANDO-3	1.22	1.17	1.00	1.26	1.51	2.73	0.48	0.67	0.68	0.65	0.90	1.24	0.83	0.91
UPO-10-1	0.72	1.25	0.89	1.43	1.22	2.70	0.28	0.82	0.96	0.60	1.07	0.81	0.81	1.06
JO-03-97	1.15	0.82	0.80	1.16	1.30	3.01	0.46	1.11	1.08	0.59	1.26	1.12	0.72	1.15
OS-377	1.24	0.75	0.60	1.15	1.55	3.07	0.41	0.90	0.50	0.71	1.12	0.85	0.91	1.01
Kent (NC)	1.30	0.94	0.79	1.23	1.57	2.82	0.44	0.89	1.18	0.56	0.93	1.10	0.66	1.04
OS-6 (NC)	1.12	0.70	0.71	1.22	1.57	3.01	0.44	0.71	0.77	0.59	0.93	0.90	0.56	1.35
Palampur-1 (ZC-HZ)														
OL-125 (ZC-NWZ)				1.15			0.37	0.97						
JHO-99-2 (ZC-NEZ)									0.58	0.65	1.02	1.13		
JHO-822 (ZC-CZ)		0.70			1.51	2.71							0.65	
JHO-2000-4 (ZC-SZ)			0.64											1.02
Mean	1.15	0.95	0.78	1.14	1.47	2.67	0.39	0.89	0.92	0.64	1.05	0.94	0.74	1.09

Table 3.4 IVT Oat (SC): Initial Varietal Trial in Oat (Single cut): Dry Matter Yield (q/ha/day)

Entries	Urulikanchan	Mandya	Pantnagar	Karjat	Srinagar	Jhansi	Pusa*	Average	Rank
OL-1709	1.16	1.39	0.69	1.89	0.57	0.88	1.37	1.12	1
JHO-2010-2	1.39	1.08	0.49	1.87	0.59	0.84	1.36	1.07	7
NDO-712	1.01	1.17	0.63	0.90	0.62	0.77	1.23	0.93	12
UPO-10-2	1.65	1.17	0.55	1.02	0.60	0.87	1.25	1.11	2
JO-03-99	1.47	1.09	0.66	1.02	0.68	0.98	1.33	1.09	5
NDO-729	1.44	0.71	0.48	1.09	0.60	0.72	1.39	0.96	11
SKO-170	1.00	0.46	0.64	1.95	0.59	0.60	1.37	0.86	13
JHO-2010-1	1.77	1.58	0.58	1.30	0.59	0.84	1.44	1.09	5
SKO-188	1.60	0.63	0.63	2.28	0.86	0.65	1.35	1.02	9
ANDO-3	1.63	0.98	0.61		0.62	0.83	1.35	1.05	8
UPO-10-1	1.66	1.84	0.68	1.04	0.62	0.89		1.07	7
JO-03-97	1.52	1.57	0.58	1.10	0.53	0.91	1.39	1.10	3
OS-377	1.62	0.68	0.71		0.60	0.88	1.41	1.01	10
Kent (NC)	1.17	1.11	0.63	1.73	0.57	0.87	1.35	1.08	6
OS-6 (NC)	1.74	1.38	0.60	2.23	0.61	0.87	1.33	1.10	4
Palampur-1 (ZC-HZ)				1.86	0.48				
OL-125 (ZC-NWZ)			0.66	1.21					
JHO-99-2 (ZC-NEZ)							1.35		
JHO-822 (ZC-CZ)	1.43			1.57		0.82			
JHO-2000-4 (ZC-SZ)		1.43							
Mean	1.46	1.12	0.61	1.50	0.61	0.83	1.35	1.06	

Table 3.5 IVT Oat (SC): Initial Varietal Trial in Oat (Single cut): Crude Protein Yield (q/ha)

Entries	Palam-pur	Ranchi	Hisar	Jabal-pur	Hydera-bad	Anand	Ludhi-ana	Faiza-bad	Bhuba-neswar	Rahuri	Jorhat	Mandya	Imphal	Uruli-kanchan	Rai-pur	Ave-rage	Rank
OL-1709	5.0	7.4	14.2	6.8	6.1	11.5	6.6	7.8	5.1	5.1	4.1	13.2	1.8	6.6	6.9	7.2	8
JHO-2010-2	5.4	10.0	11.0	5.5	5.3	12.5	5.6	8.4	6.5	6.0	3.2	9.9	2.5	8.4	7.0	7.1	9
NDO-712	4.9	7.2	11.5	10.1	4.4	8.3	4.7	10.6	5.6	4.0	5.0	12.6	1.6	5.7	7.1	6.9	11
UPO-10-2	5.8	9.3	16.1	8.8	6.8	17.5	8.8	9.7	6.3	6.3	5.5	12.7	3.3	9.4	7.0	8.9	1
JO-03-99	5.5	8.1	16.6	10.5	5.7	17.9	7.3	11.4	7.1	7.1	5.4	10.9	2.3	7.8	6.9	8.7	2
NDO-729	5.3	8.3	12.7	5.6	8.8	15.0	4.3	9.0	6.4	4.2	5.1	8.7	1.6	8.5	7.2	7.4	6
SKO-170	7.5	9.7	9.0	7.2	9.6	13.8	7.7	3.2	5.5	4.8	5.2	4.1	2.5	7.4	7.9	7.0	10
JHO-2010-1	4.8	8.8	15.9	8.0	7.1	15.2	7.9	7.3	5.0	5.4	4.7	15.0	1.9	9.4	6.3	8.2	3
SKO-188	6.8	12.8	9.3	8.0	8.0	15.3	7.6	7.6	4.5	6.0	6.5	5.7	2.9	11.4	7.6	8.0	4
ANDO-3	4.5	7.9	10.4	8.8	5.9	11.6	6.2	4.2	5.1	5.2	6.2	10.4	3.7	10.7	6.9	7.2	8
UPO-10-1	4.2	5.8	15.7	9.1	6.2	11.7	6.4	7.5	5.2	5.6	4.9	19.0	3.2	9.2	7.0	8.0	4
JO-03-97	5.7	7.5	11.9	6.4	6.1	11.0	2.8	8.6	5.2	5.1	6.7	16.3	1.8	9.8	6.8	7.5	5
OS-377	4.1	9.5	11.6	5.7	6.0	13.7	8.8	3.8	6.5	6.8	3.9	6.8	2.4	12.5	7.4	7.3	7
Kent (NC)	4.7	8.8	10.6	6.9	7.0	15.9	6.1	9.7	5.2	4.4	4.5	8.9	2.0	7.2	7.1	7.3	7
OS-6 (NC)	6.5	7.3	13.8	4.0	5.9	11.7	5.4	5.6	5.1	3.7	4.7	10.5	2.8	9.2	7.1	6.9	11
Palampur-1 (ZC-HZ)	4.3																
OL-125 (ZC-NWZ)			12.3				8.4										
JHO-99-2 (ZC-NEZ)								4.2	5.2		5.0		2.5				
JHO-822 (ZC-CZ)				4.9		11.9				4.5				8.9	7.0		
JHO-2000-4 (ZC-SZ)					6.4							14.8					
Mean	5.3	8.6	12.6	7.4	6.6	13.5	6.5	7.4	5.6	5.3	5.0	11.0	2.4	8.9	7.1	7.6	

Table 3.6 IVT Oat (SC): Initial Varietal Trial in Oat (Single cut): Crude Protein (%)

Entries	Palam-pur	Ranchi	Hisar	Hydera-bad	Anand	Ludhi-ana	Faiza-bad	Bhuba-neswar	Rahuri	Jorhat	Jabal-pur	Mandya	Imphal	Uruli-kanchan	Raipur	Ave-rage	Rank
OL-1709	9.3	7.9	13.2	13.6	10.0	5.8	8.3	10.1	8.0	7.6	7.8	13.1	7.8	7.6	7.6	9.2	3
JHO-2010-2	10.8	8.3	10.6	9.2	9.5	5.3	8.8	10.3	7.4	7.3	7.6	12.5	7.0	7.4	8.0	8.7	7
NDO-712	9.0	7.4	11.6	9.6	10.6	5.8	8.6	10.2	7.7	9.0	8.3	15.0	7.0	7.2	8.0	9.0	5
UPO-10-2	9.6	7.4	11.6	10.5	11.1	5.8	8.8	10.0	7.4	10.0	8.2	15.0	6.6	6.9	8.0	9.1	4
JO-03-99	9.9	8.3	12.2	11.8	13.1	6.3	9.2	10.2	8.3	9.4	8.3	13.8	5.6	6.6	7.9	9.4	2
NDO-729	10.5	7.4	12.1	11.8	13.7	6.1	8.9	10.0	7.4	8.6	7.8	16.9	7.9	7.4	8.0	9.6	1
SKO-170	11.7	7.9	9.3	13.1	11.7	8.2	7.5	10.0	7.9	9.2	7.4	10.0	7.3	8.1	8.5	9.2	3
JHO-2010-1	8.8	7.4	11.4	10.1	11.2	7.0	7.9	10.1	7.4	8.0	7.6	13.1	7.7	6.6	8.0	8.8	6
SKO-188	9.0	8.3	9.4	10.9	10.0	6.7	8.1	9.9	8.3	10.4	7.8	10.0	6.4	7.6	8.5	8.7	7
ANDO-3	10.2	7.9	8.9	9.2	10.9	7.9	7.2	10.1	7.9	9.9	8.0	15.6	7.5	9.2	8.0	9.2	3
UPO-10-1	9.0	8.3	10.7	9.7	11.9	6.7	8.4	10.2	8.3	9.8	8.1	14.4	8.1	6.9	7.8	9.2	3
JO-03-97	10.5	7.4	9.8	10.9	10.2	7.5	8.5	9.9	7.4	10.3	8.0	14.4	7.7	8.2	8.0	9.2	3
OS-377	10.2	7.9	9.3	12.7	10.7	8.3	8.0	10.1	7.9	6.9	7.6	13.1	8.1	8.7	8.3	9.2	3
Kent (NC)	10.8	7.9	8.3	12.7	13.1	5.8	8.7	10.5	7.6	7.1	7.7	11.3	7.5	7.7	8.0	9.0	5
OS-6 (NC)	10.2	7.0	11.3	11.8	9.7	6.5	7.8	10.3	7.0	9.1	7.3	11.3	8.3	6.9	8.0	8.8	6
Palampur-1 (ZC-HZ)	10.8																
OL-125 (ZC-NWZ)	9.6		10.9			7.4											
JHO-99-2 (ZC-NEZ)							7.8	10.2		7.6			6.9				
JHO-822 (ZC-CZ)	10.2				10.6						7.5			7.8	8.1		
JHO-2000-4 (ZC-SZ)				13.1								14.4					
Mean	10.0	7.8	10.7	11.2	11.2	6.7	8.3	10.1	7.7	8.8	7.8	13.3	7.3	7.5	8.0	9.1	

Table 3.7 IVT Oat (SC): Initial Varietal Trial in Oat (Single cut): Plant Height (cm)

Cont…

Entries	Palam-pur	Coimba-tore	Ranchi	Jabal-pur	Hydera-bad	Hisar	Anand	Jalore	Kanpur	Bikaner	Ludhi-ana	Faiza-bad	Bhuba-neswar	Rahuri	Jorhat
OL-1709	114.6	118.3	111.9	113.5	105.0	118.5	158.1	138.1	83.8	95.1	96.7	130.4	126.8	101.0	179.7
JHO-2010-2	102.7	115.7	115.9	102.1	88.0	113.1	138.3	122.8	87.5	89.1	115.0	125.8	149.4	88.0	157.0
NDO-712	116.7	91.7	105.9	106.2	80.7	102.8	130.3	100.2	69.6	81.7	91.7	131.2	145.9	86.0	161.3
UPO-10-2	128.0	120.0	121.5	139.5	88.2	134.1	156.7	141.2	98.5	103.0	126.0	148.5	147.9	114.0	150.0
JO-03-99	125.3	132.0	113.3	138.4	91.0	116.9	165.3	135.3	84.7	91.9	123.3	158.9	156.6	102.0	152.8
NDO-729	105.3	99.3	107.4	115.9	80.1	104.1	154.8	112.0	75.5	87.9	88.3	145.7	153.2	83.0	151.7
SKO-170	87.0	100.0	101.7	111.3	89.3	93.8	158.2	98.3	99.7	77.5	96.7	110.5	142.6	77.0	158.7
JHO-2010-1	112.7	116.3	117.1	117.0	100.4	112.0	151.6	127.7	77.3	89.5	113.0	125.8	121.3	95.0	159.3
SKO-188	68.0	96.0	107.2	115.3	98.7	88.5	146.4	111.2	100.2	76.8	95.0	118.7	111.7	102.0	149.3
ANDO-3	105.0	140.0	114.3	128.5	103.6	116.7	150.6	130.6	94.5	105.6	126.7	128.9	117.8	96.0	169.7
UPO-10-1	118.3	118.7	121.9	120.4	104.7	107.9	157.1	123.1	95.3	101.7	125.0	130.2	136.4	103.0	168.3
JO-03-97	110.0	128.3	111.3	108.9	86.7	112.6	154.6	129.2	77.9	97.9	116.0	135.7	129.8	100.0	160.9
OS-377	105.7	124.0	121.3	116.3	84.0	125.1	148.2	128.3	96.8	87.8	121.7	112.6	150.6	105.0	153.7
Kent (NC)	100.0	101.0	111.3	120.4	92.0	116.1	127.9	126.0	82.2	88.6	88.7	136.7	119.4	86.0	155.0
OS-6 (NC)	111.3	127.3	111.8	128.1	105.3	101.8	142.2	142.6	78.5	91.1	109.3	115.8	124.5	101.0	175.0
Palampur-1 (ZC-HZ)	94.3														
OL-125 (ZC-NWZ)						131.3		123.6		101.8	113.3				
JHO-99-2 (ZC-NEZ)												117.5	132.9		186.7
JHO-2000-4 (ZC-SZ)		136.3			91.0										
JHO-822 (ZC-CZ)				124.6			141.7		84.0					92.0	
Mean	106.6	115.2	112.9	118.8	93.2	112.2	149.4	124.4	86.8	91.7	109.2	129.6	135.4	95.9	161.8

Table 3.7 IVT Oat (SC): Initial Varietal Trial in Oat (Single cut): Plant Height (cm)

Entries	Kalyani	Mandya	Imphal	Urulikanchan	Jhansi	Meerut	Srinagar	Pantnagar	Raipur	Karjat	Udaipur	Average	Rank
OL-1709	178.2	84.2	76.1	101.4	132.7	157.7	120.2	129.7	109.1	110.0	154.2	121.0	7
JHO-2010-2	170.5	66.7	82.2	97.2	129.2	137.3	122.1	133.0	114.3	102.0	134.6	115.4	10
NDO-712	139.1	63.0	69.6	99.4	125.0	131.0	125.8	106.0	114.3	88.0	127.7	107.3	14
UPO-10-2	188.7	78.1	95.0	104.8	142.3	154.7	124.6	135.0	116.3	107.0	146.6	127.3	1
JO-03-99	167.9	75.1	78.8	116.3	138.8	149.0	134.2	124.0	108.7	105.0	152.6	124.5	2
NDO-729	148.3	58.9	71.6	101.2	123.3	125.3	119.5	88.1	114.1	86.0	129.5	108.8	13
SKO-170	141.5	69.9	72.9	100.8	105.7	123.3	119.7	123.7	124.9	81.0	124.3	107.3	14
JHO-2010-1	174.0	76.4	68.7	110.3	134.3	147.7	120.9	119.7	117.7	99.0	155.6	117.7	9
SKO-188	152.4	74.6	70.1	111.0	113.6	146.0	132.3	119.3	121.3	87.0	140.4	109.7	12
ANDO-3	158.8	71.5	94.2	110.7	132.9	175.7	117.6	135.6	114.0	111.0	145.5	122.9	4
UPO-10-1	176.1	73.1	84.4	111.1	136.2	162.3	127.5	163.5	115.3	113.0	135.1	124.2	3
JO-03-97	167.1	70.2	66.8	112.1	135.7	156.3	126.5	125.7	117.9	113.0	142.5	119.0	8
OS-377	174.8	71.7	68.7	121.6	140.4	162.3	119.6	160.3	120.9	97.0	137.7	121.4	5
Kent (NC)	165.0	69.9	80.3	99.3	135.7	137.7	130.8	99.1	110.4	106.0	135.3	112.3	11
OS-6 (NC)	173.0	83.6	83.2	112.8	146.7	167.7	127.3	127.9	109.8	106.0	145.7	121.1	6
Palampur-1 (ZC-HZ)							123.7						
OL-125 (ZC-NWZ)						149.4		133.3			143.5		
JHO-99-2 (ZC-NEZ)	174.1		92.6										
JHO-2000-4 (ZC-SZ)		75.0											
JHO-822 (ZC-CZ)				104.3	131.6				109.9	104.0			
Mean	165.6	72.5	78.5	107.3	131.5	149.0	124.5	126.5	115.3	100.7	140.7	117.5	

Table 3.8 IVT Oat (SC): Initial Varietal Trial in Oat (Single cut): Leaf Stem Ratio

Cont…

Entries	Palam-pur	Coimba-tore	Ranchi	Jabal-pur	Hydera-bad	Kanpur	Bikaner	Ludhai-ana	Faiza-bad	Bhuba-neswar	Kalyani	Rahuri	Jorhat
OL-1709	0.47	0.45	0.45	0.80	0.49	0.37	0.47	0.43	0.58.	0.88	0.52	0.76	0.78
JHO-2010-2	0.41	0.43	0.20	0.53	0.75	0.39	0.58	0.33	0.78	1.11	0.65	0.53	0.99
NDO-712	0.35	0.45	0.26	0.64	0.89	0.38	0.38	0.33	0.88	1.05	0.82	0.50	0.56
UPO-10-2	0.53	0.46	0.25	0.74	0.87	0.40	0.81	0.33	0.87	1.09	0.82	0.63	0.60
JO-03-99	0.43	0.44	0.30	1.04	0.93	0.39	0.56	0.54	0.89	1.11	0.54	0.86	0.81
NDO-729	0.48	0.45	0.23	0.63	0.45	0.47	0.42	0.33	0.84	1.12	0.59	0.60	0.43
SKO-170	0.36	0.47	0.31	0.80	1.06	0.64	0.97	0.67	0.65	1.01	0.85	0.66	0.72
JHO-2010-1	0.47	0.48	0.32	0.65	0.45	0.48	0.63	0.43	0.81	0.84	0.66	0.83	0.59
SKO-188	0.53	0.47	0.29	0.80	0.84	0.59	0.41	0.54	0.78	0.84	0.77	0.75	0.70
ANDO-3	0.47	0.44	0.29	0.88	0.39	0.34	0.36	0.33	0.87	0.82	1.19	0.66	0.42
UPO-10-1	0.52	0.43	0.30	0.83	0.51	0.49	0.39	0.43	0.69	0.91	0.66	0.66	0.83
JO-03-97	0.50	0.46	0.40	0.78	0.52	0.41	0.48	0.33	0.75	0.87	0.68	0.83	0.55
OS-377	0.50	0.47	0.26	0.70	0.76	0.56	0.61	0.33	0.50	1.09	0.59	0.50	0.62
Kent (NC)	0.47	0.42	0.41	0.66	0.49	0.37	0.84	0.25	0.85	0.91	0.64	0.63	0.57
OS-6 (NC)	0.50	0.45	0.24	0.44	0.58	0.40	0.39	0.54	0.71	0.95	0.58	0.50	0.70
Palampur-1 (ZC-HZ)	0.51												
OL-125 (ZC-NWZ)							0.60	0.25					
JHO-99-2 (ZC-NEZ)									0.53	0.83	0.61		0.41
JHO-822 (ZC-CZ)				0.82		0.42						0.45	
JHO-2000-4 (ZC-SZ)		0.42			1.03								
Mean	0.47	0.45	0.30	0.73	0.67	0.45	0.56	0.40	0.76	0.96	0.70	0.66	0.64

Table 3.8 IVT Oat (SC): Initial Varietal Trial in Oat (Single cut): Leaf Stem Ratio

Entries	Mandya	Imphal	Urulikanchan	Jhansi	Pantnagar	Raipur	Karjat	Udaipur	Pusa*	Average	Rank
OL-1709	0.27	0.37	0.73	0.44	0.33	0.59	0.65	0.23	0.69	0.52	8
JHO-2010-2	0.34	0.41	0.81	0.41	0.51	0.60	0.76	0.28	0.73	0.56	5
NDO-712	0.29	0.44	0.69	0.32	0.34	0.57	0.75	0.17	0.68	0.53	7
UPO-10-2	0.66	0.52	0.70	0.49	0.31	0.60	0.93	0.19	0.79	0.61	3
JO-03-99	1.02	0.49	0.70	0.38	0.32	0.61	0.81	0.25	0.71	0.64	2
NDO-729	0.49	0.45	0.60	0.35	0.45	0.60	0.76	0.19	0.83	0.52	8
SKO-170	0.43	0.43	0.76	0.44	0.45	0.69	1.05	0.60	0.79	0.67	1
JHO-2010-1	0.65	0.49	0.73	0.43	0.29	0.61	0.66	0.36	0.81	0.56	5
SKO-188	0.68	0.51	0.75	0.39	0.66	0.71	0.95	0.51	0.82	0.64	2
ANDO-3	0.78	0.23	0.50	0.32	0.33	0.57	0.43	0.17	0.77	0.51	9
UPO-10-1	0.53	0.48	0.90	0.40	0.50	0.58	0.43	0.19		0.56	5
JO-03-97	0.77	0.40	0.67	0.47	0.28	0.60	0.74	0.22	0.78	0.56	5
OS-377	0.85	0.40	0.76	0.44	0.48	0.67	1.12	0.25	0.89	0.59	4
Kent (NC)	0.37	0.43	0.72	0.40	0.36	0.59	0.64	0.23	0.76	0.54	6
OS-6 (NC)	0.46	0.45	0.68	0.33	0.30	0.58	0.59	0.29	0.80	0.51	9
Palampur-1 (ZC-HZ)											
OL-125 (ZC-NWZ)					0.26			0.18			
JHO-99-2 (ZC-NEZ)		0.30							0.79		
JHO-822 (ZC-CZ)			0.82	0.38		0.61	0.88				
JHO-2000-4 (ZC-SZ)	0.40										
Mean	0.57	0.43	0.71	0.40	0.39	0.61	0.75	0.27	0.78	0.57	

Table 3.9 IVT Oat (SC): Initial Varietal Trial in Oat (Single cut): IVDMD%, DDM (q/ha), ADF (%) & NDF (%)

Entries	IVDMD (%)				DDM (q/ha)		ADF (%)		NDF (%)	
	Hisar	Ludhiana	Average	Rank	Hisar	Rank	Ludhiana	Rank	Ludhiana	Rank
OL-1709	61.3	56.3	58.8	8	65.80	12	36.20	5	57.20	10
JHO-2010-2	63.5	56.3	59.9	7	65.80	12	35.20	1	56.80	8
NDO-712	61.7	55.8	58.8	8	60.80	14	35.80	3	55.00	1
UPO-10-2	65.4	55.6	60.5	6	90.60	1	37.10	9	56.60	7
JO-03-99	57.1	56.2	56.7	11	77.70	6	38.70	12	55.20	2
NDO-729	68.6	56.0	62.3	2	71.50	8	35.60	2	56.10	4
SKO-170	66.2	57.4	61.8	4	64.00	13	38.70	12	57.20	10
JHO-2010-1	64.6	56.4	60.5	6	90.30	2	36.60	6	55.60	3
SKO-188	68.6	56.2	62.4	1	67.50	10	37.00	8	56.30	5
ANDO-3	56.6	56.7	56.7	11	66.10	11	38.20	11	57.00	9
UPO-10-1	57.5	56.0	56.8	10	84.10	3	35.90	4	55.00	1
JO-03-97	67.1	56.8	62.0	3	82.00	4	37.20	10	56.40	6
OS-377	64.4	57.0	60.7	5	79.80	5	37.00	8	57.80	12
Kent (NC)	56.2	56.6	56.4	12	71.40	9	35.80	3	56.60	7
OS-6 (NC)	59.2	56.2	57.7	9	71.80	7	36.80	7	58.00	13
Palampur-1 (ZC-HZ)										
OL-125 (ZC-NWZ)	49.7	56.3	53.0	13	56.40	15	37.00	8	57.40	11
JHO-99-2 (ZC-NEZ)										
JHO-822 (ZC-CZ)										
JHO-2000-4 (ZC-SZ)										
Mean	61.7	56.4	59.0		72.85		36.80		56.51	

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

(Table Reference: 4.1 to 4.10)

In Oat (single cut), eight entries which were 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 24 locations in five different zones of the country. Results of the trial clearly indicated that for green forage yield (q/ha), entries SKO-148 (5.5%) and SKO-156 (2.4%) in Hill Zone, entries JHO-2009-2 (13.5%) and OS-363 (5.4%) in North-West Zone, entries JHO-2009-2 (8.8%) and JHO-2009-1 (4.8%) in North-East Zone, entries UPO-09-2 (6.9%) and JHO-2009-2 (2.7%) in Central Zone and entries UPO-09-1 (9.7%) and UPO-09-2 (3.1%) in South Zone registered their superiority over respective best check whereas at national level, entries JHO-2009-2 (8.9%), UPO-09-1 (4.0%) and UPO-09-2 (3.6%) exhibited their superiority for green forage yield over best national check.

Similarly for dry matter yield (q/ha), entry JHO-2009-1 (4.5%) in Hill Zone, entries JHO-2009-2 (7.1%) and OS-363 (5.6%) in North-West Zone, entries UPO-09-1 (5.3%), JHO-2009-1 (3.8%) and JHO-2009-2 (3.8%) in North-East Zone, entries JO-03-95 (14.9%), UPO-09-2 (9.3%), JHO-2009-1 (8.1%), UPO-09-1 (7.9%), JHO-2009-2 (5.9%) and SKO-156 (5.8%) in Central Zone and entry UPO-09-1 (5.7%) in South Zone proved their superiority over respective best national or zonal check. However at the national level, entries JHO-2009-2 (8.6%) and UPO-09-1 (7.9%) recorded their superiority over best national check.

In green forage production potential (q/ha/day), entries UPO-09-2 and JHO-2009-2 whereas in dry matter production potential (q/ha/day), entry JHO-2009-2 registered superiority over best national check. For evaluation against plant height (cm), entries JHO-2009-2, UPO-09-2 and UPO-09-1 recorded their superiority over best national check.

In quality parameters, entries JHO-2009-2, JHO-2009-1 and JO-03-95 for crude protein yield (q/ha) and entries SKO-148, JHO-2009-2 and JO-03-95 for crude protein content (%) recorded their superiority with respect to check. In other quality parameters, entries SKO-156 and SKO-148 for IVDMD (%), entry OS-363 for ADF (%) and entries SKO-156 and JHO-2009-1 for NDF (%) maintained their superiority over best check.

Table 4.1 AVT Oat (SC)-1: First Advanced Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha)

Cont…

Entries	Hill Zone					North-West Zone								
	Palampur	Srinagar	Average	Rank	Superi-ority%	Bikaner	Jalore	Hisar	Ludhiana	Pant-nagar	Meerut	Average	Rank	Superi-ority%
SKO-156	274.0	510.9	392.5	2	2.4	138.1	507.0	452.6	488.9	327.5	479.2	398.9	7	
JO-03-95	205.1	469.3	337.2	11		216.6	349.3	430.4	511.1	321.5	541.7	395.1	9	
UPO-09-2	240.7	451.8	346.3	10		195.6	414.0	475.0	541.7	334.9	458.3	403.3	5	
OS-363	204.4	500.7	352.6	8		267.6	403.7	513.7	498.6	362.4	538.8	430.8	2	5.4
UPO-09-1	256.2	471.0	363.6	4		136.2	356.7	441.5	486.1	349.3	641.7	401.9	6	
JHO-2009-1	259.2	461.0	360.1	6		185.5	401.7	477.6	580.6	312.4	413.9	395.3	8	
SKO-148	303.7	504.5	404.1	1	5.5	217.5	385.7	405.4	383.3	377.6	427.7	366.2	11	
JHO-2009-2	242.1	483.9	363.0	5		251.2	432.7	527.6	569.4	350.7	652.8	464.1	1	13.5
Kent (NC)	217.7	495.3	356.5	7		257.9	410.0	452.6	502.8	323.7	505.6	408.8	3	
OS-6 (NC)	223.7	478.4	351.1	9		168.2	377.0	397.1	502.8	329.0	573.3	391.2	10	
Palampur-1 (ZC-HZ)	276.1	490.2	383.2	3										
OL-125 (ZC-NWZ)						99.4	377.7	513.7	497.2	308.2	625.0	403.5	4	
JHO-99-2 (ZC-NEZ)														
JHO-822 (ZC-CZ)														
JHO-2000-4 (ZC-SZ)														
Mean	248.2	481.6	364.9			201.0	406.4	465.5	507.5	342.0	519.3	406.9		
CD at 5%	60.7	5.5				49.6	40.9	38.2	1.2	57.2	77.5			
CV%	14.5	0.7				15.0	6.0	4.8	11.8	10.0	8.4			

Note: -Trial data not reported from Rajouri centre

Table 4.1 AVT Oat (SC)-1: First Advanced Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha)

Cont…

Entries	North-East Zone										Central Zone								
	Jor-hat	Kal-yani	Bhuba-neswar	Ran-chi	Pusa	Faiza-bad	Imp-hal	Ave-rage	Rank	Superi-ority%	Jhansi	Rahuri	Uruli-kanchan	Kan-pur	Anand	Jabal-pur	Ave-rage	Rank	Superi-ority%
SKO-156	336.8	409.8	289.6	310.0	666.0	254.5	521.3	398.3	8		320.8	453.3	666.8	686.1	508.0	463.0	516.3	7	
JO-03-95	521.4	520.9	264.5	366.7	583.0	251.4	358.0	409.4	6		384.6	383.8	617.2	650.0	556.0	583.0	529.1	4	1.8
UPO-09-2	366.7	329.6	279.0	436.7	600.0	396.2	391.4	399.9	7		337.7	514.5	632.5	738.9	709.0	400.0	555.4	1	6.9
OS-363	325.5	466.8	302.5	376.7	550.0	404.9	355.0	397.3	9		380.6	316.4	510.5	636.1	832.0	507.0	530.4	3	2.0
UPO-09-1	420.8	534.0	322.0	340.0	600.0	424.8	341.0	426.1	3	1.5	435.8	367.5	529.6	625.0	606.0	525.0	514.8	8	
JHO-2009-1	440.6	467.0	306.5	353.3	683.0	428.6	401.9	440.1	2	4.8	376.0	494.1	521.9	683.3	607.0	490.0	528.7	5	1.8
SKO-148	338.6	299.9	289.0	293.3	600.0	327.6	378.5	361.0	11		347.1	349.1	731.5	541.7	521.0	337.0	471.2	11	
JHO-2009-2	379.4	442.6	373.3	446.7	650.0	449.4	457.2	456.9	1	8.8	442.9	457.3	670.6	688.9	572.0	370.0	533.6	2	2.7
Kent (NC)	348.9	464.3	336.7	396.7	616.0	351.2	381.0	413.5	5		379.0	436.9	510.5	658.3	592.0	416.0	498.8	9	
OS-6 (NC)	302.9	400.1	316.7	423.3	566.0	281.1	378.7	381.3	10		385.6	298.1	544.8	675.0	553.0	379.0	472.6	10	
Palampur-1 (ZC-HZ)																			
OL-125 (ZC-NWZ)																			
JHO-99-2 (ZC-NEZ)	370.7	483.7	343.3	346.7	616.0	365.7	413.5	419.9	4										
JHO-822 (ZC-CZ)											427.1	408.3	480.1	708.3	601.0	492.0	519.5	6	
JHO-2000-4 (ZC-SZ)																			
Mean	391.2	433.8	303.3	365.4	616.5	367.2	400.5	411.1			378.2	417.0	610.1	656.3	613.9	459.4	522.5		
CD at 5%	13.9	18.4	29.8	44.8	43.2	56.5	54.3				20.7	57.2	46.3	95.4	64.6	100.5			
CV%	12.4	3.0	5.6	7.1	9.2	9.3	7.4				12.3	8.2	14.0	8.5	6.3	14.6			

Table 4.1 AVT Oat (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-156	180.5	293.8	333.3	269.2	11		411.3	8	
JO-03-95	282.7	392.4	352.8	342.6	5		421.4	6	0.6
UPO-09-2	322.1	472.3	375.0	389.8	2	3.1	433.9	3	3.6
OS-363	288.8	382.3	294.4	321.8	9		425.8	5	1.6
UPO-09-1	380.4	486.1	377.8	414.8	1	9.7	435.6	2	4.0
JHO-2009-1	211.0	466.8	308.3	328.7	8		430.5	4	2.8
SKO-148	169.4	445.3	277.8	297.5			385.5	10	
JHO-2009-2	226.3	493.8	319.4	346.5	4		456.3	1	8.9
Kent (NC)	286.0	411.0	302.8	333.3	7		418.9	7	
OS-6 (NC)	193.0	360.6	338.9	297.5	10		393.6	9	
Palampur-1 (ZC-HZ)									
OL-125 (ZC-NWZ)									
JHO-99-2 (ZC-NEZ)									
JHO-822 (ZC-CZ)									
JHO-2000-4 (ZC-SZ)									
Mean	419.6	406.3	308.3	378.1	3				
CD at 5%	257.7	429.1	329.9	338.9			425.0		
CV%	37.8	45.1	4.4						
	8.2	6.3	6.6						

Table 4.2 AVT Oat (SC)-1: First Advanced Varietal Trial in Oat (Single Cut): Dry matter Yield (q/ha)

Cont…

Entries	Hill Zone					North-West Zone							
	Palam-pur	Sri-nagar	Ave-rage	Rank	Superi-ority%	Bika-ner	Hisar	Ludhi-ana	Pant-nagar	Meerut	Ave-rage	Rank	Superi-ority%
SKO-156	51.7	124.1	87.9	4		36.0	76.9	88.0	44.6	174.6	84.0	9	
JO-03-95	46.1	112.0	79.1	11		41.0	77.5	97.1	46.3	146.8	81.7	10	
UPO-09-2	60.5	106.9	83.7	8		39.8	99.1	105.6	35.6	142.1	84.4	8	
OS-363	52.3	118.4	85.4	7		51.2	102.7	92.2	55.9	219.5	104.3	2	5.6
UPO-09-1	51.8	112.9	82.4	10		41.9	106.0	87.5	46.3	206.8	97.7	4	
JHO-2009-1	70.0	114.8	92.4	1	4.5	53.1	95.5	116.1	41.6	128.3	86.9	7	
SKO-148	52.7	120.7	86.7	5		52.2	68.9	67.1	47.7	124.2	72.0	11	
JHO-2009-2	61.0	115.2	88.1	3		53.2	131.9	113.9	48.1	181.8	105.8	1	7.1
Kent (NC)	54.3	117.7	86.0	6		47.9	108.6	95.5	39.1	202.7	98.8	3	
OS-6 (NC)	50.2	115.7	83.0	9		37.1	103.2	87.8	40.3	165.3	86.7	5	
Palampur-1 (ZC-HZ)	58.6	118.1	88.4	2									
OL-125 (ZC-NWZ)						20.4	92.5	91.9	45.1	200.2	90.0	5	
JHO-99-2 (ZC-NEZ)													
JHO-822 (ZC-CZ)													
JHO-2000-4 (ZC-SZ)													
Mean	55.8	115.6	85.7			46.1	94.8	95.9	45.8	165.5	89.6		
CD at 5%	NS	1.4				11.6	8.3	9.9	9.9	16.9			
CV%	13.0	0.7				15.8	5.0	11.7	13.4	5.8			

Table 4.2 AVT Oat (SC)-1: First Advanced Varietal Trial in Oat (Single Cut): Dry matter Yield (q/ha)

Cont…

Entries	North-East Zone										Central Zone								
	Jor-hat	Kal-yani	Bhuba-neswar	Ranchi	Pusa	Faiza-bad	Imp-hal	Ave-rage	Rank	Superi-ority%	Jhansi	Rahuri	Uruli-kanchan	Kanpur	Anand	Jabal-pur	Ave-rage	Rank	Superi-ority%
SKO-156	57.8	92.4	64.0	51.2	133.1	59.9	96.2	79.2	9		63.6	98.9	127.3	224.2	122.9	93.4	121.7	6	5.8
JO-03-95	92.6	112.1	54.0	78.1	121.3	59.7	89.7	86.8	4		74.7	91.1	115.8	211.9	172.4	127.2	132.2	1	14.9
UPO-09-2	65.5	68.3	57.2	77.8	129.0	99.4	79.1	82.3	7		69.7	122.1	119.3	242.8	120.5	80.0	125.7	2	9.3
OS-363	63.8	95.4	63.1	78.8	114.2	101.9	71.7	84.1	6		75.3	91.6	101.0	207.5	129.0	109.6	119.0	7	3.5
UPO-09-1	86.3	109.1	68.1	87.8	130.2	106.5	62.6	92.9	1	5.3	88.0	77.1	106.4	204.7	155.2	113.3	124.1	4	7.9
JHO-2009-1	85.4	93.3	63.3	78.7	146.3	103.8	70.3	91.6	2	3.8	72.5	120.5	95.5	223.3	131.8	102.0	124.3	3	8.1
SKO-148	60.9	68.0	58.0	89.0	131.3	78.9	64.1	78.6	10		90.6	69.6	122.7	184.7	96.9	69.0	105.6	10	
JHO-2009-2	68.1	84.4	79.7	89.7	132.0	115.6	71.4	91.6	2	3.8	91.9	108.3	123.7	223.3	108.7	75.1	121.8	5	5.9
Kent (NC)	64.5	87.6	71.7	74.7	129.7	84.8	82.6	85.1	5		66.9	93.5	111.5	214.2	97.1	86.2	111.6	9	
OS-6 (NC)	53.7	85.8	69.8	91.0	117.7	68.1	77.0	80.4	8		71.0	54.2	105.3	220.3	103.5	77.8	105.3	11	
Palampur-1 (ZC-HZ)																			
OL-125 (ZC-NWZ)																			
JHO-99-2 (ZC-NEZ)	71.7	100.0	73.6	75.7	128.1	90.9	77.2	88.2	3										
JHO-822 (ZC-CZ)											78.1	90.9	101.6	232.5	81.2	105.8	115.0	8	
JHO-2000-4 (ZC-SZ)																			
Mean	72.6	90.4	63.4	78.9	129.7	90.7	75.6	85.9			78.3	97.4	114.0	215.3	129.7	96.2	121.8		
CD at 5%	9.4	4.1	5.9	14.1	7.4	13.8	13.4				9.8	12.4	17.4	29.6	13.0	23.6			
CV%	19.5	3.2	5.3	10.5	11.2	9.2	9.5				5.8	8.0	11.3	8.0	6.4	14.7			

Table 4.2 AVT Oat (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-156	59.7	89.1	70.0	72.9	8		91.3	7	
JO-03-95	59.2	78.7	74.6	70.8	9		94.8	5	0.5
UPO-09-2	72.0	102.0	75.1	83.0	4		94.3	6	
OS-363	50.9	96.8	60.7	69.5	10		95.8	4	1.6
UPO-09-1	85.9	133.4	74.4	97.9	1	5.7	101.8	2	7.9
JHO-2009-1	44.4	91.4	63.2	66.3	11		95.9	3	1.7
SKO-148	49.8	131.4	62.5	81.2	5		85.3	9	
JHO-2009-2	56.1	153.3	70.2	93.2	2	0.6	102.5	1	8.6
Kent (NC)	70.5	105.1	61.5	79.0	6		94.3	6	
OS-6 (NC)	48.7	122.9	63.9	78.5	7		88.3	8	
Palampur-1 (ZC-HZ)									
OL-125 (ZC-NWZ)									
JHO-99-2 (ZC-NEZ)									
JHO-822 (ZC-CZ)									
JHO-2000-4 (ZC-SZ)	94.4	121.7	61.8	92.6	3				
Mean	59.8	109.5	68.8	79.4			95.2		
CD at 5%	10.9	18.9	8.7						
CV%	10.2	10.0	7.7						

Table 4.3 AVT Oat (SC)-1: First Advanced Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha/day)

Cont…

Entries	Jorhat	Faizabad	Hisar	Anand	Bikaner	Kanpur	Ranchi	Rahuri	Kalyani	Urulikanchan	Jabalpur	Mandya	Coimbatore
SKO-156	3.89	2.27	3.71	4.84	1.16	6.53	2.72	3.72	3.36	7.09	4.40	2.93	4.22
JO-03-95	5.19	2.42	4.09	6.25	2.19	6.99	4.17	4.00	5.01	7.26	5.71	4.96	5.60
UPO-09-2	3.85	3.85	4.60	8.65	1.98	8.59	5.14	5.53	3.40	7.62	4.04	5.86	5.43
OS-363	3.39	3.85	4.99	10.02	2.70	6.84	4.23	3.80	4.49	6.08	5.01	4.69	3.98
UPO-09-1	4.38	3.90	4.37	6.81	1.14	6.72	3.37	3.95	5.13	6.30	5.00	6.14	5.11
JHO-2009-1	4.60	3.97	4.38	6.82	1.56	7.35	3.80	5.04	4.49	6.00	5.75	6.09	4.28
SKO-148	3.56	2.85	3.30	4.96	1.83	4.79	2.46	2.86	2.34	7.70	3.12	4.30	3.43
JHO-2009-2	4.03	4.28	5.11	6.98	2.54	7.41	4.96	4.62	4.26	7.80	3.77	6.23	4.56
Kent (NC)	4.03	3.41	4.32	7.89	2.61	8.33	4.72	4.85	4.79	6.30	3.96	5.31	4.59
OS-6 (NC)	3.56	2.73	4.05	7.37	1.70	7.85	5.10	3.55	4.12	6.73	4.11	5.00	5.21
Palampur-1 (ZC-HZ)													
OL-125 (ZC-NWZ)			5.19		1.00								
JHO-99-2 (ZC-NEZ)	4.03	3.52					3.94		4.99				
JHO-822 (ZC-CZ)				7.81		8.43		4.54		5.93	5.17		
JHO-2000-4 (ZC-SZ)												5.08	4.40
Mean	4.11	3.42	4.32	6.92	1.89	6.90	3.86	4.19	4.06	6.98	4.60	5.15	4.58

Table 4.3 AVT Oat (SC)-1: First Advanced Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha/day)

Entries	Ludhiana	Hyderabad	Palampur	Imphal	Bhubaneshwar	Jhansi	Pantnagar	Pusa	Srinagar	Average	Rank
SKO-156	4.14	1.78	1.82	4.10	3.22	3.11	2.61	7.08	2.75	3.70	9
JO-03-95	4.33	4.18	1.47	3.62	2.97	4.01	2.81	6.34	2.49	4.37	7
UPO-09-2	4.59	4.56	1.71	3.95	3.07	3.84	3.27	6.52	2.43	4.66	1
OS-363	4.23	3.80	1.48	3.44	3.64	3.96	3.18	6.04	2.71	4.39	6
UPO-09-1	4.12	5.44	1.83	3.13	3.88	4.54	3.03	6.38	2.50	4.42	4
JHO-2009-1	4.92	2.79	1.88	3.69	3.48	3.92	2.70	7.11	2.46	4.41	5
SKO-148	3.25	1.66	2.04	2.76	3.57	2.99	2.98	6.38	2.74	3.45	10
JHO-2009-2	4.83	2.76	1.72	4.62	4.29	4.61	3.01	6.84	2.59	4.63	2
Kent (NC)	4.26	4.06	1.50	4.10	4.26	4.31	3.15	6.62	2.68	4.55	3
OS-6 (NC)	4.26	2.28	1.62	4.07	4.01	4.54	3.21	6.22	2.57	4.27	8
Palampur-1 (ZC-HZ)			2.01						2.58		
OL-125 (ZC-NWZ)	4.21						2.99				
JHO-99-2 (ZC-NEZ)				4.01	4.29			6.55			
JHO-822 (ZC-CZ)						5.02					
JHO-2000-4 (ZC-SZ)		5.83									
Mean	4.30	3.37	1.74	3.66	3.52	3.87	2.95	6.59	2.58	4.25	

Table 4.4 AVT Oat (SC)-1: First Advanced Varietal Trial in Oat (Single Cut): Dry matter Yield (q/ha/day)

Cont…

Entries	Jorhat	Faizabad	Hisar	Anand	Bikaner	Kanpur	Ranchi	Rahuri	Kalyani	Imphal	Urulikanchan	Jabalpur	Mandya
SKO-156	0.66	0.53	0.63	1.17	0.30	2.13	0.45	0.81	0.76	4.10	1.35	0.88	0.89
JO-03-95	0.92	0.57	0.74	1.94	0.42	2.28	0.89	0.95	1.08	3.62	1.36	1.24	1.00
UPO-09-2	0.68	0.96	0.97	1.47	0.40	2.82	0.92	1.31	0.70	3.95	1.44	0.80	1.27
OS-363	0.66	0.97	1.00	1.51	0.52	2.23	0.88	0.96	0.92	3.44	1.20	1.08	1.19
UPO-09-1	0.89	0.98	1.05	1.74	0.35	2.20	0.87	0.83	1.05	3.13	1.27	1.07	1.69
JHO-2009-1	0.83	0.96	0.88	1.48	0.45	2.40	0.85	1.23	0.90	3.69	1.10	1.11	1.19
SKO-148	0.66	0.68	0.56	0.92	0.44	1.63	0.75	0.57	0.53	2.76	1.29	0.65	1.27
JHO-2009-2	0.71	1.10	1.28	1.33	0.54	2.41	1.00	1.09	0.81	4.62	1.44	0.70	1.93
Kent (NC)	0.75	0.82	1.04	1.29	0.48	2.71	0.89	1.04	0.90	4.09	1.38	0.90	1.36
OS-6 (NC)	0.63	0.67	1.05	1.38	0.37	2.56	1.10	0.65	0.88	4.07	1.30	0.84	1.71
Palampur-1 (ZC-HZ)													
OL-125 (ZC-NWZ)			0.93		0.21								
JHO-99-2 (ZC-NEZ)	0.78	0.87					0.86		1.03	4.01			
JHO-822 (ZC-CZ)				1.05		2.76		1.01			1.25	1.11	
JHO-2000-4 (ZC-SZ)													1.52
Mean	0.75	0.84	0.89	1.45	0.43	2.26	0.83	0.97	0.84	3.66	1.31	0.94	1.30

Table 4.4 AVT Oat (SC)-1: First Advanced Varietal Trial in Oat (Single Cut): Dry matter Yield (q/ha/day)

Entries	Ludhiana	Hyderabad	Bhubneswar	Pantnagar	Pusa	Srinagar	Jhansi	Average	Rank
SKO-156	0.75	0.59	0.71	0.35	1.41	0.67	0.62	0.98	7
JO-03-95	0.82	0.87	0.61	0.41	1.32	0.60	0.78	1.12	5
UPO-09-2	0.90	1.02	0.63	0.35	1.40	0.57	0.79	1.16	3
OS-363	0.78	0.67	0.76	0.49	1.25	0.64	0.78	1.08	6
UPO-09-1	0.74	1.23	0.82	0.40	1.39	0.60	0.92	1.15	4
JHO-2009-1	0.98	0.59	0.72	0.36	1.52	0.61	0.75	1.12	5
SKO-148	0.57	0.49	0.72	0.38	1.39	0.65	0.78	0.88	8
JHO-2009-2	0.97	0.68	0.92	0.41	1.39	0.62	0.96	1.23	1
Kent (NC)	0.81	1.00	0.91	0.38	1.39	0.64	0.76	1.17	2
OS-6 (NC)	0.74	0.58	0.88	0.39	1.29	0.62	0.84	1.12	5
Palampur-1 (ZC-HZ)						0.62			
OL-125 (ZC-NWZ)	0.78			0.44					
JHO-99-2 (ZC-NEZ)			0.92		1.36				
JHO-822 (ZC-CZ)							0.92		
JHO-2000-4 (ZC-SZ)		1.31							
Mean	0.81	0.77	0.74	0.39	1.38	0.62	0.80	1.09	

Table 4.5 AVT Oat (SC)-1: First Advanced Varietal Trial in Oat (Single Cut): Crude Protein Yield (q/ha)

Entries	Jor-hat	Faiza-bad	Anand	Hisar	Ranchi	Kalyani	Imphal	Uruli-kanchan	Jabal-pur	Mandya	Coimba-tore	Ludhi-ana	Palam-pur	Hydera-bad	Rahuri	Bhuba-neswar	Ave-rage	Rank
SKO-156	6.2	4.4	12.4	6.7	4.3	8.6	4.9	9.9	7.3	5.5	7.6	9.6	5.2	5.0	8.2	6.4	7.0	7
JO-03-95	10.1	4.7	14.2	10.9	6.1	6.1	4.8	9.1	10.5	6.9	6.2	8.0	5.5	7.3	6.8	5.4	7.7	3
UPO-09-2	6.7	8.1	11.0	11.3	6.5	5.6	3.6	8.7	6.4	7.1	5.6	11.3	6.3	8.1	9.8	5.6	7.6	4
OS-363	5.9	9.1	13.1	10.5	5.9	9.9	3.8	7.2	9.0	6.7	5.0	8.6	5.0	5.1	6.9	6.5	7.4	5
UPO-09-1	9.3	9.3	13.2	12.0	6.2	9.2	3.7	7.9	9.4	9.9	7.4	6.8	5.9	10.1	6.0	6.9	8.3	1
JHO-2009-1	9.7	8.4	12.5	13.5	6.2	7.0	3.5	7.2	8.1	5.7	6.4	9.2	5.6	5.0	9.8	6.4	7.8	2
SKO-148	7.1	6.3	10.7	6.6	6.2	6.9	3.3	9.5	5.4	9.9	8.2	5.1	5.3	5.9	5.6	5.6	6.7	8
JHO-2009-2	8.1	9.6	9.7	16.4	6.7	7.2	3.8	9.0	5.8	8.6	8.0	8.9	6.8	6.9	9.6	8.3	8.3	1
Kent (NC)	7.2	6.7	7.4	16.7	5.9	4.4	3.5	8.4	6.8	5.8	4.8	7.2	5.3	8.6	7.8	7.2	7.1	6
OS-6 (NC)	5.6	5.3	9.2	10.1	7.6	5.9	5.7	8.3	6.2	7.7	6.2	8.0	5.9	5.1	4.0	7.1	6.7	8
Palampur-1 (ZC-HZ)													4.6					
OL-125 (ZC-NWZ)				13.0								7.2						
JHO-99-2 (ZC-NEZ)	8.8	7.1			6.3	7.6	5.1									7.5		
JHO-822 (ZC-CZ)			8.5					7.9	8.7						7.6			
JHO-2000-4 (ZC-SZ)										6.1	5.7			9.9				
Mean	7.9	7.5	12.1	11.0	6.0	7.6	3.9	8.6	7.7	7.5	6.8	8.4	5.7	6.7	7.8	6.4	7.6	

Table 4.6 AVT Oat (SC)-1: First Advanced Varietal Trial in Oat (Single Cut): Crude Protein (%)

Entries	Faiza-bad	Anand	Hisar	Ranchi	Imphal	Uruli-kanchan	Mandya	Coimba-tore	Palam-pur	Ludhi-ana	Hydera-bad	Bhuba-neswar	Jor-hat	Rahuri	Pant-nagar	Bika-ner	Ave-rage	Rank
SKO-156	7.3	10.1	8.7	8.3	5.1	7.8	6.2	10.9	11.2	10.9	8.3	9.9	11.0	8.3	11.2	6.8	8.9	4
JO-03-95	7.9	8.2	14.1	7.9	5.4	7.9	8.7	8.3	10.8	8.2	12.3	10.0	10.9	7.4	9.4	8.1	9.1	2
UPO-09-2	8.2	9.1	11.4	8.3	4.6	7.3	6.9	7.4	10.5	10.7	11.4	9.7	10.3	8.0	9.3	7.8	8.8	5
OS-363	8.9	10.2	10.2	7.4	5.3	7.2	6.9	8.3	9.3	9.3	10.1	10.3	9.4	7.6	9.4	6.9	8.5	7
UPO-09-1	8.7	8.5	11.3	7.0	6.0	7.5	7.5	10.1	10.2	7.8	11.8	10.1	10.9	7.7	9.4	6.3	8.8	5
J HO-2009-1	8.1	9.5	14.1	7.9	4.9	7.6	6.2	10.1	9.0	8.0	11.4	10.1	11.4	8.2	11.2	6.6	9.0	3
SKO-148	8.0	10.5	9.6	7.0	5.2	7.7	7.5	13.1	10.1	7.6	11.8	9.6	11.8	8.0	9.8	12.0	9.3	1
JHO-2009-2	8.3	8.9	12.5	7.4	5.2	7.2	5.6	11.4	10.8	7.8	12.3	10.4	11.9	8.9	11.2	8.6	9.3	1
Kent (NC)	7.9	7.6	15.4	7.9	4.2	7.6	5.6	7.9	9.9	7.5	12.3	10.1	11.2	8.3	9.8	6.0	8.7	6
OS-6 (NC)	7.8	8.9	9.8	8.3	7.2	7.9	6.2	9.6	10.5	9.1	10.5	10.1	10.7	7.3	9.8	5.9	8.7	6
Palampur-1 (ZC-HZ)									9.0									
OL-125 (ZC-NWZ)			14.1							7.9					11.2	8.4		
JHO-99-2 (ZC-NEZ)	7.8			8.3	6.6							10.2	12.3					
JHO-822 (ZC-CZ)		10.5				7.8								8.3				
JHO-2000-4 (ZC-SZ)							5.0	9.2			10.5							
Mean	8.2	9.4	11.5	7.7	5.2	7.5	6.9	10.0	10.2	8.8	11.2	10.0	10.9	8.0	10.1	7.9	9.0	

Table 4.7 AVT Oat (SC)-1: First Advanced Varietal Trial in Oat (Single Cut): Plant Height (cm)

Cont…

Entries	Jorhat	Faizabad	Hisar	Anand	Bikaner	Kanpur	Ranchi	Rahuri	Kalyani	Imphal	Urulikanchan	Jabalpur	Mandya	Coimbatore
SKO-156	169.3	110.5	98.5	140.8	85.5	96.9	93.7	110.0	138.1	141.4	99.6	98.0	90.5	103.2
JO-03-95	163.7	118.7	120.2	130.7	83.1	102.1	108.5	103.0	164.9	117.8	108.7	128.0	97.7	127.8
UPO-09-2	184.9	112.5	129.1	190.6	92.9	101.3	110.3	117.0	169.8	150.4	110.1	134.1	114.1	122.8
OS-363	171.0	135.8	128.5	144.2	89.9	96.5	108.7	112.0	166.7	133.3	107.6	124.0	106.9	123.0
UPO-09-1	165.0	140.2	111.5	128.2	80.7	103.2	105.1	116.0	175.3	121.8	108.0	134.8	106.3	126.6
JHO-2009-1	145.3	118.5	102.8	144.2	75.4	107.8	105.1	131.0	161.2	120.6	102.9	121.2	114.9	89.0
SKO-148	164.0	113.8	87.5	108.2	67.1	85.8	92.2	86.0	136.0	82.8	101.3	93.3	90.0	78.6
JHO-2009-2	199.7	135.6	129.7	159.9	103.5	95.8	115.9	127.0	169.6	142.7	118.0	134.4	122.4	120.4
Kent (NC)	162.3	125.8	109.9	142.8	93.7	94.8	104.9	99.0	166.9	138.2	104.9	119.2	91.1	115.6
OS-6 (NC)	165.0	115.2	114.5	146.1	96.5	96.2	110.5	101.0	168.6	140.1	104.9	108.9	122.5	138.0
Palampur-1 (ZC-HZ)														
OL-125 (ZC-NWZ)			133.3		85.7									
JHO-99-2 (ZC-NEZ)	167.0	130.5					112.3		175.8	136.9				
JHO-822 (ZC-CZ)				141.1		94.8		97.0			104.4	143.6		
JHO-2000-4 (ZC-SZ)													93.5	136.6
Mean	169.0	122.7	113.2	143.6	86.8	98.0	105.5	110.2	161.7	128.9	106.6	119.6	105.6	114.5

Table 4.7 AVT Oat (SC)-1: First Advanced Varietal Trial in Oat (Single Cut): Plant Height (cm)

Entries	Hyderabad	Ludhiana	Palampur	Bhubneswar	Jhansi	Meerut	Pantnagar	Srinagar	Average	Rank
SKO-156	99.5	83.7	85.0	124.3	97.0	152.7	126.3	128.7	112.4	9
JO-03-95	115.7	126.7	106.6	124.6	140.8	146.0	131.7	126.8	122.4	6
UPO-09-2	120.2	123.3	106.7	120.4	140.7	154.0	132.9	125.5	130.2	2
OS-363	105.2	119.0	118.0	127.4	142.4	151.7	138.7	126.6	126.2	4
UPO-09-1	122.0	118.3	110.3	141.3	153.6	170.0	126.3	113.4	126.3	3
JHO-2009-1	100.5	130.0	111.3	121.5	131.8	155.0	135.1	128.2	120.6	8
SKO-148	82.0	71.7	71.3	131.5	91.8	145.0	129.7	131.1	101.9	10
JHO-2009-2	116.4	140.0	125.7	153.3	166.8	160.7	129.3	129.1	136.2	1
Kent (NC)	106.1	124.0	106.7	146.3	122.3	160.3	124.9	118.2	121.7	7
OS-6 (NC)	117.2	120.7	101.0	136.5	134.3	161.3	125.3	121.0	124.8	5
Palampur-1 (ZC-HZ)			119.7					122.0		
OL-125 (ZC-NWZ)		121.7				167.7	129.1			
JHO-99-2 (ZC-NEZ)				148.4						
JHO-822 (ZC-CZ)					133.0					
JHO-2000-4 (ZC-SZ)	127.3									
Mean	108.5	115.7	104.3	132.7	132.1	155.7	130.0	124.9	122.3	

Table 4.8 AVT Oat (SC)-1: First Advanced Varietal Trial in Oat (Single Cut): Leaf Stem Ratio

Cont…

Entries	Jorhat	Faizabad	Anand	Bikaner	Kanpur	Ranchi	Rahuri	Kalyani	Imphal	Jabalpur	Mandya	Coimbatore
SKO-156	1.23	0.74	0.39	0.33	0.46	0.33	0.53	0.45	0.40	0.84	0.26	0.50
JO-03-95	1.17	0.75	0.44	0.44	0.48	0.41	0.60	0.79	0.41	1.01	0.38	0.34
UPO-09-2	0.90	0.77	0.50	0.67	0.47	0.37	0.81	0.53	0.37	0.66	0.40	0.29
OS-363	0.87	0.82	0.30	0.96	0.40	0.36	0.42	0.77	0.54	0.81	0.35	0.41
UPO-09-1	0.72	0.83	0.34	0.31	0.47	0.18	0.45	0.93	0.54	0.95	0.34	0.45
JHO-2009-1	0.61	0.79	0.37	0.45	0.39	0.26	0.53	0.55	0.49	0.61	0.29	0.55
SKO-148	0.68	0.77	0.38	0.97	0.57	0.26	0.66	0.53	0.46	0.85	0.27	0.58
JHO-2009-2	0.70	0.83	0.46	0.42	0.57	0.29	0.42	0.63	0.33	0.56	0.45	0.42
Kent (NC)	0.46	0.75	0.52	0.55	0.44	0.35	0.53	0.73	0.37	0.90	0.32	0.43
OS-6 (NC)	0.73	0.72	0.41	0.52	0.40	0.32	0.69	0.60	0.39	0.65	0.23	0.42
Palampur-1 (ZC-HZ)												
OL-125 (ZC-NWZ)				0.67								
JHO-99-2 (ZC-NEZ)	0.76	0.80				0.29		0.63	0.43			
JHO-822 (ZC-CZ)			0.55		0.39		0.53			0.82		
JHO-2000-4 (ZC-SZ)											0.35	0.47
Mean	0.86	0.79	0.40	0.57	0.48	0.31	0.55	0.65	0.44	0.79	0.34	0.44

Table 4.8 AVT Oat (SC)-1: First Advanced Varietal Trial in Oat (Single Cut): Leaf Stem Ratio

Entries	Ludhiana	Palampur	Hyderabad	Urulikanchan	Bhubaneswar	Jhansi	Pantnagar	Pusa	Average	Rank
SKO-156	0.67	0.50	0.40	0.57	0.95	0.41	0.41	0.89	0.56	5
JO-03-95	0.33	0.48	0.64	0.92.	0.74	0.33	0.33	0.88	0.58	3
UPO-09-2	0.33	0.50	0.53	0.87	0.80	0.33	0.33	0.90	0.57	4
OS-363	0.54	0.44	0.47	0.66	0.98	0.36	0.36	0.89	0.59	2
UPO-09-1	0.43	0.53	0.47	0.85	1.08	0.26	0.26	0.88	0.56	5
JHO-2009-1	0.43	0.53	0.46	0.79	0.98	0.30	0.30	0.87	0.53	8
SKO-148	1.00	0.48	1.45	0.75	0.93	0.29	0.29	0.95	0.66	1
JHO-2009-2	0.43	0.50	0.44	0.79	1.11	0.33	0.33	0.94	0.55	6
Kent (NC)	0.33	0.53	0.41	0.85	1.11	0.38	0.38	0.91	0.56	5
OS-6 (NC)	0.43	0.50	0.46	0.74	1.07	0.32	0.29	0.87	0.54	7
Palampur-1 (ZC-HZ)		0.51								
OL-125 (ZC-NWZ)	0.43									
JHO-99-2 (ZC-NEZ)					1.09			0.90		
JHO-822 (ZC-CZ)				0.63		0.35	0.35			
JHO-2000-4 (ZC-SZ)			0.39							
Mean	0.52	0.50	0.61	0.75	0.95	0.33	0.33	0.90	0.57	

Table 4.9 AVT Oat (SC)-1: First Advanced Varietal Trial in Oat (Single Cut): IVDMD (%) & DDM (q/ha)

Entries	IVDMD (%)									DDM (q/ha)	
	Anand	Hisar	Ranchi	Ludhiana	Palampur	Rahuri	Pantnagar	Average	Rank	Hisar	Rank
SKO-156	55.6	51.0	71.0	59.6	58.6	66.5	52.4	59.2	1	39.2	10
JO-03-95	48.0	48.6	59.0	57.8	53.8	57.4	55.4	54.3	10	37.6	11
UPO-09-2	51.0	49.7	66.8	59.8	56.2	53.7	55.7	56.1	3	49.3	4
OS-363	57.2	47.2	67.4	58.0	56.8	51.3	53.4	55.9	4	48.5	5
UPO-09-1	52.8	40.6	65.0	58.6	54.6	61.3	53.9	55.3	7	43.0	7
JHO-2009-1	53.4	46.2	64.4	55.9	55.8	60.1	53.4	55.6	5	44.1	8
SKO-148	59.4	53.1	70.8	58.0	56.6	57.5	52.8	58.3	2	36.6	12
JHO-2009-2	49.6	43.0	72.0	57.3	54.6	52.3	54.8	54.8	9	56.7	2
Kent (NC)	42.8	48.9	67.2	57.8	52.8	64.0	55.0	55.5	6	53.1	3
OS-6 (NC)	49.6	39.6	69.6	58.0	54.6	61.6	53.6	55.2	8	40.9	9
Palampur-1 (ZC-HZ)					56.0						
OL-125 (ZC-NWZ)		50.8		57.8			51.8			47.0	6
JHO-99-2 (ZC-NEZ)			71.2							67.2	1
JHO-822 (ZC-CZ)	56.4					67.2					
JHO-2000-4 (ZC-SZ)											
Mean	53.4	47.4	67.1	58.1	55.9	57.5	54.0	56.2		44.4	

Table 4.10 AVT Oat (SC)-1: First Advanced Varietal Trial in Oat (Single Cut): ADF (%) & NDF (%)

Entries	ADF (%)							NDF (%)							
	Ranchi	Ludhi-ana	Palam-pur	Rahuri	Pant-nagar	Ave-rage	Rank	Anand	Ranchi	Ludhi-ana	Palam-pur	Rahuri	Pant-nagar	Ave-rage	Rank
SKO-156	64.2	36.7	52.0	43.9	63.6	52.1	3	69.0	43.6	55.2	63.4	65.0	46.9	57.2	1
JO-03-95	69.6	37.6	47.6	46.3	63.6	52.9	5	78.0	48.3	56.2	64.6	69.1	49.4	60.9	9
UPO-09-2	69.4		50.2	48.1	59.8	56.9	9	69.0	54.1	55.1	63.8	68.3	44.8	59.2	5
OS-363	62.6	36.8	47.8	46.2	59.4	50.6	1	67.0	49.3	55.0	60.4	66.3	48.8	57.8	3
UPO-09-1	66.2	37.2	49.4	50.9	59.0	52.5	4	68.0	56.2	57.0	62.2	63.4	50.4	59.5	6
JHO-2009-1	68.8	37.9	51.8	52.1	62.8	54.7	7	66.0	49.4	56.7	60.0	63.5	49.5	57.5	2
SKO-148	68.0	37.6	51.4	48.4	58.9	52.9	5	70.0	47.2	56.6	60.6	65.2	51.7	58.6	4
JHO-2009-2	69.6	37.0		53.5	63.8	56.0	8	71.0	48.5	56.2	64.0	69.5	49.8	59.8	7
Kent (NC)	69.0	38.2	51.2	46.5	61.7	53.3	6	78.0	52.6	56.4	59.6	65.0	47.3	59.8	7
OS-6 (NC)	66.4	37.1	48.6	45.3	62.0	51.9	2	77.0	48.3	56.8	62.0	70.1	48.6	60.5	8
Palampur-1 (ZC-HZ)			48.4								63.5				
OL-125 (ZC-NWZ)		36.6			58.4					56.6			52.4		
JHO-99-2 (ZC-NEZ)	67.2								50.9						
JHO-822 (ZC-CZ)		36.7		43.1				67.0				63.1			
JHO-2000-4 (ZC-SZ)															
Mean	67.3	37.3	50.0	48.7	61.4	52.9		69.8	49.6	56.0	62.4	66.3	48.9	58.8	

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

(Table Reference: 5.1 to 5.10)

In Oat (single cut), three entries namely SKO-96, SKO-133 and JO-03-291 promoted from AVT-1 were evaluated against two national checks OS-6 and Kent and zonal checks i.e. Palampur-1, OL-125, JHO-99-2, JHO-822 and JHO-2000-4 at 23 locations in five different zones. Results of the trial reported from different centres clearly indicated that for green forage yield (q/ha), entries SKO-96 (16.1%) and SKO-133 (11.0%) performed superiority with respect to national check OS-6. In North-West Zone, entries SKO-96 (2.5%), SKO-133 (2.0%), and in Central Zone entry JO-03-291 (5.2%) proved their superiority over best national or zonal check. On all India basis, entries JO-03-291 (6.0%) and SKO-133 (5.6%) recorded their superiority over best national check OS-6.

