ALL INDIA COORDINATED RESEARCH PROJECT ON FORAGE CROPS

Annual Report : Rabi 2013

EXECUTIVE SUMMARY

The present report encompasses the results of the coordinated trials conducted on Crop Improvement, Crop Production, Crop Protection as well as the Breeder seed production of the different forage crops during Rabi 2012-13 at different locations/centers in the country placed in five zones *viz*., Hill zone, North West zone, North East zone, Central zone and South zone. Weather data are also reported to correlate the growth and yield of forage crops with weather parameters at different sites during crop period.

A. FORAGE CROP IMPROVEMENT

In Rabi 2012-13, thirteen breeding trials of four annuals and two perennial forage species comprising test entries along with their respective checks were conducted at 30 locations in five zones. The forage species evaluated were Berseem, Oat (Single cut, Multi cut and Dual), Lathyrus and Rye grass in annuals and Lucerne and Tall Fescue in perennials. In annuals, there was one trial in Berseem, four trials in Oat (single cut), one trial in Oat (multi cut), one trial in Oat (dual), two trials in Lathyrus and one trial in Rye grass. In perennial, one trial on Lucerne is in second year of evaluation whereas other is in third and final year of evaluation. Trial on Tall Fescue is in fourth and final year of evaluation.

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:

An initial varietal trial in Berseem comprising four entries along with two national checks and one zonal check was conducted at eight centers located in two different zones. Results obtained from different centers clearly revealed that for green forage yield (q/ha), entries JBSC-2, JBSC-1, JBSC-4 and JBSC-3 in Central zone and JBSC-2 in North-West zone registered their superiority over zonal/national checks. At national level, all the test entries performed better than national check but entries JBSC-2 and JBSC-1 registered their higher superiority in comparison to other entries. Similarly for dry matter (q/ha), entries JBSC-2, JBSC-1 and JBSC-4 in Central zone and entries JBSC-4, JBSC-1 and JBSC-3 in North-West zone registered their superiority over zonal/national checks whereas at national level again all the test entries exhibited superiority over checks but some of the superior entries were JBSC-1, JBSC-4 and JBSC-2.

Oat (Single cut):

In IVT Oat (Single cut), twelve entries along with two national checks and five zonal checks for respective zones were evaluated in initial varietal trial at 27 locations across the five zones in the country. Results obtained from different testing location revealed that for green forage yield (q/ha), entries JO-04-14 and JHO-2012-2 in Hill zone, OS-405, JHO-2012-1, OL-1760, RSO-59, JO-04-14 and JHO-2012-2 in North West zone, OS-405, OL-1760, JHO-2012-1, JO-4-14 and RSO-59 in North East zone, OS-405, UPO-12-1, JO-04-14, OL-1760, JHO-2012-1, JHO-2012-2, RSO-60 and RSO-59 in Central zone and OS-405, JHO-2012-2, SKO-190 and OL-1760 in South zone exhibited superiority over best

national/zonal check. At national level, entry OS-405 with 16.3 per cent superiority was ranked best performer. For dry matter yield (q/ha), entries JO-04-14, JHO-2012-2 and OL-1709 in Hill zone, entry JHO-2012-2 in North West zone, entry OS-405 in North East zone, entries OS-405, UPO-12-1, RSO-59, RSO-60, OL-1760, JO-04-14, JHO-2012-1, SKO-190, UPO-12-2 and JHO-2012-2, in Central zone and entries OS-405, JHO-2012-2, SKO-190, JO-04-14, OL-1760, OL-1709, RSO-60, RSO-59, UPO-12-1 and NDO-724 in South zone exhibited their superiority with respect to check. Coming to the national level, OS-405 (13.9%) was best performer for this character.

In AVT-1 Oat (Single cut), eight entries along with national checks namely Kent and OS-6 and five zonal checks for respective zones were evaluated in advanced varietal trial at 27 locations across the five zones. For green forage yield (q/ha), entries NDO-711, NDO-10, UPO-06-1, UPO-05-1 and OS-403 in Hill zone, OS-403 and UPO-05-1 in North-West zone, NDO-711, OS-403, NDO-10 and RJB-1 in North East zone, JO-04-11, NDO-10, NDO-711, RJB-1, OS-403 and UPO-06-1 in central zone and NDO-711 and JO-04-11 in South zone exhibited their superiority whereas at national level entry OS-403 (9.7%) ranked first for this character. Similarly for dry matter yield (q/ha), entries UPO-06-1, NDO-711, OS-403 and UPO-05-1 in Hill zone, OS-403 in North-West zone, NDO-711, NDO-10, OS-403, RJB-1, UPO-06-1 and JO-04-11 in North-East zone, UPO-06-1, NDO-711, NDO-10, RJB-1 and JO-04-11 in central zone, NDO-711 in South zone exhibited superiority over best zonal/national check, while, at national level entry NDO-711 (7.6%) ranked first for this character. For fodder production potential (q/ha/day), entry NDO-711 was superior both for green forage and for dry matter production potential.

In AVT II Oat (single cut), nine entries promoted from AVT-1 were evaluated against two national checks and five zonal checks at 27 locations in five different zones. For green forage yield (q/ha), entries JHO-10-2, JO-03-99, JO-03-97, SKO-188 and UPO-10-2 in Hill zone, entries OS-377 and UPO-10-1 in North-West zone, entry JO-03-97 in North-East zone, entries UPO-10-2, JHO-10-1 and OS-377 in Central zone, entries UPO-10-2, UPO-10-1, OS-377, JHO-10-2 and SKO-188 in South zone exhibited superiority over best zonal/national check. At national level, UPO-10-2, UPO-10-1, JO-03-97, OS-377, JO-03-99, JHO-10-2 and JHO-10-1 recorded superiority over best national check. Similarly for dry matter yield (q/ha), entries JHO-10-2, JO-03-99 and JO-03-97 in Hill zone, entries UPO-10-2 and OS-377 in North-West zone, UPO-10-1, JO-03-97 and UPO-10-2 in North-East zone, JHO-10-1, JO-03-97, UPO-10-2 and UPO-10-1 in Central zone and UPO-10-2, OS-377, SKO-188, SKO-170 and UPO-10-1 in South zone registered superiority over best check. At national level, UPO-10-2, JO-03-97, UPO-10-1, OS-377 and JHO-10-1 recorded superiority over best national check.

In AVT –II seed Single cut, nine entries along with two national checks and five zonal checks for respective zones were evaluated at ten locations distributed in five zones of the country. Result indicated that none of the entries showed superiority against zonal/national check in south zone and at national level. However, entry OS-377 in Hill Zone, JO-03-99 in North West zone, entries OS-377, UPO-10-2 and JHO-10-1 in North East zone and JO-03-99 in Central zone registered superiority over best check.

Oat (Multi cut):

An initial varietal trial comprising six entries and three national checks was conducted at nineteen locations across the country. For green forage yield (q/ha), entries OL-1766 and HFO-488 in North-East zone and JO-04-315 and HFO-488, PLP-14 and JHO-2012-3 in Central zone proved their superiority over best national check. However in other zones as

well as at national level, none of the entries was found superior than the checks. For dry matter yield (q/ha), entry OL-1769 in Hill zone, entries OL-1769, OL-1766 and JHO-2012-3 in North-West zone, HFO-488 and OL-1766 in North-East zone and JO-04-315, PLP-14, HFO-488, JHO-2012-3 and OL-1766 in central zone proved superiority, whereas at national level, entry HFO-488 (3.8%) ranked first for this character.

Oat (Dual):

An IVT Oat (Dual) trial comprising seven entries along with three national checks was conducted at 20 centres located at four zones of the country. Results obtained from different centers revealed that for green forage yield (q/ha), entry NDO-1709 in Hill zone, entries JO-09-504, NDO-1709 and OL-1709 in North-East zone registered their superiority over best national check. None of the entries recorded superiority in other zone, as well as at national level. Similarly for dry matter yield (q/ha), entry NDO-1709 in Hill zone, entries JO-09-504, NDO-1709 and OL-1775 in North West zone, entry OL-1775 in Central zone registered superiority whereas, entries NDO-1709 and JO-09-504 exhibited their superiority at national level. For seed yield (q/ha), the national check JHO-822 recorded 18.1 q/ha seed yield at national level.

Lathyrus:

An initial varietal trial in Lathyrus comprising seven entries along with three national checks namely Mahateora, Prateek and Nirmal was conducted at ten centers. Results of the trial reported from different centers revealed that for green forage yield, four entries *i.e.,* JLJO-09-2, BK-12-2, RLS-3006-2 and JHLS-2012-2 proved their superiority at national level. Similarly for dry matter yield (q/ha), all the test entries except BK-12-1 proved their superiority over the best check Prateek. For fodder production potential (q/ha/day), entry BK-12-2 was adjudged best performer both for green forage (3.15 q/ha/day) as well as dry matter production potential (0.63 q/ha/day).

An advanced varietal trial in Lathyrus with three entries along with one national check was conducted at eight locations across the country. Results obtained from different centers clearly revealed that for green forage yield (q/ha), entries JHLS-2011-2 and JLJ-09-1 and for dry matter yield (q/ha), entries JLJ-09-1 and JHLS-2011-2 proved their superiority over national check Nirmal. Similarly for fodder production potential, entry JHLS-2011-2 established its superiority both for green forage and dry matter production potential (q/ha/day).

Rye Grass:

An initial varietal trial in rye grass with four entries along with one national check i.e. PBRG-1 was conducted at six locations across the country. Results obtained from different centers clearly revealed that for green forage as well as dry matter yield (q/ha), none of the entries excelled in performance with respect to national check PBRG-1. Similar was the case for fodder production potential (q/ha/day) where national check established superiority both for green forage and dry matter production potential (q/ha/day). Even for plant height, PBRG-1 was adjudged best for growth. For the character leafiness (L/S ratio), entry BB-MG-001 (1.83) ranked first followed by PBRG-1 (1.68).

Lucerne:

The varietal trial in Lucerne (perennial) comprising of eight entries along with two national checks *i.e.*, Anand-2 and RL-88 was established during 2011-12 at twelve centers of the North West, Central and South zone. This is the 2nd year of the evaluation and entries are in coded form. For green forage yield (q/ha), entry VTL-11-9 ranked first in Central zone, South zone and at national level. Similar was the trend for dry matter

yield (q/ha) in which same entry VTL-11-9 exhibited superiority in Central zone (212.0 q/ha), South zone (126.4
q/ha) and at national level (145.4 q/ha). Entry VTL-11-9 also established its superiority both for green forage and dry matter production potential (q/ha/day).

Another varietal trial in Lucerne comprising nine entries and two national checks namely Anand-2 and RL-88 was established during Rabi 2010-11. This is being the 3rd and final year of evaluation hence all the entries are decoded. The results obtained from different centers clearly revealed that for green forage (q/ha), entry RLH-4 (602.4 q/ha) at national level exhibited its superiority. Similarly for dry matter yield again entry RLH-4 (123.4 q/ha) at all India level recorded its superiority. For fodder production potential (q/ha/day), entry Anand-23 proved its superiority both for green forage (1.88 q/ha/day) as well as dry matter production potential (0.49 q/ha/day).

Tall Fescue:
The varietal trial in Tall Fescue grass (Perennial) comprising of two entries *i.e.* Hima-14 and Hima-15 along with two zonal checks Hima-1 and Hima-4 was initiated during Rabi 2009-10 at sub-temperate and temperate Himalayan Hill region at Palampur, Srinagar and Almora. Data reported from this centre clearly indicated that both for green forage as well as dry matter yield (q/ha), entry Hima-14 was adjudged best performer. Entry Hima-14 recorded 15.6% superiority for green forage yield as well as 17.9% superiority for dry matter yield over best zonal check.

B. FORAGE CROP PRODUCTION

The programme on forage crop production was undertaken at 25 sites in five agro-climatic zones of the country. Research aspects included: resource conservation through forages; tillage and nutrient management of rice-oat cropping system; performance of forage crops raised through waste water under varied nutrient levels; effect of irrigation levels on yield and quality of forages during lean period; stubble and nutrient management in rice-oats cropping system; performance of dual purpose forage crops under different cutting management system; weed management in berseem; effect of soil amendment on productivity of rice-berseem cropping system; effect of soil amendment on yield of fodder sorghum in saline-alkali soil; production potential of forages in rice fallows under varied nutrient levels; banana based fodder intercropping systems; effect of sources of nitrogen on oats and residual effect on succeeding crops; performance of BN hybrid as influenced by micro nutrients; effect of sowing time and Zn & thiourea application on seed yield of dual purpose oat; agronomic trials for AVT-2 entries of tall fescue, and oats and effect of integrated nutrient management on yield and quality of oat.

AST-1.1: Effect of vegetative barriers and improved forage species on conservation of degraded grassland (Hill zone; rainfed conditions): In the hill zone at Palampur, vegetative barrier of Bajra napier hybrid produced 294.55 q/ha green fodder, which was 15.60% and 29.09% more than Setaria grass as vegetative barrier and no vegetative barrier, respectively. Among vegetative cover treatments, Setaria *anceps* + *Stylosanthes hamata* (370.80 q/ha) were significantly superior over other treatments. *Setaria* + *Stylosanthes hamata* produced 10.97, 94.63 and 162.53% more green fodder yield than *Setaria* grass, *Stylosanthes hamata* and local grasses, respectively. *Stylosanthes hamata* alone as well as with *Setaria* grass resulted in more soil biomass carbon (42 mg $Kg^{-1)}$ indicating more microbial population in the system.

AST-1.2: Effect of planting methods and forage crop combinations on fodder productivity through moisture conversation (Central zone): On location mean basis planting of grasses + legumes on ridges and furrows recorded higher GFY (454.9 q/ha),

DMY (121.7 q/ha) and CPY (11.1 q/ha) over flat bed and recorded percent increase of 21.4, 23.8 and 22.0 for GFY, DMY and CPY, respectively.

AST-1.3: Effect of moisture conservation practices on production of perennial grasses (North-East zone): At **Ranchi**, planting of perennial BN hybrid recorded significantly highest GFY (1527 q/ha), DMY (499 q/ha) and CPY (33.23 q/ha) over *Brachiaria* and *Setaria* grasses. With respect to moisture conservation practices, live mulch (intercropping with rice bean) attained significantly highest GFY (1548 q/ha), DMY (443 q/ha), CPY (31.97 q/ha) and CP content (8.2 %) as compared to control and soil mulch. At **Faizabad**, total GFY (523.0 q/ha), DMY (109.64 q/ha), CPY (11.68 q/ha) and net monetary returns (Rs 35850 /ha/yr) were highest under guinea grass + intercropping (berseem) combination of perennial grass and moisture conservation practices over rest of the treatments. At **Jorhat**, growing of *Brachiaria* grass attained highest GFY (1113.24 q/ha), CPY (19.26 q/ha), water use efficiency (12.8 q/ha-cm and net monetary returns (Rs 43901 /ha/yr) over BN hybrid and *Setaria* grasses. The practice of the live mulch (intercropping with rice bean) as moisture conservation practice recorded significantly highest GFY (803.5 q/ha), DMY (252.37 q/ha), CPY (19.04 q/ha), water use efficiency (13.68 q/ha-cm) and net monetary returns (Rs 45635 /ha/yr) over control and soil mulch. At **Bhubaneswar**, growing of guinea grass recorded significantly highest GFY (764.78 q/ha), DMY (152.2 q/ha), CPY (13.9 q/ha) and net monetary returns (Rs39163/ha/yr) over *Setaria* and *Brachiaria* grasses. Live mulch (intercropping with rice bean) resulted in significantly highest GFY (765.44 q/ha), DMY (147.86 q/ha) and CPY (12.69 q/ha) of perennial grasses over control and soil mulch. At **Kalyani**, perennial grass *Setaria* recorded highest GFY (981.18 q/ha), CPY (15.57 q/ha), plant height (98.87 cm) and L:S (2.88) over guinea and *Brachiaria* grasses. The practicing of live mulch (intercropping with rice bean) under grasses resulted in highest GFY (991.06 q/ha), DMY (240.42 q/ha), CPY (6.04 q/ha), net monetary returns (Rs 62480/ha/yr) and equivalent yield of guinea grass (1069.8 q/ha) over control and soil mulch.

AST-1.4: Intensive forage production through silvipasture system under rainfed ecosystem (South zone-silvipasture): On location mean basis, growing of subabul + *Cenchrus ciliaris* + *Desmanthus* silvipasture system (T_5) recorded highest GFY (536.4 q/ha), DMY (103.1 q/ha) and forage equivalent yield (209.3 q/ha). CPY (15.8 q/ha) was highest under Subabul + *Desmanthus virgatus* silvipasture system (T_3) and lowest in Subabul sole (T_8). The microbial population of fungi, actinomycetes and bacteria were higher over its initial population in the soil after third year of experimentation.

AST-1.5: Cassava based sustainable alley farming system for rainfed areas of the humid tropics (South zone -Alley cropping): Alley cropping system cassava + BN hybrid + fodder cowpea (T_2) being at par with T_1 (cassava + BN hybrid+ fodder cowpea + AMF), T_3 (cassava + BN hybrid + AMF) and T_4 (cassava + BN hybrid) treatments attained significantly highest green fodder yield (521.8 q/ha) of BN hybrid grass over rest of the treatments. The adoption of cassava + AMF alley cropping system (T_{11}) fetched significantly highest net monetary returns (Rs 172733/ha/yr) over rest of the alley cropping systems.

AST-2: Effect of tillage and nutrient management on the productivity of rice-oat cropping system: The growing of oats in minimal or conventional tillage supplemented with 75 % RDF + Biofertilizers or 100 % RDF + Biofertilizers or 125 % RDF recorded highest productivity in terms of green fodder, dry matter, crude protein yield of oats and

rice grain and straw yields and economics of the system at all the locations (except Ranchi, where the highest grain yield of rice was recorded under zero tillage).

AST-3: Performance of forage crops raised through waste water under varied nutrient levels: At Hyderabad, planting of para grass recorded significantly highest GFY (996.27 q/ha), DMY (184.35 q/ha), net monetary returns (Rs 44776 /ha/yr) and benefit cost ratio (3.99) over BN hybrid, guinea grass and lucerne crops. The application of 100% RDF to the forage crops being at par with 75% RDF, attained significantly highest GFY (629.3 q/ha), DMY (122.5 q/ha), CPY (10.59 q/ha), NMR (Rs 25493 /ha/yr) and benefit cost ratio (2.70) over rest of the nutrient levels at the same location. The application of 100% RDF to forage crops recorded highest concentration of heavy metals *viz.,* Co, Ni and Cr in dry matter as compared to its lower levels and lowest being with control. At Coimbatore, planting of cumbu napier hybrid recorded significantly highest GFY (2990 q/ha), DMY (467 q/ha) and CPY (34.17 q/ha) over rest of the forages. The application of 100% RDF to forages attained significantly highest GFY (2010 q/ha), DMY (328 q/ha) and CPY (28.67 q/ha) over its lower levels at the same location.

AST-4: Studies on the effect of irrigation levels on green forage yield and quality of different forage crops during lean period: On location mean basis, application of irrigation at IW/CPE-1.0 recorded highest GFY (385.7 q/ha), DMY (92.71 q/ha) and CPY (7.09 q/ha) over IW/CPE-0.6 and IW/CPE-0.8. The magnitude of increase in IW/CPE 1.0 was 29.4% and 25.90% for GFY and DFY respectively over IW/CPE-0.6 and 8.16% and 7.46% for GFY and DFY respectively over IW/CPE-0.8. The planting of fodder maize being at par with fodder sorghum and fodder pearl millet for DMY at significantly highest GFY (413.4 q/ha), DMY (99.0 q/ha), CPY (7.61 q/ha) on mean basis as well as location wise compared with rest of the fodder crops**.**

AST-5: Effect of stubble management and INM on yield, quality and growth attributes of oat in rice – oat cropping system: The highest grain yield of rice and GFY (234.8q/ha) & DMY (50.60 q/ha) of oat, green fodder equivalent yield (590.9 q/ha/yr) and net monetary returns (Rs 27696/ha) was recorded with the application of 25% N through FYM + 50 % NPK of RDF + Biofertilizer (*Azotobacter* + PSB) + Green Manure (38.63 q/ha) as compared to rest of the treatments. Among cutting management, rice stubble when cut at 30 cm height fetched higher net monetary returns (Rs 28633/ha) as compared to normal cutting. Normal cutting of rice produced higher GFY of oat (262 q/ha).

AST-6: Performance of dual purpose forage crops under different cutting management system: Over the zones, oat crop produced highest green fodder yield as compared to barley and wheat. Whereas, grain yield and net monetary returns was recorded highest under wheat crop. With respect to cutting management practices in hill zone, in terms of oat green fodder equivalent yield and economic returns, one cut of the crops at 70 DAS appeared suitable preposition to obtain dual benefit from the crops during winter months in the hills. In NW, NE and CZ, uncut forage crops recorded higher grain yield as compared to cutting at 50, 60 and 70 DAS, whereas, cutting of forages at 70 DAS recorded highest green fodder yield. In NWZ at Ludhiana, no cutting of forages fetched highest net monetary returns (Rs 22124/ha) and benefit cost ratio (1.03) over rest of the cutting management practices. In North Eastern and Central Zone, cutting of dual purpose crops at 60 DAS and 50 DAS for fodder fetched highest net monetary returns and B:C ratio, respectively.

AST-7: Effect of weed management on forage and seed yield of berseem (*Trifolium alexandrinum*): On over all mean basis over the zones (NW, NE and CZ), application of oxyflourfen @ 0.100 kg *a.i.* /ha + imazethapyr @ 0.100 kg *a.i* /ha (immediate after harvest of first cut) in berseem resulted in highest GFY (451.8 q/ha), seed yield (2.97 q/ha), straw yield (24.89 q/ha), CPY (11.15 q/ha), leaf stem ratio (0.98), weed control efficiency (72.69%), net monetary returns (Rs 54450/ha/yr) and B: C ratio (2.17) over rest of the herbicide treatments.

AST-9: Effect of soil amendments on productivity of rice-berseem and changes in soil properties of sodic soil: The application of RDF + gypsum @ 75% GR + FYM 10 t/ ha (T_7) in rice –oat cropping system attained significantly highest berseem forage equivalent yield (482.7 q/ha) over rest of the treatments. The application of different soil amendments brought down the values of pH, EC and ESP over its initial value whereas, organic carbon content of soil was increased over its initial value after the crop cycle.

AST-10: Effect of soil amendments on yield of fodder sorghum in saline-alkali soil: The application of recommended dose of NPK + FYM (10t/ha) + $ZnSO_4$ (20 kg/ha) + Gypsum 500 kg/ha (T_8) recorded higher green forage (297.74 q/ha), dry matter yield (76.59q/ha) and net returns (Rs. 13024/ha) over rest of the treatments.

AST-11: Production potential of forage crops in rice fallows under varied nitrogen levels: The intercropping of cowpea with maize had highest GFY, DMY as well as CPY over the sorghum + cowpea & pearl millet + cowpea cropping systems. The application of 100% recommended dose of nitrogen to different cropping systems recorded highest GFY (362.47 q ha^{-1}), DMY (74.00 q ha^{-1}) & CPY (6.8 q ha^{-1}) and fetched higher net monetary returns (Rs 22848/ha) and benefit cost ratio (3.21).

AST-12: Banana based fodder intercropping in the homesteads of Kerala: Planting of sole BN hybrid (T_7) recorded significantly highest green fodder (1039.3 q/ha), crude protein yield (16.7 q/ha) and crude fibre yield (59.7 q/ha) over rest of the treatments. Banana + BN hybrid intercropping system (T_2) fetched highest net monetary returns (Rs 318800/ha/yr) and benefit cost ratio (2.40) over rest of the treatments.

AST 13: Effect of sources of nitrogen on oat and residual effect on succeeding crops: Adopting of oat– maize + cowpea – turnip cropping sequence resulted in the production of higher total GFY (1130.95 q/ha) and DMY (307.14 q/ha) than oat-maize-turnip cropping sequence indicating beneficial effects of inclusion of legume (cowpea) in the system. Application of 75% N through urea + 25% N through sheep manure to oat resulted in the production of higher GFY (1211 q/ha) and DMY (323.63 q/ha).

AST-14: Performance of bajra napier hybrid grass as influenced by micro-nutrients under irrigated conditions: The application of NPK + $FeSO_4$ @ 50 kg/ha + $ZnSO_4$ @ 25 kg/ha to the bajra napier hybrid recorded significantly highest GFY (3267 q/ha), DMY (640 q/ha), CPY (82 q/ha) and crude protein content (12.8%) over rest of the treatments.

AST 15: Effect of sowing time and Zn & thiourea spray on seed yield of dual purpose oat: Sowing of oat on 1st Nov and 15th Nov remained at par with each other recorded significantly higher seed yield over sowing on 30th Nov. $ZnSO_4$ 25 kg /ha as soil application (basal) recorded significantly highest GFY (83.18 q/ha) and DMY (19.53 q/ha) over control and 12.5 kg $ZnSO_4$/ha as soil application at sowing followed by 0.5% $ZnSO_4$ spray (for DMY). The soil application of 12.5 kg $ZnSO_4$/ha as basal followed by 0.5%

$ZnSO_4$ + 0.05% TU sprays recorded significantly highest seed yield (18.36 q/ha) and net returns (Rs 40419 /ha) over control and remained at par with rest of the treatments.

AST 16: Effect of N levels on promising entries on Tall fescue grass (AVT-2): On mean basis, entry Hima-4 (ZC) resulted in higher DMY & CPY and was followed by entries Hima-14 and Hima-15. The interaction effects of entries x nitrogen indicated that Hima-14 and Hima-15 with the application of 120 kg N/ha resulted in the production of significantly higher GFY, DMY and CPY as compared to other treatments.

AST-17: Effect of nitrogen levels on green fodder yield of promising entries of oat (AVTO-2-SC): On all India mean basis, test entry JHO-922 produced better green forage (479.6 q/ha) and dry matter (85.5 q/ha) yields than national checks OS-6 (375.9 q/ha green fodder and 81.6 q/ha dry matter yield) and Kent (366.0 q/ha green fodder yield and 77.8 q/ha dry matter yield). The forage yield increased consistently with increasing level of nitrogen upto 120 kg nitrogen/ha.

AST-18: Effect of Integrated Nutrient Management on yield and quality of oat (Exploratory): The application of N @ 60 kg/ha + FYM @ 7.5 t/ha to oat recorded highest GFY (390.48 q/ha), CPY (7.00 q/ha) and leaf stem ratio (0.20) over rest of the treatments.

C. FORAGE CROP PROTECTION

Forage crop protection trials included monitoring of pest and disease incidences in oats, Lucerne and Berseem; screening of the breeding materials of these crops for resistance to diseases and pests; management of diseases and pest problems of economic importance. These trials were conducted at Bhubaneswar, Hisar, Hyderabad, Jhansi, Ludhiana, Palampur and Rahuri Centres.

Occurrence and abundance of major diseases and insect pests: In berseem, stem rot (*Sclerotinia trifoliorum*) and root rot (*Rhizoctonia solani and Fusarium semitactum*) incidences were severe at Ludhiana and Jhansi centers. The development and spread of stem rot disease at both the centers was found to be favoured by low temperature and high humidity conditions (7.6-15.0^{0}C mean temp and 81-83% RH). The root rot disease intensity was maximum (5%) at Palampur.

In Lucerne, the population of pea aphid (*Acyrthosiphion pisum*) were at peak (26.4 aphids/tiller) in the month of January whereas *Aphid craccivora* (28.2 aphids/tiller) in February at Rahuri center. *Heliothis armigera* is also becoming a serious pest of Lucerne seed crop. At Jhansi, Downey mildew (*Perenospora trifoli)* and rust (*Uromyces striatus)* occurred in moderate (5%) to severe (30%) form. At Palampur, leaf spot disease and defoliator insect pest were recorded in mild form during second week of May. At Dharwad, aphid infestation (218 aphids/plant) and rust (54%) were recorded.

In Oat, leaf blight (*Helminthosporium avenae*) incidences were recorded at Bhubaneswar, Jhansi, Ludhiana and Palampur center. The disease intensity varied from 5-35.9% at different locations. Powdery mildew disease occurred at Palampur with maximum intensity (90%). It is a location specific disease problem. At Rahuri, aphid infestation (89.2 aphid/tiller) was recorded in second week of January. Aphid predators lady bird beetle and Syrphid fly were also recorded during the aphid infestation.

Screening of breeding material: In perennial Lucerne, varietal evaluation revealed that aphid infestation was least (12.37 and 12.40 aphid/tiller) in IVTL-11-2 and IVTL-11-5

respectively at Rahuri. All entries were either susceptible or highly susceptible to Downey mildew at Ludhiana.

In Oats IVT single cut, entries OS-405, OL-1709 OL-1760 and NDO-724 were resistant to leaf blight. Entries OL-1709 and OL-1760 were resistant to powdery mildew disease also under natural epiphytotic conditions at Palampur. AVTO (SC) entry SKO-16 showed resistance against leaf blight across the center and entries UPO-06-1 and SKO-167 also showed moderately resistant reaction against powdery mildew at Palampur

In dual type oats, IVT entries RO-19, JHO-2012-5, UPO-212, OL-1775, JHO-2012-4 and NDO-1709 were found resistant to leaf blight. Entry JHO-2012-4 also showed least infestation of aphids.

In multi cut oats, IVT entries RO-19, PLP-14, HFO-488, UPO-212, OL-1766 and JHO-2012-3 showed resistance against leaf blight disease. Entries RO-19 and OL-1766 showed least infestation of aphids also.

In single cut Berseem, entries JB-SC-1, JB-SC-2, JB-SC-3 and JB-SC-4 showed resistance against stem and root rot disease.

Management of diseases and pest: Integrated disease management in white clover (PPT-12) trial was conducted at Palampur as a location specific trial. The results revealed that seed treatment with carbendazim (2gm/kg) + *Trichoderna viride* (5gm/kg) and foliar spray of carbendazim (0.5%) followed by contaf of (0.4%) was found as most effective in managing the powdery mildew 3.8% against 57.8% and clover rot 1.5% against 9.7% in untreated control respectively.

The study of pathogenic variability of *Erysiphe graminis* fsp. avenae on oat (PPT-17) trial showed that three isolates (EGA-1, EGA-2 and EGA-3) of the test pathogen tested on 70 genotypes of oats showed pathogenic variability.

Trial on evaluation of entomopathogenic fungi on insect pests of Lucerne (PPT-18) was conducted at Dharwad, Jhansi, Hyderabad and Rahuri centers. The results revealed that *Verticillium lecanii* and *Beauveria bassiana* @ $4x10^6$ cfu/ml were found most effective in reducing the aphid infestation significantly across the location.

D. BREEDER SEED PRODUCTION

In Rabi 2012-13, the indent for Breeder Seed Production was received from DAC, GOI for 28 varieties in four forage crops *viz*., Oat (9), Berseem (10), Lucerne (4) and Gobhi Sarson (5). The quantity allocated to produce was 914.12q and it was assigned to eleven Breeder Seed producing centers of the different SAUs/NGO/ICAR institutes. Among quantity indented for different forage crops, the maximum was for Oat (1278.1q) followed by Berseem (87.25q), Lucerne (7.1q) and minimum was for Gobhi Sarson (0.42q).

The final Breeder Seed Production Report (BSP-IV) received from different seed producing centres revealed that in crops such as Berseem and Gobhi Sarson, the overall breeder seed production was higher with respect to allocated quantity whereas in crops like Oat and Lucerne, the breeder seed production was less than the allocated quantity. The overall breeder seed production was 217.4q (23.78%) less as evident from seed production of 696.72q against the indent for 1372.87q.

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

Zone	Coordinated Centers				Testing Locations		
	Sl. No.	Location	Establishment Year	State	Sl. No.	Location	State
I. Hill States = 03 Locations = 2+2 = 4	1.	Palampur, CSKHPKV	1970	Himachal Pradesh	1.	Almora, VPKAS*	Uttarakhand
	2.	Srinagar, SKUAT	2010	Jammu & Kashmir			
II. North West States = 05 Locations = 4+5 = 9	3.	Ludhiana, PAU	1989	Punjab	2.	Meerut, SVBPUA&T	Uttar Pradesh
	4.	Hisar, CCS HAU	1970	Haryana	3.	Avikanagar, IGFRI-RRS*	Rajasthan
	5.	Pantnagar, GBPUAT	1995	Uttarakhand	4.	Jodhpur, CAZRI-RRS*	Rajasthan
	6.	Bikaner, SKRAU	1995	Rajasthan	5.	Jalore, RAU-RRS	Rajasthan
					6.	Udaipur MPUAT	Rajasthan
					7.	Pali-Marwar CAZRI-RRS*	Rajasthan
					8.	Jaisalmer, CAZRI-RRS*	Rajasthan
					9.	Fatehpur Shekhawati, SKRAU	Rajasthan
					10.	Bawal, HAU	Haryana
III. North East States = 8	7.	Faizabad, NDUAT	1982	Uttar Pradesh	11.	Umiam (Barapani), ICAR Res. Complex for NEH Region*	Meghalaya
Locations = 6+2= 8	8.	Ranchi, BAU	1970	Jharkhand	12.	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 Locations		
	Sl. No.	Location	Establishment Year	State	Sl. No	Location	State
IV. Central States = 5 Locations = 5+5 =10	13.	Anand, AAU	1970	Gujarat	13.	Kanpur, CSAU&T	Uttar Pradesh
	14.	Jabalpur, JNKVV	1970	Madhya Pradesh	14.	Jhansi, IGFRI*	Uttar Pradesh
	15.	Rahuri, MPKV	1971	Maharashtra	15.	Dhari & Jamnagar, GAU	Gujarat
	16.	Urulikanchan, BAIF	1982	Maharashtra	16.	Akola, PDKVV	Maharashtra
	17.	Raipur, IGKV	2010	Chhattisgarh	17.	Dapoli & Palghar, KKV	Maharashtra
V. South States =5 Locations = 4+3 = 7	18.	Mandya, UAS (B)	1986	Karnataka	18.	Dharwad, IGFRI-RRS*	Karnataka
	19.	Coimbatore, TNAU	1976	Tamil Nadu	19.	Pondicherry, PJLNCA & RI, Karaikal	Pondicherry
	20.	Vellayani, KAU	1971	Kerala			
	21.	Hyderabad, ANGRAU	1970	Andhra Pradesh			

Summary: Zone = 5, States = 23, Coordinating Centres = 21, Testing Locations = 19

*ICAR Institute

AICRP ON FORAGE CROPS (Breeding): ENTRIES CODE FOR Rabi 2012-13

Contributor	Entry name	Code name	Contributor	Entry name	Code name
1. IVT Berseem (SC)			**2. IVT Oat (SC)**		
IGFRI, Jhansi	JBSC-1	IVTBSC-2	HAU, Hisar	OS-405	IVTOSC-3
IGFRI, Jhansi	JBSC-2	IVTBSC-6	JNKVV, Jabalpur	JO-04-14	IVTOSC-7
IGFRI, Jhansi	JBSC-3	IVTBSC-4	PAU, Ludhiana	OL-1760	IVTOSC-10
IGFRI, Jhansi	JBSC-4	IVTBSC-3	PAU, Ludhiana	OL-1709	IVTOSC-5
NC	Wardan	IVTBSC-1	IGFRI, Jhansi	JHO-2012-2	IVTOSC-15
NC	Mescavi	IVTBSC-7	IGFRI, Jhansi	JHO-2012-1	IVTOSC-9
ZC	BB-2	IVTBSC-5	NDUA&T, Faizabad	NDO-724	IVTOSC-19
			MPKV, Rahuri	RSO-60	IVTOSC-13
			MPKV, Rahuri	RSO-59	IVTOSC-18
			GBPUAT, Pantnagar	UPO-12-1	IVTOSC-1
			GBPUAT, Pantnagar	UPO-12-2	IVTOSC-16
			SKUAT, Srinagar	SKO-190	IVTOSC-12
			NC	Kent	IVTOSC-17
			NC	Os-6	IVTOSC-14
			ZC-HZ	SKO-90	IVTOSC-4
			ZC-NWZ	OL-125	IVTOSC-2
			ZC-NEZ	JHO-99-2	IVTOSC-11
			ZC-CZ	JHO-822	IVTOSC-8
			ZC-SZ	JHO-2000-4	IVTOSC-6
3. AVT Oat (SC)-1			**4. AVT Oat (SC)-2**		
SKUAT, Srinagar	SKO-167	AVTOSC-1-14	SKUAT, Srinagar	SKO-170	AVTOSC-2-5
GBPUAT, Pantnagar	UPO-05-1	AVTOSC-1-2	SKUAT, Srinagar	SKO-188	AVTOSC-2-8
GBPUAT, Pantnagar	UPO-06-1	AVTOSC-1-6	JNKVV, Jabalpur	JO-03-97	AVTOSC-2-10
NDUA&T, Faizabad	NDO-10	AVTOSC-1-13	JNKVV, Jabalpur	JO-03-99	AVTOSC-2-1
NDUA&T, Faizabad	NDO-711	AVTOSC-1-4	HAU, Hisar	OS-377	AVTOSC-2-14
HAU, Hisar	OS-403	AVTOSC-1-1	GBPUAT, Pantnagar	UPO-10-1	AVTOSC-2-12
JNKVV, Jabalpur	JO-04-11	AVTOSC-1-15	GBPUAT, Pantnagar	UPO-10-2	AVTOSC-2-16
SKRAU, Bikaner	RJB-1	AVTOSC-1-8	IGFRI, Jhansi	JHO-10-1	AVTOSC-2-3
NC	Kent	AVTOSC-1-9	IGFRI, Jhansi	JHO-10-2	AVTOSC-2-6
NC	OS-6	AVTOSC-1-12	NC	Kent	AVTOSC-2-9
ZC-HZ	SKO-90	AVTOSC-1-7	NC	OS-6	AVTOSC-2-15
ZC-NWZ	OL-125	AVTOSC-1-10	ZC-HZ	Palampur-1	AVTOSC-2-11
ZC-NEZ	JHO-99-2	AVTOSC-1-5	ZC-NWZ	OL-125	AVTOSC-2-2
ZC-CZ	JHO-822	AVTOSC-1-11	ZC-NEZ	JHO-99-2	AVTOSC-2-13
ZC-SZ	JHO-2000-4	AVTOSC-1-3	ZC-CZ	JHO-822	AVTOSC-2-7
			ZC-SZ	JHO-2000-4	AVTOSC-2-4
5. AVT Oat (SC)-2 (seed)			**6. IVTO (MC)**		
SKUAT, Srinagar	SKO-170	AVTOSCS-2-5	HAU, Hisar	HFO-488	IVTOMC-3
SKUAT, Srinagar	SKO-188	AVTOSCS-2-8	PAU, Ludhiana	OL-1769	IVTOMC-5
JNKVV, Jabalpur	JO-03-97	AVTOSCS-2-10	PAU, Ludhiana	OL-1766	IVTOMC-7
JNKVV, Jabalpur	JO-03-99	AVTOSCS-2-1	JNKVV, Jabalpur	JO-04-315	IVTOMC-9
HAU, Hisar	OS-377	AVTOSCS-2-14	IGFRI, Jhansi	JHO-2012-3	IVTOMC-8
GBPUAT, Pantnagar	UPO-10-1	AVTOSCS-2-12	CSKHPKV, Palampu	PLP-14	IVTOMC-2
GBPUAT, Pantnagar	UPO-10-2	AVTOSCS-2-16	NC	Kent	IVTOMC-10
IGFRI, Jhansi	JHO-10-1	AVTOSCS-2-3	NC	UPO-212	IVTOMC-4
IGFRI, Jhansi	JHO-10-2	AVTOSCS-2-6	NC	RO-19	IVTOMC-1
NC	Kent	AVTOSCS-2-9			
NC	OS-6	AVTOSCS-2-15			
ZC-HZ	Palampur-1	AVTOSCS-2-11	**7. IVT Oat (Dual)**		
ZC-NWZ	OL-125	AVTOSCS-2-2	IGFRI, Jhansi	JHO-2012-5	IVTOD-3
ZC-NEZ	JHO-99-2	AVTOSCS-2-13	IGFRI, Jhansi	JHO-2012-4	IVTOD-9
ZC-CZ	JHO-822	AVTOSCS-2-7	HAU, Hisar	OS-387	IVTOD-5
ZC-SZ	JHO-2000-4	AVTOSCS-2-4	PAU, Ludhiana	OL-1775	IVTOD-7
			PAU, Ludhiana	OL-1709	IVTOD-1
			NDUA&T, Faizabad	NDO-1709	IVTOD-10
			JNKVV, Jabalpur	JO-09-504	IVTOD-6
			NC	RO-19	IVTOD-2
			NC	UPO-212	IVTOD-4
			NC	JHO-822	IVTOD-8

8. IVT Lathyrus			**9. AVT Lathyrus-1**		
BCKV, Kalyani	BK-12-2	IVTL-3	IGFRI, Jhansi	JHLS-2011-1	AVTL-2
BCKV, Kalyani	BK-12-1	IVTL-5	IGFRI, Jhansi	JHLS-2011-2	AVTL-4
IGFRI, Jhansi	JHLS-2012-1	IVTL-7	JNKVV, Jabalpur	JLJ-09-1	AVTL-1
IGFRI, Jhansi	JHLS-2012-2	IVTL-10	NC	Nirmal	AVTL-3
IGKV, Raipur	RLS-3009-4	IVTL-8			
IGKV, Raipur	RLS-3006-2	IVTL-2			
JNKVV, Jabalpur	JLJO-09-2	IVTL-9			
NC	Nirmal	IVTL-6			
NC	Mahateora	IVTL-1			
NC	Prateek	IVTL-4			
10. IVT Rye Grass			**12: VTL-2010 (P) Lucerne**		
Advanta	BB-MG-004	IVTRG-4	MPKV, Rahuri	RRP-5-4	LP-10-10
Advanta	BB-MG-001	IVTRG-1	MPKV, Rahuri	CAP-3-2	LP-10-2
Advanta	BB-MG-002	IVTRG-3	MPKV, Rahuri	RLH-4	LP-10-8
Advanta	BB-MG-003	IVTRG-5	MPKV, Rahuri	RLH-5	LP-10-1
Check	PBRG-1	IVTRG-2	AAU, Anand	Anand-23	LP-10-9
			AAU, Anand	ALP-1-1	LP-10-3
			AAU, Anand	ACP-3-1	LP-10-5
			TNAU, Coimbatore	ACP-1-2	LP-10-11
			SKRAU, Bikaner	RRB-07-1	LP-10-7
			NC	Anand-2	LP-10-4
			NC	RL-88	LP-10-6

Decodes of AVT Oat Agronomical trial of Rabi 2012-13

AST-17: AVT Oat (AVT-2-SC)	
Name of entry	**Code name**
JO-03-97	AVTOSC-2-1
JO-03-99	AVTOSC-2-2
SKO-170	AVTOSC-2-3
SKO-188	AVTOSC-2-4
OS-6 (NC)	AVTOSC-2-5
Kent (NC)	AVTOSC-2-6
OS-377	AVTOSC-2-7
JHO-99-2 (NEZ)	AVTOSC-2-8
JHO-822 (CZ)	AVTOSC-2-9
UPO-10-1	AVTOSC-2-10
JHO-10-2	AVTOSC-2-11
JHO-10-1	AVTOSC-2-12
UPO-10-2	AVTOSC-2-13
JHO-2000-4 (SZ)	AVTOSC-2-14
Palampur-1 (HZ)	AVTOSC-2-15
OL-125 (NWZ)	AVTOSC-2-16

NC: National Check
ZC: Zonal Check

CHAPTER-1

FORAGE CROP IMPROVEMENT

1. IVTB: Initial Varietal Trial in Berseem

(Table Reference 1.1 to 1.7)

An initial varietal trial in Berseem comprising of four entries along with two national checks *i.e.* Wardan and Mescavi and one zonal check *i.e.* Bundel Berseem-2 was conducted at eight centers located in two different zones *i.e.* Central and North-West zone. For green forage yield (q/ha), entries JBSC-2 (20.2%), JBSC-1 (16.7%), JBSC-4 (10.5%) and JBSC-3 (2.4%) in Central zone and entry JBSC-2 (14.5%) in North-West zone registered their superiority over zonal/national checks. At national level all the test entries performed better than national checks but entries JBSC-2 (20.7%) and JBSC-1 (14.4%) registered higher superiority in comparison to other entries.

For dry matter yield (q/ha), entries JBSC-2 (15.5%), JBSC-1 (9.7%) and JBSC-4 (5.3%) in Central zone and entries JBSC-4 (19.7%), JBSC-1 and JBSC-3 (13.1%) in North-West zone registered their superiority over zonal/national checks. At national level all the test entries exhibited superiority over checks. Some of the superior entries were JBSC-1 (14.0%), JBSC-4 (13.4%) and JBSC-2 (11.6%).

In green forage and dry matter production potential (q/ha/day), all the test entries registered their superiority over national check Wardan.

Test entry JBSC-1 (52.7cm) ranked first for the character plant height. For the character leafiness, entry JBSC-4 (1.00) performed better.

In quality parameters, entry JBSC-4 for crude protein yield (q/ha) and JBSC-2 for crude protein (%) ranked first. Entries JBSC-1 for ADF (%), JBSC-3 for IVDMD (%) and JBSC-4 for DDM (q/ha) exhibited their superiority whereas for NDF (%), JBSC-2 and Mescavi (NC) were best performer.

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

Entries	Central Zone								North West Zone						All India Average		
	Jhansi	Rahuri	Jabal.	Urulik.	Karj.*	Avera.	Rank	Super%	Bikan.	Ludhi.	Hisar*	Avera.	Rank	Super%	Avera.	Rank	Super%
JBSC-1	323.2	80.0	150.6	57.9	49.1	152.9	2	16.7	41.7	125.9	225.9	83.8	3		129.9	2	14.4
JBSC-4	311.1	98.6	117.3	52.1	42.2	144.8	3	10.5	40.7	125.9	214.8	83.3	5		124.3	3	9.5
JBSC-3	285.5	88.8	118.6	44.0	38.3	134.2	4	2.4	27.4	125.9	207.4	76.7	6		115.0	4	1.3
JBSC-2	350.1	125.9	105.3	48.3	29.5	157.4	1	20.2	40.4	151.9	118.5	96.2	1	14.5	137.0	1	20.7
Wardan (NC)	238.4	85.6	115.9	72.9	30.3	128.2	6		75.5	92.6	144.4	84.0	2		113.5	5	
Mescavi (NC)	244.4	104.1	98.6	77.0	17.8	131.0	5		46.2	92.6	159.3	69.4	7		110.5	6	
BB-2 (ZC)	241.0	76.3	99.9	59.3	32.9	119.1	7		67.3	100.0	125.9	83.6	4				
Mean	**284.8**	**94.2**	**115.2**	**58.8**	**34.3**	**138.2**			**48.5**	**116.4**	**170.9**	**82.4**			**121.7**		
CD at 5%	46.6	18.2	32.4	7.8	12.6				16.1	20.8	70.4						
CV%	9.2	10.8	15.8	19.5	21.9				18.7	10.0	20.5						

* not included in zonal and all India average due to CV>= 20

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

Entries	Central Zone								North West Zone						All India Average		
	Jhansi	Rahuri	Jabal.	Urulik.	Karjat*	Aver.	Rank	Super%	Bikan.	Hisar	Ludhi.	Aver.	Rank	Super%	Aver.	Rank	Super%
JBSC-1	44.4	14.6	20.6	10.8	16.9	22.6	2	9.7	7.2	28.9	10.4	15.5	2	13.1	19.6	1	14.0
JBSC-4	42.8	18.7	15.4	10.1	14.5	21.7	3	5.3	9.5	30.0	9.8	16.4	1	19.7	19.5	2	13.4
JBSC-3	41.7	16.5	15.7	8.8	13.2	20.7	4	0.5	6.5	28.2	11.7	15.5	2	13.1	18.4	4	6.9
JBSC-2	48.7	23.4	13.7	9.4	10.2	23.8	1	15.5	8.6	17.4	13.3	13.1	4		19.2	3	11.6
Wardan (NC)	36.6	13.2	15.2	12.9	10.4	19.5	6		14.3	19.1	7.7	13.7	3		17.0	6	
Mescavi (NC)	37.0	19.2	12.5	13.7	6.2	20.6	5		8.1	22.2	7.7	12.7	5		17.2	5	
BB-2 (ZC)	34.1	13.8	12.8	11.1	11.3	17.9	7		11.1	18.2	8.4	12.5	6				
Mean	**40.7**	**17.1**	**15.1**	**11.0**	**11.8**	**21.0**			**9.3**	**23.4**	**9.9**	**14.2**			**18.5**		
CD at 5%	8.1	3.3	4.2	1.4	4.2				3.2	10.4	1.5						
CV%	11.1	10.9	15.7	16.3	21.1				19.4	18.2	8.8						

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

Entries	Green Forage Yield (q/ha/day)					Dry Matter Yield (q/ha/day)				
	Karjat	Bikaner	Ludhiana	Average	Rank	Karjat	Bikaner	Ludhiana	Average	Rank
JBSC-1	0.82	0.48	2.03	1.11	2	0.28	0.08	0.17	0.18	1
JBSC-4	0.70	0.47	2.03	1.07	3	0.24	0.11	0.16	0.17	2
JBSC-3	0.64	0.31	2.03	0.99	4	0.22	0.08	0.19	0.16	3
JBSC-2	0.49	0.46	2.44	1.13	1	0.17	0.10	0.22	0.16	3
Wardan (NC)	0.50	0.87	1.49	0.95	5	0.17	0.16	0.12	0.15	4
Mescavi (NC)	0.30	0.53	1.49	0.77	6	0.10	0.09	0.12	0.10	5
BB-2 (ZC)	0.55	0.77	1.61			0.19	0.13	0.14		
Mean	**0.57**	**0.56**	**1.87**	**1.00**		**0.20**	**0.11**	**0.16**	**0.15**	

Table 1.4: IVT Berseem: Initial varietal Trial in Berseem(SC):Crude Protein Yield (q/ha) & Crude Protein(%)

Entries	Crude Protein Yield (q/ha)							Crude Protein (%)						
	Rahuri	Jabal.	Urulik.	Hisar	Ludhi.	Aver.	Rank	Rahuri	Urulik.	Hisar	Ludhi.	Jabal.	Aver.	Rank
JBSC-1	2.7	3.3	1.9	4.9	1.9	2.9	3	18.8	17.3	17.0	18.2	16.9	17.6	5
JBSC-4	3.6	2.5	1.7	5.8	2.0	3.1	1	19.3	17.2	19.5	20.1	16.3	18.5	2
JBSC-3	3.2	2.5	1.5	5.4	2.5	3.0	2	19.5	16.2	19.3	21.3	16.5	18.5	2
JBSC-2	4.2	2.1	1.7	3.7	3.0	2.9	3	17.9	17.7	21.0	22.5	16.1	19.1	1
Wardan (NC)	2.6	2.4	2.3	3.4	1.3	2.4	5	19.5	18.1	17.8	17.5	16.2	17.8	4
Mescavi (NC)	3.6	2.0	2.5	3.7	1.7	2.7	4	18.8	17.9	16.5	22.5	16.1	18.4	3
BB-2 (ZC)	2.5	2.0	2.0	3.1	1.8			18.4	17.8	17.3	21.0	16.0		
Mean	**3.2**	**2.4**	**1.9**	**4.3**	**2.0**	**2.9**		**18.9**	**17.5**	**18.3**	**20.4**	**16.3**	**18.3**	

Table 1.5: IVT Berseem: Initial Varietal Trial in Berseem (SC): Plant Height (cm)

Entries	Jhansi	Rahuri	Jabalpur	Urulik.	Karjat	Bikaner	Hisar	Ludhiana	Average	Rank
JBSC-1	105.0	51.2	36.6	44.1	49.9	44.0	54.4	36.7	52.7	1
JBSC-4	102.7	55.0	32.6	23.6	49.3	43.0	57.9	38.0	50.3	4
JBSC-3	101.7	50.9	35.3	38.1	49.9	39.0	51.2	39.0	50.6	3
JBSC-2	107.3	52.2	30.4	38.4	40.9	37.0	44.3	41.3	49.0	5
Wardan (NC)	81.3	56.3	31.3	46.0	47.5	57.0	47.1	39.3	50.7	2
Mescavi (NC)	77.7	58.7	28.6	47.0	40.1	44.0	46.9	36.3	47.4	6
BB-2 (ZC)	80.0	49.6	29.0	50.4	49.1	46.0	45.8	34.0		
Mean	**93.7**	**53.4**	**32.0**	**41.1**	**46.7**	**44.3**	**49.7**	**37.8**	**50.1**	

Table 1.6: IVT Berseem: Initial varietal Trial in Berseem(SC):Leaf Stem Ratio

Entries	Rahuri	Jabalpur	Urulika.	Karjat	Bikaner	Ludhiana	Average	Rank
JBSC-1	0.85	0.89	1.08	0.66	1.00	0.94	0.90	3
JBSC-4	1.00	0.82	1.18	0.68	1.05	1.28	1.00	1
JBSC-3	0.67	0.85	1.01	0.70	1.00	0.86	0.85	5
JBSC-2	1.00	0.74	0.89	0.67	1.00	0.91	0.87	4
Wardan (NC)	1.00	0.78	1.01	0.53	0.90	1.42	0.94	2
Mescavi (NC)	0.54	0.69	0.85	0.55	0.81	1.15	0.77	6
BB-2 (ZC)	0.67	0.70	0.98	0.73	0.93	1.32		
Mean	**0.82**	**0.78**	**1.00**	**0.65**	**0.96**	**1.13**	**0.89**	

Table 1.7: IVT Berseem (Exploratory):Initial varietal Trial in Berseem(SC) :quality parameters

Entries	IVDMD(%)				ADF (%)		NDF(%)		DDM(q/ha)	
	Hisar	Ludhiana	Average	Rank	Ludhiana	Rank	Ludhaina	Rank	Hisar	Rank
JBSC-1	55.2	60.2	57.7	6	22.9	1	45.4	5	15.95	3
JBSC-4	59.4	63.2	61.3	4	27.4	6	44.5	4	17.82	1
JBSC-3	62.6	64.0	63.3	1	26.7	4	41.4	2	17.62	2
JBSC-2	59.8	64.4	62.1	2	26.3	3	41.3	1	10.41	6
Wardan (NC)	61.0	60.0	60.5	5	28.7	7	46.7	6	11.63	5
Mescavi (NC)	59.0	64.4	61.7	3	25.5	2	41.3	1	13.11	4
BB-2 (ZC)	56.6	62.0			26.9	5	41.5	3	10.27	7
Mean	**59.1**	**62.6**	**61.1**		**26.3**		**43.2**		**14.42**	

2. IVTO (SC): Initial Varietal Trial in Oat (Single cut)

(Table Reference: 2.1 to 2.9)

In Oat (Single cut), twelve entries along with two national checks namely OS-6 and Kent and five zonal checks *viz*., SKO-90, OL-125, JHO-99-2, JHO-822 and JHO-2000-4 for respective zones were evaluated in initial varietal trial at 27 locations across the five zones in the country. Results obtained from different testing locations revealed that for the character green forage yield (q/ha), entries JO-04-14 (10.2%) and JHO-2012-2 (4.5%) in Hill zone, OS-405 (9.8%), JHO-2012-1 (7.8%), OL-1760 (5.4%), RSO-59 (1.7%), JO-04-14 (1.6%) and JHO-2012-2 (1.2%) in North West zone, OS-405 (7.2%), OL-1760 (5.8%), JHO-2012-1 (5.7%), JO-4-14 (0.8%) and RSO-59 (0.7%) in North East zone, OS-405 (11.3%), UPO-12-1 (7.0%), JO-04-14 (6.6%), OL-1760 (5.7%), JHO-2012-1 (5.6%), JHO-2012-2 (4.7%), RSO-60 (3.6%), and RSO-59 (1.8%) in Central zone and OS-405 (8.9%), JHO-2012-2 (7.9%), SKO-190 (5.9%) and OL-1760 (1.0%) in South zone exhibited superiority over best national/zonal check. At national level, entry OS-405 with 16.3 per cent superiority was best performer.

For the character dry matter yield (q/ha), entries JO-04-14 (9.2%), JHO-2012-2 (5.9%) and OL-1709 (0.6%) in Hill zone, entry JHO-2012-2 (0.5%) in North West zone, entry OS-405 (1.0%) in North East zone, entries OS-405 (15.9%), UPO-12-1 (9.9%), RSO-59 (6.7%), RSO-60 (6.6%), OL-1760 (6.3%), JO-04-14 (5.7%), JHO-2012-1 (5.0%), SKO-190 (4.5%), UPO-12-2 (3.2%) and JHO-2012-2 (1.0%), in Central zone and entries OS-405 (28.0%), JHO-2012-2 (14.5%), SKO-190 (13.5%), JO-04-14 (8.5%), OL-1760 (5.0%), OL-1709 (4.8%), RSO-60 (4.2%), RSO-59 (4.2%), UPO-12-1 (1.6%) and NDO-724 (0.7%) in South zone exhibited their superiority over checks. Coming to the national level, OS-405 (13.9%) was best performer.

For fodder production potential (q/ha/day), entry OS-405 for green forage yield and dry matter yield registered its superiority. For plant height, OS-405, JHO-2012-2, JO-04-14 and OL-1709 were adjudged best performer. For the character leafiness (L/S Ratio), entry OL-1760 ranked first.

For quality parameters, entries OS-405 and JO-04-14 for crude protein yield (q/ha) and NDO-724 for crude protein content (%) proved superiority. For other quality parameters, entry JO-04-14 for ADF (%), NDF (%), and IVDMD (%) registered superiority over best national/ zonal check.

Table 2.1 IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha)

Cont.....

Entries	Hill Zone					North West Zone									
	Palam.	Srina.	Aver.	Rank	Super%	Bikan.	Jalore	Hisar	Ludhi.	Pantn.	Udaipur	Meerut	Aver.	Rank	Super.%
UPO-12-1	216.8	419.3	318.1	11		180.0	417.7	648.1	497.2	678.2	521.8	595.7	505.5	9	
OS-405	224.8	464.1	344.5	5		304.7	539.0	711.0	463.9	802.5	538.2	649.3	572.7	1	9.8
OL-1709	216.4	473.5	344.9	4		135.9	517.3	607.4	513.9	608.2	555.7	550.7	498.4	11	
JO-04-14	259.9	500.7	380.3	1	10.2	313.5	463.0	629.6	441.7	663.7	608.8	590.3	530.1	5	1.6
JHO-2012-1	215.9	445.0	330.5	9		312.3	515.3	737.0	491.7	650.4	601.0	627.0	562.1	2	7.8
OL-1760	173.2	450.0	311.6	13		264.7	510.3	737.0	486.1	649.3	556.2	642.7	549.5	3	5.4
SKO-190	247.5	439.0	343.3	6		243.9	472.7	559.2	472.2	705.9	494.1	561.7	501.4	10	
RSO-60	181.3	475.2	328.3	10		279.2	378.3	677.7	508.3	649.3	563.3	581.3	519.6	8	
JHO-2012-2	207.0	514.3	360.6	2	4.5	339.2	427.3	729.6	500.0	624.9	444.8	630.0	528.0	6	1.2
UPO-12-2	132.8	491.4	312.1	12		258.7	440.3	451.8	325.0	639.3	470.4	664.3	464.3	15	
RSO-59	228.4	433.8	331.1	7		214.5	445.3	699.9	472.2	702.6	521.6	655.3	530.2	4	1.7
NDO-724	137.7	442.3	290.0	15		180.5	397.3	696.2	375.0	654.9	453.5	660.0	488.2	12	
OS-6 (NC)	205.3	456.0	330.7	8		285.3	358.0	555.5	355.6	616.0	533.1	596.3	471.4	13	
Kent (NC)	195.0	494.9	345.0	3		247.6	362.0	599.9	402.8	545.0	538.1	599.7	470.7	14	
SKO-90 (ZC-HZ)	185.3	428.1	306.7	14											
OL-125 (ZC-NWZ)						274.1	459.3	622.2	519.4	600.5	535.1	639.7	521.5	7	
JHO-99-2 (ZC-NEZ)															
JHO-822 (ZC-CZ)															
JHO-2000-4 (ZC-SZ)															
Mean	**201.8**	**461.8**	**331.8**			**255.6**	**446.9**	**644.1**	**455.0**	**652.7**	**529.0**	**616.3**	**514.2**		
CD at 5%	24.0	32.3				78.1	81.8	85.7	55.6	57.7	57.5	11.6			
CV%	7.1	12.4				18.3	11.0	7.9	6.8	5.3	11.3	1.1			

Table 2.1 IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha)

Cont.....

Entries	North East Zone										Central Zone										
	Jorh.	Kaly.	Bhub.	Ranc.	Pusa	Faiza.	Imp.	Aver.	Rank	Super.%	Jhan.	Rahu.	Urul.	Karj.	Kanp.	Ana.	Jabal.	Raip.	Aver.	Rank	Super.%
UPO-12-1	293.6	410.0	471.88	417.1	490.0	437.3	245.8	395.1	9		626.3	519.1	773.3	192.4	974.1	824.0	469.2	184.4	570.3	2	7.0
OS-405	421.8	474.8	367.24	497.7	534.0	410.7	387.0	441.9	1	7.2	770.2	567.2	624.0	234.2	914.8	909.0	529.8	194.7	593.0	1	11.3
OL-1709	365.7	481.4	337.25	400.0	482.0	465.6	219.9	393.1	10		585.3	532.1	725.3	126.3	755.6	647.0	538.5	203.7	514.2	11	
JO-04-14	288.9	460.3	426.56	422.1	486.0	515.7	310.3	415.7	4	0.8	596.3	539.0	725.3	208.3	863.0	844.0	550.5	218.5	568.1	3	6.6
JHO-2012-1	351.2	441.1	489.88	444.4	438.0	500.8	386.7	436.0	3	5.7	714.7	478.9	895.9	216.2	788.9	771.0	427.8	209.7	562.9	5	5.6
OL-1760	383.8	455.9	427.89	444.4	547.0	509.9	285.6	436.3	2	5.8	633.0	433.1	784.0	167.0	922.2	855.0	521.2	188.3	563.0	4	5.7
SKO-190	345.0	395.9	466.55	333.3	480.0	368.0	150.0	362.7	14		497.7	506.6	741.3	211.4	803.7	820.0	485.2	168.2	529.3	10	
RSO-60	444.1	438.5	333.25	417.7	487.0	400.0	343.6	409.2	7		672.0	469.6	794.6	208.7	800.0	792.0	506.5	170.7	551.8	7	3.6
JHO-2012-2	355.9	456.3	405.23	395.6	448.0	437.3	334.8	404.7	8		666.7	455.7	757.3	234.6	785.2	904.0	497.2	164.0	558.1	6	4.7
UPO-12-2	254.4	467.4	449.89	448.9	475.0	352.0	200.0	378.2	12		407.3	402.5	789.3	202.0	822.2	797.0	533.2	145.5	512.4	12	
RSO-59	423.8	463.7	419.23	413.3	495.0	362.7	329.7	415.3	5	0.7	607.3	594.5	736.0	215.3	825.9	731.0	466.5	161.8	542.3	8	1.8
NDO-724	343.8	452.2	352.58	475.6	443.0	390.9	247.3	386.5	11		551.5	402.5	744.0	189.4	807.4	619.0	461.2	158.2	491.6	15	
OS-6 (NC)	325.8	480.3	339.92	360.0	416.0	386.7	323.7	376.0	13		611.0	555.2	698.6	152.3	644.4	596.0	553.2	178.9	498.7	13	
Kent (NC)	276.4	435.9	343.25	368.9	482.0	373.3	238.1	359.7	15		638.8	432.6	733.3	194.7	737.0	860.0	491.8	174.6	532.8	9	
SKO-90 (ZC-HZ)																					
OL-125 (ZC-NWZ)																					
JHO-99-2 (ZC-NEZ)	400.6	450.0	385.90	400.0	455.0	440.0	354.8	412.3	6												
JHO-822 (ZC-CZ)											636.8	566.8	624.0	221.3	722.2	614.0	385.2	197.5	496.0	14	
JHO-2000-4 (ZC-SZ)																					
Mean	351.7	450.9	401.1	415.9	477.2	423.4	290.5	401.5			614.3	497.0	743.1	198.3	811.1	772.2	494.5	181.2	539.0		
CD at 5%	8.7	17.4	2.1	36.2	39.4	108.3	42.3				15.7	82.3	30.3	42.3	73.1	118.9	98.5	15.6			
CV%	7.2	2.8	4.1	6.8	11.2	12.6	8.7				1.5	9.9	9.0	12.8	4.6	9.2	11.8	5.1			

Table 2.1 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%
UPO-12-1	381.1	249.7	270.0	300.3	7		459.4	7	6.5
OS-405	440.3	242.3	318.1	333.6	1	8.9	501.3	1	16.3
OL-1709	344.1	264.1	278.9	295.7	9		441.9	9	2.5
JO-04-14	407.0	245.4	231.9	294.7	10		474.5	3	10.0
JHO-2012-1	333.0	212.5	260.0	268.5	14		479.9	2	11.3
OL-1760	403.3	269.4	255.9	309.5	4	1.0	479.9	2	11.3
SKO-190	407.0	287.2	278.9	324.4	3	5.9	442.3	8	2.6
RSO-60	314.5	276.2	277.0	289.3	12		460.7	6	6.8
JHO-2012-2	469.9	258.9	263.0	330.6	2	7.9	470.6	4	9.1
UPO-12-2	340.4	209.7	182.2	244.1	15		420.5	13	
RSO-59	381.1	314.3	220.0	305.1	6		464.2	5	7.6
NDO-724	377.4	213.8	298.5	296.6	8		426.9	11	
OS-6 (NC)	366.3	291.4	260.7	306.2	5		426.0	12	
Kent (NC)	432.9	245.9	198.5	292.4	11		431.2	10	
SKO-90 (ZC-HZ)									
OL-125 (ZC-NWZ)									
JHO-99-2 (ZC-NEZ)									
JHO-822 (ZC-CZ)									
JHO-2000-4 (ZC-SZ)	370.0	211.2	244.4	275.2	13				
Mean	384.6	252.8	255.9	297.7			455.7		
CD at 5%	60.6	13.0	29.7						
CV%	9.4	3.1	9.8						

Table 2.2 IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Dry Matter Yield (q/ha) Cont.....

Entries	Hill Zone					North West Zone							
	Palam.	Srina.	Aver.	Rank	Super%	Bikan.	Hisar	Ludhi.	Pantn.	Meerut	Aver.	Rank	Super%
UPO-12-1	44.6	110.6	77.6	12		39.5	103.7	154.8	127.6	114.6	108.0	8	
OS-405	45.1	122.1	83.6	5		88.8	99.6	123.7	128.7	124.9	113.1	6	
OL-1709	44.3	124.6	84.4	3	0.6	31.5	97.8	171.3	118.7	105.9	105.0	10	
JO-04-14	50.9	132.3	91.6	1	9.2	91.4	100.7	161.1	120.9	113.6	117.5	3	
JHO-2012-1	42.3	117.2	79.7	9		73.0	103.2	120.3	107.6	120.6	104.9	11	
OL-1760	33.8	118.2	76.0	13		50.6	117.9	153.8	116.5	123.6	112.5	7	
SKO-190	47.7	116.0	81.9	6		56.9	78.3	151.4	140.9	108.1	107.1	9	
RSO-60	35.4	125.4	80.4	8		82.0	94.9	164.2	133.2	111.8	117.2	4	
JHO-2012-2	42.2	135.5	88.9	2	5.9	78.4	116.7	178.1	109.8	121.2	120.8	1	0.5
UPO-12-2	26.0	129.3	77.7	11		46.7	54.2	92.4	128.7	127.8	90.0	14	
RSO-59	42.9	114.0	78.4	10		57.9	98.0	159.9	137.6	126.1	115.9	5	
NDO-724	26.5	116.4	71.5	15		44.6	111.4	123.5	117.6	127.0	104.8	12	
OS-6 (NC)	41.9	120.0	81.0	7		80.2	100.0	120.9	119.8	114.7	107.1	9	
Kent (NC)	37.8	129.9	83.9	4		73.0	108.0	126.4	99.9	115.4	104.5	13	
SKO-90 (ZC-HZ)	38.2	113.0	75.6	14									
OL-125 (ZC-NWZ)						76.2	124.4	170.9	106.5	123.1	120.2	2	
JHO-99-2 (ZC-NEZ)													
JHO-822 (ZC-CZ)													
JHO-2000-4 (ZC-SZ)													
Mean	40.0	121.6	80.8			64.7	100.6	144.8	120.9	118.6	109.9		
CD at 5%	5.0	11.4				20.7	13.4	15.3	19.9	2.2			
CV%	7.5	8.3				19.1	7.9	7.8	10.0	1.1			

Table 2.2 IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Dry Matter Yield (q/ha)

Cont.....

Entries	North East Zone										Central Zone										
	Jorh.	Kaly.	Bhuba.	Ranc.	Pusa	Faiza.	Imph.	Aver.	Rank	Super%	Jhansi	Rahu.	Uruli.	Karj.	Kanp.	Anand	Jabal.	Raip.	Aver.	Rank	Super%
UPO-12-1	57.9	57.3	94.7	124.1	98.6	81.3	50.3	80.6	5		97.4	64.9	143.9	37.5	331.9	154.1	102.1	47.9	122.5	2	9.9
OS-405	80.5	68.2	73.4	121.3	103.5	75.5	58.4	83.0	1	1.0	128.5	83.9	139.1	42.2	311.9	160.9	116.9	50.2	129.2	1	15.9
OL-1709	67.4	72.2	68.3	89.9	96.0	94.4	50.4	76.9	7		107.7	84.6	146.0	23.3	256.7	97.6	119.7	51.9	110.9	12	
JO-04-14	54.1	64.6	85.1	91.6	95.9	105.7	57.4	79.2	6		85.4	82.1	135.5	40.7	293.3	126.6	123.1	55.9	117.8	6	5.7
JHO-2012-1	63.9	60.2	104.4	103.3	87.1	98.8	56.4	82.0	3		112.4	71.1	164.6	43.2	268.2	139.6	83.8	53.9	117.1	7	5.0
OL-1760	67.3	64.6	85.7	86.7	109.6	99.4	59.6	81.8	4		87.3	64.7	149.2	33.4	314.1	135.6	114.9	48.8	118.5	5	6.3
SKO-190	54.5	59.4	106.6	90.5	93.6	72.4	33.1	72.9	14		119.3	74.8	137.0	41.6	274.8	135.9	105.8	42.4	116.5	8	4.5
RSO-60	69.5	66.5	65.2	85.7	94.2	74.2	61.8	73.9	12		109.5	89.2	132.2	41.7	271.9	149.9	113.3	43.3	118.9	4	6.6
JHO-2012-2	60.7	66.2	80.3	83.5	90.9	90.1	55.8	75.4	9		103.7	54.5	170.0	43.3	265.2	106.7	115.5	42.8	112.7	10	1.0
UPO-12-2	42.9	64.5	90.2	105.6	95.8	69.3	52.2	74.4	10		86.9	58.1	165.6	40.4	281.5	131.1	119.3	37.8	115.1	9	3.2
RSO-59	59.3	69.4	83.9	85.7	100.4	73.9	60.9	76.2	8		109.3	89.4	132.9	43.1	285.2	149.6	101.4	41.0	119.0	3	6.7
NDO-724	59.8	62.4	71.0	109.5	87.0	75.3	53.9	74.1	11		88.0	64.9	126.5	36.9	276.7	133.9	101.1	39.2	108.4	13	
OS-6 (NC)	57.6	71.2	76.1	80.3	83.4	72.6	72.2	73.3	13		96.0	80.7	130.8	30.5	220.4	134.6	123.5	45.7	107.8	14	
Kent (NC)	45.0	62.9	69.7	81.9	95.6	74.9	55.2	69.3	15		105.3	69.7	139.1	37.6	250.0	138.0	107.5	44.8	111.5	11	
SKO-90 (ZC-HZ)																					
OL-125 (ZC-NWZ)																					
JHO-99-2 (ZC-NEZ)	77.9	66.8	77.4	107.9	89.6	87.0	68.9	82.2	2												
JHO-822 (ZC-CZ)											107.0	70.1	122.4	44.3	247.0	91.5	79.1	48.9	101.3	15	
JHO-2000-4 (ZC-SZ)																					
Mean	61.2	65.1	82.1	96.5	94.7	83.0	56.4	77.0			102.9	73.5	142.3	38.6	276.6	132.4	108.5	46.3	115.1		
CD at 5%	5.8	6.8	0.4	23.9	14.3	13.0	10.9				11.6	12.7	11.8	7.7	44.7	20.7	20.1	5.7			
CV%	11.6	6.1	4.3	14.7	10.1	9.4	11.6				7.0	10.3	10.7	11.9	4.8	9.6	11.0	7.4			

Table 2.2 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%
UPO-12-1	71.3	47.9	56.9	58.7	8	1.6	96.6	4	7.0
OS-405	93.2	54.2	74.5	74.0	1	28.0	102.8	1	13.9
OL-1709	64.4	58.8	58.5	60.6	6	4.8	92.1	10	2.1
JO-04-14	89.5	48.3	50.4	62.7	4	8.5	98.2	2	8.9
JHO-2012-1	63.8	41.4	57.5	54.2	12		94.3	8	4.5
OL-1760	69.0	61.3	51.9	60.7	5	5.0	96.7	3	7.2
SKO-190	71.6	66.2	58.9	65.6	3	13.5	93.5	9	3.7
RSO-60	58.7	63.3	58.7	60.2	7	4.2	95.8	7	6.2
JHO-2012-2	88.1	50.8	59.9	66.2	2	14.5	96.4	5	6.9
UPO-12-2	70.0	49.1	38.7	52.6	13		88.2	14	
RSO-59	66.6	69.8	44.3	60.2	7	4.2	96.1	6	6.5
NDO-724	65.7	48.8	60.0	58.2	9	0.7	89.1	13	
OS-6 (NC)	65.6	65.5	51.2	60.7	5		90.2	11	
Kent (NC)	73.5	58.2	41.6	57.8	10		89.6	12	
SKO-90 (ZC-HZ)									
OL-125 (ZC-NWZ)									
JHO-99-2 (ZC-NEZ)									
JHO-822 (ZC-CZ)									
JHO-2000-4 (ZC-SZ)	74.5	48.2	46.5	56.4	11				
Mean	72.4	55.4	54.0	60.6			94.3		
CD at 5%	8.6	4.3	7.1						
CV%	15.4	4.6	11.9						

Table 2.3 IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha/day)

Cont.....

Entries	Palam.	Bikaner	Hisar	Ludhi.	Pantn.	Meerut	Jorhat	Kalyani	Bhuban.	Ranchi	Pusa	Faiza.
UPO-12-1	1.05	1.71	5.14	3.80	5.51	5.72	3.42	4.32	5.19	4.21	5.33	3.71
OS-405	1.08	2.90	5.88	3.93	6.85	6.24	5.15	5.70	6.12	5.30	5.51	3.63
OL-1709	1.05	1.29	5.24	4.99	6.05	5.29	4.71	6.25	5.11	4.76	5.07	4.39
JO-04-14	1.26	2.99	5.43	4.02	6.30	5.67	3.78	5.35	5.84	4.80	5.23	4.91
JHO-2012-1	1.00	2.97	6.30	4.17	5.51	6.05	3.99	4.64	6.05	4.78	4.87	4.72
OL-1760	0.81	2.52	6.19	4.19	5.56	6.18	4.93	5.30	5.03	4.88	5.82	4.76
SKO-190	1.10	2.32	4.37	3.50	5.34	5.39	3.37	4.17	5.02	3.12	5.05	3.22
RSO-60	0.84	2.66	5.47	4.38	5.69	5.59	5.70	5.69	5.55	4.97	5.47	3.60
JHO-2012-2	1.00	3.23	6.08	4.55	5.29	6.05	4.03	5.93	5.40	4.55	5.20	3.94
UPO-12-2	0.62	2.16	3.50	2.48	5.19	6.38	2.47	4.97	5.06	4.40	5.22	3.06
RSO-59	1.10	2.04	5.51	4.29	6.21	5.76	4.73	4.93	6.35	4.86	5.38	3.48
NDO-724	0.64	1.72	5.95	3.23	5.67	6.34	3.75	4.81	5.26	5.28	4.61	3.65
OS-6 (NC)	1.00	2.72	4.71	3.23	5.83	5.73	3.75	6.24	5.15	4.24	4.78	4.49
Kent (NC)	0.94	2.36	5.22	3.91	5.36	6.30	3.10	4.49	4.83	4.44	5.48	3.39
SKO-90 (ZC-HZ)	0.86											
OL-125 (ZC-NWZ)		2.61	4.41	5.04	6.01	6.15						
JHO-99-2 (ZC-NEZ)							5.25	5.84	6.65	4.65	4.95	4.03
JHO-822 (ZC-CZ)												
JHO-2000-4 (ZC-SZ)												
Mean	**0.96**	**2.41**	**5.29**	**3.98**	**5.76**	**5.92**	**4.14**	**5.24**	**5.51**	**4.62**	**5.20**	**3.93**

Table 2.3 IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha/day)

Entries	Jhansi	Rahuri	Urulika.	Karjat	Kanp.	Anand	Raipur	Hydera.	Mandya	Coimba.	Average	Rank
UPO-12-1	6.46	5.41	8.41	2.43	8.33	8.41	2.19	4.21	3.06	4.15	4.64	12
OS-405	7.94	6.45	7.26	2.93	9.06	9.57	2.59	5.51	3.21	4.89	5.35	1
OL-1709	6.65	7.39	9.94	1.83	8.59	8.51	2.72	4.55	4.23	4.65	5.15	6
JO-04-14	6.63	6.57	8.63	2.54	8.81	9.70	2.60	5.11	3.37	3.57	5.14	7
JHO-2012-1	7.37	5.38	10.18	2.81	7.44	8.12	2.50	4.28	3.10	4.13	5.02	9
OL-1760	6.53	4.71	8.81	2.04	8.70	12.95	2.24	4.91	3.63	3.88	5.21	4
SKO-190	4.37	5.17	7.41	2.58	6.75	8.37	2.00	4.71	3.31	4.10	4.31	13
RSO-60	7.43	5.87	10.32	3.16	9.09	9.90	2.28	4.38	4.68	4.62	5.33	2
JHO-2012-2	7.17	5.30	8.91	2.86	8.01	10.39	2.19	5.76	3.72	4.17	5.17	5
UPO-12-2	3.57	4.03	7.66	2.52	7.41	7.89	1.52	4.54	2.45	2.60	4.08	14
RSO-59	6.60	7.25	9.68	3.53	9.18	9.14	2.16	5.32	5.24	3.38	5.28	3
NDO-724	5.81	4.85	9.54	2.91	7.99	7.74	1.88	4.88	3.47	4.74	4.76	11
OS-6 (NC)	6.79	7.71	9.32	2.54	7.24	7.45	2.38	5.09	4.64	4.21	4.96	10
Kent (NC)	7.22	5.34	9.65	3.25	8.28	13.03	2.33	5.55	3.90	3.20	5.07	8
SKO-90 (ZC-HZ)												
OL-125 (ZC-NWZ)												
JHO-99-2 (ZC-NEZ)												
JHO-822 (ZC-CZ)	7.24	7.00	8.43	3.21	7.52	7.68	2.63					
JHO-2000-4 (ZC-SZ)								4.67	3.28	3.94		
Mean	**6.52**	**5.90**	**8.94**	**2.74**	**8.16**	**9.26**	**2.28**	**4.90**	**3.69**	**4.02**	**4.96**	

Table 2.4 IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Dry Matter Yield (q/ha/day)

Cont....

Entries	Bikaner	Hisar	Ludhiana	Pantna.	Jorhat	Kalyani	Bhuban.	Ranchi	Pusa	Faizabad	Jhansi
UPO-12-1	0.38	0.82	1.18	1.03	0.67	0.60	1.04	1.25	1.07	0.68	1.00
OS-405	0.85	0.82	1.05	1.10	0.98	0.82	1.22	1.29	1.06	0.67	1.33
OL-1709	0.30	0.84	1.66	1.17	0.87	0.94	1.03	1.07	1.01	0.89	1.22
JO-04-14	0.87	0.87	1.46	1.14	0.71	0.75	1.17	1.04	1.03	1.01	0.95
JHO-2012-1	0.69	0.88	1.02	0.91	0.73	0.63	1.29	1.11	0.97	0.93	1.16
OL-1760	0.48	0.99	1.33	1.00	0.86	0.75	1.01	0.95	1.17	0.92	0.90
SKO-190	0.54	0.61	1.12	1.06	0.53	0.63	1.15	0.85	0.98	0.63	1.05
RSO-60	0.78	0.77	1.42	1.16	0.89	0.86	1.09	1.02	1.06	0.67	1.21
JHO-2012-2	0.75	0.97	1.62	0.93	0.69	0.68	1.07	0.96	1.04	0.81	1.11
UPO-12-2	0.39	0.42	0.71	1.04	0.42	0.69	1.01	1.05	1.05	0.60	0.76
RSO-59	0.55	0.77	1.45	1.21	0.66	0.74	1.27	1.01	1.09	0.71	1.19
NDO-724	0.42	0.95	1.06	1.01	0.65	0.66	1.06	1.22	0.91	0.70	0.93
OS-6 (NC)	0.76	0.85	1.10	1.13	0.66	0.92	1.15	0.94	0.96	0.84	1.07
Kent (NC)	0.70	0.94	1.23	0.98	0.50	0.65	0.98	0.99	1.09	0.68	1.19
SKO-90 (ZC-HZ)											
OL-125 (ZC-NWZ)	0.73	0.88	1.66	1.06							
JHO-99-2 (ZC-NEZ)					1.02	0.87	1.33	1.25	0.97	0.80	
JHO-822 (ZC-CZ)											1.22
JHO-2000-4 (ZC-SZ)											
Mean	**0.61**	**0.83**	**1.27**	**1.06**	**0.72**	**0.75**	**1.12**	**1.07**	**1.03**	**0.77**	**1.09**

Table 2.4 IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Dry Matter Yield (q/ha/day)

Entries	Rahuri	Urulika.	Karjat	Kanpur	Anand	Raipur	Hydera.	Mandya	Coimbatore	Average	Rank
UPO-12-1	0.68	1.56	0.47	2.84	1.57	0.57	0.79	0.59	0.87	0.98	9
OS-405	0.95	1.62	0.53	3.09	1.69	0.67	1.18	0.72	1.15	1.14	1
OL-1709	1.17	2.00	0.34	2.92	1.28	0.69	0.85	0.94	0.97	1.11	3
JO-04-14	1.00	1.61	0.50	2.99	1.46	0.67	1.12	0.66	0.78	1.09	4
JHO-2012-1	0.80	1.87	0.56	2.53	1.47	0.64	0.82	0.60	0.91	1.03	7
OL-1760	0.70	1.68	0.41	2.96	2.05	0.58	0.84	0.83	0.79	1.06	5
SKO-190	0.76	1.37	0.51	2.31	1.39	0.50	0.83	0.76	0.87	0.92	10
RSO-60	1.12	1.72	0.63	3.09	1.87	0.58	0.82	1.07	0.98	1.14	1
JHO-2012-2	0.63	2.00	0.53	2.71	1.23	0.57	1.09	0.73	0.95	1.05	6
UPO-12-2	0.58	1.61	0.50	2.54	1.30	0.39	0.93	0.57	0.55	0.86	11
RSO-59	1.09	1.75	0.71	3.17	1.87	0.55	0.93	1.16	0.68	1.13	2
NDO-724	0.78	1.62	0.57	2.74	1.67	0.47	0.85	0.79	0.95	1.00	8
OS-6 (NC)	1.12	1.74	0.51	2.48	1.68	0.61	0.91	1.04	0.83	1.06	5
Kent (NC)	0.86	1.83	0.63	2.81	2.09	0.60	0.94	0.92	0.67	1.06	5
SKO-90 (ZC-HZ)											
OL-125 (ZC-NWZ)											
JHO-99-2 (ZC-NEZ)											
JHO-822 (ZC-CZ)	0.87	1.65	0.64	2.57	1.14	0.65					
JHO-2000-4 (ZC-SZ)							0.94	0.75	0.75		
Mean	**0.87**	**1.71**	**0.54**	**2.78**	**1.58**	**0.58**	**0.92**	**0.81**	**0.85**	**1.05**	

Table 2.5 IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Crude Protein Yield (q/ha)

Entries	Palam.	Ludhi.	Bhuban.	Faizab.	Imphal	Rahuri	Urulika.	Anand	Jabal.	Raipur	Hydera.	Mandya	Coimba.	Ranchi	Aver.	Rank
UPO-12-1	4.3	10.8	10.1	6.5	2.5	5.1	11.6	13.6	8.1	4.0	8.1	3.2	8.2	10.3	7.6	2
OS-405	4.1	8.4	7.2	6.2	3.3	7.7	11.7	15.9	9.5	4.3	7.5	3.1	10.1	10.1	7.8	1
OL-1709	4.7	11.1	6.8	7.5	2.6	6.3	14.8	9.7	9.7	4.6	5.3	3.9	7.4	8.3	7.3	4
JO-04-14	4.9	14.3		8.2	3.2	5.4	11.5	13.4	10.0	5.0	7.8	3.2	7.5	7.6	7.8	1
JHO-2012-1	4.1	7.8	10.5	7.9	3.4	5.6	13.6	12.2	6.5	4.7	5.3	2.5	8.8	8.6	7.2	5
OL-1760	3.9	9.7	8.6	8.1	2.2	4.8	13.0	11.4	9.3	4.1	5.7	3.8	7.4	8.3	7.2	5
SKO-190	4.9	9.8	10.4	6.2	1.3	4.9	10.3	13.8	8.5	3.3	6.2	5.8	8.9	8.3	7.3	4
RSO-60	3.5	11.8	6.2	6.4	2.6	6.3	12.7	16.7	9.1	3.5	5.6	4.2	9.0	7.1	7.5	3
JHO-2012-2	2.5	12.5	7.9	7.5	3.1	4.1	13.9	14.7	9.1	3.4	7.3	4.0	8.4	6.9	7.5	3
UPO-12-2	3.8	8.1	9.1	5.8	2.9	4.8	14.0	12.8	9.6	2.7	6.4	3.9	6.3	8.8	7.1	6
RSO-59	2.6	10.7	8.4	5.8	2.2	6.7	12.9	13.7	8.1	3.2	6.7	4.9	6.2	7.1	7.1	6
NDO-724	4.3	8.9	7.7	5.9	4.8	5.4	11.6	11.3	8.0	2.9	6.3	4.0	8.4	9.1	7.1	6
OS-6 (NC)	3.8	9.1	7.7	5.8	3.8	5.7	13.3	11.1	10.1	3.8	6.6	4.6	7.2	7.4	7.1	6
Kent (NC)	4.2	10.6	6.9	5.9	1.9	4.6	12.5	15.5	8.3	3.6	6.1	4.1	6.0	6.8	6.9	7
SKO-90 (ZC-HZ)	4.0															
OL-125 (ZC-NWZ)		13.5														
JHO-99-2 (ZC-NEZ)			7.6	7.2	3.7									9.4		
JHO-822 (ZC-CZ)			8.5			5.2	12.5	9.6	6.1	4.2						
JHO-2000-4 (ZC-SZ)											5.1	3.2	7.4			
Mean	**4.0**	**10.5**	**8.2**	**6.7**	**2.9**	**5.5**	**12.7**	**13.0**	**8.7**	**3.8**	**6.4**	**3.9**	**7.8**	**8.3**	**7.3**	

Table 2.6 IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Crude Protein (%)

Entries	Palam.	Ludhi.	Bhuban.	Faiza.	Imphal	Rahuri	Urulika.	Anand	Jabal.	Raipur	Hyder.	Coimb.	Ranchi	Aver.	Rank
UPO-12-1	9.6	7.0	10.7	8.0	4.9	7.9	8.1	8.8	8.0	8.3	11.4	14.4	8.3	8.9	4
OS-405	9.0	6.8	9.8	8.2	5.7	9.2	8.4	9.9	8.2	8.6	8.1	13.6	8.3	8.7	6
OL-1709	10.5	6.5	10.0	7.9	5.1	7.4	10.2	9.9	8.2	8.8	8.3	12.7	9.2	8.8	5
JO-04-14	9.6	8.9	10.0	7.8	5.6	6.6	8.5	10.1	8.2	8.9	8.7	14.9	8.3	8.9	4
JHO-2012-1	9.6	6.5	10.1	8.0	6.0	7.9	8.3	8.8	7.8	8.6	8.3	15.3	8.3	8.7	6
OL-1760	11.4	6.3	10.0	8.2	3.6	7.4	8.7	8.4	8.1	8.4	8.3	14.4	9.6	8.7	6
SKO-190	10.2	6.5	9.8	8.5	4.1	6.6	7.5	9.2	8.1	7.9	8.7	15.1	9.2	8.6	7
RSO-60	9.9	7.2	9.5	8.6	4.1	7.0	9.6	12.4	8.1	8.0	9.6	15.3	8.3	9.1	2
JHO-2012-2	9.6	7.0	9.8	8.3	5.5	7.4	8.2	11.2	8.2	7.9	8.3	14.0	8.3	8.7	6
UPO-12-2	9.9	8.8	10.0	8.4	5.6	8.3	8.4	9.3	8.2	7.2	9.2	16.2	8.3	9.1	2
RSO-59	9.6	6.7	10.0	7.8	3.6	7.4	9.7	10.2	8.0	7.7	10.1	14.0	8.3	8.7	6
NDO-724	10.2	7.2	10.9	7.9	8.9	8.3	9.2	11.3	8.0	7.5	9.6	14.0	8.3	9.3	1
OS-6 (NC)	8.8	7.5	10.2	8.0	5.2	7.0	10.2	10.4	8.2	8.2	10.1	14.0	9.2	9.0	3
Kent (NC)	9.9	8.4	9.9	7.9	3.4	6.6	9.0	10.3	8.1	8.1	8.3	14.4	8.3	8.7	6
SKO-90 (ZC-HZ)	10.5														
OL-125 (ZC-NWZ)		7.9													
JHO-99-2 (ZC-NEZ)			9.8	8.3	5.3								8.8		
JHO-822 (ZC-CZ)						7.4	10.2	10.5	7.8	8.7					
JHO-2000-4 (ZC-SZ)											6.6	15.8			
Mean	**9.9**	**7.3**	**10.0**	**8.1**	**5.1**	**7.5**	**8.9**	**10.0**	**8.1**	**8.2**	**8.9**	**14.5**	**8.6**	**8.8**	

Table 2.7 IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Plant Height (cm)

Cont.....

