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ANNUAL REPORT

(2013-14)

Part-II : Rabi - 2013-14

ALL INDIA COORDINATED RESEARCH PROJECT ON FORAGE CROPS

(Indian Council of Agricultural Research)




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Project Coordinating Unit
IGFRI, Jhansi - 284 003 (U.P.)

PREFACE

Annual Report (2013-14), Part II- *Rabi* 2013-14, embodies the results of various research trials conducted to test and develop technologies for augmenting forage resources in the country. The breeder seed produced against the DAC indent is also compiled and reported. Other activities related to research, extension, training, tribal sub-plan *etc.* being carried out by centres are also included in the report.

Results have been presented in the form of chapters. Chapter-1 contains results of forage crop improvement trials, which includes multi-location test performance of newly developed genetic material in both single and dual purpose forage species including test performance of perennials. The findings on crop production studies are presented in chapter-2, which includes development of technologies in different agro-climatic conditions as well as national perspective. Chapter-3 deals with different aspects of plant protection in selected Rabi forage crops *viz.*, berseem, oat and lucerne and generation of technologies for insect and disease management. Chapter-4 provides breeder seed production status crop-wise and state-wise. Other chapters include details of in-house breeding and other activities, weather details etc.

The contribution and sincere efforts made by each and every member of the team and their associates at the centres deserve appreciation in achieving the objectives of this project. Their valuable contribution for over all inputs of AICRP on Forage Crops is gratefully acknowledged.

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Dated: 18 August, 2014
Place: Jhansi

A. K. Roy
Project Coordinator

CONTENTS

EXECUTIVE SUMMARY

The present report contains results of the coordinated trials conducted on Crop Improvement, Crop Production, Crop Protection as well as the Breeder Seed Production of forage crops during *Rabi* 2013-14 at different locations/centres in the country placed in five zones *viz*., Hill zone, North-West zone, North-East zone, Central zone and South zone. Weather data are also reported to correlate the growth and yield of forage crops with weather parameters at different sites during crop period. The report also includes various other activities carried out by the AICRP centres for enhancing the forage resources including research, teaching and extension.

A. FORAGE CROP IMPROVEMENT

In *Rabi* 2013-14, seventeen breeding trials of three annuals and two perennial forage species comprising test entries along with their respective checks were conducted at 29 locations placed in five zones. The forage species evaluated were Berseem, Oat (single cut, multi cut and dual purpose) and Lathyrus in annuals and Lucerne and Tall Fescue in perennials. In annuals, there were two trials in Berseem, six trials in Oat (Single cut), two trials in Oat (multi cut), one trial in Oat (dual) and four in Lathyrus. In perennial Lucerne, one trial was completed and other one is in first 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. The summarized results of different forage evaluation trials are as below:

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BERSEEM:

An IVT in Berseem comprising of four entries along with two national checks and three zonal checks was conducted at 19 centres located in four different zones. For GFY, HFB-36 in Hill zone, JB-4-21 and HFB-6-1 in North East zone registered superiority over best check. For DMY, JB-4-21 at national level as well as in North East zone exhibited superiority. Mescavi for CPY and national check Wardan for CP content (%) ranked first. **An AVT in Berseem** (single cut) comprising of four entries along with two national checks and one zonal check was conducted. For green forage and dry matter yield, all the test entries in North West zone, Central zone and at national level registered superiority over zonal/national checks. In quality parameters, entry JBSC-1 for crude protein yield (q/ha) and JBSC-3 for crude protein content (%) ranked first.

OAT:

Oat (Single cut): In IVT Oat (SC), thirteen entries along with two national checks and five zonal checks were evaluated at 26 locations. For GFY, entries OL-1689, RO-11-1, OS-406, NDO-952 in North West zone; RO-11-1, OL-1689, OL-1804, RSO-8 and OS-406 in North East zone; OS-406, RO-11-1, RSO-8, and OL-1804 in Central zone; entries OS-406 and NDO-952 in South zone exhibited superiority over best national/zonal check. At national level, entry OS-406 was best performer. For quality parameters, entry OS-406 for CPY and OL-1689 for CP (%) was best. **In AVT-1 Oat (SC),** nine entries promoted from IVT were evaluated against two national checks and zonal checks at 27 locations. For GFY, entries UPO-12-1 and JHO-2012-2 in Hill zone, RSO-60 in North West zone, SKO-190 in Central zone, OL-1760 in South zone exhibited superiority over best check. At national level, all the test entries recorded superiority over best national check. For quality parameters, entries SKO-190 and OL-1760 for CPY and OL-1760 for CP (%) ranked first. **In AVT-2 Oat (SC),** four entries promoted from AVT-1 were evaluated against two national checks and five respective zonal checks at 27 locations. For GFY, entries NDO-10 and NDO-711 in Hill zone; entries OS-403 and NDO-711 in North-East zone and entry NDO-711 in Central zone exhibited superiority. At national level, all the test entries recorded superiority over best national check. In quality parameters, entries NDO-711 and OS-403 for CPY and national check Kent for CP (%) recorded superiority. **In AVT-2 Oat (SC) seed**, four entries along with two national checks were evaluated at five zones. For seed yield, entry OS-403 in Hill zone; entry

UPO-06-1 in North East zone; entry NDO-711 in Central zone were superior over national checks.

In AVT-2 Oat SC repeat, (trial was repeated as per varietal identification committee recommendation), eight entries were evaluated against two national checks and zonal checks at 24 locations. For GFY, entries UPO-09-2, OS-363 and JHO-2009-2 in North West zone and all the test entries except SKO-148 in Central zone and entries JHO-2009-1, UPO-09-2 and OS-363 in South zone registered superiority over best check. At national level, all the test entries except SKO-148 and SKO-156 recorded superiority over best national check. For quality parameters, entry JO-03-95 for CPY and UPO-09-1 for CP content proved superior. **In AVT-2 Oat SC (seed) repeat,** entries JO-03-95, SKO-156 and UPO-09-2 in Hill zone; entry SKO-156 in North West zone; entry UPO-09-1 in North East zone and entry JHO-2009-1 in South zone was superior over best zonal/national check. At national level, entry UPO-09-1 gave highest seed yield (21.0 q/ha).

Oat (multicut): In IVT Oat (MC) conducted at 18 centres located in four zones, entry JO-4-317 in North West zone, national level; JO-4-317 and RSO-60 in Central zone exhibited superiority over best zonal/national check for GFY. In quality parameters, JO-4-317 ranked first for CPY and entries OS-385 and JHO-13-2 for crude protein content. **In Oat AVT-1 (MC),** six entries were evaluated against three national checks at 18 locations in four zones. For GFY, entry JHO-2012-13 in Hill zone; entries JHO-2012-13 and PLP-14 in North East zone performed better than best zonal/national check. Entries HFO-488 for CPY and JHO-2012-13 for CP (%) were superior.

Oat (dual purpose): In IVT Oat (Dual), six entries along with three national checks were evaluated at 17 centres. For GFY, entry OS-419 in North East zone registered superiority over best check. None of the entries recorded superiority in other zones, as well as at national level. For quality parameters, national check RO-19 for CPY and CP (%) exhibited superiority.

Lathyrus

An IVT in Lathyrus comprising of three entries along with three national checks was conducted at eight centres. For GFY and DMY, CPY and CP%, plant height, national check Nirmal was superior at national level. **An AVT-1 in Lathyrus** with five entries along with three national checks was conducted at eight locations. Entry RLS-3006-2 for GFY and DMY was superior over national checks. Entries JHLS-2012-1 for CPY and JLJ-09-2 for CP (%) were best performers. **In AVT-2 Lathyrus and AVT-2 (seed),** two entries promoted from AVT-1 were evaluated against three national checks. None of the entries was found superior than the checks for GFY, DMY, CPY and CP content and seed yield.

Lucerne (Perennial)

Varietal trial on Lucerne (Perennial)- 2011 comprising of six entries along with two national checks was established during *Rabi*-2011 at twelve centres. This is being the third and final year of evaluation hence all the entries are decoded. For GFY and DMY check RL-88 ranked first at national level. Pooled performance during last three years indicates that national check RL-88 maintained its superiority for fodder yield. V**arietal trial on Lucerne (Perennial) -2013** comprising of five entries along with two national checks was established during *Rabi* 2013-14 at twelve centres. This is the first year of evaluation and entries are in coded form. For GFY, entry VTL-2-6 in North-West zone and as well as at all India level; entry VTL-2-5 in Central zone; entry VTL-2-3 in south zone ranked first. For quality parameters, entry VTL-2-5 for CPY and VTL-2-3 for CP content ranked first.

B. FORAGE CROP PRODUCTION

The forage crop production programme was executed at 24 locations in five zones. In total 20 experiments were conducted, out of which 13 were in network (11 coordinated and 2 AVT based) and 7 were in location specific mode. Research aspects included: resource conservation through forages; tillage and nutrient management of rice-oat cropping system; 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 INM on yield and quality of oat; study of round the year fodder production systems under irrigated conditions; effect of soil amendment on rice-berseem cropping system productivity; production potential of forages in rice fallows under varied nutrient levels; effect of sources of N on oat 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; effect of sources of nitrogen on oats and residual effect on succeeding crops; agronomic trials for AVT-2 entries of lathyrus and oats (SC); performance of perennial sorghum under different spacing and cutting management systems; yield potential of cereals with forage legumes under pure and mixed stand; evaluation of fodder crops under different rice fallow system and grasspea varieties as forage crop under different sowing methods in rice based cropping systems. Brief summary of experiments conducted during *rabi* 2013-14 is summarized below:

AST-1.1: Effect of vegetative barriers and improved forage species on conservation of degraded grassland. (Hill zone Location: Palampur**; rainfed conditions): At Palampur,** vegetative barrier of BxN Hybrid produced 289.23 q/ha green fodder, which was 7.62% and 26.01% more than *Setaria* grass and no vegetative barrier, respectively. The respective increase in DFY was 5.38% and 13.31%. Among vegetative cover, *Setaria* + *Stylosanthes* (347.86 q/ha) was significantly superior over other treatments and it was followed by *Setaria* grass alone (309.37 q/ha). *Setaria* + *Stylosanthes* produced 12.44%, 44.17% and 129.64% more GFY than *Setaria* grass, *Stylosanthes* and local grasses. The respective increase in term of DFY was 17.09%, 73.11% and 98.34%. 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.

AST-1.2: Effect of different tillage practices on productivity of forage crop in the prevalent crop sequence (NWZ Location: Pantnagar and Ludhiana). **At Pantnagar,** practicing of two cultivation through rotavator under sorghum being at par with conventional tillage (1888 q/ha), one cultivation through disc harrow (1898 q/ha) and one cultivation through rotavator (1867 q/ha) recorded significantly higher total GFY of sorghum-wheat-maize + cowpea cropping system. Adoption of zero tillage in sorghum under sorghum-wheat-maize + cowpea cropping system recorded highest organic carbon (0.92%), available N (301.2 kg/ha), P (22.50 kg P/ha) and K (250.3 kg K/ha) in soil over rest of treatment as well as initial level of soil fertility after completion of cropping sequence. **At Ludhiana,** practicing of two cultivation (rotavator) gave highest GFY (608.6 q/ha).

AST-1.3: Effect of planting methods and forage crop combinations on fodder productivity through moisture conversation (Central zone Location: Rahuri, Jabalpur, Anand and Urulikanchan) At **Jabalpur**, planting of forage crops on ridge and furrow system recorded significantly higher GFY (626.4 q/ha), DMY (245.6 q/ha) and net monetary return (Rs 50533/ha/yr) over flat bed system. The planting of *Dichanthium* + *Desmanthus* grass and legume combination recorded significantly highest GFY (698.3/ha/yr), DMY (284.8 q/ha/yr) and net monetary return (Rs 58005/ha/yr). At **Rahuri**, planting of *Cenchrus* + *Desmanthus* combination recorded highest available N (152.7 kg/ha), whereas, highest available K (657.2 kg/ha) was recorded under *Dichanthium* + *Stylosanthes* after crop cycle. **At Anand,** planting of *Dichanthium* + *Stylosanthes* combination being at par with *Dichanthium* + *Desmanthus* combination, recorded significantly higher available P (36.7 kg/ha) and K (253.5 kg/ha) in the soil after crop cycle over *Cenchrus* + *Desmanthus* and *Cenchrus* and *Stylosanthes* combination of grasses and legumes. **At Urulikanchan,** growing of grasses and legumes under different planting methods recorded higher level of pH, electrical conductivity, organic carbon and available N, P and K in soil as compared to initial status after completion of experiment.

AST-1.4: Effect of moisture conservation practices on production of perennial grasses (North-East zone Location: Jorhat, Faizabad, Ranchi, Bhubaneswar and Kalyani**): At Faizabad,** planting of guinea grass without mulch (T_4) being at par with T_5 (guinea grass + soil mulch) recorded significantly highest GFY (360.5 q/ha) and DMY (81.2 q/ha) of perennial grasses. Guinea grass + intercropping (berseem) recorded highest GFY (525.3 q/ha) and DMY (108.8

q/ha). **At Bhubaneswar,** guinea grass recorded significantly highest GFY (757.3 q/ha), DMY (151.5 q/ha), CPY (11.5 q/ha) and net monetary return (Rs 46062/ha/yr) over *Setaria* and *Brachiaria* grasses. With respect to moisture conservation practices, live mulch (intercropping of grasses with rice bean) recorded significantly highest GFY (760.5 q/ha/yr), DMY (147.2 q/ha/yr), CPY (11.4 q/ha/yr and net monetary return (Rs 44054/ha/yr) of grasses over control and soil mulch. **At Kalyani,** perennial grass *Setaria* recorded significantly highest GFY (881.2 q/ha/yr), DMY (169.6 q/ha/yr), CPY (14.5 q/ha) and net monetary return (Rs 77756/ha/yr) over guinea and *Brachiaria* grasses. The practicing of live mulch (intercropping with rice bean) recorded significantly highest GFY (904.1 q/ha/yr), DMY (167.9 q/ha), CPY (14.5 q/ha/yr) and net monetary return (98411/ha/yr) of grasses over control and soil mulch. **At Jorhat,** planting of BN hybrid or *Setaria* grasses being at par with each other recorded significantly higher level of available N and K in soil over *Brachiaria* grass. With respect to moisture conservation practices, live mulch (intercropping with rice bean) recorded significantly higher organic carbon (0.75 %), available N (271.1 kg/ha), P (14.35 kg/ha) and available K (123.9 kg/ha) over soil mulch and control treatments. **At Ranchi,** adopting of live mulch (intercropping with rice bean) resulted in significantly highest organic carbon content (0.412 %) and available N (283.1 kg/ha) in soil over control and soil mulch after completion of the experiment.

AST-1.5: Intensive forage production through silvipasture system under rainfed ecosystem (South zone-silvipasture Location: Hyderabad, Coimbatore and Mandya**):** On location mean basis of **Mandya and Coimbatore,** planting of subabul + pearl millet + horse gram silvipasture system (T_7) recorded highest GFY (416.1 q/ha), NMR (Rs 15356/ha/yr) and B:C ratio (2.23) while CPY (11.65 q/ha) was highest under subabul + *Stylosanthes* (T_2) silvipasture system and lowest GFY (129.9 q/ha), DMY (21.4 q/ha) and CPY (4.37 q/ha) was with subabul sole (T_8). **At Hyderabad,** growing of Subabul + BN hybrid + *Desmanthus virgatus* (T_5) intensive silvipasture system being at par with Subabul + BN hybrid + *Stylosanthes* (T_4) system recorded significantly highest GFY (339.5 q/ha), DMY (72.7 q/ha) and fetched highest NMR (Rs 44074/ha/yr) and B:C ratio (3.75) over rest of the silvipasture systems.

AST-1.6: Cassava based sustainable alley farming system for rainfed areas of humid tropics (South zone -Alley cropping Location: Vellayani**)**: At Vellayani, planting cassava + BN hybrid + fodder cowpea system recorded highest GFY (444.4 q/ha), whereas, cassava + AMY alley cropping system produced highest tuber yield (238.5 q/ha) and fetched maximum NMR (Rs 143098/ha/yr). Growing of cassava + BN hybrid + fodder cowpea retained highest organic carbon in soil (0.85 %) and lowest being with cassava + BN hybrid (0.67 %).

AST-2: Effect of tillage and nutrient management on the productivity of rice-oat cropping system (Central zone Location: Raipur and Jabalpur**):** Oat grown under conventional tillage being at par with minimal tillage (478.42 q/ha) recorded significantly higher GFY (437.71 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. The oats supplemented with 100% RDF + biofertilizer being at par with 100% RDF, recorded significantly highest GFY (477.31q/ha) of oat over rest of the treatments.

AST-3: Studies on the effect of irrigation levels on green forage yield and quality of different forage crops during lean period (SZ Location: Mandya, Hyderabad and Dharwad**):** On location mean basis, application of irrigation at IW /CPE-1.0 recorded highest GFY (318.6q/ha), DMY (90.82q/ha), CPY (7.27q/ha) and net monetary return (Rs 21320/ha) over IW/CPE-0.6 and, IW/CPE-0.8 irrigation levels. The planting of fodder maize recorded significantly highest GFY, DMY and CPY at all the locations (except Hyderabad) as well as on mean basis compared with rest of the fodder crops including baby corn.

AST-4: Effect of stubble management and INM on yield, quality and growth attributes of oat in rice – oat cropping system (NEZ Location: Jorhat and Bhubaneswar**):** Highest grain yield of rice was recorded in both the locations with the application of 25% N through FYM + 50 % NPK of RDF + Biofertilizer (*Azotobacter* + PSB) + Green manure (M_3) being 43.9 and 47.2 q/ha,

respectively at Jorhat and Bhubaneswar. On mean basis, highest GFY (259q/ha), and DMY (59.52q/ha) of oat were recorded under conventional tillage. Residual effect of 25% N through FYM + 50 % NPK of RDF + Biofertilizer (*Azotobacter* + PSB)+GM applied in rice recorded highest GFY (275.2q/ha) and DMY (60.2q/ha) of oats.

AST-6: Performance of dual purpose forage crops under different cutting management system: In hill zone (Location: Palampur, Srinagar, Almora)**,** mean data indicated that oat crop produced significantly higher GFY (140.1 q/ha), which was 40.44% and 53.29% more than barley and wheat, respectively. Highest grain yield was recorded in wheat (32.39 q/ha), followed by barley (27.24 q/ha) and oat (24.87 q/ha). Harvesting for fodder at 90 DAS produced 134.41 q/ha GFY, increase of 28.83 and 48.77% in comparison to 80 and 70 DAS cuts, respectively. Uncut system recorded highest grain yield (34.0q/ha) of forage crops. **In NW zone** (Location: Ludhiana, Hisar, Bikaner)**,** on location mean basis, oat produced highest GFY (176.1 q/ha) and DMY (26.3 q/ha), recording 56.5 and 99.8% more green fodder over barley and wheat crops, respectively. Cutting of forage crops at 70 DAS recorded highest GFY (170.4 q/ha) and DMY (33.7 q/ha) as compared to cutting at 50 DAS (87.5 q/ha GFY and 13.8 q/ha DMY) and 60 DAS (144.6 q/ha GFY and 21.7 q/ha DMY), whereas, no cutting of forage crops produced higher grain (35.4 q/ha) and grain equivalent yield (61.5 q/ha). **In NE zone** (Location: Jorhat, Bhubaneswar)**,** on location mean basis, oat crop produced higher GFY (210.7 q/ha) and DMY (45.0 q/ha) than barley (110.0 q/ha GFY and 26.1q/ha DMY) and wheat crop (97.4 q/ha GFY and 22.9 q/ha). Harvesting of dual purpose crop(s) at 70 DAS produced 195.8 q/ha green fodder with increase of 47.4 and 17.2% over cutting at 50 and 60 DAS, respectively on mean basis. **In Central zone** (Location: Jabalpur, Raipur, Rahuri, Anand, Urulikanchan)**,** on location mean basis, oat crop recorded highest GFY (360.3 q/ha), DMY (65.6 q/ha) and CPY (7.0 q/ha), which was 61.0 and 141.1% more over barley and wheat respectively. Wheat crop recorded highest grain yield (29.6 q/ha). The harvesting of forages at 70 DAS recorded highest GFY (296 q/ha), DMY (64.2 q/ha) and CPY (7.7 q/ha), which was 53.8 and 14.7 % more over 50 and 60 DAS cutting, respectively. The uncut crops recorded highest grain yield (31.9 q/ha) and it decreased by 29.8, 48.9 and 64.9 % with cutting at 50, 60 and 70 days after sowing, respectively over no cut system on mean basis.

AST-6: Effect of weed management on forage and seed yield of berseem (NE, NW & CZ (Locations: Ludhiana, Pantnagar, Ranchi, Rahuri, Jabalpur, Urulikanchan and Raipur)**:** On over all mean basis over the zones, imazethapyr @ 0.100 kg a.i./ha (immediate after 1st and 2nd cut) recorded highest GFY (431.4 q/ha), DMY (61.2 q/ha) and net monetary return (Rs 77572/ha).

AST-7: Effect of Integrated Nutrient Management on yield and quality of oat (NEZ Location: Kalyani and Imphal): Application of N@100 kg/ha+FYM@10 t/ha recorded highest GFY (447.8 q/ha) followed by N@120 kg/ha+FYM@10 t/ha (442.23 q/ha) and N@60 kg/ha+FYM@7.5 t/ha (408.89 q/ha), while highest DMY of 103.82 q/ha was recorded in the treatment N@120 kg/ha+FYM@10 t/ha.

AST-8: Study on different models for year round green fodder production under irrigated condition (CZ & NWZ Location: Urulikanchan, Anand, Rahuri and Bikaner)**:** On location mean basis, planting of BN hybrid + cowpea/ berseem/ cowpea recorded highest GFY (1375.6 q/ha/yr), DMY (255.5 q/ha/yr) and CPY (147.3 q/ha/yr).

AST-10: Effect of soil amendments on productivity of rice-berseem and changes in soil properties of sodic soil (Location: Faizabad) : At Faizabad, application of RDF + gypsum @ 75% GR + FYM 10 t/ha in rice-berseem cropping system registered highest uptake of N, P and K (222.4, 31.2 and 81.65 kg N, P_2O_5 and K_2O/ha, respectively). The application of different soil amendments brought down the values of pH, EC and ESP over its initial values. Whereas, organic carbon content of soil was increased over its initial value after the crop cycle.

AST-11: Production potential of forage crops in rice fallows under varied nitrogen levels (Location: Mandya)**:** At Mandya, adoption of inter-cropping of cowpea with maize produced highest GFY (336.7q/ha), DMY (79.9q/ha) as well as CPY (4.29q/ha) over sorghum + cowpea & pearl millet + cowpea cropping systems. Net monetary returns (Rs.10232 /ha) also followed the same trend.

AST 13: Effect of sowing time and Zn & thiourea spray on seed yield of dual purpose oat (Location: Bikaner)**:** At Bikaner, maximum GFY and DMY were noted in 1st November sown crop which were higher by 23.70 and 37.97 % over 15th November and by 55.67 and 51.73 % over 30th November sown crop, respectively. Application of 12.50 kg $ZnSO_4$ /ha as basal followed by two foliar spray of 0.05 % thiourea or 0.5 % $ZnSO_4$ being at par, recorded significantly higher GFY, DMY and straw yield over control. Also, application of 25 kg $ZnSO_4$ per ha as basal showed superiority over control in growth, GFY, DMY, grain & straw yields, net returns and quality of oat.

AST-14: Performance of bajra napier hybrid grass as influenced by micro-nutrients under irrigated conditions (Location: Coimbatore)**:** At Coimbatore, application of NPK+$FeSO_4$ @ 50 kg/ha + $ZnSO_4$ @ 25 kg/ha to the bajra napier hybrid recorded significantly highest GFY (4118 q/ha), DMY (808.5 q/ha), CPY (77.2 q/ha) and crude protein content (9.5%).

AST- 16: Effect of phosphorus levels on forage yield of promising entries of lathyrus (NE & CZ Locations: Jorhat, Kalyani , Bhubaneswar ,Ranchi, Jhansi , Jabalpur and Raipur)**:** Over all mean basis (mean of two zones) JLJ-09-1 recorded highest GFY (130.17 q/ha). Highest DMY (24.58 q/ha) was recorded by JHLS-2011-2. The forage yield increased consistently with increasing level up to 60 kg P_2O_5 /ha.

AST-17: Effect of nitrogen levels on green fodder yield of promising entries of oat (AVTO-2-SC Locations: Palampur, Srinagar, Hisar, Pantnagar, Jorhat, Ranchi, Kalyani, Jhansi, Jabalpur, Coimbatore, Mandya)**:** On all India mean basis, JHO-822 produced better GFY (479.9 q/ha) and DMY (101.7 q/ha) than best national check OS-6 (382.8 q/ha GFY and 82.7 q/ha DMY). The forage yield increased consistently with increasing level of nitrogen upto 120 kg nitrogen/ha.

AST-19 (NT): Yield potential of cereals with forage legumes under pure stand and mixtures (Location: Srinagar)**:** At Srinagar, in pure stand, maximum GFY (378.5q/ha) was attained by oat crop followed by barley (285 q/ha) and field pea (225.5 q/ha) and the lowest being with vetch (186.7 q/ha). In mixtures, maximum GFY (325.6q/ha) was obtained by oat + field pea mixture followed by oat + vetch mixture and barley + field pea. DMY trend was similar to GFY.

AST-7 (Kharif): Evaluation of fodder crops under different rice fallow system (NEZ Locations: Ranchi, Jabalpur and Bhubaneswar)**:** On mean basis over the locations, forage crops grown after conventional planting of rice establishment recorded highest GFY (334.1q/ha) whereas aerobic method recorded lowest GFY (324.7q/ha). Sowing of forages after SRI flat bed method of rice attained highest DMY (60.1 q/ha). Among fodder crops, berseem recorded highest GFY (443.2q/ha) and lowest being with lathyrus (142.0 q/ha) on mean basis. Berseem recorded 10.4 and 212.1 % more GFY over oats and lathyrus, respectively, whereas, highest DMY (82.4q/ha) was recorded under oat crop.

AST-9 (Kharif): Evaluation of different varieties of grasspea (*Lathyrus sativus* L.) as forage crop under different sowing methods in rice based cropping system (Location: Jorhat and Raipur)**:** Nirmal variety recorded 17.1 and 24.0 % more GFY than Mahateora and Prateek, respectively. Under integrated nutrient management, highest GFY (83.6q/ha) and DMY (16.0q/ha) was recorded in the treatment receiving sowing behind the plough with 50 % higher seed rate and a spacing of 20 x10cm (M_4).

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 (10.3-15.0^{0}C mean temperature and 80-90% RH). The root rot disease intensity was mild (4%) at Palampur. Beetle infestation was maximum (30%) in last week of May.

In Lucerne, the population of pea aphid (*Acyrthosiphion pisum*) and *Aphid craccivora* (12.3 aphids/tiller) was at peak (54.67 aphids/tiller) in January at Rahuri center. At Jhansi, Downey mildew (*Perenospora trifoli)* and rust (*Uromyces striatus)* occurred in moderate (10%) to severe (40%) form. At Palampur, leaf spot disease and defoliator insect pest were in mild form during second week of May. Alfafa weevil infestations were severe (70%) during first and second week of February. At Dharwad, aphid infestation (210 aphids/stem) and rust (48%) were recorded. At Ludhiana, Downey mildew occurred in severe form (85%) because of high humidity and low temperature.

In Oat, leaf blight (*Helminthosporium avenae*) incidences were recorded at Bhubaneswar, Jhansi, Ludhiana and Palampur center. The disease intensity varied from (1.0-38.9%) at different locations. Powdery mildew disease occurred at Palampur with maximum intensity (80%). It is a location specific disease problem. At Rahuri, maximum aphid infestation (125.33 aphid/tiller) was recorded in third 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 (19.1 and 22.6 aphid/tiller) in IVTL-11-9 and IVTL-8 respectively at Rahuri. All entries were resistant to rust and pea aphids at Hyderabad. However, in another perennial Lucerne trial all the entries were susceptible to highly susceptible to Downey mildew at Ludhiana.

In Oats IVT single cut, entries OL-1750, JO-04-18 and OL-1804 were resistant to leaf blight at Jhansi however at Bhubneswar all the entries were found resistant. Entries OL-1804, Ol-1760, JHO-13-5 and NDO-952 were moderately resistant to powdery mildew at Palampur. However, at Ludhiana all the entries showed susceptible to moderately susceptible reactions. AVTO (SC) entry SKO-190 showed resistance against leaf blight across the center. Only one entry RSO-60 showed resistant reactions against powdery mildew at Palampur.

AVT (SC-2) Oat repeat entries UPO-09-1, SKO-156 and UPO-09-2 were found resistant however rest of the entries were found moderately resistant to leaf blight at Jhansi centre. Entries NDO-711 and Palampur -1 were found moderately resistant to powdery mildew disease at Palampur. However, at Ludhiana all the entries showed moderately susceptible reaction against leaf blight. At Bhubaneswar, all the entries were resistant for leaf spot as well as leaf blight while at Hisar entries were free from rust infection.

In dual type oats, IVT entries JHO-13-3, UPO-212 (NC), JHO-822 (NC), OL1733 and JO-9-506 showed resistant reaction against powdery mildew. Entry JHO-13-3 and JHO-822 (NC) were least infested with aphid.

In multi cut oats, all IVT entries were resistant to moderately resistant to leaf blight disease except OS-1689. Entries JHO-13-14 and RSO-60 showed least infestation of aphids also. Entry UPO-212 was found resistant to powdery mildew, whereas RO-19 was highly susceptible at Palampur. In AVT (MC) oat, two entries UPO-212 and OL-1766 were least infested with aphid. At Jhansi, PLP-14, OL-1769 and JO-04-315 were resistant while at Palampur, only JHO-2012-3 showed resistant reaction to leaf blight and Powdery mildew respectively. In AVT (SC) seed, entries NDO-711 and Palampur-1 showed moderately resistant reaction to powdery mildew at Palampur.

In the repeat trial AVT (SC-2) oat seed, all the entries were found resistant to leaf blight and leaf spot at Bhubaneswar centre. Entries Palampur-1, Kent and SKO-156 showed moderately resistant reaction to powdery mildew.

In IVT Lathryus, entry JHLS-2013-1 showed lowest root rot incidence of 5.00% while it was highest in Mahateora (13.25 %). In AVT Lathyrus, JLJ-09-2 was highly susceptible and showed highest damage by root rot (70%) while minimum root rot was recorded in the JHLS-2012-2 (1.6

%). In Lathyrus AVT-2 seed, entry JHLS-2011-2 showed lowest root rot incidence of 13.7 % while highest incidence was recorded in Mahateora (56.25%) followed by Prateek (36.25 %).

In single cut Berseem, all the single cut entries were moderately to highly susceptible to root and stem rot diseases. AVT entries were susceptible to highly susceptible to root and stem rot diseases at Jhansi. Ludhiana centre stem rot was observed but reaction was found to be resistant.

Management of diseases and pest

Integrated disease management trial in white clover (PPT-12) was conducted at Palampur as a location specific trial. 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 2.9% against 59.3% and clover rot 1.1% against 8.1% in untreated control respectively.

The study of pathogenic variability of *Erysiphe graminis* f. sp. avenae on oat (PPT-17) trial showed virulence pattern of the 7 isolates of *Blumeria graminis* f. sp. *avenae* on differential set (10 lines). On the basis of reaction of 10 differentials, the 7 isolates were grouped into 5 different pathotypes [PMO-1 (1), PMO-2 (2), PMO-3 (1), PMO-4 (2), PMO-5 (1)].

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 2013-14, the indent for Breeder Seed Production was received from DAC, GOI for 26 varieties in four forage crops *viz*., Oat (10), Berseem (8), Lucerne (4) and Gobhi Sarson (4). The quantity allocated was 443.37 q and it was assigned to ten Breeder Seed producing centers of different SAUs/ NGO/ ICAR institutes. Among forage crops, maximum quantity indented was for Oat (402.2 q) followed by Berseem (35.05 q), Lucerne (5.8 q) and Gobhi Sarson (0.32 q).

BSP-IV received from different centres revealed surplus production in Berseem and Gobhi Sarson, as compared to allocated quantity [Berseem, production was 36.70 q (1.65q surplus) and Gobhi Sarson, production was 0.43 q (0.11 q surplus)]. However in Oat, the production was 398.3 q (3.9 q deficit) against the allocation of 402.2 q. Similarly in Lucerne, there was 0.50 q deficit in production with respect to 5.8 q allocation. The overall breeder seed production was 2.64 q (0.59 per cent) less as evident from seed production of 440.73 q against the indent for 443.37q.

E. FORAGE TECHNOLOGY DEMONSTRATION

During *Rabi* 2013-14, a total of 593 FTDs were conducted on farmer's field of 19 states across the country. Major forage crops demonstrated were berseem (150), lucerne (80), oat (275), tall fescue (5), lathyrus (15), oat + berseem (10), guinea (5), BxN hybrid (10) *Rabi* maize (5), cowpea (15), white clover (3) and rye grass (20).

F. TRIBAL SUB PLAN (TSP) ACTIVITIES

Various fodder and livestock related activities were demonstrated and training was imparted under the Tribal sub-plan activities. Various AICRP FC centers carried out various activities for ST beneficiaries in different identified districts/ states. The programmes were executed in districts Nandurbar (Maharashtra), Koraput, Gajpati, Keonjhar, Kandhmal (Odhisha), Dindori (MP), Mahboobnagar (Andhra Pradesh/ Telengana), Karbi angling (Assam), Lohardaga (Jharkhand), Kinnaur, Lahaul& Spiti (HP), Ganderbal (J&K), Senapati (Manipur), Kanker (Chhatisgarh).

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 Locations = 6+2= 8	7.	Faizabad, NDUAT	1982	Uttar Pradesh	11.	Umiam (Barapani), ICAR Res. Complex for NEH Region*	Meghalaya
	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 CODES FOR Rabi 2013-14

1. Initial Varietal Trial in Berseem (IVT Berseem)			2. First Advanced Varietal Trial in Berseem (SC) (AVT-1-SC)		
Contributor	**Entry name**	**Code name**	**Contributor**	**Entry name**	**Code name**
Hisar	HFB-36	IVTB-1	Jhansi	JBSC-1	AVTB-6
Hisar	HFB-6-1	IVTB-4	Jhansi	JBSC-2	AVTB-1
Jabalpur	JB-4-21	IVTB-8	Jhansi	JBSC-3	AVTB-5
Jhansi	IGFRI-13-1	IVTB-2	Jhansi	JBSC-4	AVTB-4
NC	Wardan	IVTB-3	NC	Wardan	AVTB-2
NC	Mescavi	IVTB-7	NC	Mescavi	AVTB-3
ZC-HZ	BL-22	IVTB-9	ZC-CZ & NWZ	Bundel Berseem-2	AVTB-7
ZC-CZ & NWZ	Bundel Berseem-2	IVTB-5			
ZC-NEZ	Bundel Berseem-3	IVTB-6			
3. Initial Varietal Trial in Oat (Single Cut) (IVTO-SC)			**4. First Advanced Varietal Trial in Oat (SC) (AVTO-1-SC)**		
Contributor	**Entry name**	**Code name**	**Contributor**	**Entry name**	**Code name**
Srinagar	SKO-196	IVTO-SC-1	Pantnagar	UPO-12-1	AVTO-SC-1-2
Srinagar	SKO-198	IVTO-SC-5	Hisar	OS-405	AVTO-SC-1-15
Srinagar	SKO-199	IVTO-SC-18	Jabalpur	JO-04-14	AVTO-SC-1-14
Hisar	OS-406	IVTO-SC-2	Jhansi	JHO-2012-1	AVTO-SC-1-8
Ludhiana	OL-1689	IVTO-SC-6	Jhansi	JHO-2012-2	AVTO-SC-1-4
Ludhiana	OL-1750	IVTO-SC-10	Ludhiana	OL-1760	AVTO-SC-1-16
Ludhiana	OL-1804	IVTO-SC-15	Srinagar	SKO-190	AVTO-SC-1-1
Rahuri	RSO-8	IVTO-SC-3	Rahuri	RSO-59	AVTO-SC-1-3
Rahuri	RO-11-1	IVTO-SC-7	Rahuri	RSO-60	AVTO-SC-1-9
Jhansi	JHO-13-6	IVTO-SC-4	NC	Kent	AVTO-SC-1-5
Jhansi	JHO-13-5	IVTO-SC-11	NC	OS-6	AVTO-SC-1-6
Jabalpur	JO-04-18	IVTO-SC-12	ZC-HZ	SKO-90	AVTO-SC-1-7
Faizabad	NDO-952	IVTO-SC-13	ZC-NWZ	OL-125	AVTO-SC-1-10
NC	Kent	IVTO-SC-19	ZC-NEZ	JHO-99-2	AVTO-SC-1-11
NC	OS-6	IVTO-SC-20	ZC-CZ	JHO-822	AVTO-SC-1-12
ZC-HZ	SKO-90	IVTO-SC-8	ZC-SZ	JHO-2000-4	AVTO-SC-1-13
ZC-NWZ	OL-125	IVTO-SC-9			
ZC-NEZ	JHO-99-2	IVTO-SC-14			
ZC-CZ	JHO-822	IVTO-SC-16			
ZC-SZ	JHO-2000-4	IVTO-SC-17			

5. Second Advanced Varietal Trial in Oat (Single cut) (AVTO-2-SC)			6. Second Advanced Varietal Trial in Oat (SC) for Seed (AVTO-2-Seed		
Contributor	**Entry name**	**Code name**	**Contributor**	**Entry name**	**Code name**
Faizabad	NDO-711	AVTO-SC-2-1	Faizabad	NDO-711	AVTO-SCS-1
Faizabad	NDO-10	AVTO-SC-2-11	Faizabad	NDO-10	AVTO-SCS-11
Hisar	OS-403	AVTO-SC-2-5	Hisar	OS-403	AVTO-SCS-5
Pantnagar	UPO-06-1	AVTO-SC-2-7	Pantnagar	UPO-06-1	AVTO-SCS-7
NC	Kent	AVTO-SC-2-3	NC	Kent	AVTO-SCS-3
NC	OS-6	AVTO-SC-2-8	NC	OS-6	AVTO-SCS-8
ZC-HZ	Palampur-1	AVTO-SC-2-2	ZC-HZ	Palampur-1	AVTO-SCS-2
ZC-NWZ	OL-125	AVTO-SC-2-4	ZC-NWZ	OL-125	AVTO-SCS-4
ZC-NEZ	JHO-99-2	AVTO-SC-2-6	ZC-NEZ	JHO-99-2	AVTO-SCS-6
ZC-CZ	JHO-822	AVTO-SC-2-9	ZC-CZ	JHO-822	AVTO-SCS-9
ZC-SZ	JHO-2000-4	AVTO-SC-2-10	ZC-SZ	JHO-2000-4	AVTO-SCS-10
7. AVT Oat-2 (SC) 2011-12 (Repeat)			**8. AVT Oat-2 (SC) for Seed 2011-12 (Repeat)**		
Contributor	**Entry name**	**Code name**	**Contributor**	**Entry name**	**Code name**
Jhansi	JHO-2009-1	AVTO-SC-2-R-15	Jhansi	JHO-2009-1	AVTO-SCS-R-15
Jhansi	JHO-2009-2	AVTO-SC-2-R-7	Jhansi	JHO-2009-2	AVTO-SCS-R-7
Pantnagar	UPO-09-1	AVTO-SC-2-R-1	Pantnagar	UPO-09-1	AVTO-SCS-R-1
Pantnagar	UPO-09-2	AVTO-SC-2-R-12	Pantnagar	UPO-09-2	AVTO-SCS-R-12
Srinagar	SKO-148	AVTO-SC-2-R-3	Srinagar	SKO-148	AVTO-SCS-R-3
Srinagar	SKO-156	AVTO-SC-2-R-8	Srinagar	SKO-156	AVTO-SCS-R-8
Hisar	OS-363	AVTO-SC-2-R-2	Hisar	OS-363	AVTO-SCS-R-2
Jabalpur	JO-03-95	AVTO-SC-2-R-11	Jabalpur	JO-03-95	AVTO-SCS-R-11
NC	Kent	AVTO-SC-2-R-4	NC	Kent	AVTO-SCS-R-4
NC	OS-6	AVTO-SC-2-R-6	NC	OS-6	AVTO-SCS-R-6
ZC-HZ	Palampur-1	AVTO-SC-2-R-5	ZC-HZ	Palampur-1	AVTO-SCS-R-5
ZC-NWZ	OL-125	AVTO-SC-2-R-9	ZC-NWZ	OL-125	AVTO-SCS-R-9
ZC-NEZ	JHO-99-2	AVTO-SC-2-R-10	ZC-NEZ	JHO-99-2	AVTO-SCS-R-10
ZC-CZ	JHO-822	AVTO-SC-2-R-14	ZC-CZ	JHO-822	AVTO-SCS-R-14
ZC-SZ	JHO-2000-4	AVTO-SC-2-R-13	ZC-SZ	JHO-2000-4	AVTO-SCS-R-13

9. Initial Varietal Trial in Oat (Multi Cut)-IVTO (MC)			10. First Advanced Varietal Trial in Oat-MC [AVTO-1 (MC)]		
Contributor	**Entry name**	**Code name**	**Contributor**	**Entry name**	**Code name**
Jabalpur	JO-4-317	IVTO-MC-8	Jabalpur	JO-04-315	AVTO-MC-1-8
Rahuri	RSO-60	IVTO-MC-7	Hisar	HFO-488	AVTO-MC-1-9
Jhansi	JHO-13-4	IVTO-MC-1	Ludhiana	OL-1766	AVTO-MC-1-5
Jhansi	JHO-13-2	IVTO-MC-5	Ludhiana	OL-1769	AVTO-MC-1-7
Ludhiana	OL-1689	IVTO-MC-2	Jhansi	JHO-2012-3	AVTO-MC-1-6
Ludhiana	OL-1736	IVTO-MC-9	Palampur	PLP-14	AVTO-MC-1-4
Ludhiana	OL-1802	IVTO-MC-12	NC	Kent	AVTO-MC-1-3
Hisar	OS-385	IVTO-MC-3	NC	UPO-212	AVTO-MC-1-1
Palampur	PLP-15	IVTO-MC-10	NC	RO-19	AVTO-MC-1-2
NC	Kent	IVTO-MC-4			
NC	UPO-212	IVTO-MC-6			
NC	RO-19	IVTO-MC-11			
11. Initial Varietal Trial in Oat (Dual) [IVTO (Dual)]			**12. Initial Varietal Trial in Lathyrus (IVTL)**		
Contributor	**Entry name**	**Code name**	**Contributor**	**Entry name**	**Code name**
Jabalpur	JO-9-506	IVTO-D-9	Kalyani	BK-37-2	IVTL-3
Jhansi	JHO-13-3	IVTO-D-5	Jhansi	JHLS-2013-1	IVTL-5
Jhansi	JHO-13-1	IVTO-D-2	Jhansi	JHLS-2013-2	IVTL-2
Hisar	OS-419	IVTO-D-3	NC	Nirmal	IVTL-6
Ludhiana	OL-1744	IVTO-D-4	NC	Mahateora	IVTL-4
Ludhiana	OL-1733	IVTO-D-8	NC	Prateek	IVTL-1
NC	RO-19	IVTO-D-1			
NC	UPO-212	IVTO-D-6			
NC	JHO-822	IVTO-D-7			

13. First Advanced Varietal Trial in Lathyrus (AVT-1 Lathyrus)			14. Second Advanced Varietal Trial in Lathyrus (AVT Lathyrus-2)		
Contributor	**Entry name**	**Code name**	**Contributor**	**Entry name**	**Code name**
Jabalpur	JLJ-09-2	AVTL-1-8	Jhansi	JHLS-2011-2	AVTL-2-1
Kalyani	BK-12-2	AVTL-1-1	Jabalpur	JLJ-09-1	AVTL-2-4
Raipur	RLS-3006-2	AVTL-1-2	NC	Nirmal	AVTL-2-2
Jhansi	JHLS-2012-1	AVTL-1-5	NC	Mahateora	AVTL-2-3
Jhansi	JHLS-2012-2	AVTL-1-3	NC	Prateek	AVTL-2-5
NC	Nirmal	AVTL-1-4			
NC	Mahateora	AVTL-1-6			
NC	Prateek	AVTL-1-7			
15. Second AVT in Lathyrus for Seed (AVTL-2 for seed)			**16. Varietal Trial in Lucerne (P) 3rd Year-VT Lucerne (P)-2011**		
			Anand	Anand-24	VTL-11-6
Jhansi	JHLS-2011-2	AVTL-S-2-1	Urulikanchan	ACP-3-2	VTL-11-3
Jabalpur	JLJ-09-1	AVTL-S-2-4	Dharwad	DWR-1	VTL-11-7
NC	Nirmal	AVTL-S-2-2	Rahuri	RL-10-1	VTL-11-5
NC	Mahateora	AVTL-S-2-3	Coimbatore	CCP-1-1	VTL-11-2
NC	Prateek	AVTL-S-2-5	Bikaner	RRB-10-1	VTL-11-8
			Advanta*	Seed Not received	VTL-11-4
			NC	Anand-2	VTL-11-1
			NC	RL-88	VTL-11-9
Entry Codes of Agronomical Trials of Rabi-2013-14					
AST-16: Effect of P levels on forage yield of promising entries of Lathyrus (AVT-2)	JHLS-2011-2	AVTL-2-2	**AST-17: Effect of nitrogen levels on forage yield of promising entries of oat (AVT-2 SC)**	NDO-711	AVTOSC-2-4
	JLJ-09-1	AVTL-2-4		OS-403	AVTOSC-2-6
	Nirmal (NC)	AVTL-2-1		UPO-06-1	AVTOSC-2-9
	Mahateora (NC)	AVTL-2-5		NDO-10	AVTOSC-2-1
	Prateek (NC)	AVTL-2-3		OS-6 (NC)	AVTOSC-2-11
				Kent (NC)	AVTOSC-2-2
				Palampur-1 (HZ)	AVTOSC-2-8
				OL-125 (NWZ)	AVTOSC-2-10
				JHO-99-2 (NEZ)	AVTOSC-2-5
				JHO-822 (CZ)	AVTOSC-2-7
				JHO-2000-4 (SZ)	AVTOSC-2-3

CHAPTER-1

FORAGE CROP IMPROVEMENT

1. IVTB: INITIAL VARIETAL TRIAL IN BERSEEM

(Reference Tables 1.1 to 1.9)

An initial varietal trial in berseem comprising of four entries along with two national checks (Wardan and Mescavi) and three zonal checks (BL-22, BB-2 and BB-3) was conducted at 19 centers located in four different zones of the country. For green forage yield (q/ha), HFB-36 (1.9%) in Hill zone, JB-4-21 (9.2%) and HFB-6-1 (2.3%) in North East zone registered their superiority over best zonal/national checks. At national level, national check Mescavi recorded superiority for green forage yield. For dry matter yield (q/ha), JB-4-21 in North East zone as well as at national level exhibited superiority over check. In green forage and dry matter production potential (q/ha/day), HFB-36 registered superiority over zonal/national check. Check variety Mescavi ranked first for the character plant height. For the character leafiness, entry HFB-36 performed better. In quality parameters, entry Mescavi for crude protein yield (q/ha) and national check Wardan for crude protein content (%) ranked first. Check Wardan for ADF (%), IGFRI-13-1 for NDF (%) and BB-2 for IVDMD (%) exhibited their superiority.

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

(Reference Tables 2.1 to 2.8)

An advanced varietal trial in Berseem (single cut) comprising of four entries along with two national checks (Wardan and Mescavi) and one zonal check (BB-2) was conducted at eight centres located in two zones (Central and North West zone). For green forage and dry matter yield, all the test entries in North West zone, Central zone and at national level registered superiority over zonal/national checks. In green forage and dry matter production potential (q/ha/day), all the test entries registered their superiority over national check except JBSC-3 for dry matter production potential.

Test entry JBSC-1 (59.5 cm) ranked first for the character plant height. For the character leafiness, entry JBSC-3 (0.89) performed better. In quality parameters, entry JBSC-1 for crude protein yield (q/ha) and JBSC-3 for crude protein content (%) ranked first. Entry JBSC-3 for ADF (%) and IVDMD (%), Wardan for NDF (%) were best performers.

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

Entries	Hill Zone					North West Zone							
	Palam-pur	Sri-nagar	Aver-age	Ra-nk	Superi-ority%	**Bika-ner	His-ar	Ludh-iana	Jal-ore	Udai-pur	Aver-age	Ra-nk	Superi-ority%
HFB-36	373.7	91.9	232.8	1	1.9	38.0	614.8	658.9	273.0	546.9	523.4	2	
IGFRI-13-1	372.6	79.9	226.2	3		53.1	540.7	529.6	267.2	573.7	477.8	6	
HFB-6-1	330.7	115.1	222.9	4		54.0	551.9	627.8	260.1	604.3	511.0	4	
JB-4-21	355.5	96.9	226.2	3		59.3	577.8	637.0	278.0	547.7	510.0	5	
Wardan (NC)	329.6	93.6	211.6	5		18.4	511.1	655.6	200.8	515.3	470.7	7	
Mescavi (NC)	329.2	127.6	228.4	2		48.6	588.9	685.2	270.6	544.1	522.2	3	
BL-22 (ZC-HZ)	289.6	104.1	196.8	6									
Bundel Berseem-2 (ZC-CZ, NWZ)						57.6	566.7	755.6	278.0	544.7	536.2	1	
Mean	**340.1**	**101.3**	**220.7**			**47.0**	**564.6**	**649.9**	**261.1**	**553.8**	**507.4**		
CD at 5%	38.4	5.1				13.3	56.7	32.1	5.5	37.4			
CV%	6.4	2.1				15.9	5.9	2.8	11.9	3.8			

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

Entries	North East Zone							
	Kalyani	Ranchi	Faizabad	Bhubaneswar	Pusa	Average	Rank	Superiority%
HFB-36	338.1	453.8	443.3	51.2	251.0	307.5	4	
IGFRI-13-1	371.8	426.0	376.7	44.7	263.0	296.4	7	
HFB-6-1	352.6	551.0	436.9	21.8	277.0	327.8	2	2.3
JB-4-21	361.5	620.4	452.0	34.7	282.0	350.1	1	9.2
Wardan (NC)	370.3	569.4	308.4	22.0	247.0	303.4	6	
Mescavi (NC)	354.4	467.6	464.1	43.5	273.0	320.5	3	
Bundel Berseem-3 (ZC-NEZ)	368.1	449.0	363.4	61.1	283.0	304.9	5	
Mean	359.5	505.3	406.4	39.9	268.0	315.8		
CD at 5%	14.2	91.7	73.5	6.5	26.8			
CV%	2.2	10.1	10.2	9.3	8.3			

** Not included in zonal or all India average due to very poor yield

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

Entries	Central Zone										All India		
	Jha-nsi	Rah-uri	Jabal-pur	Urulika-nchan	Rai-pur	Kan-pur	**Palg-har	Aver-age	Ra-nk	Superi-ority	Aver-age	Ra-nk	Superi-ority%
HFB-36	972.2	308.4	939.6	224.8	312.8	611.1	163.3	561.5	4		439.1	3	
IGFRI-13-1	1038.9	261.4	923.0	323.7	277.6	622.2	139.2	574.5	3		429.0	6	
HFB-6-1	948.2	289.6	896.6	279.2	268.5	592.6	88.6	574.8	6		435.5	4	
JB-4-21	1035.2	273.9	892.4	260.7	255.0	618.5	70.1	555.9	5		445.8	2	
Wardan (NC)	945.9	136.3	913.3	221.4	259.7	488.9	139.3	494.2	7		399.3	5	
Mescavi (NC)	1054.8	276.4	957.7	261.3	302.3	625.9	72.6	579.7	2		448.6	1	
Bundel Berseem-2 (ZC-CZ, NWZ)	1059.3	299.6	1070.1	266.5	310.7	685.2	87.3	615.2	1				
Mean	**1007.8**	**263.7**	**941.8**	**262.5**	**283.8**	**606.3**	**108.6**	**561.0**					
CD at 5%	103.5	33.1	233.6	31.5	32.6	69.8	12.7						
CV%	5.8	7.1	14.1	13.2	7.2	4.8	7.5						

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

Entries	Hill Zone					North West Zone					
	Palam-pur	Srina-gar	Aver-age	Ra-nk	Superi-ority%	**Bika-ner	His-ar	Ludh-iana	Aver-age	Ra-nk	Superi-ority%
HFB-36	66.9	17.1	42.0	4		10.9	58.7	93.3	76.0	3	
IGFRI-13-1	70.2	14.8	42.5	2		14.4	50.0	75.0	62.5	7	
HFB-6-1	63.5	21.4	42.4	3		14.3	52.5	88.9	70.7	5	
JB-4-21	65.1	18.0	41.5	5		17.6	63.2	88.1	75.6	4	
Wardan (NC)	61.2	17.3	39.3	6		5.6	50.8	87.4	69.1	6	
Mescavi (NC)	65.4	23.6	44.5	1		13.0	56.5	95.8	76.1	2	
BL-22 (ZC-HZ)	52.3	19.2	35.8	7							
Bundel Berseem-2 (ZC-CZ, NWZ)						17.3	54.6	102.0	78.3	1	
Mean	**63.5**	**18.8**	**41.1**			**13.3**	**55.2**	**90.1**	**72.6**		
CD at 5%	9.8	1.3				3.1	8.8	4.2			
CV%	8.6	2.5				13.1	9.4	2.7			

** Not included in zonal and all India average due to very poor yield

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

Entries	North East Zone							
	Kalyani	Ranchi	Faizabad	Bhubaneswar	Pusa	Average	Rank	Superiority%
HFB-36	55.3	69.1	81.0	10.5	45.0	52.2	7	
IGFRI-13-1	56.6	77.2	75.3	9.3	47.0	53.1	6	
HFB-6-1	56.0	73.8	87.6	4.6	49.4	54.3	3	
JB-4-21	55.7	107.2	87.1	7.3	50.2	61.5	1	12.8
Wardan (NC)	55.8	103.1	63.4	4.7	44.2	54.2	4	
Mescavi (NC)	56.2	70.1	88.7	8.9	48.8	54.5	2	
Bundel Berseem-3 (ZC-NEZ)	57.2	77.5	71.3	12.4	50.4	53.7	5	
Mean	56.1	82.6	79.2	8.2	47.8	54.8		
CD at 5%	NA	18.9	12.9	1.4	5.4			
CV%	2.2	12.8	9.2	9.6	9.6			

Table1.2: IVT Berseem: Initial Varietal Trial in Berseem: Dry Matter Yield (q/ha)

Entries	Central Zone										All India		
	Jha-nsi	Rah-uri	Jabal-pur	Urulika-nchan	Rai-pur	Kan-pur	*Pal-ghar	Aver-age	Ra-nk	Superi-ority%	Aver-age	Ra-nk	Superi-ority%
HFB-36	156.2	53.9	137.6	33.1	64.5	88.9	38.1	89.0	4		68.7	3	
IGFRI-13-1	161.9	46.6	134.9	44.3	57.5	92.6	29.3	89.6	3		67.5	5	
HFB-6-1	153.8	51.6	130.8	41.0	55.8	86.3	16.3	86.6	5		67.8	4	
JB-4-21	160.3	50.6	129.7	36.1	52.3	89.6	18.1	86.4	6		70.7	1	0.42
Wardan (NC)	146.3	25.2	133.1	28.2	53.8	72.6	29.3	76.5	7		63.1	6	
Mescavi (NC)	162.3	48.0	139.3	36.8	62.5	93.0	18.9	90.3	2		70.4	2	
Bundel Berseem-2 (ZC-CZ, NWZ)	172.1	52.6	150.4	37.4	64.0	97.0	23.0	95.6	1				
Mean	**159.0**	**46.9**	**136.5**	**36.7**	**58.6**	**88.6**	**24.7**	**87.7**			**65.1**		
CD at 5%	19.0	5.9	30.2	8.2	6.5	11.8	8.6						
CV%	6.7	7.1	12.4	15.6	6.9	2.1	20.7						

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

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

Entries	Bika-ner	His-ar	Ludh-iana	Kal-yani	Ran-chi	Faiza-bad	Bhuban-eswar	Pu-sa	Jha-nsi	Pal-ghar	Kan-pur	Rai-pur	Aver-age	Ra-nk
HFB-36	0.27	21.21	3.49	2.77	3.00	3.38	0.81	2.01	5.93	5.10	5.56	4.34	4.82	1
IGFRI-13-1	0.38	17.97	2.80	3.05	2.82	2.87	0.76	2.10	7.21	4.35	5.66	3.86	4.49	4
HFB-6-1	0.38	19.43	3.32	2.89	3.65	3.33	0.39	2.20	5.58	2.69	5.39	3.73	4.42	5
JB-4-21	0.42	19.17	3.37	2.96	4.11	3.45	0.58	2.20	7.19	2.26	5.62	3.54	4.57	3
Wardan (NC)	0.13	17.51	3.47	3.04	3.77	2.35	0.39	1.96	6.71	3.66	4.44	3.61	4.25	6
Mescavi (NC)	0.34	20.20	3.63	2.91	3.10	3.54	0.71	2.18	6.39	2.13	5.69	4.20	4.59	2
Bundel Berseem-2 (ZC-CZ, NWZ)	0.41	19.10	4.00						7.62	2.24	6.23	4.31		
Bundel Berseem-3 (ZC-NEZ)				3.02	2.97	2.77	0.99	2.25						
Mean	**0.33**	**19.23**	**3.44**	**2.95**	**3.35**	**3.10**	**0.66**	**2.13**	**6.66**	**3.20**	**5.51**	**3.94**	**4.52**	

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

Entries	Bika-ner	His-ar	Ludh-iana	Kal-yani	Ran-chi	Faiza-bad	Bhuba-neswar	Pu-sa	Jha-nsi	Pal-ghar	Kan-pur	Rai-pur	Aver-age	Ra-nk
HFB-36	0.08	1.94	0.49	0.45	0.46	0.62	0.17	0.36	0.95	1.19	0.81	0.90	0.70	1
IGFRI-13-1	0.10	1.63	0.40	0.46	0.51	0.57	0.16	0.38	1.12	0.92	0.84	0.80	0.66	3
HFB-6-1	0.10	1.76	0.47	0.46	0.49	0.67	0.08	0.39	0.90	0.49	0.78	0.78	0.61	6
JB-4-21	0.12	1.98	0.47	0.46	0.71	0.66	0.12	0.39	1.11	0.58	0.81	0.73	0.68	2
Wardan (NC)	0.04	1.67	0.46	0.46	0.68	0.48	0.08	0.35	1.04	0.77	0.66	0.75	0.62	5
Mescavi (NC)	0.09	1.85	0.51	0.46	0.46	0.68	0.15	0.38	0.98	0.56	0.85	0.87	0.65	4
Bundel Berseem-2 (ZC-CZ, NWZ)	0.12	1.72	0.54						1.24	0.59	0.88	0.89		
Bundel Berseem-3 (ZC-NEZ)				0.47	0.51	0.54	0.20	0.40						
Mean	**0.09**	**1.79**	**0.48**	**0.46**	**0.55**	**0.60**	**0.14**	**0.38**	**1.05**	**0.73**	**0.80**	**0.82**	**0.65**	

Table1.5: IVT Berseem: Initial Varietal Trial in Berseem: Crude Protein Yield (q/ha)

Entries	Palam-pur	Ludh-iana	Faiza-bad	Bhuban-eswar	Jha-nsi	Rah-uri	Jabal-pur	Urulika-nchan	Rai-pur	His-ar	Aver-age	Rank
HFB-36	8.8	20.6	13.2	1.9	29.4	10.3	19.5	5.8	10.5	14.2	13.4	2
IGFRI-13-1	10.6	18.1	12.1	1.8	32.0	8.7	19.1	8.1	8.5	11.4	13.0	3
HFB-6-1	10.0	19.5	14.2	0.9	28.9	9.9	18.7	7.2	8.3	12.7	13.0	3
JB-4-21	9.2	18.9	13.9	1.3	30.1	9.7	18.4	6.3	7.2	15.2	13.0	3
Wardan (NC)	9.5	20.4	10.2	0.9	30.4	4.9	19.0	4.9	7.5	12.4	12.0	4
Mescavi (NC)	10.0	19.5	14.9	1.8	30.6	9.0	19.9	6.3	9.3	13.5	13.5	1
BL-22 (ZC-HZ)	9.7											
Bundel Berseem-2 (ZC-CZ, NWZ)		23.3			28.9	9.7	22.6	6.3	9.8	12.9		
Bundel Berseem-3 (ZC-NEZ)			11.2	2.0								
Mean	**9.7**	**20.0**	**12.8**	**1.5**	**30.0**	**8.9**	**19.6**	**6.4**	**8.7**	**13.2**	**13.0**	

Table1.6: IVT Berseem: Initial Varietal Trial in Berseem: Crude Protein (%)

Entries	Palam-pur	Ludh-iana	Faiza-bad	Bhuban-eswar	Jha-nsi	Rah-uri	Urulika-nchan	Rai-pur	His-ar	Aver-age	Ra-nk
HFB-36	18.0	22.1	16.3	18.2	19.9	19.1	18.2	16.2	24.2	19.1	5
IGFRI-13-1	19.8	24.2	16.1	19.4	21.2	18.7	19.4	14.8	22.8	19.6	2
HFB-6-1	21.0	21.9	16.3	19.0	20.2	19.1	18.4	14.8	23.6	19.4	3
JB-4-21	19.2	21.4	15.9	18.4	19.9	19.3	18.5	13.9	24.2	19.0	6
Wardan (NC)	21.0	23.3	16.0	20.0	22.1	19.5	18.8	14.0	24.2	19.9	1
Mescavi (NC)	20.4	20.3	16.8	19.8	20.3	18.7	18.3	15.0	23.9	19.3	4
BL-22 (ZC-HZ)	18.5										
Bundel Berseem-2 (ZC-CZ, NWZ)		22.8			18.0	18.5	17.7	15.4	23.6		
Bundel Berseem-3 (ZC-NEZ)			15.8	16.5							
Mean	**19.7**	**22.3**	**16.2**	**18.8**	**20.2**	**19.0**	**18.5**	**14.9**	**23.8**	**19.4**	

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

Entries	Palam-pur	Sri-nagar	Bika-ner	His-ar	Ludh-iana	Udai-pur	Kal-yani	Ran-chi	Faiza-bad	Bhuban-eswar
HFB-36	41.3	58.3	39.0	51.4	46.4	56.8	64.0	38.4	45.2	55.5
IGFRI-13-1	38.0	50.4	41.0	51.5	42.4	52.2	65.7	40.5	52.5	52.3
HFB-6-1	33.3	73.2	40.5	47.3	47.9	58.5	66.2	41.6	65.6	39.1
JB-4-21	39.0	61.3	40.5	53.1	42.4	54.1	68.1	54.7	72.5	45.3
Wardan (NC)	37.0	59.3	41.5	52.1	47.3	50.5	67.4	47.4	54.7	43.2
Mescavi (NC)	34.3	80.7	44.0	55.6	46.4	54.3	66.8	49.6	63.4	48.3
BL-22 (ZC-HZ)	29.0	65.6								
Bundel Berseem-2 (ZC-CZ, NWZ)			47.0	52.8	47.3	51.9				
Bundel Berseem-3 (ZC-NEZ)							66.5	47.3	55.7	58.4
Mean	**36.0**	**64.1**	**41.9**	**52.0**	**45.7**	**54.0**	**66.4**	**45.6**	**58.5**	**48.9**

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

Entries	Rah-uri	Jabal-pur	Urulika-nchan	Pal-ghar	Kan-pur	Rai-pur	Aver age	Ra nk
HFB-36	52.7	42.8	55.5	49.0	48.2	72.8	51.1	4
IGFRI-13-1	51.7	42.2	62.9	46.0	53.9	67.5	50.7	5
HFB-6-1	50.6	38.9	54.7	46.0	51.2	64.3	51.2	3
JB-4-21	54.8	36.6	54.9	32.0	58.0	54.9	51.4	2
Wardan (NC)	47.4	41.4	58.1	45.0	53.9	58.8	50.3	6
Mescavi (NC)	51.7	46.2	55.6	42.0	48.9	66.6	53.4	1
BL-22 (ZC-HZ)								
Bundel Berseem-2 (ZC-CZ, NWZ)	51.8	50.2	59.6	47.0	52.3	62.2		
Bundel Berseem-3 (ZC-NEZ)								
Mean	**51.5**	**42.6**	**57.3**	**43.9**	**52.3**	**63.9**	**51.3**	

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

Entries	Palam-pur	Sri-nagar	Bika-ner	His-ar	Ludh-iana	Kal-yani	Ran-chi	Faiza-bad
HFB-36	0.42	0.86	0.89	0.67	0.98	0.52	0.71	0.77
IGFRI-13-1	0.49	0.75	1.31	0.70	1.01	0.55	0.55	0.71
HFB-6-1	0.45	1.09	0.95	0.70	1.05	0.63	0.55	0.77
JB-4-21	0.58	0.91	0.95	0.62	1.08	0.54	0.55	0.74
Wardan (NC)	0.43	0.89	1.07	0.58	1.02	0.56	0.47	0.74
Mescavi (NC)	0.50	1.20	0.78	0.61	1.07	0.61	0.71	0.78
BL-22 (ZC-HZ)	0.53	0.98						
Bundel Berseem-2 (ZC-CZ, NWZ)			0.90	0.65	1.01			
Bundel Berseem-3 (ZC-NEZ)						0.61	0.67	0.70
Mean	**0.49**	**0.95**	**0.98**	**0.65**	**1.03**	**0.57**	**0.60**	**0.74**

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

Entries	Bhuba-neswar	Rah-uri	Jabal-pur	Urulika-nchan	Pal-ghar	Kan-pur	Rai-pur	Aver-age	Ra-nk
HFB-36	1.09	0.92	0.73	0.94	0.71	0.42	1.02	0.78	1
IGFRI-13-1	1.03	0.89	0.68	0.65	0.79	0.37	0.91	0.76	3
HFB-6-1	0.87	0.84	0.58	0.85	0.78	0.36	0.86	0.76	3
JB-4-21	0.94	0.74	0.52	0.8	0.56	0.45	0.74	0.71	5
Wardan (NC)	0.90	0.83	0.65	0.82	0.72	0.37	0.76	0.72	4
Mescavi (NC)	0.98	0.79	0.76	0.74	0.61	0.45	0.94	0.77	2
BL-22 (ZC-HZ)									
Bundel Berseem-2 (ZC-CZ, NWZ)		0.86	0.78	0.88	0.56	0.46	0.97		
Bundel Berseem-3 (ZC-NEZ)	1.15								
Mean	**0.99**	**0.84**	**0.67**	**0.81**	**0.68**	**0.41**	**0.89**	**0.75**	

Table 1.9: IVT Berseem: Initial Varietal Trial in Berseem: ADF (%), NDF (%) and IVDMD (%)

Entries	ADF (%)				NDF (%)				IVDMD (%)			
	Ludh-iana	Jha-nsi	Aver-age	Ra-nk	Ludh-iana	Jha-nsi	Aver-age	Ra-nk	Ludh-iana	His-ar	Aver-age	Ra-nk
HFB-36	29.9	40.4	35.2	5	38.5	52.8	45.7	6	62.6	58.4	60.5	6
IGFRI-13-1	25.8	41.6	33.7	2	31.3	50.3	40.8	1	66.0	57.5	61.8	5
HFB-6-1	30.8	39.7	35.2	6	38.8	50.9	44.9	4	67.4	58.5	62.9	3
JB-4-21	29.4	38.9	34.1	3	39.3	60.0	49.7	7	68.4	58.2	63.3	2
Wardan (NC)	28.3	38.1	33.2	1	34.9	49.1	42.0	2	67.2	56.4	61.8	5
Mescavi (NC)	31.3	38.6	34.9	4	41.1	49.6	45.3	5	67.6	57.7	62.7	4
Bundel Berseem-2 (ZC-CZ, NWZ)	29.4	43.1	36.3	7	36.4	51.0	43.7	3	68.4	58.7	63.6	1
Mean	**29.3**	**40.1**	**34.7**		**37.2**	**52.0**	**44.6**		**66.8**	**57.9**	**62.4**	

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

Entries	North West Zone					
	Bikaner	Hisar	Ludhiana	Average	Rank	Superiority%
JBSC-2	59.3	188.9	108.3	118.9	1	71.6
JBSC-4	66.5	175.0	108.3	116.6	2	56.3
JBSC-3	44.6	177.8	50.0	90.8	4	31.0
JBSC-1	37.4	158.3	102.8	99.5	3	48.3
Wardan (NC)	42.8	108.3	45.8	65.7	6	
Mescavi (NC)	51.0	108.3	48.6	69.3	5	
Bundel Berseem-2 (ZC-CZ, NWZ)	38.1	105.6	41.7	61.8	7	
Mean	**48.5**	**146.0**	**72.2**	**88.9**		
CD at 5%	13.6	28.9	9.5			
CV%	15.8	11.6	7.4			

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

Entries	Central Zone								All India		
	Jha-nsi	Rah-uri	Urulikan-chan	Kar-jat	Jabal-pur	Aver-age	Ra-nk	Superi-ority%	Aver-age	Ra-nk	Superi-ority%
JBSC-2	427.6	85.8	67.3	61.7	172.8	163.1	2	20.4	146.5	2	32.3
JBSC-4	409.6	103.5	69.4	71.7	150.0	160.8	3	18.7	144.3	3	30.4
JBSC-3	435.9	71.7	61.2	65.4	159.2	158.7	4	17.1	133.2	4	20.3
JBSC-1	441.5	90.0	98.7	87.4	163.4	176.2	1	30.0	147.4	1	33.2
Wardan (NC)	292.9	32.1	96.7	63.0	138.4	124.6	6		102.5	6	
Mescavi (NC)	298.5	78.2	85.7	78.0	137.4	135.5	5		110.7	5	
Bundel Berseem-2 (ZC-CZ, NWZ)	276.3	76.8	70.2	47.8	117.6	117.7	7				
Mean	**368.9**	**76.9**	**78.5**	**67.9**	**148.4**	**148.1**			**130.8**		
CD at 5%	51.8	12.8	14.1	7.6	33.7						
CV%	7.9	9.3	19.2	6.7	12.8						

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

Entries	North West Zone					
	Bikaner	Hisar	Ludhiana	Average	Rank	Superiority%
JBSC-2	15.1	16.6	10.6	14.1	1	58.4
JBSC-4	18.0	15.1	9.1	14.1	1	58.4
JBSC-3	12.0	12.3	4.1	9.4	3	5.6
JBSC-1	9.4	12.9	9.9	10.7	2	20.2
Wardan (NC)	9.6	10.3	4.3	8.1	5	
Mescavi (NC)	11.4	10.9	4.4	8.9	4	
Bundel Berseem-2 (ZC-CZ, NWZ)	8.7	7.1	4.1	6.6	6	
Mean	**12.0**	**12.2**	**6.6**	**10.3**		
CD at 5%	4.0	3.5	0.04			
CV%	18.7	17.1	3.4			

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

Entries	Central Zone								All India		
	Jha-nsi	Rah-uri	Urulika-nchan	Kar-jat	Jabal-pur	Aver-age	Ra-nk	Superi-ority%	Aver-age	Ra-nk	Superi-ority%
JBSC-2	48.3	13.4	13.0	10.9	23.9	21.9	2	17.1	19.0	2	25.8
JBSC-4	42.3	17.3	13.8	10.7	19.7	20.7	3	10.7	18.2	3	20.5
JBSC-3	41.1	12.1	11.5	10.5	20.8	19.2	4	2.7	15.5	4	2.6
JBSC-1	61.8	14.5	18.2	12.4	21.8	25.7	1	37.4	20.1	1	33.1
Wardan (NC)	41.6	5.3	17.3	11.1	17.7	18.6	6		14.7	6	
Mescavi (NC)	31.8	15.7	16.0	13.6	16.6	18.7	5		15.1	5	
Bundel Berseem-2 (ZC-CZ, NWZ)	38.8	13.7	13.4	9.6	13.5	17.8	7				
Mean	**43.7**	**13.1**	**14.7**	**11.3**	**19.1**	**20.4**			**17.1**		
CD at 5%	8.1	2.1	2.7	2.2	4.4						
CV%	6.1	9.1	16.6	10.9	13.0						

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

Entries	Bikaner	Hisar	Ludhiana	Jhansi	Urulikanchan	Karjat	Average	Rank
JBSC-2	0.52	2.86	1.75	7.13	1.12	1.05	2.41	2
JBSC-4	0.58	2.65	1.75	6.83	1.16	1.16	2.36	3
JBSC-3	0.39	2.69	0.81	7.27	1.02	1.08	2.21	4
JBSC-1	0.33	2.40	1.66	7.36	1.65	1.46	2.48	1
Wardan (NC)	0.38	1.64	0.74	4.88	1.61	1.05	1.72	6
Mescavi (NC)	0.45	1.64	0.78	4.97	1.43	1.30	1.76	5
Bundel Berseem-2 (ZC-CZ, NWZ)	0.33	1.60	0.67	4.60	1.17	0.80		
Mean	0.43	2.21	1.17	6.15	1.31	1.13	2.15	

Table 2.4: AVT-1: Advanced Varietal Trial in Berseem (SC): Dry Matter Yield (q/ha/day)

Entries	Bikaner	Hisar	Ludhiana	Jhansi	Urulikanchan	Karjat	Average	Rank
JBSC-2	0.13	0.25	0.17	0.80	0.22	0.18	0.29	2
JBSC-4	0.16	0.23	0.15	0.70	0.23	0.18	0.27	3
JBSC-3	0.11	0.19	0.07	0.68	0.19	0.18	0.24	5
JBSC-1	0.08	0.19	0.16	1.03	0.30	0.21	0.33	1
Wardan (NC)	0.08	0.16	0.07	0.69	0.29	0.19	0.25	4
Mescavi (NC)	0.10	0.17	0.07	0.53	0.27	0.23	0.23	6
Bundel Berseem-2 (ZC-CZ, NWZ)	0.08	0.11	0.07	0.65	0.22	0.18		
Mean	**0.11**	**0.19**	**0.11**	**0.73**	**0.25**	**0.19**	**0.27**	

Table 2.5: AVT-1: Advanced Varietal Trial in Berseem (SC): Crude Protein Yield (q/ha) and Crude Protein (%)

Entries	Crude Protein Yield (q/ha)						Crude Protein (%)					
	Jha-nsi	Rah-uri	Urulika-nchan	Jabal-pur	Aver-age	Ra-nk	Jha-nsi	Rah-uri	Urulika-nchan	Jabal-pur	Aver-age	Ra-nk
JBSC-2	7.7	2.5	2.4	3.8	4.1	2	16.8	18.8	18.2	16.3	17.5	4
JBSC-4	7.5	3.3	2.5	3.1	4.1	2	18.9	19.1	17.9	16.2	18.0	2
JBSC-3	7.2	2.3	2.1	3.3	3.7	3	18.9	19.3	18.2	16.2	18.1	1
JBSC-1	10.4	2.8	3.1	3.4	4.9	1	17.9	19.3	17.2	16.2	17.6	3
Wardan (NC)	6.9	1.0	3.1	2.8	3.4	5	17.5	19.3	17.7	16.1	17.6	3
Mescavi (NC)	5.5	3.1	2.9	2.7	3.5	4	18.3	19.5	18.0	16.1	18.0	2
Bundel Berseem-2 (ZC-CZ, NWZ)	6.2	2.6	2.4	2.1			17.0	18.8	18.2	16.1		
Mean	**7.3**	**2.5**	**2.6**	**3.0**	**4.0**		**17.9**	**19.1**	**17.9**	**16.2**	**17.8**	

Table 2.6 AVT-1: Advanced Varietal Trial in Berseem (SC): Plant Height (cm)

Entries	Bikaner	Hisar	Ludhiana	Jhansi	Rahuri	Urulikanchan	Karjat	Jabalpur	Average	Rank
JBSC-2	57.0	47.4	29.3	81.8	53.3	49.2	53.2	74.9	55.8	3
JBSC-4	64.0	49.4	31.4	84.4	50.4	39.3	59.9	63.0	55.2	4
JBSC-3	65.0	48.9	22.8	84.6	52.3	52.7	56.3	67.4	56.2	2
JBSC-1	62.0	50.7	29.1	90.7	50.7	59.0	61.0	72.9	59.5	1
Wardan (NC)	74.0	38.9	23.0	72.8	47.5	59.2	58.2	54.7	53.5	6
Mescavi (NC)	62.0	46.9	22.0	74.0	57.4	58.3	54.5	60.0	54.4	5
Bundel Berseem-2 (ZC-CZ, NWZ)	57.0	44.8	21.2	71.2	52.2	51.7	57.9	51.8		
Mean	**63.0**	**46.7**	**25.5**	**79.9**	**52.0**	**52.8**	**57.3**	**63.5**	**55.8**	

Table 2.7: AVT-1: Advanced Varietal Trial in Berseem (SC): Leaf Stem Ratio

Entries	Bikaner	Hisar	Ludhiana	Rahuri	Urulikanchan	Karjat	Jabalpur	Average	Rank
JBSC-2	0.86	0.46	0.89	0.80	0.92	0.52	0.81	0.75	5
JBSC-4	0.83	0.43	0.69	0.80	1.17	0.62	0.68	0.75	5
JBSC-3	1.33	0.50	1.02	0.90	1.17	0.61	0.73	0.89	1
JBSC-1	1.17	0.46	0.97	0.80	0.91	0.47	0.78	0.79	4
Wardan (NC)	1.20	0.81	1.43	0.90	0.80	0.46	0.55	0.88	2
Mescavi (NC)	0.83	0.91	1.47	0.80	0.76	0.59	0.65	0.86	3
Bundel Berseem-2 (ZC-CZ, NWZ)	1.17	0.97	1.44	0.80	0.82	0.32	0.55		
Mean	**1.06**	**0.65**	**1.13**	**0.83**	**0.94**	**0.51**	**0.68**	**0.82**	

Table 2.8: AVT-1: Advanced Varietal Trial in Berseem (SC): ADF (%), NDF (%) and IVDMD (%)

Entries	ADF (%)				NDF (%)				IVDMD (%)	
	Jha-nsi	Rah-uri	Aver-age	Ra-nk	Jha-nsi	Rah-uri	Aver-age	Ra-nk	Rah-uri	Ra-nk
JBSC-2	45.4	33.4	39.4	6	57.3	42.8	50.1	6	62.8	5
JBSC-4	42.1	26.8	34.5	2	52.8	37.2	45.0	3	68.0	2
JBSC-3	43.8	24.4	34.1	1	55.6	39.2	47.4	4	69.9	1
JBSC-1	46.3	26.8	36.6	5	58.8	38.8	48.8	5	68.0	2
Wardan (NC)	42.4	27.3	34.8	4	54.6	24.2	39.4	1	67.7	4
Mescavi (NC)	43.6	27.0	35.3	3	53.9	35.4	44.6	2	67.8	3
Bundel Berseem-2 (ZC-CZ, NWZ)	41.7	23.7			54.8	36.2			70.4	
Mean	**43.6**	**27.1**	**35.8**		**55.4**	**36.3**	**45.9**		**67.8**	

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

(Reference Tables: 3.1 to 3.9)

In Oat (Single cut), thirteen 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 26 locations across the five zones in the country. For the character green forage yield (q/ha), entries OL-1689 (12.5%), RO-11-1 (10.6%), OS-406 (10.3%), NDO-952 (8.53%), RSO-8 (3.3%), SKO-196 (1.5%) and OL-1804 (0.02%) in North West zone; RO-11-1 (10.1%), OL-1689 (9.8%), OL-1804 (7.0%), RSO-8 (6.2%) and OS-406 (5.6%) in North East zone; OS-406 (21.7%), RO-11-1 (16.8%), RSO-8 (11.6%), OL-1804 (6.0%), SKO-196 (4.6%), NDO-952 (3.4%), JHO-13-5 (2.2%), SKO-198 (1.9%), JO-04-18 (1.3%) and OL-1689 (0.4%) in Central zone; entries OS-406 (10.4%) and NDO-952 (6.0%) in South zone exhibited superiority over best national/zonal check. At national level, entry OS-406 with 14.9 per cent superiority was best performer.