Similarly for character dry matter yield (q/ha), entries SKO-96 (12.8%), SKO-133 (5.5%) in Hill Zone, SKO-96 (4.5%) in North-West Zone and SKO-133 (6.1%) in Central Zone exhibited their superiority over best national or zonal check. At national level, entry SKO-133 (2.7%) was adjudged best performer with respect to national check. Coming to the forage production potential (q/ha/day), entry JO-03-291 (4.64 q/ha/day) recorded superiority for green forage yield whereas national check OS-6 (1.16 q/ha/day) proved superiority for dry matter yield potential. For evaluation against plant height (cm), national check OS-6 (125.5 cm) registered superiority. For the character leaf stem ratio, all the testing entries performed better than check.

In quality parameters, national checks OS-6 (7.8q/ha) and Kent (9.3%) proved superiority for crude protein yield and crude protein content, respectively. For other quality parameters like IVDMD and NDF (%), entry SKO-133, national check OS-6 for DDM (q/ha) and Kent for ADF (%) proved superiority with respect to other entries.

Table 5.1 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha)

Cont…

Entries	Hill Zone					North-West Zone								
	Palam-pur	Sri-nagar	Ave-rage	Rank	Superi-ority%	Bika-ner	Jalore	Hisar	Ludhi-ana	Pant-nagar	Meerut	Ave-rage	Rank	Superi-ority%
SKO-96	282.6	499.4	391.0	1	16.1	166.1	481.0	414.4	716.7	540.9	491.7	468.5	1	2.5
JO-03-291	216.7	443.3	330.0	5		229.5	440.3	412.3	683.3	385.7	497.9	441.5	4	
SKO-133	246.7	501.4	374.1	2	11.0	157.0	557.3	445.5	679.2	492.9	466.7	466.4	2	2.0
OS-6 (NC)	201.9	471.9	336.9	3		214.8	460.3	416.5	586.5	385.3	437.5	416.8	5	
Kent (NC)	182.0	469.5	325.8	6		206.1	423.3	389.4	607.3	356.5	389.6	395.4	6	
Palampur-1 (ZC-HZ)	212.4	450.7	331.6	4										
OL-125 (ZC-NWZ)						233.9	454.7	431.1	693.8	406.5	522.9	457.2	3	
JHO-99-2 (ZC-NEZ)														
JHO-822 (ZC-CZ)														
JHO-2000-4 (ZC-SZ)														
Mean	226.0	477.1	351.5			194.7	472.4	415.6	654.6	432.3	456.7	437.7		
CD at 5%	45.5	4.8				43.7	36.2	26.7	85.2	63.8	36.7			
CV%	13.5	0.9				14.4	5.1	4.2	8.6	7.6	5.3			

Note: *Data reported from Pusa centre not included in average due to two more entries tested in the trial

-Trial data not reported from Rajouri centre

Table 5.1 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha)

Cont…

Entries	North-East Zone										Central Zone								
	Jor-hat	Kal-yani	Ranchi	Bhuba-neswar	Faiza-bad	Imphal	Pusa*	Ave-rage	Rank	Superi-ority%	Jhansi	Rahuri	Uruli-kanchan	Kanpur	Anand	Jabal-pur	Ave-rage	Rank	Superi-ority%
SKO-96	421.7	340.2	267.5	254.5	306.0	285.8	285.0	312.6	6		303.7	254.7	479.9	612.5	525.0	482.0	443.0	6	
JO-03-291	375.4	450.4	340.0	303.0	309.7	138.4	301.0	319.5	4		409.4	372.6	697.1	635.4	698.0	564.0	562.8	1	5.2
SKO-133	372.4	422.1	390.0	265.0	364.7	171.3	316.0	330.9	2		344.9	370.1	548.5	699.9	611.0	509.0	513.9	3	
OS-6 (NC)	319.1	383.7	345.0	287.0	379.4	183.9	308.0	316.4	5		455.6	277.2	631.4	739.6	419.0	422.0	490.8	5	
Kent (NC)	335.7	435.8	327.5	316.0	398.3	164.1	344.0	329.6	3		380.8	330.5	671.4	650.0	587.0	398.0	503.0	4	
Palampur-1 (ZC-HZ)																			
OL-125 (ZC-NWZ)																			
JHO-99-2 (ZC-NEZ)	369.1	430.8	385.0	343.0	415.7	154.3	290.0	349.7	1										
JHO-822 (ZC-CZ)											412.8	309.5	708.5	672.9	539.0	568.0	535.1	2	
JHO-2000-4 (ZC-SZ)																			
Mean	364.9	406.4	334.0	285.1	351.6	188.7	310.8	321.8			378.9	321.0	605.7	667.5	568.0	475.0	502.7		
CD at 5%	8.6	15.4	34.4	3.7	63.9	15.8	31.7				20.2	45.4	23.9	78.8	62.4	100.3			
CV%	12.3	3.0	6.7	4.2	11.7	4.7	8.5				13.4	9.5	13.8	7.8	7.2	14.0			

Table 5.1 AVT Oat (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%
SKO-96	158.3	378.9	337.5	291.6	5		391.3	3	0.5
JO-03-291	237.8	358.4	293.7	296.6	4		412.7	1	6.0
SKO-133	155.1	385.3	306.2	282.2	6		411.4	2	5.6
OS-6 (NC)	249.9	390.6	295.8	312.1	2		389.3	4	
Kent (NC)	233.9	384.9	302.1	307.0	3		388.7	5	
Palampur-1 (ZC-HZ)									
OL-125 (ZC-NWZ)									
JHO-99-2 (ZC-NEZ)									
JHO-822 (ZC-CZ)									
JHO-2000-4 (ZC-SZ)	304.5	526.3	275.0	368.6	1				
Mean	207.0	379.6	307.1	297.9			398.7		
CD at 5%	12.7	31.5	NS						
CV%	3.9	5.2	8.5						

Table 5.2 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut): Dry Matter Yield (q/ha)

Cont…

Entries	Hill Zone					North-West Zone						
	Palampur	Srinagar	Average	Rank	Superiority%	Bikaner	Hisar	Ludhiana	Pantnagar	Average	Rank	Superiority%
SKO-96	70.3	119.6	95.0	1	12.8	37.8	82.9	143.3	85.5	87.4	1	4.5
JO-03-291	47.8	104.1	76.0	5		41.5	86.6	129.8	59.1	79.3	4	
SKO-133	58.5	119.0	88.8	2	5.5	38.6	75.8	129.0	74.4	79.5	3	
OS-6 (NC)	57.4	110.9	84.2	3		41.6	99.9	105.3	53.9	75.2	5	
Kent (NC)	39.6	110.3	75.0	6		37.9	89.6	112.4	54.0	73.5	6	
Palampur-1 (ZC-HZ)	52.5	106.5	79.5	4								
OL-125 (ZC-NWZ)						43.0	94.8	135.3	61.1	83.6	2	
JHO-99-2 (ZC-NEZ)												
JHO-822 (ZC-CZ)												
JHO-2000-4 (ZC-SZ)												
Mean	54.7	112.8	83.8			39.5	87.0	124.0	65.4	78.9		
CD at 5%	15.1	1.6				NS	5.5	16.2	13.2			
CV%	18.8	0.8				14.7	4.1	8.6	11.4			

Table 5.2 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut): Dry Matter Yield (q/ha)

Cont…

Entries	North-East Zone										Central Zone								
	Jor-hat	Kal-yani	Ranchi	Bhuba-neswar	Faiza-bad	Imphal	Pusa*	Ave-rage	Rank	Superi-ority%	Jhansi	Rahuri	Uruli-kanchan	Kanpur	Anand	Jaba-lpur	Ave-rage	Rank	Superi-ority%
SKO-96	83.0	76.3	81.4	52.3	73.9	86.1	56.9	75.5	3		80.3	57.1	84.8	208.2	110.6	99.4	106.7	6	
JO-03-291	73.1	80.2	86.7	58.5	76.0	30.5	60.5	67.5	6		73.8	80.1	115.8	192.7	116.6	126.9	117.7	3	
SKO-133	66.7	103.3	101.5	52.5	88.6	48.9	64.8	76.9	1	0.6	84.6	82.9	104.1	281.3	114.3	112.0	129.9	1	6.1
OS-6 (NC)	61.3	75.2	81.9	58.9	100.9	47.7	63.7	71.0	5		77.2	54.0	133.1	212.5	104.6	93.2	112.4	4	
Kent (NC)	61.3	89.5	79.5	64.6	105.1	47.2	71.2	74.5	4		76.6	59.8	126.2	205.0	102.8	84.8	109.2	5	
Palampur-1 (ZC-HZ)																			
OL-125 (ZC-NWZ)																			
JHO-99-2 (ZC-NEZ)	68.6	93.9	84.8	73.9	105.3	31.8	58.0	76.4	2										
JHO-822 (ZC-CZ)											83.8	61.7	135.8	209.0	115.8	128.3	122.4	2	
JHO-2000-4 (ZC-SZ)																			
Mean	69.1	84.9	86.2	57.4	88.9	52.1	63.4	73.1			78.5	66.8	112.8	219.9	109.8	103.3	115.2		
CD at 5%	4.9	4.1	1.5	7.7	10.0	8.3	7.1				14.4	9.2	15.5	26.7	NS	22.9			
CV%	16.0	3.9	8.9	4.2	7.3	9.2	9.3				9.6	9.3	17.4	8.1	7.3	14.2			

Table 5.2 AVT Oat (SC)-2: Second 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	49.9	109.7	52.7	70.8	4		87.9	3	
JO-03-291	50.0	128.5	50.9	76.5	3		86.2	4	
SKO-133	50.3	110.6	50.4	70.4	5		92.7	1	2.7
OS-6 (NC)	63.1	206.1	57.0	108.7	1	27.6	90.3	2	
Kent (NC)	61.0	88.7	48.2	66.0	6		83.1	5	
Palampur-1 (ZC-HZ)									
OL-125 (ZC-NWZ)									
JHO-99-2 (ZC-NEZ)									
JHO-822 (ZC-CZ)									
JHO-2000-4 (ZC-SZ)	70.0	136.5	49.0	85.2	2				
Mean	54.9	128.7	51.8	78.5			88.0		
CD at 5%	5.7	22.8	NS						
CV%	6.5	11.7	9.9						

Table 5.3 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha/day)

Cont…

Entries	Rahuri	Bhubaneswar	Ludhiana	Palampur	Coimbatore	Ranchi	Hyderabad	Jabalpur	Hisar	Anand	Kanpur	Bikaner
SKO-96	2.09	2.74	5.47	2.02	4.22	5.99	1.64	4.77	3.34	5.00	5.42	1.40
JO-03-291	4.19	3.29	5.22	1.84	4.32	6.82	3.34	5.87	4.07	8.60	7.56	2.32
SKO-133	3.19	3.01	5.18	1.87	3.83	7.55	1.60	5.30	3.71	5.80	6.67	1.32
OS-6 (NC)	3.42	3.26	4.48	1.74	4.62	6.80	3.47	4.39	3.93	6.50	7.95	2.17
Kent (NC)	3.84	3.40	4.64	1.54	4.38	6.26	3.20	4.10	3.71	7.60	7.74	2.08
Palampur-1 (ZC-HZ)				1.62								
OL-125 (ZC-NWZ)			5.30						4.31			2.36
JHO-99-2 (ZC-NEZ)		3.99				6.76						
JHO-822 (ZC-CZ)	3.56							5.11		7.00	8.52	
JHO-2000-4 (ZC-SZ)					4.04		4.48					
Mean	3.35	3.14	5.00	1.80	4.27	6.68	2.65	4.89	3.75	6.70	7.07	1.86

Table 5.3 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha/day)

Entries	Faizabad	Jorhat	Mandya	Imphal	Urulikanchan	Jhansi	Pantnagar	Kalyani	Pusa*	Average	Rank
SKO-96	2.83	3.65	3.83	2.69	5.22	2.60	4.29	2.66	3.09	3.59	5
JO-03-291	3.16	3.91	5.04	1.61	9.05	4.37	3.71	4.55	3.23	4.64	1
SKO-133	3.25	4.43	4.29	1.55	6.16	3.32	4.01	3.46	3.39	3.98	4
OS-6 (NC)	3.79	3.46	5.73	2.15	8.20	5.36	3.67	3.88	3.28	4.45	2
Kent (NC)	4.02	3.63	5.42	1.93	8.72	4.24	3.40	4.40	3.69	4.41	3
Palampur-1 (ZC-HZ)											
OL-125 (ZC-NWZ)							3.76				
JHO-99-2 (ZC-NEZ)	4.07	3.84		1.81				4.35	3.15		
JHO-822 (ZC-CZ)					9.20	4.60					
JHO-2000-4 (ZC-SZ)			6.78								
Mean	3.41	3.82	4.86	1.99	7.47	3.98	3.82	3.79	3.34	4.21	

Table 5.4 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut): Dry Matter Yield (q/ha/day)

Cont…

Entries	Rahuri	Bhubaneswar	Mandya	Coimbatore	Ranchi	Hyderabad	Jabalpur	Ludhiana	Hisar	Anand	Kanpur	Bikaner
SKO-96	0.47	0.56	1.11	0.66	0.65	0.52	0.98	1.09	0.67	1.05	1.84	0.32
JO-03-291	0.90	0.64	1.81	0.75	0.98	0.77	1.32	0.99	0.86	1.44	2.29	0.42
SKO-133	0.71	0.60	1.23	0.63	0.91	0.52	1.16	0.99	0.63	1.09	2.68	0.32
OS-6 (NC)	0.71	0.67	3.03	0.89	0.92	0.88	0.97	0.81	0.94	1.38	2.28	0.42
Kent (NC)	0.69	0.69	1.25	0.70	0.86	0.83	0.87	0.86	0.85	1.34	2.44	0.38
Palampur-1 (ZC-HZ)												
OL-125 (ZC-NWZ)								1.03	0.95			0.43
JHO-99-2 (ZC-NEZ)	0.67	0.86			0.93							
JHO-822 (ZC-CZ)							1.15			1.50	2.65	
JHO-2000-4 (ZC-SZ)			1.76	0.72		1.03						
Mean	0.70	0.63	1.69	0.73	0.86	0.70	1.06	0.95	0.79	1.26	2.31	0.37

Table 5.4 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut): Dry Matter Yield (q/ha/day)

Entries	Faizabad	Jorhat	Urulikanchan	Pantnagar	Kalyani	Srinagar	Jhansi	Pusa*	Average	Rank
SKO-96	0.68	0.71	0.92	0.68	0.60	2.68	0.69	0.62	0.89	5
JO-03-291	0.77	0.76	1.50	0.57	0.81	2.36	0.79	0.65	1.09	2
SKO-133	0.79	0.79	1.17	0.60	0.85	2.76	0.81	0.69	1.01	4
OS-6 (NC)	1.01	0.66	1.75	0.51	0.76	2.54	0.91	0.68	1.16	1
Kent (NC)	1.06	0.66	1.64	0.51	0.90	2.54	0.85	0.77	1.05	3
Palampur-1 (ZC-HZ)						2.48				
OL-125 (ZC-NWZ)				0.57						
JHO-99-2 (ZC-NEZ)	1.03	0.71			0.95			0.63		
JHO-822 (ZC-CZ)			1.76				0.93			
JHO-2000-4 (ZC-SZ)										
Mean	0.86	0.72	1.40	0.57	0.78	2.58	0.81	0.68	1.04	

Table 5.5 AVT Oat (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	Mandya
SKO-96	5.1	5.1	13.8	7.3	6.3	7.1	6.0	8.0	2.6	9.6
JO-03-291	6.5	6.2	12.5	5.4	6.4	9.3	6.8	10.1	3.7	14.4
SKO-133	6.5	5.9	11.5	5.8	6.4	7.3	7.6	9.2	3.5	9.8
OS-6 (NC)	4.3	7.8	9.8	5.3	6.3	9.3	6.8	7.0	4.7	20.5
Kent (NC)	5.1	6.8	11.2	4.3	5.5	12.6	6.3	6.4	4.8	8.8
Palampur-1 (ZC-HZ)				5.8						
OL-125 (ZC-NWZ)			11.2			8.3				
JHO-99-2 (ZC-NEZ)							6.8			
JHO-822 (ZC-CZ)	4.9							10.7		
JHO-2000-4 (ZC-SZ)					5.8				6.3	11.9
Mean	5.5	6.4	11.8	5.6	6.2	9.1	6.7	8.1	3.9	12.6

Table 5.5 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut): Crude Protein Yield (q/ha)

Entries	Anand	Faizabad	Jorhat	Imphal	Urulikanchan	Kalyani	Average	Rank
SKO-96	11.8	5.8	7.6	4.7	6.0	6.2	7.1	4
JO-03-291	12.5	5.7	6.8	1.8	8.9	5.7	7.7	2
SKO-133	10.1	7.7	6.1	2.9	7.7	5.5	7.1	4
OS-6 (NC)	9.7	8.2	6.3	2.6	10.2	5.5	7.8	1
Kent (NC)	8.5	8.6	6.5	3.2	9.5	8.2	7.3	3
Palampur-1 (ZC-HZ)								
OL-125 (ZC-NWZ)								
JHO-99-2 (ZC-NEZ)		9.0	6.9	1.7		8.7		
JHO-822 (ZC-CZ)	11.1				10.3			
JHO-2000-4 (ZC-SZ)								
Mean	10.5	7.2	6.7	3.0	8.5	6.2	7.4	

Table 5.6 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut): Crude Protein (%)

Cont…

Entries	Rahuri	Bhubaneswar	Ludhiana	Palampur	Coimbatore	Hisar	Ranchi	Hyderabad	Pantnagar	Anand	Bikaner
SKO-96	8.9	9.8	9.6	11.4	11.8	8.6	7.4	5.3	9.4	10.7	10.8
JO-03-291	8.1	10.6	9.6	10.9	12.7	10.7	7.9	6.8	11.2	10.7	10.7
SKO-133	7.9	10.2	8.9	10.5	12.7	9.6	7.4	7.0	9.4	8.8	9.5
OS-6 (NC)	8.0	10.0	9.3	11.2	11.0	9.3	8.3	7.4	11.2	9.3	9.4
Kent (NC)	8.5	10.6	9.9	10.1	11.4	14.1	7.9	7.9	9.8	8.3	8.8
Palampur-1 (ZC-HZ)				10.3							
OL-125 (ZC-NWZ)			8.3			8.7			9.8		9.3
JHO-99-2 (ZC-NEZ)		10.6					7.9			10.1	
JHO-822 (ZC-CZ)	8.0									9.5	
JHO-2000-4 (ZC-SZ)					11.8			9.0			
Mean	8.3	10.2	9.5	10.8	11.9	10.5	7.8	6.9	10.2	9.6	9.8

Table 5.6 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut): Crude Protein (%)

Entries	Faizabad	Jabalpur	Jorhat	Mandya	Imphal	Urulikanchan	Kalyani	Average	Rank
SKO-96	7.8	8.1	9.2	8.7	8.7	7.1	8.1	9.0	2
JO-03-291	7.5	8.0	9.4	11.3	6.0	7.7	7.1	9.3	1
SKO-133	8.7	8.3	9.2	8.8	5.9	7.4	5.3	8.6	4
OS-6 (NC)	8.1	7.6	10.3	10.0	5.5	7.6	7.4	8.9	3
Kent (NC)	8.2	7.6	10.8	10.0	6.8	7.5	9.2	9.3	1
Palampur-1 (ZC-HZ)									
OL-125 (ZC-NWZ)									
JHO-99-2 (ZC-NEZ)	8.5		10.1		5.4		9.3		
JHO-822 (ZC-CZ)		8.4				7.6			
JHO-2000-4 (ZC-SZ)				8.8					
Mean	8.1	7.9	9.8	9.8	6.6	7.5	7.4	9.0	

Table 5.7 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut): Plant Height (cm)

Cont…

Entries	Rahuri	Bhubaneswar	Ludhiana	Palampur	Coimbatore	Ranchi	Hyderabad	Jabalpur	Hisar	Anand	Kanpur	Bikaner	Faizabad
SKO-96	63.0	138.9	92.5	73.0	95.4	76.7	94.0	88.7	98.7	110.5	89.3	71.4	98.7
JO-03-291	86.0	149.6	132.5	102.5	131.4	117.2	110.7	117.0	109.3	152.1	89.8	95.0	127.5
SKO-133	101.0	141.3	98.8	101.0	84.6	104.7	108.4	108.6	113.4	125.8	92.8	76.9	105.6
OS-6 (NC)	99.0	147.3	125.0	106.5	128.0	116.9	109.2	125.9	120.7	140.6	97.8	100.0	137.8
Kent (NC)	87.0	156.8	125.0	102.3	115.0	118.1	100.3	119.6	115.5	140.5	91.7	89.0	130.5
Palampur-1 (ZC-HZ)				88.0									
OL-125 (ZC-NWZ)			132.5						116.2			97.7	
JHO-99-2 (ZC-NEZ)		159.5				121.6							140.5
JHO-822 (ZC-CZ)	90.0							130.7		144.6	93.3		
JHO-2000-4 (ZC-SZ)					112.4		116.8						
Mean	87.2	146.8	114.8	97.1	110.9	106.7	104.5	112.0	111.5	133.9	92.3	86.5	120.0

Table 5.7 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut): Plant Height (cm)

Entries	Jorhat	Mandya	Imphal	Urulikanchan	Jhansi	Meerut	Pantnagar	Srinagar	Kalyani	Average	Rank
SKO-96	151.8	101.5	108.1	95.9	100.4	118.0	107.3	132.2	142.8	102.2	5
J O-03-291	170.3	99.6	82.2	111.9	136.0	159.0	130.0	128.0	175.5	123.3	3
SKO-133	168.3	117.5	77.7	111.0	125.5	126.0	128.9	132.4	144.1	113.4	4
OS-6 (NC)	163.5	116.2	93.6	114.2	133.1	141.0	156.9	115.7	171.4	125.5	1
Kent (NC)	159.6	108.3	88.0	113.2	129.7	129.0	153.8	123.2	171.8	121.3	2
Palampur-1 (ZC-HZ)								121.6			
OL-125 (ZC-NWZ)						141.0	157.7				
JHO-99-2 (ZC-NEZ)	181.0		80.0						176.4		
JHO-822 (ZC-CZ)				105.8	130.8						
JHO-2000-4 (ZC-SZ)		86.7									
Mean	162.7	108.6	89.9	109.2	124.9	134.6	135.4	126.3	161.1	117.1	

Table 5.8 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut): Leaf Stem Ratio

Cont…

Entries	Rahuri	Bhubaneswar	Ludhiana	Palampur	Coimbatore	Ranchi	Hyderabad	Jabalpur	Anand	Kanpur	Bikaner
SKO-96	0.42	0.89	1.00	0.47	0.54	0.23	0.50	0.80	0.48	0.43	0.78
JO-03-291	0.53	1.08	0.82	0.49	0.51	0.28	0.38	0.86	0.38	0.54	0.55
SKO-133	0.53	0.95	0.67	0.50	0.51	0.43	0.38	0.92	0.31	0.45	0.55
OS-6 (NC)	0.69	1.10	0.54	0.46	0.49	0.23	0.40	0.61	0.47	0.39	0.59
Kent (NC)	0.66	1.10	0.67	0.46	0.53	0.24	0.40	0.56	0.37	0.41	0.50
Palampur-1 (ZC-HZ)				0.49							
OL-125 (ZC-NWZ)			0.67								0.52
JHO-99-2 (ZC-NEZ)		1.15				0.26					
JHO-822 (ZC-CZ)	0.81							0.91	0.37	0.45	
JHO-2000-4 (ZC-SZ)					0.52		0.47				
Mean	0.57	1.02	0.74	0.48	0.52	0.28	0.41	0.75	0.40	0.44	0.59

Table 5.8 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut): Leaf Stem Ratio

Entries	Faizabad	Jorhat	Mandya	Imphal	Urulikanchan	Jhansi	Pantnagar	Kalyani	Pusa*	Average	Rank
SKO-96	0.74	0.69	0.25	0.51	0.76	0.33	0.53	0.53	0.81	0.57	1
JO-03-291	0.72	0.64	0.28	0.44	0.81	0.42	0.44	0.65	0.89	0.57	1
SKO-133	0.79	0.77	0.50	0.35	0.72	0.43	0.46	0.62	0.84	0.57	1
OS-6 (NC)	0.78	0.65	0.23	0.47	0.63	0.36	0.43	0.72	0.92	0.54	3
Kent (NC)	0.80	0.65	0.34	0.43	0.76	0.36	0.48	0.69	0.96	0.55	2
Palampur-1 (ZC-HZ)											
OL-125 (ZC-NWZ)							0.49				
JHO-99-2 (ZC-NEZ)	0.81	0.58		0.40				0.65	0.83		
JHO-822 (ZC-CZ)					0.63	0.35					
JHO-2000-4 (ZC-SZ)			0.30								
Mean	0.77	0.68	0.32	0.44	0.74	0.38	0.47	0.64	0.88	0.56	

Table 5.9 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut): IVDMD (%) & DDM (q/ha)

Entries	IVDMD (%)									DDM (q/ha)	
	Rahuri	Ludhiana	Palampur	Hisar	Ranchi	Anand	Pantnagar	Average	Rank	Hisar	Rank
SKO-96	57.4	60.6	57.2	60.3	64.8	61.2	51.8	59.0	3	50.0	5
JO-03-291	61.0	60.4	54.8	58.6	66.4	60.2	53.8	59.3	2	50.7	3
SKO-133	57.2	58.9	58.2	68.1	66.4	57.0	53.8	59.9	1	51.6	2
OS-6 (NC)	56.4	59.5	56.0	62.2	66.6	59.4	54.7	59.3	2	62.2	1
Kent (NC)	56.4	60.9	57.7	56.2	65.8	56.4	52.6	58.0	4	50.3	4
Palampur-1 (ZC-HZ)			56.0								
OL-125 (ZC-NWZ)		58.5		49.8			54.7			47.2	6
JHO-99-2 (ZC-NEZ)					62.0						
JHO-822 (ZC-CZ)	52.6					58.0					
JHO-2000-4 (ZC-SZ)											
Mean	57.7	60.1	56.8	61.1	66.0	58.8	53.3	59.1		53.0	

Table 5.10 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut): ADF (%) & NDF (%)

Entries	ADF (%)							NDF (%)							
	Ludhi-ana	Palam-pur	Ranchi	Rahuri	Pant-nagar	Ave-rage	Rank	Anand	Ludhi-ana	Palam-pur	Ranchi	Rahuri	Pant-nagar	Ave-rage	Rank
SKO-96	36.7	51.2	60.0	46.6	58.4	50.6	2	66.0	55.3	64.6	51.6	66.5	47.8	58.6	4
JO-03-291	36.1	46.4	61.0	49.9	61.4	51.0	3	69.0	55.8	61.8	43.7	64.3	46.9	56.9	2
SKO-133	37.7	51.8	63.6	48.1	59.8	52.2	4	70.0	56.1	62.5	41.5	63.6	45.8	56.6	1
OS-6 (NC)	36.9	49.5	69.6	46.5	58.7	52.2	4	68.0	55.5	63.7	53.6	62.8	48.4	58.7	5
Kent (NC)	36.5	50.4	64.2	45.1	54.1	50.1	1	75.0	55.7	64.5	44.5	61.1	50.4	58.5	3
Palampur-1 (ZC-HZ)		47.8								67.4					
OL-125 (ZC-NWZ)	38.2				62.7				56.4				48.4		
JHO-99-2 (ZC-NEZ)			61.0								45.9				
JHO-822 (ZC-CZ)				44.7				68.0				61.3			
JHO-2000-4 (ZC-SZ)															
Mean	36.8	49.9	63.7	47.2	58.5	51.2		69.6	55.7	63.4	47.0	63.7	47.9	57.9	

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

(Table Reference: 6)

Results of the advanced varietal trial in Oat (single cut) for seed with three entries i.e. SKO-96, JO-03-291 and SKO-133 along with two national checks i.e. OS-6 and Kent and zonal checks for respective zones i.e. Palampur-1, OL-125, JHO-99-2, JHO-822 and JHO-2000-4 conducted at seventeen 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 except for entry JO-03-291 in Central zone which was at par with zonal check JHO-822. At national level, seed yield of national check OS-6 was 21.7 q/ha which was followed by entry JO-03-291 (20.7q/ha).

Table 6 AVT Oat (SC)-2 (Seed): Advanced Varietal Trial -2 in Oat (Single cut) for seed: Seed Yield (q/ha)

Cont…

Entries	Hill Zone					North-West Zone								
	Palam-pur	Sri-nagar	Ave-rage	Rank	Superi-ority%	Bika-ner	Hisar	Ludhi-ana	Pant-nagar	Jalore	Meerut	Ave-rage	Rank	Superi-ority%
SKO-96	22.2	33.5	27.8	3		4.1	20.8	18.8	19.4	2.1	13.3	13.1	4	
JO-03-291	26.6	25.4	26.0	5		26.6	29.2	17.8	11.1	21.0	13.9	19.9	2	
SKO-133	14.1	32.4	23.2	6		2.8	16.7	12.7	11.9	2.2	14.7	10.2	5	
OS-6 (NC)	27.4	29.0	28.2	2		26.7	31.2	24.7	13.8	21.5	16.9	22.5	1	
Kent (NC)	29.8	23.8	26.8	4		31.3	25.0	13.0	11.1	23.1	15.9	19.9	2	
Palampur-1 (ZC-HZ)	27.2	32.5	29.8	1										
OL-125 (ZC-NWZ)						21.4	25.0	12.5	16.1	16.2	20	18.5	3	
JHO-99-2 (ZC-NEZ)														
JHO-822 (ZC-CZ)														
JHO-2000-4 (ZC-SZ)														
Mean	24.5	29.4	27.0			18.3	24.6	17.4	13.5	14.0	14.9	17.1		
CD at 5%	7.2	6.0				5.4	4.6	0.4	2.9	1.1	1.7			
CV%	19.6	11.2				19.1	12.2	13.8	11.7	5.2	7.2			

Note: -Trial data not reported from Rajouri centre

Table 6 AVT Oat (SC)-2 (Seed): Advanced Varietal Trial -2 in Oat (Single cut) for seed: Seed Yield (q/ha)

Cont…

Entries	North-East Zone						Central Zone					
	Ranchi	Jorhat	Bhubaneswar	Average	Rank	Superiority%	Jhansi	Urulikanchan	Jabalpur	Average	Rank	Superiority%
SKO-96	17.5	18.2	13.4	16.4	5		6.3	15.6	15.0	12.3	5	
JO-03-291	32.5	14.9	14.4	20.6	3		18.1	23.6	35.0	25.6	1	0.4
SKO-133	14.0	17.4	16.5	16.0	6		3.8	13.2	18.8	11.9	6	
OS-6 (NC)	35.9	18.5	17.9	24.1	1		17.2	16.8	23.1	19.0	4	
Kent (NC)	33.8	15.9	15.5	21.7	2		22.3	21.3	26.1	23.3	3	
Palampur-1 (ZC-HZ)												
OL-125 (ZC-NWZ)												
JHO-99-2 (ZC-NEZ)	33.3	14.1	12.1	19.8	4							
JHO-822 (ZC-CZ)							25.6	17.8	32.1	25.2	2	
JHO-2000-4 (ZC-SZ)												
Mean	26.7	17.0	15.5	19.7			13.5	18.1	23.6	18.4		
CD at 5%	5.7	2.3	1.5				3.2	0.7	6.6			
CV%	13.5	15.5	3.4				2.2	10.1	16.3			

Table 6 AVT Oat (SC)-2 (Seed): Advanced Varietal Trial -2 in Oat (Single cut) for seed: Seed Yield (q/ha)

Entries	South Zone						All India		
	Hyderabad	Mandya	Coimbatore	Average	Rank	Superiority%	Average	Rank	Superiority%
SKO-96	1.8	5.0	21.0	9.3	6		14.6	4	
JO-03-291	8.3	14.9	18.8	14.0	2		20.7	2	
SKO-133	2.2	8.8	21.2	10.7	5		13.1	5	
OS-6 (NC)	8.9	19.7	20.1	16.2	1		21.7	1	
Kent (NC)	7.5	13.6	19.6	13.6	3		20.5	3	
Palampur-1 (ZC-HZ)									
OL-125 (ZC-NWZ)									
JHO-99-2 (ZC-NEZ)									
JHO-822 (ZC-CZ)									
JHO-2000-4 (ZC-SZ)	7.3	8.7	17.0	11.0	4		18.1		
Mean	5.8	12.4	20.1	12.8					
CD at 5%	1.1	1.5	1.8						
CV%	12.3	8.7	6.1						

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

(Table Reference: 7.1 to 7.10)

An initial varietal trial in Oat (Multi cut) comprising six entries namely UPO-10-3, JHO-2010-4, JHO-2010-3, OL-1690, OS-387 and JO-03-309 along with three national checks i.e. RO-19, UPO-212 and Kent and three zonal checks for respective zones i.e. Palampur-1, JHO-2000-4 and JHO-822 was conducted at 18 centres located in four zones *viz*., Hill, North-West, North-East and Central Zone. Results of the trial reported from different centres clearly revealed that for green forage as well as dry matter yield (q/ha), none of the testing entries exhibited their superiority at zonal or national level in comparison to best zonal or national check except for entry JO-03-309 (2.41%) in Central Zone for dry matter yield (q/ha). For green forage yield (q/ha), national check RO-19 ranked first in all the zones as well as at national level. Similarly for dry matter yield (q/ha), check UPO-212 in Hill Zone, JHO-2000-4 in North-West Zone, RO-19 in North-East Zone, entry JO-03-309 in Central Zone and RO-19 at national level exhibited superiority.

For the character forage production potential (q/ha/day), national check RO-19 for green forage and entry UPO-10-3 for dry matter production potential (q/ha/day) registered their superiority over other entries. Same was the trend for character plant height (cm) and leaf stem ratio.

In quality parameters, national checks RO-19 and Kent were adjudged best performer for character crude protein yield (q/ha) and crude protein content (%). For other quality parameters like ADF and NDF (%), check UPO-212 was recorded best performer.

Table 7.1 IVT Oat (Multi Cut): Initial Varietal Trial in Oat (Multi Cut): Green Forage Yield (q/ha)

Cont…

Entries	Hill Zone					North-West Zone							
	Palampur	Srinagar	Average	Rank	Superiority%	Pantnagar	Hisar	Jalore	Ludhiana	Udaipur	Average	Rank	Superiority%
UPO-10-3	280.5	464.1	372.3	9		359.0	385.1	737.0	763.0	500.0	548.8	6	
JHO-2010-4	321.0	481.9	401.5	4		254.1	362.9	621.5	822.2	525.9	517.3	8	
JHO-2010-3	308.3	480.0	394.2	6		305.7	374.0	491.4	744.4	540.7	491.2	10	
OL-1690	335.5	485.9	410.7	2		302.4	414.8	649.1	822.2	603.7	558.4	3	
OS-387	285.5	431.2	358.4	10		278.2	370.3	595.5	740.7	600.0	516.9	9	
JO-03-309	377.2	427.5	402.4	3		297.4	437.0	599.7	813.0	600.0	549.4	4	
RO-19 (NC)	411.6	432.3	422.0	1		294.0	448.1	682.9	920.4	555.6	580.2	1	
UPO-212 (NC)	338.3	427.8	383.1	8		307.4	407.4	652.5	833.3	603.7	560.9	2	
Kent (NC)	343.3	458.3	400.8	5		313.2	400.0	559.4	798.1	518.5	517.8	7	
Palampur-1 (ZC-HZ)	357.7	421.7	389.7	7									
JHO-2000-4 (ZC-NW & NEZ)						264.9	377.7	655.3	829.6	618.5	549.2	5	
JHO-822 (ZC-CZ)													
Mean	333.5	454.3	393.9			301.3	400.0	621.0	806.4	560.9	537.9		
CD at 5%	59.5	6.2				39.0	36.4	71.8	2.4	NS			
CV%	10.3	0.8				5.3	5.3	6.7	6.4	9.7			

Note: *Not included in zonal and all India average due to same yield reported for many entries (Reason is not given)

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

-Trial data not reported from Rajouri centre

Table 7.1 IVT Oat (Multi Cut): Initial Varietal Trial in Oat (Multi Cut): Green Forage Yield (q/ha)

Entries	North-East Zone								Central Zone								All India		
	Ran-chi	Faiza-bad	Jor-hat	Bhuba-neswar	Pusa*	Ave-rage	Ra-nk	Superi-ority%	Jha-nsi	Ana-nd	Jabal-pur	Ra-huri	Uruli-kanch an	Kar-jat	Ave-rage	Ra-nk	Superi-ority%	Ave-rage	Ra-nk	Superi-ority%
UPO-10-3	337.7	445.3	490.9	304.0	500.0	394.5	3		315.7	696.0	578.5	717.6	762.6	268.0	556.4	6		494.4	4	
JHO-2010-4	333.3	416.0	551.8	300.4	483.0	400.4	2		321.0	772.0	678.5	694.4	746.6	197.0	568.3	5		494.1	5	
JHO-2010-3	275.5	410.7	399.2	307.9	483.0	348.3	9		278.8	579.0	606.5	688.6	623.9	350.0	521.1	10		456.7	9	
OL-1690	355.5	358.4	447.1	293.3	466.0	363.6	7		394.4	803.0	638.5	593.1	735.9	320.0	580.8	3		503.1	3	
OS-387	346.6	357.3	440.4	346.1	450.0	372.6	6		334.6	833.0	685.1	691.5	623.9	265.0	572.2	4		483.8	6	
JO-03-309	328.8	437.3	465.1	341.7	483.0	393.2	5		365.4	730.0	807.7	656.8	693.3	356.0	601.5	2		513.8	2	
RO-19 (NC)	497.7	421.3	441.2	364.4	466.0	431.2	1		375.7	826.0	630.5	703.1	885.3	228.0	608.1	1		536.4	1	
UPO-212 (NC)	288.8	224.0	437.3	340.8	483.0	322.7	10		338.5	803.0	658.5	517.9	655.9	335.0	551.5	7		480.6	8	
Kent (NC)	297.7	453.3	466.7	358.6	466.0	394.1	4		328.2	734.0	706.5	651.0	661.3	174.0	542.5	8		483.7	7	
Palampur-1 (ZC-HZ)																				
JHO-2000-4 (ZC-NW & NEZ)	302.2	402.1	393.7	310.1	483.0	352.0	8													
JHO-822 (ZC-CZ)									301.6	690.0	634.5	682.8	591.9	250.0	525.1	9				
Mean	340.2	391.5	460.0	328.6	475.6	380.1			339.1	752.9	665.6	657.1	709.9	277.0	566.9			494.1		
CD at 5%	52.9	75.3	11.9	2.0	43.2				23.0	64.8	144.6	75.5	45.5	38.2						
CV%	9.2	11.2	10.4	4.8	8.7				13.4	5.1	12.7	6.6	12.4	8.3						

Table 7.2 IVT Oat (Multi Cut): Initial Varietal Trial in Oat (Multi Cut): Dry Matter Yield (q/ha)

Cont…

Entries	Hill Zone					North-West Zone						
	Palam-pur	Sri-nagar	Average	Rank	Superi-ority%	Pant-nagar	Hisar	Ludhi-ana	Udaipur**	Average	Rank	Superi-ority%
UPO-10-3	44.2	114.0	79.1	7		55.7	51.8	125.6	190.9	106.0	10	
JHO-2010-4	45.5	124.5	85.0	3		35.1	55.7	128.0	210.4	107.3	9	
JHO-2010-3	48.2	122.0	85.1	2		51.7	64.5	108.5	208.7	108.4	7	
OL-1690	47.2	118.5	82.9	5		40.8	53.3	131.2	251.1	119.1	3	
OS-387	43.3	106.0	74.7	10		41.5	62.1	110.9	231.1	111.4	6	
JO-03-309	53.1	103.9	78.5	9		48.1	64.7	129.8	241.7	121.1	2	
RO-19 (NC)	51.9	105.8	78.9	8		43.4	51.5	153.0	211.6	114.9	5	
UPO-212 (NC)	46.5	150.1	98.3	1		39.0	56.6	132.3	232.4	115.1	4	
Kent (NC)	55.1	111.5	83.3	4		50.4	58.2	122.8	200.2	107.9	8	
Palampur-1 (ZC-HZ)	51.3	110.6	81.0	6								
JHO-2000-4 (ZC-NW & NEZ)						39.2	58.3	131.8	261.1	122.6	1	
JHO-822 (ZC-CZ)												
Mean	48.3	117.4	82.9			45.1	57.6	126.9	219.8	112.3		
CD at 5%	NS	6.8				7.1	5.5	3.1	NS			
CV%	10.2	3.5				9.4	5.6	7.2	20.1			

Table 7.2 IVT Oat (Multi Cut): Initial Varietal Trial in Oat (Multi Cut): Dry Matter Yield (q/ha)

Entries	North-East Zone								Central Zone									All India		
	Ran-chi	Faiza-bad	Jor-hat	Bhuba-neswar	Pu-sa*	Ave-rage	Ra-nk	Superi-ority%	Jha-nsi	An-and	Jabal-pur	Ra-huri	Uruli-kanchan	Kar-jat	Ave-rage	Ra-nk	Superi-ority%	Ave-rage	Ra-nk	Superi-ority%
UPO-10-3	97.0	104.5	69.0	61.1	102.5	82.9	2		105.0	103.8	118.7	113.8	108.6	122.0	112.0	4		93.0	3	
JHO-2010-4	73.1	99.2	77.9	60.5	100.5	77.7	3		103.8	117.0	144.6	115.2	113.0	59.0	108.8	5		90.1	5	
JHO-2010-3	59.5	92.8	63.3	62.9	101.6	69.6	8		96.5	83.1	128.7	112.8	120.9	87.0	104.8	8		86.8	8	
OL-1690	65.6	86.9	69.5	60.0	97.3	70.5	7		107.7	105.9	134.9	103.1	106.1	89.0	107.8	6		88.0	6	
OS-387	71.7	82.1	67.4	69.7	94.7	72.7	6		111.5	105.1	165.1	102.3	100.2	62.0	107.7	7		86.7	9	
JO-03-309	62.4	104.5	64.5	70.1	100.4	75.4	4		117.7	89.3	175.8	106.3	111.3	114.0	119.1	1	2.4	94.4	2	
RO-19 (NC)	93.8	106.4	65.7	71.5	97.9	84.4	1		127.7	139.0	156.6	106.8	123.9	44.0	116.3	2		96.1	1	
UPO-212 (NC)	52.4	48.0	65.2	72.3	101.3	59.5	10		106.7	127.5	139.3	94.4	99.3	123.0	115.0	3		90.2	4	
Kent (NC)	57.8	97.6	68.7	70.9	98.1	73.8	5		104.6	101.1	148.7	101.5	101.3	53.0	101.7	9		86.9	7	
Palampur-1 (ZC-HZ)																				
JHO-2000-4 (ZC-NW & NEZ)	57.2	99.7	58.6	60.1	100.7	68.9	9													
JHO-822 (ZC-CZ)									103.8	98.7	134.5	84.9	84.6	72.0	96.4					
Mean	70.4	91.3	67.9	66.6	99.4	74.0			109.0	108.0	145.8	106.2	109.4	83.7	110.4			90.2		
CD at 5%	13.6	18.2	6.4	3.9	17.6				19.9	9.5	26.9	13.1	16.7	13.1						
CV%	11.5	11.5	14.5	4.6	11.2				11.6	5.2	10.8	7.3	12.2	9.5						

Table 7.3 IVT Oat (Multi Cut): Initial Varietal Trial in Oat (Multi Cut): Green Forage Yield (q/ha/day)

Cont…

Entries	Bhubaneswar	Ranchi	Hisar	Anand	Ludhiana	Faizabad	Rahuri	Jhansi
UPO-10-3	3.89	2.79	3.06	6.63	6.58	4.45	5.88	3.10
JHO-2010-4	3.85	3.24	2.94	8.04	7.09	4.28	5.94	3.21
JHO-2010-3	3.98	2.73	3.16	6.51	6.42	4.28	6.44	2.85
OL-1690	3.78	3.42	3.30	8.19	7.09	3.51	5.20	3.94
OS-387	4.40	3.30	3.01	8.50	6.39	3.40	5.91	3.37
JO-03-309	4.38	3.99	3.46	7.60	7.01	4.08	5.66	3.61
RO-19 (NC)	4.61	4.44	3.54	7.87	7.93	4.25	6.01	3.56
UPO-212 (NC)	4.39	2.89	3.37	9.02	7.19	2.28	4.50	3.38
Kent (NC)	4.52	2.92	3.33	8.25	6.88	4.19	5.61	3.28
Palampur-1 (ZC-HZ)								
JHO-2000-4 (ZC-NW & NEZ)	4.06	2.99	3.10		7.15	4.14		
JHO-822 (ZC-CZ)				7.04			6.32	3.03
Mean	4.20	3.30	3.24	7.85	6.95	3.86	5.68	3.37

Table 7.3 IVT Oat (Multi Cut): Initial Varietal Trial in Oat (Multi Cut): Green Forage Yield (q/ha/day)

Entries	Pantnagar	Jorhat	Urulikanchan	Karjat	Srinagar	Pusa*	Average	Rank
UPO-10-3	3.15	4.50	5.88	3.43	2.45	5.32	4.29	7
JHO-2010-4	2.23	5.06	5.94	2.59	2.61	5.08	4.39	3
JHO-2010-3	2.68	3.87	6.44	4.38	2.64	5.14	4.34	5
OL-1690	2.65	3.99	5.20	4.15	2.63	5.01	4.39	3
OS-387	2.44	4.04	5.91	3.35	2.33	4.79	4.33	6
JO-03-309	2.61	4.51	5.66	4.51	2.34	5.14	4.57	2
RO-19 (NC)	2.58	4.42	6.01	2.82	2.34	5.01	4.64	1
UPO-212 (NC)	2.70	4.24	4.50	4.18	2.31	5.19	4.23	8
Kent (NC)	2.75	4.53	5.61	2.23	2.47	5.06	4.35	4
Palampur-1 (ZC-HZ)					2.25			
JHO-2000-4 (ZC-NW & NEZ)	2.32	3.82				5.14		
JHO-822 (ZC-CZ)			6.32	3.38				
Mean	2.64	4.35	5.68	3.52	2.46	5.08	4.39	

Table 7.4 IVT Oat (Multi Cut): Initial Varietal Trial in Oat (Multi Cut): Dry matter Yield (q/ha/day)

Entries	Bhuba-neswar	Ran-chi	Hisar	Anand	Ludhi-ana	Faiza-bad	Jorhat	Sri-nagar	Karjat	Pant-nagar	Jhansi	Pusa*	Ave-rage	Rank
UPO-10-3	0.78	0.80	0.41	0.99	1.09	1.04	0.63	0.60	1.56	0.49	1.03	1.07	0.86	1
JHO-2010-4	0.78	0.71	0.45	1.22	1.11	1.02	0.71	0.66	0.77	0.31	1.04	1.06	0.80	4
JHO-2010-3	0.81	0.59	0.54	0.93	0.94	0.97	0.61	0.65	1.09	0.45	0.99	1.08	0.78	6
OL-1690	0.77	0.63	0.42	1.08	1.14	0.85	0.62	0.63	1.15	0.36	1.08	1.05	0.79	5
OS-387	0.89	0.68	0.51	1.07	0.96	0.78	0.61	0.56	0.79	0.36	1.12	1.01	0.76	8
JO-03-309	0.90	0.62	0.51	0.93	1.13	0.98	0.62	0.56	1.44	0.42	1.16	1.06	0.84	2
RO-19 (NC)	0.91	0.84	0.41	1.21	1.33	1.07	0.66	0.59	0.54	0.38	1.21	1.05	0.83	3
UPO-212 (NC)	0.93	0.52	0.47	1.43	1.15	0.49	0.63	0.56	1.54	0.34	1.07	1.09	0.83	3
Kent (NC)	0.89	0.57	0.49	1.14	1.07	0.90	0.66	0.61	0.68	0.44	1.05	1.07	0.77	7
Palampur-1 (ZC-HZ)								0.55						
JHO-2000-4 (ZC-NW & NEZ)	0.79	0.57	0.48		1.15	1.02	0.56			0.34		1.07		
JHO-822 (ZC-CZ)				1.01					0.98		1.04			
Mean	0.85	0.66	0.47	1.11	1.10	0.90	0.64	0.60	1.06	0.39	1.08	1.06	0.81	

Table 7.5 IVT Oat (Multi Cut): Initial Varietal Trial in Oat (Multi Cut): Crude Protein Yield (q/ha)

Entries	Bhuba-neswar	Rahuri	Palam-pur	Hisar	Faiza-bad	Ludhi-ana	Anand	Jabal-pur	Ranchi	Jorhat	Uruli-kanchan	Ave-rage	Rank
UPO-10-3	6.1	9.1	4.5	5.4	8.6	13.2	13.6	9.0	7.2	6.5	11.7	8.6	5
JHO-2010-4	6.2	9.7	4.7	7.1	7.9	14.3	15.4	11.4	5.1	8.1	12.5	9.3	2
JHO-2010-3	6.4	8.9	4.6	7.3	7.7	11.5	11.5	9.7	4.7	6.3	13.4	8.4	6
OL-1690	6.0	8.1	4.4	5.8	6.3	15.1	14.6	10.4	4.9	7.8	11.6	8.6	5
OS-387	7.0	8.1	5.1	6.7	6.4	13.1	16.4	13.2	5.3	6.5	10.9	9.0	4
JO-03-309	7.0	9.1	4.6	9.0	8.7	13.6	13.9	14.0	4.6	5.5	11.9	9.3	2
RO-19 (NC)	7.3	8.6	5.6	6.9	8.5	15.0	20.2	12.3	6.6	6.4	13.8	10.1	1
UPO-212 (NC)	7.1	7.7	4.6	6.3	3.6	15.6	15.9	10.5	4.1	5.7	11.5	8.4	6
Kent (NC)	7.1	8.0	5.3	8.9	8.6	13.4	14.8	11.6	4.6	7.3	11.3	9.2	3
Palampur-1 (ZC-HZ)			4.8										
JHO-2000-4 (ZC-NW & NEZ)	6.1			6.8	8.1	15.3			4.8	6.2		7.9	7
JHO-822 (ZC-CZ)		7.6					14.6	10.1			9.2		
Mean	6.7	8.6	4.8	7.0	7.4	13.9	15.1	11.3	5.2	6.7	12.1	9.0	

Table 7.6 IVT Oat (Multi Cut): Initial Varietal Trial in Oat (Multi Cut): Crude Protein (%)

Entries	Bhuba-neswar	Rahuri	Palam-pur	Hisar	Faiza-bad	Ludhi-ana	Anand	Ranchi	Jorhat	Uruli-kanchan	Average	Rank
UPO-10-3	10.0	8.0	10.2	10.6	8.2	10.5	14.5	7.4	9.7	10.8	10.0	8
J HO-2010-4	10.2	8.5	10.2	14.7	8.0	11.2	15.8	7.0	10.9	11.1	10.8	2
JHO-2010-3	10.2	7.9	9.6	14.2	8.3	10.6	15.8	7.9	10.3	11.1	10.6	4
OL-1690	10.0	7.9	9.3	11.4	7.3	11.5	15.5	7.4	11.1	11.0	10.2	7
OS-387	10.0	7.9	11.7	12.6	7.8	11.8	18.1	7.4	9.0	10.8	10.7	3
JO-03-309	10.0	8.6	8.8	14.1	8.3	10.5	16.4	7.4	9.0	10.7	10.4	6
RO-19 (NC)	10.2	8.0	10.8	14.6	8.0	9.8	16.9	7.0	10.3	11.1	10.7	3
UPO-212 (NC)	9.8	8.2	10.5	13.9	7.5	11.8	14.7	7.9	8.7	11.5	10.5	5
Kent (NC)	10.0	7.9	9.6	16.1	8.8	10.9	16.2	7.9	11.1	11.2	11.0	1
Palampur-1 (ZC-HZ)			9.3									
JHO-2000-4 (ZC-NW & NEZ)	10.1			12.8	8.1	11.6		8.3	10.8			
JHO-822 (ZC-CZ)		8.9					15.9			10.9		
Mean	10.0	8.1	10.1	13.6	8.0	11.0	16.0	7.5	10.0	11.0	10.5	

Table 7.7 IVT Oat (Multi Cut): Initial Varietal Trial in Oat (Multi Cut): Plant Height (cm)

Cont…

Entries	Bhubaneswar	Rahuri	Palampur	Ranchi	Jabalpur	Anand	Ludhiana	Faizabad	Jorhat	Hisar
UPO-10-3	143.6	82.0	73.0	86.3	86.7	95.1	85.3	142.2	130.2	62.1
JHO-2010-4	141.5	73.0	75.2	88.8	93.7	96.3	87.3	133.5	110.8	59.3
JHO-2010-3	145.7	65.0	74.7	88.6	80.4	93.5	79.3	135.6	151.1	56.3
OL-1690	139.8	73.0	76.7	92.4	82.1	106.5	89.7	132.8	125.9	59.9
OS-387	155.7	76.0	78.8	105.1	82.1	95.7	97.0	138.6	112.2	54.9
JO-03-309	148.7	79.0	88.7	86.5	98.9	111.1	83.3	144.8	113.6	65.0
RO-19 (NC)	164.1	83.0	87.5	103.6	95.3	117.0	89.7	143.5	119.9	66.1
UPO-212 (NC)	153.9	77.0	84.7	90.3	89.3	106.7	83.0	103.8	117.9	66.5
Kent (NC)	158.2	72.0	86.5	91.9	77.6	95.1	88.3	148.7	113.5	64.3
Palampur-1 (ZC-HZ)			71.5							
JHO-2000-4 (ZC-NW & NEZ)	146.9			91.6			85.3	128.4	119.8	68.5
JHO-822 (ZC-CZ)		72.0			75.5	101.2				
Mean	150.1	75.6	80.6	92.6	87.3	101.9	87.0	135.9	121.7	61.6

Table 7.7 IVT Oat (Multi Cut): Initial Varietal Trial in Oat (Multi Cut): Plant Height (cm)

Entries	Urulikanchan	Jhansi	Pantnagar	Karjat	Srinagar	Udaipur	Average	Rank
UPO-10-3	52.8	103.3	128.8	91.8	130.8	125.5	101.2	5
JHO-2010-4	60.4	94.0	94.3	94.6	108.6	136.7	96.8	9
JHO-2010-3	60.7	92.3	103.6	107.5	121.2	131.6	99.2	8
OL-1690	62.0	110.7	103.9	110.5	132.0	139.3	102.3	4
OS-387	52.5	94.3	117.5	86.1	111.6	142.6	100.0	7
JO-03-309	59.9	99.7	108.9	105.1	132.3	149.9	104.7	2
RO-19 (NC)	60.0	109.0	123.9	116.5	115.7	153.6	109.3	1
UPO-212 (NC)	64.1	112.0	125.1	102.1	129.8	140.5	102.9	3
Kent (NC)	59.1	85.7	113.7	96.7	120.9	133.0	100.3	6
Palampur-1 (ZC-HZ)					131.2			
JHO-2000-4 (ZC-NW & NEZ)			121.4			145.3		
JHO-822 (ZC-CZ)	62.3	102.3		102.5				
Mean	59.1	100.1	113.3	101.2	122.5	139.2	101.9	

Table 7.8 IVT Oat (Multi Cut): Initial Varietal Trial in Oat (Multi Cut): Leaf Stem Ratio

Cont…

Entries	Bhubaneswar	Rahuri	Palampur	Ranchi	Jabalpur	Ludhiana	Faizabad	Jorhat
UPO-10-3	0.99	0.76	0.65	0.37	0.86	0.43	0.69	0.69
JHO-2010-4	1.10	0.76	0.53	0.29	0.78	0.54	0.68	0.82
JHO-2010-3	0.95	0.76	0.63	0.87	0.68	0.43	0.84	0.58
OL-1690	0.78	1.01	0.54	0.37	0.88	0.54	0.83	0.82
OS-387	0.11	1.01	0.53	0.35	0.97	0.54	0.81	0.91
JO-03-309	0.82	0.79	0.59	0.32	1.20	0.43	0.85	1.03
RO-19 (NC)	1.15	0.71	0.54	0.36	0.86	0.43	0.78	0.93
UPO-212 (NC)	1.11	0.74	0.50	0.32	0.92	0.43	0.72	0.97
Kent (NC)	1.10	0.92	0.60	0.26	0.89	0.33	0.89	0.91
Palampur-1 (ZC-HZ)			0.67					
JHO-2000-4 (ZC-NW & NEZ)	0.85			0.31		0.43	0.75	0.77
JHO-822 (ZC-CZ)		0.88			0.93			
Mean	0.90	0.83	0.57	0.39	0.89	0.46	0.79	0.85

Table 7.8 IVT Oat (Multi Cut): Initial Varietal Trial in Oat (Multi Cut): Leaf Stem Ratio

Entries	Urulikanchan	Jhansi	Pantnagar	Karjat	Udaipur	Pusa*	Average	Rank
UPO-10-3	1.03	0.43	0.39	1.58	0.38	0.98	0.71	1
JHO-2010-4	0.97	0.38	0.73	1.30	0.28	0.93	0.70	2
JHO-2010-3	0.85	0.35	0.52	0.45	0.18	0.92	0.62	7
OL-1690	0.97	0.47	0.46	1.04	0.25	0.89	0.69	3
OS-387	0.87	0.34	0.60	1.35	0.22	0.87	0.66	6
JO-03-309	0.84	0.38	0.38	1.21	0.28	0.97	0.70	2
RO-19 (NC)	1.03	0.35	0.46	0.89	0.31	0.87	0.68	4
UPO-212 (NC)	0.81	0.42	0.49	1.06	0.20	0.97	0.67	5
Kent (NC)	0.85	0.41	0.49	1.00	0.16	0.93	0.68	4
Palampur-1 (ZC-HZ)								
JHO-2000-4 (ZC-NW & NEZ)			0.57		0.26	0.89		
JHO-822 (ZC-CZ)	0.86	0.32		0.92				
Mean	0.91	0.39	0.50	1.10	0.25	0.93	0.68	

Table 7.9 IVT Oat (Multi Cut): Initial Varietal Trial in Oat (Multi Cut): IVDMD (%) & DDM (q/ha)

Entries	IVDMD (%)				DDM (q/ha)	
	Ludhiana	Hisar	Average	Rank	Hisar	Rank
UPO-10-3	61.0	65.0	63.0	1	33.4	7
JHO-2010-4	61.8	61.8	61.8	4	33.8	5
JHO-2010-3	61.4	57.7	59.6	9	35.7	5
OL-1690	61.2	60.3	60.8	7	32.1	10
OS-387	62.0	60.9	61.5	5	35.8	2
JO-03-309	61.0	62.7	61.9	3	40.5	1
RO-19 (NC)	59.0	63.1	61.1	6	32.3	9
UPO-212 (NC)	62.2	61.9	62.1	2	35.0	4
Kent (NC)	61.0	59.1	60.1	8	33.7	6
Palampur-1 (ZC-HZ)						
JHO-2000-4 (ZC-NW & NEZ)	61.0	55.8	58.4	10	32.8	8
JHO-822 (ZC-CZ)						
Mean	61.2	61.4	61.3		34.7	

Table 7.10 IVT Oat (Multi Cut): Initial Varietal Trial in Oat (Multi Cut): ADF (%) & NDF (%)

Entries	ADF (%)		NDF (%)	
	Ludhiana	Rank	Ludhiana	Rank
UPO-10-3	40.5	9	53.2	6
JHO-2010-4	36.7	5	52.3	4
JHO-2010-3	39.3	6	53.4	7
OL-1690	36.2	3	52.0	3
OS-387	36.0	2	51.8	2
JO-03-309	40.2	8	53.8	8
RO-19 (NC)	41.6	10	55.6	9
UPO-212 (NC)	35.0	1	51.1	1
Kent (NC)	39.4	7	52.8	5
Palampur-1 (ZC-HZ)				
JHO-2000-4 (ZC-NW & NEZ)	36.2	4	52.3	4
JHO-822 (ZC-CZ)				
Mean	38.3		52.9	

8. AVTO (MC)-1: FIRST ADVANCED VARIETAL TRIAL IN OAT (MULTI CUT)

(Table Reference: 8.1 to 8.9)

In Oat (Multi cut), four entries namely UPO-09-3, JO-03-301, JO-03-307 and JHO-2009-3 promoted from IVT were evaluated against three national checks i.e. UPO-212, Kent and RO-19 and zonal checks in respective zones i.e. Palampur-1 and JHO-822 at seven locations in Hill and Central Zone. Results reported from different centres clearly revealed that for green forage yield (q/ha), entries JO-03-301 (15.3%) and JO-03-307 (4.4%) in Hill Zone and UPO-09-3 (4.1%) in Central Zone expressed their superiority over best zonal or national check. At national level, entry UPO-09-3 (2.3%) ranked first. Similarly for dry matter yield (q/ha), entries JO-03-301 (10.0%) and JHO-2009-3 (5.3%) in Hill Zone and UPO-09-3 (7.2%) and JHO-2009-3 (5.3%) in Central Zone recorded their superiority. Even at national level, entries JHO-2009-3 (5.9%) and UPO-09-3 (5.7%) were recorded best performer.