Entries	Palam.	Srina.	Bikaner	Jalore	Hisar	Ludhi.	Pantn.	Udaipur	Meerut	Jorhat	Kalyani	Bhuban.	Ranchi	Faiza.
UPO-12-1	97.3	121.6	99.0	116.3	109.7	141.0	158.0	138.4	161.4	143.7	114.6	178.6	132.0	100.5
OS-405	105.6	154.9	146.0	157.0	140.7	121.3	161.0	148.8	139.5	171.3	152.9	155.5	139.0	125.8
OL-1709	113.0	145.4	110.0	151.7	130.6	115.0	144.3	145.3	146.2	142.7	153.9	137.5	128.0	128.0
JO-04-14	123.0	165.1	124.0	148.0	126.9	120.0	151.0	142.2	147.1	145.0	141.1	164.4	136.0	138.0
JHO-2012-1	112.3	124.5	123.0	143.0	123.2	124.3	147.0	128.7	133.3	143.9	135.6	173.5	130.0	122.6
OL-1760	89.3	132.2	108.0	138.3	119.1	110.3	157.3	130.7	157.2	146.2	138.9	165.0	134.0	123.8
SKO-190	82.0	100.0	93.0	114.7	101.7	120.0	156.7	107.6	162.4	134.3	111.2	168.7	101.0	115.8
RSO-60	78.6	145.9	119.0	135.7	121.3	113.3	143.3	132.9	149.7	151.0	146.2	134.5	127.2	117.0
JHO-2012-2	115.3	169.0	134.0	139.7	142.5	120.7	165.0	144.9	143.0	141.3	138.0	162.0	129.4	142.0
UPO-12-2	104.6	124.8	95.0	113.3	111.7	130.0	163.3	130.3	140.2	127.0	149.7	167.4	124.6	135.0
RSO-59	110.0	138.3	124.0	141.3	130.9	97.3	170.0	127.2	146.9	159.9	145.3	166.0	123.4	137.8
NDO-724	85.3	135.6	92.0	147.7	146.6	113.3	166.0	129.7	151.9	142.7	136.1	151.3	128.6	140.5
OS-6 (NC)	100.6	142.7	104.0	147.0	133.9	113.7	135.0	140.9	150.5	141.8	151.5	141.5	127.2	138.5
Kent (NC)	105.0	132.2	107.0	139.7	137.1	102.3	138.0	127.9	150.3	138.5	133.9	146.3	123.5	136.6
SKO-90 (ZC-HZ)	67.3	132.8												
OL-125 (ZC-NWZ)			121.0	146.3	128.5	108.0	146.7	128.8	146.5					
JHO-99-2 (ZC-NEZ)										158.7	140.4	158.5	128.0	126.0
JHO-822 (ZC-CZ)														
JHO-2000-4 (ZC-SZ)														
Mean	**99.3**	**137.7**	**113.3**	**138.6**	**127.0**	**116.7**	**153.5**	**133.6**	**148.4**	**145.9**	**139.3**	**158.0**	**127.5**	**128.5**

Table 2.7 IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Plant Height (cm)

Entries	Imphal	Jhansi	Rahuri	Urulika.	Karjat	Kanpur	Anand	Jabal.	Raipur	Hyder.	Mandya	Coimba.	Aver.	Rank
UPO-12-1	161.9	159.4	122.3	100.4	78.7	94.9	156.5	122.9	120.8	94.2	83.3	112.0	123.8	6
OS-405	166.6	166.2	125.7	105.1	80.5	99.0	156.3	139.2	112.4	105.1	96.9	120.0	134.3	1
OL-1709	152.0	161.2	120.7	107.2	83.8	98.4	141.8	139.7	92.1	87.8	71.9	135.0	126.3	4
JO-04-14	151.2	147.6	103.5	103.0	75.8	105.5	138.5	143.9	102.6	93.2	66.9	102.0	127.1	3
JHO-2012-1	140.8	148.7	108.3	116.7	79.7	94.8	143.4	112.4	92.5	91.1	30.8	110.0	120.5	8
OL-1760	134.3	145.7	111.9	99.4	87.5	96.2	137.5	122.0	84.6	92.5	72.6	100.0	120.6	7
SKO-190	120.2	153.9	102.5	125.3	89.3	103.3	134.4	120.2	73.0	93.0	63.0	92.0	113.0	11
RSO-60	144.1	133.7	104.1	100.2	98.2	88.5	130.2	135.1	93.9	79.5	71.7	128.0	120.1	9
JHO-2012-2	140.0	154.3	115.2	109.3	93.4	124.8	139.9	135.1	95.3	105.0	36.0	124.0	129.2	2
UPO-12-2	121.9	165.7	110.3	112.3	90.6	94.8	159.4	142.4	83.9	85.8	70.3	81.0	120.6	7
RSO-59	132.7	130.9	113.8	95.9	98.2	85.2	117.6	111.5	78.4	82.6	70.5	98.0	120.5	8
NDO-724	130.4	139.8	113.7	97.2	79.2	98.7	136.7	113.8	86.0	87.7	82.2	104.0	120.6	7
OS-6 (NC)	139.7	134.8	128.7	106.6	100.8	99.1	126.7	144.7	93.6	86.0	76.8	125.0	124.3	5
Kent (NC)	124.9	139.0	115.9	94.6	86.6	97.2	140.8	126.2	79.9	89.5	38.4	85.0	116.8	10
SKO-90 (ZC-HZ)														
OL-125 (ZC-NWZ)														
JHO-99-2 (ZC-NEZ)	131.0													
JHO-822 (ZC-CZ)		136.0	106.8	91.9	85.2	90.4	122.9	109.8	80.4					
JHO-2000-4 (ZC-SZ)										93.8	29.9	117.0		
Mean	**139.4**	**147.8**	**113.6**	**104.3**	**87.2**	**98.1**	**138.8**	**127.9**	**91.3**	**91.1**	**64.1**	**108.9**	**122.7**	

Table 2.8 IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut):Leaf Stem Ratio

Cont.....

Entries	Palam.	Srina.	Bikaner	Ludhi.	Pantn.	Meerut	Jorhat	Kaly.	Bhuba.	Ranchi	Faiza.	Imphal
UPO-12-1	0.45	0.38	0.40	0.67	0.40	0.21	1.08	1.14	1.21	0.33	0.71	0.37
OS-405	0.49	0.49	0.37	0.67	0.47	0.20	1.23	0.63	0.85	0.32	0.72	0.49
OL-1709	0.46	0.46	0.36	1.35	0.46	0.21	0.88	0.50	0.75	0.38	0.75	0.34
JO-04-14	0.45	0.52	0.66	0.67	0.49	0.17	1.06	1.00	0.99	0.47	0.80	0.49
JHO-2012-1	0.41	0.39	0.40	0.60	0.60	0.19	0.91	0.56	1.24	0.25	0.79	0.33
OL-1760	0.82	0.42	0.68	0.67	0.50	0.21	0.98	0.92	1.03	0.53	0.75	0.41
SKO-190	0.69	0.32	0.63	0.82	0.48	0.21	1.02	0.71	1.12	0.24	0.69	0.32
RSO-60	0.42	0.46	0.43	1.00	0.37	0.18	0.99	0.50	0.73	0.28	0.75	0.50
JHO-2012-2	0.29	0.53	0.60	0.82	0.55	0.19	0.97	0.93	0.93	0.35	0.75	0.35
UPO-12-2	0.64	0.39	0.90	0.60	0.35	0.19	0.84	1.00	1.10	0.43	0.81	0.49
RSO-59	0.70	0.44	0.29	0.67	0.35	0.20	1.04	1.08	0.96	0.38	0.81	0.35
NDO-724	0.55	0.43	0.63	0.90	0.50	0.18	1.16	0.85	0.80	0.41	0.80	0.51
OS-6 (NC)	0.69	0.45	0.29	0.54	0.40	0.18	1.08	0.88	0.77	0.28	0.74	0.36
Kent (NC)	0.56	0.42	0.43	0.48	0.42	0.18	0.99	1.09	0.80	0.34	0.80	0.32
SKO-90 (ZC-HZ)	0.52	0.42										
OL-125 (ZC-NWZ)			0.63	1.00	0.58	0.20						
JHO-99-2 (ZC-NEZ)							1.03	0.56	0.90	0.33	0.71	0.59
JHO-822 (ZC-CZ)												
JHO-2000-4 (ZC-SZ)												
Mean	**0.54**	**0.43**	**0.51**	**0.76**	**0.46**	**0.19**	**1.02**	**0.82**	**0.94**	**0.35**	**0.76**	**0.41**

Table 2.8 IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut):Leaf Stem Ratio

Entries	Rahuri	Urulikan.	Karjat	Kanpur	Jabalpur	Raipur	Hydera.	Mandya	Coimbat.	Average	Rank
UPO-12-1	0.87	0.74	0.72	0.62	0.62	0.58	0.58	0.47	0.35	0.61	3
OS-405	0.67	0.65	0.74	0.43	0.72	0.63	0.37	0.43	0.42	0.57	5
OL-1709	0.77	0.65	0.82	0.37	0.71	0.54	0.52	0.32	0.32	0.57	5
JO-04-14	0.83	0.61	0.83	0.35	0.77	0.66	0.41	0.39	0.37	0.62	2
JHO-2012-1	0.49	0.58	0.77	0.41	0.56	0.51	0.38	0.27	0.45	0.53	9
OL-1760	0.94	0.99	0.82	0.55	0.70	0.38	0.56	0.36	0.43	0.65	1
SKO-190	0.67	0.98	0.89	0.48	0.67	0.32	0.33	0.43	0.46	0.59	4
RSO-60	0.49	0.68	0.82	0.44	0.68	0.46	0.44	0.20	0.36	0.53	9
JHO-2012-2	0.65	0.63	0.92	0.38	0.74	0.45	0.27	0.24	0.32	0.56	6
UPO-12-2	0.72	0.75	0.68	0.56	0.74	0.39	0.61	0.42	0.40	0.62	2
RSO-59	0.47	0.46	0.86	0.45	0.61	0.34	0.54	0.15	0.39	0.55	7
NDO-724	0.78	0.83	0.74	0.48	0.63	0.40	0.54	0.24	0.40	0.61	3
OS-6 (NC)	0.36	0.82	0.79	0.35	0.77	0.43	0.50	0.26	0.37	0.54	8
Kent (NC)	0.88	0.58	0.78	0.35	0.67	0.35	0.53	0.24	0.36	0.55	7
SKO-90 (ZC-HZ)											
OL-125 (ZC-NWZ)											
JHO-99-2 (ZC-NEZ)											
JHO-822 (ZC-CZ)	0.77	0.50	0.75	0.36	0.51	0.36					
JHO-2000-4 (ZC-SZ)							0.54	0.31	0.33		
Mean	**0.69**	**0.70**	**0.80**	**0.44**	**0.67**	**0.45**	**0.47**	**0.32**	**0.38**	**0.58**	

Table 2.9 IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut):IVDMD (%), ADF (%) & NDF(%)

Entries	IVDMD (%)		ADF (%)		NDF (%)	
	Ludhiana	Rank	Ludhiana	Rank	Ludhiana	Rank
UPO-12-1	60.6	7	37.7	7	53.4	7
OS-405	60.0	8	38.7	8	53.8	8
OL-1709	59.0	9	39.0	9	56.8	11
JO-04-14	64.8	1	34.1	1	50.5	1
JHO-2012-1	59.0	9	39.2	11	56.0	9
OL-1760	58.9	10	39.5	12	58.4	12
SKO-190	59.0	9	39.2	11	56.8	11
RSO-60	61.0	6	37.0	6	53.3	6
JHO-2012-2	60.6	7	37.7	7	53.4	7
UPO-12-2	64.0	2	34.5	2	51.1	2
RSO-59	59.2	8	39.1	10	56.5	10
NDO-724	61.0	6	37.0	6	53.3	6
OS-6 (NC)	61.4	5	35.6	5	52.6	5
Kent (NC)	63.2	3	34.9	3	51.2	3
SKO-90 (ZC-HZ)						
OL-125 (ZC-NWZ)	61.8	4	35.1	4	51.8	4
JHO-99-2 (ZC-NEZ)						
JHO-822 (ZC-CZ)						
JHO-2000-4 (ZC-SZ)						
Mean	**60.9**		**37.2**		**53.9**	

3. AVTO (SC)-1: First Advanced Varietal Trial in Oat (Single Cut)

(Table Reference: 3.1 to 3.10)

In Oat (Single cut), eight entries namely OS-403, UPO-05-1, NDO-711, UPO-06-1, RJB-1, NDO-10, SKO-167 and JO-04-11 along with national checks namely Kent and OS-6 and five zonal checks *i.e.* SKO-90, OL-125, JHO-99-2, JHO-822 and JHO-2000-4 for respective zones were evaluated in advanced varietal trial at 27 locations across five zones of the country. For the character green forage yield (q/ha), entries NDO-711 (7.0%), NDO-10 (4.8%), UPO-06-1 (4.6%), UPO-05-1 (3.8%) and OS-403 (1.2%) in Hill zone, OS-403 (16.6%) and UPO-05-1 (3.2%) in North-West zone, NDO-711 (8.9%), OS-403 (5.6%), NDO-10 (2.1%) and RJB-1 (0.6%) in North East zone, JO-04-11 (4.7%), NDO-10 (4.5%), NDO-711 (4.1%), RJB-1 (3.6%), OS-403 (2.6%) and UPO-06-1 (2.5%) in central zone and NDO-711 (5.3%) and JO-04-11 (1.5%) in South zone exhibited their superiority whereas at national level entry OS-403 (9.7%) ranked first for this character.

Similarly for dry matter yield (q/ha), entries UPO-06-1 (7.9%), NDO-711 (4.9%), OS-403 (4.5%) and UPO-05-1 (2.5%) in Hill zone, OS-403 (10.4%) in North-West zone, NDO-711 (10.3%), NDO-10 (4.9%), OS-403 (4.6%), RJB-1 (2.0%), UPO-06-1 and JO-04-11 (1.9%) in North-East zone, UPO-06-1 (11.5%), NDO-711 (4.1%), NDO-10 (2.1%), RJB-1 (1.0%) and JO-04-11 (0.1%) in central zone, NDO-711 (0.2%) in South zone exhibited superiority over best zonal/national check. While, at national level, entry NDO-711 (7.6%) ranked first for this character. For fodder production potential (q/ha/day), entry NDO-711 maintained superiority both for green forage and dry matter production potential.

For plant height, entry OS-403 (128.6 cm) ranked first whereas for leaf stem ratio, entry UPO-06-1 (0.60) established its superiority.

In quality parameters, entry UPO-06-1 ranked first for crude protein yield (q/ha). SKO-167 was adjudged best performer for crude protein content. For other quality parameters, entry RJB-1 for IVDMD (%), JO-04-11 for ADF (%) and UPO-05-1 for NDF (%) was observed to be best performers.

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

Cont.....

Entries	Hill Zone					North West Zone									
	Palam.	**Srina.**	**Aver.**	**Rank**	**Super%**	**Bika.**	**Jalore**	**Hisar**	**Ludhi.**	**Pantn.**	**Udaipur**	**Meerut**	**Aver.**	**Rank**	**Super%**
OS-403	262.2	502.8	382.5	5	1.2	340.9	304.3	941.3	455.6	530.6	524.1	875.0	567.4	1	16.6
UPO-05-1	278.6	506.2	392.4	4	3.8	295.9	351.3	827.5	419.4	477.3	532.5	610.0	502.0	2	3.2
NDO-711	285.7	523.7	404.7	1	7.0	341.6	302.7	730.3	444.4	523.1	451.0	608.3	485.9	5	
UPO-06-1	215.5	575.3	395.4	3	4.6	313.5	310.0	713.6	508.3	452.3	446.0	613.3	479.6	6	
RJB-1	258.6	477.7	368.1	9		351.9	250.0	655.3	388.9	455.0	385.0	659.3	449.3	9	
NDO-10	280.8	511.4	396.1	2	4.8	205.3	227.3	655.3	422.2	533.9	385.5	630.7	437.2	11	
SKO-167	294.4	450.0	372.2	8		293.8	321.3	658.1	452.8	455.4	566.2	656.3	486.3	4	
JO-04-11	251.1	478.0	364.6	10		317.4	308.3	724.7	319.4	466.5	429.4	687.3	464.7	7	
Kent (NC)	261.3	494.5	377.9	6		283.8	242.7	699.7	297.2	470.6	416.5	680.0	441.5	10	
OS-6 (NC)	268.4	425.3	346.9	11		233.0	241.7	827.5	372.2	522.3	530.1	679.3	486.6	3	
SKO-90 (ZC-HZ)	240.8	508.8	374.8	7											
OL-125 (ZC-NWZ)						278.1	251.3	741.4	361.1	471.5	494.4	638.7	462.4	8	
JHO-99-2 (ZC-NEZ)															
JHO-822 (ZC-CZ)															
JHO-2000-4 (ZC-SZ)															
Mean	**263.4**	**495.8**	**379.6**			**295.9**	**282.8**	**743.1**	**403.8**	**487.1**	**469.2**	**667.1**	**478.4**		
CD at 5%	36.4	18.4				69.0	41.8	104.3	62.7	41.6	59.6	32.2			
CV%	8.1	6.3				13.7	8.7	8.2	6.3	5.0	12.9	2.8			

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

Cont....

Entries	North East Zone										Central Zone										
	Jorhat	Kaly.	Bhuba.	Ranc.	Pusa	Faiza.	Imph.	Aver.	Rank	Super%	Jhan.	Rahu.	Urulik.	Karj.	Kanp.	Anand	Jabal.	Raip.	Aver.	Rank	Super%
OS-403	275.8	540.3	452.5	276.7	491.0	394.7	382.0	401.9	2	5.6	388.7	397.7	685.8	188.9	933.3	629.0	328.0	161.4	464.1	5	2.6
UPO-05-1	316.3	443.2	417.5	253.3	495.0	361.5	293.3	368.6	7		338.8	401.2	461.0	151.4	844.4	545.0	316.0	189.7	405.9	11	
NDO-711	427.8	501.5	472.0	310.0	487.0	433.1	268.0	414.2	1	8.9	438.7	431.0	533.4	177.8	1025.0	489.0	431.0	243.2	471.1	3	4.1
UPO-06-1	314.3	402.6	454.0	296.7	524.0	306.3	268.0	366.6	9		374.9	364.7	758.2	163.9	863.9	497.0	462.0	225.6	463.8	6	2.5
RJB-1	351.7	434.8	441.0	340.0	480.0	327.6	303.3	382.6	4	0.6	485.9	363.0	563.9	164.7	961.1	588.0	433.0	190.5	468.8	4	3.6
NDO-10	312.3	522.0	420.5	303.3	468.0	373.0	318.7	388.2	3	2.1	447.0	433.5	643.9	168.9	958.3	502.0	431.0	198.6	472.9	2	4.5
SKO-167	311.7	439.8	401.0	306.7	460.0	307.4	254.0	354.4	10		424.8	319.6	723.9	173.6	672.3	667.0	379.0	232.5	449.1	9	
JO-04-11	273.4	503.1	455.0	313.3	486.0	285.7	294.0	372.9	6		424.8	482.8	476.3	156.7	919.4	567.0	543.0	220.4	473.8	1	4.7
Kent (NC)	274.0	418.2	431.0	323.3	522.0	323.8	276.7	367.0	8		388.7	441.8	529.6	174.4	827.8	503.0	526.0	216.3	450.9	8	
OS-6 (NC)	300.4	482.6	422.5	263.3	513.0	260.9	216.0	351.2	11		413.7	393.5	542.9	156.9	913.9	471.0	525.0	202.9	452.5	7	
SKO-90 (ZC-HZ)																					
OL-125 (ZC-NWZ)																					
JHO-99-2 (ZC-NEZ)	321.0	439.3	483.0	326.7	491.0	364.2	238.0	380.4	5												
JHO-822 (ZC-CZ)											394.3	439.0	525.8	147.2	686.1	504.0	417.0	186.1	412.4	10	
JHO-2000-4 (ZC-SZ)																					
Mean	316.2	466.1	440.9	301.2	492.5	339.8	282.9	377.1			410.9	406.2	585.9	165.9	873.2	542.0	435.5	206.1	453.2		
CD at 5%	7.7	38.0	3.9	40.2	43.5	84.9	31.0				10.5	76.0	26.6	38.0	66.9	39.7	81.0	18.4			
CV%	7.7	5.8	4.7	7.8	9.3	14.7	6.4				6.3	11.0	16.8	13.7	4.6	4.3	10.9	5.2			

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

Entries	South Zone						All India		
	Hyderabad	Mandya	Coimbatore	Average	Rank	Superiority%	Average	Rank	Superiority%
OS-403	223.0	278.1	185.8	229.0	9		442.6	1	9.7
UPO-05-1	150.5	179.3	219.4	183.1	11		395.4	10	
NDO-711	357.5	252.1	197.2	268.9	1	5.3	432.8	2	7.3
UPO-06-1	257.3	246.9	198.9	234.4	8		412.1	4	2.1
RJB-1	260.6	237.8	158.3	218.9	10		406.2	6	0.7
NDO-10	270.0	262.1	191.7	241.3	6		410.3	5	1.7
SKO-167	306.0	205.1	216.7	242.6	5		405.5	7	0.5
JO-04-11	321.5	231.7	224.2	259.1	2	1.5	413.3	3	2.5
Kent (NC)	316.5	260.5	188.9	255.3	3		399.6	9	
OS-6 (NC)	263.9	264.0	183.3	237.1	7		403.3	8	
SKO-90 (ZC-HZ)									
OL-125 (ZC-NWZ)									
JHO-99-2 (ZC-NEZ)									
JHO-822 (ZC-CZ)									
JHO-2000-4 (ZC-SZ)	301.6	253.8	200.0	251.8	4				
Mean	**275.3**	**242.8**	**196.8**	**238.3**			**412.1**		
CD at 5%	50.7	24.8	23.6						
CV%	10.8	6.0	10.0						

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

Cont....

Entries	Hill Zone					North West Zone							
	Palam.	Srina.	Aver.	Rank	Super%	Bikaner	Hisar	Ludhi.	Pantn.	Meerut	Aver.	Rank	Super%
OS-403	57.9	141.4	99.6	3	4.5	78.1	131.8	94.9	95.5	168.3	113.7	1	10.4
UPO-05-1	57.5	137.8	97.7	4	2.5	61.9	148.9	82.5	91.6	117.4	100.5	5	
NDO-711	52.7	147.3	100.0	2	4.9	64.7	116.8	122.0	91.3	117.0	102.4	3	
UPO-06-1	44.0	161.8	102.9	1	7.9	57.3	114.2	113.9	87.5	124.4	99.4	7	
RJB-1	48.4	129.9	89.1	10		86.3	91.7	96.0	69.9	126.9	94.2	9	
NDO-10	51.7	138.0	94.9	6		55.1	131.1	119.7	81.1	121.3	101.7	4	
SKO-167	60.0	126.5	93.2	8		65.7	92.1	106.0	77.7	126.3	93.6	10	
JO-04-11	46.5	134.6	90.5	9		70.5	116.0	80.1	78.3	132.2	95.4	8	
Kent (NC)	49.2	139.4	94.3	7		78.3	98.0	72.0	81.0	130.8	92.0	11	
OS-6 (NC)	52.6	120.2	86.4	11		59.0	148.9	92.0	86.6	128.4	103.0	2	
SKO-90 (ZC-HZ)	47.3	143.4	95.3	5									
OL-125 (ZC-NWZ)						73.5	133.5	83.8	84.3	122.9	99.6	6	
JHO-99-2 (ZC-NEZ)													
JHO-822 (ZC-CZ)													
JHO-2000-4 (ZC-SZ)													
Mean	**51.6**	**138.2**	**94.9**			**68.2**	**120.3**	**96.6**	**84.1**	**128.7**	**99.6**		
CD at 5%	NS	6.1				16.1	17.1	19.0	14.9	3.0			
CV%	12.0	5.4				13.9	8.3	8.0	10.9	1.4			

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

Cont....

Entries	North East Zone										Central Zone										
	Jorh.	Kaly.	Bhuba.	Ranc.	Pusa	Faiza.	Imph.	Aver.	Rank	Supe%	Jhansi	Rahu.	Urulik.	Karj.	Kanp.	Anand	Jabal.	Raip.	Aver.	Rank	Super%
OS-403	48.5	80.1	91.0	69.2	98.4	68.6	69.6	75.0	3	4.6	79.4	95.6	124.7	27.5	316.9	119.6	68.0	40.9	109.1	6	
UPO-05-1	64.2	60.5	84.1	56.6	98.4	66.7	57.2	69.7	7		112.7	93.8	87.8	28.1	287.2	79.1	65.2	47.2	100.1	9	
NDO-711	80.5	76.9	100.5	65.8	96.1	79.2	54.8	79.1	1	10.3	96.3	91.4	110.4	28.6	348.9	80.3	94.1	59.1	113.6	2	4.1
UPO-06-1	56.5	59.0	92.4	74.6	101.6	68.0	59.9	73.1	5	1.9	120.4	90.2	174.2	28.4	295.6	108.3	101.4	55.1	121.7	1	11.5
RJB-1	60.8	66.6	88.6	74.6	93.9	70.0	57.9	73.2	4	2.0	107.3	84.0	113.3	26.3	328.6	80.0	95.4	47.3	110.3	4	1.0
NDO-10	61.0	75.7	85.6	69.7	91.6	76.3	66.4	75.2	2	4.9	103.2	80.0	126.1	27.8	326.4	84.8	94.1	49.1	111.4	3	2.1
SKO-167	48.9	59.5	78.5	64.9	90.7	75.7	47.1	66.5	10		111.9	79.2	140.9	25.4	229.7	112.1	78.9	56.7	104.4	8	
JO-04-11	48.0	77.2	98.1	78.6	94.7	61.7	53.4	73.1	5	1.9	90.5	90.0	106.5	24.1	313.6	73.2	121.6	54.0	109.2	5	0.1
Kent (NC)	45.1	59.7	83.0	69.8	104.4	65.5	57.4	69.3	8		79.5	83.6	105.1	24.9	282.5	77.5	166.6	53.1	109.1	6	
OS-6 (NC)	53.7	72.4	85.0	55.9	100.4	63.2	43.9	67.8	9		85.5	88.4	110.5	21.4	311.7	73.0	116.8	50.1	107.2	7	
SKO-90 (ZC-HZ)																					
OL-125 (ZC-NWZ)																					
JHO-99-2 (ZC-NEZ)	57.0	65.1	105.9	70.5	98.8	61.3	43.5	71.7	6												
JHO-822 (ZC-CZ)											88.1	97.6	108.0	29.5	235.0	69.5	89.8	46.4	95.5	10	
JHO-2000-4 (ZC-SZ)																					
Mean	**56.8**	**68.4**	**90.3**	**68.2**	**97.2**	**68.7**	**55.6**	**72.2**			**97.7**	**88.5**	**118.8**	**26.5**	**297.8**	**87.0**	**99.3**	**50.8**	**108.3**		
CD at 5%	3.7	6.5	1.4	10.9	8.7	9.4	7.6				3.6	16.9	10.8	5.0	22.6	6.6	18.6	4.1			
CV%	8.7	6.7	6.0	9.31	7.4	8.0	8.0				2.2	11.2	19.1	11.3	2.7	4.5	11.5	4.7			

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

Entries	South Zone						All India		
	Hyderabad	Mandya	Coimbatore	Average	Rank	Superiority%	Average	Rank	Superiority%
OS-403	48.3	64.9	31.5	48.3	7		93.1	3	6.1
UPO-05-1	27.4	34.7	39.8	34.0	11		84.2	10	
NDO-711	74.7	56.6	34.1	55.1	1	0.2	94.4	1	7.6
UPO-06-1	53.8	48.1	38.2	46.7	8		94.2	2	7.4
RJB-1	48.6	51.9	31.4	44.0	10		87.9	6	0.2
NDO-10	61.3	60.1	32.7	51.4	5		91.6	4	4.4
SKO-167	67.6	49.3	37.8	51.5	4		85.1	9	
JO-04-11	63.8	52.6	44.9	53.8	3		89.0	5	1.5
Kent (NC)	72.8	58.4	33.8	55.0	2		87.7	7	
OS-6 (NC)	49.8	51.7	34.9	45.5	9		87.0	8	
SKO-90 (ZC-HZ)									
OL-125 (ZC-NWZ)									
JHO-99-2 (ZC-NEZ)									
JHO-822 (ZC-CZ)									
JHO-2000-4 (ZC-SZ)	61.7	49.4	37.0	49.4	6				
Mean	**57.3**	**52.5**	**36.0**	**48.6**			**89.4**		
CD at 5%	13.9	5.7	3.8						
CV%	14.3	6.3	8.7						

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

Cont.....

Entries	Palam.	Bikaner	Hisar	Ludhi.	Pantn.	Meerut	Jorhat	Kalyani	Bhuban.	Ranchi	Pusa	Faiza.
OS-403	2.13	3.25	7.91	3.48	4.28	8.41	2.94	5.69	6.56	2.85	5.17	3.40
UPO-05-1	2.14	2.82	6.90	3.20	3.85	6.19	3.12	4.66	4.49	2.56	5.21	3.14
NDO-711	2.43	3.25	6.41	4.12	5.25	5.84	4.75	6.51	5.97	3.52	5.02	4.09
UPO-06-1	1.67	2.99	5.58	3.77	3.62	6.21	3.36	4.24	4.99	2.88	5.40	2.61
RJB-1	2.20	3.35	5.60	3.78	4.64	6.34	3.91	5.30	6.68	4.00	5.39	3.00
NDO-10	2.32	1.96	5.90	4.10	5.20	6.06	3.47	6.78	5.19	3.65	5.14	3.58
SKO-167	2.25	2.80	5.10	3.35	3.35	6.31	2.97	4.63	4.41	2.89	5.23	2.60
JO-04-11	2.13	3.02	6.41	2.96	4.66	6.60	3.04	6.14	5.42	3.69	5.40	2.67
Kent (NC)	2.22	2.70	6.25	2.75	4.71	6.53	3.07	5.43	5.82	3.76	5.67	3.11
OS-6 (NC)	2.27	2.22	7.32	3.21	5.13	6.41	3.34	6.27	5.22	3.03	5.34	2.39
SKO-90 (ZC-HZ)	1.84											
OL-125 (ZC-NWZ)		2.65	6.56	3.34	3.76	6.14						
JHO-99-2 (ZC-NEZ)							3.53	5.29	6.04	3.59	5.40	3.37
JHO-822 (ZC-CZ)												
JHO-2000-4 (ZC-SZ)												
Mean	**2.15**	**2.82**	**6.36**	**3.46**	**4.40**	**6.46**	**3.41**	**5.54**	**5.53**	**3.31**	**5.31**	**3.09**

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

Entries	Jhansi	Rahuri	Urulika.	Karjat	Kanpur	Anand	Raipur	Hyder.	Mandya	Coimba.	Average	Rank
OS-403	4.23	4.85	7.88	2.62	8.19	9.53	2.12	2.39	3.69	2.86	4.75	3
UPO-05-1	3.68	4.95	5.36	2.19	7.47	5.74	2.00	1.59	2.36	3.13	3.94	10
NDO-711	4.80	6.43	7.02	3.12	11.39	6.43	3.20	4.29	3.52	3.29	5.03	1
UPO-06-1	4.07	4.56	8.24	2.52	7.32	5.23	2.72	2.72	3.28	2.92	4.13	8
RJB-1	5.38	5.04	7.05	2.23	10.80	7.35	2.51	3.08	3.17	2.44	4.69	4
NDO-10	4.99	6.37	8.47	2.25	10.42	6.61	2.61	3.11	3.51	3.04	4.76	2
SKO-167	4.62	4.10	7.31	2.23	5.51	6.81	2.45	3.19	2.76	3.28	4.01	9
JO-04-11	4.55	6.90	6.03	2.18	10.10	7.46	2.90	4.13	3.14	3.50	4.68	5
Kent (NC)	4.26	7.36	6.70	2.57	9.51	6.29	2.85	3.78	3.52	3.05	4.63	6
OS-6 (NC)	4.55	5.96	6.96	2.34	9.93	6.20	2.67	3.42	3.54	2.96	4.58	7
SKO-90 (ZC-HZ)												
OL-125 (ZC-NWZ)												
JHO-99-2 (ZC-NEZ)												
JHO-822 (ZC-CZ)	4.35	6.18	6.66	2.50	7.46	6.30	2.45					
JHO-2000-4 (ZC-SZ)								3.48	3.42	3.08		
Mean	**4.50**	**5.70**	**7.06**	**2.43**	**8.92**	**6.72**	**2.59**	**3.20**	**3.26**	**3.05**	**4.52**	

Table 3.4 AVT Oat (SC)1: First Advanced Varietal Trial in Oat (Single Cut)SC-1: Dry Matter Yield (q/ha/day) Cont.....

Entries	Bikaner	Hisar	Ludhi.	Pantn.	Jorhat	Kalyani	Bhuban.	Ranchi	Pusa	Faiza.	Jhansi
OS-403	0.74	1.11	0.72	0.77	0.52	0.84	1.32	0.71	1.04	0.59	0.86
UPO-05-1	0.59	1.24	0.63	0.74	0.63	0.64	0.90	0.57	1.04	0.58	1.23
NDO-711	0.62	1.02	1.13	0.92	0.89	1.00	1.27	0.73	0.99	0.75	1.05
UPO-06-1	0.55	0.89	0.84	0.70	0.60	0.62	1.02	0.72	1.05	0.58	1.31
RJB-1	0.82	0.78	0.93	0.71	0.68	0.81	1.34	0.88	1.06	0.64	1.19
NDO-10	0.52	1.18	1.16	0.79	0.68	0.98	1.06	0.84	1.01	0.73	1.15
SKO-167	0.63	0.71	0.79	0.57	0.47	0.63	0.86	0.61	1.03	0.64	1.22
JO-04-11	0.67	1.03	0.74	0.78	0.53	0.94	1.17	0.92	1.05	0.57	0.97
Kent (NC)	0.75	0.87	0.67	0.81	0.51	0.77	1.12	0.81	1.13	0.63	0.87
OS-6 (NC)	0.56	1.32	0.79	0.85	0.60	0.94	1.05	0.64	1.05	0.58	0.94
SKO-90 (ZC-HZ)											
OL-125 (ZC-NWZ)	0.70	1.18	0.78	0.67							
JHO-99-2 (ZC-NEZ)					0.63	0.78	1.32	0.77	1.09	0.57	
JHO-822 (ZC-CZ)											0.97
JHO-2000-4 (ZC-SZ)											
Mean	**0.65**	**1.03**	**0.83**	**0.76**	**0.61**	**0.81**	**1.13**	**0.75**	**1.05**	**0.62**	**1.07**

Entries	Rahuri	Urulika.	Karjat	Kanpur	Anand	Raipur	Hydera.	Mandya	Coimba.	Average	Rank
OS-403	1.17	1.43	0.38	2.78	1.81	0.54	0.52	0.86	0.49	0.96	5
UPO-05-1	1.16	1.02	0.41	2.54	0.83	0.50	0.29	0.46	0.57	0.83	7
NDO-711	1.36	1.45	0.50	3.88	1.06	0.78	0.89	0.79	0.57	1.08	1
UPO-06-1	1.13	1.89	0.44	2.50	1.14	0.66	0.57	0.64	0.56	0.92	6
RJB-1	1.17	1.42	0.36	3.69	1.00	0.62	0.57	0.69	0.48	0.99	3
NDO-10	1.18	1.66	0.37	3.55	1.12	0.65	0.71	0.80	0.52	1.03	2
SKO-167	1.02	1.42	0.33	1.88	1.14	0.60	0.71	0.66	0.57	0.82	8
JO-04-11	1.29	1.35	0.33	3.45	0.96	0.71	0.82	0.71	0.70	0.98	4
Kent (NC)	1.39	1.33	0.37	3.25	0.97	0.70	0.87	0.79	0.54	0.96	5
OS-6 (NC)	1.34	1.42	0.32	3.39	0.96	0.66	0.64	0.69	0.56	0.96	5
SKO-90 (ZC-HZ)											
OL-125 (ZC-NWZ)											
JHO-99-2 (ZC-NEZ)											
JHO-822 (ZC-CZ)	1.38	1.37	0.50	2.55	0.87	0.61					
JHO-2000-4 (ZC-SZ)							0.71	0.66	0.57		
Mean	**1.24**	**1.43**	**0.39**	**3.04**	**1.08**	**0.64**	**0.66**	**0.70**	**0.56**	**0.95**	

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

Entries	Palam.	Ludhi.a	Kaly.	Bhuba.	Ranchi	Faiza.	Imphal	Rahuri	Urulik.	Anand	Jabal.	Raipur	Hyder.	Mandya	Coimb.	Aver.	Rank
OS-403	5.6	6.8	5.8	8.6	5.8	5.4	3.0	7.1	10.3	13.3	5.0	3.0	3.0	5.7	4.6	6.2	5
UPO-05-1	5.4	6.5	6.1	7.8	4.7	5.5	2.3	6.6	8.0	8.1	5.0	3.4	1.6	2.0	6.1	5.3	7
NDO-711	5.5	8.7	2.8	10.1	5.8	6.3	2.2	6.0	9.8	8.2	7.5	5.9	5.8	5.2	4.0	6.3	4
UPO-06-1	4.6	8.0	5.4	9.1	7.2	5.6	2.9	6.7	13.0	11.8	8.2	5.3	4.5	4.0	5.5	6.8	1
RJB-1	5.4	6.9	7.0	8.6	6.2	5.9	2.7	7.7	10.8	7.9	7.6	3.8	4.0	4.3	4.1	6.2	5
NDO-10	5.3	8.2	6.5	8.2	5.8	6.1	2.4	7.1	11.5	8.2	7.5	4.1	4.2	4.7	4.3	6.3	4
SKO-167	5.8	8.5	5.6	7.5	5.4	6.1	2.7	6.2	12.7	12.4	6.2	5.1	4.4	4.3	6.8	6.6	2
JO-04-11	4.5	6.0	5.9	10.2	7.6		2.3	6.7	9.9	7.7	9.8	5.0	5.0	4.4	4.7	6.4	3
Kent (NC)	5.0	5.3	5.3	7.7	7.0	5.6	2.2	5.9	9.2	7.6	9.4	5.2	4.8	4.9	4.1	5.9	6
OS-6 (NC)	4.8	6.4	5.8	8.3	5.6	5.1	2.6	5.8	9.2	7.9	9.4	4.3	3.3	5.0	5.0	5.9	6
SKO-90 (ZC-HZ)	4.8																
OL-125 (ZC-NWZ)		6.2															
JHO-99-2 (ZC-NEZ)			5.1	10.5	6.2	5.0	2.0										
JHO-822 (ZC-CZ)								6.4	9.9	10.7	7.1	3.6					
JHO-2000-4 (ZC-SZ)													4.6	4.1	5.3		
Mean	**5.1**	**7.0**	**5.6**	**8.8**	**6.1**	**5.7**	**2.5**	**6.6**	**10.4**	**9.4**	**7.5**	**4.4**	**4.1**	**4.4**	**5.0**	**6.2**	

Table 3.6 AVT Oat (SC)1: First Advanced Varietal Trial in Oat (Single Cut) SC-1: Crude Protein (%)

Entries	Palam.	Ludhi.	Kalya.	Bhuba.	Ranchi	Faiza.	Imph.	Rahuri	Urulik.	Anand	Jabal.	Raip.	Hyder.	Coimb.	Pantn.	Aver.	Rank
OS-403	9.6	7.2	8.0	9.5	8.3	7.9	4.3	7.4	8.3	11.1	7.4	7.4	6.1	14.4	10.5	8.5	6
UPO-05-1	9.3	7.9	9.5	9.3	8.3	8.2	4.0	7.0	9.2	10.2	7.8	7.1	5.7	15.3	9.6	8.6	5
NDO-711	10.5	7.2	6.9	10.0	8.8	8.0	4.0	6.6	8.8	10.2	8.0	10.0	7.9	11.8	10.5	8.6	5
UPO-06-1	10.5	7.0	10.1	9.8	9.6	8.3	4.8	7.4	7.4	10.9	8.2	9.5	8.3	14.4	10.5	9.1	2
RJB-1	11.1	7.2	7.1	9.7	8.3	8.4	4.8	9.2	9.5	9.9	8.0	8.0	8.3	13.1	8.8	8.8	4
NDO-10	10.2	6.8	9.8	9.6	8.3	8.0	3.6	8.9	9.1	9.6	8.0	8.3	7.0	13.1	11.4	8.8	4
SKO-167	9.6	8.1	9.3	9.6	8.3	8.0	5.7	7.9	9.0	11.0	7.9	9.0	6.6	17.9	10.5	9.2	1
JO-04-11	9.6	7.5	8.6	10.4	9.6		4.3	7.4	9.3	10.5	8.1	9.3	7.9	10.5	10.5	8.8	4
Kent (NC)	10.2	7.4	7.8	9.3	10.1	8.5	3.9	7.0	8.8	9.8	8.1	9.8	6.6	12.3	9.6	8.6	5
OS-6 (NC)	9.0	7.0	9.2	9.8	10.1	8.1	5.9	6.6	8.3	10.9	8.1	8.6	6.6	14.4	10.5	8.9	3
SKO-90 (ZC-HZ)	10.2																
OL-125 (ZC-NWZ)		7.4													11.4		
JHO-99-2 (ZC-NEZ)			8.2	9.9	8.8	8.1	4.7										
JHO-822 (ZC-CZ)								6.6	9.2	15.4	7.9	7.7					
JHO-2000-4 (ZC-SZ)													7.4	14.4			
Mean	**10.0**	**7.3**	**8.6**	**9.7**	**8.9**	**8.2**	**4.5**	**7.4**	**8.8**	**10.9**	**7.9**	**8.6**	**7.1**	**13.8**	**10.3**	**8.8**	

Table 3.7 AVT Oat (SC)1: First Advanced Varietal Trial in Oat (Single Cut)SC-1: Plant Height (cm)

Cont.....

Entries	Palam.	Srina.	Bikan.	Jalore	Hisar	Ludhi.	Pantn.	Udaip.	Meerut	Jorhat	Kalya.	Bhuba.	Ranchi	Faiza.
OS-403	107.0	135.7	120.0	139.7	142.5	136.7	172.7	137.3	159.4	150.7	164.7	161.6	111.4	138.5
UPO-05-1	129.0	137.1	130.0	136.7	121.4	129.7	172.7	139.4	134.1	122.5	127.9	139.2	119.0	101.2
NDO-711	106.0	151.5	139.0	133.3	141.9	103.7	138.7	139.1	133.3	159.9	159.8	174.7	119.2	119.8
UPO-06-1	116.0	132.1	122.0	134.7	119.5	147.0	173.0	140.0	133.6	163.7	134.1	165.2	115.0	123.4
RJB-1	98.0	148.8	107.0	120.7	128.7	107.3	143.0	129.1	174.9	150.0	149.2	156.7	121.9	104.6
NDO-10	101.3	125.5	124.0	120.0	130.0	102.7	140.7	122.4	146.3	131.7	162.7	144.2	121.2	108.6
SKO-167	79.3	113.3	90.0	95.7	105.1	100.0	146.7	137.1	141.8	138.5	121.6	136.2	113.6	95.7
JO-04-11	95.6	143.8	132.0	130.3	136.6	110.7	148.7	150.2	144.3	150.2	156.8	169.9	125.4	
Kent (NC)	103.3	132.7	124.0	123.7	130.3	106.0	150.0	131.1	148.6	143.3	148.7	151.6	124.8	107.0
OS-6 (NC)	102.3	136.2	119.0	119.7	132.6	123.0	136.0	150.4	137.9	164.8	158.1	147.4	122.2	114.5
SKO-90 (ZC-HZ)	81.0	145.4												
OL-125 (ZC-NWZ)			128.0	127.3	137.9	106.0	148.7	155.6	163.5					
JHO-99-2 (ZC-NEZ)										163.9	156.3	178.9	119.0	125.0
JHO-822 (ZC-CZ)														
JHO-2000-4 (ZC-SZ)														
Mean	**101.7**	**136.6**	**121.4**	**125.6**	**129.7**	**115.7**	**151.9**	**139.2**	**147.1**	**149.0**	**149.1**	**156.9**	**119.3**	**113.8**

Entries	Imph.	Jhansi	Rahuri	Urulik.	Karjat	Kanpur	Anand	Jabal.	Raipur	Hyder.	Mandya	Coimb.	Aver.	Rank
OS-403	156.4	148.0	104.0	110.8	81.0	131.0	130.8	119.7	108.0	98.8	79.1	98.0	128.6	1
UPO-05-1	142.4	157.1	93.0	107.0	79.0	122.1	140.8	107.9	101.8	73.5	41.1	96.0	119.3	6
NDO-711	133.1	137.8	103.0	102.7	105.0	107.9	127.8	128.2	93.0	89.8	53.1	121.8	124.0	4
UPO-06-1	135.5	147.6	98.0	119.1	78.0	114.0	136.6	135.8	106.2	87.4	58.7	102.0	124.5	3
RJB-1	129.0	122.6	94.0	102.3	100.0	108.7	122.6	128.2	98.4	67.4	51.4	106.0	118.1	8
NDO-10	142.8	132.8	104.0	97.2	90.0	99.8	119.0	127.9	117.1	92.3	58.8	115.0	118.4	7
SKO-167	128.9	134.8	94.0	114.4	88.0	97.8	113.0	113.5	86.2	84.7	52.0	83.0	107.9	10
JO-04-11	131.5	145.7	107.0	106.2	79.0	111.5	134.0	145.3	113.4	94.8	72.8	95.0	125.2	2
Kent (NC)	128.1	126.0	100.0	92.1	76.0	104.9	123.4	133.4	102.8	87.4	54.8	100.0	117.5	9
OS-6 (NC)	138.4	127.4	114.0	97.1	101.0	108.4	124.4	141.0	109.3	82.2	66.0	120.0	122.8	5
SKO-90 (ZC-HZ)														
OL-125 (ZC-NWZ)														
JHO-99-2 (ZC-NEZ)	129.7													
JHO-822 (ZC-CZ)		131.6	99.0	95.7	91.0	108.9	124.4	118.5	88.3					
JHO-2000-4 (ZC-SZ)										82.9	63.2	99.0		
Mean	**136.0**	**137.4**	**100.9**	**104.1**	**88.0**	**110.5**	**127.0**	**127.2**	**102.2**	**85.6**	**59.2**	**103.3**	**120.6**	

Table 3.8 AVT Oat (SC)1: First Advanced Varietal Trial in Oat (Single Cut)SC-1: Leaf Stem Ratio Cont.....

Entries	Palam.	Srina.	Bikaner	Ludhiana	Pantn.	Meerut	Jorhat	Kalyani	Bhuba.	Ranchi	Faizabad	Imphal
OS-403	0.47	0.45	0.63	0.48	0.33	0.22	0.79	0.71	1.01	0.37	0.68	0.35
UPO-05-1	0.55	0.43	0.65	0.67	0.37	0.20	1.01	1.00	0.94	0.38	0.75	0.31
NDO-711	0.62	0.47	0.58	0.48	0.48	0.21	0.74	0.88	1.24	0.32	0.71	0.34
UPO-06-1	0.63	0.52	0.67	0.48	0.45	0.19	0.90	1.00	1.14	0.34	0.77	0.38
RJB-1	0.65	0.44	0.45	0.60	0.50	0.24	1.08	0.88	0.94	0.32	0.76	0.27
NDO-10	0.59	0.44	0.60	0.74	0.44	0.18	0.90	0.88	0.84	0.29	0.73	0.29
SKO-167	0.62	0.42	0.76	0.60	0.37	0.18	1.56	0.53	0.87	0.50	0.74	0.34
JO-04-11	0.52	0.43	0.68	0.60	0.53	0.20	0.89	0.50	1.25	0.35		0.57
Kent (NC)	0.73	0.44	0.42	0.33	0.41	0.21	0.96	0.63	0.91	0.35	0.70	0.34
OS-6 (NC)	0.43	0.40	0.60	0.60	0.43	0.23	0.98	0.50	0.89	0.38	0.72	0.36
SKO-90 (ZC-HZ)	0.66	0.47										
OL-125 (ZC-NWZ)			0.45	1.00	0.52	0.21						
JHO-99-2 (ZC-NEZ)							0.95	0.86	1.38	0.30	0.75	0.35
JHO-822 (ZC-CZ)												
JHO-2000-4 (ZC-SZ)												
Mean	**0.59**	**0.45**	**0.59**	**0.60**	**0.44**	**0.21**	**0.98**	**0.76**	**1.04**	**0.35**	**0.73**	**0.35**

Entries	Rahuri	Urulik.	Karjat	Kanpur	Jabalpur	Raipur	Hyder.	Mandya	Coimb.	Average	Rank
OS-403	0.72	1.02	0.78	0.37	0.54	0.35	0.49	0.35	0.33	0.55	6
UPO-05-1	0.63	0.71	0.87	0.64	0.50	0.39	0.40	0.39	0.42	0.58	3
NDO-711	0.88	0.61	0.79	0.37		0.52	0.49	0.25	0.40	0.57	4
UPO-06-1	0.67	0.71	0.91	0.47	0.68	0.56	0.36	0.33	0.43	0.60	1
RJB-1	0.82	0.63	0.88	0.35	0.68	0.41	0.64	0.27	0.39	0.58	3
NDO-10	0.61	0.51	0.75	0.44	0.67	0.46	0.48	0.44	0.40	0.56	5
SKO-167	0.61	0.49	0.82	0.41	0.56	0.56	0.49	0.62	0.44	0.59	2
JO-04-11	0.60	0.74	0.86	0.43	0.81	0.52	0.47	0.21	0.37	0.58	3
Kent (NC)	0.66	0.71	0.92	0.32	0.76	0.44	0.44	0.23	0.38	0.54	7
OS-6 (NC)	0.71	0.56	0.79	0.35	0.72	0.48	0.47	0.21	0.35	0.53	8
SKO-90 (ZC-HZ)											
OL-125 (ZC-NWZ)											
JHO-99-2 (ZC-NEZ)											
JHO-822 (ZC-CZ)	0.76	0.67	0.82	0.36	0.64	0.34					
JHO-2000-4 (ZC-SZ)							0.72	0.28	0.38		
Mean	**0.70**	**0.67**	**0.84**	**0.41**	**0.66**	**0.46**	**0.50**	**0.33**	**0.39**	**0.57**	

Table 3.9 AVT Oat (SC)1: First Advanced Varietal Trial in Oat (Single Cut)SC-1: IVDMD (%)&ADF(%)

Entries	IVDMD (%)					ADF (%)						
	Ludhiana	Ranchi	Rahuri	Average	Rank	Palampur	Ludhiana	Ranchi	Rahuri	Pantn.	Average	Rank
OS-403	60.0	57.4	50.4	55.9	10	53.4	39.2	40.5	44.7	54.6	46.5	10
UPO-05-1	64.6	63.4	52.5	60.2	3	50.4	36.0	32.7	45.0	56.2	44.1	2
NDO-711	60.0	59.4	54.3	57.9	6	54.6	39.2	37.9	41.9	58.6	46.4	9
UPO-06-1	59.0	61.3	51.5	57.3	8	54.0	40.0	35.4	41.9	55.4	45.3	7
RJB-1	60.0	63.9	58.2	60.7	1	52.6	39.2	32.1	44.2	54.0	44.4	4
NDO-10	57.6	60.5	51.6	56.6	9	53.8	40.7	36.4	43.2	53.8	45.6	8
SKO-167	64.8	59.6	53.4	59.3	4	54.0	35.5	37.6	43.8	54.2	45.0	5
JO-04-11	63.2	64.8	53.8	60.6	2	54.6	36.4	30.9	42.2	54.6	43.7	1
Kent (NC)	60.6	61.6	52.0	58.0	5	54.2	36.6	35.1	42.0	53.8	44.3	3
OS-6 (NC)	59.0	60.8	53.0	57.6	7	53.2	40.0	36.1	44.0	52.6	45.2	6
SKO-90 (ZC-HZ)						55.8						
OL-125 (ZC-NWZ)	60.6						36.6			54.2		
JHO-99-2 (ZC-NEZ)		59.6						37.6				
JHO-822 (ZC-CZ)			58.0						43.1			
JHO-2000-4 (ZC-SZ)												
Mean	**60.9**	**61.1**	**53.5**	**58.4**	**5.5**	**53.7**	**38.1**	**35.7**	**43.3**	**54.7**	**45.1**	

Table 3.10 AVT Oat (SC)1: First Advanced Varietal Trial in Oat (Single Cut)SC-1:NDF%

Entries	Palampur	Ludhiana	Ranchi	Rahuri	Pantnagar	Average	Rank
OS-403	61.8	52.0	56.2	57.0	64.8	58.4	3
UPO-05-1	64.6	51.9	54.8	51.1	63.8	57.2	1
NDO-711	61.4	52.0	60.0	56.6	66	59.2	6
UPO-06-1	61.8	58.0	56.0	53.1	64.6	58.7	4
RJB-1	64.2	52.0	67.0	60.4	63.8	61.5	9
NDO-10	61.8	59.2	59.6	52.0	61.4	58.8	5
SKO-167	62.6	51.6	56.0	55.4	65.8	58.3	2
JO-04-11	63.0	55.0	56.0	53.5	64.6	58.4	3
Kent (NC)	66.0	54.6	60.4	55.6	63.4	60.0	7
OS-6 (NC)	64.2	58.0	63.4	53.3	63.6	60.5	8
SKO-90 (ZC-HZ)	62.2						
OL-125 (ZC-NWZ)		54.6			61.8		
JHO-99-2 (ZC-NEZ)			62.0				
JHO-822 (ZC-CZ)				53.3			
JHO-2000-4 (ZC-SZ)							
Mean	**63.1**	**54.4**	**59.2**	**54.7**	**64.0**	**59.1**	

4. AVTO (SC)-2: Second Advanced Varietal trial in Oat (Single cut)

(Table Reference: 4.1 to 4.9)

In Oat (single cut), nine entries namely JO-03-99, JHO-10-1, SKO-170, JHO-10-2, SKO-188, JO-03-97, UPO-10-1, OS-377 and UPO-10-2 promoted from AVT-1 were evaluated against two national checks Kent and OS-6 and zonal checks Palampur-1, OL-125, JHO-99-2, JHO-822 and JHO-2000-4 at 27 locations in five different zones. For green forage yield (q/ha), entries JHO-10-2 (10.3%), JO-03-99 (6.7%), JO-03-97 (6.6%), SKO-188 (5.0%) and UPO-10-2 (2.7%) in Hill zone, entries OS-377 (3.0%) and UPO-10-1 (2.1%) in North-West zone, entry JO-03-97 (1.5%) in North-East zone, entries UPO-10-2 (4.3%), JHO-10-1 (2.6%) and OS-377 (0.3%) in Central zone, entries UPO-10-2 (11.8%), UPO-10-1 (6.7%), OS-377 (3.5%), JHO-10-2 (2.3%) and SKO-188 (2.2%) in South zone exhibited superiority over best zonal/national check. At national level, UPO-10-2 (7.3%), UPO-10-1 (6.6%), JO-03-97 (5.4%), OS-377 (5.3%), JO-03-99 (3.4%), JHO-10-2 (2.6%) and JHO-10-1 (1.7%) recorded superiority over best national check.

For dry matter yield (q/ha), entries JHO-10-2 (6.8%), JO-03-99 (3.1%) and JO-03-97 (1.6%) in Hill zone, entries UPO-10-2 (2.6%) and OS-377 (1.0%) in North-West zone, UPO-10-1 (7.0%), JO-03-97 (3.9%) and UPO-10-2 (2.0%) in North-East zone, JHO-10-1 (4.3%), JO-03-97 (2.1%), UPO-10-2 (1.3%) and UPO-10-1 (0.6%) in Central zone and UPO-10-2 (18.1%), OS-377 (13.7%), SKO-188 (10.4%), SKO-170 (7.9%) and UPO-10-1 (6.7%) in South zone registered superiority over best check. At national level, UPO-10-2 (7.2%), JO-03-97 (5.2%), UPO-10-1 (5.1%), OS-377 (4.0%) and JHO-10-1 (0.9%) recorded superiority over best check.

Forage production potential (q/ha/day), entries UPO-10-1, UPO-10-2 and JO-03-97 for green forage yield and entries UPO-10-2, JO-03-97 and UPO-10-1 for dry matter production potential were adjudged superior performers.

For plant height, entry JHO-10-1 (129.2 cm) was adjudged best performer. For the character leafiness, entry JO-03-99 (0.68) was ranked first.

In quality parameters like crude protein yield (q/ha) and crude protein content (%) national check OS-6 maintained superiority. For other quality parameters, OS-6 for IVDMD (%), UPO-10-1 for ADF (%) and JO-03-99 for NDF (%) ranked first.

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

Cont.....

Entries	Hill Zone					North West Zone									
	Palam.	**Srina.**	**Aver.**	**Rank**	**Super%**	**Bikan.**	**Jalore**	**Hisar**	**Ludhi.**	**Pantn.**	**Udaip.**	**Meerut**	**Aver.**	**Rank**	**Super%**
JO-03-99	312.3	456.1	384.2	2	6.7	369.9	322.7	710.8	480.6	543.9	535.1	630.7	513.4	7	
JHO-10-1	287.5	405.7	346.6	7		244.1	359.3	672.0	372.2	598.1	560.4	624.3	490.1	12	
SKO-170	281.5	402.5	342.0	10		215.8	423.3	569.2	591.7	577.3	501.7	678.7	508.2	9	
JHO-10-2	299.1	494.8	397.0	1	10.3	330.1	362.0	633.1	394.4	593.9	569.1	696.3	511.3	8	
SKO-188	322.2	433.5	377.8	4	5.0	268.8	499.0	580.3	533.3	560.6	473.8	743.3	522.7	6	
JO-03-97	317.9	449.9	383.9	3	6.6	241.1	355.3	846.9	416.7	570.6	568.5	673.3	524.6	5	
UPO-10-1	287.1	397.2	342.2	9		302.4	391.7	824.7	522.2	563.9	570.3	671.3	549.5	2	2.1
OS-377	234.5	419.3	326.9	11		427.0	392.0	883.0	461.1	587.3	460.6	666.3	553.9	1	3.0
UPO-10-2	305.0	434.1	369.6	5	2.7	328.2	328.0	766.4	536.1	568.1	568.7	636.7	533.2	4	
Kent (NC)	276.0	417.0	346.5	8		302.1	348.0	691.4	466.7	614.7	546.9	473.7	491.9	11	
OS-6 (NC)	260.6	392.0	326.3	12		277.8	343.7	696.9	438.9	563.9	493.3	667.7	497.5	10	
Palampur-1 (ZC-HZ)	264.0	455.7	359.8	6											
OL-125 (ZC-NWZ)						319.5	322.7	780.2	611.1	537.3	561.3	631.7	537.7	3	
JHO-99-2 (ZC-NEZ)															
JHO-822 (ZC-CZ)															
JHO-2000-4 (ZC-SZ)															
Mean	**287.3**	**429.8**	**358.6**			**302.2**	**370.6**	**721.2**	**485.4**	**573.3**	**534.1**	**649.5**	**519.5**		
CD at 5%	37.6	17.6				52.1	50.1	107.6	63.8	47.2	70.9	12.0			
CV%	7.7	8.9				10.2	8.0	8.8	5.4	4.9	13.6	1.1			

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

Cont.....

Entries	North East Zone										Central Zone										
	Jorh.	Kaly.	Bhub.	Ranc.	Pusa	Faiza.	Imph.	Aver.	Rank	Super%	Jhan.	Rahu.	Urulik.	Karj.	Kanp.	Anand	Jabal.	Raip.	Aver.	Rank	Super%
JO-03-99	271.1	513.6	483.5	273.3	486.0	305.5	256.7	370.0	5		535.9	380.3	784.9	236.1	833.3	429.0	516.0	328.6	505.5	5	
JHO-10-1	340.1	442.2	420.0	233.3	496.0	285.7	358.7	368.0	7		522.0	361.2	895.4	188.1	927.8	445.0	501.0	313.1	519.2	2	2.6
SKO-170	248.0	287.2	405.0	273.3	362.0	314.3	213.3	300.4	12		485.9	274.4	628.7	128.6	777.8	460.0	443.0	226.9	428.2	11	
JHO-10-2	302.4	521.4	341.0	256.7	494.0	287.2	263.3	352.3	10		541.5	425.5	640.1	232.8	983.3	474.0	409.0	332.9	504.9	7	
SKO-188	239.8	456.9	350.0	256.7	372.0	294.5	173.3	306.2	11		519.2	319.6	628.7	219.3	794.4	441.0	397.0	244.0	445.4	10	
JO-03-97	367.3	525.3	386.5	286.7	554.0	300.6	358.7	397.0	1	1.5	519.2	368.2	784.9	241.3	925.0	540.0	420.0	245.8	505.5	5	
UPO-10-1	412.2	507.5	469.0	303.3	516.0	266.7	260.0	390.7	3		533.1	366.8	743.0	220.4	966.7	482.0	432.0	297.6	505.2	6	
OS-377	338.3	408.0	451.0	336.7	505.0	257.1	292.7	369.8	6		544.2	370.6	723.9	234.1	844.4	601.0	445.0	293.7	507.1	3	0.3
UPO-10-2	324.4	400.5	432.5	333.3	495.0	306.7	359.3	378.8	4		591.4	365.7	868.7	234.0	933.3	423.0	471.0	334.1	527.7	1	4.3
Kent (NC)	368.2	518.0	354.5	273.3	489.0	291.8	276.7	367.4	8		535.9	420.3	662.9	230.9	852.8	443.0	378.0	300.6	478.0	9	
OS-6 (NC)	325.0	424.7	372.5	246.7	552.0	301.0	283.3	357.9	9		505.4	377.6	880.1	227.1	766.7	413.0	544.0	319.5	504.2	8	
Palampur-1 (ZC-HZ)																					
OL-125 (ZC-NWZ)																					
JHO-99-2 (ZC-NEZ)	330.5	502.2	474.0	270.0	523.0	297.5	342.0	391.3	2												
JHO-822 (ZC-CZ)											494.2	397.7	720.1	216.4	1016.7	453.0	397.0	350.8	505.7	4	
JHO-2000-4 (ZC-SZ)																					
Mean	**322.3**	**459.0**	**411.6**	**278.6**	**487.0**	**292.4**	**286.5**	**362.5**			**527.3**	**369.0**	**746.8**	**217.4**	**885.2**	**467.0**	**446.1**	**299.0**	**494.7**		
CD at 5%	8.0	23.7	3.1	44.1	34.7	74.6	40.0				9.9	72.6	21.9	39.4	44.9	40.4	80.5	16.7			
CV%	7.6	3.7	4.5	9.3	10.2	14.4	8.2				5.9	11.6	12.8	10.8	3.1	5.1	10.6	3.3			

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

Entries	South Zone						All India		
	Hyderabad	Mandya	Coimbatore	Average	Rank	Superiority%	Average	Rank	Superiority%
JO-03-99	439.9	219.2	211.7	290.3	7		439.5	5	3.4
JHO-10-1	423.3	220.4	171.9	271.9	10		432.2	7	1.7
SKO-170	469.8	220.0	180.3	290.0	8		394.1	11	
JHO-10-2	451.0	229.4	213.9	298.1	4	2.3	436.0	6	2.6
SKO-188	433.8	234.9	224.7	297.8	5	2.2	408.0	10	
JO-03-97	428.8	224.2	186.1	279.7	9		448.2	3	5.4
UPO-10-1	417.8	306.2	208.3	310.8	2	6.7	453.3	2	6.6
OS-377	417.8	244.0	242.8	301.5	3	3.5	447.5	4	5.3
UPO-10-2	409.5	349.5	217.8	325.6	1	11.8	456.3	1	7.3
Kent (NC)	464.8	222.6	186.1	291.2	6		422.4	9	
OS-6 (NC)	384.6	237.0	178.1	266.6	11		424.9	8	
Palampur-1 (ZC-HZ)									
OL-125 (ZC-NWZ)									
JHO-99-2 (ZC-NEZ)									
JHO-822 (ZC-CZ)									
JHO-2000-4 (ZC-SZ)	392.9	230.1	160.3	261.1	12				
Mean	**427.8**	**244.8**	**198.5**	**290.4**			**432.9**		
CD at 5%	44.7	28.8	28.5						
CV%	6.2	7.0	12.0						

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

Cont.....

Entries	Hill Zone					North West Zone							
	Palam.	Srina.	Aver.	Rank	Super.%	Bikan.	Hisar	Ludhi.	Pantn.	Meerut	Average	Rank	Super%
JO-03-99	62.2	121.4	91.8	2	3.1	74.2	113.7	105.4	84.9	121.3	99.9	8	
JHO-10-1	56.9	108.2	82.6	8		59.8	121.0	89.7	107.4	120.1	99.6	9	
SKO-170	57.7	104.6	81.1	9		53.6	68.3	143.4	97.5	127.9	98.1	11	
JHO-10-2	58.3	131.9	95.1	1	6.8	88.7	76.0	95.3	109.1	135.0	100.8	7	
SKO-188	58.4	115.7	87.1	6		73.0	69.6	110.9	95.8	143.0	98.5	10	
JO-03-97	61.5	119.5	90.5	3	1.6	57.7	169.4	106.3	108.3	129.5	114.2	4	
UPO-10-1	61.8	106.0	83.9	7		80.6	132.0	100.1	104.1	129.2	109.2	5	
OS-377	48.8	108.2	78.5	11		102.1	158.9	92.2	98.3	128.2	116.0	2	1.0
UPO-10-2	59.4	115.5	87.4	5		86.2	153.3	130.5	96.6	122.5	117.8	1	2.6
Kent (NC)	52.9	108.1	80.5	10		82.2	124.5	97.8	94.9	91.1	98.1	11	
OS-6 (NC)	50.6	104.6	77.6	12		75.8	125.5	116.7	88.3	128.5	106.9	6	
Palampur-1 (ZC-HZ)	56.3	121.7	89.0	4									
OL-125 (ZC-NWZ)						88.5	124.8	148.6	90.8	121.5	114.8	3	
JHO-99-2 (ZC-NEZ)													
JHO-822 (ZC-CZ)													
JHO-2000-4 (ZC-SZ)													
Mean	**57.1**	**113.8**	**85.4**			**76.9**	**119.7**	**111.4**	**98.0**	**124.8**	**106.2**		
CD at 5%	8.3	8.4				19.4	18.0	18.5	17.6	3.0			
CV%	8.6	7.8				14.9	8.8	6.8	10.6	1.4			

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

Cont.....

Entries	North East Zone										Central Zone										
	Jorh.	Kaly.	Bhuba.	Ranc.	Pusa	Faiza.	Imph.	Aver.	Rank	Super%	Jhansi	Rahu.	Urulik.	Karj.	Kanp.	Anand	Jabal.	Raip.	Aver.	Rank	Super%
JO-03-99	50.9	72.9	101.5	59.9	96.62	58.3	44.5	69.2	8		114.4	76.0	138.5	44.6	283.3	70.9	114.5	80.2	115.3	7	
JHO-10-1	60.4	64.2	87.5	65.8	99.40	51.6	60.7	69.9	7		118.4	69.2	178.8	41.0	315.3	64.6	109.9	76.7	121.7	1	4.3
SKO-170	46.2	40.1	86.7	62.4	70.57	57.1	67.8	61.6	11		123.6	49.2	131.6	27.1	264.4	77.3	95.5	56.9	103.2	11	
JHO-10-2	58.7	79.1	67.6	65.4	99.20	52.8	54.8	68.2	10		112.6	86.5	106.1	43.6	333.9	74.0	86.7	81.2	115.6	6	
SKO-188	41.9	66.3	70.9	64.3	72.81	65.0	49.5	61.5	12		137.8	69.2	127.6	43.5	269.7	55.6	80.7	60.8	105.6	10	
JO-03-97	65.0	74.4	75.7	78.6	109.27	66.1	67.1	76.6	2	3.9	109.0	81.6	160.1	43.2	318.1	85.9	89.2	61.3	118.5	2	2.1
UPO-10-1	81.4	74.5	98.8	81.0	102.58	65.5	48.3	78.9	1	7.0	124.8	77.3	119.8	40.8	328.3	77.2	92.6	73.1	116.7	4	0.6
OS-377	65.1	57.8	90.1	85.2	99.41	58.7	51.3	72.5	5		118.3	74.8	134.3	44.2	287.2	93.8	96.3	72.2	115.1	8	
UPO-10-2	60.5	56.8	86.2	83.2	97.83	65.2	76.5	75.2	3	2.0	91.1	79.7	159.4	42.5	317.5	66.0	102.4	81.4	117.5	3	1.3
Kent (NC)	62.0	69.1	70.8	62.1	96.26	60.3	62.7	69.0	9		110.7	83.2	111.8	43.9	290.3	64.3	74.0	73.8	106.5	9	
OS-6 (NC)	60.3	63.7	74.4	64.6	109.96	66.3	54.3	70.5	6		108.9	79.0	162.1	41.5	260.8	76.1	121.7	78.1	116.0	5	
Palampur-1 (ZC-HZ)																					
OL-125 (ZC-NWZ)																					
JHO-99-2 (ZC-NEZ)	57.7	70.3	99.1	63.6	104.60	61.0	59.7	73.7	4												
JHO-822 (ZC-CZ)											99.5	79.3	106.9	43.3	345.6	81.5	81.4	85.3	115.3	7	
JHO-2000-4 (ZC-SZ)																					
Mean	**59.2**	**65.8**	**84.1**	**69.7**	**96.5**	**60.6**	**58.1**	**70.6**			**114.1**	**75.4**	**136.4**	**41.6**	**301.2**	**73.9**	**95.4**	**73.4**	**113.9**		
CD at 5%	4.6	6.4	0.4	17.8	8.4	9.9	8.7				4.9	14.6	12.2	6.7	40.9	6.4	17.4	3.8			
CV%	10.3	7.0	3.1	15.1	8.1	9.6	8.9				2.7	11.4	17.5	9.6	4.8	5.1	10.7	3.1			

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

Entries	South Zone						All India		
	Hyderabad	Mandya	Coimbatore	Average	Rank	Superiority%	Average	Rank	Superiority%
JO-03-99	74.3	42.7	43.8	53.6	9		90.0	8	
JHO-10-1	82.7	48.9	34.3	55.3	8		91.7	5	0.9
SKO-170	103	48.9	34.8	62.2	4	7.9	83.8	11	
JHO-10-2	75.9	53.6	40.3	56.6	7		90.6	7	
SKO-188	98.3	45.2	47.2	63.6	3	10.4	85.3	10	
JO-03-97	69.3	43.9	38.2	50.5	11		95.5	2	5.2
UPO-10-1	72.3	69.2	43.0	61.5	5	6.7	95.4	3	5.1
OS-377	86.7	57.0	52.7	65.5	2	13.7	94.5	4	4.0
UPO-10-2	80.5	77.6	46.0	68.0	1	18.1	97.4	1	7.2
Kent (NC)	82.4	50.9	39.4	57.6	6		86.4	9	
OS-6 (NC)	66.8	54.8	36.2	52.6	10		90.8	6	
Palampur-1 (ZC-HZ)									
OL-125 (ZC-NWZ)									
JHO-99-2 (ZC-NEZ)									
JHO-822 (ZC-CZ)									
JHO-2000-4 (ZC-SZ)	69.8	45.2	33.4	49.4	12				
Mean	**80.2**	**53.2**	**40.8**	**58.0**			**91.0**		
CD at 5%	16.5	6.9	5.8						
CV%	12.2	7.7	12.0						

Table 4.3 AVT Oat (SC-2): Second Advanced Varietal Trial in Oat (Single Cut) SC-2: Green Forage Yield (q/ha/day) Cont.....

Entries	Palam.	Bikaner	Hisar	Ludhi.	Pantn.	Meerut	Jorhat	Kalyani	Bhuba.	Ranchi	Pusa	Faiza.
JO-03-99	2.50	3.52	6.13	4.14	4.70	6.06	2.88	5.84	5.62	2.82	5.28	2.75
JHO-10-1	2.34	2.33	5.74	3.21	5.30	6.00	3.63	5.08	5.06	5.18	5.33	2.62
SKO-170	1.91	1.80	4.41	4.05	4.30	6.52	2.50	2.99	5.00	2.37	3.98	2.68
JHO-10-2	2.40	3.14	5.41	3.4	5.40	6.69	3.22	5.99	4.94	2.85	5.15	2.65
SKO-188	2.18	2.24	4.57	3.95	4.10	7.14	2.41	4.76	4.93	2.27	4.13	2.47
JO-03-97	2.55	2.30	7.63	3.86	5.40	6.47	3.95	6.33	5.22	3.33	5.71	2.89
UPO-10-1	2.20	2.88	7.05	4.43	4.90	6.45	4.43	5.83	5.52	3.33	5.61	2.31
OS-377	1.81	4.07	7.42	3.91	5.10	6.40	3.60	4.25	5.50	3.66	5.43	2.33
UPO-10-2	2.45	3.13	6.49	4.62	5.20	6.12	3.40	4.60	5.47	3.70	5.44	2.94
Kent (NC)	2.23	2.88	6.06	4.53	6.10	4.55	3.96	6.17	4.38	3.11	5.09	2.72
OS-6 (NC)	2.11	2.65	5.96	3.78	5.50	6.41	3.50	5.44	5.32	2.77	6.00	2.81
Palampur-1 (ZC-HZ)	1.90											
OL-125 (ZC-NWZ)		3.04	5.60	5.93	5.20	6.07						
JHO-99-2 (ZC-NEZ)							3.52	6.44	6.24	3.00	5.75	2.75
JHO-822 (ZC-CZ)												
JHO-2000-4 (ZC-SZ)												
Mean	**2.22**	**2.83**	**6.04**	**4.15**	**5.10**	**6.24**	**3.42**	**5.31**	**5.27**	**3.20**	**5.24**	**2.66**

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

Entries	Jhansi	Rahuri	Urulik.	Karjat	Kanpur	Anand	Raipur	Hyder.	Mandya	Coimba.	Aver.	Rank
JO-03-99	5.58	5.43	9.57	3.11	9.06	5.17	4.44	5.09	2.59	3.26	4.80	5
JHO-10-1	5.44	5.24	10.66	2.54	9.77	5.36	4.23	5.11	2.72	2.65	4.80	5
SKO-170	4.30	2.92	6.48	1.57	6.08	4.26	2.91	4.43	2.57	2.91	3.68	7
JHO-10-2	5.80	6.08	7.90	2.65	10.24	6.16	4.50	5.65	3.25	3.10	4.84	4
SKO-188	4.60	3.51	6.62	2.46	6.41	4.64	3.13	3.77	2.79	3.30	3.93	6
JO-03-97	5.58	5.11	9.57	3.09	9.84	6.51	3.32	5.32	2.80	2.81	4.98	2
UPO-10-1	5.55	5.02	9.17	2.56	10.07	5.54	4.02	5.36	4.74	2.98	5.00	1
OS-377	5.67	4.81	8.52	2.66	8.71	6.91	3.97	4.97	2.99	3.74	4.84	4
UPO-10-2	6.43	4.75	10.72	2.75	9.72	5.10	4.51	4.65	4.52	3.35	5.00	1
Kent (NC)	5.89	6.47	8.18	2.57	9.37	5.54	4.06	5.96	2.85	2.91	4.80	5
OS-6 (NC)	5.53	5.64	11.28	2.87	8.33	5.43	4.32	5.31	3.54	2.87	4.88	3
Palampur-1 (ZC-HZ)												
OL-125 (ZC-NWZ)												
JHO-99-2 (ZC-NEZ)												
JHO-822 (ZC-CZ)	5.39	5.85	9.00	2.49	11.55	5.46	4.74					
JHO-2000-4 (ZC-SZ)								4.81	2.83	2.67		
Mean	**5.48**	**5.07**	**8.97**	**2.61**	**9.10**	**5.51**	**4.01**	**5.04**	**3.18**	**3.05**	**4.69**	

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

Cont.....