For the character dry matter yield (q/ha), entries NDO-952 (41.3%), JHO-13-5 (24.1%), SKO-198 (22.5%), RSO-8 (20.7%), JO-04-18 (19.1%), OL-1689 (16.9%), SKO-196 (13.7%), OS-406 (10.1%), SKO-199 (8.8%) and RO-11-1 (4.6%) in North West zone; entries RO-11-1 (6.7%), OL-1689 (1.9%) and OL-1804 (0.3%) in North East zone; entries OS-406 (24.1%), RO-11-1 (23.1%), RSO-8 (18.0%), SKO-196 (13.6%), SKO-198 (6.9%), JHO-13-5 (6.6%), JO-04-18 (6.4%) NDO-952 (0.7%) in central zone; entries OS-406 (12.7%) and NDO-952 (3.0%) in South zone exhibited superiority over checks. At national level, OS-406 (18.7%) was best performer.

For fodder production potential (q/ha/day), RSO-8 for green forage yield and dry matter yield registered its superiority. For plant height, OS-406 was adjudged best performer. For the character leafiness (L/S ratio), entry SKO-198 ranked first. For quality parameters, entry OS-406 for crude protein yield (q/ha) and OL-1689 for crude protein content (%) proved superiority. For other quality parameters, entry SKO-198 for ADF (%) and SKO-196 for NDF (%) registered superiority over best national checks.

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

Entries	Hill Zone					North West Zone								
	Palam-pur	Sri-nagar	Aver-age	Ra-nk	Superi-ority%	Bika-ner	Jal-ore	His-ar	Ludh-iana	Udai-pur	Mee-rut	Aver-age	Ra-nk	Superi-ority%
SKO-196	302.2	451.6	376.9	9		220.0	425.3	429.6	470.4	529.6	658.9	455.6	6	1.5
OS-406	333.3	431.7	382.5	7		186.2	450.0	437.0	407.4	787.0	703.3	495.2	3	10.3
RSO-8	280.4	476.8	378.6	8		219.3	462.7	429.6	440.7	703.7	525.6	463.6	5	3.3
JHO-13-6	274.6	438.9	356.8	15		162.6	366.7	303.7	285.2	477.8	625.5	370.2	15	
SKO-198	235.5	517.6	376.5	10		241.8	367.3	370.4	485.2	548.1	392.2	400.8	14	
OL-1689	334.6	467.7	401.2	2		199.9	426.7	463.0	414.8	674.1	852.2	505.1	1	12.5
RO-11-1	355.1	438.5	396.8	4		183.2	479.7	414.8	418.5	737.1	744.4	496.3	2	10.6
OL-1750		422.1							66.7					
JHO-13-5	316.0	480.2	398.1	3		214.5	392.3	455.6	440.7	570.4	618.9	448.7	9	
JO-04-18	294.2	457.8	376.0	11		182.6	471.7	492.6	437.0	509.3	466.7	426.6	13	
NDO-952	293.3	456.2	374.8	12		197.7	442.0	474.1	525.9	646.3	636.7	487.1	4	8.53
OL-1804	314.2	459.2	386.7	6		220.5	475.0	488.9	311.1	661.1	536.7	448.9	7	0.02
SKO-199	289.3	503.8	396.6	5		166.5	406.7	518.5	325.9	555.6	641.1	435.7	12	
Kent (NC)	314.2	430.8	372.5	13		208.1	391.7	451.9	311.1	514.8	755.5	438.8	11	
OS-6 (NC)	308.0	421.4	364.7	14		190.3	410.0	488.9	303.7	511.1	777.8	447.0	10	
SKO-90 (ZC-HZ)	331.5	507.4	419.5	1										
OL-125 (ZC-NWZ)						210.0	433.0	474.1	277.8	553.7	744.4	448.8	8	
Mean	305.1	460.1	383.9			200.2	426.7	446.2	370.1	598.6	645.3	451.2		
CD at 5%	55.8	36.1				NS	8.3	77.8	61.6	3.3	56.9			
CV%	10.9	7.8				14.3	11.7	10.3	3.9	2.3	5.3			

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

Entries	North East Zone									
	Jorhat	Kalyani	Bhubaneswar	Ranchi	Pusa	Faizabad	Imphal	Average	Rank	Superiority%
SKO-196	242.3	445.9	428.6	284.4	588.0	285.3	172.1	349.5	13	
OS-406	380.6	464.1		302.3	527.0	341.3	376.4	398.6	5	5.6
RSO-8	320.3	452.6	393.9	355.6	549.0	394.7	340.5	400.9	4	6.2
JHO-13-6	254.4	457.8	433.2	275.6	583.0	282.7	192.6	354.2	12	
SKO-198	246.6	439.3	424.4	275.6	538.0	453.3	158.9	362.3	10	
OL-1689	416.3	438.9	399.2	364.4	496.0	301.3	482.2	414.1	2	9.8
RO-11-1	374.0	477.0	389.9	320.0	561.0	346.7	439.8	415.5	1	10.1
OL-1750			261.9		627.0	42.7				
JHO-13-5	277.1	424.8		271.1	516.0	330.7	250.2	345.0	15	
JO-04-18	304.6	421.9	384.4	288.9	483.0	261.3	286.1	347.2	14	
NDO-952	311.6	445.9	347.3	297.7	505.0	333.3	353.1	370.6	8	
OL-1804	366.1	491.9	395.9	315.6	605.0	397.3	254.8	403.8	3	7.0
SKO-199	334.8	444.8	350.6	324.4	561.0	357.3	232.9	372.3	7	
Kent (NC)	324.6	434.4	412.6	342.3	494.0	280.0	282.2	367.1	9	
OS-6 (NC)	288.1	430.0		302.3	494.0	328.0	307.1	358.2	11	
JHO-99-2 (ZC-NEZ)	359.1	458.1	336.1	257.7	572.0	277.3	380.7	377.3	6	
Mean	**320.0**	**448.5**	**381.4**	**305.2**	**543.7**	**313.3**	**300.6**	**375.8**		
CD at 5%	6.9	16.3	30.3	45.7	52.1	51.3	39.3			
CV%	10.0	2.2	4.7	8.9	11.4	9.8	11.8			

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

Entries	Central Zone										
	Jha-nsi	Rah-uri	Urulika-nchan	Kan-pur	Pal-ghar	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk	Superi-ority%
SKO-196	496.4	499.1	640.0	485.2	308.1	743.0	481.2	431.5	510.6	5	4.6
OS-406	570.4	655.6	773.3	677.8	286.2	921.0	445.2	422.2	594.0	1	21.7
RSO-8	558.1	623.7	778.6	555.6	279.5	843.0	419.9	296.3	544.3	3	11.6
JHO-13-6	444.0	375.5	469.3	363.0	277.8	741.0	353.2	300.0	415.5	15	
SKO-198	573.5	421.3	608.0	418.5	269.4	849.0	447.8	390.7	497.3	8	1.9
OL-1689	530.3	457.4	725.3	581.5	265.7	762.0	266.6	331.5	490.0	10	0.4
RO-11-1	613.6	575.0	736.0	633.3	255.9	873.0	478.5	394.4	570.0	2	16.8
OL-1750	539.6		80.0		254.9			137.0			
JHO-13-5	588.9	478.7	672.0	488.9	242.9	807.0	518.5	192.6	498.7	7	2.2
JO-04-18	585.8	506.1	650.6	563.0	237.9	679.0	526.5	207.4	494.5	9	1.3
NDO-952	625.9	530.6	698.6	529.6	235.9	760.0	394.2	261.1	504.5	6	3.4
OL-1804	625.9	485.2	874.6	566.7	200.3	810.0	307.9	268.5	517.4	4	6.0
SKO-199	592.0	430.6	490.6	414.8	286.6	709.0	391.9	279.6	449.4	14	
Kent (NC)	675.3	475.0	624.0	533.3	300.5	731.0	338.5	225.9	487.9	11	
OS-6 (NC)	567.3	540.3	677.3	492.6	286.2	610.0	443.8	224.1	480.2	12	
JHO-822 (ZC-CZ)	616.7	488.5	736.0	522.2	267.9	715.0	241.2	166.7	469.3	13	
Mean	**575.2**	**502.8**	**639.6**	**521.7**	**266.0**	**770.2**	**403.7**	**283.1**	**501.6**		
CD at 5%	16.9	74.8	84.0	55.5	79.4	109.9	77.6	62.5			
CV%	1.8	8.9	15.6	4.5	18.7	8.6	11.5	13.8			

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

Entries	South Zone						All India		
	Hyderabad	Mandya	Coimbatore	Average	Rank	Superiority%	Average	Rank	Superiority%
SKO-196	237.0	132.2	305.6	224.9	14		411.3	8	
OS-406	433.3	166.6	477.8	359.2	1	10.4	478.3	1	14.9
RSO-8	411.1	148.7	316.7	292.1	7		445.2	4	6.9
JHO-13-6	251.8	109.2	361.1	240.7	12		363.9	14	
SKO-198	270.3	163.8	511.1	315.1	6		408.4	11	
OL-1689	407.4	174.7	377.8	320.0	4		446.6	3	7.2
RO-11-1	537.0	177.5	242.6	319.0	5		469.1	2	12.6
OL-1750			177.8						
JHO-13-5	322.2	114.0	261.1	232.4	13		409.8	9	
JO-04-18	277.8	101.8	281.5	220.4	15		398.4	13	
NDO-952	344.4	163.7	525.9	344.7	2	6.0	436.0	5	4.7
OL-1804	411.1	171.1	288.9	290.4	8		434.8	6	4.4
SKO-199	344.4	144.2	298.1	262.3	10		399.8	12	
Kent (NC)	288.9	145.8	540.7	325.1	3		416.4	7	
OS-6 (NC)	340.7	115.8	381.5	279.3	9		409.6	10	
JHO-2000-4(ZC-SZ)	266.6	142.4	350.0	253.0	11				
Mean	**342.9**	**144.8**	**356.1**	**285.2**			**423.4**		
CD at 5%	60.4	17.8	55.4						
CV%	10.5	7.9	9.3						

Note- - (OL-1750) not germinated at so many locations and in few location yields too low, therefore deleted in zonal and all Iindia average

***Not included in zonal and all Iindia average due to CV>= 20**

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

Entries	Hill Zone					North West Zone					
	Palam-pur	Sri-nagar	Aver-age	Ra-nk	Superi-ority%	Bika-ner	His-ar	Ludh-iana	Aver-age	Ra-nk	Superi-ority%
SKO-196	60.4	107.0	83.7	10		54.9	65.2	108.7	76.3	7	13.7
OS-406	64.5	105.5	85.0	9		73.8	66.3	81.7	73.9	8	10.1
RSO-8	53.4	116.5	85.0	9		74.1	73.8	95.1	81.0	4	20.7
JHO-13-6	53.4	107.2	80.3	14		43.8	41.2	45.6	43.5	14	
SKO-198	45.7	131.9	88.8	4		54.9	68.7	122.9	82.2	3	22.5
OL-1689	63.6	110.9	87.3	7		67.6	81.6	86.3	78.5	6	16.9
RO-11-1	69.6	107.1	88.3	5		54.0	66.7	89.9	70.2	10	4.6
OL-1750		103.0						13.5			
JHO-13-5	60.5	117.3	88.9	3		79.9	76.1	94.1	83.3	2	24.1
JO-04-18	57.4	108.5	82.9	11		66.9	83.6	89.1	79.9	5	19.1
NDO-952	63.6	111.4	87.5	6		64.4	74.3	145.8	94.8	1	41.3
OL-1804	62.1	112.1	87.1	8		62.4	81.6	56.3	66.8	12	
SKO-199	56.0	126.1	91.0	2		68.6	90.4	60.0	73.0	9	8.8
Kent (NC)	58.8	103.8	81.3	13		70.3	75.2	54.9	66.8	12	
OS-6 (NC)	58.5	105.6	82.0	12		67.1	83.6	50.5	67.1	11	
SKO-90 (ZC-HZ)	62.2	123.0	92.6	1							
OL-125 (ZC-NWZ)						64.8	89.3	42.8	65.7	13	
Mean	**59.3**	**112.3**	**86.1**			**64.5**	**74.5**	**77.3**	**73.5**		
CD at 5%	10.6	7.6				NS	20.5	20.8			
CV%	10.7	9.4				17.8	16.2	16.1			

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

Entries	North East Zone									
	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa	Faiza-bad	Imp-hal	Aver-age	Ra-nk	Superi-ority%
SKO-196	46.9	63.5	89.6	62.8	115.7	63.7	29.5	67.4	11	
OS-406	69.2	63.8		71.2	103.9	75.7	72.6	76.1	6	
RSO-8	58.0	64.5	85.6	77.7	109.1	77.6	70.8	77.6	5	
JHO-13-6	47.1	65.2	90.7	50.1	115.2	60.8	33.3	66.1	13	
SKO-198	47.7	63.7	87.6	63.5	106.9	83.7	37.8	70.1	10	
OL-1689	78.6	65.8	86.0	98.8	99.0	62.8	74.5	80.8	2	1.9
RO-11-1	71.6	73.9	82.0	83.3	110.7	75.5	95.3	84.6	1	6.7
OL-1750			53.6		123.7	8.8				
JHO-13-5	47.0	63.7		60.9	102.6	71.9	43.4	64.9	14	
JO-04-18	54.6	61.2	82.5	97.3	96.4	58.3	52.2	71.8	9	
NDO-952	57.7	64.7	73.1	71.9	100.7	62.2	72.4	71.8	9	
OL-1804	61.8	76.2	85.5	87.6	118.9	86.7	39.8	79.5	3	0.3
SKO-199	56.4	66.7	75.1	86.8	111.8	73.6	54.0	74.9	7	
Kent (NC)	62.8	64.1	88.1	118.7	97.4	64.3	59.7	79.3	4	
OS-6 (NC)	51.4	63.4		83.5	98.2	56.5	56.8	68.3	12	
JHO-99-2 (ZC-NEZ)	53.5	64.1	72.2	80.9	112.8	56.3	63.8	71.9	8	
Mean	**57.6**	**65.6**	**80.9**	**79.7**	**107.7**	**64.9**	**57.1**	**73.7**		
CD at 5%	3.2	2.4	7.6	19.9	13.9	9.9	9.1			
CV%	10.8	2.2	5.6	14.9	12.7	9.2	14.4			

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

Entries	Central Zone										
	Jha-nsi	Rah-uri	Urulika-nchan	Kan-pur	Rai-pur	Ana-nd	Jabal-pur	*Pal-ghar	Aver-age	Ra-nk	Superi-ority%
SKO-196	79.4	97.7	140.4	165.6	105.9	140.4	105.3	93.0	119.2	4	13.6
OS-406	90.3	134.3	154.6	231.5	104.0	161.1	96.3	80.9	138.9	1	24.1
RSO-8	74.0	126.7	143.3	190.0	73.9	169.4	89.4	75.1	123.8	3	18.0
JHO-13-6	82.1	80.5	106.7	124.1	74.8	139.3	73.5	75.9	97.3	13	
SKO-198	108.3	85.3	130.6	141.9	97.1	125.7	96.9	70.6	112.2	5	6.9
OL-1689	56.6	89.2	117.2	197.8	82.1	118.1	51.1	65.8	101.7	10	
RO-11-1	93.4	113.1	149.2	215.2	97.9	132.7	102.3	61.6	129.1	2	23.1
OL-1750	76.2		17.5		35.8			61.9			
JHO-13-5	81.7	101.3	117.8	165.9	49.5	151.8	114.3	64.9	111.8	6	6.6
JO-04-18	99.4	107.1	91.9	192.2	53.2	120.8	116.5	54.1	111.6	7	6.4
NDO-952	80.9	104.8	114.4	181.9	66.1	104.9	86.2	53.8	105.6	8	0.7
OL-1804	76.2	93.5	124.3	193.7	67.9	116.7	62.3	40.0	104.9	9	
SKO-199	76.9	89.8	72.9	141.1	69.7	89.3	82.5	55.0	88.9	15	
Kent (NC)	77.4	88.7	105.9	181.5	57.6	106.8	69.8	85.9	98.2	11	
OS-6 (NC)	92.3	111.7	120.3	168.2	57.2	89.0	95.4	59.8	104.9	9	
JHO-822 (ZC-CZ)	75.7	91.0	110.8	180.4	43.3	105.1	45.8	67.5	93.2	14	
Mean	**82.6**	**101.0**	**113.6**	**178.0**	**71.0**	**124.7**	**85.8**	**66.6**	**109.4**		
CD at 5%	13.9	15.2	15.7	19.2	14.5	20.5	16.4	40.5			
CV%	10.5	9.0	18.2	2.7	13.8	9.5	11.4	36.1			

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

Entries	South Zone						All India		
	Hydera-bad	Man-dya	Coimba-tore	Aver-age	Ra-nk	Superi-ority%	Aver-age	Ra-nk	Superi-ority%
SKO-196	59.3	40.7	50.1	50.0	14		84.2	8	1.5
OS-406	101.2	52.9	92.7	82.3	1	12.7	98.4	1	18.7
RSO-8	73.9	54.8	59.0	62.6	8		91.4	3	10.5
JHO-13-6	69.0	37.8	67.9	58.2	12		73.1	14	
SKO-198	66.4	49.9	100.3	72.2	4		87.2	5	5.2
OL-1689	83.2	55.7	71.5	70.1	5		86.3	6	4.1
RO-11-1	101.9	60.0	43.6	68.5	6		94.9	2	14.5
OL-1750			29.6						
JHO-13-5	59.3	55.4	45.6	53.4	13		83.8	9	1.1
JO-04-18	55.5	41.9	50.2	49.2	15		83.5	10	0.7
NDO-952	60.8	57.2	107.4	75.2	2	3.0	87.6	4	5.7
OL-1804	85.2	53.8	51.7	63.6	7		84.4	7	1.8
SKO-199	65.0	61.5	56.1	60.9	10		78.7	13	
Kent (NC)	60.6	52.1	106.4	73.0	3		82.9	11	
OS-6 (NC)	64.7	48.9	73.0	62.2	9		80.7	12	
JHO-2000-4(ZC-SZ)	49.6	65.8	65.1	60.2	11				
Mean	**70.4**	**52.6**	**66.9**	**64.1**			**81.6**		
CD at 5%	13.6	11.0	13.4						
CV%	11.6	13.4	12.0						

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

Entries	Palam-pur	Bika-ner	His-ar	Ludh-iana	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa	Faiza-bad
SKO-196	2.19	1.96	3.65	3.70	2.45	5.37	5.16	2.90	6.39	2.48
OS-406	2.49	1.66	3.74	3.30	4.25	5.87		3.25	5.73	3.25
RSO-8	2.24	1.96	3.76	3.60	3.91	5.73	4.69	4.00	5.84	3.79
JHO-13-6	2.05	1.45	2.66	2.30	2.62	5.52	5.35	3.08	6.27	2.64
SKO-198	1.71	2.16	3.23	3.90	2.54	5.29	5.51	2.76	5.85	4.16
OL-1689	2.62	1.78	4.00	3.40	4.73	5.56	5.05	4.39	5.51	3.01
RO-11-1	2.78	1.64	3.54	3.30	4.45	5.75	5.34	3.64	6.16	3.50
OL-1750				0.50			3.40		6.67	0.36
JHO-13-5	2.49	1.91	3.94	3.60	3.38	5.12		3.12	5.67	2.80
JO-04-18	2.30	1.63	4.33	3.60	3.63	5.08	4.47	3.24	5.37	2.51
NDO-952	2.65	1.77	4.24	4.70	3.77	6.37	4.57	3.17	5.61	3.33
OL-1804	2.37	1.97	4.23	2.40	4.36	6.23	4.89	3.59	6.37	3.93
SKO-199	2.29	1.49	4.66	2.60	4.12	6.35	6.49	3.86	6.16	3.47
Kent (NC)	2.55	1.86	4.12	2.50	3.97	6.03	5.22	4.12	5.49	2.74
OS-6 (NC)	2.50	1.70	4.34	2.40	3.53	5.97		3.68	5.49	3.28
SKO-90 (ZC-HZ)	2.48									
OL-125 (ZC-NWZ)		1.88	4.32	2.20						
JHO-99-2 (ZC-NEZ)					4.38	5.80	4.05	3.00	6.22	2.80
Mean	**2.38**	**1.79**	**3.92**	**3.00**	**3.74**	**5.74**	**4.94**	**3.45**	**5.93**	**3.00**

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

Entries	Jha-nsi	Rah-uri	Urulika-nchan	Kan-pur	Pal-ghar	Ana-nd	Rai-pur	Hydera-bad	Man-dya	Coimb-atore	Aver-age	Ra-nk
SKO-196	4.42	4.75	6.46	5.33	3.26	7.74	4.00	2.21	1.58	3.43	3.97	13
OS-406	5.03	7.37	8.59	6.85	3.87	10.12	3.91	5.81	1.94	5.37	4.86	2
RSO-8	5.94	8.10	9.73	6.24	3.21	10.04	3.37	5.74	1.76	5.76	4.97	1
JHO-13-6	3.50	4.04	4.89	3.46	3.52	7.26	2.78	3.00	1.27	4.01	3.58	14
SKO-198	5.03	4.48	6.08	3.99	3.28	9.33	3.62	3.37	1.93	5.62	4.19	11
OL-1689	5.66	5.51	9.07	6.06	3.06	9.07	3.07	5.47	2.05	4.29	4.67	7
RO-11-1	5.45	6.69	8.46	6.40	3.24	9.09	3.65	6.68	2.13	2.67	4.73	5
OL-1750	5.00		0.82	5.09	3.05		1.27			2.22		
JHO-13-5	6.69	5.84	8.73	6.47	2.79	9.61	1.78	4.33	1.37	2.97	4.35	10
JO-04-18	6.15	6.10	8.24	5.82	2.75	8.08	1.92	3.75	1.24	3.35	4.18	12
NDO-952	7.33	6.03	9.19		3.10	9.74	2.42	4.73	2.02	6.26	4.79	4
OL-1804	6.90	5.71	11.07	6.00	2.80	9.64	3.05	5.52	2.05	3.17	4.81	3
SKO-199	6.99	5.74	7.32	4.88	3.12	10.13	2.59	5.56	1.72	3.55	4.65	8
Kent (NC)	7.64	5.79	8.21	6.13	3.23	9.37	2.57	3.87	1.76	6.36	4.68	6
OS-6 (NC)	6.26	7.11	8.80	5.60	3.08	7.82	2.55	4.82	1.41	4.83	4.48	9
JHO-99-2 (ZC-NEZ)				5.90								
JHO-822 (ZC-CZ)	6.85	5.96	9.44		2.98	9.17	1.54					
JHO-2000-4(ZC-SZ)								3.60	1.69	4.02		
Mean	**5.93**	**5.95**	**7.82**	**5.61**	**3.15**	**9.08**	**2.76**	**4.56**	**1.73**	**4.24**	**4.49**	

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

Entries	Bika-ner	His-ar	Ludh-iana	Jor-hat	Kal-yani	Bhuba-neswar	Ran-chi	Pu-sa	Faiza-bad	Jha-nsi
SKO-196	0.49	0.55	0.80	0.47	0.77	1.08	0.64	1.26	0.55	0.71
OS-406	0.66	0.57	0.60	0.77	0.81		0.77	1.13	0.72	0.80
RSO-8	0.66	0.65	0.80	0.71	0.82	1.02	0.87	1.16	0.75	0.79
JHO-13-6	0.39	0.36	0.40	0.49	0.79	1.12	0.55	1.24	0.57	0.65
SKO-198	0.49	0.60	1.00	0.49	0.77	1.14	0.63	1.16	0.77	0.95
OL-1689	0.60	0.71	0.70	0.89	0.83	1.09	1.19	1.10	0.63	0.60
RO-11-1	0.48	0.57	0.70	0.85	0.89	1.12	0.95	1.22		0.83
OL-1750						0.70		1.31	0.07	0.71
JHO-13-5	0.71	0.66	0.80	0.57	0.77		0.70	1.13	0.61	0.93
JO-04-18	0.60	0.74	0.70	0.65	0.74	0.96	1.05	1.07	0.56	1.04
NDO-952	0.58	0.66	1.10	0.70	0.92	0.96	0.76	1.12	0.62	0.95
OL-1804	0.56	0.71	0.40	0.74	0.97	1.06	1.00	1.25	0.86	0.84
SKO-199	0.61	0.81	0.50	0.69	0.95	1.39	1.03	1.23	0.74	0.91
Kent (NC)	0.63	0.69	0.40	0.77	0.89	1.12	1.42	1.08	0.63	0.88
OS-6 (NC)	0.60	0.74	0.40	0.63	0.88		0.12	1.09	0.56	1.02
SKO-90 (ZC-HZ)										
OL-125 (ZC-NWZ)	0.58	0.81	0.30						0.76	
JHO-99-2 (ZC-NEZ)				0.65	0.81	0.87	0.94	1.23	0.57	
JHO-822 (ZC-CZ)										0.84
Mean	**0.58**	**0.66**	**0.64**	**0.67**	**0.84**	**1.05**	**0.84**	**1.17**	**0.62**	**0.84**

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

Entries	Rah-uri	Urulika-nchan	Kan-pur	Pal-ghar	Ana-nd	Rai-pur	Hydera-bad	Coimb-atore	Aver-age	Ra-nk
SKO-196	0.93	1.42	1.82	1.09	1.46	0.98	0.55	0.56	0.90	10
OS-406	1.51	1.72	2.34	1.08	1.77	0.96	1.36	1.04	1.09	1
RSO-8	1.65	1.79	2.13	0.86	2.02	0.84	1.03	1.07	1.09	1
JHO-13-6	0.87	1.11	1.18	0.96	1.37	0.69	0.82	0.75	0.79	11
SKO-198	0.91	1.31	1.35	0.86	1.38	0.90	0.83	1.10	0.92	8
OL-1689	1.07	1.46	2.06	0.76	1.41	0.76	1.12	0.81	0.99	4
RO-11-1	1.32	1.71	2.17	0.78	1.38	0.91	1.27	0.48	1.04	2
OL-1750		0.18		0.74		0.33		0.37		
JHO-13-5	1.24	1.53	1.73	0.75	1.81	0.46	0.80	0.52	0.92	8
JO-04-18	1.29	1.16	2.21	0.65	1.44	0.49	0.75	0.60	0.93	7
NDO-952	1.19	1.51	1.99	0.76	1.34	0.61	0.84	1.28	0.99	4
OL-1804	1.10	1.57	2.02	0.75	1.39	0.77	1.14	0.57	0.98	5
SKO-199	1.20	1.09	1.66	0.90	1.28	0.65	1.05	0.67	0.96	6
Kent (NC)	1.08	1.39	2.09	0.78	1.37	0.65	0.81	1.25	1.00	3
OS-6 (NC)	1.47	1.56	1.91	0.85	1.14	0.65	0.92	0.92	0.91	9
JHO-822 (ZC-CZ)	1.11	1.42	2.07	0.80	1.35	0.40				
JHO-2000-4(ZC-SZ)							0.67	0.75		
Mean	**1.19**	**1.37**	**1.92**	**0.84**	**1.46**	**0.69**	**0.93**	**0.80**	**0.97**	

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

Entries	Palam-pur	Ludh-iana	Jor-hat	Bhuba-neswar	Faiza-bad	Imp-hal	Rah-uri	Urulika-nchan	Ana-nd	Jabal-pur	Rai-pur	Hydera-bad	Man-dya	Coimb-atore	Aver-age	Ra-nk
SKO-196	6.3	9.9	4.7	8.7	5.1	1.7	7.8	11.3	12.2	8.5	8.9	3.9	2.1	7.2	7.0	5
OS-406	6.6	6.7	6.5		6.1	3.7	10.6	11.0	15.4	7.7	8.5	5.4	2.3	13.4	8.0	1
RSO-8	5.3	7.5	5.3	8.4	6.5	4.5	9.8	12.8	12.9	7.2	5.8	4.2	1.9	7.8	7.1	4
JHO-13-6	5.0	2.9	4.2	8.8	4.9	2.0	6.0	8.0	11.8	5.7	6.2	6.5	2.0	9.1	5.9	10
SKO-198	4.8	11.9	4.7	8.4	6.5	1.9	6.8	10.8	10.7	7.7	8.0	4.9	2.0	14.9	7.4	2
OL-1689	6.7	8.4	7.9	8.4	5.3	4.8	7.5	10.4	10.4	4.0	6.7	8.0	2.4	9.1	7.1	4
RO-11-1	7.5	5.8	6.8	7.6		4.6	8.6	11.5	11.4	8.1	7.8	5.8	2.1	5.7	7.2	3
OL-1750		0.3		5.3	0.4			1.5			2.6			4.4		
JHO-13-5	6.7	7.0	4.6		5.5	2.4	9.0	10.0	21.0	9.3	3.8	4.3	1.9	6.6	7.1	4
JO-04-18	6.5	5.3	5.0	8.0	3.8	2.9	8.6	8.9	7.1	9.5	4.2	4.2	1.3	6.1	5.8	11
NDO-952	6.7	9.0	5.2	7.1	4.0	4.2	7.0	9.7	7.5	6.9	4.9	4.8	2.3	13.1	6.6	6
OL-1804	5.8	3.5	6.1	7.8	6.5	2.5	8.3	10.9	11.8	4.9	4.6	6.0	3.1	6.6	6.3	7
SKO-199	5.7	4.4	5.2	7.6	5.5	3.0	7.6	7.0	7.9	6.5	5.1	4.5	2.7	6.7	5.7	12
Kent (NC)	5.8	3.3	6.1	8.3	4.8	3.2	7.4	8.8	9.3	5.9	4.3	4.5	2.5	12.1	6.2	8
OS-6 (NC)	5.5	3.4	5.1		4.4	3.3	10.3	10.1	8.6	7.6	4.2	5.1	2.6	8.9	6.1	9
SKO-90 (ZC-HZ)	6.4															
OL-125 (ZC-NWZ)		2.8			8.9											
JHO-99-2 (ZC-NEZ)			5.2	6.9	3.8	3.2										
JHO-822 (ZC-CZ)							8.2	9.7	9.6	3.5	3.3					
JHO-2000-4(ZC-SZ)												3.5	3.2	8.0		
Mean	**6.1**	**5.8**	**5.5**	**7.8**	**5.1**	**3.2**	**8.2**	**9.5**	**11.2**	**6.9**	**5.6**	**5.0**	**2.3**	**8.7**	**6.7**	

Table 3.6 IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): CP (%)

Entries	Palam-pur	Ludh-iana	Jor-hat	Bhuban-eswar	Faiza-bad	Imp-hal	Rah-uri	Urulika-nchan	Ana-nd	Rai-pur	Hydera-bad	Man-dya	Coimb-atore	Jabal-pur	Aver-age	Ra-nk
SKO-196	10.5	9.1	10.1	9.7	8.0	3.9	8.0	8.0	8.7	8.4	6.6	5.3	14.4	8.1	8.5	2
OS-406	10.2	8.2	9.3		8.1	3.5	7.9	7.1	9.5	8.1	5.3	4.4	14.4	8.1	8.0	6
RSO-8	9.9	7.9	9.2	9.7	8.4	4.2	7.7	8.9	7.6	7.9	5.7	3.5	13.1	8.0	8.0	6
JHO-13-6	9.4	6.3	9.0	9.7	8.1	4.0	7.4	7.5	8.5	8.3	9.6	5.3	13.6	7.9	8.2	4
SKO-198	10.5	9.7	9.9	9.6	7.8	3.6	8.0	8.2	8.5	8.2	7.4	3.9	14.9	8.1	8.5	2
OL-1689	10.5	9.7	10.1	9.8	8.4	4.3	8.5	8.8	8.8	8.2	9.6	4.4	12.7	7.8	8.7	1
RO-11-1	10.8	6.4	9.5	9.3			7.6	7.7	8.6	8.0	5.7	3.5	13.1	8.1	8.2	4
OL-1750		7.2		9.9	4.5	3.8		8.4		7.1			14.9			
JHO-13-5	11.1	7.4	9.9		7.6	4.1	8.9	8.5	9.0	7.6	7.4	3.5	14.4	8.2	8.3	3
JO-04-18	11.4	5.9	9.2	9.7	6.5	3.8	8.0	9.7	5.9	7.8	7.4	3.1	12.3	8.2	7.8	8
NDO-952	10.5	6.2	9.1	9.7	6.5	3.8	6.7	8.5	7.2	7.5	7.9	4.0	12.3	8.0	7.7	9
OL-1804	9.3	6.2	10.0	9.2	7.5	4.2	8.9	8.8	10.2	6.8	7.0	5.8	12.7	7.9	8.2	4
SKO-199	10.2	7.4	9.3	10.2	7.4	3.7	8.5	9.6	8.8	7.3	7.0	4.4	11.8	7.9	8.1	5
Kent (NC)	9.9	6.1	9.8	9.4	7.5	3.6	8.3	8.3	8.7	7.5	7.4	4.8	11.4	7.9	7.9	7
OS-6 (NC)	9.3	6.8	10.0		7.8	3.9	9.2	8.4	9.7	7.4	7.9	5.3	12.3	8.0	8.1	5
SKO-90 (ZC-HZ)	10.2															
OL-125 (ZC-NWZ)		6.5			7.8	3.3										
JHO-99-2 (ZC-NEZ)			9.8	9.6	6.8	3.4										
JHO-822 (ZC-CZ)							9.0	8.7	9.1	7.7				7.7		
JHO-2000-4(ZC-SZ)											7.0	4.8	12.3			
Mean	10.2	7.3	9.6	9.7	7.4	3.8	8.2	8.4	8.6	7.7	7.3	4.4	13.2	8.0	8.1	

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

Entries	Palam-pur	Sri-nagar	Bika-ner	His-ar	Ludh-iana	Udai-pur	Mee-rut	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Faiza-bad
SKO-196	88.7	120.9	86.0	122.9	119.2	126.3	135.0	87.5	104.3	156.5	101.0	92.2
OS-406	139.7	119.3	140.0	152.1	133.3	156.4	157.0	148.4	136.3		114.0	101.5
RSO-8	113.3	131.7	125.0	151.2	124.8	151.2	170.0	138.5	120.9	139.2	100.0	112.3
JHO-13-6	79.6	121.1	68.0	85.7	123.3	62.8	117.0	91.5	77.6	158.2	119.0	85.6
SKO-198	89.6	149.1	90.0	116.2	119.4	124.9	135.0	102.0	93.2	155.2	114.0	90.8
OL-1689	111.3	125.4	101.0	149.2	120.3	142.3	168.0	124.4	135.9	145.9	103.0	135.4
RO-11-1	115.6	121.0	110.0	148.6	112.8	154.6	142.0	155.1	139.1	135.6	96.0	151.2
OL-1750		116.3			117.3					123.5		122.5
JHO-13-5	114.0	132.6	125.0	144.6	113.2	137.0	150.0	114.5	118.7		103.0	101.4
JO-04-18	114.7	122.6	118.0	149.3	134.8	138.7	120.0	137.2	116.1	133.1	95.0	160.5
NDO-952	113.0	125.9	105.0	149.2	108.1	132.9	145.0	135.5	120.5	127.6	107.0	162.2
OL-1804	145.0	126.6	121.0	152.7	120.0	141.9	143.0	139.2	143.8	143.2	107.0	150.2
SKO-199	111.0	142.4	121.0	138.4	101.8	118.6	144.0	131.3	136.8	132.1	100.0	145.4
Kent (NC)	112.7	117.2	105.0	135.8	109.0	143.9	144.0	125.0	136.3	147.2	100.0	147.8
OS-6 (NC)	115.0	119.3	113.0	151.6	126.4	136.0	137.0	134.6	137.8		105.0	150.7
SKO-90 (ZC-HZ)	104.7	139.0										
OL-125 (ZC-NWZ)			143.0	154.0	117.3	146.6	164.0					
JHO-99-2 (ZC-NEZ)								145.6	125.4	126.5	97.0	152.3
Mean	**111.2**	**126.9**	**111.4**	**140.1**	**118.8**	**134.3**	**144.7**	**127.4**	**122.8**	**140.3**	**104.1**	**128.9**

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

Entries	Imp-hal	Jha-nsi	Rah-uri	Urulika-nchan	Kan-pur	Pal-ghar	Ana-nd	Jabal-pur	Rai-pur	Hydera-bad	Man-dya	Coimb-atore	Aver-age	Ra-nk
SKO-196	93.9	162.4	105.6	113.1	119.3	106.0	151.9	130.2	132.8	78.7	62.5	143.0	114.2	12
OS-406	140.4	162.4	118.7	96.9	137.3	76.0	147.4	126.8	123.6	119.6	90.9	155.0	130.1	1
RSO-8	141.4	172.1	88.3	135.6	149.5	91.0	139.6	118.6	101.5	105.2	85.8	146.0	127.2	3
JHO-13-6	73.6	137.7	84.7	98.3	99.2	95.0	147.3	115.5	112.9	78.0	50.1	153.0	101.4	14
SKO-198	94.8	170.7	105.7	104.0	128.5	104.0	142.9	125.3	88.5	85.1	72.1	134.0	114.0	13
OL-1689	111.4	172.2	101.4	113.8	118.9	89.0	145.1	103.6	101.9	103.5	84.8	140.0	122.8	6
RO-11-1	148.9	180.2	115.6	130.4	125.3	79.0	151.1	120.3	93.1	115.6	86.1	143.0	127.9	2
OL-1750		155.4		58.9		98.0			80.3			125.0		
JHO-13-5	92.1	150.0	88.6	106.2	137.7	110.0	147.5	134.1	103.4	92.5	77.9	140.0	118.9	10
JO-04-18	112.1	176.4	99.0	111.8	128.6	106.0	168.6	138.7	102.7	101.8	87.6	144.0	125.7	5
NDO-952	120.8	152.8	88.9	102.4	138.4	91.0	129.8	115.1	104.5	88.5	84.5	140.0	120.4	8
OL-1804	101.9	172.6	103.1	110.0	138.7	109.0	158.2	109.1	92.4	84.4	89.6	130.0	126.4	4
SKO-199	100.7	150.0	82.2	96.7	128.9	93.0	131.1	114.8	86.4	94.9	72.5	123.0	116.5	11
Kent (NC)	135.9	154.7	101.2	103.4	132.5	100.0	131.0	113.4	94.8	92.1	81.4	120.0	120.2	9
OS-6 (NC)	124.9	148.8	102.1	114.1	120.2	89.0	136.1	119.3	95.5	96.6	90.5	121.0	121.1	7
JHO-99-2 (ZC-NEZ)	136.0													
JHO-822 (ZC-CZ)		147.1	82.9	110.1	137.4	56.0	132.2	101.8	88.1					
JHO-2000-4(ZC-SZ)										94.8	87.9	126.0		
Mean	**115.3**	**160.3**	**97.9**	**106.6**	**129.4**	**93.3**	**144.0**	**119.1**	**100.1**	**95.4**	**80.3**	**136.4**	**120.5**	

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

Entries	Palam-pur	Sri-nagar	Bika-ner	His-ar	Ludh-iana	Jor-hat	Kal-yani	Bhuba-neswar	Ran-chi	Faiza-bad	Imp-hal
SKO-196	0.47	0.43	0.90	0.76	0.50	0.92	0.81	1.29	0.55	0.75	0.28
OS-406	0.33	0.42	0.54	0.74	0.50	0.76	0.75		0.44	0.80	0.32
RSO-8	0.46	0.47	0.33	0.69	0.40	0.76	0.81	1.16	0.48	0.81	0.35
JHO-13-6	0.47	0.43	0.67	0.79	0.50	0.71	0.56	1.32	0.55	0.80	0.28
SKO-198	0.49	0.53	0.89	0.85	0.30	0.81	0.80	1.27	0.79	0.73	0.33
OL-1689	0.37	0.45	0.45	0.67	0.40	0.67	0.56	1.25	0.36	0.81	0.52
RO-11-1	0.43	0.43	0.63	0.73	0.70	0.67	0.71	1.09	0.61	0.75	0.31
OL-1750		0.41			0.50			0.98		0.78	
JHO-13-5	0.43	0.47	0.37	0.69	0.60	0.73	0.56		0.41	0.25	0.38
JO-04-18	0.52	0.44	0.75	0.67	0.70	0.70	0.92	1.08	0.46	0.71	0.39
NDO-952	0.40	0.45	0.45	0.55	0.80	0.73	0.81	1.03	0.42	0.76	0.35
OL-1804	0.33	0.45	0.53	0.69	0.60	1.06	0.94	1.17	0.32	0.70	0.78
SKO-199	0.28	0.51	0.42	0.56	0.70	0.58	0.86	1.06	0.30	0.78	0.29
Kent (NC)	0.38	0.42	0.41	0.60	0.60	0.83	0.56	1.25	0.31	0.79	0.32
OS-6 (NC)	0.44	0.43	0.50	0.58	0.70	0.57	0.86		0.39	0.81	0.32
SKO-90 (ZC-HZ)	0.51	0.50									
OL-125 (ZC-NWZ)			0.58	0.58	0.50						
JHO-99-2 (ZC-NEZ)						0.76	0.63	0.99	0.32	0.73	0.37
Mean	**0.42**	**0.45**	**0.56**	**0.68**	**0.56**	**0.75**	**0.74**	**1.15**	**0.45**	**0.74**	**0.37**

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

Entries	Rah-uri	Urulik-anchan	Kan-pur	Pal-ghar	Ana-nd	Jabal-pur	Rai-pur	Hydera-bad	Man-dya	Coimb-atore	Aver-age	Ra-nk
SKO-196	0.61	0.55	0.46	0.85	1.68	0.82	0.64	0.30	0.67	0.48	0.70	2
OS-406	0.50	0.87	0.34	0.89	1.59	0.75	0.70	0.42	0.62	0.38	0.63	5
RSO-8	0.61	0.84	0.37	0.98	1.39	0.70	0.59	0.49	0.57	0.35	0.65	4
JHO-13-6	0.71	0.46	0.67	0.93	1.50	0.56	0.72	0.26	0.60	0.33	0.66	3
SKO-198	0.74	0.53	0.58	0.77	1.90	0.79	0.39	0.34	0.63	0.47	0.71	1
OL-1689	0.83	0.58	0.44	0.82	1.23	0.56	0.56	0.36	0.63	0.35	0.61	7
RO-11-1	0.64	0.67	0.47	0.82	0.77	0.82	0.42	0.40	0.64	0.41	0.62	6
OL-1750		0.84		0.83			0.36			0.33		
JHO-13-5	0.74	0.71	0.42	0.77	1.24	0.87	0.51	0.54	0.57	0.39	0.58	9
JO-04-18	0.61	0.73	0.45	0.89	1.07	0.87	0.48	0.45	0.55	0.32	0.66	3
NDO-952	0.70	0.83	0.25	0.89	1.95	0.65	0.50	0.60	0.57	0.27	0.66	3
OL-1804	0.62	0.76	0.37	0.82	0.96	0.57	0.43	0.66	0.59	0.33	0.65	4
SKO-199	0.53	0.76	0.29	0.78	1.18	0.64	0.37	0.36	0.52	0.24	0.57	10
Kent (NC)	0.74	0.71	0.28	0.76	1.18	0.65	0.44	0.41	0.55	0.32	0.60	8
OS-6 (NC)	0.50	0.73	0.36	0.81	1.66	0.72	0.49	0.40	0.54	0.26	0.60	8
JHO-822 (ZC-CZ)	0.56	0.72	0.27	0.91	1.43	0.48	0.38					
JHO-2000-4(ZC-SZ)								0.52	0.49	0.29		
Mean	**0.64**	**0.71**	**0.40**	**0.85**	**1.38**	**0.70**	**0.50**	**0.43**	**0.58**	**0.35**	**0.64**	

Table 3.9 IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): ADF (%) and NDF (%)

Entries	ADF (%)		NDF (%)	
	Ludhiana	Rank	Ludhiana	Rank
SKO-196	37.5	3	56.0	1
OS-406	39.2	7	57.9	4
RSO-8	38.1	4	58.2	6
JHO-13-6	41.2	8	59.9	11
SKO-198	37.0	1	57.1	2
OL-1689	37.1	2	57.3	3
RO-11-1	44.1	13	62.1	14
OL-1750	38.7	6	58.8	7
JHO-13-5	38.4	5	58.9	8
JO-04-18	44.0	12	60.1	12
NDO-952	42.3	10	60.4	13
OL-1804	42.8	11	59.0	9
SKO-199	39.2	7	58.1	5
Kent (NC)	44.2	14	63.8	15
OS-6 (NC)	41.3	9	59.1	10
OL-125 (ZC-NWZ)	42.3	10	59.0	9
Mean	**40.5**		**59.1**	

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

(Reference Tables: 4.1 to 4.9)

In Oat (single cut), nine entries promoted from IVT were evaluated against two national checks (Kent and OS-6) and zonal checks in respective zones (SKO-90, JHO-99-2, OL-125, JHO-822 and JHO-2000-4) at 27 locations in five different zones of the country. For green forage yield (q/ha), entries UPO-12-1 (6.7%), JHO-2012-2 (4.5%), OL-1760 (4.3%), RSO-60 (3.3%), JO-04-14 (2.9%), OS-405 (2.6%), RSO-59 (1.6%) and JHO-2012-1 (0.4%) in Hill zone; entries RSO-60 (5.6%), JHO-2012-1 (3.6%) and OS-405 (2.9%) in North west zone; entries RSO-59 (4.3%), JHO-2012-2 (4.1%), SKO-190 (3.3%), OL-1760 (2.3%) and OS-405 (2.1%) in North-East zone; entries SKO-190 (6.3%), JHO-2012-1 (3.7%), RSO-59 (0.4%) and JHO-2012-2 (0.10%) in Central zone; entries OL-1760 (11.5%) and JHO-2012-2 (4.2%) in South zone exhibited superiority over best check. At national level, all the test entries recorded their superiority over best national check.

Similarly for dry matter yield (q/ha), entries UPO-12-1 (5.3%), OL-1760 (3.7%), JHO-2012-2 (3.6%), JO-04-14 (2.7%), RSO-60 (2.5%) and OS-405 (2.4%) in Hill zone; entries RSO-60 (12.1%), OS-405 (4.6%) and JHO-2012-2 (1.8%) in North West zone; entry OS-405 (2.0%) in North-East zone; entries SKO-190 (7.3%), JHO-2012-2 (6.8%), JHO-2012-1 (5.3%), OS-405 (5.0%), RSO-59 (2.9%) and JO-04-14 (1.1%) in Central zone; entries OL-1760 (28.7%), JHO-2012-2 (16.2%), JO-04-14 (10.5%), UPO-12-1 (7.5%) and OS-405 (2.9%) in South zone proved their superiority over respective best zonal or national check. At national level also all the test entries except SKO-190 recorded their superiority over national check.

In green forage production potential (q/ha/day), entry RSO-59 and in dry matter production potential entry RSO-60 and OS-405 ranked first. For plant height (cm), entry OS-405 (138.0 cm) was ranked first. For the character leafiness, SKO-190 and JO-04-14 (0.62) were adjudged best performers. For quality parameters, entries SKO-190 and OL-1760 (6.7 q/ha) for crude protein yield and OL-1760 (8.7%) for crude protein content ranked first. For other quality parameters, entry OL-1760 for ADF (%) and IVDMD (%) and UPO-12-1 for NDF (%) were superior.

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

Entries	Hill Zone					North West Zone									
	Palam-pur	Sri-nagar	Aver-age	Ra-nk	Superi-ority%	Bika-ner	Jal-ore	His-ar	Ludh-iana	Pant-nagar	Udai-pur	Mee-rut	Aver-age	Ra-nk	Superi-ority%
SKO-190	140.0	530.7	335.4	11		295.0	325.0	370.4	369.4	369.0	557.4	425.0	387.3	12	
UPO-12-1	298.2	484.6	391.4	1	6.7	243.5	350.0	466.7	391.7	671.4	537.5	519.2	454.3	5	
RSO-59	282.2	463.1	372.6	7	1.6	246.8	318.3	514.8	491.7	516.5	696.2	333.3	445.4	6	
JHO-2012-2	261.7	504.5	383.1	2	4.5	276.0	296.3	525.9	486.1	602.5	541.2	319.2	435.3	9	
JHO-2012-1	232.4	503.8	368.1	8	0.4	339.6	332.3	500.0	425.0	433.2	650.2	625.0	472.2	2	3.6
RSO-60	253.3	504.0	378.7	4	3.3	240.6	340.0	533.3	516.7	608.1	683.0	449.9	481.7	1	5.6
JO-04-14	272.4	482.5	377.5	5	2.9	200.1	314.7	522.2	488.9	533.1	617.8	347.5	432.0	10	
OS-405	273.3	479.2	376.3	6	2.6	230.2	385.0	463.0	563.9	591.4	720.6	330.8	469.3	3	2.9
OL-1760	254.2	510.4	382.3	3	4.3	257.1	394.3	518.5	416.7	497.0	702.2	322.5	444.1	7	
Kent (NC)	248.4	475.2	361.8	10		143.7	285.0	522.2	400.0	580.3	585.8	574.9	441.7	8	
OS-6 (NC)	260.0	473.5	366.7	9		199.1	266.7	485.2	461.1	538.6	655.4	358.3	423.5	11	
SKO-90 (ZC-HZ)	154.2	502.8	328.5	12											
OL-125 (ZC-NWZ)						275.8	291.3	511.1	441.7	680.2	560.3	430.8	455.9	4	
Mean	**244.2**	**492.8**	**368.5**			**245.6**	**324.9**	**494.4**	**454.4**	**551.8**	**625.6**	**419.7**	**445.2**		
CD at 5%	33.8	21.7				59.8	7.9	143.1	41.4	95.4	93.9	49.2			
CV%	8.2	9.4				14.3	14.4	17.0	3.7	10.3	8.9	6.8			

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

Entries	North East Zone									
	Jor-hat	Kal-yani	Bhuba-neswar	Ran-chi	Pu-sa	Faiza-bad	Imp-hal	Aver-age	Ra-nk	Superi-ority%
SKO-190	358.0	491.7	421.5	200.0	616.0	377.1	235.3	385.7	3	3.3
UPO-12-1	316.6	447.2	420.0	306.7	505.0	356.2	240.6	370.3	7	
RSO-59	348.2	473.3	399.0	340.0	527.0	366.2	272.3	389.4	1	4.3
JHO-2012-2	408.9	418.6	354.5	296.7	605.0	398.1	239.2	388.7	2	4.1
JHO-2012-1	360.6	526.9	302.0	210.0	572.0	337.1	251.1	365.7	9	
RSO-60	328.5	414.7	461.5	180.0	561.0	356.1	256.4	365.5	10	
JO-04-14	300.7	415.8	442.0	220.0	516.0	432.3	236.9	366.2	8	
OS-405	311.7	437.2	323.0	293.3	594.0	363.8	345.4	381.2	5	2.1
OL-1760	323.3	453.6	435.5	296.7	549.0	361.9	254.4	382.1	4	2.3
Kent (NC)	253.5	425.5	386.3	230.0	494.0	293.4	262.6	335.0	12	
OS-6 (NC)	339.8	451.4	364.0	226.7	494.0	318.1	257.8	350.2	11	
JHO-99-2 (ZC-NEZ)	333.7	426.9	385.7	223.3	561.0	390.5	292.3	373.3	6	
Mean	**145.7**	**448.6**	**391.2**	**252.0**	**549.5**	**362.6**	**262.0**	**371.1**		
CD at 5%	6.2	26.6	44.1	34.2	56.2	69.5	29.1			
CV%	5.8	3.5	6.7	8.0	9.3	11.2	9.3			

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

Entries	South Zone						All India		
	Hyderabad	Mandya	Coimbatore	Average	Rank	Superiority%	Average	Rank	Superiority%
SKO-190	166.6	265.2	481.9	304.6	10		406.5	9	1.7
UPO-12-1	305.4	287.8	431.9	341.7	5		409.6	8	2.5
RSO-59	274.9	321.9	211.1	269.3	11		413.2	6	3.4
JHO-2012-2	372.1	293.3	420.8	362.1	2	4.2	421.1	2	5.4
JHO-2012-1	302.7	307.5	186.1	265.4	12		417.9	4	4.6
RSO-60	291.6	254.8	433.3	326.6	6		420.8	3	5.3
JO-04-14	352.6	305.9	380.6	346.4	4		411.3	7	2.9
OS-405	402.6	301.0	252.8	318.8	7		422.2	1	5.7
OL-1760	324.9	350.5	486.1	387.2	1	11.5	416.1	5	4.1
Kent (NC)	299.9	327.0	415.3	347.4	3		399.6	10	
OS-6 (NC)	288.8	279.2	372.2	313.4	8		393.2	11	
JHO-2000-4 (ZC-SZ)	349.9	254.7	312.5	305.7	9				
Mean	**311.0**	**295.7**	**365.4**	**324.0**			**404.0**		
CD at 5%	96.5	39.2	75.6						
CV%	8.8	7.8	12.2						

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

Entries	Hill Zone					North West Zone						
	Palam-pur	Sri-nagar	Aver-age	Ra-nk	Super-ority%	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Aver-age	Ra-nk	Superi-ority%
SKO-190	27.4	128.3	77.9	10		70.0	41.1	63.9	72.7	61.9	12	
UPO-12-1	57.6	117.1	87.4	1	5.3	64.1	72.8	68.4	108.3	78.4	8	
RSO-59	52.8	112.2	82.5	8		77.4	73.1	111.3	85.0	86.7	5	
JHO-2012-2	49.9	122.1	86.0	3	3.6	80.2	71.6	97.9	109.4	89.8	3	1.8
JHO-2012-1	43.3	121.7	82.5	8		77.5	61.3	78.1	75.7	73.2	10	
RSO-60	48.2	122.0	85.1	5	2.5	72.2	89.1	124.7	115.2	100.3	1	12.1
JO-04-14	53.6	116.9	85.2	4	2.7	60.2	77.7	106.2	95.2	84.8	6	
OS-405	53.9	116.0	85.0	6	2.4	56.4	58.9	152.2	101.6	92.3	2	4.6
OL-1760	48.8	123.4	86.1	2	3.7	68.6	72.0	80.4	84.6	76.4	9	
Kent (NC)	47.7	115.1	81.4	9		45.0	70.1	74.5	98.0	71.9	11	
OS-6 (NC)	51.5	114.5	83.0	7		63.7	67.8	97.9	96.3	81.4	7	
SKO-90 (ZC-HZ)	29.5	121.9	75.7	11								
OL-125 (ZC-NWZ)						68.4	73.4	86.3	124.9	88.2	4	
Mean	**47.0**	**119.3**	**83.1**			**67.0**	**69.1**	**95.2**	**97.2**	**82.1**		
CD at 5%	7.2	4.9				16.3	26.1	40.3	20.7			
CV%	9.1	3.1				14.3	15.3	17.4	12.8			

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

Entries	North East Zone									
	Jorhat	Kalyani	Bhubaneswar	Ranchi	Pusa	Faizabad	Imphal	Average	Rank	Superiority%
SKO-190	53.7	72.5	89.9	28.9	120.5	79.8	45.0	70.1	7	
UPO-12-1	46.3	64.8	88.3	92.6	101.4	80.4	46.8	74.4	3	
RSO-59	55.0	67.5	85.9	62.9	106.0	83.0	55.7	73.7	5	
JHO-2012-2	68.9	63.8	73.1	69.5	118.9	84.4	38.3	73.8	4	
JHO-2012-1	72.9	81.7	63.5	47.1	114.2	69.3	40.2	69.8	8	
RSO-60	52.8	64.3	97.0	38.8	111.9	75.2	48.7	69.8	8	
JO-04-14	53.2	60.3	92.9	48.9	102.8	86.7	48.0	70.4	6	
OS-405	62.2	65.6	66.8	74.2	116.7	74.3	72.4	76.0	1	2.0
OL-1760	47.4	68.0	91.6	74.4	108.9	76.2	41.8	72.6	5	
Kent (NC)	40.4	61.7	83.8	54.4	99.2	61.5	54.9	65.1	10	
OS-6 (NC)	63.2	66.4	76.5	52.7	98.9	68.6	51.7	68.3	9	
JHO-99-2 (ZC-NEZ)	61.1	63.0	81.1	73.9	111.3	80.8	50.2	74.5	2	
Mean	**56.4**	**66.6**	**82.5**	**59.9**	**109.2**	**76.7**	**49.5**	**71.5**		
CD at 5%	3.9	4.0	9.7	19.3	13.4	7.9	9.4			
CV%	8.9	3.5	7.0	19.1	11.3	6.1	15.9			

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

Entries	Central Zone										
	Jha-nsi	Rah-uri	Urulika-nchan	Kar-jat	Kan-pur	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk	Superi-ority%
SKO-190	75.1	95.2	139.5	42.0	238.1	148.8	92.2	67.9	112.3	1	7.3
UPO-12-1	76.0	97.5	87.2	52.3	222.2	120.1	112.4	53.4	102.6	10	
RSO-59	53.0	112.8	96.1	56.4	273.1	135.7	88.3	46.2	107.7	5	2.9
JHO-2012-2	82.2	102.8	101.7	55.6	263.9	162.6	76.1	49.5	111.8	2	6.8
JHO-2012-1	73.7	96.8	131.0	43.4	240.3	132.5	106.6	57.0	110.2	3	5.3
RSO-60	48.5	116.9	87.9	58.1	251.1	128.4	86.3	56.3	104.2	9	
JO-04-14	74.3	83.6	101.3	48.9	254.4	125.1	100.2	58.5	105.8	6	1.1
OS-405	66.2	95.9	116.7	48.4	267.2	164.7	58.6	61.1	109.9	4	5.0
OL-1760	67.4	93.9	83.7	48.9	251.7	132.2	69.7	62.1	101.2	11	
Kent (NC)	78.3	90.4	75.6	47.0	232.5	148.5	120.1	45.6	104.7	7	
OS-6 (NC)	77.3	94.5	93.2	38.8	252.2	126.8	66.7	53.4	100.4	12	
JHO-822 (ZC-CZ)	59.6	102.7	84.4	49.7	245.6	124.0	124.7	44.2	104.4	8	
Mean	**69.3**	**98.6**	**99.8**	**49.1**	**249.4**	**137.5**	**91.8**	**54.6**	**106.3**		
CD at 5%	2.0	13.3	17.7	10.5	18.7	6.2	15.9	9.0			
CV%	1.2	7.9	19.7	12.6	2.4	2.7	10.2	10.2			

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

Entries	South Zone						All India		
	Hydera-bad	Man-dya	Coimba-tore	Aver-age	Ra-nk	Superi-ority%	Aver-age	Ra-nk	Superi-ority%
SKO-190	36.9	64.1	94.6	65.2	9		82.8	9	
UPO-12-1	77.2	82.0	71.9	77.1	4	7.5	85.9	7	4.1
RSO-59	51.8	91.4	32.5	58.5	12		86.0	5	4.2
JHO-2012-2	82.2	90.1	77.8	83.3	2	16.2	91.3	1	10.7
JHO-2012-1	58.8	94.6	31.5	61.6	11		83.9	8	1.7
RSO-60	58.4	71.4	79.0	69.6	7		87.6	3	6.2
JO-04-14	75.0	98.5	64.1	79.2	3	10.5	86.9	4	5.3
OS-405	86.6	96.1	38.7	73.8	5	2.9	90.5	2	9.7
OL-1760	68.6	109.0	99.4	92.3	1	28.7	86.4	6	4.7
Kent (NC)	67.7	82.3	65.1	71.7	6		81.6	11	
OS-6 (NC)	55.0	86.7	66.7	69.5	8		82.5	10	
JHO-2000-4 (ZC-SZ)	79.3	62.3	51.3	64.3	10				
Mean	**66.5**	**85.7**	**64.4**	**72.2**			**84.5**		
CD at 5%	19.9	14.0	10.2						
CV%	16.9	9.7	9.4						

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

Entries	Palam-pur	Bika-ner	His-ar	Ludh-iana	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa	Faiza-bad
SKO-190	0.89	2.59	3.23	3.10	4.20	5.92	5.70	2.17	6.48	3.17
UPO-12-1	1.93	2.14	4.01	3.30	4.28	6.21	5.83	4.04	5.43	3.39
RSO-59	1.85	2.16	4.40	4.10	4.75	6.15	6.54	4.36	5.73	3.52
JHO-2012-2	1.78	2.42	4.67	4.10	5.21	5.04	4.60	3.71	6.37	3.79
JHO-2012-1	1.52	2.98	4.29	3.50	4.29	6.35	3.73	2.73	6.09	3.34
RSO-60	1.66	2.11	4.65	4.30	4.48	5.39	7.44	2.40	5.91	3.63
JO-04-14	1.86	1.76	4.51	4.10	3.71	5.01	5.26	2.50	5.67	4.60
OS-405	1.79	2.02	4.04	4.70	3.85	5.27	3.89	3.26	6.25	3.75
OL-1760	1.66	2.26	4.52	3.50	3.99	5.89	5.58	3.26	5.78	3.62
Kent (NC)	1.70	1.26	4.69	3.60	3.46	5.53	5.68	2.80	5.43	2.93
OS-6 (NC)	1.79	1.75	4.34	4.20	4.63	6.27	5.60	2.70	5.31	3.21
SKO-90 (ZC-HZ)	0.99									
OL-125 (ZC-NWZ)		2.42	4.62	4.00						
JHO-99-2 (ZC-NEZ)					4.22	5.14	5.76	2.60	6.03	3.94
Mean	**1.62**	**2.16**	**4.33**	**3.88**	**4.26**	**5.68**	**5.47**	**3.04**	**5.87**	**3.57**

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

Entries	Jha-nsi	Rah-uri	Urulika-nchan	Kar-jat	Kan-pur	Ana-nd	Rai-pur	Hydera-bad	Man-dya	Coimb-atore	Aver-age	Ra-nk
SKO-190	3.21	5.82	6.97	2.18	6.67	7.15	3.06	1.57	3.38	5.30	4.14	10
UPO-12-1	3.49	6.23	5.03	2.96	6.59	7.31	2.40	3.62	4.05	5.14	4.37	8
RSO-59	3.66	7.57	7.35	3.57	8.36	7.82	2.06	3.91	4.29	2.64	4.74	1
JHO-2012-2	3.86	5.48	5.72	2.40	7.75	8.98	2.22	4.99	4.19	4.78	4.60	3
JHO-2012-1	3.46	5.46	7.71	2.10	6.77	8.82	2.57	4.05	4.06	2.02	4.29	9
RSO-60	3.48	8.08	7.07	2.86	7.73	8.52	2.53	4.18	3.44	4.71	4.73	2
JO-04-14	3.62	5.19	5.62	2.47	7.87	8.81	2.64	4.46	4.07	4.28	4.40	6
OS-405	3.62	5.41	6.19	2.34	7.89	8.84	2.73	5.08	3.87	2.78	4.38	7
OL-1760	3.37	5.95	6.02	2.35	7.26	8.39	2.79	4.64	4.86	5.52	4.56	5
Kent (NC)	3.44	5.90	5.74	2.71	7.89	8.77	2.03	4.64	4.61	4.72	4.38	7
OS-6 (NC)	3.61	6.03	7.24	3.08	8.33	8.66	2.37	4.37	3.59	4.60	4.58	4
JHO-822 (ZC-CZ)	3.93	7.13	6.83	2.21	7.55	7.81	1.97					
JHO-2000-4 (ZC-SZ)								4.80	3.49	3.51		
Mean	**3.56**	**6.19**	**6.46**	**2.60**	**7.56**	**8.32**	**2.45**	**4.19**	**3.99**	**4.17**	**4.47**	

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

Entries	Bika-ner	His-ar	Ludh-iana	Jor-hat	Kal-yani	Bhuba-neswar	Ran-chi	Pu-sa	Faiza-bad	Jha-nsi
SKO-190	0.61	0.36	2.90	0.63	0.87	1.22	0.31	1.27	0.67	0.56
UPO-12-1	0.56	0.63	3.10	0.63	0.90	1.23	1.22	1.09	0.76	0.68
RSO-59	0.68	0.63	5.10	0.75	0.88	1.41	0.81	1.15	0.80	0.53
JHO-2012-2	0.70	0.64	4.50	0.86	0.77	0.95	0.87	1.25	0.80	0.74
JHO-2012-1	0.68	0.53	3.60	0.87	0.98	0.78	0.61	1.21	0.68	0.78
RSO-60	0.63	0.78	5.70	0.72	0.83	1.56	0.52	1.18	0.77	0.52
JO-04-14	0.53	0.67	4.80	0.66	0.73	1.11	0.56	1.13	0.92	0.67
OS-405	0.49	0.51	6.90	0.77	0.79	0.80	0.82	1.23	0.76	0.66
OL-1760	0.60	0.63	3.70	0.58	0.88	1.17	0.82	1.15	0.78	0.61
Kent (NC)	0.40	0.63	3.40	0.55	0.80	1.23	0.66	1.09	0.61	0.71
OS-6 (NC)	0.56	0.61	4.40	0.86	0.92	1.18	0.63	1.06	0.69	0.74
SKO-90 (ZC-HZ)										
OL-125 (ZC-NWZ)	0.60	0.66	3.90							
JHO-99-2 (ZC-NEZ)				0.77	0.76	1.21	0.86	1.19	0.81	
JHO-822 (ZC-CZ)										0.60
JHO-2000-4 (ZC-SZ)					0.73					
Mean	**0.59**	**0.61**	**4.33**	**0.72**	**0.83**	**1.15**	**0.72**	**1.17**	**0.75**	0.65

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

Entries	Rah-uri	Urulika-nchan	Kar-jat	Kan-pur	Ana-nd	Rai-pur	Hydera-bad	Coimb-atore	Aver-age	Ra-nk
SKO-190	1.01	1.39	0.49	2.27	1.46	0.76	0.37	1.04	1.01	10
UPO-12-1	1.19	1.12	0.75	2.24	1.45	0.60	0.91	0.86	1.11	7
RSO-59	1.45	1.37	0.81	2.84	1.63	0.52	0.74	0.41	1.25	2
JHO-2012-2	1.14	1.27	0.65	2.64	1.79	0.56	1.16	0.88	1.23	3
JHO-2012-1	1.06	1.54	0.51	2.29	1.46	0.64	0.79	0.34	1.07	9
RSO-60	1.46	1.27	0.83	2.59	1.59	0.63	0.95	0.86	1.30	1
JO-04-14	0.93	1.27	0.58	2.68	1.49	0.66	0.97	0.72	1.17	5
OS-405	1.04	1.33	0.57	2.67	1.81	0.69	1.10	0.43	1.30	1
OL-1760	1.09	1.13	0.58	2.49	1.59	0.70	1.00	1.13	1.15	6
Kent (NC)	1.09	1.01	0.67	2.67	1.90	0.51	1.10	0.74	1.10	8
OS-6 (NC)	1.20	1.31	0.55	2.83	1.65	0.60	0.96	0.82	1.20	4
JHO-822 (ZC-CZ)	1.25	1.17	0.60	2.56	1.53	0.50				
JHO-2000-4 (ZC-SZ)							1.13	0.58		
Mean	**1.16**	**1.27**	**0.63**	**2.56**	**1.61**	**0.61**	**0.93**	**0.73**	**1.17**	

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

Entries	Palam-pur	Ludh-iana	Jor-hat	Kal-yani	Bhuba-neswar	Faiza-bad	Imp-hal	Rah-uri
SKO-190	3.0	4.5	5.7	5.3	8.1	6.5	1.6	8.6
UPO-12-1	6.6	5.4	4.5	4.3	8.0	6.6	1.5	8.8
RSO-59	5.7	7.8	5.2	5.8	7.8	6.6	2.0	10.5
JHO-2012-2	5.5	7.0	7.2	3.9	6.7	6.9	1.2	9.6
JHO-2012-1	4.4	5.8	7.7	6.7	5.7	5.8	1.4	8.0
RSO-60	5.1	9.0	5.0	5.7	8.6	6.2	1.2	10.9
JO-04-14	6.1	7.2	5.2	4.8	8.4	7.3	1.6	7.9
OS-405	5.8	12.8	6.7	3.5	6.1	6.0	2.2	8.8
OL-1760	5.3	6.5	5.1	6.9	8.4	6.3	1.6	8.9
Kent (NC)	4.7	5.4	4.3	5.0	7.2	5.2	2.3	8.2
OS-6 (NC)	5.6	7.2	6.4	5.9	6.9	5.6	2.1	8.8
SKO-90 (ZC-HZ)	3.3							
OL-125 (ZC-NWZ)		6.4						
JHO-99-2 (ZC-NEZ)			6.4	4.4	7.4	6.6	1.5	
JHO-822 (ZC-CZ)								9.9
Mean	**5.1**	**7.1**	**5.8**	**5.2**	**7.4**	**6.3**	**1.7**	**9.1**

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

Entries	Urulika-nchan	Ana-nd	Jabal-pur	Rai-pur	Hydera-bad	Man-dya	Coimb-atore	Aver-age	Ra-nk
SKO-190	11.8	10.5	7.6	6.1	3.0	2.8	14.9	6.7	1
UPO-12-1	7.2	7.9	9.3	4.0	4.4	5.7	9.7	6.3	4
RSO-59	7.8	8.7	7.2	3.0	4.3	5.2	4.5	6.1	6
JHO-2012-2	7.7	10.6	6.2	3.4	4.3	6.3	9.1	6.4	3
JHO-2012-1	9.7	10.5	8.8	4.9	5.4	6.6	2.9	6.3	4
RSO-60	7.1	6.9	7.1	4.3	4.6	3.7	10.4	6.4	3
JO-04-14	7.9	8.1	8.3	4.8	5.8	6.5	6.4	6.4	3
OS-405	9.1	10.5	4.6	5.1	6.8	4.5	4.2	6.5	2
OL-1760	6.9	8.2	5.6	5.6	5.1	5.7	14.0	6.7	1
Kent (NC)	6.4	8.6	9.9	3.3	4.4	6.8	7.1	5.9	7
OS-6 (NC)	7.6	9.5	5.4	4.7	4.1	4.6	8.2	6.2	5
JHO-822 (ZC-CZ)	7.0	10.1	10.3	2.9					
JHO-2000-4 (ZC-SZ)					6.5	4.1	5.8		
Mean	**8.0**	**9.2**	**7.5**	**4.4**	**4.9**	**5.2**	**8.1**	**6.3**	

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

Entries	Palam-pur	Ludh-iana	Pant-nagar	Jor-hat	Kal-yani	Bhuban-eswar	Faiza-bad	Imp-hal	Jabal-pur
SKO-190	11.1	7.0	9.6	10.7	7.3	9.0	8.1	3.6	8.3
UPO-12-1	11.4	7.9	8.8	9.9	6.6	9.1	8.2	3.3	8.3
RSO-59	10.8	7.0	9.6	9.6	8.6	9.1	8.0	3.6	8.2
JHO-2012-2	11.1	7.2	10.5	10.5	6.1	9.1	8.2	3.2	8.2
JHO-2012-1	10.2	7.4	10.5	10.6	8.2	9.0	8.3	3.5	8.3
RSO-60	10.5	7.2	9.6	9.5	8.9	8.8	8.2	2.5	8.2
JO-04-14	11.4	6.8	9.6	9.8	7.9	9.1	8.4	3.2	8.3
OS-405	10.8	8.4	9.6	10.8	5.3	9.2	8.1	3.0	8.1
OL-1760	10.8	8.1	10.5	10.8	10.2	9.1	8.3	4.0	8.2
Kent (NC)	9.9	7.3	9.6	10.8	8.1	8.7	8.4	4.2	8.3
OS-6 (NC)	10.8	7.4	8.8	10.2	8.9	9.1	8.1	4.0	8.1
SKO-90 (ZC-HZ)	11.1								
OL-125 (ZC-NWZ)		7.4	8.8						
JHO-99-2 (ZC-NEZ)				10.5	7.0	9.1	8.2	2.9	
JHO-822 (ZC-CZ)									8.3
Mean	**10.8**	**7.4**	**9.6**	**10.3**	**7.7**	**9.0**	**8.2**	**3.4**	**8.2**

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

Entries	Urulika-nchan	Ana-nd	Rai-pur	Rah-uri	Hydera-bad	Man-dya	Coimb-atore	Aver-age	Ra-nk
SKO-190	8.5	7.1	9.0	9.0	8.3	4.4	15.8	8.5	2
UPO-12-1	8.2	6.6	7.5	9.0	5.7	7.0	13.6	8.2	5
RSO-59	8.1	6.4	6.4	9.3	8.3	5.7	14.0	8.3	4
JHO-2012-2	7.6	6.6	6.9	9.3	5.3	7.0	11.8	8.0	7
JHO-2012-1	7.4	8.0	8.6	8.3	9.2	7.0	9.2	8.4	3
RSO-60	8.1	5.3	7.7	9.3	7.9	5.2	13.1	8.1	6
JO-04-14	7.8	6.5	8.1	9.5	7.7	6.6	10.1	8.2	5
OS-405	7.8	6.4	8.4	9.2	7.9	4.7	10.9	8.0	7
OL-1760	8.3	6.2	9.1	9.5	7.4	5.2	14.0	8.7	1
Kent (NC)	8.5	5.8	7.2	9.0	6.6	8.3	10.9	8.2	5
OS-6 (NC)	8.1	7.5	8.9	9.3	7.4	5.3	12.3	8.4	3
JHO-822 (ZC-CZ)	8.3	8.1	6.6	9.6					
JHO-2000-4 (ZC-SZ)					8.3	6.6	11.4		
Mean	**8.0**	**6.7**	**7.9**	**9.2**	**7.5**	**6.1**	**12.3**	**8.3**	