Coming to the forage production potential (q/ha/day), entry JHO-2009-3 was adjudged best performer for green forage yield (5.07q/ha/day) as well as dry matter yield (1.20q/ha/day). For the character plant height (cm), entry UPO-09-3 (91.2cm) ranked first followed by JO-03-301 (91.1cm) and JO-03-307 (88.1cm). However for the character leaf stem ratio, national check RO-19 (0.81) proved superiority.

In quality parameters, entries UPO-09-3 (10.8 q/ha) and JHO-2009-3 (10.6 q/ha) for crude protein yield and JO-03-307 (10.5%) and UPO-09-3 (9.9%) for crude protein content were recorded good performer. For other quality parameters, check RO-19 for ADF(%), Kent for NDF(%) and JHO-2009-3 for IVDMD (%) was adjudged best performer.

Table 8.1 AVT Oat (Multi Cut)-1: First Advanced Varietal Trial in Oat (Multi Cut): Green Forage Yield (q/ha)

Entries	Hill Zone					Central Zone								All India		
	Palam-pur	Sri-nagar	Ave-rage	Rank	Superi-ority%	Jhansi	Rahuri	Jabal-pur	Uruli-kanchan	Anand	Ave-rage	Rank	Superi-ority%	Ave-rage	Rank	Superi-ority%
UPO-09-3	250.0	391.8	320.9	8		194.8	622.7	707.0	876.1	854.0	650.9	1	4.1	556.6	1	2.3
JO-03-301	343.3	466.6	405.0	1	15.3	213.1	661.5	692.0	681.8	743.0	598.3	4		543.0	3	
JO-03-307	306.6	426.4	366.5	2	4.4	255.6	608.4	601.0	655.2	825.0	589.0	6		525.5	5	
JHO-2009-3	258.3	435.6	347.0	5		242.2	692.1	624.0	613.3	843.0	602.9	3		529.8	4	
UPO-212 (NC)	298.3	383.7	341.0	6		209.2	639.0	671.0	750.4	856.0	625.1	2		543.9	2	
Kent (NC)	293.3	373.4	333.4	7		217.5	620.7	533.0	537.1	707.0	523.1	8		468.9	7	
RO-19 (NC)	276.6	421.3	349.0	4		211.3	716.6	711.0	571.4	753.0	592.7	5		523.0	6	
Palampur-1 (ZC-HZ)	293.3	409.0	351.2	3												
JHO-822 (ZC-CZ)						238.8	767.7	692.0	521.8	716.0	587.3	7				
Mean	291.3	420.8	356.1			223.0	644.7	659.0	715.4	824.2	613.3					
CD at 5%	28.0	1.2				28.5	70.8	117.3	31.5	74.5						
CV%	5.3	8.4				16.2	6.1	10.0	17.5	5.4						

Table 8.2 AVT Oat (Multi Cut)-1: First Advanced Varietal Trial in Oat (Multi Cut): Dry Matter Yield (q/ha)

Entries	Hill Zone					Central Zone								All India		
	Palam-pur	Sri-nagar	Ave-rage	Rank	Superi-ority%	Jhansi	Rahuri	Jabal-pur	Uruli-kanchan	Anand	Ave-rage	Rank	Superi-ority%	Ave-rage	Rank	Superi-ority%
UPO-09-3	14.6	92.1	53.4	7		110.0	105.0	152.6	139.8	156.0	132.7	1	7.2	110.0	2	5.7
JO-03-301	14.6	111.0	62.8	1	10.0	113.8	99.8	148.8	108.5	107.3	115.6	5		100.5	4	
JO-03-307	14.6	99.8	57.2	3	0.2	129.3	102.8	128.0	108.6	113.1	116.4	4		99.5	5	
JHO-2009-3	15.6	104.5	60.1	2	5.3	129.4	115.4	131.4	114.8	161.0	130.4	2	5.3	110.3	1	5.9
UPO-212 (NC)	16.2	93.5	54.9	6		112.3	108.5	142.9	142.8	112.3	123.8	3		104.1	3	
Kent (NC)	14.9	87.4	51.2	8		109.9	96.2	109.3	92.2	105.0	102.5	8		87.8	7	
RO-19 (NC)	14.5	99.4	57.0	5		109.7	102.9	150.3	102.2	97.1	112.4	7		96.6	6	
Palampur-1 (ZC-HZ)	16.9	97.3	57.1	4												
JHO-822 (ZC-CZ)						117.2	118.7	148.1	92.1	100.9	115.4	6				
Mean	15.1	98.1	56.6			117.5	104.6	135.5	117.8	125.8	120.2					
CD at 5%	NS	1.2				17.9	12.4	24.0	17.7	10.9						
CV%	8.4	2.1				10.2	6.7	9.9	17.6	5.2						

Table 8.3 AVT Oat (Multi Cut)-1: First Advanced Varietal Trial in Oat (Multi Cut): Green Forage Yield (q/ha/day)

Entries	Anand	Jhansi	Rahuri	Srinagar	Average	Rank
UPO-09-3	8.13	1.92	5.66	2.10	4.45	6
JO-03-301	7.58	2.13	6.13	2.50	4.59	4
JO-03-307	8.51	2.56	5.34	2.33	4.69	3
JHO-2009-3	8.97	2.47	6.47	2.37	5.07	1
UPO-212 (NC)	9.62	2.11	5.86	2.09	4.92	
Kent (NC)	7.29	2.20	5.40	2.03	4.23	7
RO-19 (NC)	7.68	2.10	6.02	2.32	4.53	5
Palampur-1 (ZC-HZ)				2.18		
JHO-822 (ZC-CZ)	7.54	2.44	6.98			
Mean	8.56	2.24	5.89	2.28	4.74	

Table 8.4 AVT Oat (Multi Cut)-1: First Advanced Varietal Trial in Oat (Multi Cut): Dry Matter Yield (q/ha/day)

Entries	Anand	Srinagar	Jhansi	Average	Rank
UPO-09-3	1.49	0.49	1.09	1.02	2
JO-03-301	1.09	0.61	1.14	0.95	5
JO-03-307	1.17	0.55	1.29	1.00	3
JHO-2009-3	1.71	0.57	1.32	1.20	1
UPO-212 (NC)	1.26	0.51	1.13	0.97	4
Kent (NC)	1.08	0.48	1.11	0.89	6
RO-19 (NC)	0.99	0.54	1.09	0.87	7
Palampur-1 (ZC-HZ)		0.52			
JHO-822 (ZC-CZ)	1.06		1.20		
Mean	1.34	0.55	1.19	1.03	

Table 8.5 AVT Oat (Multi Cut)-1: First Advanced Varietal Trial in Oat (Multi Cut): Crude Protein Yield (q/ha)

Entries	Palampur	Rahuri	Urulikanchan	Jabalpur	Anand	Average	Rank
UPO-09-3	4.8	8.9	11.5	12.2	16.4	10.8	1
JO-03-301	5.1	8.2	8.3	11.7	13.3	9.3	5
JO-03-307	6.8	8.8	8.7	10.1	15.9	10.1	4
JHO-2009-3	4.3	9.4	8.9	10.1	20.1	10.6	2
UPO-212 (NC)	4.7	8.5	11.7	11.3	16.5	10.5	3
Kent (NC)	5.7	7.6	7.3	8.5	13.4	8.5	6
RO-19 (NC)	5.1	9.0	7.6	12.1	12.8	9.3	5
Palampur-1 (ZC-HZ)	5.0						
JHO-822 (ZC-CZ)		9.9	7.4	11.9	13.9		
Mean	5.2	8.8	9.8	11.1	16.4	10.3	

Table 8.6 AVT Oat (Multi Cut)-1: First Advanced Varietal Trial in Oat (Multi Cut): Crude Protein (%)

Entries	Palampur	Rahuri	Urulikanchan	Anand	Jabalpur	Average	Rank
UPO-09-3	11.4	8.5	8.3	13.3	8.0	9.9	2
JO-03-301	11.4	8.2	7.6	14.1	7.9	9.8	3
JO-03-307	12.3	8.6	7.9	16.0	7.9	10.5	1
JHO-2009-3	9.0	8.2	7.8	15.2	7.9	9.6	5
UPO-212 (NC)	9.6	7.9	8.2	15.8	8.0	9.9	2
Kent (NC)	10.5	7.9	7.9	15.3	7.8	9.9	2
RO-19 (NC)	10.8	8.8	7.4	13.7	8.0	9.7	4
Palampur-1 (ZC-HZ)	10.5						
JHO-822 (ZC-CZ)		8.3	8.0	15.2	8.1		
Mean	10.7	8.3	8.0	14.9	7.9	10.0	

Table 8.7 AVT Oat (Multi Cut)-1: First Advanced Varietal Trial in Oat (Multi Cut): Plant Height (cm)

Entries	Palampur	Rahuri	Urulikanchan	Jhansi	Jabalpur	Srinagar	Anand	Average	Rank
UPO-09-3	73.7	65.0	58.3	86.0	114.7	134.8	105.6	91.2	1
JO-03-301	74.2	65.0	61.6	86.0	103.5	134.3	113.4	91.1	2
JO-03-307	79.8	65.0	60.7	89.8	105.2	99.2	117.1	88.1	3
JHO-2009-3	72.7	60.0	52.1	79.8	96.9	113.4	99.4	82.0	6
UPO-212 (NC)	79.8	64.0	57.6	82.6	98.0	124.3	104.3	87.2	4
Kent (NC)	81.3	64.0	54.1	84.3	101.0	97.8	109.0	84.5	5
RO-19 (NC)	79.8	72.0	58.7	80.7	116.1	96.2	107.2	87.2	4
Palampur-1 (ZC-HZ)	75.5					137.2			
JHO-822 (ZC-CZ)		62.0	57.3	83.7	104.2		103.4		
Mean	76.0	63.8	58.1	84.8	103.7	121.2	108.0	87.9	

Table 8.8 AVT Oat (Multi Cut)-1: First Advanced Varietal Trial in Oat (Multi Cut): Leaf Stem Ratio

Entries	Rahuri	Urulikanchan	Jhansi	Jabalpur	Palampur	Anand	Average	Rank
UPO-09-3	1.03	0.94	0.44	1.03	0.67	0.66	0.80	2
JO-03-301	0.92	0.91	0.32	0.92	0.63	0.32	0.67	6
JO-03-307	0.95	0.88	0.40	0.95	0.62	0.56	0.73	3
JHO-2009-3	0.89	0.78	0.35	0.89	0.59	0.72	0.70	4
UPO-212 (NC)	0.85	0.88	0.35	0.85	0.55	0.61	0.68	5
Kent (NC)	0.86	0.76	0.39	0.86	0.51	0.51	0.65	7
RO-19 (NC)	1.20	0.95	0.41	1.20	0.44	0.66	0.81	1
Palampur-1 (ZC-HZ)					0.66			
JHO-822 (ZC-CZ)	1.03	0.80	0.30	1.03		0.38		
Mean	0.96	0.87	0.38	0.96	0.57	0.58	0.72	

Table 8.9 AVT Oat (Multi Cut)-1: First Advanced Varietal Trial in Oat (Multi Cut): ADF (%), NDF (%) and IVDMD (%)

Entries	ADF (%)				NDF (%)					IVDMD (%)				
	Ra-huri	Palam-pur	Ave-rage	Rank	Anand	Rahuri	Palam-pur	Ave-rage	Rank	Anand	Rahuri	Palam-pur	Ave-rage	Rank
UPO-09-3	38.70	50.20	44.5	3	68.0	64.1	62.2	64.8	2	55.4	54.4	57.2	55.67	3
JO-03-301	43.20	50.20	46.7	6	75.0	65.3	64.6	68.3	6	48.8	55.5	58.6	54.30	5
JO-03-307	39.50	48.00	43.8	2	67.0	70.2	61.8	66.3	5	56.4	53.9	56.8	55.70	2
JHO-2009-3	42.20	51.20	46.7	6	68.0	66.5	64.2	66.2	4	57.2	60.4	54.6	57.40	1
UPO-212 (NC)	40.80	49.80	45.3	5	71.0	72.1	62.6	68.6	7	49.6	56.4	56.0	54.00	7
Kent (NC)	40.90	49.20	45.1	4	66.0	66.5	61.4	64.6	1	57.6	51.6	55.4	54.87	4
RO-19 (NC)	38.30	47.40	42.9	1	72.0	60.7	65.4	66.0	3	43.4	64.5	57.8	55.23	6
Palampur-1 (ZC-HZ)		51.20					64.0					55.8		
JHO-822 (ZC-CZ)	45.10				70.0	62.9				52.8	52.1			
Mean	40.9	49.9	45.4		69.8	67.6	63.1	66.8		53.5	56.1	56.6	55.41	

9. VTL (P) – 2010: VARIETAL TRIAL IN LUCERNE (PERENNIAL)-1st YEAR

(Table Reference: 9.1 to 9.8)

The varietal trial on Lucerne (Perennial) comprising nine entries along with two national checks i.e. Anand-2 and RL-88 was established during Rabi 2009-10 at ten centres of the North-West, Central and South Zone. This is the first year of evaluation and entries are in coded form, it will be decoded after completion of trial in the third and final year of evaluation. Results obtained from different centres clearly revealed that for green forage yield (q/ha), entry LP-10-7 ranked first in North-West Zone (323.9 q/ha), Central Zone (713.5 q/ha) as well as at all India level (439.8 q/ha). Similar was the trend for dry matter yield (q/ha) in which same entry LP-10-7 exhibited superiority in North-West Zone (96.3 q/ha), Central Zone (135.8 q/ha) and also at all India level (97.5 q/ha).

Coming to the fodder production potential (q/ha/day), again entry LP-10-7 ranked first both for green forage yield (2.15q/ha/day) as well as for dry matter yield (0.48q/ha/day). For the evaluation against growth parameter, entry LP-10-4 (69.1cm) ranked first for plant height whereas entry LP-10-1 (1.02) adjudged best performer for the character leaf stem ratio.

For evaluation against quality parameters, entry LP-10-9 ranked first both for crude protein yield (20.1 q/ha) and crude protein content (23.5%). For IVDMD (%), entry LP-10-11 (74.6%) was adjudged best performer.

Table 9.1 VT Lucerne (P)-2010: Varietal Trial in Lucerne (Perennial) –1st year: Green Forage Yield (q/ha)

Entries	North-West Zone						Central Zone						South Zone							All India		
	Ludhi-ana	Bika-ner	Udai-pur	Ave-rage	Ra-nk	Superi-ority%	Uruli-kanchan	Ra-huri	An-and	Ave-rage	Ra-nk	Superi-ority%	Coimba-tore	Man-dya	Dhar-wad	Hydera-bad	Ave-rage	Ra-nk	Superi-ority%	Ave-rage	Ra-nk	Superi-ority%
LP-10-1	133.3	201.8	473.9	269.7	7		484.4	727.4	619.0	610.3	10		461.1	180.8	433.8	233.2	327.2	2		394.9	8	
LP-10-2	126.4	163.9	522.2	270.8	5		573.4	725.4	664.0	654.3	6		477.2	220.0	438.9	191.6	331.9	1		410.3	2	
LP-10-3	109.7	201.5	527.8	279.7	4		428.0	702.9	618.0	583.0	11		436.1	177.5	350.2	199.9	290.9	11		375.2	10	
LP-10-4	141.7	138.7	508.3	262.9	8		580.7	755.2	757.0	697.6	2		431.9	176.3	383.8	229.1	305.3	10		410.3	2	
LP-10-5	152.8	146.9	544.4	281.4	3		477.4	727.4	753.0	652.6	7		456.9	204.9	390.1	215.9	317.0	4		407.0	3	
LP-10-6	130.6	210.8	444.4	261.9	10		628.9	687.4	684.0	666.8	4		494.4	198.9	351.9	183.3	307.1	8		401.5	5	
LP-10-7	201.4	270.8	499.6	323.9	1		633.0	727.4	780.0	713.5	1		509.7	198.6	353.9	223.5	321.4	3		439.8	1	
LP-10-8	156.9	229.9	425.0	270.6	6		515.4	743.8	732.0	663.7	5		411.1	165.1	408.9	237.4	305.6	9		402.6	4	
LP-10-9	79.2	194.4	413.9	229.2	11		552.6	692.7	783.0	676.1	3		438.9	174.3	406.1	209.6	307.2	7		394.5	9	
LP-10-10	91.7	202.8	568.9	287.8	2		387.2	756.0	731.0	624.7	9		511.4	195.1	369.6	184.6	315.2	5		399.8	6	
LP-10-11	122.2	187.2	477.7	262.4	9		476.2	707.4	755.0	646.2	8		523.6	177.3	392.4	166.6	315.0	6		398.6	7	
Mean	131.4	195.3	491.5	272.8			521.6	723.0	716.0	653.5			468.4	188.1	389.1	206.8	313.1			403.1		
CD at 5%	NS	45.5	NS				65.0	43.5	93.9				48.3	23.5	29.9	41.8						
CV%	11.7	13.7	9.7				15.9	3.5	7.7				6.1	7.3	4.5	11.9						

Table 9.2 VT Lucerne (P)-2010: Varietal Trial in Lucerne (Perennial) -1st year: Dry Matter Yield (q/ha)

Entries	North-West Zone						Central Zone						South Zone							All India		
	Ludhi-ana	Bika-ner	Udai-pur	Ave-rage	Ra-nk	Superi-ority%	Uruli-kanchan	Ra-huri	An-and	Ave-rage	Ra-nk	Superi ority%	Coimba-tore	Man-dya	Dha-rwad	Hydera-bad	Ave-rage	Ra-nk	Superi-ority%	Ave-rage	Ra-nk	Superi-ority%
LP-10-1	17.2	57.3	171.1	81.9	7		88.2	128.2	150.4	122.3	6		77.8	46.3	101.1	82.5	76.9	2		92.0	4	
LP-10-2	15.9	46.1	188.5	83.5	6		95.5	120.5	136.3	117.4	7		86.2	61.2	106.2	66.2	80.0	1		92.3	3	
LP-10-3	13.6	55.0	199.7	89.4	3		74.4	121.2	129.9	108.5	11		82.2	37.1	88.2	62.2	67.4	9		86.4	10	
LP-10-4	18.6	40.8	182.8	80.7	8		93.9	124.6	171.2	129.9	4		73.7	36.8	91.9	72.8	68.8	6		90.7	6	
LP-10-5	20.3	43.2	201.0	88.2	4		77.6	100.1	162.6	113.4	10		81.8	40.7	92.3	69.5	71.1	3		88.9	8	
LP-10-6	16.7	58.7	180.8	85.4	5		106.4	120.1	165.8	130.8	3		90.7	38.9	85.3	63.1	69.5	5		92.7	2	
LP-10-7	28.2	73.6	187.1	96.3	1		107.3	124.8	175.3	135.8	1		89.5	37.9	84.6	67.0	69.8	4		97.5	1	
LP-10-8	21.7	69.6	147.1	79.5	9		84.8	122.4	168.3	125.2	5		69.9	32.3	98.6	71.9	68.2	7		88.7	8	
LP-10-9	10.3	56.1	162.2	76.2	11		98.4	122.9	178.4	133.2	2		73.9	34.8	98.6	58.7	66.5	10		89.4	7	
LP-10-10	11.2	54.0	221.3	95.5	2		73.0	119.5	158.8	117.1	9		84.9	38.7	94.2	54.9	68.2	7		91.1	5	
LP-10-11	15.4	50.5	164.6	76.8	10		85.5	108.3	157.9	117.2	8		88.5	37.0	90.7	54.8	67.8	8		85.3	11	
Mean	17.2	55.0	182.4	84.9			89.5	119.3	159.5	122.8			81.7	40.2	93.8	65.8	70.4			90.5		
CD at 5%	NS	13.4	NS				18.3	7.1	22.4				10.3	7.8	10.4	14.6						
CV%	11.8	14.3	14.4				15.7	3.5	8.2				7.4	11.4	14.2	13.1						

Table 9.3 VT Lucerne (P)-2010: Varietal Trial in Lucerne (Perennial) -1st year: Green Forage Yield (q/ha/day)

Entries	Bikaner	Ludhiana	Anand	Mandya	Hyderabad	Average	Rank
LP-10-1	1.15	0.90	3.14	2.08	1.55	1.76	8
LP-10-2	0.94	0.90	3.37	2.67	1.28	1.83	5
LP-10-3	1.15	0.80	3.14	2.09	1.33	1.70	9
LP-10-4	0.79	1.00	3.84	2.22	1.53	1.88	4
LP-10-5	0.84	1.10	3.82	2.45	1.44	1.93	2
LP-10-6	1.20	0.90	3.47	2.23	1.22	1.80	6
LP-10-7	1.55	1.40	3.96	2.33	1.49	2.15	1
LP-10-8	1.31	1.10	3.72	1.81	1.58	1.90	3
LP-10-9	1.11	0.60	3.97	1.92	1.40	1.80	6
LP-10-10	1.16	0.70	3.71	2.19	1.23	1.80	6
LP-10-11	1.07	0.90	3.83	1.96	1.11	1.77	7
Mean	1.12	0.94	3.63	2.18	1.38	1.85	

Table 9.4 VT Lucerne (P)-2010: Varietal Trial in Lucerne (Perennial) -1st year: Dry Matter Yield (q/ha/day)

Entries	Bikaner	Ludhiana	Anand	Mandya	Hyderabad	Average	Rank
LP-10-1	0.33	0.12	0.76	0.53	0.55	0.46	2
LP-10-2	0.26	0.11	0.69	0.74	0.44	0.45	3
LP-10-3	0.31	0.10	0.66	0.44	0.41	0.38	8
LP-10-4	0.23	0.13	0.87	0.46	0.49	0.44	4
LP-10-5	0.25	0.14	0.83	0.49	0.46	0.43	5
LP-10-6	0.34	0.12	0.84	0.44	0.42	0.43	5
LP-10-7	0.42	0.20	0.89	0.44	0.45	0.48	1
LP-10-8	0.40	0.15	0.85	0.35	0.48	0.45	3
LP-10-9	0.32	0.07	0.91	0.38	0.39	0.41	6
LP-10-10	0.31	0.08	0.81	0.43	0.37	0.40	7
LP-10-11	0.29	0.11	0.80	0.41	0.37	0.40	7
Mean	0.31	0.12	0.81	0.46	0.44	0.43	

Table 9.5 VT Lucerne (P)-2010: Varietal Trial in Lucerne (Perennial) -1st year: Crude Protein Yield (q/ha)

Entries	Rahuri	Mandya	Ludhiana	Urulikanchan	Anand	Hyderabad	Dharwad	Average	Rank
LP-10-1	24.0	11.9	3.3	15.7	38.4	17.3	20.9	18.8	6
LP-10-2	21.9	13.8	3.5	17.3	34.4	15.3	28.6	19.3	3
LP-10-3	23.1	10.8	3.0	13.6	33.1	13.8	23.2	17.2	9
LP-10-4	23.3	9.4	3.6	16.9	42.8	15.4	24.7	19.4	2
LP-10-5	17.5	10.5	4.6	14.3	40.4	15.2	24.9	18.2	7
LP-10-6	20.8	10.0	6.7	18.9	41.8	13.2	20.2	18.8	6
LP-10-7	22.5	8.7	6.3	18.7	43.3	14.7	20.1	19.2	4
LP-10-8	22.8	8.0	4.9	14.9	42.5	15.3	24.0	18.9	5
LP-10-9	22.3	12.1	2.1	18.0	46.2	13.3	26.5	20.1	1
LP-10-10	22.4	9.9	2.3	13.1	39.4	11.7	20.1	17.0	10
LP-10-11	20.9	8.1	3.5	15.7	38.7	11.2	23.8	17.4	8
Mean	22.0	10.3	4.0	16.1	40.1	14.2	23.4	18.6	

Table 9.6 VT Lucerne (P)-2010: Varietal Trial in Lucerne (Perennial) -1st year: Crude Protein (%)

Entries	Rahuri	Mandya	Ludhiana	Urulikanchan	Anand	Hyderabad	Bikaner	Average	Rank
LP-10-1	18.7	25.6	19.1	17.9	25.4	21.0	22.1	21.4	9
LP-10-2	18.2	22.5	21.9	18.1	25.1	23.2	23.4	21.8	7
LP-10-3	19.0	29.1	21.7	18.3	25.2	22.3	24.5	22.9	2
LP-10-4	18.7	25.3	19.4	18.0	24.9	21.1	26.0	21.9	6
LP-10-5	17.4	25.9	22.6	18.3	24.6	21.9	24.9	22.2	3
LP-10-6	17.4	25.9	21.9	17.8	25.1	21.4	24.6	22.0	5
LP-10-7	18.0	22.8	22.4	17.4	24.1	21.9	24.4	21.6	8
LP-10-8	18.6	24.7	22.8	17.6	25.3	21.4	24.0	22.1	4
LP-10-9	18.2	34.7	20.7	18.4	25.8	22.8	24.0	23.5	1
LP-10-10	18.7	25.6	21.0	18.1	24.9	21.4	24.2	22.0	5
LP-10-11	19.3	21.9	22.9	18.3	24.6	20.1	22.9	21.4	9
Mean	18.4	25.8	21.5	18.0	25.0	21.7	24.1	22.1	

Table 9.7 VT Lucerne (P)-2010: Varietal Trial in Lucerne (Perennial) -1st year: Plant Height (cm)

Entries	Rahuri	Mandya	Bikaner	Ludhiana	Urulikanchan	Anand	Hyderabad	Udaipur	Average	Rank
LP-10-1	64.0	68.1	46.5	56.0	51.6	59.5	70.1	87.8	63.0	11
LP-10-2	59.0	69.5	58.3	56.0	65.4	71.5	71.3	90.2	67.7	5
LP-10-3	61.0	73.3	57.3	52.7	54.6	70.1	71.7	90.6	66.4	6
LP-10-4	64.0	77.5	54.5	56.7	63.1	70.2	75.0	91.5	69.1	1
LP-10-5	64.0	75.2	39.8	56.3	60.2	75.0	65.0	90.8	65.8	8
LP-10-6	61.0	68.6	46.3	52.7	63.2	69.4	57.4	88.4	63.4	10
LP-10-7	63.0	69.9	58.0	62.0	61.0	75.7	66.6	86.2	67.8	4
LP-10-8	60.0	61.1	58.3	59.0	59.3	71.1	67.7	89.0	65.7	9
LP-10-9	62.0	65.5	57.8	56.7	61.2	74.7	62.3	87.9	66.0	7
LP-10-10	60.0	73.2	60.3	53.3	56.0	75.6	75.0	92.9	68.3	2
LP-10-11	65.0	76.3	47.5	51.0	63.3	76.8	71.0	92.0	67.9	3
Mean	62.1	70.7	53.1	55.7	59.9	71.8	68.5	89.8	66.4	

Table 9.8 VT Lucerne (P)-2010: Varietal Trial in Lucerne (Perennial) -1st year: Leaf Stem Ratio & IVDMD (%)

Entries	Leaf Stem Ratio									IVDMD (%)	
	Rahuri	Mandya	Bikaner	Ludhiana	Urulikanchan	Hyderabad	Udaipur	Average	Rank	Ludhiana	Rank
LP-10-1	1.00	0.87	1.09	1.00	1.19	1.08	0.91	1.02	1	70.0	9
LP-10-2	0.66	0.91	0.72	1.00	1.16	1.07	0.76	0.90	8	73.9	4
LP-10-3	1.00	0.75	0.70	0.82	1.18	1.05	0.73	0.89	9	73.6	6
LP-10-4	1.00	0.79	0.98	1.00	1.16	1.07	0.66	0.95	4	71.0	9
LP-10-5	1.00	0.81	0.77	0.82	1.24	1.10	0.70	0.92	6	74.0	3
LP-10-6	1.00	0.74	0.75	1.22	1.06	1.27	0.79	0.98	2	73.6	6
LP-10-7	1.22	0.78	0.75	1.00	1.20	1.03	0.75	0.96	3	74.3	2
LP-10-8	0.81	0.79	0.70	0.82	1.19	1.06	0.82	0.88	10	73.8	5
LP-10-9	1.00	0.70	0.83	0.67	1.06	1.31	0.80	0.91	7	72.8	8
LP-10-10	0.81	0.84	1.04	1.00	1.20	1.05	0.61	0.94	5	73.0	7
LP-10-11	1.00	0.81	0.80	0.82	1.09	0.85	0.78	0.88	11	74.6	1
Mean	0.95	0.80	0.83	0.92	1.16	1.09	0.76	0.93		73.1	

10. VTTF (P) – 2009: VARIETAL TRIAL IN TALL FESCUE GRASS (PERENNIAL) IN SUB- TEMPERATE AND TEMPERATE HIMALAYAN HILL REGION (2nd YEAR)

(Table Reference: 10.1 to 10.4)

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, Srinagar and Almora. Data reported from all the three centres clearly indicated that for green forage yield (q/ha) as were at dry matter yield (q/ha), both the test entries performed better with respect to zonal checks. Entries Hima-14 (14.8%) and Hima-15 (3.9%) exhibited their superiority for green forage yield with respect to best zonal check Hima-1. Similarly Hima-14 (14.6%) and Hima-15 (6.9%) registered their superiority for dry matter yield (q/ha) with respect to zonal check Hima-1. However, for evaluation against growth parameter, zonal check Hima-4 (61.0cm) ranked first for plant height as well as for leaf stem ratio (0.69).

For evaluation against quality parameters, zonal check Hima-4 (7.0 q/ha) ranked first for crude protein yield whereas entry Hima-14 (13.6%) exhibited superiority for crude protein content. For other quality parameters i.e. NDF, ADF and IVDMD (%), entry Hima-15 was recorded good performer.

Table 10.1 VTTF (2009)- 2nd Year: Varietal Trial in Tall Fescue Grass: Green Forage Yield & Dry Matter Yield (q/ha)

Entries	Green Forage Yield (q/ha)						Dry Matter Yield (q/ha)					
	Palampur	Srinagar	Almora	Average	Rank	Superiority%	Palampur	Srinagar	Almora	Average	Rank	Superiority%
Hima-14	213.3	92.7	223.1	176.4	1	14.8	52.3	23.3	53.6	43.1	1	14.6
Hima-15	242.0	81.2	155.9	159.7	2	3.9	60.6	20.8	39.2	40.2	2	6.9
Hima-1 (ZC)	207.2	72.7	181.0	153.6	3		52.0	18.1	42.7	37.6	3	
Hima-4 (ZC)	202.1	62.3	153.7	139.4	4		49.3	16.1	36.5	34.0	4	
Mean	216.2	77.2	178.4	157.3			53.6	19.6	43.0	38.7		
CD at 5%	24.6	3.2	34.6				NS	0.8	7.0			
CV%	8.3	3.0	14.1				12.9	3.0	11.9			

Table 10.2 VTTF (2009)- 2nd Year: Varietal Trial in Tall Fescue Grass: Crude Protein Yield (q/ha) & CP (%)

Entries	CP (%)		Crude Protein Yield (q/ha)	
	Palampur	Rank	Palampur	Rank
Hima-14	13.6	1	5.8	3
Hima-15	11.5	3	6.5	2
Hima-1 (ZC)	11.2	4	5.8	3
Hima-4 (ZC)	13.1	2	7.0	1
Mean	12.4		6.3	

Table 10.3 VTTF (2009)- 2nd Year: Varietal Trial in Tall Fescue Grass: Plant Height (cm) & Leaf Stem Ratio

Entries	Plant Height (cm)		Leaf Stem Ratio	
	Palampur	Rank	Palampur	Rank
Hima-14	58.6	2	0.66	2
Hima-15	58.4	3	0.66	2
Hima-1 (ZC)	57.5	4	0.67	3
Hima-4 (ZC)	61.0	1	0.69	1
Mean	58.9		0.7	

Table 10.4 VTTF (2009)- 2nd Year: Varietal Trial in Tall Fescue Grass: NDF (%), ADF (%) & IVDMD (%)

Entries	NDF (%)		ADF (%)		IVDMD (%)	
	Palampur	Rank	Palampur	Rank	Palampur	Rank
Hima-14	68.2	4	57.8	4	53.0	3
Hima-15	65.4	1	54.6	2	54.4	1
Hima-1 (ZC)	68.0	3	57.4	3	54.0	2
Hima-4 (ZC)	66.6	2	54.0	1	53.0	3
Mean	67.1		56.0		53.6	

CHAPTER-2

FORAGE CROP PRODUCTION

The forage crop production programme was executed at 22 locations in five zones identified under this project. In total 14 experiments were conducted, out of which 9 in net work and 5 in location specific mode were undertaken with the aim to generate region specific forage production technologies. The emphasis of natural resource management under forage crops was to increase system productivity and resource use optimization in forage based system. Salient research achievement has been discussed in this chapter for the forage crop production programme during Rabi 2010-11

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A. ON-GOING COORDINATED TRIALS

AST-1: Effect of sowing methods and cutting management on green fodder and seed yield in Lucerne

Location: Urulikanchan and Rahuri

This was the third year of experimentation at two lucerne growing locations in Central zone. The 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 methods (S_1 – broadcasting and S_2 – line sowing) and three 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 for seed production in second week of February every year and C_3 – regular cutting for two and half years and leaving for seed production at the end. The crop was grown as per recommended practices. Uniform doses of FYM @ 10 t ha^{-1} and 15: 80: 40 kg NPK ha^{-1} were applied to the crop. The forage yield was significantly higher with broadcasting sowing at Urulikanchan. Whereas numerically higher green fodder yield was recorded in line sowing (S_2) at Rahuri. On location mean basis both the sowing methods recorded almost equal green fodder yield.

Among cutting management, C_3 system recorded highest green fodder, dry matter, crude protein and seed yields followed by C_2 cutting management at both the location and mean basis. Line sowing and C_3 cutting management resulted in better seed production (1.91 q/ha) over rest of the combinations at Urulikanchan. With respect to growth parameters, on location mean basis both the sowing methods recorded almost equal plant height and leaf stem ratio. Dry matter yield and crude protein did not differ significantly by sowing methods at Rahuri. Whereas, both dry matter and crude protein yield was also followed same trend as green fodder yield at Urulikanchan. The C_1 cutting management recorded boldest seeds over C_2 and C_3 cutting management. Cutting management did not caused significant variation in plant height (except Urulikanchan) and leaf stem ratio at both the locations (Tables 1(a) to 1(c)).

Table-1 (a): Effect of sowing methods and cutting management on yield of lucerne

Treatment	Green fodder yield (q/ha)			Dry matter yield (q/ha)			Crude protein yield (q/ha)		
	Rahuri	Uruli-kanchan	Mean	Rahuri	Uruli-kanchan	Mean	Rahuri	Uruli-kanchan	Mean
A. Sowing method									
S_1	820.67	489.79	655.28	169.46	108.95	139.21	30.97	20.42	25.70
S_2	861.72	446.82	654.27	179.50	98.87	139.19	32.81	18.78	25.80
SEm±	17.04	7.92		4.50	1.83		0.73	0.33	
CD at 5%	NS	32.38		NS	3.35		NS	1.35	
B. Cutting management									
C_1	776.50	427.83	602.17	159.29	95.46	127.37	29.13	18.18	23.65
C_2	837.93	416.35	627.14	173.47	93.62	133.54	31.62	17.52	24.57
C_3	909.16	560.74	734.95	190.69	122.65	156.67	34.91	23.11	29.01
SEm±	35.33	9.70		9.82	2.24		1.28	0.40	
CD at 5%	76.98	39.66		21.41	9.16		3.93	1.63	
C. Interaction : S X C									
SEm±	49.97	13.73		13.89	3.17		1.80	0.58	
CD at 5%	NS	NS		NS	NS		NS	NS	
CV%	8.40			11.26			11.31		

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

Table -1(b): Effect of sowing methods and cutting management on yield of lucerne

Treatment	Seed yield (q/ha)			1000 seed weight (g)		
	Rahuri	Urulikanchan	Mean	Rahuri	Urulikanchan	Mean
A. Sowing method						
S_1	4.33	1.86	3.10	3.21	3.45	3.33
S_2	4.65	1.73	3.19	3.23	3.23	3.23
SEm±	0.10	0.01		0.03	0.02	
CD at 5%	NS	0.03		NS	0.08	
B. Cutting management						
C_1	3.73	1.79	2.76	3.12	3.39	3.26
C_2	4.55	1.78	3.16	3.25	3.34	3.30
C_3	5.21	1.83	3.52	3.29	3.30	3.30
SEm±	0.25	0.01		0.05	0.02	
CD at 5%	0.76	0.04		NS	0.08	
C. Interaction : S X C						
SEm±	0.35	0.02		0.07	0.04	
CD at 5%	NS	0.06		NS	NS	
CV%	15.57			4.42		

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

Table -1(b-1): Interaction effects of sowing methods and cutting management on seed yield of Lucerne at Urulikanchan

Sowing methods / Cutting management	Seed yield (q/ha)			
	C1	**C2**	**C3**	**Mean**
Line sowing (S1)	1.82	1.87	1.91	1.86
Broadcasting (S2)	1.75	1.69	1.76	1.73
Mean	1.79	1.78	1.83	
	Sowing methods (S)	**Cutting management (C)**	**CXS**	
SE(m)±	0.01	0.01	0.02	
CD at 5 %	0.03	0.04	0.06	

Table -1(c): Effect of sowing methods and cutting management on growth parameter of lucerne

Treatment	Plant height (cm)			Leaf stem ratio			Number of tillers/ m row length
	Rahuri	Urulikanchan	Mean	Rahuri	Urulikanchan	Mean	Rahuri
A. Sowing method							
S_1	76.98	76.63	76.81	0.71	1.27	0.99	91.58
S_2	77.74	76.45	77.10	0.73	1.25	0.99	94.79
SEm±	1.04	0.76		0.04	0.01		2.15
CD at 5%	NS	NS		NS	NS		NS
B. Cutting management							
C_1	74.35	75.77	75.06	0.65	1.25	0.95	86.41
C_2	78.10	74.47	76.29	0.73	1.25	0.99	93.56
C_3	79.77	79.39	79.58	0.79	1.27	1.03	99.59
SEm±	2.23	0.93		0.07	0.01		4.35
CD at 5%	NS	3.80		NS	NS		9.48
C. Interaction : S X C							
SEm±	3.16	1.32		0.10	0.01		6.16
CD at 5%	NS	NS		NS	NS		NS
CV%	5.77			19.81			9.34

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

AST-2: Resource conservation through forages

AST-2.1: Influence of resource conservation techniques on forage production and physiochemical status of soil.

Locations:
Hill zone: Palampur
Northwest zone: Irrigated – Ludhiana, Hisar and Pantnagar
Rainfed – Bikaner
Central zone: Rahuri, Jabalpur, Anand and Urulikanchan
North-East zone: Jorhat, Faizabad, Ranchi, Bhubaneswar and Kalyani
South zone: Silvipasture – Hydrabad, Coimbatore and Mandya
Alley farming -Vellayani

The field experiment was initiated in *kharif* 2009 and executed in *kharif* 2010 at 18 locations to study the effect of resource conservation techniques on forage productivity, physiochemical status of soil and economics of the system. This was the first year of the experiment and data has been reported in Tables 2(a) to 2(v). The results of the experiment are given below as zone wise.

Hill zone:

Sub title: Effect of vegetative barriers and improved forage species on conservation of degraded grassland

Location: Palampur

In the hill zone an experiment was initiated in split plot design from *Kharif* 2009 with three vegetative barriers (No vegetative barriers, Napier bajra hybrid and Setaria grass) in main plot and planting of improved forages as vegetative covers (Setaria grass, *Stylo*, Setaria + *Stylo* and local grasses) in subplot. The experiment was initiated with an objective to study the effect of treatments on production potential of degraded grassland system. The 2009-10 was considered an establishment year and the data for the year 2010-11 have been presented in table 1(a) to 1(c). The results indicated no significant effect of treatments on plant height and shoot number of grass species. In general, Napier bajra hybrid and Setaria grass as vegetative barriers resulted in better plant height of Setaria grass and *Stylo* with more shoot number of Setaria grass under these two treatments. Napier bajra hybrid as a vegetative barrier resulted in the production of significantly higher herbage yields and this was followed by Setaria grass as a vegetative barrier. Vegetative barrier of NBH resulted in the production of 287.93 q/ha green fodder, which was 6.4% and 20.6% more than Setaria grass as vegetative barrier and no vegetative barrier, respectively. The respective increase in dry fodder yield was 13.3% and 18.0%. Among vegetative cover of forage species Setaria + *Stylo* (364.53q/ha) maintained its significant superiority over other treatments and this treatment was followed by Setaria grass alone (307.82q/ha). Setaria + *Stylo* produced 15.5%, 35.6% and 61.7% more green fodder than Setaria grass, *Stylo* and local grasses. The respective increase in term of dry fodder yield was 16.8%, 39.6 and 54.8%.

Napier bajra hybrid and Setaria grass as vegetative barrier remaining at par with each other resulted in higher crude protein content and crude protein yield. Among forage species *Stylo* resulted in higher crude protein content (10.6%), but Setaria grass+ *Stylo* resulted in significantly better crude protein yield (8.37q/ha). Napier bajra hybrid as vegetative barrier resulted in higher net return (Rs.21, 090/ha) than vegetative of barrier Setaria grass (Rs.19, 164/ha) and no vegetative barrier (Rs.15, 121/ha). The respective B: C under these treatments was 1.51, 1.39 and 1.15. Planting of Setaria + *Stylo* resulted in ret return of Rs28,473/ha, which was Rs. 5,841; 12,498 and 21,720/ha more than Setaria grass, *Stylo* and local grasses, respectively. Similar trend was also observed with respect to B:C.

Planting of improved forage species as vegetative barrier as well as vegetative cover resulted in higher contents of soil NPK and OC over other treatments consisted of local grasses. *Stylo* alone as well as with Setaria grass resulted in more soil biomass carbon (40 mg Kg^{-1}) indicating more microbial population in the system. No appreciable effect of treatments on soil pH was observed.

The study of periodic soil moisture content indicated that lower soil depth in general contain higher moisture content than upper soil layer. The data shows that after rains (rainy season) vegetative barriers as well as planting of improved grasses and legume resulted in more soil moisture content.

North- West Zone (Irrigated conditions):
Sub title: Effect of different tillage practices on productivity of forage crop in the prevalent crop sequence
Location: **Ludhiana, Hisar and Pantnagar**

The experiment was conducted at three locations with different cropping sequences. The cropping sequences taken at Pantnagar, Hisar and Ludhiana were sorghum-wheat-maize + cowpea, sorghum-wheat and pearl millet-wheat, respectively. The tillage practices done in fodder crops were common at all the locations comprises of eight treatments namely conventional tillage (1 disc harrow + 2 cultivator) (T_1), 2 cultivation (1 disc harrow + 1 cultivator) (T_2), 2 cultivation (rotavator) (T_3), 1 cultivation (disc harrow) (T_4), 1 cultivation (rotavator) (T_5), broadcasting of seed before T_3 (T_6), broadcasting of seed before T_5 (T_7) and no cultivation (zero tillage) (T_8) laid out in randomized block design and replicated three times. The data has been presented in Tables 2(d) to 2(f).

A Pantnagar, growing of sorghum under conventional tillage (T_1) being at par with T_2 (1889 and 316.8 q/ha) recorded significantly highest green fodder (2080 q/ha) and dry matter yields (340.9 q/ha) over rest of the tillage practices. Similarly, conventional tillage recorded significantly highest crude protein yield (33.6 q/ha) over rest of the treatments. With respect to net monetary returns and benefit cost ratio conventional tillage (T_1) again proved superiority over rest of the treatments (being at par with T_2 for net monetary returns and with T_2 and T_3 for benefit cost ratio).

At Hisar, growing of sorghum under conventional tillage or 2 cultivation tillage treatments being at par with T_3, T_4, T_5 and T_6, recorded significantly highest forage equivalent yield (1079 q/ha each) over T_7 and T_8 tillage treatments. The conventional tillage recorded highest number of tillers / m^3 (420) and maximum cost of cultivation (Rs 23460/ha). Whereas, 2 cultivation (T_2) fetched highest net monetary returns (Rs 84940/ha) followed by conventional tillage (Rs 84440/ha). The benefit cost ratio was did not differed significantly by different tillage practices. The conventional tillage being at par with 2 cultivation (with rotavator) and 1 cultivation recorded significantly highest wheat grain yield (44.0 q/ha) over rest of the treatments (Table 2(c)).

At Ludhiana, growing of pearl millet under different tillage practices caused significant variation in green fodder, dry matter yield, plant height and number of tillers /m^2. Conventional tillage being at par with T_2 and T_5 tillage practices recorded significantly highest crude protein yield (9.76 q/ha) over rest of the treatments. The 1 cultivation (with rotavator) fetched highest net monetary returns (Rs 22695/ha) whereas, the maximum benefit cost ratio (2.65) was realized under zero tillage (Table (2c)).

North-West zone (Rain fed):
Sub title: **Conservation of rangelands by incorporating grass species in alleys of improved variety of khejari (*Prosopis cineraria*)**
Location: Bikaner

As per plan of work, khejari plantation has been done during *kharif* 2010. This year kharif 2011 grass components (*Lasiurus sindicus*, *Cenchrus ciliaris*, *Cenchrus setigerus* and *Panicum antidotale*) were incorporated. Since growth of khejari tree is very slow, the budding with improved variety “Thar Shobha” will be done this year. Results will be reported from next year (2012) onwards.

Central zone:

Sub title: Effect of planting methods and forage crop combinations on fodder productivity through moisture conversation

Location: **Rahuri, Jabalpur, Anand and Urulikanchan**

This experiment was started during *kharif* 2010 at four locations to assess the effect of planting methods and forage crop combinations on productivity of forage grasses. The treatments consisted of two planting methods (ridge and furrow and flat bed method) and four combinations of grasses and legumes (*Cenchrus* + *Desmenthus, Cenchrus* + *Stylosanthes, Dicanthium* + *Desmenthus and Dicanthium* + *Stylosanthes*) laid out in randomized block design and replicated three times. The data has been presented in Table 2(g) to 2(i-2) revealed that on location mean basis planting of grasses on ridges and furrows recorded higher green fodder (686.03 q/ha) and dry matter yields (156.03 q/ha) over flat bed. At all the locations ridges and furrows method of planting recorded significantly higher green fodder yield over flat bed planting. On location means basis *Cenchrus* + *Desmenthus* combination of grass and legume recorded highest green fodder (832.0 q/ha) and dry matter yield (187.08 q/ha) over rest of the combinations. The highest green fodder and dry matter yields was recorded at Urulikanchan followed by Rahuri and lowest being with Jabalpur. The significant interaction effects of planting method and grasses and legumes combination were also reported at Urulikanchan and Anand for green fodder and crude protein yields and At Urulikanchan for dry fodder yield. Planting of forage crop on ridges and furrows recorded significantly higher crude protein yield at Rahuri and Jabalpur over flat sowing. Whereas, reverse trend was observed at Anand for the same trait. On location mean basis *Cenchrus* + *Desmenthus* recorded highest crude protein yield over rest of the combinations.

North-East zone:

Sub title: Effect of moisture conservation practices on production of perennial grasses

Location: Jorhat, Faizabad, Bhubaneswar, Kalyani and Ranchi

A field experiment was started in *kharif* 2010 at five locations to assess the effect of different mulching practices on water use efficiency and productivity of perennial grasses. The treatments consisted of three perennial grasses (*Brachiaria*, hybrid napier and *Setaria*) and three mulching practices (control, soil mulch and live mulch (intercropping)) laid out in randomized block design and replicated three times. The data has been presented in Tables 2 (j) to 2(q).

At Faizabad, growing of guinea grass + soil mulch recorded highest green fodder yield of perennial grasses (365.75 q/ha), dry matter yield (99.71 q/ha) and crude protein yield (7.99 q/ha) over rest of the combinations. However, total green fodder yield was recorded highest (525.2 q/ha) under guinea grass + live mulch (berseem) over rest of the combinations. Similarly, guinea grass + intercropping (berseem) fetched highest net monetary returns (Rs. 24250/ha) over rest of the treatments. Whereas, growing of guinea grass with soil mulch (T_5) registered highest NPK uptake over rest of the combinations in perennial grasses (Table 2 (i)).

At Jorhat, planting of *Setaria* recorded significantly highest green fodder (830.3 q/ha) and dry matter yields (177.3 q/ha) over *Brachiaria* and hybrid napier. Crude protein yield, consumptive use of water, water use efficiency (WUE), net monetary returns and benefit cost ratio was did not differed significantly by planting of different perennial grasses (Table 2(k)). The adoption of live mulch (intercropping) or soil mulch as moisture conservation practices being at par with each other recorded significantly higher green fodder, dry matter and crude protein yields over control. Similarly, same treatments also recorded significantly higher water use efficiency and fetched higher net monetary returns over control. The interaction effects of perennial grasses and moisture conservation practices were also observed for GFY, DMY and crude protein yield.

At Kalyani under perennial grasses hybrid napier recorded highest green fodder yield (1196.28 q/ha / year). Whereas, *Brachiaria* realized highest dry matter and crude protein yields. The planting of hybrid napier realized significantly highest net monetary returns (Rs 22144 /ha/year) and benefit cost ratio (0.50) over *Brachiaria* and *Setaria* grasses. With respect to moisture conservation practices live mulch (intercropping) attained highest green fodder, dry matter and crude protein yields over rest of the moisture conservation practices. Similarly, the same treatments (live mulch) fetched highest net monetary returns (Rs. 15286.4/ha/year) and lowest benefit cost ratio (0.29) over control and soil mulch (Table 2(o). The *kharif* season recorded higher GFY of perennial grasses as compared to Rabi and summer seasons.

At Bhubaneswar, planting of guinea grass recorded significantly highest total green fodder (732 q/ha), total dry matter yield (143.2 q/ha) and total crude protein yield (being at par with *Setaria*) over *Brachiaria* and *Setaria* grasses. Whereas, net monetary returns (Rs 49664/ha/year) recorded highest in *Setaria* grass followed by guinea grass (Rs 43880/ha/year). With respect to moisture conservation practices, live mulch (intercropping) recorded significantly highest total green fodder (838.3 q/ha/year), dry matter (160.9 q/ha), crude protein yields (13.7 q/ha/year) and net monetary returns (Rs 33260 q/ha/year) over control and soil mulch. The interaction effect of perennial grasses and moisture conservation practices were also observed for GFY, DFY and CPY (Table 2 (p) to 2 (p-2)).

At Ranchi, planting of perennial grass Napier hybrid realized highest green fodder (1012.6q/ha) over *Brachiaria* and *Setaria* grasses. Under moisture conservation practices soil mulch or live mulch (intercropping) being at par with each other recorded higher green fodder and dry matter yields over control (Table 2(q)).

South zone (Silvipasture):

Subtitle: Intensive forage production through silvipasture system under rain fed ecosystem

Location: Hyderabad, Coimbatore and Mandya

This experiment was started during kharif 2010 at three locations. The eight treatments consisted of Subabul + *Cenchrus ciliaris* (T_1), Subabul + *Stylosanthes* (T_2), Subabul + *Desmenthus virgatus* (T_3), Subabul + *Cenchrus ciliaris* + *Stylosanthes*(T_4), Subabul + *Cenchrus ciliaris* + Desmenthus (T_5), Subabul + sorghum + horse bean (T_6), Subabul + pearl millet + horse bean (T_7) and Subabul sole (T_8) was laid out in randomized block design with three replications. The data of first year has been presented in Tables 2(r) to 2 (u). On location mean basis, growing of subabul + pearl millet + horse bean silvipasture system (T_7) recorded highest green fodder (438.6 q/ha) and dry matter yields (90.97 q/ha) and lowest being with subabul sole (90.14 and 17.83 q/ha, GFY and DFY, respectively). Similarly the same silvipasture system T_7 recorded significantly highest green fodder yield (513.6 q/ha) at Coimbatore. On location mean basis, adopting of subabul +pearl millet + horse gram(T_7) system again recorded highest crude protein yield (mean of three locations), net monetary returns and benefit cost ratio (mean of Hyderabad and Coimbatore) over rest of the silvipasture systems. The intensive silvipasture systems also caused remarkable changes in soil fertility status after the first year of cropping cycle at Coimbatore. The OC %, pH, EC and available N remained unchanged over initial level. Whereas, available P and K decreased over initial level of fertility. The population of actinomycetes and bacteria were increased over its initial population in the soil after first year of experimentation at the same place.

South zone (Alley cropping):
Sub title: **Cassava based sustainable alley farming system for rainfed areas of the humid tropics.**
Location: Vellayani

The experiment was conducted during *Kharif* 2010 to find out best alley cropping system on the basis of crop yields and soil health for cassava in the humid tropics **.**
The treatments consisted of three grasses (Bajra Napier hybrid , *Brachiaria brizentha* and no grass), two legumes (fodder cowpea and no fodder legumes) and two bio-fertilizers (VAM and no bio-fertilizers) laid out in RBD and replicated thrice .The total treatments combinations was 12. The data of first year has been presented in tables 2(u) to 2(v) revealed that alley cropping system cassava +BN hybrid (T4) being at par with T_2 and T_3 treatments recorded significantly highest green fodder yield (242.7q/ha) of BN hybrid grass. Whereas the lowest green fodder yield (167.4q/ha) was recorded under cassava + *Brachiaria* grass +fodder cowpea +AMF alley cropping system The highest dry fodder yield (51.4 q |ha) and crude protein content (8.1%) was recorded under cassava + *Brachiaria* + fodder cowpea alley cropping system. With respect to cowpea, green fodder and dry matter yields was recorded highest under cassava + fodder cowpea + AMF alley cropping system. Cassava tuber yield was recorded significantly highest (283.1 q/ha) under cassava + AMF (T_{11}) alley cropping system followed by T_{12} and T_6 and lowest being with T_7. Planting of cassava + AMF alley cropping system realized significantly highest net monetary returns (Rs. 67460/ ha) followed by T_{12} (Rs. 64556 /ha) and lowest being with T_7 (Rs.1213/ha). The adoption of T_2, T_3, T_6 and T_8 alley cropping systems recorded higher organic carbon (0.9% each) in the soil over rest of the treatments .The status of available N ,P and K in soil was differed significantly under different alley cropping system. The highest available N in soil after alley cropping (381.7kg |ha) was recorded under T_{10} and T_9 treatments and lowest being with T_2 treatment. Whereas, available P was recorded significantly highest (82.6 kg/ha) under T_8 treatment. The available K in the soil was observed significantly highest (125.33 Kg K/ha) under cassava + fodder cowpea + AMF alley cropping system (T_9).