Entries	Bikaner	Hisar	Ludhiana	Pantna.	Jorhat	Kalyani	Bhuban.	Ranchi	Pusa	Faizabad	Jhansi
JO-03-99	0.71	0.98	0.91	0.74	0.54	0.74	1.18	0.62	1.05	0.52	1.19
JHO-10-1	0.57	1.03	0.77	0.96	0.65	0.74	1.05	1.46	1.07	0.47	1.23
SKO-170	0.45	0.53	0.98	0.72	0.47	0.42	1.07	0.54	0.78	0.48	1.09
JHO-10-2	0.84	0.65	0.82	1.00	0.62	0.91	0.98	0.73	1.03	0.49	1.21
SKO-188	0.61	0.55	0.82	0.71	0.42	0.69	1.00	0.57	0.81	0.54	1.22
JO-03-97	0.55	1.53	0.98	1.03	0.70	0.90	1.02	0.91	1.13	0.63	1.17
UPO-10-1	0.77	1.13	0.85	0.91	0.88	0.86	1.16	0.89	1.12	0.56	1.30
OS-377	0.97	1.34	0.78	0.85	0.69	0.60	1.10	0.93	1.07	0.53	1.23
UPO-10-2	0.82	1.30	1.12	0.88	0.63	0.65	1.09	0.92	1.08		0.99
Kent (NC)	0.78	1.09	0.95	0.94	0.67	0.82	0.87	0.71	1.00	0.56	1.22
OS-6 (NC)	0.72	1.07	1.01	0.86	0.65	0.82	1.06	0.73	1.20	0.62	1.19
Palampur-1 (ZC-HZ)											
OL-125 (ZC-NWZ)	0.84	1.15	1.44	0.88							
JHO-99-2 (ZC-NEZ)					0.61	0.90	1.30	0.71	1.15	0.56	
JHO-822 (ZC-CZ)											1.09
JHO-2000-4 (ZC-SZ)											
Mean	**0.72**	**1.03**	**0.95**	**0.87**	**0.63**	**0.75**	**1.07**	**0.81**	**1.04**	**0.54**	**1.18**

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

Entries	Rahuri	Urulika.	Karjat	Kanpur	Anand	Raipur	Hyderabad	Mandya	Coimbat.	Average	Rank
JO-03-99	1.09	1.69	0.59	3.08	0.85	1.08	0.86	0.50	0.67	0.98	7
JHO-10-1	1.00	2.13	0.55	3.32	0.78	1.04	1.00	0.60	0.53	1.05	3
SKO-170	0.52	1.36	0.33	2.07	0.72	0.73	0.97	0.57	0.56	0.77	9
JHO-10-2	1.23	1.31	0.50	3.48	0.96	1.10	0.95	0.76	0.58	1.01	5
SKO-188	0.76	1.34	0.49	2.18	0.59	0.78	0.86	0.54	0.69	0.81	8
JO-03-97	1.13	1.95	0.55	3.38	1.03	0.83	0.85	0.55	0.58	1.07	2
UPO-10-1	1.06	1.48	0.47	3.42	0.89	0.99	0.93	1.07	0.61	1.07	2
OS-377	0.97	1.58	0.50	2.96	1.08	0.98	1.03	0.70	0.81	1.04	4
UPO-10-2	1.04	1.97	0.50	3.31	0.80	1.10	0.91	1.00	0.71	1.10	1
Kent (NC)	1.28	1.38	0.49	3.19	0.80	1.00	1.06	0.65	0.62	1.00	6
OS-6 (NC)	1.18	2.08	0.52	2.84	1.00	1.06	0.93	0.82	0.58	1.05	3
Palampur-1 (ZC-HZ)											
OL-125 (ZC-NWZ)											
JHO-99-2 (ZC-NEZ)											
JHO-822 (ZC-CZ)	1.17	1.34	0.50	3.93	0.98	1.15					
JHO-2000-4 (ZC-SZ)							0.85	0.56	0.56		
Mean	**1.04**	**1.63**	**0.50**	**3.10**	**0.87**	**0.99**	**0.93**	**0.69**	**0.63**	**0.99**	

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

Entries	Palam.	Ludhi.	Kaly.	Bhuban.	Ranchi	Faiza.	Imphal	Urulik.	Anand	Jabal.	Raipur	Hyder.	Mandya	Coimba.	Rahuri	Aver.	Rank
JO-03-99	6.5	7.9	6.2	9.6	5.0	4.7	2.6	12.2	7.8	9.4	7.6	4.2	3.0	6.3	5.4	6.6	3
JHO-10-1	5.8	6.4	4.6	8.5	5.5	4.1	3.6	13.7	6.2	8.9	6.4	6.8	2.3	4.5	4.5	6.1	6
SKO-170	5.6	10.5	3.5	8.3	4.9	4.3	3.1	10.2	9.0	7.7	4.1	8.1	3.8	6.9	4.3	6.3	5
JHO-10-2	5.9	6.7	3.9	6.5	6.0	4.3	2.8	10.0	8.5	6.9	7.4	6.0	2.6	5.3	7.2	6.0	7
SKO-188	6.8	8.2	4.5	6.9	5.3	5.4	2.1	9.9	6.2	6.3	4.6	8.2	2.8	7.7	6.1	6.1	6
JO-03-97	5.7	7.8	5.8	7.4	6.5	5.3	3.3	12.5	9.2	7.2	4.5	4.2	2.9	6.2	6.8	6.4	4
UPO-10-1	5.8	7.7	6.6	9.7	6.7	5.4	1.9	10.6	8.8	7.4	5.8	5.4	4.6	6.3	6.4	6.6	3
OS-377	5.1	6.6	4.4	8.8	8.6	4.6	2.3	10.3	9.9	7.6	5.9	6.3	4.0	6.7	5.6	6.4	4
UPO-10-2	5.7	9.4	3.9	8.3	8.4	5.1	3.0	14.1	7.1	8.2	7.3	5.3	5.1	6.2	5.3	6.8	2
Kent (NC)	5.6	8.0	3.7	6.9	5.4	5.0	3.0	9.5	6.9	5.7	6.3	5.7	3.1	6.3	6.9	5.9	8
OS-6 (NC)	5.0	11.2	6.1	7.4	6.5	5.2	2.6	14.8	8.3	10.0	6.8	5.4	3.8	4.2	7.3	7.0	1
Palampur-1 (ZC-HZ)	5.3																
OL-125 (ZC-NWZ)		10.9															
JHO-99-2 (ZC-NEZ)			5.7	9.7	5.3	4.9	3.1										
JHO-822 (ZC-CZ)								9.0	9.3	6.4	8.3				5.3		
JHO-2000-4 (ZC-SZ)												4.0	2.8	5.6			
Mean	**5.7**	**8.4**	**4.9**	**8.2**	**6.2**	**4.9**	**2.8**	**11.4**	**8.1**	**7.6**	**6.3**	**5.8**	**3.4**	**6.0**	**5.9**	**6.4**	

Table 4.6 AVT Oat (SC-2): Second Advanced Varietal Trial in Oat (Single Cut)SC-2: Crude Protein (%)

Entries	Palam.	Ludhi.	Kaly.	Bhuba.	Ranchi	Faiza.	Imphal	Urulik.	Anand	Raipur	Hyder.	Coimb.	Rahuri	Pantn.	Jabal.	Aver.	Rank
JO-03-99	10.5	7.5	8.5	9.5	8.3	8.1	5.7	8.8	10.9	9.5	5.7	14.4	7.1	9.6	8.2	8.8	4
JHO-10-1	10.2	7.2	7.2	9.7	8.3	7.9	6.0	7.7	9.60	8.4	8.3	13.1	6.6	10.5	8.2	8.6	6
SKO-170	9.6	7.4	8.6	9.6	7.9	7.5	4.6	7.8	11.6	7.1	7.9	19.7	8.8	9.6	8.1	9.0	2
JHO-10-2	10.2	7.0	4.9	9.7	9.2	8.2	5.2	9.4	11.5	9.2	7.9	13.1	8.4	11.4	8.0	8.9	3
SKO-188	11.4	7.4	6.8	9.7	8.3	8.3	4.1	7.8	11.1	7.5	8.3	16.2	8.8	10.5	7.8	8.9	3
JO-03-97	9.3	7.4	7.8	9.8	8.3	8.0	4.9	7.8	10.6	7.4	6.1	16.4	8.3	10.5	8.1	8.7	5
UPO-10-1	9.3	7.7	8.9	9.8	8.3	8.3	4.0	8.8	11.3	8.0	7.4	14.7	8.3		8.0	8.8	4
OS-377	10.5	7.2	7.6	9.7	10.1	7.9	4.4	7.7	10.5	8.1	7.2	12.7	7.4	10.5	8.1	8.6	6
UPO-10-2	9.6	7.2	6.9	9.6	10.1	7.8	4.0	8.9	10.7	9.0	6.6	13.6	6.6	9.6	8.1	8.5	7
Kent (NC)	10.5	8.2	5.3	9.7	8.8	8.4	4.7	8.5	10.6	8.5	7.0	15.8	8.3	10.5	7.8	8.8	4
OS-6 (NC)	9.9	9.6	9.6	9.9	10.1	7.9	4.7	9.1	10.8	8.7	8.1	11.8	9.2	9.6	8.2	9.1	1
Palampur-1 (ZC-HZ)	9.3													11.4			
OL-125 (ZC-NWZ)		7.4												10.5			
JHO-99-2 (ZC-NEZ)			8.1	9.7	8.3	8.1	5.2										
JHO-822 (ZC-CZ)								8.5	11.3	9.8			6.6		7.9		
JHO-2000-4 (ZC-SZ)											5.7	16.6					
Mean	**10.0**	**7.6**	**7.5**	**9.7**	**8.8**	**8.0**	**4.8**	**8.4**	**10.9**	**8.4**	**7.2**	**14.8**	**7.9**	**10.4**	**8.0**	**8.8**	

Table 4.7 AVT Oat (SC-2): Second Advanced Varietal Trial in Oat (Single Cut) SC-2: Plant Height (cm)

Cont....

Entries	Palampur	Srinagar	Bikaner	Jalore	Hisar	Ludhiana	Pantna.	Udaipur	Meerut	Jorhat	Kalyani	Bhuban.	Ranchi	Faizabad
JO-03-99	114.0	140.0	140.0	135.7	136.9	114.7	145.0	150.2	144.8	149.5	137.6	184.7	114.6	115.2
JHO-10-1	116.0	143.9	139.0	138.7	142.1	119.3	139.3	148.7	146.1	151.8	148.6	159.2	116.7	116.8
SKO-170	99.3	94.9	80.0	86.3	104.6	110.0	139.0	127.4	121.1	104.9	110.2	163.3	91.9	95.7
JHO-10-2	108.6	165.7	113.0	139.3	128.7	117.0	143.3	147.0	153.2	135.8	153.5	143.3	113.0	100.5
SKO-188	103.6	115.4	125.0	98.3	106.7	134.3	150.0	155.4	149.5	124.1	113.2	146.3	104.1	98.6
JO-03-97	116.3	147.7	113.0	150.0	146.6	125.3	141.0	153.9	126.2	149.9	152.9	160.1	114.6	106.2
UPO-10-1	115.3	128.0	102.0	145.0	145.4	117.3	150.7	147.8	149.4	160.5	153.7	177.4	113.2	90.5
OS-377	109.3	134.4	81.0	139.7	134.7	115.0	144.3	137.1	144.2	142.5	121.5	171.3	112.0	94.6
UPO-10-2	119.6	143.0	90.0	148.3	142.7	130.0	151.7	119.0	142.8	152.1	139.0	165.6	119.4	125.2
Kent (NC)	116.6	125.4	117.0	138.0	138.8	106.7	141.7	148.8	127.2	143.9	152.6	150.1	115.9	99.5
OS-6 (NC)	112.3	142.3	102.0	156.7	131.3	124.3	145.0	130.9	129.4	152.1	155.4	153.6	112.2	112.8
Palampur-1 (ZC-HZ)	123.6	147.6												
OL-125 (ZC-NWZ)			129.0	146.7	143.3	101.0	145.7	135.8	136.5					
JHO-99-2 (ZC-NEZ)										160.7	155.6	179.6	118.0	110.2
JHO-822 (ZC-CZ)														
JHO-2000-4 (ZC-SZ)														
Mean	**112.9**	**135.7**	**110.9**	**135.2**	**133.5**	**117.9**	**144.7**	**141.8**	**139.2**	**144.0**	**141.2**	**162.9**	**112.1**	**105.5**

Table 4.7 AVT Oat (SC-2): Second Advanced Varietal Trial in Oat (Single Cut) SC-2: Plant Height (cm)

Entries	Imphal	Jhansi	Rahuri	Urulika.	Karjat	Kanpur	Anand	Jabalpur	Raipur	Hyder.	Mandya	Coimba.	Aver.	Rank
JO-03-99	116.6	148.3	100.0	109.6	78.0	106.1	126.1	141.1	133.3	91.5	57.1	112.0	124.7	5
JHO-10-1	127.6	154.0	96.0	130.7	100.0	109.8	128.8	141.7	158.3	105.0	61.3	120.0	129.2	1
SKO-170	103.1	103.9	74.0	97.9	76.0	86.9	109.5	129.8	122.2	68.9	38.8	117.0	102.2	11
JHO-10-2	134.2	131.8	101.0	111.8	91.0	107.0	128.7	121.1	141.2	94.0	50.7	102.0	122.2	7
SKO-188	103.1	118.7	93.0	117.7	90.0	99.2	125.8	109.8	121.8	80.1	49.2	123.0	113.7	10
JO-03-97	136.1	140.9	99.0	125.3	98.0	116.7	129.4	123.6	127.3	92.4	64.1	104.0	125.4	4
UPO-10-1	143.1	152.0	104.0	119.9	89.0	117.9	134.8	126.2	130.8	104.3	63.9	111.0	126.7	2
OS-377	120.9	150.6	105.0	133.1	85.0	103.8	118.7	131.5	138.5	100.1	53.7	117.0	120.7	8
UPO-10-2	139.4	138.1	104.0	122.2	84.0	120.1	137.4	135.1	130.3	92.5	73.8	122.0	126.4	3
Kent (NC)	136.7	142.2	102.0	116.3	95.0	108.2	134.0	90.6	120.9	91.2	54.2	110.0	120.1	9
OS-6 (NC)	129.8	141.9	105.0	120.9	88.0	108.1	130.9	144.9	128.5	79.8	73.9	124.0	124.5	6
Palampur-1 (ZC-HZ)														
OL-125 (ZC-NWZ)														
JHO-99-2 (ZC-NEZ)	126.8													
JHO-822 (ZC-CZ)		135.1	96.0	112.8	101.0	109.1	122.0	117.0	132.0					
JHO-2000-4 (ZC-SZ)										100.0	57.1	135.0		
Mean	**126.4**	**138.1**	**98.3**	**118.2**	**89.6**	**107.7**	**127.2**	**126.0**	**132.1**	**91.7**	**58.2**	**116.4**	**121.4**	

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

Cont.....

Entries	Palampur	Srinagar	Bikaner	Ludhiana	Pantna.	Meerut	Jorhat	Kalyani	Bhuban.	Ranchi	Faizabad	Imphal
JO-03-99	0.79	0.50	0.89	1.00	0.54	0.29	1.00	0.63	1.25	0.38	0.75	0.91
JHO-10-1	0.50	0.44	0.50	0.82	0.51	0.23	0.94	0.87	0.98	0.30	0.74	0.39
SKO-170	0.74	0.43	1.14	0.43	0.34	0.20	0.91	0.81	0.96	0.34	0.71	0.27
JHO-10-2	0.71	0.52	0.67	0.74	0.64	0.26	0.75	0.93	0.74	0.34	0.75	0.37
SKO-188	0.65	0.47	0.74	0.67	0.31	0.20	1.03	0.93	0.77	0.36	0.8	0.37
JO-03-97	0.79	0.49	0.72	0.60	0.49	0.20	1.08	0.75	0.89	0.41	0.74	0.52
UPO-10-1	0.61	0.43	0.89	0.43	0.28	0.22	1.03	0.87	1.18	0.49	0.71	0.39
OS-377	0.55	0.44	0.83	0.48	0.44	0.24	0.97	0.63	1.14	0.37	0.78	0.55
UPO-10-2	0.71	0.47	0.83	0.67	0.44	0.20	0.96	0.93	1.09	0.40	0.79	0.39
Kent (NC)	0.64	0.44	0.69	0.60	0.40	0.20	0.90	0.75	0.81	0.35	0.75	0.40
OS-6 (NC)	0.64	0.47	0.63	0.60	0.51	0.20	1.43	0.67	0.84	0.35	0.81	0.46
Palampur-1 (ZC-HZ)	0.63	0.54										
OL-125 (ZC-NWZ)			0.54	0.48	0.56	0.21						
JHO-99-2 (ZC-NEZ)							0.66	0.75	1.21	0.38	0.73	0.39
JHO-822 (ZC-CZ)												
JHO-2000-4 (ZC-SZ)												
Mean	**0.66**	**0.47**	**0.76**	**0.63**	**0.46**	**0.22**	**0.97**	**0.79**	**0.99**	**0.37**	**0.76**	**0.45**

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

Entries	Rahuri	Urulika.	Karjat	Kanpur	Jabalpur	Raipur	Hyderabad	Mandya	Coimba.	Average	Rank
JO-03-99	0.62	0.65	0.88	0.51	0.77	0.82	0.52	0.28	0.40	0.68	1
JHO-10-1	0.77	0.74	0.92	0.34	0.74	0.66	0.29	0.30	0.38	0.59	5
SKO-170	0.96	0.73	0.82	0.67	0.70	0.51	0.28	0.29	0.43	0.60	4
JHO-10-2	0.71	0.95	0.79	0.43	0.60	0.79	0.48	0.33	0.36	0.61	3
SKO-188	0.93	0.59	0.82	0.56	0.55	0.56	0.26	0.31	0.45	0.59	5
JO-03-97	0.63	0.75	0.87	0.38	0.63	0.57	0.51	0.23	0.33	0.60	4
UPO-10-1	0.76	0.53	0.88	0.44	0.67	0.68	0.46	0.25	0.37	0.60	4
OS-377	0.71	0.59	0.87	0.45	0.70	0.62	0.39	0.35	0.40	0.60	4
UPO-10-2	0.87	0.70	0.90	0.37	0.72	0.73	0.49	0.28	0.39	0.63	2
Kent (NC)	0.76	0.67	0.92	0.34	0.51	0.62	0.40	0.22	0.36	0.56	6
OS-6 (NC)	0.76	0.46	0.83	0.28	0.82	0.72	0.57	0.26	0.36	0.60	4
Palampur-1 (ZC-HZ)											
OL-125 (ZC-NWZ)											
JHO-99-2 (ZC-NEZ)											
JHO-822 (ZC-CZ)	0.81	0.63	0.75	0.32	0.46	0.77					
JHO-2000-4 (ZC-SZ)							0.56	0.29	0.34		
Mean	**0.77**	**0.67**	**0.85**	**0.42**	**0.66**	**0.67**	**0.43**	**0.28**	**0.38**	**0.61**	

Table 4.9 AVT Oat (SC-2): Second Advanced Varietal Trial in Oat (Single Cut)SC-2: IVDMD(%), ADF(%) & NDF(%)

Entries	IVDMD(%)					ADF (%)							NDF (%)							
	Ludhi.	Ranchi	Rahu.	Aver.	Rank	Palam.	Ludhi.	Ranchi	Rahuri	Pantn.	Aver.	Rank	Palam.	Ludhi.	Ranchi	Anand	Rahu.	Pantn.	Aver.	Rank
JO-03-99	61.8	63.5	57.2	60.8	3	54.0	38.4	32.6	43.6	55.8	44.9	4	63.8	55.6	53.4	61.0	55.4	63.8	58.8	1
JHO-10-1	60.0	58.4	51.3	56.5	10	56.4	39.7	39.2	47.7	52.6	47.1	8	65.2	58.2	60.8	66.0	56.5	63.6	61.7	8
SKO-170	61.0	56.9	50.5	56.1	11	54.6	39.2	41.1	45.2	55.8	47.2	9	63.4	55.8	57.6	63.0	54.1	60.6	59.1	2
JHO-10-2	57.6	62.3	58.5	59.4	6	56.0	41.4	34.2	48.7	57.2	47.5	10	64.0	59.8	60.6	66.0	59.0	65.4	62.5	9
SKO-188	61.0	63.6	52.9	59.1	7	53.0	39.1	32.5	49.0	58.0	46.3	7	62.2	55.8	57.4	65.0	50.1	63.8	59.1	2
JO-03-97	61.0	63.4	51.5	58.6	9	54.6	39.2	32.7	47.1	52.6	45.2	5	63.8	55.8	54.2	66.0	58.0	63.4	60.2	4
UPO-10-1	60.3	63.4	55.7	59.8	5	52.2	41.3	32.4	45.0		42.7	1	61.6	58.3	59.2	66.0	57.5		60.5	5
OS-377	60.0	64.1	59.0	61.0	2	53.4	39.8	31.8	48.1	56.6	45.9	6	62.6	58.2	60.8	65.0	55.2	61.8	60.6	6
UPO-10-2	60.3	64.8	55.7	60.2	4	55.0	39.8	31.0	42.5	55.8	44.8	3	63.6	58.2	57.6	67.0	56.3	65.4	61.4	7
Kent (NC)	63.2	59.8	53.2	58.7	8	57.4	38.1	37.4	49.2	55.6	47.5	10	66.0	53.9	58.2	61.0	57.5	64.0	60.1	3
OS-6 (NC)	64.4	64.1	57.6	62.0	1	52.6	34.0	31.8	45.9	53.2	43.5	2	65.4	51.3	57.8	64.0	55.6	65.4	59.9	2
Palampur-1 (ZC-HZ)						56.0				55.8			64.6					62.2		
OL-125 (ZC-NWZ)	61.0						39.2			52.2				55.8				64.6		
JHO-99-2 (ZC-NEZ)		62.3						34.1							62.2					
JHO-822 (ZC-CZ)			55.6						40.9							60.0	61.1			
JHO-2000-4 (ZC-SZ)																				
Mean	**61.0**	**62.2**	**54.8**	**59.3**		**54.6**	**39.1**	**34.2**	**46.1**	**55.1**	**45.7**		**63.9**	**56.4**	**58.3**	**64.2**	**56.4**	**63.7**	**60.3**	

5. AVTO (SC)-2 (Seed): Second Advanced Varietal Trial in Oat (Single cut) for seed. (Table Reference 5.1)

An advanced varietal trial in Oat (Single cut) for seed with nine entries i.e. JO-03-99, JHO-10-1, SKO-170, JHO-10-2, SKO-188, JO-03-97, UPO-10-1, OS-377 and UPO-10-2, along with two national checks i.e. Kent and OS-6 and five zonal checks i.e. Palampur-1, OL-125, JHO-99-2, JHO-822 and JHO-2000-4 for respective zones was conducted at ten locations distributed in five zones of the country. Result obtained from different centres indicated that none of the entries were superior against zonal/national check in south zone and at national level. However entries OS-377 (1.8%) in Hill Zone, JO-03-99 (4.9%) in North West zone, entries OS-377 (12.7%), UPO-10-2 (2.1%) and JHO-10-1 (0.7%) in North East zone and JO-03-99 (1.6%) in Central zone registered their superiority over best check.

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

Cont.....

Entries	Hill Zone					North West Zone					North East Zone				
	Palam.	Srina.	Average	Rank	Super%	Hisar	Pantn.	Average	Rank	Super%	Jorhat	Ranchi	Average	Rank	Super%
JO-03-99	12.3	24.3	18.3	12		20.1	13.9	17.0	1	4.9	16.5	10.0	13.3	8	
JHO-10-1	16.9	24.0	20.4	10		18.6	11.7	15.2	4		18.2	10.3	14.3	3	0.7
SKO-170	22.2	25.4	23.8	3		11.0	12.9	12.0	10		15.1	6.3	10.7	10	
JHO-10-2	16.0	30.5	23.2	4		16.0	15.8	15.9	3		12.7	5.0	8.9	11	
SKO-188	14.2	28.4	21.3	7		3.8	9.9	6.8	11		16.8	7.0	11.9	9	
JO-03-97	16.1	22.7	19.4	11		18.1	14.4	16.2	2		17.4	10.3	13.8	5	
UPO-10-1	19.8	22.6	21.2	8		14.4	14.2	14.3	7		13.0	14.0	13.5	7	
OS-377	26.8	29.2	28.0	1	1.8	16.7	12.7	14.7	6		17.7	14.3	16.0	1	12.7
UPO-10-2	17.8	23.7	20.7	9		17.2	12.5	14.8	5		15.9	13.0	14.5	2	2.1
Kent (NC)	15.3	27.6	21.4	6		17.2	11.1	14.2	8		18.3	9.0	13.6	6	
OS-6 (NC)	17.3	26.2	21.8	5		16.7	15.8	16.2	2		17.1	11.3	14.2	4	
Palampur-1 (ZC-HZ)	24.2	30.7	27.5	2											
OL-125 (ZC-NWZ)						17.2	10.8	14.0	9						
JHO-99-2 (ZC-NEZ)											13.9	13.7	13.8	5	
JHO-822 (ZC-CZ)															
JHO-2000-4 (ZC-SZ)															
Mean	**18.2**	**26.3**	**22.2**			**15.6**	**13.0**	**14.3**			**16.1**	**10.4**	**13.2**		
CD at 5%	5.4	2.1				2.2	2.8				1.3	3.3			
CV%	17.6	3.5				8.1	12.8				5.7	18.7			

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

Entries	Central Zone					South Zone				All India	
	Jhansi	Jabalpur	Average	Rank	Superiority%	Mandya	Hyderabad	Average	Rank	Average	Rank
JO-03-99	30.7	32.7	31.7	1	1.6	7.5	23.3	15.4	5	19.1	3
JHO-10-1	25.0	33.9	29.4	3		6.9	18.1	12.5	8	18.4	5
SKO-170	15.6	25.1	20.4	9		5.2	17.0	11.1	9	15.6	9
JHO-10-2	26.8	27.4	27.1	5		12.8	24.0	18.4	3	18.7	4
SKO-188	9.0	10.3	9.7	11		6.3	18.8	12.5	8	12.4	10
JO-03-97	22.1	25.5	23.8	7		11.8	21.1	16.4	4	17.9	6
UPO-10-1	25.1	30.9	28.0	4		11.2	25.5	18.4	3	19.1	3
OS-377	19.4	31.2	25.3	6		6.7	23.0	14.9	6	19.8	2
UPO-10-2	18.9	24.0	21.4	8		5.9	15.5	10.7	10	16.4	8
Kent (NC)	25.8	36.5	31.2	2		12.0	25.7	18.9	2	19.9	1
OS-6 (NC)	24.4	10.0	17.2	10		14.8	24.4	19.6	1	17.8	7
Palampur-1 (ZC-HZ)											
OL-125 (ZC-NWZ)											
JHO-99-2 (ZC-NEZ)											
JHO-822 (ZC-CZ)	22.6	25.0	23.8	7							
JHO-2000-4 (ZC-SZ)						9.5	18.6	14.1	7		
Mean	**22.1**	**26.0**	**24.1**			**9.2**	**21.3**	**15.2**		**17.7**	
CD at 5%	9.9	5.0				2.2	5.0				
CV%	5.9	11.4				13.9	14.1				

6. IVTO (MC): Initial Varietal Trial in Oat (Multi cut)

(Table Reference: 6.1 to 6.9)

In oat (multi cut), an initial varietal trial comprising of six entries and three national checks namely RO-19, UPO-212 and Kent was conducted at nineteen locations across the country. For the character, green forage yield (q/ha), entries OL-1766 (2.5%) and HFO-488 (1.0%) in North-East zone and JO-04-315 (5.3%), HFO-488 (5.0%), PLP-14 (1.9%) and JHO-2012-3 (0.2%) in Central zone proved their superiority over best national check. However in other zones as well as at national level none of the entries was found superior than the checks.

For the character dry matter yield (q/ha), entry OL-1769 (3.4%) in Hill zone, entries OL-1769 (11.9%), OL-1766 (8.4%) and JHO-2012-3 (5.3%) in North-West zone, HFO-488 (1.8%) and OL-1766 (1.2%) in North-East zone and JO-04-315 (11.3%), PLP-14 (9.6%), HFO-488 (9.4%), JHO-2012-3 (8.8%) and OL-1766 (1.8%) in Central zone proved superiority. At national level, entry HFO-488 (3.8%) ranked first for this character. For fodder production potential (q/ha/day), check variety UPO-212 maintained superiority both for green forage and dry matter production potential.

For the character plant height, entry OL-1766 (98.5 cm) and for leafiness (L/S ratio) OL-1769 (0.67) ranked first. For quality parameters, entries OL-1766 and JO-04-315 for crude protein yield (q/ha) and Kent for crude protein content (%) proved superiority. For other quality parameters, entry OL-1769 for IVDMD (%), ADF (%) and NDF (%) registered its superiority over best national check.

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

Entries	Hill Zone					North West Zone						
	Palampur	Srinagar	Almora	Average	Rank	Pantna.	Hisar	Jalore	Ludhiana	Udaipur	Average	Rank
PLP-14	375.0	374.0	165.0	304.7	3	327.7	607.4	443.0	622.2	775.6	555.2	4
HFO-488	282.1	401.0	175.9	286.3	8	362.5	555.5	475.7	570.4	777.1	548.2	5
OL-1769	361.3	394.3	178.9	311.5	2	472.2	666.6	492.3	525.9	737.4	578.9	2
OL-1766	271.1	322.2	201.1	264.8	9	109.9	677.7	413.7	574.1	703.9	495.9	9
JHO-2012-3	283.5	372.9	204.1	286.8	7	514.8	614.8	435.7	525.9	729.2	564.1	3
JO-04-315	319.5	368.7	180.3	289.5	6	497.3	577.7	460.3	455.6	719.2	542.0	6
RO-19 (NC)	306.6	357.9	211.5	292.0	5	429.6	666.6	605.3	585.2	707.0	598.7	1
UPO-212 (NC)	333.3	437.2	191.4	320.6	1	401.8	607.4	447.3	577.8	651.9	537.2	7
Kent (NC)	312.8	399.5	168.4	293.6	4	412.5	555.5	460.3	507.4	731.0	533.3	8
Mean	**316.1**	**380.8**	**186.3**	**294.4**		**392.0**	**614.3**	**470.4**	**549.4**	**725.8**	**550.4**	
CD at 5%	55.9	7.7	30.4			54.4	47.8	50.6	33.8	9.2		
CV%	10.2	6.8	9.3			7.5	4.5	6.2	4.4	3.1		

Entries	North East Zone									Central Zone								All India	
	Ranchi	Pusa	Faiza.	Jorhat	Bhuba.	Imphal	Aver.	Rank	Super.%	Jhansi	Anand	Jabal.	Rahuri	Urulik.	Aver.	Rank	Super%	Aver.	Rank
PLP-14	506.7	448.0	333.3	389.0	442.6	313.5	405.5	6		349.7	627.0	625.1	555.2	592.0	549.8	3	1.9	466.9	3
HFO-488	460.0	476.0	328.0	421.3	519.9	325.7	421.8	2	1.0	401.0	605.0	723.8	531.6	570.6	566.4	2	5.0	471.7	2
OL-1769	393.3	429.0	184.0	359.8	518.5	308.2	365.5	9		383.0	590.0	567.8	505.7	573.3	524.0	8		454.8	7
OL-1766	462.3	454.0	402.7	333.7	471.2	444.6	428.1	1	2.5	364.0	611.0	621.1	539.5	557.3	538.6	6		449.2	8
JHO-2012-3	566.7	437.0	325.3	385.8	409.9	318.9	407.3	5		382.3	526.0	661.1	590.4	541.3	540.2	4	0.2	464.5	5
JO-04-315	497.7	429.0	432.0	350.5	417.9	286.9	402.3	7		426.0	596.0	623.8	583.0	610.6	567.9	1	5.3	464.8	4
RO-19 (NC)	520.0	534.0	221.9	366.8	434.6	428.5	417.6	3		360.7	600.0	547.8	571.9	616.0	539.3	5		477.5	1
UPO-212 (NC)	473.3	464.0	338.7	452.3	475.2	268.4	412.0	4		379.7	628.0	554.5	528.8	576.0	533.4	7		462.5	6
Kent (NC)	377.7	473.0	346.7	406.7	343.3	250.9	366.4	8		390.3	538.0	466.5	474.2	573.3	488.5	9		431.0	9
Mean	**473.1**	**460.4**	**323.6**	**385.1**	**448.1**	**327.3**	**402.9**			**381.9**	**591.2**	**599.1**	**542.2**	**578.9**	**538.7**			**460.3**	
CD at 5%	61.2	31.5	81.7	10.2	43.6	8.0				4.7	55.9	125.4	60.1	25.7					
CV%	7.4	9.1	14.6	10.0	3.6	5.2				2.7	5.5	12.1	6.4	4.5					

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

Entries	Hill Zone						North West Zone					
	Palampur	Srinagar	Almora	Average	Rank	Superiority%	Pantnagar	Hisar	Ludhiana	Average	Rank	Superiority%
PLP-14	65.8	115.0	19.7	66.9	7		41.1	63.4	139.2	81.2	9	
HFO-488	53.7	132.1	24.0	69.9	4		45.9	96.1	125.9	89.3	5	
OL-1769	63.9	130.4	26.5	73.6	1	3.4	60.7	124.4	120.2	101.8	1	11.9
OL-1766	53.2	106.1	29.0	62.8	8		51.1	110.5	134.3	98.6	2	8.4
JHO-2012-3	54.1	122.8	32.2	69.7	5		76.7	95.5	115.2	95.8	3	5.3
JO-04-315	56.7	101.3	24.8	61.0	9		61.1	91.3	100.5	84.3	8	
RO-19 (NC)	53.1	118.5	29.9	67.1	6		55.2	71.3	133.1	86.5	7	
UPO-212 (NC)	59.9	127.2	26.4	71.2	2		49.2	94.5	129.4	91.0	4	
Kent (NC)	59.2	131.6	22.2	71.0	3		54.1	100.0	112.4	88.8	6	
Mean	**57.7**	**120.5**	**26.1**	**68.1**			**55.0**	**94.1**	**123.4**	**90.8**		
CD at 5%	NS	3.6	4.4				7.7	7.6	14.0			
CV%	11.6	7.6	9.7				8.1	4.6	11.3			

Entries	North East Zone									Central Zone								All India		
	Ranc.	Pusa	Faiza.	Jorhat	Bhuba.	Imph.	Aver.	Rank	Super%	Jhan.	Anand	Jabal.	Rahu.	Urulik.	Aver.	Rank	Super%	Aver	Rank	Super%
PLP-14	36.3	88.9	64.0	73.5	88.2	54.8	67.6	8		68.2	88.4	141.4	93.7	97.8	97.9	2	9.6	78.8	7	
HFO-488	37.3	93.2	71.9	77.3	105.0	58.9	73.9	1	1.8	69.9	87.1	154.3	92.7	84.7	97.7	3	9.4	82.9	1	3.8
OL-1769	37.2	84.6	54.9	58.8	103.7	67.0	67.7	7		60.1	74.8	116.6	82.2	94.3	85.6	8		80.0	4	0.1
OL-1766	34.0	91.2	84.3	58.1	95.9	77.3	73.5	2	1.2	67.6	74.4	129.3	91.9	91.5	90.9	5	1.8	81.2	3	1.6
JHO-2012-3	45.5	87.9	72.7	62.9	83.2	59.2	68.6	4		69.3	78.5	139.5	100.9	97.9	97.2	4	8.8	82.0	2	2.6
JO-04-315	35.6	84.0	96.3	60.4	84.5	50.6	68.5	5		75.2	85.9	130.9	103.7	101.2	99.4	1	11.3	79.1	6	
RO-19 (NC)	38.5	107.0	51.7	64.8	86.8	57.0	67.6	8		57.2	85.1	113.4	100.7	90.0	89.3	6		77.3	8	
UPO-212 (NC)	42.4	91.2	74.6	77.6	95.8	54.1	72.6	3		66.6	79.0	108.7	85.8	95.9	87.2	7		79.9	5	
Kent (NC)	31.1	92.9	83.2	72.1	69.5	58.8	67.9	6		66.5	71.4	91.8	86.3	96.9	82.6	9		76.5	9	
Mean	**37.5**	**91.2**	**72.6**	**67.3**	**90.3**	**59.7**	**69.8**			**66.7**	**80.5**	**125.1**	**93.1**	**94.5**	**92.0**			**79.7**		
CD at 5%	6.5	7.5	9.2	2.6	32.7	3.9				12.0	7.9	22.6	11.4	8.3						
CV%	10.1	8.4	7.3	6.2	5.5	10.1				6.9	5.7	10.4	7.1	6.2						

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

Entries	Pantnagar	Hisar	Ludhiana	Ranchi	Pusa	Faizabad	Bhuban.	Anand	Jorhat	Average	Rank
PLP-14	2.51	4.53	4.71	4.78	4.67	3.28	5.03	6.21	3.87	4.40	6
HFO-488	2.78	4.21	4.60	4.38	5.17	3.18	5.78	5.99	4.17	4.47	5
OL-1769	3.66	5.29	4.24	4.28	4.71	1.87	5.70	5.84	3.56	4.35	8
OL-1766	3.18	5.21	4.35	4.77	4.99	3.94	5.12	6.05	3.30	4.55	2
JHO-2012-3	4.14	4.73	4.24	5.78	4.65	3.22	4.55	5.21	3.84	4.48	4
JO-04-315	4.05	4.44	3.67	5.18	4.71	4.32	4.75	5.90	3.51	4.50	3
RO-19 (NC)	3.15	5.01	4.18	4.95	5.62	2.22	4.78	5.94	3.68	4.39	7
UPO-212 (NC)	3.27	4.71	4.66	4.78	4.94	3.42	5.34	6.41	4.50	4.67	1
Kent (NC)	3.48	4.44	4.09	4.06	5.09	3.20	3.73	5.49	4.05	4.18	9
Mean	**3.36**	**4.73**	**4.30**	**4.77**	**4.95**	**3.18**	**4.98**	**5.89**	**3.83**	**4.44**	

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

Entries	Pantnagar	Hisar	Ludhiana	Ranchi	Pusa	Faizabad	Jorhat	Bhuban.	Anand	Average	Rank
PLP-14	0.31	0.47	1.05	0.34	0.93	0.63	0.73	1.00	0.88	0.70	8
HFO-488	0.35	0.73	1.02	0.36	1.01	0.69	0.77	1.17	0.86	0.77	2
OL-1769	0.47	0.99	0.97	0.40	0.93	0.56	0.58	1.14	0.74	0.75	4
OL-1766	0.40	0.85	1.02	0.35	1.00	0.83	0.58	1.04	0.74	0.76	3
JHO-2012-3	0.62	0.73	0.93	0.46	0.94	0.72	0.63	0.92	0.78	0.75	4
JO-04-315	0.50	0.70	0.81	0.37	0.92	0.96	0.61	0.96	0.85	0.74	5
RO-19 (NC)	0.41	0.54	0.95	0.37	1.13	0.52	0.65	0.95	0.84	0.71	7
UPO-212 (NC)	0.40	0.73	1.04	0.43	0.97	0.75	0.77	1.08	0.81	0.78	1
Kent (NC)	0.46	0.80	0.91	0.33	0.99	0.77	0.69	0.76	0.73	0.72	6
Mean	**0.44**	**0.73**	**0.97**	**0.38**	**0.98**	**0.71**	**0.67**	**1.00**	**0.80**	**0.74**	

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

Entries	Palampur	Ludhiana	Faizabad	Bhuban.	Imphal	Anand	Jabalpur	Rahuri	Urulikan.	Ranchi	Average	Rank
PLP-14	5.6	11.6	5.2	8.4	6.3	11.8	10.4	7.8	9.6	4.0	8.1	3
HFO-488	4.9	11.1	5.7	10.3	5.6	12.4	12.4	7.3	8.2	3.6	8.1	3
OL-1769	6.2	11.7	4.7	9.9	8.3	12.5	9.2	6.1	9.4	3.6	8.2	2
OL-1766	4.2	11.8	6.7	9.3	7.5	11.6	10.2	8.7	9.0	3.7	8.3	1
JHO-2012-3	4.6	10.0	5.8	8.3	5.4	12.2	11.0	9.7	9.3	4.4	8.1	3
JO-04-315	6.0	8.7	7.8	8.4	6.3	12.8	10.2	8.6	9.9	3.9	8.3	1
RO-19 (NC)	5.1	11.1	4.1	8.4	6.3	9.8	8.8	9.0	8.6	3.7	7.5	4
UPO-212 (NC)	6.3	11.5	5.8	9.4	5.8	12.2	8.2	7.9	9.6	4.5	8.1	3
Kent (NC)	5.5	9.8	6.7	7.1	7.2	11.3	7.2	7.6	9.7	3.3	7.5	4
Mean	**5.4**	**10.8**	**5.8**	**8.8**	**6.5**	**11.8**	**9.7**	**8.1**	**9.2**	**3.8**	**8.0**	

Table 6.6:IVTO (MC): Initial Varietal Trial in Oat (Multi cut) Crude Protein (%)

Entries	Palampur	Ludhiana	Faizabad	Bhuban.	Imphal	Anand	Jabalpur	Rahuri	Urulikan.	Ranchi	Average	Rank
PLP-14	8.5	8.3	8.1	9.6	13.0	15.7	8.0	8.3	9.8	10.9	10.0	5
HFO-488	9.0	8.8	7.9	9.8	10.2	16.3	8.2	7.9	9.7	9.6	9.7	7
OL-1769	9.6	9.7	7.7	9.6	13.7	17.2	8.0	7.4	10.0	9.6	10.3	4
OL-1766	7.9	8.8	7.9	9.7	10.0	17.0	8.0	9.4	9.8	10.9	9.9	6
JHO-2012-3	8.5	8.7	8.0	9.9	9.9	17.5	8.1	9.6	9.5	9.6	9.9	6
JO-04-315	10.5	8.7	8.1	9.9	13.8	16.6	8.0	8.3	9.7	10.9	10.5	2
RO-19 (NC)	9.6	8.3	8.0	9.6	11.6	13.7	7.9	9.0	9.6	9.6	9.7	7
UPO-212 (NC)	10.5	8.9	7.8	9.8	12.6	17.3	7.8	9.2	10.1	10.5	10.4	3
Kent (NC)	9.3	8.7	8.0	10.2	14.5	18.1	7.9	8.8	9.9	10.5	10.6	1
Mean	**9.3**	**8.8**	**7.9**	**9.8**	**12.1**	**16.6**	**8.0**	**8.7**	**9.8**	**10.3**	**10.1**	

Table 6.7:IVTO (MC): Initial Varietal Trial in Oat (Multi cut) Plant Height (cm)

Entries	Palam.	Srina.	Pantn.	Hisar	Ludhi.	Udaip.	Ranchi	Faiza.	Jorhat	Bhuban.	Imphal	Jhansi	Anand	Jabal.	Rahuri	Urulika.	Jalore	Aver.	Rank
PLP-14	78.0	109.5	135.3	100.9	96.4	96.8	80.7	115.4	74.2	107.3	60.3	91.7	92.5	96.4	73.7	52.2	85.3	91.0	8
HFO-488	75.3	114.5	143.7	101.6	104.3	99.3	79.2	118.7	96.5	119.9	63.3	98.4	94.3	92.9	73.0	51.3	86.2	94.8	3
OL-1769	82.1	113.1	123.7	118.6	88.0	100.9	83.9	101.4	83.3	137.6	71.6	102.1	104.2	86.6	83.9	56.1	86.6	95.5	2
OL-1766	78.8	113.5	132.0	109.5	99.6	93.5	82.7	135.2	91.1	133.2	72.4	91.7	100.6	114.8	80.6	63.5	82.7	98.5	1
JHO-2012-3	84.5	113.7	120.3	104.0	104.1	98.4	79.5	130.3	74.5	121.0	65.4	92.4	89.1	110.4	78.2	53.4	76.2	93.8	5
JO-04-315	81.5	117.4	110.0	99.9	89.2	97.7	79.8	136.8	90.4	109.4	58.3	90.4	98.1	107.4	71.7	54.3	84.7	92.8	7
RO-19 (NC)	76.5	102.1	146.0	81.3	113.2	95.0	83.5	105.2	81.8	127.6	73.8	88.7	95.4	98.4	87.5	59.4	93.7	94.6	4
UPO-212 (NC)	81.3	108.8	115.0	95.5	104.9	100.2	77.9	125.2	88.9	112.4	60.0	86.7	100.9	112.1	68.0	53.7	87.4	92.9	6
Kent (NC)	78.1	122.4	110.0	105.4	89.2	91.4	81.2	120.5	79.1	104.4	55.1	87.8	94.1	104.8	68.2	57.2	82.6	90.1	9
Mean	**79.6**	**112.8**	**126.2**	**101.9**	**98.8**	**97.0**	**80.9**	**121.0**	**84.4**	**119.2**	**64.5**	**92.2**	**96.6**	**102.6**	**76.1**	**55.7**	**85.0**	**93.8**	

Table 6.8:IVTO (MC): Initial Varietal Trial in Oat (Multi cut) Leaf Stem Ratio

Entries	Palampur	Srinagar	Pantnagar	Ludhiana	Ranchi	Faizabad	Jorhat	Bhuban.	Imphal	Jhansi	Jabalpur	Rahuri	Urulika.	Average	Rank
PLP-14	0.44	0.41	0.42	0.90	0.39	0.80	1.02	0.88	0.35	0.20	0.70	1.01	0.78	0.64	4
HFO-488	0.55	0.47	0.31	0.67	0.33	0.76	0.89	1.06	0.50	0.23	0.67	1.06	0.81	0.64	4
OL-1769	0.55	0.47	0.63	0.54	0.41	0.68	1.28	1.18	0.46	0.25	0.63	0.97	0.62	0.67	1
OL-1766	0.46	0.38	0.47	0.67	0.28	0.76	0.98	1.09	0.50	0.21	0.84	0.90	0.85	0.65	3
JHO-2012-3	0.44	0.44	0.46	0.82	0.31	0.78	0.74	0.99	0.36	0.20	0.76	1.07	0.64	0.62	5
JO-04-315	0.55	0.36	0.80	0.67	0.29	0.81	0.96	0.91	0.36	0.23	0.69	0.91	0.81	0.64	4
RO-19 (NC)	0.53	0.42	0.22	1.00	0.28	0.75	0.97	1.07	0.46	0.25	0.74	0.93	1.00	0.66	2
UPO-212 (NC)	0.44	0.45	0.59	0.60	0.39	0.79	0.80	0.94	0.35	0.24	0.81	0.98	0.73	0.62	5
Kent (NC)	0.50	0.47	0.46	0.67	0.32	0.78	1.01	0.87	0.31	0.21	0.64	1.03	0.76	0.62	5
Mean	**0.50**	**0.43**	**0.48**	**0.73**	**0.33**	**0.77**	**0.96**	**1.00**	**0.40**	**0.22**	**0.72**	**0.98**	**0.78**	**0.64**	

Table 6.9:IVTO (MC): Initial Varietal Trial in Oat (Multi cut) IVDMD (%), ADF(%) & NDF(%)

Entries	IVDMD(%)		ADF(%)		(NDF%)	
	Ludhiana	Rank	Ludhiana	Rank	Ludhiana	Rank
PLP-14	60.5	6	38.3	7	58.8	6
HFO-488	61.8	4	36.9	6	56.6	4
OL-1769	62.8	1	34.6	1	54.3	1
OL-1766	62.4	3	36.0	5	55.5	3
JHO-2012-3	61.2	5	35.9	4	56.9	5
JO-04-315	61.8	4	35.5	3	56.6	4
RO-19 (NC)	60.5	6	38.5	8	59.1	7
UPO-212 (NC)	62.5	2	35.0	2	55.1	2
Kent (NC)	61.2	5	35.9	4	56.9	5
Mean	**61.6**		**36.3**		**56.6**	

7. IVTO (Dual): Initial Varietal Trial in Oat (Dual)

(Table Reference: 7.1 to 7.10)

An initial varietal trial in oat (Dual) comprising of seven entries along with three national checks i.e. RO-19, UPO-212 and JHO-822 was conducted at 20 centres located in four zones of the country.

Results obtained from different centres revealed that for green forage yield (q/ha), entry NDO-1709 (7.0%) in Hill zone, entries JO-09-504 (6.2%), NDO-1709 (5.5%) and OL-1709 (1.7%) in North-East zone registered their superiority over best national check. None of the entries recorded superiority in other zones, as well as at national level. Similarly for dry matter yield (q/ha), entry NDO-1709 (1.0%) in Hill zone, entries JO-09-504 (14.2%), NDO-1709 (7.5%) and OL-1775 (6.7%) in North West zone, entry OL-1775 (2.9%) in Central zone registered superiority whereas, entries NDO-1709 (2.4%) and JO-09-504 (2.2%) exhibited their superiority at national level.

In green forage production potential (q/ha/day), entries NDO-1709 and OL-1709 registered their superiority over national check RO-19 whereas, entries JO-09-504, Ol-1709 and NDO-1709 exhibited their superiority for dry matter production potential (q/ha/day), For plant height, entry OL-1775 recorded its superiority over national check. For the character leaf stem ratio, entries JHO-2012-4, NDO-1709, JO-09-504, OL-1709 and OL-1775 were adjudged good performers.

In quality parameters, entry OL-1709 for crude protein yield (q/ha) and OS-387 for crude protein content (%) ranked first. For other quality parameters, entries UPO-212 and JHO-822 (NC) for IVDMD (%) and ADF (%) and entry NDO-1709 for NDF (%) proved superiority.

For seed yield (q/ha), the national check JHO-822 recorded 18.1 q/ha seed yield at national level.

Table 7.1 IVT Oat (Dual): Initial Varietal Trial in Oat (Dual) Green Forage Yield (q/ha) Cont.....

Entries	Hill Zone					North West Zone							
	Palampur	Srinagar	Average	Rank	Superiority	Bikaner	Jalore	Hisar	Ludhiana	Pantnagar	Udaipur	Average	Rank
OL-1709	122.2	224.17	173.2	7		128.3	122.7	103.7	122.2	236.6	347.0	176.7	4
JHO-2012-5	102.2	247.61	174.9	6		69.7	77.7	118.5	151.9	234.2	350.7	167.1	5
OS-387	94.4	296.31	195.4	5		59.9	76.7	100.0	103.7	214.4	251.8	134.4	8
JO-09-504	117.7	292.78	205.2	4		137.5	90.7	111.1	140.7	237.7	351.3	178.2	3
OL-1775	146.6	177.63	162.1	8		133.4	116.7	140.7	125.9	213.6	354.1	180.7	2
JHO-2012-4	114.4	190.26	152.3	9		56.1	56.0	55.6	44.4	112.1	232.6	92.8	9
NDO-1709	155.5	288.35	221.9	1	7.0	147.7	95.8	159.2	114.8	220.1	346.8	180.7	2
RO-19 (NC)	137.2	212.55	174.9	6		126.7	130.3	163.0	118.5	251.1	381.8	195.2	1
UPO-212 (NC)	96.6	314.37	205.5	3		58.0	88.7	103.7	92.6	258.6	214.1	135.9	7
JHO-822 (NC)	110.5	304.15	207.3	2		86.9	87.7	125.9	151.9	198.6	325.7	162.8	6
Mean	**119.7**	**254.8**	**187.3**			**100.4**	**94.3**	**118.1**	**116.7**	**217.7**	**315.6**	**160.5**	
CD at 5%	25.1	18.1				33.0	13.6	18.9	33.8	48.8	39.2		
CV%	12.2	7.4				19.2	8.4	9.3	4.4	13.3	12.5		

Entries	North East Zone								Central Zone								All India	
	Jorhat	Bhuba.	Ranchi	Pusa	Faiza.	Aver.	Rank	Super%	Jhansi	Rahuri	Urulik.	Karjat	Anand	Jabal.	Raipur	Aver.	Rank	Aver.	Rank
OL-1709	133.7	326.6	120.0	223.0	260.3	212.7	3	1.7	177.0	276.2	490.6	273.3	412.0	257.2	196.9	297.6	3	227.7	4
JHO-2012-5	109.8	279.9	120.0	221.0	261.3	198.4	7		170.7	258.6	464.0	219.3	293.0	227.9	219.5	264.7	8	209.9	6
OS-387	143.1	241.3	111.1	122.0	249.1	173.3	10		132.1	264.7	570.6	219.6	290.0	198.6	206.1	268.8	6	197.3	9
JO-09-504	172.5	324.6	120.0	253.0	241.1	222.2	1	6.2	154.4	283.2	442.6	272.2	319.0	333.2	183.4	284.0	5	228.9	3
OL-1775	119.6	136.6	106.7	269.0	294.9	185.4	9		189.0	305.4	533.3	307.8	427.0	211.9	190.6	309.3	2	225.0	5
JHO-2012-4	129.4	242.6	106.7	226.0	259.2	192.8	8		112.0	192.9	368.0	267.8	205.0	166.6	247.6	222.8	10	169.3	10
NDO-1709	178.0	337.9	120.0	224.0	244.3	220.8	2	5.5	168.2	208.2	501.3	238.5	384.0	271.9	224.7	285.3	4	231.5	2
RO-19 (NC)	155.6	299.9	80.0	279.0	231.5	209.2	4		189.0	312.3	560.0	243.7	403.0	293.2	186.2	312.5	1	237.7	1
UPO-212 (NC)	109.0	291.3	93.3	242.0	281.1	203.3	5		172.3	230.4	464.0	222.2	317.0	239.9	231.4	268.2	7	206.0	8
JHO-822 (NC)	109.4	273.9	133.3	235.0	248.5	200.0	6		122.3	257.7	458.6	219.6	229.0	289.2	198.5	253.6	9	208.3	7
Mean	**136.0**	**275.5**	**111.1**	**229.4**	**257.1**	**201.8**			**158.7**	**259.0**	**485.3**	**248.4**	**327.9**	**249.0**	**208.5**	**276.7**		**214.2**	
CD at 5%	6.6	1.7	21.9	29.7	55.4				4.4	33.8	36.3	40.2	43.6	65.4	11.3				
CV%	10.4	4.6	11.4	10.2	12.6				2.5	7.6	12.4	9.7	7.8	15.2	3.1				

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

Cont.....

Entries	Hill Zone					North West Zone						
	Palampur	Srinagar	Average	Rank	Superiority	Bikaner	Hisar	Ludhiana	Pantnagar	Average	Rank	Superiority
OL-1709	23.43	66.2	44.8	8		31.3	10.4	29.3	25.0	24.0	5	
JHO-2012-5	20.57	74.5	47.5	6		17.1	11.9	36.4	30.3	23.9	6	
OS-387	17.73	87.0	52.4	5		12.7	8.0	24.9	24.8	17.6	9	
JO-09-504	23.26	88.3	55.8	4		38.2	11.1	32.4	34.0	28.9	1	14.2
OL-1775	29.27	53.6	41.5	9		35.5	16.9	29.0	26.7	27.0	3	6.7
JHO-2012-4	22.43	59.8	41.1	10		13.7	4.4	10.7	15.1	11.0	10	
NDO-1709	32.39	83.8	58.1	1	1.0	38.1	15.9	26.4	28.4	27.2	2	7.5
RO-19 (NC)	29.08	64.1	46.6	7		26.3	14.7	27.3	32.9	25.3	4	
UPO-212 (NC)	19.87	95.1	57.5	2		17.0	14.5	22.2	30.0	20.9	8	
JHO-822 (NC)	22.33	92.2	57.3	3		19.9	10.1	36.4	21.1	21.9	7	
Mean	**24.0**	**76.5**	**50.2**			**25.0**	**11.8**	**27.5**	**26.8**	**22.8**		
CD at 5%	5.7	5.1				7.6	1.9	4.7	5.8			
CV%	13.8	2.1				17.7	9.1	12.2	12.9			

Entries	North East Zone							Central Zone									All India		
	Jorh.	Bhuba.	Ranchi	Pusa	Faiza.	Aver.	Rank	Jhansi	Rahuri	Urulik.	Karj.	Anand	Jabal.	Raip.	Aver.	Rank	Super%	Aver.	Rank	Super%
OL-1709	16.6	65.5	19.6	44.0	50.1	39.2	5	14.3	39.1	64.7	73.0	47.4	43.3	52.2	47.7	3		39.7	4	
JHO-2012-5	13.5	57.8	18.5	44.3	53.9	37.6	6	14.4	38.8	60.6	58.1	34.9	41.3	57.6	43.7	9		38.0	8	
OS-387	21.2	48.7	16.8	23.9	61.3	34.4	9	10.3	38.4	76.6	60.2	32.5	35.2	54.4	44.0	8		36.4	9	
JO-09-504	19.8	64.5	16.1	49.6	49.7	40.0	3	13.1	37.5	55.6	69.5	38.3	62.7	49.0	46.5	5		41.8	2	2.2
OL-1775	13.3	28.4	13.6	53.1	53.1	32.3	10	15.8	46.7	68.6	76.2	51.3	38.4	50.7	49.7	1	2.9	38.9	6	
JHO-2012-4	21.1	49.5	15.2	44.6	50.1	36.1	8	9.6	29.2	47.0	68.1	28.1	28.8	64.4	39.3	10		32.3	10	
NDO-1709	26.1	67.1	18.0	44.0	46.1	40.3	2	12.9	34.6	72.6	58.6	40.0	49.7	58.9	46.8	4		41.9	1	2.4
RO-19 (NC)	20.3	60.0	10.4	55.5	58.1	40.9	1	14.7	45.9	68.3	64.6	40.7	54.1	49.7	48.3	2		40.9	3	
UPO-212 (NC)	13.8	59.5	13.2	47.6	63.5	39.5	4	13.6	35.7	60.5	56.6	37.7	43.7	60.5	44.1	7		39.1	5	
JHO-822 (NC)	14.1	54.9	19.7	46.3	50.4	37.1	7	9.9	38.1	58.6	66.1	31.6	52.9	52.6	44.3	6		38.7	7	
Mean	**18.0**	**55.6**	**16.1**	**45.3**	**53.6**	**37.7**		**12.9**	**38.4**	**63.3**	**65.1**	**38.3**	**45.0**	**55.0**	**45.4**			**38.8**		
CD at 5%	2.0	0.3	4.4	5.8	5.1			3.8	5.0	6.9	10.6	4.8	28.0	2.7						
CV%	8.8	4.0	15.8	8.1	8.6			2.2	7.6	14.0	9.8	7.3	16.8	2.9						

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

Entries	Bikaner	Hisar	Ludhiana	Pantna.	Jorhat	Bhuban.	Ranchi	Faizabad	Jhansi	Karjat	Anand	Raipur	Average	Rank
OL-1709	1.78	0.82	1.94	4.73	2.16	5.44	1.33	2.47	3.11	4.08	7.77	2.56	3.18	2
JHO-2012-5	0.97	0.92	2.41	4.68	1.77	4.67	1.22	2.51	3.05	3.18	5.53	2.85	2.81	7
OS-387	0.83	0.76	1.65	4.29	2.31	4.02	1.10	2.51	2.32	3.23	5.47	2.24	2.56	9
JO-09-504	1.91	0.90	2.23	4.75	2.78	5.41	1.36	2.45	2.76	4.19	6.02	2.38	3.09	4
OL-1775	1.85	1.10	2.00	4.27	1.93	2.28	1.16	2.86	3.37	5.05	8.06	2.47	3.03	5
JHO-2012-4	0.78	0.41	0.71	2.24	2.09	4.04	1.01	2.49	2.04	3.88	3.87	2.69	2.19	10
NDO-1709	2.05	1.26	1.82	4.40	2.87	5.63	1.26	2.32	2.95	3.51	7.25	2.92	3.19	1
RO-19 (NC)	1.76	1.24	1.88	5.02	2.51	5.00	0.62	2.22	3.38	3.58	7.60	2.42	3.10	3
UPO-212 (NC)	0.81	0.80	1.47	5.17	1.76	4.85	0.96	2.81	3.13	3.17	5.98	3.00	2.83	6
JHO-822 (NC)	1.21	1.00	2.41	3.97	1.76	4.57	1.53	2.39	2.22	3.23	4.32	2.58	2.60	8
Mean	**1.40**	**0.92**	**1.85**	**4.35**	**2.19**	**4.59**	**1.16**	**2.50**	**2.83**	**3.71**	**6.19**	**2.61**	**2.86**	

Table 7.4 IVT Oat (Dual): Initial Varietal Trial in Oat (Dual) Dry Matter Yield (q/ha/day)

Entries	Bikaner	Hisar	Ludhiana	Pantna.	Jorhat	Bhuba.	Ranchi	Faizabad	Jhansi	Karjat	Anand	Raipur	Average	Rank
OL-1709	0.43	0.08	0.47	0.50	0.27	1.09	0.22	0.48	0.25	1.09	0.89	0.68	0.54	2
JHO-2012-5	0.24	0.09	0.58	0.61	0.22	0.96	0.19	0.52	0.26	0.84	0.66	0.75	0.49	5
OS-387	0.18	0.06	0.40	0.50	0.34	0.81	0.17	0.61	0.18	0.89	0.61	0.59	0.45	7
JO-09-504	0.53	0.09	0.51	0.68	0.32	1.08	0.18	0.50	0.23	1.07	0.72	0.64	0.55	1
OL-1775	0.49	0.13	0.46	0.53	0.21	0.47	0.15	0.54	0.28	1.25	0.97	0.66	0.51	4
JHO-2012-4	0.19	0.03	0.17	0.30	0.34	0.83	0.14	0.48	0.17	0.99	0.53	0.70	0.41	8
NDO-1709	0.53	0.13	0.42	0.57	0.42	1.12	0.19	0.44	0.23	0.86	0.75	0.76	0.53	3
RO-19 (NC)	0.37	0.11	0.43	0.65	0.33	1.00	0.08	0.54	0.26	0.95	0.77	0.64	0.51	4
UPO-212 (NC)	0.24	0.11	0.35	0.60	0.22	0.99	0.14	0.63	0.25	0.81	0.71	0.79	0.49	5
JHO-822 (NC)	0.28	0.08	0.58	0.42	0.23	0.92	0.23	0.49	0.18	0.97	0.60	0.68	0.47	6
Mean	**0.35**	**0.09**	**0.44**	**0.54**	**0.29**	**0.93**	**0.17**	**0.52**	**0.23**	**0.97**	**0.72**	**0.69**	**0.49**	

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

Entries	Palampur	Ludhiana	Bhuba.	Faizabad	Rahuri	Urulika.	Anand	Jabalpur	Raipur	Average	Rank
OL-1709	2.5	3.1	6.4	4.1	3.2	7.0	8.9	3.8	3.8	4.8	1
JHO-2012-5	1.9	3.6	5.7	4.5	3.1	6.5	6.6	3.3	4.5	4.4	3
OS-387	1.8	2.6	4.8	5.3	3.5	7.7	6.9	2.8	3.9	4.4	3
JO-09-504	2.6	3.4	6.3	4.2	3.1	5.6	6.1	5.2	3.2	4.4	3
OL-1775	3.2	2.9	3.0	4.2	3.8	6.7	6.3	3.0	3.4	4.1	4
JHO-2012-4	2.0	1.1	4.9	4.2	2.6	4.6	6.0	2.2	5.2	3.6	5
NDO-1709	3.1	2.8	6.6	3.7	2.7	7.2	6.7	4.0	5.0	4.6	2
RO-19 (NC)	2.8	2.6	5.8	4.9	3.5	6.7	7.9	4.4	3.1	4.6	2
UPO-212 (NC)	1.9	2.4	5.7	5.4	3.0	6.0	7.1	3.4	5.1	4.4	3
JHO-822 (NC)	2.1	4.0	5.4	4.1	3.0	6.0	6.4	4.4	4.0	4.4	3
Mean	**2.4**	**2.9**	**5.5**	**4.5**	**3.1**	**6.4**	**6.9**	**3.7**	**4.1**	**4.4**	

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

Entries	Palampur	Ludhiana	Bhuban.	Faizabad	Rahuri	Urulika.	Anand	Jabalpur	Raipur	Average	Rank
OL-1709	10.5	10.5	9.8	8.1	8.1	10.9	18.7	8.3	7.3	10.2	4
JHO-2012-5	9.3	10.0	9.8	8.4	7.9	10.7	19.0	8.2	7.8	10.1	5
OS-387	10.2	10.5	10.0	8.6	9.2	10.0	21.3	8.1	7.2	10.5	1
JO-09-504	11.1	10.5	9.7	8.4	8.3	10.1	16.0	8.3	6.6	9.9	6
OL-1775	11.1	10.2	10.6	8.0	8.1	9.7	18.1	8.1	6.7	10.1	5
JHO-2012-4	8.8	10.6	9.9	8.3	8.8	9.9	21.3	8.1	8.1	10.4	2
NDO-1709	9.6	10.7	9.9	8.0	7.7	9.8	16.7	8.3	8.5	9.9	6
RO-19 (NC)	9.6	9.5	9.7	8.5	7.7	9.8	19.3	8.3	6.2	9.8	7
UPO-212 (NC)	9.3	10.9	9.6	8.5	8.3	10.0	18.7	8.2	8.4	10.2	4
JHO-822 (NC)	9.6	10.9	9.9	8.2	7.9	10.3	20.2	8.3	7.6	10.3	3
Mean	**9.9**	**10.4**	**9.9**	**8.3**	**8.2**	**10.1**	**18.9**	**8.2**	**7.4**	**10.2**	

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

Entries	Palam.	Bikan.	Jalore	Hisar	Ludhi.	Pantn.	Udaipur	Jorhat	Bhuban.	Ranchi	Faiza.	Rahuri	Urulik.	Karj.	Anand	Jabal.	Raipur	Aver.	Rank
OL-1709	72.6	60.0	48.9	60.5	42.3	66.3	126.4	68.8	154.6	48.6	120.2	65.0	60.1	96.4	107.8	100.5	111.7	83.0	2
JHO-2012-5	79.0	48.0	38.9	65.9	41.7	53.6	112.9	76.0	137.1	53.3	115.6	53.0	50.0	85.6	94.5	70.5	113.1	75.8	5
OS-387	68.3	45.0	27.8	54.9	25.0	55.3	125.0	55.1	126.5	56.8	125.8	45.0	46.9	92.4	87.0	39.1	106.0	69.5	8
JO-09-504	70.6	54.0	46.7	70.1	45.0	62.0	123.1	95.9	151.2	55.8	118.0	66.0	54.8	95.2	90.5	95.4	107.6	82.5	3
OL-1775	78.0	60.0	50.7	67.7	50.7	60.8	127.3	92.4	121.2	49.4	124.5	69.0	78.4	105.2	110.5	64.7	133.1	84.9	1
JHO-2012-4	61.6	30.0	24.1	26.5	5.7	37.0	95.9	39.4	129.1	49.3	124.2	30.0	26.3	94.5	75.1	45.7	80.1	57.3	9
NDO-1709	63.3	60.0	48.8	67.9	40.0	51.0	117.1	105.3	158.8	54.2	119.8	51.0	47.4	93.2	98.0	85.6	118.5	81.2	4
RO-19 (NC)	69.0	51.0	53.4	68.2	40.7	51.0	104.2	94.9	148.4	53.5	121.4	71.0	58.6	95.2	102.1	94.4	134.0	83.0	2
UPO-212 (NC)	71.0	36.0	40.2	57.5	29.3	46.3	107.3	50.4	144.2	55.8	123.4	46.0	48.9	97.2	97.2	73.0	128.9	73.7	6
JHO-822 (NC)	78.3	36.0	43.2	63.5	35.0	49.9	103.1	65.6	134.5	51.1	120.1	51.0	45.7	85.2	89.3	91.1	101.9	73.2	7
Mean	**71.2**	**48.0**	**42.3**	**60.3**	**35.5**	**53.3**	**114.2**	**74.4**	**140.6**	**52.8**	**121.3**	**54.7**	**51.7**	**94.0**	**95.2**	**76.0**	**113.5**	**76.4**	

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

Entries	Bikaner	Ludhiana	Jorhat	Bhuban.	Faizabad	Rahuri	Urulika.	Karjat	Jabalpur	Raipur	Average	Rank
OL-1709	1.09	0.60	0.89	1.07	0.79	1.14	0.95	0.82	1.14	0.66	0.92	4
JHO-2012-5	1.08	0.33	0.86	0.87	0.83	1.52	1.02	0.71	0.96	0.75	0.89	6
OS-387	1.07	0.29	0.96	0.74	0.82	1.24	1.39	0.78	0.90	0.76	0.90	5
JO-09-504	1.05	0.60	0.93	1.03	0.85	1.31	0.99	0.93	1.09	0.68	0.95	3
OL-1775	1.11	0.67	1.25	0.71	0.80	1.07	1.08	0.85	0.93	0.72	0.92	4
JHO-2012-4	1.05	0.11	0.91	0.81	0.80	2.77	1.32	0.82	0.89	0.85	1.03	1
NDO-1709	1.07	0.14	1.04	1.09	0.81	1.62	1.09	0.91	0.97	0.91	0.97	2
RO-19 (NC)	1.04	0.43	1.05	0.98	0.81	1.00	1.07	0.89	1.04	0.67	0.90	5
UPO-212 (NC)	1.09	0.14	0.91	0.94	0.84	1.40	1.05	0.82	0.97	0.89	0.90	5
JHO-822 (NC)	1.07	0.18	0.79	0.83	0.81	1.14	1.24	0.77	1.00	0.80	0.86	7
Mean	**1.07**	**0.35**	**0.96**	**0.91**	**0.82**	**1.42**	**1.12**	**0.83**	**0.99**	**0.77**	**0.92**	

Table 7.9 IVT Oat (Dual): Initial Varietal Trial in Oat (Dual) IVDMD (%) , ADF (%) & NDF (%)

Entries	IVDMD (%)		ADF (%)		NDF (%)	
	Ludhiana	Rank	Ludhiana	Rank	Ludhiana	Rank
OL-1709	62.2	3	35.7	3	55.0	3
JHO-2012-5	59.0	7	40.0	7	55.8	6
OS-387	62.2	3	35.7	3	55.0	3
JO-09-504	62.2	3	37.7	6	55.0	3
OL-1775	61.0	4	35.9	4	55.1	4
JHO-2012-4	60.2	5	36.0	5	55.7	5
NDO-1709	62.4	2	35.0	2	34.1	1
RO-19 (NC)	59.2	6	41.3	8	56.5	7
UPO-212 (NC)	62.6	1	34.9	1	54.0	2
JHO-822 (NC)	62.6	1	34.9	1	54.0	2
Mean	**61.4**		**36.7**		**53.0**	

Table 7.10 IVT Oat (Dual): Initial Varietal Trial in Oat (Dual) Seed Yield (q/ha)

Entries	Palam.	Srina.	Bikan.	Jalore	Hisar	Ludhi.	Pantn.	Udaipur	Jorhat	Bhuba.	Ranchi	Faiza.	Jhansi	Rahuri	Urulika.	Anand	Jabal.	Aver.	Rank
OL-1709	18.9	9.0	14.6	13.1	24.6	14.2	8.7	22.1	13.4	4.7	22.6	18.4	18.5	15.2	8.9	16.1	20.0	15.5	5
JHO-2012-5	25.3	9.9	12.2	15.8	24.1	20.5	16.6	17.7	14.4	6.0	18.1	18.7	19.3	14.7	6.9	10.8	26.1	16.3	3
OS-387	17.2	10.4	19.0	20.6	26.3	20.4	9.3	25.0	9.2	4.3	11.1	18.1	18.3	11.0	6.7	4.7	22.7	15.0	6
JO-09-504	7.4	10.8	20.1	18.6	25.3	19.5	27.7	24.6	11.9	6.9	12.9	18.7	21.7	24.3	10.6	12.9	25.0	17.6	2
OL-1775	19.2	7.9	10.5	10.4	22.2	14.9	16.2	20.9	14.6	4.1	17.8	13.9	15.6	9.6	7.0	6.6	18.4	13.5	8
JHO-2012-4	23.9	7.8	16.8	13.6	32.8	19.9	17.1	29.3	14.1	5.7	8.9	16.0	24.1	18.6	10.9	8.6	31.7	17.6	2
NDO-1709	11.6	9.8	8.8	13.4	28.9	16.7	16.8	17.3	12.3	7.0	9.7	17.6	15.9	15.5	9.0	10.0	27.0	14.5	7
RO-19 (NC)	16.3	8.9	13.2	7.0	15.0	7.4	5.2	13.8	14.9	2.1	14.8	18.1	16.9	15.0	10.3	7.8	14.3	11.8	9
UPO-212 (NC)	20.6	10.7	10.6	15.6	22.4	16.7	15.6	29.2	12.6	4.7	26.7	17.6	19.6	15.6	6.9	1.1	25.5	16.0	4
JHO-822 (NC)	17.8	12.1	11.5	17.0	28.5	31.9	18.4	28.6	14.3	6.8	16.9	15.5	21.3	13.9	8.3	16.1	28.4	18.1	1
Mean	**17.8**	**9.7**	**13.7**	**14.5**	**25.0**	**18.2**	**15.2**	**22.9**	**13.2**	**5.2**	**16.0**	**17.3**	**19.1**	**15.3**	**8.5**	**9.5**	**23.9**	**15.6**	
CD at 5%	3.2	0.4	3.2	2.8	3.6	0.8	3.9	3.1	1.1	0.4	5.7	3.9	4.8	2.5	0.4	3.8	5.8		
CV%	10.4	2.2	13.6	11.2	8.2	3.3	15.3	13.8	5.4	4.4	17.3	13.2	2.8	9.4	18.6	13.4	14.1		

8. IVTL: Initial Varietal Trial in Lathyrus

(Table Reference: 8.1 to 8.6)

An initial varietal trial in Lathyrus comprising of seven entries namely RLS-3006-2, BK-12-2, BK-12-1, JHLS-2012-1, RLS-3009-4, JLJO-09-2 and JHLS-2012-2 along with three national check namely Mahateora, Prateek and Nirmal was conducted at ten centers. Results of the trial reported from different centres revealed that for green forage yield, four entries i.e. JLJO-09-2 (9.5%), BK-12-2 (9.2%), RLS-3006-2 (8.9%) and JHLS-2012-2 (6.7%) proved their superiority at national level. Similarly for dry matter yield (q/ha), all the test entries except BK-12-1 proved their superiority over the best check Prateek.

For fodder production potential (q/ha/day), entry BK-12-2 was adjudged best performer both for green forage (3.15 q/ha/day) as well as dry matter production potential (0.63 q/ha/day).

For growth parameters, entry RLS-3006-2 (50.4 cm) ranked first for plant height. For the character leafiness, entries JHLS-2012-2 (1.30) and BK-12-2 (1.22) were observed best performer.

In quality parameters, entry JLJO-09-2 for crude protein yield (q/ha) and JHLS-2012-2 for crude protein content recorded their superiority. For NDF (%) and ADF (%), entry JHLS-2012-2 was adjudged best performer.

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

Entries	Jorhat	Kalyani	Bhuban.	Ranchi	Pusa	Jabalpur	Kanpur	Karjat	Raipur	Jhansi*	Average	Rank	Superiority%
RLS-3006-2	89.0	303.7	112.5	180.6	115.0	180.0	100.0	20.9	118.5	86.7	135.6	3	8.9
BK-12-2	111.1	330.2	129.2	83.3	115.0	194.6	103.3	20.6	137.0	119.3	136.0	2	9.2
BK-12-1	59.2	225.8	120.8	69.4	128.0	147.9	96.7	18.7	107.7	98.9	108.3	9	
JHLS-2012-1	53.2	221.0	172.2	97.2	113.0	180.0	107.8	19.9	116.8	88.5	120.1	6	
RLS-3009-4	61.2	237.0	86.8	157.4	126.0	194.6	66.7	21.4	125.8	92.6	119.7	7	
JLJO-09-2	102.0	243.8	169.5	83.3	128.0	195.9	141.1	16.6	147.3	107.8	136.4	1	9.5
JHLS-2012-2	119.6	229.7	170.2	60.1	112.0	211.9	111.1	18.5	163.3	100.4	132.9	4	6.7
Mahateora (NC)	74.7	204.2	90.3	83.3	102.0	157.3	70.0	20.2	109.1	107.0	101.2	10	
Prateek (NC)	82.3	266.6	136.1	125.0	120.0	177.2	92.2	19.0	102.3	103.3	124.5	5	
Nirmal (NC)	48.8	216.9	102.8	143.5	120.0	118.6	88.9	20.0	130.2	96.3	110.0	8	
Mean	**80.1**	**247.9**	**129.0**	**108.3**	**117.9**	**175.8**	**97.8**	**19.6**	**125.8**	**100.1**	**122.5**		
CD at 5%	5.5	19.1	0.7	36.5	9.1	33.3	23.0	5.5	16.4	50.9			
CV%	11.4	5.5	4.2	19.5	10.2	11.2	4.1	16.4	7.6	29.6			

* not included in all india average due to CV G.E. 20

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

Entries	Jorhat	Kalyani	Bhuban.	Ranchi	Pusa	Jabalpur	Kanpur	Karjat	Raipur	Jhansi*	Average	Rank	Superiority%
RLS-3006-2	12.1	39.2	22.6	31.9	26.2	33.7	40.0	4.3	40.1	19.7	27.8	4	13.4
BK-12-2	14.9	59.0	25.5	13.6	26.0	37.3	42.2	3.9	45.9	38.2	29.8	2	29.6
BK-12-1	9.1	32.7	24.4	11.3	29.0	26.9	38.9	3.5	36.7	26.9	23.6	8	
JHLS-2012-1	7.8	30.3	34.1	20.3	25.7	33.4	41.1	3.7	39.5	21.9	26.2	5	6.5
RLS-3009-4	8.6	42.8	17.2	24.6	28.5	34.8	26.7	4.1	42.4	29.2	25.5	6	3.9
JLJO-09-2	15.4	34.3	33.7	16.1	28.7	37.0	55.6	3.1	49.2	32.2	30.3	1	23.7
JHLS-2012-2	17.7	28.7	34.2	12.8	25.1	41.7	44.4	3.5	54.2	27.8	29.2	3	19.2
Mahateora (NC)	9.6	35.7	18.5	17.8	23.1	28.8	27.8	3.8	37.1	28.0	22.5	10	
Prateek (NC)	11.8	31.0	27.0	19.4	27.2	30.4	35.6	3.6	35.0	30.8	24.5	7	
Nirmal (NC)	6.4	28.1	20.7	25.7	27.3	20.5	35.6	3.8	43.8	25.2	23.5	9	
Mean	**11.3**	**36.2**	**25.8**	**19.3**	**26.7**	**32.5**	**38.8**	**3.7**	**42.4**	**28.0**	**26.3**		
CD at 5%	1.3	2.8	0.1	6.3	3.5	6.2	7.2	5.5	5.2	13.6			
CV%	7.4	5.5	4.3	18.9	9.7	11.1	2.0	17.6	7.1	28.8			

* not included in all india average due to CV G.E. 20

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

Entries	Green Forage Yield (q/ha/day)									Dry Matter Yield (q/ha/day)								
	Jorhat	Kalya.	Bhuba.	Ranchi	Kanpur	Karjat	Raipur	Avera.	Rank	Jorhat	Kalya.	Bhuba.	Ranchi	Kanpur	Karjat	Raipur	Avera.	Rank
RLS-3006-2	1.76	11.99	2.21	2.82	1.23	0.43	1.36	3.11	2	0.24	1.55	0.44	0.50	0.49	0.09	0.46	0.54	2
BK-12-2	2.26	13.03	2.31	1.24	1.22	0.42	1.58	3.15	1	0.30	2.33	0.46	0.20	0.50	0.08	0.53	0.63	1
BK-12-1	1.21	8.91	2.20	0.93	1.15	0.40	1.24	2.29	9	0.19	1.29	0.44	0.15	0.46	0.07	0.42	0.43	7
JHLS-2012-1	1.07	8.72	2.87	1.33	1.22	0.41	1.34	2.42	7	0.16	1.20	0.57	0.28	0.47	0.08	0.45	0.46	5
RLS-3009-4	1.22	9.36	1.67	2.31	0.79	0.44	1.45	2.46	6	0.17	1.69	0.33	0.36	0.32	0.08	0.49	0.49	4
JLJO-09-2	2.04	9.62	2.78	1.13	1.62	0.35	1.69	2.75	4	0.31	1.36	0.55	0.22	0.64	0.06	0.57	0.53	3
JHLS-2012-2	2.38	9.07	2.74	0.85	1.29	0.39	1.88	2.66	5	0.35	1.13	0.55	0.18	0.52	0.07	0.62	0.49	4
Mahateora (NC)	1.51	8.06	1.70	1.41	0.85	0.41	1.25	2.17	10	0.19	1.41	0.35	0.30	0.34	0.08	0.43	0.44	6
Prateek (NC)	1.65	10.52	2.52	2.05	1.17	0.40	1.18	2.78	3	0.24	1.22	0.50	0.32	0.45	0.08	0.40	0.46	5
Nirmal (NC)	0.99	8.56	1.90	2.05	1.01	0.42	1.50	2.35	8	0.13	1.11	0.38	0.37	0.40	0.08	0.50	0.42	8
Mean	**1.61**	**9.78**	**2.29**	**1.61**	**1.16**	**0.41**	**1.45**	**2.61**		**0.23**	**1.43**	**0.46**	**0.29**	**0.46**	**0.08**	**0.49**	**0.49**	

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

Entries	Crude Protein Yield (q/ha)							Crude Protein (%)						
	Bhuban.	Ranchi	Jhansi	Jabalpur	Raipur	Average	Rank	Bhuban.	Ranchi	Jhansi	Jabalpur	Raipur	Average	Rank
RLS-3006-2	3.57	8.38	3.03	4.20	5.67	4.97	3	15.8	26.3	15.4	13.0	14.1	16.9	3
BK-12-2	3.33	3.69	5.25	4.80	7.09	4.83	4	13.1	27.1	13.8	13.1	15.4	16.5	5
BK-12-1	3.66	3.20	3.74	3.20	4.84	3.73	9	15.0	28.4	13.9	12.4	13.2	16.6	4
JHLS-2012-1	5.23	5.32	2.86	4.20	5.63	4.65	5	15.4	26.3	13.1	13.0	14.2	16.4	6
RLS-3009-4	2.92	7.31	4.11	4.50	5.99	4.97	3	17.0	29.8	14.1	13.1	14.1	17.6	2
JLJO-09-2	5.09	4.65	5.04	4.80	7.48	5.41	1	15.1	28.9	15.7	13.1	15.2	17.6	2
JHLS-2012-2	4.68	3.75	5.14	5.40	7.95	5.38	2	13.7	29.3	18.5	13.4	14.7	17.9	1
Mahateora (NC)	3.10	4.59	5.35	3.60	5.05	4.34	8	16.8	25.8	19.1	12.6	13.6	17.6	2
Prateek (NC)	4.35	5.36	3.99	3.80	4.65	4.43	6	16.1	27.6	12.9	13.0	13.3	16.6	4
Nirmal (NC)	3.29	6.74	3.29	2.40	6.40	4.42	7	15.9	26.3	13.0	12.2	14.6	16.4	6
Mean	**3.92**	**5.30**	**4.18**	**4.09**	**6.08**	**4.71**		**15.39**	**27.56**	**14.95**	**12.88**	**14.26**	**17.01**	

Table 8.5:IVT Lathyrus: Initial Varietal Trial in Lathyrus:Plant Height (Cm)

Entries	Jorhat	Kalyani	Bhuban.	Ranchi	Jhansi	Jabalpur	Kanpur	Karjat	Raipur	Average	Rank
RLS-3006-2	56.8	72.7	63.1	25.3	41.1	73.8	40.3	38.5	42.2	50.4	1
BK-12-2	29.8	79.1	67.6	29.5	50.9	77.8	41.7	32.7	39.9	49.9	2
BK-12-1	17.2	61.4	64.5	24.4	48.5	68.3	41.7	33.1	38.6	44.2	9
JHLS-2012-1	12.6	62.1	77.5	28.8	44.3	73.6	43.5	31.7	40.4	46.1	7
RLS-3009-4	14.2	67.9	55.2	28.7	53.3	80.9	42.2	35.4	33.2	45.7	8
JLJO-09-2	17.2	67.7	72.6	25.2	49.5	81.6	41.2	28.9	39.9	47.1	6
JHLS-2012-2	14.4	62.6	74.7	26.4	45.1	85.1	40.5	30.5	46.4	47.3	5
Mahateora (NC)	43.5	58.9	57.3	32.3	52.4	70.9	39.9	36.2	43.8	48.4	3
Prateek (NC)	44.3	69.2	70.1	29.6	37.1	72.8	41.4	34.6	32.0	47.9	4
Nirmal (NC)	15.9	62.4	60.2	25.3	44.6	59.6	39.9	29.4	31.5	41.0	10
Mean	**26.6**	**66.4**	**66.3**	**27.6**	**46.7**	**74.4**	**41.2**	**33.1**	**38.8**	**46.8**	

Table 8.6:IVT Lathyrus: Initial Varietal Trial in Lathyrus:Leaf Stem Ratio & ADF (%), NDF (%)

Entries	Leaf Stem Ratio									ADF (%)		NDF (%)	
	Jorhat	Kalyani	Bhuban.	Jabalpur	Kanpur	Karjat	Raipur	Average	Rank	Jhansi	Rank	Jhansi	Rank
RLS-3006-2	1.68	1.31	0.87	1.02	1.54	1.09	0.77	1.18	4	28.7	4	42.0	6
BK-12-2	1.60	1.54	0.94	1.05	1.94	0.68	0.82	1.22	2	35.1	9	43.9	8
BK-12-1	1.62	1.15	0.91	1.02	1.25	0.66	0.71	1.05	9	30.4	7	40.9	4
JHLS-2012-1	1.40	1.32	1.08	1.04	1.76	0.69	0.84	1.16	5	29.7	6	40.4	3
RLS-3009-4	1.44	1.37	0.82	1.08	1.15	1.01	0.88	1.11	6	28.5	3	41.8	5
JLJO-09-2	1.34	1.18	1.14	1.13	1.30	0.65	0.91	1.09	8	29.7	6	42.1	7
JHLS-2012-2	1.39	2.59	1.02	1.18	1.32	0.63	0.94	1.30	1	26.0	1	37.6	1
Mahateora (NC)	1.50	1.56	0.73	1.03	1.13	1.02	0.76	1.10	7	27.9	2	42.1	7
Prateek (NC)	1.55	2.23	0.97	1.02	1.21	0.72	0.68	1.20	3	31.6	8	41.8	5
Nirmal (NC)	1.38	1.25	0.77	1.00	1.34	0.58	0.96	1.04	10	29.5	5	38.1	2
Mean	**1.49**	**1.55**	**0.93**	**1.06**	**1.39**	**0.77**	**0.83**	**1.14**		**29.7**		**41.1**	

9.AVTL-1: First Advanced Varietal Trial in Lathyrus

(Table Reference: 9.1 to 9.6)

An advanced varietal trial in Lathyrus with three entries namely JLJ-09-1, JHLS-2011-1 and JHLS-2011-2 along with one national check i.e. Nirmal was conducted at eight locations across the country. Results obtained from different centres clearly revealed that for green forage yield (q/ha), entries JHLS-2011-2 (9.0%) and JLJ-09-1 (7.3%) and for dry matter yield (q/ha), entries JLJ-09-1 (6.5%) and JHLS-2011-2 (5.1%) proved their superiority over national check Nirmal.

For fodder production potential, entry JHLS-2011-2 established its superiority both for green forage and dry matter production potential (q/ha/day).

For evaluation against growth parameters, entry JLJ-09-1 ranked first followed by JHLS-2011-2 for plant height as well as for leaf stem ratio. Even for quality parameters, entry JLJ-09-1 for crude protein yield (q/ha) and JHLS-2011-2 for crude protein content (%) was adjudged good performer. For other quality parameters, entry JHLS-2011-1 maintained its superiority for IVDMD (%) and ADF (%) while, entry JLJ-09-1 for NDF (%) registered its superiority over national check.