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

Entries	Palam-pur	Sri-nagar	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Udai-pur	Mee-rut	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Faiza-bad	Imp-hal	Jha-nsi
SKO-190	82.0	145.1	95.0	124.7	96.3	128.7	123.1	150.0	109.3	139.6	147.2	100.0	82.5	106.7	156.9
UPO-12-1	107.3	137.3	120.0	133.9	108.4	168.3	140.0	184.0	138.6	143.4	145.3	132.0	162.4	125.2	167.7
RSO-59	102.0	136.8	120.0	134.0	102.0	168.7	147.4	133.0	137.5	147.3	143.0	126.0	155.8	110.4	160.0
JHO-2012-2	110.7	141.3	135.0	136.3	125.6	177.3	151.2	157.0	158.1	138.6	132.8	128.0	165.2	120.9	188.4
JHO-2012-1	99.0	122.7	106.0	126.8	97.0	146.3	136.7	152.0	161.6	149.9	127.6	128.0	155.2	124.2	173.6
RSO-60	98.3	141.3	150.0	134.6	114.8	153.7	139.1	183.0	129.7	141.9	157.3	136.0	145.8	112.7	120.4
JO-04-14	117.7	134.0	107.0	131.4	130.1	142.3	160.2	148.0	154.3	146.9	154.4	132.0	158.5	127.9	179.4
OS-405	114.7	122.7	145.0	143.3	124.6	167.7	149.8	182.0	161.9	147.0	129.9	124.0	153.2	159.6	195.3
OL-1760	102.0	128.3	120.0	137.1	122.8	136.7	143.6	156.0	167.1	144.8	149.9	130.0	156.7	131.2	171.2
Kent (NC)	113.3	130.3	105.0	131.6	106.3	138.3	140.0	150.0	133.0	145.6	141.1	99.0	175.3	121.1	162.8
OS-6 (NC)	111.3	135.8	125.0	133.4	108.2	137.0	151.8	142.0	139.5	150.6	135.4	129.0	160.4	125.4	178.2
SKO-90 (ZC-HZ)	87.7	124.6													
OL-125 (ZC-NWZ)			125.0	143.3	110.2	144.0	137.7	180.0							
JHO-99-2 (ZC-NEZ)									157.9	145.6	137.3	133.0	157.4	135.9	
JHO-822 (ZC-CZ)															151.4
Mean	**103.8**	**133.3**	**121.1**	**134.2**	**112.2**	**150.8**	**143.4**	**159.8**	**145.7**	**145.1**	**141.8**	**124.8**	**152.4**	**125.1**	**167.1**

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

Entries	Rah-uri	Urulika-nchan	Kar-jat	Kan-pur	Ana-nd	Jabal-pur	Rai-pur	Hydera-bad	Man-dya	Coimb-atore	Aver-age	Ra-nk
SKO-190	106.6	101.3	86.0	118.8	150.5	116.5	107.8	80.0	84.8	133.0	114.9	11
UPO-12-1	103.9	118.7	132.2	123.5	154.2	125.3	100.9	98.2	105.5	140.0	132.6	3
RSO-59	103.6	98.1	129.0	130.2	140.0	114.2	88.4	85.9	98.3	138.0	126.0	9
JHO-2012-2	115.4	120.2	111.2	122.7	148.1	110.3	81.9	95.4	104.7	152.0	133.1	2
JHO-2012-1	103.1	120.9	119.8	131.0	131.0	122.7	102.6	90.6	96.3	152.0	127.1	8
RSO-60	105.1	102.8	126.1	126.7	152.9	114.3	100.4	88.0	99.0	132.0	128.2	7
JO-04-14	102.5	113.3	120.8	122.0	150.2	118.8	96.8	93.9	98.1	150.0	131.6	5
OS-405	115.9	126.3	138.2	134.3	143.9	100.7	99.9	103.5	112.0	155.0	138.0	1
OL-1760	112.5	102.6	124.6	133.3	160.7	106.3	111.2	94.1	106.5	143.0	131.7	4
Kent (NC)	100.2	100.0	114.1	134.7	127.6	127.4	93.5	93.0	100.6	148.0	125.3	10
OS-6 (NC)	112.6	100.8	129.5	129.1	154.5	111.3	97.7	84.2	109.2	155.0	129.9	6
JHO-822 (ZC-CZ)	99.7	93.6	119.9	124.6	148.6	131.9	83.9					
JHO-2000-4 (ZC-SZ)								99.9	90.1	135.0		
Mean	**106.8**	**108.2**	**121.0**	**127.6**	**146.9**	**116.6**	**97.1**	**92.2**	**100.4**	**144.4**	**128.9**	

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

Entries	Palam-pur	Srina-gar	Bika-ner	His-ar	Ludhi-ana	Pant-nagar	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi
SKO-190	0.46	0.49	0.55	0.83	0.30	0.58	0.83	0.71	1.20	0.64
UPO-12-1	0.37	0.43	0.61	0.67	0.50	0.30	0.77	0.86	1.17	0.21
RSO-59	0.35	0.43	0.65	0.71	0.50	0.40	0.93	0.93	1.09	0.27
JHO-2012-2	0.35	0.46	0.43	0.57	0.70	0.24	0.75	0.88	0.90	0.26
JHO-2012-1	0.36	0.45	0.73	0.92	0.40	0.45	0.84	0.88	0.85	0.35
RSO-60	0.46	0.47	0.41	0.77	0.90	0.31	0.90	0.93	1.31	0.29
JO-04-14	0.46	0.44	0.59	0.63	0.50	0.50	0.81	0.93	1.29	0.24
OS-405	0.45	0.44	0.48	0.73	0.80	0.34	0.88	0.88	0.89	0.33
OL-1760	0.56	0.46	0.44	0.68	0.30	0.50	1.09	1.00	1.25	0.30
Kent (NC)	0.33	0.44	0.77	0.99	0.60	0.42	0.75	0.93	1.03	0.20
OS-6 (NC)	0.40	0.44	0.53	0.57	0.70	0.46	0.81	0.93	0.96	0.29
SKO-90 (ZC-HZ)	0.44	0.44					0.84			
OL-125 (ZC-NWZ)			0.58	0.72	0.60	0.39				
JHO-99-2 (ZC-NEZ)							0.82	0.86	0.98	0.25
Mean	**0.42**	**0.45**	**0.56**	**0.73**	**0.57**	**0.41**	**0.85**	**0.89**	**1.08**	**0.30**

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

Entries	Faiza-bad	Imp-hal	Rah-uri	Urulika-nchan	Kar-jat	Kan-pur	Ana-nd	Jabal-pur	Rai-pur	Hydera-bad	Man-dya	Coimba-tore	Aver-age	Ra-nk
SKO-190	0.79	0.32	0.87	0.73	0.46	0.58	1.22	0.64	0.58	0.40	0.27	0.24	0.62	1
UPO-12-1	0.78	0.37	0.76	0.77	0.51	0.38	1.14	0.76	0.49	0.40	0.26	0.36	0.59	2
RSO-59	0.79	0.32	0.56	0.54	0.50	0.32	0.85	0.58	0.41	0.46	0.18	0.27	0.55	5
JHO-2012-2	0.81	0.30	0.63	0.73	0.54	0.36	0.83	0.52	0.43	0.32	0.17	0.31	0.52	6
JHO-2012-1	0.80	0.37	0.45	0.69	0.50	0.36	0.91	0.72	0.46	0.34	0.22	0.29	0.56	4
RSO-60	0.75	0.32	0.85	0.44	0.53	0.36	1.03	0.62	0.50	0.40	0.24	0.28	0.59	2
JO-04-14	0.83	0.36	0.85	0.71	0.56	0.43	1.12	0.68	0.59	0.50	0.20	0.36	0.62	1
OS-405	0.79	0.35	0.56	0.56	0.50	0.35	0.99	0.52	0.55	0.40	0.17	0.36	0.56	4
OL-1760	0.80	0.41	0.77	0.49	0.49	0.38	0.93	0.52	0.54	0.35	0.21	0.41	0.59	2
Kent (NC)	0.80	0.33	0.81	0.72	0.51	0.26	0.68	0.80	0.36	0.33	0.30	0.34	0.58	3
OS-6 (NC)	0..81	0.44	0.53	0.49	0.47	0.29	0.54	0.50	0.46	0.52	0.16	0.20	0.51	7
JHO-99-2 (ZC-NEZ)	0.78	0.39												
JHO-822 (ZC-CZ)			0.88	0.59	0.48	0.36	0.87	0.82	0.36					
JHO-2000-4 (ZC-SZ)										0.45	0.17	0.31		
Mean	**0.79**	**0.36**	**0.71**	**0.62**	**0.50**	**0.37**	**0.93**	**0.64**	**0.48**	**0.41**	**0.21**	**0.31**	**0.57**	

Table 4.9 AVT Oat (SC-1): First Advanced Varietal Trial in Oat (Single Cut): ADF (%), NDF (%) and IVDMD (%)

Entries	ADF (%)						NDF (%)							IVDMD (%)	
	Palam-pur	Ludh-iana	Pant-nagar	Rah-uri	Aver-age	Ra-nk	Palam-pur	Ludh-iana	Pant-nagar	Rah-uri	Ana-nd	Aver-age	Ra-nk	Rah-uri	Ra-nk
SKO-190	57.8	63.8	56.6	32.5	52.7	6	62.0	41.9	66.0	53.7	69.0	58.5	3	63.6	4
UPO-12-1	59.8	61.0	55.8	37.8	53.6	8	61.6	41.3	62.6	54.7	71.0	58.2	1	59.5	9
RSO-59	60.0	62.6	53.4	38.9	53.7	9	63.8	42.0	64.0	55.7	68.0	58.7	4	58.6	10
JHO-2012-2	57.2	62.5	56.6	35.3	52.9	7	65.0	41.6	62.2	56.7	68.0	58.7	4	61.4	7
JHO-2012-1	54.6	61.1	59.2	33.2	52.0	4	66.2	40.3	63.0	59.7	68.0	59.4	5	63.0	5
RSO-60	56.2	61.9	54.0	33.7	51.4	3	63.4	40.8	63.4	60.7	72.0	60.1	7	62.7	6
JO-04-14	58.0	65.1	56.2	39.0	54.6	10	64.2	42.1	63.8	62.7	72.0	61.0	9	58.5	11
OS-405	56.6	58.4	57.6	37.0	52.4	5	65.4	38.0	62.6	63.7	69.0	59.7	6	60.1	8
OL-1760	58.2	56.2	58.6	27.3	50.1	1	61.8	38.2	63.4	64.7	64.0	58.4	2	67.6	1
Kent (NC)	56.0	61.6	58.2	28.1	51.0	2	63.2	41.2	63.8	57.7	71.0	59.4	5	67.0	2
OS-6 (NC)	59.4	61.1	56.4	31.1	52.0	4	63.8	41.7	65.4	58.7	73.0	60.5	8	64.7	3
SKO-90 (ZC-HZ)	58.6						64.0								
OL-125 (ZC-NWZ)		61.4	55.2					41.2	64.0						
JHO-99-2 (ZC-NEZ)															
JHO-822 (ZC-CZ)				27.5						61.7	65.0			67.5	
JHO-2000-4 (ZC-SZ)															
Mean	57.7	61.4	56.5	33.4	52.4		63.7	40.9	63.7	59.2	69.2	59.3		62.8	

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

(Reference Tables: 5.1 to 5.9)

In Oat (Single cut), four entries namely NDO-711, OS-403, UPO-06-1 and NDO-10 promoted from AVT-1 were evaluated against two national checks Kent and OS-6 and five respective zonal checks Palampur-1, JHO-99-2, OL-125, JHO-822 and JHO-2000-4 at 27 locations in five different zones. Results obtained from different centres clearly revealed that for green forage yield (q/ha), entries NDO-10 (13.8%), NDO-711 (5.0%) and OS-403 (0.1%) in Hill zone; entries NDO-10 (3.6%) and UPO-06-1 (0.78%) in North-West zone; entries OS-403 (10.7%), NDO-711 (8.3%) and UPO-06-1 (4.2%) in North-East zone and entries NDO-711 (5.6%) and OS-403 (4.8%) in Central zone exhibited superiority over best zonal/national check. At national level, all the test entries recorded superiority over best national check. Similarly for dry matter yield (q/ha), entries NDO-10 (14.1%), NDO-711 (6.6%) and OS-403 (1.5%) in Hill zone; entries NDO-711 (4.6%) and NDO-10 (0.6%) in North-West zone; entries OS-403 (10.8%), NDO-711 (9.9%), NDO-10 (0.6%) and UPO-06-1 (0.3%) in North-East zone; entries OS-403 (13.4%), NDO-711 (6.0%) and UPO-06-1 (1.2%) in Central zone and entries OS-403 (8.4%) and UPO-06-1 (4.8%) in South zone registered superiority over best check. At national level, OS-403 (8.7%) followed by NDO-711 (6.7%) recorded superiority over best national check.

For forage production potential (q/ha/day), entry NDO-711 for green forage and dry matter production potential was adjudged superior performer. For plant height, entries OS-403 (134.9 cm) and NDO-711 (128.1 cm) were adjudged best performers. For the character leafiness, entry NDO-711 (0.62) was ranked first.

In quality parameters, entries NDO-711 and OS-403 for crude protein yield (q/ha) and national check Kent (9.0%) for crude protein content recorded superiority. For other quality parameters, national check Kent for IVDMD (%), UPO-06-1 for ADF (%) and NDO-711 for NDF (%)ranked first.

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

(Reference Tables: 6.1)

Results of the advanced varietal trial in Oat for seed with four entries, NDO-711, OS-403, UPO-06-1 and NDO-10 along with two national checks, Kent and OS-6 conducted at five zones across the country revealed that for seed yield (q/ha), entry OS-403 (5.9%) in Hill zone; entry UPO-06-1 (9.6%) in North East zone; entries NDO-711 (16.2%) and NDO-10 (2.9%) in Central zone were superior over national checks. At national level, none of the entries showed superiority over the national checks. Seed yield of national check OS-6 was 18.0 q/ha which was followed by entry OS-403 (17.6 q/ha).

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

Entries	Hill Zone					North West Zone									
	Palampur	Srinagar	Average	Rank	Superiority%	Bikaner	Jalore	Hisar	Ludhiana	Pantnagar	Udaipur	Meerut	Average	Rank	Super-iority%
NDO-711	221.3	515.7	368.5	2	5.0	251.2	288.7	402.8	544.4	585.8	625.8	466.7	452.2	7	
OS-403	191.1	510.8	351.0	3	0.1	414.4	410.7	425.0	458.3	424.8	745.1	414.2	470.4	4	
UPO-06-1	196.0	483.0	339.5	5		350.5	422.3	419.4	477.8	413.7	646.9	666.7	485.3	2	0.78
NDO-10	291.1	507.6	399.3	1	13.8	342.0	391.0	402.8	472.2	646.4	580.7	658.3	499.1	1	3.6
Kent (NC)	188.0	433.5	310.8	6		327.5	345.0	338.9	536.1	527.5	503.9	627.5	458.0	6	
OS-6 (NC)	251.1	450.4	350.8	4		256.7	371.7	375.0	497.2	616.4	593.5	566.7	468.2	5	
Palampur-1 (ZC-HZ)	187.1	430.6	308.8	7											
OL-125 (ZC-NWZ)						317.8	363.0	402.8	433.3	563.6	646.1	644.2	481.5	3	
Mean	217.9	476.0	347.0			322.9	370.3	395.2	488.5	539.7	620.3	577.8	473.5		
CD at 5%	34.9	15.3				96.4	6.5	47.4	32.5	58.9	95.9	47.5			
CV%	9.0	6.4				16.8	9.8	7.1	6.5	6.1	9.1	4.4			

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

Entries	North East Zone									
	Jorhat	Kalyani	Bhubaneswar	Ranchi	Pusa	Faizabad	Imphal	Average	Rank	Super-iority%
NDO-711	271.4	488.0	434.0	320.0	575.0	400.0	284.2	396.1	2	8.3
OS-403	324.7	498.9	408.5	286.7	508.0	411.4	396.8	405.0	1	10.7
UPO-06-1	256.6	449.4	398.5	296.7	581.0	403.8	282.0	381.2	3	4.2
NDO-10	313.7	438.6	323.7	293.3	560.0	386.7	215.3	361.6	5	
Kent (NC)	241.0	463.9	412.0	238.7	545.0	333.4	215.3	349.9	6	
OS-6 (NC)	265.9	457.5	379.5	226.7	423.0	293.4	177.5	317.6	7	
JHO-99-2 (ZC-NEZ)	269.7	468.6	328.3	236.7	562.0	447.7	248.5	365.9	4	
Mean	277.6	466.4	383.5	271.3	536.3	382.3	259.9	368.2		
CD at 5%	7.2	16.0	26.3	37.2	43.4	86.3	19.5			
CV%	9.2	1.9	3.9	7.6	9.3	12.7	6.0			

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

Entries	Central Zone										
	Jha-nsi	Rah-uri	Urulika-nchan	Kar-jat	Kan-pur	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk	Super-iority%
NDO-711	370.1	704.4	628.7	199.9	802.8	562.0	504.0	211.1	497.9	1	5.6
OS-403	437.2	542.6	495.3	195.9	955.6	534.0	557.0	236.1	494.2	2	4.8
UPO-06-1	351.6	541.8	476.3	184.4	844.4	633.0	463.0	169.4	458.0	4	
NDO-10	418.7	512.3	575.3	203.8	800.0	373.0	419.0	216.7	439.9	5	
Kent (NC)	400.2	484.5	541.0	188.0	833.3	509.0	542.0	275.0	471.6	3	
OS-6 (NC)	407.1	451.5	483.9	173.8	805.6	515.0	358.0	181.9	422.1	7	
JHO-822 (ZC-CZ)	414.1	510.6	525.8	180.5	897.2	341.0	387.0	205.6	432.7	6	
Mean	**399.9**	**535.4**	**532.3**	**189.5**	**848.4**	**495.3**	**461.4**	**213.7**	**459.5**		
CD at 5%	11.7	72.2	45.3	29.3	69.5	39.8	91.1	37.9			
CV%	6.6	7.6	10.3	9.2	4.6	4.5	11.1	11.3			

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

Entries	South Zone						All India		
	Mandya	Hyderabad	Coimbatore	Average	Rank	Superiority%	Average	Rank	Superiority%
NDO-711	308.4	308.2	225.0	280.5	4		425.9	2	5.4
OS-403	284.9	355.4	316.7	319.0	1		434.8	1	7.6
UPO-06-1	322.1	336.0	200.0	286.0	3		417.3	3	3.3
NDO-10	290.2	241.6	250.0	260.6	6		412.0	4	1.9
Kent (NC)	336.6	288.8	233.3	286.3	2		404.0	5	
OS-6 (NC)	272.3	249.9	247.2	256.5	7		383.3	6	
JHO-2000-4 (ZC-SZ)	321.2	233.2	227.8	260.7	5				
Mean	305.1	287.6	242.9	278.5			412.9		
CD at 5%	29.2	30.7	33.5						
CV%	5.4	6.0	7.8						

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

Entries	Hill Zone					North West Zone						
	Palam-pur	Sri-nagar	Aver-age	Ra-nk	Super-iority%	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Aver-age	Ra-nk	Superi-ority%
NDO-711	43.4	125.4	84.4	2	6.6	72.5	82.5	160.8	106.6	105.6	1	4.6
OS-403	36.6	124.2	80.4	3	1.5	119.0	69.8	110.3	87.1	96.6	4	
UPO-06-1	38.2	117.5	77.8	5		72.0	76.7	120.7	74.7	86.0	7	
NDO-10	57.3	123.5	90.4	1	14.1	98.4	75.4	116.2	116.2	101.6	2	0.6
Kent (NC)	35.6	105.6	70.6	6		91.2	64.2	154.4	94.4	101.0	3	
OS-6 (NC)	49.0	109.5	79.2	4		77.2	66.8	131.5	101.0	94.1	5	
Palampur-1 (ZC-HZ)	36.0	104.7	70.4	7								
OL-125 (ZC-NWZ)						79.0	72.2	98.2	109.6	89.8	6	
Mean	**42.3**	**115.8**	**79.0**			**87.0**	**72.5**	**127.4**	**98.5**	**96.4**		
CD at 5%	6.7	4.3				26.2	12.4	40.2	18.2			
CV%	8.9	3.1				16.9	10.1	3.7	10.7			

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

Entries	North East Zone									
	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa	Faiza-bad	Imp-hal	Aver-age	Ra-nk	Superi-ority%
NDO-711	53.3	68.3	93.0	78.4	113.4	77.9	63.6	78.3	2	9.9
OS-403	65.7	68.6	83.8	60.0	110.4	83.2	80.4	78.9	1	10.8
UPO-06-1	48.9	65.2	83.5	65.8	114.6	77.0	44.6	71.4	4	0.3
NDO-10	61.8	62.5	67.8	65.8	111.3	75.8	56.0	71.6	3	0.6
Kent (NC)	42.3	62.6	88.3	66.8	107.9	68.0	52.0	69.7	6	
OS-6 (NC)	49.8	64.1	79.9	54.4	84.1	64.3	47.9	63.5	7	
JHO-99-2 (ZC-NEZ)	47.4	64.4	69.0	67.5	110.9	91.6	47.6	71.2	5	
Mean	**52.7**	**65.1**	**80.7**	**65.5**	**107.5**	**76.8**	**56.0**	**72.1**		
CD at 5%	3.2	2.2	8.3	7.4	8.7	10.6	7.5			
CV%	9.3	1.9	5.8	6.3	7.6	7.8	10.7			

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

Entries	Central Zone										
	Jhansi	Rahuri	Urulikanchan	Karjat	Kanpur	Anand	Jabalpur	Raipur	Average	Rank	Superiority%
NDO-711	58.0	149.7	110.3	53.4	272.8	87.6	110.0	49.9	111.4	2	6.0
OS-403	81.1	103.5	104.5	51.0	324.4	110.6	122.0	56.3	119.2	1	13.4
UPO-06-1	69.2	97.7	98.5	49.5	286.4	110.0	100.0	39.5	106.4	3	1.2
NDO-10	61.6	112.6	79.4	51.8	273.1	105.8	90.0	51.8	103.3	5	
Kent (NC)	65.0	96.2	80.7	54.1	284.2	75.4	119.0	65.8	105.1	4	
OS-6 (NC)	70.4	101.6	66.7	47.5	271.9	84.4	75.0	42.7	95.0	7	
JHO-822 (ZC-CZ)	71.5	105.9	76.5	44.9	306.1	65.9	82.0	48.6	100.2	6	
Mean	**68.1**	**109.6**	**88.1**	**50.3**	**288.4**	**91.4**	**99.7**	**50.7**	**105.8**		
CD at 5%	8.4	15.0	8.1	4.5	25.0	6.7	20.4	9.1			
CV%	4.7	7.7	18.5	5.1	3.1	4.2	11.5	11.2			

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

Entries	South Zone						All India		
	Mandya	Hyderabad	Coimbatore	Average	Rank	Superiority%	Average	Rank	Superiority%
NDO-711	71.6	68.2	34.4	58.1	5		91.9	2	6.7
OS-403	77.1	76.8	55.3	69.7	1	8.4	94.2	1	8.7
UPO-06-1	93.6	76.2	32.3	67.4	2	4.8	85.5	5	
NDO-10	69.2	55.6	41.4	55.4	7		86.7	3	0.7
Kent (NC)	101.5	57.8	33.5	64.3	3		86.1	4	
OS-6 (NC)	79.5	61.7	38.6	59.9	4		80.0	6	
JHO-2000-4 (ZC-SZ)	85.3	48.9	35.2	56.5	6				
Mean	**82.5**	**63.6**	**38.7**	**61.6**			**87.4**		
CD at 5%	12.1	10.2	8.2						
CV%	8.2	9.0	12.0						

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

Entries	Rahuri	Urulikanchan	Karjat	Kanpur	Anand	Raipur	Mandya	Hyderabad	Coimbatore	Average	Rank
NDO-711	8.49	7.31	2.27	8.82	7.21	2.29	4.22	4.66	2.88	4.74	1
OS-403	5.83	5.21	2.36	9.46	6.21	2.57	4.00	3.95	3.48	4.35	4
UPO-06-1	5.70	5.12	2.53	8.04	6.59	1.84	4.76	3.73	2.25	4.12	6
NDO-10	6.74	7.77	2.43	7.92	4.49	2.36	4.35	3.64	3.16	4.39	3
Kent (NC)	5.91	6.85	2.06	9.47	6.79	2.99	4.73	4.19	2.95	4.43	2
OS-6 (NC)	5.86	6.54	2.31	8.39	6.87	1.98	3.73	4.10	3.17	4.21	5
JHO-822 (ZC-CZ)	6.38	6.74	2.54	10.43	4.37	2.23					
JHO-2000-4 (ZC-SZ)							4.15	3.45	2.53		
Mean	**6.42**	**6.51**	**2.36**	**8.93**	**6.08**	**2.32**	**4.28**	**3.96**	**2.92**	**4.37**	

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

Entries	Bikaner	Hisar	Ludhiana	Jorhat	Kalyani	Bhubaneswar	Ranchi	Faizabad	Pusa	Faizabad
NDO-711	0.64	0.75	1.40	0.63	0.96	1.31	0.96	0.79	1.21	0.79
OS-403	1.04	0.61	0.90	0.76	0.84	1.03	0.65	0.83	1.20	0.83
UPO-06-1	0.63	0.68	1.00	0.55	0.79	1.13	0.70	0.74	1.22	0.74
NDO-10	0.86	0.68	0.90	0.73	0.88	1.01	0.77	0.70	1.20	0.70
Kent (NC)	0.80	0.59	1.30	0.50	0.82	1.13	0.79	0.69	1.14	0.69
OS-6 (NC)	0.68	0.61	1.10	0.58	0.93	1.07	0.68	0.54	0.91	0.54
OL-125 (ZC-NWZ)	0.69	0.66	0.80							
JHO-99-2 (ZC-NEZ)				0.54	0.79	1.03	0.76	0.88	1.18	0.88
Mean	0.76	0.65	1.06	0.61	0.86	1.10	0.76	0.74	1.15	0.74

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

Entries	Jhansi	Rahuri	Urulikanchan	Karjat	Kanpur	Anand	Raipur	Hyderabad	Coimbatore	Average	Rank
NDO-711	0.69	1.80	1.28	0.61	3.00	1.12	0.54	1.03	0.44	1.06	1
OS-403	0.78	1.11	1.10	0.61	3.21	1.29	0.61	0.85	0.61	1.00	2
UPO-06-1	0.54	1.03	1.06	0.68	2.72	1.15	0.43	0.85	0.36	0.90	6
NDO-10	0.67	1.48	1.07	0.62	2.70	1.27	0.56	0.84	0.52	0.97	3
Kent (NC)	0.66	1.17	1.02	0.59	3.23	1.01	0.72	0.84	0.42	0.97	4
OS-6 (NC)	0.74	1.32	0.90	0.63	2.83	1.13	0.46	1.01	0.49	0.92	5
JHO-822 (ZC-CZ)	0.74	1.32	0.98	0.63	3.56	0.84	0.53				
JHO-2000-4 (ZC-SZ)								0.72	0.39		
Mean	**0.69**	**1.32**	**1.06**	**0.62**	**3.04**	**1.12**	**0.55**	**0.88**	**0.46**	**0.97**	

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

Entries	Palampur	Ludhiana	Jorhat	Kalyani	Bhubaneswar	Faizabad	Imphal	Rahuri
NDO-711	4.6	10.9	5.1	4.1	8.5	6.2	1.9	15.7
OS-403	4.2	7.8	5.7	7.3	7.7	6.8	2.6	9.8
UPO-06-1	4.0	11.9	4.6	3.7	7.7	6.4	1.4	9.1
NDO-10	5.9	10.6	5.8	4.5	6.3	6.1	1.6	10.3
Kent (NC)	4.2	13.4	4.1	5.6	7.6	5.4	1.7	9.4
OS-6 (NC)	4.7	12.6	4.5	5.5	7.0	5.2	1.5	9.5
Palampur-1 (ZC-HZ)	4.1							
OL-125 (ZC-NWZ)		6.0						
JHO-99-2 (ZC-NEZ)			4.7	4.9	6.4	7.4	1.5	
JHO-822 (ZC-CZ)								9.9
Mean	**4.5**	**10.5**	**4.9**	**5.1**	**7.3**	**6.2**	**1.7**	**10.5**

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

Entries	Urulika-nchan	Ana-nd	Jabal-pur	Rai-pur	Man-dya	Hyder-abad	Coimba-tore	Aver-age	Ra-nk
NDO-711	9.0	8.0	8.9	3.8	5.0	6.9	4.4	6.9	1
OS-403	8.2	9.1	10.0	4.5	5.4	6.7	6.8	6.8	2
UPO-06-1	7.4	10.5	8.0	2.7	5.7	6.7	4.3	6.3	4
NDO-10	7.4	8.6	7.2	4.2	5.7	3.6	5.0	6.2	5
Kent (NC)	7.5	7.9	9.6	6.0	8.0	4.5	4.1	6.6	3
OS-6 (NC)	5.9	8.3	6.0	3.0	5.9	4.6	4.2	5.9	6
JHO-822 (ZC-CZ)	7.1	5.5	6.6	3.5					
JHO-2000-4 (ZC-SZ)					7.9	3.4	3.8		
Mean	7.5	8.3	8.0	4.0	6.2	5.2	4.7	6.4	

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

Entries	Palam-pur	Ludh-iana	Pant-nagar	Jor-hat	Kal-yani	Bhuban-eswar	Faiza-bad	*Imp-hal	Rah-uri
NDO-711	10.5	6.8	10.5	9.6	6.1	9.1	8.0	3.0	10.5
OS-403	11.4	7.1	10.5	8.8	10.6	9.2	8.2	3.2	9.5
UPO-06-1	10.5	9.9	10.5	9.5	5.6	9.3	8.3	3.1	9.3
NDO-10	10.2	9.1	9.6	9.4	7.1	9.3	8.0	2.8	9.2
Kent (NC)	11.7	8.7	9.6	9.8	8.9	8.6	8.0	3.3	9.8
OS-6 (NC)	9.6	9.6	10.5	9.1	8.6	8.7	8.1	3.1	9.3
Palampur-1 (ZC-HZ)	11.4								
OL-125 (ZC-NWZ)		6.1	8.8						
JHO-99-2 (ZC-NEZ)				9.9	7.6	9.2	8.1	3.1	
JHO-822 (ZC-CZ)									9.3
Mean	**10.7**	**8.2**	**10.0**	**9.4**	**7.8**	**9.1**	**8.1**	**3.1**	**9.6**

Cont.

Entries	Urulika-nchan	Ana-nd	Rai-pur	Jabal-pur	Man-dya	Hydera-bad	Coimb-atore	Aver-age	Ra-nk
NDO-711	8.2	9.1	7.7	8.2	7.0	10.1	12.7	8.9	3
OS-403	7.8	8.2	8.1	8.2	7.0	8.7	12.3	9.0	2
UPO-06-1	7.5	9.5	6.9	8.1	6.1	8.7	13.6	8.9	3
NDO-10	9.3	8.1	8.1	8.1	8.3	6.6	12.2	8.8	4
Kent (NC)	9.3	10.5	9.1	8.2	7.9	7.9	12.3	9.3	1
OS-6 (NC)	8.9	9.8	7.1	8.1	7.4	7.4	10.9	8.9	3
JHO-822 (ZC-CZ)	9.3	8.4	7.2	8.1					
JHO-2000-4 (ZC-SZ)					9.2	7.0	10.9		
Mean	**8.6**	**9.1**	**7.7**	**8.1**	**7.6**	**8.1**	**12.1**	**9.0**	

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

Entries	Palam-pur	Sri-nagar	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Udai-pur	Mee-rut	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Faiza-bad	Imp-hal
NDO-711	107.3	136.6	140.0	130.1	134.0	128.3	134.3	178.0	133.0	150.3	152.0	114.0	145.6	111.8
OS-403	112.0	136.7	160.0	124.4	119.9	155.7	146.7	171.0	153.7	128.4	144.2	106.0	140.2	148.1
UPO-06-1	107.0	129.2	150.0	113.1	116.4	164.3	154.9	180.0	126.3	129.5	128.8	93.0	135.7	123.2
NDO-10	106.3	135.9	118.0	124.9	122.8	139.7	139.0	192.0	142.7	130.0	119.2	119.0	118.5	126.6
Kent (NC)	107.3	116.2	110.0	128.0	132.1	140.7	147.9	163.0	127.3	133.2	137.0	105.0	135.8	93.6
OS-6 (NC)	104.3	120.4	120.0	124.4	117.2	140.3	149.9	188.0	145.9		133.1	120.0	110.6	107.7
Palampur-1 (ZC-HZ)	97.3	115.2												
OL-125 (ZC-NWZ)			143.0	117.6	126.7	139.3	141.7	193.0						
JHO-99-2 (ZC-NEZ)									138.9	140.8	129.1	110.0	147.8	123.7
Mean	**105.9**	**127.2**	**134.4**	**123.2**	**124.2**	**144.0**	**144.9**	**180.7**	**138.3**	**135.4**	**134.7**	**109.6**	**133.5**	**119.2**

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

Entries	Jha-nsi	Rah-uri	Urulika-nchan	Kar-jat	Kan-pur	Ana-nd	Jabal-pur	Rai-pur	Man-dya	Hydera-bad	Coimb-atore	Aver-age	Ra-nk
NDO-711	154.6	103.0	104.0	122.6	133.4	131.4	117.9	120.9	106.6	84.8	128.0	128.1	2
OS-403	182.8	103.2	131.9	116.3	140.8	134.3	134.7	128.0	121.7	96.4	136.0	134.9	1
UPO-06-1	172.9	95.4	130.0	114.5	136.8	132.6	113.3	110.7	111.3	86.6	123.0	127.1	3
NDO-10	152.8	97.8	100.3	119.2	132.6	121.1	112.4	115.4	126.6	97.9	160.0	126.8	4
Kent (NC)	141.8	89.7	92.7	128.4	137.9	126.3	126.4	143.4	117.5	88.4	135.0	124.2	6
OS-6 (NC)	146.9	107.2	101.3	111.8	147.1	135.1	103.5	110.6	130.3	92.6	140.0	126.1	5
JHO-822 (ZC-CZ)	143.7	97.2	90.4	106.4	135.5	129.2	110.8	109.7					
JHO-2000-4 (ZC-SZ)									120.7	89.6	154.0		
Mean	**156.5**	**99.1**	**107.2**	**117.0**	**137.7**	**130.0**	**117.0**	**119.8**	**119.2**	**90.9**	**139.4**	**127.9**	

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

Entries	Palam-pur	Sri-nagar	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Faiza-bad	Imp-hal	Rah-uri
NDO-711	0.42	0.51	0.67	0.42	0.70	0.43	0.43	0.69	1.29	0.31	0.81	0.34	1.00
OS-403	0.44	0.51	0.50	0.50	0.30	0.25	0.43	0.81	1.14	0.40	0.80	0.30	0.66
UPO-06-1	0.42	0.48	0.45	0.56	0.30	0.33	0.41	0.93	1.11	0.40	0.81	0.43	0.63
NDO-10	0.41	0.50	0.47	0.49	0.30	0.53	0.47	0.76	0.97	0.28	0.79	0.25	0.94
Kent (NC)	0.37	0.43	0.44	0.48	1.00	0.41	0.58	0.80	1.19	0.28	0.82	0.33	0.90
OS-6 (NC)	0.38	0.45	0.60	0.57	0.80	0.48	0.59	0.75	1.08	0.28	0.80	0.29	0.92
Palampur-1 (ZC-HZ)	0.40	0.43											
OL-125 (ZC-NWZ)			0.69	0.48	0.90	0.53							
JHO-99-2 (ZC-NEZ)							0.66	0.81	1.04	0.30	0.82	0.23	
JHO-822 (ZC-CZ)													0.80
Mean	**0.41**	**0.47**	**0.55**	**0.50**	**0.61**	**0.42**	**0.51**	**0.79**	**1.12**	**0.32**	**0.81**	**0.31**	**0.84**

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

Entries	Urulika-nchan	Kar-jat	Kan-pur	Ana-nd	Jabal-pur	Rai-pur	Man-dya	Hydera-bad	Coimb-atore	Aver-age	Ra-nk
NDO-711	0.72	0.64	0.28	1.53	0.69	0.59	0.29	0.51	0.31	0.62	1
OS-403	0.73	0.59	0.34	1.24	0.81	0.74	0.42	0.42	0.32	0.57	3
UPO-06-1	0.70	0.54	0.43	0.85	0.65	0.53	0.38	0.42	0.32	0.55	4
NDO-10	0.69	0.68	0.37	1.00	0.56	0.65	0.39	0.33	0.23	0.55	4
Kent (NC)	0.85	0.56	0.28	1.20	0.74	0.76	0.38	0.49	0.28	0.62	2
OS-6 (NC)	0.72	0.63	0.23	0.54	0.50	0.60	0.31	0.34	0.21	0.55	4
JHO-822 (ZC-CZ)	0.63	0.64	0.28	1.20	0.52	0.55					
JHO-2000-4 (ZC-SZ)							0.39	0.53	0.40		
Mean	**0.72**	**0.61**	**0.31**	**1.08**	**0.64**	**0.63**	**0.37**	**0.43**	**0.30**	**0.58**	

Table 5.9: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oats (Single Cut): ADF (%), NDF (%) and IVDMD (%)

Entries	ADF (%)						NDF (%)							IVDMD (%)	
	Palam-pur	Ludh-iana	Pant-nagar	Rah-uri	Aver-age	Ra-nk	Palam-pur	Ludh-iana	Pant-nagar	Rah-uri	Ana-nd	Aver-age	Ra-nk	Rah-uri	Ra-nk
NDO-711	57.2	65.3	56.0	33.7	53.0	5	66.4	43.1	62.4	33.1	55.0	52.0	1	62.7	5
OS-403	59.4	67.4	59.6	30.9	54.3	6	63.4	42.0	63.8	35.1	66.0	54.1	4	64.9	3
UPO-06-1	57.6	54.3	54.2	34.1	50.0	1	65.4	34.8	66.0	36.1	60.0	52.5	2	62.3	6
NDO-10	59.0	59.8	58.2	28.7	51.4	2	63.4	37.9	63.0	39.1	69.0	54.5	5	66.6	2
Kent (NC)	60.0	63.1	55.4	28.5	51.8	3	66.0	41.2	65.2	34.1	64.0	54.1	4	66.7	1
OS-6 (NC)	58.6	58.3	56.6	34.9	52.1	4	66.0	37.7	63.6	37.1	61.0	53.1	3	61.7	7
Palampur-1 (ZC-HZ)	60.4						65.8								
OL-125 (ZC-NWZ)		69.5	58.6					45.2	65.4						
JHO-99-2 (ZC-NEZ)															
JHO-822 (ZC-CZ)				33.1						38.1	65.0			63.1	4
Mean	**58.9**	**62.5**	**56.9**	**32.0**	**52.1**		**65.2**	**40.3**	**64.2**	**36.1**	**62.9**	**53.4**		**64.0**	

Table 6.1: AVT Oat (SC)-2 (Seed): Second Advanced Varietal Trial in Oats (Single cut) for seed: Seed Yield (q/ha)

Entries	Hill Zone					North West Zone					North East Zone				
	Palam-pur	Sri-nagar	Aver-age	Ra-nk	Super-iority%	Pant-nagar	His-ar	Aver-age	Ra-nk	Superi-ority%	Ran-chi	Jor-hat	Aver-age	Ra-nk	Superi-ority%
NDO-711	11.6	28.5	20.1	3		25.0	15.4	20.2	2		27.0	11.6	19.3	6	
OS-403	15.3	28.0	21.6	1	5.9	16.7	19.4	18.1	6		32.0	11.3	21.7	3	
UPO-06-1	10.5	23.0	16.7	7		15.7	22.6	19.2	4		34.0	13.8	23.9	1	9.6
NDO-10	7.3	26.6	16.9	5		19.2	18.8	19.0	5		24.0	15.2	19.6	5	
Kent (NC)	16.0	24.7	20.4	2		21.3	18.5	19.9	3		30.3	9.2	19.7	4	
OS-6 (NC)	13.2	24.6	18.9	4		18.5	17.6	18.1	6		28.6	15.1	21.8	2	
Palampur-1 (ZC-HZ)	8.2	25.4	16.8	6											
OL-125 (ZC-NWZ)						19.7	22.9	21.3	1						
JHO-99-2 (ZC-NEZ)											24.0	13.2	18.6	7	
Mean	**11.7**	**25.8**	**18.8**			**19.4**	**19.3**	**19.4**			**28.6**	**12.8**	**20.7**		
CD at 5%	3.8	2.4				1.9	5.4				5.6	0.8			
CV%	18.4	4.3				5.6	16.5				11.5	4.9			

7. AVTO (SC)-2: SECOND ADVANCED VARIETAL TRIAL IN OAT (SINGLE CUT) 2011-12 (REPEAT)

(Reference Tables: 7.1 to 7.9)

This trial was repeated as per varietal Identification committee recommendation.

In oat (single cut), eight entries namely UPO-09-1, OS-363, SKO-148, JHO-2009-2, SKO-156, JO-03-95, UPO-09-2 and JHO-2009-1 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 24 locations in five different zones. For green forage yield (q/ha), entry UPO-09-1 (0.6%) in Hill zone; entries UPO-09-2 (11.1%), OS-363 (6.0%), JHO-2009-2 (56.7%), JO-03-95 (2.6%) and UPO-09-1 (0.5%) in North West zone; entry UPO-09-1 (1.6%) in North East zone, all the test entries except SKO-148 in Central zone and entries JHO-2009-1 (18.0%), UPO-09-2 (8.8%), OS-363 (8.2%) and UPO-09-1 (4.3%) in South zone registered superiority over best check. At national level, all the test entries except SKO-148 and SKO-156 recorded superiority over best national check.

For dry matter yield (q/ha), entries UPO-09-1 (7.9%), SKO-148 (3.4%), OS-363 (1.6%) and JO-03-95 (0.7%) in Hill zone, entries JHO-2009-1 (8.8%), JO-03-95 (8.4%), JHO-2009-2 (4.7%), UPO-09-2 (4.2%), UPO-09-1 (1.8%) and OS-363 (0.2%) in Central zone and entries OS-363 (26.0%), JHO-2009-1 (9.5%), SKO-148 (7.8%), UPO-09-2 (2.7%) and UPO-09-1 (1.5%) in South zone exhibited superiority over best zonal/national check. While, at national level entry JO-03-95 (7.5%) ranked first for this character. For fodder production potential (q/ha/day), entry JO-3-95 for green forage yield and national check OS-6 for dry matter yield registered superiority.

For plant height, UPO-09-2, OS-363, UPO-09-1, JHO-2009-1 and JO-03-95 were adjudged best performer. For the character leafiness (L/S ratio), entry JHO-2009-2 ranked first. For quality parameters, entry JO-03-95 for crude protein yield (q/ha) and UPO-09-1 for crude protein content (%) proved superior. For other quality parameters, entry SKO-148 for ADF (%) and IVDMD (%) and Kent for NDF (%) registered superiority over best national/zonal check.

8. AVTO (SC)-2 (SEED): SECOND ADVANCED VARIETAL TRIAL IN OAT (SINGLE CUT) FOR SEED 2011-12 (REPEAT)

(Reference Tables: 8.1)

This trial was repeated as per varietal Identification committee recommendation.

Results of the advanced varietal trial in Oat (Single cut) for seed with eight entries along with two national checks (Kent and OS-6) and five zonal checks for respective zones *i.e.* Palampur-1 for Hill zone, OL-125 for North West zone, JHO-99-2 for North East zone, JHO-2000-4 for South zone and JHO-822 for Central zone conducted at nine locations distributed in five zones of the country revealed that for seed yield (q/ha), entries JO-03-95 (23.6%), SKO-156 (11.6%), UPO-09-2 (5.2%) and JHO-2009-1 (0.8%) in Hill zone; entries SKO-156 (19.2%) and UPO-09-1 (3.3%) in North West zone; entry UPO-09-1 (8.7%) in North East zone and entry JHO-2009-1 (5.8%) in South zone was superior over best zonal/national check. At national level, seed yield of the test entry UPO-09-1 was 21.0 q/ha which was followed by national check Kent (20.9 q/ha).

Table 7.1 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut) 2011-12 (Repeat): Green Forage Yield (q/ha)

Entries	Hill Zone					North West Zone								
	Palam-pur	Sri-nagar	Aver-age	Ra-nk	Superi-ority	Bika-ner	Jal-ore	His-ar	Ludh-iana	Pant-nagar	Mee-rut	Aver-age	Ra-nk	Super-iority
UPO-09-1	288.4	494.2	391.3	1	0.6	241.0	464.3	250.0	550.0	476.1	810.8	465.4	5	0.5
OS-363	284.4	489.2	386.8	4		262.4	446.7	430.6	561.1	619.2	627.5	491.2	2	6.0
SKO-148	229.0	542.4	385.7	5		227.0	354.3	361.1	444.4	380.4	549.9	386.2	11	
JHO-2009-2	240.8	470.9	355.9	10		238.2	455.3	388.9	575.0	509.5	769.2	489.3	3	5.7
SKO-156	182.2	531.4	356.8	9		253.7	398.3	347.2	388.9	332.6	610.8	388.6	10	
JO-03-95	311.1	466.7	388.9	3		251.9	409.7	347.2	713.9	669.1	460.8	475.4	4	2.6
UPO-09-2	287.5	454.1	370.8	7		246.2	395.7	388.9	597.2	702.5	755.8	514.4	1	11.1
JHO-2009-1	314.2	449.2	381.7	6		273.9	475.3	333.3	497.2	484.5	444.2	418.1	9	
Kent (NC)	300.0	477.9	389.0	2		197.9	388.7	375.0	569.4	683.1	564.2	463.0	6	
OS-6 (NC)	280.0	431.4	355.7	11		288.3	420.7	347.2	525.0	522.0	469.2	428.7	8	
Palampur-1 (ZC-HZ)	274.6	459.3	367.0	8										
OL-125 (ZC-NWZ)						247.8	314.7	513.9	658.3	516.5	466.7	453.0	7	
Mean	**272.0**	**478.8**	**375.4**			**248.0**	**411.2**	**371.2**	**552.8**	**536.0**	**593.6**	**452.1**		
CD at 5%	61.6	21.4				NS	10.9	76.1	49.4	93.7	62.5			
CV%	13.3	7.6				18.2	15.6	12.1	3.6	10.3	6.2			

Table 7.1 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut) 2011-12 (Repeat): Green Forage Yield (q/ha)

Entries	North East Zone									
	Jor-hat	Bhuban-eswar	Ran-chi	Pu-sa	Faiza-bad	Kal-yani	Imp-hal	Aver-age	Ra-nk	Super-iority
UPO-09-1	240.1	412.0	355.6	616.0	295.2	514.4	272.2	386.5	1	1.6
OS-363	203.1	443.5	382.3	594.0	280.0	510.0	240.0	379.0	3	
SKO-148	161.1	409.4	337.7	561.0	255.2	486.4	220.6	347.3	10	
JHO-2009-2	210.2	422.0	337.7	570.0	283.8	528.3	241.7	370.5	5	
SKO-156	193.2	425.6	333.3	522.0	297.1	494.4	191.1	351.0	9	
JO-03-95	209.9	412.0	337.7	505.0	266.6	505.8	258.3	356.5	7	
UPO-09-2	202.8	431.4	297.7	594.0	268.6	426.4	261.7	354.6	8	
JHO-2009-1	228.0	392.0	360.0	572.0	327.7	502.5	222.8	372.1	4	
Kent (NC)	186.0	387.5	284.4	561.0	247.7	456.9	271.1	342.1	11	
OS-6 (NC)	176.3	371.5	315.6	594.0	375.2	487.2	228.9	364.1	6	
JHO-99-2 (ZC-NEZ)	228.0	374.3	377.7	538.0	358.1	479.7	307.2	380.4	2	
Mean	**203.5**	**407.4**	**338.2**	**566.1**	**295.9**	**490.2**	**246.9**	**364.0**		
CD at 5%	4.3	32.6	95.9	47.4	80.4	19.9	24.4			
CV%	5.4	4.7	7.2	8.7	16.0	2.4	8.2			

Table 7.1 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut) 2011-12 (Repeat): Green Forage Yield (q/ha)

Entries	Central Zone								
	Jha-nsi	Rah-uri	Urulika-nchan	Kan-pur	Ana-nd	Jabal-pur	Aver-age	Ra-nk	Super-iority
UPO-09-1	595.1	378.6	396.2	727.8	740.0	412.0	541.6	7	1.9
OS-363	487.2	396.0	598.2	791.7	721.0	467.0	576.8	3	8.4
SKO-148	490.3	372.3	529.6	736.1	603.0	382.0	518.9	11	
JHO-2009-2	585.8	485.2	487.7	700.0	715.0	483.0	576.1	4	8.4
SKO-156	622.8	373.4	480.1	713.9	687.0	506.0	563.9	5	6.1
JO-03-95	582.8	418.5	582.9	805.6	638.0	540.0	594.6	2	11.8
UPO-09-2	536.5	372.3	480.1	750.0	769.0	435.0	557.1	6	4.8
JHO-2009-1	625.9	584.2	457.2	783.3	693.0	478.0	603.6	1	13.5
Kent (NC)	400.8	404.3	575.3	755.6	669.0	385.0	531.7	8	
OS-6 (NC)	459.4	444.6	598.2	741.7	533.0	406.0	530.5	9	
JHO-822 (ZC-CZ)	496.4	408.5	525.8	719.4	656.0	342.0	524.7	10	
Mean	**534.8**	**421.6**	**519.2**	**747.7**	**674.9**	**439.6**	**556.3**		
CD at 5%	9.5	77.5	55.7	57.8	63.6	91.3			
CV%	5.7	10.8	12.6	4.3	5.5	12.2			

Table 7.1 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut) 2011-12 (Repeat): Green Forage Yield (q/ha)

Entries	South Zone						All India		
	Hyderabad	Mandya	Coimbatore	Average	Rank	Superiority	Average	Rank	Superiority
UPO-09-1	322.1	270.8	188.9	260.6	4	4.3	429.7	6	4.7
OS-363	319.3	266.7	225.0	270.3	3	8.2	443.6	1	8.0
SKO-148	244.3	222.9	183.3	216.9	8		386.8	10	
JHO-2009-2	238.8	214.3	173.6	208.9	10		430.2	5	4.8
SKO-156	205.5	175.4	172.2	184.4	11		393.3	9	
JO-03-95	352.6	220.2	169.4	247.4	6		434.8	3	5.9
UPO-09-2	386.0	225.5	204.2	271.9	2	8.8	436.2	2	6.2
JHO-2009-1	410.9	237.5	236.1	294.8	1	18.0	432.6	4	5.4
Kent (NC)	319.3	219.5	175.0	237.9	7		410.6	7	
OS-6 (NC)	261.0	200.1	173.6	211.6	9		402.1	8	
JHO-2000-4 (ZC-SZ)	311.0	221.9	216.7	249.8	5				
Mean	**306.4**	**225.0**	**192.5**	**241.3**			**420.0**		
CD at 5%	61.7	37.7	31.8						
CV%	11.8	9.8	9.7						

Table 7.2 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut) 2011-12 (Repeat): Dry Matter Yield (q/ha)

Entries	Hill Zone					North West Zone						
	Palam-pur	Sri-nagar	Aver-age	Ra-nk	Superi-ority	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Aver-age	Ra-nk	Superi-ority
UPO-09-1	66.2	121.7	93.9	1	7.9	75.2	44.5	158.5	93.3	92.9	8	
OS-363	56.4	120.4	88.4	3	1.6	74.1	93.8	164.6	97.2	107.4	4	
SKO-148	44.6	135.5	90.0	2	3.4	72.2	64.4	109.8	84.4	82.7	10	
JHO-2009-2	46.6	115.8	81.2	9		76.1	70.3	162.5	99.7	102.2	6	
SKO-156	35.5	126.0	80.8	10		85.5	66.7	81.4	69.7	75.8	11	
JO-03-95	60.5	114.8	87.6	4	0.7	84.7	61.7	232.8	110.0	122.3	2	
UPO-09-2	55.5	111.7	83.6	7		90.5	77.2	184.3	118.5	117.6	3	
JHO-2009-1	62.0	110.5	86.2	6		79.3	72.8	127.4	86.0	91.4	9	
Kent (NC)	56.4	117.6	87.0	5		69.8	69.1	170.1	114.9	106.0	5	
OS-6 (NC)	52.6	106.2	79.4	11		104.4	59.7	141.9	94.1	100.0	7	
Palampur-1 (ZC-HZ)	50.5	113.1	81.8	8								
OL-125 (ZC-NWZ)						87.0	107.2	202.4	101.9	124.6	1	
Mean	**53.3**	**117.5**	**85.4**			**81.7**	**71.6**	**157.8**	**97.2**	**102.1**		
CD at 5%	12.5	6.5				25.9	23.9	53.7	20.7			
CV%	14.0	3.4				18.6	19.7	13.7	12.9			

Table 7.2 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut) 2011-12 (Repeat): Dry Matter Yield (q/ha)

Entries	North East Zone									
	Jorhat	Bhubaneswar	Ranchi	Pusa	Faizabad	Kalyani	Imphal	Average	Rank	Superiority
UPO-09-1	36.6	86.5	64.4	121.5	55.2	83.6	49.5	71.0	5	
OS-363	31.8	93.5	78.4	116.9	60.4	81.6	47.3	72.8	3	
SKO-148	31.1	86.0	54.5	110.6	51.4	77.8	44.7	65.2	10	
JHO-2009-2	36.6	88.3	53.6	112.4	57.0	83.2	47.7	68.4	6	
SKO-156	36.1	89.2	61.7	104.2	69.5	76.6	39.7	68.2	7	
JO-03-95	34.2	86.9	77.6	100.8	48.0	77.1	54.5	68.4	6	
UPO-09-2	37.8	91.2	64.0	116.9	54.6	61.8	49.4	67.9	8	
JHO-2009-1	39.0	82.5	84.7	112.8	65.9	77.9	37.9	71.5	4	
Kent (NC)	33.9	81.6	58.5	110.7	49.1	73.1	50.3	65.3	9	
OS-6 (NC)	29.5	78.2	80.3	117.4	78.5	76.7	51.3	73.1	2	
JHO-99-2 (ZC-NEZ)	43.1	79.2	82.8	106.5	73.0	74.4	62.8	74.5	1	
Mean	**35.4**	**85.7**	**69.1**	**111.9**	**60.2**	**76.7**	**48.6**	**69.7**		
CD at 5%	2.0	6.8	20.3	12.3	12.7	3.1	5.6			
CV%	6.1	4.7	17.1	10.4	12.4	2.4	9.5			

Table 7.2 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut) 2011-12 (Repeat): Dry Matter Yield (q/ha)

Entries	Central Zone								
	Jhansi	Rahuri	Urulikanchan	Kanpur	Anand	Jabalpur	Average	Rank	Superiority
UPO-09-1	125.2	82.5	79.3	247.5	132.4	91.0	126.3	5	1.8
OS-363	90.5	87.5	89.2	269.7	107.4	103.0	124.6	6	0.2
SKO-148	79.9	74.8	127.0	248.1	88.0	83.0	116.8	9	
JHO-2009-2	104.4	94.2	116.8	238.3	124.4	103.0	130.2	4	4.7
SKO-156	105.1	78.0	96.6	240.3	113.3	112.0	124.2	8	
JO-03-95	114.9	91.8	96.3	273.6	113.0	119.0	134.8	2	8.4
UPO-09-2	110.3	90.0	99.4	253.6	128.4	95.0	129.5	3	4.2
JHO-2009-1	111.6	116.4	89.4	265.3	124.0	105.0	135.3	1	8.8
Kent (NC)	79.5	98.4	85.5	257.5	93.0	83.0	116.1	10	
OS-6 (NC)	112.3	99.1	103.8	250.8	90.7	89.0	124.3	7	
JHO-822 (ZC-CZ)	72.9	82.0	83.6	243.9	96.4	74.0	108.8	11	
Mean	**100.6**	**90.4**	**97.0**	**253.5**	**110.1**	**96.1**	**124.6**		
CD at 5%	11.3	16.7	10.4	20.3	9.8	20.4			
CV%	6.8	10.8	14.9	2.6	5.2	12.4			

Table 7.2 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut) 2011-12 (Repeat): Dry Matter Yield (q/ha)

Entries	South Zone						All India		
	Hyderabad	Mandya	Coimbatore	Average	Rank	Superiority	Average	Rank	Superiority
UPO-09-1	62.2	108.3	31.9	67.5	2	1.5	91.7	5	2.3
OS-363	71.7	108.3	42.1	74.1	1	26.0	94.8	2	5.8
SKO-148	70.3	87.3	32.5	63.4	4	7.8	84.5	9	
JHO-2009-2	59.9	54.6	27.0	47.1	10		89.7	6	0.1
SKO-156	53.0	58.1	26.0	45.7	11		82.9	10	
JO-03-95	71.4	72.4	24.5	56.1	8		96.4	1	7.5
UPO-09-2	75.3	72.0	33.9	60.4	5	2.7	94.1	3	5.0
JHO-2009-1	78.9	68.8	45.4	64.4	3	9.5	92.9	4	3.7
Kent (NC)	77.0	70.5	28.9	58.8	6		87.7	8	
OS-6 (NC)	60.3	67.7	27.5	51.8	9		89.6	7	
JHO-2000-4 (ZC-SZ)	57.4	74.0	38.3	56.5	7				
Mean	**67.0**	**76.6**	**32.5**	**58.7**			**90.4**		
CD at 5%	16.4	11.9	7.2						
CV%	14.4	9.1	13.0						

Table 7.3 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut) 2011-12 (Repeat): Green Forage Yield (q/ha/day)

Entries	Palam-pur	Bika-ner	His-ar	Ludh-iana	Jor-hat	Bhuba-neswar	Ran-chi	Pu-sa	Faiza-bad	Kal-yani
UPO-09-1	2.08	2.17	2.11	4.50	2.75	5.09	3.78	6.42	2.76	6.27
OS-363	2.17	2.36	3.76	4.60	2.19	5.69	4.02	6.25	2.59	6.22
SKO-148	1.66	2.04	3.09	3.50	1.74	5.12	3.34	5.97	2.34	5.93
JHO-2009-2	1.75	2.15	3.30	4.60	2.47	5.70	3.37	6.19	2.60	6.37
SKO-156	1.33	2.29	2.87	3.10	2.09	6.17	3.37	5.67	2.72	5.96
JO-03-95	2.40	2.27	3.07	6.30	2.27	5.42	3.79	5.55	2.56	6.17
UPO-09-2	2.17	2.22	3.40	5.40	2.39	6.08	3.00	6.12	2.61	5.54
JHO-2009-1	2.33	2.47	2.76	4.10	2.68	4.90	3.75	6.02	3.21	6.05
Kent (NC)	2.37	1.78	3.40	5.10	2.19	4.91	3.30	5.96	2.53	6.35
OS-6 (NC)	2.14	2.60	3.07	4.70	2.07	5.80	3.76	6.32	3.80	6.77
Palampur-1 (ZC-HZ)	2.00									
OL-125 (ZC-NWZ)		2.23	4.50	5.80						
JHO-99-2 (ZC-NEZ)					2.68	5.67	3.89	5.85	3.34	6.66
Mean	**2.04**	**2.23**	**3.21**	**4.70**	**2.32**	**5.50**	**3.58**	**6.03**	**2.82**	**6.21**

Table 7.3 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut) 2011-12 (Repeat): Green Forage Yield (q/ha/day)

Entries	Jha-nsi	Rah-uri	Urulika-nchan	Kan-pur	Ana-nd	Hydera-bad	Man-dya	Coimb-atore	Aver-age	Ra-nk
UPO-09-1	4.65	4.40	4.89	7.21	8.22	4.44	3.74	2.08	4.31	6
OS-363	3.81	4.71	7.67	7.76	8.01	4.39	3.77	2.85	4.60	2
SKO-148	3.83	4.05	5.95	6.94	6.35	3.24	3.14	1.99	3.90	8
JHO-2009-2	4.34	5.05	4.83	6.60	7.08	3.12	2.90	2.04	4.14	7
SKO-156	4.42	3.93	5.22	6.86	6.80	2.70	2.29	1.87	3.87	9
JO-03-95	4.55	5.17	7.67	8.39	7.69	4.80	3.14	2.09	4.63	1
UPO-09-2	4.19	4.49	5.93	7.81	9.38	5.26	3.17	2.32	4.53	5
JHO-2009-1	4.89	6.87	5.58	7.46	7.97	5.66	3.36	2.78	4.60	2
Kent (NC)	3.43	4.99	8.10	8.68	9.04	4.65	3.09	2.06	4.55	4
OS-6 (NC)	3.59	6.01	8.19	8.15	6.92	3.88	2.87	2.02	4.59	3
JHO-822 (ZC-CZ)	4.24	5.37	7.01	8.27	8.30					
JHO-2000-4 (ZC-SZ)						4.20	3.02	2.46		
Mean	**4.18**	**5.00**	**6.46**	**7.65**	**7.80**	**4.21**	**3.14**	**2.23**	**4.37**	

Table 7.4 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut) 2011-12 (Repeat): Dry Matter Yield (q/ha/day)

Entries	Bika-ner	His-ar	Ludh-iana	Jor-hat	Bhuban-eswar	Ran-chi	Pu-sa	Faiza-bad	Kal-yani
UPO-09-1	0.68	0.37	1.30	0.42	1.07	0.68	1.27	0.52	1.02
OS-363	0.67	0.82	1.40	0.34	1.20	0.83	1.23	0.56	1.00
SKO-148	0.65	0.55	0.90	0.34	1.08	0.54	1.18	0.47	0.95
JHO-2009-2	0.69	0.60	1.30	0.43	1.19	0.54	1.22	0.52	1.00
SKO-156	0.77	0.55	0.70	0.39	1.29	0.62	1.13	0.64	0.92
JO-03-95	0.76	0.55	2.10	0.37	1.14	0.87	1.11	0.46	0.94
UPO-09-2	0.82	0.68	1.60	0.44	1.28	0.65	1.21	0.53	0.80
JHO-2009-1	0.71	0.60	1.10	0.46	1.03	0.88	1.19	0.65	0.94
Kent (NC)	0.63	0.63	1.50	0.40	1.03	0.68	1.18	0.50	1.02
OS-6 (NC)	0.94	0.53	1.30	0.35	1.22	0.96	1.25	0.79	1.07
OL-125 (ZC-NWZ)	0.78	0.94	1.80						
JHO-99-2 (ZC-NEZ)				0.51	1.20	0.85	1.16	0.68	1.03
Mean	**0.74**	**0.62**	**1.36**	**0.40**	**1.16**	**0.74**	**1.19**	**0.57**	**0.97**

Table 7.4 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut) 2011-12 (Repeat): Dry Matter Yield (q/ha/day)

Entries	Jha-nsi	Rah-uri	Urulika-nchan	Kan-pur	Ana-nd	Hydera-bad	Coimb-atore	Aver-age	Ra-nk
UPO-09-1	0.98	0.96	0.98	2.04	1.47	0.62	0.35	0.92	7
OS-363	0.71	1.04	1.14	2.64	1.19	0.72	0.53	1.00	5
SKO-148	0.62	0.81	1.43	2.34	0.93	0.70	0.35	0.87	8
JHO-2009-2	0.77	0.98	1.16	2.25	1.23	0.60	0.32	0.93	6
SKO-156	0.75	0.82	1.05	2.31	1.12	0.53	0.28	0.87	8
JO-03-95	0.90	1.13	1.27	2.85	1.36	0.71	0.30	1.05	2
UPO-09-2	0.86	1.08	1.23	2.64	1.57	0.75	0.38	1.03	3
JHO-2009-1	0.87	1.37	1.09	2.53	1.43	0.79	0.53	1.01	4
Kent (NC)	0.68	1.22	1.20	2.96	1.26	0.77	0.34	1.00	5
OS-6 (NC)	0.88	1.34	1.42	2.76	1.18	0.60	0.32	1.06	1
JHO-822 (ZC-CZ)	0.62	1.08	1.11	2.80	1.22				
JHO-2000-4 (ZC-SZ)						0.57	0.43		
Mean	**0.79**	**1.08**	**1.19**	**2.56**	**1.27**	**0.67**	**0.38**	**0.97**	

Table 7.5 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut) 2011-12 (Repeat): Crude Protein Yield (q/ha)

Entries	Palam-pur	Ludh-iana	Jor-hat	Bhuban-eswar	Faiza-bad	Kal-yani	Imp-hal	Rah-uri	Urulik-anchan	Ana-nd	Jabal-pur	Hydera-bad	Man-dya	Coimb-atore	Aver-age	Ra-nk
UPO-09-1	5.9	13.5	4.3	7.9	4.1	8.3	1.7	7.8	5.8	12.5	7.2	5.7	4.7	4.9	6.7	3
OS-363	5.9	12.8	3.6	8.8	4.7	5.7	1.7	7.1	6.8	9.4	8.3	4.7	3.8	5.9	6.4	6
SKO-148	4.5	7.6	3.1	7.9	3.9	6.4	1.5	6.0	8.5	10.2	6.6	6.2	3.8	4.4	5.8	8
JHO-2009-2	5.0	9.9	3.8	8.4	4.6	8.0	1.7	7.4	7.8	11.8	8.3	4.4	4.1	4.3	6.4	6
SKO-156	4.0	5.1	4.0	8.2	5.5	3.2	1.4	8.0	7.2	10.7	9.1	4.1	2.8	4.7	5.6	9
JO-03-95	6.5	23.8	3.7	8.1	3.7	8.2	1.7	9.1	7.4	8.6	9.7	5.6	2.9	3.3	7.3	1
UPO-09-2	5.9	18.2	3.8	8.2	4.1	4.4	1.7	7.2	6.9	11.2	7.7	5.9	2.8	4.1	6.6	4
JHO-2009-1	6.5	10.7	4.3	7.8	5.2	3.5	1.2	11.5	7.0	12.3	8.5	7.3	3.0	6.2	6.8	2
Kent (NC)	6.3	17.0	3.4	7.5	3.8	6.1	1.8	8.8	7.3	10.3	6.7	6.7	2.2	3.5	6.5	5
OS-6 (NC)	5.6	14.0	3.1	7.0	6.2	2.8	2.0	10.0	8.3	8.3	7.1	5.2	3.0	3.5	6.1	7
Palampur-1 (ZC-HZ)	5.3															
OL-125 (ZC-NWZ)		12.7														
JHO-99-2 (ZC-NEZ)			5.2	7.3	5.5	7.4	2.3									
JHO-822 (ZC-CZ)								8.3	6.4	11.6	5.9					
JHO-2000-4 (ZC-SZ)												4.5	3.5	4.7		
Mean	5.6	13.2	3.8	7.9	4.7	5.8	1.7	8.3	7.2	10.6	7.7	5.5	3.3	4.5	6.4	

Table 7.6 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (SC) 2011-12 (Repeat): Crude Protein (%)

Entries	Palam-pur	Ludh-iana	Pant-nagar	Jor-hat	Bhuban-eswar	Faiza-bad	Kal-yani	Imp-hal	Rah-uri
UPO-09-1	10.5	8.5	9.6	11.9	9.2	7.5	9.9	3.4	9.5
OS-363	10.5	7.8	9.6	11.6	9.4	7.8	7.0	3.7	8.2
SKO-148	10.2	6.9	10.5	10.2	9.1	7.6	8.2	3.2	8.0
JHO-2009-2	10.8	6.1	10.5	10.5	9.5	8.0	9.6	3.5	7.9
SKO-156	11.1	6.3	9.6	11.1	9.2	7.9	4.2	3.6	10.2
JO-03-95	10.8	9.8	9.6	10.9	9.3	7.7	10.6	3.0	9.9
UPO-09-2	10.5	9.9	9.6	10.2	9.0	7.5	7.1	3.4	8.0
JHO-2009-1	10.5	8.4	10.5	11.2	9.5	7.9	4.5	3.2	9.9
Kent (NC)	11.1	10.0	9.6	10.2	9.1	7.8	8.4	3.5	8.9
OS-6 (NC)	10.5	9.9	10.5	10.8	8.9	7.9	3.7	3.8	10.1
Palampur-1 (ZC-HZ)	10.5								
OL-125 (ZC-NWZ)		6.0	8.8						
JHO-99-2 (ZC-NEZ)				12.2	9.2	7.5	9.9	3.7	
JHO-822 (ZC-CZ)									10.1
Mean	**10.6**	**8.1**	**9.9**	**11.0**	**9.2**	**7.7**	**7.6**	**3.5**	**9.1**

Table 7.6 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (SC) 2011-12 (Repeat): Crude Protein (%)

Entries	Urulika-nchan	Ana-nd	Jabal-pur	Hydera-bad	Man-dya	Coimb-atore	Aver-age	Ra-nk
UPO-09-1	7.3	9.5	8.1	9.2	4.4	15.3	8.9	1
OS-363	7.6	8.8	8.1	6.6	3.5	14.0	8.3	6
SKO-148	6.7	11.6	8.0	8.7	4.4	13.6	8.5	5
JHO-2009-2	6.7	9.5	8.2	7.3	7.5	16.2	8.8	2
SKO-156	7.4	9.4	8.2	7.9	4.8	17.9	8.6	4
JO-03-95	7.6	7.6	8.2	7.9	4.0	13.6	8.7	3
UPO-09-2	7.0	8.8	8.1	7.9	3.9	12.3	8.2	7
JHO-2009-1	7.9	9.9	8.1	9.2	4.4	13.6	8.6	4
Kent (NC)	8.6	11.1	8.0	8.7	3.1	12.3	8.7	3
OS-6 (NC)	8.0	9.2	8.0	8.7	4.4	12.7	8.5	5
JHO-822 (ZC-CZ)	7.7	12.1	8.0					
JHO-2000-4 (ZC-SZ)				7.9	4.8	12.3		
Mean	**7.5**	**9.8**	**8.1**	**8.2**	**4.5**	**14.0**	**8.6**	

Table 7.7 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut) 2011-12 (Repeat): Plant Height (cm)

Entries	Palam-pur	Sri-nagar	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Mee-rut	Jor-hat	Bhuban-eswar	Ran-chi	Faiza-bad	Kal-yani	Imp-hal	Jha-nsi	Rah-uri
UPO-09-1	124.0	127.3	105.0	123.0	124.6	150.6	153.0	111.9	149.2	113.0	125.5	145.6	126.0	177.9	105.0
OS-363	110.3	122.7	120.0	165.6	134.6	135.0	180.0	104.0	161.4	109.0	102.8	148.1	125.1	180.1	109.2
SKO-148	86.3	147.2	121.0	154.4	87.2	123.7	145.0	58.2	144.3	89.0	77.5	126.9	105.6	165.4	97.7
JHO-2009-2	90.6	127.8	110.0	162.2	80.0	117.0	134.0	83.8	155.5	100.0	80.8	123.9	119.7	143.7	101.0
SKO-156	71.0	130.9	108.0	129.8	68.1	121.0	145.0	66.0	158.2	93.0	75.8	117.6	126.6	147.3	102.2
JO-03-95	112.6	126.7	105.0	146.1	139.4	155.0	150.0	105.8	147.3	114.0	110.8	144.7	109.4	196.3	105.2
UPO-09-2	112.3	106.6	126.0	174.1	130.6	155.0	170.0	110.0	159.4	109.0	130.4	145.7	108.9	193.3	112.6
JHO-2009-1	113.0	122.0	121.0	166.3	124.6	146.7	170.0	72.7	141.2	115.0	118.7	144.1	117.2	173.0	116.0
Kent (NC)	105.6	129.7	95.0	158.9	122.0	133.0	138.0	79.2	137.7	120.0	115.0	145.7	117.7	159.2	105.9
OS-6 (NC)	112.3	111.0	100.0	158.3	113.8	136.7	168.0	97.5	129.9	108.0	135.2	146.0	109.6	175.8	92.0
Palampur-1 (ZC-HZ)	97.0	124.4													
OL-125 (ZC-NWZ)			120.0	183.1	148.3	134.7	168.0								
JHO-99-2 (ZC-NEZ)								112.4	133.2	114.0	125.4	114.6	122.9		
JHO-822 (ZC-CZ)														153.3	79.4
Mean	**103.2**	**125.1**	**111.9**	**156.5**	**115.7**	**137.1**	**156.5**	**91.0**	**147.0**	**107.6**	**108.9**	**136.6**	**117.1**	**169.6**	**102.4**

Table 7.7 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut) 2011-12 (Repeat): Plant Height (cm)

Entries	Urulika-nchan	Kan-pur	Ana-nd	Jabal-pur	Hydera-bad	Man-dya	Coimb-atore	Aver-age	Ra-nk
UPO-09-1	116.8	134.0	146.7	111.5	92.0	98.7	131.0	126.9	3
OS-363	109.9	133.8	148.3	124.0	87.9	84.0	148.0	129.3	2
SKO-148	120.4	123.6	127.3	103.6	71.2	79.2	119.0	112.4	8
JHO-2009-2	99.1	124.2	126.4	132.1	73.3	71.1	100.0	111.6	10
SKO-156	112.2	135.6	146.5	132.8	90.0	80.5	105.0	112.0	9
JO-03-95	108.2	134.6	140.7	135.6	88.3	88.2	106.0	125.9	5
UPO-09-2	119.3	135.6	139.0	116.0	93.9	97.3	126.0	130.5	1
JHO-2009-1	122.0	126.6	142.1	128.6	95.3	90.5	115.0	126.4	4
Kent (NC)	107.1	127.8	123.3	102.9	80.1	83.1	97.0	117.5	7
OS-6 (NC)	108.0	141.2	140.2	108.2	90.8	104.5	138.0	123.9	6
JHO-822 (ZC-CZ)	105.8	134.3	143.4	102.1					
JHO-2000-4 (ZC-SZ)					101.2	89.3	125.0		
Mean	111.7	131.9	138.5	117.9	87.6	87.9	119.1	121.6	

Table 7.8 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut) 2011-12 (Repeat): Leaf Stem Ratio

Entries	Palam-pur	Sri-nagar	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Jor-hat	Bhuban-eswar
UPO-09-1	0.49	0.49	0.44	0.83	0.50	0.46	0.95	1.28
OS-363	0.34	0.48	0.80	0.37	0.50	0.56	1.12	1.37
SKO-148	0.47	0.53	0.79	0.42	0.70	0.50	0.75	1.20
JHO-2009-2	0.46	0.46	1.06	0.53	0.70	0.37	0.67	1.30
SKO-156	0.45	0.52	0.67	0.74	0.90	0.39	0.82	1.31
JO-03-95	0.36	0.46	0.62	0.81	0.50	0.51	0.78	1.24
UPO-09-2	0.47	0.45	0.50	0.44	1.00	0.58	0.68	1.34
JHO-2009-1	0.33	0.44	0.45	0.32	0.40	0.43	1.36	1.15
Kent (NC)	0.31	0.47	0.50	0.44	0.80	0.39	0.79	1.06
OS-6 (NC)	0.32	0.42	0.32	0.65	1.00	0.56	0.84	0.89
Palampur-1 (ZC-HZ)	0.56	0.45						
OL-125 (ZC-NWZ)			0.56	0.54	0.90	0.49		
JHO-99-2 (ZC-NEZ)							0.83	0.98
Mean	**0.41**	**0.47**	**0.61**	**0.55**	**0.72**	**0.48**	**0.87**	**1.19**

Table 7.8 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut) 2011-12 (Repeat): Leaf Stem Ratio

Entries	Ran-chi	Faiza-bad	Kal-yani	Imp-hal	Rah-uri	Urulika-nchan	Kan-pur	Ana-nd	Jabal-pur	Hydera-bad	Man-dya	Coimba-tore	Aver-age	Ra-nk
UPO-09-1	0.44	0.81	0.60	0.35	0.78	0.55	0.24	1.27	0.66	0.46	0.51	0.24	0.62	4
OS-363	0.56	0.80	0.65	0.32	0.87	0.61	0.45	0.84	0.72	0.34	0.42	0.34	0.62	4
SKO-148	0.57	0.82	0.65	0.33	0.94	0.52	0.43	1.99	0.49	0.50	0.37	0.33	0.67	3
JHO-2009-2	0.67	0.84	0.74	0.32	0.84	0.92	0.46	1.30	0.77	0.45	0.45	0.47	0.69	1
SKO-156	0.85	0.84	0.65	0.35	0.86	0.60	0.44	1.33	0.78	0.34	0.36	0.48	0.68	2
JO-03-95	0.41	0.80	0.68	0.30	0.83	0.68	0.35	1.00	0.82	0.43	0.40	0.21	0.61	5
UPO-09-2	0.42	0.80	0.57	0.36	0.62	0.60	0.35	1.28	0.66	0.48	0.45	0.30	0.62	4
JHO-2009-1	0.48	0.81	0.65	0.47	0.67	0.59	0.33	1.12	0.75	0.35	0.34	0.18	0.58	7
Kent (NC)	0.52	0.81	0.65	0.36	0.71	0.67	0.33	1.60	0.54	0.45	0.40	0.18	0.60	6
OS-6 (NC)	0.36	0.83	0.65	0.38	0.51	0.57	0.45	1.43	0.58	0.41	0.35	0.41	0.60	6
JHO-99-2 (ZC-NEZ)	0.44	0.81	0.57	0.37										
JHO-822 (ZC-CZ)					0.84	0.67	0.33	0.71	0.46					
JHO-2000-4 (ZC-SZ)										0.51	0.44	0.25		
Mean	**0.52**	**0.82**	**0.64**	**0.36**	**0.77**	**0.63**	**0.38**	**1.26**	**0.66**	**0.43**	**0.41**	**0.31**	**0.63**	

Table 7.9 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut) 2011-12 (Repeat): ADF (%), NDF (%) and IVDMD %)

Entries	ADF (%)						NDF (%)							IVDMD (%)	
	Palam-pur	Ludh-iana	Pant-nagar	Rah-uri	Aver-age	Ra-nk	Palam-pur	Ludh-iana	Pant-nagar	Rah-uri	Ana-nd	Aver-age	Ra-nk	Rah-uri	Ra-nk
UPO-09-1	58.6	61.5	62.6	38.3	55.3	7	63.4	38.9	54.6	36.0	63.0	51.2	2	59.1	8
OS-363	54.6	62.8	65.8	34.4	54.4	3	63.8	39.3	55.8	37.0	66.0	52.4	4	62.1	3
SKO-148	57.4	63.0	63.4	31.7	53.9	1	65.2	39.5	57.2	38.0	68.0	53.6	6	64.2	1
JHO-2009-2	54.6	63.7	64.2	36.3	54.7	6	65.4	43.6	55.8	41.0	67.0	54.6	8	60.6	6
SKO-156	58.0	63.1	64.0	31.9	54.3	2	65.0	43.2	54.6	42.0	57.0	52.4	4	64.0	2
JO-03-95	54.6	59.1	63.8	41.0	54.6	5	61.8	37.7	57.8	43.0	56.0	51.3	3	57.0	9
UPO-09-2	56.4	59.2	64.0	50.3	57.5	9	64.0	37.3	56.6	44.0	67.0	53.8	7	49.7	10
JHO-2009-1	59.4	61.6	64.2	36.5	55.4	8	63.8	39.1	57.2	46.0	62.0	53.6	6	60.5	7
Kent (NC)	58.4	56.0	65.2	35.9	53.9	1	62.2	33.0	55.8	39.0	61.0	50.2	1	60.9	5
OS-6 (NC)	60.0	57.0	66.2	34.7	54.5	4	68.0	36.8	56.6	40.0	66.0	53.5	5	61.9	4
Palampur-1 (ZC-HZ)	59.4						65.2								
OL-125 (ZC-NWZ)		66.1	63.0					43.7	55.2						
JHO-99-2 (ZC-NEZ)															
JHO-822 (ZC-CZ)				51.5						45.0	63.0			48.8	
JHO-2000-4 (ZC-SZ)			64.2												
Mean	**57.4**	**61.2**	**64.2**	**38.4**	**54.8**		**64.3**	**39.3**	**56.1**	**41.0**	**63.3**	**52.6**		**59.0**	

Table 8.1: AVT Oat (SC)-2 (Seed): Second Advanced Varietal Trial in Oat (Single cut) for Seed 2011-12 (Repeat): Seed Yield (q/ha)

Entries	Hill Zone				North West Zone				North East Zone				
	*Palam-pur	Sri-nagar	Ra-nk	Superi-ority	Pant-nagar	His-ar	Ra-nk	Superi-ority	Jor-hat	Ran-chi	Aver-age	Ra-nk	Superi-ority
UPO-09-1	26.5	24.4	6		26.2	24.3	5		16.2	36.3	26.3	1	8.7
OS-363	15.6	22.6	10		20.8	26.4	3		17.2	28.6	22.9	6	
SKO-148	18.7	23.0	8			16.5	9		15.1	31.6	23.3	5	
JHO-2009-2	10.1	22.8	9			16.7	8		17.3	26.6	21.9	7	
SKO-156	25.8	27.9	2	11.6		29.2	2		17.4	30.3	23.8	3	
JO-03-95	18.4	30.9	1	23.6	24.0	21.5	6		13.9	28.6	21.3	8	
UPO-09-2	6.1	26.3	3	5.2	24.2	24.4	4		17.0	21.0	19.0	10	
JHO-2009-1	15.8	25.2	4	0.8	21.9	20.8	7		17.1	18.3	17.7	11	
Kent (NC)	7.1	24.3	7		20.8	26.4	3		12.7	34.6	23.7	4	
OS-6 (NC)	15.0	25.0	5		18.4	30.7	1		16.8	31.6	24.2	2	
Palampur-1 (ZC-HZ)	19.4	24.4	6										
OL-125 (ZC-NWZ)					17.5	16.5							
JHO-99-2 (ZC-NEZ)									13.0	28.3	20.7	9	
Mean	16.2	25.2			21.7	23.0			15.8	28.7	22.3		
CD at 5%	5.9	1.7			2.9	11.0			1.0	5.6			
CV%	21.2	2.4			10.9	18.2			4.6	11.5			

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

Table 8.1: AVT Oat (SC)-2 (Seed): Second Advanced Varietal Trial in Oat (Single cut) for Seed 2011-12 (Repeat): Seed Yield (q/ha)

Entries	Central Zone					South Zone			All India		
	Jhansi	Jabalpur	Average	Rank	Superiority	Mandya	Rank	Superiority	Average	Rank	Superiority
UPO-09-1	17.6	14.7	16.1	7		8.2	4		20.2	5	
OS-363	21.1	19.7	20.4	2		7.6	6		20.5	3	
SKO-148	9.7	5.8	7.8	8		3.5	11		15.0	9	
JHO-2009-2	11.7	3.6	7.6	9		5.5	10		14.9	10	
SKO-156	10.6	1.1	5.9	10		5.6	9		17.4	8	
JO-03-95	22.8	16.4	19.6	3		8.3	3		20.4	4	
UPO-09-2	19.6	17.4	18.5	5		7.3	7		19.0	6	
JHO-2009-1	19.6	19.1	19.3	4		8.8	1	5.8	18.4	7	
Kent (NC)	20.8	19.9	20.4	2		8.1	5		21.0	1	
OS-6 (NC)	18.5	13.8	16.2	6		8.6	2		20.7	2	
JHO-822 (ZC-CZ)	20.5	23.9	22.2	1							
JHO-2000-4 (ZC-SZ)						6.1	8				
Mean	**17.5**	**14.1**	**15.8**			**7.0**			**18.9**		
CD at 5%	6.5	2.9				1.1					
CV%	3.9	12.0				9.1					

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

(Reference Tables: 9.1 to 9.9)

An initial varietal trial in Oat (Multi cut) comprising of nine entries namely OS-385, JO-4-317, RSO-60, JHO-13-2, OL-1689, OL-1802, PLP-15, JHO-13-4 and OL-1736 along with three national checks (Kent, UPO-212 and RO-19) was conducted at 18 centres located in four zones of the country. For green forage yield, entries OS-385 (4.9%) and JO-4-317 (0.9%) in Hill zone; entries JO-4-317 (10.1%), OS-385 (3.9%) and OL-1689 (1.0%) in North West zone; entries JO-4-317 (2.4%) and RSO-60 (1.9%) in North East zone; JO-4-317 (6.6%), RSO-60 (5.1%) and OL-1802 (3.8%) in Central zone exhibited superiority over best zonal/national check. At national level, entries JO-4-317 (7.6%), RSO-60 (2.9%), OS-385 (2.3%) and OL-1802 (0.3%) performed better than checks.