Table 2 (a): Effect of vegetative barriers and improved forage species on yield attributes, yield, quality and economics at Palampur in Hill Zone

Treatments	Plant height (cm)			Shoot number (m^2)		Green fodder yield (q/ha)	Dry fodder yield (q/ha)	Crude protein content (%)	Crude protein yield (q/ha)	Net returns (Rs./ha)	B:C
	NBH	Setaria	*Stylo*	NBH ($plant^{-1}$)	Setaria (m^{-2})						
A. Vegetative barriers											
No vegetative barrier	-	65.4	44.6	-	229	228.38	56.08	9.0	5.16	15121	1.15
Napier bajra hybrid	89.1	74.0	46.0	18	245	287.93	68.42	9.7	6.67	21090	1.51
Setaria grass	-	70.9	48.3	-	241	269.23	59.30	9.5	5.68	19164	1.39
SEm±	-	1.88	1.84	-	3	1.72	0.38	0.1	0.05	179	0.02
CD5%	-	NS	NS	-	9	5.85	1.50	0.2	0.21	704	0.06
B. Improves forage species											
Setaria grass	86.1	68.9	-	17	238	307.82	70.65	9.1	6.41	22632	1.57
Stylo	90.5	-	46.7	18	-	235.59	51.21	10.6	5.41	15975	1.29
Setaria+ *Stylo*	91.5	71.2	45.9	19	240	364.53	84.86	9.9	8.37	28473	1.86
Local grasses	88.2	-	-	18	-	139.44	38.35	8.1	3.15	6753	0.67
SEm±	4.72	1.06	0.51	1	4	5.21	1.13	0.1	0.13	625	0.05
CD5%	NS	NS	NS	NS	NS	15.48	3.52	0.3	0.39	1857	0.16
Interaction	-	NS	NS	-	NS	NS	NS	NS	NS	NS	NS

Table 2 (b): Effect of vegetative barriers and improved forage species on soil properties at Palampur in Hill Zone

Treatments	Soil properties						
	N (kg/ha)	P (kg/ha)	K (kg/ha)	OC %	CEC C mol (P^+) kg^{-1}	Soil biomass carbon (mg $Kg^{-1)}$	pH
A. Vegetative barriers							
No vegetative barrier	202	10	232	0.54	12	37	5.7
Napier bajra hybrid	219	11	234	0.55	12	37	5.6
Setaria grass	216	11	230	0.57	12	36	5.6
B. Improves forage species							
Setaria grass	225	11	235	0.58	12	35	5.6
Stylo	222	11	234	0.54	12	40	5.5
Setaria+ *Stylo*	225	11	239	0.57	12	40	5.6
Local grasses	176	9	220	0.53	12	32	5.7
Initial	**213**	**9**	**218**	**0.51**	**11**	**33**	**5.5**

Table 2 (c): Effect of vegetative barriers and improved forage species on soil moisture content at Palampur in Hill Zone

Treatments	Soil moisture content (%)												
	Apr., 2010	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan. 2011	Feb.	Mar.	Apr.
A. Vegetative barriers													
No vegetative barrier	15.3	18.8	18.5	22.1	27.6	27.0	21.8	17.5	16.5	25.0	26.6	18.3	17.0
	(16.9)*	(21.2)	(23.5)	(29.4)	(35.5)	(35.8)	(28.0)	(23.2)	(21.7)	(24.4)	(26.8)	(22.7)	(20.3)
Napier bajra hybrid	16.0	19.8	22.4	21.6	28.1	30.3	24.8	20.2	18.5	27.0	26.0	19.7	17.6
	(17.9)	(22.2)	(26.3)	(29.4)	(34.7)	(37.3)	(33.0)	(28.4)	(24.5)	(24.7)	(27.6)	(24.3)	(23.8)
Setaria grass	15.3	19.7	23.4	21.8	28.6	30.5	24.3	18.5	18.6	25.4	25.1	20.2	17.3
	(17.2)	(22.5)	(26.5)	(28.6)	(34.7)	(36.6)	(32.1)	(23.3)	(20.8)	(25.3)	(27.4)	(24.4)	(24.0)
B. Improves forage species													
Setaria grass	15.3	19.8	21.6	21.8	28.7	29.5	24.1	18.9	18.0	26.1	26.1	19.7	17.4
	(17.9)	(22.6)	(25.9)	(29.1)	(35.1)	(36.9)	(31.5)	(25.8)	(22.5)	(25.2)	(27.3)	(24.2)	(22.8)
Stylo	15.3	19.1	21.0	21.3	27.5	29.8	23.5	18.6	17.8	25.8	26.4	19.2	17.1
	(17.4)	(21.4)	(24.7)	(28.4)	(35.1)	(36.4)	(30.7)	(24.6)	(22.4)	(25.2)	(27.3)	(23.6)	(22.3)
Setaria+ *Stylo*	16.1	20.0	22.4	22.6	29.7	29.7	24.3	19.7	18.4	25.5	25.9	19.9	17.6
	(17.1)	(22.7)	(26.6)	(30.6)	(36.2)	(37.8)	(32.5)	(26.2)	(22.6)	(24.7)	(28.0)	(24.4)	(24.1)
Local grasses	15.3	18.7	20.7	21.6	26.7	28.0	22.6	17.8	17.2	25.8	25.1	18.7	16.9
	(16.8)	(21.2)	(24.5)	(28.4)	(33.6)	(35.1)	(29.3)	(23.3)	(21.9)	(24.1)	(26.4)	(23.1)	(21.5)

*** Figures in parenthesis are soil moisture content at 15-30 cm soil depth**

Table 2 (d): Effect of different tillage practices on productivity of forage crops in prevalent crop sequence of Sorghum – Wheat – Maize + Cowpea at Pantnagar in North West zone

Treatment	Green forage equivalent yield (q/ha/yr)	Dry matter yield (q/ha/yr)	Crude protein yield (q/ha/yr)	Net monetary return (Rs/ha/yr)	Benefit cost ratio
T_1	2080.0	340.9	33.6	74663.0	1.80
T_2	1889.0	316.8	30.9	68863.0	1.68
T_3	1824.0	301.5	31.7	63610.0	1.55
T_4	1606.0	282.3	31.4	51377.0	1.30
T_5	1489.0	266.2	31.3	41957.0	1.06
T_6	1608.0	289.6	30.5	53390.0	1.35
T_7	1596.0	263.4	30.1	52987.0	1.34
T_8	1444.0	254.6	29.0	45430.0	1.16
SEm±	63.8	9.4	0.5	3795.0	0.1
CD at 5%	193.6	28.6	1.4	11508.0	0.3

T_1 = Conventional tillage (1 Disc harrow + 2 Cultivator)	T_5 = 1 Cultivation (Rotavator)
T_2 = 2 Cultivation (1 Disc harrow + 1 Cultivator)	T_6 = Broadcasting of seed before T-3
T_3 = 2 Cultivation (Rotavator)	T_7 = Broadcasting of seed before T-5
T_4 = 1 Cultivation (Disc harrow)	T_8 = No cultivation (Zero tillage)

Table 2 (e): Effect of different tillage practices on productivity of forage crops in prevalent crop sequence of Sorghum – Wheat at Hisar in North West zone

Treatment	Grain yield (q/ha)	Straw yield (q/ha)	Forage equivalent yield (q/ha)	Plant height (cm)	No. of tillers/m^2	Leaf : Stem Ratio	Gross income (Rs/ha)	Cost of cultivation (Rs./ha)	Net income (Rs./ha)	Benefit cost ratio
T_1	44.0	57.9	1079	73	420	0.39	107900	23460	84440	3.6
T_2	42.1	72.6	1079	66	417	0.42	107900	22960	84940	3.6
T_3	42.1	62.9	1057	72	409	0.38	105733	22960	82773	3.6
T_4	40.6	75.5	1055	74	400	0.40	105533	22460	83073	3.7
T_5	36.1	72.7	994	70	405	0.40	99400	22460	76940	3.4
T_6	39.8	67.1	984	71	391	0.38	98400	22960	75773	3.3
T_7	38.1	57.0	941	73	387	0.39	94100	22460	71640	3.2
T_8	35.1	44.5	928	66	411	0.38	92800	22460	70340	3.1
SEm±	2.3	4.9	33.3	2.0	2.7		3325.0		3288.8	0.2
CD at 5%	6.9	15.2	101.8	6	8.4	NS	10183		10072.2	NS
CV%	10.1	13.4	5.7	4.8	1.2	12.1	5.7		7.2	7.6

T_1 = Conventional tillage (1 Disc harrow + 2 Cultivator)
T_2 = 2 Cultivation (1 Disc harrow + 1 Cultivator)
T_3 = 2 Cultivation (Rotavator)
T_4 = 1 Cultivation (Disc harrow)
T_5 = 1 Cultivation (Rotavator)
T_6 = Broadcasting of seed before T-3
T_7 = Broadcasting of seed before T-5
T_8 = No cultivation (Zero tillage)

Table 2 (f): Effect of different tillage practices on productivity, plant characters, crude protein and economics of forage pearl millet in the prevalent crop sequence at Ludhiana in North West zone

Treatment	Green fodder yield (q/ha)	Dry matter yield (q/ha)	Plant height (cm)	No. of tillers/m row length	Leaf stem ratio	Crude protein yield (q/ha)	Crude protein (%)	Cost of cultivation (Rs./ha)	Net income (Rs./ha)	B : C Ratio
T_1	642.7	136.2	231.4	31.1	0.82	9.76	7.17	10025	21695	2.16
T_2	634.4	132.4	229.2	30.6	0.85	9.61	7.26	9525	21220	2.23
T_3	614.9	124.2	213.6	30.1	0.72	9.01	7.26	9775	22360	2.29
T_4	609.4	121.9	223.8	29.0	0.67	8.48	7.17	8775	21695	2.45
T_5	634.4	130.8	226.1	30.3	0.72	9.38	7.17	9025	22695	2.51
T_6	567.7	116.4	207.4	28.5	0.64	8.64	7.42	9775	18885	1.93
T_7	513.2	117.8	213.6	28.6	0.64	8.55	7.26	9025	20500	2.27
T_8	590.5	119.9	223.6	28.8	0.67	8.90	7.42	7775	20610	2.65
SEm±	33.3	6.87	10.64	1.27		0.18				
CD at 5%	NS	NS	NS	NS		0.53				
CV%	9.61	9.53	8.24	7.46		8.18				

T_1 = Conventional tillage (1 Disc harrow + 2 Cultivator)
T_2 = 2 Cultivation (1 Disc harrow + 1 Cultivator)
T_3 = 2 Cultivation (Rotavator)
T_4 = 1 Cultivation (Disc harrow)
T_5 = 1 Cultivation (Rotavator)
T_6 = Broadcasting of seed before T-3
T_7 = Broadcasting of seed before T-5
T_8 = No cultivation (Zero tillage)

Table 2 (g): Effect of planting methods and forage crop combinations on green fodder yield of grasses and legumes in Central zone

Treatment	Green fodder yield (q/ha)				
	Rahuri	Urulikan chan	Jabalpur	Anand	Mean
A. Moisture conservation techniques					
Ridges and furrows	948.2	1295.2	208.8	292.0	686.0
Flat bed	824.6	1263.8	174.9	232.0	623.8
SEm±	35.6	9.3	4.5	4.4	
CD at 5%	104.8	36.3	15.6	13.4	
B. Combination of grasses and legumes					
Cenchrus + Desmenthus (1:1)	1137.1	1528.1	221.9	441.0	832.0
Cenchrus + Stylosanthes (1:1)	745.4	1395.7	160.1	404.0	676.3
Dicanthium + Desmenthus (1:1)	1023.4	1128.6	234.4	113.0	624.8
Dicanthium + Stylosanthes (1:1)	639.7	1065.5	150.9	90.0	486.5
SEm±	50.4	13.2	6.8	6.2	
CD at 5%	148.2	51.3	18.4	19.0	
C. Interaction: Moisture conservation techniques X Combination of grasses and legumes					
SEm±	71.3	18.6	6.5	8.8	
CD at 5%	NS	72.2	NS	26.9	
CV%	16.1	15.8	12.5	5.8	

Table 2 (g-1): Interaction effects of planting methods and forage crop combinations on green fodder yield of grasses and legumes at Urulikanchan in Central zone

Moisture conservation technique / Grass & legume combination	Green fodder yield (q/ha)				
	C1	C2	C3	C4	Mean
Ridges & furrow (M1)	1525.33	1342.63	1164.4	1148.33	1295.17
Flat beds (M2)	1530.77	1448.83	1092.8	982.68	1263.77
Mean	1528.05	1395.73	1128.60	1065.50	
	Moisture conservation technique (M)	Grass & legume combination (C)	M X C		
SE(m)±	9.31	13.16	18.62		
CD at 5 %	36.31	51.32	72.22		
CV%			15.84		

Table 2 (g-2): Interaction effects of planting methods and forage crop combinations on green fodder yield of grasses and legumes at Anand in Central zone

Moisture conservation technique / Grass & legume combination	Green fodder yield (q/ha)				
	C1	C2	C3	C4	Mean
Ridges & furrow (M1)	486	438	139	105	292
Flat beds (M2)	395	370	88	75	232
Mean	441	404	113	90	
	Moisture conservation technique (M)	Grass & legume combination (C)	M X C		
SE(m)±	4.43	6.27	8.87		
CD at 5 %	13.46	19.04	26.93		
CV%			5.86		

Table 2 (h): Effect of planting methods and forage crop combinations on dry matter yield of grasses and legumes in Central zone

Treatment	Dry matter yield (q/ha)				
	Rahuri	Urulikanchan	Jabalpur	Anand	Mean
A. Moisture conservation techniques					
Ridges and furrows	162.17	306.31	64.05	91.60	156.03
Flat bed	135.01	301.48	53.86	74.20	141.13
SEm+	7.80	2.19	0.89	1.52	
CD at 5%	22.95	NS	2.47	4.63	
B. Combination of grasses and legumes					
Cenchrus + Desmenthus (1:1)	185.42	362.98	65.04	134.90	187.08
Cenchrus + Stylosanthes (1:1)	125.82	349.07	42.25	125.10	160.56
Dicanthium + Desmenthus (1:1)	167.98	249.95	74.10	40.60	133.15
Dicanthium + Stylosanthes (1:1)	115.14	253.60	48.20	39.90	114.21
SEm+	11.04	3.10	1.90	2.16	
CD at 5%	32.46	12.09	4.50	6.56	
C. Interaction: Moisture conservation techniques X Combination of grasses and legumes					
SEm+	15.61	4.39	2.10	3.05	
CD at 5%	NS	17.12	NS	NS	
CV%	21.01	18.14	6.80	6.38	

Table 2 (h-1): Interaction effects of planting methods and forage crop combinations on dry matter yield of grasses and legumes at Urulikanchan in Central zone

Moisture conservation technique / Grass & legume combination	Dry matter yield (q/ha)				
	C1	C2	C3	C4	Mean
Ridges & furrow (M1)	368.20	332.68	257.30	267.07	306.31
Flat beds (M2)	357.75	365.46	242.60	240.13	301.48
Mean	362.98	349.07	249.95	253.60	
	Moisture conservation technique (M)	Grass & legume combination (C)	M X C		
SE(m)±	2.19	3.10	4.39		
CD at 5 %	NS	12.09	17.12		
CV%			18.14		

Table 2 (i): Effect of planting methods and forage crop combinations on crude protein yield of grasses and legumes in Central zone

Treatment	Crude protein yield (q/ha)				
	Rahuri	Uruli-kanchan	Jabal-pur	Anand	Mean
A. Moisture conservation techniques					
Ridges and furrows	14.87	36.05	6.87	8.78	16.64
Flat bed	12.09	36.75	5.93	10.73	16.37
SEm±	0.72	0.30	0.06	0.18	
CD at 5%	2.12	NS	0.18	0.55	
B. Combination of grasses and legumes					
Cenchrus + Desmenthus (1:1)	16.74	42.84	7.94	21.13	22.16
Cenchrus + Stylosanthes (1:1)	11.65	45.27	4.84	10.38	18.03
Dicanthium + Desmenthus (1:1)	14.91	27.76	8.17	4.39	13.80
Dicanthium + Stylosanthes (1:1)	10.62	29.77	4.65	3.12	12.04
SEm±	1.02	0.42	0.21	0.26	
CD at 5%	3.00	1.64	0.62	0.78	
C. Interaction: Moisture conservation techniques X Combination of grasses and legumes					
SEm±	1.44	0.60	0.24	0.36	
CD at 5%	NS	2.34	NS	1.10	
CV%	21.42	20.00	4.30	6.47	

Table 2 (i-1): Interaction effects of planting methods and forage crop combinations on crude protein yield of grasses and legumes at Urulikanchan in Central zone

Moisture conservation technique / Grass & legume combination	Crude protein yield (q/ha)				
	C1	**C2**	**C3**	**C4**	Mean
Ridges & furrow (M1)	42.14	43.31	27.51	31.26	36.05
Flat beds (M2)	43.53	47.18	28.02	28.27	36.75
Mean	42.84	45.27	27.76	29.77	
	Moisture conservation technique (M)	**Grass & legume combination (C)**	**M X C**		
SE(m)±	0.30	0.42	0.60		
CD at 5 %	NS	1.64	2.34		
CV%			20.00		

Table 2 (i-2): Interaction effects of planting methods and forage crop combinations on crude protein yield of grasses and legumes at Anand in Central zone

Moisture conservation technique / Grass & legume combination	Crude protein yield (q/ha)				
	C1	**C2**	**C3**	**C4**	Mean
Ridges & furrow (M1)	14.44	11.12	5.70	3.85	8.78
Flat beds (M2)	27.81	9.65	3.07	2.39	10.73
Mean	21.13	10.38	4.39	3.12	
	Moisture conservation technique (M)	**Grass & legume combination (C)**	**M X C**		
SE(m)±	0.18	0.26	0.36		
CD at 5 %	0.55	0.78	1.10		
CV%			6.47		

Table 2 (j): Effect of moisture conservation practices and perennial grasses on yields, economics and nutrient uptake at Faizabad in North East Zone

Treatment	Perennial grasses			Berseem (3 cuts)			Gross income	Net monetary return (Rs/ha/yr)	Uptake (kg/ha) by perennial grasses		
	Green fodder yield (q/ha)	Dry matter yield (q/ha)	Crude protein yield (q/ha)	Green fodder yield (q/ha)	Dry matter yield (q/ha)	Crude protein yield (q/ha)			N	P	K
T_1	155.65	36.72	2.89				14493	7838	77.11	5.51	6.98
T_2	169.76	39.50	3.42				15222	6622	94.80	7.11	9.09
T_3	145.10	31.75	2.74	170.5	32.45	5.60	28064	14104	73.03	6.35	6.99
T_4	350.65	82.25	7.89				22246	15496	180.95	15.63	14.81
T_5	365.75	99.71	7.99				23540	15890	199.42	18.94	19.94
T_6	335.60	71.51	7.37	190.2	37.80	6.85	38150	24250	150.17	15.02	16.45
T_7	209.55	52.56	5.07				9536	2936	110.38	12.09	11.56
T_8	216.65	58.70	5.69				10967	2067	135.01	9.98	12.33
T_9	188.65	42.46	5.10	195.0	38.69	7.25	26236	13256	93.41	8.49	8.49
SEm±	10.28	5.78	0.98								
CD at 5%	21.79	12.25	2.08						2.58	1.75	1.43
CV%	12.78	13.52	9.25						10.25	11.12	9.95

T_1 = *Brachiaria* + without mulch (control)
T_2 = *Brachiaria* + soil mulch
T_3 = *Brachiaria* + Inter cropping (Berseem)
T_4 = Guinea grass + without mulch (control)
T_5 = Guinea grass + soil mulch
T_6 = Guinea grass + Inter cropping (Berseem)
T_7 = *Setaria* grass + without mulch (control)
T_8 = *Setaria* grass + soil mulch
T_9 = *Setaria* grass + Inter cropping (Berseem)

Table 2 (k): Effect of moisture conservation practices and perennial grasses on yields a economics at Jorhat in North East Zone

Treatment	Green fodder yield (q/ha)	Dry matter yield (q/ha)	Crude protein yield (q/ha)	Consumptive use of water (cm)	WUE (q/ha-cm)	Net monetary return (Rs/ha)	Benefit cost ratio
A. Perennial grass							
Brachiaria	773.3	161.3	15.1	85.2	9.09	45626	2.76
Hybrid napier	800.1	167.9	15.4	89.2	8.98	52832	3.18
Setaria	830.3	177.3	15.9	92.1	9.03	55253	3.31
SEm±	2.8	1.9	0.2	0.3	0.05	2189	0.14
CD at 5%	14.6	9.8	NS	NS	NS	NS	NS
B. Moisture conservation							
Control	743.8	158.5	14.4	91.2	8.16	43768	2.89
Soil mulch	829.2	174.7	16.1	88.3	9.38	53399	3.20
Live mulch (intercropping)	830.8	173.4	16.0	87.0	9.56	56544	3.17
SEm±	2.8	1.9	0.2	0.3	0.05	2189	0.14
CD at 5%	14.6	9.8	1.0	NS	0.26	11242	NS
C. Interaction : Perennial grass X Moisture conservation							
SEm±	4.9	3.3	0.3	0.6	0.09	3793	0.25
CD at 5%	25.3	16.9	1.7	2.9	0.45	NS	NS
CV%	20.3	15.0	1.5	0.03	4.00	17.2	10.00

Table 2 (k-1): Interaction effects of moisture conservation practices and perennial grasses on green fodder yield at Jorhat in North East Zone

Perennial grass / Moisture conservation	Green fodder yield (q/ha)			
	Brachiaria	**Hybrid napier**	***Setaria***	**Mean**
Control	716.29	773.63	741.33	743.75
Soil mulch	785.00	778.16	924.34	829.17
Live mulch (intercropping)	818.67	848.38	825.26	830.77
Mean	773.32	800.06	830.31	
	Perennial grass	**Moisture conservation**	**G X M**	
SE(m)±	2.847	2.847	4.931	
CD at 5 %	14.616	14.616	25.316	
CV%			20.3	

Table 2 (k-2): Interaction effects of moisture conservation practices and perennial grasses on dry matter yield at Jorhat in North East Zone

Perennial grass / Moisture conservation	Dry matter yield (q/ha)			
	Brachiaria	**Hybrid napier**	***Setaria***	**Mean**
Control	151.98	162.52	160.88	158.46
Soil mulch	166.56	163.92	193.71	174.73
Live mulch (intercropping)	165.37	177.30	177.51	173.39
Mean	161.30	167.91	177.37	
	Perennial grass	**Moisture conservation**	**G X M**	
SE(m)±	1.91	1.91	3.30	
CD at 5 %	9.79	9.79	16.96	
CV%			15.0	

Table 2 (k-3): Interaction effects of moisture conservation practices and perennial grasses on crude protein yield at Jorhat in North East Zone

Perennial grass / Moisture conservation	Crude protein yield (q/ha)			
	Brachiaria	**Hybrid napier**	***Setaria***	**Mean**
Control	14.11	14.77	14.40	14.43
Soil mulch	15.72	15.10	17.33	16.05
Live mulch (intercropping)	15.53	16.30	16.08	15.97
Mean	15.12	15.39	15.94	
	Perennial grass	**Moisture conservation**	**G X M**	
SE(m)±	0.19	0.19	0.33	
CD at 5 %	0.99	0.99	1.72	
CV%			15.0	

Table 2 (l): Effect of moisture conservation practices and perennial grasses on yield of grasses at Kalyani in North East Zone

Treatment	Green fodder yield (q/ha)				Dry matter yield (q/ha)			
	Kharif	Rabi	Summer	Total	Kharif	Rabi	Summer	Total
A. Perennial grass								
Brachiaria	345.56	162.00	341.22	848.78	81.61	44.61	96.44	222.66
Hybrid napier	545.78	222.50	428.00	1196.28	95.11	35.07	81.44	211.62
Setaria	303.11	126.56	267.44	671.11	64.94	26.23	70.68	161.85
SEm±	15.09	2.96	2.65		3.03	0.83	0.90	
CD at 5%	45.24	8.88	7.97		9.08	2.49	2.70	
B. Moisture conservation								
Control	394.56	156.22	306.78	857.56	76.67	31.21	69.69	177.57
Soil mulch	408.22	178.00	352.67	938.89	80.26	36.93	86.38	203.57
Live mulch (intercropping)	391.67 (126.11)	176.83 (108.89)	377.22 (64.44)	945.72 (299.44)	84.74 (23.42)	37.78 (16.21)	92.49 (11.26)	215.01 (50.89)
SEm±	15.09	2.96	2.65		3.03	0.83	0.90	
CD at 5%	NS	8.88	7.97		NS	2.49	2.70	
C. Interaction : Perennial grass X Moisture conservation								
SEm±	26.13	5.13	4.60		5.24	1.44	1.56	
CD at 5%	NS	15.39	13.80		NS	4.31	4.68	
CV%	11.37	5.22	2.31		11.29	7.07	3.26	

Table 2 (m): Effect of moisture conservation practices and perennial grasses on crude protein yield and crude protein content of grasses at Kalyani in North East Zone

Treatment	Crude protein yield (q/ha)				Crude protein (%)		
	Kharif	Rabi	Summer	Total	Kharif	Rabi	Summer
A. Perennial grass							
Brachiaria	5.44	3.49	9.32	18.25	6.61	7.83	9.60
Hybrid napier	6.50	2.39	7.23	16.12	6.73	6.77	8.81
Setaria	4.79	2.21	5.91	12.91	7.20	8.41	8.27
SEm±	0.22	0.06	0.08		-		-
CD at 5%	0.67	0.18	0.25		-		-
B. Moisture conservation							
Control	3.46	2.22	5.75	11.43	4.63	7.14	8.18
Soil mulch	4.25	2.83	7.53	14.61	5.31	7.73	8.63
Live mulch (intercropping)	9.02 (3.22)	3.04 (2.03)	9.18 (1.60)	21.24 (6.85)	10.68 (13.72)	8.14 (12.52)	9.87 (14.20)
SEm±	0.22	0.06	0.08				
CD at 5%	0.67	0.18	0.25				
C. Interaction: Perennial grass X Moisture conservation							
SEm±	0.39	0.10	0.15				
CD at 5%	NS	0.31	0.44				
CV%	12.16	6.63	3.35				

Table 2 (n): Effect of moisture conservation practices and perennial grasses on plant height and leaf stem ratio of grasses at Kalyani in North East Zone

Treatment	Plant height (cm)			Leaf stem ratio		
	Kharif	Rabi	Summer	Kharif	Rabi	Summer
A. Perennial grass						
Brachiaria	168.41	160.06	176.50	0.85	0.88	1.06
Hybrid napier	164.04	84.41	140.62	0.96	2.56	0.87
Setaria	93.90	44.46	94.08	0.81	3.16	1.22
SEm±	4.87	1.80	1.85	-		-
CD at 5%	14.60	5.41	5.57	-		-
B. Moisture conservation						
Control	144.72	100.42	135.18	0.80	1.62	0.98
Soil mulch	143.32	97.24	142.29	0.86	2.30	1.07
Live mulch (intercropping)	138.31 (73.00)	91.26 (35.3)	133.73 (66.58)	0.95 (1.16)	2.69 (0.72)	
SEm±	4.87	1.80	1.85			
CD at 5%	NS	5.41	5.57			
C. Interaction: Perennial grass X Moisture conservation						
SEm±	8.43	3.13	3.21			
CD at 5%	NS	NS	9.65			
CV%	10.28	5.62	4.07			

Table 2 (o): Effect of moisture conservation practices and perennial grasses on economics of grasses at Kalyani in North East Zone

Treatment	Plant population/ m^2			Cost of cultivation (Rs/ha/yr)	Net monetary return (Rs/ha/yr)	Benefit cost ratio
	Kharif	Rabi	Summer			
A. Perennial grass						
Brachiaria	8.89	8.89	8.89	39500	10577.78	0.27
Hybrid napier	8.56	8.56	8.56	44167	22144.11	0.50
Setaria	8.67	8.67	8.67	35500	6608.33	0.19
SEm±	0.16	0.16	0.16	-	920.99	-
CD at 5%	NS	NS	NS	-	2761.12	-
B. Moisture conservation						
Control	8.56	8.56	8.56	30667	12210.78	0.40
Soil mulch	8.89	8.89	8.89	35167	11833.00	0.34
Live mulch (intercropping)	8.67 (40.5)	8.67 (92.62)	8.67 (17.11)	53333	15286.44	0.29
SEm±	0.16	0.16	0.16		920.99	
CD at 5%	NS	NS	NS		2761.12	
C. Interaction: Perennial grass X Moisture conservation						
SEm±	0.28	0.28	0.28		1595.20	
CD at 5%	NS	NS	NS		NS	
CV%	5.69	5.69	5.69		18.77	

Table 2 (p): Effect of moisture conservation practices and perennial grasses on yields, growth parameters and economics of grasses at Bhubaneswar in North East Zone

Treatment	Total green fodder yield (q/ha)	Total dry matter yield (q/ha)	Total crude protein yield (q/ha)	Plant height (cm)	Leaf stem ratio	Number of tillers/ m^2	Net monetary return of the system (Rs/ha)
A. Perennial grass							
Brachiaria	687.4	129.9	9.6	80.6	0.99	53.8	25416
Guinea	732.6	143.2	11.9	111.8	0.92	50.8	43880
Setaria	680.9	126.8	11.5	73.2	0.97	53.8	49664
SEm±	4.4	1.6	0.2	0.8	0.02	0.2	347.7
CD at 5%	12.7	4.7	0.5	2.3	NS	0.7	1019.5
B. Moisture conservation							
Control	525.9	97.9	7.5	85.2	0.85	54.2	30852
Soil mulch	736.8	141.1	11.8	88.0	0.94	51.0	29876
Live mulch (intercropping)	838.3	160.9	13.7	92.4	1.08	53.1	33260
SEm±	4.4	1.6	0.2	0.8	0.02	0.2	347.7
CD at 5%	12.7	4.7	0.5	2.3	0.06	0.7	1019.5
C. Interaction: Perennial grass X Moisture conservation							
SEm±	7.5	2.8	0.3	1.4	0.03	0.4	602.2
CD at 5%	22.1	8.2	NS	NS	NS	1.2	1765.8
CV%	1.9	3.6	4.5	2.6	5.9	1.3	1.9

Table 2 (p-1): Interaction effects of moisture conservation practices and perennial grasses on green fodder yield at Bhubaneswar in North East Zone

Perennial grass / Moisture conservation	Green fodder yield (q/ha)			
	Control	Soil mulch	Live mulch (intercropping)	Mean
Brachiaria	476.17	737.93	847.97	687.36
Guinea	560.37	753.37	884.17	732.63
Setaria	541.20	719.00	782.63	680.94
Mean	525.91	736.77	838.26	
	Perennial grass	**Moisture conservation**	**G X M**	
SE(m)±	4.35	4.35	7.53	
CD at 5 %	12.74	12.74	22.07	
CV%	1.86			

Table 2 (p-2): Interaction effects of moisture conservation practices and perennial grasses on dry matter yield at Bhubaneswar in North East Zone

Perennial grass / Moisture conservation	Dry matter yield (q/ha)			
	Control	Soil mulch	Live mulch (intercropping)	Mean
Brachiaria	87.03	139.80	162.93	129.92
Guinea	107.77	149.47	172.43	143.22
Setaria	98.90	134.10	147.33	126.78
Mean	97.90	141.12	160.90	
	Perennial grass	**Moisture conservation**	**G X M**	
SE(m)±	1.62	1.62	2.80	
CD at 5 %	4.74	4.74	8.21	
CV%	3.64			

Table 2 (q): Effect of moisture conservation practices and perennial grasses on yields of grasses at Ranchi in North East Zone

Treatment	Green fodder yield (q/ha)	Dry matter yield (q/ha)	Napier hybrid equivalent yield (q/ha)
A. Perennial grass			
Brachiaria	829.9	170.2	1045.2
Napier hybrid	1012.6	201.1	1065.7
Setaria	963.6	156.4	1215.6
SEm±			
CD at 5%	41.6	15.0	49.3
B. Moisture conservation			
Control	851.2	143.4	958.6
Soil mulch	991.3	188.2	1118.6
Live mulch (intercropping)	963.6	196.0	1249.4
SEm±			
CD at 5%	41.6	15.0	49.3
C. Interaction: Perennial grass X Moisture conservation			
SEm±			
CD at 5%			
CV%			

Table 2 (r): Effect of silvipasture systems on yield of subabul and grasses under rain fed ecosystem in South zone

Treatment	Green fodder yield (q/ha)				Dry matter yield (q/ha)				Forage equivalent yield (q/ha)
	Mandya	Hyderabad	Coimbatore	Mean	Mandya	Hyderabad	Coimbatore	Mean	Coimbatore
T_1	255.65	195.48	355.93	269.02	56.77	36.57	64.24	52.53	299.5
T_2	313.08	223.85	285.02	273.98	83.95	51.21	51.61	62.26	265.7
T_3	382.04	135.05	302.77	273.29	85.18	35.84	54.20	58.41	285.1
T_4	268.52	227.55	321.73	272.60	54.92	58.54	57.23	56.90	279.3
T_5	276.48	148.62	360.47	261.86	56.67	32.90	56.13	48.57	274.0
T_6	212.22	320.05	490.03	340.77	46.30	72.90	88.71	69.30	394.1
T_7	275.93	368.15	671.73	438.60	58.52	95.24	119.14	90.97	513.6
T_8	35.18	36.38	199.05	90.14	8.79	8.78	35.92	17.83	199.1
SEm±	16.32	10.17	9.75		8.16	2.34	1.94		7.8
CD at 5%	49.51	30.86	29.70		24.79	7.08	5.89		23.8
CV%		8.50				8.30			

T_1 = Subabul + *Cenchrus ciliaris*
T_2 = Subabul + *Stylosanthes*
T_3 = Subabul + *Desmenthus virgatus*
T_4 = Subabul + *Cenchrus ciliaris* + *Stylosanthes*(3:1)
T_5 = Subabul + *Cenchrus ciliaris* + *Desmenthus (*3:1)
T_6 = Subabul + Sorghum + Horsegram (3:1)
T_7 = Subabul + Pearlmillet+ Horsegram (3:1)
T_8 = Subabul (Sole)

Table 2 (s): Effect of silvipasture systems on crude protein yield and economics of subabul and grasses under rain fed ecosystem in South zone

Treatment	Crude protein yield (q/ha)				Net monetary return (Rs.)			Benefit cost ratio		
	Mandya	Hydera-bad	Coimba-tore	Mean	Hydera-bad	Coimba-tore	Mean	Hydera-bad	Coimba-tore	Mean
T_1	5.05	3.78	8.05	5.63	4017	8381	6199.0	1.25	1.23	1.24
T_2	14.44	8.19	8.70	10.44	10862	3790	7326.0	1.68	1.11	1.39
T_3	14.50	5.63	9.03	9.72	206	3516	1861.0	1.01	1.09	1.05
T_4	5.56	4.50	7.54	5.87	6211	4572	5391.5	1.37	1.12	1.24
T_5	5.30	7.87	7.73	6.97	834	2981	1907.5	1.05	1.08	1.06
T_6	4.63	16.68	9.50	10.27	15375	22532	18953.5	1.90	1.62	1.76
T_7	5.24	21.16	11.26	12.55	20185	41789	30987.0	2.19	2.19	2.19
T_8	2.22	1.96	6.24	3.47	-7634	12409		036	1.71	1.03
SEm±	0.72	0.49	0.31					0.07		
CD at 5%	2.18	1.49	0.93					0.22		
CV%		9.7						9.1		

T_1 = Subabul + *Cenchrus ciliaris*	T_5 = Subabul + *Cenchrus ciliaris* + *Desmenthus virgatus (*3:1)
T_2 = Subabul + *Stylosanthes*	T_6 = Subabul + Sorghum + Horsegram (3:1)
T_3 = Subabul + *Desmenthus virgatus*	T_7 = Subabul + Pearlmillet+ Horsegram (3:1)
T_4 = Subabul + *Cenchrus ciliaris* + *Stylosanthes*(3:1)	T_8 = Subabul (Sole)

Cost of produce

Green and cereal fodder : Rs. 1000/t
Lucerne : Rs. 1500/t (Coimbatore)
Legumes : Rs. 1200/t (Hyderabad)

Table 2 (t): Effect of Intensive forage production through silvipasture system on soil fertility and microbial status of soil under rain fed ecosystem at Coimbatore in South zone

Treatment	OC (%)	pH	EC (dSm^{-1})	N (kg/ha)	P (kg/ha)	K (kg/ha)	Fungi CFU X 10^3	Actinomycetes CFU X 10^3	Bacteria CFU X 10^6
T_1	0.51	7.7	0.54	220	17.8	412	11.00	7.24	29.61
T_2	0.51	7.7	0.52	220	17.7	410	11.10	7.30	29.48
T_3	0.52	7.7	0.53	221	17.6	414	11.00	7.28	30.00
T_4	0.52	7.8	0.52	218	17.8	396	11.40	7.28	30.02
T_5	0.52	7.7	0.54	219	16.4	400	11.40	7.32	30.10
T_6	0.53	7.7	0.53	220	16.0	398	12.00	7.40	30.00
T_7	0.53	7.7	0.54	218	16.2	401	12.00	7.40	30.12
T_8	0.50	7.9	0.50	220	17.6	410	10.40	7.24	29.30
Initial	0.49	7.9	0.46	223	21.4	440	10.10	7.20	28.90

T_1 = Subabul + *Cenchrus ciliaris*
T_2 = Subabul + *Stylosanthes*
T_3 = Subabul + *Desmenthus virgatus*
T_4 = Subabul + *Cenchrus ciliaris* + *Stylosanthes*(3:1)
T_5 = Subabul + *Cenchrus ciliaris* + *Desmenthus virgatus (*3:1)
T_6 = Subabul + Sorghum + Horsegram (3:1)
T_7 = Subabul + Pearl millet+ Horsegram (3:1)
T_8 = Subabul (Sole)

Table 2 (u): Effect of cassava based sustainable alley farming system of productivity of grasses and cowpea in rain fed areas of the humid tropics ecosystem at Vellayani in South zone

Treatment	Grass					Cowpea				
	Green fodder yield (q/ha)	Dry fodder yield (q/ha)	Crude protein (%)	Crude fibre (%)	Plant height (cm)	Green fodder yield (q/ha)	Dry fodder yield (q/ha)	Crude protein (%)	Crude fibre (%)	Plant height (cm)
T_1	218.8	35.3	6.3	26.0	164.2	17.2	3.4	20.2	24.9	90.2
T_2	239.8	37.0	6.7	26.1	161.5	16.1	2.3	20.8	25.6	89.2
T_3	233.3	37.0	6.0	27.1	161.0					
T_4	242.7	41.7	7.3	29.0	137.2					
T_5	167.7	34.1	7.5	27.8	91.5	21.3	3.2	20.4	26.0	70.0
T_6	201.5	51.4	8.1	28.8	80.0	19.4	3.1	19.7	25.6	64.6
T_7	174.5	39.8	7.5	28.4	89.2					
T_8	188.1	49.0	6.7	28.8	98.3					
T_9						120.3	15.7	17.9	25.2	67.1
T_{10}						87.5	14.3	18.8	26.1	58.0
T_{11}										
T_{12}										
SEm±	6.3	1.9	0.2	0.3	2.0	4.9	0.7	0.4	0.4	2.4
CD at 5%	19.2	5.9	0.5	0.9	6.0	15.5	2.2	1.3	1.3	7.7
CV%	3.0	4.8	2.5	1.1	1.6	10.4	10.3	2.1	1.7	3.3

T_1 = Cassava +Bajra Napier Hybrid +Fodder cowpea + AMF
T_2 = Cassava +Bajra Napier Hybrid +Fodder cowpea
T_3 = Cassava +Bajra Napier Hybrid +AMF
T_4 = Cassava +Bajra Napier Hybrid
T_5 = Cassava + *Brachiaria* +Fodder cowpea +AMF
T_6 = Cassava + *Brachiaria* +Fodder cowpea
T_7 = Cassava + *Brachiaria* +AMF
T_8 = Cassava + *Brachiaria*
T_9 = Cassava +Fodder cowpea+AMF
T_{10} = Cassava +Fodder cowpea
T_{11} = Cassava +AMF
T_{12} = Cassava

Table 2 (v): Effect of cassava based sustainable alley farming system on tuber yield, net returns and soil fertility in rain fed areas of the Humid tropics ecosystem at Vellayani in South zone

Treatment	Cassava			Net monetary return (Rs/ha)	Organic carbon (%)	Available nutrient (kg/ha)		
	Tuber yield (q/ha)	Harvest index	Plant height (cm)			N	P	K
T_1	74.4	0.81	83.5	2068	0.8	344.2	40.0	60.0
T_2	85.8	0.80	74.7	17221	0.9	296.0	58.4	63.7
T_3	83.6	0.73	90	6972	0.9	374.2	67.6	101.3
T_4	64.4	0.63	80.4	4929	0.7	325.9	69.7	57.7
T_5	121.6	0.81	82.5	20553	0.8	334.3	60.6	111.1
T_6	128.7	0.82	92.7	39577	0.9	325.9	55.6	87.2
T_7	61.7	0.65	82.0	1213	0.8	353.1	42.7	72.3
T_8	93.9	0.71	95.5	16689	0.9	344.7	82.6	83.0
T_9	160.6	0.80	96.0	28776	0.8	381.7	57.9	125.3
T_{10}	120.6	0.82	100.1	14866	0.8	381.7	67.5	101.7
T_{11}	238.1	0.80	103.5	67460	0.8	336.9	41.3	85.3
T_{12}	229.4	0.81	98.5	64556	0.8	336.9	57.1	104.2
SEm±	2.0	0.01	0.8	741	0.04	5.9	1.4	5.4
CD at 5%	5.9	0.03	2.3	2173	0.13	17.4	4.0	15.7
CV%	1.6	1.05	2.4	3.1	5.8	1.7	2.3	6.1

T_1 = Cassava +Bajra Napier Hybrid +Fodder cowpea + AMF
T_2 = Cassava +Bajra Napier Hybrid +Fodder cowpea
T_3 = Cassava +Bajra Napier Hybrid +AMF
T_4 = Cassava +Bajra Napier Hybrid
T_5 = Cassava + *Brachiaria* +Fodder cowpea +AMF
T_6 = Cassava + *Brachiaria* +Fodder cowpea
T_7 = Cassava + *Brachiaria* +AMF
T_8 = Cassava + *Brachiaria*
T_9 = Cassava +Fodder cowpea+AMF
T_{10} = Cassava +Fodder cowpea
T_{11} = Cassava +AMF
T_{12} = Cassava

Market price of cassava = Rs. 500/q
Market price of cowpea = Rs. 350/q
Market price of grass = Rs.150/q

AST-3: Influence of nutrients (macro and micro) on forage production and quality of berseem in North - West zone (Exploratory)

Locations: Ludhiana, Hisar and Pantnagar

This was the second year of experimentation at the same site with previous year treatments at three locations of North-West zone. The treatments of sulphur, molybdenum and boron 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 (736.6 q/ha), dry matter (110.2 q/ha) and crude protein yields (24.9 q/ha) on location mean basis. T_{11} remained at par with T_5, T_6 and T_{10} for green fodder yield at Ludhiana, with T_6, T_7 and T_{11} for same at Hisar. At Pantnagar, the application of RDF to berseem recorded significantly highest GFY, DMY and CPY over rest of the treatments (Table 3(a) to 3(c). On mean basis again T_{11} produced taller plants as compared to rest of the treatments. The lowest GFY, DFY, CPY and Crude fibre yield were recorded under absolute control over rest of the treatments.

Table 3 (a): Influence of nutrients (macro & micro) on green fodder yield and dry matter yields of berseem in North West Zone

Treatment	Green fodder yield (q/ha)				Dry matter yield (q/ha)			
	Ludhiana	Hisar	Pantnagar	Mean	Ludhiana	Hisar	Pantnagar	Mean
Absolute control	616.4	634.3	365.0	538.6	93.5	77.5	62.1	77.7
RDF	736.9	796.0	524.7	685.8	110.5	106.3	89.2	102.0
FYM @ 5 t/ha	632.7	694.3	353.3	560.1	95.3	94.4	60.1	83.3
FYM @ 10 t/ha	698.7	745.3	404.7	616.2	105.1	100.5	68.9	91.5
RDF + FYM @ 5 t/ha	822.5	793.3	425.7	680.5	123.9	105.8	72.4	100.7
RDF + FYM @ 10 t/ha	848.4	845.7	442.3	712.1	127.3	119.0	75.2	107.2
RDF + S + Mo + B	760.9	818.0	446.7	675.2	114.6	112.4	76.0	101.0
FYM @ 5 t/ha + S + Mo + B	663.8	674.0	451.7	596.5	99.7	91.9	76.8	89.5
FYM @ 10 t/ha + S + Mo + B	728.4	695.3	457.0	626.9	109.9	94.1	77.7	93.9
RDF + FYM @ 5 t/ha + S + Mo + B	832.3	820.7	477.0	710.0	124.8	109.6	81.0	105.1
RDF + FYM @ 10 t/ha + S +Mo+ B	876.6	848.0	485.3	736.6	130.4	117.6	82.5	110.2
SEm±	28.4	16.5	10.9		5.0	1.6	1.9	
CD at 5%	83.6	48.9	32.2		14.8	4.8	5.5	
CV%	7.1	3.8			7.8	2.7		

Table 3 (b): Influence of nutrients (macro & micro) on forage quality of berseem in North West Zone

Treatment	Crude protein yield (q/ha)				Ludhiana		
	Ludhiana	Hisar	Pantnagar	Mean	Crude fibre yield (q/ha)	Crude protein (%)	Crude fibre (%)
Absolute control	16.3	18.6	12.4	15.8	22.6	17.4	24.2
RDF	21.7	26.3	17.8	21.9	25.9	19.7	23.4
FYM @ 5 t/ha	17.9	23.4	12.0	17.8	22.6	18.8	23.7
FYM @ 10 t/ha	20.1	25.4	13.8	19.8	23.5	19.1	22.4
RDF + FYM @ 5 t/ha	24.6	27.0	14.5	22.0	28.5	19.9	23.0
RDF + FYM @ 10 t/ha	25.7	30.9	15.1	23.9	27.9	20.2	21.9
RDF + S + Mo + B	22.6	29.2	15.2	22.3	25.8	19.7	22.5
FYM @ 5 t/ha + S + Mo + B	19.0	24.0	15.4	19.5	22.9	19.0	23.0
FYM @ 10 t/ha + S + Mo + B	21.2	24.9	15.5	20.5	25.1	19.3	22.8
RDF + FYM @ 5 t/ha + S + Mo + B	25.2	28.8	16.2	23.4	27.5	20.2	22.0
RDF + FYM @ 10 t/ha + S + Mo + B	27.0	31.2	16.5	24.9	28.3	20.7	21.7
SEm±			0.1				
CD at 5%			0.3				
CV%							

Table 3 (c): Influence of nutrients (macro & micro) on plant height, leaf stem ratio and plant population of berseem in North West Zone

Treatment	Plant height (cm)			Leaf stem ratio	Plant population/m^2
	Ludhiana	Pantnagar	Mean	Pantnagar	Ludhiana
Absolute control	55.5	46.3	50.9	1.07	347.7
RDF	60.6	45.3	53.0	1.32	389.6
FYM @ 5 t/ha	56.9	45.3	51.1	1.41	377.9
FYM @ 10 t/ha	58.7	46.7	52.7	1.47	384.0
RDF + FYM @ 5 t/ha	60.8	45.3	53.1	1.55	401.8
RDF + FYM @ 10 t/ha	62.4	47.3	54.9	1.32	439.9
RDF + S + Mo + B	60.6	43.7	52.2	1.34	401.8
FYM @ 5 t/ha + S + Mo + B	56.9	44.3	50.6	1.26	382.6
FYM @ 10 t/ha + S + Mo + B	58.9	46.3	52.6	1.44	385.7
RDF + FYM @ 5 t/ha + S + Mo + B	61.8	48.3	55.1	1.31	421.1
RDF + FYM @ 10 t/ha + S + Mo + B	63.8	49.3	56.6	1.33	438.3
SEm±	3.2	1.1			18.5
CD at 5%	9.5	3.2			54.5
CV%	9.3				8.1

AST-4: Optimization of nitrogen for maize in different forage based cropping systems

This experiment was allotted to Shillong and Imphal but could not conduct the trial.

B. ON-GOING LOCATION SPECIFIC TRIALS

AST-5: Remunerative forage based cropping system for sustained productivity under irrigated conditions.

Location: Mandya

The experiment was conducted in sixth year at fixed site to evaluate most remunerative forage based cropping system for the region. It is clear from the data (Table 5(a)) that round the forage production system i.e. Napier bajra hybrid (Perennial) recorded the net monetary return of Rs. 69026/ha/yr. Maize + Cowpea (F) – Sunflower (G) – Ragi (G) cropping sequence fetched highest monetary return of Rs. 83129/ha/yr. The magnitude of increase with best treatment was in order of 52.5, 85.4, 9.07, 31.45 and 20.4 percent over Ragi (G) – Field bean (G) – Sunflower (G), Sorghum(F) – Lucerne, Maize(G) – Maize(F) – Groundnut (S), Sunflower (G) – Cowpea (S) – Maize(F) + Cowpea (F) and BN hybrid, respectively.

Table 5 (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				
Ragi(G)	Field bean(G)	Sunflower(G)	30.28	9.01	16.49	54512
Sorghum(F)(MC)	Lucerne		851.67	248.7	-	44835
Maize(F) + Cowpea(F)	Sunflower(G)	Ragi(G)	701.87	14.31	38.39	83129
Maize(G)	Maize(F) + Cowpea(F)	Groundnut(S)	42.68	683.11	18.19	76214
Sunflower(G)	Cowpea(S)	Maize(F) + Cowpea(F)	16.32	12.45	579.19	63239
Napier X Bajra hybrid(P)			513.33	406.74	438.71	69026

Selling price (Rs./q)

Grain		Fodder	
Field bean	2000	Sorghum	60
Sun Flower	1800	Maize	60
Ragi	1000	Hybrid napier	60
Cowpea	2200	Lucerne	75
Maize	800	Cowpea (Stover)	75
Groundnut	2000	Groundnut (Stover)	75
		Ragi (Straw)	100
		Maize (Straw)	40
		Field Bean (Stover)	75

AST-6: Optimization of nitrogen for sorghum in different cropping system

Location: Ludhiana and Pantnagar

This was the second year of experimentation at Ludhiana and Pantnagar to find out the nitrogen requirement of sorghum in different cropping systems. The results of complete sequence will be reported in *Kharif* 2012.

AST-7: Effect of soil amendments on productivity of rice-berseem and change in soil properties of sodic soil

Location: Faizabad

This was the second year of experimentation at the same site with the previous year treatments. The experiment was conducted with a view to study the effect of soil amendments on the productivity of sodic soils. The initial pH of soil was 9.1 with EC of 0.97/dS/m and exchangeable sodium 31.4%. During *kharif* application of recommended dose of fertilizers (RDF) + gypsum @ 75% +FYM 10t/ha (T_7) recorded significantly highest grain yield of rice (24.28 q/ha) and was at par with RDF + press mud @ 75% GR + FYM 10t/ha (T_9). During Rabi season also this treatment (T_7) proved significantly 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. The application of T_7 treatment maintained its significant superiority by producing 48.56% higher forage equivalent yield over RDF (T_1). The uptake of N and P was recorded more with berseem than rice. Application of RDF + gypsum @ 75% GR + FYM 10t/ha (T_7) to the rice – berseem system again recorded highest total N, P and K uptake over rest of the treatments. Treatments did not bring any remarkable effect on soil properties (pH, EC (dS/m), exchangeable Na percentage, OC% and available nutrients) in comparison to initial soil values (Tables 7(a) to 7(c)).

Table 7 (a): Effect of soil amendment on yield in rice-berseem cropping 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 (q/ha)	
T_1	10.50	19.48	35.75	195.35	36.87	5.41	312.67
T_2	13.56	23.45	38.25	225.67	40.52	7.24	370.20
T_3	19.58	30.95	37.50	215.80	39.50	6.32	403.50
T_4	16.78	31.00	37.25	230.1	39.10	6.41	367.80
T_5	19.25	28.45	38.75	210.5	36.95	6.37	365.30
T_6	17.87	24.20	40.98	204.35	37.10	5.92	351.70
T_7	24.28	35.48	38.52	255.70	46.70	7.67	464.50
T_8	21.52	31.35	38.08	242.80	44.20	7.35	434.60
T_9	22.60	34.58	39.57	245.52	44.05	7.10	435.70
T_{10}	17.98	31.20	38.75	231.51	42.20	6.55	402.51
SEm±	0.85	2.32	0.87	9.27	2.30	0.77	11.25
CD at 5%	1.78	4.87	1.83	19.47	4.83	0.98	23.63
CV%	7.60	9.50	4.35	7.82	8.70	10.51	8.98

T_1 = RDF (120 kg N : 60kg P_2O_5 : 25 kg Zn SO_4/ha)
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 (b): Effect of soil amendment on N, P and K uptake in rice-berseem cropping 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	24.25	90.95	5.65	13.50	23.40	24.50	115.20	19.15	47.90
T_2	27.80	114.20	6.72	16.20	32.25	31.20	142.00	23.42	63.45
T_3	36.70	100.25	8.50	17.90	37.80	25.60	136.25	26.30	63.40
T_4	34.50	100.55	7.80	17.05	35.40	27.80	135.05	24.80	63.20
T_5	35.70	103.80	7.70	18.20	33.46	25.20	139.50	25.10	58.60
T_6	26.87	94.26	6.75	17.80	24.28	24.80	125.58	24.55	50.28
T_7	43.20	128.70	11.20	19.40	45.70	25.20	171.90	30.60	80.90
T_8	38.40	119.50	9.20	20.50	37.80	35.20	157.90	29.70	69.20
T_9	41.50	114.20	9.70	20.30	35.40	32.42	155.70	30.40	69.82
T_{10}	35.20	107.8	7.75	20.90	35.80	31.47	143.00	28.65	67.82
SEm±	1.84	4.25	0.84	1.25	3.42	1.75			
CD at 5%	3.86	8.92	1.76	2.62	7.18	3.67			
CV%	9.50	10.28	10.45	11.25	11.84	12.45			

T_1 = RDF (120 kg N : 60kg P_2O_5 : 25 kg Zn SO_4/ha)
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 (c): Effect of soil amendment on soil fertility status after completion of rice-berseem cropping system at Faizabad

Treatment	pH	EC (dS/m)	Exchangeable Na (%)	Organic Carbon (%)	Available nutrients (kg/ha)		
					N	P	K
T_1	9.1	0.96	31.4	0.24	92.1	12.9	279.5
T_2	9.1	0.94	32.4	0.24	94.2	14.8	280.4
T_3	9.0	0.95	27.8	0.23	93.4	13.6	281.2
T_4	9.0	0.96	28.2	0.22	93.5	14.2	281.6
T_5	9.0	0.97	28.9	0.24	94.2	11.4	279.4
T_6	9.0	0.96	21.2	0.24	93.2	13.5	281.5
T_7	9.0	0.94	27.5	0.23	94.5	13.2	282.6
T_8	9.1	0.95	27.8	0.24	94.3	14.5	281.3
T_9	9.1	0.95	27.9	0.26	94.5	14.8	283.6
T_{10}	9.1	0.95	28.7	0.24	95.0	14.5	281.5
Initial value	9.1	0.97	31.4	0.21	91.0	13.2	287.0

T_1 = RDF (120 kg N : 60kg P_2O_5 : 25 kg Zn SO_4/ha)	T_6 = RDF + pressmud@ 50 % GR
T_2 = RDF + FYM 10 t/ha	T_7 = RDF +gypsum @75% GR + FYM 10 t/ha
T_3 = RDF +gypsum @75 % GR	T_8 = RDF +gypsum @ 50 % GR +FYM10 t/ha
T_4 = RDF +gypsum @50 % GR	T_9 = RDF + pressmud@ 75 % GR +FYM 10 t/ha
T_5 = RDF +pressmud @75% GR	T_{10} = RDF + pressmud@ 50 % GR +FYM 10t/ha

AST-8: Effect of soil amendments on productivity of rice based cropping system in acidic soil

This experiment was allotted to Shillong but could not conduct the trial.

C. AVT-2 BASED AGRONOMY TRIALS

AST 9: Effect of nitrogen levels on Promising entries of tall fescue grass

Locations: Palampur

A field trial on tall fescue grass entries was conducted to find out the response of N levels on growth and yield of the crop in the hill zone. The treatments consisted of three entries (HIMA-1, HIMA-4 and EC-178182) and four levels of nitrogen (0, 40, 80 and 120 kg N/ha).

At Palampur center during second year no significant effect on leaf stem ratio and crude protein content (%) was observed among entries, whereas with respect to other parameters under study significant variation among entries was observed. The entry EC-178182 produced significantly taller plant than HIMA-1 and HIMA-4. With respect to shoot number (m^{-2}) entries EC-178182 and HIMA-4 remaining at par with each other proved better than HIMA-1. Entry EC-178182 maintained its significant superiority over other entries by producing higher green forage, dry forage and crude protein yields. The growth parameters, yield and quality increased consistently with increasing levels of nitrogen up to 120 kg N/ha.

The interaction effect of entries and nitrogen levels on dry fodder yield indicated that entries HIMA-1 and HIMA-4 responded up to 120 kg N/ha and entry EC-178182 responded up to 80kg N/ha. Significantly highest dry fodder yield was obtained of entry HIMA-4 with the application of 120 kg N/ha which was at par with application of 80kgN/ha to entry EC-178182.

Table 9 (a): Effect of nitrogen levels on the performance of promising entries of tall fescue grass at Palampur

Treatments	Plant height (cm)	Shoot number (m^2)	Leaf stem ratio	Green fodder yield (q/ha)	Dry fodder yield (q/ha)	Crude Protein (%)	Crude protein yield (q/ha)
Entries							
HIMA-1	68.83	184.50	0.61	161.18	44.87	9.70	4.42
HIMA -4	68.42	209.00	0.62	168.15	47.60	9.63	4.69
EC-178182	74.58	209.25	0.63	182.98	50.02	9.68	4.94
SEm±	1.22	3.69	0.01	2.61	0.72	0.08	0.07
CD at 5%	3.58	10.81	NS	7.65	2.10	NS	0.22
Nitrogen levels (kg/ha)							
N_0	53.40	127.67	0.51	72.24	23.36	8.67	2.02
N_{40}	65.06	190.33	0.59	124.45	35.64	9.83	3.50
N_{80}	76.86	220.33	0.65	226.60	63.45	10.0	6.35
N_{120}	87.12	265.33	0.73	259.78	67.53	10.17	6.86
SEm±	1.41	4.26	0.01	3.01	0.82	0.09	0.09
CD at 5%	4.13	12.48	0.04	8.83	2.43	0.27	0.25
Interaction	NS	Sig.	NS	NS	Sig.	NS	Sig.

Table 9 (a-1): Interaction effects of nitrogen levels and varieties on dry fodder yield of tall fescue grass at Palampur

	Dry fodder yield (q/ha)				
	Nitrogen levels (kg/ha)				
Varieties	**0**	**40**	**80**	**120**	**Mean**
HIMA-1	21.31	35.35	58.70	64.11	44.87
HIMA -4	23.38	33.56	62.17	71.28	47.60
EC-178182	25.38	38.01	69.48	67.19	50.02
Mean	23.36	35.64	63.45	67.53	
SEm±	Var. = 0.72	N=0.82	N x Var.=1.44		
CD at 5%	Var.=2.10	N=2.43	N x Var. =4.21		

AST-10: Effect of nitrogen levels of forage yield of promising entries of Oats (AVT-2)

Locations: Srinagar, Palampur, Hisar, Pantnagar, Ludhiana, Bikaner and Udaipur

A field trial was conducted to find out the response of promising AVT-2 entries of oats with supplementation of graded doses of nitrogen. The study was undertaken at 7 locations with 6 entries (including one zonal and two national checks) under Hill and North – West zones of the country. The treatment consisted of six entries and four levels of nitrogen (0, 40, 80 and 120 kg N/ha). The results indicated that testing entry SKO-96 out yielded on mean basis in terms of green forage (350.7 q/ha) and dry matter yields (88.8 q/ha) was closely followed by Kent (National check) under Hill zone (Palampur and Srinagar). In the same zone, the response of N was gradual with increasing level up to 120 kg N/ha. The application of 120 kg N/ha recorded the highest green fodder yield and magnitude of increase was 75.6, 22.3, and 6.1% over control, 40 and 80 kg N/ha.

Under North - West zone on location mean basis the testing entry SKO-133 recorded highest green fodder (393.7 q/ha), dry matter (72.9 q/ha) and crude protein yields (7.7 q/ha) closely followed by national check Kent. The Udaipur and Pantnagar produced higher yield of oats than Hisar, Ludhiana and Bikaner. None of the testing entries (except SKO-133) surpassed the national or zonal check at Pantnagar, Ludhiana, Bikaner and Udaipur. The influence of N was linear up to the highest tested rate of application (120 kg N/ha). The magnitude of increase for green fodder was 67.5, 31.6 and 10.4% over control, 40 and 80 kg N/ha. Interaction of entries and N levels was evident at Ludhiana, Bikaner and Pantnagar.

On all India mean basis, none of the testing entry remarkably surpassed the national check (Kent) for green fodder and dry matter yields. However, testing entry SKO-133 recorded numerically higher GFY and DFY (375.9 and 76.5 q/ha, respectively) over national check Kent (373.3 and 74.6 q/ha). The green fodder and dry matter yields increased consistently with increasing levels of nitrogen upto 120 kg N/ha.