Table 9.1 : AVT Lathyrus-1: First Advanced Trial in Lathyrus: Green Forage Yield (q/ha)

Entries	Jorhat	Kalyani	Bhuban.	Ranchi	Pusa	Jabalpur	Kanpur	Jhansi*	Average	Rank	Superiority%
JLJ-09-1	117.5	140.3	88.1	36.5	124.0	164.5	96.7	76.5	109.6	2	7.3
JHLS-2011-1	81.3	162.7	85.4	30.2	112.0	108.2	131.7	73.7	101.6	4	
JHLS-2011-2	134.4	158.8	81.3	50.0	109.0	127.0	118.3	66.0	111.3	1	9.0
Nirmal (NC)	72.6	147.2	83.4	77.1	113.0	110.3	111.1	77.2	102.1	3	
Mean	**101.5**	**152.2**	**84.5**	**48.4**	**114.5**	**127.5**	**114.4**	**73.3**	**106.2**		
CD at 5%	3.4	3.5	7.7	12.6	7.4	22.2	21.4	37.3			
CV%	12.4	2.0	6.7	18.8	8.3	12.6	5.1	36.9			

* not included in zonal and all India average due to cv>=20

Table 9.2 : AVT Lathyrus-1: First Advanced Trial in Lathyrus: Dry Matter Yield (q/ha)

Entries	Jorhat	Kalyani	Bhuban.	Ranchi	Pusa	Jabalpur	Kanpur	Jhansi*	Average	Rank	Superiority%
JLJ-09-1	20.8	14.0	17.4	9.9	28.0	31.5	37.8	26.2	22.8	1	6.5
JHLS-2011-1	12.4	16.3	17.6	5.3	25.4	18.6	52.3	19.8	21.1	4	
JHLS-2011-2	21.7	15.6	15.8	10.2	24.7	23.9	45.5	16.9	22.5	2	5.1
Nirmal (NC)	13.3	14.4	16.5	17.0	25.3	19.1	44.0	24.4	21.4	3	
Mean	**17.0**	**15.1**	**16.8**	**10.6**	**25.9**	**23.3**	**44.9**	**21.8**	**21.9**		
CD at 5%	1.3	0.8	0.7	2.0	NS	4.0	10.3	11.9			
CV%	11.8	4.8	3.2	13.8	10.8	12.5	3.9	39.6			

Table 9.3 : AVT Lathyrus-1: First Advanced Trial in Lathyrus: Green Forage Yield (q/ha/day) & Dry Matter Yield (q/ha/day)

Entries	Green Forage Yield (q/ha/day)							Dry Matter Yield (q/ha/day)						
	Jorhat	Kalyani	Bhuban.	Ranchi	Kanpur	Average	Rank	Jorhat	Kalyani	Bhuban.	Ranchi	Kanpur	Average	Rank
JLJ-09-1	2.39	1.75	1.54	0.51	1.15	1.47	2	0.42	0.09	0.31	0.14	0.45	0.28	2
JHLS-2011-1	1.63	2.03	1.47	0.43	1.55	1.42	3	0.25	0.10	0.30	0.08	0.62	0.27	3
JHLS-2011-2	2.69	1.99	1.29	0.68	1.38	1.61	1	0.43	0.10	0.25	0.14	0.53	0.29	1
Nirmal (NC)	1.47	1.84	1.34	1.06	1.20	1.38	4	0.27	0.09	0.27	0.23	0.47	0.27	3
Mean	**2.04**	**1.90**	**1.41**	**0.67**	**1.32**	**1.47**		**0.34**	**0.09**	**0.28**	**0.15**	**0.52**	**0.28**	

Table 9.4 : AVT Lathyrus-1: First Advanced Trial in Lathyrus: Crude Protein Yield (q/ha) & Crude Protein Content

Entries	Crude Protein Yield (q/ha)							Crude Protein (%)						
	Kalyani	Bhuban.	Ranchi	Jhansi	Jabalpur	Average	Rank	Kalyani	Bhuban.	Ranchi	Jhansi	Jabalpur	Average	Rank
JLJ-09-1	2.0	2.7	2.9	3.8	4.0	3.1	1	14.1	15.6	28.9	14.6	13.2	17.2	2
JHLS-2011-1	2.0	2.8	1.6	3.0	2.1	2.3	4	12.4	15.7	29.8	15.0	12.0	17.0	3
JHLS-2011-2	2.4	2.5	2.8	3.0	3.0	2.7	3	15.7	15.9	27.1	17.7	12.6	17.8	1
Nirmal (NC)	1.9	2.6	4.3	3.1	2.3	2.8	2	13.1	15.7	25.4	12.6	13.1	16.0	4
Mean	**2.1**	**2.6**	**2.9**	**3.2**	**2.9**	**2.7**		**13.8**	**15.7**	**27.8**	**14.9**	**12.7**	**17.0**	

Table 9.5 : AVT Lathyrus-1: First Advanced Trial in Lathyrus: Plant Height (Cm) and Leaf Stem Ratio

Entries	Plant height (Cm)									Leaf Stem Ratio						
	Jorhat	Kalyani	Bhuban.	Ranchi	Jhansi	Jabal.	Kanpur	Aver.	Rank	Jorhat	Kalyani	Bhuban.	Jabal.	Kanpur	Aver.	Rank
JLJ-09-1	43.4	62.2	74.6	38.2	43.3	72.0	37.9	53.1	1	1.38	1.22	1.05	1.32	1.49	1.29	1
JHLS-2011-1	38.7	68.6	71.6	36.4	38.2	50.4	37.9	48.8	3	1.53	1.22	0.97	1.06	1.26	1.21	3
JHLS-2011-2	49.3	65.2	63.2	36.9	43.2	63.4	38.9	51.5	2	1.47	1.22	0.84	1.26	1.47	1.25	2
Nirmal (NC)	34.7	64.3	66.5	39.9	38.9	58.2	37.5	48.6	4	1.22	1.22	0.91	1.22	1.34	1.18	4
Mean	**41.5**	**65.1**	**69.0**	**37.9**	**40.9**	**61.0**	**38.1**	**50.5**		**1.4**	**1.2**	**0.9**	**1.2**	**1.4**	**1.2**	

Table 9.6 : AVT Lathyrus-1: First Advanced Trial in Lathyrus: IVDMD (%), ADF(%) & NDF(%)

Entries	IVDMD (%)		ADF (%)				NDF (%)			
	Ranchi	Rank	Ranchi	Jhansi	Average	Rank	Ranchi	Jhansi	Average	Rank
JLJ-09-1	69.8	3	24.5	30.7	27.6	3	30.4	44.6	37.5	1
JHLS-2011-1	70.4	1	23.8	29.1	26.4	1	34.0	41.1	37.6	2
JHLS-2011-2	69.9	2	24.4	29.7	27.0	2	33.4	45.3	39.4	3
Nirmal (NC)	64.4	4	31.4	34.5	32.9	4	44.6	45.4	45.0	4
Mean	**68.6**		**26.0**	**31.0**	**28.5**		**35.6**	**44.1**	**39.9**	

10. IVT Rye Grass: Initial Varietal Trial in Rye Grass

(Table Reference: 10.1 to 10.4)

An initial varietal trial in rye grass with four entries namely BB-MG-001, BB-MG-002, BB-MG-003 and BB-MG-004 along with one national check i.e. PBRG-1 was conducted at six locations across the country. Results obtained from different centres clearly revealed that for green forage as well as dry matter yield (q/ha), none of the entries excelled in performance with respect to national check PBRG-1. Similar was the case for fodder production potential (q/ha/day) where national check established their superiority both for green forage and dry matter production potential (q/ha/day). Even for plant height, PBRG-1 was adjudged best for growth. For the character leafiness (L/S ratio), entry BB-MG-001 (1.83) ranked first followed by PBRG-1 (1.68).

For quality parameters, entry BB-MG-003 showed best performance for crude protein yield (q/ha), crude protein content (%), IVDMD (%), ADF (%) and NDF (%).

Table 10.1: IVT Rye Grass : Initial Varietal Trial in Rye grass: Green Forage Yield (q/ha)

Entries	Green Forage Yield (q/ha)								Dry Matter Yield (q/ha)						
	Palam.	Almora	Pantna.	Ludhi.	Udaipur	Jorhat	Average	Rank	Palam.	Almora	Pantna.	Ludhi.	Jorhat	Average	Rank
BB-MG-001	228.0	429.7	532.9	764.6	420.8	164.1	423.3	4	42.5	104.3	77.8	97.9	18.3	68.2	4
BB-MG-002	42.1	97.6	599.9	261.5	0.0	84.4	180.9	5	9.2	21.7	76.3	33.5	11.9	30.5	5
BB-MG-004	218.0	469.3	661.4	847.9	362.6	139.7	449.8	2	41.6	114.5	108.1	112.8	16.4	78.7	2
BB-MG-003	220.2	483.2	542.8	844.5	447.2	139.9	446.3	3	42.1	117.0	85.4	108.2	19.6	74.5	3
PBRG-1 (C)	244.9	558.9	543.6	876.4	373.3	161.7	459.8	1	47.6	134.6	94.1	113.2	18.7	81.6	1
Mean	**190.6**	**407.7**	**576.1**	**719.0**	**320.8**	**137.9**	**392.0**		**36.6**	**98.4**	**88.3**	**93.1**	**17.0**	**66.7**	
CD at 5%	27.4	60.2	69.2	51.0	22.2	5.8			4.7	13.7	6.1	6.8	1.9		
CV%	7.5	9.7	6.4	4.5	3.5	7.2			8.3	9.1	3.7	4.7	6.6		

Table 10.2 IVT Rye Grass : Varietal Trial in Rye grass: Green Forage Yield (q/ha/day) & Dry Matter Yield (q/ha/day), Crude Protein Yield (q/ha), Crude Protein (%)

Entries	Green Forage Yield (q/ha/day)				Dry Matter Yield (q/ha/day)				Crude Protein Yield (q/ha)				Crude Protein (%)			
	Ludhi.	Jorhat	Average	Rank	Ludhi.	Jorhat	Average	Rank	Palam.	Ludhi.	Average	Rank	Palam.	Ludhi.	Average	Rank
BB-MG-001	3.92	2.13	3.03	4	0.50	0.24	0.37	3	2.3	12.8	7.5	4	12.3	13.1	12.7	5
BB-MG-002	1.34	1.10	1.22	5	0.17	0.15	0.16	4	2.9	4.3	3.6	5	13.3	12.8	13.1	4
BB-MG-004	4.35	1.81	3.08	2	0.58	0.21	0.40	2	2.7	18.7	10.7	2	14.0	16.6	15.3	2
BB-MG-003	4.33	1.82	3.07	3	0.55	0.25	0.40	2	2.6	19.4	11.0	1	13.6	17.9	15.7	1
PBRG-1 (C)	4.49	2.10	3.30	1	0.58	0.24	0.41	1	2.5	17.9	10.2	3	13.1	15.8	14.5	3
Mean	**3.69**	**1.79**	**2.74**		**0.48**	**0.22**	**0.35**		**2.6**	**14.6**	**8.6**		**13.3**	**15.2**	**14.2**	

Table 10.3 IVT Rye Grass : Varietal Trial in Rye grass: Plant Height (cm) & Leaf Stem Ratio

Entries	Plant Height (cm)							Leaf Stem Ratio			
	Palam.	Pantna.	Ludhi.	Udaipur	Jorhat	Average	Rank	Palam.	Jorhat	Average	Rank
BB-MG-001	51.8	62.3	36.4	57.8	64.4	54.5	2	2.28	1.38	1.83	1
BB-MG-002	15.9	27.7	10.1	16.5	35.2	21.1	5		1.30	1.30	5
BB-MG-004	51.0	60.0	37.7	56.3	62.7	53.5	3	1.78	1.21	1.49	4
BB-MG-003	47.3	61.0	36.0	55.6	58.3	51.6	4	1.62	1.44	1.53	3
PBRG-1 (C)	59.0	65.0	40.4	62.6	74.9	60.4	1	1.95	1.41	1.68	2
Mean	**45.0**	**55.2**	**32.1**	**49.8**	**59.1**	**48.2**		**1.9**	**1.3**	**1.6**	

Table 10.4 IVT Rye Grass : Varietal Trial in Rye grass: IVDMD (%), ADF (%) & NDF (%)

Entries	IVDMD (%)		ADF (%)		NDF (%)	
	Ludhiana	Rank	Ludhiana	Rank	Ludhiana	Rank
BB-MG-001	78.4	4	26.3	4	43.0	4
BB-MG-002	78.0	5	29.3	5	47.4	5
BB-MG-004	80.8	2	23.2	2	36.4	2
BB-MG-003	84.6	1	23.0	1	33.1	1
PBRG-1 (C)	80.6	3	24.3	3	39.7	3
Mean	**80.5**		**25.2**		**39.9**	

11. VTL (P)-2011: Varietal Trial in Lucerne (Perennial)-2nd Year

(Table Reference: 11.1 to 11.8)

The varietal trial in Lucerne (perennial) comprising of eight entries along with two national checks i.e. Anand-2 and RL-88 was established during 2011-12 at twelve centers of the North West, Central and South zone of the country. This is the 2nd year of the evaluation and entries are in coded form, it will be decoded after completion of the trial in the third and final year of evaluation.

Results obtained from different centres clearly revealed that for green forage yield (q/ha), entry VTL-11-9 ranked first in Central zone, South zone and at national level. Similar was the trend for dry matter yield (q/ha) in which same entry VTL-11-9 exhibited superiority in Central zone (212.0 q/ha), South zone (126.4 q/ha) and at national level (145.4 q/ha).

Similarly for fodder production potential (q/ha/day), where entry VTL-11-9 established its superiority both for green forage and dry matter production potential (q/ha/day). Even for plant height, entry VTL-11-9 established best performance. For the character leafiness (L/S ratio), entry VTL-11-1 (1.09) ranked first followed by VTL-11-3 (1.08).

For quality parameters, entry VTL-11-9 (25.8 q/ha) for crude protein yield and VTL-11-6 (20.8%) for crude protein content proved its superiority. Entry VTL-11-3 for IVDMD (%), ADF (%) and NDF (%) was ranked first.

Table 11.1 IVT Lucerne (P)-2011: Varietal Trial in Lucerne (Perennial)-2nd Year : Green Forage Yield (q/ha)

Entries	North West Zone					Central Zone					South Zone					All India	
	Ludhi.	Hisar	Bikaner	Average	Rank	Rahuri	Urulika.	Anand	Average	Rank	Hyder.	Coimba.	Dharwad	Average	Rank	Average	Rank
VTL 11-1	221.2	265.7	446.1	311.0	7	629.6	1366.9	147.0	714.5	7	154.1	702.8	602.8	486.5	5	504.0	8
VTL 11-2	206.6	293.5	475.1	325.1	6	568.2	1374.3	160.0	700.8	8	169.4	681.9	635.3	495.5	4	507.1	7
VTL 11-3	195.5	277.3	448.3	307.0	8	634.0	1545.8	125.0	768.2	5	161.0	658.0	564.2	461.1	8	512.1	6
VTL 11-4																	
VTL 11-5	566.1	276.3	529.6	457.3	1	914.6	1720.6	137.0	924.1	2	167.2	918.0	600.8	562.0	2	647.8	2
VTL 11-6	401.1	251.6	423.2	358.6	5	770.9	1760.2	52.0	861.0	4	152.7	742.2	558.6	484.5	6	568.1	4
VTL 11-7	225.9	229.6	744.4	400.0	3	681.2	1520.1	61.0	754.1	6	243.0	728.9	584.7	518.9	3	557.6	5
VTL 11-8	329.9	269.1	591.3	396.8	4	849.7	1640.5	244.0	911.4	3	165.2	675.8	587.5	476.2	7	594.8	3
VTL 11-9	531.4	296.8	462.8	430.3	2	1012.8	1748.8	493.0	1084.9	1	177.2	1043.0	602.2	607.5	1	707.6	1
Mean	**334.7**	**270.0**	**515.1**	**373.3**		**757.6**	**1584.6**	**177.4**	**839.9**		**173.7**	**768.8**	**592.0**	**511.5**		**574.9**	
CD at 5%	21.9	25.8	118.0			66.1	166.1	19.7			23.6	40.1	129.3				
CV%	4.1	5.4	13.1			5.0	10.3	6.4			7.8	4.2	12.8				

Table 11.2 IVT Lucerne (P)-2011: Varietal Trial in Lucerne (Perennial)-2nd Year : Dry Matter Yield (q/ha)

Entries	North West Zone					Central Zone					South Zone					All India	
	Ludhi.	Hisar	Bikaner	Average	Rank	Rahuri	Urulika.	Anand	Average	Rank	Hyder.	Coimba.	Dharwad	Average	Rank	Average	Rank
VTL 11-1	35.1	45.2	136.7	72.3	8	122.6	245.8	31.4	133.3	6	28.8	105.4	155.5	96.6	5	100.7	7
VTL 11-2	32.6	46.5	141.5	73.5	6	106.1	240.8	36.7	127.8	8	33.3	106.5	146.9	95.6	6	99.0	8
VTL 11-3	33.0	44.4	141.1	72.8	7	136.0	272.9	28.0	145.6	5	32.5	103.1	156.0	97.2	4	105.2	6
VTL 11-4																	
VTL 11-5	93.6	45.8	156.3	98.6	1	187.1	309.8	28.6	175.2	2	35.0	154.9	154.0	114.6	2	129.5	2
VTL 11-6	74.6	40.3	126.7	80.5	5	156.7	303.7	13.1	157.8	4	31.1	116.8	137.1	95.0	7	111.1	5
VTL 11-7	41.0	37.4	209.6	96.0	3	126.1	255.0	15.6	132.2	7	52.0	114.9	156.8	107.9	3	112.0	4
VTL 11-8	51.1	43.8	174.4	89.8	4	162.0	272.9	55.8	163.6	3	33.9	104.2	147.0	95.0	7	116.1	3
VTL 11-9	92.7	52.6	148.4	97.9	2	199.1	327.5	109.5	212.0	1	35.4	186.2	157.6	126.4	1	145.4	1
Mean	**56.7**	**44.5**	**154.3**	**85.2**		**149.5**	**278.5**	**39.8**	**155.9**		**35.3**	**124.0**	**151.3**	**103.5**		**114.9**	
CD at 5%	4.1	4.3	31.1			13.4	55.6	4.8			7.0	4.4	34.1				
CV%	4.5	5.4	11.5			5.1	15.3	6.9			11.4	2.9	13.2				

Table 11.3 IVT Lucerne (P)-2011: Varietal Trial in Lucerne (Perennial)-2nd Year : Green Forage Yield (q/ha/day), Dry Matter Yield (q/ha/day)

Entries	Green Forage Yield (q/ha/day)							Dry Matter Yield (q/ha/day)						
	Ludhi.	Hisar	Bikaner	Anand	Dharwad	Average	Rank	Ludhi.	Hisar	Bikaner	Anand	Dharwad	Average	Rank
VTL 11-1	1.26	1.14	1.26	0.45	1.65	1.15	7	0.19	0.21	0.39	0.10	0.43	0.26	6
VTL 11-2	1.17	1.26	1.35	0.49	1.74	1.20	6	0.18	0.21	0.40	0.11	0.40	0.26	6
VTL 11-3	1.11	1.19	1.27	0.38	1.55	1.10	8	0.19	0.20	0.40	0.09	0.43	0.26	6
VTL 11-4														
VTL 11-5	3.22	1.19	1.50	0.42	1.65	1.60	2	0.53	0.21	0.44	0.09	0.42	0.34	2
VTL 11-6	2.28	1.08	1.20	0.16	1.53	1.25	4	0.42	0.18	0.36	0.04	0.38	0.28	5
VTL 11-7	1.28	0.99	2.11	0.19	1.60	1.23	5	0.23	0.17	0.59	0.05	0.43	0.29	4
VTL 11-8	1.88	1.15	1.67	0.75	1.61	1.41	3	0.29	0.20	0.49	0.17	0.40	0.31	3
VTL 11-9	3.02	1.27	1.31	1.51	1.65	1.75	1	0.53	0.24	0.42	0.33	0.43	0.39	1
Mean	**1.90**	**1.16**	**1.46**	**0.54**	**1.62**	**1.34**		**0.32**	**0.20**	**0.44**	**0.12**	**0.42**	**0.30**	

Table 11.5 VT Lucerne (P)-2011: Varietal Trial in Lucerne (Perennial)- 2nd Year : Crude Protein Yield (q/ha)

Entries	Ludhiana	Hisar	Rahuri	Urulikanchan	Anand	Hyderabad	Dharwad	Average	Rank
VTL 11-1	7.2	1.3	25.0	48.0	6.9	5.0	32.0	17.9	7
VTL 11-2	7.7	1.4	21.7	47.3	7.7	5.6	29.1	17.2	8
VTL 11-3	7.8	1.2	28.6	52.6	5.9	5.6	33.9	19.4	5
VTL 11-4									
VTL 11-5	21.4	1.3	37.0	60.6	6.2	6.9	33.0	23.8	2
VTL 11-6	17.5	1.2	32.0	54.5	3.0	6.0	29.5	20.5	3
VTL 11-7	9.6	1.0	23.9	50.4	3.6	10.6	32.5	18.8	6
VTL 11-8	11.8	1.4	33.5	49.5	12.0	6.2	27.7	20.3	4
VTL 11-9	22.1	1.6	39.5	57.6	23.7	6.4	29.6	25.8	1
Mean	**13.1**	**1.3**	**30.1**	**52.6**	**8.6**	**6.5**	**30.9**	**20.5**	

Table 11.6 VT Lucerne (P)-2011: Varietal Trial in Lucerne (Perennial)- 2nd Year : Crude Protein (%) & Plant Height (cm)

Entries	Crude Protein (%)									Plant Height (cm)							
	Ludhi.	Hisar	Rahuri	Urulik.	Anand	Hyder.	Dharwad	Average	Rank	Ludhi.	Hisar	Bikan.	Rahuri	Urulik.	Anand	Average	Rank
VTL 11-1	20.5	20.4	20.4	19.6	22.0	17.3	20.6	20.1	6	64.6	64.0	90.9	64.0	54.4	61.3	66.5	6
VTL 11-2	23.5	20.7	20.4	19.6	21.8	16.7	19.5	20.3	4	59.7	66.1	86.9	63.3	55.8	65.3	66.2	7
VTL 11-3	23.7	19.6	21.0	19.2	21.6	17.3	21.7	20.6	3	57.4	66.8	89.4	63.1	65.8	58.9	66.9	5
VTL 11-4																	
VTL 11-5	22.9	19.6	19.8	19.6	21.9	19.7	21.4	20.7	2	64.0	65.4	84.9	65.2	66.6	62.6	68.1	2
VTL 11-6	23.5	20.7	20.4	18.0	22.0	19.3	21.4	20.8	1	63.7	70.5	86.1	64.5	72.2	50.0	67.8	3
VTL 11-7	23.5	19.9	19.0	19.7	21.7	20.3	20.8	20.7	2	65.0	68.3	84.1	64.3	57.9	50.3	65.0	8
VTL 11-8	23.1	19.2	20.7	18.1	21.7	18.3	18.8	20.0	7	62.7	66.4	83.1	64.6	66.4	61.6	67.5	4
VTL 11-9	23.8	20.9	19.8	17.6	22.2	18.0	18.8	20.2	5	59.3	62.6	83.9	66.0	71.4	72.5	69.3	1
Mean	**23.1**	**20.1**	**20.2**	**18.9**	**21.9**	**18.4**	**20.4**	**20.4**		**62.1**	**66.3**	**86.2**	**64.4**	**63.8**	**60.3**	**67.2**	

Table 11.8 IVT Lucerne (P)-2011: Varietal Trial in Lucerne (Perennial)-2nd Year : Leaf Stem Ratio, IVDMD (%) & ADF(%) & NDF(%)

Entries	Leaf Stem Ratio						IVDMD (%)				ADF (%)		NDF (%)	
	Hisar	Bikaner	Rahuri	Urulikanchan	Average	Rank	Ludhiana	Hisar	Average	Rank	Ludhiana	Rank	Ludhiana	Rank
VTL 11-1	0.87	1.25	0.91	1.31	1.09	1	63.2	65.0	64.1	7	43.5	7	55.7	7
VTL 11-2	0.90	0.92	1.01	1.06	0.97	6	71.6	60.4	66.0	3	39.5	2	51.9	2
VTL 11-3	0.88	0.99	1.00	1.44	1.08	2	73.2	64.2	68.7	1	39.2	1	50.7	1
VTL 11-4														
VTL 11-5	0.86	1.10	0.98	0.99	0.98	5	64.4	61.2	62.8	8	43.1	6	54.9	6
VTL 11-6	0.80	1.01	0.96	1.12	0.97	6	67.4	64.4	65.9	4	42.1	5	54.8	5
VTL 11-7	0.85	0.89	0.93	1.50	1.04	3	68.0	62.0	65.0	6	40.7	4	54.4	4
VTL 11-8	0.86	0.91	0.99	1.36	1.03	4	71.6	63.2	67.4	2	39.5	2	51.9	2
VTL 11-9	0.89	1.02	0.97	1.04	0.98	5	75.6	56.0	65.8	5	40.4	3	52.0	3
Mean	**0.86**	**1.01**	**0.97**	**1.23**	**1.02**		**69.4**	**62.1**	**65.7**		**41.0**		**53.3**	

12. VTL (P)-2010: Varietal Trial in Lucerne (Perennial)- 3rd Year

(Table Reference: 12.1 to 12.6)

In Lucerne, a varietal trial comprising of nine entries and two national checks namely Anand-2 and RL-88 was established during Rabi 2010-11. This is being the 3rd and final year of evaluation hence all the entries are decoded. The results obtained from different centres clearly revealed that for green forage (q/ha), entry RLH-4 (602.4 q/ha) at national level exhibited its superiority. Similarly for dry matter yield , entry RLH-4 (123.4 q/ha) at all India level recorded its superiority.

For fodder production potential (q/ha/day), entry Anand-23 proved its superiority both for green forage (1.88 q/ha/day) as well as dry matter production potential (0.49 q/ha/day). Entry RLH-4 (72.8 cm) for plant height and RLH-5 (1.11) for leafiness was adjudged best performer.

In quality parameters, check variety RL-88 (19.6 q/ha) for crude protein yield and Anand-23 (19.8%) for crude protein content recorded its superiority over other entries.

After compiling the data over the years (2010-11, 2011-12 and 2012-13), results clearly revealed that for the character green forage yield (q/ha), entries Anand-23 (1.9%) and RLH-4 (1.7%) and entries Anand-23 (1.4%), RRB-07-1 (1.2%) and RLH-4 (0.6%) for dry matter yield (q/ha) performed their superiority with respect to best national check.

Table 12.1 VT Lucerne (P)-2010: Varietal Trial in Lucerne (Perennial)-3rd Year: Green Forage Yield (q/ha)

Entries	Bikaner	Rahuri	Urulikanchan	Hyderabad	Coimbatore	Dharwad	Anand**	Average	Rank	Superiority%
RLH-5	831.4	380.6	524.8	229.1	704.7	643.5	18.0	552.3	5	
CAP-3-2	852.5	133.3	362.7	211.0	708.3	842.5	11.0	518.4	6	
ALP-1-1	779.5	115.1	219.7	188.8	748.6	635.9	12.0	447.9	8	
ACP-3-1	461.7	77.3	426.4	187.4	655.5	471.8	12.0	380.0	11	
RRB-07-1	1096.9	289.2	586.9	220.7	695.3	542.1	60.0	571.8	4	
RLH-4	878.6	487.1	760.4	273.5	744.9	470.0	12.0	602.4	1	0.98
Anand-23	918.5	232.5	653.4	219.4	655.8	816.4	433.0	582.7	3	
RRP-5-4	660.2	155.3	332.4	201.3	700.1	541.1	28.0	431.7	9	
ACP-1-2	885.4	201.4	289.2	177.7	989.1	549.6	42.0	515.4	7	
Anand-2 (NC)	647.6	135.0	239.7	187.4	700.0	625.6	13.0	422.5	10	
RL-88 (NC)	758.9	445.8	832.3	216.6	709.0	616.3	20.0	596.5	2	
Mean	**797.4**	**241.1**	**475.3**	**210.3**	**728.3**	**614.1**	**60.1**	**511.1**		
CD at 5%	109.5	29.1	119.6	41.7	33.3	33.7				
CV%	8.1	7.1	19.3	11.6	3.8	3.2				

**Data not included in average due to entries were not regenreted

Table 12.2 VT Lucerne (P)-2010: Varietal Trial in Lucerne (Perennial)-3rd Year: Dry Matter Yield (q/ha)

Entries	Bikaner	Rahuri	Urulikanchan	Hyderabad	Coimbatore	Dharwad	Anand**	Average	Rank	Superiority%
RLH-5	214.3	68.2	99.7	48.8	110.1	126.3	5.1	111.2	4	
CAP-3-2	227.5	23.7	73.2	41.8	112.8	162.3	3.5	106.9	6	
ALP-1-1	212.1	19.5	42.3	39.6	123.4	118.0	3.7	92.5	8	
ACP-3-1	128.7	14.0	82.1	38.8	104.2	104.0	3.6	78.6	11	
RRB-07-1	286.6	48.1	118.5	44.2	110.9	121.7	9.3	121.6	3	
RLH-4	229.2	86.2	150.3	57.5	118.3	98.8	3.6	123.4	1	1.21
Anand-23	237.7	39.6	124.6	44.5	107.1	154.2	91.5	117.9	5	
RRP-5-4	167.6	26.6	64.5	40.3	111.4	118.1	7.9	88.1	9	
ACP-1-2	216.4	37.6	58.6	38.5	175.5	109.3	11.5	106.0	7	
Anand-2 (NC)	167.9	23.0	48.8	38.9	109.9	132.3	4.5	86.8	10	
RL-88 (NC)	201.8	78.0	161.6	44.8	114.5	130.8	6.4	121.9	2	
Mean	**208.2**	**42.2**	**93.1**	**43.4**	**118.0**	**125.1**	**13.7**	**105.0**		
CD at 5%	31.5	5.0	26.8	9.9	5.5	11.5				
CV%	8.9	6.9	19.2	13.5	3.9	4.2				

**Data not included in average due to entries were not regenreted

Table 12.3 VT Lucerne (P)-2010: Varietal Trial in Lucerne (Perennial)-3rd Year: Green Forage Yield (q/ha/day) & Dry Matter Yield(q/ha/day)

Entries	Green Forage Yield (q/ha/day)					Dry Matter Yield (q/ha/day)				
	Bikaner	Dharwad	Anand**	Average	Rank	Bikaner	Dharwad	Anand**	Average	Rank
RLH-5	1.40	1.76	0.28	1.58	4	0.37	0.45	0.08	0.41	3
CAP-3-2	1.37	2.31	0.17	1.84	2	0.37	0.61	0.05	0.49	1
ALP-1-1	1.33	1.74	0.18	1.54	5	0.36	0.43	0.06	0.40	4
ACP-3-1	0.83	1.29	0.18	1.06	11	0.24	0.34	0.06	0.29	8
RRB-07-1	1.86	1.49	0.20	1.68	3	0.49	0.41	0.03	0.45	2
RLH-4	1.51	1.29	0.18	1.40	10	0.41	0.32	0.06	0.37	6
Anand-23	1.51	2.24	1.43	1.88	1	0.40	0.58	0.30	0.49	1
RRP-5-4	1.18	1.48	0.43	1.33	9	0.31	0.40	0.12	0.36	7
ACP-1-2	1.45	1.51	0.14	1.48	7	0.36	0.38	0.04	0.37	6
Anand-2 (NC)	1.06	1.71	0.20	1.39	8	0.28	0.47	0.07	0.38	5
RL-88 (NC)	1.32	1.69	0.07	1.51	6	0.36	0.46	0.02	0.41	3
Mean	**1.35**	**1.68**	**0.31**	**1.52**	**6.00**	**0.36**	**0.44**	**0.08**	**0.40**	

**Data not included in average due to entries were not regenreted

Table 12.4 VT Lucerne (P)-2010: Varietal Trial in Lucerne (Perennial)-3rd Year: Crude Protein Yield (q/ha)

Entries	Crude Protein Yield (q/ha)							Crude Protein (%)						
	Rahuri	Urulika.	Hyder.	Dharwad	Anand**	Average	Rank	Urulika.	Hyder.	Dharwad	Rahuri	Anand**	Average	Rank
RLH-5	11.4	16.6	10.0	27.1	1.2	16.3	4	16.7	20.3	16.4	17.2	24.5	17.6	8
CAP-3-2	4.0	13.4	9.1	31.8	0.9	14.6	6	18.2	21.7	14.2	21.3	25.4	18.8	4
ALP-1-1	3.2	7.6	8.6	24.9	0.9	11.1	11	18.2	21.7	15.8	20.7	25.2	19.1	2
ACP-3-1	2.2	14.1	8.1	22.0	0.9	11.6	8	17.1	20.7	17.7	18.1	25.6	18.4	5
RRB-07-1	8.0	20.0	9.3	25.0	2.2	15.6	5	16.9	21.0	16.8	21.0	20.5	18.9	3
RLH-4	14.0	26.2	12.2	18.4	1.9	17.7	3	17.4	21.3	15.8	17.2	25.1	17.9	7
Anand-23	6.6	21.6	9.6	38.7	21.0	19.1	2	17.4	21.7	18.4	21.6	20.8	19.8	1
RRP-5-4	4.2	11.6	8.2	22.1	2.0	11.5	9	18.0	20.3	15.3	19.8	24.7	18.4	5
ACP-1-2	6.0	10.3	8.1	22.5	2.9	11.7	7	17.6	21.0	16.2	20.7	20.7	18.9	3
Anand-2 (NC)	3.9	8.4	8.6	24.7	1.1	11.4	10	17.0	22.2	14.4	21.9	25.4	18.9	3
RL-88 (NC)	13.3	28.4	9.2	27.4	1.5	19.6	1	17.6	20.7	16.2	18.1	20.6	18.1	6
Mean	**7.0**	**16.2**	**9.2**	**25.9**	**3.3**	**14.6**		**17.5**	**21.1**	**16.1**	**19.8**	**23.5**	**18.6**	

**Data not included in average due to entries were not regenreted

Table 12.5 VT Lucerne (P)-2010: Varietal Trial in Lucerne (Perennial)-3rd Year: Plant Height (cm) & Leaf Stem Ratio

Entries	Plant Height (cm)						Leaf Stem Ratio				
	Bikaner	Rahuri	Urulika.	Anand**	Average	Rank	Bikaner	Rahuri	Urulika.	Average	Rank
RLH-5	59.1	66.5	78.94	55.8	68.2	8	1.17	0.97	1.18	1.11	1
CAP-3-2	71.2	62.9	76.17	41.4	70.1	4	0.94	1.00	1.05	1.00	5
ALP-1-1	68.2	63.1	74.01	41.4	68.4	7	0.95	0.95	1.10	1.00	5
ACP-3-1	56.6	62.8	79.00	59.2	66.1	9	1.11	0.97	0.91	1.00	5
RRB-07-1	66.4	64.8	79.05	64.5	70.1	4	1.08	1.04	1.08	1.07	2
RLH-4	69.7	66.3	82.50	59.3	72.8	1	0.95	0.95	1.01	0.97	7
Anand-23	66.0	65.1	79.72	58.1	70.3	3	1.09	0.97	0.91	0.99	6
RRP-5-4	69.2	64.3	82.16	55.9	71.9	2	1.14	0.95	0.90	1.00	5
ACP-1-2	63.8	64.2	78.61	58.5	68.9	6	1.06	1.00	1.05	1.04	4
Anand-2 (NC)	67.5	62.1	80.78	38.4	70.1	4	1.16	0.97	1.02	1.05	3
RL-88 (NC)	58.0	66.1	85.44	63.7	69.8	5	1.04	0.96	0.99	1.00	5
Mean	**65.0**	**64.4**	**79.7**	**54.2**	**69.7**		**1.1**	**1.0**	**1.0**	**1.0**	

**Data not included in average due to entries were not regenreted

Table 12.6 VT Lucerne (P): Pooled Performance of entries during the different years.

Entries	Green Forage Yield (q/ha)						Dry Matter yield (q/ha)					
	2010-11	2011-12	2012-13	Average	Rank	Super%	2010-11	2011-12	2012-13	Average	Rank	Super%
RLH-5	394.9	767.1	552.3	571.4	5		92.0	128.9	111.2	110.7	5	
CAP-3-2	410.3	706.3	518.4	545.0	6		92.3	113.3	106.9	104.2	6	
ALP-1-1	375.2	626.4	447.9	483.2	10		86.4	96.4	92.5	91.8	10	
ACP-3-1	407.0	595.0	380.0	460.7	11		88.9	95.8	78.6	87.8	11	
RRB-07-1	439.8	792.1	571.8	601.2	4		97.5	138.0	121.6	119.0	2	1.2
RLH-4	402.6	841.5	602.4	615.5	2	1.7	88.7	142.9	123.4	118.3	3	0.6
Anand-23	394.5	872.6	582.7	616.6	1	1.9	89.4	150.2	117.9	119.2	1	1.4
RRP-5-4	399.8	689.6	431.7	507.0	8		91.1	106.5	88.1	95.2	8	
ACP-1-2	398.6	707.4	515.4	540.5	7		85.3	117.1	106.0	102.8	7	
Anand-2 (NC)	410.3	639.8	422.5	490.9	9		90.7	101.5	86.8	93.0	9	
RL-88 (NC)	401.5	817.7	596.5	605.2	3		92.7	138.2	121.9	117.6	4	
Mean	**403.1**	**732.3**	**511.1**	**548.8**			**90.5**	**120.8**	**105.0**	**105.4**		

13. VTTF (P)-2009: Varietal Trial in Tall Fescue Grass (perennial) in Sub-Temperate and Temperate Himalayan Hill Region (4th Year)

(Table Reference: 13.1 to 13.2)

The varietal trial in Tall Fescue grass (Perennial) comprising two entries *i.e.* Hima-14 and Hima-15 along with two zonal checks i.e. Hima-1 and Hima-4 was initiated during Rabi 2009-10 at sub-temperate and temperate Himalayan Hill region at Palampur, Srinagar and Almora. This year data has been reported from Palampur only. Data reported from this centre clearly indicated that both for green forage as well as dry matter yield (q/ha), entry Hima-14 was adjudged best performer. Entry Hima-14 recorded 15.6% superiority for green forage yield as well as 17.9% superiority for dry matter yield over best zonal check. The check variety *i.e.* Hima-4 was ranked first for plant height (50.4 cm) and check variety Hima-1 (0.59) for leafiness was adjudged best performer.

For evaluation against quality parameters, entry Hima-14 (3.5 q/ha) was ranked first for crude protein yield whereas check Hima-4 (10.9%) was observed to be best performer for crude protein content. Similarly for NDF (%) and ADF (%), entry Hima-14 maintained its superiority.

After compiling the data over the years, results clearly revealed that for the character green forage yield (q/ha), entries Hima-14 (17.2%) and Hima-15 (2.7%) and entry Hima-15 (3.3%) for dry matter yield (q/ha) performed their superiority with respect to best zonal check.

Table 13.1 VTTF (2009)-4th Year: Varietal Trial in Tall Fescue Grass Under Sub-Temperate & Temperate Himalayan Rangelands :Performance of different entries of tall fescue at Palampur

Entries	GFY (q/ha)	Ran.	Super%	DMY(q/ha)	Ran.	Super%	CPY(q/ha)	Ran.	CP(%)	Ran.	Pl Ht(Cm)	Ran.	L/S Ratio	Ran.	ADF (%)	Ran.	NDF(%)	Ran.
HIMA-14	157.8	1	15.6	32.8	1	17.9	3.50	1	10.7	2	47.7	2	0.54	2	55.8	1	65.4	1
HIMA-15	149.8	2	9.7	30.6	2	10.0	3.10	2	10.2	4	43.7	4	0.54	2	56.4	3	66.6	4
HIMA-1 (ZC)	126.3	4		26.5	4		2.74	4	10.3	3	47.2	3	0.59	1	56.0	2	66.0	3
HIMA-4 (ZC)	136.5	3		27.8	3		3.02	3	10.9	1	50.4	1	0.51	3	57.2	4	65.8	2
Mean	142.6			29.4			3.0		10.5		47.3		0.5		56.4		66.0	
CD at 5%	14.7			3.5														
CV%	7.5			8.6														

Table 13.2 VTTF (P): Pooled Performance of entries during different years

Entries	Green Forage Yield (q/ha)							Dry Matter Yield (q/ha)						
	2009-10	2010-11	2011-12	2012-13	Average	Rank	Super%	2009-10	2010-11	2011-12	2012-13	Average	Rank	Super%
Hima-14	152.1	176.4	269.6	157.8	189.0	1	17.2	36.5	43.1	61.9	32.8	43.6	4	
Hima-15	142.5	159.7	210.0	149.8	165.5	2	2.7	34.4	40.2	45.6	30.6	37.7	1	3.3
Hima-1 (ZC)	140.2	153.6	224.8	126.3	161.2	3		31.2	37.6	50.8	26.5	36.5	2	
Hima-4 (ZC)	126.8	139.4	192.6	136.5	148.8	4		30.8	34.0	45.2	27.8	34.5	3	
Mean	**140.4**	**157.3**	**224.3**	**142.6**	**166.1**			**33.2**	**38.7**	**50.9**	**29.4**	**38.1**		

CHAPTER-2

FORAGE CROP PRODUCTION

Forage Crop Production

In the forage crop production programme, a total of 17 experiments were executed at 25 locations in five zones to generate region specific forage production technology. The experiments comprised of 10 in network (8 coordinated and 2 AVT based) and 7 in location specific mode. The main emphasis of natural resource management under forage crops was to increase system productivity and resource use optimization in forages and forage-based systems. The salient research achievements during *Rabi* 2012-13 are as follows.

A. ON-GOING COORDINATED TRIALS

AST-1: Influence of resource conservation techniques on forage production and physio-chemical status of soil

Locations

Hill zone : **Palampur**

North-West zone : **Irrigated-Ludhiana, Hisar and Pantnagar**

North-East zone : **Jorhat, Faizabad, Ranchi, Bhubaneswar and Kalyani**

Central zone : **Rahuri, Jabalpur, Anand, and Urulikanchan**

South zone : **Silvipasture- Hyderabad, Coimbatore and Mandya**
Alley farming-Vellayani

The field experiment was initiated in kharif 2009 and executed in kharif 2010 at 17 locations to study the effect of resource conservation technologies (RCT) on forage yield, physico-chemical properties of soil and economics of the system. The experimental results of third year study are summarized zone wise.

Hill zone: Location: Palampur: (Table reference 1a to 1d)

Sub title: **Effect of vegetative barrier and improved forage species on conservation of degraded grassland (rainfed conditions)**

In the hill zone at Palampur, BN hybrid as vegetative barrier resulted in the production of significantly higher herbage yields. It was followed by Setaria grass as a vegetative barrier. Vegetative barrier of BNH produced 294.55 q/ha green fodder, which was 15.60% and 29.09% more than Setaria grass as vegetative barrier and no vegetative barrier, respectively. The respective increase in dry fodder yield was 5.15% and 13.22%. Among vegetative cover treatments, Setaria *anceps* + *Stylosanthes hamata* (370.80 q/ha) were significantly superior over other treatments. It was followed by *Setaria* grass alone (334.12q/ha). *Setaria* + *Stylosanthes hamata* produced 10.97, 94.63 and 162.53% more green fodder yield than *Setaria* grass, *Stylosanthes hamata* and local grasses, respectively. The respective increase in term of dry fodder yield was 15.02%, 97.91% and 116.65%.

Among improved forage species, *Stylosanthes hamata* resulted in higher crude protein content (9.9%) and was at par with Setaria grass + *Stylosanthes* (9.7%). Setaria grass + *Stylosanthes hamata* resulted in significantly better crude protein yield (8.3q/ha). BN hybrid as vegetative barrier resulted in highest net return (Rs 28971/ha) of the production system followed by Setaria grass as barrier (Rs.23324/ha) and no vegetative barrier (Rs. 20190/ha). The respective B: C under these treatments was 1.83, 1.49 and 1.33. Planting of *Setaria* + *Stylosanthes hamata* resulted in net return of Rs. 38600/ha, which was Rs. 4539; 24070 and 29144/ha more than *Setaria* grass, *Stylosanthes hamata* and local grasses, respectively. Similar trend was also observed w.r.t. B: C (2.27, 2.12, 1.02 and 0.89, respectively). The interaction effect of vegetative barrier and improved forage species on green fodder yield indicated that Setaria + *Stylosanthes hamata* with vegetative

barrier of BN hybrid produced significantly highest green fodder yield, whereas minimum green fodder yield was produced in local grasses under no vegetative barrier system.

Planting of improved forage species as vegetative barrier as well as vegetative cover resulted in higher contents of soil NPK and OC (%) over treatments consisting of local grasses. *Stylosanthes hamata* alone as well as with *Setaria* grass resulted in more soil biomass carbon (42 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, indicating a better soil moisture conservation.

Central zone **Table reference: 1 (e) to 1 (g)**

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

Location: Rahuri, Jabalpur, Anand and Urulikanchan

The experiment was started in 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 & furrow and flat bed methods) and four combinations of grasses and legumes (*Cenchrus* + *Desmanthus*, *Cenchrus* + *Stylosanthes*, *Dichanthium* + *Desmanthus* and *Dichanthium* + *Stylosanthes*) laid out in randomized block design and replicated three times.

The experiment result of third year study showed that on location mean basis planting of grasses + legumes on ridges and furrows recorded higher GFY (454.9 q/ha), DMY (121.7 q/ha) and CPY (11.1 q/ha) over flat bed and recorded percent increase of 21.4, 23.8 and 22.0 for GFY, DMY and CPY, respectively. At all the locations, ridges and furrows method of planting recorded significantly higher GFY, DMY and CPY over flat bed method. On location mean basis, *Cenchrus* + *Desmanthus* combination of grass and legumes resulted highest GFY (527.6 q/ha), DMY (132.1 q/ha) and CPY (12.4 q/ha) of forages over rest of the combinations. The highest GFY,DMy and CPY were recorded at Jabalpur followed by Rahuri and lowest being with Anand**.**

The significant interaction effects of planting methods and grasses + legumes combinations were also reported for GFY at Anand, Urulikanchan and Jabalpur. The planting of *Cenchrus* + *Desmanthus* grass + legumes combination of forages recorded highest GFY, DMY and CPY at Rahuri, Anand and Urulikanchan. *Dichanthium* + *Desmanthus* combination recorded higher GFY, DMY and CPY over rest of the grass+ legume combinations at Jabalpur.

At Rahuri, planting methods did not cause significant variations for crude protein content, leaf stem ratio of grasses and legumes and plant height of grasses. Significant variations for crude protein content and plant height were observed by planting of grasses and legumes combinations at the same place. L: S remains unaffected by these combinations**.**

North-East zone: **Table reference: 1(h) to 1(n)**

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

Location: Jorhat, Faizabad, Ranchi, Bhubaneswar and Kalyani

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, BN hybrid/guinea and Setaria) and three mulching practices [control, soil mulch and live mulch (intercropping)] laid out in randomized block design and replicated three times. This was the third year of experimentation.

At Ranchi, planting of perennial BN hybrid recorded significantly highest GFY (1527 q/ha), DMY (499 q/ha) and CPY (33.23 q/ha) over *Brachiaria* and *Setaria* grasses. *Brachiaria* or *Setaria* grasses being at par with each other recorded significantly higher CP content over BN hybrid. With respect to moisture conservation practices, live mulch (intercropping with rice bean) attained significantly highest GFY (1548 q/ha), DMY (443 q/ha), CPY (31.97 q/ha) and CP content (8.2 %) as compared to control and soil mulch.

At Faizabad, Guinea grass without mulch (T_4) being at par with T_5 (guinea grass + soil mulch) for GFY and with T_5 and T_6 treatments for DMY and CPY, recorded significantly highest GFY (358.5 q/ha), DMY (79.31 q/ha) and CPY (5.86 q/ha) of perennial grasses as compared to rest of the treatment combinations. Total GFY (523.0 q/ha), DMY (109.64 q/ha), CPY (11.68 q/ha) and net monetary returns (Rs 35850 /ha/yr) were highest under guinea grass + intercropping (berseem) combination of perennial grass and moisture conservation practices over rest of the treatments. Planting of guinea grass + without mulch (control) recorded highest N uptake (157.21 kg/ha) by the grass. Maximum P and K uptake was recorded by guinea grass supplemented with soil mulch. The lowest N, P and K uptake was recorded under *Brachiaria* + without mulch treatment combination of grasses and moisture conservation practices.

At Jorhat, growing of *Brachiaria* grass attained highest GFY (1113.24 q/ha), CPY (19.26 q/ha), water use efficiency (12.8 q/ha-cm and net monetary returns (Rs 43901 /ha/yr) over BN hybrid and *Setaria* grasses. The practice of the live mulch (intercropping with rice bean) as moisture conservation measure recorded significantly highest GFY (803.5 q/ha), DMY (252.37 q/ha), CPY (19.04 q/ha), water use efficiency (13.68 q/ha-cm) and net monetary returns (Rs 45635 /ha/yr) over control and soil mulch. The magnitude of increase for GFY in live mulch (intercropping) over control and soil mulch was 37.1 and 6.20 %, respectively.

At Bhubaneswar, growing of guinea grass recorded significantly highest GFY (764.78 q/ha), DMY (152.2 q/ha), CPY (13.9 q/ha) and net monetary returns (Rs39163/ha/yr) over *Setaria* and *Brachiaria* grasses. With respect to moisture conservation practices, live mulch (intercropping with rice bean) being at par with soil mulch for net returns, resulted in significantly highest GFY (765.44 q/ha), DMY (147.86 q/ha), CPY (12.69 q/ha) and net monetary returns (Rs 36890/ha/yr) of perennial grass(es) over control and soil mulch.

At Kalyani, perennial grass *Setaria* recorded highest GFY (981.18 q/ha), CPY (15.57 q/ha), plant height (98.87 cm) and L:S (2.88) over guinea and Brachiaria grasses. Brachiaria grass attained highest DMY (207.56 q/ha), net monetary returns (Rs 56311/ha/yr) and green fodder equivalent yield of guinea grass (1001.45 q/ha) over rest of the grasses. The practicing of live mulch (intercropping with rice bean) under grasses resulted in highest GFY (991.06 q/ha), DMY (240.42 q/ha), CPY (6.04 q/ha), net monetary returns (Rs 62480/ha/yr) and equivalent yield of guinea grass (1069.8 q/ha) over control and soil mulch.

South zone (Silvipasture): Table reference: 1(o) to 1(q)

Sub title: Intensive forage production through silvipasture system under rainfed ecosystem

Location: Hyderabad, Coimbatore and Mandya

The experiment was started during kharif 2010 at three locations. The eight treatments consisted of Subabul + *Cenchrus ciliaris* (T1), Subabul + *Stylosanthes* (T2), Subabul + *Desmanthus virgatus* (T3), Subabul + *Cenchrus ciliaris* + *Stylosanthes* (T4), Subabul + *Cenchrus ciliaris* + *Desmanthus virgatus* (T5), Subabul + sorghum + horse bean (T6), Subabul + pearl millet + horse bean (T7) and Subabul sole (T8). These were laid out in randomized block design with three replications. The experimental results of third year are as follows.

On location mean basis, growing of subabul + *Cenchrus ciliaris* + *Desmanthus* silvipasture system (T_5) recorded highest GFY (536.4 q/ha), DMY (103.1 q/ha) and forage equivalent yield (209.3 q/ha) while CPY (15.8 q/ha) was highest under Subabul + *Desmenthus virgatus* silvipasture system (T_3) and lowest being with Subabul sole (T_8). On location mean basis, adoption of Subabul + *Cenchrus ciliaris* + *Desmanthus virgatus* silvipasture system fetched highest net monetary return and B:C (Rs 53908/ha and 3.08, respectively) and lowest being with T_8. The intensive silvipasture system also caused remarkable changes in soil fertility after the third year of cropping cycle at Coimbatore. The OC (%) and EC values in the soil recorded higher and pH decreased over initial levels. Available N, P, and K decreased over its initial level of soil fertility. The microbial population of fungi, actinomycetes and bacteria were recorded higher over its initial population in the soil after third year of experimentation.

South zone (Alley farming): **Table reference: 1(r) to 1 (t)**

Sub title: Cassava based sustainable alley farming system for rainfed areas of humid tropics

Location: Vellayani

The experiment was started during kharif 2010 to find out the 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 (BN hybrid, palisade grass and no grass), two legumes (fodder cowpea and no fodder legume) and two biofertilizers (VAM and no biofertilizer) laid out in RBD with three replication. The treatment combinations were twelve. The results of third year study showed that alley cropping system cassava + BN hybrid + fodder cowpea (T_2) being at par with T_1, T_3 and T_4 treatments attained significantly highest green fodder yield (521.8 q/ha) of BN hybrid grass over rest of the treatments. The lowest GFY of grass was recorded under cassava + palisade grass + AMF (T_7). Similarly highest DMY of BN hybrid (75.86 q/ha) was realized under cassava + BN hybrid + AMF alley cropping system. With respect to legume, GFY (132.3 q/ha) and DMY (15.9 q/ha) of cowpea was significantly highest under cassava + fodder cowpea + AMF alley cropping system (T_9) followed by cassava + fodder cowpea alley cropping system (119.9 and 15.36 q/ha GFY & DFY, respectively) and lowest being with T_1 treatment. The cassava tuber yield was realized significantly highest (237.9 q/ha) under cassava + AMF (T_{11}) alley cropping system followed by T_{12} (230.3 q/ha) and T_9 (172.6 q/ha) and lowest being with T_7 (75 q/ha).

The adoption of cassava + AMF alley cropping system fetched significantly highest net monetary returns (Rs 172733/ha/yr) over rest of the alley cropping system. However, it remained at par with T_{12} (Rs. 165300 /ha/yr). Cassava + BN hybrid + fodder cowpea +AMF recorded highest organic carbon content (0.90%) in soil over rest of the alley cropping systems. The status of available N, P and K in soil was differed significantly under different alley cropping systems and available N was recorded highest under T_6, whereas P and K were in T_8.treatment.

North-West zone:

Sub title: Effect of different tillage practices on productivity of forage crop in the prevalent crop sequence (Irrigated conditions)

Location: Ludhiana, Hisar and Pantnagar

The crop cycle could not be completed due to failure of sorghum crop caused by heavy rains in Kharif 2012 and the cycle will be completed by the end of Kharif 2013 at Pantnagar. This year trial could not be conducted at Hisar centre. Hence after completion of crop cycle data of Pantnagar and Ludhiana centre will be reported in annual report of *kharif* 2013.

Table- 1 (a): Effect of vegetative barriers and improved forage species treatments on yield attributes, yield, quality and economics (Hill Zone- Palampur)

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	-	87.5	48.0	-	280	228.17	56.57	8.9	5.09	20190	1.33
Napier bajra hybrid	87.9	83.5	51.3	71	264	294.55	64.05	9.3	5.98	28971	1.83
Setaria grass	-	69.8	48.8	-	274	254.79	60.91	9.7	5.79	23324	1.49
SEm±	-	1.02	1.83	-	3.18	2.70	0.95	0.1	0.11	-	-
CD5%	-	3.9	NS	-	NS	10.62	3.72	0.3	0.43	-	-
B. Forage species											
Setaria grass	86.3	79.9	-	73	270	334.12	74.19	9.0	6.7	34061	2.12
Stylo	88.8	-	50.2	69	-	190.51	43.12	9.9	4.2	14530	1.02
Setaria+ *Stylo*	91.3	80.7	48.6	73	276	370.80	85.34	9.7	8.3	38600	2.27
Local grasses	85.3	-	-	69	-	141.24	39.39	8.2	3.3	9456	0.89
SEm±	2.75	1.02	1.20	1.94	1.5	3.06	1.20	0.1	0.14	-	-
CD at 5%	NS	NS	NS	NS	5	9.08	3.56	0.2	0.40	-	-

Table- 1 (b): Effect of vegetative barriers and forage species treatments 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
Vegetative barriers							
No vegetative barrier	208	11	245	0.56	11	42	5.5
Napier bajra hybrid	224	12	248	0.56	12	44	5.6
Setaria grass	226	11	242	0.57	13	41	5.6
Forage species							
Setaria grass	232	11	249	0.59	12	40	5.6
Stylo	244	12	248	0.56	14	44	5.6
Setaria+ *Stylo*	238	11	242	0.56	12	44	5.7
Local grasses	163	11	241	0.54	10	41	5.6
Initial	**213**	**9**	**218**	**0.51**	**11**	**33**	**5.5**

Table- 1(c): Effect of vegetative barriers and improved forage species on soil moisture content (%) at 0-15 cm soil depth at Palampur Hill Zone

Treatments	Soil moisture content (%)												
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Vegetative barriers													
No vegetative barrier	15.3	22.8	25.5	30.4	30.6	29.0	22.8	19.5	14.5	24.0	24.6	23.3	21.2
Napier bajra hybrid	16.0	26.8	28.4	31.6	34.2	33.3	26.8	21.2	17.5	28.0	28.0	25.7	25.8
Setaria grass	16.3	28.7	29.4	32.4	33.4	33.5	26.3	21.5	18.6	26.4	29.1	24.8	21.4
Improves forage species													
Setaria grass	16.3	25.8	28.6	32.8	32.7	31.5	26.1	21.9	18.o	26.1	27.2	23.7	22.9
Stylo	16.3	27.1	29.8	32.3	34.5	33.8	26.5	22.6	16.8	27.8	29.4	25.8	23.3
Setaria+ *Stylo*	16.1	26.0	30.0	31.8	33.7	32.8	26.3	21.7	17.4	26.5	27.2	26.8	23.9
Local grasses	14.7	25.5	22.7	28.9	30.0	29.6	22.3	16.7	15.3	24.1	25.1	22.1	21.1

Table-1 (d): Effect of vegetative barriers and improved forage species on soil moisture content (%) at 15-30 cm soil depth (Hill zone- Palampur)

Treatments	Soil moisture content (%)												
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Vegetative barriers													
No vegetative barrier	18.4	25.9	29.6	31.6	37.4	38.8	30.8	25.0	22.5	27.0	24.8	20.1	18.9
Napier bajra hybrid	19.1	29.7	32.8	32.8	41.0	43.1	34.6	27.5	25.5	31.2	28.6	22.9	23.5
Setaria grass	19.4	31.9	33.3	33.6	40.2	43.3	34.5	27.8	26.6	29.8	29.4	21.9	19.1
Improves forage species													
Setaria grass	19.2	28.9	32.5	34.0	39.6	41.3	34.3	27.9	26.0	29.3	28.3	20.7	20.6
Stylo	19.6	30.5	33.9	33.5	41.4	43.6	34.5	28.6	24.8	31.0	28.3	22.9	21.0
Setaria+ *Stylo*	19.2	29.0	34.4	33.0	40.5	42.6	34.3	27.7	25.4	29.9	29.0	23.8	21.6
Local grasses	17.7	28.5	26.8	30.1	36.6	39.4	30.0	22.7	23.3	27.1	24.8	19.1	18.8

Table-1 (e): Effect of planting methods and forage crops combination on yields of grasses + legumes in Central zone

Treatment	Green fodder yield (q/ha)					Dry matter yield (q/ha)				
	Rahuri	Anand	Urulikanchan	Jabalpur	Mean	Rahuri	Anand	Urulikanchan	Jabalpur	Mean
A. Moisture conservation Techniques										
Ridge and furrow	574.7	362.2	275.4	607.1	454.9	99.6	114.3	58.7	214.3	121.7
Flat bed	489.4	255.3	239.9	514.2	374.7	77.3	79.3	50.5	186.1	98.3
SEm±	18.3	9.4	2.3	6.6		5.6	2.8	0.5	4.5	
C D at 5%	53.7	28.6	8.9	18.6		16.6	8.57	1.9	12.6	
B. Combination of grasses And legume										
Cenchrus + Desmanthus (1:1)	682.6	384.0	432.1	611.5	527.6	106.1	111.1	90.9	220.3	132.1
Cenchrus + Stylosanthes (1:1)	465.1	317.9	382.8	489.4	413.8	74.8	93.0	79.7	157.6	101.3
Dichanthium + Desmanthus (1:1)	606.3	282.1	124.7	667.7	420.2	109.5	95.9	27.6	251.1	121.0
Dichanthium + Stylosanthes (1:1)	374.1	250.9	91.0	474.0	297.5	63.5	87.2	20.2	171.9	85.7
SEm±	25.8	13.3	3.22	5.6		8.0	4.0	0.7	2.9	
C D at 5%	76.0	40.4	12.6	15.4		23.4	12.13	2.7	6.6	
C. Interaction: M X C										
SEm±	36.5	18.8	4.6	5.2		11.3	5.7	1.0	2.1	
C D at 5%	NS	57.1	17.8	15.2		NS	NS	3.8	6.4	
CV%	13.7	10.6	18.2	10.5		25.4	10.1	18.0	10.5	

Table-1 (f): Effect of planting methods and forage crops combination on yield of grasses and legumes in Central zone

Treatment	Crude protein yield (q/ha)				
	Rahuri	Anand	Urulikanchan	Jabalpur	Mean
A. Moisture conservation techniques					
Ridge and furrow	9.2	8.6	5.8	20.7	11.1
Flat bed	6.9	5.8	4.9	18.6	9.1
SEm±	0.6	0.2	0.1	0.1	
C D at 5%	1.6	0.6	0.2	0.2	
B. Combination of grasses and legume					
Cenchrus + Desmanthus (1:1)	9.1	8.3	8.9	23.3	12.4
Cenchrus + Stylosanthes (1:1)	6.5	6.4	7.4	15.6	9.0
Dichanthium + Desmanthus (1:1)	10.3	7.6	3.0	24.5	11.4
Dichanthium + Stylosanthes (1:1)	6.3	6.6	2.3	15.3	7.6
SEm±	0.8	0.3	0.1	0.7	
C D at 5%	2.3	0.9	0.3	1.2	
C. Interaction: M X C					
SEm±	1.1	0.4	0.1	0.4	
C D at 5%	NS	NS	0.4	1.2	
CV%	27.2	9.7	17.4	6.3	

Table-1 (g): Effect of planting methods and forage crops combination on crude protein content and growth of grasses and legumes at Rahuri in Central zone

Treatment	Crude protein (%)		Leaf stem ratio		Plant height (cm)		Plant population/ m row length	
	Grasses	Legumes	Grasses	Legumes	Grasses	Legumes	Grasses	Legumes
A. Moisture conservation techniques								
Ridge and furrow	6.8	11.6	0.63	0.63	89.2	94.9	87.7	117.1
Flat bed	6.8	11.5	0.57	0.58	83.4	86.1	73.1	94.9
SEm±	0.1	0.1	0.02	0.03	2.1	2.8	2.5	2.4
C D at 5%	NS	NS	NS	NS	NS	8.1	7.4	7.0
B. Combination of grasses and legume								
Cenchrus + Desmanthus (1:1)	6.3	10.4	0.66	0.66	97.6	106.6	124.8	130.1
Cenchrus + Stylosanthes (1:1)	6.2	12.6	0.61	0.59	94.1	78.3	105.3	94.8
Dichanthium + Desmanthus (1:1)	7.4	10.7	0.59	0.63	79.0	98.9	52.4	107.8
Dichanthium + Stylosanthes (1:1)	7.4	12.6	0.53	0.54	74.4	78.3	39.1	91.3
SEm±	0.1	0.1	0.04	0.05	3.0	3.9	3.6	3.4
C D at 5%	0.2	0.3	NS	NS	8.8	11.5	10.5	10.0
C. Interaction: M X C								
SEm±	0.1	0.1	0.05	0.07	4.2	5.5	5.0	4.8
C D at 5%	NS	NS	NS	NS	NS	NS	14.8	14.1
CV%	2.7	2.2	16.72	22.42	9.8	12.2	12.5	9.0

Table-1 (h): Effect of moisture conservation practices and perennial grasses on yield, crude protein content and leaf stem ratio of Forages at Ranchi in North East zone

Treatment	Green fodder yield (q/ha)	Dry matter yield (q/ha)	Crude protein yield (q/ha)	Crude protein (%)	Leaf stem ratio	Plant height (cm)	Number of tillers/m^2
A. Perennial grass							
Brachiaria	1364	361	25.94	7.15	0.81	161	171
Napier hybrid	1527	499	33.23	6.16	0.68	168	178
Setaria	1180	303	21.32	7.00	0.87	97	167
SEm±	33.1	8.35	0.68	0.05	0.01	1.13	1.31
CD at 5%	98.9	25.04	2.04	0.15	0.03	3.41	3.94
B. Moisture conservation practices							
Control	1221	345	23.25	6.90	0.75	138	168
Soil mulch	1302	375	25.27	7.11	0.80	141	172
Live mulch (intercropping)	1548	443	31.97	8.20	0.81	148	175
SEm±	33.1	8.35	0.68	0.05	0.01	1.13	1.31
CD at 5%	98.9	25.04	2.04	0.15	0.03	3.41	3.94
C. Interaction: Perennial grass X Moisture conservation practices							
SEm±	57.1	14.40	1.18	0.08	0.01	1.97	2.28
CD at 5%	NS	NS	NS	0.26	NS	NS	NS

Table-1 (i): Effect of moisture conservation practices and perennial grasses on yield, economics and nutrient uptake of forages at Faizabad in North East zone

Treatment	Perennial grasses			Berseem (3 cuts)			Gross monetary return (Rs/ha/yr)	Net monetary return (Rs/ha/yr)	Nutrient 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	155.56	34.41	2.54	-	-	-	15556	7856	73.00	6.31	7.75
T_2	170.66	37.75	2.78	-	-	-	17066	8561	83.95	7.92	9.60
T_3	147.12	32.55	2.40	168.50	31.97	5.46	31562	17510	72.51	7.05	7.90
T_4	358.50	79.31	5.86	-	-	-	35850	24792	157.21	18.20	15.75
T_5	354.60	78.45	5.79	-	-	-	35460	20900	156.05	21.00	21.74
T_6	330.50	73.12	5.40	192.50	36.52	6.28	52300	35850	150.25	17.05	16.75
T_7	205.60	45.49	3.36	-	-	-	20560	13360	108.81	13.95	12.76
T_8	215.60	47.70	3.52	-	-	-	21560	14360	115.28	11.95	13.30
T_9	139.45	43.25	3.19	206.00	39.08	6.73	40050	26390	105.92	9.36	9.58
SEm±	10.22	5.73	0.90	-	-	-			2.08	1.75	1.21
CD at 5%	22.65	10.62	2.12	-	-	-			4.88	3.52	2.84
CV%	12.65	12.52	10.15	-	-	-			11.35	10.89	10.73

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-1 (j): Effect of moisture conservation practices and perennial grasses on yields, economics and WUE of forages 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 (ha-cm)	WUE (q/ha-cm)	Gross return (Rs/ha)	Net return (Rs/ha)
A. Perennial grass							
Brachiaria	1113.24	227.18	19.26	87.19	12.80	55661	43901
Napier hybrid	848.00	199.91	12.95	83.92	10.09	42400	30640
Setaria	1104.67	247.16	17.71	86.93	12.72	55233	43473
SEm±	1.44		0.03	0.17	0.03	71.9	71.9
CD at 5%	4.41		0.08	0.53	0.08	220.6	220.6
B. Moisture conservation practices							
Control	837.16	184.15	13.29	86.22	9.63	41858	34098
Soil mulch	1080.83	237.75	17.59	87.91	12.30	54041	38281
Live mulch (intercropping)	1147.91	252.37	19.04	83.91	13.68	57395	45635
SEm±	1.44		0.03	0.17	0.03	71.9	71.9
CD at 5%	4.41		0.08	0.53	0.08	220.6	220.6
C. Interaction: Perennial grass X Moisture conservation practices							
SEm±	4.31		0.08	0.52	0.08	215.6	215.6
CD at 5%	13.23		0.24	1.60	0.24	661.7	661.7
CV%	-		6.00	0.04	6.00	16.9	16.9

Table-1 (k): Effect of moisture conservation practices and perennial grasses on growth, yields and economics of forages at Bhubaneswar in North East zone

Treatment	Green fodder yield (q/ha)	Dry matter yield (q/ha)	Crude protein yield (q/ha)	Plant height (cm)	Leaf stem ratio	Number of tillers/ m^2	GMR of the system (Rs/ha)	NMR of the system (Rs/ha)
A. Perennial grass								
Brachiaria	696.67	130.02	10.90	84.81	1.00	58.67	62700	33033
Guinea	764.78	152.20	13.90	111.50	0.91	58.78	68830	39163
Setaria	684.56	126.52	9.79	75.74	0.95	54.56	61610	31943
SEm±	9.45	2.45	0.31	2.12	0.02	1.91	850	850
CD at 5%	27.71	7.18	0.91	6.23	0.05	5.61	2493	2493
B. Moisture conservation practices								
Control	676.00	130.07	10.47	87.20	0.90	55.67	60840	32840
Soil mulch	704.56	130.82	11.43	90.95	0.93	57.00	63410	34410
Live mulch (intercropping)	765.44	147.86	12.69	93.91	1.02	59.33	68890	36890
SEm±	9.45	2.45	0.31	2.12	0.02	1.91	850	850
CD at 5%	27.71	7.18	0.91	6.23	0.05	5.61	2493	2493
C. Interaction: Perennial grass X Moisture conservation practices								
SEm±	16.36	4.24	0.54	3.68	0.03	3.31	1472	1472
CD at 5%	47.99	12.44	1.58	10.78	0.09	9.72	4318	4318
CV%	3.96	5.39	8.08	7.02	5.48	10.01	4.0	7.4

Table-1 (l): Effect of moisture conservation practices and perennial grasses on yield of forages 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								
Guinea	281.8	188.06	174.17	644.03	80.22	50.74	46.22	177.18
Setaria	491.9	216.11	273.17	981.18	83.39	50.60	58.80	192.79
Brachiaria	415.9	154.17	249.33	819.40	101.79	42.91	62.86	207.56
SEm±	6.17	4.832	6.538		1.720	1.563	1.683	
CD at 5%	19.01	14.486	19.601		5.300	4.686	5.046	
B. Moisture conservation practices								
Control	324.9	158.06	179.83	662.79	68.39	38.23	41.69	148.31
Soil mulch	362.4	183.89	244.17	790.46	82.74	46.89	59.17	188.80
Live mulch (intercropping)	502.2 (70.9)	216.39 (109.9)	272.67 (51.60)	991.06 (232.4)	114.27 (10.93)	59.13 (25.76)	67.02 (8.65)	240.42 (45.34)
SEm±	6.17	4.832	6.538		0.172	1.563	1.683	
CD at 5%	19.01	14.486	19.601		0.530	4.686	5.046	
C. Interaction: Perennial grass X Moisture conservation practices								
SEm±	10.68	8.370	11.324		2.980	2.708	2.915	
CD at 5%	32.92	NS	NS		9.182	NS	NS	
CV%	4.67	7.79	8.45		5.83	9.75	9.02	

Table-1 (m): Effect of moisture conservation practices and perennial grasses on crude protein yield and growth parameters of forages at Kalyani in North East zone

Treatment	Crude protein yield (q/ha)				Plant height (cm)			Leaf stem ratio		
	Kharif	Rabi	Summer	Total	Kharif	Rabi	Summer	Kharif	Rabi	Summer
A. Perennial grass										
Guinea	5.38	4.61	4.17	14.16	125.6	71.47	84.71	0.77	2.67	2.85
Setaria	6.31	4.24	5.02	15.57	127.8	57.86	89.87	1.08	1.56	2.88
Brachiaria	6.17	3.80	5.52	15.49	94.7	32.87	72.39	0.95	2.07	2.55
SEm±	0.115	0.135	0.148		1.08	1.07	1.040	-	-	-
CD at 5%	0.354	0.405	0.444		3.32	3.22	3.118	-	-	-
B. Moisture conservation practices										
Control	4.34	3.21	3.51	11.06	112.1	56.34	80.78	0.76	1.87	2.40
Soil mulch	5.52	4.08	5.17	14.77	119.5	53.03	84.68	0.92	2.09	2.77
Live mulch (Intercropping)	7.99 (1.18)	5.35 (3.59)	6.04 (1.20)	19.38 (5.97)	116.5 (62.4)	52.81 (28.43)	81.51 (64.76)	1.11 (1.26)	2.35 (1.14)	3.12 (1.17)
SEm±	0.115	0.135	0.148		1.08	1.07	1.040			
CD at 5%	0.354	0.405	0.444		3.32	NS	3.118			
C. Interaction: Perennial grass X Moisture conservation										
SEm±	0.199	0.233	0.256		1.87	1.86	1.802			
CD at 5%	0.613	NS	NS		5.756	NS	NS			
CV%	5.80	9.59	9.04		2.79	5.95	3.79			

Table-1 (n): Effect of moisture conservation practices and perennial grasses on economics of forages at Kalyani in North East zone

Treatment	Net monetary return of the system (Rs/ha)				Benefit cost ratio				Equivalent yield of guinea grass (q/ha/yr)
	Kharif	Rabi	Summer	Total	Kharif	Rabi	Summer	Mean	
A. Perennial grass									
Guinea	13988	9639	14833	38460	1.76	1.39	1.27	1.47	717.94
Setaria	17744	11944	14833	44521	1.96	1.45	1.51	1.64	778.55
Brachiaria	35395	6083	14833	56311	2.22	1.23	1.47	1.64	1001.45
SEm±	628	-	-		-	-	-		
CD at 5%	1882	-	-		-	-	-		
B. Moisture conservation practices									
Control	10617	5806	10000	26423	1.46	1.34	1.42	1.41	584.23
Soil mulch	32002	6389	12000	50391	2.46	1.33	1.48	1.76	843.91
Live mulch (intercropping)	24508	15472	22500	62480	2.02	1.41	1.35	1.59	1069.80
SEm±	628								
CD at 5%	1882								
C. Interaction: Perennial grass X Moisture conservation practices									
SEm±	1089								
CD at 5%	3264								
CV%	8.43								

Table-1 (o): Effect of silvipasture systems on yield of subabul and grasses under rainfed ecosystem in South zone

Treatment	Green fodder yield (q/ha)				Dry matter yield (q/ha)				FEY (q/ha)
	Mandya	Hyderabad	Coimbatore	Mean	Mandya	Hyderabad	Coimbatore	Mean	Coimbatore
T_1	206.17	719.67	297.00	407.61	43.15	158.68	44.76	82.20	133.01
T_2	334.93	431.80	310.33	359.02	76.78	95.73	50.14	74.22	155.17
T_3	337.54	531.83	291.67	387.01	82.15	117.51	41.95	80.54	145.83
T_4	248.83	780.71	462.00	497.18	50.53	173.44	68.30	97.42	205.62
T_5	300.43	841.52	467.33	536.43	60.87	182.67	65.64	103.06	209.28
T_6	331.65	310.88	450.33	364.29	77.39	69.89	69.68	72.32	193.27
T_7	366.97	345.12	485.00	399.03	79.00	77.55	69.44	75.33	202.45
T_8	71.10	63.15	211.33	115.19	14.91	15.21	30.00	20.04	105.67
SEm±	15.43	69.23	9.54		3.19	2.2	2.16		4.44
CD at 5%	46.79	210	20.46		9.67	6.7	4.63		9.53
CV%	9.73	22.8	4.44		9.12	3.4	6.79		4.57

Table-1 (p): Effect of silvipasture systems on crude protein yield and economics of subabul and grasses under rainfed ecosystem in South zone

Treatment	Crude protein yield (q/ha)				Net monetary return (Rs.)				Benefit cost ratio			
	Mandya	Hyderabad	Coimbatore	Mean	Mandya	Hyderabad	Coimbatore	Mean	Mandya	Hyderabad	Coimbatore	Mean
T_1	5.81	10.14	5.05	7.00	9498	111905	51	40485	1.85	5.00	1.00	2.62
T_2	16.73	11.03	8.03	11.93	22073	56905	2161	27046	2.93	3.28	1.10	2.44
T_3	18.81	21.93	6.73	15.82	22390	70487	1077	31318	2.97	3.20	1.05	2.41
T_4	7.96	12.17	8.62	9.58	13212	120322	9341	47625	2.13	4.76	1.43	2.77
T_5	11.35	23.21	9.03	14.53	18542	133213	9969	53908	2.61	5.16	1.47	3.08
T_6	11.85	7.46	8.13	9.15	18554	33040	5863	19152	2.27	2.32	1.25	1.95
T_7	11.23	9.93	7.22	9.46	22519	39708	8568	23598	2.59	2.59	1.39	2.19
T_8	3.39	2.96	4.89	3.75	2654	1946	9419	4673	1.60	1.39	2.59	1.86
SEm±	0.66	1.14	0.30			1930				0.07		
CD at 5%	2.00	3.5	0.65			5855				0.23		
CV%	10.5	16.1	7.25			4.7				3.9		

Table-1 (q): Effect of Intensive forage production through silvipasture system on soil fertility and microbial status of soil under rainfed Ecosystem at Coimbatore in South zone

Treatment	OC (%)	pH	EC (dSm^{-1})	N (kg/ha)	P (kg/ha)	K (kg/ha)	Fungi CFU X 10^4 g-1	Actinomycetes CFU X 10^4 g-1	Bacteria CFU X 10^7 g-1
T_1	0.52	7.60	0.50	220	16.0	410	1.10	0.74	3.00
T_2	0.52	7.60	0.50	222	16.6	400	1.10	0.73	3.01
T_3	0.52	7.70	0.51	218	16.0	410	1.10	0.74	3.00
T_4	0.52	7.70	0.51	218	16.8	400	1.12	0.74	3.00
T_5	0.52	7.60	0.51	216	16.0	400	1.14	0.73	3.01
T_6	0.52	7.70	0.52	220	16.0	400	1.60	0.74	3.00
T_7	0.52	7.60	0.51	220	16.4	410	1.60	0.74	3.01
T_8	0.50	7.70	0.50	222	16.8	416	1.04	0.72	2.90
Initial	0.49	7.90	0.46	223	21.4	440	1.01	0.72	2.89

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

Table-1 (r): Cassava based sustainable alley farming system for yield maximization in rainfed areas of the humid tropics at Vellayani in South zone

Treatment	Green fodder yield (q/ha)		Dry matter yield (q/ha)		Tuber yield of cassava (q/ha)	Harvest index (%)
	Cowpea	Grasses	Cowpea	Grasses		
T_1 - Cassava +Bajra Napier Hybrid +Fodder cowpea + AMF	18.83	515.36	3.00	71.86	87.50	0.76
T_2 - Cassava +Bajra Napier Hybrid +Fodder cowpea	23.20	521.80	2.93	72.50	98.56	0.73
T_3 - Cassava +Bajra Napier Hybrid +AMF	-	520.73	-	75.86	91.76	0.72
T_4 - Cassava +Bajra Napier Hybrid	-	508.66	-	70.70	92.13	0.70
T_5 - Cassava + Palisade grass +Fodder cowpea +AMF	25.96	241.86	3.46	42.33	128.70	0.70
T_6 - Cassava + Palisade grass +Fodder cowpea	25.56	260.10	3.20	42.70	128.70	0.66
T_7 - Cassava + Palisade grass +AMF	-	224.90	-	41.20	75.00	0.70
T_8 - Cassava + Palisade grass	-	237.50	-	40.66	94.16	0.69
T_9 - Cassava +Fodder cowpea+AMF	132.33	-	15.86	-	172.56	0.77
T_{10} - Cassava +Fodder cowpea	119.93	-	15.36	-	125.16	0.80
T_{11} - Cassava +AMF	-	-	-	-	237.93	0.84
T_{12} - Cassava Sole	-	-	-	-	230.30	0.83
SEm±	2.12	6.13	0.29	1.01	4.19	0.04
CD at 5%	6.70	18.60	0.92	3.06	12.31	0.11
CV%	3.69	1.62	4.01	1.78	3.22	4.96

Table-1 (s): Crude protein content, crude fiber content and plant height of forage crops in cassava based Sustainable alley farming system in rainfed areas of the humid tropics at Vellayani in South zone

Treatment	Crude protein (%)		Crude fibre (%)		Plant height (cm)		
	Cowpea	Grasses	Cowpea	Grasses	Cowpea	Grasses	Cassava
T_1 - Cassava +Bajra Napier Hybrid +Fodder cowpea + AMF	19.70	6.40	25.26	26.90	93.50	161.23	88.73
T_2 - Cassava +Bajra Napier Hybrid +Fodder cowpea	20.06	6.86	25.10	26.00	91.40	160.36	80.76
T_3 - Cassava +Bajra Napier Hybrid +AMF	-	6.40	-	26.80	-	151.03	91.26
T_4 - Cassava +Bajra Napier Hybrid	-	6.73	-	27.83	-	142.46	82.40
T_5 - Cassava + Palisade grass +Fodder cowpea +AMF	18.90	7.90	25.76	26.73	98.63	90.16	92.63
T_6 - Cassava + Palisade grass +Fodder cowpea	17.80	7.60	25.26	28.50	101.63	83.60	84.26
T_7 - Cassava + Palisade grass +AMF	-	7.66	-	28.00	-	88.73	92.96
T_8 - Cassava + Palisade grass	-	6.83	-	28.33	-	89.06	99.33
T_9 - Cassava +Fodder cowpea+AMF	18.23	-	25.70	-	105.90	-	93.97
T_{10} - Cassava +Fodder cowpea	17.56	-	25.50	-	106.76	-	140.33
T_{11} - Cassava +AMF	-	-	-	-	-	-	124.73
T_{12} - Cassava Sole	-	-	-	-	-	-	130.16
SEm±	0.54	0.24	0.26	0.38	4.07	4.00	4.04
CD at 5%	1.70	0.72	0.82	1.15	12.81	12.13	11.87
CV%	2.89	3.36	1.03	1.39	4.08	3.31	4.04

Table-1 (t): Net monetary return and available nutrients in soil after crop cycle of cassava based sustainable alley farming system in rainfed areas of the humid tropics at Vellayani in South zone

Treatment	Net monetary return (Rs/ha)	Organic carbon (%)	Available nutrient (kg/ha)		
			N	P	K
T_1 - Cassava +Bajra Napier Hybrid +Fodder cowpea + AMF	110797	0.90	327.33	46.66	96.60
T_2 - Cassava +Bajra Napier Hybrid +Fodder cowpea	124957	0.76	314.16	52.66	105.80
T_3 - Cassava +Bajra Napier Hybrid +AMF	84277	0.70	349.46	55.73	68.80
T_4 - Cassava +Bajra Napier Hybrid	83433	0.60	359.33	61.03	80.73
T_5 - Cassava + Palisade grass +Fodder cowpea +AMF	85470	0.63	304.53	58.76	104.13
T_6 - Cassava + Palisade grass +Fodder cowpea	88730	0.70	368.93	44.96	84.06
T_7 - Cassava + Palisade grass +AMF	34155	0.63	301.66	46.43	85.43
T_8 - Cassava + Palisade grass	55792	0.60	338.70	65.93	112.66
T_9 - Cassava +Fodder cowpea+AMF	123942	0.66	353.60	52.20	110.00
T_{10} - Cassava +Fodder cowpea	74143	0.56	325.33	60.76	104.50
T_{11} - Cassava +AMF	172733	0.80	329.90	64.40	105.63
T_{12} - Cassava Sole	165300	0.76	323.66	43.00	103.06
SEm±	4087	0.06	16.92	3.34	6.64
CD at 5%	11988	0.16	49.63	9.82	19.48
CV%	4	7.93	5.08	6.16	6.86

AST-2: Effect of tillage and nutrient management on the productivity of rice-oat cropping system [Table Reference 2(a) to 2(i)]

Location: Kalyani, Jorhat, Bhubaneswar, Ranchi, Jabalpur and Raipur

A field experiment was initiated during kharif 2010 at four locations (Kalyani, Jorhat, Bhubaneswar, Ranchi) and during kharif 2011 at six locations (as mentioned above) 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, Jabalpur, Raipur, 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 were studied in kharif rice. The results of third year from Kalyani, Jorhat, Bhubaneswar, Ranchi and second year from Jabalpur, Raipur are given below.

At Jorhat, the adoption of conventional tillage in oat being at par with minimal tillage recorded significantly highest GFY (316.76 q/ha), DMY (72.85 q/ha) and CPY (6.08 q/ha) over zero tillage. However zero and minimal tillage remained at par with each other for these parameters. The grain and straw yield of rice did not differ significantly under residual effect of different tillage applied in oats. The productivity of the system in terms of green forage equivalent yield and net monetary returns remained at par under different tillage applied to oats. However, highest GFY (633.05 q/ha) and net income (Rs 30071 /ha) were realized under conventional tillage. With respect to nutrient management, application of 100% RDF + biofertilizer to oat recorded significantly highest GFY (316.91 q/ha), DMY (72.89 q/ha) and CPY (6.08 q/ha) over rest of the treatments. The grain and straw yields of rice did not differ significantly under residual effect of different nutrient management treatment applied to oats. With respect to system productivity, application of 100% RDF + biofertilizer being at par with 100% RDF alone recorded significantly highest green forage equivalent yield (631.24 q/ha) and net monetary returns (Rs 31282 /ha) over rest of the treatments. The magnitude of increase for net returns in 100% RDF + biofertilizer over 75% RDF, 75% RDF + biofertilizer and 100% RDF were 85.9, 42.9 and 19.0%, respectively.

At Kalyani, cultivating oat under conventional tillage attained significantly highest GFY (361.75 q/ha), DMY (82.63 q/ha) and CPY (8.78 q/ha) over zero and minimal tillage. The respective treatment recorded percent increase of 36.4 and 19.8 over zero and minimal tillage for GFY, respectively. Similarly to GFY and DMY, conventional tillage fetched highest net monetary returns (Rs 13675 /ha). The grain yield of rice significantly increased under conventional tillage (29.1 q/ha) over minimal (25.8 q/ha) and zero tillage (27.3 q/ha) applied to oat. With respect to system productivity in terms of yield and economics, conventional tillage recorded highest green fodder equivalent yield of oat (1071 q/ha) and net monetary return (Rs 58071 /ha/yr) over rest of the tillage practices under rice-oat cropping system. The application of 100% RDF + biofertilizer to oat resulted in significantly highest GFY (346.89 q/ha), DMY (80.34 q/ha), CPY (9.39 q/ha), net monetary returns (Rs 16022/ha) and B: C ratio (1.86) of oat over rest of the treatments. The residual effect of 100% RDF + biofertilizer applied to oat being at par with 100% RDF and 75% RDF + biofertilizer (for straw yield) attained significantly highest grain (29.6 q/ha) and straw yields (110.2 q/ha) of rice over rest of the treatments. With respect to system productivity, application of 100% RDF + biofertilizer to oats in rice-oats cropping system realized highest green fodder equivalent yield of oats (1066 q/ha) and found most remunerative treatment (Rs 60911 /ha/yr) over rest of the nutrient management practices.

At Ranchi, growing of oat under conventional tillage recorded significantly highest GFY (439 q/ha), DMY (88.9 q/ha) and CPY (8.88 q/ha) of oat over minimal and zero tillages. Whereas, zero tillage applied in oat recorded significantly highest grain (29.89 q/ha) and straw yields (64.95 q/ha) of rice over rest of the tillage practices. With respect to productivity in terms of economics, practicing of zero tillage under oat in rice-oat cropping system fetched significantly highest net monetary returns (Rs 73431 /ha/yr) and benefit cost ratio (1.49) over minimal and conventional tillage. The application of 125% RDF to oat recorded significantly highest GFY (467 q/ha), DMY (95.62 q/ha) and CPY (9.71 q/ha) of oat and grain (31.05 q/ha being at par with 100% RDF) and straw yield (70.86 q/ha) of rice over rest of the treatments. Similarly to GFY and DMY of oat, application of 125% RDF to oats in rice-oat CS realized significantly highest net monetary returns (Rs 82896 /ha/yr) and B: C (1.60) over rest of the nutrient management treatments.