Similarly for dry matter yield (q/ha), entries JO-4-317 (5.6%) and OS-385 (0.9%) in Hill zone; entries JO-4-317 (17.3%), RSO-60 (6.6%), OL-1689 (4.0%) and JHO-13-2 (1.6%) in North-West zone; entries JHO-13-4 (5.3%), JO-4-317 (5.0%), OS-385 (3.0%) and RSO-60 (1.6%) in North-East zone, entries RSO-60 (7.3%), OL-1802 (5.0%) and JO-4-317 (2.0%) in Central zone registered superiority over best check. At national level, JO-4-317 (10.4%), RSO-60 (6.1%), JHO-13-4 (0.5%) and JHO-13-2 (0.4%) recorded superiority over best national check. For the character forage production potential (q/ha/day), JO-4-317 was ranked first for green forage production potential as well as for dry matter production potential. For plant height, entry national check RO-19 (90.0 cm) ranked first whereas for leafiness, entry OL-1736 (0.78) established its superiority.

In quality parameters, JO-4-317 (8.0 q/ha) ranked first for crude protein yield and entries OS-385 and JHO-13-2 (9.8%) were adjudged best performers for crude protein content. For other quality parameters, JHO-13-2 for IVDMD (%), OS-385 for ADF (%) and OL-1736 for NDF (%) were observed to be best performers.

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

(Reference Tables: 10.1 to 10.9)

In Oat (Multi cut), six entries namely PLP-14, OL-1766, JHO-2012-13, OL-1769, JO-04-315 and HFO-488 were evaluated against three national checks (Kent, RO-19 and UPO-212) at 18 locations in four zones of the country. For green forage yield (q/ha), entry JHO-2012-13 (1.8%) in Hill zone; entries JHO-2012-13 (3.1%) and PLP-14 (2.8%) in North East zone performed better than best zonal/national check. While in dry matter production (q/ha), entry JHO-2012-13 (1.7%) in Hill zone; entries HFO-488 (3.9%), OL-1769 and JO-04-315 (2.7%) and OL-1766 (0.8%) in North West zone; entries JHO-2012-13 (3.2%) and PLP-14 (0.7%) in North East zone; entries HFO-488 (12.7%), PLP-14 (6.3%), JO-04-315 (6.1%) and OL-1766 (1.9%) in Central zone exhibited their superiority. At national level, entries HFO-488 (6.1%), PLP-14 (2.5%), JHO-2012-13 (2.4%), JO-04-315 (1.2%) and OL-1766 (0.4%) recorded superiority over best national check. For evaluation against fodder production potential (q/ha/day), entry HFO-488 exhibited superiority over best check both for green forage as well as dry matter production potential.

For evaluation against growth parameter, OL-1769 (100.8 cm) ranked first for plant height whereas entry HFO-488 (0.81) was adjudged best performer for leafiness. In quality parameters, HFO-488 (7.9 q/ha) for crude protein yield and JHO-2012-13 (9.6%) for crude protein content proved their superiority. For other quality parameters, JO-04-315 for ADF (%) and IVDMD (%) and national check UPO-212 for NDF (%) was adjudged best performer.

Table 9.1: IVTO (MC): Initial Varietal Trial in Oat (Multi cut): Green Forage Yield (q/ha)

Entries	Hill Zone						North West Zone						
	Palam-pur	Sri-nagar	Alm-ora	Aver-age	Ra-nk	Superi-ority%	His-ar	Jal-ore	Ludh-iana	Udai-pur	Aver-age	Ra-nk	Superi-ority%
JHO-13-4	246.7	421.9	500.2	389.6	11		303.7	294.3	440.7	687.0	431.4	11	
OL-1689	214.2	394.6	668.3	425.7	7		300.0	374.0	548.1	807.9	507.5	3	1.0
OS-385	224.8	384.6	932.7	514.0	1	4.9	296.3	337.7	577.8	875.9	521.9	2	3.9
JHO-13-2	270.2	365.3	697.5	444.3	6		255.6	302.7	611.1	703.7	468.3	9	
RSO-60	231.5	441.6	666.5	446.5	5		322.2	321.0	603.7	741.2	497.0	5	
JO-4-317	251.9	425.3	806.6	494.6	2	0.9	331.5	374.7	681.5	826.0	553.4	1	10.1
OL-1736		453.3	232.6	343.0	12		240.7	51.4	396.3	0.0	172.1	12	
PLP-15	208.4	423.0	541.9	391.1	10		242.6	326.0	477.8	759.9	451.6	10	
OL-1802	153.3	402.6	715.4	423.7	9		268.5	342.0	559.3	811.1	495.2	6	
Kent (NC)	253.8	388.2	828.2	490.0	3		244.4	345.7	559.3	756.4	476.5	8	
UPO-212 (NC)	288.0	357.4	785.9	477.1	4		337.0	336.0	529.6	710.3	478.2	7	
RO-19 (NC)	169.7	368.7	736.2	424.9	8		255.6	418.0	564.8	771.4	502.4	4	
Mean	**228.4**	**402.2**	**676.0**	**438.7**			**283.2**	**318.6**	**545.8**	**704.2**	**463.0**		
CD at 5%	54.9	28.3	73.3				56.1	6.5	48.0	14.3			
CV%	14.1	7.4	19.0				11.7	11.7	6.4	11.3			

Table 9.1: IVTO (MC): Initial Varietal Trial in Oat (Multi cut): Green Forage Yield (q/ha)

Entries	North East Zone								
	Ranchi	Pusa	Faizabad	Jorhat	Bhubaneswar	Imphal	Average	Rank	Superiority%
JHO-13-4	426.7	549.0	328.0	381.6	445.2	235.1	394.3	8	
OL-1689	386.7	594.0	392.0	357.5	461.0	233.1	404.0	6	
OS-385	346.7	605.0	344.0	342.0	512.9	295.2	407.6	4	
JHO-13-2	346.7	594.0	360.0	402.0	454.3	275.1	405.3	5	
RSO-60	413.3	549.0	341.3	391.4	536.1	288.1	419.9	2	1.9
JO-4-317	426.7	561.0	381.3	423.9	438.0	299.1	421.7	1	2.4
OL-1736	324.4	572.0	333.3	462.9	45.3	258.8	332.8	12	
PLP-15	373.3	561.0	336.0	323.2	522.8	227.1	390.6	9	
OL-1802	386.7	616.0	357.3	349.9	441.2	267.6	403.1	7	
Kent (NC)	386.7	549.0	370.7	299.5	403.1	256.4	377.6	11	
UPO-212 (NC)	440.0	472.0	325.3	401.2	429.5	262.2	388.4	10	
RO-19 (NC)	413.3	538.0	333.3	384.2	480.8	320.7	411.7	3	
Mean	**389.3**	**563.3**	**350.2**	**376.6**	**430.9**	**268.2**	**396.4**		
CD at 5%	41.5	52.6	10.2	9.1	27.0	9.8			
CV%	6.2	9.7	15.2	8.0	3.7	8.5			

Table 9.1: IVTO (MC): Initial Varietal Trial in Oat (Multi cut): Green Forage Yield (q/ha)

Entries	Central Zone								All India		
	Jhansi	Anand	Jabalpur	Rahuri	Urulikanchan	Average	Rank	Superiority%	Average	Rank	Superiority%
JHO-13-4	279.7	773.0	513.2	511.9	599.6	535.5	11		441.0	11	
OL-1689	295.1	840.0	546.5	597.6	623.6	580.6	7		479.7	6	
OS-385	306.6	834.0	574.5	589.7	632.1	587.4	6		500.7	3	2.3
JHO-13-2	319.2	839.0	571.8	604.5	506.4	568.2	9		471.0	8	
RSO-60	305.8	839.0	615.8	643.9	810.2	642.9	2	5.1	503.4	2	2.9
JO-4-317	324.8	890.0	710.5	672.5	660.9	651.8	1	6.6	527.0	1	7.6
OL-1736	262.2		533.2	474.8	413.1	420.8	12		315.9	12	
PLP-15	296.5	880.0	659.8	536.5	585.8	591.7	5		460.1	10	
OL-1802	308.3	876.0	594.5	597.1	799.5	635.1	3	3.8	491.5	4	0.3
Kent (NC)	295.9	746.0	571.8	587.8	560.2	552.4	10		466.8	9	
UPO-212 (NC)	336.7	743.0	630.5	571.7	583.6	573.1	8		474.4	7	
RO-19 (NC)	298.1	832.0	615.8	686.0	625.7	611.5	4		489.6	5	
Mean	**302.4**	**826.5**	**594.8**	**589.5**	**616.7**	**579.2**			**468.4**		
CD at 5%	14.3	52.3	118.5	85.1	72.6						
CV%	2.8	3.7	11.8	8.5	18.0						

Table 9.2: IVTO (MC): Initial Varietal Trial in Oat (Multi cut): Dry Matter Yield (q/ha)

Entries	Hill Zone						North West Zone				
	Palam-pur	Sri-nagar	Alm-ora	Aver-age	Ra-nk	Super-iority%	His-ar	Ludh-iana	Aver-age	Ra-nk	Super-iority%
JHO-13-4	49.2	105.3	26.9	60.5	7		58.4	80.5	69.4	10	
OL-1689	40.9	94.2	29.5	54.8	10		55.3	105.0	80.2	3	4.0
OS-385	43.2	99.3	46.3	62.9	2	0.9	45.1	100.5	72.8	7	
JHO-13-2	50.5	93.3	31.6	58.5	8		45.8	111.0	78.4	4	1.6
RSO-60	43.3	113.6	28.9	61.9	5		59.9	104.6	82.2	2	6.6
JO-4-317	48.6	106.9	41.8	65.8	1	5.6	56.8	123.9	90.4	1	17.3
OL-1736		113.5	10.5	62.0	4		38.5	69.8	54.2	12	
PLP-15	39.8	101.9	24	55.2	9		39.2	90.2	64.7	11	
OL-1802	29.0	100.6	33.7	54.5	11		43.0	101.6	72.3	8	
Kent (NC)	47.2	98.4	41.2	62.3	3		47.2	97.3	72.2	9	
UPO-212 (NC)	54.9	89.2	41.3	61.8	6		61.0	91.0	76.0	6	
RO-19 (NC)	32.5	92.3	34.9	53.2	12		45.5	108.6	77.1	5	
Mean	**43.5**	**100.7**	**32.6**	**59.4**			**49.6**	**98.7**	**74.1**		
CD at 5%	11.0	4.4	8.0				12.7	12.2			
CV%	14.9	2.1	14.6				15.1	9.0			

Table 9.2: IVTO (MC): Initial Varietal Trial in Oat (Multi cut): Dry Matter Yield (q/ha)

Entries	North East Zone								
	Ran-chi	Pu-sa	Faiza-bad	Jor-hat	Bhuba-neswar	Imp-hal	Aver-age	Ra-nk	Superi-ority%
JHO-13-4	90.5	108.7	60.0	57.3	88.8	33.5	73.1	1	5.3
OL-1689	61.1	117.2	59.5	46.3	89.0	26.7	66.6	9	
OS-385	60.1	118.4	63.5	48.5	101.9	36.0	71.4	3	3.0
JHO-13-2	63.2	116.0	60.0	53.7	89.9	31.0	69.0	6	
RSO-60	57.3	109.6	73.1	48.2	105.2	29.6	70.5	4	1.6
JO-4-317	63.3	110.9	84.0	58.2	85.1	36.0	72.9	2	5.0
OL-1736	45.5	112.8	74.1	72.5	8.8	27.0	56.8	12	
PLP-15	54.7	110.9	60.5	42.4	100.5	24.0	65.5	11	
OL-1802	59.3	121.3	69.8	43.4	84.8	24.0	67.1	8	
Kent (NC)	68.1	109.2	72.5	48.3	78.7	29.6	67.8	7	
UPO-212 (NC)	64.7	94.2	63.0	60.3	85.1	29.9	66.2	10	
RO-19 (NC)	66.8	107.4	60.3	54.8	92.5	34.7	69.4	5	
Mean	**62.9**	**111.4**	**66.7**	**52.8**	**84.2**	**30.2**	**68.0**		
CD at 5%	11.9	9.8	10.7	3.2	6.9	3.1			
CV%	11.1	8.6	9.5	7.5	4.9	12.7			

Table 9.2: IVTO (MC): Initial Varietal Trial in Oat (Multi cut): Dry Matter Yield (q/ha)

Entries	Central Zone								All India		
	Jhansi	Anand	Jabalpur	Rahuri	Urulikanchan	Average	Rank	Superiority%	Average	Rank	Superiority%
JHO-13-4	29.1	114.0	105.3	94.8	100.6	88.8	8		75.2	3	0.5
OL-1689	28.4	104.4	115.9	99.4	95.5	88.7	9		73.0	10	
OS-385	31.1	109.0	105.3	92.3	82.2	84.0	10		73.9	8	
JHO-13-2	34.0	115.1	117.3	114.7	74.8	91.2	6		75.1	4	0.4
RSO-60	30.4	115.8	126.6	114.7	109.3	99.3	2	7.3	79.4	2	6.1
JO-4-317	34.5	121.1	150.6	110.9	89.6	101.3	1	2.0	82.6	1	10.4
OL-1736	26.7		116.0	88.9	60.4	73.0	11		61.8	12	
PLP-15	31.9	116.3	140.0	95.0	74.3	91.5	5		71.6	11	
OL-1802	35.7	116.0	124.0	102.3	107.4	97.1	3	5.0	74.7	6	
Kent (NC)	31.9	105.7	120.0	102.5	89.8	90.0	7		74.2	7	
UPO-212 (NC)	35.2	111.2	132.0	100.2	83.7	92.5	4		74.8	5	
RO-19 (NC)	26.4	100.1	126.6	108.3	82.6	88.8	8		73.4	9	
Mean	**31.3**	**111.7**	**123.3**	**102.0**	**87.5**	**90.5**			**74.1**		
CD at 5%	5.0	7.5	28.4	16.2	10.0						
CV%	9.5	4.0	13.6	9.4	11.2						

Table 9.3: IVTO (MC): Initial Varietal Trial in Oat (Multi cut): Green Forage Yield (q/ha/day)

Entries	His-ar	Ludh-iana	Ran-chi	Pu-sa	Faiza-bad	Jor-hat	Bhuba-neswar	Ana-nd	Rah-uri	Aver-age	Ra-nk
JHO-13-4	2.15	3.00	5.47	5.90	3.15	4.15	5.71	7.16	5.39	4.68	7
OL-1689	2.13	3.70	4.83	6.25	3.66	3.47	5.62	7.78	5.80	4.80	4
OS-385	2.10	3.90	3.85	6.37	3.24	3.32	6.11	7.32	5.51	4.64	10
JHO-13-2	1.81	4.20	4.08	6.39	3.43	4.10	6.06	7.77	5.99	4.87	2
RSO-60	2.29	4.10	3.29	5.90	3.48	3.80	6.54	7.77	6.44	4.85	3
JO-4-317	2.35	4.60	4.96	5.97	3.81	4.16	5.69	7.81	7.01	5.15	1
OL-1736	1.71	2.70	3.64	6.09	3.30	4.49	0.60		4.90	3.43	12
PLP-15	1.72	3.30	4.01	5.97	3.29	3.14	6.97	7.72	5.06	4.58	11
OL-1802	1.90	3.80	4.44	6.48	3.47	3.43	5.52	8.11	5.74	4.77	5
Kent (NC)	1.73	3.80	4.66	5.97	3.71	3.64	5.45	6.91	6.06	4.66	9
UPO-212 (NC)	2.39	3.60	5.57	5.13	3.29	4.09	5.30	6.88	5.77	4.67	8
RO-19 (NC)	1.81	3.80	4.44	5.91	3.30	3.73	6.09	7.30	6.41	4.75	6
Mean	**2.01**	**3.71**	**4.44**	**6.03**	**3.43**	**3.79**	**5.47**	**7.50**	**5.84**	**4.65**	

Table 9.4: IVTO (MC): Initial Varietal Trial in Oat (Multi cut): Dry Matter Yield (q/ha/day)

Entries	His-ar	Ludh-iana	Ran-chi	Pu-sa	Faiza-bad	Bhuban-eswar	Ana-nd	Rah-uri	Aver-age	Ra-nk
JHO-13-4	0.41	0.60	1.16	1.17	0.58	1.14	1.06	1.00	0.89	3
OL-1689	0.39	0.70	0.76	1.23	0.55	1.08	0.97	0.96	0.83	5
OS-385	0.32	0.70	0.67	1.25	0.60	1.21	0.96	0.86	0.82	6
JHO-13-2	0.32	0.80	0.74	1.25	0.57	1.20	1.07	1.14	0.89	3
RSO-60	0.42	0.70	0.68	1.18	0.74	1.28	1.07	1.15	0.90	2
JO-4-317	0.40	0.90	0.74	1.18	0.84	1.11	1.06	1.16	0.92	1
OL-1736	0.27	0.50	0.51	1.20	0.73	0.12		0.92	0.61	8
PLP-15	0.28	0.60	0.59	1.18	0.59	1.34	1.02	0.90	0.81	7
OL-1802	0.30	0.70	0.83	1.28	0.68	1.06	1.07	0.98	0.86	4
Kent (NC)	0.33	0.70	0.82	1.19	0.72	1.06	0.98	1.06	0.86	4
UPO-212 (NC)	0.43	0.60	0.82	1.02	0.64	1.05	1.03	1.01	0.83	5
RO-19 (NC)	0.32	0.70	0.71	1.18	0.60	1.17	0.88	1.01	0.82	6
Mean	**0.35**	**0.68**	**0.75**	**1.19**	**0.65**	**1.07**	**1.02**	**1.01**	**0.84**	

Table 9.5: IVTO (MC): Initial Varietal Trial in Oat (Multi cut): Crude Protein Yield (q/ha)

Entries	Palam-pur	His-ar	Ludh-iana	Faiza-bad	Jor-hat	Bhuban-eswar	Imp-hal	Ana-nd	Jabal-pur	Rah-uri	Urulika-nchan	Aver-age	Ra-nk
JHO-13-4	4.7	5.6	10.1	4.7	3.1	8.4	1.6	13.7	8.5	8.9	8.7	7.1	7
OL-1689	4.3	5.4	15.1	4.7	2.5	8.0	1.1	14.5	9.4	8.8	8.3	7.5	4
OS-385	4.2	4.8	16.2	4.8	2.6	9.2	1.9	12.3	9.4	8.2	7.4	7.4	5
JHO-13-2	5.3	4.5	15.4	4.9	2.9	8.2	1.8	14.9	9.4	9.3	6.9	7.6	3
RSO-60	4.2	5.4	13.0	5.8	2.4	9.5	1.4	15.2	10.5	8.7	10.4	7.9	2
JO-4-317	4.9	5.8	12.9	6.8	3.1	8.0	1.8	13.6	12.5	9.9	8.4	8.0	1
OL-1736		3.7	10.5	6.0	3.8	0.8	1.8		9.3	6.6	5.8	5.4	9
PLP-15	4.1	3.4	11.8	4.8	2.2	9.3	1.4	13.5	11.4	7.7	6.9	6.9	8
OL-1802	2.9	4.3	15.3	5.4	2.2	7.8	1.3	15.5	10.1	7.8	9.9	7.5	4
Kent (NC)	4.4	4.4	14.2	5.7	2.6	7.4	1.4	11.3	9.7	8.3	8.3	7.1	7
UPO-212 (NC)	5.8	5.8	11.7	5.0	3.2	7.9	1.5	13.1	10.9	8.5	7.9	7.4	5
RO-19 (NC)	3.4	4.0	14.3	4.8	2.9	8.5	1.6	12.5	10.5	9.2	7.9	7.2	6
Mean	**4.4**	**4.7**	**13.4**	**5.3**	**2.8**	**7.7**	**1.6**	**13.7**	**10.1**	**8.5**	**8.1**	**7.2**	

Table 9.6: IVTO (MC): Initial Varietal Trial in Oat (Multi cut): Crude Protein (%)

Entries	Palam-pur	His-ar	Ludh-iana	Faiza-bad	Jor-hat	Bhuban-eswar	Imp-hal	Ana-nd	Jabal-pur	Rah-uri	Urulika-nchan	Aver-age	Ra-nk
JHO-13-4	9.6	9.7	12.5	7.8	11.0	9.4	4.9	12.8	8.5	9.4	8.6	9.5	3
OL-1689	10.5	9.7	14.4	7.9	11.0	9.0	4.0	14.3	8.5	8.9	8.7	9.7	2
OS-385	9.6	10.8	16.1	7.5	10.9	9.1	5.3	12.0	8.5	8.9	9.1	9.8	1
JHO-13-2	10.5	10.0	13.9	8.1	10.8	9.1	5.6	13.4	8.5	8.1	9.3	9.8	1
RSO-60	9.6	9.2	12.4	8.0	10.4	9.0	4.7	13.8	8.5	7.6	9.5	9.3	5
JO-4-317	10.2	10.2	10.4	8.1	10.8	9.4	4.9	11.9	8.6	8.9	9.4	9.3	5
OL-1736		9.6	15.0	8.1	10.7	9.2	6.2		8.1	7.5	9.5	9.3	5
PLP-15	9.6	8.6	13.1	8.0	10.5	9.3	5.8	13.0	8.5	8.1	9.3	9.4	4
OL-1802	10.5	10.1	15.1	7.8	10.5	9.2	5.4	14.1	8.5	7.6	9.2	9.8	1
Kent (NC)	9.3	9.3	14.6	7.9	11.0	9.4	4.8	11.5	8.5	8.1	9.3	9.4	4
UPO-212 (NC)	10.5	9.5	12.9	8.0	10.7	9.2	5.0	12.4	8.5	8.5	9.5	9.5	3
RO-19 (NC)	10.2	8.8	13.2	7.9	10.8	9.2	4.5	12.9	8.6	8.5	9.5	9.5	3
Mean	**10.0**	**9.6**	**13.6**	**7.9**	**10.8**	**9.2**	**5.1**	**12.9**	**8.5**	**8.3**	**9.2**	**9.5**	

Table 9.7: IVTO (MC): Initial Varietal Trial in Oat (Multi cut): Plant Height (cm)

Entries	Palam-pur	Sri-nagar	His-ar	Ludh-iana	Udai-pur	Ran-chi	Faiza-bad	Jor-hat
JHO-13-4	74.3	122.8	93.6	66.1	84.3	76.0	110.0	56.8
OL-1689	73.3	115.2	98.7	76.6	87.7	69.0	101.5	78.5
OS-385	65.7	103.9	97.9	76.6	94.9	59.0	115.8	73.7
JHO-13-2	62.7	122.3	92.7	66.4	79.6	63.0	101.2	69.4
RSO-60	62.0	127.1	95.4	67.5	90.2	37.0	110.8	80.1
JO-4-317	69.3	116.0	94.4	74.3	91.0	68.0	115.4	78.9
OL-1736		128.7	90.2	71.5	0.0	84.0	103.6	48.1
PLP-15	69.0	135.2	93.4	67.5	94.8	68.0	105.8	73.4
OL-1802	71.3	126.3	93.9	75.3	90.6	72.0	130.5	68.9
Kent (NC)	70.7	116.2	99.7	67.2	83.7	63.0	120.6	68.1
UPO-212 (NC)	73.7	120.3	107.6	76.7	86.5	64.0	126.7	80.9
RO-19 (NC)	69.7	116.4	93.3	75.2	94.1	69.0	125.6	71.7
Mean	**69.2**	**120.9**	**95.9**	**71.7**	**81.4**	**66.0**	**114.0**	**70.7**

Table 9.7: IVTO (MC): Initial Varietal Trial in Oat (Multi cut): Plant Height (cm)

Entries	Bhuban-eswar	Imp-hal	Jha-nsi	Ana-nd	Jabal-pur	Rah-uri	Urulika-nchan	Aver-age	Ra-nk
JHO-13-4	106.2	74.5	54.8	105.4	70.0	77.4	57.8	82.0	10
OL-1689	111.1	79.6	56.1	117.8	72.6	78.1	61.3	85.1	8
OS-385	125.6	94.2	59.1	147.4	77.6	90.9	62.1	89.6	2
JHO-13-2	103.1	80.7	63.8	107.6	80.1	71.5	55.4	81.3	11
RSO-60	126.5	81.9	70.6	119.1	82.8	80.9	72.8	87.0	7
JO-4-317	109.1	87.4	75.1	109.3	90.1	82.0	57.6	87.9	5
OL-1736	98.4	83.5	74.0		74.9	72.5	65.5	76.5	12
PLP-15	119.6	77.2	71.2	106.6	87.6	81.1	55.5	87.1	6
OL-1802	114.3	95.4	64.6	107.6	68.6	77.3	64.9	88.1	4
Kent (NC)	99.3	83.0	62.7	112.2	79.0	72.5	62.3	84.0	9
UPO-212 (NC)	102.2	89.8	67.1	112.5	85.1	75.1	61.2	88.6	3
RO-19 (NC)	116.5	92.9	69.9	112.9	82.6	91.5	69.3	90.0	1
Mean	**111.0**	**85.0**	**65.7**	**114.4**	**79.3**	**79.2**	**62.1**	**85.6**	

Table 9.8: IVTO (MC): Initial Varietal Trial in Oat (Multi cut): Leaf Stem Ratio

Entries	Palam-pur	Sri-nagar	His-ar	Ludh-iana	Ran-chi	Faiza-bad	Jor-hat	Bhuban-eswar
JHO-13-4	0.41	0.5	0.61	0.70	0.18	0.71	0.69	1.01
OL-1689	0.41	0.47	0.82	0.50	0.35	0.70	0.93	1.08
OS-385	0.34	0.47	0.77	0.30	0.36	0.69	0.77	1.19
JHO-13-2	0.30	0.5	0.69	0.40	0.23	0.67	0.52	0.98
RSO-60	0.42	0.49	0.65	0.90	0.36	0.69	0.55	1.24
JO-4-317	0.36	0.42	0.74	1.00	0.25	0.67	0.82	1.05
OL-1736		0.53	0.74	0.70	0.40	0.65	0.64	0.89
PLP-15	0.45	0.49	0.95	0.70	0.32	0.69	0.67	1.17
OL-1802	0.42	0.52	0.88	0.60	0.29	0.70	0.48	1.11
Kent (NC)	0.37	0.49	0.59	0.90	0.23	0.66	0.68	0.89
UPO-212 (NC)	0.34	0.47	0.71	0.30	0.39	0.68	0.53	0.94
RO-19 (NC)	0.47	0.48	0.75	0.30	0.32	0.68	0.88	1.14
Mean	**0.39**	**0.49**	**0.74**	**0.61**	**0.31**	**0.68**	**0.68**	**1.06**

Table 9.8: IVTO (MC): Initial Varietal Trial in Oat (Multi cut): Leaf Stem Ratio

Entries	Imp-hal	Jha-nsi	Jabal-pur	Rah-uri	Urulika-nchan	Aver-age	Ra-nk
JHO-13-4	0.74	0.25	0.70	0.67	0.90	0.62	8
OL-1689	1.14	0.32	0.75	0.73	1.20	0.72	2
OS-385	0.93	0.23	0.75	0.92	0.94	0.67	5
JHO-13-2	1.06	0.24	0.75	0.70	0.94	0.61	9
RSO-60	0.65	0.31	0.82	0.67	0.87	0.66	6
JO-4-317	0.94	0.25	0.90	0.75	1.01	0.70	3
OL-1736	1.56	0.25	0.62	1.08	1.36	0.78	1
PLP-15	1.11	0.42	0.89	0.80	1.57	0.72	2
OL-1802	1.25	0.26	0.78	0.66	0.90	0.68	4
Kent (NC)	0.72	0.22	0.76	0.72	0.89	0.62	8
UPO-212 (NC)	0.90	0.26	0.85	0.84	0.96	0.63	7
RO-19 (NC)	0.86	0.25	0.81	0.76	1.02	0.67	5
Mean	**0.99**	**0.27**	**0.78**	**0.77**	**1.05**	**0.67**	

Table 9.9: IVTO (MC): Initial Varietal Trial in Oat (Multi cut): ADF (%), NDF (%) and IVDMD (%)

Entries	ADF (%)		NDF (%)				IVDMD (%)			
	Ludh-iana	Ra-nk	Ludh-iana	Ana-nd	Aver-age	Ra-nk	His-ar	Ludh-iana	Aver-age	Ra-nk
JHO-13-4	38.9	10	47.9	56.0	52.0	6	54.8	51.2	53.0	11
OL-1689	34.7	4	42.6	63.0	52.8	8	53.8	57.2	55.5	6
OS-385	31.3	1	40.4	58.0	49.2	3	53.3	60.4	56.9	5
JHO-13-2	35.7	6	44.1	63.0	53.6	9	59.8	56.6	58.2	1
RSO-60	39.1	11	47.0	67.0	57.0	11	59.5	50.2	54.8	8
JO-4-317	39.9	12	49.8	70.0	59.9	12	58.7	49.6	54.2	10
OL-1736	33.0	2	41.3		41.3	1	57.7	58.0	57.9	3
PLP-15	36.9	8	44.4	60.0	52.2	7	59.7	55.8	57.8	4
OL-1802	35.5	5	43.1	57.0	50.1	4	58.6	57.4	58.0	2
Kent (NC)	34.0	3	42.4	67.0	54.7	10	57.9	57.6	57.8	4
UPO-212 (NC)	38.1	9	45.3	57.0	51.2	5	56.4	52.4	54.4	9
RO-19 (NC)	36.0	7	44.2	51.0	47.6	2	55.4	55.0	55.2	7
Mean	**36.1**		**44.4**	**60.8**	**51.8**		**57.1**	**55.1**	**56.1**	

Table 10.1: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): Green Forage Yield (q/ha)

Entries	Hill Zone						North West Zone						
	Palam-pur	Srina-gar	Alm-ora	Aver-age	Ra-nk	Superi-ority%	His-ar	Ludh-iana	Udai-pur	*Jal-ore	Aver-age	Ra-nk	Superi-ority%
PLP-14	160.9	393.0	180.4	244.8	9		333.3	644.4	591.6	386.0	523.1	7	
OL-1766	202.6	375.4	211.9	263.3	8		355.6	658.3	659.7	452.7	557.9	2	
JHO-2012-13	216.0	412.6	249.8	292.8	1	1.8	363.9	602.8	587.5	444.7	518.1	8	
OL-1769	217.3	380.9	247.0	281.7	4		330.6	655.6	680.7	433.0	555.6	4	
JO-04-315	221.7	349.5	255.9	275.7	6		380.6	619.4	673.3	478.3	557.8	3	
HFO-488	224.8	399.0	226.1	283.3	3		352.8	619.4	676.4	482.7	549.5	5	
UPO-212 (NC)	219.5	413.8	229.3	287.6	2		358.3	647.2	604.2	451.7	536.6	6	
RO-19 (NC)	122.2	399.7	306.7	276.2	5		305.6	655.6	774.9	562.3	578.7	1	
Kent (NC)	191.1	403.5	208.2	267.6	7		269.4	533.3	557.0	441.0	453.2	9	
Mean	**197.3**	**391.9**	**235.0**	**274.8**			**338.9**	**626.2**	**645.0**	**459.1**	**536.7**		
CD at 5%	25.7	12.4	48.4				69.2	48.9	98.6	18.6			
CV%	7.5	4.6	12.0				12.0	3.9	8.8	23.4			

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

Table 10.1: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): Green Forage Yield (q/ha)

Entries	North East Zone								
	Ranchi	Pusa	Faizabad	Jorhat	Bhubaneswar	Imphal	Average	Rank	Superiority%
PLP-14	293.3	571.0	382.9	338.9	414.1	390.3	398.4	2	2.8
OL-1766	273.3	594.0	392.3	338.5	435.8	246.6	380.1	5	
JHO-2012-13	303.3	505.0	337.1	377.1	480.5	394.1	399.5	1	3.1
OL-1769	263.3	520.0	300.9	327.3	498.0	238.7	358.0	9	
JO-04-315	296.7	532.0	358.1	292.6		368.6	369.6	7	
HFO-488	320.0	553.0	333.4	294.8	436.7	377.9	386.0	4	
UPO-212 (NC)	280.0	452.0	325.7	387.9		375.6	364.2	8	
RO-19 (NC)	306.7	447.0	365.7	315.7	528.1	361.1	387.4	3	
Kent (NC)	316.7	568.0	388.6	276.5	384.7	327.7	377.0	6	
Mean	**294.8**	**526.9**	**353.9**	**327.7**	**454.0**	**342.3**	**380.0**		
CD at 5%	29.1	43.4	71.1	9.0	42.1	8.6			
CV%	5.7	9.1	11.6	9.7	5.2	7.5			

Table 10.1: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): Green Forage Yield (q/ha)

Entries	Central Zone								All India		
	Jha-nsi	Ana-nd	Jabal-pur	Rah-uri	Urulika-nchan	Aver-age	Ra-nk	Super-iority%	Aver-age	Ra-nk	Superi-ority%
PLP-14	413.3	818.0	442.0	695.4	758.2	625.4	3		460.1	4	
OL-1766	396.2	800.0	395.0	649.2	803.9	608.9	5		458.1	5	
JHO-2012-13	377.5	651.0	467.0	613.7	784.9	578.8	7		454.3	6	
OL-1769	413.1	704.0	469.0	570.3	868.7	605.0	6		452.1	7	
JO-04-315	379.9	825.0	404.0	656.5	807.7	614.6	4		463.8	3	
HFO-488	395.8	875.0	539.0	647.1	731.5	637.7	2		470.7	2	
UPO-212 (NC)	414.8	717.0	372.0	624.5	712.5	568.2	8		445.9	8	
RO-19 (NC)	389.1	775.0	467.0	670.0	887.7	637.8	1		475.2	1	
Kent (NC)	386.1	650.0	469.0	540.8	723.9	554.0	9		423.2	9	
Mean	**396.2**	**757.2**	**447.1**	**629.7**	**786.6**	**603.4**			**455.9**		
CD at 5%	20.0	41.9	85.9	88.0	47.9						
CV%	2.9	3.2	11.1	8.1	7.9						

Table 10.2: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): Dry Matter Yield (q/ha)

Entries	Hill Zone						North West Zone				
	Palam-pur	Srina-gar	Alm-ora	Aver-age	Ra-nk	Superi-ority%	His-ar	Ludh-iana	Aver-age	Ra-nk	Superi-ority%
PLP-14	31.3	96.2	26.8	51.4	9		58.2	114.9	86.6	5	
OL-1766	38.4	91.9	25.1	51.8	6		57.2	119.7	88.4	3	0.8
JHO-2012-13	40.9	101.1	39.0	60.3	1	1.7	59.7	111.3	85.5	6	
OL-1769	41.3	93.3	32.1	55.6	8		60.3	119.9	90.1	2	2.7
JO-04-315	42.1	85.8	40.3	56.1	5		61.3	119.0	90.1	2	2.7
HFO-488	44.1	97.6	31.9	57.8	3		66.5	115.5	91.0	1	3.8
UPO-212 (NC)	42.5	101.3	34.1	59.3	2		59.1	116.3	87.7	4	
RO-19 (NC)	24.2	97.7	47.2	56.3	4		44.5	118.1	81.3	7	
Kent (NC)	37.8	98.8	30.5	55.7	7		38.5	92.5	65.5	8	
Mean	**38.1**	**96.0**	**34.1**	**56.0**			**56.1**	**114.1**	**85.1**		
CD at 5%	6.0	4.5	6.2				12.0	18.3			
CV%	9.1	3.1	14.0				12.6	6.4			

Table 10.2: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): Dry Matter Yield (q/ha)

Entries	North East Zone								
	Ran-chi	Pu-sa	Faiza-bad	Jor-hat	Bhuba-neswar	Imp-hal	Aver-age	Ra-nk	Superi-ority%
PLP-14	59.7	112.2	80.8	50.0	84.3	41.7	71.4	2	0.7
OL-1766	50.0	116.7	81.8	51.2	88.5	29.4	69.6	4	
JHO-2012-13	57.5	110.8	72.0	52.6	98.4	47.8	73.2	1	3.2
OL-1769	50.7	103.0	62.1	39.0	101.0	25.9	63.6	8	
JO-04-315	52.1	105.6	69.0	41.3		48.0	63.2	9	
HFO-488	57.5	109.9	67.4	43.3	88.8	47.8	69.1	5	
UPO-212 (NC)	57.1	90.0	76.4	57.2		39.2	64.0	7	
RO-19 (NC)	56.6	89.2	78.5	44.7	106.5	49.7	70.9	3	
Kent (NC)	65.5	111.8	78.3	34.4	77.9	34.9	67.1	6	
Mean	**56.3**	**105.5**	**74.0**	**46.0**	**92.2**	**40.5**	**68.0**		
CD at 5%	8.6	11.3	8.3	2.9	8.6	2.8			
CV%	8.8	10.7	6.5	8.4	5.3	7.8			

Table 10.2: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): Dry Matter Yield (q/ha)

Entries	Central Zone								All India		
	Jha-nsi	Ana-nd	Jabal-pur	Rah-uri	Urulika-nchan	Aver-age	Ra-nk	Superi-ority%	Aver-age	Ra-nk	Superi-ority%
PLP-14	65.6	114.0	91.0	121.1	90.9	96.5	2	6.3	77.4	2	2.5
OL-1766	60.0	110.5	81.0	114.2	96.6	92.5	4	1.9	75.8	5	0.4
JHO-2012-13	57.5	85.7	100.0	110.6	92.6	89.3	7		77.3	3	2.4
OL-1769	62.8	81.3	97.0	99.7	100.7	88.3	8		73.1	8	
JO-04-315	60.9	104.0	85.0	129.6	102.1	96.3	3	6.1	76.4	4	1.2
HFO-488	65.5	118.7	112.6	123.1	91.8	102.3	1	12.7	80.1	1	6.1
UPO-212 (NC)	63.9	106.5	77.0	115.1	91.5	90.8	5		75.1	7	
RO-19 (NC)	52.8	96.1	98.0	107.7	96.6	90.2	6		75.5	6	
Kent (NC)	58.1	83.2	97.0	91.0	95.8	85.0	9		70.4	9	
Mean	**60.8**	**100.0**	**93.2**	**112.5**	**95.4**	**92.4**					
CD at 5%	8.7	6.1	16.5	17.5	5.9				**75.7**		
CV%	8.3	3.5	10.2	9.0	4.3						

Table 10.3: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): Green Forage Yield (q/ha/day)

Entries	Hisar	Ludhiana	Ranchi	Pusa	Anand	Rahuri	Bhubaneswar	Faizabad	Average	Rank
PLP-14	2.36	4.40	3.33	6.01	7.18	6.75	5.45	3.64	4.89	2
OL-1766	2.52	4.50	3.07	6.25	7.02	6.43	5.59	3.70	4.88	3
JHO-2012-13	2.58	4.10	3.53	5.43	6.03	6.02	6.49	3.21	4.67	5
OL-1769	2.34	4.50	2.99	5.59	6.52	5.54	6.15	3.10	4.59	7
JO-04-315	2.70	4.20	3.26	5.66	7.24	6.63		3.73	4.77	4
HFO-488	2.50	4.20	3.44	5.95	7.68	6.34	5.98	3.36	4.93	1
UPO-212 (NC)	2.54	4.40	3.22	4.91	6.29	6.06		3.19	4.37	9
RO-19 (NC)	2.17	4.50	3.26	4.86	6.80	6.32	5.86	3.45	4.65	6
Kent (NC)	1.91	3.60	3.73	5.98	6.02	5.35	5.13	3.74	4.43	8
Mean	**2.40**	**4.27**	**3.31**	**5.63**	**6.75**	**6.16**	**5.81**	**3.46**	**4.69**	

Table 10.4: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): Dry Matter Yield (q/ha/day)

Entries	Hisar	Ludhiana	Ranchi	Pusa	Jorhat	Anand	Rahuri	Bhubaneswar	Faizabad	Average	Rank
PLP-14	0.41	0.80	0.68	1.18	0.51	1.00	1.18	1.11	0.77	0.85	1
OL-1766	0.41	0.80	0.56	1.23	0.52	0.97	1.13	1.13	0.77	0.84	2
JHO-2012-13	0.42	0.80	0.67	1.19	0.55	0.79	1.08	1.33	0.69	0.84	2
OL-1769	0.43	0.80	0.58	1.11	0.40	0.75	0.97	1.25	0.64	0.77	5
JO-04-315	0.43	0.80	0.57	1.12	0.45	0.91	1.31		0.72	0.79	3
HFO-488	0.47	0.80	0.62	1.18	0.46	1.04	1.21	1.22	0.68	0.85	1
UPO-212 (NC)	0.42	0.80	0.66	0.98	0.62	0.93	1.12		0.75	0.78	4
RO-19 (NC)	0.32	0.80	0.60	0.97	0.46	0.84	1.02	1.38	0.74	0.79	3
Kent (NC)	0.27	0.60	0.77	1.18	0.37	0.77	0.90	1.04	0.75	0.74	6
Mean	**0.40**	**0.78**	**0.63**	**1.13**	**0.48**	**0.89**	**1.10**	**1.21**	**0.72**	**0.81**	

Table 10.5: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): Crude Protein Yield (q/ha)

Entries	Palam-pur	His-ar	Ludh-iana	Faiza-bad	Jor-hat	Bhuban-eswar	Imp-hal	Ana-nd	Jabal-pur	Rah-uri	Urulika-nchan	Aver-age	Ra-nk
PLP-14	3.2	5.3	13.4	6.5	2.2	7.9	1.8	12.3	7.3	8.4	8.4	7.0	6
OL-1766	4.0	5.1	13.3	6.7	2.6	8.9	1.5	13.4	6.5	9.0	8.8	7.3	3
JHO-2012-13	4.3	5.8	14.9	6.0	2.6	9.9	2.4	10.4	8.3	9.7	8.8	7.5	2
OL-1769	4.2	5.6	17.3	5.0	2.1	9.4	1.2	9.9	7.8	6.1	9.6	7.1	5
JO-04-315	4.1	5.9	16.2	5.5	2.1		1.8	11.8	6.8	8.5	9.7	7.2	4
HFO-488	4.6	5.9	16.7	5.4	2.2	8.3	2.0	14.0	9.1	10.2	8.2	7.9	1
UPO-212 (NC)	4.7	5.5	15.4	6.2	2.9		2.0	12.1	6.0	10.0	8.5	7.3	3
RO-19 (NC)	2.6	4.2	13.9	6.3	2.3	10.5	2.7	10.8	8.0	8.9	9.1	7.2	4
Kent (NC)	4.1	3.6	12.1	6.3	1.7	7.5	1.7	11.2	7.9	6.7	8.9	6.5	7
Mean	**4.0**	**5.2**	**14.8**	**6.0**	**2.3**	**8.9**	**1.9**	**11.8**	**7.5**	**8.6**	**8.9**	**7.2**	

Table 10.6: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): Crude Protein (%)

Entries	Palam-pur	His-ar	Ludh-iana	Faiza-bad	Jor-hat	Bhuban-eswar	Imp-hal	Ana-nd	Rah-uri	Urulika-nchan	Jabal-pur	Aver-age	Ra-nk
PLP-14	10.2	9.1	11.7	8.1	9.8	9.4	4.9	11.5	7.0	9.1	8.2	9.0	7
OL-1766	10.5	9.2	11.1	8.2	10.2	10.1	4.4	12.4	7.9	8.7	8.2	9.2	5
JHO-2012-13	10.5	9.6	13.4	8.3	9.9	10.1	5.0	12.3	8.7	9.2	8.2	9.6	1
OL-1769	10.2	9.3	14.4	8.1	10.9	9.3	4.6	11.9	6.1	9.3	8.2	9.3	4
JO-04-315	9.6	9.7	13.6	8.0	10.5		4.3	11.4	6.5	9.0	8.1	9.1	6
HFO-488	10.5	9.1	14.5	8.0	10.2	9.4	4.4	13.0	8.3	8.4	8.2	9.5	2
UPO-212 (NC)	11.1	9.2	13.2	8.1	10.4		5.0	12.7	8.7	8.6	8.0	9.5	2
RO-19 (NC)	10.8	9.3	11.8	8.0	10.1	9.9	4.7	11.2	8.3	8.9	8.2	9.2	5
Kent (NC)	10.8	9.5	13.1	8.0	9.9	9.7	4.5	13.6	7.3	9.0	8.2	9.4	3
Mean	**10.5**	**9.3**	**13.0**	**8.1**	**10.2**	**9.7**	**4.6**	**12.2**	**7.7**	**8.9**	**8.2**	**9.3**	

Table 10.7: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): Plant Height (cm)

Entries	Palam-pur	Srina-gar	His-ar	Ludh-iana	Udai-pur	Ran-chi	Faiza-bad	Jor-hat	Bhuban-eswar	Imp-hal	Jha-nsi	Ana-nd	Jabal-pur	Rah-uri	Urulikan-chan	Aver-age	Ra-nk
PLP-14	56.5	117.5	94.2	82.3	88.3	100.0	112.3	85.5	105.3	80.2	70.7	112.5	86.0	85.4	62.1	89.2	8
OL-1766	61.0	112.2	110.3	84.1	95.6	96.0	165.2	94.1	115.7	100.2	85.0	106.5	73.0	90.2	70.6	97.3	2
JHO-2012-13	58.0	123.4	101.8	77.9	91.2	97.0	145.8	85.1	120.3	86.8	83.0	114.5	93.9	86.7	64.3	95.3	4
OL-1769	66.0	114.0	112.8	88.4	96.1	99.0	155.4	92.9	118.6	100.3	77.0	125.3	103.5	90.3	73.1	100.8	1
JO-04-315	58.7	104.9	107.2	77.8	95.2	102.0	132.0	78.9		84.9	95.0	112.0	78.1	82.8	63.6	90.9	6
HFO-488	60.0	119.0	105.9	77.2	96.0	103.0	125.6	83.8	109.3	81.4	83.0	119.1	106.1	82.8	60.1	94.2	5
UPO-212 (NC)	62.0	123.7	107.0	78.0	92.8	93.0	145.7	77.1		79.7	74.0	107.4	70.6	82.8	65.7	90.0	7
RO-19 (NC)	59.0	119.1	107.7	79.9	96.0	94.0	135.8	88.3	123.6	86.0	99.7	112.6	94.3	94.2	62.0	96.8	3
Kent (NC)	53.2	120.7	95.9	77.2	82.9	55.0	138.4	70.7	102.4	80.9	80.7	116.6	98.7	79.7	62.3	87.7	9
Mean	**59.4**	**117.1**	**104.8**	**80.3**	**92.7**	**93.2**	**139.6**	**84.1**	**113.6**	**86.7**	**83.1**	**114.1**	**89.4**	**86.1**	**64.9**	**93.6**	

Table 10.8: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): Leaf Stem Ratio

Entries	Palam-pur	Srina-gar	His-ar	Ludh-iana	Ran-chi	Faiza-bad	Jor-hat	Bhuban-eswar	Imp-hal	Jha-nsi	Jabal-pur	Rah-uri	Urulika-nchan	Aver-age	Ra-nk
PLP-14	0.41	0.49	0.85	1.70	0.22	0.70	0.67	1.09	0.91	0.32	0.68	0.77	0.89	0.75	4
OL-1766	0.33	0.47	0.75	1.10	0.36	0.69	0.43	1.19	0.60	0.26	0.56	0.91	0.77	0.65	7
JHO-2012-13	0.41	0.52	0.77	1.80	0.35	0.68	0.71	1.29	0.87	0.32	0.74	0.75	0.85	0.77	2
OL-1769	0.47	0.48	0.71	0.90	0.32	0.66	0.69	1.27	0.63	0.31	0.84	0.72	0.77	0.67	6
JO-04-315	0.34	0.44	0.92	0.90	0.44	0.67	0.64		0.89	0.35	0.63	0.77	0.85	0.65	7
HFO-488	0.37	0.50	0.69	1.90	0.42	0.68	0.59	1.16	1.20	0.38	0.87	0.89	0.83	0.81	1
UPO-212 (NC)	0.41	0.52	0.72	2.20	0.29	0.64	0.79		0.99	0.26	0.50	0.91	0.87	0.76	3
RO-19 (NC)	0.47	0.50	0.80	0.90	0.42	0.67	0.73	1.34	0.81	0.31	0.72	1.00	0.78	0.73	5
Kent (NC)	0.33	0.51	0.71	1.90	0.35	0.71	0.49	0.99	0.68	0.31	0.77	0.81	0.89	0.73	5
Mean	**0.39**	**0.49**	**0.77**	**1.48**	**0.35**	**0.68**	**0.64**	**1.19**	**0.84**	**0.31**	**0.70**	**0.84**	**0.83**	**0.72**	

Table 10.9: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): ADF (%), NDF (%) and IVDMD (%)

Entries	ADF (%)					NDF (%)						IVDMD (%)				
	Palam-pur	Ludh-iana	Rah-uri	Aver-age	Ra-nk	Palam-pur	Ludh-iana	Ana-nd	Rah-uri	Aver-age	Ra-nk	His-ar	Ludhi-ana	Rah-uri	Aver-age	Ra-nk
PLP-14	56.0	49.3	48.5	51.3	8	62.2	37.9	58.0	53.5	52.9	4	62.4	53.8	51.1	55.8	8
OL-1766	55.4	50.4	46.7	50.8	7	64.0	38.9	55.5	53.4	52.9	4	63.9	53.0	52.6	56.5	6
JHO-2012-13	58.6	44.2	49.4	50.7	6	63.4	35.9	64.0	51.2	53.6	6	63.3	59.1	50.4	57.6	4
OL-1769	58.6	42.9	45.9	49.1	5	62.6	30.8	64.0	58.1	53.9	7	61.1	60.4	53.2	58.2	3
JO-04-315	57.0	43.1	42.5	47.5	1	64.6	32.3	58.0	52.0	51.7	2	63.0	58.8	55.8	59.2	1
HFO-488	57.8	41.5	44.9	48.1	3	63.8	30.2	61.0	54.7	52.4	3	60.3	62.6	53.9	58.9	2
UPO-212 (NC)	55.8	43.9	44.2	48.0	2	62.0	35.5	54.0	53.7	51.3	1	59.6	58.6	54.5	57.6	4
RO-19 (NC)	59.8	49.2	45.3	51.4	9	63.8	37.8	57.5	52.6	52.9	4	60.1	54.0	53.6	55.9	7
Kent (NC)	54.6	45.0	45.5	48.4	4	65.6	35.6	60.5	51.7	53.3	5	61.4	56.4	53.5	57.1	5
Mean	**57.1**	**45.5**	**45.8**	**49.5**		**63.6**	**35.0**	**59.2**	**53.4**	**52.8**		**61.7**	**57.4**	**53.2**	**57.4**	

11. IVTO (DUAL): INITIAL VARIETAL TRIAL IN OAT (DUAL)

(Table Reference: 11.1 to 11.10)

An initial varietal trial in Oat (Dual) comprising of six entries along with three national checks (RO-19, UPO-212 and JHO-822) was conducted at 17 centres located at four zones of the country. Results obtained from different centres revealed that for green forage yield (q/ha), entry JO-9-506 (2.5%) in Hill zone; entry OS-419 (9.5%) in North East zone registered their superiority over best check. None of the entries recorded superiority in other zones, as well as at national level. Similarly for dry matter yield (q/ha), entry JO-9-506 (2.6%) in North East, Central and at national level registered superiority whereas, OS-419 (0.68%) in Central zone exhibited its superiority. For the character fodder production potential (q/ha/day), OS-419 was adjudged best performer both for green forage as well as dry matter production potential.

National check RO-19 (91.4 cm) ranked first for the character plant height. For the character leafiness, entry JHO-13-3 (0.99) performed better. For evaluation against quality parameters, national check RO-19 for crude protein yield (5.0 q/ha) and crude protein content (11.2%) exhibited superiority. For other quality parameters, RO-19 ranked first for ADF (%), NDF (%) and IVDMD (%). For seed yield (q/ha), the national check JHO-822 recorded 20.9 q/ha seed yield at national level.

Table 11.1 IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Green Forage Yield (q/ha)

Entries	Hill Zone					North West Zone						
	Palam-pur	Sri-nagar	Aver-age	Ra-nk	Super-iority%	Ludh-iana	His-ar	Bika-ner	Udai-pur	Aver-age	Ra-nk	Superi-ority%
JHO-13-1	84.4	233.0	158.7	8		251.9	192.6	93.9	200.0	184.6	5	
OS-419	105.7	239.0	172.4	6		244.4	218.5	116.8	229.6	202.3	3	
OL-1744	71.1	198.0	134.6	9		229.6	170.4	148.8	142.6	172.8	7	
JHO-13-3	129.3	217.0	173.2	5		211.1	163.0	113.7	175.9	165.9	9	
OL-1733	99.9	251.0	175.5	4		233.3	125.9	100.6	209.3	167.3	8	
JO-9-506	128.0	273.0	200.5	1	2.5	255.6	129.6	100.2	218.5	176.0	6	
RO-19 (NC)	153.3	203.0	178.2	3		318.5	211.1	124.8	300.0	238.6	1	
UPO-212 (NC)	101.3	290.0	195.7	2		277.8	166.7	97.2	244.4	196.5	4	
JHO-822 (NC)	113.7	220.0	166.9	7		281.5	181.5	142.8	237.0	210.7	2	
Mean	**109.6**	**236.0**	**172.8**			**256.0**	**173.3**	**115.4**	**217.5**	**190.5**		
CD at 5%	26.4	8.4				7.4	67.6	31.4	26.8			
CV%	13.9	7.5				17.6	17.0	15.8	12.4			

Table 11.1 IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Green Forage Yield (q/ha)

Entries	North East Zone						
	Jorhat	Bhubaneswar	Ranchi	Faizabad	Average	Rank	Superiority%
JHO-13-1	167.4	269.0	120.0	157.3	178.4	9	
OS-419	230.7	354.3	133.3	200.0	229.6	1	9.5
OL-1744	190.9	270.0	155.6	184.0	200.1	6	
JHO-13-3	179.3	221.3	160.0	217.6	194.6	7	
OL-1733	110.2	257.3	151.1	237.3	189.0	8	
JO-9-506	124.7	267.6	191.1	237.3	205.2	3	
RO-19 (NC)	171.3	346.6	155.5	165.3	209.7	2	
UPO-212 (NC)	176.4	290.6	137.7	213.3	204.5	4	
JHO-822 (NC)	169.7	238.3	124.4	282.7	203.8	5	
Mean	169.0	279.5	147.6	210.5	201.6		
CD at 5%	8.6	11.5	35.3	54.2			
CV%	12.7	5.9	13.9	14.9			

Table 11.1 IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Green Forage Yield (q/ha)

Entries	Central Zone										All India		
	Jha-nsi	Rah-uri	Urulika-nchan	Kar-jat	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk	Superi-ority	Aver-age	Ra-nk	Superi-ority
JHO-13-1	107.3	290.8	357.1	167.4	382.0	205.2	136.3	235.2	8		200.9	8	
OS-419	149.9	385.2	517.0	203.1	501.0	249.4	164.4	310.0	2		249.6	2	
OL-1744	115.3	250.0	495.7	145.9	381.0	193.2	162.2	249.1	6		206.1	7	
JHO-13-3	130.7	311.1	362.4	154.5	364.0	142.6	88.9	222.0	9		196.6	9	
OL-1733	120.3	312.1	538.3	161.9	371.0	202.6	133.3	262.8	5		212.7	6	
JO-9-506	134.4	351.9	485.0	210.7	417.0	282.6	148.2	290.0	3		232.7	3	
RO-19 (NC)	136.9	436.1	591.6	154.1	520.0	246.6	166.7	321.7	1		258.9	1	
UPO-212 (NC)	120.9	368.5	554.3	189.6	413.0	131.9	114.1	270.3	4		228.7	4	
JHO-822 (NC)	96.2	289.4	426.4	175.6	337.0	210.6	111.1	235.2	7		214.0	5	
Mean	**123.5**	**332.8**	**480.9**	**173.6**	**409.6**	**207.2**	**136.1**	**266.2**			**222.2**		
CD at 5%	9.2	76.1	97.7	27.4	34.0	56.5	39.7						
CV%	4.3	13.2	17.2	9.4	4.8	14.2	18.2						

Table 11.2 IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Dry Matter Yield (q/ha)

Entries	Hill Zone					North West Zone						
	Palam-pur	Sri-nagar	Aver-age	Ra-nk	Superi-ority%	Ludh-iana	His-ar	Bika-ner	Udai-pur	Aver-age	Ra-nk	Superi-ority%
JHO-13-1	15.9	49.3	32.6	5		38.7	26.2	13.4	69.7	37.0	4	
OS-419	19.2	45.8	32.5	6		35.7	34.5	16.2	69.0	38.8	3	
OL-1744	13.5	38.6	26.0	9		27.1	21.3	20.2	71.5	35.0	7	
JHO-13-3	24.3	42.1	33.2	3		26.8	25.8	16.0	62.4	32.7	8	
OL-1733	18.7	47.4	33.1	4		33.0	18.7	15.0	75.6	35.6	6	
JO-9-506	23.4	45.4	34.4	2		38.4	21.5	14.8	70.2	36.2	5	
RO-19 (NC)	25.7	35.7	30.7	7		54.7	28.6	19.2	63.5	41.5	1	
UPO-212 (NC)	19.0	64.2	41.6	1		45.4	26.7	14.3	68.7	38.8	3	
JHO-822 (NC)	20.1	38.4	29.2	8		48.5	27.6	20.8	64.1	40.3	2	
Mean	20.0	45.2	32.6			38.7	25.7	16.7	68.3	37.3		
CD at 5%	5.8	2.4				10.7	10.2	4.7	14.4			
CV%	16.9	4.1				14.8	16.4	16.3	12.3			

Table 11.2 IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Dry Matter Yield (q/ha)

Entries	North East Zone						
	Jorhat	Bhubaneswar	Ranchi	Faizabad	Average	Rank	Superiority%
JHO-13-1	18.6	53.7	18.3	32.2	30.7	8	
OS-419	20.3	71.1	21.3	38.9	37.9	3	
OL-1744	14.5	54.3	28.7	37.9	33.9	7	
JHO-13-3	17.7	44.6	26.3	46.9	33.9	7	
OL-1733	9.5	51.3	21.5	55.5	34.4	5	
JO-9-506	12.8	53.7	29.9	59.7	39.0	1	2.6
RO-19 (NC)	14.4	69.4	20.5	31.7	34.0	6	
UPO-212 (NC)	20.1	58.2	21.7	52.0	38.0	2	
JHO-822 (NC)	14.0	47.8	21.2	60.0	35.7	4	
Mean	**15.8**	**56.0**	**23.3**	**46.1**	**35.3**		
CD at 5%	1.9	2.3	6.5	10.4			
CV%	9.2	6.0	16.3	13.1			

Table 11.2 IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Dry Matter Yield (q/ha)

Entries	Central Zone										All India		
	Jha-nsi	Rah-uri	Urulika-nchan	Kar-jat	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk	Superi-ority%	Aver-age	Ra-nk	Superi-ority
JHO-13-1	12.8	38.4	40.1	41.1	40.1	37.3	30.3	34.3	9		33.9	8	
OS-419	15.7	51.2	60.1	48.5	51.7	45.3	35.6	44.0	2	0.68	40.0	2	
OL-1744	14.9	34.2	63.3	49.8	41.9	34.6	35.3	39.1	6		35.4	6	
JHO-13-3	16.2	40.8	48.0	53.5	38.9	43.8	20.6	37.4	7		35.0	7	
OL-1733	15.0	40.7	69.0	51.4	39.4	36.0	29.6	40.2	5		36.9	4	
JO-9-506	16.3	51.9	63.9	52.8	41.7	51.9	32.6	44.4	1	1.6	40.1	1	0.3
RO-19 (NC)	13.0	57.5	64.6	49.2	51.0	34.3	36.4	43.7	3		39.4	3	
UPO-212 (NC)	14.8	48.8	65.8	49.4	43.4	42.6	25.4	41.5	4		40.0	2	
JHO-822 (NC)	12.2	39.5	53.3	52.2	33.7	38.6	24.7	36.3	8		36.3	5	
Mean	**14.5**	**44.8**	**58.7**	**49.8**	**42.4**	**40.5**	**30.1**	**40.1**			**37.4**		
CD at 5%	3.5	10.5	12.0	6.4	3.5	10.3	8.3						
CV%	14.0	13.5	16.3	7.4	4.8	14.2	17.3						

Table 11.3 IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Green Forage Yield (q/ha/day)

Entries	Ludh-iana	Hi-sar	Bika-ner	Jor-hat	Bhuba-neswar	Ran-chi	Faiza-bad	Jha-nsi	Kar-jat	Ana-nd	Rai-pur	Aver-age	Ra-nk
JHO-13-1	3.70	3.16	1.24	2.99	5.38	1.33	1.56	1.99	1.88	7.21	1.51	2.90	7
OS-419	3.60	3.68	1.54	4.12	7.09	1.43	1.98	2.78	2.45	9.45	1.83	3.63	1
OL-1744	3.40	2.97	1.96	3.41	5.40	1.74	1.84	2.14	1.92	7.19	1.80	3.07	4
JHO-13-3	3.10	2.75	1.50	3.20	4.43	1.70	2.15	2.42	1.84	6.87	0.99	2.81	8
OL-1733	3.40	2.02	1.32	1.97	5.15	1.57	2.38	2.23	1.90	7.00	1.48	2.76	9
JO-9-506	3.80	2.29	1.32	2.23	5.35	1.91	2.34	2.49	2.39	7.87	1.65	3.06	5
RO-19 (NC)	4.70	3.27	1.64	3.06	6.93	1.77	1.62	2.54	1.98	9.81	1.85	3.56	2
UPO-212 (NC)	4.10	2.92	1.28	3.15	5.81	1.51	2.09	2.24	2.18	7.79	1.27	3.12	3
JHO-822 (NC)	4.10	3.15	1.88	3.03	4.77	1.27	2.80	1.78	2.09	6.36	1.23	2.95	6
Mean	**3.77**	**2.91**	**1.52**	**3.02**	**5.59**	**1.58**	**2.08**	**2.29**	**2.07**	**7.73**	**1.51**	**3.10**	

Table 11.4 IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Dry Matter Yield (q/ha/day)

Entries	Ludh-iana	His-ar	Bika-ner	Jor-hat	Bhuban-eswar	Ran-chi	Faiza-bad	Jha-nsi	Kar-jat	Ana-nd	Rai-pur	Aver-age	Ra-nk
JHO-13-1	0.60	0.43	0.18	0.33	1.07	0.20	0.32	0.24	0.46	0.76	0.34	0.45	5
OS-419	0.50	0.58	0.21	0.36	1.42	0.23	0.38	0.29	0.58	0.98	0.40	0.54	1
OL-1744	0.40	0.37	0.27	0.26	1.09	0.32	0.37	0.28	0.65	0.79	0.39	0.47	4
JHO-13-3	0.40	0.43	0.21	0.32	0.89	0.28	0.46	0.30	0.64	0.73	0.23	0.44	6
OL-1733	0.50	0.30	0.20	0.17	1.03	0.22	0.53	0.28	0.60	0.74	0.33	0.45	5
JO-9-506	0.50	0.38	0.20	0.23	1.07	0.29	0.59	0.30	0.60	0.79	0.36	0.48	3
RO-19 (NC)	0.80	0.44	0.25	0.26	1.39	0.23	0.31	0.24	0.63	0.96	0.40	0.54	1
UPO-212 (NC)	0.60	0.47	0.19	0.36	1.16	0.24	0.51	0.27	0.57	0.82	0.28	0.50	2
JHO-822 (NC)	0.70	0.48	0.27	0.25	0.96	0.22	0.59	0.23	0.62	0.64	0.27	0.48	3
Mean	**0.56**	**0.43**	**0.22**	**0.28**	**1.12**	**0.25**	**0.45**	**0.27**	**0.59**	**0.80**	**0.33**	**0.48**	

Table 11.5 IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Crude Protein Yield (q/ha)

Entries	Palam-pur	Ludh-iana	Jor-hat	Bhuban-eswar	Faiza-bad	Rah-uri	Urulika-nchan	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk
JHO-13-1	1.7	5.5	2.2	5.2	2.7	3.7	4.2	6.7	3.0	2.5	3.7	6
OS-419	1.7	5.1	2.2	6.0	3.2	5.0	6.1	9.5	3.8	3.1	4.6	2
OL-1744	1.3	3.7	1.5	5.0	3.1	3.1	6.7	7.4	3.4	3.3	3.8	5
JHO-13-3	2.5	3.5	1.9	4.3	3.3	3.7	5.0	7.8	3.7	1.6	3.7	6
OL-1733	2.0	4.6	1.0	4.8	4.4	3.9	7.1	7.5	3.0	2.5	4.1	4
JO-9-506	2.4	5.0	1.4	4.9	4.8	5.3	6.6	8.0	4.4	2.9	4.6	2
RO-19 (NC)	2.8	8.5	1.6	6.7	2.6	5.6	6.9	8.6	3.9	3.4	5.0	1
UPO-212 (NC)	2.0	4.3	2.2	5.1	4.2	4.1	6.6	8.1	3.4	1.8	4.2	3
JHO-822 (NC)	2.0	7.4	1.4	4.7	5.0	3.5	5.3	6.3	3.2	1.8	4.1	4
Mean	**2.0**	**5.3**	**1.7**	**5.2**	**3.7**	**4.2**	**6.1**	**7.8**	**3.5**	**2.5**	**4.2**	

Table 11.6 IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Crude Protein (%)

Entries	Palam-pur	Ludh-iana	Jor-hat	Faiza-bad	Rah-uri	Urulika-nchan	Ana-nd	Rai-pur	Jabal-pur	Aver-age	Ra-nk
JHO-13-1	10.8	14.3	11.9	8.5	9.6	10.6	16.6	8.1	8.5	11.0	3
OS-419	9.0	14.2	11.4	8.1	9.8	10.2	18.4	8.6	8.5	10.9	4
OL-1744	9.6	13.8	10.4	8.2	9.0	10.5	17.6	9.3	8.4	10.8	5
JHO-13-3	10.2	13.1	11.3	8.0	9.0	10.4	19.9	7.9	8.6	10.9	4
OL-1733	10.5	13.8	10.7	8.0	9.6	10.3	19.2	8.4	8.5	11.0	3
JO-9-506	10.2	13.1	11.5	8.0	10.3	10.4	19.1	8.9	8.6	11.1	2
RO-19 (NC)	10.8	15.6	11.3	8.2	9.8	10.7	16.8	9.3	8.6	11.2	1
UPO-212 (NC)	10.2	9.4	11.3	8.1	8.5	10.0	18.7	7.3	8.5	10.2	6
JHO-822 (NC)	9.9	15.3	10.5	8.3	8.9	9.9	18.8	7.4	8.5	10.8	5
Mean	**10.1**	**13.6**	**11.1**	**8.2**	**9.4**	**10.3**	**18.3**	**8.3**	**8.5**	**10.9**	

Table 11.7 IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Plant Height (cm)

Entries	Palam-pur	Ludh-iana	Hi-sar	Bika-ner	Udai-pur	Jor-hat	Ran-chi	Faiza-bad	Rah-uri	Urulika-nchan	Kar-jat	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk
JHO-13-1	58.3	57.1	91.9	40.0	79.0	63.8	91.0	110.5	66.2	68.0	112.0	98.0	52.0	100.5	77.7	8
OS-419	62.0	63.9	100.8	60.0	77.5	70.1	94.0	125.6	77.0	69.3	120.1	104.7	63.0	119.8	86.3	2
OL-1744	57.3	54.7	89.1	52.0	72.2	50.9	101.0	100.5	66.1	38.7	121.3	103.7	43.6	101.8	75.2	9
JHO-13-3	67.0	62.7	96.0	50.0	69.8	67.3	105.0	128.5	73.5	51.3	115.5	102.1	72.7	91.7	82.4	4
OL-1733	54.7	58.7	90.0	53.0	81.7	59.1	100.0	135.6	67.3	58.7	115.6	98.3	48.2	116.0	81.2	5
JO-9-506	63.3	62.1	98.0	40.0	80.1	64.6	96.0	132.8	74.0	59.4	102.4	103.3	71.9	106.7	82.5	3
RO-19 (NC)	76.7	70.6	98.1	60.0	80.7	68.3	99.0	136.5	84.1	62.2	142.0	105.5	74.8	120.6	91.4	1
UPO-212 (NC)	55.7	59.2	90.4	45.0	79.9	63.3	96.0	120.7	72.1	59.9	115.1	103.6	62.1	95.4	79.9	6
JHO-822 (NC)	54.0	60.3	91.1	60.0	75.2	59.9	99.0	101.2	67.5	73.9	101.7	99.1	55.5	96.9	78.2	7
Mean	**61.0**	**61.0**	**93.9**	**51.1**	**77.3**	**63.0**	**97.9**	**121.3**	**72.0**	**60.2**	**116.2**	**102.0**	**60.4**	**105.5**	**81.6**	

Table 11.8 IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Leaf Stem Ratio

Entries	Ludh-iana	His-ar	Bika-ner	Jor-hat	Faiza-bad	Rah-uri	Urulika-nchan	Kar-jat	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk
JHO-13-1	0.30	0.74	1.07	0.66	0.80	1.20	1.08	0.58	1.88	0.63	0.64	0.87	6
OS-419	0.50	0.76	1.24	0.61	0.75	1.20	0.97	0.62	1.65	0.61	0.72	0.88	5
OL-1744	0.40	0.82	1.21	0.60	0.72	1.10	1.29	0.61	2.20	0.64	0.85	0.95	3
JHO-13-3	0.50	0.69	1.21	0.88	0.78	1.13	1.74	0.63	2.04	0.61	0.72	0.99	1
OL-1733	0.60	0.85	1.23	0.98	0.75	1.07	1.19	0.60	2.02	0.57	0.68	0.96	2
JO-9-506	0.50	0.72	1.19	0.57	0.78	0.87	1.19	0.69	1.72	0.82	0.76	0.89	4
RO-19 (NC)	0.50	0.67	1.10	0.72	0.79	0.86	1.12	0.56	2.00	0.71	0.81	0.89	4
UPO-212 (NC)	0.50	0.67	1.13	0.61	0.89	1.33	1.53	0.56	2.08	0.54	0.65	0.95	3
JHO-822 (NC)	0.40	0.79	1.13	0.72	0.82	0.83	1.31	0.62	1.59	0.53	0.63	0.85	7
Mean	**0.47**	**0.75**	**1.17**	**0.71**	**0.79**	**1.07**	**1.27**	**0.61**	**1.91**	**0.63**	**0.72**	**0.92**	

Table 11.9 IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): ADF (%), NDF (%) and IVDMD (%)

Entries	ADF (%)		NDF (%)		IVDMD (%)	
	Ludhiana	Rank	Ludhiana	Rank	Ludhiana	Rank
JHO-13-1	35.6	2	46.1	4	56.6	3
OS-419	36.6	3	46.3	5	56.4	4
OL-1744	37.3	5	46.4	6	50.9	5
JHO-13-3	37.4	6	47.9	8	50.0	8
OL-1733	37.1	4	46.0	3	50.8	6
JO-9-506	37.4	7	47.0	7	50.6	7
RO-19 (NC)	33.9	1	39.2	1	59.6	1
UPO-212 (NC)	38.3	8	55.8	9	49.4	9
JHO-822 (NC)	33.9	1	39.8	2	59.0	2
Mean	**36.4**		**46.1**		**53.7**	

Table 11.10 IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Seed Yield (q/ha)

Entries	Palam-pur	Sri-nagar	Ludh-iana	His-ar	Bika-ner	Udai-pur	Jor-hat	Bhuba-neswar	Ran-chi	Jha-nsi	Rah-uri	Urulika-nchan	Ana-nd	Jabal-pur	Faiza-bad	Aver-age	Ra-nk
JHO-13-1	20.4	9.0	22.1	23.3	12.8	23.5	14.9	5.9	25.7	25.1	29.7	21.0	20.7	33.6	18.7	20.4	2
OS-419	13.5	9.2	20.2	21.3	15.1	23.3	14.4	5.9	19.5	13.6	17.2	11.5	10.0	30.8	20.3	16.4	8
OL-1744	14.8	7.7	19.9	14.8	19.0	23.4	12.6	6.3	28.8	19.6	31.9	20.2	22.2	25.3	18.1	19.0	5
JHO-13-3	13.4	8.4	31.4	22.2	17.7	20.6	9.2	5.1	27.1	15.4	29.7	24.8	18.5	28.7	21.1	19.6	3
OL-1733	13.9	9.7	18.5	18.0	13.0	24.6	14.3	7.0	26.7	15.4	24.5	15.0	16.7	27.4	19.2	17.6	7
JO-9-506	13.0	10.7	25.8	23.7	14.1	20.6	14.1	6.4	31.5	21.4	23.8	23.0	21.1	23.2	20.8	19.5	4
RO-19 (NC)	9.6	7.9	9.1	15.6	9.6	14.3	13.4	6.5	35.5	12.2	12.6	8.6	7.8	28.1	18.1	13.9	9
UPO-212 (NC)	19.1	11.2	26.4	22.2	9.8	20.3	11.9	6.0	26.7	18.0	24.0	12.7	18.3	29.5	19.2	18.4	6
JHO-822 (NC)	18.2	8.6	27.5	21.9	17.7	23.1	14.6	5.5	24.4	17.6	32.4	25.2	19.6	32.7	25.1	20.9	1
Mean	**15.1**	**9.2**	**22.3**	**20.3**	**14.3**	**21.5**	**13.3**	**6.1**	**27.3**	**17.6**	**25.1**	**18.0**	**17.2**	**28.8**	**20.1**	**18.4**	
CD at 5%	4.6	1.1		7.7	4.7	1.6	1.1	0.1	7.9	5.9	3.3	5.0	3.7	5.7	5.3		
CV%	17.6	2.0		17.4	19.1	7.7	5.8	4.5	16.7	19.5	7.6	15.7	12.5	11.5	15.4		

12. IVTL: INITIAL VARIETAL TRIAL IN LATHYRUS

(Reference Tables: 12.1 to 12.8)

An initial varietal trial in Lathyrus comprising of three entries namely JHLS-2013-2, BK-37-2 and JHLS-2013-1 along with three national checks Nirmal, Prateek and Mahateora was conducted at eight centres in North-East and Central zone of the country. For green forage and dry matter yield national check Nirmal was superior at national level. For fodder production potential (q/ha/day), check Nirmal for green forage (1.66 q/ha/day) and Mahateora for dry matter production potential (0.44 q/ha/day) was adjudged best performer.