Table 10(a): Effect of nitrogen levels on yield of promising entries of oats (AVT-2) in Hill zone

Treatment	Green fodder yield (q/ha)			Dry matter yield (q/ha)			Palampur		
	Srinagar	Palampur	Mean	Srinagar	Palampur	Mean	Crude protein yield (q/ha)	Plant height (cm)	Leaf stem ratio
A. Entry									
SKO – 133	432.2	230.2	331.2	99.0	68.3	83.6	7.8	88.2	0.63
SKO – 96	425.7	275.7	350.7	96.3	81.3	88.8	9.5	96.1	0.58
JO – 03 – 291	410.5	248.6	329.6	91.4	73.7	82.6	8.0	111.2	0.61
Palampur – 1	414.4	261.5	337.9	91.1	77.5	84.2	8.8	102.4	0.62
OS – 6 (NC)	408.9	244.6	326.7	91.9	72.7	82.3	8.1	111.8	0.62
Kent (NC)	418.6	260.5	339.6	93.8	77.1	85.4	8.6	107.0	0.72
SEm±		4.0			1.2		0.1	7.6	0.02
CD at 5%	2.7	12.6		1.8	3.8		0.4	23.9	0.07
B. Nitrogen levels (kg/ha)									
0	328.8	131.0	229.9	73.5	32.7	53.1	3.3	79.1	0.44
40	404.1	255.7	329.9	89.4	79.3	84.3	8.9	102.9	0.55
80	454.7	306.3	380.5	103.1	91.9	97.5	10.5	113.2	0.71
120	486.1	321.1	403.6	109.6	96.4	103.0	11.2	116.1	0.82
SEm±		3.3			0.9		0.1	6.0	0.02
CD at 5%	2.2	9.5		1.4	2.7		0.3	17.2	0.06
C. Interaction Entry X Nitrogen levels									
SEm±		8.1			2.3		0.2		
CD at 5%	5.4	23.2		3.6	6.8		0.7	NS	Sig.
CV%	1.8			2.3					

Table 10(a-1): Interaction effects of nitrogen levels and AVT-2 entries on green fodder yield of oats at Palampur

Entry/ Nitrogen levels	Green fodder yield (q/ha)				
	0	**40**	**80**	**120**	**Mean**
SKO – 133	120.00	231.93	273.53	295.53	230.25
SKO – 96	160.82	264.70	314.44	363.10	275.77
JO – 03 – 291	110.73	249.88	316.50	317.38	248.62
Palampur – 1	142.91	258.21	324.82	320.33	261.57
OS – 6 (NC)	116.84	255.55	302.26	303.60	244.56
Kent (NC)	134.90	273.97	306.62	326.63	260.53
Mean	131.03	255.71	306.36	321.10	
	Entry	**N levels**	**Entry X N levels**		
SEm±	4.03	3.32	8.12		
CD at 5%	12.69	9.51	23.28		
CV%					

Table 10(a-2): Interaction effects of nitrogen levels and AVT-2 entries on green fodder yield of oats at Srinagar

Entry/ Nitrogen levels	Green fodder yield (q/ha)				
	0	**40**	**80**	**120**	**Mean**
SKO – 133	338.5	415.1	470.9	504.2	432.2
SKO – 96	336.4	407.4	465.6	493.4	425.7
JO – 03 – 291	332.7	400.7	444.6	447.3	410.5
Palampur – 1	327.5	400.7	447.5	481.8	414.4
OS – 6 (NC)	317.5	397.5	442.3	478.2	408.9
Kent (NC)	329.6	403.1	457.3	484.5	418.6
Mean	328.8	404.1	454.7	486.1	
	Entry	**N levels**	**Entry X N levels**		
SEm±					
CD at 5%	2.7	2.2	5.5		
CV%			1.8		

Table 10(a-3): Interaction effects of nitrogen levels and AVT-2 entries on dry matter yield of oats at Palampur

Entry/ Nitrogen levels	Dry matter yield (q/ha)				
	0	40	80	120	Mean
SKO – 133	30.00	71.90	82.60	88.74	68.31
SKO – 96	40.21	81.86	94.33	108.90	81.33
JO – 03 – 291	27.68	77.46	94.81	95.21	73.79
Palampur – 1	35.73	80.50	97.45	96.10	77.45
OS – 6 (NC)	29.21	79.22	90.68	91.80	72.73
Kent (NC)	33.52	84.93	91.99	97.99	77.11
Mean	32.73	79.31	91.98	96.46	
	Entry	**N levels**	**Entry X N levels**		
SEm±	1.23	0.97	2.38		
CD at 5%	3.87	2.78	6.81		
CV%					

Table 10(a-4): Interaction effects of nitrogen levels and AVT-2 entries on dry matter yield of oats at Srinagar

Entry/ Nitrogen levels	Dry matter yield (q/ha)				
	0	40	80	120	Mean
SKO – 133	77.0	94.2	108.2	116.4	99.0
SKO – 96	76.6	87.2	107.1	114.4	96.4
JO – 03 – 291	72.1	89.0	99.4	105.2	91.5
Palampur – 1	71.1	88.1	99.6	105.5	91.1
OS – 6 (NC)	71.2	88.7	100.4	107.4	91.9
Kent (NC)	73.3	89.5	103.9	108.5	93.8
Mean	73.6	89.5	103.1	109.6	
	Entry	**N levels**	**Entry X N levels**		
SEm±					
CD at 5%	1.8	1.5	3.7		
CV%			2.4		

Table 10(a-5): Interaction effects of nitrogen levels and AVT-2 entries on crude protein yield of oats at Palampur

Entry/ Nitrogen levels	Crude protein yield (q/ha)				
	0	**40**	**80**	**120**	**Mean**
SKO – 133	3.26	8.11	9.49	10.24	7.78
SKO – 96	4.25	9.64	11.17	12.92	9.50
JO – 03 – 291	2.74	8.44	10.54	10.61	8.08
Palampur – 1	3.52	8.90	11.16	11.90	8.87
OS – 6 (NC)	2.90	8.90	10.30	10.40	8.14
Kent (NC)	3.40	9.50	10.30	11.30	8.62
Mean	3.35	8.91	10.50	11.24	
	Entry	**N levels**	**Entry X N levels**		
SEm±	0.14	0.11	0.27		
CD at 5%	0.44	0.31	0.76		
CV%					

Table 10(b): Effect of nitrogen levels on green fodder yield of promising entries of oats (AVT-2) in North West zone

Treatment	Green fodder yield (q/ha)									
	North West Zone						Hill Zone			All India mean
	Hisar	Pantnagar	Ludhiana	Bikaner	Udaipur	Mean	Srinagar	Palampur	Mean	
A. Entry										
SKO – 133	365.2	472.3	385.4	177.6	568.1	393.7	432.2	230.2	331.2	375.9
SKO – 96	178.0	463.5	324.5	165.3	525.7	331.4	425.7	275.7	350.7	336.9
JO – 03 – 291	271.4	406.4	319.7	244.4	500.7	348.5	410.5	248.6	329.6	343.1
OL – 125	254.4	463.0	391.9	211.0	573.5	378.7	-	-	-	378.8
Palampur–1	-	-	-	-	-	-	414.4	261.5	337.9	338.0
OS – 6 (NC)	303.7	519.0	365.9	171.4	381.9	348.3	408.9	244.6	326.7	342.2
Kent (NC)	344.0	486.7	336.7	196.3	570.1	386.7	418.6	260.5	339.6	373.3
SEm±	13.2	10.5	7.3	5.9	43.2			4.0		
CD at 5%	41.4	29.8	22.6	16.8	NS		2.7	12.6		
B. Nitrogen levels (kg/ha)										
0	239.7	299.5	226.1	95.8	468.5	265.9	328.8	131.0	229.9	255.6
40	274.0	456.5	318.5	149.2	494.4	338.5	404.1	255.7	329.9	336.1
80	303.5	544.7	407.2	207.4	555.6	403.7	454.7	306.3	380.5	397.1
120	327.5	573.2	464.3	325.0	537.5	445.5	486.1	321.1	403.6	433.5
SEm±	4.0	8.5	6.7	5.0	35.3			3.3		
CD at 5%	11.6	24.3	19.3	17.4	NS		2.2	9.5		
C. Interaction: Entry X Nitrogen levels										
SEm±		20.9	17.8	11.7				8.1		
CD at 5%		NS	50.9	33.5			5.4	23.2		
CV%			8.7	10.5			1.8			

Table 10(b-1): Interaction effects of nitrogen levels (kg/ha) and AVT-2 entries on green fodder yield of oats at Ludhiana

Entry/ Nitrogen levels	Green fodder yield (q/ha)				
	0	40	80	120	Mean
SKO – 133	219.7	361.6	459.4	501.1	385.4
SKO – 96	172.1	272.3	402.6	451.0	324.5
JO – 03 – 291	194.6	312.2	359.1	411.8	319.7
OL – 125	328.0	305.7	417.6	516.2	391.9
OS – 6 (NC)	213.0	340.8	428.5	481.1	365.9
Kent (NC)	229.1	317.4	375.8	424.3	336.7
Mean	226.1	318.5	407.2	464.3	
	Entry	**N levels**	**Entry X N levels**		
SEm±	7.3	6.7	17.8		
CD at 5%	22.6	19.3	50.9		
CV%			8.7		

Table 10(b-2): Interaction effects of nitrogen levels and AVT-2 entries on green fodder yield of oats at Bikaner

Entry/ Nitrogen levels	Green fodder yield (q/ha)				
	0	40	80	120	Mean
SKO – 133	84.7	149.4	191.4	285.0	177.6
SKO – 96	85.0	141.1	180.6	254.4	165.3
JO – 03 – 291	116.9	179.4	251.7	429.7	244.4
OL – 125	101.4	150.3	218.6	373.6	211.0
OS – 6 (NC)	89.4	132.2	190.3	273.6	171.4
Kent (NC)	97.2	142.5	211.9	333.3	196.3
Mean	95.8	149.2	207.4	325.0	
	Entry	**N levels**	**Entry X N levels**		
SEm±	5.9	5.0	11.7		
CD at 5%	16.8	17.4	33.5		
CV%			10.5		

Table 10(c): Effect of nitrogen levels on dry matter yield of promising entries of oats (AVT-2) in North West zone

Treatment	Dry matter yield (q/ha)									
	North West Zone						Hill Zone			All India Mean
	Hisar	Pantnagar	Ludhiana	Bikaner	Udaipur*	Mean	Srinagar	Palampur	Mean	
A. Entry										
SKO – 133	72.6	97.6	83.9	37.7	225.9	72.9	99.0	68.3	83.6	76.5
SKO – 96	33.2	100.5	67.3	36.5	211.0	59.3	96.3	81.3	88.8	69.2
JO – 03 – 291	54.3	82.4	65.7	50.8	182.2	63.3	91.4	73.7	82.6	69.7
OL – 125	51.0	94.9	87.1	44.1	212.9	69. 3	-	-	-	69.3
Palampur – 1	-	-	-	-	-	-	91.1	77.5	84.2	84.3
OS – 6 (NC)	60.7	105.0	74.8	37.0	138.9	69.4	91.9	72.7	82.3	63.2
Kent (NC)	67.9	96.2	71.8	40.6	228.5	69.1	93.8	77.1	85.4	74.6
SEm±	2.6	2.1	2.0	1.6	18.1			1.2		
CD at 5%	8.3	5.9	6.2	4.6	NS		1.8	3.8		
B. Nitrogen levels (kg/ha)										
0	46.9	64.6	43.5	23.0	181.5	44.5	73.5	32.7	53.1	47.4
40	54.2	93.8	66.1	33.0	195.3	61.8	89.4	79.3	84.3	53.5
80	60.5	109.9	88.6	44.7	221.5	75.9	103.1	91.9	97.5	83.1
120	65.0	116.1	102.2	63.8	201.3	86.8	109.6	96.4	103.0	92.2
SEm±	0.7	1.7	1.6	1.4	14.8			0.9		
CD at 5%	2.0	4.8	4.5	4.8	NS		1.4	2.7		
C. Interaction: Entry X Nitrogen levels										
SEm±		4.2	4.1					2.3		
CD at 5%		NS	11.8	NS			3.6	6.8		
CV%			9.5	13.7			2.3			

*****Not included in mean due to higher values with respect to GFY.

Table 10(c-1): Interaction effect of nitrogen levels and AVT-2 entries on dry matter yield of oats at Ludhiana

Entry/ Nitrogen levels	Dry matter yield (q/ha)				
	0	**40**	**80**	**120**	**Mean**
SKO – 133	42.8	75.9	104.3	112.7	83.9
SKO – 96	32.2	53.1	84.5	99.2	67.3
JO – 03 – 291	38.3	64.8	72.5	87.3	65.7
OL – 125	63.0	66.3	96.9	122.3	87.1
OS – 6 (NC)	39.8	69.9	89.9	99.6	74.8
Kent (NC)	45.1	66.7	83.4	92.1	71.8
Mean	43.5	66.1	88.6	102.2	
	Entry	**N levels**	**Entry X N levels**		
SEm±	2.0	1.5	4.1		
CD at 5%	6.2	4.4	11.8		
CV%			9.5		

Table 10(d): Effect of nitrogen levels on crude protein yield and growth parameter of promising entries of oats (AVT-2) in North-West zone

Treatment	Crude protein yield (q/ha)				Number of tillers/ m row length				
	Hisar	Pantnagar	Ludhiana	Mean	Hisar	Pantnagar	Ludhiana	Udaipur	Mean
A. Entry									
SKO – 133	5.4	9.7	8.2	7.7	52.2	74.7	44.3	159.1	82.5
SKO – 96	2.3	9.7	6.2	6.1	37.3	65.5	50.9	158.3	78.0
JO – 03 – 291	4.0	8.2	6.4	6.2	56.5	80.7	30.5	176.7	86.1
OL – 125	3.9	9.4	8.1	7.1	52.4	73.5	42.9	170.9	84.9
OS – 6 (NC)	4.1	10.2	7.3	7.2	51.0	81.8	45.3	167.3	86.3
Kent (NC)	4.9	9.6	6.7	7.1	48.8	73.3	39.3	172.8	83.5
SEm±		0.2			0.8	3.1	1.0	7.2	
CD at 5%		0.5			2.6	8.8	3.1	NS	
B. Nitrogen levels (kg/ha)									
0	2.7	6.3	3.1	4.0	44.8	64.7	32.5	151.5	73.4
40	3.8	9.2	6.2	6.4	47.3	79.3	40.2	174.0	85.2
80	4.8	10.9	8.3	8.0	51.8	76.8	45.9	174.3	87.2
120	5.6	11.4	11.0	9.3	54.8	78.9	50.2	170.3	88.6
SEm±		0.1			0.7	2.5	0.8	5.8	
CD at 5%		0.4			2.1	7.1	2.2	NS	
C. Interaction Entry X Nitrogen levels									
SEm±		0.4				6.2	2.0		
CD at 5%		1.2				NS	5.7		
CV%							8.3		

Table 10 (d-1): Interaction effects of nitrogen levels and AVT-2 entries on crude protein yield of oats at Pantnagar

Entry/ Nitrogen levels	Crude protein yield (q/ha)				
	0	**40**	**80**	**120**	**Mean**
SKO – 133	6.73	10.03	11.36	10.83	9.74
SKO – 96	6.24	7.99	11.56	13.21	9.75
JO – 03 – 291	4.86	8.86	10.07	9.14	8.23
OL – 125	6.09	7.97	11.20	12.45	9.43
OS – 6 (NC)	7.66	10.12	11.83	11.20	10.20
Kent (NC)	6.38	10.54	9.85	11.68	9.61
Mean	6.33	9.25	10.98	11.42	
	Entry	**N levels**	**Entry X N levels**		
SEm±	0.20	0.16	0.40		
CD at 5%	0.57	0.47	1.15		
CV%					

Table 10 (d-2): Interaction effects of nitrogen levels and AVT-2 entries on number of tiller/m row length of oats at Ludhiana

Entry/ Nitrogen levels	Number of tiller/ m row length				
	0	**40**	**80**	**120**	**Mean**
SKO – 133	31.1	36.1	53.0	57.0	44.3
SKO – 96	37.0	52.5	55.6	58.6	50.9
JO – 03 – 291	23.6	28.6	34.5	35.1	30.5
OL – 125	39.5	40.5	45.0	46.5	42.9
OS – 6 (NC)	31.1	44.0	46.3	60.0	45.3
Kent (NC)	32.6	39.3	41.1	44.1	39.3
Mean	32.5	40.2	45.9	50.2	
	Entry	**N levels**	**Entry X N levels**		
SEm±	1.0	0.8	2.0		
CD at 5%	3.1	2.2	5.7		
CV%			8.3		

Table 10(e): Effect of nitrogen levels on plant height of promising entries of oats (AVT-2) in North West zone

Treatment	Plant height (cm)					
	Hisar	Pantnagar	Ludhiana	Bikaner	Udaipur	Mean
A. Entry						
SKO – 133	104.7	140.1	79.3	73.2	116.9	102.8
SKO – 96	86.8	141.7	52.5	70.1	102.2	90.6
JO – 03 – 291	146.4	151.8	103.6	90.8	133.1	125.1
OL – 125	120.9	158.0	90.9	80.9	131.8	116.5
OS – 6 (NC)	140.8	150.4	91.6	75.0	128.8	117.3
Kent (NC)	92.7	158.8	87.0	72.4	132.6	108.7
SEm±	1.3	1.6	1.7	2.0	2.9	
CD at 5%	4.2	4.6	5.5	5.7	6.8	
B. Nitrogen levels (kg/ha)						
0	99.4	125.8	60.0	32.8	120.8	87.8
40	109.0	151.4	80.8	58.3	127.5	105.4
80	124.3	158.6	92.2	96.5	124.3	119.2
120	128.8	164.7	100.7	120.7	124.4	127.9
SEm±	0.9	1.3	1.2	2.1	2.4	
CD at 5%	2.5	3.8	3.5	7.4	NS	
C. Interaction Entry X Nitrogen levels						
SEm±		3.3	3.2	4.0		
CD at 5%		9.3	9.2	11.4		
CV%			6.6	9.0		

Table 10(e-1): Interaction effects of nitrogen levels and AVT-2 entries on plant height of oats at Bikaner

Entry/ Nitrogen levels	Plant height (cm)				
	0	**40**	**80**	**120**	**Mean**
SKO – 133	34.5	57.9	85.7	114.8	73.2
SKO – 96	30.9	53.9	83.2	112.5	70.1
JO – 03 – 291	35.0	70.7	109.8	147.7	90.8
OL – 125	31.9	60.7	104.5	126.6	80.9
OS – 6 (NC)	33.3	52.3	98.5	116.1	75.0
Kent (NC)	31.6	54.3	97.5	106.3	72.4
Mean	32.8	58.3	96.5	120.7	
	Entry	**N levels**	**Entry X N levels**		
SEm±	2.0	2.1	4.0		
CD at 5%	5.7	7.4	11.4		
CV%			9.0		

Table 10(e-2): Interaction effect of nitrogen levels and AVT-2 entries on plant height of oats at Ludhiana

Entry/ Nitrogen levels	Plant height (cm)				
	0	**40**	**80**	**120**	**Mean**
SKO – 133	54.5	70.3	95.4	97.1	79.3
SKO – 96	39.0	49.0	55.3	66.8	52.5
JO – 03 – 291	75.4	105.1	112.9	121.0	103.6
OL – 125	65.0	90.7	103.8	104.1	90.9
OS – 6 (NC)	61.3	85.7	108.4	111.1	91.6
Kent (NC)	64.6	84.0	95.3	104.1	87.0
Mean	60.0	80.8	92.2	100.7	
	Entry	**N levels**	**Entry X N levels**		
SEm±	1.7	1.2	3.2		
CD at 5%	5.4	3.5	9.2		
CV%			6.6		

Table 10(e-3): Interaction effect of nitrogen levels and AVT-2 entries on plant height of oats at Pantnagar

Entry/ Nitrogen levels	Plant height (cm)				
	0	**40**	**80**	**120**	**Mean**
SKO – 133	105.3	148.0	149.7	157.3	140.1
SKO – 96	96.7	139.0	162.0	169.0	141.7
JO – 03 – 291	139.3	152.0	156.0	159.7	151.8
OL – 125	135.7	159.7	165.7	170.7	158.0
OS – 6 (NC)	132.0	152.3	154.7	162.7	150.4
Kent (NC)	145.7	157.3	163.3	169.0	158.8
Mean	125.8	151.4	158.6	164.7	
	Entry	**N levels**	**Entry X N levels**		
SEm±	1.7	1.4	3.3		
CD at 5%	4.7	3.8	9.4		
CV%					

Table 10(f): Effect of nitrogen levels on Leaf stem ratio of promising entries of oats (AVT-2) in North West zone

Treatment	Leaf stem ratio					
	Hisar	Pantnagar	Ludhiana	Bikaner	Udaipur	Mean
A. Entry						
SKO – 133	0.38	0.42	0.94	0.35	0.62	0.54
SKO – 96	0.39	0.38	0.84	0.33	0.59	0.50
JO – 03 – 291	0.37	0.39	0.92	0.40	0.46	0.50
OL – 125	0.39	0.46	0.88	0.38	0.53	0.52
OS – 6 (NC)	0.4	0.45	0.97	0.35	0.48	0.53
Kent (NC)	0.38	0.48	0.87	0.36	0.39	0.49
SEm±	0.01	0.02		0.01	0.06	
CD at 5%	0.02	0.05		0.02	NS	
B. Nitrogen levels (kg/ha)						
0	0.33	0.43	0.74	0.30	0.49	0.46
40	0.37	0.40	0.86	0.34	0.53	0.50
80	0.41	0.44	0.98	0.39	0.48	0.54
120	0.41	0.46	1.04	0.42	0.55	0.58
SEm±	0.01	0.01		0.002	0.05	
CD at 5%	0.02	0.04		0.007	NS	
C. Interaction Entry X Nitrogen levels						
SEm±		0.04				
CD at 5%		0.10		NS		
CV%				7.65		

Table 10(f-1): Interaction effect of nitrogen levels and AVT-2 entries on leaf stem ratio of oats at Pantnagar

Entry/ Nitrogen levels	Leat stem ratio				
	0	**40**	**80**	**120**	**Mean**
SKO – 133	0.36	0.48	0.50	0.35	0.42
SKO – 96	0.38	0.38	0.39	0.37	0.38
JO – 03 – 291	0.35	0.36	0.40	0.43	0.39
OL – 125	0.41	0.45	0.45	0.51	0.46
OS – 6 (NC)	0.49	0.35	0.47	0.50	0.45
Kent (NC)	0.56	0.37	0.41	0.58	0.48
Mean	0.43	0.40	0.44	0.46	
	Entry	**N levels**	**Entry X N levels**		
SEm±	0.02	0.01	0.04		
CD at 5%	0.05	0.04	0.10		
CV%					

D. NEW RESEARCH TRIALS

AST-11: Effect of soil amendments on yield of fodder sorghum in saline – alkali soil

Location: Mandya

The experiment was initiated during Rabi 2010-11 on location specific mode with a view to study the effect of soil amendments on fodder yield, water and land use efficiency and economics of fodder sorghum. The total eight treatments comprises of recommended dose of NPK through inorganic (T_1), RDF + FYM 10 t ha^{-1} (T_2), RDF + press mud 10 t ha^{-1} (T_3), RDF + vermin-compost 5 t ha^{-1} (T_4), RDF + FYM 10 t ha^{-1} + elemental sulphur 25 kg ha^{-1} (T_5), RDF + FYM 10 t ha^{-1} + gypsum 500 kg ha^{-1} (T_6), RDF + FYM 10 t ha^{-1} + Zn SO_4 20 kg ha^{-1} (T_7) and RDF + FYM 10 t ha^{-1} + Zn SO_4 20 kg ha^{-1} + gypsum 500 kg ha^{-1} laid out in RBD and replicated thrice and data has been presented in Table 11(a). The inference of data revealed that application of recommended dose of NPK + FYM 10 t ha^{-1} + Zn SO_4 20 kg ha^{-1} + gypsum 500 kg ha^{-1} (T_8) to the fodder sorghum being at par with T_6 and T_5 (only GFY) treatments recorded significantly higher green fodder (200.6 q/ha) and dry matter yield (56.9 q/ha) over rest of the treatments and lowest being with recommended dose of NPK alone through inorganic (131.17 and 30.27 q/ha GFY and DFY, respectively). The same treatment (T_8) also maintained superiority with regards to crude protein yield (3.61 q/ha), plant height (175.4 cm) and leaf stem ratio (0.35) over rest of the treatments. The application of T_8 treatment to the sorghum increased the green fodder yield by magnitude of 52.96, 20.02, 17.13, 18.23, 12.10, 5.71 and 18.22 percent over T_1, T_2, T_3, T_4, T_5, T_6 and T_7 respectively.

Table 11 (a): Effect of soil amendment on growth parameters and yields of sorghum in saline alkali soil at Mandya

Treatment	Green fodder yield (q/ha)	Dry matter yield(q/ha)	Crude protein yield(q/ha)	Plant height (cm)	Leaf stem ratio
T_1	131.17	30.27	2.13	138.55	0.18
T_2	160.46	38.98	2.68	140.33	0.26
T_3	171.29	45.56	2.03	147.14	0.25
T_4	169.72	45.27	3.15	143.44	0.23
T_5	178.98	42.54	2.96	164.10	0.31
T_6	189.81	50.09	2.87	171.10	0.35
T_7	169.72	41.01	2.31	158.60	0.32
T_8	200.64	56.94	3.61	175.42	0.35
SEm±	9.35	3.05	0.29	5.98	0.02
CD at 5%	28.32	9.16	0.89	18.14	0.07
CV%					

T_1 = Rec. NPK alone through inorganics
T_2 = Rec. NPK + FYM 10 t/ha^{-1}
T_3 = Rec. NPK + Pressmud 10 t/ha^{-1}
T_4 = Rec. NPK + Vermi-compost 5 t/ha^{-1}
T_5 = Rec. NPK + FYM 10 t/ha^{-1}+ Elemental sulphur 25 kg ha^{-1}
T_6 = Rec. NPK + FYM 10 t/ha^{-1} + Gypsum 500 kg ha^{-1}
T_7 = Rec. NPK + FYM 10 t/ha^{-1} + Zn SO_4 20 kg ha^{-1}
T_8 = Rec. NPK + FYM 10 t/ha^{-1} + Zn SO_4 20 kg ha^{-1} + Gypsum 500 kg ha^{-1}

Initial Soil pH - 9.2, **EC- 0.5dsm^{-1}**

E. MISCELLANEOUS TRIALS (NEW / COORDINATED/ LOCATION SPECIFIC)

AST-12: Banana based fodder intercropping in the homesteads of Kerala

Location: Vellayani

The experiment initiated during *kharif* 2010 with a view to evaluate the production potential, quality and economics of fodder crops in banana based production systems. Eight treatments consisted of forage crops alone or in banana based intercropping system, laid out in randomized block design and replicated thrice. This was the first year of experimentation and data has been given in Table 12(a) to 12(c). Planting of sole hybrid napier (T_7) recorded significantly highest green fodder (1001 q/ha), crude protein yield (13.36 q/ha) and crude fibre yield (46.50 q/ha) followed by congosignal sole (T_8) which recorded 529.3 q/ha of green fodder, 13.36 q/ha of crude protein yield and 46.5 q/ha of crude fibre yield and lowest being with banana + cowpea (T_4) intercropping system. Whereas banana + cowpea intercropping system (T_4) being on par with sole banana (125 q/ha) recorded significantly highest banana bunch yield (131.6 q/ha) and significantly lowest was with banana + guinea grass(T_1) intercropping system. The planting of hybrid napier with banana (T_2) intercropping system being at par with banana + congosignal grass intercropping system (1795 q/ha) significantly produced highest forage equivalent yield (1930 q/ha) and lowest being with banana + cowpea intercropping system (940.2 q/ha). Banana + cowpea intercropping system (T_4) fetched highest net monetary returns (Rs. 219216 /ha) and benefit cost ratio (2.63) being at par with banana + hybrid napier (T_2) and banana sole (T_5). Significantly lowest net monetary returns were fetched by growing of guinea grass sole (Rs.10150/ha), congosignal sole (Rs. 17600/ha), cowpea sole Rs. 20000/ha), hybrid napier sole (Rs.89450/ha) and banana + guinea grass (Rs. 159233/ha) as compared to banana + cowpea (T_4) and banana + hybrid napier (T_2). The growing of sole grasses significantly recorded higher uptake of nutrients as compared to cowpea sole and grasses grown in banana based intercropping systems (banana + hybrid napier, banana + guinea grass and banana + congosignal grass). The total nutrients uptake was also recorded significantly higher under hybrid napier sole (216, 33.7 and 159.3 kg NPK, respectively) as compared to other cropping systems (being at par with congosignal sole for K). The banana + hybrid napier systems recorded higher nutrient use efficiency for N and P over other cropping system.

Table 12 (a): Effect of banana based intercropping on growth attributes and yields of forage crops in the homestead of Kerala

Treatment	Green fodder yield (q/ha)	Banana bunch yield (q/ha)	Crude protein yield (q/ha)	Forage equivalent yield (q/ha)	Crude fibre yield (q/ha)	Crude protein (%)	Crude fibre (%)	Plant height (cm)	Plant popu-lation/m^2	Leaf stem ratio
T_1	210.00	101.33	2.13	1682.13	9.55	7.23	31.50	94.26	6	0.50
T_2	357.00	116.26	5.50	1930.00	18.16	7.96	26.16	184.40	3	0.83
T_3	222.66	108.13	4.30	1795.00	15.03	7.80	27.16	111.33	12	0.66
T_4	58.66	131.63	2.33	940.17	3.20	17.9	24.40	82.60	16	0.43
T_5	-	125.00	-	-	-	-	-	-	-	-
T_6	482.33	-	5.86	-	27.56	6.60	32.16	85.63	6	0.63
T_7	1001.00	-	13.36	-	46.50	7.56	26.30	179.96	3	0.71
T_8	529.33	-	8.76	-	42.13	7.06	27.50	86.43	12	0.90
T_9	256.00	-	7.53	-	10.43	17.66	24.50	97.00	16	0.43
SEm±	14.76	3.78	1.14	65.83	1.74	0.31	0.31	6.54		0.04
CD at 5%	44.78	12.36	3.45	227.82	5.29	0.94	0.94	19.84		0.12
CV%	3.78	3.2	18.3	4.1	8.0	3.09	1.12	5.6		6.19

T_1 = Banana+ Guinea grass
T_2 = Banana +Hybrid Napier
T_3 = Banana + Congosignal grass
T_4 = Banana +Cowpea
T_5 = Banana sole
T_6 = Guinea Grass sole
T_7 = Hybrid Napier sole
T_8 = Congo signal sole
T_9 = Cowpea sole

Table 12 (b): Effect of banana based intercropping on economics and nutrient uptake of forage crops in the homestead of Kerala

Treatment	Net monetary return	Benefit cost ratio	Uptake by fodder (kg/ha)			Uptake by banana (kg/ha)		
			N	P	K	N	P	K
T_1	159233	2.23	35.30	3.00	45.63	49.93	5.24	49.90
T_2	204716	2.60	88.79	14.37	63.03	54.43	8.46	55.50
T_3	178133	2.43	69.83	6.93	68.66	51.76	8.20	51.83
T_4	219216	2.63	38.06	2.64	16.30	64.60	6.87	66.33
T_5	193300	2.56	-	-	-	62.70	6.47	67.43
T_6	10150	1.13	91.79	14.20	128.83	-	-	-
T_7	89450	2.43	216.00	33.70	159.26	-	-	-
T_8	17600	1.23	174.06	20.26	194.20	-	-	-
T_9	20000	1.23	121.03	8.50	52.10	-	-	-
SEm±	9560	0.08	10.19	3.26	7.92	2.60	0.84	3.03
CD at 5%	28663	0.24	30.94	9.89	24.04	8.48	2.72	9.90
CV%	7.8	4.0	9.77	25.0	8.7	4.5	11.8	5.2

Market Price of Banana - Rs. 2500/q
Market Price of Fodder grass – Rs. 150/q
Market Price of Fodder cowpea --Rs. 350/q

T_1 = Banana+ Guinea grass	T_6 = Guinea Grass sole
T_2 = Banana +Hybrid Napier	T_7 = Hybrid Napier sole
T_3 = Banana + Congosignal grass	T_8 = Congo signal sole
T_4 = Banana +Cowpea	T_9 = Cowpea sole
T_5 = Banana sole	

Table 12 (c): Nutrient uptake in banana based fodder intercropping in the home steads of Kerala

Treatment	Total uptake by fodder and banana (kg/ha)			Nutrient use efficiency		
	N	P	K	N	P	K
T_1	85.23	8.24	95.53	171.20	163.50	191.16
T_2	143.23	21.50	118.53	265.50	254.73	213.40
T_3	121.60	15.13	120.50	234.90	186.03	231.30
T_4	102.66	9.50	82.63	159.16	140.00	124.70
T_5	62.70	6.47	-	-	-	-
T_6	91.79	14.20	128.83	-	-	-
T_7	216.00	33.70	159.26	-	-	-
T_8	174.06	20.26	194.20	-	-	-
T_9	121.03	8.56	52.10	--	-	-
SEm±	9.79	3.05	8.35	15.12	5.94	8.96
CD at 5%	29.36	9.16	25.35	52.33	20.57	31.01
CV%	7.8	19.9	7.02	7.2	3.1	4.7

T_1 = Banana+ Guinea grass
T_2 = Banana +Hybrid Napier
T_3 = Banana + Congosignal grass
T_4 = Banana +Cowpea
T_5 = Banana sole
T_6 = Guinea Grass sole
T_7 = Hybrid Napier sole
T_8 = Congo signal sole
T_9 = Cowpea sole

AST-13: Effect of tillage and nutrient management on productivity of rice-oats cropping system

Locations: Kalyani, Ranchi, Bhubaneswar and Jorhat

A field experiment was initiated during *kharif* 2010 at four locations with a view to study the effect of tillage and nutrient management in oats on the productivity of rice-oats cropping system. The treatment consisted of three tillage practices (zero, minimal and conventional tillage) and four levels of nutrients (75% RDF, 75% RDF + biofertilizers, 100% RDF, 100% RDF + Biofertilizers at Jorhat, Kalyani and Bhubaneswar and 75% RDF, 75% RDF + Biofertilizers, 100% RDF and 125% RDF at Ranchi) laid out in split plot design and replicated three times. Tillage and nutrient management was done in oat crop and residual effects of the treatments will be studied in *kharif* rice. This year rice was grown as normal crop without any effect of oats treatments.

At Jorhat, grain and straw yields of rice were recorded almost similar under different tillages and nutrient management treatments. The adoption of conventional tillage being at par with minimal tillage resulted significantly higher green fodder (367.13 q/ha), crude protein yield (8.03 q/ha) and crude protein (10.20%) over zero tillage at the same place [Table 13(a)]. Whereas, dry matter yield, leaf stem ratio and green forage equivalent yield did not differed significantly by adoption of different tillage practices. The application of 100% RDF + biofertilizers being at par with 75% RDF + biofertilizers, recorded significantly highest green fodder yield (401.2 q/ha) as compared to 75% RDF and 100% RDF. With respect to crude protein yield, application of 100% RDF + biofertilizers recorded significantly highest crude protein yield (8.8 q/ha) as compared to 75% RDF but it remained at par with 75% RDF + biofertilizers and 100% RDF treatments. The application of different doses of nutrients did not caused significant variation in crude protein content (%), leaf stem ratio and green forage equivalent yield.

At Kalyani, the tillage practices and nutrient management did not caused significant variation in grain and straw yields of rice. The conventional tillage recorded significantly highest green fodder (478.6 q/ha), dry matter (93.6 q/ha) and crude protein yields (9.5 q/ha) and plant height (152.9 cm) of oats over minimal and zero tillage (Table 13(b). The application of 75% RDF + biofertilizers to the oats being at par with 100% RDF, recorded significantly highest green fodder yield (469.8 q/ha) over 75% RDF (398.9 q/ha) and 100% RDF + biofertilizers (453.9 q/ha). Whereas, application of 100% RDF + biofertilizers recorded significantly highest dry matter yield (90.9 q/ha) over 75% RDF; crude protein yield (10.6 q/ha) over rest of treatments. The tallest plants and highest leaf stem ratio were recorded with 100% RDF. Interaction effect was also observed for green fodder, dry matter, crude protein and plant height. The adoption of minimum tillage fetched highest (non-significant) net monetary returns (Rs 20110/ha) and benefit cost ratio (0.48).

At Bhubaneswar, zero tillage recorded significantly highest grain (37.7 q/ha) and straw yields (29.2 q/ha) of rice over minimal and conventional tillage. Application of 100% RDF + biofertilizers being at par with 75% RDF + biofertilizers recorded significantly highest grain yield (36.6 q/ha) of rice over 75% RDF and 75% RDF + biofertilizers. The growing of oats under conventional tillage resulted significantly highest green fodder (260.9 q/ha) and dry matter yield (47.2 q/ha) over zero and minimum tillage. Similarly, rice-equivalent yield (73.1 q/ha) and net monetary returns (Rs 7884/ha) were also realized significantly highest under conventional tillage. The application of 100% RDF + biofertilizers to the oats proved superiority with respect to green fodder yield (232.0 q/ha) over rest of the treatments. The magnitude of increase with same treatment for green fodder yield was 22.70, 16.34 and 5.98% over 75% RDF, 75% RDF + biofertilizers and 100% RDF, respectively. The application of 100% RDF to oats recorded significantly highest dry matter yield (45.8 q/ha). The rice equivalent yield (70.4 q/ha) and net monetary returns of the system (Rs 8391/ha) were recorded significantly highest by application of 100% RDF + biofertilizers over rest of the treatments (Table 13 (e)).

At Ranchi, growing of oats under conventional tillage recorded significantly highest green fodder (324.2 q/ha) and dry matter yields (76.4 q/ha) over zero and minimal tillage (Table 13(d) to 13 (d-1)). The application of 125% RDF to oats recorded significantly highest green fodder yield (337.6 q/ha) over rest of the treatments. The growing of oats under conventional tillage supplemented with 125% recommended dose of fertilizers being at par with zero tillage + 125% RDF, recorded significantly highest green fodder yield (359.5 q/ha) over rest of the combinations.

Table 13(a): Effect of tillage and nutrient management on the productivity of rice – oats cropping system at Jorhat

Treatment	Rice		Oat					Green forage equivalent yield (q/ha)
	Grain yield (q/ha)	Straw yield (q/ha)	Green fodder yield (q/ha)	Dry matter yield (q/ha)	Crude protein yield (q/ha)	Crude protein (%)	Leaf stem ratio	
A. Tillage practices								
Zero tillage	38.54	42.92	304.63	61.38	6.07	9.12	0.73	930.06
Minimal tillage	38.61	41.50	345.37	69.92	7.32	10.03	0.81	968.92
Conventional tillage	37.50	41.00	367.13	74.41	8.03	10.22	0.84	974.12
SEm±								
CD at 5%	NS	NS	30.92	NS	1.30	0.77	NS	NS
B. Nutrient management								
75% RDF	38.06	40.89	256.79	54.70	5.39	9.61	0.78	871.35
75% RDF + Biofertilizer	37.50	42.67	357.41	73.06	7.00	9.48	0.78	967.74
100% RDF	38.89	41.22	340.74	74.26	7.38	9.90	0.77	967.63
100% RDF + Biofertilizer	38.43	42.44	401.24	72.27	8.80	10.15	0.85	1024.08
SEm±								
CD at 5%	NS	NS	53.31	NS	2.32	NS	NS	NS
C. Interaction : Tillage practices X Nutrient management								
SEm±								
CD at 5%	NS	NS	Sig.	NS	NS	NS		NS
CV%	13.31	5.52	3.21	8.16	6.44	2.77	9.10	10.00

Table 13(b): Effect of tillage and nutrient management on the productivity of rice – oats cropping system at Kalyani

Treatment	Rice			Oat				
	Grain yield (q/ha)	Straw yield (q/ha)	Plant height (cm)	Green fodder yield (q/ha)	Dry matter yield (q/ha)	Crude protein yield (q/ha)	Plant height (cm)	Leaf stem ratio
A. Tillage practices								
Zero tillage	42.1	116.6	98.4	431.2	77.1	7.3	153.1	1.52
Minimal tillage	47.1	125.4	99.6	427.3	83.6	8.1	150.8	1.54
Conventional tillage	39.8	114.5	101.7	478.6	93.6	9.5	152.9	1.49
SEm±	1.5	2.6	2.6	2.2	0.4	0.03	0.27	
CD at 5%	NS	NS	NS	8.5	1.4	0.10	1.04	
B. Nutrient management								
75% RDF	41.8	114.0	100.1	398.9	70.4	5.5	152.2	1.59
75% RDF + Biofertilizer	40.9	114.2	99.9	469.8	88.1	8.0	149.8	1.49
100% RDF	44.8	124.3	100.9	460.3	89.7	9.0	154.5	1.66
100% RDF + Biofertilizer	44.5	122.8	98.7	453.9	90.9	10.6	152.6	1.30
SEm±	1.4	3.2	2.1	4.1	0.7	0.07	0.54	
CD at 5%	NS	NS	NS	12.1	2.2	0.21	1.60	
C. Interaction : Tillage practices X Nutrient management								
SEm±	2.3	5.6	3.6	7.1	1.3	0.12	0.93	
CD at 5%	NS	16.6	NS	21.0	3.8	0.36	2.78	
CV%	9.4	8.1	6.2	2.7	2.6	2.6	1.06	

Table 13(c): Effect of tillage and nutrient management on economics of rice – oats cropping system at Kalyani

Treatment	Cost of cultivation (Rs/ha/yr)	Net monetary return (Rs/ha/yr)	Benefit cost ratio
A. Tillage practices			
Zero tillage	40750	18113	0.44
Minimal tillage	42250	20110	0.48
Conventional tillage	45250	14757	0.33
SEm±		1159	
CD at 5%		NS	
B. Nutrient management			
75% RDF	42000	14599	0.35
75% RDF + Biofertilizer	42500	17776	0.42
100% RDF	43000	19730	0.46
100% RDF + Biofertilizer	43500	18537	0.43
SEm±		943	
CD at 5%		2801	
C. Interaction : Tillage practices X Nutrient management			
SEm±		1633	
CD at 5%		4852	
CV%		16.0	

Table 13(d): Effect of tillage and nutrient management on yields of oats in rice – oats cropping system at Ranchi

Treatment	Green fodder yield (q/ha)	Dry matter yield (q/ha)
A. Tillage practices		
Zero tillage	313.5	63.7
Minimal tillage	283.2	62.7
Conventional tillage	324.2	76.4
SEm±	2.4	2.4
CD at 5%	9.2	9.3
B. Nutrient management		
75% RDF	264.7	62.2
75% RDF + Biofertilizer	314.1	68.8
100% RDF	311.3	67.6
125% RDF	337.6	71.9
SEm±	2.7	3.0
CD at 5%	8.1	NS
C. Interaction : Tillage practices X Nutrient management		
SEm±	4.7	4.8
CD at 5%	15.1	NS
CV%		

Table 13 (d-1): Interaction effects of tillage and nutrient management on green fodder yield of oats in rice – oats cropping system at Ranchi

Tillage practices/ Nutrient management	Green fodder yield (q/ha)				
	75% RDF	75% RDF + BF	100% RDF	125% RDF	Mean
Zero tillage	261.8	317.5	327.4	346.7	313.7
Minimal tillage	247.5	295.6	283.4	306.5	283.2
Conventional tillage	284.8	329.1	323.2	359.5	324.2
Mean	264.7	314.1	311.3	337.6	
	Tillage practices	**Nutrient management**	**Tillage practices X Nutrient management**		
SE(m)±	2.4	2.7	4.7		
CD at 5 %	9.2	8.1	15.1		
CV%					

Table 13(e): Effect of tillage and nutrient management on the productivity of rice – oats cropping system at Bhubaneswar

Treatment	Rice		Oat		Rice equivalent yield (q/ha) of the system	Net monetary return (Rs/ha) of the system
	Grain yield (q/ha)	Straw yield (q/ha)	Green fodder yield (q/ha)	Dry matter yield (q/ha)		
A. Tillage practices						
Zero tillage	37.7	29.2	160.5	33.8	61.1	6252
Minimal tillage	34.3	26.3	208.6	43.9	64.6	5370
Conventional tillage	35.2	27.0	260.9	47.2	73.1	7884
SEm±	0.5	0.3	1.9	0.3	0.6	329.4
CD at 5%	1.8	1.0	7.6	1.3	2.4	1292.8
B. Nutrient management						
75% RDF	34.8	26.7	189.6	40.1	62.4	4728
75% RDF + Biofertilizer	36.5	28.1	199.4	41.8	65.5	6277
100% RDF	35.0	27.2	218.9	45.8	66.8	6612
100% RDF + Biofertilizer	36.6	28.0	232.0	36.7	70.4	8391
SEm±	0.4	0.4	1.3	0.3	0.4	236.4
CD at 5%	1.3	NS	3.9	0.8	1.3	702.3
C. Interaction : Tillage practices X Nutrient management						
SEm±	0.9	0.8	3.1	0.6	1.0	558.8
CD at 5%	NS	NS	NS	NS	NS	NS
CV%			1.89			

AST-14: Performance of forage crops raised through waste water under varied nutrient levels

Location: Hyderabad and Coimbatore

This experiment was initiated from *Kharif* 2010 with the objective to access the production, quality and economics of various forage crops raised through waste water under varied nutrient levels. The twenty treatments comprised of four forage crops laid out in main plots and five levels of nutrient studied in sub plots in split plot design and replicated thrice.

At Hyderabad, growing of paragrass recorded significantly highest green fodder (804.3 q/ha) and dry matter yields (141.0 q/ha) over BN napier, guinea grass and lucerne crop. The percent increase recorded by paragrass for green fodder and dry matter yield were 39.8 & 26.9, 38.8 & 54.8 and 202.0 & 143.5, respectively over bajra napier hybrid, guinea grass and lucerne (Table 14(a)). Lucerne crop recorded significantly highest crude protein yield (15.11 q ha^{-1}) over rest of the treatments. Similar to green fodder yield para grass again proved superiority with respect to economics and fetched highest net monetary returns (Rs. 24880/ha) and benefit cost ratio (1.95). The different forage crops did not influenced remarkably the soil fertility status after one year of experimentation with respect to each other. However, on mean basis the available N and P status after crop cycle recorded lower over initial levels of N and P in the soil. The application of different recommended doses of fertilizer to the forage crops did not caused significant variation in yields and soil fertility (except nitrogen). The application of 100% RDF to the forage crops fetched highest net monetary returns (Rs. 11950/ha) and benefit cost ratio (1.43) over lower levels of recommended dose of fertilizers.

At Coimbatore the same treatments as Hyderabad were taken for the experiment except multi cut fodder sorghum which were grown instead of paragrass at Coimbatore. The planting of cumbu napier hybrid recorded highest green fodder (3129.6 q/ha), dry matter (555.8 q/ha) and crude protein yield (46.1 q/ha) and fetched highest net monetary return and benefit cost ratio over rest of the forage crops. The graded supplementation of recommended doses of fertilizers up to highest level increased yields and economics of the forage crops. The application of 100% RDF to forage crops realized highest green fodder, dry matter and crude protein yields and net monetary returns and benefit cost ratio over lower levels of RDF. The growing of cumbu napier hybrid supplied with 100% RDF recorded significantly highest green fodder (3588.9 q/ha) over rest of the combinations (Table 14 (b) and 14 (b-1).

Table 14(a): Effect of forage crops and nutrient levels on yields and economics of forages raised under waste water at Hyderabad

Treatment	Green fodder yield (q/ha)	Dry matter yield (q/ha)	Crude protein yield (q/ha)	Crude fibre yield (q/ha)	Net monetary return (Rs/ha)	Benefit cost ratio	Available nutrient (kg/ha)		
							N	P	K
A. Forage crops									
Bajra Napier hybrid (APBN-1)	575.33	111.13	10.08	29.23	3520	1.11	128.26	76.46	442.69
Guinea grass (COGG-3)	579.33	91.08	6.75	26.19	3760	1.12	125.53	89.56	464.65
Para grass	804.33	141.00	12.92	29.05	24880	1.95	125.53	96.76	356.60
Lucerne (CO-1)	266.33	57.91	15.11	5.78	4200	1.18	128.26	92.22	492.20
SEm±	18.26	3.64	0.27	1.33	1173	0.05	2.23	6.31	45.36
CD at 5%	63.2	12.6	0.95	4.61	4058	0.16	NS	NS	NS
B. Nutrient levels									
Control	509.17	87.90	9.50	19.93	6925	1.28	111.50	89.53	478.70
25% RDF	539.58	95.48	10.62	21.74	8075	1.32	111.67	85.92	398.62
50% RDF	579.16	101.04	11.08	22.89	8825	1.33	118.67	88.78	467.97
75% RDF	586.67	103.53	11.72	23.55	9675	1.37	167.33	88.92	410.85
100% RDF	587.08	113.45	13.12	24.70	11950	1.43	125.33	90.61	439.04
SEm±	47.28	22.8	0.85	1.92	948	0.03	15.07	6.47	42.87
CD at 5%	NS	NS	NS	NS	3280	0.11	52.13	NS	NS
C. Interaction Forage crops X Nutrient levels									
SEm±									
CD at 5%	NS	NS	NS	NS	NS	NS	NS	NS	NS
CV%									

Table 14(b): Effect of forage crops and nutrient levels on yields and economics of forages raised under waste water at Coimbatore

Treatment	Green fodder yield (q/ha)	Dry matter yield (q/ha)	Crude protein yield (q/ha)	Cost of cultivation (Rs/ha)	Net monetary return (Rs/ha)	Benefit cost ratio
A. Forage crops						
Cumbu Napier hybrid (CO(CN)4)	3129.6	555.8	46.1	72658.2	240303.6	4.30
Guinea grass (CO(GG)2)	2657.4	461.2	30.8	71759.0	193983.0	3.69
Multi-cut fodder sorghum (CO(FS)29	1391.8	240.7	16.3	54474.8	84708.4	2.55
Lucerne (CO-1)	839.3	129.0	22.5	62964.0	62936.8	2.00
SEm±	44.1					
CD at 5%	107.8					
B. Nutrient levels						
Control	1694.6	280.2	21.4	62656.3	116041.5	2.79
25% RDF	1832.1	310.9	25.0	64360.8	128926.0	2.93
50% RDF	2031.2	354.7	29.5	65564.5	147783.5	3.17
75% RDF	2183.6	383.1	33.0	66767.8	162772.8	3.35
100% RDF	2281.3	404.6	36.0	67971.0	171891.0	3.44
SEm±	42.7					
CD at 5%	87.1					
C. Interaction Forage crops X Nutrient levels						
SEm±	88.2					
CD at 5%	188.7					
CV%						

Table 14(b-1): Interaction of forage crops and nutrient levels on green fodder yield of forages raised under waste water at Coimbatore

Crops/ Nutrient levels	Green fodder yield (q/ha/year)					
	Control	**25 % of RDF**	**50 % of RDF**	**75 % of RDF**	**100 % of RDF**	**Mean**
Cumbu Napier hybrid (CO(CN)4)	2664.5	2892.8	3139.8	3362.1	3588.9	3129.6
Guinea grass (CO(GG)2)	2218.2	2380.3	2786.9	2935.0	2966.7	2657.4
Multi-cut fodder sorghum (CO(FS)29)	1156.7	1249.7	1379.7	1542.5	1630.5	1391.8
Lucerne (CO-1)	739.0	805.8	818.4	894.7	938.9	839.3
Mean	1694.6	1832.1	2031.2	2183.6	2281.3	
	Crops	**N levels**	**Crop X N levels**			
S.Em ±	44.1	42.7	88.2			
C D at 5%	107.8	87.1	188.7			

AST-15: Response of fodder oat to thiourea under varying irrigation schedules (Exploratory trial)

Location: Udaipur

The trial was conducted during Rabi 2010-11 at Udaipur to assess the effect of irrigation regimes and thiourea on productivity of oats. The treatments comprised of three irrigation schedule (IW/ CPE 1.0, IW/ CPE 0.8 and IW/ CPE 0.6) four thiourea levels (control, seed soaking with water, seed soaking with thiourea, two sprays of thiourea and seed soaking with thiourea + two sprays of thiourea). The different irrigation schedules and thiourea levels could not bring significant improvement in yield attributes and green fodder yield of oats in comparision to control (Table 15). The trial was failed at Bikaner due to continuous rains which could not meet the requirements of different irrigation schedule (IW: CPE ratio approach).

Table 15: Response of fodder Oat to thiourea under varying irrigation schedules (Exploratory trial) at Udaipur

Treatment	Plant height	Number of tillers/ m row	Leaf shoot ratio	Green fodder yield (q/ha)
A. Irrigation				
IW/ CPE 1.0	97.9	160.6	0.48	424.3
IW/ CPE 0.8	96.1	171.6	0.45	378.9
IW/ CPE 0.6	87.2	148.9	0.41	365.0
SEm±	1.3	6.8	0.04	14.3
CD 5%	NS	NS	NS	NS
B. Thiourea				
Control	95.8	175.6	0.42	410.9
Seed soaking with water	92.3	155.2	0.39	371.3
Seed soaking with thiourea	94.2	152.1	0.41	405.5
Two sprays of thiourea	94.9	162.0	0.51	394.4
Seed soaking with thiourea + Two sprays of	91.4	156.9	0.51	364.8
SEm±	1.7	6.9	0.04	24.4
CD 5%	NS	NS	NS	NS

AST-16: Production potential of forage crops in rice fallows under varied nitrogen levels

Location: Mandya

The experiment was initiated during Rabi 2010-11 to assess the effect of cropping systems and nitrogen levels on productivity, quality and economics of forage crops in rice fallows. The treatment consisted of three cropping systems (C_1 – sorghum + cowpea, C_2 – maize + cowpea and C_3 – pearl millet + cowpea) and three levels of nitrogen (50% RDN, 75% RDN and 100% RDN) laid out in split plot design and replicated four times. The planting of maize + cowpea cropping system recorded highest green fodder, dry matter and crude protein yields and fetched highest net returns followed by pearl millet + cowpea cropping system (except crude protein). Whereas, highest benefit cost ratio was realized in pearl millet + cowpea intercropping system. Application of 100% recommended dose of nitrogen (RDN) to the forage crops recorded significantly highest green fodder, dry matter and crude protein yields and fetched highest net monetary returns (Rs. 13841/ha) and benefit cost ratio (2.37) and taller plants of main crops as compared to lower levels of nitrogen. The maize + cowpea intercropping system supplemented with 100% RDN produced significantly highest green fodder, dry matter and crude protein yields over other rest of the combinations (Table 16(a) to 16(a-3)).

Table 16 (a): Effect of cropping systems and nitrogen levels on yields and economics of forage crops in rice fallows at Mandya

Treatments	Green fodder yield (q/ha)	Dry matter yield (q/ha)	Crude protein yield (q/ha)	Cost of cultivation (Rs/ha)	Net return (Rs/ha)	Benefit cost ratio	Plant height (cm)		Leaf stem ratio	
							Main crops	Inter crop	Main crops	Inter crop
A. Cropping systems										
Sorghum + Cowpea	248.2	56.4	5.9	9431	5507	1.53	170.5	41.8	0.21	0.47
Maize + Cowpea	406.9	84.6	6.8	11050	13366	2.20	185.0	40.6	0.36	0.44
Pearl millet + Cowpea	337.3	66.9	5.5	8601	11654	2.35	125.7	51.4	0.39	0.54
SEm±	0.2	1.9	0.2				2.7	1.0	0.01	0.013
CD at 5%	0.6	6.3	0.6				9.2	3.5	0.04	0.044
B. Nitrogen levels (kg/ha)										
50% RDN	267.1	48.2	3.9	9388	6640	1.71	138.5	41.0	0.29	0.41
75% RDN	329.5	69.2	5.7	9727	10046	2.04	165.2	45.1	0.31	0.49
100% RDN	396.8	92.5	8.5	9967	13841	2.37	177.5	47.6	0.36	0.55
SEm±	0.14	2.4	0.2				2.8	0.9	0.01	0.012
CD at 5%	0.46	7.2	0.5				8.3	2.7	0.03	0.037
Interaction	Sig.	Sig.	Sig.							

Table 16(a-1): Interaction effects of nitrogen levels and cropping systems on green fodder yields of forage crops in rice fallows at Mandya

Cropping system/ Nitrogen levels	Green fodder yield (q/ha)			
	50 % of RDN	75 % of RDN	100 % of RDN	Mean
Sorghum + Cowpea	198.33	255.74	292.87	248.98
Maize +Cowpea	314.16	392.22	514.53	406.94
Pearl millet + Cowpea	289.07	340.74	382.96	337.31
Mean	267.12	329.53	396.76	-
	Main plot(M)	**Sub plot (S)**	**M x S**	**S x M**
S.Em ±	0.15	0.14	0.26	0.26
C D at 5%	0.55	0.46	0.80	0.83

Table 16(a-2): Interaction of nitrogen levels and cropping systems on dry matter yield of forage crops in rice fallows at Mandya

Cropping system/ Nitrogen levels	Dry matter yield (q/ha)			
	50 % of RDN	75 % of RDN	100 % of RDN	Mean
Sorghum + Cowpea	40.27	58.70	76.30	58.42
Maize + Cowpea	52.40	82.68	118.79	84.63
Pearl millet + Cowpea	52.03	66.01	82.41	66.85
Mean	48.24	69.17	92.50	-
	Main plot(M)	**Sub plot (S)**	**M x S**	**S x M**
SEm ±	1.85	2.40	4.16	3.89
C D at 5%	6.30	7.22	12.41	11.48

Table 16(a-3): Interaction of nitrogen levels and cropping systems on crude protein yield of forage crops in rice fallows at Mandya

Cropping system/ Nitrogen levels	Crude protein yield (q/ha)			
	50 % of RDN	75 % of RDN	100 % of RDN	Mean
Sorghum + Cowpea	3.61	5.83	8.33	5.92
Maize + Cowpea	4.07	6.48	9.44	6.75
Pearl millet + Cowpea	3.80	4.63	7.87	5.46
Mean	3.86	5.65	8.52	-
	Main plot(M)	**Sub plot (S)**	**M x S**	**S x M**
SEm ±	0.17	0.17	0.28	0.28
C D at 5%	0.56	0.50	0.85	0.84

CHAPTER-3

FORAGE CROP PROTECTION

PPT-1: SURVEY AND SURVEILLANCE OF DISEASES AND INSECT-PESTS IN BERSEEM, LUCERNE AND OATS.

(Locations: Anand, Bhubneswar, Hisar, Hyderabad, Jhansi, 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 Bhubaneswar, leaf spot and leaf blight diseases appeared in the first week of January and progressed up to the last week of February. Maximum disease severity 2.8 was recorded was in 0-5 scale. Root rot incidences started from the last week of January (1.8%) and progressed up to last week of February (9.2%). Defoliator insect were also recorded during this period (4.9/10 plants).

At Ludhiana, development and progression of stem rot *(Sclerotinia trifoliorum)* was observed on BL-42 variety.The selected area was left unharvested till the last week of February.The disease appeared in the first week of January and progressed slowly till the last week of January when mean temperature and RH ranging from 10.2-17.8℃ and 74-83% respectively. Thereafter disease progressed rapidly and reached its maximum severity (64.84%) under the mean temperature and RH ranging from 14.4-16.6℃ and 81-83 percent.

At Palampur,root rot *(Rhizoctonia solani*) appeared in the first week of March and disease incidence progressed up to second week. Severity of disease was mild (5%) during these days. The leaf spot disease incidence started appearing in the third week of March and progressed up to third week of April (10%). Defoliating insect infestation started from third week of March and reached at maximum level (12%)in the third week of April.

At Jhansi, the incidence of stem rot *(S. trifoliorum*) started appearing from first week of January and it was at peak (16.2%) in the second week of February. The root rot (*Rhizoctonia solani* and *Fusarium semitactum*) disease incidences started appearing from first week of March and progressed continuously up to last week of April with maximum disease severity (32.4%) in berseem variety wardan. Two nematode viz. stunt nematode (*Tylenchorhynchus vulgaris*) and root knot (*Meloidogyne* spp) nematode was found associated with the crop in most of the samples. However, *Helicotylenchus* and *pratylenchus* were also recorded in some cases. At Hyderabad, Galerucid beetle and leaf minor infestation started appearing from third week of December and remained active up to mid March. Maximum population of Galerucid beetle and leaf minor was 5 bettles/m^2 during this period. The jassid population was also recorded as 5 jassid/m^2 but for a short period of crop season.

LUCERNE

At Anand, thrips, jassids, whitefly, aphid and leaf minor were found associated with the crop during entire crop season. However, aphids were found from last week of December to third week of March. Maximum population 182 aphids/100 plants occurred in the mid of February. Entire plant population was found infested with the thrips through out the crop season.

At Bhubaneswar, leaf spot and blight and alfalfa mosaic disease incidences started from first week of January and progressed up to last week of February reaching at the maximum severity 2.6 and 2.8 respectively. Infestation of leaf defoliators (3.6/10 plants) was also recorded in the last week of February.