At Bhubaneswar, cultivation of oat under conventional tillage attained significantly highest GFY (321.67 q/ha), DMY (67.24 q/ha) and CPY (6.61 q/ha) of oat and rice equivalent yield (74.1 q/ha) and net monetary returns (Rs 40849 /ha/yr being at par with minimal tillage) as compared to minimal and zero tillage practices. Residual effect of tillage did not caused significant variation in grain and straw yield of rice. The application of 100% RDF + biofertilizer to oats proved superiority with respect to GFY (283.53 q/ha), DMY (58.32 q/ha) and CPY (5.77 q/ha) and rice equivalent yield (70.70 q/ha) over rest of the treatments. However, respective treatment remained at par with 100% RDF for CPY and REY. Residual effect of 75% RDF applied to oat recorded significantly highest grain and straw yield of rice over rest of the treatments. With respect to system productivity in terms of economics, application of 100% RDF to oat being at par with 100% RDF + biofertilizer fetched higher net monetary returns (Rs 35694 /ha/yr) over rest of the treatments.

At Jabalpur, oat grown under minimal tillage being at par with conventional tillage (625.8 q/ha) recorded significantly higher GFY (631.7 q/ha) over zero tillage. However, direct and residual effect of different tillage practices done in oat under rice-oat cropping system could not bring significant variation in DMY and CPY of oats and grain and straw yields of rice. With respect to system productivity in terms of economics, minimal tillage fetched highest net monetary returns (Rs 81302 /ha/yr). Whereas, highest benefit cost ratio (3.05) was realized under zero tillage. The oats supplemented with 100% RDF + biofertilizer being at par with 100% RDF, recorded significantly highest GFY (635.34 q/ha) of oat over rest of the treatments. Whereas, application of 75% RDF + biofertilizer fetched highest net monetary returns (Rs 80625 /ha/yr) and benefit cost ratio (2.98) of the rice-oat cropping system. The residual effect of nutrient management done in oats did not caused significant variation in the yields of rice crop. Soil fertility after rice-oat cropping system remains unchanged over its initial levels.

At Raipur, practicing of conventional tillage under oat recorded significantly highest GFY (306.51 q/ha), DMY (79.93 q/ha) and CPY (7.40 q/ha) of oats over minimal and zero tillers. The respective treatment (CT) fetched highest NMR (Rs 62364 /ha/yr) and benefit cost ratio (1.93) of rice-oat cropping system. The minimal tillage done in oat recorded highest grain yield (52.34 q/ha) of rice crop over rest of the treatments. The application of 100% RDF + biofertilizer to oat recorded significantly highest GFY (295.61 q/ha), DMY (76.53 q/ha) and CPY (6.82 q/ha) of oat and fetched highest net monetary return (Rs 62965 /ha/yr) and benefit cost ratio (1.94) of rice-oat cropping system over rest of the treatment. Similarly to oat, respective treatment (CT) done in oat recorded highest grain (53.21 q/ha) and straw yields (82.08 q/ha) of rice crop.

Table-2 (a): Effect of tillage and nutrient management on productivity of rice – oats cropping system at Jorhat

Treatment	Rice		Oat					Green forage equivalent yield (q/ha)	Gross monetary returns (Rs/ha)	Net monetary returns (Rs/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	35.28	45.83	208.98	48.07	3.72	7.68	0.74	490.81	49081	18947
Minimal tillage	35.78	49.10	264.82	60.91	5.01	8.22	0.84	544.04	54404	23270
Conventional tillage	41.22	47.15	316.76	72.85	6.08	8.33	0.86	633.05	63305	30071
SEm±	2.20	1.41	7.19	1.65	0.15	0.06	0.01	17.22	1722	1722
CD at 5%	NS	NS	70.53	16.21	1.47	0.59	0.10	NS	NS	NS
B. Nutrient management										
75% RDF	32.77	44.72	204.32	46.99	3.77	7.95	0.78	479.88	47988	16828
75% RDF + Biofertilizer	33.69	47.96	248.64	57.19	4.58	7.95	0.79	532.55	53255	21991
100% RDF	35.23	47.04	284.20	65.37	5.31	8.07	0.81	580.18	58018	26282
100% RDF + Biofertilizer	37.43	49.72	316.91	72.89	6.08	8.33	0.86	631.24	63124	31282
SEm±	1.25	1.34	3.63	0.84	0.09	0.09	0.01	9.33	932	932
CD at 5%	NS	NS	24.45	5.62	0.59	0.64	0.10	62.77	6277	6277
C. Interaction: Tillage practices X Nutrient management										
F at same S	2.17	2.32	6.29	1.45	0.15	0.16	0.03	16.15	1615	1615
SEm±	NS	NS	26.69	6.14	0.64	NS	NS	NS	NS	NS
CD at 5%										
S at same or dift F										
SEm±	2.89	2.45	9.02	2.07	0.20	0.15	0.03	22.19	2219	2219
CD at 5%	NS	NS	38.26	8.80	0.84	NS	NS	NS	NS	NS

Table-2 (b): Effect of tillage and nutrient management on productivity of the oats in rice – oats cropping system at Kalyani

Treatment	Rice						
	Plant height (cm)	Effective tiller / plant	Panicle length (cm)/ plant	Grain yield (q/ha)	Straw yield (q/ha)	Net return (Rs/ha)	Benefit cost ratio
A. Tillage practices							
Zero tillage	94.32	9.95	23.39	27.3	98.6	41520	2.72
Minimal tillage	94.68	10.30	23.72	25.8	104.6	39270	2.54
Conventional tillage	94.22	10.40	22.86	29.1	109.1	44395	2.67
SEm±	0.48	0.23	0.30	0.6	1.6	1034	-
CD at 5%	1.49	0.69	0.92	1.8	NS	3099	-
B. Nutrient management							
75% RDF	93.90	8.93	23.33	25.0	95.3	37500	2.58
75% RDF + Biofertilizer	94.18	9.70	23.13	26.3	101.9	40138	2.62
100% RDF	93.40	10.66	23.09	28.7	108.9	44388	2.72
100% RDF +Biofertilizer	96.14	11.58	23.73	29.6	110.2	44888	2.66
SEm±	0.85	0.14	0.38	0.6	1.8	1094	
CD at 5%	2.61	0.44	1.17	1.7	5.6	3099	
C. Interaction: Tillage practices X Nutrient management							
SEm±	1.47	0.25	0.66	1.0	3.1	1895	
CD at 5%	4.51	0.76	2.03	3.0	9.7	5681	
CV%	2.69	4.21	4.90	6.13	5.2	7.87	

Table-2(c): Effect of tillage and nutrient management on productivity of rice and system productivity in rice – oats cropping system at Kalyani

Treatment	Oat							System		
	Plant height (cm)	Leaf stem ratio	Green fodder yield (q/ha)	Dry matter yield (q/ha)	Crude protein yield (q/ha)	Net return (Rs/ha)	Benefit cost ratio	Equiva-lent yield of oat (q/ha)	Gross return (Rs/ha/yr)	Net return (Rs/ha/yr)
A. Tillage practices										
Zero tillage	105.68	0.83	265.17	57.19	5.57	11517	1.77	922	92163	53038
Minimal tillage	107.87	0.85	302.00	66.62	6.71	11700	1.63	950	94971	50971
Conventional tillage	113.03	0.87	361.75	82.63	8.78	13675	1.61	1071	107071	58071
SEm±	1.09		2.92	0.75	0.09	-	-	-	-	-
CD at 5%	4.27		11.48	2.95	0.35	-	-	-	-	-
B. Nutrient management										
75% RDF	103.98	0.83	273.33	56.90	4.71	8667	1.46	887	88667	46167
75% RDF + Biofertilizer	107.07	0.84	300.00	65.91	6.09	11333	1.61	950	94972	51472
100% RDF	110.60	0.85	318.33	72.10	7.88	13167	1.71	1021	102056	57556
100% RDF + Biofertilizer	113.80	0.87	346.89	80.34	9.39	16022	1.86	1066	106578	60911
SEm±	0.97		2.47	0.89	0.10					
CD at 5%	2.89		7.35	2.64	0.28					
C. Interaction: Tillage practices X Nutrient management										
SEm±	1.68		4.28	1.54	0.17					
CD at 5%	NS		12.72	NS	0.49					
CV%	2.68		2.39	3.87	4.07					

Table-2 (d): Effect of tillage and nutrient management on productivity, economics and soil fertility of rice – oats cropping system at Ranchi

Treatment	Rice					Oat			Net monetary return of the system (Rs/ha/yr)	Benefit cost ratio
	Grain yield (q/ha)	Straw yield (q/ha)	Harvest index (%)	1000 grain wt. (g)	Plant height (cm)	Green fodder yield (q/ha)	Dry matter yield (q/ha)	Crude protein yield (q/ha)		
A. Tillage practices										
Zero tillage	29.89	64.95	31.00	23.16	97.3	422	81.42	7.84	73431	1.49
Minimal tillage	27.04	58.84	31.00	23.16	95.5	345	71.75	7.20	53473	1.06
Conventional tillage	25.11	60.26	28.00	22.01	94.4	439	88.90	8.88	68916	1.33
SEm±	0.91	0.60	0.8	0.27	0.13	3.69	0.95	0.06	783	0.02
CD at 5%	3.57	2.36	NS	NS	0.53	14.44	3.70	0.25	3058	0.06
B. Nutrient management										
125% RDF	31.05	70.86	31.00	23.28	98.4	467	95.62	9.71	82896	1.60
100% RDF	28.40	61.40	29.00	22.32	95.2	425	82.57	8.19	57868	1.34
75% RDF	24.21	54.92	30.00	22.55	93.4	339	69.60	6.71	49543	1.00
75% RDF + Biofertilizer	25.74	58.24	30.00	22.94	96.1	378	74.96	7.28	60784	1.22
SEm±	0.97	0.55	1.00	0.20	0.29	4.50	0.92	0.11	1041	0.02
CD at 5%	2.89	1.63	NS	0.59	0.86	13.3	2.74	0.32	3094	0.06
CV%	10.81	2.68		2.63	0.90				4.97	5.11
C. Interaction: Between N at same T										
SEm±	1.83	1.21	1.6	0.53	0.27	7.39	1.90	0.13	1568	0.03
CD at 5%	NS	3.14	NS	1.17	NS	24.84	5.23	0.58	5697	0.11
Between T at same or different N levels										
SEm±	1.72	1.02	1.6	0.40	0.33	7.69	1.68	0.17	1747	0.04
CD at 5%	NS	3.38	NS	1.36	NS	24.53	5.49	0.54	5520	0.11

Table-2 (e): Effect of Tillage and Nutrient management on weed flora in oat under rice- oat cropping system at Ranchi

Treatment		Weed population/m^2				Weed weight (g/m^2)	
		Narrow leaves	Sedge	Broad leaves	Total	Green	Dry
Tillage Management (T)							
Zero tillage		65.75	75.58	10.25	163.6	41.27	5.82
Minimal tillage		81.41	113.66	22.16	231.7	83.51	8.69
Conventional tillage		70.50	50.0	14.83	137.1	49.09	5.61
S. Em		1.86	2.29	0.47	2.85	1.99	0.11
CD at 5%		7.28	8.97	1.84	11.16	7.79	0.42
Nutrient Management (N)							
125% RDF		73.55	94.89	18.11	200	70.96	7.48
100% RDF		83.33	75.34	14.00	186	55.48	7.48
75% RDF		62.00	67.78	12.11	155	47.75	5.70
75% RDF+Bio-fertilizer		71.33	82.0	18.78	167	57.65	6.17
S. Em		1.58	1.67	1.53	2.16	1.69	0.15
CD at 5%		4.70	4.96	4.54	6.42	5.05	0.46
Interaction (TXN)							
Between N at same T	S. Em	3.72	4.59	0.94	5.71	3.99	0.22
	CD at 5%	9.12	9.84	7.9	12.65	9.79	0.85
Between T at same or different N levels	S. Em	3.02	3.40	2.34	4.32	3.23	0.26
	CD at 5%	10.04	11.56	7.05	14.61	10.77	0.81

Table-2 (f): Effect of tillage and nutrient management on productivity and economics of rice – oats cropping system at Bhubaneswar

Treatment	Rice		Oat				Rice equivalent yield (q/ha)	Gross return of the system (Rs/ha/yr)	Net return of the system (Rs/ha/yr)
	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 (%)			
A. Tillage practices									
Zero tillage	38.23	46.63	194.21	40.65	3.96	9.73	62.31	62309	31059
Minimal tillage	38.28	46.79	253.88	51.73	5.16	9.98	68.35	68351	36100
Conventional tillage	37.34	45.94	321.67	67.24	6.61	9.83	74.10	74099	40849
SEm±	0.53	0.72	4.47	0.59	0.08	0.07	1.35	1346	1347
CD at 5%	NS	NS	17.56	2.31	0.33	0.29	5.29	5285	5286
CV%	6.16	5.33	6.04	3.83	5.50	2.58	6.83		
B. Nutrient management									
75% RDF	39.94	48.27	226.92	48.24	4.80	9.98	67.46	67459	35959
75% RDF + Biofertilizer	37.49	45.59	246.18	50.51	4.87	9.62	66.66	66663	34663
100% RDF	36.69	45.29	269.71	55.76	5.54	9.90	68.19	68194	35694
100% RDF + Biofertilizer	37.68	46.66	283.53	58.32	5.77	9.88	70.70	70695	37695
SEm±	0.49	0.57	4.12	0.80	0.11	0.13	0.92	921	921
CD at 5%	1.44	1.69	12.25	2.38	0.31	0.39	2.74	2736	2736
CV%	3.92	3.67	4.82	4.51	6.05	4.04	4.05		
C. Interaction: Main within Sub									
SEm±	0.96	1.28	8.82	1.54	0.21	0.25	2.23	2227	2228
CD at 5%	2.97	4.32	29.08	4.87	0.66	0.76	7.65	7654	7654
Sub within Main									
SEm±	0.98	0.98	7.14	1.39	0.18	0.23	1.60	1595	1595
CD at 5%	2.87	2.92	21.22	4.12	0.54	0.68	4.74	4739	4739

Table-2 (g): Effect of tillage and nutrient management on productivity and economics of rice – oats cropping system at Jabalpur

Treatment	Rice		Oat				Net monetary return (Rs/ha/yr)	Benefit cost ratio
	Grain yield (q/ha)	Straw yield (q/ha)	Green fodder yield (q/ha)	Dry matter yield (q/ha)	Crude protein yield (q/ha)	Leaf stem ratio		
A. Tillage practices								
Zero tillage	50.02	101.11	614.32	140.24	10.55	0.95	80897	3.05
Minimal tillage	52.14	100.05	631.70	142.89	11.02	0.92	81302	2.94
Conventional tillage	49.68	98.99	625.84	142.36	10.77	0.96	77751	2.83
SEm±	1.63	1.4	3.45	1.22	1.85	0.001		
CD at 5%	NS	NS	10.35	NS	NS	0.003		
B. Nutrient management								
75% RDF	51.19	99.87	583.34	135.11	10.21	0.93	78490	2.96
75% RDF + Biofertilizer	50.77	99.69	614.91	142.48	10.76	0.89	80625	2.98
100% RDF	51.06	100.46	621.61	144.04	10.95	0.95	80525	2.92
100% RDF + Biofertilizer	50.02	99.99	635.34	145.70	11.20	0.97	80293	2.90
SEm±	1.21	1.24	5.52	2.48	1.25	0.002		
CD at 5%	NS	NS	16.56	7.44	NS	0.003		
C. Interaction: Tillage practices X Nutrient management								
SEm±	1.61	1.14	4.53	1.63	1.53	0.001		
CD at 5%	NS	NS	13.59	4.89	NS	0.003		

Table-2 (h): Effect of tillage and nutrient management on soil fertility status of rice – oats cropping system at Jabalpur

Treatment	pH	EC dS/mhos	BD	OC%	Available (Kg/ha)		
					N	P	K
T_1	7.47	0.46	1.35	0.65	242.8	16.71	359.2
T_2	7.47	0.46	1.36	0.65	244.6	16.75	360.0
T_3	7.45	0.45	1.36	0.66	242.2	16.72	360.5
T_4	7.46	0.45	1.36	0.66	244.6	16.80	361.9
T_5	7.45	0.43	1.35	0.64	235.4	16.80	360.3
T_6	7.47	0.45	1.33	0.63	238.5	16.83	361.2
T_7	7.47	0.45	1.33	0.64	238.8	16.81	358.3
T_8	7.47	0.45	1.35	0.66	240.6	16.83	362.8
T_9	7.47	0.45	1.33	0.64	240.5	16.66	360.4
T_{10}	7.46	0.45	1.34	0.65	232.5	16.63	359.6
T_{11}	7.47	0.47	1.35	0.65	242.4	16.67	360.3
T_{12}	7.46	0.45	1.33	0.64	235.6	16.66	359.6
Initial status	7.46	0.45	1.34	0.62	235.8	16.79	360.2

Table-2 (i): Effect of tillage and nutrient management on productivity and economics of rice – oats cropping system at Raipur

Treatment	Rice		Oat					Net return of the system (Rs/ha/yr)	Benefit cost ratio of the system
	Grain yield (q/ha)	Straw yield (q/ha)	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	50.49	78.92	241.70	63.46	5.26	131.18	0.59	55481	1.78
Minimal tillage	52.34	79.60	267.28	70.16	6.05	139.08	0.65	59776	1.88
Conventional tillage	51.64	79.80	306.51	79.93	7.40	133.01	0.72	62364	1.93
SEm±									
CD at 5%			5.45	4.5	0.40	4.46	0.3		
B. Nutrient management									
75% RDF	50.25	77.74	243.93	65.30	5.59	132.76	0.58	55636	1.79
75% RDF + Biofertilizer	50.83	78.00	266.84	69.54	6.07	130.96	0.63	58129	1.85
100% RDF	51.67	79.93	280.95	73.38	6.47	137.57	0.67	60097	1.88
100% RDF + Biofertilizer	53.21	82.08	295.61	76.53	6.82	136.40	0.72	62965	1.94
SEm±									
CD at 5%			8.83	2.36	0.20	2.26	0.03		
C. Interaction: Tillage practices X Nutrient management									
SEm±									
CD at 5%									

AST-3: Performance of crops raised through waste water under varied nutrient levels

[Table reference: 3(a) to 3(e)]

Location: Hyderabad and Coimbatore

The experiment was conducted to assess the production, quality and economics of various crops raised through wastewater under varied nutrient levels. The twenty treatments comprised of four forages crops laid out in main plot and five levels of nutrient allotted in sub-plots of split plot design and replicated thrice. This was the third year of experimentation with previous year treatments.

At Hyderabad, planting of para grass recorded significantly highest GFY (996.27 q/ha), DMY (184.35 q/ha), net monetary returns (Rs 44776 /ha/yr) and benefit cost ratio (3.99) over BN hybrid, guinea grass and lucerne crops; whereas, BN hybrid recorded highest crude protein yield (12.36 q/ha) over rest of the forages. The application of 100% RDF to the forage crops being at par with 75% RDF, attained significantly highest GFY (629.3 q/ha), DMY (122.5 q/ha), CPY (10.59 q/ha), NMR (Rs 25493 /ha/yr) and benefit cost ratio (2.70) over rest of the nutrient levels. With respect to soil fertility after crop cycle, growing of different forage crops did not cause significant variation in soil fertility status in terms of OC, available N, P and K in the soil. Application of 100% RDF recorded highest available N (117.33 kg N/ha) and P (96.77 kg P_2O_5/ha). The concentration of Cd and Pb in forage crops did not differ significantly. Lowest concentration of Cobalt was found in lucerne (0.73 ppm) followed by BN hybrid (0.77 ppm). Lowest concentration of nickel and Cr was found in BN hybrid (0.49 and 3.07 ppm, respectively) and highest being in guinea grass (7.48 ppm Cr) and para grass (1.56 ppm nickel). The application of 100% RDF to forage crops recorded highest concentration of heavy metals *viz.,* Co, Ni and Cr in dry matter as compared to its lower levels and lowest being with control. The quantity of heavy metals in the soil remained unchanged by growing of different forage crops. With respect to nutrient levels, application of different doses of RDF to the forages did not affect considerably the levels of heavy metals in the soil after crop cycle (except Pb).

At Coimbatore, treatments similar to Hyderabad were undertaken for experiment except multi-cut fodder sorghum instead of paragrass. The planting of cumbu napier hybrid recorded significantly highest GFY (2990 q/ha), DMY (467 q/ha) and CPY (34.17 q/ha) over rest of the forages. The magnitude of increase in GFY of cumbu napier hybrid over guinea, multi-cut sorghum and lucerne was 46.8, 123.9 and 166.9%, respectively. The application of 100% RDF to forages attained significantly highest GFY (2010 q/ha), DMY (328 q/ha) and CPY (28.67 q/ha) over its lower levels. The respective treatment recorded 16.2, 11.1, 7.7 and 3.7 % more GFY over control, 25% RDF, 50% RDF and 75% RDF, respectively.

Table-3 (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)	Net monetary return (Rs/ha)	Benefit cost ratio
A. Forage crops					
Bajra Napier hybrid (APBN-1)	608.60	130.79	12.36	21516	2.43
Guinea grass (COGG-3)	538.67	121.31	8.91	17320	2.16
Para grass	996.27	184.35	10.06	44776	3.99
Lucerne (CO-1)	251.40	29.15	7.07	10140	1.68
SEm±	16.0	3.2	0.35	968	0.065
CD at 5%	55.21	11.19	1.23	3350	0.225
B. Nutrient levels					
Control	562.5	109.9	8.60	21110	2.41
25% RDF	577.1	111.5	9.02	22028	2.47
50% RDF	607.8	117.5	9.57	23912	2.60
75% RDF	617.0	120.6	10.22	24647	2.64
100% RDF	629.3	122.5	10.59	25493	2.70
SEm±	5.76	1.5	0.135	371	0.025
CD at 5%	16.54	4.25	0.39	1064	0.071
C. Interaction Forage crops X Nutrient levels					
SEm±					
CD at 5%	23.39	6.02	0.55	1504	0.10
CV%					

Table-3 (b): Effect of forage crops and nutrient levels on soil fertility status after crop cycle raised under waste water at Hyderabad

Treatment	pH	EC (d Sm^{-1})	OC (%)	Available N (kg/ha)	Available P_2O_5 (kg/ha)	Available K_2O (kg/ha)
A. Forage crops						
Bajra Napier hybrid (APBN-1)	7.82	0.25	0.27	96.47	92.60	472.80
Guinea grass (COGG-3)	7.65	0.27	0.30	100.27	95.29	473.33
Para grass	7.61	0.27	0.29	88.80	94.35	449.87
Lucerne (CO-1)	7.67	0.28	0.28	106.80	98.15	468.60
CD at 5%	NS	NS	NS	NS	NS	NS
B. Nutrient levels						
Control	7.79	0.24	0.28	78.75	93.87	456.6
25% RDF	7.73	0.25	0.29	92.17	96.58	466.4
50% RDF	7.70	0.26	0.30	97.00	93.96	473.5
75% RDF	7.67	0.29	0.29	105.17	94.32	468.3
100% RDF	7.64	0.27	0.28	117.33	96.77	466.3
CD at 5%	NS	NS	NS	26.29	NS	14.6
C. Interaction Forage crops X Nutrient levels						
CD at 5%	NS	NS	NS	NS	4.42	20.70

Table-3(c): Concentration of micronutrients (mg kg $^{-1}$) and heavy metals (mg kg $^{-1}$) in forage crops grown under sewage irrigation at Hyderabad

Treatment	Micro nutrients (mg kg $^{-1}$)				Heavy metals (mg kg $^{-1}$)				
	Zn	Fe	Cu	Mn	Co	Ni	Cd	Pb	Cr
A. Forage crops									
Bajra Napier hybrid (APBN-1)	1.77	77.99	4.75	15.98	0.77	0.49	1.62	3.53	3.07
Guinea grass (COGG-3)	1.19	81.91	4.56	15.91	0.79	1.50	1.73	3.57	7.48
Para grass	1.24	83.89	3.62	13.55	0.93	1.56	1.72	3.82	4.68
Lucerne (CO-1)	1.40	97.11	5.44	14.68	0.73	0.77	1.72	4.02	4.60
SEm±	0.02	0.99	0.12	0.36	0.02	0.02	0.06	0.23	0.16
CD at 5%	0.07	3.42	0.41	1.24	0.07	0.06	NS	NS	0.56
B. Nutrient levels									
Control	1.38	84.02	4.62	14.30	0.78	1.31	1.67	3.59	4.83
25% RDF	1.39	85.37	4.63	14.99	0.79	1.32	1.70	3.58	4.92
50% RDF	1.41	85.48	4.58	15.11	0.79	1.34	1.69	3.58	4.92
75% RDF	1.41	84.98	4.56	14.91	0.81	1.32	1.68	4.35	4.99
100% RDF	1.41	86.29	4.57	15.83	0.83	1.37	1.74	3.56	5.11
SEm±	0.03	0.73	0.10	0.25	0.01	0.02	0.04	0.24	0.08
CD at 5%	NS	NS	NS	0.72	0.04	0.06	NS	0.69	0.23
C. Interaction: Forage crops X Nutrient levels									
SEm±									
CD at 5%	NS	NS	NS	NS	NS	NS	NS	NS	NS
CV%									

Table-3 (d): Concentration of Micro nutrients (mg kg $^{-1}$) and heavy metals (mg kg $^{-1}$) in soil under sewage irrigation at Hyderabad

Treatment	Micro nutrients (mg kg $^{-1}$)				Heavy metals (mg kg $^{-1}$)				
	Fe	Mn	Zn	Cu	Co	Ni	Cd	Pb	Cr
A. Forage crops									
Bajra Napier hybrid (APBN-1)	9.56	15.98	1.21	4.75	1.62	1.00	1.61	3.53	0.60
Guinea grass (COGG-3)	9.42	15.91	1.28	4.56	1.73	1.06	1.73	3.57	0.58
Para grass	9.06	13.55	1.34	3.62	1.72	1.02	1.72	3.82	0.58
Lucerne (CO-1)	12.34	14.67	1.39	5.44	1.72	1.16	1.72	4.02	0.60
SEm±	0.38	0.36	0.99	0.12	NS	NS	NS	NS	NS
CD at 5%	1.30	1.24	NS	0.41	8.93	31.59	8.92	16.85	5.63
B. Nutrient levels									
Control	10.02	14.30	1.25	4.62	1.67	1.03	1.67	3.59	0.57
25% RDF	10.20	14.99	1.28	4.63	1.70	1.11	1.70	3.58	0.58
50% RDF	10.12	15.11	1.37	4.58	1.69	1.06	1.69	3.58	0.59
75% RDF	10.08	14.91	1.35	4.56	1.68	1.04	1.68	4.35	0.62
100% RDF	10.05	15.83	1.28	4.57	1.74	1.06	1.73	3.56	0.59
SEm±	0.14	0.25	0.05	0.10	0.04	0.05	0.04	0.24	0.02
CD at 5%	NS	0.72	NS	NS	NS	NS	NS	0.69	NS
C. Interaction: Forage crops X Nutrient levels									
SEm±									
CD at 5%	NS	NS	NS	0.42	NS	NS	NS	NS	NS
CV%									

Table 3(e): Effect of forage crops and nutrient levels on yields and growth parameters of forages raised under waste water at Coimbatore

Treatment	Green fodder yield (q/ha)	Dry matter yield (q/ha)	Crude protein yield (q/ha)	Crude protein (%)	Plant population/m row length	Plant height (cm)	Leaf stem ratio
A. Forage crops							
Cumbu Napier hybrid (CO(CN)4)	2990	467	34.17	7.29	2.0	158.27	0.41
Guinea grass (CO(GG)2)	2037	325	20.96	6.44	2.0	148.15	0.37
Multicut fodder sorghum (CO(FS)29)	1335	207	12.37	5.98	10.0	194.85	0.29
Lucerne (CO-1)	1120	175	29.57	16.80	18.4	104.45	0.48
SEm±	12.32	4.99	0.57	0.09	0.08	1.03	0.003
CD at 5%	30.16	12.20	1.40	0.22	0.20	2.52	0.01
B. Nutrient levels							
Control	1730	260	19.86	8.53	8.1	132.63	0.35
25% RDF	1809	278	22.44	8.94	8.1	143.42	0.37
50% RDF	1867	294	24.23	9.14	8.1	150.23	0.39
75% RDF	1939	307	26.13	9.39	8.1	159.64	0.41
100% RDF	2010	328	28.67	9.62	8.2	171.23	0.43
SEm±	11.22	3.09	0.25	0.05	0.12	1.19	0.004
CD at 5%	22.86	6.29	0.52	0.09	NS	2.42	0.01
C. Interaction: Forage crops X Nutrient levels							
SEm±							
CD at 5%	50.63	16.52	1.68	0.27	NS	4.99	NS
CV%	2.55	6.58	9.15	3.81	2.76	2.63	2.92

AST-4: Studies on the effect of irrigation levels on green forage yield and quality of different forage crops during lean period [Reference Table: 4(a) to 4(d)]

Location: Mandya, Hyderabad and Dharwad

This experiment was started during Rabi 2011-12 at three locations to study the performance of forage crops under varied nutrient regimes and to identify suitable and most remunerative crop for limited irrigation. The treatment consisted of three irrigation levels (IW/CPE-0.6, IW/CPE-0.8 and IW/CPE-1.0) and four crops (fodder maize, fodder sorghum, fodder pearl millet and baby corn) laid out in split plot design with irrigation in main plot and crops under sub-plots with three replications. The data of second year experimentation revealed that application of irrigation at IW/CPE-1.0 recorded significantly highest GFY and DMY over its lower levels at Mandya and Dharwad. However, irrigation levels at IW/CPE 1.0 and 0.8 remained at par with each other recorded significantly higher GFY, DFY and CPY of forage crops over IW/CPE-0.6 at Hyderabad.

On location mean basis, application of irrigation at IW/CPE-1.0 recorded highest GFY (385.7 q/ha), DMY (92.71 q/ha) and CPY (7.09 q/ha) over IW/CPE-0.6 and IW/CPE-0.8. The magnitude of increase in IW/CPE 1.0 was 29.4% and 25.90% for GFY and DFY, respectively over IW/CPE-0.6 and 8.16% and 7.46% for GFY and DFY, respectively over IW/CPE-0.8. On location mean basis, similar to GFY and DFY, irrigation level IW/CPE-1.0 fetched highest net monetary return (Rs 24458/ha), benefit cost ratio (2.39) and water use efficiency (12.8 q/ha-cm) over rest of the irrigation regimes.

The planting of fodder maize being at par with fodder sorghum and fodder pearl millet for DMY at Hyderabad recorded significantly highest GFY (413.4 q/ha), DMY (99.0 q/ha), CPY (7.61 q/ha) on mean basis as well as location wise compared with rest of the fodder crops. The fodder maize crop recorded maximum water use efficiency at all the locations as well as on mean basis (13.97 q/ha-cm). Growing of baby corn fetched highest net monetary return (Rs 35695/ha) and benefit cost ratio (2.81) over rest of the fodder crops on mean basis. At Dharwad, fodder maize was found most remunerative in terms of net monetary returns (Rs. 11155/ha) and benefit cost ratio (1.28) over rest of the fodder crops. Significant interactions of irrigation levels and forage crops at Dharwad for GFY and at Mandya for DMY were observed.

Table-4 (a): Effect of irrigation levels on fodder yield of different forage crops during lean period

Treatment	Green fodder yield (q/ha)				Dry matter yield (q/ha)			
	Hyderabad	Mandya	Dharwad	Mean	Hyderabad	Mandya	Dharwad	Mean
A. Irrigation level								
IW/CPE-0.6	333.2	288.91	272.39	298.17	65.02	59.86	95.95	73.61
IW/CPE-0.8	450.8	333.41	285.59	356.60	90.55	67.70	100.55	86.27
IW/CPE-1.0	483.1	375.23	298.76	385.70	94.82	77.47	105.83	92.71
SEm±	9.3	6.04	2.06		1.6	1.33	1.11	
CD at 5%	36.5	23.73	8.07		6.3	5.21	4.33	
B. Crops								
Fodder maize	484.4	424.95	330.92	413.42	92.27	87.41	117.35	99.01
Fodder sorghum	427.6	328.56	308.77	354.98	85.67	69.84	109.26	88.26
Fodder pearl millet	446.3	317.84	309.41	357.85	88.43	62.90	109.03	86.79
Baby corn	331.2	258.71	193.21	261.04	67.50	53.22	67.45	62.72
SEm±	9.6	5.57	0.91		2.8	1.40	0.56	
CD at 5%	28.5	9.65	2.70		8.3	4.16	1.67	
C. Irrigation x Crops								
SEm±		9.65	1.82			2.43		
CD at 5%	NS	NS	5.40		NS	7.21	NS	

Table-4 (b): Effect of irrigation levels on CP yield, protein content and WUE of different forage crops during lean period

Treatment	Crude protein yield (q/ha)				Crude protein (%)			Water Use efficiency (q/ha-cm)			
	Hyderabad	Mandya	Dharwad	Mean	Hyderabad	Dharwad	Mean	Hyderabad	Mandya	Dharwad	Mean
A. Irrigation level											
IW/CPE-0.6	5.26	4.21	6.93	5.47	8.11	7.21	7.66	11.19	13.44	10.90	11.84
IW/CPE-0.8	8.15	4.75	7.27	6.72	8.99	7.22	8.11	14.42	13.06	9.52	12.33
IW/CPE-1.0	8.56	5.07	7.64	7.09	9.05	7.20	8.13	14.71	15.15	8.54	12.80
SEm±	0.17	0.09	0.07		0.20	0.01		0.72		0.07	
CD at 5%	0.66	0.37	0.28		0.82	NS		2.84		0.27	
B. Crops											
Fodder maize	8.59	5.73	8.52	7.61	9.27	7.26	8.27	15.31	15.43	11.18	13.97
Fodder sorghum	4.92	4.72	7.90	5.85	5.70	7.23	6.47	13.33	-	10.44	11.89
Fodder pearl millet	9.45	4.78	7.91	7.38	10.57	7.26	8.92	13.95	-	10.45	12.20
Baby corn	6.33	3.47	4.79	4.86	9.33	7.10	8.22	11.35	12.57	6.53	10.15
SEm±	0.37	0.09	0.04		0.35	0.00		0.44		0.03	
CD at 5%	1.11	0.26	0.13		1.04	0.01		1.30		0.09	
C. Irrigation x Crops											
SEm±		0.15								0.06	
CD at 5%	NS	0.44	NS		NS	NS		NS		0.17	

Table-4(c): Effect of irrigation levels on growth parameters of different forage crops during lean period

Treatment	Plant height (cm)				Leaf stem ratio			
	Hyderabad	Mandya	Dharwad	Mean	Hyderabad	Mandya	Dharwad	Mean
A. Irrigation level								
IW/CPE-0.6	166.80	139.10	188.7	164.87	0.28	0.24	0.38	0.30
IW/CPE-0.8	173.16	146.55	193.8	171.17	0.31	0.26	0.39	0.32
IW/CPE-1.0	182.77	164.95	203.6	183.77	0.33	0.28	0.40	0.34
SEm±	7.6	1.90	5.3		0.02	0.004	0.03	
CD at 5%	NS	5.56	NS		NS	0.014	NS	
B. Crops								
Fodder maize	190.3	171.67	221.1	194.36	0.39	0.28	0.39	0.35
Fodder sorghum	172.3	147.94	201.6	173.95	0.23	0.24	0.34	0.27
Fodder pearl millet	179.9	141.45	197.0	172.78	0.25	0.25	0.46	0.32
Baby corn	154.6	139.74	161.7	152.01	0.35	0.27	0.36	0.33
SEm±	5.4	2.19	4.4		0.02	0.005	0.02	
CD at 5%	16.1	6.42	13.2		0.06	0.016	0.05	
C. Irrigation x Crops								
SEm±		3.79				0.01		
CD at 5%	NS	11.13	NS		NS	NS	NS	

Table-4 (d): Effect of irrigation levels on economics of different forage crops during lean period

Treatment	Net monetary return (Rs/ha)				Benefit cost ratio			
	Hyderabad	Mandya	Dharwad	Mean	Hyderabad	Mandya	Dharwad	Mean
A. Irrigation level								
IW/CPE-0.6	26020	17481	9241	17581	2.52	2.53	1.13	2.06
IW/CPE-0.8	38578	21393	9721	23231	3.22	2.79	1.12	2.38
IW/CPE-1.0	39314	23873	10188	24458	3.32	2.74	1.11	2.39
SEm±	2254	--	116		0.07	-	0.01	
CD at 5%	8849	--	452		0.29	-	NS	
B. Crops								
Fodder maize	31420	29135	11155	23903	2.84	3.18	1.28	2.43
Fodder sorghum	26260	23329	9826	19805	2.58	3.44	1.13	2.38
Fodder pearl millet	29127	22509	10365	20667	2.87	3.42	1.26	2.52
Baby corn	51743	47821	7520	35695	3.80	3.80	0.82	2.81
SEm±	2432		54		0.07		0.01	
CD at 5%	7226		159		0.22		0.02	
C. Irrigation x Crops								
SEm±								
CD at 5%	NS		NS		NS			

AST-5: Effect of stubble management and INM on yield, quality and growth attributes of oat in rice – oat Cropping system [Reference Table: 5(a), 5(b)]

Locations: Jorhat and Bhubaneswar

The experiment was initiated during Kharif 2012 with a view to increase forage productivity in rice fallow system keeping in view the application of nutrient in INM mode and saving time during turnaround period (i.e. harvesting of Sali (Kharif) rice and sowing of Rabi forage) through rice stubble cutting management treatment, so that timely sowing of Rabi forage, oat after medium duration rice variety (cv. Mahsuri) is possible skipping the normal tillage practices. The trial was conducted in split plot design with three cutting management treatments in the main plot and four INM treatments in the sub plot.

This experiment could not be conducted at Bhubaneswar.

The data of first year indicated that highest grain yield of rice was recorded with the application of 25% N through FYM + 50 % NPK of RDF + Biofertilizer (Azotobacter + PSB) + Green Manure (38.63 q/ha) followed by 50 % of N through FYM + GM + Biofertilizer (Azotobacter + PSB (38.40 q/ha). The highest GFY (234.8q/ha) and DMY (50.60 q/ha) were recorded with INM treatment 25% N through FYM + 50 % NPK of RDF + Biofertilizer (Azotobacter + PSB) + Green manure. Among cutting management treatments rice stubble when cut at 30 cm height could produce 94.66% of green forage (248.1q/ha) as compared to normal cultivation(262.0q/ha). The highest CP % and CPY were recorded in normal cultivation followed by cutting of rice stubble at 30 cm height. Green forage equivalent yield of the system indicated that among cutting management treatments, normal cultivation (615.02q/ha) recorded the highest green forage equivalent yield (GFEY); whereas among INM treatments, application of 25% N through FYM + 50 % NPK of RDF + Biofertilizer (Azotobacter + PSB) + Green Manure recorded the highest GFEY (590.99q/ha) and highest net monetary return (Rs 27696/ha). Cutting of rice stubble at 30 cm height produced the highest net monetary return (Rs 28633/ha). Interaction effect of cutting management and INM treatments was significant in respect of plant height, green forage equivalent yield and gross monetary return only.

Table-5 (a): Effect of stubble management and INM on yield, quality and growth attributes of oat in rice – oat Cropping system at Jorhat

Treatments	Oat						
	GFY (q/ha)	DMY (q/ha)	Crude protein yield (q/ha)	Crude protein (%)	Number of tillers/m	Plant height (cm)	Leaf stem ratio
A. Stubble management							
Cutting of rice stubble at ground level	150.3	32.4	239.77	7.39	98.6	85.2	0.78
Cutting of rice stubble at ground level	248.1	53.5	421.52	7.88	115.3	89.3	0.83
Normal Cultivation	262.0	56.5	451.19	7.99	113.2	95.6	0.87
SEm+	10.9	2.3	19.62	0.02	3.41	1.99	0.01
CD at 5%	106.5	23.0	192.59	0.23	33.48	19.58	0.10
CV%	17.1	16.1	18.3	10.0	10.8	7.7	4.2
B. Integrated nutrient management							
100% NPK of RDF	196.4	42.4	327.27	7.65	105.1	84.7	0.81
50% N through FYM + 50 % NPK of RDF	229.8	49.5	385.55	7.73	114.2	94.7	0.81
25% N through FYM + 50 % NPK of RDF + Biofertilizer (Azotobacter+PSB) + Green Manure	234.8	50.6	395.60	7.77	113.2	92.9	0.84
50 % of N through FYM + GM + Biofertilizer (Azotobacter+PSB)	219.6	47.3	374.89	7.86	103.6	88.0	0.85
SEm+	3.8	0.8	8.88	0.07	1.25	1.52	0.01
CD at 5%	25.7	5.5	59.75	NS	8.44	10.22	0.06
CV%	5.2	6.5	7.2	6.8	3.4	5.1	3.4
C. Interaction:							
M at same S							
SEm+	6.6	1.4	15.37	0.13	2.17	2.63	0.02
CD at 5%	NS	NS	NS	NS	NS	11.16	NS
S at same M							
SEm+	12.3	2.6	23.71	0.11	3.89	3.03	0.02
CD at 5%	NS	NS	NS	NS	NS	12.84	NS

Table-5 (b): Effect of stubble management and INM on yield and economics of rice and system in rice – oat cropping system at Jorhat

Treatments	Rice		Equivalent yield of the system (q/ha)	GMR (Rs/ha)	NMR (Rs/ha)
	Grain yield (q/ha)	Straw yield (q/ha)			
A. Stubble management					
Cutting of rice stubble at ground level	37.36	46.02	495.26	49526	19392
Cutting of rice stubble at ground level	37.15	47.39	592.67	59267	28633
Normal Cultivation	38.26	46.96	615.02	61502	28268
SEm+	0.62	0.63	14.92	1492	1492
CD at 5%	NS	NS	146.44	NS	NS
CV%	5.8	4.7	9.1	9.1	20.3
B. Integrated nutrient management					
100% NPK of RDF	35.97	44.88	529.05	52905	21746
50% N through FYM + 50 % NPK of RDF	37.36	46.28	574.96	57496	26231
25% N through FYM + 50 % NPK of RDF + Biofertilizer (*Azotobacter*+PSB) + Green Manure	38.63	47.14	590.99	59099	27696
50 % of N through FYM + GM + Biofertilizer(*Azotobacter* +PSB)	38.40	48.87	575.60	57560	26051
SEm+	0.67	0.44	7.92	792	792
CD at 5%	4.49	2.94	53.32	5332	5332
CV%	5.3	5.8	4.2	4.2	9.3
C. Interaction:					
M at same S					
SEm+	1.16	0.76	13.72	1372	1372
CD at 5%	NS	NS	58.211	5820	NS
S at same M					
SEm+	1.18	0.91	19.07	1907	1907
CD at 5%	NS	NS	80.92	8092	NS

AST-6 (AST-16): Performance of dual purpose forage crops under different cutting management system [Table Reference: 6(a) to 6(o)]

Locations: Hill zone: Palampur, Srinagar, Almora
NWZ: Ludhiana, Hisar, Bikaner
NEZ: Jorhat, Bhubaneshwar
CZ: Jabalpur, Raipur, Rahuri, Anand, Urulikanchan

The experiment was started in Rabi 2011-12 as exploratory trial to study the effect of cutting management on forage and grain potential of forage crops. Twelve treatments consisted of three forage crops (in main plot) and four cutting management practices (in sub-plot) laid out in split plot design with three replication. After realizing the results of exploratory trial it was conducted at thirteen locations under HZ, NWZ, NEZ, and CZ of the country. The data of first year experimentation has been given zone wise. The data of Rahuri and Bikaner are not included due to unexpected yield & delay in sowing and deviation from approved technical programme, respectively.

Hill Zone: Palampur, Almora and Srinagar

In hill zone at Palampur and Almora, the cutting scheduling for forage were no cut and one cut at 70, 80, 90 days after sowing (DAS), whereas at Srinagar due to slow growth of the crops during winter the green fodder cuttings were taken at 120, 130 and 140 DAS. The mean data indicated that at maturity, barley crop had less height, less tillers and L: S than oat and wheat. The L: S ratio was significantly better in wheat and was followed by oat. Oat crop produced significantly higher GFY of 203.15q/ha, which was 45.33% and 59.82 % more that barley and wheat, respectively. The respective increase in DMY was 47.07 and 70.29%. Similar trend was observed with respect to CPY at Palampur. Contrary to GFY, reverse trend was observed with respect to grain yield. Highest grain yield was recorded in wheat (32.09q/ha), followed by barley (28.39q/ha) and oat (26.55q/ha).

At Palampur in terms of oat green forage equivalent yield (OGFEY), wheat crops resulted in higher OGFEY (473.58 q/ha) and was followed by oat (444.01 q/ha) and barley (424.93 q/ha). Wheat crop also resulted in higher net returns (Rs. 56468/ha) and B: C (3.91) than Oat (53094; 3.85) and barley (Rs.50372; 3.94).

Herbage yield increased with delay in harvesting of the crops at first cut. Harvesting for fodder at 90 DAS produced 207.13q/ha GFY, which reflected increase of 58.75 and 92.59 % in comparison to cut taken at 80 and 70 DAS, respectively. The respective value w.r.t. dry fodder yield was 42.33 and 87.2 %. Delay in the harvesting of the crops for fodder significantly decreases the growth parameters of the crops at all the locations at maturity. At Palampur Crop left for seed production after taking one cut at 70 DAS produced significantly higher seed yield, whereas no cut failed to produce higher yield due to heavy lodging losses. However, at other two locations no cutting of crops for fodder resulted in higher seed production of the crops. No cut system resulted in the production of higher straw yield at all the locations. The data of Palampur location indicated that in terms of OGFEY (511.78 q/ha) and economic returns (net returns of Rs. 62,353/ha and B:C of 4.32) one cut of the crops at 70 DAS appeared suitable preposition to obtain dual benefit from the crops during winter months in the hills.

North West Zone: Ludhiana and Hisar

On location mean basis, oat produced highest GFY (166.95 q/ha) and DMY (26.27 q/ha) over barley and wheat crops. The respective crop recorded 57.1 and 70.4 % more green fodder over barley and wheat, respectively. Contrary to GFY, wheat crop produced highest grain yield (35.5 q/ha) and grain equivalent yield (50.0 q/ha) on mean basis. For grain yield wheat crop proved superior in terms of net monetary returns (Rs 36593/ha) and benefit cost ratio (1.21) over barley and oats at Ludhiana.

With respect to cutting management practices, on mean basis, cutting of forage crops at 70 DAS recorded highest GFY (168.2 q/ha) and DMY (32.11 q/ha) as compared to cutting at 50 DAS (95.8 q/ha GFY and 12.38 q/ha DMY) and 60 DAS (120.85 q/ha GFY and 20.05 q/ha DMY). The respective treatment (cutting at 70 DAS) recorded 74.6 and 25.1 % more GFY over cutting at 50 DAS and 60 DAS, respectively; whereas, no cutting of forage crops attained higher grain (31.7 q/ha) and grain equivalent yield (36.7 q/ha) over rest of the cutting management practices. The percent reduction in grain yield under cutting at 50 DAS, 60 DAS and 70 DAS over no cutting was 10.4, 17.0 and 24.0, respectively. At Ludhiana no cutting of forages fetched highest net monetary returns (Rs 22124/ha) and benefit cost ratio (1.03) over rest of the cutting management practices.

North East Zone: Jorhat and Bhubaneswar

On location mean basis, oat crop produced higher GFY (174.67 q/ha) and DMY (38.68 q/ha) than barley (102.97 q/ha GFY and 22.05 q/ha DMY) and wheat crop (101.21 q/ha GFY and 20.45 q/ha DMY). The highest grain yield was recorded under wheat crop (15.77 q/ha) than barley (15.16 q/ha) and oats (14.12 q/ha). Barley crop fetched highest net monetary returns (Rs 32437/ha) and B: C ratio (4.6) over rest of the crops. The herbage yield increased consistently with delay in harvesting for green fodder. Harvesting of dual purpose crop(s) at 70 days after sowing produced 173.06 q/ha green fodder with increase of 29.8 and 12.1 % over cutting at 50 and 60 DAS, respectively on mean basis. The respective increase in dry matter yield was 30.7 and 11.5 %.

The grain and straw yields decreased with delay in harvesting for green fodder. It is worth mentioning that cutting for fodder at 50 DAS did not cause remarkable reduction in grain yield of the crops. Uncut crops recorded highest grain yield (20.88 q/ha) and grain yield decreased to the tune of 18.4, 40.0 and 53.7% with cutting at 50, 60 and 70 DAS over no cut system. Cutting of dual purpose crop(s) at 60 DAS fetched highest net monetary returns (Rs 30096 /ha) and B:C ratio (3.54 at Bhubaneswar) over no cut, cutting at 60 and 70 DAS on mean basis.

Central Zone: Jabalpur, Anand, Urulikanchan and Raipur

On location mean basis, oat crop recorded highest green fodder (290.5 q/ha), dry matter (52.1 q/ha) and crude protein yield (5.0 q/ha) than barley and wheat crops. The respective crop recorded 53.4 and 147.4 % more GFY over barley and wheat crops, respectively. Wheat crop recorded highest grain yield (32.3 q/ha), net monetary returns (Rs 36508/ha) and B: C ratio (2.2) as compared to barley and oat crops on mean basis. The maximum grain yield of wheat (56.1 q/ha) was recorded at Jabalpur and lowest being with Raipur (17.0 q/ha).

The herbage yield of dual purpose forage crops increased consistently with delay in harvesting for green fodder. The harvesting of dual purpose crops at 70 DAS recorded highest GFY (249.1 q/ha), DMY (37.07 q/ha) and CPY (3.9 q/ha) as compared to cutting at 50 and 60 DAS. The respective cutting (70 DAS) recorded 48.3 and 11.6 % more GFY over cutting at 50 and 60 DAS, respectively. The grain and straw yields of forages decreased with delay in harvesting for green fodder. The uncut crops recorded highest grain yield (34.2 q/ha) and it decreased to the extent of 29.2, 42.7 and 59.1 % with cutting at 50, 60 and 70 days after sowing, respectively over no cut system. Cutting of dual purpose crops at 50 DAS for green fodder fetched maximum net monetary returns (Rs 31922/ha) and benefit cost ratio (2.0). Significant interaction effects of cutting management and dual purpose crops were also observed at Jabalpur and Urulikanchan for GFY and DMY.

Table-6 (a): Effect of cutting management on growth of *Rabi* crops (Hill zone)

Treatments	Plant height (cm)				Tiller number (per m row length)				L: S	
	Palampur	Almora	Srinagar	Mean	Palampur	Almora	Srinagar	Mean	Palampur	Srinagar
Crop										
Oat	95.8	149.6	86.8	110.7	228	65	149	147	0.59	0.55
Barley	82.2	96.1	72.6	83.6	220	99	81	133	0.55	0.37
Wheat	86.8	105.4	80.1	90.8	166	71	102	113	0.63	0.40
SEm±	1.07	0.66	1.54	-	9	1.20	2	-	0.01	0.01
CD at 5%	4.2	2.64	6.1	-	33	4.86	5	-	0.02	0.03
Cutting management										
No cut	103.7	123.6	114.14	113.8	224	92	114	143	-	0.45
Cutting at 70 DAS	97.7	119.5	56.9	91.4	203	86	103	131	0.65	0.45
Cutting at 80 DAS	83.3	117.8	68.6	89.9	196	76	106	126	0.60	0.43
Cutting at 90 DAS	68.2	107.2	79.7	85.0	194	60	120	125	0.53	0.43
SEm±	1.61	0.78	1.89	-	9	2.52	4	-	0.01	0.01
CD at 5%	4.7	2.32	3.52	-	NS	4.55	10	-	0.02	NS
Interaction	NS	Sig.	Sig.	-	NS	Sig.	NS	-	NS	NS

Table-6 (b): Effect of cutting management on forage yield of *Rabi* crops (Hill zone)

Treatments	Green fodder yield (q/ha)				Dry matter yield (q/ha)			
	Palampur	Almora	Srinagar	Mean	Palampur	Almora	Srinagar	Mean
Crops								
Oat	185.81	89.67	333.98	203.15	45.74	29.04	86.80	53.86
Barley	155.17	48.52	215.66	139.78	38.98	12.12	58.77	36.62
Wheat	86.90	36.73	257.71	127.11	21.03	6.96	66.94	31.64
SEm±	3.26	0.26	2.53	-	0.81	0.09	1.17	-
CD at 5%	12.79	2.26	11.45	-	3.18	0.38	5.32	-
Cutting management								
No cut	-	-	-	-	-	-	-	-
Cutting at 70 DAS	104.51	41.15	197.96	114.54	24.09	10.98	52.42	29.16
Cutting at 80 DAS	125.41	55.04	264.68	148.38	30.58	15.08	69.42	38.36
Cutting at 90 DAS	197.96	78.71	344.71	207.13	51.07	22.07	90.66	54.60
SEm±	3.68	0.53	3.59	-	0.91	0.36	1.14	-
CD at 5%	11.34	1.59	11.06	-	2.81	1.07	3.54	-
Interaction	Sig.	Sig.	NS	-	Sig.	Sig.	NS	-

Table-6(c): Effect of cutting management on grain and straw yields and economics of *Rabi* crops (Hill Zone)

Treatments	Grain yield (q/ha)				Straw yield (q/ha)			Oat GFEY (q/ha	Net returns (Rs./ha)	B: C
	Palampur	Almora	Srinagar	Mean	Palampur	Almora	Mean	Palampur		
Crops										
Oat	22.41	39.52	17.72	26.55	71.10	104.76	87.93	444.01	53094	3.85
Barley	24.52	39.51	21.13	28.39	62.52	51.90	57.21	424.93	50372	3.94
Wheat	35.68	35.73	24.85	32.09	66.62	96.38	81.5	473.58	56468	3.91
SEm±	0.27	0.90	0.20	-	0.88	1.18	-	2.38	-	-
CD at 5%	1.06	3.56	0.76	-	3.45	4.78	-	9.35	-	-
Cutting management										
No cut	28.64	46.39	30.24	35.09	83.06	94.40	88.73	377.07	44413	3.88
Cutting at 70 DAS	35.13	41.43	22.07	32.88	80.52	91.49	86.005	511.78	62353	4.32
Cutting at 80 DAS	26.88	37.61	18.30	27.60	56.57	85.06	70.815	463.38	55094	3.83
Cutting at 90 DAS	19.52	27.58	14.32	20.47	46.83	66.43	56.63	438.65	51384	3.58
SEm±	0.60	0.90	0.35	-	1.21	1.03	-	6.04	-	-
CDat 5%	1.79	2.72	1.03	-	3.58	3.10	-	17.95	-	-
Interaction	Sig.	Sig.	NS	-	Sig.	Sig.	-	Sig.	-	-

Table-6 (d): Effect of cutting management and dual purpose crops on the green fodder yield (1st cut)

Treatment	Green fodder yield (q/ha)					
	North West zone			North East zone		
	Ludhiana	Hisar	Mean	Bhubaneswar	Jorhat	Mean
Crops						
Oat	168.5	165.4	166.95	186.44	162.89	174.67
Barley	90.7	121.8	106.25	163.48	42.45	102.97
Wheat	86.4	109.5	97.95	140.97	61.44	101.21
SEm.+_	3.94			2.21		
CD at 5%	15.49			8.66		
Cutting management						
No cutting	-					
Cutting at 50 DAS	68.5	95.8	82.15	194.78	71.78	133.28
Cutting at 60 DAS	108.0	133.7	120.85	213.97	94.67	154.32
Cutting at 70 DAS	169.1	167.3	168.20	245.78	100.33	173.06
SEm±	3.13			4.59		
CD at 5%	9.67			13.65		
Interaction: C X CM						
SEm±	5.43			8.35		
CD at 5%	16.74			25.56		
CV (%)	8.17					

Table-6 (e): Effect of cutting management and dual purpose crops on the green fodder yield

Treatment	Green fodder yield (q/ha)					
	Central zone					
	Rahuri*	Jabalpur	Anand	Urulikanchan	Raipur	Mean
Crops						
Oat	720.7	300.5	289.9	334.8	236.8	290.5
Barley	458.7	221.3	123.6	270.9	141.7	189.4
Wheat	302.9	119.0	102.6	132.0	116.1	117.4
SEm.+_	17.9	4.3	5.5	2.9		
CD at 5%	70.2	12.6	21.6	9.3	19.9	
Cutting management						
Uncut						
Cutting at 50 DAS	428.8	178.3	162.2	190.6	141.0	168.0
Cutting at 60 DAS	510.4	203.3	257.8	268.1	163.4	223.2
Cutting at 70 DAS	543.1	259.1	268.1	279.0	190.2	249.1
SEm±	8.4	3.2	7.7	2.9		
CD at 5%	25.9	10.6	23.0	9.3	33.0	
Interaction: C X CM						
SEm±	14.5	3.6	13.4	5.1		
CD at 5%	44.8	10.6	39.8	16.1		
CV (%)	5.1	5.2	13.5			

*** Data not included in mean**

Table-6 (e-1): Interaction effect of cutting management and dual purpose crops on Green fodder yield

Crops	Green fodder yield (q/ha)									
	Jabalpur					Urulikanchan				
	No cutting	50 DAS	60 DAS	70 DAS	Mean	No cutting	50 DAS	60 DAS	70 DAS	Mean
Oat		248.80	283.10	369.50	300.47	0	251.13	373.63	379.75	334.84
Barley		190.50	217.50	256.00	221.33	0	236.84	302.17	273.58	270.86
Wheat		95.70	109.30	151.90	118.97	0	83.71	128.63	183.75	132.03
Mean		178.33	203.30	259.13		0	190.56	268.14	279.03	
	Crop	**CM**	**CRX CM**			**Crop**	**CM**	**CRX CM**		
SEm±	4.32	3.24	3.6			2.91	2.91	5.05		
CD at 5%	12.63	10.64	10.62			9.28	9.28	16.11		
CV%			5.21							

Table-6 (I-1): Interaction effect of cutting management and dual purpose crops on grain yield

Crops	Grain yield (q/ha)									
	Jabalpur					Urulikanchan				
	No cutting	50 DAS	60 DAS	70 DAS	Mean	No cutting	50 DAS	60 DAS	70 DAS	Mean
Oat	30.5	24.90	20.80	15.10	22.83	27.49	17.63	12.91	6.47	16.13
Barley	38.6	31.33	26.20	17.40	28.38	42.48	16.24	13.74	5.41	19.47
Wheat	60.1	57.50	56.10	50.60	56.08	40.34	29.3	27.85	17.49	28.75
Mean	43.07	37.91	34.37	27.70		36.77	21.06	18.17	9.79	
	Crop	**CM**	**CRX CM**			**Crop**	**CM**	**CRX CM**		
SEm±	2.1	1.4	1.5			0.22	0.25	0.44		
CD at 5%	5.2	4.5	4.6			0.70	0.79	1.40		
CV%			10.3							

Table-6 (f): Effect of cutting management and dual purpose crops on the dry matter yield (1st cut)

Treatment	Dry matter yield (q/ha)					
	North West zone			North East zone		
	Ludhiana	Hisar	Mean	Bhubaneswar	Jorhat	Mean
Crops						
Oat	21.64	30.9	26.27	42.33	35.02	38.68
Barley	12.98	27.4	20.19	34.98	9.12	22.05
Wheat	12.05	24.0	18.03	27.69	13.21	20.45
SEm.+_	0.60			0.39		
CD at 5%	2.35			1.54		
Cutting management						
No cutting	-					
Cutting at 50 DAS	8.15	16.6	12.38	41.30	15.43	28.37
Cutting at 60 DAS	14.10	26.0	20.05	46.13	20.35	33.24
Cutting at 70 DAS	24.42	39.8	32.11	52.56	21.57	37.07
SEm±	0.42			0.66		
CD at 5%	1.30			1.97		
Interaction: C X CM						
SEm±	0.73			1.23		
CD at 5%	2.24			3.82		
CV (%)	8.12					

Table-6 (g): Effect of cutting management and dual purpose crops on the Dry matter yield

Treatment	Dry matter yield (q/ha)					
	Central zone					
	Rahuri*	Jabalpur	Anand	Urulikanchan	Raipur	Mean
A. Crops						
Oat	126.7	68.7	36.3	48.8	54.6	52.1
Barley	89.7	49.1	20.4	49.3	37.0	39.0
Wheat	52.1	43.5	16.3	23.5	33.6	29.2
SEm.+_	3.9	1.4	0.7	0.5		
CD at 5%	15.5	4.8	2.9	1.7	6.2	
B. Cutting management						
Uncut cutting at 50 DAS	76.1	48.0	19.6	25.5	37.2	32.6
cutting at 60 DAS	92.0	54.6	36.5	36.7	41.5	42.3
cutting at 70 DAS	100.3	58.7	41.2	59.4	46.6	51.5
SEm±	1.7	1.5	1.2	0.5		
CD at 5%	5.3	4.6	3.6	1.7	7.6	
C. Interaction: C X CM						
SEm±	3.0	2.4	2.1	0.9		
CD at 5%	NS	6.1	6.3	2.9		
CV (%)		3.5	15.0			

*** Data not included in mean**

Table-6 (h): Effect of cutting management and dual purpose crops on the crude protein yield and leaf stem ratio

Treatment	Central zone									
	Crude protein yield (q/ha)						Leaf stem ratio			
	Rahuri*	Jabalpur	Anand	Urulikanchan	Raipur	Mean	Rahuri*	Jabalpur	Raipur	Mean
Crops										
Oat	72.1	5.3	5.5	4.5	4.5	5.0	0.91	0.89	0.92	0.91
Barley	58.4	3.9	3.6	6.2	3.4	4.3	0.84	0.80	0.78	0.79
Wheat	30.9	3.5	3.4	2.2	2.5	2.9	1.85	0.75	0.69	0.72
SEm.+_	2.9	0.3	0.2	0.1			0.03	0.02		
CD at 5%	11.4	0.9	0.7	0.2	0.5		0.12	0.06	0.03	
Cutting management										
Uncut							-	0.77	-	0.77
Cutting at 50 DAS	49.0	3.9	4.2	2.8	3.1	3.5	1.75	0.81	0.71	0.76
Cutting at 60 DAS	55.3	4.4	5.9	3.9	3.4	4.4	1.16	0.86	0.78	0.82
Cutting at 70 DAS	57.0	4.5	6.7	6.3	3.9	5.4	0.68		0.89	0.89
SEm±	1.3	0.8	0.2	0.1			0.03	0.01		
CD at 5%	4.1	NS	0.7	0.2	0.6		0.11	0.03	0.03	
Interaction: C X CM										
SEm±	2.3	0.7	0.4	0.1			0.06	0.02		
CD at 5%	NS	NS	1.2	0.3			0.19	0.06		
CV (%)	7.5	2.5	16.7				8.75	2.54		

*** Data not included in mean**

Table-6 (i): Effect of cutting management and dual purpose crops on plant height (cm) (1st cut)

Treatment	Plant height (cm)					
	North West zone			North East zone		
	Ludhiana	Hisar	Mean	Bhubaneswar	Jorhat	Mean
Crops						
Oat	26.9	77.1	52.0	82.18	101.58	91.9
Barley	32.8	65.7	49.3	56.54	62.42	59.5
Wheat	17.8	58.6	38.2	53.53	70.08	61.8
SEm.+_	0.31			1.06	1.62	
CD at 5%	1.21			4.16	15.93	
Cutting management						
No cutting						
Cutting at 50 DAS	18.4	50.7	34.6	71.01	90.00	80.5
Cutting at 60 DAS	24.9	71.4	48.2	88.48	66.89	77.7
Cutting at 70 DAS	34.2	79.2	56.7	96.86	53.67	75.3
SEm±	0.68			2.06	1.21	
CD at 5%	2.11			6.12	8.11	
Interaction: C X CM						
SEm±	1.19			3.77	2.09	
CD at 5%	3.65			11.58	8.85	
CV (%)	7.94					

Table-6 (j): Effect of cutting management and dual purpose crops on no. of tillers/m row length and Plant height (cm) at harvest

Treatment	Central zone								
	Plant height (cm)					Number of tillers/ m row length			
	Rahuri*	Jabalpur	Anand	Raipur	Mean	Rahuri*	Jabalpur	Anand	Mean
Crops									
Oat	86.5	109.8	108.42	99.0	105.7	124.1	106.6	70.0	88.3
Barley	77.5	78.7	62.31	79.8	73.6	108.9	102.1	36.0	69.1
Wheat	65.8	79.8	93.72	72.2	81.9	183.2	75.9	58.0	67.0
SEm.+_	1.2	1.1	1.69			1.3	2.4	1.99	
CD at 5%	4.8	3.1	6.62	4.7		5.1	6.8	7.80	
Cutting management									
Uncut	92.7	97.0	105.44	98.8	100.4	139.0	100.9	71.0	86.0
Cutting at 50 DAS	53.1	91.0	95.48	69.3	85.3	138.9	97.2	46.0	71.6
Cutting at 60 DAS	77.0	86.8	76.63	79.6	81.0	138.9	92.7	50.0	71.4
Cutting at 70 DAS	83.7	82.9	75.04	87.0	81.6	138.1	88.6	52.0	70.3
SEm±	1.3	1.4	2.21			1.21	2.8	3.05	
CD at 5%	4.0	3.1	6.56	4.8		NS	8.5	9.07	
Interaction: C X CM									
SEm±	2.3	1.2	3.83			2.1	2.5	5.29	
CD at 5%	NS	3.4	11.37			NS	7.4	15.72	
CV (%)	5.2	5.2	7.52			2.7	8.3	16.76	

*** Data not included in mean**

Table-6 (k): Effect of cutting management and dual purpose crops on grain yield

Treatment	North West zone				North East zone			
	Grain yield (q/ha)			Grain equivalent yield (q/ha)	Grain yield (q/ha)			Grain equivalent yield (q/ha)
	Ludhiana	Hisar	Mean	Ludhiana	Bhubaneswar	Jorhat	Mean	Jorhat
Crops								
Oat	24.8	23.0	23.9	30.9	19.07	9.17	14.12	305.47
Barley	25.8	21.1	23.5	28.7	25.72	4.60	15.16	123.77
Wheat	47.4	23.6	35.5	50.0	22.98	8.55	15.77	217.02
SEm.+_	0.8			0.53	0.50	0.17		3.11
CD at 5%	3.0			2.07	1.97	1.63		30.52
Cutting management								
No cutting	36.7	26.6	31.7	36.7	30.26	11.50	20.88	229.96
Cutting at 50 DAS	33.2	23.5	28.4	33.2	26.62	7.43	17.03	220.31
Cutting at 60 DAS	30.9	21.7	26.3	30.9	18.84	6.11	12.48	216.93
Cutting at 70 DAS	29.8	18.4	24.1	29.8	14.62	4.71	9.67	194.47
SEm±	0.9			0.73	0.49	0.13		2.44
CD at 5%	2.6			2.18	1.45	0.84		16.40
Interaction: C X CM								
SEm±	1.5			1.27	1.03	0.22		4.22
CD at 5%	NS			3.78	3.36	0.92		17.90
CV (%)	8.0			5.86				

Table-6 (l): Effect of cutting management and dual purpose crops on the Grain yield

Treatment	Grain yield (q/ha)					
	Central zone					
	Rahuri*	Jabalpur	Anand	Urulikanchan	Raipur	Mean
Crops						
Oat	7.4	22.8	12.6	16.1	15.7	16.8
Barley	10.9	28.4	12.2	19.5	18.9	19.8
Wheat	13.9	56.1	27.4	28.8	17.0	32.3
SEm.+_	0.2	2.1	0.4	0.2		
CD at 5%	0.7	5.2	1.7	0.7	1.6	
Cutting management						
Uncut	23.2	43.1	30.4	36.8	26.3	34.2
Cutting at 50 DAS	9.3	37.9	19.4	21.1	18.3	24.2
Cutting at 60 DAS	6.8	34.4	11.7	18.2	13.9	19.6
Cutting at 70 DAS	3.5	27.7	8.0	9.8	10.3	14.0
SEm±	0.3	1.4	0.8	0.3		
CD at 5%	1.0	4.5	2.3	0.8	2.7	
Interaction: C X CM						
SEm±	0.6	1.5	1.3	0.4		
CD at 5%	1.7	4.6	4.0	1.4		
CV (%)	9.5	10.3	13.3			

*** Data not included in mean**

Table-6 (m): Effect of cutting management and dual purpose crops on straw yield

Treatment	Straw yield (q/ha)							
	NWZ	NEZ	Central zone					
	Ludhiana	Bhubaneswar	Rahuri*	Jabalpur	Anand	Urulikanchan	Raipur	Mean
Crops								
Oat	144.2	14.26	52.9	47.9	98.1	50.3	30.5	56.7
Barley	111.6	18.77	34.7	40.4	40.3	26.7	25.5	33.2
Wheat	149.1	21.74	24.1	71.6	53.7	47.1	22.8	48.8
SEm.+_	2.56	0.43	3.0	2.2	3.2	1.0		
CD at 5%	10.06	1.70	11.6	6.2	12.7	3.3	3.1	
Cutting management								
No cutting	154.9	26.00	66.1	60.7	80.3	63.5	42.0	61.6
Cutting at 50 DAS	139.2	19.94	40.9	57.3	81.4	44.4	27.7	52.7
Cutting at 60 DAS	132.7	14.73	47.3	52.0	51.7	35.4	20.6	39.9
Cutting at 70 DAS	112.9	12.34	14.6	43.2	42.7	22.3	14.8	30.8
SEm±	1.93	0.74	2.7	1.9	2.8	1.2		
CD at 5%	5.74	2.21	8.0	5.8	8.3	3.8	4.3	
Interaction: C X CM								
SEm±	3.35	1.38	4.7	2.4	4.8	2.1		
CD at 5%	NS	4.27	NS	6.4	14.4	6.6		
CV (%)	4.30		21.7	8.5	13.1			

Table-6 (n): Effect of cutting management and dual purpose crops on net monetary return

Treatment	Net monetary return (Rs/ha)									
	NWZ	North East zone			Central zone					
	Ludh-iana	Bhuba-neswar	Jor-hat	Mean	Rah-uri*	Jabal-pur	An-and	Urulika-nchan	Rai-pur	Mean
Crops										
Oat	11887	39733	15277	27505	34996	27285	29602	37961	23494	29586
Barley	9049	67767	-2893	32437	27195	26262	6750	35081	19386	21870
Wheat	36593	25091	6432	15762	18499	59381	35381	32414	18854	36508
SEm.+_	307	792	311		1168			579		
CD at 5%	1207	3109	3052		4584			1846		
Cutting management										
Uncut	22124	41622	7725.6	24674	27071	29636	25227	35331	25394	28897
Cutting at 50 DAS	19906	53430	6761.1	30096	28230	41677	26664	35605	23740	31922
Cutting at 60 DAS	17488	43592	6423.3	25008	28581	40236	24147	42428	18417	31307
Cutting at 70 DAS	17188	38143	4176.7	21160	23703	39021	19605	27243	14761	25158
SEm±	643	1200	244		1176			668		
CD at 5%	1912	3566	1640		3494			2132		
Interaction: C X CM										
SEm±	1024	2271	422		2037			1158		
CD at 5%	3044	7099	1791		6052			3692		
CV (%)	5.34				13.1					

*** Data not included in mean**

Table-6 (o): Effect of cutting management and dual purpose crops on the benefit cost ratio

Treatment	Benefit cost ratio							
	NWZ	NEZ	Central zone					
	Ludhiana	Bhubaneswar	Rahuri*	Jabalpur	Anand	Urulikanchan	Raipur	Mean
Crops								
Oat	0.72	3.11	2.22	2.38	1.36	1.95	1.81	1.9
Barley	0.48	4.60	1.95	2.33	0.31	1.88	1.49	1.5
Wheat	1.21	1.34	1.66	4.00	1.66	1.85	1.26	2.2
SEm.+_	0.03	0.05	0.04			0.01		
CD at 5%	0.11	0.21	0.16			0.03		
Cutting management								
Uncut	1.03	2.95	1.95	2.50	1.30	1.90	1.84	1.9
Cutting at 50 DAS	0.84	3.54	1.97	3.10	1.19	1.90	1.75	2.0
Cutting at 60 DAS	0.70	2.97	2.00	3.03	1.08	2.07	1.37	1.9
Cutting at 70 DAS	0.65	2.60	1.83	2.97	0.88	1.69	1.11	1.7
SEm±	0.04	0.08	0.04			0.01		
CD at 5%	0.13	0.24	NS			0.03		
Interaction: C X CM								
SEm±	0.07	0.15	0.07			0.03		
CD at 5%	0.20	0.48	0.21			0.09		
CV (%)	6.73		6.38					

*** Data not included in mean**

AST-7: Effect of weed management on forage and seed yield of berseem (*Trifolium alexandrinum*) [Table reference: 7(a) to 7(n)]

Location: Ludhiana, Ranchi, Rahuri, Jabalpur, Urulikanchan, Raipur and Pantnagar

A field experiment was conducted at seven locations to assess the possibility of weed management and efficacy of herbicides in controlling of weed in berseem. During Rabi 2011-12, it was conducted as exploratory trial and on the basis of importance of study and result; it was taken as coordinated trial at seven locations for three year duration.

The data provided by Pantnagar centre is not according to approved technical programme, hence data is not included in the report. The data of the first year study is given zone wise below.

North West Zone: Ludhiana

The practicing of weed management T_6 treatment (Imazethapyr @ 0.100 kg a.i. /ha immediate after harvest of 1st and 2nd cut) in berseem recorded significantly highest GFY (945.8 q/ha), DMY (129.3 q/ha) and seed yield (4.38 q/ha) and straw yield (47.9 q/ha) over rest of the treatments. The respective treatment fetched significantly highest net monetary returns (Rs 64413/ha) and benefit cost ratio over rest of the treatments. Lowest GFY, DMY, seed yield and net monetary returns were realized when weed management in berseem was done by application of oxyflourfen @ 0.100 kg a.i. /ha + imazethapyr @ 0.100 kg a.i./ ha (immediate after harvest of first cut).

North East Zone: Ranchi

The application of pendimethalin @ 0.300 kg a.i./ha (T_3) in berseem being at par with pendimethalin @ 0.300 kg a.i. /ha + imazethapyr @ 0.100 kg a.i. /ha (immediately after harvest of 1st cut) (T_8) recorded significantly highest GFY (442.3 q/ha), DMY (71.3 q/ha) and CPY (12.83 q/ha) as compared to rest of the herbicide treatments. Weed management in berseem through pendimethalin @ 0.300 kg a.i. /ha being at par with control produced significantly highest seed yield (4.33 q/ha) over rest of the herbicide treatments. The maximum weed control efficiency (79.37%) was observed when T_8 (Pendimethalin @ 0.300 kg a.i /ha + imazethapyr @ 0.1 kg a.i./ha) herbicide treatment is applied to berseem and lowest being with oxyflourfen @0.1kg a.i./ha (T_5) .

Central Zone: Raipur, Jabalpur, Rahuri and Urulikanchan

On location mean basis, application of oxyflourfen @ 0.100 kg a.i. /ha + imazethapyr @ 0.100 kg a.i. /ha (T_7) in berseem resulted in highest GFY (441.13 q/ha), DMY (75.99 q/ha), seed yield (2.71 q/ha), straw yield (23.61 q/ha), CPY (11.53 q/ha), taller plants (50.11 cm), leaf stem ratio (0.98), net returns (Rs 61333/ha) and B:C ratio (2.50) over rest of the herbicide treatments including control. The respective treatment recorded 85.13, 46.74, 49.15, 44.45, 16.75, 23.94, 23.62, 24.88, and 25.31% more GFY over T_1, T_2, T_3, T_4, T_5, T_6, T_8, T_9, and T_{10} herbicide treatments, respectively. With respect to weed control efficiency, the same treatment (T_7) achieved maximum weed control efficiency (75.84%) followed by T_5 (oxyflourfen @ 0.1kg a.i./ha) (62.17%) and lowest being with T_2 (Pendimethalin@ 0.3 kg a.i. /ha) (42.29%) compared with weedy check on mean basis. At Rahuri, application of different herbicides in berseem crop recorded higher level of available N, P and K in the soil after crop harvest as compared to weedy check (control). Minor variation for available N, P and K in the soil of herbicide treated plots and un-weeded plot were observed after berseem harvest. Soil fertility in terms of available N, P and K was lower as compared to initial level of soil fertility at Urulikanchan.

On over all mean basis over the zones, application of oxyflourfen @ 0.100 kg a.i. /ha + imazethapyr @ 0.100 kg a.i /ha (immediate after harvest of first cut) in berseem resulted in highest GFY (451.8 q/ha), seed yield (2.97 q/ha), straw yield (24.89 q/ha), CPY (11.15 q/ha), leaf stem ratio (0.98), weed control efficiency (72.69%), net monetary returns (Rs 54450/ha/yr) and B: C ratio (2.17) over rest of the herbicide treatments.

Table-7 (a): Effect of weed management on GFY of berseem (*Trifolium alexandrinum* L.)

Treatment	Green fodder yield (q/ha)							
	NWZ	NEZ	Central zone					Over all mean
	Ludhiana	Ranchi	Rahuri	Jabalpur	Urulikanchan	Raipur	Mean	
T_1	843.6	292.16	327.90	278.0	141.49	205.68	238.27	348.14
T_2	721.1	375.96	259.29	529.2	168.44	245.60	300.63	383.27
T_3	669.8	442.33	234.77	532.8	154.96	260.50	295.76	382.53
T_4	611.3	377.33	214.88	591.6	141.49	273.40	305.34	368.33
T_5	572.0	387.67	366.82	616.1	217.84	310.61	377.84	411.84
T_6	945.8	341.33	408.90	553.7	172.93	288.15	355.92	451.80
T_7	477.4	320.33	452.74	633.3	313.29	365.18	441.13	427.04
T_8	609.1	427.33	307.33	552.4	238.06	329.52	356.83	410.62
T_9	598.8	385.33	285.27	585.5	199.88	344.26	353.73	399.84
T_{10}	563.8	371.33	268.46	622.3	165.07	352.25	352.02	390.54
SEm ±	20.48	6.93	8.98	30.64	9.46			
CD at 5 %	60.80	20.77	26.69	90.21	32.73	19.83		
CV %	5.46	3.22	4.98	14.5	17.08	3.87		

Table-7 (b): Effect of weed management on DMY of berseem (*Trifolium alexandrinum* L.)

Treatment	Dry matter yield (q/ha)							
	NWZ	NEZ	Central zone					Over all mean
	Ludhiana	Ranchi	Rahuri	Jabalpur	Urulikanchan	Raipur	Mean	
	115.8	63.67	57.46	39.0	26.51	40.92	40.97	57.23
T_2	105.7	63.00	43.93	77.1	26.26	46.04	48.33	60.34
T_3	96.1	71.33	40.29	77.9	26.42	49.00	48.40	60.17
T_4	89.5	61.33	34.58	89.5	24.33	49.54	49.49	58.13
T_5	80.9	56.00	61.45	90.8	37.51	56.44	61.55	63.85
T_6	129.3	55.67	70.74	82.1	32.61	53.19	59.66	70.60
T_7	71.4	53.60	79.08	96.7	61.41	66.76	75.99	71.49
T_8	88.0	69.33	52.81	81.7	45.33	58.56	59.60	65.96
T_9	86.6	49.33	48.94	88.0	39.56	61.79	59.57	62.37
T_{10}	82.5	50.33	46.24	94.7	30.77	66.25	59.49	61.80
SEm ±	2.54	1.43	1.63	5.2	2.03			
CD at 5 %	7.56	4.29	4.84	15.4	7.02	4.46		
CV %	8.85	4.18	5.27	6.5	16.76	4.72		

T_1 ï Weedy check (Control)	T_6 ï Imazethapyr @ 0.1 kg a.i. /ha (Immediate after harvest of 1st & 2nd cut)
T_2 ï Pendimethalin @ 0.3 kg a.i. /ha	T_7 ï Oxyflourrfen @ .1 kg a. i./ha + Imazethapyr @ 0.1 kg a.i. /ha
T_3 ï Pendimethalin @ 0.4 kg a.i. /ha	T_8 ï Pendimethalin @ 0.3 kg a.i./ ha + Imazethapyr @ 0.1 kg a.i. /ha
T_4 ï Pendimethalin @ 0.5 kg a.i. /ha	T_9ï Pendimethalin @ 0.4 kg a.i. /ha + Imazethapyr @ 0.1 kg a.i. /ha
T_5 ï Oxyflourfen @ 0.1 kg a.i. /ha	T_{10} ï Pendimethalin @ 0.5 kg a.i. /ha + Imazethapyr @ 0.1 kg a.i. /ha

Table-7(c): Effect of weed management on seed yield of berseem (*Trifolium alexandrinum* L.)

Treatment	Seed yield (q/ha)							
	NWZ	NEZ	Central zone					Over all mean
	Ludhiana	Ranchi	Rahuri	Jabalpur	Urulikanchan	Raipur	Mean	
T_1	3.08	4.10	1.80	1.53	0.68	0.84	1.21	2.01
T_2	3.61	4.33	1.16	3.88	0.87	0.89	1.70	2.46
T_3	3.53	3.96	1.13	3.89	0.78	1.04	1.71	2.39
T_4	3.48	3.80	1.08	4.65	0.70	1.32	1.94	2.51
T_5	3.51	3.70	1.93	4.85	1.03	1.51	2.33	2.76
T_6	4.38	3.67	2.25	4.26	0.92	1.91	2.34	2.90
T_7	3.61	3.40	2.46	5.08	1.27	2.01	2.71	2.97
T_8	3.74	3.27	1.60	4.05	1.13	1.61	2.10	2.57
T_9	3.60	3.27	1.47	4.47	0.96	1.71	2.15	2.58
T_{10}	3.58	3.10	1.22	5.01	0.87	1.82	2.23	2.60
SEm ±	0.08	0.10	0.07	0.62	0.03			
CD at 5 %	0.24	0.29	0.20	1.83	0.10	0.14		
CV %	5.17	4.52	7.10	3.2	18.67	5.67		

Table-7 (d): Effect of weed management on straw yield of berseem (*Trifolium alexandrinum* L.)

Treatment	Straw yield (q/ha)							Over all mean
	NWZ	NEZ	Central zone					
	Ludhiana	Ranchi	Rahuri	Jabalpur	Urulikanchan	Raipur	Mean	
T_1	39.5	20.33	7.90	27.31	6.55	9.30	12.77	18.48
T_2	31.3	12.33	5.16	39.56	7.11	9.93	15.44	17.57
T_3	36.4	15.00	4.97	41.16	6.89	11.46	16.12	19.31
T_4	43.3	15.67	4.89	50.22	6.22	12.30	18.41	22.10
T_5	34.6	14.00	8.68	51.81	8.83	12.85	20.54	21.80
T_6	47.9	14.67	10.06	45.32	8.05	15.87	19.83	23.65
T_7	41.9	13.00	12.17	53.90	11.11	17.27	23.61	24.89
T_8	44.5	15.00	7.22	44.10	9.33	13.25	18.48	22.23
T_9	38.9	14.00	6.60	46.91	8.50	13.60	18.90	21.42
T_{10}	40.3	15.67	5.48	52.18	7.66	14.79	20.03	22.68
SEm ±	0.79	0.89	0.31	1.4	0.26			
CD at 5 %	2.35	2.67	0.92	3.6	0.89	1.51		
CV %	6.44	10.33	7.36	5.2	17.83	6.70		

T_1 ï Weedy check (Control)	T_6 ï Imazethapyr @ 0.1 kg a.i. /ha (Immediate after harvest of 1st & 2nd cut)
T_2 ï Pendimethalin @ 0.3 kg a.i. /ha	T_7 ï Oxyflourrfen @ .1 kg a. i./ha + Imazethapyr @ 0.1 kg a.i. /ha
T_3 ï Pendimethalin @ 0.4 kg a.i. /ha	T_8 ï Pendimethalin @ 0.3 kg a.i./ ha + Imazethapyr @ 0.1 kg a.i. /ha
T_4 ï Pendimethalin @ 0.5 kg a.i. /ha	T_9ï Pendimethalin @ 0.4 kg a.i. /ha + Imazethapyr @ 0.1 kg a.i. /ha
T_5 ï Oxyflourfen @ 0.1 kg a.i. /ha	T_{10} ï Pendimethalin @ 0.5 kg a.i. /ha + Imazethapyr @ 0.1 kg a.i. /ha

Table-7 (e): Effect of weed management on crude protein yield of berseem (*Trifolium alexandrinum* L.)

Treatment	Crude protein yield (q/ha)					
	NEZ	Central zone				Over all mean
	Ranchi	Rahuri	Urulikanchan	Raipur	Mean	
T_1	10.89	10.31	4.50	5.91	6.91	7.90
T_2	11.61	8.39	4.69	6.65	6.58	7.84
T_3	12.83	7.75	4.63	7.08	6.49	8.07
T_4	10.77	6.66	4.42	7.16	6.08	7.25
T_5	9.83	10.84	6.45	8.16	8.48	8.82
T_6	10.99	13.10	5.58	7.69	8.79	9.34
T_7	10.00	14.19	10.76	9.65	11.53	11.15
T_8	12.78	9.39	8.06	8.46	8.64	9.67
T_9	9.31	8.64	6.92	8.93	8.16	8.45
T_{10}	9.72	8.29	5.12	9.57	7.66	8.18
SEm ±	0.26	0.34	0.36			
CD at 5 %	0.78	1.01	1.24	0.64		
CV %	4.16	6.03	15.07	4.72		

Table-7 (f): Effect of weed management on crude protein content and plant height of berseem (*Trifolium alexandrinum* L.)