For evaluation against growth parameter, check Nirmal (58.8 cm) ranked first for plant height. For the character leafiness, entry JHLS-2013-2 (1.03) was observed best performer. In quality parameters, check Nirmal for crude protein yield (4.9 q/ha) and crude protein content (15.1%) recorded superiority

13. AVTL-1: FIRST ADVANCED VARIETAL TRIAL IN LATHYRUS

(Reference Table: 13.1 to 13.6)

An advanced varietal trial in Lathyrus with five entries namely BK-12-2, RLS-3006-2, JHLS-2012-1, JHLS-2012-2 and JLJ-09-2 along with three national checks Nirmal, Mahateora and Prateek was conducted at eight locations. Entry RLS-3006-2 for green forage (3.4%) and dry matter yield (2.9%) proved superiority over national checks. For fodder production potential, check Nirmal established superiority both for green forage and dry matter production potential (q/ha/day).

For growth parameters, entry JHLS-2012-1 (60.6 cm) ranked first followed by Nirmal for plant height while for leaf stem ratio, check variety Mahateora (0.98) maintained its superiority. For quality parameters, entry JHLS-2012-1 for crude protein yield (5.1 q/ha) and JLJ-09-2 (16.0%) for crude protein content were adjudged best performers.

14. AVTL-2: SECOND ADVANCED VARIETAL TRIAL IN LATHYRUS:

(Reference Tables: 14.1 to 14.7)

In Lathyrus, two entries namely JHLS-2011-2 and JLJ-09-1 promoted from AVT-1 were evaluated against three national checks Nirmal, Mahateora and Prateek. None of the entries was found superior than the checks for green forage (q/ha) as well as dry matter yield. Coming to the forage production potential (q/ha/day), entry JLJ-09-1 (1.76 q/ha/day) recorded superiority for green forage yield whereas national check Nirmal (0.43 q/ha/day) proved superior for dry matter yield potential. For plant height, JLJ-09-1 (54.5 cm) registered superiority. For the character leaf stem ratio, entry JHLS-2011-2 performed better than the checks. In quality parameters, national checks Nirmal (4.6 q/ha) and Mahateora (15.5%) proved superiority for crude protein yield and crude protein content, respectively.

15. AVTL-2 (SEED): SECOND ADVANCED VARIETAL TRIAL IN LATHYRUS FOR SEED

(Reference Tables: 15.1)

Results of the advanced varietal trial in Lathyrus for seed with two entries i.e. JHLS-2011-2 and JLJ-09-1 along with three national checks i.e. Nirmal, Mahateora and Prateek conducted at five locations across the country revealed that for seed yield (q/ha), none of the entries was found superior over national checks. At national level, seed yield of national check Nirmal was 14.6 q/ha followed by entry JHLS-2011-2 (14.5 q/ha).

Table 12.1 IVT Lathyrus: Initial Varietal Trial in Lathyrus: Green Forage Yield (q/ha)

Entries	Jorhat	Kalyani	Bhubaneswar	Ranchi	Pusa	Jabalpur	Kanpur	Raipur	Average	Rank
JHLS-2013-2	96.8	220.8	92.9	47.5	74.0	320.6	94.4	101.4	131.1	2
BK-37-2	118.0	206.2	93.9	45.8	81.0	247.0	125.0	87.6	125.6	3
JHLS-2013-1	147.0	222.9	96.9	59.7	64.0	259.5	88.9	110.2	131.1	2
Prateek (NC)	123.1	168.7	89.6	41.0	82.0	226.2	102.8	108.3	117.7	5
Mahateora (NC)	81.3	152.1	102.2	56.9	72.0	306.7	113.9	78.7	120.5	4
Nirmal (NC)	135.0	227.1	91.1	49.6	70.0	283.1	105.6	112.0	134.2	1
Mean	**116.9**	**199.6**	**94.4**	**50.1**	**73.8**	**273.9**	**105.1**	**99.7**	**126.7**	
CD at 5%	7.9	17.8	11.8	8.6	14.8	62.8	22.4	18.6		
CV%	16.5	5.9	8.3	11.3	12.3	13.1	4.3	11.6		

Table 12.2 IVT Lathyrus: Initial Varietal Trial in Lathyrus: Dry Matter Yield (q/ha)

Entries	Jorhat	Kalyani	Bhubaneswar	Ranchi	Pusa	Jabalpur	Kanpur	Raipur	Average	Rank
JHLS-2013-2	16.4	28.3	18.6	8.3	16.86	61.0	39.2	28.7	27.2	4
BK-37-2	19.8	36.8	18.7	7.9	18.41	47.2	51.1	24.9	28.1	2
JHLS-2013-1	25.9	32.3	19.5	10.6	14.55	48.5	36.7	30.7	27.3	3
Prateek (NC)	19.0	27.4	18.0	7.2	18.64	43.0	41.9	29.5	25.6	6
Mahateora (NC)	14.8	17.7	20.5	10.8	16.4	58.3	47.5	22.9	26.1	5
Nirmal (NC)	26.2	29.4	19.1	9.2	15.91	54.1	43.6	30.4	28.5	1
Mean	**20.4**	**28.6**	**19.1**	**9.0**	**16.8**	**52.0**	**43.3**	**27.8**	**27.1**	
CD at 5%	2.0	2.5	2.4	1.7	2.4	12.3	9.1	4.4		
CV%	9.8	5.8	8.4	12.6	9.1	13.5	2.8	9.9		

Table 12.3 IVT Lathyrus: Initial Varietal Trial in Lathyrus: Green Forage Yield (q/ha/day)

Entries	Jorhat	Kalyani	Bhubaneswar	Ranchi	Kanpur	Raipur	Average	Rank
JHLS-2013-2	1.26	2.98	1.90	0.86	1.37	1.30	1.61	5
BK-37-2	1.36	2.79	1.88	0.80	1.81	1.12	1.63	3
JHLS-2013-1	1.52	2.79	1.90	1.01	1.22	1.41	1.64	2
Prateek (NC)	1.76	2.28	1.91	0.95	1.43	1.39	1.62	4
Mahateora (NC)	1.00	2.06	1.97	0.95	1.70	1.01	1.45	6
Nirmal (NC)	1.39	2.84	1.98	0.80	1.49	1.44	1.66	1
Mean	**1.38**	**2.62**	**1.92**	**0.90**	**1.50**	**1.28**	**1.60**	

Table 12.4 IVT Lathyrus: Initial Varietal Trial in Lathyrus: Dry Matter Yield (q/ha/day)

Entries	Jorhat	Kalyani	Bhubaneswar	Ranchi	Kanpur	Raipur	Average	Rank
JHLS-2013-2	0.21	0.38	0.38	0.15	0.57	0.37	0.34	5
BK-37-2	0.23	0.50	0.37	0.14	0.74	0.32	0.38	2
JHLS-2013-1	0.27	0.40	0.38	0.18	0.50	0.39	0.35	4
Prateek (NC)	0.27	0.37	0.38	0.14	0.58	0.38	0.35	4
Mahateora (NC)	0.18	0.24	0.39	0.80	0.71	0.29	0.44	1
Nirmal (NC)	0.27	0.37	0.41	0.15	0.61	0.39	0.37	3
Mean	**0.24**	**0.38**	**0.39**	**0.26**	**0.62**	**0.36**	**0.37**	

Table 12.5 IVT Lathyrus: Initial Varietal Trial in Lathyrus: Crude Protein Yield (q/ha)

Entries	Crude Protein Yield (q/ha)						Crude Protein (%)					
	Jorhat	Bhubaneswar	Jabalpur	Raipur	Average	Rank	Jorhat	Bhubaneswar	Raipur	Jabalpur	Average	Rank
JHLS-2013-2	1.9	3.0	9.8	4.0	4.7	2	12.1	16.1	13.9	16.1	14.5	3
BK-37-2	2.3	2.9	7.3	3.3	3.9	5	11.7	15.4	13.5	16.0	14.1	6
JHLS-2013-1	3.3	3.0	7.7	4.5	4.6	3	13.1	15.4	14.7	16.0	14.8	2
Prateek (NC)	2.3	2.7	6.5	4.2	3.9	5	12.4	15.0	14.3	15.8	14.4	4
Mahateora (NC)	1.8	3.2	9.2	3.0	4.3	4	12.3	15.5	13.2	16.1	14.3	5
Nirmal (NC)	3.6	2.9	8.4	4.6	4.9	1	13.9	15.3	15.0	16.0	15.1	1
Mean	**2.5**	**2.9**	**8.2**	**3.9**	**4.4**		**12.5**	**15.4**	**14.1**	**16.0**	**14.5**	

Table 12.7 IVT Lathyrus: Initial Varietal Trial in Lathyrus: Plant Height (cm) & Leaf Stem Ratio

Entries	Plant height (cm)									Leaf stem ratio							
	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Jabal-pur	Kan-pur	Rai-pur	Aver-age	Ra-nk	Jor-hat	Kal-yani	Bhuba-neswar	Jabal-pur	Kan-pur	Rai-pur	Aver-age	Ra-nk
JHLS-2013-2	40.0	73.4	37.1	43.5	84.2	47.2	53.5	54.1	4	0.78	0.79	0.80	1.21	1.66	0.95	1.03	1
BK-37-2	34.1	75.5	39.2	48.3	74.6	48.5	49.7	52.8	5	0.68	0.43	0.88	1.10	1.52	0.89	0.92	5
JHLS-2013-1	44.2	73.0	42.7	41.8	74.6	48.7	57.7	54.7	2	1.04	0.67	0.94	1.04	1.38	1.05	1.02	2
Prateek (NC)	38.9	72.1	33.2	50.3	73.3	55.0	55.7	54.1	4	0.84	0.56	0.75	1.05	1.59	1.00	0.97	4
Mahateora (NC)	35.8	64.3	45.3	47.4	81.9	53.3	51.5	54.2	3	0.71	0.48	1.03	1.15	1.34	0.76	0.91	6
Nirmal (NC)	53.5	81.5	35.2	45.7	76.9	57.1	62.0	58.8	1	1.10	0.69	0.78	1.08	1.23	1.03	0.98	3
Mean	**41.1**	**73.3**	**38.8**	**46.2**	**77.6**	**51.6**	**55.0**	**54.8**		0.86	0.60	0.86	1.11	1.45	0.95	0.97	

Table 13.1 AVT Lathyrus-1: First Advanced Varietal Trial in Lathyrus: Green Forage Yield (q/ha)

Entries	Jorhat	Kalyani	Bhubaneswar	Ranchi	Pusa	Jabalpur	Kanpur	Raipur	Average	Rank	Superiority%
BK-12-2	122.7	302.8	58.2	35.4	83.0	190.5	150.0	103.6	130.8	5	
RLS-3006-2	113.7	238.9	67.2	32.9		206.1	163.9	170.8	141.9	1	3.4
JHLS-2012-2	142.2	233.3	70.9	42.0	66.0	252.9	186.1	92.5	135.7	3	
JHLS-2012-1	123.0	252.8	71.2	38.1	71.0	236.3	152.8	132.1	134.7	4	
JLJ-09-2	86.9	133.3	66.5	29.8	57.0	284.2	144.4	149.9	119.0	7	
Nirmal (NC)	132.4	261.1	75.9	35.4	69.0	245.6	175.0	104.0	137.3	2	
Mahateora (NC)	73.3	158.3	73.2	34.0	64.0	269.6	138.9	156.8	121.0	6	
Prateek (NC)	107.3	177.8	72.2	43.8	57.0	151.9	147.2	154.3	113.9	8	
Mean	**112.7**	**219.8**	**69.4**	**36.4**	**66.7**	**229.6**	**157.3**	**133.0**	**129.3**		
CD at 5%	3.0	34.0	8.7	6.8	10.4	49.8	27.3	27.1			
CV%	5.8	8.7	7.2	10.6	12.7	12.4	4.3	12.7			

Table 13.2 AVT Lathyrus- : First Advanced Varietal Trial in Lathyrus: Dry Matter Yield (q/ha)

Entries	Jorhat	Kalyani	Bhubaneswar	Ranchi	Pusa	Jabalpur	Kanpur	Raipur	Average	Rank	Superiority%
BK-12-2	18.9	49.3	11.7	6.4	19.1	34.3	58.6	35.3	29.2	5	
RLS-3006-2	19.7	30.6	13.4	6.0		37.4	64.4	54.5	32.3	1	2.9
JHLS-2012-2	24.0	35.8	14.5	7.4	15.4	46.8	72.5	32.1	31.1	3	
JHLS-2012-1	21.2	36.6	14.3	4.4	16.4	43.7	58.9	43.4	29.9	4	
JLJ-09-2	17.1	19.4	13.3	5.0	13.3	54.1	54.7	48.5	28.2	6	
Nirmal (NC)	24.6	42.9	15.0	6.0	16.0	44.7	66.7	35.4	31.4	2	
Mahateora (NC)	13.9	20.6	14.7	5.3	14.8	51.0	53.6	50.5	28.0	7	
Prateek (NC)	19.9	25.3	14.5	6.9	13.2	27.0	55.8	49.8	26.5	8	
Mean	**19.9**	**32.6**	**13.9**	**5.9**	**15.5**	**42.4**	**60.7**	**43.7**	**29.6**		
CD at 5%	1.7	5.4	1.9	1.4	2.3	9.4	9.4	7.7			
CV%	7.9	9.4	7.7	13.6	11.8	12.6	2.4	11.0			

Table 13.3 AVT Lathyrus-1: First Advanced Varietal Trial in Lathyrus: Green Forage Yield (q/ha/day)

Entries	Jorhat	Kalyani	Bhubaneswar	Ranchi	Kanpur	Raipur	Average	Rank
BK-12-2	1.68	4.04	1.24	0.66	2.00	1.36	1.83	2
RLS-3006-2	1.56	2.95	1.37	0.59	2.28	2.25	1.83	2
JHLS-2012-2	1.95	2.88	1.54	0.74	2.58	1.22	1.82	3
JHLS-2012-1	1.72	3.12	1.48	0.72	2.09	1.74	1.81	4
JLJ-09-2	1.20	1.78	1.55	0.50	1.93	1.97	1.49	7
Nirmal (NC)	1.83	3.48	1.49	0.59	2.33	1.37	1.85	1
Mahateora (NC)	1.01	2.11	1.41	0.55	2.10	2.06	1.54	6
Prateek (NC)	1.48	2.37	1.42	0.68	2.10	2.03	1.68	5
Mean	**1.55**	**2.84**	**1.44**	**0.63**	**2.18**	**1.75**	**1.73**	

Table 13.4 AVT Lathyrus-1: First Advanced Varietal Trial in Lathyrus: Dry Matter Yield (q/ha/day)

Entries	Jorhat	Kalyani	Bhubaneswar	Ranchi	Kanpur	Raipur	Average	Rank
BK-12-2	0.26	0.66	0.25	0.12	0.78	0.46	0.42	2
RLS-3006-2	0.27	0.38	0.27	0.11	0.90	0.72	0.44	1
JHLS-2012-2	0.33	0.44	0.32	0.13	1.01	0.42	0.44	1
JHLS-2012-1	0.30	0.45	0.30	0.08	0.81	0.57	0.42	2
JLJ-09-2	0.24	0.26	0.31	0.08	0.73	0.64	0.38	4
Nirmal (NC)	0.34	0.57	0.29	0.10	0.89	0.47	0.44	1
Mahateora (NC)	0.19	0.27	0.28	0.08	0.81	0.66	0.38	4
Prateek (NC)	0.28	0.34	0.28	0.11	0.80	0.65	0.41	3
Mean	**0.27**	**0.42**	**0.29**	**0.10**	**0.84**	**0.57**	**0.42**	

Table 13.5 AVT Lathyrus-1: First Advanced Varietal Trial in Lathyrus: Crude Protein Yield (q/ha) & Crude Protein (%)

Entries	Crude Protein Yield (q/ha)							Crude Protein (%)						
	Jor-hat	Kal-yani	Bhuban-eswar	Rai-pur	Jabal-pur	Aver-age	Ra-nk	Jor-hat	Kal-yani	Bhuban-eswar	Rai-pur	Jabal-pur	Aver-age	Ra-nk
BK-12-2	2.0	9.5	1.9	5.1	5.3	4.7	4	10.8	19.2	16.0	14.3	15.7	15.2	6
RLS-3006-2	2.3	5.8	2.0	8.8	6.0	5.0	2	11.9	18.8	14.8	16.2	16.2	15.6	3
JHLS-2012-2	2.8	6.2	2.2	4.5	7.7	4.7	4	12.1	17.3	15.3	14.0	16.4	15.0	8
JHLS-2012-1	2.8	6.6	2.3	6.7	7.0	5.1	1	13.7	17.9	15.8	15.4	16.2	15.8	2
JLJ-09-2	2.2	3.5	2.1	7.7	8.7	4.9	3	13.5	18.2	16.0	16.0	16.4	16.0	1
Nirmal (NC)	2.9	7.0	2.4	5.3	7.4	5.0	2	12.0	16.2	16.0	14.8	16.4	15.1	7
Mahateora (NC)	1.7	3.9	2.2	7.5	8.2	4.7	4	12.8	19.0	14.6	15.0	16.4	15.5	4
Prateek (NC)	2.4	4.7	2.3	7.4	4.1	4.2	5	12.1	18.7	15.8	14.8	15.7	15.4	5
Mean	**2.4**	**5.9**	**2.2**	**6.6**	**6.8**	**4.8**		**12.3**	**18.2**	**15.5**	**15.1**	**16.2**	**15.5**	

Table 13.6 AVT Lathyrus-1: First Advanced Varietal Trial in Lathyrus: Plant Height (cm) & Leaf stem ratio

Entries	Plant height (cm)								Leaf stem ratio							
	Kal-yani	Bhuban-eswar	Ran-chi	Jabal-pur	Kan-pur	Rai-pur	Aver-age	Ra-nk	Jor-hat	Kal-yani	Bhuban-eswar	Jabal-pur	Kan-pur	Rai-pur	Aver-age	Ra-nk
BK-12-2	109.0	36.5	34.3	66.1	51.1	52.5	58.3	5	0.81	0.51	0.89	1.02	0.87	0.83	0.82	7
RLS-3006-2	94.0	40.2	38.8	74.7	49.9	55.7	58.9	4	0.65	0.52	0.96	1.07	0.94	1.06	0.87	6
JHLS-2012-2	82.3	42.2	37.8	85.2	49.3	47.9	57.4	6	0.84	0.79	0.98	1.15	1.05	0.74	0.92	4
JHLS-2012-1	93.5	45.6	41.1	84.8	47.6	50.7	60.6	1	0.86	0.48	1.01	1.11	1.09	1.00	0.92	4
JLJ-09-2	74.7	38.0	39.8	98.1	44.4	47.9	57.1	7	0.98	0.65	0.93	1.21	0.93	0.97	0.95	2
Nirmal (NC)	95.5	51.3	38.7	87.4	42.6	46.3	60.3	2	0.71	0.48	1.18	1.25	0.95	0.90	0.91	5
Mahateora (NC)	78.6	48.3	39.6	95.3	46.7	48.5	59.5	3	0.89	0.66	1.14	1.24	0.93	1.04	0.98	1
Prateek (NC)	86.5	47.7	38.6	57.2	49.7	39.9	53.3	8	0.98	0.69	1.07	1.01	0.95	0.93	0.94	3
Mean	**89.3**	**43.7**	**38.6**	**81.1**	**47.7**	**48.7**	**58.2**		**0.84**	**0.60**	**1.02**	**1.13**	**0.96**	**0.93**	**0.91**	

Table 14.1 AVT Lathyrus-2: Second Advanced Varietal Trial in Lathyrus: Green Forage Yield (q/ha)

Entries	Jorhat	Kalyani	Bhubaneswar	Ranchi	Pusa	Jabalpur	Kanpur	Average	Rank
JHLS-2011-2	146.0	225.0	43.6	46.4	82.0	263.3	156.3	137.5	2
JLJ-09-1	124.3	266.7	39.2	35.1	71.0	255.0	164.6	136.5	3
Nirmal (NC)	130.6	212.5	38.7	41.9	68.0	312.3	204.2	144.0	1
Mahateora (NC)	102.8	100.0	24.9	38.0	56.0	223.8	131.3	96.7	5
Prateek (NC)	120.6	179.2	26.0	43.2	51.0	239.4	147.9	115.3	4
Mean	**124.8**	**196.7**	**34.5**	**40.9**	**65.6**	**258.8**	**160.8**	**126.0**	
CD at 5%	7.9	23.2	4.1	7.0	11.7	53.1	37.0		
CV%	11.2	7.6	7.6	11.1	13.1	13.3	6.6		

Table 14.2 AVT Lathyrus-2: Second Advanced Varietal Trial in Lathyrus: Dry Matter Yield (q/ha)

Entries	Jorhat	Kalyani	Bhubaneswar	Ranchi	Pusa	Jabalpur	Kanpur	Average	Rank
JHLS-2011-2	29.2	38.7	8.8	7.8	18.6	48.9	61.0	30.4	2
JLJ-09-1	21.0	43.7	7.8	7.5	16.1	46.8	66.3	29.9	3
Nirmal (NC)	20.4	36.1	7.8	7.7	15.5	59.3	81.3	32.6	1
Mahateora (NC)	20.8	18.0	5.2	5.4	12.8	41.6	51.7	22.2	5
Prateek (NC)	21.9	28.3	5.2	9.2	11.6	44.7	59.8	25.8	4
Mean	**22.7**	**33.0**	**7.0**	**7.5**	**14.9**	**48.3**	**64.0**	**28.2**	
CD at 5%	1.8	4.0	0.8	1.6	2.7	12.5	13.4		
CV%	12.5	7.7	8.1	13.5	13.4	13.1	3.8		

Table 14.3 AVT Lathyrus-2: Second Advanced 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)						
	Jor-hat	Kal-yani	Ran-chi	Kan-pur	Bhuba-neswar	Aver-age	Ra-nk	Jor-hat	Kal-yani	Ran-chi	Kan-pur	Bhuban-eswar	Aver-age	Rank
JHLS-2011-2	2.07	2.81	0.65	2.23	0.93	1.74	2	0.41	0.52	0.11	0.87	0.19	0.42	2
JLJ-09-1	1.76	3.33	0.52	2.29	0.91	1.76	1	0.30	0.56	0.11	0.92	0.18	0.41	3
Nirmal (NC)	1.84	2.66	0.63	2.76	0.79	1.74	2	0.29	0.46	0.12	1.10	0.16	0.43	1
Mahateora (NC)	1.45	1.25	0.59	1.99	0.55	1.17	4	0.29	0.17	0.08	0.78	0.11	0.29	5
Prateek (NC)	1.67	2.24	0.66	2.18	0.50	1.45	3	0.30	0.39	0.14	0.88	0.10	0.36	4
Mean	**1.76**	**2.46**	**0.61**	**2.29**	**0.74**	**1.57**		**0.32**	**0.42**	**0.11**	**0.91**	**0.15**	**0.38**	

Table 14.5 AVT Lathyrus-2: Second Advanced Varietal Trial in Lathyrus: Crude Protein Yield (q/ha) & Crude Protein (%)

Entries	Crude Protein Yield (q/ha)						Crude Protein (%)					
	Jor-hat	Kal-yani	Bhuba-neswar	Jabal-pur	Aver-age	Ra-nk	Jor-hat	Kal-yani	Bhuban-eswar	Jabal-pur	Aver-age	Rank
JHLS-2011-2	3.6	5.5	1.3	7.7	4.5	2	12.6	14.2	14.5	15.9	14.3	4
JLJ-09-1	2.4	6.1	1.2	7.5	4.3	3	11.9	14.0	15.3	15.9	14.3	4
Nirmal (NC)	2.3	5.5	1.2	9.4	4.6	1	11.7	15.1	15.2	16.1	14.5	3
Mahateora (NC)	2.5	3.2	0.8	6.4	3.2	5	12.5	17.6	16.1	15.8	15.5	1
Prateek (NC)	2.7	4.7	0.8	7.0	3.8	4	12.6	16.7	16.0	15.8	15.3	2
Mean	2.7	5.0	1.1	7.6	4.1		12.3	15.5	15.4	15.9	14.8	

Table 14.7 AVT Lathyrus-2: Second Advanced Varietal Trial in Lathyrus: Plant Height (cm) & Leaf stem ratio

Entries	Plant height (cm)								Leaf stem Ratio						
	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Jabal-pur	Kan-pur	Aver-age	Ra-nk	Jor-hat	Kal-yani	Bhuban-eswar	Jabal-pur	Kan-pur	Aver-age	Ra-nk
JHLS-2011-2	44.1	74.9	24.2	46.0	86.3	45.6	53.5	2	1.20	0.54	0.79	1.24	1.44	1.04	1
JLJ-09-1	43.7	86.5	21.3	48.8	81.9	45.2	54.5	1	0.77	0.63	0.74	1.19	0.93	0.85	5
Nirmal (NC)	37.9	80.7	20.2	37.4	89.8	44.2	51.7	3	0.82	0.68	0.69	1.28	1.24	0.94	3
Mahateora (NC)	38.2	68.3	20.1	35.5	62.4	44.2	44.8	5	1.42	0.80	0.65	1.17	0.76	0.96	2
Prateek (NC)	28.9	78.5	18.5	34.8	79.6	43.9	47.4	4	0.98	0.74	0.66	1.11	1.13	0.92	4
Mean	**38.5**	**77.7**	**20.9**	**40.5**	**80.0**	**44.6**	**50.4**		**1.04**	**0.68**	**0.71**	**1.20**	**1.10**	**0.94**	

Table 15.1 AVT Lathyrus-2: Second Advanced Varietal Trial in Lathyrus for seed: Seed Yield (q/ha)

Entries	Jorhat	Kalyani	Bhubaneswar	Jabalpur	*Ranchi	Average	Rank	Superiority%
JHLS-2011-2	8.2	30.2	3.3	16.4	3.9	14.5	2	
JLJ-09-1	7.8	23.4	2.8	17.2	7.8	12.8	4	
Nirmal (NC)	7.2	30.4	2.3	18.3	4.9	14.6	1	
Mahateora (NC)	6.5	22.2	1.1	5.1	7.0	8.7	5	
Prateek (NC)	5.6	31.5	1.8	15.8	4.7	13.7	3	
Mean	7.1	27.5	2.3	14.6	5.6	12.9		
CD at 5%	1.0	3.0	0.2	2.9	0.2			
CV%	16.6	7.0	6.7	12.9	20.4			

*** Not include in zonal and all India average due to CV>=20**

16. VTL (P)-2011: VARIETAL EVALUATION TRIAL IN LUCERNE (PERENNIAL)-3rd YEAR

(Reference Tables: 16.1 to 16.6)

The varietal trial on Lucerne (Perennial) comprising of six entries *viz.* CCP-1-1, ACP-3-2, RL-10-1, Anand-24, DWR-1 and RRB-10-1 along with two national checks *i.e.* Anand-2 and RL-88 was established during *Rabi*-2011 at twelve centers of the North-West, Central and South zone but this year data has been received from seven centers. This is being the third and final year of evaluation hence all the entries are decoded. Results obtained from testing locations clearly revealed that for green forage and dry matter yield (q/ha) check RL-88 ranked first at national level.

For the forage production potential (q/ha/day), DWR-1 was found better in performance over national check. For the character plant height (cm), entry RRB-10-1 (66.3 cm) ranked first and entries CCP-1-1 and ACP-3-2 (1.20) were best performers for leaf stem ratio. For quality parameters, check RL-88 for crude protein yield (q/ha) and Anand-2 for crude protein content (%) proved their superiority.

Pooled performance of entries during last three years over the locations indicate that national check RL-88 maintained its superiority for high fodder yield (green forage and dry matter).

17. VTL (P) – 2013: VARIETAL TRIAL IN LUCERNE (PERENNIAL)-1st YEAR

(Reference Tables: 17.1 to 17.8)

The varietal trial on Lucerne (Perennial) comprising of five entries along with two national checks *i.e.* Anand-2 and RL-88 was established during Rabi 2013-14 at twelve centres of the North-West, Central and South zone. This is the first year of evaluation and entries are in coded form, it will be decoded after completion of trial in the third and final year of evaluation.

Results obtained from different centres clearly revealed that for green forage yield (q/ha), entry VTL-2-6 in North-West zone (408.3 q/ha) and as well as at all India level (465.5 q/ha); entry VTL-2-5 in Central zone (622.9 q/ha); entry VTL-2-3 (402.8 q/ha) in south zone ranked first. For dry matter yield (q/ha), entry VTL-2-2 (67.2 q/ha) in North West zone; entry VTL-2-5 (129.4 q/ha) in Central zone; entry VTL-2-3 (78.1 q/ha) in South zone; entry VTL-2-6 (90.6 q/ha) at national level exhibited superiority.

For fodder production potential (q/ha/day), entry VTL-2-2 ranked first both for green forage yield (2.67 q/ha/day) as well as for dry matter yield (0.49 q/ha/day). For growth parameter, entry VTL-2-7 (84.9 cm) ranked first for plant height whereas entry VTL-2-5 (0.97) was adjudged best performer for the character leaf stem ratio. For quality parameters, entry VTL-2-5 for crude protein yield (19.6 q/ha) and VTL-2-3 for crude protein content (20.9%) ranked first. Entries VTL-2-7 for ADF (%) and NDF (%) and VTL-2-5 for IVDMD (%) exhibited their superiority.

Table 16.1 VT Lucerne (P)-2011: Varietal Trial in Lucerne (Perennial)-3rd Year: Green Forage Yield (q/ha)

Entries	Urulikanchan	Dharwad	Rahuri	Coimbatore	Bikaner	Hyderabad	Hisar	Average	Rank	Superiority%
CCP-1-1	97.1	604.7	74.8	600.3	643.0	158.3	254.8	347.6	7	
ACP-3-2	125.4	609.7	296.0	656.1	605.4	126.3	260.6	382.8	6	
RL-10-1	470.5	508.6	578.1	909.7	676.2	137.4	268.3	507.0	2	
Anand-24	350.2	614.4	363.3	659.4	562.5	152.7	254.7	422.5	4	
DWR-1	165.8	497.5	178.2	666.1	929.3	177.7	229.9	406.3	5	
RRB-10-1	494.2	493.6	492.7	719.4	794.3	152.7	270.2	488.2	3	
Anand-2 (NC)	147.4	595.3	102.0	639.7	615.7	95.8	160.6	336.6	8	
RL-88 (NC)	607.7	608.9	724.5	806.6	599.0	324.9	246.4	559.7	1	
Mean	**307.3**	**566.6**	**351.2**	**707.2**	**678.2**	**165.7**	**243.2**	**431.3**		
CD at 5%	51.7	17.9	100.2	54.4	124.9	36.7	28.8			
CV%	19.0	1.8	16.3	4.4	10.5	12.6	8.2			

Table 16.2 VT Lucerne (P)-2011: Varietal Trial in Lucerne (Perennial)-3rd Year: Dry Matter Yield (q/ha)

Entries	Hisar	Urulikanchan	Dharwad	Rahuri	Coimbatore	Bikaner	Hyderabad	Average	Rank	Superiority%
CCP-1-1	42.5	22.2	150.6	18.7	96.8	186.9	31.2	78.4	8	
ACP-3-2	44.1	30.1	168.7	91.1	98.0	182.1	25.3	91.4	6	
RL-10-1	47.3	114.4	134.6	164.2	164.8	198.6	28.8	121.8	2	
Anand-24	43.1	80.3	159.0	102.4	108.0	162.4	31.1	98.0	4	
DWR-1	39.3	37.3	138.8	46.1	106.8	258.9	38	95.0	5	
RRB-10-1	45.8	113.0	129.1	126.2	117.9	229.0	31.2	113.2	3	
Anand-2 (NC)	30.6	33.7	158.3	27.3	99.5	183.1	17.9	78.6	7	
RL-88 (NC)	46.4	144.5	163.5	181.1	137.8	185.9	64.8	132.0	1	
Mean	**42.4**	**71.9**	**150.3**	**94.6**	**116.2**	**198.4**	**33.5**	**101.1**		
CD at 5%	4.1	12.0	11.6	27.0	9.8	29.0	7.9			
CV%	6.5	16.0	4.4	16.3	4.9	8.3	13.6			

Table 16.3 VT Lucerne (P)-2011: 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)				
	Dharwad	Hisar	Bikaner	Average	Rank	Hisar	Dharwad	Bikaner	Average	Rank
CCP-1-1	2.16	1.46	1.17	1.60	1	0.24	0.54	0.34	0.37	4
ACP-3-2	2.18	1.50	1.10	1.59	2	0.25	0.60	0.33	0.39	2
RL-10-1	1.82	1.54	1.23	1.53	5	0.27	0.48	0.36	0.37	4
Anand-24	2.19	1.46	1.02	1.56	4	0.25	0.56	0.29	0.37	4
DWR-1	1.78	1.32	1.69	1.60	1	0.23	0.49	0.47	0.40	1
RRB-10-1	1.76	1.55	1.44	1.58	3	0.26	0.46	0.42	0.38	3
Anand-2 (NC)	2.13	0.92	1.12	1.39	6	0.18	0.58	0.33	0.36	5
RL-88 (NC)	2.17	1.42	1.09	1.56	4	0.27	0.56	0.34	0.39	2
Mean	**2.02**	**1.40**	**1.23**	**1.55**		**0.24**	**0.53**	**0.36**	**0.38**	

Table 16.4 VT Lucerne (P)-2011: Varietal Trial in Lucerne (Perennial)-3rd Year: Crude Protein Yield (q/ha) & Crude Protein (%)

Entries	Crude Protein Yield (q/ha)						Crude Protein (%)					
	Urulika-nchan	Dhar-wad	Rah-uri	Hydera-bad	Aver-age	Ra-nk	Urulika-nchan	Dhar-wad	Rah-uri	Hydera-bad	Aver-age	Ra-nk
CCP-1-1	4.4	32.3	3.8	5.7	11.6	8	20.0	21.4	20.4	18.2	20.0	1
ACP-3-2	5.8	33.2	19.1	4.7	15.7	5	19.2	19.7	21.0	18.7	19.7	2
RL-10-1	21.9	23.6	32.6	5.0	20.8	2	19.2	17.5	19.8	17.3	18.5	5
Anand-24	15.4	32.0	20.9	5.9	18.6	4	19.2	20.1	20.4	19.0	19.7	2
DWR-1	7.4	23.7	8.7	7.7	11.9	7	19.8	17.1	19.0	20.3	19.1	4
RRB-10-1	22.3	23.1	26.1	5.7	19.3	3	19.7	17.9	20.7	18.3	19.2	3
Anand-2 (NC)	6.6	33.2	5.6	3.4	12.2	6	19.4	21.0	20.4	19.2	20.0	1
RL-88 (NC)	27.9	31.5	35.9	11.7	26.8	1	19.3	19.3	19.8	18.0	19.1	4
Mean	**14.0**	**29.1**	**19.1**	**6.2**	**17.1**		**19.5**	**19.3**	**20.2**	**18.6**	**19.4**	

Table 16.5 VT Lucerne (P)-2011: Varietal Trial in Lucerne (Perennial)-3rd Year: Plant Height (cm) & Leaf Stem Ratio

Entries	Plant Height (cm)						Leaf Stem Ratio					
	His-ar	Urulikan-chan	Rah-uri	Bika-ner	Aver-age	Ra-nk	His-ar	Urulika-nchan	Rah-uri	Bika-ner	Aver-age	Ra-nk
CCP-1-1	68.2	64.4	52.9	79.3	66.2	2	0.8	1.57	0.98	1.43	1.20	1
ACP-3-2	70.5	60.4	53.1	74.1	64.5	4	0.77	1.49	1.04	1.51	1.20	1
RL-10-1	62.9	65.9	53.5	65.3	61.9	7	0.83	1.23	0.93	1.66	1.16	2
Anand-24	71.7	65.2	52.4	74.0	65.8	3	0.79	1.36	0.97	1.49	1.15	3
DWR-1	65.2	61.9	51.2	79.4	64.4	5	0.78	1.31	0.93	1.50	1.13	5
RRB-10-1	68.5	67.2	53.2	76.2	66.3	1	0.79	1.41	0.95	1.40	1.14	4
Anand-2 (NC)	54.3	66.1	52.3	74.4	61.8	8	0.74	1.49	0.92	1.66	1.20	1
RL-88 (NC)	60.2	67.0	53.0	75.1	63.8	6	0.78	1.28	0.95	1.53	1.14	4
Mean	**65.2**	**64.8**	**52.7**	**74.7**	**64.4**		**0.79**	**1.39**	**0.96**	**1.52**	**1.16**	

Table: 16.6: IVT Lucerne (P)-2011: Varitel Trial in Lucerne (Perennial): Pooled performance of entries of Lucerne over the year (2012-14)

Entries	Green Forage Yield (q/ha)						Dry Matter Yield(q/ha)					
	2011	2012	2013	Average	Rank	Superiority	2011	2012	2013	Average	Rank	Superiority
CCP-1-1	440.5	507.1	347.6	431.7	8		84.3	99.0	78.4	87.2	8	
ACP-3-2	425.5	512.1	382.8	440.1	6		84.2	105.2	91.4	93.6	6	
RL-10-1	424.2	647.8	507.0	526.3	2		80.9	129.5	121.8	110.7	2	
Anand-24	419.0	568.1	422.5	469.9	4		76.3	111.1	98.0	95.1	5	
DWR-1	424.7	557.6	406.3	462.9	5		81.0	112.0	95.0	96.0	4	
RRB-10-1	446.3	594.8	488.2	509.8	3		85.0	116.1	113.2	104.8	3	
Anand-2 (NC)	455.0	504.0	336.6	431.9	7		87.3	100.7	78.6	88.9	7	
RL-88 (NC)	447.7	707.6	559.7	571.7	1		90.4	145.4	132.0	122.6	1	
Mean	**435.4**	**574.9**	**431.3**	**480.5**			**83.7**	**114.9**	**101.1**	**99.9**		

Table 17.1 VT Lucerne (P)-2013: Varietal Trial in Lucerne (Perennial)-1st Year: Green Forage Yield (q/ha)

Entries	South Zone						All India		
	Hyderabad	Coimbatore	Mandya	Average	Rank	Superiority%	Average	Rank	Superiority%
VTL-2-1	359.6	402.6	187.9	316.7	7		420.3	6	
VTL-2-2	369.3	545.4	195.5	370.1	5		455.5	4	
VTL-2-3	401.2	648.5	158.8	402.8	1		392.5	7	
VTL-2-4	359.6	626.1	190.5	392.1	2		452.6	5	
VTL-2-5	338.8	558.6	199.5	365.6	6		455.7	3	
VTL-2-6	333.2	621.0	211.7	388.6	3		465.5	1	
VTL-2-7	355.4	554.0	241.3	383.6	4		456.9	2	
Mean	**359.6**	**565.2**	**197.9**	**374.2**			**442.7**		
CD at 5%	41.9	86.0	26.5						
CV%	6.6	8.6	7.5						

Table 17.2 VT Lucerne (P)-2013: Varietal Trial in Lucerne (Perennial)-1st Year: Dry Matter Yield (q/ha)

Entries	North West Zone						Central Zone						
	Ludh-iana	His-ar	Bika-ner	Aver-age	Ra-nk	Superi-ority%	Rah-uri	Urulika-nchan	Ana-nd	Rai-pur	Aver-age	Ra-nk	Superi-ority%
VTL-2-1	72.8	46.4	48.0	55.7	5		82.4	143.0	154.0	68.3	111.9	6	
VTL-2-2	62.2	53.9	85.6	67.2	1		88.2	151.5	163.9	79.8	120.9	3	
VTL-2-3	36.3	41.8	59.8	45.9	7		59.0	128.0	129.1	72.7	97.2	7	
VTL-2-4	58.3	48.5	63.9	56.9	4		87.3	141.7	167.2	81.4	119.4	5	
VTL-2-5	60.1	39.6	60.0	53.2	6		108.9	143.2	183.4	82.0	129.4	1	
VTL-2-6	59.1	44.3	94.8	66.1	2		77.6	163.4	161.4	80.4	120.7	4	
VTL-2-7	59.9	41.6	75.6	59.0	3		88.6	158.4	171.9	66.2	121.3	2	
Mean	**58.4**	**45.1**	**69.7**	**57.7**			**84.6**	**147.0**	**161.6**	**75.8**	**117.2**		
CD at 5%	3.6	5.1	11.7				15.3	14.0	13.9	14.4			
CV%	3.7	6.2	9.5				10.1	8.0	4.9				

Table 17.2 VT Lucerne (P)-2013: Varietal Trial in Lucerne (Perennial)-1st Year: Dry Matter Yield (q/ha)

Entries	South Zone						All India		
	Hyderabad	Coimbatore	Mandya	Average	Rank	Superiority%	Average	Rank	Superiority%
VTL-2-1	67.0	65.3	38.9	57.1	7		78.6	6	
VTL-2-2	72.7	91.1	44.2	69.3	5		89.3	2	
VTL-2-3	80.4	118.1	35.9	78.1	1		76.1	7	
VTL-2-4	75.4	106.8	39.1	73.8	3		87.0	5	
VTL-2-5	68.8	92.0	45.7	68.8	6		88.4	3	
VTL-2-6	71.6	104.0	49.5	75.1	2		90.6	1	
VTL-2-7	72.2	92.3	49.7	71.4	4		87.6	4	
Mean	**72.6**	**95.7**	**43.3**	**70.5**			**85.4**		
CD at 5%	NS	8.6	8.1						
CV%	8.3	5.0	10.5						

Table 17.3 VT Lucerne (P)-2013: Varietal Trial in Lucerne (Perennial)-1st 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)						
	Ludh-iana	His-ar	Bika-ner	Ana-nd	Rai-pur	Aver-age	Ra-nk	Ludh-iana	His-ar	Bika-ner	Rai-pur	Ana-nd	Aver-age	Ra-nk
VTL-2-1	2.97	1.63	1.11	4.09	1.76	2.31	6	0.34	0.27	0.28	0.37	0.86	0.42	4
VTL-2-2	2.65	1.99	2.02	4.63	2.06	2.67	1	0.29	0.31	0.50	0.43	0.91	0.49	1
VTL -2-3	1.48	1.44	1.39	3.66	1.87	1.97	7	0.17	0.24	0.35	0.39	0.72	0.37	5
VTL-2-4	2.60	1.68	1.45	4.56	2.10	2.48	4	0.27	0.28	0.38	0.44	0.93	0.46	3
VTL-2-5	2.56	1.32	1.46	5.09	2.11	2.51	3	0.28	0.23	0.35	0.44	1.02	0.46	3
VTL-2-6	2.42	1.54	2.28	4.48	2.07	2.56	2	0.28	0.25	0.56	0.43	0.90	0.48	2
VTL-2-7	2.55	1.42	1.78	4.89	1.70	2.47	5	0.28	0.24	0.44	0.36	0.96	0.46	3
Mean	**2.46**	**1.57**	**1.64**	**4.49**	**1.95**	**2.42**		**0.27**	**0.26**	**0.41**	**0.41**	**0.90**	**0.45**	

Table 17.4 VT Lucerne (P)-2013: Varietal Trial in Lucerne (Perennial)-1st Year: Crude Protein Yield (q/ha)

Entries	Crude Protein Yield(q/ha)								
	Ludhiana	Rahuri	Urulikanchan	Anand	Raipur	Hyderabad	Mandya	Average	Rank
VTL-2-1	2.2	15.3	26.9	39.9	12.1	13.2	8.8	16.9	6
VTL-2-2	2.0	17.2	28.4	42.4	15.2	14.9	9.2	18.5	2
VTL-2-3	1.3	10.8	24.3	33.3	13.4	17.0	8.5	15.5	7
VTL-2-4	1.5	15.4	26.9	43.1	16.1	13.9	7.0	17.7	5
VTL-2-5	1.9	22.1	26.3	47.3	16.4	13.6	9.6	19.6	1
VTL-2-6	1.9	16.1	29.7	40.7	15.3	14.7	10.5	18.4	3
VTL-2-7	1.9	16.5	27.0	45.2	11.5	15.0	10.5	18.2	4
Mean	**1.8**	**16.2**	**27.1**	**41.7**	**14.3**	**14.6**	**9.1**	**17.8**	

Table 17.5 VT Lucerne (P)-2013: Varietal Trial in Lucerne (Perennial)-1st Year: Crude Protein (%)

Entries	Crude Protein (%)								
	Ludhiana	Rahuri	Urulikanchan	Anand	Raipur	Hyderabad	Mandya	Average	Rank
VTL-2-1	20.8	18.5	18.8	25.7	17.7	19.7	22.8	20.6	4
VTL-2-2	19.1	19.5	18.7	25.6	19.1	20.6	21.0	20.5	5
VTL-2-3	20.4	18.3	19.0	25.5	18.5	21.2	23.6	20.9	1
VTL-2-4	21.5	17.7	19.0	25.5	19.8	18.4	17.9	20.0	7
VTL-2-5	20.8	20.3	18.4	25.5	20.1	19.7	21.0	20.8	2
VTL-2-6	20.0	20.7	18.2	24.9	19.0	20.6	21.4	20.7	3
VTL-2-7	21.7	18.6	17.1	26.0	17.3	20.8	21.0	20.3	6
Mean	**20.6**	**19.1**	**18.5**	**25.5**	**18.8**	**20.1**	**21.3**	**20.5**	

Table 17.6 VT Lucerne (P)-2013: Varietal Trial in Lucerne (Perennial)-1st Year: Plant height (cm)

Entries	Ludhiana	Hisar	Bikaner	Udaipur	Rahuri	Urulikanchan	Anand	Raipur	Mandya	Average	Rank
VTL-2-1	49.1	82.7	64.3	61.0	64.3	84.4	75.7	60.6	180.9	80.3	7
VTL-2-2	47.5	88.9	73.8	58.7	60.4	85.1	76.2	67.6	187.4	82.8	6
VTL-2-3	44.4	82.8	73.5	53.5	61.5	93.8	77.9	63.8	212.4	84.8	2
VTL-2-4	46.1	89.8	63.3	63.8	62.9	82.7	74.6	70.0	197.1	83.4	5
VTL-2-5	41.5	86.6	69.0	62.1	60.8	90.8	79.5	74.3	193.8	84.2	4
VTL-2-6	44.8	87.4	73.5	60.1	59.0	88.0	78.0	64.7	204.1	84.4	3
VTL-2-7	44.8	82.9	69.0	60.4	65.5	91.0	78.4	62.8	209.0	84.9	1
Mean	**45.5**	**85.9**	**69.5**	**59.9**	**62.0**	**88.0**	**77.2**	**66.3**	**197.8**	**83.6**	

Table 17.7 VT Lucerne (P)-2013: Varietal Trial in Lucerne (Perennial)-1st Year: Leaf Stem Ratio

Entries	Hisar	Bikaner	Rahuri	Urulikanchan	Raipur	Mandya	Average	Rank
VTL-2-1	0.72	1.55	0.90	0.89	0.83	0.72	0.94	3
VTL-2-2	0.74	1.42	1.00	0.81	0.97	0.49	0.90	4
VTL-2-3	0.77	1.12	1.03	0.72	0.9	0.47	0.83	6
VTL-2-4	0.77	1.52	0.96	0.75	1.04	0.74	0.96	2
VTL-2-5	0.74	1.47	1.18	0.77	1.06	0.60	0.97	1
VTL-2-6	0.76	1.35	0.95	0.86	0.93	0.57	0.90	4
VTL-2-7	0.78	1.35	0.98	0.74	0.78	0.64	0.88	5
Mean	**0.75**	**1.40**	**1.00**	**0.79**	**0.93**	**0.60**	**0.91**	

Table 17.8 VT Lucerne (P)-2013: Varietal Trial in Lucerne (Perennial)-1st Year: ADF (%), NDF (%) and IVDMD (%)

Entries	ADF (%)		NDF (%)		IVDMD (%)	
	Ludhiana	Rank	Ludhiana	Rank	Ludhiana	Rank
VTL-2-1	37.3	4	50.4	4	68.4	4
VTL-2-2	38.3	5	49.4	3	65.8	5
VTL-2-3	35.5	2	49.1	2	63.2	7
VTL-2-4	36.3	3	49.4	3	73.2	2
VTL-2-5	41.5	6	53.2	6	74.4	1
VTL-2-6	37.3	4	52.8	5	63.3	6
VTL-2-7	31.7	1	48.8	1	72.2	3
Mean	**36.8**		**50.4**		**68.6**	

CHAPTER-2

FORAGE CROP PRODUCTION

Forage Crop Production

The forage crop production programme was executed at 24 locations in five zones. In total 20 experiments were conducted, out of which 13 were in network (11 coordinated and 2 AVT based) and 7 were 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 cropping systems. The salient research achievements of the forage crop production trials during *rabi* 2013-14 are as follow.

(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, physio-chemical properties of soil and economics of the system. The experimental results of fourth (final) year study are summarized zone wise.

Hill Zone: Location: Palampur **[Table Reference: 1(a) to 1 (d)]**

Sub title: Effect of vegetative barriers and improved forage species on conservation of degraded grasslands (rainfed conditions)

In the Hill zone at Palampur, vegetative barrier of BxN Hybrid resulted in the production of 289.23 q/ha green fodder, which was 7.62% and 26.01% more than *Setaria* grass and no vegetative barrier, respectively. The respective increase in dry fodder yield was 5.38% and 13.31%. Among vegetative cover of forage species, *Setaria* + *Stylosanthes* (347.86 q/ha) was significantly superior over other treatments and it was followed by *Setaria* grass alone (309.37 q/ha). *Setaria* + *Stylosanthes* produced 12.44%, 44.17% and 129.64% more green fodder yield than *Setaria* grass, *Stylosanthes* and local grasses. The respective increase in term of dry fodder yield was 17.09%, 73.11% and 98.34%.

BN hybrid as vegetative barrier resulted in significantly higher crude protein content (6.3%). Among improved forage species, *Stylosanthes* resulted in higher crude protein content (10.54%). *Setaria* grass + *Stylosanthes* resulted in significantly better crude protein yield (8.21q/ha). BN hybrid as vegetative barrier resulted in higher net return (Rs. 28649/ha) followed by *Setaria* grass as barrier (Rs. 25984/ha) and no vegetative barrier (Rs. 21033/ha). The respective B: C under these treatments was 1.89, 1.75 and 1.49. Planting of *Setaria* + *Stylosanthes* resulted in net return of Rs. 35711/ha, which was Rs. 5003, 12914 and 24040/ha more than *Setaria* grass, *Stylosanthes* and local grasses, respectively. Similar trend was also observed with respect to benefit cost ratio.

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*

alone as well as with *Setaria* grass resulted in more soil biomass carbon 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.

North West Zone (Irrigated conditions) **[Table Reference: l(e) to l(h)]**

Sub title: Effect of different tillage practices on productivity of forage crop in the prevalent crop sequence.

Location: Ludhiana, Hisar and Pantnagar

The experiment was conducted at two locations with different cropping sequences. The cropping sequences taken at Pantnagar and Ludhiana were sorghum-wheat-maize+cowpea, and pearl millet-wheat, respectively. The tillage practices done in fodder crops were common at all the location comprising of eight treatments namely **T_1 :** Conventional tillage (1 disc harrow + 2 cultivator), **T_2:** 2 cultivation (1 disc harrow + 1 cultivator), **T_3 :**2 cultivation (rotavator), **T_4:**1 cultivation (disc harrow), **T_5:**1 cultivation (rotavator), T_6**:**broadcasting of seed before T_3, **T_7:**broadcasting of seed before T_5 and **T_8:**no cultivation (zero tillage) laid out in randomized block design and replicated three time. This year trial could not be conducted at Hisar centre.

At Pantnagar different tillage treatment were applied in sorghum crop followed by cultivation of wheat-maize + cowpea cropping system under normal package of practices. Practicing of two cultivation through rotavator under sorghum being at par with conventional tillage (1888 q/ha), One cultivation through disc harrow (1898 q/ha) and one cultivation through rotavator (1867 q/ha) recorded significantly higher total green forage yield of sorghum-wheat-maize + cowpea cropping system. Whereas, total dry matter yield (306.5 q/ha) and benefit cost ratio (3.00) of respective cropping system was recorded significantly highest under one cultivation through rotavator after broadcasting of seed (T_7). Crude protein yield and net monetary return of sorghum-wheat-maize + cowpea cropping system remained unaffected by adoption of different tillage practices under sorghum crop. However, practicing of two cultivation through rotavator in sorghum fetched highest net monetary return (Rs 149729/ha/yr) under sorghum-wheat-maize + cowpea cropping system. With respect to soil fertility, adoption of zero tillage in sorghum under sorghum-wheat-maize + cowpea cropping system recorded highest organic carbon (0.92%), available N (301.2 kg/ha), P (22.50 kg P/ha) and K (250.3 kg K/ha) in soil over rest of treatment as well as initial level of soil fertility after completion of cropping sequence.

At Ludhiana, growing of pearl millet under different tillage practices caused significant variation in green fodder, dry matter, plant height, CPY, NMR and B:C ratio. Practicing of two cultivation (rotavator) being at par with T_1, T_2, T_4, and T_5 recorded significantly highest GFY (608.6 q/ha) over rest of two tillage practices. Whereas, conventional tillage (T_1) being at par with T_2, T_3, T_4, and T_5 treatment, recorded highest dry matter yield (142.1 q/ha) over rest of two tillage practices. Highest net monetary return (Rs 25109/ha) was fetched when pearl millet was grown with two cultivation through rotavator. Whereas, zero tillage recorded highest B:C ratio.

North East Zone: **[Table Reference: l (i) to l (n)]**

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

Locations: Faizabad, Jorhat, Bhubaneswar, Ranchi 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 fourth year of experimentation.

At Faizabad, planting of guinea grass without mulch (T_4) being at par with T_5 (guinea grass + soil mulch) recorded significantly highest GFY (360.5 q/ha) and DMY (81.2 q/ha) of perennial grasses. With respect to total GFY, guinea grass + intercropping (berseem) recorded highest GFY (525.3 q/ha) and DMY (108.8 q/ha). Planting of guinea grass + intercropping (berseem) fetched highest net monetary return (Rs. 36071/ha). With respect to nutrient uptake, planting of guinea grass without mulch recorded highest uptake of nitrogen (158.2 kg N/ha), whereas, highest uptake of P (20.56 kg P/ha) and K (21.56 kg K/ha) was observed under guinea supplemented with soil mulch.

At Bhubaneswar, growing of guinea grass recorded significantly highest GFY (757.3 q/ha), DMY (151.5 q/ha), CPY (11.5 q/ha) and net monetary return (Rs 46062/ha/yr) over *Setaria* and *Brachiaria* grasses. With respect to moisture conservation practices, live mulch (intercropping of grasses with rice bean) recorded significantly highest GFY (760.5 q/ha/yr), DMY (147.2 q/ha/yr), CPY (11.4 q/ha/yr and net monetary return (Rs 44054/ha/yr) of grasses over control and soil mulch. The magnitude of increase for GFY in live mulch (intercropping with rice bean) over control and soil mulch was 14.0 and 9.3 %, respectively. The planting of different grasses recorded higher soil fertility level in terms of organic carbon, available N, P and K in soil as compared to initial soil fertility level after completion of experiment. With respect to moisture conservation practices, practice of live mulch (intercropping of grasses with rice bean) recorded higher level of organic carbon and available N, P and K in soil as compared to control and soil mulch as well as initial level of soil fertility.

At Kalyani, perennial grass *Setaria* recorded significantly highest GFY (881.2 q/ha/yr), DMY (169.6 q/ha/yr), CPY (14.5 q/ha) and net monetary return (Rs 77756/ha/yr) over guinea and *Brachiaria* grasses. Respective grass recorded 30.9 and 31.5 % more GFY over guinea and *Brachiaria* grasses, respectively. The practicing of live mulch (intercropping with rice bean) recorded significantly highest GFY (904.1 q/ha/yr), DMY (167.9 q/ha), CPY (14.5 q/ha/yr) and net monetary return (98411/ha/yr) of grasses over control and soil mulch. Live mulch recorded 48.31 and 27.3 % more GFY of grasses over control and soil mulch, respectively. The planting of *Setaria* grass with live mulch (rice bean) recorded significantly highest GFY (1087.5 q/ha/yr) over rest of the grasses and moisture conservation combinations.

At Jorhat, level of organic carbon and available nutrients (N, P and K) in soil was recorded higher over initial level of soil after completion of the experiment. The planting of BN hybrid or *Setaria* grasses being at par with each other recorded significantly higher level of available N and K in soil over *Brachiaria* grass. With respect to moisture conservation practices, live mulch (intercropping with rice bean) recorded significantly higher organic carbon (0.75 %), available N (271.1 kg/ha), P (14.35 kg/ha) and available K (123.9 kg/ha) over soil mulch and control treatments.

At Ranchi, planting of different grasses did not cause significant variation in soil organic carbon content and pH after completion of the experiment. Significantly higher available N (266.1.kg/ha) in soil was observed under *Brachiaria* grass over BN hybrid and *Setaria* grasses. *Brachiaria* being at par with BN hybrid grass retained significantly highest available P (41.2 kg/ha) and K (163.5 kg/ha) over *Setaria* grass in soil after completion of the experiment. With respect to moisture conservation practices, adopting of live mulch (intercropping with rice bean) resulted in significantly highest organic carbon content (0.412 %) and available N (283.1 kg/ha) in soil over control and soil mulch after completion of the experiment.

Central Zone **[Table Reference: 1(o) to 1 (s)]**

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

Locations: 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 forages. The treatment 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 experimental result of fourth year study has given below.

At Jabalpur, planting of forage crops on ridge and furrow system recorded significantly higher GFY (626.4 q/ha), DMY (245.6 q/ha) and net monetary return (Rs 50533/ha/yr) over flat bed system. The planting of *Dichanthium* + *Desmanthus* grass and legume combination recorded significantly highest GFY (698.3/ha/yr), DMY (284.8 q/ha/yr) and net monetary return (Rs 58005/ha/yr) over rest of the combinations. Under different planting systems and forage crop combinations, soil fertility in terms of available nutrients, OC and bulk density remain unchanged over initial level after completion of the experiment.

At Rahuri, soil fertility in terms of organic carbon and available nutrients (N, P and K) in soil was not affected significantly by different moisture conservation practices after end of the experiment. Planting of *Cenchrus* + *Desmanthus* grass and legume combination recorded highest available N (152.7 kg/ha), whereas, highest available K (657.2 kg/ha) in soil was recorded under *Dichanthium* + *Stylosanthes* grass and legume combination after crop cycle. Organic carbon, pH EC (dSm-1) and available P in soil did not differed significantly under different grasses and legumes combination.

At Anand, moisture conservation techniques (ridge & furrow and flat bed method) did not cause significant variation in soil fertility after crop cycle and fertility remained almost same as initial soil fertility. The planting of *Dichanthium* + *Stylosanthes* combination of grass and legume system being at par with *Dichanthium* + *Desmanthus* combination, recorded significantly higher available P (36.7 kg/ha) and K (253.5 kg/ha) in the soil after crop cycle over *Cenchrus* + *Desmanthus* and *Cenchrus* and *Stylosanthes* combination of grasses and legumes.

At Urulikanchan, growing of grasses and legumes under different planting methods recorded higher level of pH, electrical conductivity, organic carbon and available N, P and K in soil as compared to initial status after completion of experiment. However, available P in soil decreased remarkably under different planting methods + grass & legume combinations over initial level of soil fertility.

South Zone (Silvipasture): [Table Reference: 1(t) to 1 (x)]

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* (T_1), Subabul + *Stylosanthes* (T_2), Subabul + *Desmanthus virgatus* (T_3), Subabul + *Cenchrus ciliaris* + *Stylosanthes* (T_4), Subabul + *Cenchrus ciliaris* + *Desmanthus virgatus* (T_5), Subabul + sorghum + horse bean (T_6), Subabul + pearl millet + horse bean (T_7) and Subabul sole (T_8). All eight treatments were common at three locations except Hyderabad, where BN hybrid replaced *Cenchrus ciliaris*. Treatments were laid out in randomized block design with three replications. The experimental results of fourth (final) year are as follows.

On location mean basis of Mandya and Coimbatore, planting of subabul + pearl millet + horse gram silvipasture system (T_7) recorded highest GFY (416.1 q/ha), net monetary return (Rs 15356/ha/yr) and benefit cost ratio (2.23) while CPY (11.65 q/ha) was observed highest under subabul + *Stylosanthes* (T_2) silvipasture system and lowest GFY (129.9 q/ha), DMY (21.4 q/ha) and CPY (4.37 q/ha) was with subabul sole (T_8).

The intensive silvipasture system also caused remarkable changes in soil fertility after fourth year of cropping cycle at Mandya. The growing of subabul + *Cenchrus ciliaris* + *Desmanthus virgatus* (T_5) silvipasture system resulted in highest organic carbon (0.72 %), available N (373.6 kg N/ha), P (27.4 kg P/ha) and K (266.4 kg K/ha) over rest of the treatments. The higher level of available N in soil was recorded over its initial level under all the intensive forage production system except T_6 and T_7 treatments. At Coimbatore, moisture content in soil varies with treatments and higher level of moisture content in soil was recorded under different silvipasture system at 0-15 cm and 15-30 cm of soil depth over sole subabul except few values.

At Hyderabad, growing of Subabul + BN hybrid + *Desmanthus virgatus* (T_5) intensive silvipasture system being at par with Subabul + BN hybrid + *Stylosanthes* (T_4) system recorded significantly highest GFY (339.5 q/ha), DMY (72.7 q/ha) and fetched highest net monetary return (Rs 44074/ha/yr) and BC ratio (3.75) over rest of the silvipasture system. However, subabul + *Desmanthus virgatus* (T_3) fodder production system being at par with T_5 treatment recorded significantly highest crude protein yield (11.3 q/ha) over rest of the treatments.