At Palampur, leaf spot disease started from third week of March and progressed up to third week of April. Maximum incidences (10%) were recorded in the month of April. Defoliating beetles appeared during this period. At Jhansi, leaf spot *(Cercospora medicaginis* and *Stemphylium botryosum*) and rust *(Uromyces striatus*) incidences occurred during mid of January to first week of April. Maximum severity (46.4%) of rust was recorded in the last week of April. Maximum population of two nematode species *viz. Pratylenchus zeae* and *Meloidogyne incognita* was recorded 142-965/250 g soil in the month of April. Heavy infestation (6.4 larvae/plant) of alfalfa weevil was recorded in the month of February.

At Rahuri , the population of cowpea aphid *(Aphis craccivora*) started appearing on lucerne during last week of December (8.37/tiller) and increased up to second week of January reaching highest population (110.6/tiller). Similarly pea aphid *(Acyrthosiphon pisum)* appeared during second week of January (3.66 aphid/tiller) and reached at peak in the second week of February (12.33 aphids/tiller). Spotted alfalfa aphid *(Therioaphis maculata)* also started appearing during third week of January (8.66 aphid/tiller) and reached at maximum level (87.0 aphid/tiller) during second week of April. During the aphid infestation, population of Lady bird beetle was observed moderate to high level (0.80 to 9.80 grubs/tiller).

The larval population of defoliators started appearing from last week of December (0.5/m^2) and reached at its maximum population (1.5/m^2) in the third week of January. Larval population of *Helliothis armigera* was noticed on lucerne seed crop during first week of March (0.67/m^2) and showed increasing trend up to second week of April (3.67/m^2). Rust *(Uromyces striatus*) disease was observed at low to moderate level (5-25%) in the month of March and April.

OATS

At Bhubaneswar, leaf blight (*Helminthosporium avenae*) and root rot (*Sclerotium rolfsi*) were recorded in the month of January to February. Both the diseases progressed up to last week of February reaching at the maximum disease severity 2.6 and 12.6 respectively. Infestation of leaf defoliators (4.8/10 plants) was also recorded.

At Jhansi, leaf blight *(H. avenae*) and foot rot (*Sclerotium rolfsi*) diseases were recorded during February and March. The maximum disease severity was recorded (<5%). Aphid infestation was also noticed at seed stage of the crop.

At Ludhiana, progression of leaf blight disease was recorded on variety OL-125 in the third week of February and showed increasing trend up to first week of April reaching its maximum level (67.70%) with the mean temperature and RH ranging from 17.3 – 25.3℃ and 63-75% respectively.

PPT-2A: EVALUATION OF VARIETAL TRIALS FOR RESISTANCE TO DISEASES, INSECT-PESTS AND NEMATODES.

(Locations: Anand, Hisar, Jhansi, Rahuri, Hyderabad, Bhubaneswar and Palampur)

A. LUCERNE

The insect-pest reactions among entries of lucerne are presented in Table PPT 2A.1. At Jhansi the population of Lucerne weevil ranged (2.3-8.4) per plant. The population of cowpea aphids at Rahuri ranged (12.13-34.07)/tiller.

Table PPT 2A.1. Insect-pests population in Lucerne VTL- 2009

Entries	Cowpea aphid/tiller (Rahuri)	Alfalfa weevil/plant Jhansi
RLH-5	24.60	8.4
CAP-3-2	21.47	6.2
ALP-1-1	16.07	4.6
Anand-2	28.93	2.4
ACP-3-1	26.93	8.2
RL-88	16.93	4.6
BRB-07-1	30.33	4.0
RLH-4	34.07	8.4
Anand-23	15.07	2.0
RRP-5-4	19.40	4.5
ACP-1-2	12.13	4.2

Disease reactions of lucerne entries are presented in table PPT-2A-2. At Jhansi and Hyderabad all the entries were found susceptible to rust. Entry CAP-3-2 and ACP=3=1 were found resistant to anthracnose at Jhansi.

Table PPT 2A.2. Disease incidence in Lucerne VTL- 2009

Entries	Downy mildew 0-5 scale	Rust	Jhansi	Anthracnose Jhansi
RLH-5	3.2	42.4	39.32	12.4
CAP-3-2	2.2	38.2	37.66	8.6
ALP-1-1	1.4	36.6	38.34	16.2
Anand-2	3.6	32.0	35.41	18.4
ACP-3-1	3.2	38.4	37.66	9.3
RL-88	1.6	35.6	46.92	12.2
BRB-07-1	1.4	32.0	52.14	11.6
RLH-4	1.8	34.6	49.21	12.8
Anand-23	2.6	32.2	39.52	16.4
RRP-5-4	2.4	38.6	43.47	12.4
ACP-1-2	1.8	28.8	39.32	18.4

B. OATS (Single cut)

Leaf blight disease reaction among the entries of initial varietal trial is presented in Table PPT 2A.3. Entry UPO-10-2 showed minimum disease incidences (0.0-1.6)) at all the centers except Ludhiana(57.77%) which is also minimum among the entries. At Hyderabad, disease did not appeared. However all the entires showed susceptibility against leaf blight at Ludhiana.

Table PPT 2A.3. Reaction of IVT entries of Oats (single cut) to leaf blight

Entries	Hisar	Jhansi	Ludhiana	Bhubaneswar	Hyderabad
OL-1789	1.7	1.0	60.00	1.4	0.00
JHO-2010-2	1.0	1.0	57.77	1.2	0.00
JHO-2000-4	-	1.4	-	-	0.00
NDO-712	2.0	1.2	65.55	2.4	0.00
Kent	2.7	3.6	66.66	1.6	0.00
OLS-125	1.0	2.2	67.77	-	-
UPO-10-2	0.0	1.6	57.77	1.2	0.00
JO-03-99	0.0	1.0	70.00	1.4	0.00
NDO-729	1.0	2.0	73.00	2.8	0.00
SKO-170	1.0	1.2	80.00	2.6	0.00
JHO-822	-	1.2	-	-	-
OS-6	1.3	1.2	63.33	3.2	0.00
JHO-2010-1	1.0	2.0	-61.11	2.8	0.00
SKO-188	2.0	1.2	85.55	3.4	0.00
ANDO-3	1.0	2.4	65.55	1.2	0.00
Palampur-1	-	1.6	-	-	-
UPO-10-1	0.0	1.4	60.00	2.6	0.00
JO-03-97	0.0	2.2	50.00	2.8	0.00
OS-377	2.0	3.6	63.33	3.2	0.00
JHO-99-2	-	1.6	-	3.4	-

Results of reaction of entries of initial varietal trial to other diseases and insect pests are presented in Table PPT 2A-4. Entries UPO-10-2, JO-03-99, JHO-2010-1, ANDO-3, UPO-10-1 and JHO-99-2 showed resistant reaction (<10% DI) against sclerotium rot at Jhansi and at Bhubaneswar < 2 Score in O-5 scale. At Palampur, all the entries showed susceptible to highly susceptible reaction against powdery mildew.

Table PPT 2A.4. Reaction of IVT entries to diseases and nematode

Entries	Sclerotium root rot (%)		Aphids/tiller	Powdery mildew (%)
	Jhansi	Bhubneshwar	Rahuri	Palampur
OL-1789	10.2	1.2	48.33	3.0
JHO-2010-2	12.6	1.6	45.13	3.0
JHO-2000-4	8.4	-	-	-
NDO-712	14.0	1.8	62.07	4.0
Kent	18.0	0.8	55.73	5.0
OLS-125	12.6	-	-	-
UPO-10-2	8.2	1.4	44.07	4.0
JO-03-99	9.6	1.2	49.20	4.0
NDO-729	11.3	1.6	60.60	5.0
SKO-170	9.4	3.2	50.40	4.0
JHO-822	8.3	-	68.33	-
OS-6	12.6	1.4	37.27	5.0
JHO-2010-1	9.5	1.2	45.27	4.0
SKO-188	10.3	3.6	65.33	5.0
ANDO-3	6.2	1.6	53.00	5.0
Palampur-1	5.3	-	-	5.0
UPO-10-1	9.6	1.2	44.00	5.0
JO-03-97	12.4	0.8	73.93	3.0
OS-377	10.6	1.4	65.60	5.0
JHO-99-2	8.6	1.2	-	-

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 (0.00-3.20) at Bhubneshwar, Hyderabad and Jhansi centers. Whereas at Hisar SKO-156 was found highly resistant to the leaf blight. All the entries showed highly susceptible disease reactions to leaf blight and Ludhiana.

The results of disease and pest reaction for AVT entries are presented in Table PPT 2A-6. Entry UPO-09-2 was found least infested with aphids at Rahuri & Jhansi. All the entries tested at Bhubaneswar and Palampur against sclerotium rot and powdery mildew respectively showed susceptible reaction.

Table PPT 2A.5. Reaction of AVT (SC-1) entries of Oats (single cut) to leaf blight

Entries	Hisar	Jhansi	Bhubaneswar	Hyderabad	Ludhiana%
OS-6	1.67	2.60	1.4	0.00	62.22
SKO-156	0.0	1.42	1.8	0.00	48.88
JHO-2000-4	-	1.20	-	0.00	-
JO-03-95	1.0	1.00	1.2	0.00	73.33
UPO-09-2	1.0	1.00	1.6	0.00	61.11
JHO-822	-	2.20	-	-	-
OS-363	2.0	3.20	1.2	0.00	63.33
OL-125	1.0	1.20	-	-	82.22
UPO-09-1	1.67	2.80	1.6	0.00	48.88
JHO-99-2	-	1.42	3.2	-	-
Kent	1.0	3.20	1.2	0.00	61.11
JHO-2009-1	-	1.33	1.4	0.00	77.77
Palampur-1	-	2.36	-	-	-
SKO-148	-	1.26	2.8	0.00	57.77
JHO-2009-2	1.0	1.42	2.8	0.00	80.00
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

	Aphids/tiller		Sclerotium root rot	Powdery mildew
Entries	Rahuri	Jhansi	Bhubaneswar	Palampur
OS-6	59.27	14.2	2.33	12.2
SKO-156	64.60	16.0	3.99	43.0
JHO-2000-4	-	0.0	-	-
JO-03-95	113.27	15.3	2.99	82.3
UPO-09-2	52.33	8.2	-	85.0
JHO-822	135.67	10.2	-	-
OS-363	122.07	12.4	-	47.0
OL-125	-	12.2	-	85.0
UPO-09-2	145.67	10.6	-	56.7
JHO-99-2	-	8.4	-	55.3
Kent	114.00	16.4	2.33	90.0
JHO-2009-1	79.33	6.4	3.66	63.0
Palampur-1	-	8.2	-	-
SKO-148	73.93	12.4	3.33	-
JHO-2009-2	57.20	10.4	-	-
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-96 was resistant to leaf blight at Bhubaneswar, Hyderabad and Jhansi centers. All the entries were found susceptible to leaf blight at Ludhiana. At Jhansi, minimum incidences of sclerotium rot (5.4%) was recorded in JHO-822. Entries SKO-96 and Palampur-1 were found resistant to powdery mildew at Palampur.

Table PPT 2A7. Reaction of AVT (SC-2) entries of Oats (single cut) to leaf blight

Entries	Jhansi	Hyderabad	Hisar	Ludhiana	Bhubaneswar
SKO-96	1.2	0.0	-	64.44	1.4
JHO-2000-4	0.6	0.0	-	58.88	-
PALAMPUR-1	2.0	-	-	-	-
JO-03-291	1.4	0.0	-	60.00	2.8
OL-125	2.6	-	1.0	-	-
JHO-822	3.0	-	-	76.66	-
SKO-133	2.2	0.0	1.0	76.66	3.2
OS-6	1.8	0.0	1.0	-	2.8
JHO-99-2	1.4	-	-	6.22	3.2
KENT	3.2	0.0	2.0	-	-

Table PPT 2A.8. Reaction of AVT (SC-2) entries of Oats (single cut) to diseases and nematode

Entries	Sclerotium root rot (%)		Aphids/tiller	Powdery mildew (%)
	Bhubaneswar	Jhansi	Jhansi	Palampur
SKO-96	2.66	6.66	36.32	6.0
JHO-2000-4	-	8.2	28.40	-
PALAMPUR-1	-	6.4	26.36	5.8
JO-03-291	3.33	10.6	32.42	30.3
OL-125	-	8.6	16.32	-
JHO-822	-	5.4	18.12	-
SKO-133	3.66	8.6	34.63	28.0
OS-6	4.33	12.2	32.16	68.8
JHO-99-2	2.99	9.3	14.40	-
KENT	-	12.2	28.36	69.5
Highly resistant (No symptom); Resistant (Up to 10 % disease incidence) Moderately resistant (11-25%); Susceptible (26-50%);Highly susceptible (>50%).				

C. OATS (Multi cut)

The results of IVT trial are presented in Table PPT 2A-9. For leaf blight entries UPO-212 showed minimum leaf blight incidences at Hisar and Jhansi. All the entries were found susceptible to leaf blight at Ludhiana. Entry UPO-10-3 was found resistant to powdery mildew at palampur.Entries UPO-212 and JO-03 –309 showed highly resistant reaction to sclerotium rot at Jhansi.

The results of AVT (MC) trial are presented in table PPT2A-10 . The result revealed that entries UPO-09-3 and JHO-2009-3 were found resistant to powdery mildew at Palampur. Where as all the entries expect kent showed resistant reaction to leaf blight at Jhansi.

Table PPT 2A.9. Reaction of IVTO (multi cut) to pests

Entries	Leaf Blight*				Powdery mildew	Sclerotium rot
	Hisar	Jhansi	Bhuba-neswar	Ludhi-ana	Palampur	Jhansi
UPO-10-3	-	1.0	2.8	87.77	12.0	4.2
PALAMPUR-1	-	1.0	-	-	43.0	8.2
JHO-822	-	1.0	-	-	-	2.0
JHO-2010-4	2.67	1.2	3.2	57.77	82.3	0.00
UPO-212	1.0	1.0	2.6	55.55	85.0	0.00
JHO-2000-4	1.0	1.4	3.2	61.11	-	4.6
JHO-2010-3	-	1.0	2.8	57.77	47.0	4.2
DL-1690	2.0	2.6	1.2	68.88	25.0	12.0
DS-367	1.0	2.4	2.8	54.44	56.7	10.4
LO-19	-	1.8	3.8	71.11	55.3	8.0
JO-03-309	1.0	1.6	2.6	64.44	90.0	0.0
KENT	2.67	3.0	1.4	52.22	62.0	14.6
For leaf blight, 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.10. Reaction of AVTO(MC) to diseases.

Entries	Leaf blight (Jhansi)	Powdery mildew (Palampur)
Palampur-1	1.6	89.3
UPO-09-3	1.0	17.7
JO-03-301	1.2	43.0
Kent	2.8	69.7
JO-03-307	1.2	87.3
RO-19	1.8	56.3
JHO-822	1.4	-
UPO-212	1.4	58.7
JHO-2009-3	1.0	18.3

PPT-2B: EVALUATION OF BERSEEM ENTRIES FOR RESISTANCE TO ROOT AND STEM ROT DISEASES UNDER SICK PLOT

(Locations: Hisar,Jhansi and Palampur)

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 and Hisar for Stem rot showed that entry JHB-1—1 and BB-3 were resistant where as for root rot most of the entries showed resistant reaction at Palampur. At Jhansi, entries HFB-165-1, JHB-10-1, JHB-10-2, JB-03-17 and BL-22 showed resistant reaction to root rot. Among the AVT entries HFB-6-6 showed resistant reaction against root rot at Jhansi and Palampur. (PPT 2B-2)

Table PPT 2B.1. Reaction of berseem entries in IVT to diseases and nematode

Entries	Stem rot % Incidence		Root rot % incidence	
	Hisar	Jhansi	Jhansi	Palampur
MESCAVI	14.0	12.0	18.2	10.7
HFB-165-1	25.5	17.4	9.6	8.3
BUNDAL B-2	40.0	26.2	14.4	-
JHB-10-1	0.0	8.2	9.4	6.7
WARDAN	18.5	12.6	20.2	2.0
BB-3	-	8.4	14.0	-
BL-150	9.5	11.2	10.0	1.7
JHB-10-2	15.0	12.0	6.2	2.0
JB-03-17	38.0	22.0	8.6	4.0
BL-22	-	10.6	9.2	6.3

Table PPT 2B.2. Reaction of Berseem entries in AVT to diseases

Entries	Root Rot % Jhansi	Root Rot % Palampur
Wardan	14.6	4.0
BL-2	12.2	1.7
HFB-6-6	8.6	1.7
Mescavi	10.4	1.3
HFB-30	16.4	2.0

PPT-10: Bio-Intensive pest and disease management in Lucerne.

(Locations: Anand, Hyderabad and Rahuri)

The trial was conducted at Anand,Hyderabad and Rahuri in randomized block design (RBD) with three replication of 8 different treatments viz.T1=Seed treatment with Trichoderma @ 5g/kg seed, T2=Seed treatment with neem seed powder @ 50g/kg,T3=Folier spray of NSKE @5%2 weeks after each cut, T4= T1+T2, T5=T1+T3, T6=T2+T3,T7=Check-1.Seed treatment with carbendazim @2g/kg+carbofuran@1kg a.i./ha+Folior spray of mancozeb @ 0.25% 7days after each cut, T8= Untreated control.The results revealed that T7 was found highly effective among all the treatments. There was significant reduction in leaf spot, mosaic,rust and root rot disease incidences at Anand. Whereas at Hyderabad maximum reduction in aphid infestation was recorded in T6 (6.53 aphids/plant) as against 15.32 aphids/ plant in untreated control. Significant reduction in population of thrips was also recorded in all the treatments. At Rahuri, maximum reduction in aphid population (12.89/tiller) and *H. armigera* (1.00lar/m^2) was recorded against 30.56 aphid/tiller and 4.67 lar/m^2 respectively in untreated control.

The GFY and seed yield data presented in table (10.2) revealed that significant increased in GFY (2967.67q/ha) and seed yield (1.44 q/ha) was recorded at Hyderabad in T7 where as at Rahuri maximum GFY was obtained in T5 and seed yield in T6.

Table PPT 10.1. Effect of treatments on diseases and insect pest incidences

Treatment	Anand				Hyderabad			Rahuri	
	Leaf spot	Mosaic	Rust	Root Rot	Aphid	Thrips	Rust	Aphid No./tiller	H.armiger Lar/m^2
T1	9.34	8.99	7.18	6.14	9.88	14.14	20.69	29.78	4.22
T2	9.32	8.99	7.18	7.10	10.82	13.62	28.94	28.00	4.00
T3	7.84	8.43	7.09	8.39	11.89	12.35	30.09	12.89	1.00
T4	9.33	8.97	7.18	6.12	11.47	11.48	32.58	29.00	4.33
T5	8.00	8.44	7.08	6.11	11.47	12.88	32.58	13.33	0.78
T6	8.05	8.43	7.11	6.05	6.53	11.89	30.20	14.67	1.00
T7	5.28	8.33	4.32	3.59	7.33	11.99	28.07	30.89	4.33
T8	9.34	8.99	7.18	8.39	15.32	17.44	39.23	30.56	4.67
CD5%	0.67	0.23	0.32	0.18	2.20	3.12	1.61	0.77	0.23

Table PPT 10.2. Effect of treatment on green fodder and seed yield

Treatment	GFY q/ha			Seed yield q/ha	
	Anand	Hyderabad	Rahuri	Hyderabad	Rahuri
T1	135.8	230.00	212.50	1.22	3.80
T2	126.8	240.00	209.17	1.33	3.70
T3	143.8	241.67	228.33	1.26	4.42
T4	136.4	251.67	213.06	1.29	3.63
T5	111.6	265.00	229.72	1.35	4.32
T6	129.2	286.67	226.11	1.45	4.52
T7	126.4	296.67	211.94	1.44	3.59
T8	140.8	211.67	207.78	1.02	3.49
CD5%	12.16	11.22	15.98	0.48	0.30

PPT-11: Assessment of yield losses due to rust in Lucerne seed crop.

(Locations: Anand, Hyderabad and Rahuri)

This was second 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	21.88	12.5	2.4	3.53	1.20	5.67
Unprotected	30.82	40.0	11.3	2.49	0.90	5.11

PPT-12: Integrated disease management in White Clover.

(Lccation: Palampur)

This is the second 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. Highly significant reduction in powdery mildew and clover rot was recorded in T9 and in turn provided maximum green forage yield.

Table PPT 12.1. Disease incidence and GFY (q/ha)

Treatments	Disease Intensity		GFY (q/ha)
	Powdery mildew	Clover Rot	
T_1	43.3	2.3	2.1
T_2	49.1	4.9	2.0
T_3	29.1	1.2	1.9
T_4	33.8	3.0	2.8
T_5	6.9	1.5	2.9
T_6	6.5	4.1	2.1
T_7	6.2	1.2	2.5
T_8	5.6	4.2	2.6
T_9	6.0	1.1	2.9
T_{10}	58.1	5.7	1.9
CD5%	1.4	0.3	0.1
CV%	2.9	5.1	3.6

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.

PPT-13 Validation of recommended treatments for disease management Technology for seed production in Oat.

(Locations: Palampur and Ludhiana)

The trial was conducted in paired plot design with three replications of two different treatments i.e.Treated (Seed treatment with vitavax @2.5g/kg seed +Trichoderma @ 5g/kg followed by foliar spray of propiconazole @ 0.01% at the appearance of disease) and untreated control on large plot area 50m^2. The results revealed that highly significant reduction in diseases and increase in seed yield was obtained at both the centres in treated over untreated control (table PPT-13.1).

Table 13.1. Effect of recommended treatment on disease incidences and seed yield

Treatments	Palampur			Ludhiana	Seed yield q/ha	
	PM%	LB%	LS%	LB%	Palampur	Ludhiana
T1	5.3	4.5	0.0	15.55	15.9	27.73
T2	88.5	22.0	1.6	51.12	13.9	23.44
CD5%	6.8	2.4	0.2	6.34	0.9	3.36
CV%	4.6	5.1	5.1	14.54	1.7	5.81

PM = powdery mildew, LB = Leaf blight LS=Loose smut.

PPT-14: Validation of recommended Treatment for the management of root rot in Oat.

(Location: Bhubaneswar)

The trial was conducted in paired plot design with three replications of two different treatments i.e. treated (Soil application of pitcher compost @ 3%) and untreated control on large plot area of 100m2. The results revealed that there was considerable reduction in percent disease incidence and increased in GFY and DMY q/ha (Table PPT: 14.1).

Table 14.1. Effect of treatment on disease incidences, GFY & DMY q/ha

Treatment	Percent disease incidence	GFY q/ha	DMY Q/ha
T1- Soil application of Pitcher compost @ 3%	14.99	372.53	73.18
T2 – Untreated Control	30.66	255.07	50.72

PPT-15: Effect of foliar diseases on quality of oat variety.

(Locations: Ludhiana & Palampur)

This trial was conducted with five varities of oats i.e. Kent PLP-1,OL-9, OL-125 and OS-6 protected (falior sprayes of Hexaconazole/Propiconazole @ 0.05% at 15 days interval from the appearance of powdery mildew /leaf blight disease and unprotected . the data on percent disease incidence, quality character and green and dry matter yield q/ha was recorded. The results revealed that there was significant reduction in percent disease incidence in the protected plots. The quality character, GFY, DMY and seed yield was also increased in the protected treatment (Table PPT 15.1-3).

Table 15.1. Disease incidences and quality of Oat varieties at Ludhiana

Treatment	LB%	Quality				Chlorophyl/MG/Tissue			See yield q/ha
		CP	CF	ADF	NDF	Chla	Chlb	Total	
Kent (P)	9.99	9.68	27.6	36.5	53.4	0.30	0.87	1.17	31.63
Kent (UP)	47.28	8.59	28.7	37.3	52.1	0.84	0.25	0.32	27.97
PLP-1 (P)	13.70	9.46	26.4	35.1	52.7	0.53	1.15	1.47	24.33
PLP- (UP)	61.14	8.74	26.9	36.1	51.1	0.86	0.23	0.31	21.33
OL-9(P)	10.77	9.47	24.3	38.2	53.3	0.52	1.00	1.32	30.83
OL-9 (UP)	58.88	8.48	25.4	38.9	52.1	0.98	0.20	0.30	26.67
OL-125 (P)	13.33	8.34	26.4	34.3	52.4	0.32	1.30	1.62	27.56
OL-125 (UP)	55.18	7.67	28.8	36.4	51.9	0.11	0.18	0.24	24.55
OS-6 (P)	11.36	9.01	26.6	36.6	53.6	0.37	1.26	1.63	28.88
OS-6 (UP)	44.81	7.84	28.5	37.8	55.0	0.17	0.38	0.55	25.00
CD 5%	5.96	0.35	0.22	0.24	0.33	0.53	0.86	0.37	NS
CV%	10.64	2.74	0.47	0.46	0.37	4.34	8.75	18.47	7.41

Table PPT15.2. Effect of faliar disease on the quality of Oat varieties at Palampur

Treatment	PM%	Quality characters						
		CP%	DM%	Chlo a (mg/g)	Chlo b (mg/g)	Total Chlo (mg/g	NDF%	ADF%
T1	8.3	9.3	30.3	0.65	0.31	1.28	64.0	49.4
T2	40.0	9.1	27.4	0.80	0.31	1.11	64.6	52.0
T3	7.0	10.5	24.2	0.73	0.50	1.77	63.4	50.2
T4	35.0	8.2	21.1	0.80	0.28	1.06	63.8	53.4
T5	8.0	10.2	29.8	1.20	0.42	1.65	62.0	48.2
T6	54.7	7.3	26.8	0.77	0.26	1.06	67.4	51.8
T7	5.3	10.8	31.1	1.43	0.47	1.91	62.6	48.6
T8	52.3	7.6	27.3	0.82	0.31	1.11	64.0	50.0
T9	4.3	9.9	29.9	1.35	0.41	1.77	64.8	48.8
T10	50.7	7.3	28.2	0.76	0.27	1.03	64.6	50.6
CD5%	3.6	0.8	4.4	0.2	0.1	0.2		
CV%	7.3	5.0	9.4	12.5	11.9	7.9		

Table PPT-15.3. Green fodder,Dry matter, Grain and CP yield q/ha

Treatment	Yield q/ha			
	Grain	Green fodder	Dry matter	CP
T1	20.5	287	87.1	8.1
T2	18.6	249	68.1	6.2
T3	21.3	252	61.3	6.4
T4	20.7	241	50.8	4.2
T5	19.0	286	85.4	8.7
T6	18.9	241	64.7	4.7
T7	18.1	282	87.7	9.7
T8	17.7	251	66.5	5.2
T9	19.1	277	82.9	8.2
T10	17.8	233	65.6	4.8
CD5%	0.8	15.2	13.6	1.5
CV%	2.6	3.4	11.0	13.1

Treatments:

T_1= Kent (protected)

T_2= Kent (unprotected)

T_3= PLP-1 (protected)

T_4= PLP-1 (unprotected)

T_5= OL-9 (protected)

T_6= OL -9 (unprotected)

T_7= OL-125 (protected)

T_8= OL-125 (unprotected)

T_9= OS-6 (protected)

T_{10}= OS-6 (unprotected)

* Protected with chemicals (Foliar sprays of Hexaconazole/Propiconazole @0.05% at 15 day interval from the appearance of powdery mildew/leaf blight disease, respectively)

CHAPTER-4

BREEDER SEED PRODUCTION

BREEDER SEED PRODUCTION IN FORAGE CROPS (RABI 2010-11)

(Table Reference: 1 & 2)

In Rabi 2010-11, the indent for Breeder Seed Production was received from DAC, GOI for 24 varieties in four forage crops *viz*., Oat (8), Berseem (8), Lucerne (5) and Gobhi Sarson (3). The allocation for producing the indented quantity of Breeder Seed i.e. 277.74 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 (202.10q) followed by Berseem (68.80q), Lucerne (6.40q) 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 Oat, there was shorfall in production of variety JHO-99-1 and JHO-2000-4 by 2.50 and 3.50 q, respectively. In Berseem, there was shorfall in production of variety Budel Berseem-3, Mescavi, BL-10, BL-42 and BL-180 by 4.50, 5.45, 17.40, 7.90 and 0.50 q, respectively. Similarly, in Lucerne, there was shorfall in production of variety T-9 and Sirsa Type-9 by 0.32 and 0.10 q, respectively. However, in other varieties either there was surplus production or there was no shortfall. In Gobhi Sarson, there was surplus production in all the varieties against the indent.

When we talk of overall production, as compared to indent in Oat (202.10.30q), the actual production was 305.33q, which was 103.23q in surplus. But in Berseem, against the indent of 68.80 q, the actual prouction was 50.00q which was deficit by 18.80 q. In Lucerne too, against the indent of 6.40q, the actual production was 6.38q i.e. 0.02q deficit. In Gobhi Sarson the actual production was 0.96q more against indent of 0.44 q i.e. production was 1.40q.

The overall Breeder Seed Production was 85.37q more or we can say that it was 30.74 percent higher as evident from seed production of 363.11q against the indent for 277.74q.

Table 1: Centre-wise Breeder Seed Production
(q)

Sl. No.	Name of Producing Centre /state	Name of Variety	DAC Indent	Allocation as per BSP-1 target	Actual production	Production Surplus (+)/Deficit (-)
1.	GAU, Anand	Kent	20.00	20.00	20.00	-
		Anand-2 (GAUL-1)	4..50	4.50	4.50	-
		AL-3	0.20	0.20	0.20	-
2.	IGFRI, Jhansi	Kent	40.00	40.00	60.00	(+) 20.00
		JHO-2000-4	10.00	10.00	6.50	(-) 3.50
		JHO-851	5.00	5.00	20.00	(+) 15.00
		JHO-99-2	10.00	10.00	22.00	(+) 12.00
		JHO-99-1	10.00	10.00	7.50	(-) 2.50
		Wardan	0.80	0.80	7.00	(+) 6.20
		Bundel Berseem-3	10.50	10.50	6.00	(-) 4.50
3.	PAU, Ludhiana	Kent	57.10	57.10	58.00	(+) 0.90
		BL-1	5.00	5.00	5.30	(+) 0.30
		BL-10	25.90	25.90	8.50**	(-) 17.40
		BL-42	8.40	8.40	0.50*	(-) 7.90
		BL-180	0.50	0.50	0.00***	(-) 0.50
		GSL-1	0.11	0.11	0.40	(+) 0.29
		GSC-5	0.03	0.03	0.60	(+) 0.57
4.	CCS HAU, Hisar	HJ-8	10.00	10.00	10.00	-
		Mescavi	6.20	6.20	0.75	(-) 5.45*
		T-9	0.50	0.50	0.18	(-) 0.32*
		Sirsa Type-9	0.10	0.10	0.00	(-) 0.10
5.	JNKVV, Jabalpur	Kent	10.00	10.00	45.80	(+) 35.80
		JB-1	11.50	11.50	21.95	(+) 10.45
6.	GBPUAT, Pantnagar	UPO-212	2.50	2.50	10.00	(+) 7.50
7.	RAU, Bikaner	Kent	12.50	12.50	27.53	(+) 15.03
8.	SKUAST, Srinagar	Sabzar	15.00	15.00	18.00	(+) 3.00
9.	MPKV, Rahuri	RL-88	1.10	1.10	1.50	(+) 0.40
10.	CSK HPKV, Palampur	HPN-1(Sheetal)	0.30	0.30	0.40	(+) 0.10

Remarks: * - less production due to heavy rain **- non-availability of adequate nucleus seed and damage by pre monsoon shower at maturity *- Seed plot rejected due to inadequate isolation**

Table 2: Variety-wise Breeder Seed Production

Sl. No.	Varieties	Allocation as per BSP-1 target	Actual Production	Production Surplus (+) Defdcit (-)
1.	Oat - Kent	139.60	211.33	(+) 71.73
	HJ-8	10.00	10.00	-
	UPO-212	2.50	10.00	(+) 7.50
	SABZAR	15.00	18.00	(+) 3.00
	JHO-99-1	10.00	7.50	(-) 2.50
	JHO-851	5.00	20.00	(+) 15.00
	JHO-99-2	10.00	22.00	(+) 12.00
	JHO-2000-4	10.00	6.50	(-) 3.50
	Total	**202.10**	**305.33**	**(+) 103.23**
2.	Berseem – JB-1	11.50	21.95	(+) 10.45
	Wardan	0.80	7.00	(+) 6.20
	Bundel Berseem-3	10.50	6.00	(-) 4.50
	Mescavi	6.20	0.75	(-) 5.45
	BL-1	5.00	5.30	(+) 0.30
	BL-10	25.90	8.50	(-) 17.40
	BL-42	8.40	0.50	(-) 7.90
	BL-180	0.50	0.00	(-) 0.50
	Total	**68.80**	**50.00**	**(-) 18.80**
3.	Lucerne - T-9	0.50	0.18	(-) 0.32
	RL-88	1.10	1.50	(+) 0.40
	Anand-2	4.50	4.50	-
	AL-3	0.20	0.20	-
	Sirsa Type-9	0.10	0.00	(-) 0.10
	Total	**6.40**	**6.38**	**(-) 0.02**
4.	Gobhi Sarson-HPN-1 (Sheetal)	0.30	0.40	(+) 0.10
	GSL-1	0.11	0.40	(+) 0.29
	GSC-5	0.03	0.60	(+) 0.57
	Total	**0.44**	**1.40**	**(+) 0.96**
	Grand Total	**277.74**	**363.11**	**(+) 85.37**

WEATHER REPORT FOR RABI-2010-11

The weather report for the season of Rabi-2010-11 of different AICRP Centres across the different zones has been presented in this chapter. The weather parameter (Table MET-1.1 (a) to 1.4 (d) included the observation during 40th standard meteorological week (October 01-07, 2010) to 21st week (May 21-27, 2011). During the period under report, weather situation clearly represented their zonal characteristics. The major variation were noted in temperature, day length (bright sun shine hours) and relative humidity. The weather parameters have also shown close correlation with the incidence and surveillance of insect-pest and diseases. Weather parameters influenced the growth, yield and quality of different annual and perennial forage crops.

Temperature:

Minimum temperature was recorded in Hill Zone irrespective of locations. Within Hill Zone Srinagar remained the coolest location recording -5.11 to -5.44^{0}C from 50th to 51st SMW. The overall temperature between 48th to 4th SMW was below 0^{0}C. Among Hill Zone locations, maximum average temperature was also highest at Srinagar i.e. 30.8^{0}C during 20th SMW. In North-West Zone, Hisar recorded lowest minimum temperature (3.1^{0}C) during 50th SMW. The maximum temperature was highest (45.6^{0}C) at Bikaner followed by Ludhiana (41.8^{0}C). In North-East Zone, Ranchi recorded the lowest temperature i.e. 1.9^{0}C during 2nd SMW followed by Faizabad (2.5^{0}C) during same week. In same zone, maximum temperature was recorded at Bhubaneswar (46.9^{0}C) during 18th SMW followed by Faizabad (39.8^{0}C) during 19th SMW. In Central Zone, Jhansi recorded the lowest temperature (2.8^{0}C) during 1st SMW followed by Jabalpur (3.1^{0}C) during 1st SMW. In the same zone, maximum temperature was recorded at Jhansi (44.0^{0}C) during 20th meteorological week followed by Anand (40.2^{0}C) during the same meteorological week. In South Zone, Hyderabad recorded the minimum temperature (7.0^{0}C) during 2nd meteorological week followed by Mandya (14.5^{0}C) and Coimbatore (16.5^{0}C).

Whereas, the maximum temperature was recorded at Hyderabad (40.2^{0}C) in 20th SMW followed by Coimbatore (34.6^{0}C) and Mandya (34.3^{0}C).

Rainfall:

In general rainfall received during the reporting period was sparse as being reflected in the data of rainfall.

In Hill Zone, Srinagar (491.4 mm) received more rainfall in comparison to Palampur (459.1 mm). In Palampur maximum rainfall (108.8 mm) was received during 7th SMW followed by 91.2 mm during 52nd standard meteorological week (SMW) at the same place. Srinagar received maximum rainfall (103.6 mm) during 3rd SMW followed by 58.0 mm during 52nd SMW. In North-West Zone, Pantnagar and Ludhiana received good amount of rainfall in comparison to Hisar and Bikaner.

The amount of rainfall received at Bikaner (32.7 mm) was negligible amount. The amount of rainfall received at Pantnagar, Ludhiana and Hisar was 147.4, 131.4 and 107.0 mm, respectively over the crop season.

In North-East Zone, good amount of rainfall with well distribution was received at Bhubaneswar (503.9 mm) and Jorhat (501.1 mm). Kalyani and Ranchi also received good amount of rainfall (359.9 and 445.7 mm, respectively) with well distribution over the crop season. In Central Zone maximum rainfall (79.4 mm) in 4 rainy days was received at Jabalpur during 42nd SMW followed by 72.4 mm at Urulikanchan during 40th SMW in 2 rainy days. The amount of rainfall received by Kanpur, Jhansi and Anand was very less. In South Zone, Vellayani received maximum rainfall (371.2 mm) in 7 rainy days during 40th SMW followed by Mandya (157.8 mm) in 17th SMW and Coimbatore (138.0 mm) during 45th SMW. The maximum rainfall was received by Vellayani (1039.8 mm) followed by Coimbatore (845.7 mm). The rain was well distributed over the crop season at Vellayani (61 rainy days) followed by Coimbatore (41 rainy days).

Relative Humidity:

In Hill Zone, Relative Humidity (RH) was higher (94.7%) in morning at Srinagar in 3rd meteorological week as compared to Palampur (87.1%) in 40th meteorological week. In North-West Zone, RH ranged from 34.0 to 100.0% in morning hours but in afternoon it ranged between 10.0 to 84%. The lowest RH was recorded at Bikaner in morning (34.0%) and in afternoon (10.0%). In North-East Zone maximum RH (99.0%) in morning was recorded at Jorhat followed by Kalyani (97.7%) whereas minimum (56.0%) was recorded at Bhubaneswar. In afternoon, the maximum (79.0%) and minimum (31.0%) RH was recorded at Bhubaneswar.

In Central Zone, the minimum relative humidity (12.0%) was recorded in morning at Jabalpur and maximum (100.0%) was recorded at Urulikanchan followed by Anand (94.1%). In South Zone, the maximum RH (94.8%) was recorded at Vellayani followed by Hyderabad (94.0%) during morning hours. Whereas, Vellayani and Mandya recorded very high relative humidity during morning hours through out the cropping season.

Sunshine Hours:

Sunshine hours were recorded at different locations in different zones. In Hill Zone, sunshine hours were maximum (10.6 h) in Srinagar as compared to Palampur (10.5 h). On mean basis over the crop season, Palampur recorded maximum sunshine hours (7.2 h) as compare to Srinagar (5.3 h). In North-West Zone, sunshine hours were maximum at Bikaner (11.3 h) followed by Ludhiana (10.2 h). On the mean basis over the crop season, Bikaner recorded maximum sunshine hours (8.1 h) followed by Pantnagar (7.3 h) and lowest being with Ludhiana (6.8 h). The Kalyani recorded maximum sunshine hours (9.9 h) followed by Bhubaneswar (9.0 h) in North-East Zone.

In the same zone, on the mean basis, Jorhat recorded lowest sunshine hours compared to other locations. In Central Zone sunshine hours were maximum at Anand (10.6 h) followed by Jhansi (10.4 h). In the South Zone, maximum sunshine was recorded at Coimbatore (10.5 h) followed by Hyderabad (9.9 h). Whereas, on the mean basis over the crop season, Hyderabad recorded maximum sunshine hours (7.6 h) followed by Mandya (7.5 h).

Table MET-1.1 (a): Temperature (^{0}C) at AICRP-FC trial locations during crop growth period, Rabi 2010-11

Met. Week & Month	Hill Zone			
	Palampur		Srinagar	
	Max.	Min.	Max.	Min.
40-Oct.01-Oct. 07, 2010	27.2	15.0	28.0	7.3
41-Oct. 08-Oct. 14, 2010	26.5	14.3	25.6	6.6
42-Oct. 15-Oct 21, 2010	26.7	15.0	26.7	6.4
43-Oct. 22-Oct. 28, 2010	23.1	14.9	16.4	2.5
44-Oct. 29-Nov. 04, 2010	23.7	10.6	20.2	2.4
45-Nov. 05-Nov. 11, 2010	24.5	10.6	20.5	4.2
46-Nov. 12-Nov. 18, 2010	23.9	09.8	18.4	-0.5
47-Nov.19-Nov. 25, 2010	21.2	08.4	16.5	1.0
48-Nov. 26-Dec. 02, 2010	20.3	07.2	15.4	-0.1
49-Dec. 03-Dec. 09, 2010	19.6	05.8	13.6	-4.3
50-Dec. 10-Dec. 16, 2010	17.7	04.7	11.9	-5.1
51-Dec. 17-Dec. 23, 2010	18.9	04.1	10.5	-5.4
52-Dec. 24-Dec.31, 2010	16.8	04.6	7.3	-4.3
1-Jan. 01-Jan 07, 2011	15.7	02.9	6.5	-3.7
2-Jan. 08-Jan. 14, 2011	17.1	04.7	6.6	-0.8
3-Jan. 15-Jan 21, 2011	12.0	02.4	5.2	-4.6
4-Jan. 22-Jan. 28, 2011	16.1	03.5	8.6	-4.2
5-Jan. 29-Feb-04, 2011	18.1	06.5	9.6	0.2
6-Feb. 05-Feb-11, 2011	19.1	07.6	9.6	1.6
7-Feb. 12-Feb.-18, 2011	14.3	06.5	7.2	1.5
8-Feb. 19-Feb. 25 2011	16.8	05.9	8.0	0.9
9-Feb. 26-Mar. 04, 2011	15.1	06.1	8.2	1.3
10-Mar. 05-Mar. 11, 2011	19.5	07.6	14.6	0.8
11-Mar.12-Mar. 18, 2011	24.4	11.2	21.2	2.9
12-Mar. 19-Mar. 25, 2011	24.8	11.7	16.4	3.3
13-Mar. 26-Apr. 01, 2011	25.9	12.2	16.2	5.5
14-Apr. 02-Apr. 08, 2011	22.7	10.5	11.6	3.2
15-Apr. 09-Apr.-15, 2011	24.4	12.6	18.0	6.4
16-Apr. 16-Apr. 22, 2011	24.0	11.8	16.4	6.2
17-Apr. 23-Apr.29, 2011	28.7	17.0	26.7	6.9
18-Apr. 30-May. 06, 2011	31.6	19.2	24.7	8.7
19-May 07-May.13, 2011	30.4	18.8	24.2	8.7
20-May. 14-May20, 2011	-	-	30.8	10.6
21-May. 21-May. 27 2011	-	-	27.3	11.6

Table MET-1.1 (b): Temperature (^{0}C) at AICRP-FC trial locations during crop growth period, Rabi 2010-11

Met. Week & Month	North-west Zone							
	Ludhiana		Hisar		Bikaner		Pantnagar	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
40-Oct. 01-Oct. 07, 2010	33.0	21.7	34.3	20.8	37.6	24.7	32.5	21.1
41-Oct. 08-Oct. 14, 2010	33.0	20.6	34.5	19.3	37.0	22.7	31.4	19.4
42-Oct. 15-Oct 21, 2010	32.5	21.0	33.9	20.2	36.9	23.7	32.6	20.6
43-Oct. 22-Oct. 28, 2010	29.0	14.2	31.5	14.2	33.9	18.8	31.0	15.2
44-Oct. 29-Nov. 04, 2010	29.0	13.6	30.0	12.8	31.5	16.1	30.0	14.5
45-Nov. 05-Nov. 11, 2010	29.2	12.5	30.0	12.2	32.1	16.5	29.7	15.1
46-Nov. 12-Nov. 18, 2010	27.4	12.2	27.7	15.5	29.7	17.5	28.8	14.5
47-Nov.19-Nov. 25, 2010	25.3	10.2	25.4	09.4	27.2	11.9	24.4	13.1
48-Nov. 26-Dec. 02, 2010	24.2	8.2	25.7	06.8	26.6	08.8	24.1	10.6
49-Dec. 03-Dec. 09, 2010	22.2	5.9	22.4	03.8	23.9	07.6	26.1	08.8
50-Dec. 10-Dec. 16, 2010	20.9	5.7	22.4	03.1	24.2	06.1	22.2	07.3
51-Dec. 17-Dec. 23, 2010	19.9	4.4	22.7	04.0	25.4	06.1	21.5	04.4
52-Dec. 24-Dec.31, 2010	18.6	6.0	17.4	06.9	20.8	04.3	21.1	06.7
1-Jan. 01-Jan 07, 2011	11.0	6.2	11.2	04.7	15.5	02.0	14.1	07.1
2-Jan. 08-Jan. 14, 2011	15.3	5.0	14.9	04.2	19.8	02.9	12.4	04.5
3-Jan. 15-Jan 21, 2011	16.4	4.8	19.2	03.2	22.5	04.8	18.1	05.6
4-Jan. 22-Jan. 28, 2011	19.5	4.1	20.6	04.4	23.6	05.6	21.6	05.3
5-Jan. 29-Feb-04, 2011	22.1	6.8	21.7	04.9	24.1	07.4	22.5	06.4
6-Feb. 05-Feb-11, 2011	21.8	10.3	24.6	08.5	27.5	10.1	24.8	08.9
7-Feb. 12-Feb.-18, 2011	19.7	10.7	21.9	09.8	23.8	10.7	22.8	11.2
8-Feb. 19-Feb. 25 2011	21.0	8.7	21.7	08.3	24.2	09.7	22.7	08.7
9-Feb. 26-Mar. 04, 2011	20.6	10.5	21.2	09.0	23.4	10.5	23.3	09.6
10-Mar. 05-Mar. 11, 2011	24.8	9.8	24.4	08.9	27.5	11.3	27.5	09.1
11-Mar.12-Mar. 18, 2011	29.3	14.4	29.9	10.7	35.4	16.0	29.3	13. 1
12-Mar. 19-Mar. 25, 2011	30.4	14.4	31.9	12.1	35.3	17.9	32.4	13. 4
13-Mar. 26-Apr. 01, 2011	31.7	16.3	33.2	14.7	37.3	19.1	31.9	15.6
14-Apr. 02-Apr. 08, 2011	31.0	14.6	32.1	13.2	34.6	17.5	33.4	14.1
15-Apr. 09-Apr.-15, 2011	33.1	17.4	35.1	15.4	35.2	19.0	34.3	16.6
16-Apr. 16-Apr. 22, 2011	32.4	16.7	33.2	15.5	38.5	19.1	35.4	16.5
17-Apr. 23-Apr.29, 2011	38.0	21.7	38.5	19.9	41.6	23.2	35.9	20.3
18-Apr. 30-May. 06, 2011	38.9	24.3	41.3	22.6	41.9	26.5	38.6	23.5
19-May 07-May.13, 2011	39.6	24.0	41.4	23.8	42.9	27.7	38.0	22.0
20-May. 14-May20, 2011	41.8	25.7	38.6	24.7	45.6	28.4	37.6	23.3
21-May. 21-May. 27 2011	34.2	24.4	40.9	25.8	42.8	18.6	34.8	22.5

Table MET-1.1(c): Temperature (^{0}C) at AICRP-FC trial locations during crop growth period, Rabi 2010-11

Met. Week & Month	North-East Zone									
	Faizabad		Ranchi		Kalyani		Bhubaneswar		Jorhat	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
40-Oct. 01-Oct. 07, 2010	33.5	27.7	29.5	19.1	32.8	25.5	32.2	24.8	32.3	24.5
41-Oct. 08-Oct. 14, 2010	35.0	22.0	28.3	17.5	31.3	24.0	30.9	25.0	28.6	22.6
42-Oct. 15-Oct 21, 2010	31.3	23.1	28.3	17.7	33.7	25.2	31.6	24.5	30.2	23.4
43-Oct. 22-Oct. 28, 2010	31.0	17.5	28.3	14.8	32.4	23.9	32.9	24.2	29.5	22.1
44-Oct. 29-Nov. 04, 2010	29.6	13.6	25.2	13.0	30.0	20.6	28.5	22.3	28.6	19.7
45-Nov. 05-Nov. 11, 2010	30.6	14.9	27.8	13.7	32.3	20.5	30.5	21.8	29.4	17.1
46-Nov. 12-Nov. 18, 2010	29.5	15.7	27.4	14.2	32.2	21.0	31.4	21.6	27.6	17.8
47-Nov.19-Nov. 25, 2010	25.2	14.7	26.8	11.2	30.5	17.8	32.1	20.9	26.3	15.4
48-Nov. 26-Dec. 02, 2010	26.1	11.5	26.1	11.0	29.0	17.5	31.2	20.9	26.4	16.0
49-Dec. 03-Dec. 09, 2010	25.8	09.2	22.1	10.7	25.1	16.4	25.3	17.0	24.7	13.4
50-Dec. 10-Dec. 16, 2010	24.3	08.5	21.7	08.0	24.9	14.6	27.1	17.5	23.4	14.7
51-Dec. 17-Dec. 23, 2010	23.6	05.0	21.8	03.5	25.0	9.4	26.4	10.9	24.1	9.9
52-Dec. 24-Dec.31, 2010	27.5	05.6	22.3	05.6	25.8	8.9	28.2	13.0	23.3	9.1
1-Jan. 01-Jan 07, 2011	16.2	03.5	19.7	02.1	23.8	9.8	26.2	12.5	22.6	10.6
2-Jan. 08-Jan. 14, 2011	15.3	02.5	20.2	01.9	22.2	8.0	27.1	11.1	23.9	9.6
3-Jan. 15-Jan 21, 2011	22.3	05.3	22.4	04.5	24.9	8.8	24.4	14.1	18.6	9.4
4-Jan. 22-Jan. 28, 2011	24.7	06.8	24.4	06.6	26.7	10.8	31.6	15.9	21.6	9.6
5-Jan. 29-Feb-04, 2011	23.6	06.1	23.6	08.3	26.9	12.0	30.2	17.7	24.0	8.9
6-Feb. 05-Feb-11, 2011	26.3	07.9	27.2	08.4	29.8	13.4	32.5	15.7	25.5	11.4
7-Feb. 12-Feb.-18, 2011	25.3	11.4	28.9	10.2	30.7	15.7	35.0	18.7	25.2	13.7
8-Feb. 19-Feb. 25 2011	25.1	08.2	24.3	10.0	28.4	14.8	32.5	18.1	26.1	11.9
9-Feb. 26-Mar. 04, 2011	27.0	10.5	28.8	10.9	31.6	13.6	32.8	18.1	28.8	13.3
10-Mar. 05-Mar. 11, 2011	29.9	11.7	32.4	16.1	34.1	18.4	37.3	20.6	29.1	15.8
11-Mar.12-Mar. 18, 2011	31.4	12.1	31.3	13.3	33.3	20.8	35.0	20.8	26.2	17.9
12-Mar. 19-Mar. 25, 2011	35.1	14.0	34.9	15.4	34.9	23.8	35.1	24.4	26.2	18.2
13-Mar. 26-Apr. 01, 2011	35.8	15.8	34.2	15.8	32.8	22.5	35.4	24.7	27.1	18.8
14-Apr. 02-Apr. 08, 2011	35.8	14.7	33.9	17.2	33.5	22.5	34.9	23.7	29.8	18.8
15-Apr. 09-Apr.-15, 2011	37.7	18.6	32.7	18.5	35.1	23.6	37.6	23.8	29.2	20.5
16-Apr. 16-Apr. 22, 2011	38.0	18.9	34.4	19.8	35.3	24.5	37.6	25.4	29.3	20.4
17-Apr. 23-Apr.29, 2011	37.9	20.1	32.3	17.7	33.4	22.5	45.3	22.8	29.4	21.2
18-Apr. 30-May. 06, 2011	39.2	25.2	35.0	21.2	33.7	23.7	46.9	24.0	32.0	22.6
19-May 07-May.13, 2011	39.8	23.5	-	-	35.1	25.0	38.4	26.4	-	-
20-May. 14-May20, 2011	39.1	26.5	-	-	34.0	25.4	38.4	27.2	-	-
21-May. 21-May. 27 2011	37.6	23.4	-	-	34.9	26.0	35.7	26.3	-	-

Table MET-1.1 (d): Temperature (^{0}C) at AICRP-FC trial locations during crop growth period, Rabi 2010-11

Met. Week & Month	Central Zone													
	Jabalpur		Rahuri		Raipur		Jhansi		Anand		Urulikanchan		Kanpur	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
40-Oct. 01-Oct. 07, 2010	32.3	20.8	30.6	20.8	-	-	35.4	19.5	37.9	22.8	34.3	20.2	-	-
41-Oct. 08-Oct. 14, 2010	32.7	19.7	32.0	19.1	-	-	35.7	19.3	34.9	23.5	33.3	18.9	-	-
42-Oct. 15-Oct 21, 2010	31.8	19.8	31.2	21.7	-	-	33.2	21.6	36.7	24.6	32.7	21.4	-	-
43-Oct. 22-Oct. 28, 2010	30.9	18.1	30.7	19.8	-	-	34.2	16.1	35.4	21.9	33.0	18.7	-	-
44-Oct. 29-Nov. 04, 2010	29.3	15.3	29.9	17.7	-	-	31.3	11.7	29.5	18.6	32.1	15.5	-	-
45-Nov. 05-Nov. 11, 2010	30.3	16.3	29.1	19.5	29.5	20.6	30.8	15.2	33.9	21.0	30.6	19.1	-	-
46-Nov. 12-Nov. 18, 2010	31.5	19.4	30.5	19.9	31.5	20.6	29.9	19.4	33.7	22.6	33.1	20.3	-	-
47-Nov.19-Nov. 25, 2010	29.7	14.5	29.8	20.1	31.6	18.1	24.3	14.4	28.4	19.4	32.2	19.7	-	-
48-Nov. 26-Dec. 02, 2010	29.2	16.3	30.3	16.2	31.7	18.7	24.9	13.0	29.6	19.0	32.1	16.3	-	-
49-Dec. 03-Dec. 09, 2010	23.7	11.5	28.4	13.8	25.7	17.6	23.6	06.3	28.8	15.8	30.9	14.1	24.7	09.7
50-Dec. 10-Dec. 16, 2010	24.8	8.9	28.0	9.7	26.2	15.0	24.2	06.7	27.2	09.8	28.7	11.1	23.4	09.9
51-Dec. 17-Dec. 23, 2010	24.7	4.9	27.5	5.3	25.8	08.2	25.2	04.8	28.4	09.5	30.9	6.1	23.9	07.3
52-Dec. 24-Dec.31, 2010	27.0	8.7	28.9	10.0	27.6	11.8	24.8	05.9	28.0	13.2	29.9	10.7	24.0	08.9
1-Jan. 01-Jan 07, 2011	21.0	3.1	25.1	9.2	24.3	09.0	15.3	02.8	25.7	08.4	28.6	10.2	12.9	05.4
2-Jan. 08-Jan. 14, 2011	23.8	3.5	28.4	5.1	26.1	07.3	20.0	03.8	27.8	08.3	32.6	6.1	17.7	05.1
3-Jan. 15-Jan 21, 2011	24.6	6.1	29.8	8.1	28.3	10.4	23.2	05.1	27.3	09.2	32.3	10.7	21.9	07.1
4-Jan. 22-Jan. 28, 2011	26.3	8.7	30.5	9.6	29.8	12.9	23.4	06.9	29.5	11.3	34.2	9.5	24.0	08.5
5-Jan. 29-Feb-04, 2011	26.3	8.5	31.2	10.1	29.9	14.0	23.1	07.1	29.6	11.6	35.9	18.6	23.6	08.9
6-Feb. 05-Feb-11, 2011	29.0	9.9	31.8	10.0	31.4	13.1	27.8	09.9	31.3	13.2	34.3	16.4	26.4	11.4
7-Feb. 12-Feb.-18, 2011	29.5	12.7	30.9	11.5	32.1	16.8	25.9	11.8	31.0	14.7	32.6	12.0	24.5	12.9
8-Feb. 19-Feb. 25 2011	26.2	10.1	30.2	11.6	27.1	15.7	24.5	09.3	31.2	13.1	33.4	13.2	25.0	10.4
9-Feb. 26-Mar. 04, 2011	29.5	12.6	32.4	14.2	32.0	16.5	26.4	11.2	33.4	14.1	34.9	16.2	26.9	13.5
10-Mar. 05-Mar. 11, 2011	32.1	13.6	34.7	14.2	35.0	19.2	28.8	12.4	34.3	15.3	37.0	15.0	21.1	14.9
11-Mar.12-Mar. 18, 2011	32.2	11.2	34.2	11.9	34.6	16.6	31.9	12.2	37.6	16.4	36.4	14.9	31.9	15.4
12-Mar. 19-Mar. 25, 2011	36.3	17.9	36.4	14.7	37.0	21.2	35.4	14.5	36.9	17.3	37.5	15.9	34.9	16.6
13-Mar. 26-Apr. 01, 2011	36.6	15.8	36.4	15.2	-	-	36.0	15.4	39.0	18.9	38.4	17.0	33.9	18.8
14-Apr. 02-Apr. 08, 2011	36.0	15.5	35.6	15.4	-	-	35.8	14.2	37.8	19.0	37.5	15.8	35.4	17.2
15-Apr. 09-Apr.-15, 2011	-	-	36.8	20.5	-	-	37.0	18.5	39.7	23.7	38.2	21.0	36.7	20.3
16-Apr. 16-Apr. 22, 2011	-	-	37.7	21.5	-	-	37.8	18.3	40.0	21.3	38.8	21.4	37.2	20.8
17-Apr. 23-Apr.29, 2011	-	-	38.2	21.5	-	-	38.7	18.9	42.0	23.3	38.3	21.7	38.1	22.2
18-Apr. 30-May. 06, 2011	-	-	38.8	22.0	-	-	41.9	25.3	39.6	24.8	38.6	23.0	40.6	26.1
19-May 07-May.13, 2011	-	-	38.0	21.3	-	-	42.5	26.4	39.1	24.6	36.9	22.3	-	-
20-May. 14-May20, 2011	-	-	39.1	22.7	-	-	44.0	25.8	40.2	25.8	36.2	24.3	-	-
21-May. 21-May. 27 2011	-	-	37.1	23.1	-	-	42.2	26.1	37.7	27.3	35.1	23.8	-	-

Table MET-1.1 (e): Temperature (^{0}C) at AICRP-FC trial locations during crop growth period, Rabi 2010-11

Met. Week & Month	South Zone							
	Hyderabad		Coimbatore		Vellayani		Mandya	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
40-Oct. 01-Oct. 07, 2010	30.7	21.7	31.5	23.4	29.6	22.3	33.0	21.2
41-Oct. 08-Oct. 14, 2010	31.8	20.4	30.8	22.3	29.7	22.2	30.4	20.2
42-Oct. 15-Oct 21, 2010	28.3	21.3	31.2	22.8	35.1	25.9	30.0	19.4
43-Oct. 22-Oct. 28, 2010	29.9	19.6	31.4	22.2	31.0	25.0	30.0	20.1
44-Oct. 29-Nov. 04, 2010	26.7	20.0	29.3	22.1	30.7	24.0	31.0	20.6
45-Nov. 05-Nov. 11, 2010	28.0	19.8	28.8	22.6	29.3	23.1	31.7	20.9
46-Nov. 12-Nov. 18, 2010	29.4	20.5	29.1	22.3	30.4	24.0	31.1	20.0
47-Nov.19-Nov. 25, 2010	30.3	19.2	27.7	21.8	30.9	23.0	31.1	19.0
48-Nov. 26-Dec. 02, 2010	29.3	16.4	25.5	21.0	30.9	23.0	30.6	18.3
49-Dec. 03-Dec. 09, 2010	26.3	18.0	28.0	19.5	30.5	23.1	31.1	19.7
50-Dec. 10-Dec. 16, 2010	28.1	15.9	30.2	19.7	30.5	22.9	30.6	19.6
51-Dec. 17-Dec. 23, 2010	28.4	07.6	27.6	19.6	30.3	23.1	30.4	19.6
52-Dec. 24-Dec.31, 2010	27.8	10.9	21.9	17.9	29.9	22.0	28.4	17.6
1-Jan. 01-Jan 07, 2011	27.4	12.4	29.1	20.1	29.6	23.5	30.0	17.4
2-Jan. 08-Jan. 14, 2011	28.3	07.0	30.6	17.9	29.8	23.7	30.1	17.1
3-Jan. 15-Jan 21, 2011	30.9	10.7	30.2	19.1	30.0	23.9	30.1	14.6
4-Jan. 22-Jan. 28, 2011	30.4	10.9	29.5	19.6	29.5	23.0	30.3	17.1
5-Jan. 29-Feb-04, 2011	30.8	12.0	30.9	17.4	29.9	22.5	30.3	18.2
6-Feb. 05-Feb-11, 2011	31.5	11.8	31.8	16.5	30.3	23.5	30.7	19.4
7-Feb. 12-Feb.-18, 2011	31.9	13.8	31.7	17.0	30.2	23.2	30.6	18.4
8-Feb. 19-Feb. 25 2011	31.3	19.1	32.4	21.5	30.7	23.8	30.7	18.7
9-Feb. 26-Mar. 04, 2011	27.4	15.9	30.9	19.7	31.0	24.1	30.6	19.6
10-Mar. 05-Mar. 11, 2011	36.1	17.4	33.7	19.3	31.4	24.5	30.8	20.9
11-Mar.12-Mar. 18, 2011	35.1	16.3	33.7	21.0	31.6	25.1	30.8	20.6
12-Mar. 19-Mar. 25, 2011	37.3	19.5	34.1	21.2	31.9	25.6	31.5	21.1
13-Mar. 26-Apr. 01, 2011	36.2	17.9	33.8	22.5	31.3	24.2	31.4	20.6
14-Apr. 02-Apr. 08, 2011	37.1	20.1	33.9	22.8	31.9	24.7	33.1	20.8
15-Apr. 09-Apr.-15, 2011	36.4	21.8	34.4	23.7	28.1	24.8	33.6	21.1
16-Apr. 16-Apr. 22, 2011	36.8	22.7	34.0	22.4	29.9	23.3	33.0	22.8
17-Apr. 23-Apr.29, 2011	35.9	23.2	31.4	22.8	30.2	24.4	33.9	22.3
18-Apr. 30-May. 06, 2011	38.9	24.5	33.3	23.2	30.0	25.6	34.2	21.9
19-May 07-May.13, 2011	38.9	24.5	33.6	21.2	31.0	21.6	34.2	22.0
20-May. 14-May20, 2011	40.4	26.4	34.6	23.7	30.8	26.1	34.3	22.4
21-May. 21-May. 27 2011	38.7	25.8	34.2	23.8	26.0	25.1	31.9	22.5