Treatment	Crude protein (%)						Plant height (cm)				
	NEZ	Central zone				Over all mean	Central zone				
	Ranchi	Rahuri	Jabalpur	Urulikanchan	Mean		Rahuri	Jabal-pur	Urulika-nchan	Raipur	Mean
T_1	17.11	17.94	16.98	13.20	16.04	16.31	44.56	37.5	36.11	40.47	39.66
T_2	18.43	19.10	17.84	13.30	16.75	17.17	36.68	41.7	25.89	45.77	37.51
T_3	18.00	19.25	17.51	13.63	16.80	17.10	33.27	41.7	23.77	49.00	36.94
T_4	17.56	19.25	18.16	14.13	17.18	17.28	32.73	45.1	23.88	52.50	38.55
T_5	17.56	17.64	17.20	14.63	16.49	16.76	37.76	48.4	41.44	57.37	46.24
T_6	19.75	18.53	17.12	14.13	16.59	17.38	38.02	43.3	31.78	55.53	42.16
T_7	18.87	17.94	17.53	15.43	16.97	17.44	39.60	52.3	43.55	64.97	50.11
T_8	18.43	17.79	17.79	14.23	16.60	17.06	34.87	42.1	53.77	59.43	47.54
T_9	18.87	17.64	17.49	14.67	16.60	17.17	35.16	44.2	51.77	60.30	47.86
T_{10}	19.31	17.94	16.65	15.20	16.60	17.28	33.00	48.8	36.44	63.40	45.41
SEm ±	0.003	0.35					2.05	1.0	1.92		
CD at 5 %	0.008	1.05		0.47			6.10	3.1	6.64	11.63	
CV %	2.31	3.34		1.92			9.73	3.6	18.61	12.3	

T_1 ï Weedy check (Control)	T_6 ï Imazethapyr @ 0.1 kg a.i. /ha (Immediate after harvest of 1st & 2nd cut)
T_2 ï Pendimethalin @ 0.3 kg a.i. /ha	T_7 ï Oxyflourrfen @ .1 kg a. i./ha + Imazethapyr @ 0.1 kg a.i. /ha
T_3 ï Pendimethalin @ 0.4 kg a.i. /ha	T_8 ï Pendimethalin @ 0.3 kg a.i./ ha + Imazethapyr @ 0.1 kg a.i. /ha
T_4 ï Pendimethalin @ 0.5 kg a.i. /ha	T_9ï Pendimethalin @ 0.4 kg a.i. /ha + Imazethapyr @ 0.1 kg a.i. /ha
T_5 ï Oxyflourfen @ 0.1 kg a.i. /ha	T_{10} ï Pendimethalin @ 0.5 kg a.i. /ha + Imazethapyr @ 0.1 kg a.i. /ha

Table-7 (g): Effect of weed management on leaf stem ratio of berseem (*Trifolium alexandrinum* L.)

Treatment	Leaf stem ratio							Plant population/ m row length			
	NEZ	Central zone					Over all mean	Central zone			
	Ranchi	Rahuri	Jabalpur	Urulika-nchan	Raipur	Mean		Rahuri	Jabalpur	Urulikanchan	Mean
T_1	1.80	0.48	0.61	0.99	0.54	0.66	0.88	116.22	132.4	151.67	133.43
T_2	1.80	0.46	0.70	0.77	0.63	0.64	0.87	93.00	140.8	143.67	125.82
T_3	1.70	0.49	0.70	1.01	0.66	0.72	0.91	81.89	139.6	109.00	110.16
T_4	1.56	0.47	0.82	0.93	0.68	0.73	0.89	83.11	141.9	102.00	109.00
T_5	1.56	0.57	0.88	0.80	0.77	0.76	0.92	83.78	136.6	128.00	116.13
T_6	1.46	0.58	0.78	0.85	0.71	0.73	0.88	114.78	136.7	124.67	125.38
T_7	1.50	0.61	0.91	0.99	0.91	0.86	0.98	100.44	139.3	147.33	129.02
T_8	1.50	0.53	0.74	0.64	0.84	0.69	0.85	74.56	136.1	140.33	117.00
T_9	1.50	0.45	0.78	0.79	0.82	0.71	0.87	77.00	134.4	120.33	110.58
T_{10}	1.43	0.50	0.89	0.87	0.87	0.78	0.91	74.44	137.0	119.67	110.37
SEm ±	0.08	0.02	0.03	0.02				3.65		2.96	
CD at 5 %	0.24	0.05	0.09	0.07	0.04			10.84		10.24	
CV %	8.87	5.52		12.79	3.35			7.03		12.59	

T_1 ï Weedy check (Control)	T_6 ï Imazethapyr @ 0.1 kg a.i. /ha (Immediate after harvest of 1st & 2nd cut)
T_2 ï Pendimethalin @ 0.3 kg a.i. /ha	T_7 ï Oxyflourrfen @ .1 kg a. i./ha + Imazethapyr @ 0.1 kg a.i. /ha
T_3 ï Pendimethalin @ 0.4 kg a.i. /ha	T_8 ï Pendimethalin @ 0.3 kg a.i./ ha + Imazethapyr @ 0.1 kg a.i. /ha
T_4 ï Pendimethalin @ 0.5 kg a.i. /ha	T_9ï Pendimethalin @ 0.4 kg a.i. /ha + Imazethapyr @ 0.1 kg a.i. /ha
T_5 ï Oxyflourfen @ 0.1 kg a.i. /ha	T_{10} ï Pendimethalin @ 0.5 kg a.i. /ha + Imazethapyr @ 0.1 kg a.i. /ha

Table-7 (h): Effect of weed management on weed control efficiency in berseem (*Trifolium alexandrinum* L.)

Treatment	Weed control efficiency (%)						
	NEZ	Central zone					Over all mean
	Ranchi	Rahuri	Jabalpur	Urulikanchan	Raipur	Mean	
T_1	0	0	0	0	0	0	0
T_2	53.33	31.65	63.81	46.01	27.70	42.29	44.50
T_3	75.62	20.22	61.71	37.95	27.62	36.88	44.62
T_4	59.73	13.60	61.69	26.43	42.23	35.99	40.74
T_5	46.44	60.29	63.94	75.36	49.10	62.17	59.03
T_6	62.46	65.87	60.83	28.35	49.62	51.17	53.43
T_7	60.10	67.88	70.37	85.37	79.72	75.84	72.69
T_8	79.37	52.80	65.73	59.65	50.26	57.11	61.56
T_9	61.56	51.14	64.33	49.41	45.79	52.67	54.45
T_{10}	58.25	50.87	68.40	44.66	65.06	57.25	57.45
SEm ±	3.52	3.57		4.37			
CD at 5 %	10.56	10.71		13.94			
CV %	1.98	13.44		8.24			

Table-7 (i): Effect of weed management on equivalent yield and weed index of yield of berseem (*Trifolium alexandrinum* L.)

Treatment	Raipur				Urulikanchan	Ludhiana
	Weed index of seed yield (%)	Weed index of green fodder yield of berseem (%)	Weed count/ m^2	Dry matter of weed/m^2	Maize fodder equivalent yield (q/ha)	Fodder equivalent yield (q/ha)
T_1	57.82	43.58	84.38	133.12	31.01	1077.3
T_2	55.31	32.62	57.01	94.30	102.50	1046.5
T_3	48.04	28.52	52.71	94.96	77.29	1000.3
T_4	34.01	24.99	42.84	74.25	49.43	953.4
T_5	24.62	14.88	38.61	65.49	158.54	897.1
T_6	4.79	21.04	37.32	66.87	65.24	1361.1
T_7	0.00	0.00	16.99	27.25	280.89	825.4
T_8	19.41	9.72	32.00	66.67	193.99	971.8
T_9	14.61	5.60	36.35	70.87	127.68	939.5
T_{10}	8.96	3.51	26.65	46.80	74.29	906.0
SEm ±					13.58	20.2
CD at 5 %	6.67	4.95	14.12	22.34	46.98	60.1
CV %	14.47	15.57	19.30	17.50	14.05	5.5

T_1 ï Weedy check (Control)

T_2 ï Pendimethalin @ 0.3 kg a.i. /ha
T_3 ï Pendimethalin @ 0.4 kg a.i. /ha
T_4 ï Pendimethalin @ 0.5 kg a.i. /ha
T_5 ï Oxyflourfen @ 0.1 kg a.i. /ha

T_6 ï Imazethapyr @ 0.1 kg a.i. /ha (Immediate after harvest of 1st & 2nd cut)
T_7 ï Oxyflourrfen @ .1 kg a. i./ha + Imazethapyr @ 0.1 kg a.i. /ha
T_8 ï Pendimethalin @ 0.3 kg a.i./ ha + Imazethapyr @ 0.1 kg a.i. /ha
T_9ï Pendimethalin @ 0.4 kg a.i. /ha + Imazethapyr @ 0.1 kg a.i. /ha
T_{10} ï Pendimethalin @ 0.5 kg a.i. /ha + Imazethapyr @ 0.1 kg a.i. /ha

Table-7 (j): Effect of weed management on species wise weed count and dry weight of weed in berseem (*Trifolium alexandrinum* L.) at Jabalpur

Treatment	Species wise weed count/ m^2				Dry weight (gm) of weed/m^2			
	Cichorium intybus	*Medicago denticulata*	*Coronopus didymus*	Others	*Cichorium intybus*	*Medicago denticulata*	*Coronopus didymus*	Others
T_1	73.33	54.33	37.67	55.00	30.48	27.92	29.40	36.24
T_2	9.33	11.67	14.33	11.33	13.65	12.98	5.91	12.36
T_3	14.67	11.67	9.33	10.67	13.54	12.22	8.65	12.69
T_4	26.33	15.67	12.33	10.00	12.97	10.97	10.74	12.27
T_5	12.00	15.67	11.67	11.67	12.36	10.10	11.32	10.41
T_6	12.33	11.67	9.67	13.00	13.66	12.49	10.96	11.23
T_7	10.67	7.67	6.67	9.33	9.74	9.30	9.47	7.97
T_8	12.67	10.67	9.67	17.33	12.16	8.03	10.16	12.26
T_9	7.00	10.00	9.00	11.00	13.10	12.16	8.50	10.11
T_{10}	9.67	11.67	8.33	12.33	10.01	9.96	9.35	9.43
SEm ±	3.5	3.2	1.5	3.50	0.85	0.92	0.81	1.23
CD at 5 %	9.63	7.6	4.3	10.64	2.36	2.74	2.6	3.41
CV %	2.4	2.6	3.4	5.2	2.4	3.2	3.1	4.2

Table-7 (k): Effect of weed management on species wise weed count, dry matter of weed and soil fertility status in berseem (*Trifolium alexandrinum* L.) at Urulikanchan

Treatment	Species wise weed count/ m^2 (Monocot+Dicot)	Weed biomass (q/ha)	OC (%)	EC (dSm^{-1})	pH	Available N (kg/ha)	Available P (kg/ha)	Available K (kg/ha)
T_1	174	3.26	0.45	0.29	8.12	128.67	25.67	191.67
T_2	129	1.76	0.41	0.33	8.18	128.67	25.00	188.33
T_3	135	2.02	0.45	0.33	8.17	128.00	23.33	190.00
T_4	147	2.40	0.47	0.32	8.20	129.33	25.33	198.33
T_5	126	0.80	0.46	0.42	8.13	130.33	23.33	194.33
T_6	176	2.33	0.50	0.34	8.07	128.67	22.33	193.33
T_7	61	0.48	0.50	0.37	8.14	129.33	23.67	191.67
T_8	111	1.31	0.52	0.33	8.22	130.00	24.00	194.00
T_9	151	1.65	0.46	0.36	8.22	130.33	24.67	192.33
T_{10}	153	1.80	0.49	0.41	8.16	130.33	26.67	191.67
Initial			0.52	0.59	7.29	147.00	43.00	195.00

T_1 ï Weedy check (Control)	T_6 ï Imazethapyr @ 0.1 kg a.i. /ha (Immediate after harvest of 1st & 2nd cut)
T_2 ï Pendimethalin @ 0.3 kg a.i. /ha	T_7 ï Oxyflourrfen @ .1 kg a. i./ha + Imazethapyr @ 0.1 kg a.i. /ha
T_3 ï Pendimethalin @ 0.4 kg a.i. /ha	T_8 ï Pendimethalin @ 0.3 kg a.i./ ha + Imazethapyr @ 0.1 kg a.i. /ha
T_4 ï Pendimethalin @ 0.5 kg a.i. /ha	T_9ï Pendimethalin @ 0.4 kg a.i. /ha + Imazethapyr @ 0.1 kg a.i. /ha
T_5 ï Oxyflourfen @ 0.1 kg a.i. /ha	T_{10} ï Pendimethalin @ 0.5 kg a.i. /ha + Imazethapyr @ 0.1 kg a.i. /ha

Table-7 (l): Effect of weed management on species wise weed count, dry matter of weed and soil fertility status in berseem (*Trifolium alexandrinum* L.) at Rahuri

Treatment	Species wise weed count/ m^2 (Monocot+Dicot)	Weed biomass (q/ha)	OC (%)	EC (dSm^{-1})	pH	Available N (kg/ha)	Available P (kg/ha)	Available K (kg/ha)
T_1	114.83	203.02	0.37	0.35	8.03	138.87	12.96	520
T_2	72.17	127.51	0.35	0.32	8.06	149.12	13.61	523
T_3	83.67	148.23	0.39	0.34	8.04	140.41	14.76	560
T_4	96.67	170.90	0.39	0.36	8.09	171.40	15.79	582
T_5	40.93	72.98	0.39	0.39	8.02	168.04	15.90	581
T_6	36.00	63.75	0.40	0.34	8.06	175.71	17.69	584
T_7	30.00	53.13	0.40	0.31	8.05	168.04	15.43	560
T_8	50.83	90.03	0.38	0.37	8.06	155.25	16.36	541
T_9	53.33	94.45	0.38	0.34	8.05	155.66	15.43	545
T_{10}	59.17	104.78	0.40	0.38	8.07	168.04	16.80	549
SEm ±	2.99	5.29	0.01	0.01	0.05	2.12	0.28	9.97
CD at 5 %	8.83	15.72	NS	0.04	NS	6.29	0.83	29.63
CV %	10.52	10.83	5.03	5.88	1.07	2.30	3.13	3.11
Initial								

Table-7 (m): Effect of weed management on net monetary return of berseem (*Trifolium alexandrinum* L.)

Treatment		Net monetary return (Rs/ha)					Over all mean
	NWZ	Central zone					
	Ludhiana	Rahuri	Jabalpur	Urulikanchan	Raipur	Mean	
T_1	49485	33919	34171	5581	8255	20482	26282
T_2	42379	15450	93028	18450	11647	34644	36191
T_3	39152	11637	92688	13912	13336	32893	34145
T_4	35872	7625	109382	8898	15087	35248	35373
T_5	31932	39259	111831	28537	19281	49727	46168
T_6	64413	47523	97100	11743	14635	42750	47083
T_7	26919	54810	116431	50561	23531	61333	54450
T_8	37163	24062	93675	34919	19578	43059	41879
T_9	34904	19138	103877	22982	21152	41787	40411
T_{10}	32557	13096	114790	13372	22072	40833	39177
SEm ±	1416	1999		2444			
CD at 5 %	4205	5938		8455			
CV %	6.21	12.99		14.05			

T_1 ï Weedy check (Control)	T_6 ï Imazethapyr @ 0.1 kg a.i. /ha (Immediate after harvest of 1st & 2nd cut)
T_2 ï Pendimethalin @ 0.3 kg a.i. /ha	T_7 ï Oxyflourrfen @ .1 kg a. i./ha + Imazethapyr @ 0.1 kg a.i. /ha
T_3 ï Pendimethalin @ 0.4 kg a.i. /ha	T_8 ï Pendimethalin @ 0.3 kg a.i./ ha + Imazethapyr @ 0.1 kg a.i. /ha
T_4 ï Pendimethalin @ 0.5 kg a.i. /ha	T_9ï Pendimethalin @ 0.4 kg a.i. /ha + Imazethapyr @ 0.1 kg a.i. /ha
T_5 ï Oxyflourfen @ 0.1 kg a.i. /ha	T_{10} ï Pendimethalin @ 0.5 kg a.i. /ha + Imazethapyr @ 0.1 kg a.i. /ha

Table-7 (n): Effect of weed management on benefit cost ratio of berseem (*Trifolium alexandrinum* L.)

Treatment		Benefit cost ratio					Over all mean
	NWZ	Central zone					
	Ludhiana	Rahuri	Jabalpur	Urulikanchan	Raipur	Mean	
T_1	1.91	1.72	2.33	1.13	0.59	1.44	1.54
T_2	1.38	1.35	4.46	1.46	0.79	2.02	1.89
T_3	1.27	1.27	4.45	1.35	0.90	1.99	1.85
T_4	1.16	1.17	4.90	1.23	1.01	2.08	1.89
T_5	1.03	1.78	4.58	1.63	1.30	2.32	2.06
T_6	2.09	1.88	4.18	1.24	0.81	2.03	2.04
T_7	0.87	1.96	4.67	1.98	1.38	2.50	2.17
T_8	1.21	1.48	3.97	1.77	1.18	2.10	1.92
T_9	1.13	1.38	4.38	1.51	1.27	2.14	1.93
T_{10}	1.05	1.27	4.72	1.30	1.31	2.15	1.93
SEm ±	0.05			0.05			
CD at 5 %	0.14			0.17			
CV %	6.13			17.80			

T_1 ï Weedy check (Control)	T_6 ï Imazethapyr @ 0.1 kg a.i. /ha (Immediate after harvest of 1st & 2nd cut)
T_2 ï Pendimethalin @ 0.3 kg a.i. /ha	T_7 ï Oxyflourrfen @ .1 kg a. i./ha + Imazethapyr @ 0.1 kg a.i. /ha
T_3 ï Pendimethalin @ 0.4 kg a.i. /ha	T_8 ï Pendimethalin @ 0.3 kg a.i./ ha + Imazethapyr @ 0.1 kg a.i. /ha
T_4 ï Pendimethalin @ 0.5 kg a.i. /ha	T_9ï Pendimethalin @ 0.4 kg a.i. /ha + Imazethapyr @ 0.1 kg a.i. /ha
T_5 ï Oxyflourfen @ 0.1 kg a.i. /ha	T_{10} ï Pendimethalin @ 0.5 kg a.i. /ha + Imazethapyr @ 0.1 kg a.i. /ha

B. ONGOING LOCATION SPECIFIC TRIALS

AST-8 (AST-6): Optimization of nitrogen for maize in different forage based cropping system

Location: Shillong

This trial was conducted during last year and this year it was could not be conducted.

AST-9: Effect of soil amendments on productivity of rice-berseem and changes in soil properties of sodic soil [Table reference: 9 (a) to 9 (c)]

Location: Faizabad

This experiment was conducted to study the effect of soil amendments on the productivity of sodic soil. This was the fourth year of experimentation at the same site with previous year treatments. The initial pH of soil was 9.1 with EC of 0.97 ds/m and exchangeable sodium values of 31.4%. During kharif, application of RDF + gypsum @ 75% GR + FYM 10 t/ ha (T_7) being at par with T_3, T_5, T_8 and T_9, attained significantly highest grain yield of rice (26.83 q/ha) over rest of the treatments; whereas significantly highest straw yield was recorded under same treatment (T_7) but it remained at par with T_3, T_4, T_8, T_9 and T_{10} treatments. During rabi season, the same treatment (T_7) recorded highest GFY (265.7 q/ha), DMY (42.4 q/ha) and CPY (7.6 q/ha) of berseem. With respect to system productivity, again T_7 treatment attained significantly highest berseem forage equivalent yield (482.7 q/ha) over rest of the treatments, and lowest being with RDF alone (328.8 q/ha). The application of RDF + gypsum @ 75% GR+FYM 10 t/ha (T_7) to kharif and rabi season crops registered highest uptake of N, P and K by the rice-berseem cropping system and lowest being with RDF (T_1) treatment. The application of different soil amendments brought down the values of pH, EC and ESP over its initial value whereas, organic carbon content of soil was increased over its initial value after the crop cycle. The available N, P, and K in soil slightly increased with application of soil amendments.

Table-9 (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	14.51	20.25	41.74	205.41	32.80	5.82	328.77
T_2	17.84	22.78	43.02	225.95	36.15	7.42	336.11
T_3	23.45	28.57	45.07	225.80	36.10	6.41	421.67
T_4	20.43	29.53	40.89	240.10	38.40	6.52	383.25
T_5	22.42	27.67	44.75	220.50	35.28	6.34	382.95
T_6	19.84	23.56	45.71	214.31	34.28	5.97	368.84
T_7	26.83	34.80	43.53	265.70	42.40	7.64	482.66
T_8	24.36	29.72	45.04	252.10	40.34	7.45	451.57
T_9	23.27	31.35	42.60	255.05	40.80	7.15	452.61
T_{10}	22.41	30.23	42.57	241.41	38.65	6.58	419.72
CD at 5%	5.39	6.78	8.31	20.31	4.95	0.99	23.92
CV%	11.25	14.34	9.97	7.96	8.97	10.42	8.99

Table-9 (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	25.35	92.98	5.75	13.60	23.60	25.05	118.33	19.55	48.65
T_2	28.90	118.21	6.82	16.30	32.35	31.30	147.11	23.12	63.65
T_3	38.65	105.31	8.60	18.05	37.90	26.05	143.96	26.65	63.95
T_4	38.21	103.40	7.90	17.15	35.60	28.60	141.61	25.05	64.20
T_5	36.52	105.90	7.80	18.20	33.48	26.20	142.42	26.00	59.68
T_6	28.97	96.26	6.85	18.05	24.35	25.05	125.23	24.90	49.40
T_7	45.25	130.75	11.30	19.55	46.60	25.40	176.00	30.85	72.00
T_8	46.60	120.60	9.30	20.60	38.20	35.40	161.20	29.90	73.60
T_9	42.60	116.25	9.80	20.40	36.05	32.65	158.85	30.20	68.70
T_{10}	36.20	108.80	7.85	21.05	36.15	31.67	145.00	28.90	38.82
CD at 5%	3.87	8.88	1.86	2.72	7.28	3.78	-	-	-
CV%	9.52	10.28	10.55	11.28	11.95	12.65	-	-	-

T_1 = RDF(120 kg N : 60 kg P_2O_5 : 40 kg K_2O and 25 kg Zn SO_4)	T_6 = RDF + press mud@ 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 +press mud @75% GR	T_{10} = RDF + pressmud@ 50 % GR +FYM 10t/ha

Table-9(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	8.87	0.87	28.2	0.35	94.5	12.8	256.5
T_2	8.88	0.88	29.3	0.32	96.5	13.9	280.5
T_3	8.79	0.87	25.2	0.29	95.3	13.8	281.4
T_4	8.75	0.86	26.0	0.30	95.4	14.3	281.6
T_5	8.77	0.88	25.8	0.32	96.3	11.6	279.8
T_6	8.76	0.85	18.1	0.35	95.2	14.2	280.8
T_7	8.79	0.86	24.5	0.33	96.4	13.9	281.5
T_8	8.73	0.87	24.2	0.31	96.7	14.8	282.5
T_9	8.78	0.85	24.8	0.35	96.5	15.8	280.7
T_{10}	8.77	0.84	25.8	0.30	93.0	15.6	281.0
Initial value	9.10	0.97	31.4	0.21	91.0	13.2	280.0

T_1 = RDF(120 kg N : 60 kg P_2O_5 : 40 kg K_2O and 25 kg Zn SO_4)	T_6 = RDF + press mud@ 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 +press mud @75% GR	T_{10} = RDF + pressmud@ 50 % GR +FYM 10t/ha

AST-10: Effect of soil amendment on yield of fodder sorghum in saline alkali soil
Location: Mandya [Table reference: 10 (a)]

The experiment was initiated during Rabi 2010-11 on location specific mode to study the effect of soil amendment on fodder yield, water & land use efficiency & economics of fodder sorghum. Total 8 treatments comprised 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 + Vermi-compost 5 t/ha^{-1}(T_4), Rec. NPK + FYM 10 t/ha^{-1}+ Elemental sulphur 25 kg ha^{-1} (T_5), Rec. NPK + FYM 10 t/ha^{-1} + Gypsum 500kg/ha (T_6), Rec. NPK + FYM 10 t/ha^{-1} + Zn SO_4 20 kg ha^{-1} (T_7) and Rec. NPK + FYM 10 t/ha^{-1} + Zn SO_4 20 kg ha^{-1} + Gypsum 500 kg/ha (T_8) laid out in RBD & replicated thrice. Experimental data of third year study revealed that application of recommended dose of NPK + FYM (10t/ha) + $ZnSO_4$ (20 kg/ha) + Gypsum 500 kg/ha recorded significantly higher green forage yield (297.74 q/ha) and dry matter yield (76.59q/ha). The same treatment (T8) realized higher net monetary returns (Rs. 13024/ha). Application of Rec. NPK + press mud 10 t/ha^{-1} recorded higher B:C ratio of 2.03. Similar to GFY, T_8 treatment produced tallest plant & highest LS ratio of the sorghum crop & lowest being with T_1.

Table-10 (a): Effect of soil amendment on yields, growth parameters and economics 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	Net monetary return (Rs/ha)	Benefit cost ratio
T_1	118.85	29.37	1.74	98.21	0.19	3635	1.44
T_2	196.09	50.42	2.95	127.67	0.23	7359	1.60
T_3	233.82	56.91	3.14	134.90	0.24	12132	2.07
T_4	242.07	63.75	3.83	135.88	0.27	5457	1.29
T_5	243.46	64.85	3.80	142.38	0.31	11221	1.85
T_6	257.76	63.63	3.34	148.58	0.26	9926	1.63
T_7	255.45	65.60	3.55	140.96	0.22	12495	1.95
T_8	297.74	76.59	4.20	155.58	0.33	13024	1.78
SEm±	10.67	3.48	0.22	3.06	0.01	--	--
CD at 5%	32.36	10.55	0.66	9.28	0.02	--	--

T_1 = Rec. NPK (90:50:40 NPK kg/ha) alone through inorganics	T_5 = Rec. NPK + FYM 10 t/ha^{-1}+ Elemental sulphur 25 kg ha^{-1}
T_2 = Rec. NPK + FYM 10 t/ha^{-1}	T_6 = Rec. NPK + FYM 10 t/ha^{-1} + Gypsum 500 kg ha^{-1}
T_3 = Rec. NPK + Pressmud 10 t/ha^{-1}	T_7 = Rec. NPK + FYM 10 t/ha^{-1} + Zn SO_4 20 kg ha^{-1}
T_4 = Rec. NPK + Vermi compost 5 t/ha^{-1}	T_8 = Rec. NPK + FYM 10 t/ha^{-1} + Zn SO_4 20 kg ha^{-1} + Gypsum 500 kg ha^{-1}

AST-11: Production potential of forage crops in rice fallows under varied nitrogen levels

Location: Mandya **[Table reference-11 (a)]**

The experiment was initiated during Rabi 2011-12 to assess the effect of cropping systems and nitrogen levels on productivity, quality & economics of forage crops in rice fallows. The treatment consisted of three cropping systems (C1-Sorghum+ Cowpea, C2-Maize+ Cowpea & C3- Pearl millet + Cowpea) & three levels of nitrogen (50% RDN, 75% RDN & 100% RDN) laid out in split plot design & replicated four times. Result of second year experimentation reveals that inter cropping of cowpea with maize had highest GFY, DMY as well as CPY over the sorghum + cowpea & - pearl millet + cowpea cropping systems. Net monetary returns & benefit ratio also followed the same trend. The application of 100% RDN to different cropping systems recorded highest green fodder yield (362.47 q ha^{-1}), dry matter yield (74.00 q ha^{-1}) & crude protein yield (6.8 q ha^{-1}) and fetched higher net monetary returns (Rs 22848/ha) and benefit cost ratio (3.21). Interaction effect among the cropping system & nitrogen levels were found non-significant with respect to dry matter & crude protein yield but it was significant with respect to green forage yield at same level of main treatment.

Table-11: Effect of nitrogen levels on yield and economics of forage crops under rice fallow at Mandya

Treatments	Green fodder yield (q/ha)	Dry matter yield (q/ha)	Crude protein yield (q/ha)	Net monetary return (Rs/ha)	Benefit cost ratio
A. Cropping systems					
Maize + Cowpea	368.52	75.43	5.02	23598	2.77
Sorghum + Cowpea	250.45	52.30	4.28	13162	2.54
Pearl millet + Cowpea	278.65	56.57	5.21	18340	2.91
SEm±	11.26	2.54	0.21	--	--
CD at 5%	38.96	8.78	0.74	--	--
B. Nitrogen levels (kg/ha)					
50% of RDN	225.78	45.32	3.01	12241	2.16
75% of RDN	309.38	64.97	4.67	20010	2.83
100% of RDN	362.47	74.01	6.82	22848	3.21
SEm±	5.13	1.69	0.17	--	--
CD at 5%	15.25	5.00	0.50	--	--
C. Interaction: CS X N					
SEm±	8.90	2.94	0.29		
CD at 5%	NS	NS	NS		

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

Location: Vellayani **Reference Table: 12 (a) to 12 (c)**

The experiment initiated during kharif 2010 with a view to evaluate the production potential, quality and economics of fodder crops in banana based production system. 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 third year of experimentation and data revealed that planting of sole BN hybrid (T_7) recorded significantly highest green fodder (1039.3 q/ha), crude protein yield (16.7 q/ha) and crude fibre yield (59.7 q/ha) over rest of the treatments. Banana + cowpea intercropping system (T_4) being at par with sole banana (131.7 q/ha) recorded significantly highest banana bunch yield (136.1 q/ha) and significantly lowest was with banana + guinea grass (T_1) intercropping system (at par with T_3). The planting of cowpea with banana (T_4) intercropping system being at par with banana sole (3068 q/ha) and banana + BN hybrid (2961.4 q/ha) significantly produced highest forage equivalent yield (3170.3 q/ha) and lowest being with banana + congo signal intercropping system (2340.1 q/ha). Banana + BN hybrid intercropping system (T_2) fetched highest net monetary returns (Rs 318800/ha/yr) and benefit cost ratio (2.40) over rest of the treatments. The growing of sole BN hybrid recorded higher uptake of N and P (266 and 22.8 kg N and P /ha, respectively) over rest of the grasses and cowpea sole and cropping system, whereas highest K uptake (185.4 kg/ha) was recorded in banana + hybrid napier system.

AST-12 (a): Effect of banana based intercropping on growth attributes and yields of forage crops and bunch yield of banana in the Homesteads of Kerala (Vellayani)

Treatment	Green fodder yield (q/ha)	Banana bunch yield (q/ha)	Crude protein yield (q/ha)	Forage equivalent yield (q/ha)	Crude fiber yield (q/ha)	Crude protein (%)	Crude fibre (%)	Plant height (cm)	Plant	Leaf stem ratio
T_1	428.66	109.66	5.72	2556.5	24.43	7.40	31.50	112.10	6.0	0.83
T_2	271.66	127.10	10.70	2961.4	35.56	7.90	26.16	202.86	3.0	0.86
T_3	420.10	100.43	5.49	2340.1	19.80	7.66	27.60	96.36	12.0	0.56
T_4	63.93	136.06	2.63	3170.3	3.38	18.03	23.13	87.46	16.0	0.43
T_5	-	131.66	-	3068	-	-	-	-	-	-
T_6	631.00	-	6.26	-	30.63	6.70	32.50	96.16	6.0	0.66
T_7	1039.30	-	16.70	-	59.73	7.46	26.60	180.43	3.0	0.76
T_8	657.00	-	12.03	-	42.13	7.76	27.10	87.20	12.0	0.56
T_9	281.33	-	7.03	-	9.63	18.06	24.73	92.00	16.0	0.43
SEm±	25.32	3.93	0.32	91.86	1.25	0.22	0.50	3.09		0.02
CD at 5%	76.81	12.82	0.98	299.6	3.81	0.69	1.52	9.40		0.08
CV%	4.77	3.25	3.90	3.25	4.44	2.24	1.83	2.59		3.12

AST-12 (b): Effect of banana based intercropping on economics of the system and nutrient uptake of forage crops in the homesteads of Kerala (Vellayani)

Treatment	Net monetary return (Rs/ha/yr)	Benefit cost ratio	Uptake by fodder crops (kg/ha)			Uptake by banana (kg/ha)			Total nutrient uptake by fodder and banana (kg/ha)		
			N	P	K	N	P	K	N	P	K
T_1	238133	2.06	85.03	7.76	106.50	49.56	4.00	52.13	134.60	11.76	156.63
T_2	318800	2.40	163.26	28.06	122.40	54.83	5.93	63.06	218.10	34.00	185.43
T_3	203531	1.90	87.79	13.90	93.46	49.00	6.46	53.50	136.80	20.56	146.96
T_4	287110	2.33	41.70	2.90	18.60	60.96	7.40	68.00	104.33	10.30	86.60
T_5	270033	2.36	-	-	-	63.76	7.60	69.80	63.76	7.60	69.80
T_6	10050	1.06	96.70	14.96	125.93	-	-	-	96.70	14.90	122.60
T_7	60900	1.60	266.00	22.83	183.66	-	-	-	266.00	22.83	180.33
T_8	13950	1.10	187.26	15.53	170.93	-	-	-	187.26	15.50	170.93
T_9	13766	1.10	110.80	7.76	46.90	-	-	-	110.80	7.76	46.90
SEm±	13377	0.07	4.70	1.20	4.55	2.69	0.82	1.84	4.06	1.03	3.98
CD at 5%	40107	0.21	14.27	3.65	13.83	8.79	2.68	6.00	12.17	3.10	11.96
CV%	-	1.12	3.62	8.44	4.19	4.83	13.00	3.00	2.77	6.41	3.07

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

AST-12(c): Nutrient use efficiency and soil fertility status of banana based fodder-intercropping system in the homesteads of Kerala Vellayani)

Treatment	Nutrient use efficiency (%)			Organic carbon (%)	Available nutrient in soil (kg/ha)		
	N	P	K		N	P	K
T_1	17.13	9.60	66.60	0.70	313.36	46.60	98.50
T_2	30.53	22.30	84.00	0.83	329.00	39.30	116.70
T_3	25.33	10.06	54.00	0.66	319.90	39.10	96.00
T_4	20.63	8.60	39.00	0.60	326.00	46.00	104.96
T_5	-	-	-	0.63	336.50	40.40	92.40
T_6	-	-	-	0.60	322.50	33.63	65.13
T_7	-	-	-	0.53	307.00	36.70	66.70
T_8	-	-	-	0.60	325.33	33.20	81.60
T_9	-	-	-	0.60	337.50	30.20	60.70
SEm±	2.57	1.72	3.46	0.03	5.98	2.69	5.56
CD at 5%	8.89	5.96	12.00	0.09	17.95	8.08	16.67
CV%	10.90	0.13	5.60	4.92	1.84	7.02	6.39

T_1 = Banana+ Guinea grass
T_2 = Banana +Hybrid Napier
T_3 = Banana + Congosignal
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 (AST18): Effect of sources of nitrogen on oat and residual effect on succeeding crops

Location: Srinagar **[Reference Table: 13(a) to 13(b)]**

The experiment was conducted to study the effect of sources of nitrogen on the productivity of oat and further residual effects on succeeding fodder crops. The experimental data of first year study showed that oatï maize + cowpea ï turnip cropping sequence resulted in the production of higher total green fodder (1130.95 q/ha) and dry matter (307.14 q/ha) than oat ï maize ï turnip cropping system indicating beneficial effects of inclusion of legume (cowpea) in the system.

Application of 75% N through urea + 25% N through sheep manure resulted in the production of higher green (1211.00 q/ha) and dry (323.63 q/ha) forage yields. This treatment remained at par with application of 75% N through urea + 25% N through FYM and 50% N through urea + 50% N through sheep manure. Cropping sequences did not exhibit any effect on nitrogen content and uptake of oat crop whereas, higher N content and uptake by maize, turnip and total of all the crops were observed when crop were grown under oat ï maize + cowpea ï turnip sequence; higher crude protein yield was also obtained in this sequence.

Sources of N did not exhibit any significant effect on N content of oat crop. Significantly higher N content in maize, turnip and total of crops was noticed by applying 75% N through urea + 25% N through FYM, which was at par with application of 75% N through urea + 25% N through sheep manure. Application of 100% N through urea resulted in higher N uptake by oat crop which remained at par with application of 75% N through urea + 25% N through FYM and 75% N through urea + 25% N through sheep manure, whereas these two later treatments remaining at par with each other resulted in higher N uptake by maize, turnip and total of all the crops. There treatments also resulted in higher crude protein yield of the system.

AST-13 (a): Green fodder and Dry matter yield (q/ha) as influenced by cropping sequence and sources of nitrogen at Srinagar

Treatment	Green fodder yield (q/ha)				Dry matter yield (q/ha)			
	Oat	Maize	Turnip	Total	Oat	Maize	Turnip	Total
Cropping sequences								
Oat-Maize-Turnip	354.20	464.48	250.6	1069.28	88.55	139.35	30.07	294.62
Oat- Maize+ Cowpea-Turnip	347.00	500.94	283.0	1130.95	86.75	150.28	33.96	307.14
SEm ±	3.81	4.15	0.78	5.43	0.95	1.24	0.09	7.84
CD at 5%	NS	25.26	4.78	33.06	NS	7.54	0.59	NS
Source of Nitrogen								
100% N through Urea	388.00	412.20	191.5	991.72	97.00	123.66	22.98	284.63
75% N through urea + 25% N through FYM	367.00	522.30	304.5	1193.82	91.75	156.69	36.54	321.12
50% N through urea + 50% N through FYM	316.50	454.25	266.5	1037.23	79.13	136.28	31.98	281.04
75% N through urea + 25% N through sheep manure	348.00	541.50	321.5	1211.00	87.00	162.45	38.58	323.63
50% N through urea + 50% N through sheep manure	333.50	483.30	250.0	1066.82	83.38	144.99	30.00	293.99
SEm ±	11.02	12.64	1.25	17.87	2.75	3.79	0.14	11.63
CD at 5%	33.04	37.89	3.73	53.55	8.26	11.36	0.44	34.86
Interaction	NS	NS	NS	NS	NS	NS	NS	NS

AST-13 (b): Nitrogen content, uptake and protein yield as influenced by cropping sequence and sources of nitrogen.

Treatment	Nitrogen content (%)				Nitrogen Uptake (kg/ha)				Crude protein yield (q/ha)			
	Oat	Maize	Turnip	Total	Oat	Maize	Turnip	Total	Oat	Maize	Turnip	Total
Cropping sequences												
Oat-Maize-Turnip	1.17	1.41	0.54	3.12	103.23	197.85	16.47	317.55	6.45	12.39	1.03	19.87
Oat- Maize+ Cowpea-Turnip	1.15	1.50	0.58	3.23	99.75	225.69	20.01	345.45	6.23	14.10	1.25	21.58
SEm ±	0.01	0.001	0.001	0.021	1.49	2.86	0.38	3.72	0.09	0.23	0.02	0.32
CD at 5%	NS	0.004	0.002	0.061	NS	11.31	1.12	16.68	NS	0.71	0.07	1.06
Source of Nitrogen												
100% N through Urea	1.15	1.36	0.49	3.00	111.58	167.63	11.33	290.55	6.97	10.47	0.71	18.14
75% N through urea + 25% N through FYM	1.15	1.53	0.61	3.29	105.57	239.95	22.45	367.97	6.58	15.02	1.40	23.00
50% N through urea + 50% N through FYM	1.18	1.42	0.55	3.14	93.40	193.07	17.48	303.95	5.83	12.07	1.09	18.99
75% N through urea + 25% N through sheep manure	1.19	1.51	0.60	3.30	103.43	245.58	23.08	372.10	6.47	15.37	1.44	23.28
50% N through urea + 50% N through sheep manure	1.12	1.47	0.56	3.15	93.48	212.62	16.83	322.93	5.85	13.30	1.06	20.21
SEm ±	0.01	0.0001	0.001	0.021	3.65	5.62	0.32	6.96	0.24	0.35	0.02	0.44
CD at 5%	NS	0.0004	0.002	0.061	10.94	16.86	0.95	20.86	0.69	1.05	0.06	1.30
Interaction	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

AST 14: Performance of bajra napier hybrid grass as influenced by micro-nutrients under irrigated conditions **[Reference Table- 14]**

Location: Coimbatore

The experiment was initiated during *kharif* 2012 on location specific mode with a view to study the effect of conjoint application of organic manure, inorganic fertilizers and micronutrients on forage yield and economics of production of BN hybrid grass. The treatment consisted of nine micronutrient levels (T_1- NPK alone, T_2 ï NPK + $FeSO_4$ @ 50 kg/ha, T_3 ï NPK + $FeSO_4$ @ 100 kg/ha, T_4 ï NPK + $ZnSO_4$ @ 25 kg/ha, T_5 ï NPK + $ZnSO_4$ @ 50 kg/ha, T_6 ï NPK + $FeSO_4$ @ 50kg/ha + $ZnSO_4$ @ 25 kg/ha, T_7 ï NPK + $FeSO_4$ @ 100 kg/ha + $ZnSO_4$ @ 25 kg/ha, T_8 ï NPK + $FeSO_4$ @ 50kg/ha + $ZnSO_4$ @ 50 kg/ha and T_9 ï NPK + $FeSO_4$ @ 100 kg/ha + $ZnSO_4$ @ 50 kg/ha) laid out in randomized block design and replicated three times. The application of nitrogen was basal and split as per recommendation, P&K as basal, micro-nutrient as basal and split application and FYM @ 25 t/ha as basal during first year was applied to the crop.

The results of first year experimentation revealed that application of NPK + $FeSO_4$ @ 50 kg/ha + $ZnSO_4$ @ 25 kg/ha to the bajra napier hybrid recorded significantly highest GFY (3267 q/ha), DMY (640 q/ha), CPY (82 q/ha) and crude protein content (12.8%) over rest of the treatments. The respective treatment also fetched highest net monetary returns (Rs 197085 /ha/yr) and benefit cost ratio (2.52) over rest of the treatments and lowest being with NPK alone (Rs 138453 /ha/yr and 2.11, respectively).

Table-14: Yield, quality and economics of BN hybrid as influenced by micronutrients under irrigated conditions

Treatment	GFY (q/ha)	DMY (q/ha)	CPY (q/ha)	Crude protein (%)	Plant height (cm)	LS ratio	Cost of cultivation (Rs/ha)	Net monetary return (Rs/ha)	B: C
NPK alone	2633.0	389.8	35.8	9.1	176.6	0.31	124844	138453	2.11
NPK+$FeSO_4$ @ 50 kg/ha	2987.0	477.4	50.2	10.4	181.6	0.34	128344	170351	2.33
NPK+$FeSO_4$ @ 100 kg/ha	2888.4	454.6	46.7	10.2	178.6	0.32	131844	156996	2.19
NPK+$ZnSO_4$ @ 25 kg/ha	2936.3	487.3	53.6	11.0	184.3	0.35	126144	167484	2.33
NPK+$ZnSO_4$ @ 50 kg/ha	2892.0	473.4	49.9	10.5	183.1	0.34	127444	161757	2.27
NPK+$FeSO_4$ @ 50 kg/ha + $ZnSO_4$ @ 25 kg/ha	3267.3	639.9	81.8	12.8	196.4	0.41	129644	197085	2.52
NPK+$FeSO_4$ @ 100 kg/ha + $ZnSO_4$ @ 25 kg/ha	3058.6	540.5	62.5	11.6	191.0	0.36	133144	172719	2.30
NPK+$FeSO_4$ @ 50 kg/ha + $ZnSO_4$ @ 50 kg/ha	3211.7	592.6	71.8	12.1	193.5	0.38	130944	190230	2.45
NPK+$FeSO_4$ @ 100 kg/ha + $ZnSO_4$ @ 50 kg/ha	3092.7	527.8	59.4	11.3	189.3	0.36	134444	174821	2.30
SEm±	46.1	17.3	2.1	0.2	3.7	0.01			
CD at 5%	97.7	36.7	4.5	0.5	7.9	0.01			
CV (%)	2.7	5.9	6.4	3.5	3.5	3.24			

AST-15 (AST-20): Effect of sowing time and Zn & thiourea spray on seed yield of dual purpose oat

Location: Bikaner **[Reference Table - 15(a) to 15(b)]**

The experiment was conducted during Rabi 2012-13 to find out the effect of sowing time, Zn and thiourea spray schedule on seed yield of dual purpose oat. In the trial, oat variety Kent was sown on 1st Nov, 2012, 15th Nov, 2012 and 30th Nov, 2012 as main plot and five zinc & thiourea application mode *viz.,* 25 kg $ZnSO_4$ as basal, 12.5 kg $ZnSO_4$ as basal followed by 0.5% $ZnSO_4$ spray at tillering, 12.5 kg $ZnSO_4$ as basal followed by 0.5% $ZnSO_4$ + 0.05% thiourea spray at tillering and 12.5 kg $ZnSO_4$ as basal followed by 0.05% thiourea spray at tillering along with control (no Zn & TU) laid out in split plot design.

The results of first year study revealed that sowing of oat crop under different dates did not cause significant variation in GFY and DMY. However, sowing on 1st Nov and 15th Nov remained at par with each other and recorded significantly higher seed yield over sowing on 30th Nov. Sowing of oat on 1stNov, being at par with 15th Nov fetched significantly higher net monetary returns (Rs 41763 /ha) and B: C ratio (2.02) over delayed sowing (30th Nov). The zinc concentration in seed of oat remained unchanged under different dates of sowing.

Data further indicated that 25 kg $ZnSO_4$/ha as soil application (basal) recorded significantly highest GFY (83.18 q/ha) and DMY (19.53 q/ha) over control and 12.5 kg $ZnSO_4$/ha as soil application at sowing followed by 0.5% $ZnSO_4$ spray (for DMY). However respective treatment remained at par with rest of the treatments. The soil application of 12.5 kg $ZnSO_4$/ha as basal followed by 0.5% $ZnSO_4$ + 0.05% TU sprays recorded significantly highest seed yield (18.36 q/ha) and net returns (Rs 40419 /ha) over control and remained at par with rest of the treatments. Different zinc treatments applied to oat recorded significantly higher concentration of zinc in seed and straw over control (no Zn & TU).

Table- 15(a): Effect of sowing time and Zn & thiourea spray on yields and growth characters of oat at Bikaner

Treatment	Green Fodder yield (q/ha)	Dry matter yield (q/ha)	Leaf stem ratio	Plant height (cm)	Tillers /m length	Seed yield (q/ha)	Straw yield (q/ha)	Harvest index (%)	Biological yield (q/ha)
A. Sowing time									
01 November	79.91	18.87	0.89	90.05	62.95	18.76	25.27	29.80	62.89
15 November	82.07	19.22	0.90	68.05	91.20	17.78	23.87	29.18	60.87
30 November	81.03	18.92	0.91	53.40	95.75	16.36	23.52	27.80	58.80
SEm±	0.88	0.21	0.01	3.58	1.02	0.37	0.34	0.47	0.45
CD at 5%	NS	NS	NS	12.37	3.52	1.29	1.17	1.63	1.57
B. Zn and TU application									
Control (no Zn &TU)	78.19	18.42	0.90	68.50	79.42	16.28	22.31	28.51	57.00
25 kg Zn SO_4 /ha soil application at sowing	83.18	19.53	0.93	72.25	86.00	17.25	24.46	28.14	61.25
12.5 kg Zn SO_4/ha soil application at sowing followed by 0.5% Zn SO_4 sprays	80.79	18.78	0.89	70.83	82.50	18.06	25.18	29.09	62.01
12.5 kg Zn SO_4 /ha soil application at sowing followed by 0.5% Zn SO_4 + 0.05% TU sprays	81.54	19.12	0.89	72.00	86.67	18.36	24.56	29.57	62.04
12.5 kg Zn SO_4 /ha soil application at sowing followed by 0.05 TU sprays	81.31	19.17	0.89	68.92	81.92	18.21	24.58	29.33	61.96
SEm±	0.74	0.21	0.01	2.18	2.41	0.39	0.50	0.46	0.74
CD at 5%	2.13	0.60	0.02	6.26	NS	1.11	1.44	1.31	2.11
CV%	3.17	3.78	2.69	10.73	10.03	7.59	7.16	5.46	4.19

Table- 15(b): Effect of sowing time and Zn & thiourea spray on economics, yield attributes and quality parameters of oat at Bikaner

Treatment	Net returns (Rs/ha)	B: C ratio	1000 grain wt. (g)	Spike length (cm)	No. of grains/ spike	Crude protein (%)	Crude protein yield (q/ha)	Zinc conc. seed (ppm)	Zinc conc. straw (ppm)
Sowing time									
01 November	41763	2.02	32.69	23.50	32.60	9.97	1.88	28.63	69.32
15 November	39108	1.89	33.22	21.10	27.50	10.43	2.00	30.03	74.95
30 November	35363	1.71	30.29	17.25	19.95	10.08	1.90	29.71	69.75
SEm±	916	0.04	0.53	0.70	0.55	0.11	0.03	0.38	0.77
CD at 5%	3169	0.15	1.83	2.41	1.89	NS	NS	NS	2.66
Zn and TU application									
Control (no Zn &TU)	35199	1.76	31.41	20.75	26.08	9.99	1.84	25.78	65.28
25 kg Zn SO_4 /ha soil application at sowing	37783	1.80	32.27	21.00	27.67	10.25	2.00	30.92	72.93
12.5 kg Zn SO_4/ha soil application at sowing followed by 0.5% Zn SO_4 sprays	40292	1.97	31.83	20.75	26.67	10.12	1.89	29.71	71.91
12.5 kg Zn SO_4 /ha soil application at sowing followed by 0.5% Zn SO_4 + 0.05% TU sprays	40419	1.92	32.39	20.67	26.42	10.21	1.95	30.56	73.56
12.5 kg Zn SO_4 /ha soil application at sowing followed by 0.5% TU sprays	40032	1.91	32.42	19.92	26.58	10.22	1.96	30.31	73.01
SEm±	1026	0.05	0.07	0.81	0.61	0.02	0.02	0.30	0.53
CD at 5%	2943	0.14	0.21	NS	NS	0.05	0.06	0.87	1.51
CV%	9.17	9.15	0.78	13.66	7.91	0.65	3.91	3.56	2.56

C. AVT-2 BASED AGRONOMY TRIALS

AST 16 (AST-11): Effect of N levels on promising entries on Tall fescue grass

Locations: Palampur and Bajaura **[Reference Table: 16(a) to 16(b)]**

A field trial was conducted to find out the response of N levels on growth and yield of four Tall fescue grass entries in the hill zone. The treatments consisted of four entries (Hima-14, Hima-15, Hima-1 (ZC) & Hima-4(ZC) and four levels of nitrogen (0, 40, 80 & 120 Kg N/ha).
At Palampur, no significant effect on shoot number (m^{-2}) was observed among entries, however at Bajaura, entry Hima-14 produced significantly higher shoot number (m^{-2}) compared to other entries. With respect to other parameters significant variation among entries was observed. The entry Hima-14, Hima-15 and Hima-4 remaining at par with each have better L:S than Hima-1 (ZC). Entry Hima-14 maintained its significant superiority over other entries by producing higher green forage yield at both the locations; however this entry remained at pat with Hima-15 in terms of green forage yield. On mean basis, entry Hima-4 (ZC) resulted in higher dry matter and crude protein yields and was followed by entries Hima-14 and Hima-15.

The interaction effects of entries x nitrogen indicated that Hima-14 and Hima-15 with the application of 120 kg N/ha resulted in the production of significantly higher green forage, dry matter and crude protein yields compared to other treatments under study.

Table-16 (a): Effect of nitrogen levels on the yield of promising entries of Tall Fescue Grass

Treatments	Green fodder yield (q/ha)			Dry matter yield (q/ha)			CP yield (q/ha)		
	Palampur	Bajaura	Mean	Palampur	Bajaura	Mean	Palampur	Bajaura	Mean
Entries									
HIMA-14	198.48	221.83	210.15	46.3	52.85	49.07	4.56	5.12	4.84
HIMA-15	193.94	219.96	206.95	46.5	53.78	49.63	4.59	5.17	4.88
HIMA-1(ZC)	173.18	189.83	181.50	42.0	47.18	44.07	4.13	4.49	5.18
HIMA-4(ZC)	179.40	195.93	187.66	50.7	51.87	52.77	4.97	4.69	4.31
SEm±	2.09	2.15	1.84	0.48	0.55	0.45	0.06	0.06	0.05
CD at 5%	6.02	6.21	5.30	1.39	1.57	1.28	0.16	0.17	0.14
Nitrogen levels (kg/ha)									
N_0	84.45	102.33	93.39	23.36	25.82	25.82	2.01	2.39	2.20
N_{40}	139.19	159.12	149.16	33.87	36.29	36.29	3.32	3.76	4.22
N_{80}	244.12	264.42	254.27	58.20	60.62	60.62	5.82	6.31	6.07
N_{120}	277.23	301.67	289.45	63.00	65.78	65.78	6.42	7.02	6.72
SEm±	2.09	2.15	1.84	0.48	0.55	0.45	0.06	0.06	0.05
CD at 5%	6.02	6.21	5.30	1.39	1.57	1.28	0.16	0.17	0.14
Interaction	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.

Table-16 (b): Effect of nitrogen levels on the growth parameters of promising entries of Tall Fescue Grass

Treatments	Plant height (cm)		Shoot m^2		L: S	
	Palampur	Bajaura	Palampur	Bajaura	Palampur	Bajaura
Entries						
HIMA-14	59.5	65.8	140	148	0.72	0.77
HIMA-15	54.8	60.2	135	142	0.74	0.76
HIMA-1 (ZC)	53.7	62.8	134	143	0.76	0.72
HIMA-4 (ZC)	55.2	61.5	134	138	0.75	0.75
SEm±	1.05	0.72	2.18	1.26	0.01	0.01
CD at 5%	3.01	2.10	NS	3.65	NS	NS
Nitrogen levels (kg/ha)						
N_0	40.3	46.6	104	106	0.60	0.61
N_{40}	53.9	60.7	132	138	0.71	0.71
N_{80}	62.7	69.6	149	157	0.78	0.78
N_{120}	66.2	73.4	157	170	0.89	0.89
SEm±	1.05	0.72	2.18	1.26	0.01	0.01
CD at 5%	3.01	2.10	6.00	3.65	0.26	0.23
Interaction	NS	Sig.	13	Sig.	NS	NS

Table-16 (a-1): Interaction effects of nitrogen levels and entries on mean green fodder yield (q/ha) of Tall Fescue Grass (Palampur and Bajaura)

Nitrogen levels (kg/ha)	Entries			
	HIMA-14	HIMA-15	HIMA-1(ZC)	HIMA-4(ZC)
N_0	87.70	85.20	103.10	97.56
N_{40}	145.77	137.03	162.10	151.73
N_{80}	226.97	249.32	267.08	273.71
N_{120}	265.58	279.10	308.32	304.79
SEm±	3.18			
CD at 5%	10.60			

Table-16 (a-2): Interaction effects of nitrogen levels and entries on mean dry matter yield (q/ha) of Tall Fescue Grass (Palampur and Bajaura)

Nitrogen levels (kg/ha)	Entries			
	HIMA-14	HIMA-15	HIMA-1(ZC)	HIMA-4(ZC)
N_0	24.56	24.71	28.66	25.37
N_{40}	36.44	62.33	37.28	37.17
N_{80}	54.47	59.84	62.50	65.69
N_{120}	60.82	64.19	67.83	70.30
SEm±	0.89			
CD at 5%	2.57			

Table-16 (a-3): Interaction effects of nitrogen levels and entries on mean crude protein yield (q/ha)

Nitrogen levels (kg/ha)	Entries			
	HIMA-14	HIMA-15	HIMA-1(ZC)	HIMA-4(ZC)
N_0	2.12	2.12	2.43	2.13
N_{40}	3.58	6.04	3.68	3.59
N_{80}	5.40	6.04	6.28	6.55
N_{120}	6.14	6.50	6.96	7.25
SEm±	0.09			
CD at 5%	0.28			

AST-17: Effect of nitrogen levels on green fodder yield of promising entries of oat (AVTO-2-SC)

[Reference Table- 17 (a) to 17(j)]

Location:	Hill Zone:	Palampur and Srinagar
	North-West Zone:	Hisar and Pantnagar
	North-East Zone:	Jorhat, Ranchi and Kalyani
	Central Zone:	Jhansi and Jabalpur
	South Zone:	Coimbatore and Mandya

A field trial was conducted to find out the response of promising AVTO-2-SC based single cut entries of oats to graded doses of nitrogen. The study was undertaken at 11 locations with 16 entries (including five zonal check and two national checks). The treatments consisted of sixteen entries and three levels of nitrogen (40, 80, 120 kg/ha) in split plot design.

In the Hill zone at Palampur, JHO-10-2 produced significantly taller plants as compared to other entries and remained at par with JO-03-97, JO-03-99 and OS-377. Significantly more number of tillers (per m row) was noticed in Palampur-1, which remained at par with OS-377, JHO-10-1 and OL-6. With respect to L:S ratio significantly better L:S was reported in Kent. Entry OL-6 produced significantly higher green fodder yield (494.50 q/ha), dry matter yield (119.00 q/ha) and crude protein yield (12.9 q/ha) as compared to other entries. The growth parameters, herbage yield and crude protein yield increased consistently with increasing level of nitrogen up to 120 Kg N/ha. At Srinagar entry OS-377 produced higher herbage yield. On mean data basis in the hill zone JHO-10-2 closely followed by SKO-188 produced higher yield. The interaction effect of entries of oat and nitrogen levels on green fodder yield at Palampur indicated that all the varieties responded up to 120 Kg N/ha. Significantly highest green fodder yield was obtained in variety OL-6 supplemented with 120 Kg N/ha. At Srinagar entry JHO-10-2 in combination with 120 kg/ha nitrogen produced higher green and dry matter yields and was at par with entry OS-377 and OS-6 national check in combination with 120 kg/ha nitrogen.

In North-West zone, on location mean basis, the testing entry JO-03-99 produced highest green fodder (439.5 q/ha) and testing entry UPO-10-2 produced highest dry matter (90.4 q/ha) yield. The production levels were more at Pantnagar than at Hisar. At Hisar entry UPO-10-2 yielded higher green fodder yield of 401.3 q/ha but remained statistically at par with entry SKO-170. Similar trend was also observed with respect to highest dry matter yield but higher dry matter yield remained at par with JHO-10-1, OS-377 and JO-03-99. At Pantnagar entry JO-03-99 produced significantly higher green and dry matter yields than all other entries under test. In the zone the effect of nitrogen was linear upto the highest tested rate of nitrogen (120 kg/ha). On location mean basis, the magnitude of increase for green fodder was 28.81 % and 9.46 % over 40 and 80 kg N/ha, respectively and magnitude of increase for dry fodder was 33.3 % and 13.7 % over 40 and 80 kg N/ha, respectively.

In North-East zone, the results indicated that on location mean basis the testing entry OS-377 and UPO-10-2 produced higher green and dry matter yields. At Jorhat entry JO-03-99 and OS-377 produced significantly more green fodder and dry matter yield. At Ranchi entry JHO-10-1 produced higher yield. On individual location basis at Kalyani the performance of OS-377 was at par with UPO-10-2 and better than zonal check and national check entries.

On location mean basis the nitrogen response was observed upto nitrogen (120 kg/ha). Interaction effect indicated that under North-East zone, on individual location basis at Ranchi, higher green fodder yield produced in combination of entry Kent (National check) 120 kg /ha nitrogen and was at par in combination of entry JHO-10-1 and JHO-99-2 (Zonal check) with 120 kg/ha nitrogen. At Jorhat, entry JHO-99-2 (Zonal check) produced significantly higher green fodder yield and was at par with SKO-188 and OS-377 in combination with 120 and 80 kg/ha nitrogen.

On location mean basis in central zone entry SKO-188 and JO-03-99 produced higher green fodder yield (536.9q/ha) and dry matter yields (93.9q/ha). The performance of all entries was better at Jhansi than Jabalpur with respect to forage yields. At Jhansi test entries OS-377 and JO-03-99 produced higher forage yields but remained at par with SKO-188 in green fodder yield. At Jabalpur entries JO-03-99 produced higher forage yields than all national checks. The herbage yield increased consistently with increasing levels of nitrogen upto 120 kg/ha nitrogen. The magnitude of increase for green fodder on location mean basis was 16.51% and 5.35%, respectively of 120 kg/ha over 40 and 80 kg/ha. Interaction effects revealed that at Jabalpur entry JO-03-99 with 120 kg/ha nitrogen produced higher green fodder yield (477.2 q/ha) and was at par with entries SKO-188 and OS-6 (National check) in combination with 120 kg/ha nitrogen and entry JO-03-99 with 80 kg/ha nitrogen. At Jabalpur, higher dry matter was produced in entry JO-03-97 in combination with 120 kg/ha nitrogen. At Jhansi, entry OS-377 produced higher green fodder yield and 120 kg/ha nitrogen applied with this entry and was significantly at par with JO-03-99 in combination with 120 kg/ha nitrogen.

In South zone on location mean basis entry SKO-188 yielded more than all treatments including all zonal check and national check entries. On individual location basis at Coimbatore trend was similar with respect to forage yields. At Mandya the performance of entry UPO-10-1 was at par with National check (Kent) and entry SKO-188 with respect to green fodder yield. For dry matter yield national check produced higher fodder and was at par with JO-03-97, JO-03-99 and OS-377. Interaction effects indicated that in South zone, at Mandya entry OS-377 yielded higher in combination with 120 kg/ha nitrogen and was at par with entry JO-03-97, JO-03-99 and Kent (National check) in combination with 120 kg/ha Nitrogen.

On all India mean basis test entry JHO-922 produced better green forage (479.6 q/ha) and dry matter (85.5 q/ha) yields than national checks OS-6 (375.9 q/ha green fodder and 81.6 q/ha dry matter yield and Kent (366.0 q/ha green fodder yield and 77.8 q/ha dry matter yield). The forage yield increased consistently with increasing level of nitrogen upto 120 kg nitrogen/ha.

With respect to quality parameter the results revealed that at Palampur (Hill zone) the entry UPO-10-2; entry JO-03-99 at Pantnagar (NW zone), at Jabalpur (Central Zone) the entry JO-03-97 produced higher crude protein yield. Under North-West Zone, the testing entry OS-6 (National Check) produced highest crude protein yield. The production levels were more at Ranchi than Jorhat and Kalyani. At Ranchi entry UPO-10-2 and OS-6 (National check) produced similar and highest crude protein yield but remained at par with entry JO-03-97. At Kalyani and Jorhat higher crude protein yield produced in entry OS-377. The crude protein yield consistently increased with increasing levels of nitrogen upto 120 kg N/ha. In south zone, entry SKO-188 produced higher crude protein yield (7.2 q/ha) than zonal and national checks. The performance of all the entries was better at Coimbatore than Mandya. At Coimbatore test entry SKO-188 produced higher crude protein yield. At Mandya, entry OS-377 produced higher crude protein. The CPY increased consistently with increasing levels of nitrogen upto 120 kg N/ha.

Table-17 (a): Effect of nitrogen levels on green fodder yield of promising entries of Oat (AVTO-2-SC)

Treatment	Green fodder yield (q/ha)									
	Hill zone			North West zone			North East zone			
	Palampur	Srinagar	Mean	Hisar	Pantnagar	Mean	Jorhat	Ranchi	Kalyani	Mean
A. Entry										
JO-03-97	435.55	325.3	380.4	343.6	449.6	396.6	290.0	337.1	241.4	289.5
JO-03-99	445.04	334.2	389.6	374.4	504.5	439.5	367.1	329.7	219.1	305.3
SKO-170	455.40	363.8	409.6	385.6	221.1	303.4	249.1	367.3	206.7	274.4
SKO-188	449.11	372.4	410.8	325.9	218.9	272.4	365.2	386.8	218.1	323.4
OS-377	347.08	406.8	376.9	341.5	475.6	408.6	401.1	448.1	290.9	380.0
UPO-10-1	383.43	358.6	371.0	340.4	474.0	407.2	297.8	350.4	232.4	293.5
JHO-10-2	429.86	395.5	412.7	308.5	451.1	379.8	314.8	449.0	231.3	331.7
JHO-10-1	408.81	341.1	375.0	335.4	448.9	392.2	229.6	472.8	268.9	323.8
UPO-10-2	494.58	368.7	431.6	401.3	471.1	436.2	328.6	409.6	272.9	337.0
JHO-99-2 (ZC)	-	-	-		-	-	361.6	471.9	240.4	358.0
JHO-822 (ZC)	-	-	-		-	-	-	-	-	-
JHO-2000-4 (ZC)	-			-	-	-	-	-	-	-
Palampur-1 (ZC)	429.27	342.5	385.9	-	-	-	-	-	-	-
OL-125 (ZC)	-	-	-	353.7	397.6	375.7	-	-	-	-
OS-6 (NC)	385.02	380.1	382.6	299.7	482.1	390.9	332.1	411.3	235.1	326.2
Kent (NC)	356.78	347.9	352.3	309.7	414.5	362.1	302.9	402.2	248.2	317.8
SEm±	9.44	7.1			11.8		13.8	5.2	7.2	
C D at 5%	27.68	20.5		21.7	34.5		40.5	15.5	21.2	
B. Nitrogen level (Kg/ha)										
40	359.06	309.7	334.4	253.4	367.6	310.5	284.0	398.0	211.7	297.9
80	425.90	366.4	396.2	360.5	428.1	394.3	322.7	412.0	239.3	324.7
120	469.92	408.1	439.0	416.1	456.6	436.4	353.2	399.0	275.4	342.5
SEm±	3.38	3.2			4.1		1.5	2.8	2.8	
C D at 5%	9.60	9.3		17.4	11.7		4.5	8.0	8.1	
C. Interaction: Entry X N levels										
SEm±		11.6					5.1	9.1	9.8	
C D at 5%	33.27	34.1					14.8	28.1	27.9	
CV%							4.8		7.0	

Table-17 (b): Effect of nitrogen levels on green fodder yield of promising entries of Oat (AVTO-2-SC)

Treatment	Green fodder yield (q/ha)						Over all mean
	Central zone			South zone			
	Jhansi	Jabalpur	Mean	Mandya	Coimbatore	Mean	
A. Entry							
JO-03-97	546.5	431.8	489.2	231.6	479.6	355.6	373.8
JO-03-99	626.5	433.6	530.1	238.4	466.6	352.5	394.5
SKO-170	561.3	390.1	475.7	160.6	496.3	328.5	350.7
SKO-188	685.8	387.9	536.9	152.8	632.4	392.6	381.4
OS-377	688.7	355.4	522.1	242.2	516.7	379.5	410.4
UPO-10-1	626.5	379.9	503.2	206.5	469.4	338.0	374.5
JHO-10-2	577.6	368.3	473.0	212.2	479.6	345.9	383.4
JHO-10-1	627.9	359.9	493.9	184.1	565.7	374.9	385.7
UPO-10-2	559.9	295.4	427.7	202.4	530.5	366.5	394.1
JHO-99-2 (ZC)	-	-		-	-	-	358.0
JHO-822 (ZC)	571.7	387.4	479.6	-	-	-	479.6
JHO-2000-4 (ZC)	-	-		227.4	450.0	338.7	338.7
Palampur-1 (ZC)	-	-		-	-		385.9
OL-125(ZC)	-	-		-	-		375.7
OS-6 (NC)	555.4	387.9	471.7	204.4	462.0	333.2	375.9
Kent (NC)	580.6	373.2	476.9	249.4	440.7	345.1	366.0
SEm±	18.6	20.6		2.9	16.5		
C D at 5%	54.6	60.6		8.6	47.9		
B. Nitrogen level (Kg/ha)							
40	566.1	316.3	441.2	165.1	456.0	310.6	335.2
80	603.9	396.5	500.2	211.0	506.0	358.5	388.4
120	632.1	424.9	528.5	251.9	535.4	393.7	420.2
SEm±	8.7	12.3		2.6	6.5		
C D at 5%	24.8	36.5		7.4	18.3		
C. Interaction: Entry X N levels							
SEm±	30.2	16.5		9.0			
C D at 5%	NS	48.6		NS	NS		
CV%	8.7	15.1			13.9		

Table-17 (b-1): Interaction effects of nitrogen levels and promising entries on green fodder yield of oat (AVTO-2 -SC) at Palampur and Srinagar

Entries	Palampur				Srinagar			
	Green fodder yield (q/ha)				Green fodder yield (q/ha)			
	N levels (kg/ha)				N levels (kg/ha)			
	40	80	120	Mean	40	80	120	Mean
JO-03-97	403.97	434.25	468.43	435.55	286.22	334.50	355.14	325.29
JO-03-99	412.75	446.45	475.92	445.04	300.15	330.40	372.10	334.22
SKO-170	380.45	474.61	511.13	455.40	276.80	393.20	421.35	363.78
SKO-188	387.56	462.98	496.78	449.11	351.70	373.40	392.10	372.40
OS-377	291.83	347.79	401.32	346.98	376.50	411.00	432.80	406.77
UPO-10-1	320.36	409.00	420.93	383.43	313.20	367.80	394.80	358.60
JHO-10-2	363.85	442.79	482.65	429.76	330.00	390.40	466.20	395.53
JHO-10-1	307.94	444.25	474.23	408.81	282.50	342.35	398.50	341.12
UPO-10-2	442.37	467.85	573.22	494.48	309.20	383.50	413.40	368.70
Palampur-1 (ZC)	359.06	427.29	501.15	429.17	298.20	328.30	401.10	342.53
OS-6 (NC)	320.34	397.06	437.67	385.02	298.30	385.60	456.30	380.07
Kent (NC)	318.25	357.91	393.88	356.68	293.80	356.50	393.40	347.90
Mean	359.06	425.90	466.92	-	309.70	366.41	408.10	
	V	N	For comparison of two N levels at same level of var.	For comparison of two varieties at same or different levels of N	V	N	VXN	
SEm±	9.44	3.38	11.70	18.99	7.05	3.18	11.63	
CD at 5%	27.68	9.60	33.27	53.57	20.46	9.30	34.10	
CV%								

Table-17 (b-2): Interaction effects of nitrogen levels and promising entries on green fodder yield of oat (AVTO-2 -SC) at Ranchi and Jorhat

Entries	Ranchi				Jorhat			
	Green fodder yield (q/ha)				Green fodder yield (q/ha)			
	N levels (kg/ha)				N levels (kg/ha)			
	40	80	120	Mean	40	80	120	Mean
JO-03-97	327.67	401.33	282.33	337.11	240.67	295.67	333.67	290.00
JO-03-99	270.33	277.00	441.67	329.67	345.67	368.00	387.67	367.11
SKO-170	391.33	457.00	253.67	367.33	232.33	247.33	267.67	249.11
SKO-188	417.00	320.33	423.00	386.78	347.33	366.33	382.00	365.22
OS-377	477.43	557.54	309.47	448.15	373.33	381.67	448.33	401.11
UPO-10-1	267.66	274.26	509.32	350.41	259.33	292.67	341.33	297.78
JHO-10-2	478.38	558.66	310.09	449.04	276.67	333.00	334.67	314.78
JHO-10-1	509.76	391.59	517.09	472.81	187.33	230.00	271.33	229.56
UPO-10-2	398.16	487.68	343.07	409.64	276.00	349.00	360.67	328.56
JHO-99-2 (ZC)	508.74	390.81	516.06	471.87	337.33	354.00	393.33	361.56
OS-6 (NC)	399.75	489.63	344.45	411.28	275.33	348.00	373.00	332.11
Kent (NC)	329.81	337.94	538.83	402.19	257.00	306.67	345.00	302.89
Mean	398.00	411.98	399.09		284.0	322.7	353.2	
	V	N	VXN		V	N	VXN	
SEm±	5.23	2.81	9.06		13.82	1.53	5.07	
CD at 5%	15.45	8.01	28.06		40.47	4.49	14.84	
CV%							4.75	

Table-17 (b-3): Interaction effects of nitrogen levels and promising entries on green fodder yield of oat (AVTO-2 -SC) at Jabalpur

Entries	Green fodder yield (q/ha)			
	N levels (kg/ha)			
	40	80	120	Mean
JO-03-97	379.9	443.8	471.8	431.8
JO-03-99	363.9	459.8	477.2	433.6
SKO-170	314.5	410.5	445.2	390.1
SKO-188	306.6	406.5	450.5	387.9
OS-377	314.5	359.9	391.9	355.4
UPO-10-1	319.9	395.9	423.8	379.9
JHO-10-2	333.2	377.2	394.5	368.3
JHO-10-1	295.9	386.5	397.2	359.9
UPO-10-2	219.9	314.5	351.9	295.4
JHO-822 (ZC)	325.2	410.5	426.5	387.4
OS-6 (NC)	300.0	413.2	450.5	387.9
Kent (NC)	322.5	379.9	417.2	373.2
Mean	316.3	396.5	424.9	
	V	N	VXN	
SEm±	20.56	12.3	16.54	
CD at 5%	60.63	36.52	48.63	
CV%			15.12	

Table-17(c): Effect of nitrogen levels on dry matter yield of promising entries of Oat (AVTO-2 -SC)

Treatment	Dry matter yield (q/ha)									
	Hill zone			North West zone			North East zone			
	Palampur	Srinagar	Mean	Hisar	Pantnagar	Mean	Jorhat	Ranchi	Kalyani	Mean
A. Entry										
JO-03-97	104.94	88.3	96.6	72.5	92.9	82.7	60.9	140.6	34.7	78.7
JO-03-99	106.05	90.7	98.4	66.9	107.7	87.3	77.1	123.2	31.1	77.1
SKO-170	109.54	97.2	103.4	76.2	46.9	61.6	52.3	105.0	29.0	62.1
SKO-188	106.90	100.8	103.9	70.4	46.5	58.5	76.7	114.5	30.7	74.0
OS-377	83.45	111.5	97.5	79.6	96.3	88.0	84.2	105.8	44.9	78.3
UPO-10-1	91.26	97.4	94.3	71.3	95.6	83.5	62.5	122.9	40.7	75.4
JHO-10-2	103.39	108.4	105.9	68.8	94.1	81.5	66.1	104.9	37.7	69.6
JHO-10-1	97.15	92.9	95.0	77.0	92.7	84.9	48.2	114.4	40.7	67.8
UPO-10-2	119.00	99.9	109.5	82.8	98.0	90.4	69.0	140.0	43.2	84.1
JHO-99-2 (ZC)	-	-		-	-		75.9	115.3	38.4	76.5
JHO-822 (ZC)	-	-		-	-		-	-	-	
JHO-2000-4 (ZC)	-	-		-	-		-	-	-	
Palampur-1 (ZC)	102.05	93.2	97.6	-	-		-	-	-	
OL-125(ZC)	-	-		71.4	92.0	81.7	-	-	-	
OS-6 (NC)	92.60	103.7	98.2	57.8	100.3	79.1	69.7	141.1	40.9	83.9
Kent (NC)	84.93	93.6	89.3	68.5	86.6	77.6	63.6	123.9	38.8	75.4
SEm±	2.27	1.8			2.5		2.8	1.8	0.9	
C D at 5%	6.66	5.2		6.6	7.4		8.1	5.3	2.6	
B. Nitrogen level (Kg/ha)										
40	89.13	77.7	83.4	52.8	73.2	63.0	59.6	123.2	31.5	71.4
80	102.22	98.4	100.3	73.5	89.4	81.5	67.8	121.9	36.8	75.5
120	108.44	118.3	113.4	89.2	99.8	94.5	74.2	117.8	44.4	78.8
SEm±	0.80	0.8			1.0		0.3	1.1	0.5	
C D at 5%	2.27	2.4		5.1	2.7		0.9	3.2	1.4	
C. Interaction: Entry X N levels										
SEm±		3.2					1.0	3.1	1.7	
C D at 5%	7.87	9.5					NS	11.1	4.8	
CV%							4.6		7.8	

Table-17 (d): Effect of nitrogen levels on dry matter yield of promising entries of Oat (AVTO-2 -SC)

Treatment	Dry matter yield (q/ha)						Over all mean
	Central zone			South zone			
	Jhansi	Jabalpur	Mean	Mandya	Coimbatore	Mean	
A. Entry							
JO-03-97	87.5	90.2	88.9	49.2	73.9	61.6	81.4
JO-03-99	98.9	88.9	93.9	49.3	67.4	58.4	82.5
SKO-170	85.8	77.4	81.6	32.9	84.0	58.5	72.4
SKO-188	89.3	77.8	83.6	31.0	112.5	71.8	77.9
OS-377	98.5	69.7	84.1	49.7	77.5	63.6	81.9
UPO-10-1	93.1	78.8	86.0	42.0	86.0	64.0	80.1
JHO-10-2	91.6	72.6	82.1	44.9	88.1	66.5	80.1
JHO-10-1	92.9	71.9	82.4	38.2	101.3	69.8	78.9
UPO-10-2	87.0	58.6	72.8	41.4	93.7	67.6	84.8
JHO-99-2 (ZC)	-	-		-			76.5
JHO-822 (ZC)	94.0	77.0	85.5	-			85.5
JHO-2000-4 (ZC)	-	-		46.2	76.2	61.2	61.2
Palampur-1 (ZC)	-	-		-			97.6
OL-125(ZC)	-	-		-			81.7
OS-6 (NC)	92.9	78.5	85.7	43.2	76.8	60.0	81.6
Kent (NC)	98.0	74.6	86.3	51.6	72.1	61.9	77.8
SEm±	6.1	7.3		0.9	2.9		
C D at 5%	NS	21.6		2.5	8.5		
B. Nitrogen level (Kg/ha)							
40	86.3	60.7	73.5	32.6	68.3	50.5	68.6
80	92.2	81.2	86.7	43.5	85.0	64.3	81.1
120	98.9	87.1	93.0	53.7	99.0	76.4	90.1
SEm±	1.8	6.3		0.6	1.3		
C D at 5%	5.1	18.2		1.7	3.6		
C. Interaction: Entry X N levels							
SEm±	6.2	6.2		2.0			
C D at 5%	17.6	18.5		5.7	NS		
CV%	11.6	10.3			14.6		

Table-17 (d-1): Interaction effects of nitrogen levels and promising entries on dry matter yield of oat (AVTO-2 -SC)

Entries	Srinagar				Ranchi				
	Dry matter yield (q/ha)				Dry matter yield (q/ha)				
	N levels (kg/ha)				N levels (kg/ha)				
	40	80	120	Mean	Entries	40	80	120	Mean
JO-03-97	71.56	90.32	102.99	88.29	JO-03-97	144.16	147.11	130.45	140.57
JO-03-99	75.04	89.21	107.91	90.72	JO-03-99	136.00	121.47	112.14	123.20
SKO-170	69.20	100.16	122.19	97.18	SKO-170	100.32	110.34	104.40	105.02
SKO-188	87.92	100.82	113.71	100.82	SKO-188	112.03	108.14	123.43	114.54
OS-377	94.13	110.97	129.51	111.54	OS-377	101.02	111.11	105.13	105.75
UPO-10-1	78.30	99.31	114.49	97.37	UPO-10-1	135.46	121.22	112.03	122.90
JHO-10-2	84.50	105.41	135.20	108.37	JHO-10-2	100.22	110.23	104.30	104.91
JHO-10-1	70.63	92.43	115.57	92.88	JHO-10-1	111.92	108.04	123.31	114.42
UPO-10-2	81.30	103.55	114.89	99.91	UPO-10-2	143.59	146.52	129.93	140.01
Palampur-1 (ZC)	74.55	88.64	116.32	93.17	JHO-99-2 (ZC)	112.82	108.90	124.30	115.34
OS-6 (NC)	74.58	104.11	132.33	103.67	OS-6 (NC)	144.74	147.70	130.97	141.13
Kent (NC)	70.45	96.26	114.09	93.60	Kent (NC)	136.54	122.19	112.92	123.89
Mean	77.68	98.43	118.27		**Mean**	123.24	121.91	117.77	
	V	**N**	**VXN**			**V**	**N**	**VXN**	
SEm±	1.80	0.83	3.22		SEm±	1.78	1.11	3.09	
CD at 5%	5.20	2.40	9.45		CD at 5%	5.27	3.19	11.14	
CV%					CV%				

Table-17 (d-2): Interaction effects of nitrogen levels and promising entries on dry matter yield of oat (AVTO-2 -SC) at Jabalpur

Entries	Dry fodder yield (q/ha)							
	Jabalpur				Jhansi			
	N levels (kg/ha)				N levels (kg/ha)			
	40	80	120	Mean	40	80	120	Mean
JO-03-97	72.7	95.9	102.1	90.2	77.4	90.2	94.7	87.5
JO-03-99	70.2	95.8	100.7	88.9	89.7	102.0	105.1	98.9
SKO-170	59.0	83.0	90.1	77.4	105.6	66.3	85.3	85.8
SKO-188	57.7	82.9	92.7	77.8	82.8	91.5	93.7	89.3
OS-377	60.6	71.1	77.4	69.7	88.0	98.4	109.0	98.5
UPO-10-1	62.7	81.7	91.9	78.8	93.5	85.3	100.6	93.1
JHO-10-2	64.5	74.7	78.6	72.6	81.8	98.4	94.6	91.6
JHO-10-1	56.5	78.3	81.0	71.9	83.2	97.1	98.3	92.9
UPO-10-2	40.9	63.7	71.3	58.6	82.7	81.3	97.1	87.0
JHO-822 (ZC)	63.1	84.9	82.9	77.0	79.8	100.3	101.9	94.0
OS-6 (NC)	57.7	85.9	91.8	78.5	79.9	95.6	103.2	92.9
Kent (NC)	62.3	76.7	84.9	74.6	91.2	99.8	102.8	98.0
Mean	60.7	81.2	87.1		86.3	92.2	98.9	
	V	N	VXN		V	N	VXN	
SEm±	7.3	6.3	6.2		6.05	1.79	6.20	
CD at 5%	21.6	18.2	18.5		NS	5.09	17.63	
CV%			10.3		19.63	11.61		

Table-17 (d-3): Interaction effects of nitrogen levels and promising entries on dry matter yield of oat (AVTO-2 -SC) at Mandya

Entries	Dry matter yield (q/ha)			
	N levels (kg/ha)			
	40	80	120	Mean
JO-03-97	32.05	55.33	60.21	49.19
JO-03-99	38.31	49.63	60.03	49.32
SKO-170	23.27	33.02	42.49	32.92
SKO-188	22.67	30.44	39.78	30.96
OS-377	34.12	50.36	64.57	49.68
UPO-10-1	33.82	37.92	54.13	41.95
JHO-10-2	33.86	48.42	52.28	44.86
JHO-10-1	29.05	38.15	47.36	38.19
UPO-10-2	33.55	38.82	51.78	41.38
JHO-2000-4 (ZC)	37.59	43.25	57.61	46.15
OS-6 (NC)	31.03	44.72	53.87	43.21
Kent (NC)	41.60	52.52	60.62	51.58
Mean	32.58	43.55	53.73	
	V	N	VXN	
SEm±	0.85	0.58	2.01	
CD at 5%	2.50	1.65	5.73	
CV%				

Table-17 (e): Effect of nitrogen levels on crude protein yield of promising entries of Oat (AVTO-2 -SC)

Treatment	Crude protein yield (q/ha)									
	HZ	NWZ	CZ	North East zone				South zone		
	Palampur	Pantnagar	Jabalpur	Ranchi	Kalyani	Jorhat	Mean	Mandya	Coimbatore	Mean
A. Entry										
JO-03-97	10.5	8.8	7.3	9.8	3.1	4.1	5.7	2.8	7.2	5.0
JO-03-99	10.2	11.7	7.0	9.0	2.8	4.8	5.5	3.0	6.9	5.0
SKO-170	11.2	4.8	6.1	8.6	2.6	3.3	4.8	2.2	9.8	6.0
SKO-188	10.7	4.6	6.1	9.3	2.7	5.5	5.8	1.9	12.5	7.2
OS-377	8.1	9.3	5.4	8.7	3.9	6.0	6.2	3.4	7.8	5.6
UPO-10-1	9.4	9.3	6.2	9.1	3.6	4.1	5.6	2.9	10.7	6.8
JHO-10-2	10.3	8.8	4.6	8.7	3.3	5.1	5.7	2.6	8.9	5.8
JHO-10-1	10.1	9.2	5.6	9.3	3.6	3.4	5.4	2.6	10.7	6.7
UPO-10-2	12.9	9.9	4.4	9.9	3.8	4.9	6.2	2.3	10.3	6.3
JHO-99-2 (ZC)		-	-	9.4	3.5	5.6	6.2	-		
JHO-822 (ZC)		-	6.2		-			-		
JHO-2000-4 (ZC)								2.9	8.3	5.6
Palampur-1 (ZC)	10.5									
OL-125(ZC)		8.8								
OS-6 (NC)	9.3	9.9	5.5	9.9	3.6	5.4	6.3	3.1	8.7	5.9
Kent (NC)	7.5	8.9	5.9	9.2	3.5	4.1	5.6	3.7	7.6	5.7
SEm±	0.2	0.3	0.6	0.1	0.1	0.2		0.1	0.4	
C D at 5%	0.7	0.7	2.1	0.4	0.2	0.6		0.3	1.2	
B. Nitrogen level (Kg/ha)										
40	7.9	7.1	4.7	9.2	2.7	3.7	5.2	1.9	7.3	4.6
80	10.3	8.9	6.2	9.6	3.3	4.3	5.7	2.8	8.8	5.8
120	11.9	10.0	6.7	8.9	4.0	5.0	6.0	3.6	11.2	7.4
SEm±	0.1	0.1	0.6	0.1	0.0	0.04		0.1	0.2	
C D at 5%	0.2	0.3	1.9	0.3	0.1	0.11		0.2	0.5	
C. Interaction: Entry X N levels										
SEm±			0.6	0.2		0.1		0.3		
C D at 5%	0.8		1.3	0.8		0.3		0.7	NS	
CV%			3.6			6.8			19.3	