South Zone (Alley cropping): [Table Reference: 1(y) to 1 (z-1)]

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 yield and soil health for cassava in the humid tropics. On the basis of polled data of three year experimentation, planting cassava + bajra napier hybrid + fodder cowpea system recorded highest green fodder yield (444.4 q/ha) over rest of the treatments. Whereas, cassava + AMY alley cropping system produced highest tuber yield (238.5 q/ha) and fetched maximum net monetary return (Rs 143098/ha/yr). With respect to soil fertility, growing of cassava + Bajra napier hybrid + fodder cowpea retained highest organic carbon in soil (0.85 %) and lowest being with cassava + Bajra napier hybrid (0.67 %)

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})						
Vegetative barriers											
No vegetative barrier	-	78.2	27.6	-	265	229.52	57.54	8.89	5.17	21033	1.49
Napier bajra hybrid	95.5	88.0	28.2	70	269	289.23	65.20	9.74	6.32	28649	1.89
Setaria grass	-	80.8	27.7	-	274	268.73	61.87	9.45	5.89	25984	1.75
SEm±	-	2.52	1.40	-	3	2.00	0.73	0.06	0.09	-	-
CD5%	-	NS	NS	-	NS	7.88	2.89	0.26	0.39	-	-
Improved forage species											
Setaria grass	100.6	77.6	24.7	66	267	309.37	71.60	8.98	6.43	30708	1.95
Stylo	96.1	-	-	70	-	241.27	48.43	10.54	5.09	22797	1.69
Setaria+ *Stylo*	93.1	87.0	31.0	80	271	347.86	83.84	9..78	8.21	35711	2.17
Local grasses	92.1	-	-	66	-	151.48	42.27	8.14	3.44	11671	1.04
SEm±	4.74	2.91	1.62	3.02	3	3.43	1.09	0.09	0.12	-	-
CD5%	NS	9.2	5.1	11	NS	10.18	3.25	0.27	0.36	-	-

Table- 1 (b): Effect of vegetative barriers and forage species treatments on soil properties (Hill zone- Palampur)

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	221.0	11.0	254.0	0.56	11.0	42.0	5.5
Napier bajra hybrid	231.0	12.0	258.0	0.56	12.0	41.0	5.6
Setaria grass	238.0	12.0	248.0	0.57	13.0	43.0	5.6
Improved forage species							
Setaria grass	234.0	13.0	258.0	0.59	12.0	39.0	5.6
Stylo	256.0	12.0	258.0	0.56	14.0	45.0	5.6
Setaria+ *Stylo*	248.0	12.0	252.0	0.56	12.0	44.0	5.7
Local grasses	182.0	10.0	245.0	0.53	12.0	37.0	5.6
Initial	**213.0**	**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 (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	17.9	23.6	26.5	28.1	31.6	29.3	19.8	24.3	15.9	21.6	21.7	21.7	11.6
Napier bajra hybrid	17.1	25.8	28.4	29.6	32.1	30.4	21.2	24.0	18.2	21.3	24.4	19.7	13.7
Setaria grass	17.9	25.9	28.4	29.8	30.2	27.1	18.8	20.1	16.9	22.8	22.1	22.8	12.4
Improved Forage Species													
Setaria grass	16.9	23.8	29.6	29.8	33.3	30.9	18.7	23.7	17.2	21.8	20.7	22.9	12.5
Stylo	17.2	27.1	29.8	28.3	31.4	26.7	20.4	21.2	16.5	20.9	21.9	20.8	12.2
Setaria+ *Stylo*	17.8	26.0	30.0	29.6	33.0	21.2	21.2	24.9	18.6	21.2	22.3	20.9	13.3
Local grasses	17.4	23.5	21.7	28.9	30.8	21.3	19.5	22.4	15.7	23.7	19.4	19.6	12.2

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	19.9	25.4	29.1	30.6	39.2	36.4	29.5	29.4	22.1	24.3	27.2	24.1	14.6
Napier bajra hybrid	23.4	26.4	31.9	30.6	40.1	38.9	32.7	29.3	27.2	24.9	26.6	23.7	16.2
Setaria grass	23.6	26.7	32.1	29.8	38.4	32.5	26.2	26.2	19.7	27.0	29.3	25.6	15.7
Improved Forage Species													
Setaria grass	22.4	24.7	28.7	30.3	37.7	36.9	23.0	29.0	20.2	26.0	26.4	24.6	16.1
Stylo	21.9	23.5	27.5	29.6	37.2	31.9	25.7	27.1	20.9	26.4	28.1	23.7	14.9
Setaria+ *Stylo*	23.7	24.8	29.4	31.8	39.9	30.7	27.6	29.6	20.4	24.4	29.4	25.0	16.2
Local grasses	21.1	23.3	27.3	29.6	35.5	31.0	26.1	27.7	21.5	24.8	26.8	21.4	14.7

Table-1 (e): Effect of different tillage practices growth, yield and economics of forage crops (maize + cowpea) in prevalent crop sequence of Sorghum – Wheat – Maize + Cowpea at Pantnagar in North West Zone

Treatment	Total green fodder yield (q/ha)	Total dry matter yield (q/ha)	Total crude protein yield (q/ha)	Gross return (Rs./ha)	Net monetary return (Rs/ha/yr)	Benefit cost ratio
T_1	562.0	127.8	12.8	56166	41666	2.87
T_2	612.0	163.5	14.3	61163	47163	3.37
T_3	624.0	142.2	14.2	62382	48082	3.36
T_4	591.0	135.5	13.2	59052	45052	3.22
T_5	557.0	130.0	11.7	55722	42222	3.13
T_6	593.0	135.8	13.7	59274	45274	3.23
T_7	611.0	141.3	13.0	61060	47960	3.66
T_8	591.0	132.9	13.4	59055	46555	3.72
SEm$\pm$	9.56	1.9	0.36	958	958	0.07
CD at 5%	29.0	5.73	1.10	2905	2905	0.21

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

Table -1 (f): **Effect of tillage on green and dry forage yield, crude protein and economics of Sorghum-Wheat- Maize + Cowpea' cropping system**

Treatments	Green forage yield (q/ha)	Dry forage yield (q/ha)	CPY (q/ha)	Gross return (Rs./ha)	Net return (Rs./ha)	B:C ratio
T_1	1888	280.14	26.8	188763	143763	2.18
T_2	1831	283.58	25.8	183147	138423	2.26
T_3	1935	291.50	27.8	193496	149729	2.39
T_4	1898	285.77	26.7	189812	147256	2.37
T_5	1867	283.01	25.3	186769	145875	2.39
T_6	1808	284.81	26.4	180793	136793	2.27
T_7	1785	306.47	26.3	178523	135140	2.36
T_8	1812	272.49	25.8	181229	140992	3.00
SEm±	30.18	3.03	0.48	3026	4518	0.05
CD at 5%	92 .0	9.2 0	NS	9178	NS	0.14
CV (%)	3.0	1.84	3.09	3.0	6.0	3.5

Table-1 (g): Effect of different tillage practices on soil fertility in prevalent crop sequence of Sorghum – Wheat – Maize + Cowpea at Pantnagar in North West Zone

Treatment	OC (%)	pH	N (kg/ha)	P (kg/ha)	K (kg/ha)
T_1	0.86	7.65	284.23	20.83	232.03
T_2	0.85	7.67	287.00	21.70	241.20
T_3	0.87	7.72	296.17	22.20	246.77
T_4	0.86	7.65	286.70	21.17	238.83
T_5	0.86	7.71	284.30	21.53	241.10
T_6	0.87	7.68	291.83	21.67	241.07
T_7	0.89	7.63	295.93	22.17	243.80
T_8	0.92	7.70	301.20	22.50	250.33
SEm±	0.01	-	2.01	1.14	3.23
CD at 5%	0.03	-	6.10	NS	9.79
CV (%)	2.1		2.0	8.36	2.31
Initial	0.86	7.63	283.56	20.78	231.20

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

Table 1 (h): Effect of different tillage practices on fodder yield, quality and attributing characters of forage pearl millet in the prevalent crop sequence at Ludhiana in North West Zone

Treatments	GFY (q/ha)	DMY (q/ha)	Plant height (cm)	Tillers/m row length	Leaf- stem ratio	CP content (%)	CPY (kg/ha)	NMR (Rs/ha)	B : C ratio
T_1	606.3	142.1	201.4	33.4	0.70	7.47	10.61	24373	2.03
T_2	596.1	137.8	197.2	32.8	0.72	7.49	10.32	24511	2.18
T_3	608.6	141.7	201.7	34.1	0.71	7.60	10.77	25109	2.20
T_4	584.4	132.2	192.2	31.9	0.72	7.67	10.14	24311	2.26
T_5	588.2	134.1	196.7	33.3	0.74	7.54	10.11	24790	2.37
T_6	436.8	114.4	174.2	22.3	0.73	7.49	8.57	15040	1.34
T_7	487.2	117.5	180.8	25.2	0.71	7.52	8.84	18969	1.85
T_8	541.7	123.3	190.4	29.9	0.74	7.49	9.24	23048	2.43
S Em $\pm$	21.09	4.73	8.04	1.38	-	0.25	0.41	1116	0.10
CD 5 %	64.0	14.3	24.4	4.18	-	NS	1.25	3383	0.30
CV %	6.57	6.28	7.26	7.87	-	5.64	7.27	8.58	8.24

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

Table-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 return (Rs/ha/yr)	NMR (Rs/ha/yr)	Nutrient uptake(kg/ha) by perennial grasses		
	GFY (q/ha)	DMY (q/ha)	CPY (q/ha)	GFY (q/ha)	DMY (q/ha)	CPY (q/ha)			N	P	K
T_1	157.2	35.1	2.7	-	-	-	15724	8024	76.24	6.75	7.98
T_2	174.7	38.3	2.8	-	-	-	17465	8965	82.84	8.01	10.20
T_3	148.3	33.2	2.5	170.4	31.4	5.4	31867	17817	74.51	7.62	8.14
T_4	360.5	81.2	6.1	-	-	-	36051	25001	158.21	17.85	15.60
T_5	356.5	79.5	5.9	-	-	-	35645	21055	156.57	20.56	21.56
T_6	334.4	73.6	5.7	190.9	35.2	6.0	52521	36071	151.43	17.13	17.16
T_7	208.4	46.4	3.8	-	-	-	20843	13643	109.24	14.20	13.02
T_8	220.6	48.7	4.0	-	-	-	22062	14462	116.30	12.01	13.87
T_9	200.3	44.1	3.4	204.2	37.6	6.4	40447	26787	107.94	9.54	9.64
SEm±	4.3	2.9	1.4	-	-	-			3.40	1.93	1.93
CD at 5%	12.9	8.8	4.3	-	-	-			10.20	5.77	5.78
CV%	12.8	12.4	9.4	-	-	-			10.52	9.80	9.57

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 growth, yields and Economics of forages at Bhubaneswar in North East zone

Treatment	GFY (q/ha)	DMY (q/ha)	CPY (q/ha)	Plant height (cm)	Leaf stem ratio	Number of tillers/ m^2	Gross return (Rs/ha)	NMR of system (Rs/ha)
A. Perennial grass								
Brachiaria	689.3	131.0	11.1	79.7	1.00	59.3	68931	39264
Guinea	757.3	151.5	11.5	107.6	0.90	59.0	75729	46062
Setaria	676.5	128.5	9.1	72.3	0.94	54.4	67654	37988
SEm±	9.5	1.9	0.2	2.2	0.02	1.8	951	951
CD at 5%	27.9	5.5	0.4	6.4	0.06	5.4	2787	2787
B. Moisture conservation practices								
Control	667.1	129.1	10.0	82.8	0.90	55.2	66707	38707
Soil mulch	695.5	134.6	10.4	87.0	0.93	57.3	69553	40553
Live mulch (intercropping)	760.5	147.2	11.4	89.7	1.02	60.2	76054	44054
SEm±	9.5	1.9	0.2	2.2	0.02	1.8	951	951
CD at 5%	27.9	5.5	0.4	6.4	0.06	5.4	2787	2787
C. Interaction: Perennial grass X Moisture conservation practices								
SEm±	16.5	3.2	0.3	3.8	0.04	3.2	1646	1646
CD at 5%	48.3	9.5	0.7	11.1	0.10	9.3	4828	4828
CV%	4.0	4.1	4.1	7.6	6.49	9.5	4.0	7.0

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

Treatment	GFY (q/ha)	DMY (q/ha)	CPY (q/ha)	Gross return (Rs./ha/yr)	NMR (Rs./ha/yr)
A. Perennial grass					
Guinea	672.7	141.3	9.5	98921	50587
Setaria	881.2	169.6	14.5	126089	77756
Brachiaria	670.0	139.9	10.9	99768	51435
SEm±	11.4	2.4	0.3	1394	1394
CD at 5%	34.0	7.3	0.8	4178	4178
B. Moisture conservation practices					
Control	609.6	132.9	9.1	76717	38217
Soil mulch	710.2	149.9	11.2	89650	43150
Live mulch (intercropping)	904.1	167.9	14.5	158411	98411
SEm±	11.4	2.4	0.3	1394	1394
CD at 5%	34.0	7.3	0.8	4178	4178
C. Interaction: Perennial grass X Moisture conservation practices					
SEm±	19.7	4.2	0.5	2414	2414
CD at 5%	NS	NS	1.4	7236	7236
CV%	4.6	4.9	6.9	4	7

Table-1 (k-1): Interaction effect of perennial grasses and moisture conservation practices on yield of forages at Kalyani

Treatment	Green Fodder Yield (q/ha)				Dry Matter Yield (q/ha)				Crude Protein Yield (q/ha)			
	Control	Soil mulch	Live mulch	Mean	Control	Soil mulch	Live mulch	Mean	Control	Soil mulch	Live mulch	Mean
Guinea	548.0	649.3	820.7	672.7	119.9	140.3	163.6	141.3	7.2	9.1	12.3	9.5
Setaria	725.7	830.3	1087.5	881.2	155.0	166.9	186.8	169.6	11.9	13.0	18.4	14.5
Brachiaria	555.0	651.0	804.0	670.0	123.7	142.6	153.3	139.7	8.1	11.7	12.9	10.9
Mean	609.6	710.2	904.1		132.9	149.9	167.9		9.1	11.2	14.5	
	G	C	GxC	CV%	G	C	GxC	CV%	G	C	GxC	CV%
SEm±	11.4	11.4	19.7	4.6	2.4	2.4	4.2	4.9	0.3	0.3	0.5	6.9
CD at 5%	34.0	34.0	58.9		7.3	7.3	12.6		0.8	0.8	1.4	

Table-1 (l): Effect of moisture conservation practices and perennial grasses on Soil fertility after crop cycle of forages at Bhubaneswar in North East zone

Treatment	Soil fertility status after completion of the experiment					
	OC (%)	pH	EC (dSm^{-1})	Available nutrient in soil		
				N (kg/ha)	P (kg/ha)	K (kg/ha)
A. Perennial grass						
Brachiaria	0.46	5.97	0.08	206.20	18.23	137.63
Guinea	0.45	6.00	0.08	213.13	17.53	132.50
Setaria	0.46	5.97	0.08	211.17	17.40	125.50
B. Moisture conservation practices						
Control	0.42	5.53	0.08	208.13	16.10	119.50
Soil mulch	0.43	5.83	0.08	193.80	17.20	130.70
Live mulch (intercropping)	0.51	6.57	0.08	228.57	19.87	145.43
Initial	0.39	5.6	0.08	190.5	14.6	110.5

Table-1 (m): Effect of moisture conservation practices and perennial grasses on soil fertility after crop cycle of forages at Jorhat in North East zone

Treatment	Soil fertility status after completion of the experiment				
	OC (%)	pH	Available nutrient in soil		
			N (kg/ha)	P (kg/ha)	K (kg/ha)
A. Perennial grass					
Brachiaria	0.70	5.65	258.8	13.63	117.9
Bajra napier hybrid	0.70	5.71	265.8	13.60	121.1
Setaria	0.70	5.65	267.3	13.88	120.5
SEm±	0.006	0.010	1.32	0.190	0.27
CD at 5%	NS	0.031	4.08	NS	0.83
B. Moisture conservation practices					
Control	0.65	5.59	252.7	12.76	113.3
Soil mulch	0.71	5.71	268.1	14.00	122.2
Live mulch (intercropping)	0.75	5.72	271.1	14.35	123.9
SEm±	0.005	0.025	0.27	0.105	0.42
CD at 5%	0.016	0.076	0.82	0.321	1.28
C. Interaction : Perennial grass X Moisture conservation practices					
SEm±	0.009	0.04	0.47	0.18	0.72
CD at 5%	NS	NS	NS	NS	NS
CV%	4.07	1.81	2.32	6.41	1.03
Initial	**0.60**	**5.45**	**252.50**	**12.67**	**110.70**

Table-1 (n): Effect of moisture conservation practices and perennial grasses on soil fertility after crop Cycle of forages at Ranchi in North East zone

Treatment	Soil fertility status after completion of the experiment				
	OC (%)	pH	Available nutrient in soil		
			N (kg/ha)	P (kg/ha)	K (kg/ha)
A. Perennial grass					
Brachiaria	0.405	6.39	266.1	41.2	163.5
Bajra napier hybrid	0.396	6.40	251.7	40.5	162.9
Setaria	0.403	6.39	251.4	32.5	154.9
SEm±	0.0045	0.002	2.5	2.5	2.2
CD at 5%	NS	NS	7.6	7.6	6.9
B. Moisture conservation practices					
Control	0.395	6.38	236.3	38.2	160.5
Soil mulch	0.397	6.40	249.9	38.5	160.8
Live mulch (intercropping)	0.412	6.41	283.1	37.7	159.9
SEm±	0.002	0.0045	2.54	2.5	2.24
CD at 5%	0.0061	0.134	7.63	NS	NS
C. Interaction: Perennial grass X Moisture conservation practices					
SEm±	0.0078	0.0035	4.4	4.4	4.1
CD at 5%	NS	NS	13.2	NS	NS

Table-1 (o): Effect of planting methods and forage crops combination on yields and soil fertility status of grasses + legumes at Jabalpur

Treatment	GFY (q/ha)	DMY (q/ha)	CYP (q/ha)	NMR (Rs/ha)
A. Moisture conservation techniques				
Ridge and furrow	626.4	245.5	22.1	50533
Flat bed	546.2	220.0	20.3	43076
SEm±	7.8	6.6	2.5	
C D at 5%	23.4	18.6	NS	
B. Combination of grasses and legume				
Cenchrus + Desmanthus (1:1)	641.4	250.5	24.4	52322
Cenchrus + Stylosanthes (1:1)	499.1	190.6	17.4	38073
Dicanthium + Desmanthus (1:1)	698.3	284.8	25.9	58005
Dicanthium + Stylosanthes (1:1)	506.3	205.2	17.1	38818
SEm±	7.1	5.6	1.9	
C D at 5%	21.4	15.4	4.6	
C. Interaction: M X C				
SEm±	5.9	5.2	1.1	
C D at 5%	17.8	15.2	3.4	
CV%	10.5	11.5	5.8	

Table-1 (p): Effect of planting methods and forage crops combination on soil fertility after completion of crop cycle of grasses and legumes at Rahuri in Central zone

Treatment	Soil fertility status after completion of experiment					
	OC (%)	pH	EC (dSm^{-1})	Available nutrient in soil		
				N (kg/ha)	P (kg/ha)	K (kg/ha)
A. Moisture conservation techniques						
Ridge and furrow	0.45	7.31	0.34	148.67	16.26	624.64
Flat bed	0.46	7.43	0.35	148.64	14.75	623.69
SEm±	0.01	0.05	0.01	1.17	0.63	5.37
C D at 5%	NS	NS	NS	NS	NS	NS
B. Combination of grasses and legume						
Cenchrus + Desmanthus (1:1)	0.44	7.39	0.34	152.65	14.76	627.32
Cenchrus + Stylosanthes (1:1)	0.47	7.41	0.33	147.92	16.85	591.87
Dicanthium + Desmanthus (1:1)	0.49	7.26	0.37	149.48	15.89	620.26
Dicanthium + Stylosanthes (1:1)	0.42	7.43	0.35	144.57	14.51	657.22
SEm±	0.02	0.08	0.01	1.66	0.89	7.59
C D at 5%	NS	NS	NS	4.87	NS	22.33
C. Interaction: M X C						
SEm±	0.03	0.11	0.01	2.34	1.26	10.74
C D at 5%	NS	NS	NS	6.89	NS	NS
CV%	14.62	2.93	5.88	3.15	16.24	3.44

Table-1 (q): Effect of planting methods and forage crops combination on soil fertility after completion of crop cycle of grasses and legumes at Anand in Central zone

Treatment	Soil fertility status after completion of experiment					
	OC (%)	pH	EC (dSm^{-1})	Available nutrient in soil		
				N (kg/ha)	P (kg/ha)	K (kg/ha)
A. Moisture conservation techniques						
Ridge and furrow	0.46	7.70	0.28	215.61	36.11	242.75
Flat bed	0.46	7.50	0.29	227.45	33.97	243.77
SEm±	0.01	0.06	0.01	4.35	0.54	2.82
C D at 5%	NS	NS	NS	NS	1.63	NS
B. Combination of grasses and legume						
Cenchrus + Desmanthus (1:1)	0.46	7.70	0.26	215.57	34.96	231.43
Cenchrus + Stylosanthes (1:1)	0.48	7.80	0.27	217.51	31.55	239.01
Dicanthium + Desmanthus (1:1)	0.44	7.40	0.31	219.61	37.00	249.15
Dicanthium + Stylosanthes (1:1)	0.45	7.60	0.29	233.44	36.66	253.45
SEm±	0.01	0.09	0.01	6.15	0.76	3.98
C D at 5%	NS	NS	NS	NS	2.31	12.08
C. Interaction: M X C						
SEm±	0.02	0.13	0.02	0.87	1.08	5.63
C D at 5%	NS	NS	NS	NS	3.27	17.09
CV%	6.37	2.84	11.20	8.70	5.33	4.01
Initial	0.43	7.95	0.23	218.00	29.69	246.56

Table-1 (r): Effect of planting methods and forage crops combination on soil fertility at Jabalpur in Central zone

Treatment	Soil fertility status after completion of experiment						
	pH	EC (dS/mhos)	BD (g/cc)	OC (%)	Available nutrients in soil (kg/ha)		
					N	P	K
Ridge and furrow+ *Cenchrus ciliaris* + *Desmanthus*	7.45	0.47	1.34	0.64	234.8	16.80	362.4
Ridge and furrow+ *Cenchrus ciliaris* + *Stylo*	7.45	0.47	1.35	0.65	235.6	16.77	361.5
Ridge and furrow+ *Dichanthium annulatum* + *Desmanthus*	7.45	0.46	1.35	0.66	245.8	16.85	360.3
Ridge and furrow+: *Dichanthium annulatum* + *Stylo*	7.44	0.47	1.35	0.62	236.5	16.70	355.4
Flat bed + *Cenchrus ciliaris* + *Desmanthus*	7.46	0.43	1.34	0.62	234.3	16.85	360.8
Flat bed + *Cenchrus ciliaris* + *Stylo*	7.45	0.44	1.33	0.62	236.2	16.82	363.3
Flat bed + *Dichanthium annulatum* + *Desmanthus*	7.47	0.44	1.34	0.61	237.8	16.82	357.4
Flat bed +: *Dichanthium annulatum* + *Stylo*	7.46	0.45	1.35	0.62	234.4	16.80	354.4
Initial status	7.46	0.45	1.34	0.62	235.8	16.79	360.2

Table-1 (s): Effect of planting methods and forage crops combination on soil fertility at Urulikanchan in Central zone

Treatment	Soil fertility status after completion of experiment					
	pH	EC (dS/mhos)	OC (%)	Available nutrients (Kg/ha)		
				N	P	K
Ridge and furrow+ *Cenchrus ciliaris* + *Desmanthus*	8.09	0.38	0.48	135.33	25.33	285.00
Ridge and furrow+ *Cenchrus ciliaris* + *Stylo*	8.06	0.39	0.48	136.67	24.67	261.67
Ridge and furrow+ *Dichanthium annulatum* + *Desmanthus*	8.12	0.41	0.39	136.00	21.67	243.33
Ridge and furrow+: *Dichanthium annulatum* + *Stylo*	8.08	0.41	0.45	135.00	21.00	280.00
Flat bed + *Cenchrus ciliaris* + *Desmanthus*	8.03	0.38	0.47	135.33	23.00	281.67
Flat bed + *Cenchrus ciliaris* + *Stylo*	8.06	0.39	0.46	136.67	21.00	256.67
Flat bed + *Dichanthium annulatum* + *Desmanthus*	8.11	0.42	0.48	134.67	22.00	258.33
Flat bed +: *Dichanthium annulatum* + *Stylo*	8.07	0.40	0.48	136.00	22.00	260.00
Initial status	7.36	0.35	0.30	134.00	28.00	265.00

Table-1(t): 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)			Forage equivalent yield (q/ha)
	Mandya	Coimbatore	Mean	Mandya	Coimbatore	Mean	Coimbatore
T_1	186.4	279.7	233.1	43.1	42.4	42.8	106.5
T_2	330.8	302.3	316.6	80.8	48.9	64.9	149.5
T_3	361.5	275.6	318.6	87.9	40.2	64.1	137.8
T_4	212.7	447.9	330.3	49.3	67.4	58.4	187.9
T_5	244.1	443.4	343.8	55.6	62.7	59.2	187.1
T_6	379.3	424.2	401.8	95.0	67.5	81.3	166.4
T_7	432.5	399.6	416.1	98.1	58.7	78.4	156.6
T_8	57.4	202.4	129.9	13.8	28.9	21.4	101.2
SEm±	10.4	12.1		3.8	2.7		5.1
CD at 5%	31.6	36.7		11.6	8.1		15.4
CV%	6.6	6.0		10.1	8.9		5.9

Table-1(u): Effect of silvipasture system 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		
	Man-dya	Coimb-atore	Mean	Man-dya	Coimba-tore	Mean	Man-dya	Coimba tore	Mean
T_1	6.05	4.86	5.46	6792	302	3547	1.81	1.01	1.41
T_2	15.25	8.05	11.65	16815	7283	12049	2.83	1.32	2.08
T_3	15.26	6.34	10.80	18996	5264	12130	2.93	1.24	2.09
T_4	9.02	8.53	8.78	8064	14575	11320	1.86	1.63	1.75
T_5	10.07	8.44	9.26	10310	14495	12403	2.10	1.63	1.87
T_6	12.56	8.27	10.42	18577	8661	13619	2.71	1.35	2.03
T_7	12.56	6.59	9.58	22695	8017	15356	3.11	1.34	2.23
T_8	4.10	4.63	4.37	1246	9419	5333	1.27	2.59	1.93
SEm±	0.48	0.44							
CD at 5%	1.46	1.33							
CV%	7.57	10.89							

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

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

Treatment	OC (%)	pH	EC (dSm^{-1})	N (kg/ha)	P (kg/ha)	K (kg/ha)
T_1	0.51	6.71	0.12	312.12	25.45	239.40
T_2	0.52	6.76	0.13	314.78	23.65	240.60
T_3	0.57	6.81	0.16	326.32	25.46	248.00
T_4	0.71	6.77	0.12	356.35	26.65	258.60
T_5	0.72	6.69	0.13	373.61	27.42	266.40
T_6	0.48	6.79	0.17	284.96	25.45	236.60
T_7	0.43	6.86	0.13	279.28	23.65	216.00
T_8	0.59	6.88	0.12	336.32	25.46	246.60
Initial	0.61	6.96	0.11	301.16	26.65	196.00

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

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

Treatment	Green fodder yield (q/ha)	Dry matter yield (q/ha)	Crude Protein Yield (q/ha)	Net monetary return (Rs.)	Benefit cost ratio
T_1	248.15	54.80	7.75	24722	2.65
T_2	216.67	47.28	7.60	19278	2.29
T_3	267.28	56.84	11.33	30296	3.02
T_4	327.78	68.63	8.37	42056	3.63
T_5	339.51	72.65	10.17	44074	3.75
T_6	150.00	35.31	6.81	8722	1.79
T_7	148.15	34.99	7.73	8889	1.81
T_8	132.10	32.30	7.10	7852	1.98
SEm±	11.27	2.79	0.58		
CD at 5%	34.19	8.47	1.77		
CV%	8.5	9.6	12.1		

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

Table-1(x): Effect of silvipasture systems on moisture content in soil of subabul and grasses under rainfed ecosystem at Coimbatore in South zone

Treatment	11.07.2013		12.08.2013		13.09.2013		16.10.2013		15.11.2013*		16.12.2013	
	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm
T_1	10.07	10.71	10.75	11.58	7.83	12.61	14.3	16.9	-	-	14.23	16.12
T_2	9.09	9.24	10.33	11.27	8.22	10.95	14.6	16.7	-	-	15.63	15.80
T_3	6.52	7.75	11.27	12.10	10.36	10.87	16.4	17.3	-	-	16.25	15.64
T_4	5.03	8.21	11.27	12.25	8.72	9.62	12.4	13.9	-	-	15.69	16.89
T_5	5.67	6.47	11.25	15.59	11.18	12.78	14.8	15.0	-	-	16.36	17.36
T_6	6.01	9.16	13.90	14.56	11.54	12.31	15.7	16.1	-	-	15.89	16.36
T_7	7.17	6.32	12.26	12.10	5.59	6.99	14.2	16.5	-	-	13.48	15.51
T_8	5.96	10.43	10.23	11.56	6.17	8.92	12.6	13.6	-	-	15.69	16.89

*continuous rains

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

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

Treatment	Green fodder yield (q/ha)		Dry fodder yield (q/ha)		Tuber yield of cassava (q/ha)	Harvest index (%)
	Cowpea	Grasses	Cowpea	Grasses		
T_1 - Cassava +Bajra Napier Hybrid +Fodder cowpea + AMF	18.08	402.93	2.81	58.88	84.20	0.79
T_2 - Cassava +Bajra Napier Hybrid +Fodder cowpea	20.06	424.36	2.76	60.27	93.84	0.78
T_3 - Cassava +Bajra Napier Hybrid +AMF	-	422.28	-	60.34	89.62	0.73
T_4 - Cassava +Bajra Napier Hybrid	-	422.98	-	61.55	79.82	0.68
T_5 - Cassava + Palisade grass +Fodder cowpea +AMF	24.34	213.71	3.35	37.03	124.48	0.77
T_6 - Cassava + Palisade grass +Fodder cowpea	23.07	237.20	3.30	45.63	128.98	0.77
T_7 - Cassava + Palisade grass +AMF	-	212.26	-	40.92	70.55	0.68
T_8 - Cassava + Palisade grass	-	222.56	-	43.51	94.96	0.70
T_9 - Cassava +Fodder cowpea+AMF	111.87	-	15.42	-	166.68	0.79
T_{10} - Cassava +Fodder cowpea	99.84	-	14.37	-	127.91	0.81
T_{11} - Cassava +AMF	-	-	-	-	238.45	0.81
T_{12} - Cassava Sole	-	-	-	-	229.47	0.81
SEm$\pm$	4.28	3.93	0.24	0.80	1.87	0.01
CD at 5%	13.49	11.92	0.75	2.44	5.50	0.04
CV%	8.64	1.22	3.44	1.57	1.46	1.31

Table-1(z-1): Crude protein content, crude fibre content and plant height of forage crops and soil fertility in cassava based sustainable alley farming system under rainfed areas of the humid tropics at Vellayani in South zone (pooled data of three year)

Treatment	Crude protein (%)		Crude fibre (%)		Plant height (cm)			NMR (Rs/ha)	Organic carbon (%)	Available nutrient (kg/ha)		
	Cowpea	Grasses	Cowpea	Grasses	Cowpea	Grasses	Cassava			N	P	K
T_1	20.04	6.22	24.97	26.30	92.35	163.88	85.45	78816	0.82	327.33	46.66	96.6
T_2	20.43	6.80	25.32	26.00	90.35	161.54	77.86	92799	0.85	314.16	52.66	105.8
T_3	-	6.16	-	26.90	-	156.78	90.47	63671	0.83	349.46	55.73	68.8
T_4	-	7.04	-	28.40	-	141.24	82.35	59652	0.67	359.33	61.03	80.73
T_5	19.80	7.63	26.07	27.20	80.22	90.51	89.45	66442	0.73	304.53	58.76	104.13
T_6	18.47	7.88	25.20	28.70	76.87	83.18	86.43	83608	0.82	368.93	44.96	84.06
T_7	-	7.56	-	28.40	-	88.75	90.45	28795	0.75	301.66	46.43	85.43
T_8	-	6.77	-	28.40	-	93.76	97.26	48876	0.78	338.70	65.93	112.66
T_9	18.10	-	25.40	-	80.60	-	96.45	94927	0.76	353.60	52.2	110.00
T_{10}	18.35	-	26.00	-	74.31	-	114.97	60389	0.73	325.33	60.76	104.50
T_{11}	-	-	-	-	-	-	112.17	143098	0.82	329.90	64.4	105.63
T_{12}	-	-	-	-	-	-	108.16	136207	0.77	323.66	43	103.06
SEm±	0.31	0.11	0.15	0.22	2.25	2.00	1.59	2713	0.03	16.92	3.34	6.64
CD at 5%	0.99	0.32	0.47	0.68	7.09	6.09	4.68	7958	0.08	49.63	9.82	19.48
CV%	1.64	1.51	0.59	0.80	2.72	1.63	1.69	3	2.56	5.08	6.16	6.86

T_1 - Cassava +Bajra Napier Hybrid +Fodder cowpea + AMF	T_7 - Cassava + Palisade grass +AMF
T_2 - Cassava +Bajra Napier Hybrid +Fodder cowpea	T_8 - Cassava + Palisade grass
T_3 - Cassava +Bajra Napier Hybrid +AMF	T_9 - Cassava +Fodder cowpea+AMF
T_4 - Cassava +Bajra Napier Hybrid	T_{10} - Cassava +Fodder cowpea
T_5 - Cassava + Palisade grass +Fodder cowpea +AMF	T_{11} - Cassava +AMF
T_6 - Cassava + Palisade grass +Fodder cowpea	T_{12} - Cassava Sole

AST-2: Effect of tillage and nutrient management on productivity of rice-oat cropping system

[Table Reference: 2(a) to2(c)]

Location: Raipur and Jabalpur

A field experiment was initiated during *kharif* 2011 at two locations (Raipur and Jabalpur) to study the effect of tillage and nutrient management in oats on the productivity of rice-oat cropping system. The treatment consisted of three tillage practices (zero, minimal and conventional tillage) and four levels of nutrients (75% RDF, 75% RDF + Biofertilizer, 100% RDF and 100% RDF + Biofertilizer) 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 Jabalpur and Raipur are given below.

Zonal mean indicates that oat grown under conventional tillage being at par with minimal tillage (478.42 q/ha) recorded significantly higher GFY (437.71 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, conventional tillage fetched highest net monetary returns (Rs 60319/ha/yr) and benefit cost ratio (1.76) was realized under zero tillage. The oats supplemented with 100% RDF + biofertilizer being at par with 100% RDF, recorded significantly highest GFY (477.31q/ha) of oat over rest of the treatments. Similarly application of 100% RDF + biofertilizer fetched highest net monetary returns (Rs 71325 /ha/yr) and benefit cost ratio (2.36) 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.

Table -2 (a): Effect of tillage and nutrient on productivity of rice –oat cropping system at Raipur

Treatment	Rice		Oat					Rice-oat cropping system	
	Grain yield (q/ha)	Straw yield (q/ha)	GFY (q/ha)	DMY (q/ha)	CPY (q/ha)	Plant height (cm)	Leaf Stem ratio	NMR of system (Rs/ha/yr)	Benefit Cost ratio
Tillage practices									
Zero tillage	45.67	72.00	261.09	68.08	5.64	105.15	0.63	53546.07	1.61
Minimal tillage	48.46	72.66	288.71	75.31	6.49	106.71	0.69	59329.36	1.76
Conventional tillage	46.25	73.12	331.00	85.85	7.23	11.69	0.77	60318.6	1.76
CD at 5%			4.86	4.83	0.44	4.5	0.034		
Nutrient management									
75% RDF	45.20	69.96	263.55	70.08	6.00	104.1333	0.62	53353.14	1.62
75% RDF + Biofertilizer	46.36	70.94	288.31	74.64	6.51	105.0433	0.68	56827.53	1.70
100% RDF	46.7	73.66	303.26	78.77	6.94	108.8733	0.72	58383.98	1.72
100% RDF + Biofertilizer	48.91	75.81	319.28	82.16	7.32	113.3467	0.77	62356.39	1.81
CD at 5 %			9.2	2.46	0.21	5.1	0.030		

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

Treatment	Rice		Oats					Rice-oats cropping system	
	Grain yield (q/ha)	Straw yield (q/ha)	GFY (q/ha)	DMY (q/ha)	CPY (q/ha)	Plant height (cm)	Leaf: Stem ratio	NMR of system (Rs/ha/yr	Benefit: Cost ratio
Tillage practices									
Zero tillage	50.02	101.11	614.32	140.24	10.55	122.70	0.95	80897	3.05
Minimal tillage	52.14	100.05	631.70	142.89	11.02	126.00	0.92	81302	2.94
Conventional tillage	49.68	98.99	625.84	142.36	10.77	125.08	0.96	77751	2.83
CD	NS	NS	10.35	3.66	NS	3.6	NS		
Nutrient management									
75% RDF	51.19	99.87	583.34	135.11	10.21	117.68	0.93	78490	2.96
75% RDF + Biofertilizer	50.77	99.69	614.91	142.48	10.76	121.36	0.89	80625	2.98
100% RDF	51.06	100.46	621.61	144.04	10.95	127.89	0.95	80525	2.92
100% RDF + Biofertilizer	50.02	99.99	635.34	145.70	11.20	131.44	0.97	80293	2.90
CD at 5 %	NS	NS	16.56	7.44	NS	7.35	NS		

Table -2 (c): Effect of tillage and nutrient management on productivity of rice –oat cropping system (Mean of Jabalpur and Raipur)

Treatment	Rice		Oats					Rice-oat cropping system	
	Grain yield (q/ha)	Straw yield (q/ha)	GFY (q/ha)	DMY (q/ha)	CPY (q/ha)	Plant height (cm)	Leaf Stem ratio	NMR of system (Rs/ha/yr)	Benefit Cost ratio
Tillage practices									
Zero tillage	47.85	86.56	437.71	104.16	8.10	113.93	0.79	67221.54	2.33
Minimal tillage	50.30	86.36	460.21	109.10	8.76	116.36	0.81	70315.68	2.35
Conventional tillage	47.97	86.06	478.42	114.11	9.00	68.39	0.87	69034.80	2.30
CD	NS	NS	5.86	5.83	0.44	4.5	0.034	-	-
Nutrient management									
75% RDF	48.20	84.92	423.45	102.60	8.11	110.91	0.78	65921.57	2.29
75% RDF + Biofertilizer	48.57	85.32	451.61	108.56	8.64	113.20	0.79	68726.27	2.34
100% RDF	48.88	87.06	462.44	111.41	8.95	118.38	0.84	69454.49	2.32
100% RDF + Biofertilizer	49.47	87.90	477.31	113.93	9.26	122.39	0.87	71324.70	2.36
CD at 5 %	NS	NS	8.2	3.46	0.31	6.1	0.040		

AST-3 (AST-4): Studies on the effect of irrigation levels on green forage yield and quality of different forage crops during lean period [Table Reference: 3 (a) to 3 (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 moisture 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, 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 third year experimentation revealed that the application of irrigation at IW /CPE-1.0 recorded significantly higher green fodder yield, DMY and CPY (except Dharwad) at all locations over its lower levels.

On location mean basis, application of irrigation at IW /CPE-1.0 recorded highest GFY (318.6q/ha), DMY (90.82q/ha) and CPY (7.27q/ha) over IW/CPE-0.6 and, IW/CPE-0.8 irrigation levels. Contrary to GFY and DMY, application of irrigation at IW/CPE-0.6 attained highest water use efficiency (14.47q/ha-cm) and lowest being with IW/CPE-1.0 (13.52q/ha-cm). On location mean basis similar to GFY and DMY, application of irrigation to forage crops at IW /CPE-1.0 fetched highest net monitory return (Rs21320/ha) and benefit cost ratio (2.15) over rest of the irrigation treatment.

The planting of fodder maize recorded significantly highest GFY, DMY and CPY at all the locations (except Hyderabad) as well as on mean basis compared with rest of the fodder crops including baby corn. The respective crop recorded highest water use efficiency at all the locations (except Mandya) as well as mean basis. On location mean basis, growing of baby corn fetched highest net monetary returns (Rs 31813/ha) and benefit cost ratio (2.45) over rest of the fodder crops. However cultivation of fodder maize fetched highest net monetary returns (Rs 10235/ha) and B:C ratio (1.25) over rest of the fodder crops at Dharwad. Significant interactions of irrigation levels and forage crops for GFY were observed at all locations.

Table-3(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	241.17	237.86	238.64	239.20	68.84	48.93	85.46	67.74
IW/CPE-0.8	296.33	277.03	269.05	280.80	79.75	62.20	95.77	79.24
IW/CPE-1.0	337.33	348.40	269.93	318.60	98.58	77.95	95.94	90.82
SEm±	6.8	7.61	3.66		4.45	2.04	1.15	
CD at 5%	26.61	26.34	14.33		17.47	6.12	4.51	
B. Crops								
Fodder maize	363.42	352.68	306.70	340.90	80.59	79.407	108.94	89.65
Fodder sorghum	252.13	279.81	279.03	270.30	91.55	60.84	99.09	83.83
Fodder pearl millet	289.00	300.48	252.98	280.80	84.91	66.38	89.35	80.21
Baby corn	261.90	218.07	198.11	226.00	72.53	45.48	72.17	63.39
SEm±	12.21	4.46	2.52		5.75	1.02	1.18	
CD at 5%	36.29	13.37	7.50		17.07	3.06	3.51	
C. Irrigation x Crops								
SEm±		8.92				2.04		
CD at 5%	44.4	26.75	*		NS	6.12	NS	

Table-3(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	Mandya	Dharwad	Mean	Hyderabad	Mandya	Dharwad	Mean
A. Irrigation level												
IW/CPE-0.6	4.74	3.74	6.08	4.85	7.14	7.59	7.09	7.27	9.64	12.19	11.93	14.47
IW/CPE-0.8	6.16	4.71	6.94	5.94	7.74	7.45	7.23	7.47	9.88	12.07	8.97	13.60
IW/CPE-1.0	8.86	6.03	6.93	7.27	8.93	7.74	7.21	7.96	9.63	13.60	7.71	13.52
SEm±	0.46	0.21	0.07		0.36	0.21	0.02				0.14	
CD at 5%	1.83	0.75	0.28		1.42	0.74	0.10				0.56	
B. Crops												
Fodder maize	6.59	6.42	7.95	6.99	8.05	8.07	7.29	7.80	12.13	13.36	11.23	16.28
Fodder sorghum	6.06	4.36	7.20	5.87	6.73	7.28	7.26	7.09	8.42	11.14	10.25	12.74
Fodder pearl millet	8.11	5.19	6.47	6.59	9.31	7.79	7.24	8.11	9.59	14.69	9.32	14.40
Baby corn	5.59	3.32	4.99	4.63	7.65	7.23	6.92	7.27	8.72	11.29	7.35	12.03
SEm±	0.54	0.10	0.08		0.31	0.09	0.02				0.11	
CD at 5%	1.61	0.31	0.25		0.92	0.28	0.05				0.32	
C. Irrigation x Crops												
SEm±		0.20				0.19						
CD at 5%	NS	0.62	NS		NS	0.57					NS	

Table-3(c): Effect of irrigation levels on growth parameters of different forage crops during lean period.

Treatment	Plant height (cm)				Leaf stem ratio			
	Hydera-bad	Man-dya	Dhar-wad	Mean	Hydera-bad	Man-dya	Dhar-wad	Mean
A. Irrigation level								
IW/CPE-0.6	141.61	119.66	197.4	152.90	0.261	0.22	0.279	0.25
IW/CPE-0.8	157.58	130.25	209.3	165.71	0.303	0.26	0.308	0.29
IW/CPE-1.0	177.69	135.73	212.3	175.24	0.330	0.29	0.313	0.31
SEm±	1.4	1.80	1.8		0.15	0.008	0.002	
CD at 5%	5.60	6.24	6.9		0.060	0.026	0.006	
B. Crops								
Fodder maize	180.5	163.44	224.8	189.58	0.346	0.27	0.329	0.32
Fodder sorghum	152.9	115.122	199.02	155.74	0.290	0.25	0.261	0.27
Fodder pearl millet	151.7	111.62	206.3	156.54	0.222	0.24	0.327	0.26
Baby corn	150.7	123.71	195.0	156.47	0.333	0.27	0.283	0.30
SEm±	4.55	1.26	1.3		0.24	0.005	0.002	
CD at 5%	13.54	3.80	3.8		0.073	0.01	0.007	
C.Irrigation x Crops								
SEm±		2.53				0.011		
CD at 5%	NS	NS	*		NS	NS	NS	

Table-3(d): Effect of irrigation levels on economics of different forage crops during lean period.

Treatment	Net monetary return (Rs/ha)				Benefit cost ratio			
	Hydera-bad	Man-dya	Dhar-wad	Mean	Hydera-bad	Man-dya	Dhar-wad	Mean
A. Irrigation level								
IW/CPE-0.6	18168	13845	8010	13341	2.13	2.17	1.07	1.79
IW/CPE-0.8	24772	18303	9438	17504	2.47	2.52	1.18	2.06
IW/CPE-1.0	31559	23810	8591	21320	2.82	2.69	0.95	2.15
SEm±			212		-		0.03	
CD at 5%			829		-		0.11	
B. Crops								
Fodder maize	20811	10318	10235	13788	2.33	1.64	1.25	1.74
Fodder sorghum	12211	11101	8575	10629	1.93	2.12	1.05	1.70
Fodder pearl millet	15483	13147	7512	12047	2.14	2.4	0.99	1.84
Baby corn	50827	36213	8398	31813	3.5	2.89	0.97	2.45
SEm±			151	-	-	-	0.02	-
CD at 5%			451	-	-	-	0.06	-
C. Irrigation x Crops								
SEm±								
CD at 5%			NS	-	-	-	NS	-

AST-4 (AST-5): Effect of stubble management and INM on forage productivity in Rice – Oat cropping system. **[Table Reference: 4 (a) to 4(b)]**

Location: 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 turn around period (Harvesting of long to medium duration *kharif* rice and sowing of oat) through rice stubble cutting management treatment, thereby skipping the time taken for normal tillage operation. The trial was conducted at two locations in split plot design taking three cutting management treatment *viz.* cutting rice stubble at ground level, cutting rice stubble at 30 cm height and normal cultivation in main plot. The INM treatments includes **M_1-** 100% NPK of RDF, **M_2-**50% N through FYM + 50 % NPK of RDF, **M_3-** 25% N through FYM + 50 % NPK of RDF+ Biofertilizer(*Azotobacter* + PSB)+ Green manure and **M_4-**50 % of N through FYM+ GM + Biofertilizer (*Azotobacter*+PSB) allotted to sub plot.

Highest grain yield was recorded in both the locations with the application of 25% N through FYM + 50 % NPK of RDF + Biofertilizer (*Azotobacter* + PSB)+ Green manure (M_3) being 43.9 and 47.2 q/ha, respectively at Jorhat and Bhubaneswar. However, M_3 recorded the highest straw yield of rice at Bhubaneswar (56.23 q/ha). At Jorhat the highest green forage yield (269.58q/ha) and dry matter yield (62.0q/ha) were recorded in conventional tillage followed by cutting rice stubble at 30 cm height and sowing oat behind the plough. As far as the INM treatment is concerned, the highest GFY and DMY were recorded with the application of M_3 treatment. The highest green fodder equivalent yield (GFEY) was recorded in conventional tillage (687.73 q/ha) followed by cutting rice stubble at 30 cm height at Jorhat; but at Bhubaneswar the highest GFEY (804.83 q/ha) was recorded with cutting rice stubble at ground level. In both the location the highest GFEY was recorded in the treatment M_3. Interaction effect on GFEY was observed only at Bhubaneswar. Again the highest net monetary return (Rs 36241/ha and Rs 59320/ha, respectively) and crude protein yield (4.20 q/ha and 6.59q/ha, respectively) were recorded in M_3 in both the location. However, at Bhubaneswar the highest net monetary return and crude protein yield was recorded in cutting management treatment with cutting rice stubble at ground level. On the other hand at Jorhat the highest net monetary was recorded in cutting rice stubble at 30 cm height but the highest crude protein yield was recorded in normal cultivation.

Table- 4 (a): Effect of stubble management and integrated nutrient management on grain and straw yield of rice and GFY and DMY of oat in rice- oat system in NE zone

Treatments	Rice						Oats					
	Grain Yield (q/ha)			Straw Yield (q/ha)			GFY (q/ha)			DMY (q/ha)		
	Jorhat	Bhubaneswar	Mean	Jorhat	Bhubaneswar	Mean	Jorhat	Bhubaneswar	Mean	Jorhat	Bhubaneswar	Mean
Cutting Management (S)												
S_1	42.4	44.2	43.3	46.5	58.6	52.5	166.7	304.0	235.3	38.3	65.3	51.79
S_2	41.7	44.6	43.2	47.8	50.8	49.3	244.7	211.6	228.2	56.3	51.9	54.06
S_3	41.1	44.5	42.8	47.9	54.9	51.5	269.6	248.5	259.0	62.0	57.0	59.52
S. Em$\pm$	0.7	1.2		0.6	1.3		5.2	5.4		1.2	0.6	
CD at 5%	NS	4.5		NS	5.3		16.8	21.0		11.7	2.3	
Integrated Nutrient Management(M)												
M_1	38.7	40.8	39.7	45.9	52.2	49.1	209.6	223.8	216.7	48.2	54.1	51.15
M_2	40.9	45.1	43.0	47.2	55.9	51.6	232.4	299.8	266.1	53.5	64.0	58.75
M_3	43.9	47.2	45.6	47.7	56.2	51.9	233.7	316.6	275.2	53.7	66.6	60.19
M_4	43.5	44.5	44.0	48.7	54.7	51.7	232.2	178.4	205.3	53.4	47.4	50.41
S EM$\pm$	0.6	1.6		0.5	1.9		3.5	3.9		0.8	0.8	
CD at 5%	3.8	3.4		3.4	5.9		10.2	11.6		5.5	2.5	
CV %	7.4	8.9		1.9	8.5		4.3	9.2		4.3	3.5	
Interaction (TXN)												
S. Em	0.9	3.0		0.9	3.8		6.1	9.2		1.4	1.6	
CD at 5%	NS	9.5		NS	11.9		NS	31.2		NS	5.0	

Cutting management (S)	**Nutrient management (M)**
S_1 - Cutting of rice stubble at ground level	M_1 - 100% NPK through RDF
S_2 - Cutting of rice stubble at 30 cm height	M_2 - 50% N through FYM + 50 % NPK of RDF
S_3 - Normal Cultivation	M_3 - 25% N through FYM + 50 % NPK of RDF + Biofertilizer (*Azotobacter* + PSB)+GM
	M_4 - 50 % of N through FYM+ GM + Biofertilizer (*Azotobacter* + PSB)

Table- 4 (b): Effect of stubble management and integrated nutrient management on green forage equivalent yield, CPY and net income in rice- oat system in NE zone

Treatments	Green Forage Equivalent Yield (q/ha/yr)			Crude protein Yield of Oat (q/ha)			Net Income (Rs/ha/yr)		
	Jorhat	Bhubaneswar	Mean	Jorhat	Bhubaneswar	Mean	Jorhat	Bhubaneswar	Mean
Cutting Management (S)									
S_1	595	805	700	2.8	6.3	4.6	29322	55482	42402
S_2	668	708	688	4.3	5.2	4.8	36182	46287	41235
S_3	688	748	718	5.0	5.6	5.3	35539	50319	42929
S. Em±	10	16		0.1	0.0		956	1617	
CD at 5%	28	63		0.3	0.2		2868	6347	
Integrated Nutrient Management(M)									
M_1	604	685	644	3.6	5.4	4.5	29205	45272	37239
M_2	648	807	728	4.2	6.2	5.2	33564	54514	44039
M_3	676	845	761	4.2	6.6	5.4	36241	59320	47781
M_4	672	678	675	4.2	4.7	4.4	35714	43678	39696
S EM+	5	18		0.1	0.1		453	1807	
CD at 5%	13	54		0.2	0.3		1432	5367	
CV %	5.0	7.0		3.3	2.8		9	11	
Interaction (TXN)									
S. Em	8	36		0.2			785	3644	
CD at 5%	NS	117		0.6	NS		NS	11738	

Cutting management (S)	**Nutrient management (M)**
S_1 - Cutting of rice stubble at ground level	M_1 – 100% NPK through RDF
S_2 - Cutting of rice stubble at 30 cm height	M_2 - 50% N through FYM + 50 % NPK of RDF
S_3 - Normal Cultivation	M_3 - 25% N through FYM + 50 % NPK of RDF + Biofertilizer (*Azotobacter* + PSB)+GM
	M_4 - 50 % of N through FYM+ GM + Biofertilizer (*Azotobacter* + PSB)

AST-5: Performance of dual purpose forage crops under different cutting management system

[Table Reference: 5(a) to 5(q)]

Locations:

Hill zone :Palampur, Srinagar, Almora

NWZ : Ludhiana, Hisar, Bikaner

NEZ : Jorhat, Bhubaneswar

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 consisting of three forage crops (in main plot) and four cutting management practices (in sub-plot) laid out in split plot design with three replications. Based on the results of exploratory trial, it was conducted at thirteen locations under HZ, NWZ, NEZ and CZ of the country. The data of second year experimentation has been given zone wise below.

Hill zone: Palampur, Almora and Srinagar

In Hill Zone at Palampur and Almora, the cutting schedule for forage were no cut and one cut at 70, 80 and 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, tiller number and L:S than oat and wheat. At Palampur, L:S ratio was significantly better in wheat and was followed by oat. The mean data indicated that oat crop produced significantly higher GFY (140.1 q/ha), which was 40.44% and 53.29% more than barley and wheat, respectively. The respective increase in DMY was 47.74 and 62.41%. 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 (32.39 q/ha), followed by barley (27.24 q/ha) and oat (24.87 q/ha).

At Palampur in terms of oat green forage equivalent yield (OGFEY), wheat crops resulted in higher OGFEY (518.5 q/ha) and was followed by oat (498.7 q/ha) and barley (384.4 q/ha). Wheat crop also resulted in higher net return (Rs. 58482/ha) and B:C (3.05) than oat (Rs 54317/ha and 2.67) and barley crops (Rs 37979/ha and 1.95).

Herbage yield increased with delay in harvesting of crop at first cut. The mean data indicated that harvesting for fodder at 90 DAS produced 134.41 q/ha GFY, which reflected in increase of 28.83 and 48.77% in comparison to cuts taken at 80 and 70 DAS, respectively. The respective dry fodder yield was 33.04 and 53.27%. Delay in harvesting of crops for fodder significantly decreased 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 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 oat green fodder equivalent yield (555.87 q/ha) and economic return (net returns of Rs. 63943 /ha and B:C of 3.29) 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, Hisar and Bikaner

On location mean basis, oat produced highest GFY (176.1 q/ha) and DMY (26.3 q/ha) over barley and wheat crops. It recorded 56.5 and 99.8% more green fodder over barley and wheat crops, respectively. Contrary to GFY, wheat crop recorded highest grain yield (32.1 q/ha) on mean basis. Oat crop proved superior in terms of net monetary return (Rs 67037 /ha) and benefit cost ratio (2.8) over barley and wheat crops at Bikaner.

With respect to cutting management practices, on mean basis, cutting of forage crops at 70 DAS recorded highest GFY (170.4 q/ha) and DMY (33.7 q/ha) as compared to cutting at 50 DAS (87.5 q/ha GFY and 13.8 q/ha DMY) and 60 DAS (144.6 q/ha GFY and 21.7 q/ha DMY). The respective treatment (cutting at 70 DAS) recorded 94.6 and 17.8% more GFY over cutting at 50 DAS and 60 DAS, respectively; whereas, no cutting of forage crops attained higher grain (35.4 q/ha) and grain equivalent yield (61.5 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 18.1, 32.2 and 42.4, respectively. At Bikaner, no cutting of forages fetched highest net monetary return (Rs 50077/ha) over rest of the cutting management practices.

North East zone: Jorhat and Bhubaneswar

On location mean basis, oat crop produced higher GFY (210.7 q/ha) and DMY (45.0 q/ha) than barley (110.0 q/ha GFY and 26.1q/ha DMY) and wheat crop (97.4 q/ha GFY and 22.9 q/ha). The highest grain yield was recorded under barley (16.3 q/ha) followed by oats (15.8 q/ha) and wheat (15.5 q/ha). Oat recorded highest green fodder equivalent yield (520.4 q/ha) and fetched highest net monetary return (Rs 36026/ha). The herbage yield increased consistently with delay in harvesting for green fodder. Harvesting of dual purpose crop(s) at 70 DAS produced 195.8 q/ha green fodder with increase of 47.4 and 17.2% over cutting at 50 and 60 DAS, respectively on mean basis. The respective increase in DMY was 46.7 and 17.1 %.

Grain and straw yield decreased with delay in harvesting for green fodder. Cutting for GFY at 50 DAS did not cause remarkable reduction in grain yield. Uncut crops recorded highest grain yield (20.2 q/ha) and it decreased to the tune of 10.1, 32.7 and 41.6 % 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 return (Rs 35275/ha) and B:C ratio (2.4) 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 GFY (360.3 q/ha), DMY (65.6 q/ha) and CPY (7.0 q/ha). It recorded 61.0 and 141.1% more GFY over barley and wheat crops, respectively. Wheat crop recorded highest grain yield (29.6 q/ha). Oat crop fetched highest net monetary return (Rs 39490/ha) and benefit cost ratio (2.3) over barley and wheat crops. The maximum grain yield of wheat (42.6 q/ha) was recorded at Jabalpur followed by Rahuri (31.2 q/ha).

The herbage yield of dual purpose forage crops increased consistently with delay in harvesting for green fodder. The harvesting of forages at 70 DAS recorded highest GFY (296 q/ha), DMY (64.2 q/ha) and CPY (7.7 q/ha) as compared to cutting at 50 and 60 DAS. 70 DAS cutting recorded 53.8 and 14.7 % more GFY over 50 and 60 DAS cutting, respectively. The grain and straw yields of forages decreased with delay in harvesting for green fodder. The uncut crops recorded highest grain yield (31.9 q/ha) and it decreased by 29.8, 48.9 and 64.9 % with cutting at 50, 60 and 70 days after sowing, respectively over no cut system. Cutting of dual purpose crops at 50 DAS for GFY and kept for grain production fetched maximum net monetary return (Rs 34222/ha) and B:C ratio (2.1). Significant interaction effect of cutting management and dual purpose crops were also observed at Anand and Urulikanchan for GFY and grain yield.

Table-5 (a) Effect of cutting management on growth of R*abi* crops (Hill zone)

Treatments	Plant Height (cm)				Tiller number (per m row length)				L:S			
	Palampur	Almora	Srinagar	Mean	Palampur	Almora	Srinagar	Mean	Palampur	Almora	Srinagar	Mean
A.Crop												
Oat	137.2	142.6	81.3	120.4	260	112	126	166	0.58	0.41	0.51	0.50
Barley	97.0	97.3	68.2	87.5	242	102	101	148	0.56	0.46	0.39	0.47
Wheat	108.7	110.2	74.5	97.8	240	118	89	150	0.62	0.41	0.43	0.49
SEm±	1.70	1.91	1.23	-	3.56	3.53	2.15	-	0.01	0.05	0.01	-
CD at 5%	6.68	6.6	4.8	-	14	12	8	-	0.02	NS	0.02	-
B.Cutting Management												
No cut	119.3	126.1	106.4	117.3	275	114	122	156		0.40	0.54	0.47
Cutting at 70 DAS	115.9	120.8	72.2	103.0	243	118	108	155	0.65	0.39	0.45	0.50
Cutting at 80 DAS	112.4	116.8	63.5	97.6	240	113	99	162	0.60	0.40	0.40	0.47
Cutting at 90 DAS	109.5	103.1	56.3	89.6	230	96	93	95	0.51	0.51	0.38	0.47
SEm±	0.93	1.53	1.83	-	3.35	2.81	3.18	-	0.01	0.02	0.01	-
CD at 5%	2.77	6.2	5.4	-	9.94	11	10	-	0.02	0.09	0.02	-
Interaction	Sig.	-	NS	-	Sig.	-	NS	-	NS	-	NS	-

Table- 5 (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
A. Crop								
Oat	94.25	100.20	225.78	225.78	20.31	31.16	63.07	38.18
Barley	58.99	46.14	145.15	145.15	12.84	11.47	35.55	19.95
Wheat	41.60	42.26	112.40	112.40	7.66	7.98	27.42	14.35
SEm±	0.70	4.36	2.09	-	0.28	0.89	1.03	-
CD at 5%	3.16	28.66	8.25	-	1.27	5.78	4.12	-
B. Cutting Management								
No cut	-	-	-	-	-	-	-	-
70 DAS Cutting	36.15	36.45	133.95	133.95	6.64	8.52	32.40	15.85
80 DAS Cutting	58.37	65.14	163.43	163.43	11.52	16.91	39.70	22.71
90 DAS Cutting	100.32	87.02	215.90	215.90	22.65	25.19	53.92	33.92
SEm±	1.53	4.09	2.41	-	0.48	1.12	1.20	-
CD at 5%	4.70	17.62	7.25	-	1.47	4.83	3.70	-
Interaction	Sig.	-	Sig.	-	Sig.	-	Sig.	-

Table- 5 (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)	NMR (Rs./ha)	B:C
	Palampur	Almora	Srinagar	Mean	Palampur	Srinagar	Mean	Palampur		
Crop										
Oat	23.66	34.63	16.32	24.87	71.81	56.10	63.96	498.72	54317	2.67
Barley	26.16	35.44	20.12	27.24	62.18	48.60	55.39	384.44	37979	1.95
Wheat	36.90	36.91	23.36	32.39	67.41	43.40	55.41	518.48	58482	3.05
SEm±	0.33	1.12	0.31	-	1.03	1.14	-	3.96	-	-
CD at 5%	1.30	3.88	1.20	-	4.06	4.53	-	15.54	-	-
Cutting Management										
No cut	30.10	43.79	28.12	34.00	83.30	81.30	82.30	464.98	51387	2.80
70 DAS Cutting	36.36	40.09	20.35	32.27	79.76	49.10	64.43	555.87	63943	3.29
80 DAS Cutting	28.76	35.84	16.12	26.91	57.39	38.80	48.10	449.86	47356	2.36
90 DAS Cutting	20.41	22.91	12.40	18.57	48.06	28.30	38.18	398.14	38352	1.79
SEm±	0.60	1.41	0.44	-	1.20	1.68	-	6.39	-	-
CD at 5%	1.78	5.78	1.32	-	3.56	4.98	-	18.99	-	-
Interaction	Sig.	-	Sig.	-	Sig.	Sig.	-	Sig.	-	-

GFEY=Green fodder equivalent yield

Table-5(d): Effect of cutting management and dual purpose crops on green fodder yield

Treatment	Green fodder yield (q/ha)						
	North West zone				North East zone		
	Ludhiana	Hisar	Bikaner	Mean	Bhubaneswar	Jorhat	Mean
A. Crops							
Oat	268.5	173.2	86.7	176.1	181.3	240.0	210.7
Barley	156.8	132.0	60.2	116.3	157.0	63.0	110.0
Wheat	98.8	115.9	49.8	88.2	130.8	64.0	97.4
SEm.+_	3.3	-	5.9		3.8	4.5	
CD at 5%	13.4	16.6	20.6		15.0	14.8	
B. Cutting management							
No cutting	-	-	-	-	-	-	-
Cutting at 50 DAS	111.5	100.8	50.1	87.5	179.6	86.0	132.8
Cutting at 60 DAS	196.2	147.0	90.7	144.6	206.2	128.0	167.1
Cutting at 70 DAS	216.4	173.3	121.4	170.4	239.6	152.0	195.8
SEm±	4.5	-	3.6		4.7	3.1	
CD at 5%	14.1	10.9	10.4		13.9	10.4	
C. Interaction: C X CM							
SEm±	5.7	-	-		9.2	5.5	
CD at 5%	26.0	-	-		29.4	18.0	
CV (%)	-	-	18.9		8.5	9.7	

Table-5(e): Effect of cutting management and dual purpose crops on green fodder yield

Treatment	Green fodder yield (q/ha)					
	Central zone					
	Rahuri	Jabalpur	Anand	Urulikanchan	Raipur	Mean
A. Crops						
Oat	456.9	228.9	350.4	488.7	276.7	360.3
Barley	236.0	224.1	178.5	304.9	165.6	221.8
Wheat	109.0	124.1	144.9	234.2	135.1	149.5
SEm.+_	0.5	3.3	8.8	3.7		
CD at 5%	2.0	9.6	34.3	14.6	41.3	
B. Cutting management						
No cutting						
Cutting at 50 DAS	228.3	188.0	121.9	258.7	164.9	192.4
Cutting at 60 DAS	269.2	209.5	232.4	388.0	190.9	258.0
Cutting at 70 DAS	304.5	253.2	319.4	381.2	221.6	296.0
SEm±	0.7	3.2	9.4	6.7		
CD at 5%	2.2	9.6	28.4	19.8	41.8	
C. Interaction: C X CM						
SEm±	1.2	3.6	14.2	10.7		
CD at 5%	3.8	10.6	42.1	32.9		
CV (%)	0.8	6.3	14.6			

Table-5(e-1): Interaction effect of cutting management and dual purpose crops on green fodder yield

Crops	Green fodder yield (q/ha)									
	Anand					Urulikanchan				
	No cutting	50 DAS	60 DAS	70 DAS	Mean	No cutting	50 DAS	60 DAS	70 DAS	Mean
Oat	0.0	168.1	368.1	515.0	262.8	0.0	371.6	526.8	567.7	488.7
Barley	0.0	106.1	180.6	248.9	133.9	0.0	228.7	375.7	310.4	304.9
Wheat	0.0	91.7	148.6	194.4	108.7	0.0	175.6	261.4	265.5	234.2
Mean						0.0	258.7	387.9	381.2	
	Crop	CM	CRX CM			Crop	CM	CRX CM		
SEm±	6.56	8.19	14.18			3.72	6.65	10.66		
CD at 5%	25.76	24.32	42.12			14.55	19.78	32.89		
CV%	13.50	14.58								

Table-5(n-1): Interaction effect of cutting management and dual purpose crops on grain yield

Crops	Grain yield (q/ha)									
	Anand					Urulikanchan				
	No cutting	50 DAS	60 DAS	70 DAS	Mean	No cutting	50 DAS	60 DAS	70 DAS	Mean
Oat	28.28	26.11	7.06	2.78	16.06	48.09	24.35	20.49	16.35	27.32
Barley	23.69	6.86	3.19	2.25	9.00	44.20	10.43	3.67	1.67	14.99
Wheat	30.19	27.97	24.11	16.75	24.76	50.87	42.26	28.08	10.01	32.80
Mean	26.93	20.90	11.92	7.93		47.72	25.68	17.41	9.34	
	Crop	CM	CRX CM			Crop	CM	CRX CM		
SEm±	0.65	0.84	1.46			0.95	0.85	1.60		
CD at 5%	2.55	2.50	4.33			3.72	2.55	5.28		
CV%	13.31	14.91								

Table-5(f): Effect of cutting management and dual purpose crops on dry matter yield

Treatment	Dry matter yield (q/ha)						
	North West zone				North East zone		
	Ludhiana	Hisar	Bikaner	Mean	Bhubaneswar	Jorhat	Mean
A. Crops							
Oat	26.8	33.1	18.9	26.3	39.9	50.0	45.0
Barley	18.2	28.1	16.3	20.9	39.2	13.0	26.1
Wheat	9.3	24.4	15.7	16.5	32.7	13.0	22.9
SEm.+_	0.5	-	0.4		0.9	0.9	
CD at 5%	2.0	3.2	1.3		3.5	3.1	
B.Cutting management							
No cutting	-	-	-	-	-	-	-
Cutting at 50 DAS	9.3	17.5	14.7	13.8	42.8	18.0	30.4
Cutting at 60 DAS	18.0	27.6	19.5	21.7	49.2	27.0	38.1
Cutting at 70 DAS	27.0	40.4	33.7	33.7	57.2	32.0	44.6
SEm±	0.5	-	0.6		1.1	0.7	
CD at 5%	1.7	2.2	1.6		3.3	2.2	
C. Interaction: C X CM							
SEm±	0.8		-		2.2	1.1	
CD at 5%	3.1		-		7.0	3.8	
CV (%)			11.3		8.4	9.7	

Table-5(g): Effect of cutting management and dual purpose crops on dry matter yield

Treatment	Dry matter yield (q/ha)					
	Central zone					
	Rahuri	Jabalpur	Anand	Urulikanchan	Raipur	Mean
A. Crops						
Oat	71.5	65.5	31.0	95.9	63.9	65.6
Barley	45.6	48.7	21.0	98.6	43.3	51.4
Wheat	22.0	25.2	17.2	65.3	39.0	33.7
SEm.+_	0.1	1.1	0.9	1.0	-	
CD at 5%	0.4	4.8	3.4	3.1	10.4	
B. Cutting management						
No cutting						
Cutting at 50 DAS	37.5	38.4	15.7	60.2	43.4	39.0
Cutting at 60 DAS	46.3	45.3	28.3	92.4	48.4	52.1
Cutting at 70 DAS	55.3	55.8	48.3	107.2	54.4	64.2
SEm±	0.2	1.0	1.1	1.0	-	
CD at 5%	0.6	4.6	3.5	3.5	9.7	
C. Interaction: C X CM						
SEm±	0.3	2.1	1.8	2.1		
CD at 5%	1.0	5.1	5.3	6.5		
CV (%)	1.3	3.6	13.3			

Table-5(h): Effect of cutting management and dual purpose crops on CPY (q/ha) and CP (%) and leaf stem ratio in NEZ

Treatment	Crude Protein Yield (q/ha)			Crude Protein (%)	Leaf Stem Ratio
	North East zone			North East zone	North East zone
	Bhubaneswar	Jorhat	Mean	Jorhat	Bhubaneswar
A. Crops					
Oat	3.6	3.7	3.7	7.4	0.82
Barley	3.6	1.0	2.3	7.8	0.70
Wheat	2.9	1.1	2.0	7.8	0.61
SEm.+_	0.1	0.1		0.03	0.02
CD at 5%	0.3	0.2		0.12	0.07
B. Cutting management					
No cutting	0.0				0.00
Cutting at 50 DAS	3.9	1.3	2.6	7.58	0.92
Cutting at 60 DAS	4.5	2.0	3.3	7.70	0.99
Cutting at 70 DAS	5.1	2.4	3.8	7.74	0.94
SEm±	0.1	0.1		0.06	0.01
CD at 5%	0.3	0.3		NS	0.04
C. Interaction: C X CM					
SEm±	0.2	0.1		0.10	0.03
CD at 5%	0.7	0.4		NS	0.11
CV (%)	9.8	10.8		2.0	9.24

Table-5(i): Effect of cutting management and dual purpose crops on the Crude protein yield, CP (%) and leaf stem ratio

Treatment	Central zone										
	Crude protein yield (q/ha)						CP (%)	Leaf stem ratio			
	Rah-uri	Jaba-lpur	Ana-nd	Uruli kanchan	Rai-pur	Mean	Rah-uri	Rah-uri	Jabal-pur	Rai-pur	Mean
A. Crops											
Oat	7.0	5.4	5.0	12.1	5.3	7.0	9.9	0.86	0.87	0.92	0.88
Barley	6.0	3.8	3.4	15.7	4.0	6.6	13.4	0.56	0.82	0.76	0.71
Wheat	2.3	2.0	3.4	10.3	3.1	4.2	10.4	2.63	0.76	0.65	1.35
SEm.+_	0.2	0.2	0.2	0.1			0.3	0.01	0.02		
CD at 5%	0.6	0.6	0.8	0.2	0.9		1.1	0.04	0.06	0.05	
B.Cutting management											
Uncut	-	-	-	-	-	-	-	-	-	-	-
Cutting at 50 DAS	4.2	3.1	3.5	8.0	3.6	4.5	11.6	1.58	0.86	0.70	1.05
Cutting at 60 DAS	5.2	3.6	5.5	13.5	4.1	6.4	11.3	1.32	0.83	0.76	0.97
Cutting at 70 DAS	6.0	4.5	6.9	16.5	4.6	7.7	10.7	1.15	0.76	0.86	0.92
SEm±	0.1	0.6	0.2	0.1			0.2	0.01	0.01		
CD at 5%	0.3	NS	0.7	0.2	0.8		0.5	0.05	0.03	0.04	
C. Interaction: C X CM											
SEm±	0.2	0.8	0.4	0.1			0.3	0.02	0.02		
CD at 5%	0.6	NS	1.2	0.4			NS	0.06	0.06		
CV (%)	6.1	2.5	16.9				4.0	2.49	2.54		

Table-5(j): Effect of cutting management and dual purpose crops on plant height (I cut)

Treatment	Plant height (cm)					
	North West zone			North East zone		
	Ludhiana	Bikaner	Mean	Bhubaneswar	Jorhat	Mean
A. Crops						
Oat	119.5	37.8	58.7	82.9	89.0	86.0
Barley	54.7	37.3	36.1	56.3	54.0	55.2
Wheat	82.3	30.6	42.9	55.6	59.0	57.3
SEm.+_	2.1	0.6		0.42	1.5	
CD at 5%	8.3	2.0		1.64	5.1	
B. Cutting management						
No cutting	95.2	-	-	-	-	-
Cutting at 50 DAS	86.6	40.1	48.5	74.1	72.0	73.1
Cutting at 60 DAS	81.3	46.1	47.9	90.0	88.0	89.0
Cutting at 70 DAS	79.0	54.7	49.8	95.6	110.0	102.8
SEm±	1.5	0.6		1.4	1.9	
CD at 5%	4.4	1.8		4.2	6.2	
C. Interaction: C X CM						
SEm±	4.1	-		2.5	3.2	
CD at 5%	8.9	-		7.6	10.7	
CV (%)	-	6.1		2.2	11.2	

Table-5(k): Effect of cutting management and dual purpose crops on no. of tillers/m row length

Treatment	No. of tillers/m row length					
	North West zone			North East zone		
	Ludhiana	Bikaner	Mean	Bhubaneswar	Jorhat	Mean
A. Crops						
Oat	67.3	116.4	91.9	93.7	88.0	90.9
Barley	44.5	51.3	47.9	92.3	85.0	88.7
Wheat	63.0	116.3	89.7	94.3	76.0	85.2
SEm.+_	1.89	1.1		0.5	3.2	
CD at 5%	7.63	3.8		1.9	10.7	
B. Cutting management						
No cutting	85.6			94.0		94.0
Cutting at 50 DAS	59.1	119.1	89.1	95.0	69.0	82.0
Cutting at 60 DAS	47.0	132.1	89.6	91.2	78.0	84.6
Cutting at 70 DAS	41.3	127.4	84.4	93.3	102.0	97.7
SEm±	2.1	1.2		1.7	1.4	
CD at 5%	6.2	3.5		5.2	4.8	
C. Interaction: C X CM						
SEm±	3.8	-		3.1	2.5	
CD at 5%	11.8	-		9.2	8.2	
CV (%)		1.5		1.8	6.2	

Table-5(I): Effect of cutting management and dual purpose crops on growth parameters at harvest

Treatment	Central zone								
	Plant height (cm)					Number of tillers/ m row length			
	Rahuri	Jabalpur	Anand	Raipur	Mean	Rahuri	Jabalpur	Anand	Mean
A. Crops									
Oat	95.0	109.9	114.3	123.8	110.8	115.0	106.1	72.0	97.7
Barley	80.0	79.6	70.1	60.0	72.4	105.0	101.5	49.0	85.2
Wheat	57.0	77.6	89.7	65.0	72.3	169.0	76.1	61.0	102.0
SEm.+_	1.1	1.2	1.3			0.4	1.4	2.8	
CD at 5%	4.7	3.3	5.2	5.0		1.5	4.2	10.8	
B. Cutting management									
Uncut	98.0	96.7	104.3	97.0	99.0	133.0	101.6	70.0	101.5
Cutting at 50 DAS	66.0	91.4	96.5	69.1	80.8	127.0	96.0	51.0	91.3
Cutting at 60 DAS	73.0	86.1	85.4	79.0	80.9	129.0	91.7	59.0	93.2
Cutting at 70 DAS	72.0	81.9	79.1	86.4	79.9	130.0	89.0	62.0	93.7
SEm±	0.9	1.5	1.8			1.1	2.5	2.0	
CD at 5%	2.7	4.1	5.3	4.6		3.1	6.3	6.0	
C. Interaction: C X CM									
SEm±	1.6	1.3	3.1			1.8	2.5	3.5	
CD at 5%	4.7	4.2	9.2			NS	7.4	10.4	
CV (%)	3.5	6.3	5.9			2.4	7.8	10.0	

Table-5(m): 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)			Green fodder equivalent yield (q/ha)		
	Ludhiana	Hisar	Bikaner	Mean	Ludhiana	Bhubaneswar	Jorhat	Mean	Bhubaneswar	Jorhat	Mean
A. Crops											
Oat	28.1	20.8	29.6	26.2	60.8	20.6	10.4	15.5	549.2	491.6	520.4
Barley	23.1	22.0	24.9	23.3	42.6	23.5	9.1	16.3	576.4	318.6	447.5
Wheat	49.6	23.7	23.0	32.1	61.0	23.0	8.5	15.8	543.8	302.5	423.2
SEm.+_	0.7	-	0.5		0.9	0.6			10.5	9.3	
CD at 5%	2.9	1.6	1.6		3.5	2.4			41.2	30.9	
B.Cutting management											
No cutting	51.0	27.2	28.1	35.4	61.5	26.9	13.5	20.2	483.1	405.8	444.5
Cutting at 50 DAS	35.0	24.2	27.8	29.0	54.8	25.6	10.3	18.0	634.1	394.1	514.1
Cutting at 60 DAS	26.0	20.0	26.0	24.0	53.7	19.6	7.5	13.6	556.6	351.9	454.3
Cutting at 70 DAS	22.4	17.3	21.4	20.4	49.2	17.5	6.0	11.8	552.0	331.7	441.9
SEm±	1.3	-	0.5		1.3	0.7			12.5	10.8	
CD at 5%	4.0	1.4	1.4		3.8	2.2			37.1	35.8	
C. Interaction: C X CM											
SEm±	1.5	-	-		1.7	1.5			24.8	18.7	
CD at 5%	7.2	-	-		7.0	4.6			79.2	62.0	
CV (%)	-	-	6.6		-	9.2			6.5	10.0	

Table-5(n): Effect of cutting management and dual purpose crops on grain yield

Treatment	Grain yield (q/ha)					
	Central zone					
	Rahuri	Jabalpur	Anand	Urulikanchan	Raipur	Mean
A. Crops						
Oat	7.9	29.8	16.1	27.3	15.7	19.4
Barley	12.0	5.3	10.8	15.0	18.9	12.4
Wheat	31.2	42.6	24.4	32.8	17.0	29.6
SEm.+_	0.1	1.1	0.5	1.0	-	
CD at 5%	0.2	4.2	2.0	3.7	1.6	
B.Cutting management						
Uncut	25.9	32.6	26.9	47.7	26.3	31.9
Cutting at 50 DAS	18.2	27.7	21.9	25.7	18.3	22.4
Cutting at 60 DAS	15.0	23.4	11.9	17.4	13.9	16.3
Cutting at 70 DAS	8.9	19.8	7.9	9.3	10.3	11.2
SEm±	0.2	1.4	0.8	0.9	-	
CD at 5%	0.6	3.5	2.2	2.6	2.7	
C. Interaction: C X CM						
SEm±	0.3	1.0	1.3	1.6		
CD at 5%	1.0	3.1	3.9	5.3		
CV (%)	3.3	9.5	13.3			

Table-5(o): Effect of cutting management and dual purpose crops on straw yield

Treatment	Straw yield (q/ha)										
	NWZ				NEZ	Central zone					
	Hisar	Ludhiana	Bikaner	Mean	Bhubaneswar	Rahuri	Jabalpur	Anand	Uruli-kanchan	Raipur	Mean
A. Crops											
Oat	32.4	95.8	58.4	62.2	17.0	111.8	51.4	98.3	72.1	25.3	71.8
Barley	35.4	77.4	41.7	51.5	19.2	43.4	41.8	25.8	21.8	21.2	30.8
Wheat	36.5	73.7	54.7	55.0	21.6	53.7	71.7	55.9	40.7	19.0	48.2
SEm.+_	-	6.11	0.5		0.3	2.3	1.2	1.8	1.4		
CD at 5%	2.3	NS	1.8		1.0	9.2	4.2	7.2	5.4	2.4	
B. Cutting management											
No cutting	42.1	108.3	71.8	74.1	25.0	99.6	61.1	100.8	89.8	35.1	77.3
Cutting at 50 DAS	38.1	76.0	59.5	57.1	20.2	70.0	57.4	66.0	43.0	23.1	51.9
Cutting at 60 DAS	31.7	53.5	41.1	42.6	16.6	62.6	53.6	47.9	30.9	17.0	42.4
Cutting at 70 DAS	27.0	56.7	34.1	41.9	15.3	46.7	47.8	25.4	15.6	12.3	29.6
SEm±	-	3.7	0.4		0.5	2.6	2.3	2.8	1.6		
CD at 5%	1.7	11.1	1.3		1.5	7.8	6.8	8.4	4.7	4.0	
C. Interaction: C X CM											
SEm±	-	12.2	-		0.9	4.6	2.1	4.9	2.8		
CD at 5%	-	22.8	-		2.8	13.5	6.3	14.6	8.9		
CV (%)	-	-	2.9		4.6	14.8	7.8	14.2			

Table-5(p): Effect of cutting management and dual purpose crops on net monetary return

Treatment	Net return (Rs/ha)									
	NWZ	North East zone			Central zone					
	Bikaner	Bhubaneswar	Jorhat	Mean	Rahuri	Jabalpur	Anand	Urulikanchan	Raipur	Mean
A. Crops										
Oat	67037	38165	33887	36026	13593	41277	30502	88766	23310	39490
Barley	27845	40885	16587	28736	9865	17156	4866	33560	15761	16242
Wheat	34488	37631	14978	26305	30405	62070	31682	58204	14651	39402
SEm.+_	921	1048	935		151			2197		
CD at 5%	3189	4116	3091		593			8579		
B. Cutting management										
Uncut	50077	32307	25313	28810	23046	33120	22336	66136	18992	32726
Cutting at 50 DAS	47335	46413	24136	35275	21390	44615	22850	61142	21114	34222
Cutting at 60 DAS	41641	38657	19922	29290	18055	41299	21489	66109	16951	32781
Cutting at 70 DAS	33440	38195	17898	28046	9592	41632	22725	47320	14573	27168
SEm±	967	1247	1081		388			2251		
CD at 5%	2805	3705	3577		1154			6691		
C. Interaction: C X CM										
SEm±	-	2476	1873		673			4029		
CD at 5%	-	7922	6196		1999			13091		
CV (%)	8.0	9.3	10.5		6.47					

Table-5(q): Effect of cutting management and dual purpose crops on the benefit cost ratio

Treatment	Benefit cost ratio								
	NWZ		NEZ	Central zone					
	Hisar	Bikaner	Bhubaneswar	Rahuri	Jabalpur	Anand	Urulikanchan	Raipur	Over all Mean
A. Crops									
Oat	2.2	2.8	3.3	1.4	2.7	1.4	3.1	1.8	2.3
Barley	2.1	1.3	3.4	1.3	1.7	0.2	1.8	1.2	1.6
Wheat	2.3	1.6	3.3	1.8	2.5	1.4	2.5	1.0	2.1
SEm.+_		0.04	0.1	0.004			0.1		
CD at 5%		0.13	NS	0.01			0.2		
B. Cutting management									
Uncut	2.1	2.5	3.0	1.6	2.1	1.0	2.6	1.4	2.0
Cutting at 50 DAS	2.2	2.1	3.7	1.5	2.4	1.0	2.5	1.6	2.1
Cutting at 60 DAS	2.2	1.7	3.3	1.5	2.3	1.0	2.6	1.3	2.0
Cutting at 70 DAS	2.1	1.3	3.3	1.3	2.3	1.1	2.1	1.1	1.8
SEm±		0.04	0.1	0.01			0.1		
CD at 5%		0.13	0.2	0.02			0.2		
C. Interaction: C X CM									
SEm±		-	0.2	0.01			0.1		
CD at 5%		-	0.5	0.02			0.3		
CV (%)		8.0	6.7	2.1					

AST-6: Effect of weed management on forage and seed yield of berseem (*Trifolium alexandrinum*)

[Table Reference: 6(a) to 6 (o)]

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

A field experiment was conducted at seven locations to assess the possibility of weed management and effect of herbicides in controlling of weeds 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 of second year study is given zone wise below.

North West Zone: Ludhiana and Pantnagar

On location mean basis, practicing of weed management T_6 treatment (imazethapyr @ 0.1 kg a.i./ha immediate after harvest of I and II cut) in berseem recorded highest GFY (649.1 q/ha), DMY (80.6 q/ha), seed yield (2.36 q/ha), stover yield (42.4 q/ha), fodder equivalent yield (1598.7 q/ha), net monetary return (Rs 110638/ha) and B:C ratio (3.6). With respect to soil fertility, application of different herbicides in berseem did not cause remarkable variation in organic carbon, soil pH, available N, P and K as compared to initial soil fertility status at Pantnagar. However, maximum available N and P was recorded when oxyflourfen @ 0.100 kg a.i/ha was applied in berseem crop as compared to rest of the treatments.

North East Zone: Ranchi

The application of pendimethalin @ 0.400 kg a.i. /ha (T_3) in berseem recorded significantly highest GFY (458.8q/ha), and DMY [(70.9q/ha) being at par with pendimethalin @ 0.300 kg a.i./ha + imazethapyr @ 0.100 kg a.i./ha (immediate after harvest of 1st cut -T_8)] over rest of the treatments. Weed management in berseem through application of pendimethalin @ 0.300 kg a.i./ha being at par with control produced significantly highest seed yield (2.53 q/ha). The application of pendimethalin @ 0.400 kg a.i./ha in berseem fetched significantly highest net monetary return (Rs 1,46,398/ha) and benefit cost ratio (6.1).