Table MET-1.2 (a): Rainfall (RF, mm) and Rainy days (RD, No.) at AICRP-FC trial locations during crop growth period, Rabi 2010-11

Met. Week & Month	Hill Zone	
	Palampur	Srinagar
	RF	RF
40-Oct. 01-Oct. 07, 2010	01.8	00.0
41-Oct. 08-Oct. 14, 2010	02.5	01.0
42-Oct. 15-Oct 21, 2010	00.0	00.0
43-Oct. 22-Oct. 28, 2010	00.0	33.0
44-Oct. 29-Nov. 04, 2010	00.0	00.0
45-Nov. 05-Nov. 11, 2010	00.0	00.0
46-Nov. 12-Nov. 18, 2010	01.2	00.0
47-Nov.19-Nov. 25, 2010	04.0	00.0
48-Nov. 26-Dec. 02, 2010	00.0	00.0
49-Dec. 03-Dec. 09, 2010	00.0	00.0
50-Dec. 10-Dec. 16, 2010	00.0	00.0
51-Dec. 17-Dec. 23, 2010	00.0	00.0
52-Dec. 24-Dec.31, 2010	91.2	58.0
1-Jan. 01-Jan 07, 2011	05.8	00.0
2-Jan. 08-Jan. 14, 2011	00.0	02.0
3-Jan. 15-Jan 21, 2011	58.2	103.6
4-Jan. 22-Jan. 28, 2011	00.0	00.0
5-Jan. 29-Feb-04, 2011	01.0	02.0
6-Feb. 05-Feb-11, 2011	23.0	36.1
7-Feb. 12-Feb.-18, 2011	108.8	47.9
8-Feb. 19-Feb. 25 2011	01.0	09.8
9-Feb. 26-Mar. 04, 2011	38.8	26.2
10-Mar. 05-Mar. 11, 2011	07.7	01.2
11-Mar.12-Mar. 18, 2011	00.0	00.0
12-Mar. 19-Mar. 25, 2011	00.0	37.5
13-Mar. 26-Apr. 01, 2011	05.4	24.2
14-Apr. 02-Apr. 08, 2011	05.0	26.0
15-Apr. 09-Apr.-15, 2011	05.6	29.6
16-Apr. 16-Apr. 22, 2011	80.1	36.9
17-Apr. 23-Apr.29, 2011	00.0	00.6
18-Apr. 30-May. 06, 2011	10.0	03.6
19-May 07-May.13, 2011	02.6	06.4
20-May. 14-May20, 2011	-	00.0
21-May. 21-May. 27 2011	-	05.8

Table MET-1.2 (b): Rainfall (RF, mm) and Rainy days (RD, No.) at AICRP-FC trial locations during crop growth period, Rabi 2010-11

Met. Week & Month	North-west Zone						
	Ludhiana		Hisar	Bikaner		Pantnagar	
	RF	RD	RF	RF	RD	RF	RD
40-Oct. 01-Oct. 07, 2010	00.0	0	00.0	00.0	0	00.0	0
41-Oct. 08-Oct. 14, 2010	00.0	0	00.0	00.0	0	04.4	1
42-Oct. 15-Oct 21, 2010	00.0	0	00.0	00.0	0	00.0	0
43-Oct. 22-Oct. 28, 2010	08.8	1	00.0	00.0	0	00.0	0
44-Oct. 29-Nov. 04, 2010	00.0	0	00.0	00.0	0	00.0	0
45-Nov. 05-Nov. 11, 2010	00.0	0	00.0	00.0	0	00.0	0
46-Nov. 12-Nov. 18, 2010	00.0	0	00.0	17.0	1	Trace	0
47-Nov.19-Nov. 25, 2010	00.0	0	00.0	00.0	0	00.4	0
48-Nov. 26-Dec. 02, 2010	00.0	0	00.0	00.0	0	00.0	0
49-Dec. 03-Dec. 09, 2010	00.0	0	00.0	00.0	0	00.0	0
50-Dec. 10-Dec. 16, 2010	00.0	0	00.0	00.0	0	00.0	0
51-Dec. 17-Dec. 23, 2010	00.0	0	00.0	00.0	0	00.0	0
52-Dec. 24-Dec.31, 2010	17.6	2	43.6	03.0	1	36.8	2
1-Jan. 01-Jan 07, 2011	00.0	0	00.0	00.0	0	22.0	1
2-Jan. 08-Jan. 14, 2011	05.4	2	00.0	00.0	0	00.0	0
3-Jan. 15-Jan 21, 2011	00.0	0	00.0	00.0	0	02.4	0
4-Jan. 22-Jan. 28, 2011	00.0	0	00.0	00.0	0	00.0	0
5-Jan. 29-Feb-04, 2011	00.0	0	00.0	00.0	0	00.0	0
6-Feb. 05-Feb-11, 2011	08.2	1	00.0	00.0	0	10.8	1
7-Feb. 12-Feb.-18, 2011	35.6	4	24.2	07.8	1	19.4	3
8-Feb. 19-Feb. 25 2011	00.4	0	08.2	00.8	0	00.0	0
9-Feb. 26-Mar. 04, 2011	06.5	1	06.7	03.6	1	04.8	1
10-Mar. 05-Mar. 11, 2011	00.0	0	03.6	00.0	0	02.4	0
11-Mar.12-Mar. 18, 2011	00.0	0	00.0	00.0	0	00.0	0
12-Mar. 19-Mar. 25, 2011	00.0	0	04.6	00.0	0	00.0	0
13-Mar. 26-Apr. 01, 2011	00.0	0	00.0	00.0	0	09.2	1
14-Apr. 02-Apr. 08, 2011	00.0	0	01.5	00.0	0	00.0	0
15-Apr. 09-Apr.-15, 2011	02.6	0	00.0	00.0	0	03.4	1
16-Apr. 16-Apr. 22, 2011	22.1	2	03.1	00.5	0	02.4	0
17-Apr. 23-Apr.29, 2011	00.0	0	00.0	00.0	0	00.0	0
18-Apr. 30-May. 06, 2011	01.8	0	00.0	00.0	0	00.0	0
19-May 07-May.13, 2011	00.0	0	00.3	00.0	0	03.4	1
20-May. 14-May20, 2011	00.0	0	06.0	00.0	0	11.8	1
21-May. 21-May. 27 2011	22.4	2	05.2	00.0	0	10.2	3

Table MET-1.2(c): Rainfall (RF, mm) and Rainy days (RD, No.) at AICRP-FC trial locations during crop growth period, Rabi 2010-11

Met. Week & Month	North-East Zone								
	Faizabad		Ranchi	Kalyani		Bhubaneswar		Jorhat	
	RF	RD	RF	RF	RD	RF	RD	RF	RD
40-Oct. 01-Oct. 07, 2010	00.0	0	15.3	30.8	2	58.5	5	02.9	0
41-Oct. 08-Oct. 14, 2010	00.0	0	04.2	31.4	3	44.2	1	76.9	5
42-Oct. 15-Oct 21, 2010	31.7	4	60.2	27.0	3	68.1	4	08.6	3
43-Oct. 22-Oct. 28, 2010	00.0	0	60.2	00.0	0	16.5	2	32.6	2
44-Oct. 29-Nov. 04, 2010	00.0	0	10.2	00.7	0	13.5	3	00.3	0
45-Nov. 05-Nov. 11, 2010	00.0	0	00.0	00.0	0	70.1	2	00.0	0
46-Nov. 12-Nov. 18, 2010	01.2	0	00.0	00.0	0	00.0	0	00.0	0
47-Nov.19-Nov. 25, 2010	00.0	0	00.0	00.0	0	00.0	0	19.5	2
48-Nov. 26-Dec. 02, 2010	00.0	0	00.0	00.0	0	00.0	0	00.0	0
49-Dec. 03-Dec. 09, 2010	00.0	0	81.8	19.2	2	35.6	4	00.7	0
50-Dec. 10-Dec. 16, 2010	00.0	0	04.2	00.3	0	05.9	2	09.7	2
51-Dec. 17-Dec. 23, 2010	00.0	0	00.0	00.0	0	00.0	0	00.0	0
52-Dec. 24-Dec.31, 2010	00.0	0	00.0	00.0	0	00.0	0	00.0	0
1-Jan. 01-Jan 07, 2011	01.3	0	00.0	00.0	0	00.0	0	04.4	1
2-Jan. 08-Jan. 14, 2011	00.0	0	00.0	00.0	0	00.0	0	00.0	0
3-Jan. 15-Jan 21, 2011	00.0	0	00.0	00.0	0	00.0	0	12.1	3
4-Jan. 22-Jan. 28, 2011	00.0	0	00.0	00.0	0	00.0	0	00.0	0
5-Jan. 29-Feb-04, 2011	00.0	0	23.8	00.0	0	00.0	0	00.0	0
6-Feb. 05-Feb-11, 2011	00.0	0	00.0	00.0	0	00.0	0	06.0	1
7-Feb. 12-Feb.-18, 2011	07.5	2	00.0	00.0	0	00.0	0	20.0	2
8-Feb. 19-Feb. 25 2011	00.0	0	00.0	00.0	0	24.6	2	00.0	0
9-Feb. 26-Mar. 04, 2011	05.1	1	00.0	00.0	0	00.0	0	00.0	0
10-Mar. 05-Mar. 11, 2011	00.0	0	00.0	03.2	1	00.0	0	02.3	0
11-Mar.12-Mar. 18, 2011	00.0	0	00.0	05.1	2	01.8	0	60.9	4
12-Mar. 19-Mar. 25, 2011	00.0	0	00.0	17.2	1	00.0	0	29.1	3
13-Mar. 26-Apr. 01, 2011	00.0	0	00.0	37.0	3	00.0	0	19.4	3
14-Apr. 02-Apr. 08, 2011	00.0	0	00.0	14.8	2	02.8	1	00.6	0
15-Apr. 09-Apr.-15, 2011	00.0	0	00.0	00.0	0	00.0	0	22.5	3
16-Apr. 16-Apr. 22, 2011	00.0	0	00.0	28.5	2	11.0	3	03.9	1
17-Apr. 23-Apr.29, 2011	00.0	0	62.2	26.1	2	07.3	2	78.0	4
18-Apr. 30-May. 06, 2011	04.2	1	123.6	35.7	4	29.2	4	90.7	4
19-May 07-May.13, 2011	03.2	1	-	23.4	3	12.0	1	-	-
20-May. 14-May20, 2011	00.0	0	-	40.7	3	97.0	1	-	-
21-May. 21-May. 27 2011	14.8	2	-	18.8	2	05.8	2	-	-

Table MET-1.2 (d): Rainfall (RF, mm) and Rainy days (RD, No.) at AICRP-FC trial locations during crop growth period, Rabi 2010-11

Met. Week & Month	Central Zone												
	Jabalpur		Jhansi		Raipur	Anand		Urulikanchan		Kanpur		Rahuri	
	RF	RD	RF	RD	RF	RF	RD	RF	RD	RF	RD	RF	RD
40-Oct. 01-Oct. 07, 2010	0.0	0	0.0	0	-	00.0	0	72.4	2	0.0	0	01.5	0
41-Oct. 08-Oct. 14, 2010	0.0	0	0.0	0	-	00.0	0	12.6	1	0.0	0	01.0	0
42-Oct. 15-Oct 21, 2010	79.4	4	0.0	0	-	00.0	0	61.0	3	0.0	0	08.6	1
43-Oct. 22-Oct. 28, 2010	0.0	0	0.0	0	-	00.0	0	33.6	1	0.0	0	03.2	1
44-Oct. 29-Nov. 04, 2010	0.4	0	0.0	0	-	00.0	0	00.0	0	0.0	0	00.0	0
45-Nov. 05-Nov. 11, 2010	0.0	0	8.2	1	00.0	02.2	0	09.0	1	0.0	0	03.8	0
46-Nov. 12-Nov. 18, 2010	1.4	0	0.4	0	06.5	08.7	2	67.0	3	0.0	0	58.5	2
47-Nov.19-Nov. 25, 2010	0.0	0	8.0	2	00.0	12.1	1	60.6	2	0.0	0	01.0	0
48-Nov. 26-Dec. 02, 2010	0.0	0	0.0	0	00.0	00.0	0	00.0	0	0.0	0	00.0	0
49-Dec. 03-Dec. 09, 2010	7.6	1	0.0	0	55.0	00.0	0	00.0	0	0.0	0	00.0	0
50-Dec. 10-Dec. 16, 2010	0.0	0	0.0	0	02.2	00.0	0	00.0	0	0.0	0	00.0	0
51-Dec. 17-Dec. 23, 2010	0.0	0	0.0	0	00.0	00.0	0	00.0	0	0.0	0	00.0	0
52-Dec. 24-Dec.31, 2010	0.0	0	1.8	0	00.0	00.0	0	00.0	0	1.2	0	00.0	0
1-Jan. 01-Jan 07, 2011	0.0	0	0.0	0	00.0	00.0	0	00.0	0	0.0	0	00.0	0
2-Jan. 08-Jan. 14, 2011	0.0	0	0.0	0	00.0	00.0	0	00.0	0	0.0	0	00.0	0
3-Jan. 15-Jan 21, 2011	0.0	0	0.0	0	00.0	00.0	0	00.0	0	0.0	0	00.0	0
4-Jan. 22-Jan. 28, 2011	0.0	0	0.0	0	00.0	00.0	0	00.0	0	0.0	0	00.0	0
5-Jan. 29-Feb-04, 2011	0.0	0	0.0	0	00.0	00.0	0	00.0	0	0.0	0	00.0	0
6-Feb. 05-Feb-11, 2011	0.0	0	0.0	0	00.0	00.0	0	00.0	0	0.0	0	00.0	0
7-Feb. 12-Feb.-18, 2011	0.0	0	1.8	0	00.0	00.0	0	00.0	0	6.2	2	00.0	0
8-Feb. 19-Feb. 25 2011	1.4	0	0.0	0	12.2	00.0	0	00.0	0	0.0	0	00.0	0
9-Feb. 26-Mar. 04, 2011	4.2	1	0.0	0	00.0	00.0	0	00.0	0	1.8	0	00.0	0
10-Mar. 05-Mar. 11, 2011	0.0	0	0.0	0	00.0	00.0	0	00.0	0	0.0	0	00.0	0
11-Mar.12-Mar. 18, 2011	0.0	0	0.0	0	00.0	00.0	0	00.0	0	0.0	0	00.0	0
12-Mar. 19-Mar. 25, 2011	0.0	0	0.0	0	00.4	00.0	0	00.0	0	0.0	0	-	-
13-Mar. 26-Apr. 01, 2011	0.0	0	0.0	0	-	00.0	0	00.0	0	6.0	2	-	-
14-Apr. 02-Apr. 08, 2011	0.0	0	0.0	0	-	00.0	0	00.0	0	0.6	0	-	-
15-Apr. 09-Apr.-15, 2011	-	-	0.0	0	-	00.0	0	00.0	0	3.0	0	-	-
16-Apr. 16-Apr. 22, 2011	-	-	0.0	0	-	00.0	0	00.0	0	7.4	3	-	-
17-Apr. 23-Apr.29, 2011	-	-	0.0	0	-	00.0	0	00.0	0	-	-	-	-
18-Apr. 30-May. 06, 2011	-	-	0.0	0	-	00.0	0	00.0	0	-	-	-	-
19-May 07-May.13, 2011	-	-	0.0	0	-	00.0	0	00.0	0	-	-	-	-
20-May. 14-May20, 2011	-	-	1.4	0	-	00.0	0	00.0	0	-	-	-	-
21-May. 21-May. 27 2011	-	-	16.2	1	-	00.0	0	00.0	0	-	-	-	-

Table MET-1.2 (e): Rainfall (RF, mm) and Rainy days (RD, No.) at AICRP-FC trial locations during crop growth period, Rabi 2010-11

Met. Week & Month	South Zone						
	Hyderabad		Coimbatore		Vellayani		Mandya
	RF	RD	RF	RD	RF	RD	RF
40-Oct. 01-Oct. 07, 2010	27.8	3	41.8	4	371.2	7	29.8
41-Oct. 08-Oct. 14, 2010	00.0	0	05.8	1	124.2	3	35.4
42-Oct. 15-Oct 21, 2010	47.2	3	02.4	0	003.2	1	00.0
43-Oct. 22-Oct. 28, 2010	32.2	1	31.0	1	006.4	1	15.6
44-Oct. 29-Nov. 04, 2010	19.0	1	83.8	4	032.2	4	12.6
45-Nov. 05-Nov. 11, 2010	11.8	3	138.0	4	032.8	6	34.4
46-Nov. 12-Nov. 18, 2010	10.6	1	56.9	2	024.0	7	21.0
47-Nov.19-Nov. 25, 2010	00.0	0	96.2	7	009.6	2	13.8
48-Nov. 26-Dec. 02, 2010	00.0	0	21.8	2	005.6	2	05.2
49-Dec. 03-Dec. 09, 2010	10.6	1	21.0	2	039.0	4	02.0
50-Dec. 10-Dec. 16, 2010	07.6	1	00.2	0	008.2	1	00.0
51-Dec. 17-Dec. 23, 2010	00.0	0	03.6	0	059.4	6	00.0
52-Dec. 24-Dec.31, 2010	00.0	0	00.0	0	148.8	7	00.0
1-Jan. 01-Jan 07, 2011	00.0	0	00.4	0	062.6	7	00.0
2-Jan. 08-Jan. 14, 2011	00.0	0	00.0	0	072.2	3	00.0
3-Jan. 15-Jan 21, 2011	00.0	0	00.0	0	000.0	0	00.0
4-Jan. 22-Jan. 28, 2011	00.0	0	00.0	0	000.0	0	00.0
5-Jan. 29-Feb-04, 2011	00.0	0	00.0	0	014.8	2	00.0
6-Feb. 05-Feb-11, 2011	00.0	0	00.0	0	003.4	1	00.0
7-Feb. 12-Feb.-18, 2011	00.0	0	00.0	0	001.8	0	04.6
8-Feb. 19-Feb. 25 2011	00.0	0	46.4	2	000.0	0	00.0
9-Feb. 26-Mar. 04, 2011	06.0	1	79.2	1	000.0	0	00.0
10-Mar. 05-Mar. 11, 2011	00.0	0	00.0	0	000.0	0	00.0
11-Mar.12-Mar. 18, 2011	00.0	0	00.0	0	000.0	0	04.6
12-Mar. 19-Mar. 25, 2011	00.0	0	00.0	0	004.0	1	06.4
13-Mar. 26-Apr. 01, 2011	00.0	0	23.6	1	000.0	0	02.8
14-Apr. 02-Apr. 08, 2011	00.0	0	02.8	1	000.0	0	00.0
15-Apr. 09-Apr.-15, 2011	01.0	0	00.2	0	000.0	0	00.0
16-Apr. 16-Apr. 22, 2011	02.0	0	132.6	3	000.0	0	17.8
17-Apr. 23-Apr.29, 2011	00.0	0	33.2	3	000.0	0	157.8
18-Apr. 30-May. 06, 2011	06.2	1	23.2	3	004.0	1	07.0
19-May 07-May.13, 2011	01.2	0	00.0	0	004.2	0	04.2
20-May. 14-May20, 2011	00.0	0	00.0	0	004.0	0	02.2
21-May. 21-May. 27 2011	00.1	0	01.6	0	004.2	1	34.2

Table MET-1.3 (a): Relative humidity (M=Morning, AN= Afternoon, AV=Average; %) at AICRP-FC trial locations during crop growth period, Rabi 2010-11

Met. Week & Month	Hill Zone					
	Palampur			Srinagar		
	M	AN	AV	M	AN	AV
40-Oct. 01-Oct. 07, 2010	87	68	77	90	57	73
41-Oct. 08-Oct. 14, 2010	77	58	68	93	66	80
42-Oct. 15-Oct 21, 2010	84	62	73	91	66	79
43-Oct. 22-Oct. 28, 2010	86	64	75	88	61	75
44-Oct. 29-Nov. 04, 2010	75	51	63	84	47	66
45-Nov. 05-Nov. 11, 2010	73	50	62	84	39	61
46-Nov. 12-Nov. 18, 2010	69	37	53	80	34	57
47-Nov.19-Nov. 25, 2010	74	51	62	86	46	66
48-Nov. 26-Dec. 02, 2010	86	58	72	87	54	70
49-Dec. 03-Dec. 09, 2010	71	41	56	93	64	79
50-Dec. 10-Dec. 16, 2010	77	55	66	92	71	82
51-Dec. 17-Dec. 23, 2010	67	38	52	90	72	81
52-Dec. 24-Dec.31, 2010	66	53	59	91	80	85
1-Jan. 01-Jan 07, 2011	67	51	59	93	80	87
2-Jan. 08-Jan. 14, 2011	63	44	54	90	75	83
3-Jan. 15-Jan 21, 2011	76	60	68	95	74	84
4-Jan. 22-Jan. 28, 2011	77	49	63	94	60	80
5-Jan. 29-Feb-04, 2011	69	50	59	91	66	78
6-Feb. 05-Feb-11, 2011	66	49	57	87	71	79
7-Feb. 12-Feb.-18, 2011	85	71	78	91	77	84
8-Feb. 19-Feb. 25 2011	76	59	67	83	64	73
9-Feb. 26-Mar. 04, 2011	81	72	77	88	67	78
10-Mar. 05-Mar. 11, 2011	66	44	55	82	40	61
11-Mar.12-Mar. 18, 2011	66	42	54	74	29	51
12-Mar. 19-Mar. 25, 2011	63	35	49	86	46	66
13-Mar. 26-Apr. 01, 2011	61	40	50	90	53	72
14-Apr. 02-Apr. 08, 2011	69	45	57	91	68	80
15-Apr. 09-Apr.-15, 2011	78	51	64	74	53	63
16-Apr. 16-Apr. 22, 2011	69	50	60	86	62	74
17-Apr. 23-Apr.29, 2011	65	46	55	67	39	53
18-Apr. 30-May. 06, 2011	78	46	62	75	46	60
19-May 07-May.13, 2011	73	44	58	83	49	66
20-May. 14-May20, 2011	-	-	-	71	29	50
21-May. 21-May. 27 2011	-	-	-	70	34	52

Table MET-1.3 (b): Relative humidity (M=Morning, AN= Afternoon, AV=Average; %) at AICRP-FC trial locations during crop growth period, Rabi 2010-11

Met. Week & Month	North-West Zone											
	Pantnagar			Ludhiana			Hisar			Bikaner		
	M	AN	AV	M	AN	AV	M	AN	AV	M	AN	AV
40-Oct. 01-Oct. 07, 2010	83	53	68	96	56	76	92	44	68	65	28	47
41-Oct. 08-Oct. 14, 2010	86	55	71	92	51	72	88	33	61	66	24	45
42-Oct. 15-Oct 21, 2010	84	47	66	91	55	73	91	43	67	73	27	50
43-Oct. 22-Oct. 28, 2010	86	41	64	82	48	65	88	28	58	65	30	48
44-Oct. 29-Nov. 04, 2010	87	38	63	93	44	69	88	31	60	62	28	45
45-Nov. 05-Nov. 11, 2010	88	41	65	93	41	67	89	33	61	65	30	48
46-Nov. 12-Nov. 18, 2010	84	42	63	92	37	65	82	44	63	90	40	65
47-Nov.19-Nov. 25, 2010	89	48	69	94	42	68	89	38	64	79	27	53
48-Nov. 26-Dec. 02, 2010	91	54	73	93	41	67	87	28	58	66	16	41
49-Dec. 03-Dec. 09, 2010	89	37	63	97	50	74	96	40	68	68	24	46
50-Dec. 10-Dec. 16, 2010	92	45	69	96	56	76	89	31	60	65	22	44
51-Dec. 17-Dec. 23, 2010	96	45	71	98	56	77	92	38	65	74	27	51
52-Dec. 24-Dec.31, 2010	93	51	72	99	61	80	100	80	90	94	42	68
1-Jan. 01-Jan 07, 2011	92	81	87	95	84	90	95	82	89	99	56	78
2-Jan. 08-Jan. 14, 2011	95	77	86	96	70	83	93	65	79	73	36	55
3-Jan. 15-Jan 21, 2011	92	55	74	98	66	82	93	31	62	58	14	36
4-Jan. 22-Jan. 28, 2011	89	48	69	97	51	74	94	38	66	71	19	45
5-Jan. 29-Feb-04, 2011	94	46	70	97	59	78	95	43	69	80	22	51
6-Feb. 05-Feb-11, 2011	90	48	69	95	66	81	93	49	71	75	20	48
7-Feb. 12-Feb.-18, 2011	88	58	73	92	74	83	95	54	75	83	41	62
8-Feb. 19-Feb. 25 2011	91	47	69	97	67	82	97	61	79	85	38	62
9-Feb. 26-Mar. 04, 2011	89	49	69	93	69	81	97	70	84	92	42	67
10-Mar. 05-Mar. 11, 2011	89	37	63	95	55	75	95	45	70	76	24	50
11-Mar.12-Mar. 18, 2011	88	35	62	94	56	75	91	37	64	53	11	32
12-Mar. 19-Mar. 25, 2011	83	27	55	91	47	69	89	34	62	43	10	29
13-Mar. 26-Apr. 01, 2011	83	33	58	83	42	63	90	39	65	50	13	32
14-Apr. 02-Apr. 08, 2011	78	27	53	74	22	48	87	36	62	50	11	31
15-Apr. 09-Apr.-15, 2011	70	22	46	75	28	52	85	48	67	53	20	37
16-Apr. 16-Apr. 22, 2011	71	26	49	74	39	57	88	44	66	57	19	38
17-Apr. 23-Apr.29, 2011	65	29	47	59	27	43	76	40	58	34	12	23
18-Apr. 30-May. 06, 2011	64	32	48	51	28	40	52	27	40	41	15	28
19-May 07-May.13, 2011	63	31	47	52	27	40	56	18	37	59	12	36
20-May. 14-May20, 2011	69	39	54	52	28	40	72	23	48	50	12	31
21-May. 21-May. 27 2011	78	48	63	67	42	55	70	42	56	55	23	39

Table MET-1.3(c): Relative humidity (M=Morning, AN= Afternoon, AV=Average; %) at AICRP-FC trial locations during crop growth period, Rabi 2010-11

Met. Week & Month	North-East Zone									
	Faizabad	Kalyani			Bhubaneswar			Jorhat		
	AV	M	AN	AV	M	AN	AV	M	AN	AV
40-Oct. 01-Oct. 07, 2010	76	93	74	84	92	60	76	95	70	83
41-Oct. 08-Oct. 14, 2010	71	96	74	85	92	78	85	96	77	87
42-Oct. 15-Oct 21, 2010	82	95	69	82	95	70	83	95	70	82
43-Oct. 22-Oct. 28, 2010	74	93	65	79	91	73	82	94	72	83
44-Oct. 29-Nov. 04, 2010	74	89	63	76	56	70	63	96	70	83
45-Nov. 05-Nov. 11, 2010	73	92	54	73	90	62	76	96	60	78
46-Nov. 12-Nov. 18, 2010	77	92	56	74	97	57	77	95	63	79
47-Nov.19-Nov. 25, 2010	74	92	51	72	89	55	72	96	67	81
48-Nov. 26-Dec. 02, 2010	70	92	51	72	89	62	76	95	67	81
49-Dec. 03-Dec. 09, 2010	68	96	70	83	89	79	84	97	64	81
50-Dec. 10-Dec. 16, 2010	67	95	59	77	92	54	73	98	67	83
51-Dec. 17-Dec. 23, 2010	70	94	44	69	90	32	61	96	56	76
52-Dec. 24-Dec.31, 2010	82	93	43	68	93	38	66	96	61	78
1-Jan. 01-Jan 07, 2011	85	97	52	74	76	38	57	98	64	81
2-Jan. 08-Jan. 14, 2011	86	98	57	77	86	31	59	98	57	78
3-Jan. 15-Jan 21, 2011	68	93	44	69	87	36	62	99	67	83
4-Jan. 22-Jan. 28, 2011	60	92	42	67	94	38	66	97	64	81
5-Jan. 29-Feb-04, 2011	71	94	43	68	92	43	68	95	53	74
6-Feb. 05-Feb-11, 2011	65	93	38	66	90	30	60	93	57	75
7-Feb. 12-Feb.-18, 2011	75	94	39	67	96	31	64	91	59	75
8-Feb. 19-Feb. 25 2011	68	93	47	70	93	59	76	88	48	68
9-Feb. 26-Mar. 04, 2011	62	89	32	61	91	49	70	88	43	65
10-Mar. 05-Mar. 11, 2011	51	87	36	62	88	30	59	87	50	68
11-Mar.12-Mar. 18, 2011	54	91	44	67	91	42	67	92	69	80
12-Mar. 19-Mar. 25, 2011	43	96	47	72	87	53	70	88	67	77
13-Mar. 26-Apr. 01, 2011	47	93	64	79	92	50	71	90	69	79
14-Apr. 02-Apr. 08, 2011	37	94	52	73	92	50	71	86	55	71
15-Apr. 09-Apr.-15, 2011	35	86	49	68	84	35	60	86	67	77
16-Apr. 16-Apr. 22, 2011	38	90	50	70	84	49	67	87	59	73
17-Apr. 23-Apr.29, 2011	42	91	58	74	86	44	65	88	69	79
18-Apr. 30-May. 06, 2011	48	91	61	76	86	51	69	92	68	80
19-May 07-May.13, 2011	50	92	63	78	94	46	70	-	-	-
20-May. 14-May20, 2011	52	92	67	79	88	56	73	-	-	-
21-May. 21-May. 27 2011	56	91	65	78	89	62	75	-	-	-

Table MET-1.3 (d): Relative humidity (M=Morning, AN= Afternoon, AV=Average; %) at AICRP-FC trial locations during crop growth period, Rabi 2010-11

Met. Week & Month	Central Zone														
	Jabalpur			Rahuri			Jhansi			Urulikanchan			Anand		
	M	AN	AV	M	AN	AV	M	AN	AV	M	AN	AV	M	AN	AV
40-Oct. 01-Oct. 07, 2010	89	51	70	92	56	74	83	47	65	100	56	85	83	34	58
41-Oct. 08-Oct. 14, 2010	86	45	66	94	42	68	79	39	59	100	51	82	88	51	69
42-Oct. 15-Oct 21, 2010	94	60	77	92	56	74	89	59	74	100	67	91	94	54	74
43-Oct. 22-Oct. 28, 2010	92	42	67	92	47	70	81	33	57	100	54	85	90	36	63
44-Oct. 29-Nov. 04, 2010	91	42	67	91	44	68	85	33	59	100	49	80	76	42	59
45-Nov. 05-Nov. 11, 2010	91	48	70	92	44	68	86	49	68	100	67	91	75	43	59
46-Nov. 12-Nov. 18, 2010	92	58	75	92	66	79	89	54	72	100	63	90	94	57	76
47-Nov.19-Nov. 25, 2010	90	38	64	91	59	75	89	58	74	100	60	89	91	68	79
48-Nov. 26-Dec. 02, 2010	91	55	73	90	51	71	87	48	68	100	51	84	92	60	76
49-Dec. 03-Dec. 09, 2010	89	47	68	90	44	67	87	38	63	100	51	82	77	51	64
50-Dec. 10-Dec. 16, 2010	91	32	62	91	38	65	87	37	62	100	48	81	90	30	60
51-Dec. 17-Dec. 23, 2010	89	24	57	88	30	59	88	33	61	100	32	74	90	34	62
52-Dec. 24-Dec.31, 2010	81	36	59	91	34	63	90	46	68	100	42	77	92	44	68
1-Jan. 01-Jan 07, 2011	95	35	65	92	50	71	89	71	80	100	45	77	75	34	55
2-Jan. 08-Jan. 14, 2011	87	25	56	90	30	60	91	42	67	100	24	67	81	38	60
3-Jan. 15-Jan 21, 2011	87	25	56	89	30	60	86	38	62	95	29	63	83	30	57
4-Jan. 22-Jan. 28, 2011	85	36	61	88	29	59	88	44	66	100	26	65	86	39	63
5-Jan. 29-Feb-04, 2011	88	37	63	90	31	61	87	47	67	98	26	57	86	38	62
6-Feb. 05-Feb-11, 2011	85	36	61	91	28	60	87	40	64	88	25	55	90	38	64
7-Feb. 12-Feb.-18, 2011	79	35	57	90	29	60	89	55	72	95	30	63	82	39	61
8-Feb. 19-Feb. 25 2011	83	38	61	91	32	62	87	52	70	93	28	59	76	28	52
9-Feb. 26-Mar. 04, 2011	86	40	63	91	32	62	86	44	65	88	32	57	77	30	54
10-Mar. 05-Mar. 11, 2011	82	34	58	91	27	59	85	34	60	79	19	45	69	20	45
11-Mar.12-Mar. 18, 2011	73	20	47	89	26	58	85	29	57	68	16	39	64	16	40
12-Mar. 19-Mar. 25, 2011	47	14	31	90	26	58	76	28	52	73	17	42	78	23	51
13-Mar. 26-Apr. 01, 2011	54	12	33	88	22	55	75	28	52	71	16	39	66	19	42
14-Apr. 02-Apr. 08, 2011	54	13	34	89	23	56	76	28	52	73	16	42	72	21	47
15-Apr. 09-Apr.-15, 2011	-	-	-	93	25	59	70	30	50	81	27	52	66	20	43
16-Apr. 16-Apr. 22, 2011	-	-	-	92	27	60	69	33	51	80	23	50	67	22	45
17-Apr. 23-Apr.29, 2011	-	-	-	91	28	60	67	33	50	89	27	59	68	18	43
18-Apr. 30-May. 06, 2011	-	-	-	90	28	59	53	30	42	82	27	55	68	31	50
19-May 07-May.13, 2011	-	-	-	91	28	60	44	25	35	81	28	56	79	37	58
20-May. 14-May20, 2011	-	-	-	91	29	60	48	23	36	81	28	52	77	37	57
21-May. 21-May. 27 2011	-	-	-	90	32	61	58	28	43	89	47	70	75	44	59

Table MET-1.3 (e): Relative humidity (M=Morning, AN= Afternoon, AV=Average; %) at AICRP-FC trial locations during crop growth period, Rabi 2010-11

Met. Week & Month	South Zone									
	Hyderabad			Vellayani			Coimbatore	Mandya		
	M	AN	AV	M	AN	AV	AV	M	AN	AV
40-Oct. 01-Oct. 07, 2010	86	66	76	91	78	85	92	91	42	67
41-Oct. 08-Oct. 14, 2010	83	50	67	91	79	85	92	91	51	71
42-Oct. 15-Oct 21, 2010	89	74	82	88	77	83	87	91	53	72
43-Oct. 22-Oct. 28, 2010	86	60	73	88	78	83	91	91	54	73
44-Oct. 29-Nov. 04, 2010	90	86	88	90	75	83	95	91	55	73
45-Nov. 05-Nov. 11, 2010	94	71	83	91	80	85	95	91	44	68
46-Nov. 12-Nov. 18, 2010	94	65	80	90	77	83	95	91	46	69
47-Nov.19-Nov. 25, 2010	91	56	74	88	78	83	96	91	46	69
48-Nov. 26-Dec. 02, 2010	92	56	74	89	77	83	92	91	47	69
49-Dec. 03-Dec. 09, 2010	83	57	70	90	76	83	96	91	47	69
50-Dec. 10-Dec. 16, 2010	90	50	70	91	77	84	93	90	48	69
51-Dec. 17-Dec. 23, 2010	84	27	56	90	76	83	93	91	51	71
52-Dec. 24-Dec.31, 2010	87	40	64	95	76	86	91	91	51	71
1-Jan. 01-Jan 07, 2011	84	43	64	93	76	85	90	91	46	69
2-Jan. 08-Jan. 14, 2011	82	24	53	94	78	86	91	91	45	68
3-Jan. 15-Jan 21, 2011	81	25	53	93	78	86	87	90	44	67
4-Jan. 22-Jan. 28, 2011	87	28	58	89	81	85	86	91	36	64
5-Jan. 29-Feb-04, 2011	89	35	62	92	81	87	86	90	45	68
6-Feb. 05-Feb-11, 2011	83	31	57	93	80	87	85	91	47	69
7-Feb. 12-Feb.-18, 2011	79	25	52	94	80	87	88	91	47	69
8-Feb. 19-Feb. 25 2011	82	40	61	94	77	85	89	91	47	69
9-Feb. 26-Mar. 04, 2011	65	33	49	91	77	84	90	90	44	67
10-Mar. 05-Mar. 11, 2011	59	19	39	90	75	83	88	91	47	69
11-Mar.12-Mar. 18, 2011	67	21	44	90	75	82	86	91	47	69
12-Mar. 19-Mar. 25, 2011	66	32	49	91	75	83	88	91	48	70
13-Mar. 26-Apr. 01, 2011	65	28	47	89	73	81	91	91	47	69
14-Apr. 02-Apr. 08, 2011	64	30	47	89	76	82	85	91	36	64
15-Apr. 09-Apr.-15, 2011	77	38	58	89	65	77	85	92	41	66
16-Apr. 16-Apr. 22, 2011	85	42	64	89	68	79	90	91	38	65
17-Apr. 23-Apr.29, 2011	74	31	53	88	72	80	94	91	37	64
18-Apr. 30-May. 06, 2011	62	28	45	90	70	80	92	91	38	65
19-May 07-May.13, 2011	53	26	40	87	68	78	88	91	36	64
20-May. 14-May20, 2011	52	26	39	89	69	79	90	91	38	65
21-May. 21-May. 27 2011	54	28	41	91	79	85	85	91	39	65

Table MET-1.4 (a): Sun Shine (hr) at AICRP-FC trial locations during crop growth period, Rabi 2010-11

Met. Week & Month	Hill Zone		North West Zone			
	Palampur	Srinagar	Ludhiana	Hisar	Bikaner	Pantnagar
40-Oct. 01-Oct. 07, 2010	8.4	8.6	6.8	8.9	9.5	9.5
41-Oct. 08-Oct. 14, 2010	8.4	8.1	5.1	8.1	9.6	8.2
42-Oct. 15-Oct 21, 2010	7.7	7.5	3.6	8.2	9.9	9.0
43-Oct. 22-Oct. 28, 2010	7.4	5.7	6.7	7.0	8.7	9.1
44-Oct. 29-Nov. 04, 2010	8.5	5.7	6.2	7.1	6.1	8.1
45-Nov. 05-Nov. 11, 2010	9.4	6.6	8.5	6.1	6.5	8.2
46-Nov. 12-Nov. 18, 2010	9.5	6.3	5.8	1.4	4.8	6.8
47-Nov.19-Nov. 25, 2010	7.0	4.7	6.2	5.2	7.0	4.0
48-Nov. 26-Dec. 02, 2010	8.4	6.1	7.7	7.5	9.3	6.3
49-Dec. 03-Dec. 09, 2010	8.7	6.1	6.9	6.5	8.3	9.0
50-Dec. 10-Dec. 16, 2010	7.0	5.2	6.7	7.5	8.9	5.5
51-Dec. 17-Dec. 23, 2010	8.6	4.2	5.7	6.9	8.7	7.4
52-Dec. 24-Dec.31, 2010	6.1	2.3	2.3	2.8	3.6	5.4
1-Jan. 01-Jan 07, 2011	8.5	2.7	1.4	1.2	5.4	1.0
2-Jan. 08-Jan. 14, 2011	7.0	2.0	3.1	4.9	7.1	1.3
3-Jan. 15-Jan 21, 2011	4.2	4.1	5.2	7.3	9.0	4.6
4-Jan. 22-Jan. 28, 2011	8.6	5.2	7.9	6.3	7.7	7.2
5-Jan. 29-Feb-04, 2011	5.0	2.3	6.8	7.4	8.6	6.6
6-Feb. 05-Feb-11, 2011	4.0	2.0	5.4	7.6	8.6	6.9
7-Feb. 12-Feb.-18, 2011	2.0	1.6	3.9	5.0	5.1	5.4
8-Feb. 19-Feb. 25 2011	4.5	0.9	5.0	6.5	8.3	7.6
9-Feb. 26-Mar. 04, 2011	2.3	1.9	4.1	5.0	5.9	6.0
10-Mar. 05-Mar. 11, 2011	7.1	7.5	10.1	8.2	8.7	9.3
11-Mar.12-Mar. 18, 2011	8.8	6.9	8.4	9.5	10.2	8.2
12-Mar. 19-Mar. 25, 2011	8.0	6.4	10.1	8.2	7.9	8.2
13-Mar. 26-Apr. 01, 2011	8.2	4.9	9.9	9.4	9.1	8.9
14-Apr. 02-Apr. 08, 2011	6.1	2.8	9.3	9.2	8.5	9.5
15-Apr. 09-Apr.-15, 2011	5.9	4.0	6.4	8.9	6.6	8.0
16-Apr. 16-Apr. 22, 2011	7.1	3.8	9.1	9.5	8.0	9.6
17-Apr. 23-Apr.29, 2011	10.5	10.2	10.2	10.1	11.3	8.9
18-Apr. 30-May. 06, 2011	9.7	7.8	9.1	9.4	10.6	9.0
19-May 07-May.13, 2011	9.3	7.7	10.2	9.2	10.4	9.2
20-May. 14-May20, 2011	-	10.6	9.8	8.7	10.3	8.3
21-May. 21-May. 27 2011	-	7.6	6.4	7.4	6.3	8.3

Table MET-1.4 (b): Sun Shine (hr) at AICRP-FC trial locations during crop growth period, Rabi 2010-11

Met. Week & Month	North East Zone			
	Jorhat	Faizabad	Kalyani	Bhubaneswar
40-Oct. 01-Oct. 07, 2010	5.7	7.0	5.3	5.6
41-Oct. 08-Oct. 14, 2010	2.8	3.5	5.3	3.8
42-Oct. 15-Oct 21, 2010	4.7	3.5	8.5	5.5
43-Oct. 22-Oct. 28, 2010	4.1	7.2	5.9	5.3
44-Oct. 29-Nov. 04, 2010	5.8	7.0	6.5	3.7
45-Nov. 05-Nov. 11, 2010	2.7	6.1	9.2	5.3
46-Nov. 12-Nov. 18, 2010	4.9	4.8	7.7	7.4
47-Nov.19-Nov. 25, 2010	5.8	3.7	7.4	7.5
48-Nov. 26-Dec. 02, 2010	4.1	6.3	7.6	4.5
49-Dec. 03-Dec. 09, 2010	3.1	7.0	2.8	3.9
50-Dec. 10-Dec. 16, 2010	4.8	4.7	6.6	4.2
51-Dec. 17-Dec. 23, 2010	7.9	5.7	8.6	8.5
52-Dec. 24-Dec.31, 2010	7.2	5.5	8.0	7.6
1-Jan. 01-Jan 07, 2011	5.2	1.3	7.9	5.8
2-Jan. 08-Jan. 14, 2011	6.1	1.4	6.9	8.3
3-Jan. 15-Jan 21, 2011	2.2	6.1	8.1	8.6
4-Jan. 22-Jan. 28, 2011	2.8	6.4	7.8	7.3
5-Jan. 29-Feb-04, 2011	7.4	4.3	8.0	4.6
6-Feb. 05-Feb-11, 2011	5.7	7.8	9.0	7.0
7-Feb. 12-Feb.-18, 2011	4.7	5.0	8.4	8.7
8-Feb. 19-Feb. 25 2011	7.9	7.2	6.9	4.9
9-Feb. 26-Mar. 04, 2011	8.5	8.0	9.9	8.5
10-Mar. 05-Mar. 11, 2011	6.0	8.7	8.5	9.0
11-Mar.12-Mar. 18, 2011	4.1	8.2	8.5	8.2
12-Mar. 19-Mar. 25, 2011	3.6	7.7	7.9	8.0
13-Mar. 26-Apr. 01, 2011	4.9	6.8	8.4	6.3
14-Apr. 02-Apr. 08, 2011	5.6	7.7	9.0	6.1
15-Apr. 09-Apr.-15, 2011	4.9	6.8	7.8	6.8
16-Apr. 16-Apr. 22, 2011	3.0	6.6	7.7	6.6
17-Apr. 23-Apr.29, 2011	5.6	5.6	8.4	8.2
18-Apr. 30-May. 06, 2011	5.4	5.8	8.4	8.7
19-May 07-May.13, 2011	-	7.7	7.7	7.4
20-May. 14-May20, 2011	-	6.2	6.9	7.6
21-May. 21-May. 27 2011	-	5.8	7.1	6.9

Table MET-1.4(c): Sun Shine (hr) at AICRP-FC trial locations during crop growth period, Rabi 2010-11

Met. Week & Month	Central Zone			
	Jabalpur	Anand	Jhansi	Kanpur
40-Oct. 01-Oct. 07, 2010	8.4	9.6	9.8	-
41-Oct. 08-Oct. 14, 2010	7.4	8.0	9.1	-
42-Oct. 15-Oct 21, 2010	4.3	9.1	6.6	-
43-Oct. 22-Oct. 28, 2010	8.2	8.3	9.0	-
44-Oct. 29-Nov. 04, 2010	7.6	9.3	9.0	-
45-Nov. 05-Nov. 11, 2010	7.3	7.5	6.7	-
46-Nov. 12-Nov. 18, 2010	4.7	6.3	4.8	-
47-Nov.19-Nov. 25, 2010	7.5	4.3	4.4	-
48-Nov. 26-Dec. 02, 2010	6.3	7.8	7.2	-
49-Dec. 03-Dec. 09, 2010	7.1	9.2	7.5	7.3
50-Dec. 10-Dec. 16, 2010	7.6	9.0	7.8	5.1
51-Dec. 17-Dec. 23, 2010	9.1	9.6	9.2	5.9
52-Dec. 24-Dec.31, 2010	8.8	7.5	8.6	4.4
1-Jan. 01-Jan 07, 2011	8.5	9.6	4.0	0.2
2-Jan. 08-Jan. 14, 2011	9.2	9.9	7.5	2.1
3-Jan. 15-Jan 21, 2011	9.4	9.7	9.5	6.0
4-Jan. 22-Jan. 28, 2011	8.6	9.9	9.1	7.2
5-Jan. 29-Feb-04, 2011	8.3	9.8	8.7	6.6
6-Feb. 05-Feb-11, 2011	9.5	9.8	9.8	7.9
7-Feb. 12-Feb.-18, 2011	7.9	9.9	8.9	4.6
8-Feb. 19-Feb. 25 2011	8.7	10.5	9.6	6.8
9-Feb. 26-Mar. 04, 2011	8.5	10.2	9.0	8.3
10-Mar. 05-Mar. 11, 2011	8.8	9.8	9.6	8.9
11-Mar.12-Mar. 18, 2011	9.3	10.1	10.4	9.4
12-Mar. 19-Mar. 25, 2011	8.3	9.5	10.0	8.5
13-Mar. 26-Apr. 01, 2011	8.8	9.3	10.3	8.5
14-Apr. 02-Apr. 08, 2011	8.3	9.3	10.1	8.7
15-Apr. 09-Apr.-15, 2011	-	9.1	8.6	6.4
16-Apr. 16-Apr. 22, 2011	-	9.3	9.2	8.5
17-Apr. 23-Apr.29, 2011	-	10.6	10.4	8.4
18-Apr. 30-May. 06, 2011	-	10.4	10.2	7.8
19-May 07-May.13, 2011	-	10.1	9.6	-
20-May. 14-May20, 2011	-	10.5	9.8	-
21-May. 21-May. 27 2011	-	9.4	9.6	-

Table MET-1.4 (d): Sun Shine (hr) at AICRP-FC trial locations during crop growth period, Rabi 2010-11

Met. Week & Month	South Zone		
	Coimbatore	Hyderabad	Mandya
40-Oct. 01-Oct. 07, 2010	5.6	5.9	7.8
41-Oct. 08-Oct. 14, 2010	3.5	6.9	6.7
42-Oct. 15-Oct 21, 2010	6.9	3.2	6.8
43-Oct. 22-Oct. 28, 2010	6.6	6.9	4.0
44-Oct. 29-Nov. 04, 2010	4.1	2.2	5.5
45-Nov. 05-Nov. 11, 2010	5.2	4.4	6.9
46-Nov. 12-Nov. 18, 2010	4.8	5.3	7.6
47-Nov.19-Nov. 25, 2010	3.7	8.4	4.5
48-Nov. 26-Dec. 02, 2010	1.4	6.7	5.7
49-Dec. 03-Dec. 09, 2010	2.8	3.5	8.3
50-Dec. 10-Dec. 16, 2010	8.3	7.7	5.4
51-Dec. 17-Dec. 23, 2010	4.8	9.4	4.4
52-Dec. 24-Dec.31, 2010	6.5	8.2	3.9
1-Jan. 01-Jan 07, 2011	4.3	6.5	8.2
2-Jan. 08-Jan. 14, 2011	7.0	9.3	5.9
3-Jan. 15-Jan 21, 2011	8.3	9.8	7.9
4-Jan. 22-Jan. 28, 2011	9.2	9.7	8.5
5-Jan. 29-Feb-04, 2011	9.7	9.3	8.4
6-Feb. 05-Feb-11, 2011	9.9	9.8	8.8
7-Feb. 12-Feb.-18, 2011	9.7	9.9	8.4
8-Feb. 19-Feb. 25 2011	7.4	7.8	7.7
9-Feb. 26-Mar. 04, 2011	8.1	6.4	9.0
10-Mar. 05-Mar. 11, 2011	10.1	9.2	9.2
11-Mar.12-Mar. 18, 2011	9.7	9.3	9.2
12-Mar. 19-Mar. 25, 2011	8.9	8.3	9.4
13-Mar. 26-Apr. 01, 2011	7.7	8.3	9.4
14-Apr. 02-Apr. 08, 2011	7.5	8.7	8.3
15-Apr. 09-Apr.-15, 2011	8.3	7.5	7.6
16-Apr. 16-Apr. 22, 2011	7.7	7.4	7.4
17-Apr. 23-Apr.29, 2011	6.9	8.8	8.5
18-Apr. 30-May. 06, 2011	7.7	9.9	7.6
19-May 07-May.13, 2011	10.5	8.4	9.6
20-May. 14-May20, 2011	9.1	8.7	9.0
21-May. 21-May. 27 2011	6.5	8.1	9.2

APPENDICES

APPENDIX I: FORAGE CROP BREEDING TRIALS AT A GLANCE (Rabi : 2010-11)

S. No.		Name of centre	Berseem		Oat (Single cut)				Oat (Multi cut)		Lucerne (P)	Tall Fescue (P)	Total Trials Allotted	Data Reported
			IVTB	AVTB-1	IVTO (SC)	AVTO-1 (SC)	AVTO-2 (SC)	AVTO-2 (SC-Seed)	IVTO (MC)	AVTO-1 (MC)	VTL 2010	VTTF 2009		
		Trial No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**		
HZ	**1.**	Palampur	DR	DR	DR	DR	DR	DR	DR	DR		DR	9	**9/9**
	2.	Srinagar	DR	DR	DR	DR	DR	DR	DR	DR		DR	9	**9/9**
	3.	Rajouri	DNR	DNR	DNR	DNR	DNR	DNR	DNR				7	**0/7**
	4.	Almora										DR	1	**1/1**
NWZ	**5.**	Bikaner			DR	DR	DR	DR			DR		5	**5/5**
	6.	Jalore	DR		DR	DR	DR	DR	DR				6	**6/6**
	7.	Hisar	DR		DR	DR	DR	DR	DR				6	**6/6**
	8.	Ludhiana	DR		DR	DR	DR	DR	DR		DR		7	**7/7**
	9.	Pantnagar	DR		DR	DR	DR	DR	DR				6	**6/6**
	10.	Udaipur	DR		DR				DR		DR		4	**4/4**
	11.	Meerut	DR		DR	DR	DR	DR					5	**5/5**
NEZ	**12.**	Jorhat			DR	DR	DR	DR	DR				5	**5/5**
	13.	Kalyani	DR		DR	DR	DR						4	**4/4**
	14.	Ranchi	DR		DR	DR	DR	DR	DR				6	**6/6**
	15.	Bhubaneswar	TNE		DR	DR	DR	DR	DR				6	**5/6**
	16.	Pusa	DR		DR	DR	DR		DR				5	**5/5**
	17.	Faizabad	DR		DR	DR	DR		DR				5	**5/5**
	18.	Imphal			DR	DR	DR						3	**3/3**
CZ	**19.**	Jhansi	DR		DR	DR	DR	DR	DR	DR			7	**7/7**
	20.	Rahuri	DR		DR	DR	DR		DR	DR	DR		7	**7/7**
	21.	Urulikanchan	DR		DR	DR	DR	DR	DR	DR	DR		8	**8/8**
	22.	Karjat	DR		DR				DR				3	**3/3**
	23.	Kanpur	DR		DR	DR	DR						4	**4/4**
	24.	Anand			DR	DR	DR		DR	DR	DR		6	**6/6**
	25.	Jabalpur	DR		DR	DR	DR	DR	DR	DR			7	**7/7**
	26.	Raipur			DR								1	**1/1**
SZ	**27.**	Hyderabad			DR	DR	DR	DR			DR		5	**5/5**
	28.	Mandya			DR	DR	DR	DR			DR		5	**5/5**
	29.	Coimbatore			DR	DR	DR	DR			DR		5	**5/5**
	30.	Dharwad									DR		1	**1/1**
		Total	**20**	**3**	**28**	**25**	**25**	**18**	**19**	**7**	**10**	**3**	**158**	**150/158**
		Data Reported	**18/20**	**2/3**	**27/28**	**24/25**	**24/25**	**17/18**	**18/19**	**7/7**	**10/10**	**3/3**		

DR- Data reported, DNR-Data not reported, TNE-Trial not established ; Data Reporting (%): 150/158= 94.94%

APPENDIX II: FORAGE CROP PRODUCTION TRIALS AT A GLANCE: (Rabi 2010-11)

Location/ Trial	AST -1	AST -2	AST -3	AST -4	AST -5	AST -6	AST -7	AST -8	AST -9	AST -10	AST -11	AST -12	AST -13	AST -14	AST -15	AST -16	TOTAL (DR & TC)
HILL ZONE																	
Palampur		DR							DR	DR							**3/3**
Srinagar		TNC							TNC	DR							**1/3**
Rajouri		DNR								DNR							**0/2**
NORTH WEST ZONE																	
Hisar		DR	DR							DR							**3//3**
Pantnagar		DR	DR			TC				DR							**4/4**
Bikaner		TC								DR					TF		**2/3**
Ludhiana		DR	DR			TC				DR							**4/4**
Udaipur										DR					DR		**2/2**
Jalore		TNC															**0/1**
NORTH EAST ZONE																	
Faizabad		DR					DR										**2/2**
Ranchi		DR											DR				**2/2**
Kalyani		DR											DR				**2/2**
Bhubaneswar		DR											DR				**2/2**
Jorhat		DR											DR				**2/2**
Raipur		TF															**0/1**
Imphal				TNC													**0/1**
Shillong				TNC				TNC									**0/2**
CENTRAL ZONE																	
Jabalpur		DR															**1/1**
Rahuri	DR	DR															**2/2**
Urulikanchan	DR	DR															**2/2**
Anand		DR															**1/1**
Dapoli-Palghar		TNC															**0/1**
SOUTH ZONE																	
Hyderabad		DR												DR			**2/2**
Mandya		DR			DR						DR					DR	**4/4**
Coimbatore		DR												DR			**2/2**
Vellayani		DR										DR					**2/2**
Total(DR & TC)	2/2	18/23	3/3	0/2	1/1	2/2	1/1	0/1	1/2	7/8	1/1	1/1	4/4	2/2	1/2	1/1	**45/56**

Abbreviations: DR = Data reported, TC = Trial continued and data to be reported after completion of the sequence, TNC = Trial not conducted, TF = Trial failed, DNR = Data not reported

Trial Success Index= 80.35%

APPENDIX -III: FORAGE CROP PROTECTION TRIALS AT A GLANCE (Rabi: 2010-11)

Locations /Trials	PPT-1	PPT-2A	PPT-2B	PPT-10	PPT-11	PPT-12	PPT-13	PPT-14	PPT-15	Total
Anand	A	A		A	A					**4**
	DR	DNR		DR	DR					**3**
Bhubaneswar	A	A						A		**3**
	DR	DR						DR		**3**
Hisar	A	A	A							**3**
	DNR	DR	DR							**2**
Hyderabad	A	A		A	A					**4**
	DR	DR		DR	DR					**4**
Jhansi	A	A	A							**3**
	DR	DR	DR							**3**
Ludhiana	A	A					A		A	**4**
	DR	DR					DR		DR	**4**
Palampur	A	A				A	A		A	**5**
	DR	DR				DR	DR		DR	**5**
Rahuri	A	A		A	A					**4**
	DR	DR		DR	DR					**4**

Abbreviations: A = Trial allotted; DR = Trial conducted and data reported; DNR = Data not reported

APPENDIX IV: FORAGE BREEDING ACTIVITIES AT AICRP-FC CENTRES DURING RABI 2010-11

A. Hill Zone

1. PALAMPUR, CSKHPKV

a. Germplasm

About 200 exotic germplasm of perennial temperate grasses and legumes *viz*., Fescue grass species *Festuca arundinacea* and *F. pratensis*, Rye Grass (*Lolium perenne*), White Clover (*Trifolium repens*), Red Clover (*T. pratense*) and Lotus (*Lotus corniculatus*) procured from, USA/UK have been evaluated, maintained and being utilized in breeding programme. About 100 indigenous germplasm of temperate and sub-tropical grasses and legumes collected/ procured from different parts of the State have been evaluated. Eighty one collections of Oat were also evaluated. Promising genotypes have been identified for different traits as below:

Crop	**Entries**
Oat	
Biomass and related traits	TRSRKC1180, IG-03/208, IG-03/246, IG-03/271, EC 605830
Fescue Grass	
Biomass, quality and persistency	TFP-9, TFP22, TFA-8, TFA-10, TFA-16, TFA-21, TFA-23, TFA -38 and TFA-46, EC 178182, EC 178184 and Sel-38
Lotus	
Persistency	TL-2
Red clover	
Biomass and resistance to powdery mildew	EC 596026, EC 596037, EC 596055, EC 596058, EC 596066, EC 596080, EC 596088, EC 596091, EC 596092 and EC 596095
White Clover	
Biomass and resistance to powdery mildew	PWC-22, PWC-25, Barot collection and RRPCL-2
Orchard grass	
Persistency	EC 476741, EC 476751 and EC 476716

- Seven new collections of white clover were made from Mandi and Kangra districts of Himachal Pradesh.

b. Generation of breeding material

i. Oat

Crosses among diverse genotypes involving *Avena sativa* x *A. sativa* and *A. sativa x A. sterilis* have been made to create genetic variability and the material is in segregating, backcross and advance generations. About 250 breeding lines have been selected. Eight promising entries have been evaluated in the station trial. Entry PLP 17 was found superior for green fodder and dry matter yields as compared to checks. Seed of the entry has been multiplied for inclusion in coordinated trial.

ii. Tall Fescue grass

Two new composites and synthetic populations are under evaluation.

iii. Red clover

Superior populations of red clover isolated through Restricted Recurrent Phenotypic Selection (RRPS) and composite population of a cross between Britta x Milvus are under evaluation.

iv. White clover

Promising composite populations of white clover, namely, PWC-3, PWC-22 and PWC- 25 evolved through RRPS are in advance stage of testing.