Table-17 (e-1): Interaction effects of nitrogen levels and promising entries on crude protein yield of oat (AVTO-2 -SC)

Entries	Jabalpur				Ranchi				
	Crude protein yield (q/ha)				Crude protein yield (q/ha)				
	N levels (kg/ha)				N levels (kg/ha)				
	40	80	120	Mean	Entries	40	80	120	Mean
JO-03-97	5.7	7.8	8.4	7.3	JO-03-97	9.24	11.59	8.56	9.79
JO-03-99	5.6	7.3	8.2	7.0	JO-03-99	8.44	8.54	10.21	9.06
SKO-170	4.5	6.6	7.2	6.1	SKO-170	8.94	10.21	6.64	8.60
SKO-188	4.4	6.6	7.4	6.1	SKO-188	10.06	7.73	10.01	9.27
OS-377	4.6	5.6	6.1	5.4	OS-377	9.05	10.33	6.72	8.70
UPO-10-1	4.8	6.5	7.3	6.2	UPO-10-1	8.49	8.61	10.30	9.13
JHO-10-2	4.9	5.8	3.2	4.6	JHO-10-2	9.02	10.30	6.70	8.67
JHO-10-1	4.6	6.1	6.2	5.6	JHO-10-1	10.15	7.80	10.10	9.35
UPO-10-2	3.0	4.9	5.4	4.4	UPO-10-2	9.29	11.66	8.61	9.85
JHO-822 (ZC)	4.9	6.6	7.2	6.2	JHO-99-2 (ZC)	10.18	7.83	10.13	9.38
OS-6 (NC)	4.4	4.8	7.3	5.5	OS-6 (NC)	9.32	11.69	8.64	9.88
Kent (NC)	4.8	6.1	6.8	5.9	Kent (NC)	8.52	8.63	10.33	9.16
Mean	4.7	6.2	6.7		**Mean**	9.23	9.58	8.91	
	V	**N**	**VXN**			**V**	**N**	**VXN**	
SEm±	0.6	0.6	0.6		SEm±	0.13	0.09	0.24	
CD at 5%	2.1	1.9	1.3		CD at 5%	0.40	0.25	0.89	
CV%			3.6		CV%				

Table-17 (e-2): Interaction effects of nitrogen levels and promising entries on crude protein yield of oat (AVTO-2 -SC) at Mandya

Entries	Crude protein yield (q/ha)			Mean
	N levels (kg/ha)			
	40	80	120	
JO-03-97	1.83	3.63	2.89	2.78
JO-03-99	2.35	3.04	3.69	3.03
SKO-170	1.32	2.02	3.17	2.17
SKO-188	1.40	1.74	2.60	1.91
OS-377	2.23	3.31	4.57	3.37
UPO-10-1	1.92	2.33	4.50	2.92
JHO-10-2	2.53	2.12	3.21	2.62
JHO-10-1	1.52	3.50	2.90	2.64
UPO-10-2	1.76	2.21	2.95	2.31
JHO-2000-4 (ZC)	2.14	2.65	4.03	2.94
OS-6 (NC)	1.63	3.14	4.45	3.07
Kent (NC)	2.39	3.89	4.82	3.70
Mean	1.92	2.80	3.64	
	V	**N**	**VXN**	
SEm±	0.12	0.07	0.26	
CD at 5%	0.35	0.21	0.73	
CV%				

Table-17 (f): Effect of nitrogen levels on crude protein content and number of tillers/m row length of promising entries of (AVTO-2 -SC)

Treatment	Crude protein (%)				Number of tillers/m row length						
	Jorhat	Ranchi	Coimbatore	Mean	Hisar	Pantnagar	Jorhat	Coimbatore	Palampur	Jhansi	Mean
A. Entry											
JO-03-97	6.7	8.56	9.8	8.4	80.2	52.4	101.6	63.6	121.0	75.3	82.4
JO-03-99	6.2	9.37	10.3	8.6	83.5	52.2	141.1	69.6	115.0	70.5	88.7
SKO-170	6.3	9.15	11.5	9.0	83.5	50.9	161.2	73.8	101.0	67.1	89.6
SKO-188	7.1	8.62	11.1	8.9	82.8	50.6	172.3	63.8	107.0	65.5	90.3
OS-377	7.0	9.19	10.1	8.8	79.9	49.4	143.5	69.7	112.0	72.0	87.8
UPO-10-1	6.6	9.46	12.4	9.5	80.1	50.2	136.0	67.4	126.0	73.7	88.9
JHO-10-2	7.6	9.24	9.9	8.9	73.9	49.2	157.9	70.8	122.0	71.3	90.9
JHO-10-1	7.1	8.70	10.6	8.8	79.5	50.5	151.2	75.4	134.0	73.7	94.1
UPO-10-2	7.1	8.65	10.9	8.9	81.3	51.4	147.5	71.0	130.0	67.6	91.5
JHO-99-2 (ZC)	7.3	8.66	-	8.0	-	-	153.0	-	-	-	153.0
JHO-822 (ZC)	-	-	-	-	-	-	-	-	-	79.4	79.4
JHO-2000-4 (ZC)	-	-	10.5	10.5	-	-	-	75.0	-	-	75.0
Palampur-1 (ZC)	-	-	-	-	-	-	-	-	95.0	-	95.0
OL-125(ZC)	-	-	-	-	74.8	59.6	-	-	-	-	67.2
OS-6 (NC)	7.8	8.60	11.2	9.2	66.4	55.3	110.7	68.1	125.0	74.1	83.3
Kent (NC)	6.4	9.41	10.5	8.8	76.7	53.8	112.1	77.3	109.0	75.4	84.1
SEm±	0.1	0.03	0.2			2.1	1.3	1.4	3.0	3.0	
C D at 5%	0.3	0.08	0.7		5.9	6.0	3.8	4.1	9.0	8.9	
B. Nitrogen level (Kg/ha)											
40	6.2	8.80	10.7	8.6	68.6	50.5	131.4	63.8	119.0	70.3	83.9
80	6.4	8.99	10.3	8.6	79.1	51.1	139.6	70.4	133.0	72.6	91.0
120	6.6	9.11	11.3	9.0	88.1	54.7	151.1	77.1	104.0	73.5	91.4
SEm±	0.03	0.01	0.1			0.9	0.6	1.0	1.0	1.7	
C D at 5%	0.09	0.02	0.3		4.8	2.5	1.8	2.7	3.0	NS	
C. Interaction: Entry X N levels											
SEm±	0.1	0.034					1.3			5.9	
C D at 5%	0.3	0.095	1.1				3.7	NS	9.0	NS	
CV%	5.0		9.4					8.4		14.3	

Table-17 (g): Effect of nitrogen levels on plant height of promising entries of Oat (AVTO-2 -SC)

Treatment	Plant height (cm)									
	Hill zone			North West zone			North East zone			
	Palampur	Srinagar	Mean	Hisar	Pantnagar	Mean	Jorhat	Ranchi	Kalyani	Mean
A. Entry										
JO-03-97	127.5	96.6	112.1	117.6	152.0	134.8	153.6	128.0	145.4	142.3
JO-03-99	127.1	102.2	114.7	129.4	153.0	141.2	151.3	129.0	145.1	141.8
SKO-170	104.1	98.2	101.2	110.4	92.3	101.4	73.9	122.0	96.2	97.4
SKO-188	123.6	112.8	118.2	100.7	97.2	99.0	124.7	138.0	110.5	124.4
OS-377	132.0	103.5	117.8	118.0	157.5	137.8	158.6	125.0	152.4	145.3
UPO-10-1	121.6	113.5	117.6	115.5	155.5	135.5	155.5	130.0	152.1	145.9
JHO-10-2	121.5	100.6	111.1	100.8	155.9	128.4	159.0	124.0	154.2	145.7
JHO-10-1	124.7	106.0	115.4	92.5	147.8	120.2	141.7	140.0	151.8	144.5
UPO-10-2	126.8	110.5	118.7	101.3	159.4	130.4	152.9	129.0	167.1	149.7
JHO-99-2 (ZC)		-			-	-	161.6	136.0	156.1	151.2
JHO-822 (ZC)		-			-	-	-	-	-	
JHO-2000-4 (ZC)		-								
Palampur-1 (ZC)	116.2	108.3	112.3							
OL-125(ZC)	-	-	-	109.8	156.0	132.9				
OS-6 (NC)	129.2	100.5	114.9	90.8	156.8	123.8	153.3	126.0	152.8	144.0
Kent (NC)	121.1	110.3	115.7	96.5	149.9	123.2	143.7	128.0	148.3	140.0
SEm±	1.91	3.1			2.0		4.2	1.7	2.0	
C D at 5%	5.16	9.0		8.5	5.8		12.2	4.9	5.9	
B. Nitrogen level (Kg/ha)										
40	114.8	84.2	99.5	89.9	137.8	113.9	134.7	144.0	137.5	138.7
80	124.9	106.7	115.8	102.6	145.1	123.9	145.2	128.0	145.4	139.5
120	131.0	124.8	127.9	126.8	150.5	138.7	152.6	117.0	150.1	139.9
SEm±	0.67	1.4			0.6		0.9	0.8	1.1	
C D at 5%	1.91	4.1		6.9	1.7		2.7	2.3	3.0	
C. Interaction: Entry X N levels										
SEm±		5.6					1.7	2.9	3.7	
C D at 5%	NS	16.3					NS	8.0	NS	
CV%							3.6		4.3	

Table-17 (h): Effect of nitrogen levels on plant height of promising entries of Oat (AVTO-2 -SC)

Treatment	Plant height (cm)						Over all mean
	Central zone			South zone			
	Jhansi	Jabalpur	Mean	Mandya	Coimbatore	Mean	
A. Entry							
JO-03-97	134.0	115.4	124.7	92.0	113.9	103.0	125.1
JO-03-99	142.4	119.1	130.8	87.5	119.8	103.7	127.8
SKO-170	122.8	110.3	116.6	58.0	100.6	79.3	99.0
SKO-188	137.1	110.2	123.7	65.2	114.0	89.6	112.2
OS-377	138.1	105.2	121.7	83.7	114.4	99.1	126.2
UPO-10-1	144.2	103.1	123.7	98.0	134.7	116.4	129.4
JHO-10-2	137.4	101.1	119.3	93.0	107.4	100.2	123.2
JHO-10-1	139.3	94.9	117.1	98.2	119.1	108.7	123.3
UPO-10-2	142.6	91.5	117.1	87.9	106.8	97.4	125.1
JHO-99-2 (ZC)	-	-		-			151.2
JHO-822 (ZC)	130.8	108.6	119.7	-			119.7
JHO-2000-4 (ZC)	-			85.6	109.8	97.7	97.7
Palampur-1 (ZC)	-			-			112.3
OL-125(ZC)	-			-			132.9
OS-6 (NC)	134.3	110.2	122.3	101.0	134.2	117.6	126.3
Kent (NC)	132.5	106.9	174.7	89.2	97.1	93.2	120.3
SEm±	2.6	1.5		1.1			
C D at 5%	7.7	3.5		3.3	6.7		
B. Nitrogen level (Kg/ha)							
40	133.2	97.5	115.4	79.0	105.7	92.4	114.4
80	136.4	108.8	122.6	88.4	116.1	102.3	122.5
120	139.3	112.9	126.1	92.4	121.1	106.8	129.0
SEm±	1.0	1.6		0.4	1.6		
C D at 5%	2.7	4.5		1.1	3.2		
C. Interaction: Entry X N levels							
SEm±	3.3	1.1		1.4			
C D at 5%	NS	3.1		3.9	NS		
CV%	4.2	8.1			8.5		

Table-17 (i): Effect of nitrogen levels on leaf stem ratio of promising entries of Oat (AVTO-2 -SC)

Treatment	Leaf stem ratio									
	Hill zone			North West zone			North East zone			
	Palampur	Srinagar	Mean	Hisar	Pantnagar	Mean	Jorhat	Ranchi	Kalyani	Mean
A. Entry										
JO-03-97	0.48	0.43	0.46	0.50	0.40	0.45	1.01	1.83	0.80	1.21
JO-03-99	0.49	0.51	0.50	0.48	0.36	0.42	1.24	1.90	0.80	1.31
SKO-170	0.50	0.47	0.49	0.42	0.38	0.40	1.06	1.86	0.80	1.24
SKO-188	0.53	0.50	0.52	0.50	0.34	0.42	0.97	1.71	0.78	1.15
OS-377	0.46	0.55	0.51	0.51	0.35	0.43	1.10	1.86	0.81	1.26
UPO-10-1	0.48	0.54	0.51	0.48	0.36	0.42	1.08	1.91	0.80	1.26
JHO-10-2	0.44	0.55	0.50	0.46	0.37	0.42	1.07	1.82	0.80	1.23
JHO-10-1	0.47	0.54	0.51	0.46	0.38	0.42	1.09	1.75	0.79	1.21
UPO-10-2	0.47	0.52	0.50	0.45	0.32	0.39	1.07	1.83	0.81	1.24
JHO-99-2 (ZC)					-		1.03	1.71	0.79	1.18
JHO-822 (ZC)					-			-	-	
JHO-2000-4 (ZC)					-					
Palampur-1 (ZC)	0.53	0.50	0.52		-					
OL-125(ZC)				0.48	0.46	0.47				
OS-6 (NC)	0.46	0.53	0.50	0.41	0.38	0.40	1.20	1.82	0.81	1.28
Kent (NC)	0.49	0.58	0.54	0.49	0.37	0.43	1.06	1.90	0.80	1.25
SEm±	0.02	0.01			0.03		0.02	0.04	-	
C D at 5%	0.05	0.03		-	NS		0.07	0.12	-	
B. Nitrogen level (Kg/ha)										
40	0.37	0.47	0.42	0.44	0.36	0.40	1.11	1.81	0.79	1.24
80	0.51	0.53	0.52	0.49	0.37	0.43	1.06	1.80	0.80	1.22
120	0.56	0.55	0.56	0.51	0.38	0.45	1.07	1.87	0.82	1.25
SEm±	0.01	0.004			0.01		0.01	0.02	-	
C D at 5%	0.03	0.013			NS		0.02	0.05	-	
C. Interaction: Entry X N levels										
SEm±		0.02					0.02	0.07	-	
C D at 5%	0.90	0.06					0.06	0.16	-	
CV%							5.8			

Table-17 (j): Effect of nitrogen levels on leaf stem ratio of promising entries of Oat (AVTO-2 -SC)

Treatment	Leaf stem ratio						Over all mean
	Central zone			South zone			
	Jhansi	Jabalpur	Mean	Mandya	Coimbatore	Mean	
A. Entry							
JO-03-97	0.44	0.71	0.58	0.51	0.34	0.43	0.68
JO-03-99	0.50	0.76	0.63	0.49	0.37	0.43	0.72
SKO-170	0.45	0.68	0.57	0.56	0.42	0.49	0.69
SKO-188	0.43	0.68	0.56	0.58	0.43	0.51	0.68
OS-377	0.50	0.62	0.56	0.35	0.37	0.36	0.68
UPO-10-1	0.45	0.58	0.52	0.30	0.34	0.32	0.67
JHO-10-2	0.45	0.61	0.53	0.50	0.34	0.42	0.67
JHO-10-1	0.41	0.57	0.49	0.46	0.32	0.39	0.66
UPO-10-2	0.42	0.54	0.48	0.45	0.35	0.40	0.66
JHO-99-2 (ZC)	-	-		-			1.18
JHO-822 (ZC)	0.40	0.62	0.51	-			0.51
JHO-2000-4 (ZC)	-			0.48	0.41	0.45	0.45
Palampur-1 (ZC)	-			-			0.52
OL-125(ZC)	-			-			0.47
OS-6 (NC)	0.36	0.68	0.52	0.47	0.30	0.39	0.67
Kent (NC)	0.42	0.64	0.53	0.59	0.35	0.47	0.70
SEm±	0.02	0.03		0.02	0.02		0.02
C D at 5%	0.07	0.08		0.05	0.04		0.12
B. Nitrogen level (Kg/ha)							
40	0.42	0.59	0.51	0.40	0.32	0.36	0.64
80	0.43	0.66	0.55	0.47	0.36	0.42	0.68
120	0.46	0.68	0.57	0.57	0.41	0.49	0.72
SEm±	0.01	0.01		0.01	0.01		
C D at 5%	NS	0.03		0.03	0.01		
C. Interaction: Entry X N levels							
SEm±	0.05	0.01		0.04			
C D at 5%	NS	0.03		0.10	NS		
CV%	19.77	4.20			15.0		

D. NEW RESEARCH TRIAL

AST-18: Effect of Integrated Nutrient Management on yield and quality of oat (Exploratory)

Location: Imphal and Kalyani **[Reference Table – 18]**

The experiment was initiated during Rabi 2012-13 on location specific mode with a view to assess the effect of nitrogen and FYM level on productivity, quality and economics of forage oat. The total ten treatment comprised of T_1- RDF (80:40 N: P), T_2- N @ 60 kg/ha+FYM @ 5 t/ha, T_3- N @ 60 kg/ha+FYM @ 7.5 t/ha, T_4- N @ 60 kg/ha+FYM @10 t/ha, T5- N @ 100 kg/ha+FYM @ 5 t/ha, T_6- N @ 100 kg/ha+FYM @7.5 t/ha, T_7- N @100 kg/ha+FYM @10 t/ha, T_8- N @120 kg/ha+FYM @5 t/ha, T_9- N@120 kg/ha+FYM @7.5 t/ha and T_{10}- N @120 kg/ha+FYM @10 t/ha laid out in RBD and replicated thrice. This trial could not be conducted at Kalyani centre. The data of first year experimentation of Imphal centre revealed that application of N @ 60 kg/ha + FYM @ 7.5 t/ha recorded highest green fodder yield (390.48 q/ha), crude protein yield (7.00 q/ha) and leaf stem ratio (0.20). Economics point of view, net monetary return and benefit cost ratio were also followed the same trend. But the treatment T_7 (N @ 100 kg/ha+FYM @10 t/ha) and T_5 (N @ 100 kg/ha+FYM @ 5 t/ha) produced tallest plant and highest crude protein content (8.58 %) over the other treatments. Overall, T_3- N@60 kg/ha+FYM@7.5 t/ha was found best in terms of quality, green fodder production and economics in the first year of experimentation.

Table-18: Effect of integrated nutrient management on yield, quality and economics of oat (sc) at Imphal

Treatment	GFY (q/ha)	DMY (q/ha)	CPY (q/ha)	Crude protein (%)	Plant height (cm)	Leaf stem ratio	Net monetary return (Rs/ha)	Benefit cost ratio
RDF (80:40 N:P)	280.95	75.18	4.43	5.95	138.56	0.20	25496	2.53
N @ 60 kg/ha + FYM @5 t/ha	304.76	87.45	5.83	6.68	132.44	0.19	25790	2.29
N @ 60 kg/ha + FYM @7.5 t/ha	390.48	95.27	7.00	7.39	143.44	0.20	36773	2.69
N @ 60 kg/ha + FYM @10 t/ha	271.43	82.16	6.33	7.81	136.33	0.17	17040	1.72
N @ 100 kg/ha + FYM @5 t/ha	257.14	70.86	6.07	8.58	130.89	0.19	17691	1.85
N @ 100 kg/ha + FYM @7.5 t/ha	338.10	84.81	5.24	6.24	139.00	0.19	27958	2.23
N @ 100 kg/ha + FYM @10 t/ha	380.95	96.18	5.31	5.53	149.44	0.18	32512	2.32
N @ 120 kg/ha + FYM @5 t/ha	352.38	97.62	4.73	4.87	137.33	0.18	31503	2.48
N @ 120 kg/ha + FYM @7.5 t/ha	276.19	75.51	5.19	7.03	136.67	0.16	18200	1.78
N @ 120 kg/ha + FYM @10 t/ha	285.71	81.19	6.42	7.91	121.89	0.19	17753	1.71
SEm±	12.63	4.00	0.43	0.73	2.48	0.01	1894	0.09
C D at 5%	37.52	11.87	1.28	2.18	7.38	NS	5628	0.26
CV%	6.97	8.18	13.22	18.68	3.15	10.99	13.09	7.00

CHAPTER-3

FORAGE CROP PROTECTION

PPT-1: MONITORING OF INSECT-PESTS AND DISEASES ASSOCIATED WITH BERSEEM, LUCERNE AND OAT ECO SYSTEM

Locations: Bhubaneswar, Dharwad, Hisar, Hyderabad, Jhansi, Ludhiana, Palampur and Rahuri

The objective of this study was to record the occurrence and abundance of major insect pest and diseases in Berseem, Lucerne and Oat at different locations and to determine their relationship with weather parameters. The crop-wise monitoring of insect pest and diseases at different centres was recorded and summarized as follows.

1. Berseem

Bhubaneswar: Berseem suffered from leaf spots and root rot. First incidence of root rot was recorded during first week of February and it was found to be 3.3%. Infestation of leaf defoliators started from first week of January (0.3 No. /10 plants) and it was found to be maximum during first week of February (1.3 No. /10 plants).

Jhansi: Incidences of stem rot (*Sclerotinia trifoliorum*) started from first week of January and continued to increase (30%) up to second week of February. Disease development was favoured by low temperature less than 15^0C and high humidity (>80%). The root rot (*Rhizoctonia solani*) appeared in the last week of March and continued to increase (35%) up to last harvest. Incidences of foliar blight (*Alternaria sp* and *Epicoccum* sp) were also recorded this year.

Ludhiana: Stem rot caused by *Sclerotinia sclerotiorum* appeared in the last week of December on BL 10 variety of berseem with the showers received during mid December. The per cent disease index was 10.10. Thereafter abrupt increase in disease incidence was observed up to mid January with mean RH of 81 to 83 per cent and mean temperature of 7.6 to 11.9^{o}C. The steady increase in disease incidence was observed with prevailing temperature of 13.6 to 16.8^{o}C although the relative humidity was more than 80.0 per cent. The disease intensity was less due to no frost and warm weather prevalent during the period. The maximum percent disease incidence was 43.94 per cent.

Palampur: Root rot caused by *Rhizoctonia solani* appeared in the third week of March and progressed up to fourth week but severity of disease remained mild (5%). The leaf spot appeared (3%) in the first week of April and progressed up to first week of May (10%). Beetle infestation initiated from first week of April and reached maximum level (20%) in the first week of May.

2. Lucerne

Rahuri: The population of pea aphid (*Acyrthosiphon pisum*) noticed on Lucerne during second week of December (2.6 aphids/tiller) and increased up to first week of January, 2013 (26.40 aphids/tiller). Thereafter the decreasing trend of pea aphid population was noticed up to third week of January, 2013. Again the population of pea aphid started increasing and reached its peak during second week of February (34.40 aphids/tiller). After that population started declining and showed nil population during first week of March. The cowpea aphid (*Aphis craccivora*) started build up on Lucerne during fourth week of January 2013 (3.8 /tiller) and increasing trend was noticed up to second week of February with highest population (28.20 aphids/tiller). Thereafter, population started declining and nil population was recorded during fourth week of February. Though the, spotted aphid (*Therioaphis maculata*) is predominant species in Western Maharashtra, it

started appearing on crop during third week of March with 6.20 aphids/tiller and it showed increasing trend up to second week of April 2013 (17.20 aphids/tiller). Thereafter population started declining and showed nil population during first week of May 2013. During the aphid infestation, population of predatory lady bird beetles was moderate to high (1.60 to 10.4 grubs/tiller).

The larval population of defoliators started appearing on Lucerne crop during first week of March, 2013 (0.5 larva / m^2) and showed increasing trend with its peak population (14.30 larvae/m^2) during the fourth week of April 2013. Thereafter, population started declining and showed nil population during the second week of June 2013 The population of *H. armigera* was noticed on Lucerne seed crop during first week of April, 2013 (1.6 larvae/m^2) and showed increasing trend up to third week of May 2013 with highest population of 9.20 larvae/m^2. After that population declined at the time of harvest in seed crop. In berseem crop, no insect- pest infestation/ incidence observed during crop period.

Bhubaneswar: Lucerne didnôt suffer from major diseases only leaf blight was recorded during third week of January (0.4 in the scale of 1-5) while it was found to be maximum during first week of February (0.8 in the scale of 1-5). Infestation of leaf defoliators also started from third week of January (0.6 no. /10 plants) and it was maximum during first week of February (1.6 no. /10 plants).

Jhansi: Incidences of downy mildew (*Perenospora trifoli*) were recorded in the month of February [maximum disease (10%)]. Rust (*Uromyces striatus*) appeared in the second week of March its intensity continued to increase (30%) up to last week of April. Alfalfa weevil infestations were severe (70%) during first and second week of February.

Palampur: Leaf spot disease initiated (2%) from first week of April and progressed up to second week of May and reached maximum (12%). Defoliating beetles also appeared during this period with maximum infestation (25%) being in first to second week of May.

Dharwad: Insect and disease incidence was observed during second fortnight of January to second fortnight of April. The aphid population started building up from January onward and reached peak during second fortnight of February (218 aphids / stem) and started declining after second fortnight of April and became nil in May. Among diseases, rust was the major one and 54% of disease severity was recorded during first fortnight of March. Disease intensity was almost nil during May.

3. Oats

Bhubaneswar: Oat suffered from leaf blight, leaf spots and leaf defoliators. Leaf blight varied from 0.4 to 1.2 while leaf spot varied from 0.6 to 1.0 in 1-5 Scale. Incidence of leaf blight was found to be 0.4 in the scale of 1-5 during third week of December and the disease was found to be maximum during first week of February (1.2 in the scale of 1-5). First incidence of leaf spots was recorded in third week of January and it was found to be 0.6 in the scale of 1-5. During first week of February, the leaf spot was found to be maximum (1.0 in the scale of 1-5). Infestation of leaf defoliators started from first week of January (0.3 No. / 10 plants) and it was maximum during first week of February (2.0 No. /10 plants).

Jhansi: Minor incidences (<5%) of leaf blight (*Helminthosporium avenae*) were recorded during February and March. Aphid infestation (*Aphis craccivora*) were high (>70%) in the oat crop grown for seed purpose during March and April.

Ludhiana: Development of leaf blight caused by *Helminthosporium avenae* was studied on Kent variety of oats. The disease appeared in the first week of February. The disease development was favoured by mean temp 15.6-20.8^{0}C at mean RH 70-75%. The period received 33.4 mm rainfall. The disease severity reached to 35.93% in third week of March.

Palampur: Powdery mildew and leaf blight were initiated in third week of March and progressed up to the second week of May, reaching to maximum disease severity of 90 &16 %, respectively. Loose smut incidence (3%) was recorded in second week of May. Aphids and Thrips infestation (5%) was recorded in fourth week of March and reached maximum by third week of April (15%).

Rahuri: Aphids (*Rhopalosiphum paddi*) was noticed during second week of January, 2013 (5.8 aphids/tiller) and it reached at maximum level (89.20 aphids/ tiller) during second week of February 2013. It started declining and recorded nil population on oat during the first week of March 2013. During the infestation of aphids, grubs and adult of predatory lady bird beetles, Chrysopa and syrphid fly were also observed on crop.

PPT- 2A: FIELD SCREENING OF RABI BREEDING MATERIALS FOR RESISTANCE TO INSECT- PEST AND DISEASES

Locations: Bhubaneswar, Dharwar, Hisar, Hyderabad, Jhansi, Palampur, Rahuri

A. Lucerne (Perennial*):* All the entries tested at Hisar and Ludhiana for downy mildew and at Rahuri for Aphid infestation were found susceptible to the pests (Table PPT 2A1).

Table PPT 2A1: Reaction of improved varieties of Lucerne against Insect-pests and diseases

Entries	Aphid/tiller (Rahuri)	Downy mildew (%) (Ludhiana)	Downy mildew (%) (Hisar)
VTL 11-1	19.30	33.00	25
VTL 11-2	12.37	25.33	25
VTL 11-3	31.27	33.67	30
VTL 11-5	12.40	37.67	20
VTL 11-6	31.07	34.33	20
VTL 11-7	38.97	43.67	35
VTL 11-8	27.60	34.00	20
VT11-9	36.53	34.00	15

B. Oats (Single cut): Entries OS-405, Ol-1709, Ol-1760 and NDO-724 were found resistant to leaf blight at Jhansi centre, whereas at Bhubaneswar all the entries showed resistant reactions (Table PPT 2A 2)

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

Entries	Hisar	Jhansi	Ludhiana	Bhubaneswar
UPO 212-1	0			1.0
OL-125	T	-	2.9	
OS-405	10	0.0	2.8	1.0
SKO-90	-	-	-	
OL1709	10	1.0	3.6	1.0
JHO-2000-4	-	-	-	
JO-04-14	T	3.3	3.8	0.2
JHO-822	-	3.3	-	
JHO-2012-1	T	2.0	2.2	1.0
OL-1760	T	0.0	-	1.0
JHO-99-2	-	-	-	1.0
SKO-190	0	2.6	2.5	1.4
RSO-60	T	3.3	2.6	1.0
OS-6	0	3.0	2.4	1.4
JHO-2012-2	T	1.3	2.3	1.0
UPO-12-2	0		2.4	1.0
KENT	0	4.0	1.6	1.2
RSO-59	0	2.0	3.0	1.0
NDO-724	0	0.0	2.4	1.4

Reactions of IVT entries of Oat against diseases and pest are presented in Table PPT.2A.3. At Palampur, entries OL-1709 and OL-1760 showed moderately resistant reactions against powdery mildew disease. At Rahuri centre, aphid infestation was least in JHO-2012-2.

Table PPT 2A 3: Reaction of IVT entries of Oats to Diseases (%) and pests

Entries	Palampur	Bhubaneswar		Rahuri
	Powdery mildew	Leaf spot	Leaf Defoliator	Aphids/tiller
UPO 212-1	44.3 (S)*	0.5	0.6	59.73
OL-125	-	-	-	70.13
OS-405	73.7(HS)	1.0	0.6	-
SKO-90	41.3(S)	-	-	-
OL1709	24.0(MR)	0.2	1.0	58.27
JHO-2000-4	-	-	-	-
JO-04-14	8.3 (MR)	1.2	0.3	51.80
JHO-822	-	-	-	48.87
JHO-2012-1	84.0 (HS)	0.5	1.3	125.10
OL-1760	15.7 (MR)	0.5	0.6	127.27
JHO-99-2	-	1.0	0.6	-
SKO-190	7.3 (MR)	0.2	0.3	34.87
RSO-60	10.0 (R)	0.1	1.0	44.97
OS-6	64.0 (HS)	0.5	1.0	38.80
JHO-2012-2	72.7 (HS)	0.7	0.6	21.83
UPO 12-2	26.0 (S)	0.5	1.0	37.77
KENT	68.3 (HS)	0.5	1.0	58.93
RSO-59	38.3 (S)	0.5	1.3	35.83
NDO-724	73.3 (HS)	0.2	0.3	24.47

* Disease reaction ï R- resistant, MR- moderately resistant, S-susceptible, HS-highly susceptible

Disease reaction of AVT (SC-1) entries presented in table PPT 2A 5. The results revealed that entry SKO-16 showed resistant reactions against leaf blight disease at Ludhiana centre. However at Jhansi centre all the entries showed resistant reactions except OS-6 and JO-04-11. At Bhubaneswar centre also similar results were obtained.

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

Entries	Ludhiana	Hisar	Jhansi	Bhubaneswar
OS-403	3.2	T	0.6	1.2
UPO-05-1	3.0	T	1.6	1.2
JHO-2000-4	-	-	-	-
NDO-711	2.3	3.3	1.4	1.0
JHO-99-2	-	-	-	1.2
UPO-06-1	2.3	3.3	1.2	1.4
SKO-90	-	-	-	-
RJB-1	2.3	3.3	1.0	1.4
KENT	2.8	T	1.6	1.4
OL-125	3.7	T	-	-
JHO-822	-	-	1.4	-
OS-6	2.7	0	2.6	2.0
NDO-10	3.4	10.0	1.6	1.4
SKO-167	1.9	T	1.8	1.4
JO-04-11	2.4	T	2.3	1.2
Scored on 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%).				

Pest reactions of AVT (SC-1) entries are presented in table PPT 2A 6. The result revealed that at Palampur centre, entries UPO-06-1 and SKO-167 showed moderately resistant reactions against powdery mildew. Aphid infestation was least in entries UPO-05-1 and SKO-167 at Rahuri centre. All the entries showed resistance against leaf spot at Bhubaneswar centre.

Table PPT 2A 6: Reaction of AVT (SC-1) entries of Oats (single cut) to pests and diseases

Entries	Palampur Powdery mildew (%)	Rahuri Aphids/tiller	Bhubaneswar	
			Leaf spot	Leaf defoliators
OS-403	87.3 (HS)	20.23	0.5	1.6
UPO-05-1	33.7 (S)	17.13	0.1	-
JHO-2000-4	-	-	-	-
NDO-711	41.7 (S)	61.67	0.3	-
JHO-99-2	-	-	0.5	-
UPO-06-1	16.0 (MR)	57.00	0.1	-
SKO-90	35.3 (S)	-	-	-
RJB-1	46.7 (S)	51.67	0.2	1.0
KENT	57.0 (HS)	29.27	0.2	-
OL-125	-	-	-	-
JHO-822	-	23.80	-	-
OS-6	52.3 (HS)	23.00	0.1	-
NDO-10	32.0 (S)	35.93	0.2	-
SKO-167	11.7 (MR)	17.40	0.1	1.0
JO-04-11	59.0 (HS)	32.67	0.1	-

*Seed not received hence not in trial

Table PPT 2A 7: Reaction of AVT (SC-2) entries of Oats (single cut) to Leaf blight

Entries	Jhansi	Ludhiana	Hisar	Bhubaneswar
JO-03-99	0.0	2.3	33.0 (S)	1.5
OL-125	-	3.0	-	-
JHO-10-1	1.2	4.0	35.0 (S)	1.5
JHO-2000-4	-	-	-	-
SKO-170	0.8	0.0	6.0 (HR)	2.0
JHO-10-2	0.0	2.2	11.3 (MR)	2.0
JHO-822	2.6	-	-	-
SKO-188	0.0	0.8	12.3 (MR)	2.0
KENT	1.6	1.1	34.7 (S)	1.5
JO-03-97	0.4	4.8	29.3 (S)	2.0
Palampur-1	-	-	7.0 (MR)	-
UPO-10-1	3.0	2.8	24.0 (MR)	1.2
JHO-99-2	-	-	-	1.5
OS-377	3.0	1.8	18.0 (MR)	1.5
OS-6	2.3	1.2	64.0 (HS)	2.0
UPO-10-2	0.3	1.8	40.3 (S)	2.0
Scored on 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%).				

Pest reactions of AVT (SC-2) entries are presented in table PPT 2A-8. The results revealed that entry SKO-170 was found resistant to powdery mildew disease at Palampur centre. Aphid infestation was least in the entries SKO-170 and JO-03-97 at Rahuri centre.

Table PPT 2A 8: Reaction of AVT (SC-2) entries of Oats to diseases and pests

Entries	Palampur	Bhubaneswar		Rahuri
	Powdery mildew (%)	Leaf spot	Leaf Defoliators	Aphids/tiller
JO-03-99	53.3 (HS)	0.1	-	28.00
OL-125	-	-	-	21.67
JHO-10-1	73.7 (HS)	0.5	-	20.40
JHO-2000-4	-	-	-	-
SKO-170	13.0 (MR)	0.2	-	10.67
JHO-10-2	72.3 (HS)	0.1	-	24.07
JHO-822	-	-	-	29.00
SKO-188	74.7 (HS)	0.2	1.0	19.40
KENT	81.0 (HS)	0.2	-	15.13
JO-03-97	82.3 (HS)	0.2	-	11.73
Palampur-1	64.0 (HS)	-	-	-
UPO-10-1	83.0 (HS)	0.1		18.20
JHO-99-2	-	1.0	-	-
OS-377	90.0 (HS)	0.5	-	30.60
OS-6	91.7 (HS)	0.2	-	26.13
UPO-10-2	76.7 (HS)	0.1	-	

Oats (Dual)

The results of IVT trial are presented in Table PPT 2A-9. Entries RO-19, JHO-2012-5, UPO-212, OL-1775, JHO-2012-4 and NDO-1709 were resistant to leaf blight at Jhansi centre.

Table PPT 2A 9: Reaction of IVT entries of Oat (Dual) to leaf blight

Entries	Jhansi	Hisar	Bhubneshwar
OL-1709	3.6	25.0	1.5
RO-19	0.0	25.0	1.5
JHO-2012-5	1.6	10.0	2.0
UPO-212	0.0	6.6	1.5
OS-387	2.6	6.6	2.0
JO-09-504	3.0	6.6	1.5
OL-1775	2.0	30.0	1.5
JHO-822	3.6	15.0	1.5
JHO-2012-4	1.2	T	1.0
NDO-1709	0.0	10.0	2.0

Pest reactions of IVT entries of oat (Dual) are presented in table PPT-2A-10. The results revealed that entry JHO-2012-4 was least infested with aphid at Rahuri centre. All the entries were highly susceptible to powdery mildew disease at Palampur.

Table PPT 2A 10: Reaction of IVT entries of Oat (Dual) to diseases and pest

Entries	Rahuri	Palampur	Bhubaneswar	
	Aphids/tiller	Powdery mildew (%)	Leaf spot	Leaf Defoliators
OL-1709	60.03	81.7 (HS)	0.4	0.3
RO-19	20.43	95.0 (HS)	0.4	0.6
JHO-2012-5	27.60	71.7 (HS)	0.4	0.3
UPO-212	36.93	63.3 (HS)	0.3	0.6
OS-387	23.13	95.0 (HS)	0.7	0.3
JO-09-504	27.93	85.0 (HS)	0.3	0.3
OL-1775	20.77	44.7 (HS)	0.4	0.3
JHO-822	14.83	72.7 (HS)	0.4	0.6
JHO-2012-4	12.10	82.0 (HS)	0.2	0.3
NDO-1709	43.63	47.0 (HS)	0.3	0.3

OATS (Multi cut)

Results of IVT trial are presented in Table PPT 2A-11. The results revealed that entries RO-19, PLP-14, HFO-488, UPO-212, OL-1766, JHO-2012-3 showed resistant to leaf blight disease at Jhansi centre. All the entries except HFO-488 showed resistance at Bhubaneswar centre.

Table PPT. 2A. 11 : Reaction of IVT entries of Oat (multi cut) to leaf blight

Entries	Jhansi	Hisar	Bhubneshwar
RO-19	0.0	25.0	1.5
PLP-14	1.0	15.0	1.2
HFO-488	1.2	15.0	2.5
UPO-212	1.8	15.0	1.8
OL-1769	2.6	30.0	1.2
OL-1766	0.0	30.0	-
JHO-2012-3	1.3	15.0	2.0
JO-04-315	2.6	15.0	1.2
Kent	3.6	10.0	0.7

Reaction of IVT entries of oat (MC) to diseases and pest are presented in Table PPT 2A-12. The results revealed that aphid infestation was least in entries RO-19 and OL-1766 at Rahuri centre. All the entries were found susceptible to powdery mildew at Palampur centre.

Table PPT 2A. 12 : Reaction of IVT entries of Oat (MC) to diseases and pest

Entries	Rahuri Aphids/tiller	Palampur Powdery mildew (%)	Bhubaneswar	
			Leaf spot	Leaf defoliators
RO-19	15.23	91.7 (HS)	0.7	0.3
PLP-14	43.03	92.3 (HS)	0.4	0.3
HFO-488	26.40	73.0 (HS)	0.4	0.6
UPO-212	23.97	73.3 (HS)	0.3	0.3
OL-1769	24.07	72.7 (HS)	0.3	0.6
OL-1766	13.60	81.0 (HS)	0.4	0.6
JHO-2012-3	22.00	71.7 (HS)	0.3	0.3
JO-04-315	26.87	66.7 (HS)	0.4	0.3
Kent	45.17	80.0 (HS)	0.2	0.6

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

Location : Jhansi and Ludhiana

Berseem frequently suffers heavy damages due to various kinds of rot diseases caused by 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 trials were tested for these diseases in the permanent stem rot and root rot sick plots. The results are presented in Table PPT 2B.1. It was noticed that all the single cut entries were resistant to root and stem rot diseases at Jhansi centre. However at Ludhiana centre these entries showed moderately susceptible reaction against stem rot disease.

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

Entry Name	Stem rot incidence (%)		Root rot
	Ludhiana	Jhansi	Jhansi
Wardan	4.3	3.6	4.0
JB-SC-1	3.0	1.0	0.0
JB-SC-4	2.3	0.0	0.0
JB-SC-3	2.7	0.0	1.3
BB-2	4.3	2.3	2.6
JB-SC-2	3.3	1.3	0.0
Mescavi	3.7	2.6	3.6

PPT-12: INTEGRATED DISEASE MANAGEMENT IN WHITE CLOVER

Location: Palampur

The trial comprised of 10 treatments (Table PPT-12). The disease incidence under various treatments showed that seed treatment with Carbendazim (2g/kg seed), *Trichoderma viride* (5 g/kg seed) and foliar spray of Carbendazim (0.5%) followed by contaf (0.4%) (T_9) was found to be the most effective with least disease incidence (Powdery mildew 3.8% and Clover rot 1.5%) as compared to un treated control (57.8% and 9.7 %, respectively). However, T_7 also showed significantly less incidence of powdery mildew as compared to control. Seed yield was also increased 2.6 q/ha against 1.8 q/ha in control.

Table PPT 12. Effect of seed treatment and foliar sprays on disease incidence and seed yield (q/ha) of white clover

Treatments	Disease Incidence (%)		Seed yield (q/ha)
	Powdery mildew	Clover Rot	
Seed treatment (ST) with Carbendazim ï T_1	36.5	2.5	1.9
Trichoderma viridae (ST) ï T_2	42.4	6.4	1.9
T_1 + foliar spray of Carbendazim ï T_3	18.9	1.9	1.8
T_2+ foliar spray of Carbendazim ï T_4	27.3	5.2	2.4
T_1+ foliar spray of Contaf ï T_5	4.3	1.9	2.5
T_2+ foliar spray of Contaf ï T_6	4.3	7.1	2.0
T_1+ foliar spray of Carbendazim followed by contaf ï T_7	3.9	2.2	2.1
T_2+ foliar spray of Carbendazim followed by contaf ï T_8	4.2	6.8	2.4
T_1+ T_2+ foliar spray of Carbendazim followed by contaf T_9	3.8	1.5	2.6
Untreated control ï T_{10}	57.8	9.7	1.8
CD 5%	0.85	0.57	0.23

PPT 17: TO STUDY THE PATHOGENIC VARIABILITY OF OATS

A. *Erysiphe graminis* f. sp. *avenae* on oat

Location: Palampur

During the season four isolates of oat powdery mildew (*Erysiphe graminis* f. sp. *Avenae*) were collected and are maintained in the Controlled conditions (Green house) for the development of differential set to study the pathogenic variability. The reaction of the three isolates was recorded on detached leaf method under *in vitro* as infection types i.e. 0-4 under stereo zoom microscope on seventy line of oat as given in tables PPT 17A, 17B. These 70 lines will be further evaluated with about 10 isolates to be collected during next season for the development of differential set of 10-12 line. The pathogenic variability will be studied after the development of differential set. The detached leaf methods for evaluation of oat germplasm under *in vitro* and scale for the recording of infection types was standardized for pea powdery mildew (Banyal, 1995) will be used.

Table PPT 17A: Isolates of *Erysiphe graminis avenae* collected from different locations

Isolate number	**Place of collection**	**Isolate number**	**Place of collection**
EGA 1	Research farm Agronomy	EGA 2	Tanda (Palampur)
EGA 3	Nagrota (Kangra)	EGA 4	Fodder farm

Table PPT 17B: Reaction of genotypes of oat to isolates of *Erysiphe graminis avenae*

S. no	Oat germplasm	Infection types with isolates			
		Agronomy (EGA 1)	Tanda (EGA 2)	Nagrota (EGA 3)	Average
1	OL-160	0	2	1	1
2	OAT H38	1	4	1	2
3	K-353	2	2	1	2
4	OL-9	0	1	1	1
5	OAT JHO-862	1	2	1	1
6	UPO-130-2011-12 R1	2	2	1	2
7	IG-03-248 R1	1	2	1	1
8	HFO-163R2	1	1	1	1
9	OAT 702	4	2	2	3
10	OAT 8655R1	2	2	1	2
11	OAT 80	2	1	1	1
12	OS-10 2011-12	0	2	1	1
13	KRR-AK-42	0	2	1	1
14	OAT OH-822	1	1	1	1
15	OAT NO-17	1	1	1	1
16	IG-03-246 OAT	1	3	1	2
17	OAT IG-03-213	4	1	2	2
18	OAT EC-605838	4	3	1	3
19	OL-822	0	2	1	1
20	UPO-119	0	2	2	1
21	OAT IG-03-254	3	3	2	3
22	KRR-AK-36	1	2	1	1
23	HFO-52	2	3	1	2

24	OAT EC-605839	1	4	1	2
25	IG-03-203-2011-12R1	1	2	2	2
26	OS-9	0	1	1	1
27	OAT 14-03-247	0	1	1	1
28	OAT IGO 3-214	3	1	1	2
29	KRR-AK-15 R2	0	3	2	2
30	OAT TRS-RKC	0	2	1	1
31	JHO-99-2	1	2	1	1
32	PLP-1	0	1	1	1
33	IG-03-251	0	2	1	1
34	OAT 190-14	0	2	1	1
35	IG-03-2111-123	4	1	1	2
36	OAT-79	0	1	1	1
37	VPO-102-2011-123	3	1	1	2
38	EC_6058	0	2	2	1
39	OAT EC-605834 2011-12R1	1	3	1	2
40	IG-03205	0	1	1	1
41	JHO-813	2	2	1	2
42	OAT NO-77	1	2	1	1
43	KRR-A6-06	0	2	2	1
44	OL-125	0	1	1	1
45	JHO-817	0	1	1	1
46	OAT902-2011-12-R-11	1	2	1	1
47	AOG1124 R1	4	1	1	2
48	CHORRI RATTR3	0	2	1	1
49	SNTM-90R!	0	1	1	1
50	KENT(C)R3	0	2	1	1
51	OS-6-2011-12R2	0	2	1	1
52	PO-113 R-111 2011 -12	0	3	1	1
53	KRR ï A6-28R3	1	2	2	2
54	HFO-702	4	1	1	2
55	OAT IG03-250	0	2	1	1
56	OAT UPO-212	4	2	1	2
57	JHO-822	0	3	2	2
58	R019	1	3	1	2
59	EC-605837	1	1	1	1
60	HFO-114	0	3	1	1
61	OAT IG-03-28	0	1	1	1
62	OAT ADG-96	1	3	1	2
63	OAT OS-121	0	1	1	1
64	OAT 99-1	4	2	1	2
65	IG-03 216	3	3	1	2
66	OAT IJ-03-266	0	2	2	1
67	OAT HJ-6	3	2	1	2
68	HFO-60	3	3	1	2
69	OAT EC-605631	0	1	4	2
70	OAT OS-92	0	2	1	1

The description of infection types (Banyal, 1995) is as below:

Infection type	Description
0	No mycelium growth.
1	Sparse mycelium growth with very little sporulation.
2	Slight growth of mycelium is evident macroscopically.
3	Moderate growth of mycelium as evident macroscopically & formation of clear colonies.
4.	Abundant growth of mycelium is evident macroscopically & colonies get mixed with each other leading to the formation of mycelia.

The above infection types were employed for studying the pathogenic variability. In designating the pathotypes, only two disease reaction categories were used viz; resistant (R) including 0,1 and 2 infection types, and susceptible (S) including 3 and 4 infection types.

B. *Helminthosprium avenae* on oat

Location : Ludhiana, Bhubaneswar and Jhansi

Isolates of *Helminthosprium avenae* from different centres were collected and maintained at Jhansi centre.

The leaf blight and spot samples were isolated on PDA (Potato dextrose agar) and incubated in BOD incubator at 22±2^{o}C. No sporulation was observed and only grayish white mycelium was observed under the microscope at Ludhiana centre. At Jhansi *Helminthosprium avenae* was isolated from the leaf blight disease sample of oats obtained from Jhansi, Ludhiana and Bhubaneswar centre.

PPT 18: EVALUATION OF ENTAMOPATHOGENIC FUNGI ON INSECT PESTS OF LUCERNE

Location : Rahuri, Hyderabad, Jhansi and Dharwad

Dharwad

The trial comprised of 11 treatments. The results revealed that aphid incidence was mainly noticed in the present experiment and the incidence of other insect pests was minor and negligible (Table PPT 18A). Entomopathonic fungi *viz.,Verticillium lecanii* @ 4x10^{6} cfu/ml (2g/l) and *Beauveria bassiana* @ 4x10^{6} cfu/ml 2g/l) and half dose of each were at par with each other and they were more effective than any other entomopathogenic fungi in bringing down the aphids population (Table PPT 18A). However, aphid reduction was also noticed in either *V. lecanii* or *B. bassiana* combined with *M. anisopliae* or *N. rileyi* . In this case mortality of aphids was purely due to *V. lecanii* or *B. bassiana* and not due to either *M. anisoplea* or *N. rileyii.* This was evident in the sole treatment of *M. anisopliae* or *N. rileyii*. Both the fungi viz., *M. anisopliae* or *N. rileyii* were causing any mortality on aphids, however, these fungi can be used beetle pests and lepidopteron pests respectively. Aphid incidence significantly influenced the green forage yield, dry matter yield and seed yield in lucerne. Highest green forage yield, dry matter yield and seed yield were recorded in *V. lecanii* and *B. bassianna* treated plots either sole or in combination. Entomopathogenic fungi *M. anisopliae* and *N. rileyii* did not reduced the aphids population and hence did not influence in achieving higher green forage, dry matter and seed yield in comparison to untreated check (Table PPT 18A).

All the entomopathogens are absolutely safe and did not affect adversely on natural enemies especially predators of aphids (Table PPT18B) as well as on pollinators of lucerne (Table PPT18C). The mean value is being given in Table 18D.

Table PPT 18A.Evaluation of entomopathogenic fungi for the management of aphids in lucerne after foliar application

Tr. No	Treatment	Pre count of aphids	Post count after 7 DAS	GFY (q/ha)	DMY (q/ha)	Seed yield (q/ha)
1	T1	106.66	35.33	410.33	99.00	2.00
2	T2	103.33	38.66	408.00	97.00	1.96
3	T3	104.66	80.33	366.33	92.66	1.87
4	T4	99.33	79.33	370.33	92.66	1.90
5	T1 + T2 (half dose of each)	108.00	36.83	405.00	94.66	1.94
6	T1 + T3 (half dose of each)	110.00	54.33	400.66	96.00	1.96
7	T1 + T4 (half dose of each)	107.33	53.33	395.00	98.66	1.93
8	T2 + T3 (half dose of each)	104.00	52.66	392.00	92.00	1.90
9	T2 + T4 (half dose of each)	101.33	66.66	398.00	94.00	1.85
10	T3 + T4 (half dose of each)	96.66	83.66	366.66	96.66	1.88
11	Untreated control	95.33	59.66	363.33	82.00	1.54
CV		4.80		2.23	2.49	5.60
CD at 5%		NS		18.20	8.40	0.18
SEM±		2.86		6.15	2.70	0.06

T1 = Foliar application of *V. lecani* @ $4x10^6$ cfu/ml (2g/l)
T2 = Foliar application of *B. bassianna* @ $4x10^6$ cfu/ml (2g/l)
T3 = Foliar application of *M. anisopliae* $4x10^6$ cfu/ml (2g/l)
T4 = Foliar application of *N. releyi* $4x10^6$ cfu/ml (2g/l)

Table PPT18B. Effect of entomopathogenic fungi on the predators of Lucerne aphids

Tr. No	Treatment	After first application		After second application	
		Pre count of predators	Post count of predators after 7 DAS	Pre count of predators	Post count of predators after 7 DAS
1	*V. lecani* @ $4x10^6$ cfu/ml (2g/l)	7.00	7.33	6.33	6.66
2	*B. bassianna* @ $4x10^6$ cfu/ml 2g/l)	7.33	8.00	7.33	7.00
3	*M. anisopliae* $4x10^6$ cfu/ml (2g/l)	7.00	7.66	5.33	6.66
4	*N. releyi* $4x10^6$ cfu/ml (2g/l)	7.00	6.33	6.33	6.00
5	T1 + T2 (half dose of each)	8.33	7.33	7.33	6.33
6	T1 + T3 (half dose of each)	6.00	6.66	7.33	7.00
7	T1 + T4 (half dose of each)	7.00	7.00	6.33	6.66
8	T2 + T3 (half dose of each)	6.33	8.00	6.66	7.33
9	T2 + T4 (half dose of each)	8.66	6.66	5.66	6.33
10	T3 + T4 (half dose of each)	8.33	7.00	6.66	6.00
11	Untreated control	8.00	6.3333	6.66	7.00
CV		11.12	12.15	11.41	10.42
CD at 5%		NS	NS	NS	NS
SEM±		0.81	0.72	0.43	0.52

Table PPT18C. Effect of entomopathogenic fungi on the pollinators of Lucerne

Tr. No	Treatment	After first application		After second application	
		Pre count of pollinators	Post count of pollinators after 7 DAS	Pre count of pollinators	Post count of pollinators after 7 DAS
1	*V. lecani* @ $4x10^6$ cfu/ml (2g/l)	6.00	6.66	7.33	7.00
2	*B. bassianna* @ $4x10^6$ cfu/ml 2g/l)	5.33	7.00	6.00	6.66
3	*M. anisopliae* $4x10^6$ cfu/ml (2g/l)	6.33	5.66	7.33	6.66
4	*N. releyi* $4x10^6$ cfu/ml (2g/l)	5.66	7.00	6.00	6.66
5	T1 + T2 (half dose of each)	6.66	6.33	6.66	7.00
6	T1 + T3 (half dose of each)	5.66	6.66	7.00	7.33
7	T1 + T4 (half dose of each)	6.00	6.33	6.00	6.66
8	T2 + T3 (half dose of each)	6.33	6.66	7.33	7.33
9	T2 + T4 (half dose of each)	5.66	7.66	7.66	6.66
10	T3 + T4 (half dose of each)	6.66	6.66	6.00	7.66
11	Untreated control	6.66	7.00	7.00	7.66
CV		14.60	12.00	8.47	12.41
CD at 5%		NS	NS	NS	NS
SEM±		0.51	0.46	0.33	0.50

Dharwad

Table PPT 18 D: Evaluation of entomopathogenic fungi for the management of aphids, predators, pollinators, GFY, DMY and seed yield in Lucerne after foliar application **(Mean table)**

Treatment	No. of aphids/tiller		No. of predators		No. of pollinators		Yield (q/ha)		
	Pre-count	Post-count 7 DAS	Pre-count	Post count 7 DAS	Pre-count	Post count 7 DAS	GFY	DMY	Seed yield
T1	106.66	35.33	6.67	7.00	6.67	6.83	410.33	99.00	2.00
T2	103.33	38.67	7.33	7.50	5.67	6.83	408.00	97.00	1.96
T3	104.66	80.33	6.17	7.16	6.83	6.16	366.33	92.66	1.87
T4	99.33	79.33	6.67	6.17	5.83	6.83	370.33	92.66	1.90
T1 + T2 (half dose of each)	108.00	36.83	7.83	6.83	6.66	6.67	405.00	94.66	1.94
T1 + T3 (half dose of each)	110.00	53.33	6.67	6.83	6.33	7.00	400.66	96.00	1.96
T1 + T4 (half dose of each)	104.00	53.33	6.67	6.83	6.00	6.50	395.00	98.66	1.93
T2 + T3 (half dose of each)	101.33	52.66	6.50	7.67	6.83	7.00	392.00	92.00	1.90
T2 + T4 (half dose of each)	96.66	66.67	7.16	6.50	6.66	7.16	398.00	94.00	1.85
T3 + T4 (half dose of each)	95.33	83.67	7.50	6.50	6.33	7.16	366.66	96.66	1.88
Untreated control	106.66	59.66	7.33	6.67	6.83	7.33	363.33	82.00	1.54
CD	NS	NS	NS	NS	NS	NS	18.20	8.40	0.18

T1 = Foliar application of *V. lecani* @ $4x10^6$ cfu/ml (2g/l)
T2 = Foliar application of *B. bassianna* @ $4x10^6$ cfu/ml (2g/l)
T3 = Foliar application of *M. anisopliae* $4x10^6$ cfu/ml (2g/l)
T4 = Foliar application of *N. releyi* $4x10^6$ cfu/ml (2g/l)

Rahuri:

At Rahuri, the results revealed that significant reduction of aphid population per tiller in Lucerne was obtained by foliar spray of *V. lecani* and *M. anisopliae* $4x10^6$ cfu/ml (Table 18E). Half dose of these two entomopathogenic fungi together was also found equally effective, whereas *Heliothis armigera* infestation was significantly reduced by the foliar spray of *B. bassianna* and *N. releyi* @ $4x10^6$ cfu/ml. Half doses of these together were also found equally effective in reducing the population of *H. armigera.* The population of pollinators was increased in all the treatment in general. The incremental cost benefit ratio was maximum in T-9 *i.e.,* half dose of *B. bassianna* and *N. releyi* followed by T4 (Table 18F)

Table PPT 18E: Influence of different entomopathogenic fungi on survival population of aphids, *S. litura, H. armigera*, Lady bird beetle (LBB), honey bee visits, green forage yield and seed yield of Lucerne (Mean table)

Treatment	No. of aphids/tiller		LBB/ tiller	No. *S. litura* larvae/m^2		No. *H. armigera* larvae/m^2		No. of honey bees & visits/plot/min		Yield (q/ha)			ICBR
	Pre-count	7 DAS	7 DAS	Pre-count	7 DAS	Pre-count	7 DAS	Visits	Bees	GFY	DMY	Seed	
T1	24.94	5.28	1.91	9.67	8.55	4.56	4.42	30.67	3.67	148.35	22.99	3.74	1:2.88
T2	25.02	16.11	1.81	9.89	3.45	4.35	1.82	29.67	3.67	155.49	24.10	4.44	1:6.33
T3	25.36	6.17	1.90	10.55	7.00	4.41	4.02	33.00	4.33	155.35	24.08	3.95	1:4.14
T4	24.27	17.49	2.15	9.33	2.33	4.66	1.36	30.33	4.67	166.11	25.75	4.98	**1:9.18**
T1 + T2 (half dose of each)	24.65	11.90	1.96	10.11	3.00	4.89	2.46	32.33	4.00	149.52	23.18	4.82	1:7.82
T1 + T3 (half dose of each)	26.48	5.07	1.90	9.78	8.11	4.75	2.47	31.33	3.67	150.84	23.38	3.75	1:3.03
T1 + T4 (half dose of each)	25.49	16.97	1.95	9.67	3.11	4.86	2.66	28.33	4.00	146.47	22.70	4.54	1:6.43
T2 + T3 (half dose of each)	25.21	16.73	1.84	10.00	3.67	4.67	2.79	27.67	3.33	145.43	22.54	4.39	1:5.70
T2 + T4 (half dose of each)	24.92	19.12	2.05	9.56	1.78	4.87	1.22	34.67	5.00	166.39	25.79	5.13	**1:9.87**
T3 + T4 (half dose of each)	24.55	15.60	1.94	9.45	4.67	4.32	2.83	24.33	3.33	146.61	22.72	4.28	1:5.24
Untreated control	25.57	36.34	2.47	10.44	12.11	4.51	6.25	31.00	3.67	114.88	17.81	3.17	-
SE±	**1.67**	**1.05**	**0.08**	**0.45**	**0.52**	**0.30**	**0.27**	**3.27**	**0.46**	**2.63**	**0.41**	**0.33**	
CD at 5%	**N.S.**	**3.08**	**0.22**	**N.S.**	**1.54**	**N.S.**	**0.80**	**N.S.**	**N.S.**	**7.73**	**1.20**	**0.99**	

T1 = Foliar application of *V. lecani* @ $4x10^6$ cfu/ml (2g/l)
T2 = Foliar application of *B. bassianna* @ $4x10^6$ cfu/ml (2g/l)
T3 = Foliar application of *M. anisopliae* $4x10^6$ cfu/ml (2g/l)
T4 = Foliar application of *N. releyi* $4x10^6$ cfu/ml (2g/l)

Table 18F : Incremental cost benefit ratio (ICBR)

Treatment	Increased GFY over Control	Increased Seed yield over control	Value of GFY (Rs./ha)	Value of seed (Rs.)	Total cost of GFY & seed	Treat cost Rs	Net profit	ICBR
T1	33.47	0.56	6526.55	12400.59	18927.15	4875	14052.15	1:2.88
T2	40.61	1.26	7918.71	27794.43	35713.14	4875	30838.14	1:6.33
T3	40.47	0.78	7891.63	17165.35	25056.99	4875	20181.99	1:4.14
T4	51.23	1.80	9989.75	39645.25	49635.00	4875	44760.00	1:9.18
T5	34.64	1.65	6754.59	36224.39	42978.98	4875	38103.98	1:7.82
T6	35.96	0.57	7011.78	12644.94	19656.72	4875	14781.72	1:3.03
T7	31.58	1.37	6158.99	30054.64	36213.63	4875	31338.63	1:6.43
T8	30.54	1.21	5955.95	26694.87	32650.82	4875	27775.82	1:5.70
T9	51.51	1.95	10043.90	42943.93	52987.82	4875	48112.82	1:9.87
T10	31.72	1.10	6186.07	24251.41	30437.47	4875	25562.47	1:5.24

Green forage Rs. 195/ quintal
Seed Rs. 22000/quintal

Insecticides	Qty /spray	For 5 spray	Cost (Rs.)	Labour charges	Total cost
V. lecani	2500 g	12.5 kg	1875	3000	4875
B. bassiana	2500 g	12.5 kg	1875	3000	4875
M. anisopliae	2500 g	12.5 kg	1875	3000	4875
N. releyi	2500 g	12.5 kg	1875	3000	4875
V+B	1250 +1250 g	6.250+6.250 kg	1875	3000	4875
V+M	1250 +1250 g	6.250+6.250 kg	1875	3000	4875
V+N	1250 +1250 g	6.250+6.250 kg	1875	3000	4875
B+M	1250 +1250 g	6.250+6.250 kg	1875	3000	4875
B+N	1250 +1250 g	6.250+6.250 kg	1875	3000	4875
M+N	1250 +1250 g	6.250+6.250 kg	1875	3000	4875

Cost of all entomopathogenic fungi : Rs. 150/ kg
Labour + spray pump charges : Rs. 600/ha

Jhansi

The trial comprising of 11 treatments was conducted at Jhansi centre. The results revealed that only alfalfa weevil infestation occurred in this experiment. The population of weevil was not affected by the spray of entomopathogenic fungi.

CHAPTER-4

BREEDER SEED PRODUCTION

BREEDER SEED PRODUCTION IN FORAGE CROPS (RABI 2012-13)

In Rabi 2012-13, the indent for Breeder Seed Production was received from DAC, GOI for 28 varieties in four forage crops *viz*., Oat (9), Berseem (10), Lucerne (4) and Gobhi Sarson (5). The quantity allocated was 914.12q and it was assigned to eleven Breeder Seed producing centers of the different SAUs/ NGO/ ICAR institutes. Among quantity indented for different forage crops, the maximum was for Oat (1278.1q) followed by Berseem (87.25q), Lucerne (7.1q) and Gobhi Sarson (0.42q).

The final Breeder Seed Production Report (BSP-IV) received from different seed producing centres revealed that in crops such as Berseem and Gobhi Sarson, the overall breeder seed production was higher with respect to allocated quantity whereas in crops like Oat and Lucerne, the breeder seed production was less than the allocated quantity. Coming to crop wise scenario, as compared to allocation in the Berseem, the production was 76.68q (7.58q surplus) and in Gobhi Sarson the production was 2.14q (1.72q surplus). However in Oat, the production was 611.3q (226.2q deficit) against the allocation of 837.5q. Similarly in Lucerne, there was 0.50q deficit in production with respect to 7.1q allocation. The overall breeder seed production was 217.4q (23.78 per cent) less as evident from seed production of 696.72q against the indent for 1372.87q. Some of the reason for less production of breeder seed in certain varieties was due to damage of crops and non-availability of nucleus seed.

Table 1: Center-wise Breeder Seed Production (q) *Rabi*-2012-13

S. N.	Producing Center	Crop	Variety	DAC Indent	Allocation as per BSP-1 target	Actual production (BSP IV)	Production Surplus (+)/ Deficit (-)
1.	GAU, Anand	Oat	Kent	150.00	60.00	60.00	-
		Lucerne	Anand 2	4.50	4.50	4.50	-
			AL 3	1.10	1.10	1.10	-
2.	IGFRI, Jhansi	Oat	Kent	200	150.00	61.20	(-) 88.80
			JHO-851	32.00	32.00	21.00	(-) 11.00
			JHO-99-2	40.00	40.00	33.60	(-) 6.40
			JHO-822	25.00	25.00	20.40	(-) 4.60
		Berseem	Wardan	16.05	12.00	2.55	(-) 9.45
			Bundel Berseem-3	7.00	7.00	5.00	(-) 2.00
			Bundel Berseem-2	1.00	1.00	2.5	(+) 1.50
3.	PAU, Ludhiana	Oat	Kent	99.60	80.00	110.00	(+) 30.00
		Berseem	BL-1	7.50	5.00	8.00	(+) 3.00
			BL-2	4.00	Nil*	-	-
			BL-10	12.20	10.00	18.30	(+) 8.30
			BL-22	0.10	0.10	0.18	(+) 0.08
			BL-42	13.40	8.00	13.50	(+) 5.50
		Gobhi Sarson	GSC 5	0.10	0.10	1.70	(+) 1.60
			GSL 1	0.02	0.02	Nil*	(-) 0.02
4.	CCS HAU, Hisar	Oat	Haryana Javi-8	12.50	12.50	04.90	(-) 7.60
			OS-6	22.00	22.50	23.00	(+) 0.50
		Berseem	Mescavi	15.25	15.25	15.25	-
		Lucerne	Type-9	1.00	1.00	1.00	-
5.	JNKVV, Jabalpur	Oat	Kent	150.00	150.00	89.00	(-) 61.00
		Berseem	JB 1	10.75	10.75	11.40	(+) 0.65
6.	GBPUAT, Pantnagar	Oat	UPO-212	110.50	110.50	45.00	(-) 65.50
			Kent	130.00	Nil	-	-
7.	SKUAST, Srinagar	Oat	Sabjar	114.00	90.00	85.00	(-) 5.00
8.	MPKV, Rahuri	Oat	Kent	107.50	15.00	20.00	(+) 5.00
			Phule Harita	10.00	10.00	7.00	(-) 3.00
		Lucerne	RL 88	0.50	0.50	Nil**	(-) 0.50
9.	CSK HPKV, Palampur	Gobhi Sarson	HPN1 (Sheetal)	0.10	0.10	0.15	(+) 0.05
			Him Sarson 1	0.10	0.10	0.15	(+) 0.05
			Neelam	0.10	0.10	0.14	(+) 0.04
10.	BAIF, Urlikanchan	Oat	Kent	40.00	40.00	31.20	(-) 8.80
11.	NDUA&T, Faizabad	Oat	Kent	35.00	Nil	-	-
		Total	1372.87	914.12	696.72	(-) 217.4	

* Nucleus seed was not available with the concerned breeder
**failed due to drought conditions in summer

Table 2: Variety-wise Breeder Seed Production (q) *Rabi* 2012-13

Crop	Name of Variety	DAC Indent	Allocation as per BSP-1 target	Actual production	Production Surplus (+)/ Deficit (-)
1	**Oat**				
	Kent	912.1	495.0	371.4	(-) 123.6
	HJ-8	12.50	12.50	04.90	(-) 7.60
	OS 6	22.00	22.50	23.00	(+) 0.50
	JHO-851	32.00	32.00	21.00	(-) 11.00
	JHO-99-2	40.00	40.00	33.60	(-) 6.40
	JHO 822	25.00	25.00	20.40	(-) 4.60
	UPO-212	110.50	110.50	45.00	(-) 65.50
	Phule Harita	10.00	10.00	7.00	(-) 3.00
	Sabzar	114.00	90.00	85.00	(-) 5.00
	Total	**1278.1**	**837.5**	**611.3**	**(-) 226.2**
2	**Berseem**				
	Wardan	16.05	12.00	2.55	(-) 9.45
	Bundel Berseem-2	1.00	1.00	2.5	(+) 1.50
	Bundel Berseem-3	7.00	7.00	5.00	(-) 2.00
	Mescavi	15.25	15.25	15.25	-
	BL 1	7.50	5.00	8.00	(+) 3.00
	BL 2	4.00	Nil*	-	-
	BL 10	12.20	10.00	18.30	(+) 8.30
	BL 22	0.10	0.10	0.18	(+) 0.08
	BL 42	13.40	8.00	13.50	(+) 5.50
	JB 1	10.75	10.75	11.40	(+) 0.65
	Total	**87.25**	**69.1**	**76.68**	**(+) 7.58**
3	**Lucerne**				
	Anand 2	4.50	4.50	4.50	-
	AL 3	1.10	1.10	1.10	-
	T 9	1.00	1.00	1.00	-
	RL 88	0.50	0.50	Nil**	(-) 0.50
	Total	**7.1**	**7.1**	**6.6**	**(-) 0.50**
4	**Gobhi Sarson**				
	HPN 1 (Sheetal)	0.10	0.10	0.15	(+) 0.05
	Him Sarson 1	0.10	0.10	0.15	(+) 0.05
	Neelam	0.10	0.10	0.14	(+) 0.04
	GSC 5	0.10	0.10	1.70	(+) 1.60
	GSL 1	0.02	0.02	Nil*	(-) 0.02
	Total	**0.42**	**0.42**	**2.14**	**(+) 1.72**
	G. Total	**1372.87**	**914.12**	**696.72**	**(-) 217.4**

APPENDICES

APPENDIX –I

WEATHER REPORT FOR RABI-2012-13

The Weather report of the AICRP-FC coordinating, cooperating and volunteer centres across the different zones during *Rabi* 2012-13 programmes have been presented in this section. The weather parameters from 40th Standard Meteorological Week (October 01-07, 2012) to 21st Standard Meteorological Week (May 21-27, 2013) were taken into consideration, which covers the *Rabi* 2012-13 season for all the testing locations for trial conduction [Table MET- 1.1 (a) to 1.4 (l)]. During the reporting period, weather variations are clearly visible in maximum and minimum temperature, rainfall, rainy days and sunshine hours in different agro-climatic zones, which have wide impact on establishment, growth, yield and quality of different forage crops and their varieties. The weather parameters have also shown close correlation with the incidence and surveillance of insect-pest and disease of forage crops. Weather parameters influenced the establishment, growth and performance of different annual and perennial forage crops and their varieties.

Temperature

In Hill Zone, Srinagar remained the coolest location recording -4.9^{0}C during 1st SMW. Maximum temperature was recorded at Palampur *i.e.* 32.8^{0}C during 21st SMW. The average minimum temperature over the season was recorded lowest at Srinagar. In North-East zone, Imphal recorded the lowest minimum temperature (1.0^{0}C) during 2nd SMW and maximum temperature was recorded at Ranchi (41.2^{0}C) during 19th SMW followed by Faizabad (41.1^{0}C) during 18th SMW. Minimum variation for maximum temperature over the season was observed at Jorhat followed by Kalyani. In North-West Zone, Bikaner recorded lowest minimum temperature (0.6^{0}C) during 1st SMW followed by Hisar (1.6^{0}C) during same week; whereas, maximum temperature was recorded at Hisar (44.9^{0}C) during 21st SMW.

In Central Zone, Jhansi recorded the lowest minimum temperature (2.2^{0}C) during 1st SMW followed by Kanpur (3.0^{0}C) during the same week. The maximum temperature was recorded at Raipur (46.0^{0}C) during 21st SMW followed by Jhansi (45.4^{0}C) during same week and Jhansi recorded lowest minimum temperature over the season as compared to rest of the locations. The minimum fluctuation in maximum temperature over the season was at Urulikanchan and Rahuri locations. In South zone, the lowest minimum temperature was recorded at Mandya (10.8^{0}C) during 9th SMW followed by Hyderabad (11.2^{0}C) during 51st SMW. The maximum temperature was recorded at Hyderabad *viz.,* 41.4^{0}C and 40.5^{0}C during 21st and 19th SMW, respectively. Hyderabad experienced higher maximum temperature over the crop season as compared to other locations in the Zone and minimum fluctuation in minimum and maximum temperature was observed at Vellayani.

Rainfall

The average annual rainfall of India is about 1192 mm and 80-90 percent rainfall in the country is mostly contributed through South-West Monsoon. During winter season some of the states receives substantial amount of rainfall specially J & K, Tamil Nadu and Andhra Pradesh as evident from the rainfall data. In Hill Zone, Srinagar received higher rainfall (538.9 mm) as compared to Palampur (505.8 mm), In North East Zone, Jorhat received highest rainfall (344.5 mm) followed by Kalyani (289.6mm) and lowest being with Faizabad (85.8 mm). Similarly the maximum number of rainy days was also recorded at Jorhat (46 days) followed by Kalyani (25 rainy days) and lowest being with Faizabad (8 rainy days).

In North-West Zone, Pantnagar received highest rainfall (200.1 mm) in 11 rainy days followed by Ludhiana (162.2 mm in 13 rainy days). Bikaner received lowest rainfall (25.4 mm) in just 5 rainy days followed by Hisar (120.0 mm). In Central Zone, maximum rainfall (137.2 mm) was received at Rahuri followed by Kanpur (127.7 mm) and lowest being with Anand (place without rainfall). Maximum number of rainy days was observed at Jabalpur and Raipur (10 rainy days each) followed by Urulikanchan (9 RD) and lowest being with Jhansi (5 RD). In South Zone, Vellayani received maximum rainfall (552 mm) in 31 rainy days followed by Coimbatore (350.7 mm in 13 RD) and lowest total rainfall was with Hyderabad (216.4 mm in 17 RD). In the same zone the well distribution of rainfall was observed at Vellayani and Mandya (evident from rainy days).

Relative Humidity

In hill Zone, the morning RH was highest at Srinagar (95.3% in 1st SMW and 94.5% in 2nd SMW); whereas, the lowest afternoon RH was recorded at Palampur (25.6%) during 21st SMW. Morning RH was recorded higher throughout the crop season at Srinagar as compared to Palampur. In North-East Zone, maximum RH of 98.1% was recorded at Kalyani during morning hours in 51st SMW followed by 97.7 % at Jorhat in the same week. The minimum RH during morning and afternoon hours was recorded at Faizabad (64.0% in 15th SMW) and Bhubaneswar (26.0% in 10th SMW), respectively. However, the average RH was recorded highest at Jorhat (91.0%) during 40th SMW.

In North-West Zone, RH ranged from 32.8 to 100 % in morning hours and between 10.9 to 81.0% in afternoon. The lowest RH during morning hours was at Bikaner (32.8%) during 18th SMW, whereas, highest morning RH was recorded at Pantnagar (100 %) during 1st SMW. In the same zone the maximum afternoon RH was recorded at Hisar (81.0%) during 1st SMW. In Central Zone, maximum RH in morning hours (100 %) was recorded at Urulikanchan during 41& 42nd SMW and lowest RH (9.0%) in afternoon was observed at Jabalpur centre during 20th SMW. In South Zone, the maximum RH (99.0%) was recorded in the morning hours at Vellayani from 48th SWM to 50th SMW. The minimum fluctuation in the morning RH was recorded at Mandya. The lowest afternoon RH was also recorded at Mandya (22.9%) during 9th SMW.

Sunshine hours

In Hill Zone, sunshine hours were recorded maximum at Palampur (9.9 during 40th SMW) followed by 9.6 h in 41 &44th SMW at the same location. In the same zone, over the season the maximum sunshine were also recorded higher at Palampur as compared to Srinagar. In North-West Zone, sunshine hours were recorded highest at Hisar (10.4 h in 20th SMW) followed by Bikaner (10.3h in 40th SMW). On mean basis Bikaner and Pantnagar recorded maximum sunshine hours (8.3 h) followed by Ludhiana (7.4h) and lowest being with Hisar (7.3h). In North-East Zone, Kalyani recorded maximum sunshine hours (10.1 h) followed by Imphal (9.7 h). Maximum average sunshine hours were recorded at Imphal (7.2 h) followed by Kalyani (6.9 h) and Bhubaneswar (6.7h) and lowest being with Jorhat (2.0 h). Jorhat experienced lowest sunshine hours over the season as compared to other locations.

In Central Zone, the maximum sunshine hours were recorded at Anand (11.5 h). On mean basis the maximum sunshine hours was recorded at Anand (9.6 h) followed by Jhansi (8.5 h) and lowest being with Kanpur (6.9 h). In South Zone, maximum sunshine hours was recorded at Coimbatore (10.5 h) followed by Hyderabad (9.9 h). On mean basis, Hyderabad recorded maximum sunshine hours (8.0 h) followed by Coimbatore (7.3h) and lowest being with Mandya (7.2 h).