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 (377.3 q/ha), DMY (57.9 q/ha), seed yield (3.18 q/ha), stover yield (32.0 q/ha), CPY (9.4 q/ha), net monetary return (Rs 70074/ha) and benefit cost ratio (2.93). The treatment T_7 recorded 56.8, 27.9, 28.6, 24.2, 12.7, 9.6, 12.5, 30.1, and 11.7% more GFY over T_1, T_2, T_3, T_4, T_5, T_6, T_8, T_9 and T_{10} respectively. The same treatment (T_7) achieved maximum weed control efficiency (74.8%) followed by T_9 (pendimethalin @ 0.400 kg a.i./ha + imazethapyr @ 0.100 kg a.i./ha)(60.3%) and lowest being with T_4 (pendimethalin @ 0.500 kg a.i./ha) (44.6%) as compared to weedy check on mean basis. At Jabalpur, application of pendimethalin @ 0.4 kg a.i./ha in berseem effectively controlled weed population and recorded lowest dry weight of weeds (6.38 g/m^2) over rest of the treatments. Whereas, at Urulikanchan, application of oxyflourfen @ 0.100 kg a.i./ha + imazethapyr @ 0.100 kg a.i./ha immediate after harvest of 1st cut recorded lowest weed biomass (0.47 q/ha) over rest of the treatments. Soil fertility in terms of available N, P and K was observed lower as compared to initial level of soil fertility at Urulikanchan.

On over all mean basis over the zones imazethapyr @ 0.100 kg a.i./ha (immediate after harvest of 1st and 2nd cut) recorded highest GFY (431.4 q/ha), DMY (61.2 q/ha) and net monetary return (Rs 77572/ha).

Table-6(a): Effect of integrated weed management on GFY of berseem

Treatment	Green fodder yield (q/ha)									
	NWZ			NEZ	Central zone					Over all mean
	Ludhiana	Pantnagar	Mean	Ranchi	Rahuri	Jabalpur	Urulikanchan	Raipur	Mean	
T_1	992.4	198.0	595.2	294.3	378.0	268.3	145.0	171.4	240.7	349.6
T_2	807.3	216.0	511.7	370.1	232.1	502.3	241.0	205.0	295.1	367.7
T_3	745.9	211.6	478.8	458.3	230.2	514.5	212.4	217.4	293.6	370.0
T_4	650.2	205.5	427.9	377.3	228.6	566.0	192.0	228.1	303.7	349.7
T_5	219.0	150.9	185.0	387.7	225.9	591.7	262.6	258.9	334.8	299.5
T_6	1092.7	205.5	649.1	343.7	402.0	531.7	204.2	239.8	344.4	431.4
T_7	447.5	129.6	288.6	321.2	215.4	603.9	383.9	305.8	377.3	343.9
T_8	717.2	221.1	469.2	425.7	246.1	529.2	294.1	274.3	335.9	386.8
T_9	641.8	218.0	429.9	387.7	238.9	383.4	251.2	286.9	290.1	344.0
T_{10}	578.5	213.9	396.2	371.3	234.3	599.0	224.6	293.2	337.8	359.3
SEm ±	-	6.4		6.8		20.6	8.9	-		
CD at 5 %	79.0	18.9		20.5	15.2	60.5	26.7	15.7		
CV %	-	5.6		9.0	3.4	15.6	15.3	-		

Table-6(b): Effect of integrated weed management on DMY of berseem

Treatment	Dry matter yield (q/ha)									
	NWZ			NEZ	Central zone					Over all mean
	Ludhiana	Pantnagar	Mean	Ranchi	Rahuri	Jabalpur	Urulikanchan	Raipur	Mean	
T_1	111.6	27.4	69.5	58.1	64.0	33.0	18.8	36.1	38.0	49.9
T_2	92.4	29.7	61.1	63.1	38.0	65.9	32.4	40.7	44.3	51.7
T_3	86.8	28.5	57.7	70.9	36.6	68.2	28.4	43.3	44.1	51.8
T_4	76.3	28.2	52.3	61.3	37.4	76.1	24.4	43.7	45.4	49.6
T_5	26.6	21.2	23.9	55.8	37.6	80.0	32.0	50.0	49.9	43.3
T_6	133.1	28.0	80.6	56.2	67.7	70.8	25.5	46.9	52.7	61.2
T_7	55.5	17.6	36.6	53.0	36.5	82.3	49.8	62.9	57.9	51.1
T_8	83.4	32.1	57.8	69.6	41.1	70.2	40.2	51.7	50.8	55.5
T_9	78.5	29.8	54.2	48.1	38.2	73.0	34.1	54.6	50.0	50.9
T_{10}	70.1	29.5	49.8	50.3	37.9	81.3	28.6	58.5	51.6	50.9
SEm ±		1.1		1.6	0.	5.2	1.4			
CD at 5 %	9.7	3.4		4.9	2.	15.4	3.4	4.1		
CV %		7.3		4.8	3.	6.5	13.8			

T_1 – Weedy check (Control)	T_6 – Imazethapyr @ 0.100 kg a. i./ha (Immediate after harvest of 1st & 2nd cut)
T_2 – Pendimethalin @ 0.3 kg a. i./ha	T_7 – Oxyflourfen @ 0.100 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_3 – Pendimethalin @ 0.4 kg a. i /ha	T_8 – Pendimethalin @ 0.300 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_4 – Pendimethalin @ 0.5 kg a. i./ha	T_9– Pendimethalin @ 0.400 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_5 – Oxyflourfen @ 0.100 kg a. i./ha	T_{10} – Pendimethalin @ 0.500 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha

Table-6(c): Effect of integrated weed management on seed yield of berseem

Treatment	Seed yield (q/ha)									
	NWZ			NEZ	Central zone					Over all
	Ludhiana	Pantnagar	Mean	Ranchi	Rahuri	Jabalpur	Urulikanchan	Raipur	Mean	mean
T_1	3.03	0.40	1.72	2.21	1.35	1.30	2.39	0.84	1.47	1.65
T_2	3.81	0.52	2.17	2.53	1.09	3.30	3.67	0.90	2.24	2.26
T_3	3.61	0.42	2.02	2.13	1.04	3.60	3.42	1.04	2.28	2.18
T_4	4.00	0.40	2.20	2.02	1.00	4.30	3.25	1.31	2.47	2.33
T_5	3.33	0.40	1.87	1.75	0.86	4.50	4.0	1.51	2.72	2.34
T_6	4.31	0.41	2.36	1.78	1.59	3.90	3.70	1.89	2.77	2.51
T_7	3.41	0.41	1.91	1.68	0.82	4.90	4.92	2.09	3.18	2.60
T_8	3.25	0.55	1.90	1.51	1.18	3.90	4.20	1.61	2.72	2.31
T_9	3.27	0.53	1.90	1.48	1.15	4.10	3.84	1.69	2.70	2.29
T_{10}	3.63	0.49	2.06	1.33	1.12	4.70	3.60	1.81	2.81	2.38
SEm ±		0.03		0.13	0.0	0.63	0.04			
CD at 5 %	0.63	0.09		0.38	0.0	1.17	0.12	0.17		
CV %		11.98		12.2	1.9	-	15.67			

Table-6(d): Effect of integrated weed management on stover yield of berseem

Treatment	Stover yield (q/ha)									Over all
	NWZ			NEZ	Central zone					
	Ludhiana	Pantnagar	Mean	Ranchi	Rahuri	Jabalpur	Urulikanchan	Raipur	Mean	mean
T_1	31.5	38.0	34.8	20.5	10.8	26.0	28.91	6.9	18.2	23.2
T_2	32.4	40.6	36.5	12.9	8.7	45.7	47.3	13.1	28.7	28.7
T_3	32.9	41.8	37.4	15.1	8.3	43.3	40.3	11.2	25.8	27.6
T_4	32.7	39.5	36.1	15.2	8.0	50.2	38.5	7.4	26.0	27.4
T_5	32.5	42.2	37.4	14.0	6.9	53.9	52.0	8.6	30.4	30.0
T_6	44.0	40.8	42.4	14.1	12.7	48.1	40.0	9.2	27.5	29.8
T_7	34.2	38.7	36.5	13.5	6.6	53.5	57.7	10.2	32.0	30.6
T_8	33.7	45.3	39.5	14.7	9.4	45.1	55.1	9.9	29.9	30.5
T_9	31.9	41.4	36.7	14.0	9.2	47.4	49.2	12.0	29.5	29.3
T_{10}	30.4	40.8	35.6	15.5	9.0	51.1	43.4	9.6	28.3	28.5
SEm ±	-	2.2		0.9	0.1	1.4	2.1			
CD at 5 %	5.4	6.5		2.6	0.3	3.6	6.3	1.5		
CV %	-	9.3		10.7	1.9	5.2	17.0			

T_1 – Weedy check (Control)	T_6 – Imazethapyr @ 0.100 kg a. i./ha (Immediate after harvest of 1st & 2nd cut)
T_2 – Pendimethalin @ 0.3 kg a. i./ha	T_7 – Oxyflourfen @ 0.100 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_3 – Pendimethalin @ 0.4 kg a. i /ha	T_8 – Pendimethalin @ 0.300 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_4 – Pendimethalin @ 0.5 kg a. i./ha	T_9– Pendimethalin @ 0.400 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_5 – Oxyflourfen @ 0.100 kg a. i./ha	T_{10} – Pendimethalin @ 0.500 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha

Table-6(e): Effect of integrated weed management on crude protein yield of berseem

Treatment	Crude protein yield (q/ha)							
	NEZ	NWZ	Central zone					Over all mean
	Ranchi	Pantnagar	Rahuri	Urulikanchan	Raipur	Jabalpur	Mean	
T_1	11.0	5.4	11.7	3.4	4.7	4.7	6.1	6.8
T_2	11.5	5.8	7.0	6.1	5.4	9.9	7.1	7.6
T_3	12.7	5.6	7.0	5.3	5.8	10.3	7.1	7.8
T_4	10.9	5.5	7.0	4.6	6.1	11.8	7.4	7.7
T_5	9.8	4.2	7.0	6.0	7.2	12.4	8.2	7.8
T_6	10.9	5.5	12.8	4.9	6.6	10.8	8.8	8.6
T_7	10.0	3.5	6.9	9.0	9.0	12.7	9.4	8.5
T_8	12.8	6.3	7.6	7.5	7.3	10.8	8.3	8.7
T_9	9.1	5.8	7.1	6.3	7.9	11.3	8.2	7.9
T_{10}	9.7	5.8	7.2	5.4	8.8	12.6	8.5	8.3
SEm ±	0.0	0.2	0.2	0.2		0.7		
CD at 5 %	0.9	0.7	0.5	0.6	0.6	2.1		
CV %	4.8	7.3	3.4	16.9		4.5		

T_1 – Weedy check (Control)	T_6 – Imazethapyr @ 0.100 kg a. i./ha (Immediate after harvest of 1st & 2nd cut)
T_2 – Pendimethalin @ 0.3 kg a. i./ha	T_7 – Oxyflourfen @ 0.100 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_3 – Pendimethalin @ 0.4 kg a. i /ha	T_8 – Pendimethalin @ 0.300 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_4 – Pendimethalin @ 0.5 kg a. i./ha	T_9– Pendimethalin @ 0.400 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_5 – Oxyflourfen @ 0.100 kg a. i./ha	T_{10} – Pendimethalin @ 0.500 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha

Table-6(f): Effect of integrated 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	NWZ			Central zone					Over all mean
	Ranchi	Rahuri	Urulikanchan	Mean		Ludhiana	Pantnagar	Mean	Rahuri	Jabalpur	Urulikanchan	Raipur	Mean	
T_1	17.3	18.2	17.9	18.1	17.8	50.1	40.4	45.3	44.6	34.0	46.3	49.8	43.7	44.2
T_2	18.3	18.4	18.8	18.6	18.5	49.4	38.8	44.1	36.7	39.0	58.2	80.4	53.6	50.4
T_3	18.0	19.1	18.7	18.9	18.6	46.5	38.4	42.5	33.3	40.0	54.3	74.7	50.6	47.9
T_4	17.9	18.8	18.8	18.8	18.5	44.4	39.1	41.8	32.7	44.0	54.3	56.3	46.8	45.1
T_5	17.6	18.7	18.8	18.8	18.4	40.3	36.4	38.4	34.9	45.0	51.6	70.8	50.6	46.5
T_6	19.4	18.8	19.1	19.0	19.1	53.5	38.7	46.1	39.6	40.0	56.5	68.7	51.2	49.5
T_7	18.9	18.8	18.0	18.4	18.6	42.6	33.8	38.2	38.0	49.0	57.0	73.0	54.3	48.9
T_8	18.4	18.4	18.6	18.5	18.5	47.1	37.6	42.4	37.8	41.0	58.2	60.3	49.3	47.0
T_9	18.9	18.5	18.5	18.5	18.6	41.8	38.2	40.0	35.2	44.0	51.4	78.6	52.3	48.2
T_{10}	19.3	18.9	19.0	18.9	19.1	44.1	38.4	41.3	33.0	47.0	50.9	64.4	48.8	46.3
SEm ±	0.1	0.2					0.8		2.1	1.0	2.1			
CD at 5 %	0.4	0.5				6.7	2.5		6.1	4.1	6.4	14.8		
CV %	10.2	1.6					3.8		9.7	3.9	7.1			

T_1 – Weedy check (Control)	T_6 – Imazethapyr @ 0.100 kg a. i./ha (Immediate after harvest of 1st & 2nd cut)
T_2 – Pendimethalin @ 0.3 kg a. i./ha	T_7 – Oxyflourfen @ 0.100 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_3 – Pendimethalin @ 0.4 kg a. i /ha	T_8 – Pendimethalin @ 0.300 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_4 – Pendimethalin @ 0.5 kg a. i./ha	T_9– Pendimethalin @ 0.400 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_5 – Oxyflourfen @ 0.100 kg a. i./ha	T_{10} – Pendimethalin @ 0.500 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha

Table-6(g): Effect of integrated weed management on leaf stem ratio of berseem (*Trifolium alexandrinum* L.)

Treatment	Leaf stem ratio								Plant population/ m row length					
	NEZ	NWZ	Central zone					Over all mean	NEZ	Central zone				Over all mean
	Ranchi	Pantnagar	Rahuri	Jabalpur	Urulikanchan	Raipur	Mean		Ranchi	Rahuri	Jabalpur	Urulikanchan	Mean	
T_1	1.70	2.01	0.48	0.56	0.63	0.54	0.55	0.99	46.0	116.2	129.0	139.8	128.3	107.8
T_2	1.75	2.23	0.46	0.67	0.70	0.90	0.68	1.12	44.0	93.0	137.0	147.3	125.8	105.3
T_3	1.81	2.22	0.57	0.69	0.62	0.81	0.67	1.12	46.0	81.9	140.0	132.5	118.1	100.1
T_4	1.56	2.30	0.53	0.81	0.76	0.63	0.68	1.10	45.0	83.1	139.0	122.2	114.8	97.3
T_5	1.56	2.29	0.61	0.86	0.74	0.76	0.74	1.14	45.0	83.8	136.0	142.5	120.8	101.8
T_6	1.46	2.34	0.49	0.78	0.59	0.71	0.64	1.06	44.0	114.8	136.0	144.8	131.9	109.9
T_7	1.43	1.95	0.47	0.94	0.89	0.83	0.78	1.09	46.0	100.4	138.0	156.8	131.7	110.3
T_8	1.50	2.50	0.50	0.71	0.64	0.65	0.63	1.08	45.0	74.6	134.0	146.8	118.5	100.1
T_9	1.49	2.58	0.45	0.77	0.68	0.86	0.69	1.14	45.0	77.0	134.0	152.5	121.2	102.1
T_{10}	1.53	2.89	0.58	0.90	0.73	0.67	0.72	1.22	46.0	74.4	135.0	120.8	110.1	94.1
SEm ±	0.08	0.22	0.02	0.02	0.03				1.1	3.7		6.8		
CD at 5 %	0.24	0.64	0.05	0.06	0.09	0.04			NS	10.9		20.2		
CV %	8.60	15.9	5.52	4.5	11.59				8.3	7.0		8.6		

T_1 – Weedy check (Control)	T_6 – Imazethapyr @ 0.100 kg a. i./ha (Immediate after harvest of 1st & 2nd cut)
T_2 – Pendimethalin @ 0.3 kg a. i./ha	T_7 – Oxyflourfen @ 0.100 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_3 – Pendimethalin @ 0.4 kg a. i /ha	T_8 – Pendimethalin @ 0.300 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_4 – Pendimethalin @ 0.5 kg a. i./ha	T_9– Pendimethalin @ 0.400 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_5 – Oxyflourfen @ 0.100 kg a. i./ha	T_{10} – Pendimethalin @ 0.500 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha

Table-6(h): Effect of integrated weed management on weed control efficiency in berseem (*Trifolium alexandrinum* L.)

Treatment	Weed control efficiency (%)					
	Central zone				NWZ	Mean
	Rahuri	Jabalpur	Urulikanchan	Mean	Ludhiana	
T_1	0.00	0.00	0.00	0.00	0.00	0.00
T_2	20.50	80.80	41.19	47.5	27.30	42.45
T_3	30.27	75.60	54.31	53.39	53.90	53.52
T_4	30.48	53.56	49.86	44.63	47.20	45.28
T_5	62.78	59.42	57.56	59.92	58.70	59.62
T_6	50.89	59.88	56.17	55.65	55.90	55.71
T_7	72.52	68.20	83.69	74.80	79.20	75.90
T_8	39.69	61.41	62.92	54.67	58.80	55.71
T_9	46.99	79.25	54.72	60.32	57.50	59.62
T_{10}	53.21	67.23	56.58	59.01	57.80	58.71
SEm ±	2.16		3.35	-	-	
CD at 5 %	6.41		10.04	-	-	
CV %	9.18		10.82	-	-	

T_1 – Weedy check (Control)	T_6 – Imazethapyr @ 0.100 kg a. i./ha (Immediate after harvest of 1st & 2nd cut)
T_2 – Pendimethalin @ 0.3 kg a. i./ha	T_7 – Oxyflourfen @ 0.100 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_3 – Pendimethalin @ 0.4 kg a. i /ha	T_8 – Pendimethalin @ 0.300 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_4 – Pendimethalin @ 0.5 kg a. i./ha	T_9– Pendimethalin @ 0.400 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_5 – Oxyflourfen @ 0.100 kg a. i./ha	T_{10} – Pendimethalin @ 0.500 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha

Table-6(i): Effect of integrated weed management on equivalent yield and weed index of yield of berseem (*Trifolium alexandrinum* L.)

Treatment	Raipur				Jabalpur		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	Weed index of green fodder yield of berseem (%)	Weed index of seed yield (%)	Maize fodder equivalent yield (q/ha)	Fodder equivalent yield (q/ha)
T_1	59.95	44.00	86.73	135.95	58.13	70.86	228.54	1348.4
T_2	57.51	33.01	59.35	97.26	-	-	529.28	1248.0
T_3	50.62	28.97	54.37	96.68	3.80	2.25	459.47	1165.7
T_4	37.33	25.46	44.65	76.02	16.62	11.27	409.67	1111.9
T_5	28.34	15.35	40.20	66.99	14.72	6.20	570.25	608.2
T_6	9.55	21.59	38.57	68.68	10.13	4.51	420.98	1598.7
T_7	0.00	0.00	17.44	28.11	5.91	3.38	808.44	846.9
T_8	23.40	10.30	32.72	67.65	12.61	4.51	633.48	1099.1
T_9	18.88	6.23	37.77	72.12	2.09	1.69	533.11	1023.9
T_{10}	13.52	4.12	27.40	48.10	9.74	4.32	470.54	997.6
SEm ±							15.81	
CD at 5 %	6.41	5.28	14.50	22.79			47.34	142.1
CV %							14.45	

T_1 – Weedy check (Control)	T_6 – Imazethapyr @ 0.100 kg a. i./ha (Immediate after harvest of 1st & 2nd cut)
T_2 – Pendimethalin @ 0.3 kg a. i./ha	T_7 – Oxyflourfen @ 0.100 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_3 – Pendimethalin @ 0.4 kg a. i /ha	T_8 – Pendimethalin @ 0.300 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_4 – Pendimethalin @ 0.5 kg a. i./ha	T_9– Pendimethalin @ 0.400 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_5 – Oxyflourfen @ 0.100 kg a. i./ha	T_{10} – Pendimethalin @ 0.500 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha

Table-6(j): Effect of integrated 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	70.33	53.33	41.66	61.66	30.16	27.62	29.01	42.51
T_2	9.33	8.66	9.33	12.66	6.45	5.61	5.72	7.02
T_3	14.66	13.0	10.66	13.66	7.35	5.86	6.97	6.38
T_4	22.66	21.66	15.33	17.66	15.11	13.94	14.29	16.70
T_5	19.66	17.0	15.33	14.66	12.86	12.92	13.00	13.58
T_6	15.33	12.33	9.00	12.66	12.69	12.57	12.68	12.01
T_7	11.66	9.00	6.66	11.00	11.05	9.99	10.18	11.14
T_8	9.33	10.66	9.00	17.33	10.49	10.03	10.07	10.53
T_9	5.66	4.66	3.66	6.00	6.90	6.62	6.54	6.76
T_{10}	25.00	17.66	15.33	21.00	13.94	12.26	12.72	12.95
SEm ±	4.5	3.2	2.5	4.50	0.85	0.92	0.81	1.23
CD at 5 %	12.63	8.6	6.3	12.64	2.36	2.74	2.6	3.41
CV %	3.4	2.6	2.4	5.2	2.4	3.2	3.1	4.2

T_1 – Weedy check (Control)	T_6 – Imazethapyr @ 0.100 kg a. i./ha (Immediate after harvest of 1st & 2nd cut)
T_2 – Pendimethalin @ 0.3 kg a. i./ha	T_7 – Oxyflourfen @ 0.100 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_3 – Pendimethalin @ 0.4 kg a. i /ha	T_8 – Pendimethalin @ 0.300 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_4 – Pendimethalin @ 0.5 kg a. i./ha	T_9– Pendimethalin @ 0.400 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_5 – Oxyflourfen @ 0.100 kg a. i./ha	T_{10} – Pendimethalin @ 0.500 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha

Table-6(k): Effect of integrated 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 dry matter yield (q/ha)	OC (%)	EC (dSm^{-1})	pH	Available N (kg/ha)	Available P (kg/ha)	Available K (kg/ha)
T_1	134.0	2.91	0.31	0.21	8.05	129.67	32.67	235.00
T_2	80.0	1.68	0.34	0.26	8.12	128.67	33.67	240.00
T_3	85.0	1.31	0.32	0.22	8.04	128.67	33.00	270.00
T_4	93.0	1.44	0.31	0.25	8.05	128.33	32.33	241.67
T_5	68.0	1.22	0.36	0.27	8.04	129.33	32.33	206.67
T_6	110.0	1.27	0.33	0.23	7.93	127.67	30.33	213.33
T_7	50.0	0.47	0.38	0.24	7.99	128.00	31.00	233.33
T_8	74.0	1.08	0.36	0.26	8.05	128.67	29.33	201.67
T_9	100.0	1.29	0.34	0.21	8.14	128.33	29.00	210.00
T_{10}	112.0	1.25	0.35	0.23	8.11	129.33	31.00	250.00
Initial			0.52	0.59	7.29	147.00	43.00	195.00

Table-6(l): Effect of integrated 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)	OC (%)	EC (dSm^{-1})	pH	Available N (kg/ha)	Available P (kg/ha)	Available K (kg/ha)
T_1	100.3	0.47	0.21	8.62	143.0	12.5	531.0
T_2	85.0	0.48	0.21	8.63	168.0	14.8	534.0
T_3	78.0	0.48	0.21	8.62	170.0	14.9	571.0
T_4	71.0	0.48	0.21	8.62	185.0	14.0	593.0
T_5	33.7	0.48	0.22	8.63	165.0	10.8	592.0
T_6	42.0	0.49	0.21	8.63	189.0	14.6	596.0
T_7	23.0	0.48	0.21	8.63	154.0	13.1	571.0
T_8	59.7	0.48	0.21	8.63	166.0	12.0	553.0
T_9	51.7	0.48	0.21	8.62	151.0	12.8	556.0
T_{10}	46.7	0.48	0.21	8.63	158.0	111.0	560.0
SEm ±	1.87	0.18	0.007	0.005	4.56	0.32	9.72
CD at 5 %	5.60	NS	NS	NS	13.53	0.94	29.63
CV %	5.49	6.56	5.86	0.11	4.79	4.19	3.05
Initial							

T_1 – Weedy check (Control)	T_6 – Imazethapyr @ 0.100 kg a. i./ha (Immediate after harvest of 1st & 2nd cut)
T_2 – Pendimethalin @ 0.3 kg a. i./ha	T_7 – Oxyflourfen @ 0.100 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_3 – Pendimethalin @ 0.4 kg a. i /ha	T_8 – Pendimethalin @ 0.300 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_4 – Pendimethalin @ 0.5 kg a. i./ha	T_9– Pendimethalin @ 0.400 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_5 – Oxyflourfen @ 0.100 kg a. i./ha	T_{10} – Pendimethalin @ 0.500 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha

Table-6(m): Effect of integrated weed management on soil fertility status in berseem (*Trifolium alexandrinum* L.) at Pantnagar

Treatment	OC (%)	pH	Available N (kg/ha)	Available P (kg/ha)	Available K (kg/ha)
T_1	0.83	7.5	282.3	21.1	231.0
T_2	0.84	7.6	285.4	21.7	234.4
T_3	0.84	7.6	285.5	22.4	233.3
T_4	0.84	7.6	285.4	21.8	233.5
T_5	0.85	7.6	287.5	24.5	236.6
T_6	0.84	7.6	284.7	21.8	233.9
T_7	0.84	7.6	287.1	24.7	236.9
T_8	0.83	7.6	285.0	21.8	233.9
T_9	0.84	7.6	285.9	22.7	234.7
T_{10}	0.84	7.6	286.7	22.5	234.2
SEm ±	0.01		0.44	0.16	0.26
CD at 5 %	NS		1.31	0.48	0.77
CV %	1.6				
Initial	0.8	7.6	284.5	21.8	232.8

T_1 – Weedy check (Control)	T_6 – Imazethapyr @ 0.100 kg a. i./ha (Immediate after harvest of 1st & 2nd cut)
T_2 – Pendimethalin @ 0.3 kg a. i./ha	T_7 – Oxyflourfen @ 0.100 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_3 – Pendimethalin @ 0.4 kg a. i /ha	T_8 – Pendimethalin @ 0.300 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_4 – Pendimethalin @ 0.5 kg a. i./ha	T_9– Pendimethalin @ 0.400 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_5 – Oxyflourfen @ 0.100 kg a. i./ha	T_{10} – Pendimethalin @ 0.500 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha

Table-6(n): Effect of integrated weed management on net monetary return of berseem (*Trifolium alexandrinum* L.)

Treatment	Net monetary return (Rs/ha)									Over all mean
	NWZ			NEZ	Central zone					
	Ludhiana	Pantnagar	Mean	Ranchi	Rahuri	Jabalpur	Urulikanchan	Raipur	Mean	
T_1	156361	27709	92035	100270	33872	29289	41137	4810	27277	56207
T_2	136135	31763	83949	128463	11091	87505	95270	7581	50362	71115
T_3	124612	30311	77462	146398	9967	92376	82704	9009	48514	70768
T_4	117088	28290	72689	119647	8320	107631	73740	10530	50055	66464
T_5	46564	24276	35420	116445	6001	109074	102646	14098	57955	59872
T_6	191902	29373	110638	103871	37244	95067	75777	9772	54465	77572
T_7	79991	20624	50308	93053	903	116107	145519	17765	70074	67709
T_8	115287	33870	74579	122608	10360	92613	114027	14046	57762	71830
T_9	104770	31939	68355	108483	8932	99720	95960	15387	55000	66456
T_{10}	101079	30661	65870	102474	7621	114359	84697	16141	55705	65290
SEm ±		1225		3607	653		2846			
CD at 5 %	19403	3639		10802	1938		8522	1612		
CV %		7.3		5.5	8.4		16.4			

T_1 – Weedy check (Control)	T_6 – Imazethapyr @ 0.100 kg a. i./ha (Immediate after harvest of 1st & 2nd cut)
T_2 – Pendimethalin @ 0.3 kg a. i./ha	T_7 – Oxyflourfen @ 0.100 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_3 – Pendimethalin @ 0.4 kg a. i /ha	T_8 – Pendimethalin @ 0.300 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_4 – Pendimethalin @ 0.5 kg a. i./ha	T_9– Pendimethalin @ 0.400 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_5 – Oxyflourfen @ 0.100 kg a. i./ha	T_{10} – Pendimethalin @ 0.500 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha

Table-6(o): Effect of integrated weed management on benefit cost ratio in berseem (*Trifolium alexandrinum* L.)

Treatment	Benefit cost ratio								Over all mean
	NWZ			NEZ	Central zone				
	Ludhiana	Pantnagar	Mean	Ranchi	Jabalpur	Urulikanchan	Raipur	Mean	
T_1	4.82	2.16	3.49	4.18	1.74	1.92	0.34	1.33	2.53
T_2	3.53	2.37	2.95	5.35	3.92	3.28	0.52	2.57	3.16
T_3	3.23	2.25	2.74	6.10	4.06	3.01	0.61	2.56	3.21
T_4	3.04	2.08	2.56	4.98	3.92	2.78	0.71	2.47	2.92
T_5	1.21	1.82	1.52	4.86	3.72	3.17	0.95	2.61	2.62
T_6	4.97	2.22	3.60	4.33	4.26	2.49	0.54	2.43	3.14
T_7	2.07	1.52	1.80	3.88	4.03	3.70	1.05	2.93	2.71
T_8	2.99	2.42	2.71	5.11	4.13	3.38	0.85	2.79	3.15
T_9	2.72	2.31	2.52	4.52	4.52	3.04	0.92	2.83	3.01
T_{10}	2.62	2.21	2.42	4.27	4.25	2.83	0.96	2.68	2.86
SEm ±		0.09		0.15		0.06			
CD at 5 %	0.51	0.27		0.45		0.18			
CV %		7.4		5.47		15.98			

T_1 – Weedy check (Control)	T_6 – Imazethapyr @ 0.100 kg a. i./ha (Immediate after harvest of 1st & 2nd cut)
T_2 – Pendimethalin @ 0.3 kg a. i./ha	T_7 – Oxyflourfen @ 0.100 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_3 – Pendimethalin @ 0.4 kg a. i /ha	T_8 – Pendimethalin @ 0.300 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_4 – Pendimethalin @ 0.5 kg a. i./ha	T_9– Pendimethalin @ 0.400 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha
T_5 – Oxyflourfen @ 0.100 kg a. i./ha	T_{10} – Pendimethalin @ 0.500 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha

AST-7 (AST-18): Effect of integrated nutrient management on yield and quality of oat (SC)

[Table Reference: 7(a), 7 (b)]

Location: Kalyani and Imphal

The experiment was initiated during *Rabi* 2012-13 on location specific mode at BCKV, Kalyani and CAU, Imphal 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, **T_5-** 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 was laid out in RBD with three replications. The data of second year (2013-14) of experimentation has been presented below.

Application of N@100 kg/ha+FYM@10 t/ha (T_7) recorded highest green fodder yield (447.8 q/ha) followed by T_{10}- N@120 kg/ha+FYM@10 t/ha (442.23 q/ha) and T_3- N@60 kg/ha+FYM@7.5 t/ha (408.89 q/ha), while highest DMYof 103.82 q/ha was recorded in the treatment T_{10}- N@120 kg/ha+FYM@10 t/ha. Tallest plant (136.95 cm) and maximum leaf stem ratio (0.69) was found with the application of N@100 kg/ha+FYM@7.5 t/ha (T_6). In terms of quality parameters, crude protein yield (9.89 q/ha) was found to be highest with the application of N@120 kg/ha+FYM@10 t/ha (T_{10}).

Maximum gross monetary return of Rs. 53,389/- was recorded in T_7- N@100 kg/ha+FYM@10 t/ha, while highest net monetary return of Rs. 20,984/- was found in the treatment T3- N@60 kg/ha+FYM@7.5 t/ha. Overall, T_7- N@100 kg/ha+FYM@10 t/ha was found to be the best in terms of quality green fodder production from all the other treatments in the second year of experimentation.

Table-7(a): Effect of integrated nutrient management on yield and quality of oat (sc) at Imphal and Kalyani in NE zone

Treatment	Plant height (cm)			Leaf Stem ratio			Green Fodder Yield (q/ha)			Dry Matter Yield (q/ha)			Crude Protein Yield (q/ha)		
	Kalyani	Imphal	Mean	Kalyani	Imphal	Mean	Kalyani	Imphal	Mean	Kalyani	Imphal	Mean	Kalyani	Imphal	Mean
T_1	116.97	137.67	127.32	0.86	0.20	0.53	388.89	277.78	333.34	68.51	71.90	70.21	6.93	3.06	5.00
T_2	116.87	135.00	125.94	0.92	0.22	0.57	397.78	316.67	357.23	62.24	84.28	73.26	4.43	4.59	4.51
T_3	118.37	146.00	132.19	1.14	0.17	0.66	451.11	366.67	408.89	84.56	108.82	96.69	7.40	6.20	6.80
T_4	117.67	130.67	124.17	1.17	0.20	0.69	462.22	277.78	370.00	87.87	79.09	83.48	8.62	4.79	6.71
T_5	127.70	125.67	126.69	0.97	0.23	0.60	491.11	261.11	376.11	85.37	67.20	76.29	6.72	3.55	5.14
T_6	130.90	143.00	136.95	1.18	0.19	0.69	488.89	322.22	405.56	91.98	94.92	93.45	9.48	4.77	7.13
T_7	125.03	132.67	128.85	0.90	0.18	0.54	551.11	344.44	447.78	109.82	90.56	100.19	12.36	4.07	8.22
T_8	123.13	121.67	122.40	1.03	0.20	0.62	464.44	350.00	407.22	89.21	104.86	97.04	7.36	4.53	5.95
T_9	129.33	142.33	135.83	0.89	0.19	0.54	528.89	277.78	403.34	108.52	78.61	93.57	11.52	3.81	7.67
T_{10}	125.07	137.33	131.20	0.79	0.22	0.51	617.78	266.67	442.23	127.90	79.73	103.82	15.67	4.10	9.89
SEm±	3.25	5.55	-	-	0.02	-	18.64	15.80	-	4.44	6.03	-	0.42	0.40	-
CD at 5%	9.65	16.50	-	-	0.05	-	55.39	46.95	-	13.19	17.92	-	1.24	1.18	-
CV%	4.57	7.11	-	-	14.33	-	6.67	8.94	-	8.40	12.15	-	7.98	15.76	-

T_1- RDF (80:40 N: P)	T_2- N@ 60kg/ha + 5 t FYM/ha
T_3- N@60 kg/ha+FYM@7.5 t/ha	T_4- N@60 kg/ha+FYM@10 t/ha
T_5- 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	T_{10}- N@120 kg/ha+FYM@10 t/ha

Table-7(b): Effect of integrated nutrient management on economics of oat (sc) at Imphal and Kalyani in NE zone

Treatment	Cost of cultivation (Rs./ha)			Gross monetary return (Rs./ha)			Net monetary return (Rs./ha)		
	Kalyani	Imphal	Mean	Kalyani	Imphal	Mean	Kalyani	Imphal	Mean
T_1	22500	17991	20246	38889	41666	40278	16389	23675	20032
T_2	30000	21268	25634	39778	47500	43639	9778	26232	18005
T_3	35000	23143	29072	45111	55000	50056	10111	31857	20984
T_4	40000	25018	32509	46222	41666	43944	6222	16648	11435
T_5	33750	22225	27988	49111	39166	44139	15361	16941	16151
T_6	38750	24100	31425	48889	48333	48611	10139	24233	17186
T_7	43750	25975	34863	55111	51666	53389	11361	25691	18526
T_8	37000	22698	29849	46444	52500	49472	9444	29802	19623
T_9	42500	24573	33537	52889	41666	47278	10389	17093	13741
T_{10}	47500	26448	36974	61778	40000	50889	14278	13552	13915
SEm±	-	-	-	1864	2370	-	1864	2370	-
CD at 5%	-	-	-	5539	7041	-	5539	7041	-
CV%	-	-	-	6.67	8.94	-	28.45	18.19	-

T_1- RDF (80:40 N: P)	T_2- N@ 60kg/ha + 5 t FYM/ha
T_3- N@60 kg/ha+FYM@7.5 t/ha	T_4- N@60 kg/ha+FYM@10 t/ha
T_5- 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	T_{10}- N@120 kg/ha+FYM@10 t/ha

AST-8 (AST-6-NT): Study on different models for year round green fodder production under irrigated condition [Table Reference: 8(a) to 8 (b)]

Location: Urulikanchan, Anand, Rahuri and Bikaner

The experiment was conducted to find out suitable models for year round green fodder production at four locations (Anand, Rahuri, Urulikanchan and Bikaner). The study was started during *kharif* 2013 with sowing perennial BNH (CO-3) at border and seasonal (*kharif*, *rabi* & *zaid*) fodder crops in between plot as per treatments. The treatment consisted of **T_1-** Maize +cowpea- oat + berseem- Bajra + cowpea, **T_2-** sorghum + cowpea- maize + berseem – Bajra + cowpea, **T_3-** BN hybrid + cowpea-berseem- cowpea, **T_4-** BN hybrid + lucerne and **T_5-** BN hybrid + *Desmanthus* was laid out in randomized block design with four replications.

On location mean basis, it is revealed that planting of BN hybrid + cowpea/berseem/cowpea (T_3) recorded highest GFY (1375.6 q/ha/yr), DMY (255.5 q/ha/yr) and CPY (147.3 q/ha/yr) over rest of the treatments. The respective treatment (T_3) recorded 26.8, 44.5, 12.6 and 17.1 % more GFY over T_1, T_2 and T_4 and T_5 treatments, respectively. However, planting of maize+ cowpea-oat + berseem- bajra+ cowpea round the year green fodder production system fetched highest net monetary returns (Rs 57303/ha/yr) and B:C ratio (1.71 at par with T_5) over rest of the treatments.

Table -8(a): GFY and DMY of forages as influenced by different models for year round green fodder production under irrigated condition

Treatment	Total GFY(q/ha/yr)					Total DMY(q/ha/yr)				
	Anand	Rahuri	Urulikanchan	Bikaner	Mean	Anand	Rahuri	Urulikanchan	Bikaner	Mean
T_1	1388.0	1192.9	909.7	847.0	1084.4	247.3	198.6	137.4	225.4	202.2
T_2	1246.0	1148.5	795.2	618.2	952.0	227.6	186.9	137.1	158.1	177.4
T_3	1710.0	2393.2	657.3	742.0	1375.6	267.9	475.6	86.7	191.8	255.5
T_4	1653.0	1864.0	530.0	837.4	1221.1	271.2	380.6	71.8	222.5	236.5
T_5	1627.0	2152.4	470.8	447.2	1174.4	241.3	441.9	71.7	137.1	223.0
SEm±	37.9		19.8	18.5		8.1		4.3	4.8	
CD at 5 %	117.0		60.3	56.9						

T_1-Maize + cowpea- oat + berseem- bajra + cowpea	T_2- Sorghum + cowpea- maize+ berseem- Bajra + cowpea
T_3-Bajra napier hybrid + cowpea- BN hybrid + berseem- BN hybrid + cowpea	T_4- BN hybrid + lucerne
T_5- BN hybrid + *Desmanthus*	

Table -8(b): CPY and economics of forages as influenced by different models for year round green fodder production under irrigated condition

Treatment	Net monetary returns (Rs/ha/yr)				Benefit cost ratio				Total CPY (q/ha/yr)				
	Anand	Bikaner	Urulikanchan	Mean	Anand	Bikaner	Urulikanchan	Mean	Anand	Rahuri	Urulikanchan	Bikaner	Mean
T_1	74809	54699	117209	57303	1.03	1.82	2.28	1.71	23.7	240.5	12.3	32.4	77.2
T_2	67029	31820	93167	41662	0.94	1.06	2.04	1.35	24.3	206.3	10.5	18.2	64.8
T_3	106102	46198	56686	34295	1.32	1.65	1.64	1.54	32.3	523.7	10.9	22.3	147.3
T_4	106883	58738	15789	24842	1.42	2.35	1.18	1.65	37.3	432.7	9.0	29.2	127.0
T_5	109465	24723	39297	21340	1.70	1.65	1.77	1.71	37.4	461.9	8.4	15.0	130.7
SEm +									1.3		0.5	0.6	
CD at 5 %													

T_1-Maize + cowpea- oat + berseem- bajra + cowpea	T_2- Sorghum + cowpea- maize+ berseem- Bajra + cowpea
T_3-Bajra napier hybrid + cowpea- BN hybrid + berseem- BN hybrid + cowpea	T_4- BN hybrid + lucerne
T_5- BN hybrid + *Desmanthus*	

(B) ON GOING LOCATION SPECIFIC TRIALS:

AST-9 (AST-8): Optimization of nitrogen for maize in different forage based cropping systems

Location: Shillong

This trial was conducted during 2011-12 and during 2012-13 and 2013-14; this trial could not be conducted.

AST-10: Effect of soil amendments on productivity of rice-berseem and changes in soil properties of sodic soil **[Table Reference: 10 (a) to 10 (c)]**

Location: Faizabad

The experiment was conducted to study the effect of soil amendments on the productivity of sodic soil. This was the fifth (Finial) 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 31.3%. During *kharif*, application of RDF + gypsum @ 75% GR+FYM 10 t/ha (T_7) attained significantly highest grain yield (34.5 q/ha) and straw yield (42.3 q/ha) of rice over rest of the treatments. During *rabi* season, the same treatment (T_7) recorded significantly highest GFY (270.6 q/ha) of berseem. Whereas, application of T_7-treatment being at par with T_2, T_3, T_4, T_5, T_8, T_9, and T_{10} recorded significantly highest DMY (52.3 q/ha) as compared to T_1 and T_6 treatments.

Application of RDF + gypsum @ 75% GR + FYM 10 t/ha in rice-berseem cropping system registered highest uptake of N, P and K (222.4, 31.2 and 81.65 kg N, P_2O_5 and K_2O/ha, respectively). The application of different soil amendments brought down the values of pH, EC and ESP over its initial values. 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 as compared to initial values.

Table-10 (a): Effect of soil amendment on yield in rice-berseem cropping system at Faizabad

Treatment	Rice			Berseem (3 cuts)		
	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	20.6	27.5	42.8	210.5	33.6	5.97
T_2	23.3	30.4	43.8	228.8	45.1	7.98
T_3	30.9	36.2	46.1	217.2	47.9	8.53
T_4	26.0	34.8	42.8	235.7	45.8	8.15
T_5	29.2	35.6	45.1	236.7	45.9	8.20
T_6	25.4	31.9	44.3	224.4	44.0	7.78
T_7	34.5	42.3	44.9	270.6	52.3	9.26
T_8	31.9	35.7	47.2	253.1	49.6	8.78
T_9	30.7	39.0	44.1	255.5	49.8	8.82
T_{10}	29.2	37.7	43.6	244.6	49.2	8.53
CD at 5%	2.3	2.6	2.5	12.1	7.8	4.98
CV%	12.3	14.5	9.7	10.4	9.3	8.70

T_1 = RDF (120 kg N : 60 kg P_2O_5 : 40 kg K_2O and 25 kg Zn SO_4)	T_6 = RDF + pressmud@ 50 % GR
T_2 = RDF + FYM 10 t/ha	T_7 = RDF +gypsum @75% GR + FYM 10 t/ha
T_3 = RDF +gypsum @75 % GR	T_8 = RDF +gypsum @ 50 % GR +FYM10 t/ha
T_4 = RDF +gypsum @50 % GR	T_9 = RDF + pressmud@ 75 % GR +FYM 10 t/ha
T_5 = RDF +pressmud @75% GR	T_{10} = RDF + pressmud@ 50 % GR +FYM 10t/ha

Table-10 (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	33.5	95.3	5.78	14.2	22.5	25.6	128.8	20.0	28.0
T_2	40.1	142.0	6.90	18.3	31.6	31.6	182.2	25.2	63.2
T_3	52.7	151.4	8.70	20.0	37.8	28.2	204.1	18.7	66.0
T_4	41.9	142.8	7.80	17.7	36.4	26.7	184.6	25.5	63.1
T_5	50.3	145.2	7.74	18.9	34.1	26.1	195.5	26.6	60.2
T_6	41.3	137.2	6.90	18.1	24.7	25.2	178.5	25.0	49.8
T_7	58.2	164.2	11.45	19.8	47.2	34.5	222.4	31.2	81.7
T_8	54.3	156.8	9.53	19.6	38.6	28.4	211.0	19.1	66.9
T_9	52.5	157.4	9.92	20.7	36.2	32.3	209.9	30.6	68.4
T_{10}	49.0	152.8	7.94	20.0	36.0	31.4	201.7	27.9	67.3
CD at 5%	7.9	10.6	5.17	6.5	7.5	7.4	-	-	-
CV%	9.6	10.2	9.98	11.3	10.8	11.7	-	-	-

Table-10 (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	8.86	0.86	28.0	0.34	95.4	12.7	258.5
T_2	8.86	0.88	29.2	0.33	96.2	13.8	280.5
T_3	8.78	0.86	25.0	0.28	95.8	13.8	281.2
T_4	8.75	0.85	25.8	0.30	95.7	14.4	281.5
T_5	8.76	0.88	25.6	0.31	96.4	12.1	279.6
T_6	8.74	0.84	28.1	0.35	95.4	14.3	280.6
T_7	8.78	0.85	24.4	0.34	96.5	13.8	281.4
T_8	8.72	0.86	24.2	0.32	96.6	14.9	282.3
T_9	8.77	0.85	24.7	0.35	96.7	15.9	281.0
T_{10}	8.78	0.83	25.6	0.31	94.0	15.6	281.6
Initial value	**9.10**	**0.97**	**31.4**	**0.21**	**90.0**	**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 + pressmud@ 50 % GR
T_2 = RDF + FYM 10 t/ha	T_7 = RDF +gypsum @75% GR + FYM 10 t/ha
T_3 = RDF +gypsum @75 % GR	T_8 = RDF +gypsum @ 50 % GR +FYM10 t/ha
T_4 = RDF +gypsum @50 % GR	T_9 = RDF + pressmud@ 75 % GR +FYM 10 t/ha
T_5 = RDF +pressmud @75% GR	T_{10} = RDF + pressmud@ 50 % GR +FYM 10t/ha

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

Location: Mandya **(Table Reference: 11)**

The experiment was initiated during *rabi* 2011-12 to assess the effect of cropping system and nitrogen levels on productivity, quality and economics of forage crops in rice fallows. The treatment consisted of three cropping systems (C_1- Sorghum + Cowpea, C_2- Maize + Cowpea & C_3- Pearl millet + Cowpea) & three levels of nitrogen (50% RDN, 75% RDN & 100% RDN) laid out in split plot design and replicated four times. Result of third year experimentation reveals that inter-cropping of cowpea with maize had highest GFY (336.7q/ha), DMY (79.9q/ha) as well as CPY (4.29q/ha) over the sorghum + cowpea & pearl millet + cowpea cropping systems. Net monetary returns (Rs.10232 /ha) also followed the same trend. Highest B:C ratio was observed with pearl millet + cowpea cropping system. The application of 100% RDN to different cropping systems recorded highest GFY (328.8 q /ha), DMY (82.0 q/ ha) & CPY (4.51 q /ha) and fetched higher net monetary returns (Rs12202/ha) and B:C ratio (2.02). Interaction effect among the cropping system & nitrogen levels were non-significant with respect to GFY & DMY but it was significant with respect to CPY at same level of main treatment.

Table-11: Effect of nitrogen levels on yield, growth characters 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)	Plant height (cm)	L: S ratio	Net monetary return (Rs/ha)	Benefit cost ratio
A. Cropping systems							
Maize + Cowpea	254.4	56.1	3.1	107.9	0.26	8727	1.83
Sorghum + Cowpea	336.7	79.9	4.3	198.4	0.31	10232	1.67
Pearl millet + Cowpea	264.7	60.8	4.2	102.8	0.26	10075	2.03
S Em±	5.8	2.4	0.17	2.3	0.006	-	-
CD at 5%	20.1	8.6	0.60	8.1	0.020	-	-
B. Nitrogen levels (kg/ha)							
50% of RDN	240.5	47.9	2.9	123.8	0.21	7057	1.65
75% of RDN	286.5	66.8	4.1	132.5	0.30	9775	1.85
100% of RDN	328.8	82.0	4.5	152.9	0.32	12202	2.02
S. Em±	3.7	1.5	0.14	2.3	0.009	-	-
CD at 5%	11.0	4.7	0.41	8.0	0.025	-	-
C. Interaction: CS X N							
SEm±	6.4	2.7	0.24	4.6	0.015	-	-
CD at 5%	NS	NS	0.71	NS	NS	-	-

AST-12 (AST-13): Effect of sources of nitrogen on oat and residual effect on succeeding crops
Location: Srinagar

The crop cycle could be completed after harvesting of the fodder turnip i.e. in the month of October-2014. Hence, after completion of crop cycle, data will be reported in annual report of *kharif* 2014.

AST-13 (AST-15): Effect of sowing time and Zn & thiourea spray on seed yield of dual purpose oat
(Table Reference: 13 (a) to 13 (b)

Location: Bikaner

The experiment was conducted to observe the effect of sowing time, Zn and thiourea application on productivity of dual purpose oats on sandy soil at Agricultural Research Station, SKRAU, Bikaner during *rabi* season of 2013-14. The soil of the experimental plot was poor in organic carbon content (0.08%) and low in available nitrogen (90 kg/ha), phosphorus (20 kg/ha) and potash (200 kg K/ha).The EC of soil was 0.25 dS/m and pH 8.2. The treatment comprised of combinations of three sowing dates (Nov 01, 15 & 30) and five levels of Zn & TU application schedule *viz.,* Control-$\mathbf{T_1}$, 25 kg $ZnSO_4$/ha as basal-$\mathbf{T_2}$, 12.5 kg $ZnSO_4$/ha as basal + 0.5% $ZnSO_4$ foliar spray-$\mathbf{T_3}$, 12.5 kg $ZnSO_4$/ha as basal + 0.5% $ZnSO_4$ + 0.05% TU foliar spray-$\mathbf{T_4}$ and 12.5 kg $ZnSO_4$/ha as basal + 0.05% TU foliar spray-$\mathbf{T_5}$) were laid out in split plot design keeping sowing dates in main plot and Zn & TU application schedule in sub-plot and replicated four times. The result of second year study has given below.

Timely sown oat crop (1 to 15 November) gave significantly higher grain yield, straw yield, net returns and B:C ratio in comparison to 30 November sown crop. The maximum green fodder and dry matter yields were noted in 1st November sown crop which were higher by 23.70 and 37.97 % over 15th November and by 55.67 and 51.73 % over 30th November sown crop, respectively. Almost similar trend was observed in plant height, number of tillers per meter row length. The application of Zn and thiourea significantly improved grain yield and straw yield over control. Application of 12.50 kg $ZnSO_4$ /ha as basal followed by two foliar spray of 0.05 % thiourea (T_5) or, 0.5 % $ZnSO_4$ (T_3) being at par, recorded significantly higher GFY, DMY and straw yield over control. Also, application of 25 kg $ZnSO_4$ per ha as basal showed superiority over control in growth, GFY, DMY, grain & straw yields, net returns and quality of oat.

Table13 (a): Effect of sowing time and Zn & thiourea application on growth parameters, yield and economics of dual purpose oat at Bikaner

Treatment	PH (cm)	Tillers/ meter row length	GFY (q/ha)	DMY (q/ha)	Grain (q/ha)	Straw yield (q/ha)	Net Return (Rs/ha)	B : C ratio
A. Date of sowing								
D_1	43.6	175.6	91.44	28.57	18.31	60.11	41890	2.00
D_2	41.7	157.2	69.76	17.72	18.04	57.79	39504	1.88
D_3	34.5	146.7	40.53	13.79	12.91	31.11	18754	0.89
S. Em.±	0.2	1.6	1.80	1.26	0.17	0.64	446	0.02
C. D at 5%.	0.5	5.5	6.24	4.36	0.60	2.20	1542	0.07
B. Zn and TU application								
N_1	37.5	153.3	57.93	16.58	15.46	47.16	31063	1.55
N_2	39.8	158.4	61.72	20.09	16.99	50.06	33906	1.57
N_3	40.1	163.7	73.07	19.33	16.85	49.17	34526	1.65
N_4	39.5	159.8	69.74	21.66	16.16	49.31	32290	1.50
N_5	42.8	163.8	73.76	22.47	16.62	52.65	35126	1.68
S.Em.±	0.6	2.0	1.58	0.86	0.34	0.63	781	0.04
C. D at 5%.	1.8	5.8	4.52	2.47	0.97	1.80	2240	0.11
C.V. (%)	5.5	4.4	8.13	14.89	7.12	4.37	8	8.05

Table 13 (b): Effect of sowing time and Zn & thiourea application on quality parameters and crude protein yield of dual purpose oat at Bikaner

Treatment	Crude protein (%) in dry matter	CPY (q/ha)	Zn content in straw (ppm)	Zn content in grain(ppm)	1000-seed weight (g)	HI (%)
A. Date of sowing						
D_1	13.84	4.06	69.85	29.07	36.32	23.44
D_2	15.52	2.80	75.47	30.47	36.84	23.94
D_3	13.95	1.92	70.27	30.15	33.91	29.62
S. Em.±	0.03	0.19	0.77	0.38	0.53	0.24
C. D at 5%.	0.10	0.67	2.66	1.31	1.83	0.83
B. Zn and TU application						
N_1	11.46	1.85	65.80	26.22	35.03	25.60
N_2	13.74	2.77	73.46	31.36	35.89	26.39
N_3	14.49	2.71	73.62	30.74	35.46	25.49
N_4	16.39	3.56	72.90	30.41	36.02	25.85
N_5	16.10	3.76	73.53	30.75	36.04	25.01
S.Em.±	0.01	0.14	0.53	0.30	0.07	0.42
C. D at 5%.	0.02	0.39	1.51	0.87	0.21	1.22
C.V. (%)	0.20	16.1	2.54	3.50	0.70	5.73

A. Date of sowing	Zn and TU application
D1-1 November	**N1**-Control (no Zn &TU) **N2**-25 kg Zn SO_4 /ha soil application at sowing
D2-15 November	**N3**-12.5 kg Zn SO_4/ha soil application at sowing followed by 0.5% Zn SO_4 sprays
D3-30 November	**N4**-12.5 kg Zn SO_4 /ha soil application at sowing followed by 0.5% Zn SO_4 + 0.05% TU sprays
	N5-12.5 kg Zn SO_4 /ha soil application at sowing followed by 0.05 TU sprays

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

Location: Coimbatore

The experiment was initiated during *kharif* 2013 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 BN hybrid grass. The treatment consisted of nine micronutrient levels (**T_1-**NPK alone, **T_2-**NPK+$FeSO_4$ @ 50 kg/ha, **T_3-** NPK+$FeSO_4$ @ 100 kg/ha, **T_4-** NPK+$ZnSO_4$ @ 25 kg/ha, **T_5-** NPK+$ZnSO_4$ @ 50 kg/ha, **T_6 -** NPK+$FeSO_4$ @ 50 kg/ha + $ZnSO_4$ @ 25 kg/ha, **T_7-** NPK+$FeSO_4$ @ 100 kg/ha + $ZnSO_4$ @ 25 kg/ha, **T_8-** NPK+$FeSO_4$ @ 50 kg/ha + $ZnSO_4$ @ 50 kg/ha and **T_9-** 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 second 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 (4118 q/ha), DMY (808.5 q/ha), CPY (77.2 q/ha) and crude protein content (9.5%) over rest of the treatments. It also fetched highest net monetary returns (Rs. 486056/ ha/yr) and benefit cost ratio (4.7) over rest of the treatments and lowest being with NPK alone (Rs. 353306/ ha/yr and 3.8), respectively.

Table- 14: Yield, quality and economics of BN hybrids 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 Return (Rs. /ha)	B:C
T_1	3201.0	456.8	33.4	7.3	168.4	0.30	126844	353306	3.8
T_2	3386.5	520.4	40.2	7.7	175.9	0.34	130344	377626	3.9
T_3	3301.0	497.0	37.9	7.6	171.2	0.32	133844	361306	3.7
T_4	3531.8	601.5	50.8	8.4	182.8	0.37	128144	401631	4.1
T_5	3490.0	559.7	45.6	8.1	178.8	0.36	129444	394056	4.0
T_6	4118.0	808.5	77.2	9.5	203.3	0.46	131644	486056	4.7
T_7	3901.0	721.6	65.3	9.0	190.7	0.42	135144	450006	4.3
T_8	3976.3	768.8	70.6	9.2	194.2	0.43	132944	463506	4.5
T_9	3822.7	690.2	61.1	8.7	185.7	0.40	136444	436956	4.2
SEm±	46.3	16.2	1.7	0.2	3.0	0.01			
CD (0.05)	138.7	48.5	5.2	0.5	9.1	0.02			
CV (%)	2.2	4.5	5.6	3.3	2.9	3.69			

T_1- NPK alone	T_6 - NPK+$FeSO_4$ @ 50 kg/ha + $ZnSO_4$ @ 25 kg/ha
T_2- NPK+$FeSO_4$ @ 50 kg/ha	T_7- NPK+$FeSO_4$ @ 100 kg/ha + $ZnSO_4$ @ 25 kg/ha
T_3 - NPK+$FeSO_4$ @ 100 kg/ha	T_8- NPK+$FeSO_4$ @ 50 kg/ha + $ZnSO_4$ @ 50 kg/ha
T_4 - NPK+$ZnSO_4$ @ 25 kg/ha	T_9 NPK+$FeSO_4$ @ 100 kg/ha + $ZnSO_4$ @ 50 kg/ha
T_5 - NPK+$ZnSO_4$ @ 50 kg/ha	

AST-15 (AST-19): Residual effect of P applied to wheat on the succeeding summer fodders in sorghum-wheat-summer fodders cropping system

Location: Ludhiana

This trial was started during *kharif* 2013 to identify suitable summer fodder crop in sorghum-wheat-summer fodder crops and to study the residual effect of phosphorus applied to wheat on succeeding summer fodder crops. The data of first year experimentation will be reported completion of cropping cycle in annual report of *kharif* 2014.

(A) AVT-2 BASED AGRONOMY TRIALS:

AST- 16: Effect of phosphorus levels on forage yield of promising entries of lathyrus

Table Reference: [16(a) to 16(f)]

Locations: **Jorhat, Kalyani , Bhubaneswar ,Ranchi, Jhansi , Jabalpur and Raipur**

A field trial on lathyrus (AVTL-2) entries was conducted to find out the effect of phosphorus levels on growth and yield of lathyrus at seven locations in NE and Central zones of the country. The treatment consisted of five entries and three levels of phosphorus (20, 40, and 60 kg P_2O_5 kg /ha) laid out in factorial randomized block design. The data of the trial has been given below.

The result revealed that under NE zone on mean basis, the testing entry JLJ-09-1 remained at par with national check Nirmal (NC) in terms of green fodder , dry matter and crude protein yields followed by JHLS-2011-2 . In general the yield was higher at Kalyani and lowest being was at Jorhat. The response of phosphorus increased gradually with increasing levels of phosphorus up to highest tested dose 60 kg P_2O_5 /ha. On location mean basis in the zone, application of 60 kg P_2O_5 /ha produced 27.02, 20.06 and 44.77 % more GFY, DFY and CPY than 20 kg P_2O_5 /ha, respectively. The interaction of entries and phosphorus levels was significant at Kalyani, Bhubaneswar and Ranchi.

In Central Zone testing entry JLJ-09-1 recorded higher green fodder yield (171.59 q/ha) and dry fodder yield (34.84 q/ha) over JHLS-2011-2 and national checks Prateek and Nirmal. The application of 60 kg P_2O_5 /ha to lathyrus recorded highest GFY (172.43 q/ha), DMY (35.73 q/ha), and CPY (4.09q/ha) over its lower levels. The magnitude of increase by application of 60 kgP_2O_5/ha to lathyrus for green fodder was 29.5 and 9.70 % more over 20 and 40 kg P_2O_5 /ha, respectively. The interaction of entries and phosphorus levels was significant at Jabalpur and Raipur.

Over all mean basis (mean of two zones) testing JLJ-09-1 recorded higher GFY (130.17 q/ha) over rest of the entries including national checks. Whereas, highest DMY (24.58 q/ha) was attained by testing entry JHLS-2011-2. The forage yield increased consistently with increasing level up to 60 kg P_2O_5 /ha.

Table-16(a): Effect of phosphorus levels on green fodder of promising entries of lathyrus (AVTL-2)

Treatment	GFY (q/ha)									
	North East Zone					Central Zone				
	Jorhat	Kalyani	Bhubaneswar	Ranchi	Zonal Mean	Jhansi	Jabalpur	Raipur	Zonal Mean	Over all mean
A. Entries										
JHLS-2011-2	65.16	115.00	69.45	144.8	98.60	80.26	319.70	110.21	170.06	129.23
JLJ-09-1	58.51	121.39	63.21	153.3	99.10	69.36	332.70	112.70	171.59	130.17
Prateek (NC)	53.46	108.06	63.61	104.2	82.33	81.75	221.20	102.59	135.18	104.98
Mahateora (NC)	40.07	130.28	61.20	89.82	80.34	88.91	192.90	101.75	127.85	100.70
Nirmal (NC)	73.09	110.56	68.06	144.7	99.10	94.41	287.60	117.02	166.34	127.92
SEm±	3.33	1.78	3.09	0.71		3.84	5.66	5.85	-	-
CD at 5%	9.75	5.14	8.96	2.05		11.13	16.98	16.94	-	-
B. Phosphorus levels (P_2O_5 kg/ha)										
20	54.34	103.83	61.49	100.8	80.12	76.63	227.30	95.38	133.10	102.82
40	58.33	124.67	68.95	123.3	93.81	85.40	279.80	106.08	157.09	120.93
60	61.50	122.67	64.89	158.0	101.77	86.78	305.40	125.10	172.43	132.05
SEm±	0.48	1.38	2.39	0.55		2.98	6.53	4.53	-	-
CD at 5%	1.42	3.98	6.94	1.59		8.62	19.59	13.12	-	-
C. Interaction: Entry X Phosphorus level										
SEm±	0.84	3.08	5.35	1.23		6.66	3.76	10.13	-	-
CD at 5%	NS	8.91	NS	3.50		NS	11.28	NS	-	-
CV%	3.64	4.55	14.26	-		13.91	11.25	16.12	-	-

Table-16 (a-1): Interaction effect of phosphorus levels and entries on green and dry matter yield of lathyrus (AVTL-2) at Jabalpur

Entry/ P levels	Jabalpur							
	Green Fodder Yield (q/ha)				Dry Matter Yield (q/ha)			
	20	40	60	Mean	20	40	60	Mean
JHLS-2011-2	281.8	322.0	355.3	319.7	54.1	61.1	69.4	61.5
JLJ-09-1	280.4	345.6	372.0	332.7	52.7	66.6	72.2	63.8
Prateek (NC)	177.7	231.8	254.0	221.2	33.3	44.4	48.6	42.1
Mahateora (NC)	149.9	199.9	229.0	192.9	27.8	37.5	43.0	36.1
Nirmal (NC)	246.6	299.8	316.5	287.6	47.2	58.3	61.1	55.5
Mean	227.3	279.8	305.4		43.0	53.6	58.9	
	Entry	**P levels**	**Entry X N level**		**Entry**	**P levels**	**Entry X N level**	
SEm±	5.66	6.53.	3.76		1.55	1.09	1.12	
CD at 5%	16.98	19.59	11.28		4.65	3.27	3.36	
CV%	11.25				8.52			

Table-16 (a-2): Interaction effect of phosphorus levels and entries on green and dry matter yield of lathyrus (AVTL-2) at Jorhat

Entry/ P levels	Jorhat							
	Green Fodder Yield (q/ha)				Dry Matter Yield (q/ha)			
	20	40	60	Mean	20	40	60	Mean
JHLS-2011-2	64.03	74.83	69.50	69.46	11.27	13.02	12.09	12.13
JLJ-09-1	61.17	66.00	62.47	63.21	11.19	11.88	11.37	11.48
Prateek (NC)	60.73	67.40	62.70	63.61	11.05	12.13	11.29	11.49
Mahateora (NC)	58.37	62.83	62.40	61.20	10.92	11.50	11.54	11.31
Nirmal (NC)	63.13	73.70	67.37	68.07	11.30	12.97	11.92	12.06
Mean	61.49	68.95	64.89		11.15	12.30	11.64	
	Entry	**P levels**	**Entry X N level**		**Entry**	**P levels**	**Entry X N level**	
SEm±	3.09	2.34	5.36		0.56	0.43	0.96	
CD at 5%	8.96	6.94	15.52		1.61	1.25	2.79	
CV%	14.26				14.23			

Table -16(b): Effect of phosphorus levels on dry matter yield of promising entries of lathyrus (AVTL-2)

Treatment	DMY (q/ha)									
	North East Zone					Central Zone				
	Jorhat	Kalyani	Bhubaneswar	Ranchi	Zonal Mean	Jhansi	Jabalpur	Raipur	Zonal Mean	Over all mean
A. Entries										
JHLS-2011-2	14.99	20.32	12.13	26.53	18.49	17.64	61.5	25.04	34.73	24.58
JLJ-09-1	13.46	20.00	11.48	24.01	17.24	15.18	63.8	25.54	34.84	23.84
Prateek (NC)	12.29	18.04	11.49	17.03	14.71	18.84	42.1	23.52	28.15	19.75
Mahateora (NC)	9.22	23.01	11.31	14.07	14.40	20.70	36.1	23.35	26.72	19.02
Nirmal (NC)	16.81	16.53	12.06	26.51	17.98	20.87	55.5	26.40	34.26	24.08
SEm±	0.77	0.53	0.56	1.03		1.05	1.55	1.17	-	
CD at 5%	2.24	1.55	1.61	2.99		3.05	4.65	3.39	-	
B. Phosphorus levels (P_2O_5 kg/ha)										
20	12.50	17.13	14.15	17.41	15.30	16.44	43.0	22.08	27.17	19.75
40	13.42	20.67	12.30	20.75	16.79	19.23	53.6	24.22	32.35	22.62
60	14.15	20.93	11.64	26.74	18.37	20.27	58.9	28.02	35.73	24.88
SEm±	0.11	0.41	0.43	0.79		0.81	1.09	0.91	-	-
CD at 5%	0.32	1.20	1.24	2.31		2.36	3.27	2.62	-	-
C. Interaction: Entry X Phosphorus level										
SEm±	0.19	0.92	0.96	1.78		1.82	1.12	2.03	-	-
CD at 5%	NS	2.68	2.78	5.18		NS	3.36	NS	-	-
CV%	3.64	8.18	14.23	-		16.92	8.52	14.17	-	-

Table -16(c): Effect of phosphorus levels on crude protein yield and crude protein content of promising entries of lathyrus (AVTL-2)

Treatment	CP yield (q/ha)								Crude protein (%)
	North East Zone				Central Zone				NEZ
	Jorhat	Kalyani	Bhubaneswar	Zonal Mean	Jabalpur	Raipur	Zonal Mean	Over all mean	Jorhat
A. Entries									
JHLS-2011-2	1.96	2.92	1.95	2.28	9.7	3.41	6.56	3.99	13.07
JLJ-09-1	1.75	2.93	1.87	2.18	10.6	3.68	7.14	4.17	13.01
Prateek (NC)	1.62	2.25	1.87	1.91	6.9	3.32	5.11	3.19	13.17
Mahateora (NC)	1.32	2.58	1.86	1.92	5.6	3.22	4.41	2.92	14.33
Nirmal (NC)	2.17	2.24	1.94	2.12	8.8	3.75	6.28	3.78	12.88
SEm±	0.11	0.07	0.09		0.41	0.17	-	-	0.41
CD at 5%	0.31	0.21	0.26		1.23	0.48	-	-	NS
B. Phosphorus levels (P_2O_5 kg/ha)									
20	1.59	2.07	1.82	1.83	6.7	3.10	4.90	3.06	12.89
40	1.79	2.65	1.99	2.14	8.6	3.39	6.00	3.68	13.45
60	1.91	3.04	1.89	2.28	9.7	3.93	6.82	4.09	13.53
SEm±	0.03	0.06	0.07		0.67	0.13	-	-	0.09
CD at 5%	0.08	0.16	0.20		2.01	0.37	-	-	0.27
C. Interaction: Entry X Phosphorus level									
SEm±	0.05	0.13	0.16		0.51	0.29	-	-	0.16
CD at 5%	NS	0.37	0.45		1.62	NS	-	-	NS
CV%	6.74	8.49	14.18		9.63	14.26	-	-	5.25

Table -16(d): Effect of phosphorus levels on plant height of promising entries of lathyrus (AVTL-2)

Treatment	Plant height (cm)									
	North East Zone					Central Zone				
	Jorhat	Kalyani	Bhubaneswar	Ranchi	Zonal Mean	Jhansi	Jabalpur	Raipur	Zonal Mean	Over all mean
A. Entries										
JHLS-2011-2	51.22	31.29	48.62	93.0	56.03	39.92	92.7	63.13	65.25	59.98
JLJ-09-1	52.89	36.29	46.23	93.0	57.10	45.93	97.2	64.23	69.12	62.25
Prateek (NC)	50.00	34.67	46.98	79.0	52.66	44.20	74.8	58.58	59.19	55.46
Mahateora (NC)	44.22	37.87	43.96	73.0	49.76	41.82	68.9	59.62	56.78	52.77
Nirmal (NC)	60.56	35.02	47.48	95.0	59.52	44.69	84.9	67.91	65.83	62.22
SEm±	2.80	0.56	0.20	-		1.92	0.36	1.96	-	-
CD at 5%	8.21	1.62	0.58	-		5.57	1.18	5.67	-	-
B. Phosphorus levels (P_2O_5 kg/ha)										
20	49.67	32.77	45.68	77.0	51.28	40.33	82.2	58.36	60.30	55.14
40	52.27	35.23	47.47	89.0	55.99	43.66	83.6	62.86	63.37	59.16
60	53.40	37.07	46.83	93.0	57.58	45.95	85.3	66.86	66.04	61.20
SEm±	0.53	0.43	0.16	-		1.49	0.23	1.52	-	-
CD at 5%	1.57	1.26	0.45	-		4.31	0.63	4.39	-	-
C. Interaction: Entry X Phosphorus level										
SEm±	0.931	0.97	0.34	-		3.33	0.22	3.39	-	-
CD at 5%	NS	NS	1.00	-		NS	0.66	NS	-	-
CV%	4.85	4.79	-	-		13.32	7.23	9.37	-	-

Table -16(e): Effect of phosphorus levels on leaf stem ratio of promising entries of lathyrus (AVTL-2)

Treatment	Leaf stem ratio								
	North East Zone				Central Zone				
	Kalyani	Bhubaneswar	Ranchi	Zonal Mean	Jhansi	Jabalpur	Raipur	Zonal Mean	Over all mean
A. Entries									
JHLS-2011-2	1.57	0.98	0.51	1.02	0.71	1.20	0.78	0.90	0.96
JLJ-09-1	1.49	0.84	0.51	0.95	0.80	1.20	0.79	0.93	0.94
Prateek (NC)	1.50	0.89	0.51	0.97	0.80	1.10	0.74	0.88	0.92
Mahateora (NC)	1.64	0.77	0.52	0.98	0.83	1.00	0.75	0.86	0.92
Nirmal (NC)	1.52	0.91	0.52	0.98	0.82	1.10	0.83	0.92	0.95
SEm±	-	0.01	-	-	0.04	0.01	0.02	-	-
CD at 5%	-	0.03	-	-	NS	0.04	NS	-	-
B. Phosphorus levels (P_2O_5 kg/ha)									
20	1.46	0.82	0.51	0.93	0.76	1.10	0.73	0.86	0.90
40	1.63	0.91	0.51	1.02	0.80	1.10	0.78	0.89	0.96
60	1.54	0.90	0.53	0.99	0.82	1.20	0.82	0.95	0.97
SEm±	-	0.01	-	-	0.03	0.01	0.02	-	-
CD at 5%	-	0.03	-	-	NS	0.03	NS	-	-
C. Interaction: Entry X Phosphorus level									
SEm±	-	0.02	-	-	0.08	0.01	0.03	-	-
CD at 5%	-	0.06	-	-	NS	0.03	NS	-	-
CV%	-	4.45	-	-	16.90	9.80	7.56	-	-

Table -16(f): Effect of phosphorus levels on plant population of promising entries of lathyrus (AVTL-2)

Treatment	Plant population/m row length					
	North East Zone				Central Zone	Over all mean
	Jorhat	Kalyani	Bhubaneswar	Zonal Mean	Jabalpur	
A. Entries						
JHLS-2011-2	26.26	20.23	19.86	22.12	18.0	21.09
JLJ-09-1	22.59	21.33	19.11	21.01	18.0	20.26
Prateek (NC)	18.85	20.19	19.27	19.44	17.8	19.03
Mahateora (NC)	24.30	20.60	18.88	21.26	17.1	20.22
Nirmal (NC)	24.11	20.39	19.48	21.33	17.9	20.47
SEm±	3.10	0.27	0.17	-	1.2	-
CD at 5%	NS	0.79	0.49	-	NS	-
B. Phosphorus levels (P_2O_5 kg/ha)						
20	22.89	19.65	18.97	20.50	17.3	19.70
40	22.67	20.24	19.77	20.89	18.1	20.20
60	24.11	21.75	19.24	21.70	17.9	20.75
SEm±	1.36	0.21	0.13	-	2.3	-
CD at 5%	NS	0.61	0.38	-	NS	-
C. Interaction: Entry X Phosphorus level						
SEm±	2.36	0.47	0.30	-	1.1	-
CD at 5%	NS	1.36	0.85	-	NS	-
CV%	7.72	3.97	2.64	-	8.5	-

AST-17: Effect of nitrogen levels on green fodder yield of promising entries of oat (AVTO-2-SC) **[Table Reference: 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. The treatments consisted of eleven entries (including five zonal check and two national checks) and three levels of nitrogen (40, 80, 120 kg/ha) laid out in split plot design with three replications.

In the Hill zone at Palampur, UPO-06-1 produced significantly taller plants as compared to other entries and was at par with OS-403, OS-6 and Kent. Significantly more number of tillers (per m row) was noticed in Palampur-1, which remained at par with OS-6. Significantly better L:S was reported in UPO-06-1, which also produced significantly higher GFY (420.1q/ha), DMY (80.2q/ha) as compared to other entries. Crude protein yield was significantly higher in Palampur-1, which was at par with UPO-06-1. 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 NDO-10 produced higher herbage yield. On mean data basis in the hill zone, UPO-06-1 followed by Palampur-1 produced higher yield. The interaction effect of entries of oat and nitrogen levels on GFY at Palampur indicated that all the varieties responded up to 120 Kg N/ha. Significantly highest GFY was obtained in variety UPO-06-1 supplemented with 120 Kg N/ha. At Srinagar entry OS-403 in combination with 120 kg/ha nitrogen produced higher green and dry matter yields and was at par with entry NDO-10 and Kent in combination with 120 kg/ha nitrogen.

In North-West zone, on location mean basis, the test entry NDO-711 produced highest GFY (403.4q/ha) and OS-6 produced highest DMY (81.0q/ha). The production levels were more at Hisar than at Pantnagar. At Hisar, Kent yielded higher GFY of 425.5 q/ha but remained statistically at par with OS-6. Similar trend was also observed with respect to DMY. At Pantnagar, entry NDO-711 produced significantly higher GFY. DMY was significantly highest in OS-6. 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 27.9% and 13.7% over 40 and 80 kg N/ha, respectively and magnitude of increase for dry fodder was 42.6% and 21.5% over 40 and 80 kg N/ha, respectively.

In North-East zone, on location mean basis, Kent produced higher GFY and DMY. At Jorhat entry JHO-99-2 and OS-403 produced significantly higher GFY and DMY. At Ranchi Kent produced higher GFY. On individual location basis at Kalyani the performance of OS-6 was at par with OS-403 and better than zonal check and other entries.

On location mean basis in Central zone, entry UPO-06-1 and OS-403 produced higher GFY (513.4q/ha) and DMY (107.5q/ha), respectively. The performance of all entries was better at Jhansi than Jabalpur with respect to forage yields.

At Jhansi, entries NDO-10 and UPO-06-1 produced higher forage yields but remained at par with all other entries in GFY. At Jabalpur, entry OS-403 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 27.9% and 13.7%, respectively of 120 kg/ha over 40 and 80 kg/ha. Interaction effects revealed that at Jabalpur entry UPO-06-1 with 120 kg/ha nitrogen produced higher GFY (558.5q/ha) and was at par with entry OS-403 in combination with 120 kg/ha nitrogen. At Jabalpur, higher DMY was produced by entry UPO-06-1 in combination with 120 kg/ha nitrogen.