2. SRINAGAR, SKUAST

a. Oats

i. Hybridization and evaluation of segregating generation

Fourty five (45) F_1s (generated during Rabi 2009-10 using diallel mating design) along with 10 parents were evaluated during Rabi 2010-11 for their specific combining ability and crosses with high sca for green fodder yield and its contributing traits were identified to look for transgressive segregants in future generations.

(ii) **Selections from segregating generations**.

Sr. No	Segregating generation	No. of individual plant selections (IPS) made
1	F_3 (8 crosses)	90
2	F_4 (10 crosses)	85

B. NORTH WEST ZONE

3. Ludhiana, PAU

a. Oat

1. Five local trials consisting of total forty-two entries and three replications were conducted to evaluate for high green fodder and dry matter yield along with other quality attributes under multicut conditions.
2. New interspecific crosses of cultivated oats (*Avena sativa*) with wild oats species like *Avena sterilis, Avena fatua, A. strigosa* etc. have been attempted to introgress the useful traits from wild species to cultivated oats. Crosses attempted during last year were advanced to BC_2 generation and were also selfed to develop BC_1F_2.
3. About thirty eight new crosses have been attempted involving promising genotypes. Breeding material consisting of F_1 = 121, F_2= 82 progenies, F_3 = 163 progenies F_4 = 572 progenies, F_7 =42 progenies, was handled following standard breeding methods and procedures.
4. Germplasm consisting of 171 lines has been evaluated in RBD, on the basis of morphological traits as per oats germplasm catalogue developed by IGFRI, Jhansi.
5. Line x Tester (8 x 5) was evaluated in RBD for GFY and other economically important traits. Data will be analysed statistically to reveal the combining ability of parents used in mating and genetic analysis for various traits.
6. Mutation programme (gamma rays induction) has been initiated using OL 9 and Kent, to generate variability.
7. Oat x Maize crossing programme has been taken up to develop genetic stocks.

b. Berseem

1. One local trial consisting of ten entries and three replications was conducted to evaluate the entries for high green fodder yield and dry matter yield along with other quality attributes.

2. Selections made from national poly cross nursery were evaluated for various morphological traits and will be evaluated for GFY and other quality traits in station trials to be conducted during *Rabi* 2011-12.

3. Germplasm (200 lines, sown in RBD) has been evaluated for GFY and various descriptors suggested by IGFRI, Jhansi.

4. Mutation breeding programme has been initiated using gamma irradiations of varieties viz; BL10, BL22 and BL42, to generate variability.

c. Lucerne

1. Maintenance breeding has been taken up.
2. Mutation breeding programme has been initiated using gamma irradiations of varieties viz; LLC 3 and LLC 5 to generate variability.

d. Shaftal

1. Maintenance breeding is being continued.
2. Mutation breeding programme has been initiated using gamma irradiations of varieties viz; SH 69 to generate variability.

e. PGR status (evaluated/maintained) of different forage crops at PAU

S.No.	Crop	Number of Accessions
1	Oats	170
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)

4. HISAR, CCS HAU

a. Berseem

i. Collection, maintenance and evaluation of germplasm

The berseem germplasm contains 225 lines of indigenous sources and 27 of exotic origin. This year the germplasm was grown for maintenance purpose.

ii. Evaluation of varietal trials for fodder yield and its components

Three station trials *viz*., LST, SST and PRT on berseem were conducted.

iii. Large Scale Trial (LST)

In Large Scale Trial (LST), 9 genotypes were evaluated for fodder yield against three checks *viz*., Mescavi, Wardan and HB 1. The genotypes *viz*., HFB 30 followed by HFB 6-6, HFB 700, HFB 4-14, HFB 5-15, HFB 36, HFB 165-1 and HFB 8-17 were observed to be superior to best of all the check *i.e.* Mescavi for both green fodder and dry matter yield based upon the overall performance.

iv. 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 9-7, HFB 36, HFB 9-5, HFB 8-14 and HFB 9-6 were adjudged to be superior to the best check *i.e.* Wardan for both green fodder and dry matter yield.

v. Progeny Row Trial (PRT)

In Progeny Row Trial (PRT), 15 genotypes were tested against three checks *viz*., Mescavi, Wardan and HB 1.The genotypes viz., HFB 10-1, HFB 10-2, HFB 10-3, HFB 10-4, HFB 10-9, HFB 10-10, HFB 10-11 and HFB 10-15 were found superior to the checks for both green and dry matter yield.

vi. 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 HB 1. 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 112 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 100 superior mutant plants were selected from M_1 generation of different treatments. These plants were harvested and threshed individually and these will be grown in single row with the repeated rows of checks in the 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) 107 superior progenies were selected from M_2 generation of different treatments which will be grown in M3 for evaluated for fodder yield in next year.

iv. 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.

v. Evaluation of polycrosses: The 24 F_2 polycrosses and 25 F_1 polycrosses developed during 2009-10 were grown in single row of 3 m length with two checks *viz.,* Mescavi and HB 1 for their evaluation for fodder yield and component traits. The cut-wise and over the cuts performance of the polycrosses is given in Table 1, 2 & 3. In the F_1 the crosses PC 3-1, PC 3-2, PC 3-3 and PC 3-5 gave better green fodder yield as compared to best check *i.e.* Mescavi on over the cuts basis. Similarly, In the F_2 almost all the crosses showed better green fodder yield over the best check *i.e.* Mescavi on over the cuts basis. However, the crosses PC 1-2, PC 1-5, PC 4-2, PC 2-5 and PC 5-5 gave higher green fodder yield.

b. Oat

i. Germplasm Collection, evaluation and conservation

Four new germplasm accessions acquired from Bulgaria through NBPGR, New Delhi were evaluated and multiplied for seed. The Forage Section at present is maintaining a collection of 568 germplasm accessions of oats. In addition to above, two M.Sc. students of Department of Genetics and Plant Breeding, working under the supervision of Dr. R.N.Arora have studied evaluated and characterized 15 species of *Avena* for various morphological traits & heterosis in intervarietal and interspecific crosses in oats.

ii. Special Hybridization Programme

In all 55 fresh single crosses in oats were attempted. Out of these, 20 were of Inter-varietal origin (i.e. *A. sativa* x *A. sativa*), and 35 crosses were of Inter-specific origin involving various *Avena* species.

In addition to above, 56 F_1's of Intervarietal origin and 50 F_1's of Interspecific origin were advanced to F_2 generation and progeny of 48 crosses in F_2, 33 crossess in F_3, 21 crosses in F_4, and 7 crossess in F_5 were grown for screening & selection for improved fodder yield and other important traits. Promising single plants from various filial generations (F_2 to F_5) were selected and promising progenies in advanced generations were bulked.

iii. Station Trials conducted

In all, six station varietal trials were conducted. Two Large Scale Trials [LST(Single Cut) and LST (Multi Cut)], Two Small Scale Trials [SST(SC) and SST (MC)], and two Progeny Row Trials [PRT (SC) and PRT (MC) were conducted to evaluate the performance of promising entries developed through hybridization and/or selected from germplasm during the previous season.

The following genotypes were found promising on the basis of their high mean performance for GFY and DMY (q/ha). These were OS 403, OS 392, OS 377, OS 350, OS 396, OS 363, OS 335, OS 346, and OS 374 from LST (SC); OS 405 and OS 406 from SST (SC); PRT 10-9, PRT 10-10 and PRT 10-8 from PRT (SC) were found significantly higher in GFY/DMY than the best check.

Like wise genotypes OS 350, OS 385 and OS 346 from LST (MC); OS 406, HFO 59, HFO 796, OS 346, OS 407, HFO 34 from SST (MC); PRT 10-11 and PRT 10-1 from PRT (MC) were found significantly higher in GFY/DMY than the best check.

iv. Seed Multiplication of Test Entries

Forty six genotypes which were tested under various station trials were also grown separately for seed multiplication also. In addition to this, seed of various releases and notified varieties was also multiplied.

v. Nucleus, Breeder and TFL Seed Production

During *rabi* season, 616 kg nucleus seed of 6 varieties of oats namely, HJ 8, OS 6, OS 346, Kent, HFO 114, and OS 7 and 10.93 qtls. breeder seed of one variety each of oats, berseem and lucerne was produced.

Additionally, 480 kg TFL seed of oats was also produced. About 1400 single plants of various varieties of oats; 15 SP's of Lucerne variety 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.

5. PANTNAGAR, GBPUAT

a. Oat

i. Germplasm Evaluation

Three hundred fifty five oat germplasm lines comprising indigenous, exotic and improved genetic stocks have been evaluated during the season.

ii. Genetic Donors Identified :

Based on germplasm evaluation studies on growth habit, leafiness, tillering, days to heading, growth rate, days to maturity and seed yielding ability certain genetic donors for different desirable traits / trait combinations had been identified for their use in the ongoing breeding research programme.

iii. Hybridization Nursery

To achieve the target set out as per the oat breeding objectives, a crossing nursery comprising the ten genetic donors/parents identified during the previous season was raised and seven new crosses were developed.

iv. Breeding Materials

Breeding materials consisting of 25F_1s, 9F_2s populations, 211F_3s, 113F_4s, 30F_5s, 18F_6 and 12 F_7 progenies were grown and selections were made following the pedigree breeding and other methods.

v. Station Evaluations

On the basis of preliminary station evaluations certain advanced generation lines were identified for further testing and evaluation in larger field plots.

vi. Multiplication of Promising Lines

Nine promising advanced breeding lines and the entries already in the National Coordinated and other state Trials were multiplied for their use in the ongoing research programme.

vii. Nucleus and Breeder Seed Production

Nucleus seed of our released oat varieties UPO 212 (110 kg) and UPO 94 (30 kg) was produced during the season. Breeder seed of UPO 212 (10.0 qtls.) was also produced during *Rabi* 2010-11 season as per BSP – I for the centre.

C. NORTH- EAST ZONE

6. FAIZABAD, NDUAT

a. Germplasm Collection status

Crop	**No of collections**
Oat	162
Berseem	36

b. Breeding Programme in oat

i. Twenty one new crosses made during Rabi 2011-12

ii. Segregating generations

F_1-24, F2-16, F_3-20, F_4-10, F_5-7

7. KALYANI, BCKV

a. Lathyrus

i. Selection of superior genotypes from collected germplasm:

Out of the collected 27 germplasm, 2 genotypes have been selected on the basis of forage yield. The best one will be shared for IVT under AICRP trials in Rabi 2011-12.

8. BHUBNESHWAR, OUAT

a. Lathyrus is the mandate crop of this center during Rabi season. Thirty seven germplasm of this crop, which were collected last year from Nayagarh and Keonjhar districts of the state, are grown during Rabi 2010-11. Based on visual observations, 77 single plants have been selected this year. These single plants will be evaluated for biometric and other qualitative characters in subsequent seasons.

9. JORHAT, AAU

a. Evaluation of Forage ricebean Germplasm

Ricebean can be grown after harvesting short or medium duration paddy crop which is harvested in the month of October. During this period residual moisture is available for growing ricebean as rain fed crop. Once established, ricebean will continue to grow up to the month of May which enables the farmers to meet the legume forage during lean period.

Considering the above points in view, the trial was initiated in 2008 with 38 ricebean germplasm. In 2010 sowing was done in the month of November. Harvesting was done in the month of May. The mean performance of the promising entries during (2008-2010) is given below:

Sl no	Entry	GFY (q/ha)	DMY (q/ha)	50% Flowering	Plant Height (Cm)
1	JCR-08-49	340.00	52.00	No Flowering	250.00
2	JCR-08- 30	366.60	57.60	No Flowering	146.00
3	JCR-08- 17	453.33	62.61	No Flowering	165.00
4	JCR-08-53	321.33	46.55	No Flowering	290.00
5	JCR-08-50	320.00	46.00	No Flowering	247.00
6	JCR-08-55	285.30	44.50	No Flowering	170.00
7	Bidhan ricebean-1	285.00	46.52	No flowering	160.00

b. Evaluation of Lathyrus germplasm

Eighteen entries of *Lathyrus* were tested during 2008-10. Out of these entry JCL 6 was found to be best in regards of green forage and dry matter yield (290.00q/ha and 46.00q/ha)

D. CENTRAL ZONE

10. ANAND, AAU

a. Lucerne :

i. Breeding materials generated through polycross programme:

Sr. No.	Centre	Generation	No. of plant progenies sown	IPS	Bulk
A.	Coimbatore	F_4	27	19	6
		F_5	7	1	3
		F_6	--	--	6
B.	Rahuri	F_4	29	2	12
		F_5	43	1	14
		F_6	3	--	1
C.	Urulicanchan	F_4	7	4	2
		F_5	9	3	4
		F_6	6	--	2
D.	Anand	F_4	21	3	6
		F_5	8	--	3
		F_6	10	--	5

ii. Lucerne varieties viz., AL-3, RL-88, Alamdar, Anand-2, ACP-3-1 and ACP-1-2 are used in Diallel mating design and Total seeds of 15 F_1 were obtained. Seed multiplication of Lucerne promising entries developed from polycross breeding.

b. Maize

i. Population improvement programme

Four population African Tall (Rahuri) - G-1, African Tall (Anand) - G-1, J-1006 (Rahuri)- G-2, J-1006 (Anand) - G-2 were grown in isolated area and superior plants were selected on the basis of morphological characters and allowed them to random mating.

11. JABALPUR, JNKVV

a. Germplasm holding

Crop	**No. of collection**
Oat	127
Berseem	191

b. Berseem

- To create variability, poly cross nursery programme five diverse parents Wardan, BL-42, Mescavi, UPB-110 and JB- are included in the study. Tripping was done to ensure cross-pollination in all possible combination. Selection has been made for different fodder traits.
- Variety JB-1 has been treated with different doses of gamma rays. Single plant selection and row bulks were done, treatment wise to rise the M_3 generation.
- In Wardan, Six superior bulks were selected from M_5 population.

c. Oat

- Under National Crossing Programme, crosses have been attempted with Kent, JO-1, JHO-852 with *Avena sterilis*. Only few seeds were obtained.
- 5 advanced lines were evaluated for different fodder traits.
- No. of crosses made -9
- Segregating material advanced/handled traits – 37
  (F_2 onwards)
- Advance breeding lines - 56

12. RAHURI, MPKV

a. Germplasm holding

SN	**Crop**	**Old**	**New**	**Total**	**Source**
1.	Lucerne	20	05	25	Farmers field

b. New Genetic Material Generated :

i. MAIZE

Twenty five full-sib crosses were made in African Tall during Rabi 2010-11 to bring uniformity in respect of plant height, vigour, leaf width, glume colour and seed colour. Plant to row progenies will be grown during kharif-11 and same procedure will be repeated.

ii. LUCERNE

Out of 109 progenies of Lucerne from segregating generation and polycross trial, promising 25 progenies (bold) were identified and random mated during summer 2011 for further improvement.

13. URULIKANCHAN, BAIF

a. Maize

i. National crossing programme – Under the population improvement programme, F_2 progenies of two G-I lots (crosses with A. T. developed at Urulikanchan and Rahuri) were grown in isolation for further selection. Individual plants of desirable characters were selected from the F_2 progenies and seed harvested from these plants was bulked together for further improvement programme.

ii. Evaluation of germplasm- seeds of twenty landraces were grown in paired row. Data on quantitative and qualitative fodder traits was collected for identification of donor lines. Individual plants of similar phenotypic characters were selected and selfed for developing inbred lines.

iii. Composite development- Fifty five individual plant selections were made from the F_4 progeny of BAIF Maize-1during *kharif*- 2010 and seeds were bulked together. Progeny of these seeds was grown in isolation during *rabi* 2010-11 for further selection. Following criteria was used for selection of individual plants.

b. Lucerne Polycross Nursery:

i. **Green Fodder Yield trial of Twenty five best cultures**

The trial was continued at the centre in the second year and so far 28 cut were taken from the trial. The cut wise and pooled data of 20 cut for yield characters and averages of 20 cut for growth observations of this trial was compiled and forwarded to TNAU. Two cultures namely ACP 3-1 (20) and ALP 1-1 (21) were identified as the best cultures in the third year of growth based on yield characters and persistence of crop. The seed production of these two cultures was taken up for contribution in coordinated trials.

ii. Evaluation of F_2, F_3 and F_4 progenies

Seeds of selections made at Rahuri (80), Urulikanchan (8) and Anand (34) centres during *rabi* 2008-09 in above segregating progenies were grown separately for further evaluation. Growth and yield observations of these progenies were taken for eleven cuttings. Individual plant selections will be made from the best performing progenies in third year.

iii. Seed Multiplication Programme

Under this programme 300 gm seed of ACP 3-2 (15) culture received from TNAU was grown on 0.012 ha area in isolation during *rabi* 2009-10. The stand was left for seed production after two cuts and only 350 gm seed were obtained. In this *rabi* (2010-11) season again the crop will be left for seed production.

iv. Forage Sugarcane

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* 20010-11. Five genotypes of sugarcane and Yashwant variety of Hy. Napier was grown in RBD with four replications. Over all 14 cuts in Hy. Napier and 7 cuts in sugarcane were taken.

E. SOUTH ZONE

14. MANDYA, UAS

a. Cowpea

No. of new crosses effected	9
Segregating material advanced/handled and selections made	
F_1s advanced to F_2	14
Advanced Breeding Lines (F_5)	24

b. Maize

Inbred development (F_5)	490
New Crosses generated	60
No. of composites developed	6
Two populations received from Rahuri center were grown and seeds were bulked from the tall plants.	

c. Bajra Napier Hybrid

About 205 selections are being evaluated which were isolated from 52 Bajra x Napier crosses received from Coimbatore center during 2010 Kharif and 6 Bajra x Napier crosses developed at Mandya.

15. COIMBATORE, TNAU

a. Lucerne Polycross breeding programme

Apart from the 25 best cultures identified from this programme, a total of 13 other promising lines superior to the variety CO 1 have been selected. The data recorded on the biometrical aspects and green fodder is given below. These advanced cultures will be evaluated further in larger plots with CO 1.

Sl. No.	Culture	Biometric observations			GFY (3 cuts) (q/ha)
		Plant height (cm)	No. of branches	LS ratio	
1	RCP 3-2/2	77.66	6.00	1.26	435.21
2	LLC-3	90.00	5.67	0.89	433.50
3	CTP1-3/1	85.33	8.00	1.12	428.30
4	CLP 4-4	77.33	7.67	1.08	424.56
5	RCP 2-1	75.33	10.33	1.20	423.44
6	RAP 4-4	81.67	10.67	1.05	419.19
7	CLP 4-4	85.00	6.67	1.42	415.83
8	ARC 2	96.28	12.33	1.35	413.29
9	ARP 4-2	80.67	7.00	1.14	410.92
10	CCP 1-1	80.33	10.00	0.97	409.58
11	RLP 5-7	80.33	7.67	1.14	409.46
12	CTP 1-2	85.67	9.67	1.03	407.88
13	CRP 1-2	85.00	11.33	1.10	402.94
14	**CO 1**	**77.00**	**7.00**	**1.05**	**366.20**

b. Exploration of germplasm on Lucerne

Actively took part in the exploration in and around Kutch district, Gujarat along with a team of scientists from AAU, Anand and BAIF, Urulikanchan during 6–9, June, 2011. The team has collected 12 accessions.

16. VELLAYANI, KAU

a. Germplasm Holding

SL.No	Crop	Germplasm collected during Rabi 2010	Total germplasm
1	Guinea grass	5	205
2	Cowpea	4	125
3	Rice bean	3	93
4	Bajra	10	130
5	Minor forage crops	–	35

b. Rice bean

Three accessions collected during Rabi 2010 were evaluated during summer 2011 along with 3 accessions selected from kharif 2010 . Two accessions with high green fodder yield, leaf/stem ratio, branch number and tolerance to pests and diseases were selected.

c. Cowpea: Germplasm collection and evaluation

F3 evaluation was done and five superior plants were selected from the selected three crosses for further evaluation and selection. Four accessions collected during Rabi 2010 were evaluated with two superior accessions selected from Kharif 2010. Five accessions with high leaf/stem ratio; green fodder yield and dry matter yield were selected for hybridisation.

d. Special Programme For Varietal Improvement in Fodder Rice bean

i. Collection and evaluation of germplasm

Three superior accessions with high leaf area, leaf density and having more number of branches and green fodder yield selected during Kharif 2009 were evaluated against Bidhan-1 during Kharif and Rabi 2010.Because of very heavy rainfall during flowering and seed setting, seed production was very poor in all the accessions. Evaluation will be repeated during kharif 2011.

ii. Intervarietal hybridisation

Using the 10 selected germplasm lines received on exchange basis from 5 AICRP Centres, intervarietal hybridisation was attempted. But hybridisation could not be completed in all the 10 lines simultaneously because of very low flowering and very heavy rainfall during the flowering period. Hybridisation was repeated during Rabi 2010 and 6 cross combinations were produced.

e. Farm trial

Four improved selections of guinea grass developed through clonal selection were tested during Rabi 2010 along with KAU released varieties at 20 locations in farmers' fields in the southern region of Kerala. Selection -2 recorded the maximum green fodder yield (120.0q/ha) followed by Selection -4 (113.0q/ha) and they are found to be promising.

17. HYDERABAD, ANGRAU

i. During *Rabi 2010-11*, in cowpea the twenty crosses in F2 generation were advanced in bulk and further the F3 generation will be raised during Kharif 2011 to take up single plant selections. The respective crosses were synthesized during *Rabi 2009-10* and the successful F1s were advanced in Kharif 2011.

ii. In fodder Maize, two populations (G1 & G2) received from MPKV, Rahuri centre were grown during *Rabi 2010-11* and only tall plants were allowed for random mating. The seeds harvested from these plants were bulked together for further cycles of recombination.

iii. Mutation Breeding

Mutation breeding using the mutagen Ethyl Methane Sulphonate was also attempted in the variety Bidhan-1.But elite variants could not be isolated.

iv. Evaluation of bajra-napier hybrids and development of hybrid varieties suited to Kerala

Fifty one bajara- napier hybrids developed at the Department of Forage Crops, Tamilnadu Agricultural University during Kharif 2009 were evaluated during Kharif and Rabi 2010... Out of the 51 hybrids sown, 20 hybrids had germinated and they were multiplied for selection of superior clones.

APPENDIX V: YIELD TRIALS ON DUAL PURPOSE BARLEY

In order to evaluate the performance of new barley genotypes for single cut forage and grain yield, coordinated trials on dual purpose barley were proposed for rabi 2010-11, 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 PAU Ludhiana in August, 2010. Additional locations at AICRP centres were included and observations to be recorded were also decided during the AICRP-FC, rabi group meeting at Palampur in September 2010.

This time the Advanced Varietals trial (AVT) could be constituted only in NEP Zone. 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 rainfed conditions in NH Zone) and then for the grain yield from the regenerated crop after the cut. The over all performance of the genotypes for forage cum grain yield is to be taken in to consideration for promotion / retention of the entry in the trial.

AVT-IR-DP-NEPZ

The AVT-IR-DP was proposed at six locations in the NEP Zone, involving states of U.P., M.P., Bihar and Jharkhand. All the trials were conducted and data were reported by the six centres. After the analysis, the grain yield data from all centres were considered for zonal mean, however, in case of forage yield, data from Ranchi were not included due to lower yield levels.

The trail was monitored at Kanpur, Faizabad, Varanasi and Rewa centres and entry HUB209 was observed to have off types. In case of disease/pest incidence, brown rust was reported on HUB209 (20S) and RD2035 (10S). The severe leaf blight incidence was reported on check RD2715 (89), while on remaining entries it was of low to moderate level.

The grain yield mean ranged from 16.3 q/ha (Ranchi) to 48.6 q/ha (Faizabad) and for forage yield the range was from 41.6 q/ha (Rewa) to 142.8 q/ha (Kanpur), indicating wide range.

Amongst the varieties, the test entry HUB209 was on second rank for grain as well as forage yield and was slightly better than best check Azad and can be considered for retention in AVT-NEPZ for final year evaluation.

Initial Varietal Trial (NWP, NEP and Central Zones)

The trial consisted of 26 entries including four ckecks. The entry NDB1503 was excluded from data analysis because of very poor germination at all test centres and only 25 effective entries were there in the trial.

The IVT (common set of new entries) was proposed in NWPZ (five), NEPZ (four) and central zones (eight) at 17 locations. The data were received from all the centres. After analysis data of both grain and forage yield from Modipuram (late sowing) were rejected in NWPZ. In case of NEPZ, the trial at Faizabad was rejected by the zonal monitoring team due to late sowing. Similarly in central zone out of eight centres, the trial was not conducted at Banswara. Amongst the entries JB217 and K1054 were reported as segregating, while BH946, PL855 and K1078 had few off-types, which needs purification.

In case of NWPZ, yellow rust was observed at Durgapura in the trial as reported in table of ancillary data. Moderate to heavy leaf blight incidence was reported in NWPZ and NEPZ. In case of central zone no serious disease and pest incidence was reported, except traces of black rust.

Grain and forage yield

In case of NWPZ, only K1077 (35.4 q/ha), RD2814 (33.2 q/ha) and check RD2552 (34.5 q/ha) were in first non-significant group for grain yield. In case of forage yield RD2812, RD2814 and check RD2715 were in first non-significant group, but RD2814 was only entry in first non significant group in both cases. Thus it is an automatic choice for promotion to AVT in NWPZ.

In case of NEPZ, based on zonal mean of grain and forage yield taken together none of the entries was better than check RD 2035.

In central zone K1077 was significantly superior for grain yield than rest of entries and checks. Similarly RD2814 and RD2715 were in first NSG for forage yield. But there was no entry, which is in first NSG simultaneously for grain and forage yield.

Forage Quality :

The forage quality analysis was taken up at PAU Ludhiana on the set of varieties in IVT. The crude protein (CP %), ADF (%), NDF (%) and in vitro dry matter digestibility (IVDMD %) have been analysed (Table 1), which indicates that the check RD2552 (17.7%) has highest crude protein content followed by DWR97 and checks Azad and RD2715. Similarly for IVDMD, 14 varieties were having high values of more than 70% IVDMD. In case of leaf: stem ratio there were eight entries having highest value (2.33), indicating more foliage in comparison to rest of the entries. Varieties RD2813 and RD2815 were having highest dry matter yield (27.23 q/ha) at Ludhiana centre. A lot of variability has been observed for ADF (%) and NDF (%) in the varieties evaluated in the IVT-dual purpose.

Table 1. Forage quality traits on IVT dual purpose analysed at PAU Ludhiana

S.No.	Varieties	Dry matter Yield	LSR	CP%	IVDMD%	ADF%	NDF%
1	BH946	20.8	1.9	14.4	65.8	44.7	54.0
2	BH949	18.4	1.9	16.3	69.8	44.9	53.7
3	HUB113	16.6	2.3	16.5	68.4	41.5	54.4
4	HUB114	16.8	1.5	16.3	67.2	44.0	56.4
5	JB217	18.2	1.2	15.4	70.6	42.2	53.5
6	JB224	12.6	2.3	16.6	70.2	42.5	57.9
7	JB225	10.8	2.3	15.5	60.2	45.5	55.6
8	RD2812	25.5	1.5	16.1	68.4	34.7	53.5
9	RD2813	27.2	1.9	14.7	72.0	42.0	54.1
10	RD2814	20.5	1.0	14.5	71.2	38.7	55.8
11	RD2815	27.7	2.3	14.3	72.2	38.8	53.8
12	PL853	13.5	2.3	16.3	71.4	41.7	55.2
13	PL854	14.0	2.3	16.5	70.2	43.8	56.1
14	PL855	18.2	3.0	16.8	72.0	45.1	55.0
15	PL856	17.7	2.3	14.0	66.2	42.0	55.0
16	K1054	23.4	1.2	14.4	71.2	42.4	53.9
17	K1076	20.7	1.9	14.2	61.2	43.3	55.6
18	K1077	16.8	1.9	15.4	65.8	44.7	54.0
19	K1078	25.0	1.2	14.8	70.6	41.8	56.9
20	NDB1524	17.3	1.9	15.8	71.2	41.0	53.1
21	DWR97	23.4	1.5	17.0	71.2	40.0	57.0
22	RD2035(C)	19.3	1.5	16.1	69.8	39.5	55.4
23	RD2552(C)	19.8	1.9	17.7	65.8	40.2	53.0
24	RD2715(C)	28.0	1.2	17.0	72.0	36.4	57.9
25	Azad (C)	15.7	1.9	17.0	67.4	40.0	55.8

AVT Rainfed (Northern Hills Zone):

The trial consisted of 16 entries and three checks, HBL276, BHS169 and BHS380. Entry VLB118 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 forage yield levels are comparatively low as the trial was under rainfed conditions. Yellow rust incidence on few entries was recorded at Bajaura centre. Lower level of powdery mildew incidence was also observed. Similarly leaf blight of high intensity was observed on UPB1017, VLB118, BHS390, VLB125, HBL276 and HBL709.

The mean grain yield ranged from 15.1 q/ha (Majhera) to 31.3 q/ha (Shimla) in the zone. The forage yield mean ranged from 13.3 q/ha (Almora) to 61.5 q/ha (Majhera). In case of entries, VLB127, BHS318 and BHS400 were in 1st non-significant group for grain yield, while VLB125 and HBL276 were in 1st NSG for forage yield. There was no entry while is common in the 1st NSG for grain and forage yield. However, VLB127 ranked first in grain yield and 3rd for forage yield, thus can be considered for promotion to AVT first year.

AVT-DUAL-NEPZ
Location wise& Zonal means (Grain Yield in q/ha)

Varieties	Kanpur			Varanasi			Pusa			Faizabad			Rewa			Ranchi			NEPZ		
	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
HUB209	31.4	4	0	32.2	1	1	28.8	3	1	52.4	1	1	34.3	5	0	18.1	1	1	32.9	2	1
RD2035 (c)	38.6	1	1	30.9	3	1	31.3	1	1	50.2	2	1	36.1	4	0	16.7	3	1	34.0	1	1
RD2552 (c)	33.8	2	0	31.5	2	1	25.0	4	0	49.4	3	0	37.5	2	0	12.3	5	0	31.6	4	0
AZAD (c)	33.8	2	0	29.2	4	1	29.8	2	1	49.3	4	0	38.6	1	1	16.5	4	1	32.9	3	1
RD2715 (c)	26.6	5	0	11.6	5	0	4.5	5	0	41.7	5	0	37.0	3	0	18.1	1	1	23.2	5	0
G.M.	**32.9**			**27.1**			**23.9**			**48.6**			**36.7**			**16.3**			**30.9**		
S.E.(M)	0.94			1.09			1.08			0.87			0.21			1.01			0.43		
C.D.	2.90			3.37			3.32			2.69			0.63			3.10			1.20		
C.V.	5.73			8.07			9.02			3.58			1.12			12.32					
DOS	20.11.10			25.11.10			3.11.10			24.11.10			18.11.10			12.11.10					

AVT-DUAL-NEPZ
Location wise& Zonal means (Forage Yield in q/ha)

Varieties	Kanpur			Varanasi			Pusa			Faizabad			Rewa			**NEPZ***		
	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
HUB209	136.0	5	0	81.2	3	0	158.6	1	1	79.7	3	1	39.8	5	1	99.0	2	1
RD2035 (c)	151.2	1	1	86.0	2	1	118.9	4	0	73.3	5	1	41.6	3	1	94.2	4	0
RD2552 (c)	141.3	4	0	72.7	5	0	117.6	5	0	83.5	1	1	42.6	2	1	91.5	5	0
AZAD (c)	141.8	3	0	75.6	4	0	155.6	2	1	79.5	4	1	44.1	1	1	99.3	1	1
RD2715 (c)	143.5	2	0	94.1	1	1	124.4	3	0	82.3	2	1	40.1	4	1	96.9	3	1
G.M.	**142.8**			**81.9**			**135.0**			**79.7**			**41.6**			**96.2**		
S.E.(M)	1.36			3.14			3.81			4.20			1.59			1.57		
C.D.	4.20			9.67			11.74			12.93			4.90			4.36		
C.V.	1.91			7.66			5.64			10.54			7.64					
DOS	20.11.10			25.11.10			3.11.10			24.11.10			18.11.10					

**data from Ranchi not reported due to low site mean (LSM)*

AVT-RF-DUAL-NHZ
Location wise& Zonal means (Grain Yield in q/ha)

Varieties	Almora			Shimla			Palampur			Majhera			Bajaura			NHZ		
	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BHS397	16.7	19	0	30.6	15	0	12.1	18	0	12.1	17	0	23.4	14	0	19.0	19	0
BHS398	32.9	4	0	32.9	4	1	26.6	1	1	18.2	2	0	28.0	2	1	27.7	2	1
BHS399	23.4	17	0	22.5	19	0	14.1	17	0	16.5	6	0	18.5	18	0	19.0	18	0
BHS400	32.7	6	0	37.3	1	1	22.1	5	0	13.8	14	0	26.4	3	1	26.5	3	1
BHS401	31.4	7	0	32.5	5	1	17.8	10	0	17.7	3	0	23.9	11	0	24.7	6	0
HBL708	28.2	9	0	28.2	18	0	15.7	16	0	14.1	13	0	23.1	15	0	21.9	15	0
HBL709	27.3	13	0	31.0	12	0	19.0	8	0	12.6	16	0	22.8	16	0	22.6	12	0
HBL710	24.4	15	0	32.3	6	1	17.3	13	0	14.8	10	0	20.6	17	0	21.9	14	0
UPB1016	30.0	8	0	32.1	7	1	24.1	3	1	17.7	4	0	23.7	12	0	25.5	4	0
UPB1017	23.9	16	0	28.7	17	0	17.8	10	0	14.2	12	0	24.2	9	0	21.8	16	0
VLB118	32.9	3	0	31.6	9	0	20.5	6	0	14.6	11	0	23.6	13	0	24.6	7	0
VLB123	28.0	10	0	30.9	13	0	17.9	9	0	16.6	5	0	26.0	5	1	23.9	9	0
VLB124	23.3	18	0	31.3	11	0	17.4	12	0	16.3	7	0	24.2	8	0	22.5	13	0
VLB125	39.0	1	1	31.7	8	0	15.8	15	0	15.5	8	0	18.1	19	0	24.0	8	0
VLB126	27.4	12	0	35.0	2	1	24.6	2	1	14.9	9	0	24.9	7	0	25.4	5	0
VLB127	32.8	5	0	33.4	3	1	19.3	7	0	24.8	1	1	29.0	1	1	27.9	1	1
HBL276 (c)	28.0	11	0	30.4	16	0	16.3	14	0	7.5	19	0	24.2	9	0	21.3	17	0
BHS169 (c)	35.4	2	1	31.6	10	0	11.7	19	0	13.8	14	0	25.8	6	1	23.7	10	0
BHS380 (c)	26.1	14	0	30.8	14	0	23.3	4	1	10.1	18	0	26.2	4	1	23.3	11	0
G.M.	**28.6**			**31.3**			**18.6**			**15.1**			**24.0**			**23.5**		
S.E.(M)	1.77			1.96			1.30			1.55			1.25			0.82		
C.D.	5.03			5.57			3.69			4.38			3.54			2.28		
C.V.	12.39			12.55			14.00			20.53			10.37					
DOS	10.11.10			4.11.10			28.10.10			29.10.10			25.10.10					

Location wise& Zonal means (Forage Yield in q/ha)

Varieties	Almora			Shimla			Palampur			Majhera			Bajaura			NHZ		
	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BHS397	12.1	15	0	20.5	16	0	10.1	18	0	43.5	17	0	15.4	6	1	20.3	17	0
BHS398	13.0	10	0	23.0	9	1	13.0	14	0	57.1	13	0	13.9	10	0	24.0	14	0
BHS399	10.3	18	0	21.3	13	0	16.3	6	1	30.7	19	0	7.9	19	0	17.3	19	0
BHS400	13.9	5	0	25.5	4	1	16.1	7	1	53.2	14	0	11.2	17	0	24.0	13	0
BHS401	11.5	16	0	20.2	18	0	18.3	4	1	50.5	15	0	9.1	18	0	21.9	16	0
HBL708	13.9	5	0	24.2	7	1	12.3	16	0	63.3	10	0	15.7	5	1	25.9	9	0
HBL709	13.8	7	0	20.5	15	0	9.2	19	0	73.8	4	0	12.4	15	0	25.9	8	0
HBL710	13.4	9	0	24.3	6	1	15.3	9	0	76.5	3	1	12.4	15	0	28.4	4	0
UPB1016	17.5	3	1	26.6	2	1	12.7	15	0	61.7	11	0	13.0	12	0	26.3	7	0
UPB1017	12.5	11	0	22.1	10	0	14.6	10	0	64.4	9	0	15.4	6	1	25.8	10	0
VLB118	17.6	2	1	21.9	11	0	10.6	17	0	60.6	12	0	15.1	9	0	25.1	12	0
VLB123	12.3	13	0	20.8	14	0	14.0	12	0	35.3	18	0	13.0	12	0	19.1	18	0
VLB124	10.9	17	0	23.2	8	1	14.4	11	0	67.9	7	0	15.4	6	1	26.3	6	0
VLB125	17.8	1	1	27.5	1	1	19.2	2	1	83.1	2	1	17.5	1	1	33.0	1	1
VLB126	9.9	19	0	19.4	19	0	19.2	2	1	66.8	8	0	13.0	12	0	25.7	11	0
VLB127	13.5	8	0	26.3	3	1	15.9	8	1	69.5	6	0	17.2	3	1	28.5	3	0
HBL276 (c)	14.9	4	0	21.4	12	0	19.6	1	1	92.0	1	1	16.3	4	1	32.8	2	1
BHS169 (c)	12.3	14	0	20.4	17	0	18.3	4	1	47.4	16	0	13.9	10	0	22.4	15	0
BHS380 (c)	12.4	12	0	24.9	5	1	13.8	13	0	71.0	5	0	17.5	1	1	27.9	5	0
G.M.	**13.3**			**22.8**			**14.9**			**61.5**			**14.0**			**25.3**		
S.E.(M)	1.00			1.85			1.38			6.25			0.81			**1.57**		
C.D.	2.84			5.23			3.91			17.73			2.29			**4.34**		
C.V.	15.01			16.16			18.53			20.35			11.57					
DOS	10.11.10			4.11.10			28.10.10			29.10.10			25.10.10					

IVT-DUAL- IR-TS-NWPZ

Location wise & Zonal means (Grain Yield in q/ha)

Varieties	Bikaner			Hisar			Durgapura			Ludhiana			NWPZ			Over All		
	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BH946	18.8	16	0	52.5	1	1	36.4	11	0	23.5	4	0	32.8	4	0	29.4	9	0
BH949	19.8	13	0	48.3	5	1	24.2	23	0	11.5	19	0	25.9	18	0	26.5	20	0
HUB113	23.7	7	1	51.9	2	1	35.6	14	0	22.7	6	0	33.5	2	1	31.4	4	0
HUB114	17.6	19	0	45.7	8	0	41.7	3	1	20.2	9	0	31.3	8	0	27.1	19	0
JB217	11.3	23	0	40.5	14	0	30.2	19	0	12.3	17	0	23.6	22	0	25.9	22	0
JB224	18.6	17	0	50.1	4	1	40.5	4	1	22.0	7	0	32.8	5	0	32.6	3	0
JB225	15.1	20	0	36.0	18	0	33.8	18	0	10.0	21	0	23.7	21	0	23.4	24	0
RD2812	27.5	1	1	31.3	25	0	39.3	5	0	15.3	14	0	28.3	12	0	28.8	12	0
RD2813	25.2	3	1	31.6	24	0	38.3	8	0	5.0	25	0	25.0	19	0	26.1	21	0
RD2814	24.2	5	1	41.5	13	0	44.1	1	1	23.0	5	0	33.2	3	1	29.1	11	0
RD2815	24.8	4	1	47.1	7	1	35.9	13	0	18.2	11	0	31.5	7	0	29.3	10	0
PL853	19.3	14	0	43.7	10	0	34.7	15	0	19.8	10	0	29.4	11	0	29.4	8	0
PL854	13.4	22	0	42.2	12	0	38.6	6	0	15.8	13	0	27.5	14	0	29.4	7	0
PL855	10.7	25	0	33.1	22	0	15.7	25	0	9.0	22	0	17.1	25	0	23.3	25	0
PL856	11.1	24	0	31.9	23	0	26.0	22	0	14.7	15	0	20.9	24	0	25.5	23	0
K1054	23.0	8	1	38.8	17	0	29.9	20	0	21.0	8	0	28.2	13	0	27.1	18	0
K1076	19.2	15	0	33.4	20	0	34.4	16	0	8.7	23	0	23.9	20	0	27.8	15	0
K1077	24.0	6	1	40.1	15	0	38.0	9	0	27.8	1	1	32.5	6	0	35.4	1	1
K1078	14.6	21	0	39.1	16	0	27.8	21	0	25.0	2	1	26.6	15	0	27.5	17	0
NDB1524	21.3	10	0	33.4	21	0	17.2	24	0	12.0	18	0	21.0	23	0	28.2	13	0
DWR97	18.5	18	0	45.0	9	0	33.8	17	0	8.3	24	0	26.4	17	0	27.7	16	0
RD2035(C)	20.9	12	0	51.5	3	1	37.4	10	0	13.2	16	0	30.8	9	0	30.9	5	0
RD2552(C)	26.6	2	1	47.6	6	1	43.5	2	1	24.7	3	0	35.6	1	1	34.5	2	1
RD2715(C)	21.2	11	0	35.5	19	0	38.6	7	0	10.3	20	0	26.4	16	0	27.8	14	0
Azad (C)	21.5	9	0	42.7	11	0	36.2	12	0	18.0	12	0	29.6	10	0	30.4	6	0
G.M.	**19.7**			**41.4**			**34.1**			**16.5**			**27.9**			**28.6**		
S.E.(M)	1.80			2.02			1.32			1.02			0.92			0.47		
C.D.	5.07			5.68			3.71			2.87			2.54			1.30		
C.V.	18.31			9.75			7.74			12.36								
DOS	1.12.10			14.11.10			22.11.10			26.11.10								

**Data from Modipuram not reported due to late sowing (LS)*

IVT-DUAL- IR-TS-NWPZ

Location wise & Zonal means (Forage Yield in q/ha)

Varieties	Hisar			Bikaner			Durgapura			Ludhiana			NWPZ			Over All		
	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BH946	81.9	8	0	40.6	3	1	176.6	12	0	143.3	8	0	110.6	9	0	171.8	9	0
BH949	79.3	10	0	29.3	20	0	159.4	17	0	131.7	12	0	99.9	13	0	163.5	14	0
HUB113	61.2	20	0	34.8	9	1	182.7	10	0	118.3	20	0	99.3	14	0	165.9	11	0
HUB114	73.9	13	0	20.2	25	0	142.5	24	0	120.0	18	0	89.1	21	0	155.7	18	0
JB217	54.8	22	0	32.3	15	0	157.0	18	0	130.0	13	0	93.5	18	0	132.6	24	0
JB224	71.4	15	0	31.9	16	0	184.8	9	0	96.7	24	0	96.2	16	0	149.9	22	0
JB225	53.6	23	0	32.9	13	0	150.1	22	0	83.3	25	0	80.0	25	0	130.9	25	0
RD2812	85.7	4	0	33.8	12	1	229.5	3	0	170.0	4	1	129.7	4	1	185.6	3	1
RD2813	85.1	5	0	33.9	10	1	200.2	6	0	180.0	3	1	124.8	5	0	175.5	6	0
RD2814	93.5	1	1	36.6	8	1	249.1	1	1	140.0	10	0	129.8	3	1	191.7	1	1
RD2815	82.1	7	0	42.0	1	1	242.5	2	1	185.0	2	1	137.9	1	1	180.3	4	0
PL853	51.4	24	0	26.0	22	0	161.5	15	0	100.0	23	0	84.7	23	0	154.9	19	0
PL854	64.3	17	0	32.4	14	0	155.2	19	0	103.3	22	0	88.8	22	0	158.5	17	0
PL855	56.2	21	0	30.3	18	0	144.9	23	0	130.0	13	0	90.3	20	0	153.7	20	0
PL856	42.8	25	0	22.1	24	0	137.7	25	0	126.7	15	0	82.3	24	0	134.3	23	0
K1054	89.1	3	1	38.2	6	1	184.9	8	0	161.7	6	1	118.5	7	0	175.4	7	0
K1076	61.8	19	0	37.0	7	1	160.0	16	0	143.3	8	0	100.5	12	0	164.1	13	0
K1077	70.7	16	0	33.9	10	1	150.4	20	0	120.0	18	0	93.7	17	0	165.6	12	0
K1078	81.2	9	0	26.3	21	0	203.8	5	0	166.7	5	1	119.5	6	0	175.8	5	0
NDB1524	71.7	14	0	25.6	23	0	164.6	14	0	123.3	17	0	96.3	15	0	152.2	21	0
DWR97	84.8	6	0	30.8	17	0	182.1	11	0	161.7	7	1	114.8	8	0	174.9	8	0
RD2035(C)	76.8	11	0	29.6	19	0	168.2	13	0	133.3	11	0	102.0	11	0	166.9	10	0
RD2552(C)	76.3	12	0	41.2	2	1	190.2	7	0	126.7	16	0	108.6	10	0	160.4	16	0
RD2715(C)	92.4	2	1	39.0	5	1	218.0	4	0	186.7	1	1	134.0	2	1	187.6	2	1
Azad (C)	63.0	18	0	40.1	4	1	150.4	20	0	116.7	21	0	92.6	19	0	162.8	15	0
G.M.	**72.2**			**32.8**			**177.8**			**135.9**			**104.7**			**163.6**		
S.E.(M)	2.62			3.11			3.74			15.21			4.67			3.22		
C.D.	7.37			8.76			10.54			42.81			12.95			8.92		
C.V.	7.25			18.96			4.21			22.38								
DOS	14.11.10			1.12.10			22.11.10			26.11.10								

**Data from Modipuram not reported due to late sowing (LS) and high C.V.*

IVT-DUAL- IR-TS- CEN Zone
Location wise & Zonal means (Grain Yield in q/ha)

Varieties	Kota			Vijapur			Udaipur			Jabalpur			Anand			Jalore			Jhansi			Cen Z		
	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BH946	46.5	8	1	7.9	13	0	43.5	3	1	19.7	18	0	4.2	22	0	34.3	23	0	31.8	10	0	26.9	11	0
BH949	32.4	18	0	4.8	25	0	36.5	11	0	21.6	12	0	11.4	15	0	33.4	24	0	40.4	3	1	25.8	19	0
HUB113	49.3	2	1	9.2	8	0	37.7	9	1	21.5	13	0	12.0	14	0	47.1	6	1	31.7	13	0	29.8	5	0
HUB114	31.3	19	0	7.7	14	0	31.3	20	0	29.8	6	0	3.3	23	0	44.1	8	0	23.9	20	0	24.5	23	0
JB217	34.1	15	0	7.4	17	0	34.5	14	0	27.5	7	0	12.7	11	0	38.8	19	0	26.0	19	0	25.8	16	0
JB224	47.2	6	1	6.8	19	0	40.6	5	1	20.5	14	0	12.3	12	0	51.2	1	1	26.4	18	0	29.3	6	0
JB225	30.4	22	0	5.4	23	0	29.6	23	0	11.3	25	0	7.4	18	0	36.6	21	0	35.6	6	0	22.3	24	0
RD2812	45.0	11	0	9.2	9	0	33.8	15	0	23.6	9	0	10.9	17	0	42.8	13	0	22.9	21	0	26.9	9	0
RD2813	30.9	21	0	10.5	5	1	31.2	22	0	20.2	16	0	17.7	5	0	49.2	3	1	22.3	22	0	26.0	14	0
RD2814	50.8	1	1	9.9	7	0	32.6	18	0	16.4	21	0	6.9	19	0	47.2	5	1	21.4	23	0	26.5	13	0
RD2815	32.5	17	0	8.2	11	0	33.0	17	0	19.6	19	0	23.2	2	0	43.3	11	0	20.7	24	0	25.8	17	0
PL853	36.0	14	0	7.7	15	0	38.5	7	1	20.5	14	0	12.8	10	0	42.6	14	0	30.1	14	0	26.9	10	0
PL854	46.1	9	1	5.2	24	0	36.1	12	0	35.6	3	0	6.1	20	0	41.4	16	0	30.0	15	0	28.7	8	0
PL855	23.4	25	0	6.4	20	0	31.2	21	0	35.9	2	0	1.7	24	0	23.6	25	0	31.7	12	0	22.0	25	0
PL856	33.7	16	0	5.5	22	0	33.0	16	0	35.3	4	0	1.6	25	0	39.1	18	0	31.8	11	0	25.7	20	0
K1054	24.6	24	0	10.0	6	0	34.5	13	0	14.9	23	0	18.2	4	0	44.1	9	0	27.8	17	0	24.9	22	0
K1076	41.1	13	0	10.6	3	1	27.0	24	0	13.9	24	0	13.8	9	0	50.5	2	1	29.2	16	0	26.6	12	0
K1077	49.0	3	1	11.9	1	1	44.0	2	1	20.2	17	0	34.2	1	1	47.9	4	1	43.8	1	1	35.9	1	1
K1078	25.1	23	0	8.2	12	0	32.1	19	0	22.6	11	0	13.9	8	0	43.2	12	0	33.7	8	0	25.5	21	0
NDB1524	48.8	4	1	7.5	16	0	37.9	8	1	23.2	10	0	20.4	3	0	44.7	7	0	34.4	7	0	31.0	4	0
DWR97	31.3	20	0	7.2	18	0	19.0	25	0	40.7	1	1	11.1	16	0	38.6	20	0	32.7	9	0	25.8	18	0
RD2035(C)	47.0	7	1	10.5	4	1	39.7	6	1	26.3	8	0	17.7	6	0	42.1	15	0	36.2	4	1	31.4	3	0
RD2552(C)	47.6	5	1	6.3	21	0	44.2	1	1	32.2	5	0	5.7	21	0	44.0	10	0	41.2	2	1	31.6	2	0
RD2715(C)	44.7	12	0	11.1	2	1	43.1	4	1	14.9	22	0	12.2	13	0	35.4	22	0	20.1	25	0	25.9	15	0
Azad (C)	45.8	10	0	9.0	10	0	36.8	10	0	18.7	20	0	17.5	7	0	39.3	17	0	36.0	5	1	29.0	7	0
G.M.	**39.0**			**8.2**			**35.2**			**23.5**			**12.4**			**41.8**			**30.5**			**27.2**		
S.E.(M)	1.69			0.67			2.43			1.19			0.72			1.83			2.91			0.79		
C.D.	4.75			1.89			6.83			3.36			2.03			5.21			8.20			2.19		
C.V.	8.66			16.42			13.77			10.17			11.71			7.60			19.11					
DOS	22.11.10			30.11.10			14.11.10			7.12.10			18.11.10			20.11.10			10.11.10					

The trial was not conducted at Banswara in CZ

IVT-DUAL- IR-TS-CZ
Location wise & Zonal means (Forage Yield in q/ha)

Varieties	Kota			Vijapur			Udaipur			Jabalpur			Anand			Jhansi			Jalore			CEN Zone		
	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G			
BH946	105.1	11	0	300.7	11	0	314.0	7	0	205.3	7	0	239.7	1	1	226.4	6	1	238.1	14	0	232.8	4	0
BH949	157.0	1	1	297.1	13	0	295.3	14	0	205.3	7	0	173.9	16	0	163.0	24	0	252.7	8	0	220.6	11	0
HUB113	102.7	17	0	284.4	16	0	314.0	7	0	205.3	6	0	199.3	10	0	226.4	6	1	210.7	18	0	220.4	12	0
HUB114	105.1	13	0	297.1	13	0	297.1	13	0	126.8	21	0	165.5	18	0	189.6	16	0	252.1	9	0	204.8	20	0
JB217	83.3	23	0	228.3	25	0	258.5	21	0	114.7	24	0	123.2	23	0	186.0	17	0	177.8	24	0	167.4	25	0
JB224	85.1	22	0	250.0	22	0	254.8	23	0	205.3	7	0	120.2	24	0	223.4	8	1	224.9	17	0	194.8	22	0
JB225	90.6	20	0	235.5	23	0	238.5	25	0	151.0	18	0	123.8	22	0	175.1	20	0	168.1	25	0	168.9	24	0
RD2812	106.9	10	0	369.6	4	1	355.7	3	1	187.2	13	0	212.0	6	1	199.3	13	0	273.7	4	0	243.5	3	0
RD2813	123.2	8	0	308.0	9	0	335.1	4	0	235.5	2	1	201.7	9	0	199.3	13	0	192.0	21	0	227.8	6	0
RD2814	155.8	2	1	414.9	1	1	394.3	1	1	151.0	19	0	220.4	4	1	199.3	13	0	286.7	3	1	260.3	1	1
RD2815	135.3	4	0	380.4	3	1	301.9	12	0	169.1	14	0	174.5	15	0	151.0	25	0	255.6	7	0	224.0	10	0
PL853	103.3	16	0	264.5	20	0	318.8	6	0	271.7	1	1	183.0	14	0	166.1	23	0	191.7	22	0	214.2	17	0
PL854	83.3	23	0	311.6	8	0	275.4	18	0	169.1	14	0	198.1	11	0	235.5	4	1	232.7	15	0	215.1	16	0
PL855	90.6	20	0	279.0	17	0	272.9	20	0	214.4	5	0	150.4	20	0	169.1	22	0	290.3	2	1	209.5	18	0
PL856	82.1	25	0	231.9	24	0	247.0	24	0	138.9	20	0	108.7	25	0	216.2	11	1	232.4	16	0	179.6	23	0
K1054	126.8	7	0	322.5	7	0	306.8	11	0	169.1	14	0	184.2	13	0	223.4	8	1	271.7	5	0	229.2	5	0
K1076	103.9	15	0	275.4	18	0	311.0	10	0	169.1	14	0	170.3	17	0	241.5	2	1	239.5	12	0	215.8	15	0
K1077	105.1	11	0	394.9	2	1	256.6	22	0	108.7	25	0	233.7	3	1	217.4	10	1	256.0	6	0	224.6	9	0
K1078	129.2	6	0	269.9	19	0	313.7	9	0	235.5	2	1	151.0	19	0	247.6	1	1	238.3	13	0	226.5	8	0
NDB1524	99.0	18	0	264.5	20	0	278.4	17	0	126.8	21	0	202.9	8	0	184.2	18	0	209.9	19	0	195.1	21	0
DWR97	130.4	5	0	300.7	11	0	287.4	16	0	217.4	4	0	207.7	7	0	205.3	12	0	244.0	11	0	227.6	7	0
RD2035(C)	105.1	13	0	351.4	5	0	273.6	19	0	199.3	10	0	189.0	12	0	172.1	21	0	245.7	10	0	219.5	14	0
RD2552(C)	107.5	9	0	286.2	15	0	320.0	5	0	199.3	10	0	138.3	21	0	178.1	19	0	205.2	20	0	204.9	19	0
RD2715(C)	137.7	3	0	342.4	6	0	364.1	2	1	120.8	23	0	218.0	5	1	241.5	2	1	308.1	1	1	247.5	2	1
Azad (C)	96.6	19	0	300.7	10	0	288.6	15	0	199.3	10	0	234.3	2	1	235.5	5	1	186.4	23	0	220.2	13	0
G.M.	**110.02**			**302.46**			**298.95**			**179.83**			**180.94**			**202.90**			**235.4**			**215.8**		
S.E.(M)	6.31			17.53			15.41			15.50			10.14			12.35			11.04			5.72		
C.D.	17.75			49.35			43.35			43.61			28.54			34.77			31.34			15.85		
C.V.	11.46			11.59			10.31			17.23			11.20			12.18			8.12					
DOS	22.11.10			30.11.10			14.11.10			7.12.10			18.11.10			10.11.10			20.11.10					

The trial was not conducted at Banswara in CZ

IVT-DUAL- IR-TS-NEPZ

Location wise & Zonal means (Grain Yield in q/ha)

Varieties	Kanpur			Varanasi			Rewa			NEPZ*		
	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BH946	33.8	22	0	29.0	7	0	38.3	10	0	33.7	6	0
BH949	35.0	17	0	21.7	15	0	36.5	17	0	31.1	17	0
HUB113	36.2	7	0	27.2	8	0	32.6	23	0	32.0	14	0
HUB114	35.6	14	0	22.3	12	0	31.9	25	0	30.0	20	0
JB217	36.2	7	0	22.3	12	0	33.8	21	0	30.8	18	0
JB224	37.4	5	0	34.4	2	1	40.9	1	1	37.6	2	1
JB225	29.0	25	0	16.9	23	0	39.5	4	1	28.5	24	0
RD2812	39.3	3	1	19.9	19	0	38.3	10	0	32.5	12	0
RD2813	35.0	17	0	20.9	17	0	32.5	24	0	29.5	22	0
RD2814	36.2	7	0	13.9	25	0	33.7	22	0	27.9	25	0
RD2815	33.2	24	0	20.5	18	0	35.8	18	0	29.8	21	0
PL853	35.0	17	0	29.6	5	0	37.6	14	0	34.1	4	0
PL854	33.8	22	0	22.9	10	0	38.5	9	0	31.8	15	0
PL855	35.6	14	0	18.7	20	0	39.2	6	1	31.2	16	0
PL856	36.2	7	0	24.2	9	0	37.9	12	0	32.8	9	0
K1054	36.2	7	0	21.7	15	0	39.9	2	1	32.6	11	0
K1076	40.5	2	1	22.9	10	0	38.7	8	0	34.0	5	0
K1077	41.1	1	1	34.4	2	1	39.5	4	1	38.3	1	1
K1078	39.3	3	1	18.7	21	0	38.9	7	0	32.3	13	0
NDB1524	36.2	7	0	22.3	12	0	39.6	3	1	32.7	10	0
DWR97	36.2	7	0	18.1	22	0	37.8	13	0	30.7	19	0
RD2035(C)	34.4	20	0	29.0	6	0	36.8	15	0	33.4	8	0
RD2552(C)	36.2	6	0	35.6	1	1	36.6	16	0	36.2	3	0
RD2715(C)	34.4	21	0	16.9	23	0	34.8	20	0	28.7	23	0
Azad (C)	35.6	14	0	30.2	4	0	35.3	19	0	33.7	6	0
G.M.	**35.9**			**23.8**			**37.0**			**32.2**		
S.E.(M)	1.03			1.10			0.68			0.64		
C.D.	2.91			3.10			1.93			1.76		
C.V.	5.75			9.25			3.17					
DOS	19.11.10			25.11.10			19.11.10					

*Faizabad trial rejected by zonal monitoring team

IVT-DUAL- IR-TS-NEPZ

Location wise & Zonal means (Forage Yield in q/ha)

Varieties	Kanpur			Varanasi			Rewa			NEPZ*		
	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G	Yield	Rk	G
BH946	113.5	12	0	184.8	10	1	44.3	10	1	114.2	8	1
BH949	117.8	8	0	164.3	18	0	42.2	16	0	108.1	16	1
HUB113	108.1	18	0	195.0	5	1	37.9	24	0	113.7	10	1
HUB114	108.7	17	0	190.2	9	1	37.6	25	0	112.2	12	1
JB217	105.1	22	0	144.3	23	0	38.9	21	0	96.1	24	0
JB224	109.3	16	0	143.1	24	0	46.6	1	1	99.7	23	0
JB225	112.9	13	0	149.2	22	0	45.6	5	1	102.6	22	0
RD2812	117.8	8	0	176.3	13	1	43.8	12	1	112.6	11	1
RD2813	114.7	11	0	176.9	12	1	38.4	23	0	110.0	13	1
RD2814	115.3	10	0	199.3	4	1	38.9	21	0	117.8	6	1
RD2815	119.0	5	0	199.3	3	1	42.2	16	0	120.1	4	1
PL853	105.7	21	0	165.5	16	0	43.4	13	1	104.8	19	0
PL854	106.3	20	0	193.2	8	1	44.6	9	1	114.7	7	1
PL855	98.4	25	0	165.5	16	0	45.3	6	1	103.1	21	0
PL856	103.9	24	0	120.8	25	0	44.1	11	1	89.6	25	0
K1054	117.8	7	0	178.1	11	1	45.8	3	1	113.9	9	1
K1076	119.6	4	0	158.2	20	0	45.2	7	1	107.7	17	1
K1077	122.0	3	0	157.0	21	0	46.4	2	1	108.5	15	1
K1078	123.8	2	1	193.2	7	1	44.9	8	1	120.6	3	1
NDB1524	109.9	15	0	203.5	2	1	45.7	4	1	119.7	5	1
DWR97	108.1	18	0	217.4	1	1	42.9	14	1	122.8	1	1
RD2035(C)	128.0	1	1	194.4	6	1	42.4	15	0	121.6	2	1
RD2552(C)	112.9	13	0	173.9	14	1	41.3	19	0	109.4	14	1
RD2715(C)	104.5	23	0	169.1	15	0	39.8	20	0	104.5	20	0
Azad (C)	119.0	5	0	161.2	19	0	41.7	18	0	107.3	18	1
G.M.	**112.9**			**175.0**			42.8			110.2		
S.E.(M)	1.82			16.52			1.38			6.42		
C.D.	5.12			46.49			3.92			17.79		
C.V.	3.23			18.89			5.58					
DOS	19.11.10			25.11.10			19.11.10					

*Faizabad trial rejected by zonal monitoring team

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