Table Met-1.1 (a): Temperature (^{0}C) at AICRP-FC trial locations during crop growth period, Rabi 2012-13

Met. Week	North West Zone							
	Bikaner		Pantnagar		Ludhiana		Hisar	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
40-Oct. 01-Oct. 07, 2012	37.6	19.2	32.0	21.0	34.0	19.8	35.4	16.8
41-Oct. 08-Oct. 14, 2012	36.6	17.9	31.7	17.8	33.3	17.4	34.3	16.2
42-Oct. 15-Oct 21, 2012	33.0	16.3	31.1	15.3	30.9	15.9	32.3	16.4
43-Oct. 22-Oct. 28, 2012	31.9	14.3	29.4	12.4	29.1	12.7	29.2	12.5
44-Oct. 29-Nov. 04, 2012	32.9	13.1	29.7	12.0	29.6	13.6	29.2	12.0
45-Nov. 05-Nov. 11, 2012	32.3	12.0	27.5	11.9	28.7	12.4	29.2	11.0
46-Nov. 12-Nov. 18 2012	31.0	9.8	27.4	9.8	26.2	10.5	27.6	8.9
47-Nov. 19-Nov. 25, 2012	28.0	8.1	26.6	8.6	25.2	9.0	26.3	7.4
48-Nov. 26-Dec. 02 2012	25.8	7.5	24.7	7.3	23.7	7.5	24.2	6.5
49-Dec. 03-Dec. 09, 2012	26.1	5.2	23.8	6.4	24.1	5.9	24.5	5.4
50-Dec. 10-Dec. 16, 2012	25.3	8.6	24.0	9.5	20.1	9.7	22.1	10.4
51-Dec. 17-Dec. 23, 2012	23.1	6.0	18.9	7.4	19.4	6.9	22.1	4.4
52-Dec. 24-Dec. 31, 2012	22.3	4.4	16.9	5.7	13.8	7.3	15.0	4.3
1-Jan. 01-Jan 07, 2013	17.5	0.6	10.8	3.9	10.5	4.7	11.6	1.6
2-Jan. 08-Jan. 14, 2013	24.4	6.3	16.2	2.5	18.6	4.7	18.8	4.0
3-Jan. 15-Jan 21, 2013	21.2	7.1	20.4	8.7	17.9	6.7	18.4	7.2
4-Jan. 22-Jan. 28, 2013	22.7	6.1	15.1	7.7	19.5	4.2	19.7	3.5
5-Jan. 29-Feb-04, 2013	26.5	10.7	23.1	7.9	20.9	8.1	22.6	8.1
6-Feb. 05-Feb-11, 2013	22.1	7.6	22.1	9.8	19.8	7.4	20.3	6.6
7-Feb. 12-Feb.-18, 2013	24.1	9.4	21.6	9.5	20.4	9.5	21.4	8.9
8-Feb. 19-Feb. 25, 2013	24.3	10.3	23.4	10.1	20.0	11.1	21.1	9.7
9-Feb. 26-Mar. 04, 2013	27.3	8.2	26.0	10.9	23.9	9.7	24.3	8.5
10-Mar. 05-Mar. 11, 2013	33.6	11.5	29.3	13.2	28.7	12.9	29.6	10.9
11-Mar. 12-Mar. 18, 2013	32.1	11.4	28.9	12.8	27.2	12.8	28.2	12.5
12-Mar. 19-Mar. 25, 2013	33.1	16.5	30.2	15.2	28.8	14.6	30.3	14.6
13-Mar. 26-Apr. 01, 2013	32.4	17.0	30.8	14.5	28.0	15.2	27.7	13.0
14-Apr. 02-Apr. 08, 2013	36.2	17.3	34.0	14.8	32.0	15.3	32.3	14.4
15-Apr. 09-Apr.-15, 2013	37.0	16.7	36.6	17.9	34.6	18.3	35.2	16.7
16-Apr. 16-Apr. 22, 2013	38.8	19.0	33.9	18.2	35.7	19.2	37.0	17.0
17-Apr. 23-Apr.29, 2013	37.8	18.8	36.2	19.5	34.4	20.2	35.7	20.5
18-Apr. 30-May. 06, 2013	40.6	20.2	38.7	19.1	38.3	19.4	39.1	18.8
19-May 07-May. 13, 2013	40.7	23.0			37.5	21.2	39.5	21.6
20-May. 14-May 20, 2013					37.2	21.0	41.4	22.9
21-May. 21-May. 27 2013					39.5	24.6	44.9	27.6

Table Met-1.1 (b): Temperature (^{0}C) at AICRP-FC trial locations during crop growth period, Rabi 2012-13

Met. Week	Hill Zone				North East Zone											
	Srinagar		Palampur		Ranchi		Faizabad		Bhubaneswar		Jorhat		Imphal		Kalyani	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
40	25.3	6.0	27.6	14.9	31.1	19.1	32.3	21.8	32.4	24.5	29.1	23.8	28.2	20.9	34.3	26.2
41	23.8	5.5	26.3	13.2	28.2	17.2	30.0	19.4	31.2	24.4	29.2	22.9	28.2	19.5	33.4	24.7
42	21.6	5.7	25.3	11.7	28.1	15.1	32.8	18.8	32.0	22.0	30.6	20.0	30.7	17.3	33.7	22.2
43	20.8	4.6	22.6	9.5	29.5	17.5	31.0	14.9	33.1	20.9	29.5	18.8	29.8	13.7	33.0	20.1
44	21.1	0.5	23.9	10.3	25.0	11.7	30.4	12.7	30.7	20.5	29.5	16.3	28.1	13.8	31.8	19.3
45	19.6	-0.2	22.0	9.2	26.0	12.8	29.2	12.1	29.6	21.0	27.8	17.3	24.6	14.7	28.8	20.7
46	18.5	-0.3	21.3	7.9	24.2	7.4	28.9	11.0	28.9	16.7	27.9	13.3	28.7	12.1	29.6	16.3
47	17.2	-0.2	20.2	7.1	24.9	9.8	27.6	9.5	30.4	20.4	28.1	15.3	27.8	12.8	30.4	18.1
48	11.0	3.3	18.2	6.2	24.0	6.5	26.1	7.8	29.8	15.4	25.7	12.6	25.4	6.0	28.7	11.8
49	10.2	-0.4	22.0	7.8	24.5	6.8	26.0	7.3	30.8	15.1	25.8	13.9	23.9	6.3	28.8	10.9
50	8.3	-0.3	15.5	6.6	26.0	11.9	26.0	9.5	32.1	20.2	22.1	12.4	19.9	7.2	27.8	15.2
51	8.6	-0.4	19.2	5.3	22.9	6.3	20.6	9.0	29.7	14.7	22.3	10.7	22.8	3.3	25.8	12.8
52	8.2	-0.4	17.4	5.4	19.5	1.8	14.8	5.1	27.4	12.0	23.8	7.0	23.6	2.5	20.1	8.9
1	8.5	-4.9	15.2	2.3	22.9	6.8	15.2	4.3	29.6	18.2	23.1	9.6	23.3	2.9	24.0	12.0
2	7.9	-3.3	14.5	6.0	19.7	2.5	18.1	2.9	28.2	12.6	20.4	7.7	19.3	1.0	22.6	6.9
3	7.5	-2.7	14.7	4.8	27.0	9.7	22.6	9.6	31.9	16.5	24.2	10.1	23.6	3.2	27.4	13.0
4	7.1	-3.0	16.6	3.6	21.9	4.4	17.3	5.0	29.3	13.9	24.4	8.6	24.4	3.9	24.1	7.0
5	9.5	1.5	17.8	6.2	22.8	5.7	23.7	6.2	29.9	14.4	25.7	10.0	25.6	6.9	27.7	10.3
6	9.9	-0.7	15.4	4.6	24.6	9.2	23.4	7.7	32.5	16.8	26.8	10.9	27.7	7.2	29.1	12.7
7	10.4	-0.1	16.3	6.8	23.2	10.3	22.5	10.2	31.6	17.4	28.0	13.2	28.1	5.9	27.4	14.4
8	9.8	0.0	16.5	6.2	23.3	9.7	24.5	11.1	32.3	16.3	28.1	11.7	28.1	8.5	30.6	11.0
9	15.7	0.6	19.5	8.6	28.3	11.9	26.3	11.5	35.7	16.9	30.9	14.8	30.5	8.1	32.3	14.1
10	17.7	2.2	23.9	11.1	28.5	13.5	30.6	12.2	37.3	16.8	31.3	15.6	30.2	6.9	31.3	17.8
11	16.9	3.0	21.4	8.9	31.1	15.0	31.3	14.0	37.5	22.6	30.2	17.2	29.2	11.5	35.8	21.7
12	16.8	3.4	22.9	10.6	31.5	12.8	33.0	14.7	38.3	23.1	27.2	17.0	27.5	12.1	38.2	21.8
13	11.5	0.4	22.1	10.4	33.8	15.0	32.8	15.0	39.0	24.5	26.9	18.1	28.4	14.0	37.6	23.2
14	17.1	4.7	24.5	12.2	34.9	18.2	35.3	16.5	40.5	24.2	27.8	18.2	28.7	13.8	39.8	24.1
15	19.3	5.2	26.9	13.4	34.1	17.3	39.2	18.5	40.0	24.7	28.0	19.5	30.8	17.1	39.5	25.3
16	18.5	5.6	26.1	14.0	33.1	17.8	34.2	19.0	37.1	24.5	26.9	19.3	26.5	14.5	34.1	21.6
17	18.8	6.4	25.1	14.9	33.6	18.9	38.2	21.2	37.8	25.3	30.5	20.4	29.3	15.9	36.8	25.2
18	21.0	7.2	29.7	17.1	40.7	24.6	41.1	20.8	39.8	27.3	28.2	21.0	26.0	17.3	37.1	27.7
19	21.4	8.5	30.4	16.6	41.2	25.2	40.7	23.4	39.1	26.5	29.2	21.8	22.6	17.3	36.8	26.4
20	23.0	8.6	31.8	17.9	38.9	24.0	39.8	24.2	37.3	27.5	28.1	22.1	26.6	19.2	34.8	23.9
21	24.0	9.4	32.8	19.5	40.5	24.5	40.4	27.8	38.2	27.7	31.1	24.6	30.8	21.3	34.5	25.4

Table Met-1.1 (c): Temperature (^{0}C) at AICRP-FC trial locations during crop growth period, Rabi 2012-13

Met. Week	Central Zone													
	Kanpur		Anand		Jabalpur		Rahuri		Urulikanchan		Raipur		Jhansi	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
40	34.9	20.6	36.3	24.7	33.4	21.9	31.4	21.7	32.2	20.9	31.9	23.9	36.0	19.3
41	33.5	18.2	35.8	21.5	32.4	18.5	32.1	19.7	33.4	21.2	31.0	20.2	35.1	16.8
42	33.3	17.0	36.1	19.6	32.5	18.6	32.2	16.9	33.2	25.1	31.9	19.5	35.0	15.9
43	30.3	14.3	35.6	19.1	31.6	15.2	31.4	19.5	33.1	15.3	31.6	18.4	32.7	14.1
44	30.3	11.9	33.5	16.2	27.9	15.6	30.0	15.6	31.3	16.4	28.9	18.4	30.9	11.4
45	29.9	12.1	32.6	13.9	28.2	14.6	31.7	14.9	31.3	14.4	28.5	17.3	30.1	11.9
46	28.1	10.9	33.2	15.5	28.6	10.0	30.2	12.7	30.7	13.5	28.4	12.7	29.8	10.0
47	27	9.1	31.4	12.4	27.9	10.6	30.0	11.3	29.1	11.5	29.6	16.4	28.8	8.7
48	26.1	8.3	31.1	13.3	28.4	11.5	31.8	13.6	30.2	17.5	30.1	14.3	27.8	7.9
49	26.5	8.5	30.5	16.0	28.7	10.6	31.3	12.6	30.6	12.9	30.3	13.6	27.6	7.8
50	25.9	9.7	31.0	13.8	29.0	14.0	31.4	12.4	28.9	16.9	30.0	18.1	27.6	9.4
51	20.2	8.0	29.7	14.2	25.3	7.1	29.9	11.2	23.5	20.4	28.3	11.0	26.2	6.0
52	15.6	4.4	28.6	10.3	23.8	5.0	32.4	20.5	24.6	22.2	25.6	8.3	19.3	4.7
1	14.3	3.0	25.9	8.9	23.3	7.2	31.3	11.2	30.4	15.7	28.0	16.0	18.6	2.2
2	21.1	3.7	27.9	9.9	23.0	5.2	29.1	10.1	26.5	7.7	26.3	9.1	24.2	5.1
3	21.9	9.4	26.9	11.2	26.7	10.1	30.4	11.7	28.6	6.9	30.7	14.6	24.1	7.3
4	19.2	5.4	26.3	11.1	21.4	5.0	30.2	13.5	29.4	11.5	27.0	12.2	21.9	3.1
5	23.0	6.8	30.5	14.2	24.6	7.4	31.7	15.9	29.4	10.9	28.8	11.4	25.0	6.5
6	22.3	10.0	28.2	12.7	25.9	11.3	30.9	15.2	30.4	9.0	30.0	16.8	22.7	9.0
7	21.7	10.5	31.1	14.9	25.2	13.0	32.0	15.2	32.1	10.2	29.7	16.4	23.7	11.1
8	24.2	10.9	31.8	14.0	25.0	11.0	33.4	12.5	33.9	11.5	29.8	14.6	25.6	10.0
9	26.3	11.7	32.7	12.8	28.0	9.2	33.8	13.6	34.8	8.8	32.3	13.8	28.5	9.7
10	30.2	12.5	37.2	15.4	30.7	9.9	35.1	13.6	33.9	8.2	34.3	14.8	32.3	12.4
11	30.4	14.5	35.4	17.7	31.6	14.7	35.4	17.2	36.0	11.8	33.8	20.4	32.2	13.7
12	33.1	15.9	36.0	19.0	33.4	16.2	36.5	16.5	37.3	13.8	36.4	20.2	33.7	15.6
13	31.9	15.5	35.4	20.1	33.8	16.2	36.5	18.0	37.9	15.4	38.1	22.7	32.3	15.4
14	36.2	17.3	37.4	19.3	35.3	15.2	37.6	16.8	38.7	17.0	38.7	21.5	35.5	16.4
15	38.4	18.7	38.0	20.3	39.5	19.9	39.6	20.2	39.3	18.1	39.9	24.7	38.0	18.6
16	35.1	18.5	36.3	22.7	36.5	20.1	37.0	16.1	37.4	19.0	38.0	21.9	37.1	19.2
17	38.9	21.0	39.3	24.6	37.6	20.6	38.9	21.7	39.6	17.8	38.1	24.4	37.9	21.1
18	40.8	20.7	41.1	24.6	42.1	21.4	40.8	22.7	38.4	18.9	43.1	27.6	41.1	21.1
19	41.7	23.0	40.2	23.9	42.1	24.1	40.1	22.4	36.7	22.7	43.6	27.2	42.2	23.5
20	42.3	23.0	40.2	26.4	42.7	23.4	39.3	24.4	38.9	21.6	43.3	27.9	42.9	23.6
21	42.9	26.2	40.9	26.1	44.1	26.8	39.6	23.7	37.9	23.6	46.0	29.0	45.4	27.9

Table Met-1.1 (d): Temperature (^{0}C) at AICRP-FC trial locations during crop growth period, Rabi 2012-13

Met. Week	South Zone							
	Coimbatore		Vellayani		Hyderabad		Mandya	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
40	33.0	21.6	31.2	23.5	29.2	21.9	32.1	21.2
41	32.6	23.1	31.4	24.1	31.7	16.7	31.2	20.2
42	29.4	22.4	29.4	23.4	30.7	16.7	31.3	19.6
43	28.0	22.5	30.1	23.9	29.9	19.5	29.3	20.1
44	28.5	21.5	29.8	23.3	27.5	18.5	27.6	21.2
45	31.1	22.4	30.1	23.0	29.0	17.3	32.9	21.0
46	31.0	18.4	30.3	23.2	27.9	11.0	32.2	21.7
47	31.7	21.0	30.5	23.1	29.9	16.6	32.8	21.3
48	30.9	18.8	30.6	22.7	30.0	15.7	28.1	18.6
49	30.8	21.5	30.5	22.6	30.5	15.0	32.4	22.0
50	31.2	18.9	30.6	22.1	32.2	13.6	32.4	18.1
51	29.4	19.9	31.1	22.8	29.1	11.2	32.5	21.3
52	30.4	21.7	30.5	23.5	27.8	11.9	32.7	21.7
1	32.4	20.2	30.6	23.4	32.6	19.3	28.9	22.1
2	31.6	18.8	30.0	22.6	30.4	15.1	29.0	20.1
3	30.7	18.5	30.1	20.8	30.9	15.3	29.2	21.6
4	31.5	17.8	30.5	21.3	29.9	16.9	29.4	19.1
5	31.2	19.5	30.4	20.8	29.4	15.3	30.1	20.8
6	32.5	22.0	31.2	22.9	30.9	18.4	31.5	15.7
7	32.5	22.5	32.0	23.0	31.3	16.9	31.6	17.6
8	31.1	20.4	31.4	21.8	30.4	17.7	33.1	14.8
9	33.5	17.2	32.0	21.4	33.6	17.0	33.5	10.8
10	32.6	24.0	32.1	24.3	34.3	17.7	35.5	16.3
11	33.9	22.6	32.3	23.9	35.3	18.6	34.1	17.2
12	35.0	23.6	32.3	23.7	36.7	21.0	35.1	17.4
13	35.5	24.1	32.6	25.3	38.4	25.6	36.1	20.4
14	36.5	24.8	32.9	26.0	38.2	22.7	36.6	21.0
15	36.7	24.4	32.8	25.6	38.4	23.7	36.1	20.7
16	36.2	23.8	33.2	25.1	38.5	24.6	36.0	19.6
17	35.3	24.3	33.3	25.0	35.9	26.5	35.1	20.5
18	35.2	25.2	32.7	25.8	40.4	26.3	34.9	19.3
19	36.2	25.3	32.0	26.1	40.5	26.6	33.1	19.0
20	36.1	24.4	32.4	25.7	40.4	26.7	34.0	20.0
21	35.0	23.6	32.1	24.2	41.4	28.4	29.0	17.0

Table MET-1.2 (e): Rainfall (RF,mm) and Rainy days (RD, No.) at AICRP-FC trial locations during crop growth period, Rabi 2012-13

Met. Week	Hill Zone		North East Zone										North-West Zone						
	Srinagar	Palampur	Ranchi	Faizabad		Bhubaneswar		Jorhat		Imphal	Kalyani		Bikaner		Pantnagar		Ludhiana		Hisar
	RF	RF	RF	RF	RD	RF	RD	RF	RD	RF	RF	RD	RF	RD	RF	RD	RF	RD	RF
40	0.0	3.4	0.0	0.0	0.0	45.2	3.0	50.7	6.0	2.8	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
41	0.0	4.2	14.3	0.0	0.0	16.4	4.0	29.7	5.0	19.0	26.7	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
42	8.9	0.0	0.0	0.0	0.0	0.0	0.0	13.9	3.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6
43	0.0	14.6	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	3.8
44	0.0	0.0	16.5	0.0	0.0	110.5	3.0	0.0	0.0	0.7	3.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45	0.0	0.0	22.5	0.0	0.0	24.4	3.0	0.0	0.0	11.9	47.2	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
47	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
48	11.8	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	1.0	0.0	0.0	0.0
49	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.4	2.0	0.0
50	38.0	34.2	17.4	0.0	0.0	0.0	0.0	5.6	0.0	0.0	7.3	1.0	6.2	1.0	1.0	0.0	0.0	0.0	5.5
51	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
52	6.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	11.0	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.2	2.0	0.0
3	78.4	73.6	0.0	3.2	1.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	41.2	2.0	0.0	0.0	43.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.6	2.0	0.0
5	6.4	26.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	9.2	1.0	1.0	0.0	4.0
6	34.6	60.6	2.2	25.9	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	39.1	2.0	33.4	2.0	10.8
7	7.8	14.0	14.0	41.2	2.0	2.8	0.0	9.3	1.0	0.0	9.0	1.0	5.0	2.0	59.6	2.0	33.4	3.0	6.0
8	53.2	46.2	0.0	15.5	2.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	5.4	1.0	24.2	1.0	4.0	0.0	11.9
9	35.0	18.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.4	1.0	0.0
11	13.0	9.4	2.1	0.0	0.0	0.0	0.0	12.7	2.0	0.5	0.0	0.0	0.0	0.0	13.4	1.0	29.0	1.0	30.5
12	38.6	76.2	0.0	0.0	0.0	0.0	0.0	23.9	3.0	2.1	0.0	0.0	4.3	1.0	0.0	0.0	1.2	0.0	0.0
13	0.0	36.2	0.0	0.0	0.0	0.0	0.0	16.6	2.0	1.9	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.6
14	29.0	0.0	2.1	0.0	0.0	0.0	0.0	18.0	1.0	5.9	0.0	0.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0
15	9.8	23.0	0.2	0.0	0.0	1.0	0.0	17.9	6.0	0.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5
16	65.4	18.6	6.3	0.0	0.0	41.2	2.0	0.6	0.0	5.4	101.5	4.0	0.0	0.0	8.4	1.0	4.4	0.0	0.8
17	31.4	13.0	2.2	0.0	0.0	0.0	0.0	102.9	3.0	0.6	11.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	4.2	0.0	0.0	0.0	0.0	0.0	0.0	18.1	7.0	10.6	0.2	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.0
19	14.0	27.2	0.0	0.0	0.0	41.7	2.0	14.5	5.0	20.4	6.2	2.0	0.0	0.0			0.0	0.0	0.0
20	8.6	0.0	0.0	0.0	0.0	0.0	0.0	4.9	1.0	7.6	23.0	5.0	0.0	0.0			0.0	0.0	0.0
21	32.2	1.2	0.0	0.0	0.0	0.0	0.0	3.3	1.0	5.4	49.8	3.0	0.0	0.0			0.0	0.0	0.0

Table MET-1.2 (f): Rainfall (RF,mm) and Rainy days (RD, No.) at AICRP-FC trial locations during crop growth period, Rabi 2012-13

Met. Week	Central Zone													South Zone							
	Kanpur		Jabalpur		Urulikanchan		Raipur		Jhansi		Rahuri		Anand	Coimbatore		Vellayani		Hyderabad		Mandya	
	RF	RD	RF	RD	RF	RD	RF	RD	RF	RD	RF	RD	RF	RF	RD	RF	RD	RF	RD	RF	RD
40	0.0	0	2.3	0	0.0	0	9.2	1	0.0	0	118.6	5	0.0	0.0	0	0.0	0	45.3	4	0.0	0
41	0.0	0	0.0	0	36.0	3	0.0	0	0.0	0	0.0	0	0.0	74.6	2	19.3	3	0.0	0	46.5	2
42	0.0	0	0.0	0	54.2	3	0.0	0	0.0	0	0.0	0	0.0	83.8	2	53.5	2	13.6	1	24.3	3
43	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	18.6	1	0.0	5.8	0	37.5	3	0.0	0	0.0	0
44	0.0	0	0.0	0	0.0	0	27.3	2	0.0	0	0.0	0	0.0	13.0	1	12.5	1	47.0	2	0.0	0
45	0.0	0	0.0	0	0.0	0	5.6	1	0.0	0	0.0	0	0.0	1.0	0	94.6	0	0.0	0	20.0	1
46	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0	0	3.0	0	0.0	0	4.7	1
47	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	9.4	1	1.0	0	0.0	0	2.8	1
48	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0	0	0.0	0	0.0	0	0.0	0
49	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2.5	0	0.5	0	0.0	0	8.6	1
50	0.0	0	3.2	1	0.0	0	0.2	0	0.0	0	0.0	0	0.0	0.0	0	0.0	0	0.0	0	0.0	0
51	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0	0	0.0	0	0.0	0	0.0	0
52	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	4.4	1	40.0	3	0.0	0	0.0	0
1	0.0	0	0.0	0	0.0	0	1.2	0	0.0	0	0.0	0	0.0	0.0	0	17.5	1	0.0	0	0.0	0
2	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0	0	24.0	1	0.0	0	0.0	0
3	4.6	1	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0	0	0.0	0	0.0	0	0.0	0
4	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0	0	0.0	0	0.0	0	0.0	0
5	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0	0	0.0	0	5.0	1	0.0	0
6	74.8	2	0.0	0	0.0	0	0.2	0	49.4	2	0.0	0	0.0	0.0	0	5.0	0	3.0	1	0.0	0
7	39.0	3	55.4	3	0.0	0	11.6	2	53.2	3	0.0	0	0.0	0.0	0	33.0	2	20.0	1	0.0	0
8	7.4	1	4.8	1	0.0	0	0.8	0	0.0	0	0.0	0	0.0	99.8	1	0.0	0	0.0	0	0.0	0
9	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0	0	0.0	0	0.0	0	0.0	0
10	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0	0	21.0	3	0.0	0	0.0	0
11	0.0	0	26.1	2	0.0	0	0.0	0	1.0	0	0.0	0	0.0	0.0	0	34.0	1	0.0	0	0.0	0
12	0.0	0	0.0	0	0.0	0	0.0	0	1.2	0	0.0	0	0.0	0.0	0	0.0	0	0.0	0	0.0	0
13	1.9	0	7.2	1	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0	0	31.0	1	0.0	0	0.0	0
14	0.0	0	3.2	1	0.0	0	0.0	0	1.2	0	0.0	0	0.0	0.0	0	0.0	0	4.2	1	3.5	1
15	0.0	0	0.0	0	0.0	0	8.6	1	0.0	0	0.0	0	0.0	0.0	0	1.5	0	0.0	0	0.0	0
16	0.0	0	10.6	1	0.0	0	26.0	2	0.0	0	0.0	0	0.0	0.0	0	0.0	0	0.0	0	0.0	0
17	0.0	0	0.0	0	0.0	0	0.0	0	4.0	0	0.0	0	0.0	46.8	3	40.6	2	42.0	2	12.8	1
18	0.0	0	0.0	0	25.4	2	0.0	0	0.0	0	0.0	0	0.0	1.2	0	7.1	1	17.8	2	41.7	2
19	0.0	0	0.0	0	0.0	0	1.0	0	1.2	0	0.0	0	0.0	0.0	0	34.4	2	13.5	1	37.0	2
20	0.0	0	0.0	0	7.6	1	0.0	0	0.0	0	0.0	0	0.0	3.2	1	5.2	1	5.0	1	1.2	0
21	0.0	0	0.0	0	0.0	0	3.6	1	0.0	0	0.0	0	0.0	5.2	1	35.8	4	0.0	0	15.2	3

Table Met-1.3 (g): Relative humidity (M=Morning, An= Afternoon, AV=Average; %) at AICRP-FC trial locations during crop growth period, Rabi 2012-13

Met. Week	Hill Zone						South Zone									
	Srinagar			Palampur			Coimbatore	Vellayani			Hyderabad			Mandya		
	M	AN	AV	M	AN	AV	M	M	AN	AV	M	AN	AV	M	AN	AV
40	85.8	47.0	66.4	74.6	60.9	67.8	75.0	89.6	66.6	78.1	94.0	69.0	81.5	89.0	52.0	70.5
41	85.5	43.7	64.6	62.7	48.0	55.4	89.0	90.3	72.9	81.6	84.0	40.0	62.0	91.0	52.0	71.5
42	86.1	51.4	68.8	65.4	49.1	57.3	94.0	94.4	79.6	87.0	84.0	43.0	63.5	90.0	53.0	71.5
43	86.7	53.3	70.0	75.3	49.7	62.5	91.0	94.6	76.9	85.8	87.0	52.0	69.5	91.0	54.0	72.5
44	86.0	50.6	68.3	69.9	52.9	61.4	85.0	91.9	73.4	82.7	85.0	65.0	75.0	89.0	52.0	70.5
45	84.1	58.8	71.5	75.3	44.1	59.7	91.0	96.9	77.3	87.1	90.0	49.0	69.5	91.0	52.3	71.7
46	84.4	54.2	69.3	69.4	47.1	58.3	89.0	95.6	68.6	82.1	86.0	28.0	57.0	91.3	52.9	72.1
47	82.6	52.7	67.7	64.3	45.1	54.7	91.0	98.6	72.3	85.5	81.0	52.0	66.5	91.1	52.1	71.6
48	93.0	57.0	75.0	74.0	55.0	64.5	89.0	99.0	67.7	83.4	84.0	45.0	64.5	78.0	43.4	60.7
49	89.8	63.8	76.8	50.4	37.7	44.1	87.0	99.0	66.3	82.7	80.0	45.0	62.5	91.0	53.9	72.5
50	89.8	71.4	80.6	76.3	64.0	70.2	86.0	99.0	62.4	80.7	78.0	34.0	56.0	90.9	40.9	65.9
51	89.4	71.3	80.4	62.6	53.0	57.8	81.0	91.4	60.3	75.9	85.0	40.0	62.5	90.7	53.7	72.2
52	89.4	72.8	81.1	70.4	51.4	60.9	85.0	99.0	71.9	85.5	74.0	39.0	56.5	91.0	51.6	71.3
1	95.3	70.7	83.0	73.3	51.3	62.3	87.0	95.4	72.0	83.7	69.0	41.0	55.0	91.0	52.0	71.5
2	94.5	73.3	83.9	72.1	51.9	62.0	87.0	96.4	74.6	85.5	67.0	35.0	51.0	90.9	52.0	71.5
3	93.2	71.3	82.3	79.4	64.6	72.0	85.0	96.0	75.1	85.6	80.0	27.0	53.5	90.0	51.0	70.5
4	92.7	71.4	82.1	64.1	51.4	57.8	85.0	96.1	73.6	84.9	81.0	33.0	57.0	90.0	52.0	71.0
5	88.7	68.0	78.4	76.3	61.4	68.9	84.0	94.3	75.4	84.9	86.0	34.0	60.0	91.8	50.0	70.9
6	90.2	61.9	76.1	75.3	57.1	66.2	82.0	93.3	74.3	83.8	84.0	37.0	60.5	92.6	44.1	68.4
7	87.7	62.0	74.9	71.0	78.4	74.7	77.0	92.4	75.7	84.1	72.0	31.0	51.5	91.9	49.0	70.5
8	86.9	62.3	74.6	77.3	59.3	68.3	90.0	89.9	74.9	82.4	79.0	33.0	56.0	93.0	31.1	62.1
9	85.7	44.0	64.9	74.1	55.9	65.0	75.0	91.3	67.4	79.4	71.0	27.0	49.0	88.0	22.9	55.5
10	80.6	41.8	61.2	63.7	43.7	53.7	82.0	94.7	80.6	87.7	74.0	28.0	51.0	85.4	48.4	66.9
11	77.4	46.9	62.2	67.1	49.7	58.4	75.0	93.4	81.3	87.4	54.0	23.0	38.5	86.0	32.3	59.2
12	77.4	46.0	61.7	68.9	52.4	60.7	77.0	91.4	75.4	83.4	66.0	26.0	46.0	90.3	57.4	73.9
13	86.0	60.0	73.0	66.3	68.7	67.5	86.0	92.6	76.3	84.5	69.0	32.0	50.5	94.0	88.4	91.2
14	68.1	62.0	65.1	62.1	39.7	50.9	89.0	92.7	77.0	84.9	80.0	44.0	62.0	79.4	65.1	72.3
15	72.6	58.5	65.6	64.1	40.6	52.4	85.0	89.9	71.4	80.7	74.0	27.0	50.5	84.9	33.3	59.1
16	77.3	60.6	69.0	59.9	43.7	51.8	84.0	84.8	76.0	80.4	48.0	26.0	37.0	83.7	38.9	61.3
17	79.4	59.5	69.5	67.9	48.9	58.4	87.0	87.0	72.7	79.9	78.0	36.0	57.0	86.4	44.7	65.6
18	80.0	53.8	66.9	46.3	26.9	36.6	84.0	90.6	81.7	86.2	60.4	23.1	41.8	90.9	48.3	69.6
19	84.5	55.6	70.1	41.1	44.0	42.6	84.0	90.7	80.9	85.8	50.9	28.7	39.8	89.1	66.2	77.7
20	81.6	50.7	66.2	40.7	26.1	33.4	81.0	90.6	76.4	83.5	56.6	33.6	45.1	91.1	64.0	77.6
21	80.4	50.4	65.4	32.6	25.6	29.1	78.0	91.7	84.6	88.2	76.3	38.1	57.2	89.1	80.0	84.6

Table Met-1.3 (h): Relative humidity (M=Morning, An= Afternoon, AV=Average; %) at AICRP-FC trial locations during crop growth period, Rabi 2012-13

Met. Week	North-East Zone																	
	Ranchi			Faizabad			Bhubaneswar			Jorhat			Imphal			Kalyani		
	M	AN	AV	M	AN	AV	M	AN	AV	M	AN	AV	M	AN	AV	M	AN	AV
40	83.0	68.4	75.7	87.8	54.2	71.0	93.0	82.0	87.5	95.0	87.0	91.0	88.7	79.9	84.3	94.4	69.1	81.8
41	82.4	71.1	76.8	86.5	56.0	71.3	84.0	84.0	84.0	92.9	78.6	85.7	91.1	80.7	85.9	95.0	69.9	82.4
42	81.1	70.7	75.9	89.7	48.4	69.1	90.0	54.0	72.0	89.3	65.7	77.5	87.4	63.6	75.5	93.1	55.4	74.3
43	83.6	72.3	78.0	87.5	56.8	72.2	92.0	59.0	75.5	92.7	64.3	78.5	82.9	56.1	69.5	90.3	48.9	69.6
44	83.9	71.7	77.8	83.4	37.4	60.4	90.0	72.0	81.0	92.3	60.4	76.4	89.1	66.1	77.6	90.7	58.7	74.7
45	82.0	70.7	76.4	87.1	49.2	68.2	96.0	72.0	84.0	93.4	64.9	79.1	93.7	78.0	85.9	97.1	72.0	84.6
46	84.4	70.6	77.5	91.2	51.2	71.2	90.0	46.0	68.0	93.6	57.1	75.4	80.0	65.4	72.7	94.7	51.1	72.9
47	84.6	70.0	77.3	82.2	50.0	66.1	91.0	62.0	76.5	92.6	56.4	74.5	87.3	67.0	77.2	88.3	49.3	68.8
48	85.1	71.0	78.1	83.4	40.2	61.8	94.0	45.0	69.5	93.1	61.4	77.3	85.9	53.6	69.8	91.6	42.0	66.8
49	83.7	71.7	77.7	78.8	27.1	53.0	95.0	41.0	68.0	94.7	63.4	79.1	86.3	53.7	70.0	91.3	43.0	67.1
50	83.3	73.6	78.5	92.1	53.4	72.8	96.0	54.0	75.0	97.1	73.0	85.1	93.0	66.7	79.9	95.4	64.3	79.9
51	83.1	72.1	77.6	82.4	58.0	70.2	90.0	38.0	64.0	97.7	66.6	82.1	89.9	58.7	74.3	98.1	57.3	77.7
52	82.3	70.0	76.2	94.2	70.8	82.5	92.0	44.0	68.0	95.3	49.6	72.4	86.6	48.0	67.3	96.8	71.0	83.9
1	83.3	71.6	77.5	94.1	68.8	81.5	96.0	63.0	79.5	96.7	57.4	77.1	85.0	39.7	62.4	94.3	57.1	75.7
2	83.4	72.1	77.8	96.4	50.0	73.2	86.0	34.0	60.0	98.4	60.6	79.5	82.9	33.3	58.1	94.1	45.9	70.0
3	85.1	59.9	72.5	91.0	50.2	70.6	95.0	43.0	69.0	96.7	57.0	76.9	82.6	38.4	60.5	91.0	54.4	72.7
4	82.9	70.4	76.7	96.1	61.1	78.6	88.0	36.0	62.0	94.7	45.0	69.9	81.3	30.1	55.7	94.6	42.1	68.4
5	83.3	67.3	75.3	89.7	50.7	70.2	94.0	41.0	67.5	92.1	42.4	67.3	77.9	35.4	56.7	91.9	47.7	69.8
6	82.6	62.6	72.6	88.0	54.8	71.4	88.0	36.0	62.0	92.9	45.4	69.1	85.3	33.0	59.2	90.7	42.3	66.5
7	82.6	66.3	74.5	88.1	63.8	76.0	90.0	40.0	65.0	91.0	50.6	70.8	73.4	26.1	49.8	89.4	51.4	70.4
8	83.0	66.0	74.5	95.1	56.0	75.6	88.0	34.0	61.0	89.4	41.9	65.6	79.1	36.6	57.9	92.7	39.9	66.3
9	83.5	70.0	76.8	88.0	44.0	66.0	88.0	28.0	58.0	87.9	42.9	65.4	75.4	24.9	50.2	90.1	33.3	61.7
10	84.0	70.7	77.4	82.4	37.1	59.8	91.0	26.0	58.5	87.7	45.4	66.6	84.1	33.7	58.9	87.9	30.6	59.2
11	83.9	65.9	74.9	76.4	39.2	57.8	90.0	34.0	62.0	88.7	49.1	68.9	73.6	38.7	56.2	90.4	40.1	65.3
12	83.6	69.6	76.6	76.5	32.0	54.3	92.0	32.0	62.0	91.1	56.6	73.9	78.7	35.0	56.9	90.4	34.3	62.4
13	84.3	69.7	77.0	77.8	46.7	62.3	89.0	40.0	64.5	91.4	62.4	76.9	86.6	44.4	65.5	84.1	32.9	58.5
14	83.1	75.0	79.1	71.8	32.4	52.1	90.0	31.0	60.5	91.3	57.6	74.5	92.4	43.6	68.0	85.1	24.7	54.9
15	82.1	72.1	77.1	64.0	32.0	48.0	89.0	36.0	62.5	94.6	64.9	76.5	81.7	38.7	60.2	82.6	35.7	59.1
16	83.9	72.0	78.0	75.5	39.5	57.5	87.0	58.0	72.5	94.6	70.0	82.3	87.9	66.3	77.1	93.0	57.3	75.1
17	83.0	63.0	73.0	75.0	37.4	56.2	92.0	47.0	69.5	91.4	60.7	76.1	85.3	49.7	67.5	91.3	56.1	73.7
18	84.4	70.3	77.4	67.2	26.1	46.7	88.0	52.0	70.0	94.3	73.0	83.7	89.4	73.9	81.7	84.3	56.9	70.6
19	85.6	72.7	79.2	67.0	40.1	53.6	91.0	57.0	74.0	94.0	69.0	81.5	94.4	86.9	90.7	88.1	60.1	74.1
20	84.3	72.9	78.6	66.7	33.8	50.3	87.0	56.0	71.5	94.1	76.0	85.0	89.0	77.3	83.2	92.4	66.4	79.4
21	86.7	73.6	80.2	72.8	37.4	55.1	85.0	65.0	75.0	90.4	69.0	79.7	89.4	66.3	77.9	95.4	76.6	86.0

Table Met-1.3 (i): Relative humidity (M=Morning, AN= Afternoon, AV=Average; %) at AICRP-FC trial locations during crop growth period, Rabi 2012-13

Met. Week	North-West Zone											
	Bikaner			Pantnagar			Ludhiana			Hisar		
	M	AN	AV	M	AN	AV	M	AN	AV	M	AN	AV
40	48.0	18.0	33.0	88.0	57.0	72.5	90.0	44.0	67.0	78.0	29.0	53.5
41	46.0	18.0	32.0	85.0	50.0	67.5	91.0	41.0	66.0	81.0	29.0	55.0
42	69.0	29.0	49.0	87.0	39.0	63.0	90.0	44.0	67.0	86.0	46.0	66.0
43	58.0	24.0	41.0	91.0	35.0	63.0	90.0	45.0	67.5	92.0	40.0	66.0
44	53.0	28.0	40.5	88.0	35.0	61.5	92.0	42.0	67.0	94.0	39.0	66.5
45	52.0	16.0	34.0	90.0	36.0	63.0	91.0	39.0	65.0	91.0	33.0	62.0
46	56.0	18.0	37.0	91.0	40.0	65.5	95.0	45.0	70.0	95.0	44.0	69.5
47	68.0	22.0	45.0	92.0	38.0	65.0	89.0	36.0	62.5	88.0	32.0	60.0
48	60.0	21.0	40.5	94.0	38.0	66.0	89.0	39.0	64.0	92.0	46.0	69.0
49	45.0	17.0	31.0	94.0	44.0	69.0	91.0	37.0	64.0	92.0	47.0	69.5
50	82.0	33.0	57.5	92.0	47.0	69.5	91.0	65.0	78.0	92.0	62.0	77.0
51	72.0	23.0	47.5	94.0	63.0	78.5	93.0	59.0	76.0	93.0	50.0	71.5
52	78.0	16.0	47.0	97.0	70.0	83.5	92.0	74.0	83.0	95.0	75.0	85.0
1	85.0	31.0	58.0	100.0	82.0	91.0	90.0	75.0	82.5	99.0	81.0	90.0
2	66.0	27.0	46.5	97.0	62.0	79.5	92.0	51.0	71.5	96.0	48.0	72.0
3	81.0	28.0	54.5	93.0	60.0	76.5	96.0	67.0	81.5	95.0	63.0	79.0
4	67.0	18.0	42.5	97.0	81.0	89.0	97.0	49.0	73.0	92.0	42.0	67.0
5	59.0	28.0	43.5	91.0	49.0	70.0	98.0	61.0	79.5	95.0	59.0	77.0
6	78.1	25.4	51.8	94.0	58.0	76.0	99.0	66.0	82.5	98.0	53.0	75.5
7	77.3	37.7	57.5	91.0	61.0	76.0	97.0	65.0	81.0	96.0	63.0	79.5
8	88.6	41.4	65.0	91.0	57.0	74.0	99.0	73.0	86.0	97.0	67.0	82.0
9	69.6	21.0	45.3	94.0	47.0	70.5	98.0	56.0	77.0	92.0	43.0	67.5
10	52.4	10.9	31.6	90.0	46.0	68.0	94.0	50.0	72.0	90.0	41.0	65.5
11	75.6	15.6	45.6	88.0	44.0	66.0	95.0	51.0	73.0	96.0	58.0	77.0
12	71.9	21.1	46.5	88.0	43.0	65.5	95.0	48.0	71.5	88.0	45.0	66.5
13	64.4	24.8	44.6	88.0	38.0	63.0	90.0	47.0	68.5	92.0	45.0	68.5
14	54.1	24.2	39.2	79.0	24.0	51.5	81.0	25.0	53.0	76.0	34.0	55.0
15	61.2	38.2	49.7	68.0	23.0	45.5	70.0	25.0	47.5	74.0	27.0	50.5
16	49.0	33.0	41.0	61.0	29.0	45.0	50.0	70.0	60.0	58.0	21.0	39.5
17	65.2	34.1	49.7	64.0	30.0	47.0	57.0	29.0	43.0	63.0	27.0	45.0
18	32.8	18.2	25.5	60.0	23.0	41.5	43.0	16.0	29.5	47.0	12.0	29.5
19	43.2	24.8	34.0				54.0	30.0	42.0	58.0	19.0	38.5
20							35.0	22.0	28.5	48.0	20.0	34.0
21							43.0	17.0	30.0	38.0	18.0	28.0

Table Met-1.3 (j): Relative humidity (M=Morning, AN= Afternoon, AV=Average; %) at AICRP-FC trial locations during crop growth period, Rabi 2012-13

Met. Week	Central Zone																	
	Anand			Jabalpur			Rahuri			Urulikanchan			Raipur			Jhansi		
	M	AN	AV	M	AN	AV	M	AN	AV	M	AN	AV	M	AN	AV	M	AN	AV
40	90.1	55.0	72.6	91.0	44.0	67.5	88.0	62.0	75.0	99.9	61.9	80.9	91.0	56.0	73.5	85.0	38.0	61.5
41	93.1	43.3	68.2	83.0	35.0	59.0	79.0	41.0	60.0	100.0	61.4	80.7	89.0	45.0	67.0	86.0	35.0	60.5
42	90.3	39.9	65.1	79.0	32.0	55.5	74.0	32.0	53.0	100.0	58.7	79.4	88.0	37.0	62.5	85.0	36.0	60.5
43	89.6	32.6	61.1	82.0	35.0	58.5	76.0	46.0	61.0	99.7	39.1	69.4	85.0	38.0	61.5	83.0	36.0	59.5
44	73.7	30.4	52.1	91.0	51.0	71.0	63.0	40.0	51.5	99.3	44.3	71.8	92.0	59.0	75.5	87.0	35.0	61.0
45	86.6	29.1	57.9	88.0	30.0	59.0	62.0	34.0	48.0	97.6	27.7	62.7	95.0	45.0	70.0	87.0	28.0	57.5
46	92.0	31.4	61.7	85.0	28.0	56.5	56.0	29.0	42.5	95.0	25.4	60.2	90.0	33.0	61.5	82.0	33.0	57.5
47	88.4	30.6	59.5	88.0	29.0	58.5	52.0	29.0	40.5	92.4	29.4	60.9	84.0	43.0	63.5	80.0	34.0	57.0
48	93.0	38.0	65.5	83.0	33.0	58.0	56.0	31.0	43.5	91.6	37.7	64.7	89.0	35.0	62.0	82.0	36.0	59.0
49	83.7	42.9	63.3	85.0	26.0	55.5	52.0	30.0	41.0	93.9	26.1	60.0	88.0	31.0	59.5	85.0	29.0	57.0
50	98.3	39.9	69.1	92.0	41.0	66.5	60.0	27.0	43.5	70.1	28.6	49.4	91.0	50.0	70.5	86.0	47.0	66.5
51	89.1	45.4	67.3	88.0	29.0	58.5	55.0	28.0	41.5	37.1	29.4	33.3	90.0	29.0	59.5	86.0	36.0	61.0
52	86.5	37.5	62.0	90.0	30.0	60.0	62.0	54.0	58.0	34.1	27.7	30.9	88.0	30.0	59.0	88.0	62.0	75.0
1	92.9	42.4	67.7	87.0	42.0	64.5	56.0	31.0	43.5	79.9	30.2	55.1	86.0	57.0	71.5	90.0	61.0	75.5
2	87.9	36.7	62.3	87.0	32.0	59.5	56.0	27.0	41.5	84.4	22.7	53.6	86.0	24.0	55.0	86.0	48.0	67.0
3	94.1	42.1	68.1	84.0	36.0	60.0	50.0	32.0	41.0	95.9	26.6	61.3	81.0	39.0	60.0	83.0	56.0	69.5
4	74.0	37.4	55.7	86.0	36.0	61.0	51.0	36.0	43.5	95.0	30.6	62.8	81.0	36.0	58.5	87.0	60.0	73.5
5	91.4	47.3	69.4	91.0	36.0	63.5	68.0	33.0	50.5	89.1	27.3	58.2	84.0	31.0	57.5	84.0	53.0	68.5
6	83.0	45.7	64.4	88.0	49.0	68.5	59.0	35.0	47.0	85.3	22.6	54.0	86.0	44.0	65.0	92.0	65.0	78.5
7	89.4	42.3	65.9	91.0	60.0	75.5	59.0	35.0	47.0	90.1	22.0	56.1	87.0	47.0	67.0	91.0	63.0	77.0
8	82.4	37.1	59.8	93.0	49.0	71.0	53.0	20.0	36.5	84.1	20.1	52.1	84.0	36.0	60.0	88.0	55.0	71.5
9	74.3	27.4	50.9	87.0	37.0	62.0	40.0	26.0	33.0	86.1	17.0	51.6	79.0	22.0	50.5	87.0	42.0	64.5
10	70.0	22.4	46.2	83.0	28.0	55.5	46.0	16.0	31.0	88.1	17.7	52.9	71.0	19.0	45.0	84.0	34.0	59.0
11	83.1	30.3	56.7	84.0	39.0	61.5	43.0	20.0	31.5	69.7	16.0	42.9	70.0	31.0	50.5	82.0	34.0	58.0
12	73.7	28.9	51.3	77.0	28.0	52.5	36.0	21.0	28.5	64.1	14.6	39.4	66.0	22.0	44.0	78.0	30.0	54.0
13	75.3	30.1	52.7	76.0	30.0	53.0	51.0	21.0	36.0	74.0	16.4	45.2	62.0	21.0	41.5	82.0	32.0	57.0
14	79.0	25.6	52.3	68.0	20.0	44.0	50.0	14.0	32.0	77.0	17.7	47.4	58.0	17.0	37.5	70.0	25.0	47.5
15	64.0	32.1	48.1	57.0	14.0	35.5	49.0	14.0	31.5	83.4	17.7	50.6	57.0	28.0	42.5	64.0	23.0	43.5
16	91.1	43.1	67.1	51.0	22.0	36.5	55.0	20.0	37.5	86.1	24.3	55.2	63.0	28.0	45.5	62.0	29.0	45.5
17	59.6	28.6	44.1	64.0	21.0	42.5	51.0	18.0	34.5	65.7	16.1	40.9	64.0	29.0	46.5	58.0	24.0	41.0
18	65.0	28.9	47.0	42.0	12.0	27.0	42.0	15.0	28.5	78.7	19.4	49.1	51.0	21.0	36.0	51.0	19.0	35.0
19	76.6	26.9	51.8	31.0	12.0	21.5	38.0	17.0	27.5	80.0	23.9	52.0	48.0	17.0	32.5	46.0	19.0	32.5
20	77.1	33.6	55.4	36.0	9.0	22.5	47.0	21.0	34.0	74.7	16.7	45.7	44.0	15.0	29.5	45.0	16.0	30.5
21	73.9	36.7	55.3	27.0	15.0	21.0	57.0	25.0	41.0	74.4	22.0	48.2	34.0	16.0	25.0	40.0	15.0	27.5

Table MET-1.4 (k): Sun Shine (hr) at AICRP -FC trial locations during crop growth period, Rabi 2012-13

Met. Week	Hill Zone		North-West Zone				North-East Zone					
	Srinagar	Palampur	Bikaner	Pantnagar	Ludhiana	Hisar	Ranchi	Faizabad	Bhubaneswar	Jorhat	Imphal	Kalyani
40	7.9	9.9	10.3	7.9	9.9	10.1	9.0	7.9	5.5	2.3	3.0	5.8
41	7.2	9.6	9.7	9.1	9.2	9.3	9.0	7.7	3.9	1.6	3.7	5.7
42	6.0	8.9	8.7	8.7	8.8	7.7	8.4	8.0	8.6	1.4	8.1	8.6
43	6.2	9.2	9.2	8.7	8.7	8.0	8.5	7.1	8.1	1.5	9.7	9.2
44	7.4	9.6	9.5	8.6	7.0	6.0	6.4	7.4	6.3	1.4	6.1	7.0
45	6.9	9.1	9.3	5.0	5.5	4.3	7.2	4.2	4.4	1.5	5.2	4.5
46	6.2	8.9	9.3	6.9	7.7	5.8	8.6	5.9	7.2	1.5	9.0	7.9
47	5.4	6.6	8.8	7.6	6.9	7.5	9.1	6.2	4.8	1.5	8.4	6.9
48	5.2	6.9	8.8	8.1	8.1	7.5	9.4	6.9	4.5	1.1	8.9	8.1
49	2.7	7.4	9.5	6.5	8.1	7.9	9.6	5.9	8.0	1.0	8.8	7.9
50	1.5	3.4	4.4	4.6	4.4	3.6	7.9	3.9	7.1	1.4	4.8	4.2
51	2.1	8.2	9.0	3.2	7.6	8.0	9.3	4.0	7.9	1.2	7.3	5.9
52	1.9	6.1	7.3	2.9	4.9	3.7	10.5	1.2	7.3	1.3	8.7	3.4
1	6.2	7.3	6.9	1.1	0.2	2.0	7.3	1.5	3.5	1.3	9.0	2.9
2	4.8	7.5	8.1	3.8	6.9	6.1	9.5	2.0	6.5	1.6	7.5	5.9
3	4.3	5.4	6.6	4.4	5.1	4.1	9.2	2.7	7.1	1.2	9.0	4.6
4	6.0	8.1	9.2	2.6	8.4	8.3	9.4	3.2	6.6	1.5	8.8	7.9
5	1.6	4.8	5.4	4.7	3.3	5.2	9.4	5.5	6.6	1.8	8.0	5.8
6	4.3	5.8	9.3	6.0	8.7	7.3	9.6	6.5	7.3	1.5	6.9	7.8
7	4.2	4.8	7.0	5.7	6.2	4.8	4.0	5.0	5.3	1.9	5.8	6.0
8	3.5	5.9	7.3	6.6	5.3	5.4	9.8	5.7	8.8	2.0	8.8	9.9
9	8.3	7.0	10.0	8.9	10.0	9.5	8.7	8.2	9.2	1.8	9.2	10.1
10	7.5	8.7	9.8	9.0	9.4	9.4	9.8	8.7	8.7	1.8	9.2	9.0
11	6.0	5.6	6.9	8.9	9.4	7.8	8.8	6.5	6.2	2.7	8.7	6.3
12	5.5	7.1	7.7	8.4	9.6	8.5	8.8	7.3	7.6	3.0	7.7	8.3
13	5.0	6.8	7.2	8.5	8.0	7.1	9.8	7.2	6.7	3.4	7.8	7.3
14	5.6	8.7	9.3	10.4	11.1	8.9	9.8	8.3	7.8	3.9	9.1	9.2
15	6.5	8.9	7.3	9.3	9.1	8.9	10.0	6.8	7.1	3.7	9.6	8.7
16	5.7	7.4	9.7	9.4	9.8	8.7	6.9	6.5	6.0	3.0	6.1	6.6
17	5.2	6.1	5.8	9.1	6.5	8.5	8.8	7.4	8.6	2.6	8.6	8.9
18	6.0	8.1	9.9	9.8	10.0	9.6	9.9	8.6	7.1	3.7	4.2	8.8
19	5.5	7.1	9.3		9.1	8.2	10.2	7.3	7.8	2.8	1.8	7.1
20	6.9	9.0			5.5	10.4	9.6	7.5	4.3	2.8	1.6	4.8
21	7.0	7.5			3.5	10.0	9.8	7.7	5.2	2.5	6.2	3.4

Table MET-1.4 (I): Sun Shine (hr) at AICRP -FC trial locations during crop growth period, Rabi 2012-13

Met. Week	Central Zone					South Zone		
	Anand	Jabalpur	Raipur	Jhansi	Kanpur	Coimbatore	Hyderabad	Mandya
40	8.5	7.3	7.6	10.1	8.4	9.7	3.0	8.1
41	8.5	9.0	8	9.6	8.2	5.1	8.8	5.5
42	9.6	9.4	8.6	8.9	8.1	4.4	7.7	6.0
43	9.7	8.4	6.9	9.1	7.3	4.0	7.0	7.4
44	8.8	6.7	4.9	7.7	4.9	4.3	4.4	6.5
45	9.6	7.7	6.6	9.0	4.5	8.3	6.3	8.4
46	9.5	8.4	9.1	8.8	6.0	8.4	8.9	8.6
47	9.5	7.6	7.3	8.3	7.5	5.4	6.8	7.1
48	9.6	8.4	8.4	8.8	7.0	8.8	7.0	6.9
49	8.8	9.0	7.7	8.3	7.7	7.2	8.1	8.2
50	8.9	7.2	6.4	7.6	5.5	9.1	9.9	8.5
51	8.6	8.6	7.9	8.4	5.7	4.5	9.1	4.9
52	9.3	9.1	9.0	5.1	0.8	5.8	7.7	6.0
1	8.3	5.9	3.3	6.3	2.1	7.7	7.8	7.1
2	9.5	9.2	8.1	9.0	4.4	6.5	9.2	6.5
3	8.5	8.1	8.8	7.2	2.9	9.3	9.5	5.2
4	9.3	7.6	6.1	9.2	5.9	9.5	8.0	7.5
5	10.2	7.4	7.9	6.4	4.9	8.2	7.7	8.0
6	9.1	6.2	6.7	6.5	5.9	7.7	8.0	8.2
7	8.9	4.1	6.7	5.9	5.7	6.6	8.9	7.9
8	10.1	9.3	9.9	9.0	7.4	7.1	9.4	8.1
9	10.7	9.8	10.0	10.2	9.4	10.5	9.9	7.3
10	10.2	9.6	9.6	10.3	9.8	5.6	8.8	8.2
11	9.4	7.4	6.1	9.3	8.6	8.4	7.3	9.1
12	9.2	8.2	8.3	9.6	8.2	8.2	7.9	8.8
13	8.2	7.8	7.8	8.2	8.3	8.1	8.6	8.6
14	10.3	8.9	9.0	10.1	9.7	6.2	8.3	8.0
15	9.7	8.7	7.8	9.1	7.9	8.4	8.5	8.6
16	9.4	8.6	9.6	6.9	6.5	9.2	8.7	8.5
17	10.5	9.0	9.5	9.1	8.9	7.5	5.4	6.5
18	11.5	10.8	10.9	10.9	9.6	7.1	9.3	6.2
19	10.8	10.6	9.4		8.0	6.4	9.0	5.8
20	11.0	10.6	8.8		9.7	7.3	7.8	5.2
21	11.0	10.0	8.6		9.0	8.7	9.9	5.0

APPENDIX II: FORAGE CROP BREEDING TRIALS AT A GLANCE (Rabi: 2012-13)

S. No.		Location	Berseem	Oat (Single cut)					Oat (Multi cut)			Rye grass	Lucerne		Tall Fescue	Total
			Trial No.-1 IVTB (SC)	Trial No.-2 IVT Oat (SC)	Trial No.-3 AVT Oat (SC-1)	Trial No.-4 AVT Oat (SC)-2	Trial No.-5 AVT Oat (SC-2) (Seed)	Trial No.-6 IVT Oat (MC)	Trail No.-7 IVT Oat Dual	Trial No.-8 IVT Lathyrus	Trial No.-9 AVT Lathyrus-1	Trial No.10 IVT Rye grass	Trial No.-11 VT Lucerne (P)-2011 2nd Year	Trial No.-12 VT Lucerne (P)-2010 3rd Year	Trial No.-13 VTT Fescue-2009 4th Year	
Zone		Trial No.	1	2	3	4	5	6	7	8	9	10	11	12	13	
HZ	1.	Palampur		DR	DR	DR	DR	DR	DR			DR			DR	8
	2.	Srinagar		DR	DR	DR	DR	DR	DR			DNR			DNR	6
	3.	Almora						DR				DR			DNR	2
NWZ	4.	Pantnagar		DR	DR	DR	DR	DR	DR			DR				7
	5.	Ludhiana	DR	DR	DR	DR		DR	DR			DR	DR	DNR		8
	6.	Hisar	DR	DR	DR	DR	DR	DR	DR				DR			8
	7.	Jalore		DR	DR	DR		DR	DR			DR	DNR			6
	8.	Udaipur		DR	DR	DR		DR	DR				DNR	DNR		5
	9.	Meerut		DR	DR	DR										3
	10.	Bikaner	DR	DR	DR	DR			DR				DR	DR		7
NEZ	11.	Kalyani		DR	DR	DR				DR	DR					5
	12.	Ranchi		DR	DR	DR	DR	DR	DR	DR	DR					8
	13.	Faizabad		DR	DR	DR		DR	DR							5
	14.	Bhubaneswar		DR	DR	DR		DR	DR	DR	DR					7
	15.	Pusa		DR	DR	DR		DR	DR	DR	DR					7
	16.	Jorhat		DR	DR	DR	DR	DR	DR	DR	DR	DR				9
	17.	Imphal		DR	DR	DR		DR								4
	18.	Barapani										DNR				
CZ	19.	Jhansi	DR	DR	DR	DR	DR	DR	DR	DR	DR			DNR		9
	20.	Rahuri	DR	DR	DR	DR		DR	DR				DR	DR		8
	21.	Jabalpur	DR	DR	DR	DR	DR	DR	DR	DR	DR					9
	22.	Urulikanchan	DR	DR	DR	DR		DR	DR				DR	DR		8
	23.	Karjat	DR	DR	DR	DR			DR	DR						6
	24.	Kanpur		DR	DR	DR				DR	DR		DR			6
	25.	Anand		DR	DR	DR		DR	DR					DR		6
	26.	Raipur		DR	DR	DR			DR	DR						5
SZ	27.	Hyderabad		DR	DR	DR	DR						DR	DR		6
	28.	Mandya		DR	DR	DR	DR						DNR	DNR		4
	29.	Coimbatore		DR	DR	DR							DR	DR		5
	30.	Dharwad											DR	DR		2
		Total														179/189
		Data Reported	8/8	27/27	27/27	27/27	10/10	19/19	20/20	10/10	8/8	6/8	9/12	7/10	1/3	

DR-Data reported, DNR-Data not reported, Data Reporting (%): 179/189=94.70% Success (%)=94.70

APPENDIX III: FORAGE CROP PRODUCTION TRIALS AT A GLANCE: (Rabi-2012-13)

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	AST -17	AST -18	Total allotted	Total DR &TC/ allotted
HILL ZONE																				
Almora						DR													1	1/1
Palampur	DR					DR										DR	DR		4	4/4
Srinagar						DR							DR				DR		3	3/3
Bajaura																DR			1	1/1
NORTH WEST ZONE																				
Hisar	TNC					DR											DR		3	2/3
Pantnagar	DR						DR										DR		3	3/3
Bikaner						DR									DR				2	2/2
Ludhiana	TC					DR	DR												3	3/3
NORTH EAST ZONE																				
Faizabad	DR								DR										2	2/2
Ranchi	DR	DR					DR										DR		4	4/4
Kalyani	DR	DR															DR	TNC	4	3/4
Bhubaneswar	DR	DR			TNC	DR													4	3/4
Jorhat	DR	DR			DR	DR											DR		5	5/5
Imphal																		DR	1	1/1
Shillong								TNC											1	0/1
CENTRAL ZONE																				
Jabalpur	DR	DR				DR	DR										DR		5	5/5
Rahuri	DR					DR	DR												3	3/3
Urulikanchan	DR					DR	DR												3	3/3
Anand	DR					DR													2	2/2
Jhansi																	DR		1	1/1
Raipur		DR				DR	DR												3	3/3
SOUTH ZONE																				
Hyderabad	DR		DR	DR															3	3/3
Mandya	DR			DR						DR	DR						DR		5	5/5
Coimbatore	DR		DR											DR			DR		4	4/4
Vellayani	DR											DR							2	2/2
Dharwad				DR															1	1/1
Total (DR & TC)	16	6	2	3	1	13	7	-	1	1	1	1	1	1	1	2	11	1	73	69/73

DR- Data reported; TC-Trial conducted; TNC-Trial not conducted; **Success of data reporting/trial conducting (%)**= 69/73= **94.52 %**

APPENDIX -IV: FORAGE CROP PROTECTION TRIALS AT A GLANCE (Rabi: 2012-13)

Locations /Trials	PPT-1	PPT-2A	PPT-2B	PPT-12	PPT-17	PPT-18	Total	Success rate (%)
Bhubaneswar	A	A			A (part-2)		**3**	
	DR	DR			DR		**3**	100
Dharwad	A	A				A	**3**	
	DR	DR				DR	**3**	100
Hisar		A					**1**	
		DR					**1**	100
Hyderabad	A	A				A	**3**	
							0	0
Jhansi	A	A	A		A (part-2)	A	**4**	
	DR	DR	DR		DR	DR	**4**	100
Ludhiana	A	A	A				**3**	
	DR	DR	DR				**3**	100
Palampur	A	A		A	A (part A)		**4**	
	DR	DR		DR	DR		**4**	100
Rahuri	A	A				A	**3**	
	DR	DR				DR	**3**	100

Abbreviations: A = Trial allotted; DR = Data Reported

APPENDIX V: FORAGE BREEDING ACTIVITIES AT AICRP–FC CENTRES DURING RABI, 2012-13

a. Hill Zone

1. CSKHPKV, Palampur

Germplasm Holding

Crop	No. of Collections
Tall Fescue Grass (*Festuca arundinacea)*	41
Orchard Grass (*Dactylis glomerata)*	4
Red Clover (*Trifolium pratense)*	4
White Clover (*Trifolium repens)*	30
Rye Grass (*Lolium perenne)*	3
Oat (*Avena* spp.)	135

- Fifty five collections of oat were procured from SKAUST, Srinagar
- Fifteen different species of *Avena* were characterized on the basis of agro morphological characters and molecular markers.
- One hundred and thirty five genotypes of oat were evaluated for forage yield and powdery mildew resistance.

Generation of breeding material

Oat

- Crosses among diverse genotypes involving *Avena sativa* x *A. sativa, A. sativa* x *A. sterilis* and *A. sterilis* x *A. byzantina* were 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 developed through hybridization programme were evaluated in the station trials.
- Crosses in Triple Test Cross mating design involving three testers and 15 lines were also made.
- Mapping population involving PLP-I (R) and HJ-6 (S) has been developed to identify molecular markers linked to powdery mildew resistance.

Tall Fescue

- Poly cross progenies are under evaluation.
- Two new composites populations are under evaluation. Entry Hima 14 has shown superiority over checks and entry is being tested in coordinated trials.

White clover

- Promising composite populations of white clover, namely, PWC-3, PWC-22 and PWC- 25 are being multiplied for further evaluation.

NORTH-EAST ZONE

2. Jorhat, AAU

Germplasm Collection: During 2012-13, 21 germplasm were collected from different locations of Manipur.

Crop	Germplasm collected (no.)	Place of collection
Ricebean	16	Manipur
Maize	4	Manipur
Cowpea	1	Manipur

Maize: During Kharif eight lines were selected.

- These selected entries were sown in November for seed multiplication.
- The entries were allowed for open pollination to develop composite variety.
- Hybridization programme was also taken with these entries and African Tall variety.

Lathyrus:

- Ten entries of Lathyrus were evaluated along with Nirmal variety as check. Four entries were selected on the basis of GFY, DMY, CPY and plant height.

Rice bean:

- Selected rice bean cross material of National Rice bean hybridization programme were grown for seed multiplication.

CENTRAL ZONE

3. JNKVV, Jabalpur

Research activity–Kharif, 2012

Forage Breeding

Crop	Existing accession	New collection	Total	Source
Soybean	61	6	67	NRC Indore & Sehore
Rice bean	28	4	32	NBPGR, New Delhi

Generation of materials/entries/crosses made during–Kharif, 2012.

S. No.	Crop	Cross made	Cross advanced	Selection made
1	Soybean	5	$4F_1$	-
			$6F_2$	24
			$5F_3$	18
			$7F_4$	07
			$8F_5$	04

Crosses made

(i) JS 04-133 x Kalitur (ii) GP 851 x BR 7 (iii) W T 49 x BR 7
(iv) JS 94-66 x MAUS 16-1 (v) NRC 43 x JS 11-01

F_1 generation

(i) BR 7 x Kalitur (ii) MAUS 61-2 x JS11-1 (iii) EC 389159 x WT-49
iv) JS 04-133 xHimso1559

F_2 generation

i) Kalitur x GP1559 ii) JS 16-1 x EC 389189 iii) EC 389189 x BR -7
iv) Himso 1521 x JS 80-21 v) MAUS 16-1 x JS 90-41 vi) JS 76-205 x JS 11-1

F_3 generation

i) Kalitur x S16-1 ii) JS 16-1 x BR 7 iii) Kalitur x NRC37
iv) JS 80-21 x Kalitur v) GP1559 x MAUS 7

F_4 generation

i) EC 389189 x S11-1 ii) Kalitur x JS 16-1 iii) NRC 37 x Kalitur
iv) JS 80-21 x JS 62-1 v) MAUS 7 x Kalitur vi) MAUS 61-2 x GP 1559
vii) JS 16-1 x S 11-1

F_5 generation

i) JS(IS) 90-5-12-2 x Kalitur ii) BR7 x NRC 608 iii) Kalitur x JS(IS) 90-5-12-2
iv) Kalitur x NRC 37 v) Kalitur x EC 393280 vi) Himso1521 x Kalitur
vii) GP 1559 x Kalitur viii) Kalitur x GP 1559

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

Rice bean

- Four new accessions were obtained by NBPGR, New Delhi
- Selections were made for different fodder traits in the mutation derived M_6 populations of Bidhan - 1 (EMS 0.4% and 0.8% for 1, 2 and 4hrs treatments)
- New crossing programme was initiated using diverse genotypes of rice bean. Single plant selections were made using different fodder traits.

4. MPKV, Rahuri

1) POLYCROSS PROGRAMME OF LUCERNE:

The new poly cross programme was initiated from Rabi-2011-12 onwards.
The details of parental lines included in the programme are as follow:

Contributing centre (Centre Code)	Name of the entry (Entry Code)
Anand (A)	Anand-24 (A)
Anand (A)	AL-3 (L)
Coimbatore (C)	TNFD-118 (T)
Urilikanchan (B)	BAIF- Lucerne-1 (B)
Rahuri (R)	RLG-08-01 (R)

Detail procedure of Lucerne Polycross programme:

Season	Activity
Rabi-2011-12	Sowing of Lucerne Polycross Programme
Summer-2012	Polycross Seed was produced.
	The Seed obtained from 25 plants in polycross progrmme at each location was harvested individually, numbered and shared among the participating centre.
Rabi-2012-13	The seed obtained from 100 plants (25 x 4) centers) was in single row of 4 m length spaced at 30 cm along with checks in an augmented block design.
	The 100 progenies were evaluated for GFY, DMY and pest/disease resistance
Rabi-2013-14	Out of 100 progenies the best 20-25 progenies will be identified at each centre on the basis of one year data on GFY, DMY and pest/disease resistance
	From selected progenies, most promising individual plants (40-50) will be identified, tagged and numbered by the monitoring team at each centre (November, 2013). Each center will maintain selected individual plants by rooted cuttings in a mother plant clonal nursery
Summer 2014	The promising plants in selected progenies will be allowed to random mate by open pollination
	The OP seed of selected promising plants (40-50) will be harvested individually at each location. The same will be shared between participating centers for progeny test.;
Rabi-2014-15	The OP seed of 160-200 (40-50 x 4) IPS will be sown in a single row of 3m length spaced at 30 cm for progeny test (Nov., 2014).
	The 160-200 progenies will be evaluated for GFY, DMY and pest/disease resistance.
Rabi-2015-16	The best 20-25 progenies at each location will be selected during August-September by the monitoring team on the basis of GFY , DMY pest/disease resistance data.
	The clones of the mother plants of selected progenies will be shared as per the need of participating centers during September.
	The selected clones: will be planted in isolation and allowed to random mate for development of synthetic population at each center during summer-2016
Rabi-2016-17	The synthetic populations so developed at each center will be tested in VTL (P).

2) EVLUATION OF POLYCROSS PROGENY IN LUCERNE

Sowing Date: 12-11-2012, Augmented, Plot Size: Single row of 4 m length,
Fertilizer: 20: 150: 40 NPK Kg/ha, Cuts on: 28.1.2013, 27.2.2013, 20.3.2013 & 10.4.2013 **(Total of Four Cuts)**

SN.	Progeny	GFY (q/ha)	DMY (q/ha)	CP %	Plant Height (cm)	Inter node Length (cm)	Tillers/ Plant (no.)
1	AAP-1	107.50	35.21	19.00	72.49	7.43	9.10
2	AAP-2	117.08	38.52	20.56	72.98	6.73	12.73
3	AAP-3	195.99	57.55	17.94	78.02	7.80	12.77
4	AAP-4	153.74	58.02	19.69	84.85	7.39	11.30
5	AAP-5	92.50	30.20	20.12	66.95	7.57	9.62
6	ALP-1	58.66	10.78	20.56	57.91	5.97	8.73
7	ALP-2	117.58	41.93	19.69	76.13	6.77	11.13
8	ALP-3	89.33	25.53	20.12	64.02	7.27	10.93
9	ALP-4	114.66	44.49	19.69	67.49	8.03	14.17
10	ALP-5	116.83	37.63	19.69	74.51	6.83	9.67
11	ATP-1	89.58	25.29	20.56	65.11	6.70	9.50
12	ATP-2	132.24	49.25	19.25	68.50	8.30	8.63
13	ATP-3	110.33	36.56	20.12	74.98	7.20	10.40
14	ATP-4	120.66	39.43	20.12	64.26	7.23	11.07
15	ATP-5	145.49	46.42	19.12	69.73	7.27	9.00
16	ABP-1	104.00	31.54	20.56	73.64	7.23	9.37
17	ABP-2	200.99	58.38	20.12	80.09	7.27	10.37
18	ABP-3	129.58	48.72	19.12	69.02	8.43	8.60
19	ABP-4	174.99	57.05	18.81	76.69	8.37	13.60
20	ABP-5	175.91	64.21	17.50	73.80	8.70	12.83
21	ARP-1	151.74	51.85	19.25	75.82	6.50	11.27
22	ARP-2	54.83	15.77	21.00	58.48	7.20	6.60
23	ARP-3	96.08	27.14	20.56	76.73	7.23	15.67
24	ARP-4	201.58	69.11	17.06	89.62	8.20	17.28
25	ARP-5	139.08	52.50	18.37	73.91	7.77	9.00
26	BAP-1	177.83	53.21	18.37	75.40	7.87	11.00
27	BAP-2	186.08	45.26	19.12	77.33	9.07	9.90
28	BAP-3	150.74	57.22	17.94	80.57	7.43	9.53
29	BAP-4	117.16	44.30	19.96	69.88	6.97	8.47
30	BAP-5	116.91	35.54	20.12	71.20	8.90	10.20
31	BLP-1	219.99	81.89	17	73.42	6.80	9.87
32	BLP-2	143.58	55.74	18.37	77.15	7.63	8.07
33	BLP-3	224.66	73.89	16.19	84.84	8.50	9.47
34	BLP-4	238.32	79.12	17	84.04	8.73	10.07
35	BLP-5	298.57	96.83	16.00	85.64	8.97	12.97
36	BTP-1	167.41	59.53	18.12	79.15	8.47	8.10
37	BTP-2	226.91	74.83	17.06	86.82	8.17	12.37
38	BTP-3	186.24	57.05	18.81	74.37	8.50	10.73
39	BTP-4	248.99	77.14	17.50	92.11	9.00	10.60
40	BTP-5	0.00	0.00	0.00	0.00	0.00	0.00
41	BBP-1	274.99	90.75	16	82.80	7.13	11.30
42	BBP-2	181.41	50.61	17.94	76.15	7.37	9.80
43	BBP-3	146.66	45.76	19.12	80.35	6.60	9.07
44	BBP-4	150.58	59.27	18.81	86.44	8.03	9.57
45	BBP-5	173.74	64.86	18.81	80.53	8.73	9.87
46	BRP-1	209.99	63.09	21.44	85.66	8.43	11.43
47	BRP-2	277.99	83.37	17.06	81.80	8.13	11.63
48	BRP-3	98.75	26.01	21.00	71.77	7.07	10.00
49	BRP-4	0.00	0.00	0.00	0.00	0.00	0.00
50	BRP-5	0.00	0.00	0.00	0.00	0.00	0.00
54	CAP-4	177.91	49.52	19.25	77.84	9.37	12.07
55	CAP-5	171.66	48.06	18.81	72.53	7.70	13.43
56	CLP-1	184.66	50.83	17.94	75.46	7.77	11.43
57	CLP-2	196.16	58.94	18.81	80.22	8.57	13.20
58	CLP-3	182.08	47.06	18.81	84.75	9.17	11.43
59	CLP-4	121.08	33.66	20.12	62.64	7.90	8.33

60	CLP-5	192.49	50.36	18.12	82.89	8.23	10.93
61	CTP-1	162.91	47.39	19.00	79.35	8.00	9.60
62	CTP-2	168.74	41.27	19.12	81.04	8.13	10.20
63	CTP-3	234.49	66.00	19.69	85.78	8.10	9.60
64	CTP-4	136.16	35.35	20.12	70.42	7.27	8.70
65	CTP-5	218.99	64.94	19.69	83.51	7.70	8.80
66	CBP-1	222.49	60.73	20.12	80.40	7.13	11.50
67	CBP-2	182.08	50.55	18.12	82.15	8.80	13.93
68	CBP-3	113.66	22.98	18.37	74.49	7.20	8.83
69	CBP-4	125.91	37.57	19.25	79.69	8.80	11.63
70	CBP-5	229.49	65.98	20.12	84.60	8.17	10.70
71	CRP-1	250.41	72.26	17.94	85.02	8.40	10.87
72	CRP-2	154.08	42.63	18.81	85.66	7.50	10.73
73	CRP-3	188.99	38.28	19.00	77.15	6.97	9.93
74	CRP-4	124.41	34.78	20.12	80.40	8.60	10.23
75	CRP-5	113.66	27.61	20.56	81.13	6.63	11.20
76	RAP-1	164.66	46.92	19.25	70.22	7.23	12.83
77	RAP-2	172.24	47.45	17.50	72.84	7.03	9.33
78	RAP-3	213.74	63.30	19.69	76.04	7.50	10.23
79	RAP-4	171.08	46.37	18.81	75.91	7.00	10.37
80	RAP-5	140.49	39.83	20.00	69.68	8.20	10.23
81	RLP-1	212.07	57.26	18.81	81.68	8.33	11.93
82	RLP-2	225.91	59.41	18.12	79.26	6.90	10.67
83	RLP-3	217.99	61.26	20.56	90.86	8.67	11.23
84	RLP-4	101.91	30.35	19.12	74.86	8.13	10.43
85	RLP-5	210.41	56.47	18.00	83.20	6.70	13.10
86	RTP-1	191.24	44.39	20.12	86.78	8.43	12.10
87	RTP-2	216.49	60.95	21	78.00	7.87	10.77
88	RTP-3	183.24	45.61	19.69	78.13	7.57	9.47
89	RTP-4	162.74	45.18	20.12	80.67	7.27	11.17
90	RTP-5	212.82	51.77	18.00	77.66	7.53	10.47
91	RBP-1	131.08	32.89	20.56	78.77	7.43	11.20
92	RBP-2	219.91	58.18	18.12	74.89	8.03	12.23
93	RBP-3	189.49	49.29	19.00	82.08	8.10	10.80
94	RBP-4	119.25	29.22	21.00	79.82	7.70	9.67
95	RBP-5	189.99	53.71	18.81	73.04	9.30	9.00
96	RRP-1	173.49	44.84	19.69	66.06	7.67	11.13
97	RRP-2	187.49	43.80	20.56	69.35	6.73	10.33
98	RRP-3	126.66	34.04	21.00	77.38	7.13	10.40
99	RRP-4	186.33	55.48	17.94	77.42	7.27	9.23
100	RRP-5	198.74	51.80	18.12	71.55	6.97	10.90
101	Anand-24 (c)	149.16	45.23	19.69	78.17	7.53	10.13
102	AL-3 (c)	213.99	63.26	18.12	79.86	8.27	10.20
103	TNFD-118 (c)	143.08	38.85	19.25	70.80	6.93	11.07
104	BAIFL-1 (c)	205.16	58.10	18.12	78.71	8.47	11.03
105	RLG-08-1 (c)	176.66	46.55	20.44	80.49	7.50	13.63
Check Mean		**177.61**	**50.40**				
SD		**55.80**	**17.80**				
Check X + SD		**233.41**	**68.20**				

Conclusion: Considering four cut data, **six** progenies viz., BLP-5 (298.57 and 96.83 q/ha), BRP-2 (277.99 and 83.37 q/ha), BBP-1 (274.99 and 90.75 q/ha), CRP-1 (250.41 and 72.26 q/ha), BTP-4 (248.99 and 77.14 q/ha) and BLP-4 (238.32 and 79.12 q/ha) were found promising for GFY and DMY respectively over check mean + SD values.

3) GERMPLASM EVLUATION IN LUCERNE:

Sowing Date: 29-11-2011, non-replicated, Plot Size: 4.00 x 1.20 m, Fertilizer: 20: 150: 40 NPK Kg/ha **(Total of Eighteen Cuts)**

SN.	Entry	GFY (q/ha)	DMY (q/ha)	CPY (q/ha)	DM %	CP (%)	NDF%	ADF%	IVDMD (%)
1	RLG-11-1	596.42	104.35	14.91	17.50	14.29	53.37	39.26	60.56
2	RLG-11-2	1032.33	180.16	39.49	17.45	**21.92**	49.87	39.48	56.24
3	RLG-11-3	1088.50	200.72	38.64	18.44	19.25	49.24	38.26	58.46
4	RLG-11-4	1048.67	179.78	31.46	17.14	17.5	49.53	38.46	59.84
5	RLG-11-5	893.40	163.53	26.23	18.30	16.04	52.43	39.56	61.80
6	RLG-11-6	982.04	131.99	18.10	13.44	13.71	52.76	38.87	60.14
7	RLG-11-7	1151.68	214.86	38.37	18.66	17.86	50.63	36.45	61.26
8	RLG-11-8	847.11	144.45	30.75	17.05	21.29	52.16	37.56	60.82
9	RLG-11-9	952.58	175.43	35.80	18.42	20.41	52.46	37.25	62.92
10	RLG-11-10	581.63	95.04	19.41	16.34	20.42	49.56	35.89	60.38
11	RLG-11-11	971.79	156.57	33.79	16.11	21.58	51.26	35.46	58.62
12	RLG-11-12	1314.48	207.42	36.92	15.78	17.8	44.65	37.89	61.48
13	RLG-11-13	1357.69	246.99	45.59	18.19	18.46	45.26	36.45	63.46
14	RLG-11-14	1054.46	202.25	33.61	19.18	16.62	44.58	38.47	60.28
15	RLG-11-15	795.11	145.73	26.04	18.33	17.87	45.76	39.45	62.88
16	RLG-11-16	1203.22	200.36	33.88	16.65	16.91	47.89	34.56	58.46
17	RLG-11-17	1145.51	166.65	23.81	14.55	14.29	48.45	39.23	60.58
18	RLG-11-18	1165.22	195.99	32.57	16.82	16.62	50.26	38.56	61.24
19	RLG-11-19	1241.85	221.50	38.03	17.84	17.17	49.81	39.48	59.36
20	RLG-11-20	1214.26	215.02	36.90	17.71	17.16	51.18	38.67	58.78
21	RLG-11-21	1116.46	194.71	34.07	17.44	17.5	52.46	39.61	57.28
22	RLG-11-22	1146.97	175.76	32.80	15.32	18.66	51.42	36.78	58.6
23	RLG-11-23	1055.83	143.47	18.82	13.59	13.12	47.81	37.91	62.48
24	RLG-11-24	1067.46	187.02	27.27	17.52	14.58	49.56	36.45	60.4
25	RLG-11-25	877.40	154.67	25.26	17.63	16.33	54.26	35.68	59.24
26	RLG-11-26	753.64	145.30	20.76	19.28	14.29	53.14	37.91	61.29
27	RLG-11-27	1005.33	185.30	31.96	18.43	17.25	51.37	38.29	60.28
28	RL-88 ©	1160.34	230.86	40.59	19.90	17.58	46.48	37.56	62.34
Mean		**1029.34**	**177.35**	**30.92**					
SD		**192.11**	**36.30**	**7.77**					

4) DEVELOPMENT OF MULTICUT SORGHUM: forty-eight hybrids were made during **Rabi 2012-13** using four CMS lines of sweet sorghum received from the Senior Sorghum Breeder, Rahuri and twelve promising Sudan grass accessions. These hybrids of sorghum x sudan grass will be evaluated along with parents and check varieties during kharif, 2013.

S. N.	Lines	S. N.	Testers	S. N.	Testers
1	185A	1	IS-722	7	IS-3307
2	479A	2	IS-3214	8	IS-3309
3	ICSA- 205A	3	IS-3225	9	IS-3312
4	ICSA-206A	4	IS-3238	10	IS-3323
		5	IS-3267	11	IS-3351
		6	IS-3289	12	IS-3338

5. BAIF, Urulikanchan

Lucerne

Polycross Programme: New cycle was initiated from *Rabi* 2011-12. The crossed seed (F_1) obtained from 22 plants was shared with participating centers *i.e.* Anand, Rahuri & Coimbatore center. We also received crossed seed (F_1) of 75 plants from these three centers. Progeny of 97 F_1's was sown in single row of 4 m length at 30 cm along with parental lines in an augmented block design. The progenies were evaluated for GFY, DMY and CPY.

Evaluation of Germplasm: The germplasm (31 lines) collected from Lucerne dominated areas of Maharashtra & Gujarat and progenies of IPS from BAIF Lucerne-1 (21no.) were grown in *Rabi* 2011-12 for evaluation. All the lines were evaluated for forage yield, quality traits and perenniality. Twelve cuts were obtained and observations on GFY, DMY, CP%, plant height, inter-nodal length, leaf stem ratio & number of tillers were collected.

Seed Multiplication: In the first cycle of Polycross programme, ALP 1-1 (21) was found the best cultures based on yield characters and persistence of crop in Green Fodder Yield trial of Twenty five best cultures. The culture was grown on 0.01 ha area for multiplication of seed. The entry will be contributed in VTL during *Rabi* 2013-14.

Maize

National breeding programme: Under the population improvement programme, F_5 progeny of bulked seed of 17 IPS done from F_4 population of G-I lot (crosses with A. T. developed at Urulikanchan) was grown in isolation. Tall, green thick stem with broad leaves and tasseling at 50-55 days were the desired characters. Undesirable plants were removed at vegetative and tasseling stage. Finally 29 IPS were made for further improvement work.

Germplasm evaluation & maintenance: The total germplasm holding of maize at the center is 197which was collected since 2001. In order to maintain the germplasm, it needs to be grown in field for once in 2-3 years. During this season, 159 accessions were grown in paired row at 30 cm distance. The data on growth, yield and quality parameters was generated for characterization and phenotypically similar plants were selfed for inbred development.

Comparative study trial: A station trial was established in Randomized Block Design for comparative study of BAIF Maize-2 & BAIF Maize -3 with African Tall. The data was collected for GFY, DMY, and CP content. BAIF maize-3 showed the superiority over A.T. for per day productivity.

SOUTH ZONE

6. Coimbatore, TNAU

National crossing programme in Bajra Napier hybrid

The B x N hybrid seeds of 52 crosses synthesized under this programme as furnished below have been dispatched to PC unit for further distribution to the designated centres on 27.06.2012.

S. No.	List of the crosses	S. No.	List of the crosses
1.	ICMV 05222 X FD 431	29.	APFB-2 X FD 434
2.	ICMV 05222 X FD 442	30.	APFB-2 X FD 439
3.	ICMV 05222 X FD 450	31.	APFB-2 X FD 449
4.	ICMV 05222 X FD 462	32.	APFB-2 X FD 451
5.	ICMV 05222 X FD 463	33.	APFB-2 X FD 462
6.	ICMV 05222 X FD 477	34.	APFB-2 X FD 463
7.	ICMV 05222 X FD 485	35.	APFB-2 X FD 468
8.	ICMV 05444 X FD 451	36.	APFB-2 X FD 477
9.	ICMV 05444 X FD 473	37.	APFB-2 X FD 479
10.	ICMV 05444 X FD 476	38.	APFB-2 X FD 480
11.	ICMV 05444 X FD 478	39.	RBB-1 X FD 477
12.	ICMV 05444 X FD 483	40.	RBB-2 X FD 450
13.	ICMV 05555 X FD 450	41.	RBB-2 X FD 451
14.	ICMV 05555 X FD 461	42.	Gaint Bajra X FD 426
15.	ICMV 05555 X FD 462	43.	Gaint Bajra X FD 430
16.	ICMV 05555 X FD 473	44.	Gaint Bajra X FD 435
17.	ICMV 05555 X FD 476	45.	Gaint Bajra X FD 476
18.	ICMV 05555 X FD 477	46.	Gaint Bajra X FD 478
19.	ICMV 05555 X FD 480	47.	BAIF Bajra X FD 431
20.	ICMV 05555 X FD 481	48.	BAIF Bajra X FD 438
21.	ICMV 05555 X FD 482	49.	BAIF Bajra X FD 451
22.	ICMV 05777 X FD 444	50.	BAIF Bajra X FD 452
23.	ICMV 05777 X FD 451	51.	BAIF Bajra X FD 460
24.	ICMV 05777 X FD 463	52.	BAIF Bajra X FD 477
25.	ICMV 05777 X FD 477	53.	BAIF Bajra X FD 478
26.	ICMV 05777 X FD 478	54.	CO 8 X FD 431
27.	ICMV 05777 X FD 479	55.	CO 8 X FD 433
28.	ICMV 05777 X FD 485	56.	CO 8 X FD 448

Poly cross breeding programme in Lucerne

The poly-crossed seeds obtained from Anand, Rahuri, BAIF Pune have been sown on 16.11.2012 along with that of Coimbatore centre as per the plan finalized during the *rabi* 2012 workshop for further studies.

Advanced entries in Fodder Cowpea

Large-scale multiplication of advanced fodder cowpea culture TNFC 0924 (CO 5 x Bundel lobia 2) has been taken up and the same will be proposed for inclusion in the ensuing AICRP trials of *kharif* 2013.

7. ANGRAU, Hyderabad

Germplasm Holding:

Crop	Collections	Source
Fodder Cowpea	40	NBPGR, Regional Station, Hyderabad; RARS, ANGRAU, Tirupati
Fodder Maize	45	Maize Research centre, ANGRAU, Hyderabad
Fodder Bajra	16	ICRISAT, Hyderabad.
Napier Lines	10	TNAU, Coimbatore

Fodder Cowpea

- Seed multiplication of APFC 10-1 was taken up to test the entry performance in 2nd year of minikit of the state for *Kharif, 2013.The* 1st year minikit feedback from farmers revealed that the entry has shown 10.3 to 17.3 % increased green fodder yield over local check.
- Six Uniform bulks were made in F6 generation of following crosses. Further these bulks will be evaluated in station OVT, Kharif 2013.

S. N.	Crosses	No. of bulks
1	CO4 X UPC 625	2
2	UPC5286 X CS88	1
3	CO2 X CO5	1
4	CN 8076 X SK-555	2

- During summer 2012-13, twenty germplasm lines obtained from NBPGR, Regional Station, Hyderabad were multiplied.

Fodder Maize:

- DHM 117 was proposed for coordinated testing in initial hybrid trial of Maize during Kharif 2012. Hybrid seed multiplication was taken-up during Rabi 2012. It was promoted to AVTHM -1for testing in NEZ and NWZ.
- A total of 20 genotypes ,majority of them are land races suitable for fodder purpose were selected from the winter nursery plots of AICRP-Maize , Hyderabad and they will be evaluated during Kharif 2013 for early duration, high green fodder yield, dry fodder yield, crude protein content and also crude fibre content.
- Among the selected land races, the taller genotypes about 10 nos will allow for random mating in isolation using African tall as one of the parent to develop a heterozygous and homogeneous population with all fodder desirable characters simultaneously.

Fodder Bajra

- APFB 09-1 was promoted to test in AVTPM-1.The seed multiplication was taken up during Rabi 2012.
- APFB 09-1 has been proposed for 1st year of mini kit testing in the state during Kharif 2013 as against the check variety APFB-2.

Multi cut Bajra:

- Ten successful crosses were effected among five parental lines during Rabi 2011were being sown during summer 2012-13 with an objective to obtain the genotypes having high tillering, early vigour, quick regeneration, high L/S ratio, CP (%) & ultimately high green fodder production.
- Parents: MRB-8, Giant bajra, ICMV 05 555, Jakarana & APFB-2.

Bajra Napier hybrids:

- 54 Bajra Napier hybrids obtained from AICRP-FC, TNAU, Coimbatore are established at the centre during Rabi, 2012-13. Among the 54 cross combinations 15 were identified promising with high tillering, long plant height, long, broad & soft leaves, glabrous at the nodes.
- Thus identified 15 promising BN hybrids will be evaluated in replicated station trail during Kharif 2013.

8. AAU, Anand

Germplasm

- Germplasm maintenance Nos. : **165**

Lucerne

New crossing programme was taken and their seeds obtained for next generation:

- Anand-2 x Alamdar
- Anand-2 x RLS-88
- Anand-2 x AL-3
- AL-3 x RL-88
- Alamdar x Anand-2
- 15 F_1 cross seeds were raised and their self-seeds obtained for next generation.
- Polycross seeds of 25 plants received from Rahuri, Coimbatore and BAIF including Anand and total 100 plants progenies were raised and plants/progenies were selected on the basis of morphological characters like plant height, tillers, interned, length and leafiness:

25 best Progenies

Anand	Coimbatore	BAIF	Rahuri
AAP-1	CAP-2	BAP-3	RAP-1
AAP-2	CAP-4	BAP-4	RAP-3
ALP-2	CLP-1	BLP-1	RAP-5
ALP-3	CLP-2	BLP-2	RLP-1
ARP-4	CLP-3	BLP-4	RRP-3
	CLP-5	BLP-5	
	CTP-2	BTP-1	
		BTP-2	

From these selected progenies most promising individual plants (40-50) will be identified during next season.

- Segregating materials generated through polycross programme.

S. N.	Centre	Generation	No. of plant progenies sown	IPS	Bulk
A	Coimbatore	F_6	16	9	1 Bulk
B	Rahuri	F_6	1	-	1 Bulk
C	Urulikanchan	F_4	2	-	-
		F_5	2	1	-
D	Anand	F_6	2	-	2 Bulk

Maize:

Population improvement: Eight populations were raised in isolated area and allowed them to random mating. From these materials, superior plants were selected on the basis of morphological characters.

G_1	:	African Tall (Anand)
G_2	:	J-1006 (Anand)
G_1	:	African Tall (Rahuri)
G_2	:	J-1006 (Rahuri)
G_1	:	African Tall (Urulikanchan)
G_2	:	J-1006 (Urulikanchan)
Cycle-4 G1	:	African Tall (Ananad)
Cycle-4 G_2	:	J-1006 (Anand)

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