In South zone on location mean basis, entry OS-403 yielded highest. On individual location basis at Mandya and Coimbatore trend was similar with respect to forage yields. On location mean basis higher dry matter yield was produced in entry OS-403.

On all India mean basis, JHO-822 produced better GFY (479.9 q/ha) and DMY (101.7 q/ha) than national checks OS-6 (382.8 q/ha green fodder and 82.7 q/ha dry matter yield) and Kent (356.8 q/ha green fodder yield and 79.8 q/ha dry matter yield). The forage yield increased consistently with increasing level of nitrogen upto 120 kg nitrogen/ha.

With respect to quality parameters, entry Palampur-1 at Palampur (Hill zone); entry OS-406 at Pantnagar (NW zone), entry OS-403 at Jabalpur (Central zone) produced higher crude protein yield. The production levels were more at Ranchi than Jorhat and Kalyani. At Ranchi Kent (National check) produced highest CPY. At Kalyani, OS-403 and OS-6 (national check) produced similar and higher CPY. At Jorhat higher CPY was produced by entry OS-403. The crude protein yield consistently increased with increasing levels of nitrogen upto 120 kg N/ha. In south zone, OS-6 (national check) produced higher CPY (6.4q/ha). The performance of all the entries was better at Coimbatore than Mandya. At Coimbatore test entry UPO-06-1 and OS-6 (national check) produced higher crude protein yield. At Mandya, entry OS-403 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										
NDO-10	342.7	380.9	361.8	402.8	391.0	396.9	394.9	289.0	355.9	346.6
NDO-711	343.7	342.3	343.0	406.7	400.0	403.4	312.8	314.0	376.3	334.4
UPO-06-1	420.1	356.1	388.1	402.6	381.0	391.8	400.8	291.0	377.8	356.5
OS-403	328.1	378.3	353.2	375.2	378.0	376.6	412.3	277.0	384.8	358.0
Palampur-1 (HZ)	397.1	343.7	370.4	-	-		-	-	-	-
JHO-99-2 (NEZ)	-	-		-	-		413.0	242.0	360.4	338.5
OL-125 (NWZ)	-	-		387.5	383.0	385.3	-	-	-	
JHO-822 (CZ)	-	-		-	-		-	-	-	
JHO-2000-4 (SZ)	-	-		-	-		-	-	-	
OS-6 (NC)	359.5	370.7	365.1	412.9	389.0	401.0	403.3	252.0	412.2	355.8
Kent (NC)	343.2	373.5	358.4	425.5	315.0	370.3	408.3	331.0	346.3	361.9
SEm±	6.4	3.2		-	6.20		11.7	1.36	9.5	
C D at 5%	19.7	9.2		16.7	19.0		34.2	3.89	29.2	
B. Nitrogen level (Kg/ha)										
40	331.5	326.8	329.2	323.6	371.0	347.3	376.7	227.0	283.2	295.6
80	365.2	368.4	366.8	395.0	386.0	390.5	392.4	271.0	383.5	349.0
120	389.5	395.7	392.6	488.2	400.0	444.1	407.4	358.0	453.5	406.3
SEm±	3.4	2.5		-	1.7		3.6	0.89	5.5	
C D at 5%	9.9	7.0		14.5	5.0		10.5	2.55	16.0	
C.Interaction: Entry X N levels										
SEm±	-	5.4		-			6.2	2.4	14.6	
C D at 5%	26.2	15.6		-	NS		NS	6.8	NS	
CV%	-	-		-			-	-	6.8	

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							
NDO-10	550.0	277.3	413.7	299.9	300.9	300.4	362.3
NDO-711	514.8	408.7	461.8	278.1	325.0	301.6	365.7
UPO-06-1	548.2	478.5	513.4	262.5	338.9	300.7	387.0
OS-403	525.0	489.2	507.1	331.6	411.1	371.4	390.1
Palampur-1 (HZ)	-	-		-	-		370.4
JHO-99-2 (NEZ)	-	-		-	-		338.5
OL-125 (NWZ)	-	-		-	-		385.3
JHO-822 (CZ)	519.4	440.3	479.9	-	-		479.9
JHO-2000-4 (SZ)	-	-	-	218.3	349.1	283.7	283.7
OS-6 (NC)	528.2	435.0	481.6	289.5	358.3	323.9	382.8
Kent (NC)	508.3	339.4	423.9	247.7	287.1	267.4	356.8
SEm±	18.7	6.3		4.2	12.5		
C D at 5%	NS	17.5		12.1	38.5		
B. Nitrogen level (Kg/ha)							
40	502.9	316.6	347.3	229.6	298.0	263.8	326.1
80	523.2	431.8	390.5	276.0	340.1	308.1	375.7
120	556.9	480.8	444.1	320.5	377.8	349.2	420.8
SEm±	9.1	5.5		7.0	4.3		
C D at 5%	26.4	15.6		21.6	12.6		
C. Interaction: Entry X N levels							
SEm±	37.9	4.2		11.1	-		
C D at 5%	NS	11.2		NS	NS		
CV%	7.9	13.2		-	11.1		

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
NDO-10	316.1	356.4	355.5	342.7	325.3	392.4	425.2	380.9
NDO-711	356.2	329.6	345.4	343.7	312.7	345.6	368.5	342.3
UPO-06-1	352.9	414.8	492.5	420.1	325.5	356.8	385.9	356.1
OS-403	302.9	337.0	344.4	328.1	327.5	387.0	420.5	378.3
Palampur-1 (HZ)	359.2	396.5	435.7	397.1	312.8	342.5	375.7	343.7
OS-6 (NC)	322.2	362.9	393.5	359.4	340.0	376.4	395.6	370.7
Kent (NC)	311.1	359.2	359.2	343.2	343.8	378.0	398.7	373.5
Mean	**331.5**	**365.2**	**389.5**		**326.8**	**368.4**	**395.7**	
	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±	6.4	3.4	9.1	11.7	3.2	2.5	5.4	
CD at 5%	19.7	9.9	26.2	33.7	9.2	7.0	15.6	
CV%	-	-	-	-	-	-	-	

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

Entries	Jabalpur			
	Green fodder yield (q/ha)			
	N levels (kg/ha)			
	40	80	120	Mean
NDO-10	201.2	287.9	342.8	277.3
NDO-711	305.2	426.5	494.5	408.7
UPO-06-1	365.2	511.8	558.5	478.5
OS-403	393.2	522.5	551.8	489.2
JHO-822 (CZ)	337.2	470.5	513.2	440.3
OS-6 (NC)	355.9	453.2	495.8	435.0
Kent (NC)	258.6	350.5	409.2	339.4
Mean	316.6	431.8	480.8	
	V	N	VXN	
SEm±	6.32	5.46	4.23	
CD at 5%	17.52	15.63	11.20	
CV%	13.2			

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										
NDO-10	67.5	94.8	81.2	77.4	75.9	76.7	82.9	117.0	51.5	83.8
NDO-711	66.1	85.3	75.7	75.5	77.1	76.3	65.7	101.0	54.1	73.6
UPO-06-1	80.2	87.8	84.0	81.1	77.2	79.2	84.2	119.0	55.0	86.1
OS-403	61.1	95.8	78.5	70.9	74.1	72.5	86.6	90.0	54.3	77.0
Palampur-1 (HZ)	76.8	87.6	82.2	-	-		-	-	-	
JHO-99-2 (NEZ)	-	-		-	-		86.7	96.0	50.6	77.8
OL-125 (NWZ)	-	-		78.2	77.9	78.1	-	-	-	
JHO-822 (CZ)	-	-		-	-		-	-	-	
JHO-2000-4 (SZ)	-	-		-	-		-	-	-	
OS-6 (NC)	68.9	92.9	80.9	82.7	79.2	81.0	84.7	106.0	60.1	83.6
Kent (NC)	65.9	94.7	80.3	86.7	72.8	79.8	85.7	143.0	50.9	93.2
SEm±	1.9	2.2		-	1.6		2.5	1.36	1.6	
C D at 5%	6.0	6.5		5.5	4.9		7.2	3.89	5.1	
B. Nitrogen level (Kg/ha)										
40	62.4	81.8	72.1	57.3	73.3	65.3	79.1	102.0	41.0	74.0
80	70.6	93.8	82.2	76.9	76.3	76.6	82.4	113.0	55.2	83.5
120	75.6	98.2	86.9	106.7	79.4	93.1	85.6	116.0	65.2	88.9
SEm±	0.9	1.8		-	0.5		0.8	0.08	1.0	
C D at 5%	2.5	5.0		4.9	1.4		2.2	0.23	2.9	
C. Interaction: Entry X N levels										
SEm±	-	-		-			1.3	0.21	2.7	
C D at 5%	6.6	-		-	NS		NS	0.61	NS	
CV%	-	-		-			4.4	-	-	

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							
NDO-10	112.4	57.3	84.9	75.5	46.8	61.2	78.1
NDO-711	103.7	90.6	97.2	70.9	50.8	60.9	76.4
UPO-06-1	108.0	104.8	106.4	64.0	51.8	57.9	83.0
OS-403	107.9	107.1	107.5	86.6	65.4	76.0	81.8
Palampur-1 (HZ)	-	-		-	-		82.2
JHO-99-2 (NEZ)	-	-		-	-		77.8
OL-125 (NWZ)	-	-		-	-		78.1
JHO-822 (CZ)	107.3	96.0	107.5	-	-		101.7
JHO-2000-4 (SZ)	-	-	-	56.0	54.4	55.2	55.2
OS-6 (NC)	107.4	94.6	101.7	77.9	55.3	66.6	82.7
Kent (NC)	104.4	66.6	85.5	62.3	44.4	53.4	79.8
SEm±	3.7	2.2		1.2	2.0		
C D at 5%	NS	6.3		3.4	6.2		
B. Nitrogen level (Kg/ha)							
40	96.9	62.5	79.7	55.6	45.0	50.3	68.8
80	107.4	95.6	101.5	70.0	52.4	61.2	81.2
120	117.3	106.4	111.9	85.7	60.6	73.2	90.6
SEm±	1.8	3.2		2.4	1.1		
C D at 5%	5.1	9.3		7.5	3.2		
C. Interaction: Entry X N levels							
SEm±	7.5	2.5		3.1	-		
C D at 5%	NS	6.5		NS	NS		
CV%	7.50	10.2		-	11.4		

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

Entries	Srinagar				Jabalpur				
	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
NDO-10	84.5	98.0	102.0	**94.8**	NDO-10	38.7	61.3	72.0	57.3
NDO-711	78.0	89.7	88.3	**85.3**	NDO-711	66.7	94.6	110.6	90.6
UPO-06-1	81.5	85.7	96.3	**87.8**	UPO-06-1	74.6	114.6	125.3	104.8
OS-403	81.8	100.6	105.0	**95.8**	OS-403	80.0	117.3	124.0	107.1
Palampur-1 (HZ)	78.5	90.4	93.8	**87.6**	JHO-822 (CZ)	68.0	105.3	114.6	96.0
OS-6 (NC)	85.5	94.6	98.8	**93.0**	OS-6 (NC)	72.3	101.3	110.6	94.6
Kent (NC)	82.8	97.8	103.5	**94.7**	Kent (NC)	37.3	74.6	88.0	66.6
Mean	**81.8**	**93.8**	**98.2**		**Mean**	62.5	95.6	106.4	
	V	**N**	**VXN**			**V**	**N**	**VXN**	
SEm±	2.2	1.8	3.8		SEm±	2.2	3.2	2.5	
CD at 5%	6.5	5.0	11.0		CD at 5%	6.3	9.3	6.5	
CV%	-	-	-		CV%	10.2			

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			Over all mean
	Palampur	Srinagar	Mean	Pantnagar	Jabalpur	Ranchi	Kalyani	Jorhat	Mean	Mandya	Coimbatore	Mean	
A. Entry													
NDO-10	6.7	7.3	7.0	7.7	4.3	10.0	3.6	6.3	6.6	3.6	5.8	4.7	6.1
NDO-711	6.7	6.6	6.7	7.7	7.5	9.3	4.2	4.4	6.0	3.6	6.9	5.3	6.3
UPO-06-1	7.2	6.6	6.9	7.6	8.4	11.1	4.4	5.8	7.1	4.0	7.6	5.8	7.0
OS-403	6.1	7.6	6.9	7.8	9.0	9.3	4.8	6.6	6.9	5.5	7.1	6.3	7.1
Palampur-1 (HZ)	7.7	6.4	7.1	-	-	-	-	-		-	-		7.1
JHO-99-2 (NEZ)	-	-		-	-	9.1	3.6	6.5	6.4	-	-		6.4
OL-125 (NWZ)	-	-		7.5	-	-	-	-		-	-		7.5
JHO-822 (CZ)	-	-			7.5	-	-	-		-	-		7.5
JHO-2000-4 (SZ)	-	-		-	-	-	-	-		2.8	6.8	4.8	4.8
OS-6 (NC)	6.7	6.8	6.8	7.1	7.5	9.7	4.8	5.9	6.8	5.2	7.6	6.4	6.8
Kent (NC)	6.4	7.1	6.8	7.2	5.3	12.5	3.9	6.2	7.5	2.8	5.4	4.1	6.3
SEm±	0.2	**0.2**		-	0.6	0.01	0.1	0.17		0.1	0.3		
C D at 5%	0.6	**0.6**		-	1.8	0.03	0.4	0.50		0.3	0.9		
B. Nitrogen level (Kg/ha)													
40	5.5	5.7	5.6	6.7	4.9	9.4	2.6	5.5	5.8	2.9	5.8	4.4	5.4
80	6.8	7.1	7.0	7.4	7.6	10.4	4.2	5.9	6.8	3.6	6.7	5.2	6.6
120	8.1	7.9	8.0	8.6	8.7	10.6	5.7	6.4	7.6	5.3	7.7	6.5	7.7
SEm±	0.1	**0.1**		-	0.2	0.008	0.1	0.11		0.2	0.2		
C D at 5%	0.2	**0.4**		-	0.61	0.02	0.2	0.32		0.5	0.6		
C. Interaction: Entry X N levels													
SEm±	-	-		-	0.4	0.022	0.2	0.19		0.3	-		
C D at 5%	-	-		-	1.1	0.065	0.6	0.56		0.9	1.5		
CV%	0.6	-		-	6.3	-	8.5	-		-	12.6		

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

Entries	Jabalpur				Jorhat				
	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
NDO-10	2.7	5.3	5.0	4.3	NDO-10	6.1	6.3	6.5	6.3
NDO-711	5.3	8.0	9.3	7.5	NDO-711	4.2	4.3	4.6	4.4
UPO-06-1	5.3	9.3	10.7	8.4	UPO-06-1	5.4	5.5	6.5	5.8
OS-403	6.7	9.6	10.7	9.0	OS-403	6.1	6.6	7.0	6.6
JHO-822 (ZC)	5.3	8.0	9.3	7.5	JHO-99-2 (ZC)	6.0	6.2	7.4	6.5
OS-6 (NC)	5.3	8	9.3	7.5	OS-6 (NC)	5.3	5.9	6.5	5.9
Kent (NC)	4.0	5.3	6.7	5.3	Kent (NC)	5.7	6.5	6.3	6.2
Mean					**Mean**	5.5	5.9	6.4	
	V	**N**	**VXN**			**V**	**N**	**VXN**	
SEm±	0.6	0.6	0.4		SEm±	0.17	0.11	0.19	
CD at 5%	1.2	1.8	1.1		CD at 5%	0.50	0.32	0.56	
CV%	6.3				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)			
	N levels (kg/ha)			
	40	80	120	Mean
NDO-10	2.8	3.7	4.3	3.6
NDO-711	2.3	3.3	5.1	3.6
UPO-06-1	2.3	4.1	5.5	4.0
OS-403	3.9	5.0	7.6	5.5
JHO-2000-4 (ZC)	1.9	2.7	3.9	2.8
OS-6 (NC)	4.3	3.7	7.5	5.2
Kent (NC)	2.5	2.6	3.4	2.8
Mean	2.9	3.6	5.3	
	V	**N**	**VXN**	
SEm±	0.1	0.2	0.3	
CD at 5%	0.3	0.5	0.9	
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						
	Srinagar	Pantnagar	Jorhat	Ranchi	Coimbatore	Mean	Palampur	Hisar	Pantnagar	Jorhat	Coimbatore	Jhansi	Mean
A. Entry													
NDO-10	7.67	10.12	7.60	8.52	12.50	9.28	97.0	80.7	82.0	80.3	58.2	74.4	78.8
NDO-711	7.73	10.02	6.60	9.16	13.40	9.38	99.0	82.4	73.0	77.4	61.0	59.2	75.3
UPO-06-1	7.53	-	6.90	9.24	14.70	9.59	89.0	81.3	47.0	69.6	64.9	49.0	66.8
OS-403	7.83	10.56	7.60	10.21	10.90	9.42	88.0	71.5	54.0	78.3	66.4	54.1	68.7
Palampur-1 (HZ)	7.20	-	-	-	-	7.20	110.0	-	-	-	-	-	110.0
JHO-99-2 (NEZ)	-	-	7.50	9.45	-	8.48	-	-	-	82.4	-	-	82.4
OL-125 (NWZ)	-	9.58	-	-	-	9.58	-	80.7	81.0	-	-	-	80.9
JHO-822 (CZ)	-	9.89	-	-	-	9.89	-	-	-	-	-	60.6	60.6
JHO-2000-4 (SZ)	-	-	-	-	12.60	12.60	-	-	-	-	61.6	-	61.6
OS-6 (NC)	7.27	9.01	7.00	9.14	13.70	9.22	107.0	87.2	88.0	79.0	59.8	60.8	80.3
Kent (NC)	7.50	9.95	7.20	8.73	12.00	9.08	97.0	83.0	80.0	76.4	61.2	62.2	76.6
SEm±	-	0.14	0.07	0.001	0.4		3.1	-	2.9	2.0	0.8	5.1	
C D at 5%	-	0.43	0.19	0.004	1.2		10.0	6.4	9.0	5.8	2.7	15.6	
B.Nitrogenlevel (Kg/ha)													
40	7.00	9.11	7.00	9.19	12.80	9.02	84.0	70.2	65.0	76.3	59.3	56.1	68.5
80	7.57	9.74	7.10	9.21	12.90	9.30	102.0	82.6	72.0	77.9	61.7	61.3	76.3
120	8.03	10.78	7.40	9.22	12.90	9.67	108.0	90.5	80.0	78.8	64.6	62.7	80.8
SEm±	-	0.07	0.10	0.001	0.3		1.5	-	1.1	0.5	0.6	2.3	
C D at 5%	-	0.20	0.30	0.003	NS		4.0	5.3	3.0	1.6	1.8	NS	
C.Interaction: Entry X N levels													
SEm±	-	-	0.18	0.003			-	-	-	0.9	-	10.1	
C D at 5%	-	NS	0.52	0.07	NS		12.0	-	NS	2.7	NS	NS	
CV%	-	-	3.6	-	9.1		-	-	-	-	4.3	17.4	

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										
NDO-10	110.7	95.0	102.9	112.7	168.0	140.4	152.1	149.0	140.7	147.3
NDO-711	114.6	90.67	102.6	110.9	174.0	142.5	148.7	90.0	149.4	129.4
UPO-06-1	121.7	88.67	105.2	111.0	177.0	144.0	153.4	136.0	124.4	137.9
OS-403	119.5	95.33	107.4	106.8	169.0	137.9	159.4	89.0	151.4	133.3
Palampur-1 (HZ)	110.3	85.33	97.8	-	-		-	-	-	
JHO-99-2 (NEZ)	-	-		-	-		148.0	148.0	129.8	141.9
OL-125 (NWZ)	-	-		116.5	172.0	144.3	-	-	-	
JHO-822 (CZ)	-	-		-	-		-	-	-	
JHO-2000-4 (SZ)	-	-		-	-		-	-	-	
OS-6 (NC)	116.0	89.33	102.7	111.3	172.0	141.7	155.3	136.0	143.2	144.8
Kent (NC)	120.4	90.7	105.6	123.4	171.0	147.2	145.8	149.0	140.6	145.1
SEm±	2.1	0.8		-	1.3		2.2	0.99	4.3	
C D at 5%	6.5	2.3		9.2	4.0		6.4	2.85	13.3	
B. Nitrogen level (Kg/ha)										
40	109.4	81.0	95.2	90.6	170.0	130.3	148.1	124.0	117.0	129.7
80	117.2	89.3	103.3	118.5	172.0	145.3	152.7	131.0	147.1	143.6
120	121.9	98.0	110.0	130.9	173.0	152.0	154.7	136.0	155.8	148.8
SEm±	0.9	0.6		-	0.5		0.7	0.7	1.9	
C D at 5%	2.7	1.8		7.8	2.0		2.0	1.9	5.5	
C. Interaction: Entry X N levels										
SEm±	-	1.3		-	-		1.2	1.7	5.0	
C D at 5%	7.04	3.9		-	5.0		3.4	4.9	NS	
CV%	-	-		-	-		-	-	6.2	

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							
NDO-10	133.8	93.8	113.8	95.2	112.5	103.9	124.0
NDO-711	137.8	107.0	122.4	96.0	108.1	102.1	120.7
UPO-06-1	155.7	125.8	140.8	96.9	111.9	104.4	127.5
OS-403	181.5	124.2	152.9	103.9	113.0	108.5	128.5
Palampur-1 (HZ)	-	-		-	-		97.8
JHO-99-2 (NEZ)	-	-		-	-		141.9
OL-125 (NWZ)	-	-		-	-		144.3
JHO-822 (CZ)	136.0	102.7	119.4	-	-		119.4
JHO-2000-4 (SZ)	-	-		85.4	127.6	106.5	106.5
OS-6 (NC)	147.0	104.7	125.9	92.7	117.7	105.2	125.9
Kent (NC)	136.0	101.4	118.7	90.9	115.9	103.4	125.9
SEm±	3.1	1.6		1.1	3.6		
C D at 5%	9.6	4.5		3.1	11.1		
B. Nitrogen level (Kg/ha)							
40	143.7	97.0	120.4	86.8	108.1	97.5	116.0
80	146.8	109.8	128.3	94.2	115.3	104.8	126.7
120	150.0	118.8	134.4	102.2	122.4	112.3	133.1
SEm±	1.2	3.5		1.6	2.2		
C D at 5%	3.4	10.2		4.9	6.3		
C. Interaction: Entry X N levels							
SEm±	6.0	4.2		2.8			
C D at 5%	NS	12.4		NS	NS		
CV%	6.34	8.5		-	9.4		

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	Kalyani	Mean
A. Entry									
NDO-10	0.38	0.45	0.42	0.43	0.39	0.41	0.50	0.76	0.63
NDO-711	0.35	0.42	0.39	0.42	0.41	0.42	0.68	0.71	0.70
UPO-06-1	0.53	0.40	0.47	0.41	0.45	0.43	0.53	0.89	0.71
OS-403	0.46	0.47	0.47	0.39	0.48	0.44	0.66	0.64	0.65
Palampur-1 (HZ)	0.47	0.48	0.48	-	-		-	-	
JHO-99-2 (NEZ)	-	-		-	-		0.47	0.76	0.62
OL-125 (NWZ)	-	-		0.44	0.42	0.43	-	-	
JHO-822 (CZ)	-	-		-	-		-	-	
JHO-2000-4 (SZ)	-	-		-	-		-	-	
OS-6 (NC)	0.46	0.48	0.47	0.42	0.40	0.41	1.04	0.59	0.82
Kent (NC)	0.36	0.42	0.39	0.48	0.38	0.43	0.73	0.69	0.71
SEm±	0.01	0.01		-	0.02		0.01		
C D at 5%	0.04	0.02		-	0.05		0.03		
B. Nitrogen level (Kg/ha)									
40	0.39	0.40	0.40	0.40	0.38	0.39	0.62	0.65	0.64
80	0.43	0.46	0.45	0.43	0.43	0.43	0.67	0.70	0.69
120	0.48	0.48	0.48	0.45	0.43	0.44	0.69	0.81	0.75
SEm±	0.01	0.003		-	0.01		0.01	-	
C D at 5%	0.02	0.01		-	0.03		0.03	-	
C. Interaction: Entry X N levels									
SEm±	-	0.01		-	-		0.01	-	
C D at 5%	0.06	NS		-	NS		NS	-	
CV%	-	-		-	-		5.2	-	

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							
NDO-10	0.48	0.60	0.54	0.31	0.24	0.28	0.45
NDO-711	0.45	0.80	0.63	0.39	0.32	0.36	0.50
UPO-06-1	0.41	0.90	0.66	0.40	0.37	0.39	0.53
OS-403	0.38	0.90	0.64	0.45	0.33	0.39	0.52
Palampur-1 (HZ)	-	-		-	-		0.48
JHO-99-2 (NEZ)	-	-		-	-		0.62
OL-125 (NWZ)	-	-		-	-		0.43
JHO-822 (CZ)	0.44	0.90	0.67	-	-		0.67
JHO-2000-4 (SZ)	-	-		0.28	0.36	0.32	0.32
OS-6 (NC)	0.44	0.80	0.62	0.37	0.31	0.34	0.53
Kent (NC)	0.40	0.70	0.55	0.35	0.35	0.35	0.49
SEm±	0.03	0.03		0.003	0.01		
C D at 5%	NS	0.08		0.01	0.03		
B. Nitrogen level (Kg/ha)							
40	0.41	0.70	0.56	0.26	0.29	0.28	0.45
80	0.43	0.80	0.62	0.36	0.34	0.35	0.51
120	0.44	0.80	0.62	0.47	0.35	0.41	0.54
SEm±	0.02	0.01		0.01	0.003		
C D at 5%	NS	0.03		0.02	0.009		
C. Interaction: Entry X N levels							
SEm±	0.06	0.01		0.01	-		
C D at 5%	NS	0.03		0.03	0.03		
CV%	17.8	5.3		-	8.1		

C. NEW RESEARCH TRIALS:

(i) COORDINATED TRIALS:

AST-18 (NT): Performance of perennial fodder sorghum (*Sorghum bicolor* Cv. COFS 29) as influenced by planting geometry and cutting intervals under irrigated conditions

Locations: Dharwad, Raipur and Bikaner

A new experiment was started during *Rabi* 2013-14 to assess the effect of planting geometry and cutting intervals on growth, yield and quality (HCN content) of perennial sorghum under irrigated condition. The results of the experiment will be reported after completion of one year experimentation in *Kharif* 2014.

(i) LOCATION SPECIFIC TRIALS:

AST -19 (NT): Yield potential of cereals with forage legumes under pure stand and mixtures

Location: Srinagar **(Table Reference: 19)**

The experiment was started during *rabi* 2013-14 to evaluate fodder yield potential and quality of cereals and legumes in mono as well as in mixed cropping. The treatment consisted of eleven cereal and legumes stands *viz*., **T_1-**sole oat, **T_2-**sole barley, **T_3-** sole ryegrass, **T_4-** sole vetch (*Vicia sativa*), **T_5-** sole field pea, **T_6-** oat + vetch (1:1), **T_7-**oat + field pea (1:1), **T_8-** barley + vetch (1:1), **T_9-** barley + field pea (1:1), **T_{10}-** ryegrass + vetch (1:1) and **T_{11}-** ryegrass + field pea (1:1) laid out in randomized block design and replicated thrice.

In pure stand, maximum GFY (378.5q/ha) was attained by oat crop followed by barley (285 q/ha) and field pea (225.5 q/ha) and the lowest being with vetch (186.7 q/ha). Whereas, in mixtures, maximum GFY (325.6q/ha) was obtained by oat + field pea mixture followed by oat + vetch mixture and then barley + field pea by attaining a GFY of 234 q/ha. DMY trend was similar to GFY. In pure stands, the highest DMY was obtained by the oat crop followed by barley, field pea and the lowest in vetch. It was also observed that sole field pea had maximum crude protein yield (11.85q/ha) followed by sole vetch (9.67 q/ha) and the minimum crude protein yield was found in sole ryegrass (2.63 q/ha).

Table 19: Effect of cereals with different legumes mixture on forages at Srinagar

Treatment	Plant height (cm)	L:S	GFY (q/ha)	DMY (q/ha)	CP content (%)	CPY (q/ha)
Sole oat	108.3	0.54	378.5	98.0	7.9	7.74
Sole barley	86.4	0.43	285.0	71.2	11.4	8.12
Sole ryegrass	62.5	1.95	220.9	41.8	6.3	2.63
Sole vetch	56.9	0.76	186.7	46.5	20.8	9.67
Sole field pea	78.0	0.48	225.5	67.7	17.5	11.85
Oat + Vetch	112.3	0.60	312.0	68.5	12.8	8.76
Oat + Field pea	104.0	0.53	325.6	74.3	11.0	8.17
Barley + Vetch	78.0	0.49	207.0	45.6	14.3	6.52
Barley + Field pea	84.3	0.46	234.0	53.3	13.1	6.97
Ryegrass + Vetch	66.8	1.73	195.6	46.7	9.5	4.40
Ryegrass + Field pea	63.0	1.40	208.0	45.2	7.8	3.52
SEm±	2.6	0.01	3.9	1.6	-	-
CD at 5%	7.5	0.03	11.5	4.5	-	-

AST-20 (NT): Studies on intensive fodder cropping systems for yield maximization

Location: Raipur

A new experiment will be conducted during summer/*kharif* 2014 to find out the appropriate cropping system for maximum fodder production and to see the effect of cropping systems on soil fertility, nutrient use and water use efficiency. After completion of the cropping cycle, results of the first year experimentation will be reported in R*abi* 2014-15.

(A) MISCELLANEOUS TRIALS:

AST-7 (Kharif): Evaluation of fodder crops under different rice fallow system

[Table Reference: 7(a) to 7(c)]

Location: Ranchi, Jabalpur and Bhubaneswar

A field experiment was started during *kharif* 2013 at three locations (Ranchi, Jabalpur and Bhubaneswar) to evaluate fodder crops under different rice fallow system. The treatment consisted of four methods of sowing of rice *Viz*., Conventional (M_1). SRI raised bed (M*2*), SRI flat bed (M_3), and Aerobic (M_4) and three crops (oat, berseem and lathyrus) laid out in split plot design and replicated three times. Result of first year experimentation is summarized below.

On mean basis over the locations, forage crops grown after conventional planting of rice establishment recorded highest GFY (334.1q/ha) and lowest being with aerobic method (324.7q/ha). However sowing of forages after SRI flat bed method of rice attained highest DMY (60.1 q/ha). Among fodder crops, growing of berseem recorded highest GFY (443.2q/ha) and lowest being with lathyrus (142.0 q/ha) on mean basis. Berseem recorded 10.4 and 212.1 % more GFY over oats and lathyrus, respectively, whereas, highest DMY (82.4q/ha) was recorded under oat crop. Oat crop recorded 19.1 and 206.3 % more DMY over berseem and lathyrus, respectively. Under different rice establishment methods, minimal differences were observed with respect to CPY of forages. Planting of berseem attained highest CPY (12.18 q/ha) on mean basis.

With respect to system productivity in terms of economics, sowing of forages after SRI flat bed method of rice establishment fetched highest net monetary returns (Rs 45232/ha) and benefit cost ratio (2.83). Among the forage crops, oats fetched highest net monetary return (Rs 51325/ha) followed by lathyrus (Rs 44127/ha) and lowest being with berseem (Rs 30170/ha) on mean basis.

AST-9 (Kharif): Evaluation of different varieties of grasspea (*Lathyrus sativus* L.) as forage crop under different sowing methods in rice based cropping system

[Table Reference: 9(a) to 9(b)]

Location: Jorhat and Raipur

The experiment was initiated during *rabi* 2013-14 to increase the availability of legume forage through utilization of rice fallow system. The treatment consisted of four grass pea varieties (3 at Jorhat) namely Mahateora, Prateek, Nirmal and Rattan (in main plots) and four sowing methods *viz*., recommended practices with 25 % seed rate (M_1), recommended practices with 50% more seed rate (M_2), zero seed drill with 25 % more seed rate (M_3) and zero seed drill with 50 % more seed rate (M_4) (in sub-plots) laid out in split plot design and replicated three times.

The results of first year experimentation are given below. Nirmal variety recorded 17.1 and 24.0 % more GFY over Mahateora and Prateek, respectively.

The respective increase for DMY was 17.5 and 11.8 %. The highest CPY (2.29 q/ha) was recorded in Nirmal followed by Mahateora (2.05q/ha). Under integrated nutrient management, highest GFY (83.6q/ha) and DMY (16.0q/ha) was recorded in the treatment receiving sowing behind the plough with 50 % higher seed rate and a spacing of 20 cmX10cm (M_4) followed by the treatment sowing seed as relay with 50% higher seed rate (M_2) with 81.10 and 14.63 q/ha, GFY and DMY, respectively. Sowing methods (M_4) recorded 20.5, 3.10 and 11.8 % more GFY over M_1, M_2 and M_3 treatments, respectively. Respective increase for DMY was 20.3, 9.6 and 12.7 %. However M_2 and M_4 treatment recorded almost similar crude protein yield.

Economic indices indicated that the highest gross return (Rs15039/ha) and net return (Rs 6099/ha) was recorded in variety Nirmal and among sowing methods the highest gross and net return were recorded in treatment receiving sowing behind the plough with 50 % higher seed rate and a spacing of 20x10cm (Rs14328 and Rs 4718/ha, respectively). The respective treatment also recorded tallest plant. Not much variations in leaf stem ratio was observed among varieties and sowing methods. It was also observed that there was no significant effect of varieties on parameters like GFY, DMY and CPY at Raipur. However at Jorhat the interaction effect of both variety and sowing methods on these parameters were found to be significant. Perusal of the data indicated that on mean basis the highest green fodder yield (86.3q/ha) was recorded in Nirmal followed by Mahateora (73.7q/ha). However the dry matter yield recorded highest in Nirmal (16.1q/ha) followed by Prateek(13.7q/ha).

Table-7 (a) Kharif: Effect of rice establishment methods and forage crops on GFY and DMY of forages under rice fallow system

Treatments		Green fodder Yield(q/h)				Dry matter Yield (q/ha)			
		Ranchi	Jabalpur	Bhubaneswar	Mean	Ranchi	Jabalpur	Bhubaneswar	Mean
Rice establishment methods(M)									
Conventional (M_1)		273.6	621.5	107.2	334.1	44.3	113.8	21.7	60.0
SRI raised bed (M_2)		250.9	614.0	111.8	325.6	42.6	111.8	22.7	59.0
SRI flat bed (M_3)		253.6	630.3	109.3	331.0	42.1	115.8	22.5	60.1
Aerobic (M_4)		233.1	626.3	114.7	324.7	39.0	114.1	23.2	58.8
S. Em$\pm$		4.1	3.1	3.4		0.8	1.2	0.8	
CD at 5%		14.0	6.9	11.9		2.6	4.5	2.4	
Forage crops(C)									
Oat (C_1)		323.6	702.8	177.6	401.3	53.7	152.3	41.1	82.4
Berseem (C_2)		343.1	914.8	71.7	443.2	53.4	142.3	11.8	69.2
Lathyrus (C_3)		91.7	251.3	83.0	142.0	19.0	47.0	14.6	26.9
S. Em$\pm$		3.5	12.4	3.5		0.6	0.3	0.6	
CD at 5%		10.6	36.5	10.1		1.9	1.0	2.8	
CV %		4.9	14.5	10.9		5.1	8.6	9.3	
Interaction(MXC)									
Between N at same T	S. Em$\pm$	7.0	12.0	8.6		1.3	0.4	1.0	
	CD at 5%	NS	36.5	19.0		NS	1.0	1.6	
Between T at same or different N levels	S. Em$\pm$	7.1	11.3	8.5		1.3	1.2	1.3	
	CD at 5%	NS	33.6	18.0		NS	4.0	2.6	

Table-7 (b) Kharif: Effect of rice establishment methods and forage crops on economics of forages under rice fallow system.

Treatments	Gross monetary returns (Rs/ha)				Net monetary returns (Rs/ha)			
	Ranchi	Jabalpur	Bhubaneswar	Mean	Ranchi	Jabalpur	Bhubaneswar	Mean
Rice establishment methods (M)								
Conventional (M_1)	110358	144162	57568	104029	72691	29845	29845	44127
SRI raised bed (M_2)	103673	141738	59412	101608	66006	32189	32189	43461
SRI flat bed (M_3)	107916	158681	58946	108514	70250	32723	32723	45232
Aerobic (M_4)	98800	157444	56894	104379	61133	33350	33350	42611
S. Em±	1023	-	-	-	1026	-	-	-
CD at 5%	3544	-	-	-	3544	-	-	-
Forage crops (C)								
Oat (C_1)	115513	147693	63036	130634	77513	36361	36361	51325
Berseem (C_2)	135340	201450	55113	74516	95840	29068	29068	30170
Lathyrus (C_3)	64707	102375	56466	104029	29207	30651	30651	44127
S. Em±	898	-	-	-			-	-
CD at 5%	2693	-	-	-			-	-
CV %	4.6	-	-	-			-	-

Table-7 (c) Kharif: Effect of rice establishment methods and forage crops on crude protein yield and B: C ratio of forages under rice fallow system.

Treatments		Crude Protein yield (q/ha)			B: C Ratio			
		Jabalpur	Bhubaneswar	Mean	Ranchi	Jabalpur	Bhubaneswar	Mean
Rice establishment methods(M)								
Conventional (M_1)		13.96	2.89	8.43	1.90	2.98	2.08	2.53
SRI raised bed (M_2)		13.76	2.92	8.34	1.72	3.06	2.18	2.62
SRI flat bed (M_3)		14.23	2.91	8.57	1.83	3.40	2.25	2.83
Aerobic (M_4)		14.06	2.98	8.52	1.59	3.46	2.41	2.94
S. Em±		0.01	0.10		0.03	-	-	-
CD at 5%		0.03	0.351		0.09	-	-	-
Forage crops(C)								
Oat (C_1)		12.38	2.88	7.63	2.04	3.36	2.37	2.87
Berseem (C_2)		21.67	2.68	12.18	2.42	3.69	2.12	2.91
Lathyrus (C_3)		7.93	2.22	5.08	0.83	2.63	2.19	2.41
S. Em±		1.23	0.10	0.67	0.023	-	-	-
CD at 5%		3.35	0.30		0.069	-	-	-
CV %		8.63	10.41		5.68	-	-	-
Interaction(MXC)-								
Between N at same Treatment	S. Em	0.63	0.30		-	-	-	-
	CD at 5%	1.18	0.60		-	-	-	-
Between T at same or different N levels	S. Em	0.52	0.30		-	-	-	-
	CD at 5%	1.14	0.60		-	-	-	-

Table-9 (a) Kharif: Effect of varieties and sowing methods on yield of grass pea under rice based cropping system

Treatments	GFY of Lathyrus (q/ha)			DMY of Lathyrus (q/ha)			CPY of Lathyrus (q/ha)		
	Jorhat	Raipur	Mean	Jorhat	Raipur	Mean	Jorhat	Raipur	Mean
Variety (V)									
V_1 – Mahateora	74.6	72.7	73.7	13.7	13.7	13.7	1.96	2.14	2.05
V_2 - Prateek	69.8	69.4	69.6	12.6	16.1	14.4	1.80	2.02	1.91
V_3 - Nirmal	100.3	72.4	86.3	18.6	13.7	16.1	2.74	1.85	2.29
V_4- Ratan	-	72.0		-	14.2		-	2.33	
SEm±	2.3	9.9		0.43	2.1		0.05	0.31	
CD at 5%	7.0	NS		1.3	NS		0.15	NS	
Sowing methods (M)									
M_1 – Sowing as relay with 25% higher seed rate	69.1	69.6	69.4	12.5	14.2	13.3	1.75	2.07	1.91
M_2 - Sowing as relay with 50% higher seed rate	81.3	80.9	81.1	14.9	14.3	14.6	2.14	2.66	2.40
M_3 - Sowing behind the plough with 25% higher seed rate	80.3	69.2	74.8	14.8	13.7	14.2	2.17	1.65	1.91
M_4 - Sowing behind the plough with 50 % higher seed rate and a spacing of 20cmX10cm	95.5	71.6	83.6	17.7	14.4	16.0	2.61	2.09	2.39
SEm±	2.3	11.3		0.4	2.4		0.05	0.35	
CD at 5%	6.9	NS		1.2	NS		0.14	NS	
CV %	9.9	3.0		8.1	12.7		8.08	3.17	
Interaction (VXM)									
SEm±	4.0	19.5		0.7	4.1		0.08	0.08	
CD at 5%	11.9	NS		2.1	NS		0.23	0.23	

Table-9 (b) Kharif: Effect of varieties and sowing methods on growth parameters and economics of grasspea under rice based cropping system

Treatments	Gross Income (Rs/ha)	Net Income (Rs/ha)	Plant Height (cm)			Leaf Stem Ratio		
	Jorhat	Jorhat	Jorhat	Raipur	Mean	Jorhat	Raipur	Mean
Variety (V)								
V_1 – Mahateora	11192	2267	82.8	64.5	73.6	0.83	0.91	0.87
V_2 - Prateek	10476	1536	82.7	57.5	70.1	0.87	0.88	0.87
V_3 - Nirmal	15039	6099	72.1	47.4	59.8	0.88	0.81	0.84
V_4- Ratan	-	-		66.5	33.3	-	0.93	
SEm±	351	351	1.8	3.8	2.8	0.003	0.049	
CD at 5%	1053	1053	5.4	12.2	8.8	0.009	NS	
Sowing methods (M)								
M_1 – Sowing as relay with 25% higher seed rate	10368	2098	79.4	60.3	69.9	0.83	0.89	0.86
M_2 - Sowing as relay with 50% higher seed rate	12195	3545	78.8	66.5	72.7	0.85	0.97	0.91
M_3 - Sowing behind the plough with 25% higher seed rate	12051	2841	78.4	53.2	65.8	0.88	0.81	0.84
M_4 -Sowing behind the plough with 50 % higher seed rate with a spacing of 20 cmX10cm	14328	4718	80.2	58.9	73.6	0.87	0.88	0.87
SEm±	345	345	0.8	4.4		0.005	0.058	
CD at 5%	1034	1034	NS	NS		0.015	NS	
CV %	9.94	-	7.8	1.4		1.258	1.236	
Interaction (VXM)								
SEm±	598	598	1.4	7.6		0.009	0.101	
CD at 5%	1792	1792	4.2	NS		0.026	NS	

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. Incidence of root rot was recorded during 1st week of February and maximum intensity was 4.0 %. Infestation of leaf defoliators started from 2nd week of January (0.2 /10 plants) and it was found to be maximum during 1st week of February. (1.0 / 10 plants).

Jhansi: Incidences of stem rot (*Sclerotinia trifoliorum*) started from first week of January and continued to increase (40%) 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 (45%) 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 second fortnight of December on BL 42 variety of Berseem with the showers received in third week of December. The per cent disease index was 9.90. Thereafter abrupt increase in disease incidence was observed upto last week of January with max RH of more than 90 per cent and mean temperature of 10.3 to 14.1 °C. Thereafter steady increase in disease incidence was observed with prevailing maximum temperature of 18.3 to 21.8ºC with maximum relative humidity of more than 90.0 per cent. The maximum percent disease incidence was 44.40 per cent.

Palampur: Root rot caused by *Rhizoctonia solani* appeared in the last week of March and progressed up to second week of April but severity of disease remained mild (4%). The leaf spot appeared (2%) in the last week of March and progressed up to first week of May (15%). Beetle infestation initiated from second week of April and reached maximum level (30%) in the last week of May.

2. Lucerne

Rahuri: The population of pea aphid (*Acyrthosiphon pisum*) was first noticed during 4th week of December 2013 (8.67 aphids/tiller) and it went on increasing till 4th week of January, 2014 (54.67 aphids/tiller). Thereafter the decreasing trend of pea aphid population was noticed upto 4th week of February, 2014 (15.67 aphids/tiller). The cowpea aphid (*Aphis craccivora*) build up started during 4th week of December 2013 (3.8 /tiller) and increased up to 1st week of January, 2014 with highest population (12.33 aphids/tiller). Thereafter, population started declining and recorded nil population during 1st week of February. Spotted aphid (*Therioaphis maculata*), a predominant species in Western Maharashtra, started appearing on crop during 1st week of January, 2014 with 13.67 aphids/tiller and showed increasing trend up to 4th week of January, 2014 (52.67 aphids/tiller). Then after population started declining and showed nil population during 2nd t week of March. During the aphid infestation, population of predatory lady bird beetles was observed at moderate to high level. (4.00 to 10.67 grubs/tiller).

The larval population of *Spodoptera litura* started appearing on lucerne crop during 4th week of March, 2014 (1.5 larvae/ m^2) and reached to its peak population (11.00 larvae/m^2) during

the 2nd week of April. Thereafter, population started declining and showed nil population during the 1st week of May. The population of *Helicoverpa armigera* was noticed on lucerne seed crop during 1st week of April, 2014 (0.5 larva/m^2) and showed increasing trend upto 4th week of May 14 with highest population of 24.33 larvae/m^2. After that population declined and showed minimum population during 2nd week of June, 2014. In Berseem crop, no insect- pest infestation/ incidence was observed during crop period.

Bhubaneswar: Leaf blight was recorded during 4th week of January (0.6 in the scale of 1-5) while it was found to be maximum during 1st week of February (1.2 in the scale of 1-5). Infestation of leaf defoliators also started from 4th week of January (0.4 /10 plants) and it was maximum during 1st week of February (0.8 /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 and its intensity continued to increase (40%) up to last week of April. Alfalfa weevil infestations were severe (70%) during first and second week of February.

Palampur: Leaf spot disease initiated (5%) from second week of April and progressed up to 1st May in a mild intensity (7%). Defoliating beetles also appeared during this period with maximum infestation (50%) being in first to third week of May.

Dharwad: Aphid population build up started from January onwards and reached peak during second fortnight of February (210 aphids / stem) and started declining after second fortnight of April and reached nil in May. Among diseases, rust was the major one and 48% of disease severity was seen during first fortnight of March. Disease intensity was almost nil during May.

Ludhiana: Downy mildew (*Peronospora aestavalis*) appeared in the mid January with the onset of showers having the per cent disease index of 9.3. Thereafter abrupt increase in disease incidence was observed till mid February with maximum RH of more than 90 per cent and mean temperature of 13.1°C. There was abrupt rise and fall in disease incidence during the period. Thereafter steady increase in disease incidence was observed till last week of March with increase in temperature from 13.3 to 19.9°C and maximum relative humidity of more than 85.0 per cent. The maximum percent disease incidence was 85.0 per cent. The percent disease index was positively and significantly correleated with temperature but negatively and significantly correlated with maximum relative humidity because of fluctuation in relative humidity.

3. Oats

Bhubaneswar: Among different diseases of oat, leaf blight and leaf spot was predominant. Leaf blight varied from 1.0 to 2.4 while leaf spot varied from 1.0 to 1.6 (in the scale of 1-5). Incidence of leaf blight was found to be 1.0 during 4th week of December and was found to be maximum during 1st week of February (2.4 in the scale of 1-5). Initial incidence of leaf spots was recorded in 4th week of January and it was found to be 1.0 in the scale of 1-5. During first week of February the leaf spot was found to be maximum (1.6 in the scale of 1-5). Incidence of root rots of oat caused by *Sclerotium rolfsii* Sacc. was found to be 1.0 % during 1st week of February. Infestation of leaf defoliators started from 2nd week of January (0.6 / 10 plants) and it was maximum during first week of February (1.4 /10 plants).

Jhansi: Major incidences (30%) 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 *Helminthiosporium avenae* was studied on Kent. The disease appeared in patches in the first week of January with the showers received in second fortnight of December and progressed slowly till the first fortnight of January. Thereafter the steady increase in disease severity was observed up to third week of February with per cent disease severity of 38.9 per cent with the prevailing maximum atmospheric temperatures of 15.7 to 21.8°C, minimum atmospheric temperatures of 8.2 to 8.8°C and mean atmospheric temperatures of 11.8 to 15.8 °C. Sharp increase in disease severity (50.0 per cent) was observed in third week of March with mean temperature of 19.4°C, RH of 72.0 per cent and rainfall of 29.0 mm respectively. The disease progressed in the last week of March with disease intensity of 55.5 percent and further increased with maximum disease severity of 62.2 per cent.

The per cent disease index was positively and significantly correleated temperature due to continuous and steady rise in temperature but negatively and significantly correlated with maximum relative humidity because of fluctuation in relative humidity.

Palampur: Powdery mildew and leaf blight were initiated in last week of March and progressed up to the third week of May, reaching to maximum disease severity of 80 &15 %, respectively. Loose smut incidence (3%) was recorded in third week of May. Aphids and Thrips infestation (2%) was recorded in fourth week of March and reached maximum by third week of April (10%).

Rahuri: Aphids, *Rhopalosiphum paddi* was noticed during 1st week of January, 2014 (20.67 aphids/tiller), reaching at maximum level (125.33 aphids/ tiller) during 3rd week of January 2014. Then it started declining to a nil population in the 2nd week of February. 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 Rahuri for Aphid infestation were found susceptible to the pests (Table PPT 2A1). However, at Hyderabad all the entries were resistant to rust and pea aphids.

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

Entries	Aphid/ tiller (Rahuri)	Pea aphid/plant (Hyderabad)	Rust (%) (Hyderabad)
VTL-11-1	29.3	1.89	6.78
VTL-11-2	38.2	2.22	5.67
VTL-11-3	29.3	2.44	5.0
VTL-11-5	24.67	1.89	4.33
VTL-11-6	34.6	1.33	4.33
VTL-11-7	34.5	2.22	5.22
VTL-11-8	22.6	1.67	3.89
VTL-11-9	19.1	1.67	5.22

All the entries were found susceptible to highly susceptible to diseases and pests at Rahuri and Ludhiana (Table PPT 2A2). However, at Hyderabad all the entries were resistant to rust and pea aphids.

Table PPT 2A2: Reaction of Lucerne entries against Insect-pests and diseases

Entries	Aphid/tiller (Rahuri)	Downy mildew (%) (Ludhiana)	Pea aphid (HYD)	Spotted aphid (HYD)	Rust (HYD)
VTL-13-1	20.22	40.8	14.55	5.22	6.55
VTL-13-2	38.33	48.3	5.77	7.66	6.78
VTL-13-3	32.44	76.7	6.44	14.33	6.77
VTL-13-4	78.55	41.7	9.21	24.99	6.56
VTL-13-5	19.33	40.0	2.77	13.33	6.55
VTL-13-6	32.67	46.7	4.66	21.66	6.56
VTL-13-7	35.78	44.2	12.77	14.55	9.0

B. Oats (Single cut): Entries OL-1750, JO-04-18 and OL-1804were found resistant to leaf blight at Jhansi centre, whereas at Bhubaneswar all the entries showed resistant reactions. However, at Ludhiana all the entries showed susceptible to moderately susceptible 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
SKO-196	-	MR	26.27	2.2
OS-406	-	MR	49.58	-
RSO-8	-	MR	58.09	0.8
JHO-13-6	-	MR	23.31	3.4
SKO-198	-	MR	34.78	1.2
OL-1689	-	S	52.54	1.0
RO-11-1	-	S	59.57	0.4
OL-125	-	MR	49.58	-
OL-1750	-	R	44.77	-
JHO-13-5	-	MR	46.62	-
JO-04-18	-	R	43.29	1.4
NDO-952	-	MR	48.10	1.0
JHO-99-2				0.4
OL-1804	-	R	47.73	0.6
SKO-199	-	MR	40.33	0.4
Kent(NC)	-	MR	44.77	1.6
OS-6(NC)	-	MR	52.54	-

Reactions of IVT entries of Oat against diseases and pest are presented in Table PPT.2A.3. At Palampur, entries OL-1804, OL-1760, JHO-13-5 and NDO-952 showed moderately resistant reactions against powdery mildew disease. At Rahuri centre, aphid infestation was least in RO-11-1 and OS-6.

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

Entries	Palampur Powdery mildew	Rahuri Aphids/tiller
SKO-196	27.7	165.3
OS-406	29.0	114.3
ROS-8	34.3	161.5
JHO-13-6	46.7	128.8
SKO-198	61.7	173.6
OL-1689	73.3	59.5
RO-11-1	75.0	32.6
SKO-90	68.3	-
OL-1750	17.7	171.0
JHO-13—5	10.3	97.5
JO-04-18	76.7	218.3
NDO-952	10.7	65.0
OL-1804	12.0	46.1
SKO-199	38.3	41.3
KENT(NC)	73.3	58.3
OS-6	78.3	39.5

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

Disease reaction of AVT (SC-1) entries presented in table PPT 2A 4. The results revealed that entry SKO-190 showed resistant reactions against leaf blight disease at Ludhiana centre. However at Jhansi centre all the entries showed resistant to moderately resistant reactions. At Hisar all the entries were free from diseases and pests.

Table PPT 2A 4: Reaction of AVT (SC-1) entries of Oats (single cut) to leaf blight (%)

Entries	Ludhiana	Hisar	Jhansi
SKO-190	23.68	DF	MR
UPO-12-1	41.81	DF	R
RSO-59	45.88	DF	R
JHO-2012-2	50.69	DF	MR
Kent(NC)	47.36	DF	MR
OS-6(NC)	42.92	DF	MR
JHO_2012-1	45.51	DF	MR
RSO-60	42.92	DF	MR
OL-125	56.98	DF	MR
JO-04-14	53.28	DF	MR
OS-405	55.50	DF	R
OL-1760	52.91	DF	R
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%), DF- Disease free			

Pest reactions of AVT (SC-1) entries are presented in table PPT 2A 5. The result revealed that at Palampur centre, only one entry RSO-60 showed resistant reactions against powdery mildew. Aphid infestation was least in entry JHO-2012-2at Rahuri centre. All the entries showed resistance against leaf spot and leaf blight at Bhubaneswar centre.

Table PPT 2A 5: Reaction of AVT (SC-1) entries of Oats (single cut) to pests and diseases

Entries	Palampur	Rahuri	Bhubaneswar	
	Powdery mildew (%)	Aphids/tiller	Leaf spot	leaf blight
SKO-190	26.7	155.5	0.2	1.8
UPO-12-1	43.3	201.6	0.2	0.8
RSO-59	41.7	185.6	0.4	1.0
JHO-2012-2	48.3	45.1	0.6	0.8
Kent(NC)	58.3	65.6	0.2	1.4
OS-6	63.3	74.3	0.4	1.6
SKO-90	53.3	*	*	*
JHO-2012-1	66.7	143.3	0.8	2.6
RSO-60	18.3	158.0	0.4	2.0
JO-04-14	36.7	164.0	0.2	0.4
OS-405	58.3	167.6	1.2	0.8
OL-1760	46.7	179.6	0.4	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%).				

*Seed not received hence not in trial

Pest reactions of AVT (SC-2) repeat entries are presented in table PPT 2A-6. The results revealed that entries UPO-09-1, SKO-156 and UPO-09-2 were resistant however rest of the entries were found moderately resistant to leaf blight at Jhansi centre. At Hisar centre all the entries was resistant to rust infestation. Aphid infestation was least in the entries JHO-2009-1 at Rahuri centre.

Table PPT 2A6: Reaction of AVT (SC-2) Repeat entries of Oats (single cut) to Diseases and Pest

Entries	Jhansi	Hisar	Rahuri
	Leaf blight	Rust	Aphids/tiller
UPO-09-1	R	3	95.67
OS-363	-	3	108.00
SKO-148	MR	1	83.00
Kent (NC)	MR	1	107.67
Palampur-1	MR	-	-
OS-6	MR	1	92.00
JHO-2009-2	MR	-	195.67
SKO-156	R	1	75.67
OL-125	MR	1	-
JHO-99-2	MR	-	-
JO-03-95	-	1	50.00
UPO-09-2	R	T	41.17
JHO-2000-4	MR	-	-
JHO-822	MR	-	53.67
JHO-2009-1	-	1	28.33

Pest reactions of AVT (SC-2) entries are presented in table PPT 2A-7. The results revealed that entry NDO-711 and Palampur -1 was found moderately resistant to powdery mildew disease at Palampur centre. However, at Ludhiana all the entries showed moderately susceptible reaction against leaf blight. At Bhubnehwar centre all the entries were resistant for leaf spot as well as leaf blight while at Hisar, entries were free from rust infection.

Table PPT 2A 7: Reaction of AVT (SC-2) entries of Oats to diseases and pests

Entries	Palampur Powdery mildew (%)	Bhubaneswar		Ludhiana Leaf blight	Hisar Rust
		Leaf spot	Leaf blight		
NDO-711	18.3	0.6	1.4	31.08	DF
Palampur-1	23.3	-	-	32.56	DF
Kent (NC)	36.7	0.6	2.0	31.45	DF
OL-125	43.3	1.0	0.8	25.9	DF
OS-403	33.3	0.6	2.2	48.84	DF
JHO-99-2	75.0	0.6	1.8	29.6	DF
UPO-06-1	78.3	0.6	1.2	33.67	DF
OS-6	-	-	-	38.85	DF
JHO-822	-	-	-	32.93	DF
JHO-2000-4	-	-	-	47.36	DF
NDO-10	-	-	-	28.12	DF

Oats (Dual)

The results of IVT trial are presented in Table PPT 2A-8. All the entries were susceptible to moderately susceptible to leaf blight at Jhansi and Ludhiana centres. However at Hisar all the entries showed resistant reaction

Table PPT 2A 8: Reaction of IVT entries of Oat (Dual) to leaf blight

Entries	Jhansi	Hisar	Ludhiana
RO-19 (NC)	S	1	56.98
JHO-13-1	Ms	1	42.92
OS-419	S	2.2	53.28
OL-1744	S	1	40.70
JHO-13-3	Ms	T	44.40
UPO-212 (NC)	S	2.2	45.14
JHO-822 (NC)	S	1	52.17
OL1733	MS	-	39.22
JO-9-506	S	2.2	49.58

Pest reactions of IVT entries of oat (Dual) are presented in table PPT-2A-9. The results revealed that entry JHO-13-3 UPO-212 (NC) JHO-822 (NC) OL1733 and JO-9-506 showed resistant reaction against powdery mildew at Palampur centre. At Rahuri centre, entries JHO-13-3 and JHO-822 (NC) were least infested with aphid. However, at Bhubaneswar centre all the entries showed resistant reaction against leaf spot and leaf blight.

Table PPT 2A 9: Reaction of IVT entries of Oat (Dual) to diseases and pest

Entries	Rahuri	Palampur	Bhubaneswar	
	Aphids/tiller	Powdery mildew (%)	Leaf spot	Leaf blight
RO-19 (NC)	59.17	28.3	0.8	1.8
JHO-13-1	21.67	53.3	0.6	0.6
OS-419	22.33	28.3	0.4	0.8
OL-1744	26.33	35.0	0.8	0.6
JHO-13-3	19.00	10.0	1.0	1.2
UPO-212 (NC)	20.33	13.3	1.2	1.4
JHO-822 (NC)	17.67	10.0	0.6	2.0
OL1733	58.20	16.7	0.6	0.8
JO-9-506	69.67	10.0	1.0	2.4

OATS (Multi cut)

Results of IVT trial are presented in Table PPT 2A-10. The results revealed that all the entries showed resistant to moderately resistant to leaf blight disease except OS-1689 at Jhansi centre. All the entries showed susceptible to moderately susceptible to leaf blight at Ludhiana centre. At Hisar all the entries showed resistant reaction to leaf blight.

Table PPT. 2A. 10: Reaction of IVT entries of Oat (multi cut) to leaf blight

Entries	Jhansi	Hisar	Ludhiana
JHO-13-4	MR	T	S
OL-1689	R	2.5	S
OS-385	S	1	S
Kent (NC)	MR	T	MS
JHO-13-2	MR	T	S
UPO-212	-	1	S
RSO-60	MR	T	MS
JO-4-317	R	1	S
OL-1736	R	1	S
PLP-15	MR	1	S
RO-19	R	1	S
OL-1802	MR	1	S

Scored on a 1-5 scale: 1= Highly resistant (No symptom), 2= Resistant (Up to 10 % disease incidence)

3= Moderately resistant (11-25%), 4= Susceptible (26-50%), 5=Highly susceptible (> 50%).

Reaction of IVT entries of oat (MC) to diseases and pest are presented in Table PPT 2A-11. The results revealed that aphid infestation was least in entries JHO-13-14 and RSO-60 at Rahuri centre. All the entries were found susceptible to powdery mildew except OL-1689, UPO-212 and RSO-60 at Palampur centre. Entry UPO-212 was found resistant to powdery mildew, whereas RO-19 which was highly susceptible at Palampur.

Table PPT 2A. 11: Reaction of IVT entries of Oat (Multi Cut) to diseases and pest

Entries	Rahuri Aphids/tiller	Palampur Powdery mildew (%)
JHO-13-4	46.0	28.3
OL-1689	66.3	16.7
OS-385	63.1	28.3
Kent	94.3	45.0
JHO-13-2	70.6	35.0
UPO-212	53.3	10.0
RSO-60	43.5	11.7
JO-4-317	86.3	23.3
OL-1736	108.0	36.7
PLP-15	67.0	46.7
RO-19	41.0	71.7
OL-1802	112.3	28.3
CD at 5%	**12.11**	**3.30**

Reaction of AVT entries of oat (MC) to diseases and pest are presented in table PPT2A-12. All the entries were found moderately susceptible to leaf blight at Ludhiana centre. At Rahuri centre, two entries UPO-212 and OL-1766 were least infested with aphid. At Jhansi, entries PLP-14, OL-1769 and JO-04-315 were found resistant while at Palampur, only JHO-2012-3 showed resistant reaction to leaf blight and Powdery mildew respectively.

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

Entries	Ludhiana Leaf blight (%)	Rahuri Aphids/tiller	Palampur Powdery mildew (%)	Jhansi Leaf blight (%)
UPO-212	50.3	26.2	31.7	MR
RO-19	61.8	34.5	46.7	MR
Kent (NC)	43.3	53.7	30.0	MR
PLP_14	58.8	64.2	36.7	R
OL-1766	55.9	26.0	16.7	MR
JHO-2012-3	60.3	45.5	10.0	S
OL-1769	59.2	31.7	16.7	R
JO-04-315	52.9	35.7	31.7	R
HFO-488	41.1	71.7	11.7	MR
UPO-212	-	-		S
RO-19	-	-		-
Kent (NC)	-	-		-

Reaction of AVT entries of oat (SC) Seed to leaf blight and powdery mildew is presented in table PPT2A-13. Results revealed that all the entries were free from disease at Hisar centre however entries NDO-711 and Palampur-1 showed moderately resistant reaction to powdery mildew at Palampur

Table PPT 2A. 13: Reaction of AVT Oat (SC-2) Seed

Entry	Hisar	Palampur Powdery mildew (%)
NDO-711	-	16.7
Palampur-1	-	18.3
Kent (NC)	-	36.7
OL-125	-	-
OS-403	-	46.7
JHO-99-2	-	-
UPO-06-1	-	35.0
OS-6	-	60.0
NDO-10	-	23.3

In the repeat trial for AVT -2 oats for seed, all the entries were found resistant to leaf blight and leaf spot at Bhubaneswar centre. However, entries Palampur-1, Kent and SKO-156 showed moderately resistant reaction to powdery mildew at Palampur centre.

Table PPT 2A. 14: Reaction of AVT Oat (SC-2) Seed Repeat

Entry	Palampur Powdery mildew (%)	Leaf Blight (Bhubaneswar) (1-5) Scale	Leaf Spot (Bhubaneswar) (1-5) Scale
UPO-09-1	26.7	1.8	1.0
OS-363	48.3	1.4	0.2
SKO-148	46.7	2.0	0.4
Kent (NC)	21.7	1.0	0.4
Palampur-1	18.3	-	-
OS-6	61.7	2.6	0.8
JHO-2009-2	51.7	3.2	0.6
SKO-156	18.3	2.4	0.8
OL-125	-	-	-
JHO-99-2	-	2.2	1.6
JO-03-95	50.0	0.8	0.8
UPO-09-2	26.7	1.2	0.6
JHO-2000-4	-	-	-
JHO-822	-	-	-
JHO-2009-1	81.7	2.2	0.6

C. Lathyrus

Reaction of IVT Lathryus entries are shown in table PPT2A. 15. All the entries were found infected by root rot at Bhubaneswar. Its incidence varied from 5 % to 13.25 %. Entry JHLS-2013-1 showed lowest root rot incidence of 5.00 % while it was highest in Mahateora (13.25 %).

Table PPT 2A. 15: Reaction of IVTL entries of Lathyrus to Root rot

Entry	Root Rot (%) Bhubaneswar
Prateek	10.25
JHLS-2013-2	8.50
BK-36-2	6.25
Mahateora	13.25
JHLS-2013-1	5.00
Nirmal	10.00

Reaction of AVT entries of Lathyrus to diseases are presented in table PPT2A-16. All the entries showed moderately resistant reaction to leaf blight except BK-12-2 and JHLS-2012-2 at Jhansi centre. In case of leaf spot, all the entries showed moderately resistant to susceptible reaction at Jhansi. Entry JLJ-09-2 was highly susceptible and showed highest damage by root rot (70%) while minimum root rot was recorded in the JHLS-2012-2 (1.6 %) at Bhubaneswar centre.

Table PPT 2A. 16: Reaction of AVT L-1

Entry	Root Rot (Bhubaneswar)	Leaf Blight (Jhansi)	Leaf Spot (Jhansi)
BK-12-2	4.0	S	S
RLS-3006-2	2.3	-	-
JHLS-2012-2	1.6	S	S
Nirmal	3.3	MR	MR
JHLS-2012-1	4.6	MR	S
Mahateora	6.6	MR	S
Prateek	6.6	MR	MR
JLJ-09-2	70.0	MR	S

In AVT-2 of Lathyrus, all the entries were found infected by root rot. Entry JHLS-2011-2 showed least root rot incidence of 14.5 % while it was highest in Prateek (47.2%) (Table PPT 2A 17).

Table PPT 2A. 17: Reaction of AVTL-2 entries of Lathyrus to Root rot

Entry	Root Rot (%) Bhubaneswar
JHLS-2011-2	14.5
Nirmal	18.2
Mahateora	30.7
JLJ-09-1	16.5
Prateek	47.2

In Lathyrus AVT-2 seed, entry, JHLS-2011-2 showed lowest root rot incidence of 13.7 % while highest incidence was recorded in Mahateora (56.25%) followed by Prateek (36.25 %) at Bhubneshwar centre (Table PPT 2A 18).

Table PPT 2A. 18: Reaction of AVTL-2 Seed entries of Lathyrus to Root rot

Entry	Root Rot (%) Bhubaneswar
JHLS-2011-2	13.70
Nirmal	20.20
Mahateora	56.25
JLJ-09-1	18.75
Prateek	36.25

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

Location: Ludhiana, Jhansi, Palampur and Bhubneshwar

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*.
IVT Berseem entries were tested for these diseases in the permanent stem rot and root rot sick plots. All the single cut entries were moderately to highly susceptible to root and stem rot diseases at Jhansi centre. However at Ludhiana centre stem rot was observed. All the entries were resistant except Wardan where incidence was 13.33 per cent. All the entries showed resistant reaction for powdery mildew at Palampur centre; however Pre emergence and post emergence germination loss was maximum in Wardan (50.0%) while it was minimum in IGFRI-13-1 (7.33 %). (Table PPT2B.1)

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

Entry Name	Stem rot incidence (%)		Root rot	Powdery mildew	(%) germination
	Ludhiana	Jhansi	Jhansi	Palampur	Bhubaneswar
HFB-36	5.00	MS	MS	2.3	15.0
IGFRI-13-1	8.33	MS	MS	5.7	7.33
Wardan	13.33	HS	HS	2.0	50.0
HFB-6-1	3.33	HS	HS	5.7	21.6
Bundel Berseem-2	5.00	HS	HS	5.7	-
Bundel Berseem-3	-	S	S	6.3	23.3
Mescavi	3.33	S	S	4.3	19.6
JB-4-21	-	S	S	-	8.0
BL-22	-	HS	HS	-	-

The results of AVT-1 are presented in Table PPT 2B.2. It was noticed that all the AVT entries were susceptible to highly susceptible to root and stem rot diseases at Jhansi centre except Mescavi, which was moderately resistant. However at Ludhiana centre stem rot was observed but reaction was found to be resistant.

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

Entry Name	Stem rot incidence (%)		Root rot
	Ludhiana	Jhansi	Jhansi
JBSC-2	R	HS	HS
Wardan	R	HS	HS
Mescavi	R	MR	MR
JBSC-4	R	MS	MS
JBSC-3	R	HS	HS
JBSC-1	R	HS	HS
Bundel Berseem-2	R	S	S

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 most effective with least disease incidence (Powdery mildew 2.9% and Clover rot 1.1%) as compared to untreated control (59.3% and 8.1 %, respectively). However, T_7 also showed significantly less incidence of powdery mildew as compared to control. Seed yield also increased (2.3 q/ha against 1.6 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	
T_1	Seed treatment (ST) with Carbendazim	38.8	1.6	1.7
T_2	*Trichoderma viridae* (ST)	44.8	5.5	1.8
T_3	T_1 + foliar spray of Carbendazim	19.7	1.3	1.7
T_4	T_2+ foliar spray of Carbendazim	31.8	5.3	2.2
T_5	T_1+ foliar spray of Contaf	4.8	1.2	2.3
T_6	T_2+ foliar spray of Contaf	4.3	5.8	1.9
T_7	T_1+ foliar spray of Carbendazim followed by contaf	3.0	1.5	2.0
T_8	T_2+ foliar spray of Carbendazim followed by contaf	4.5	5.3	2.2
T_9	T_1+ T_2+ foliar spray of Carbendazim followed by contaf	2.9	1.1	2.3
T_{10}	Untreated control	59.3	8.1	1.6
	CD 5%	1.20	0.76	0.10

PPT 17: TO STUDY THE PATHOGENIC VARIABILITY OF OATS

A. *Blumeria (syn.Erysiphe) graminis* f. sp. *avenae* on oat

Location: Palampur

During the season, four isolates of oat powdery mildew were collected (Table 17A) and 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 sterozoom microscope on seventy line of oat. These 70 lines were evaluated with 7 isolates during 2013 and 2014 and preliminary differential set of 10 lines was developed. 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 standardized for pea powdery mildew (Banyal, 1995) will be used.

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

Isolate number	Place of collection
PMO-1	Research farm Agronomy
PMO-2	Tanda
PMO-3	Nagrota
PMO- 4	Rajpur (Palampur)
PMO-5	Plant Pathology, CSKHPKV
PMO-6	Kangra
PMO-7	Fodder farm, CSKHPKV

Table PPT17B: Reaction of genotypes of oat to isolates of *Blumeria graminis.* f. sp. *avenae*

S.No	Oat germplasm	Infection types with isolates						
		2012-13			2013-14			
		PMO-1	PMO-2	PMO-3	PMO-4	PMO-5	PMO-6	PMO-7
1	OL-160	0	2	1	0	2	4	2
2	H38	1	4	1	0	1	2	4
3	K-353	2	2	1	0	2	2	1
4	OL-9	0	1	1	0	2	1	1
5	JHO-862	1	2	1	4	3	4	2
6	UPO-130-2011-12 R1	2	2	1	1	2	4	1
7	IG-03-248 R1	1	2	1	0	2	4	1
8	HFO-163R2	1	1	1	4	3	4	1
9	702	4	2	2	0	3	2	2
10	8655R1	2	2	1	1	2	4	1
11	80	2	1	1	1	2	2	0
12	OS-10 2011-12	0	2	1	0	1	2	0
13	KRR-AK-42	0	2	1	1	2	2	3
14	OH-822	1	1	1	0	1	3	1
15	NO-17	1	1	1	1	0	2	1
16	IG-03-246 OAT	1	3	1	4	4	3	1
17	IG-03-213	4	1	2	4	2	2	1
18	EC-605838	4	3	1	1	2	2	1
19	OL-822	0	2	1	2	2	1	1
20	UPO-119	0	2	2	4	2	2	1
21	IG-03-254	3	3	2	2	2	2	4
22	KRR-AK-36	1	2	1	0	0	2	1
23	HFO-52	2	3	1	1	1	4	1
24	EC-605839	1	4	1	1	3	4	2
25	IG-03-203-2011-12R1	1	2	2	0	1	4	2
26	OS-9	0	1	1	0	2	3	2
27	14-03-247	0	1	1	2	2	3	1
28	IGO 3-214	3	1	1	1	1	2	1
29	KRR-AK-15 R2	0	3	2	0	1	3	1
30	TRS-RKC	0	2	1	1	2	4	1
31	JHO-99-2	1	2	1	1	4	3	1
32	PLP-1	0	1	1	2	2	2	0
33	IG-03-251	0	2	1	1	2	4	1
34	190-14	0	2	1	2	2	2	1
35	IG-03-2111-123	4	1	1	3	2	4	1
36	79	0	1	1	2	2	3	1
37	VPO-102-2011-123	3	1	1	2	3	2	1
38	EC-6058	0	2	2	4	1	3	0
39	EC-6058342011-12R1	1	3	1	3	2	3	1
40	IG-03205	0	1	1	4	3	3	1
41	JHO-813	2	2	1	1	3	2	1
42	NO-77	1	2	1	1	4	1	1
43	KRR-A6-06	0	2	2	1	3	2	1

44	OL-125	0	1	1	2	3	1	3
45	JHO-817	0	1	1	2	2	2	1
46	902-2011-12-R-11	1	2	1	0	4	3	1
47	AOG1124 R1	4	1	1	2	2	2	1
48	CHORRI RATTR3	0	2	1	0	3	2	1
49	SNTM-90R!	0	1	1	0	2	2	1
50	KENT(C)R3	0	2	1	2	3	2	1
51	OS-6-2011-12R2	0	2	1	2	2	1	3
52	PO-113 R-111 2011 -12	0	3	1	2	1	2	2
53	KRR –A6-28R3	1	2	2	1	1	1	2
54	HFO-702	4	1	1	2	2	2	1
55	IG03-250	0	2	1	2	1	1	2
56	UPO-212	4	2	1	0	1	2	0
57	JHO-822	0	3	2	2	2	2	1
58	R019	1	3	1	2	2	2	2
59	EC-605837	1	1	1	0	2	1	1
60	HFO-114	0	3	1	4	2	0	3
61	IG-03-28	0	1	1	2	2	1	1
62	ADG-96	1	3	1	2	1	0	1
63	OS-121	0	1	1	3	3	2	4
64	99-1	4	2	1	2	3	1	3
65	IG-03 216	3	3	1	4	3	3	2
66	IJ-03-266	0	2	2	3	2	1	2
67	HJ-6	3	2	1	4	2	2	1
68	HFO-60	3	3	1	4	4	2	4
69	EC-605631	0	1	4	3	3	0	1
70	OS-92	0	2	1	4	4	1	1

Pathogenic variability:

The virulence pattern of the 7 isolates of *Blumeria graminis* f. sp. *avenae* on differential set (10 lines) is given in Table PPT 17C. On the basis of reaction of 10 differentials, the 7isolates were grouped into 5 different pathotypes (Table PPT17D). Of the 7 isolates, one isolate was placed in pathotype PMO-1, two in pathotypes PMO-2, one in pathotypes PMO-3, two in pathotypes PMO-4 and one in pathotype PMO-5.

Table PPT17C. Reaction of 7 isolates of *Blumeria graminis* f. sp. *avenae* causing powdery mildew of oats on the differential set

S. No.	Isolates	Reaction type of isolates on Differential Lines									
		OL-160	OAT- H 38	IG-03-248 R1	UPO-119	OAT-TRS-RKC	IG-03-251	EC-6058	OAT902-2011-12-R-11	HFO-114	OAT-OS-121
1	PMO-1	0	1	1	0	0	0	0	1	0	0
2	PMO-2	2	4	2	2	2	2	2	2	3	1
3	PMO-3	1	1	1	2	1	1	2	1	1	1
4	PMO-4	0	0	0	4	1	1	4	0	4	3
5	PMO-5	2	1	2	2	2	2	1	4	2	3
6	PMO-6	4	2	4	2	4	4	3	3	0	2
7	PMO-7	2	4	1	1	1	1	0	1	3	4

Table PPT 17D. Virulence pattern of isolates of *Blumeria graminis* f. sp. *avenae* causing powdery mildew of oats on differential set

S. No	Isolate	Infection Types on Differential lines										Patho types	Virulence Frequency (R: S)
		OL-160	OAT- H 38	IG-03-248 R1	UPO-119	OAT-TRS-RKC	IG-03-251	EC-6058	OAT902-2011-12-R-11	HFO-114	OAT-OS-121		
1	PMO-1	R	R	R	R	R	R	R	R	R	R	PMO-1	10:0
2	PMO-2	S	S	S	S	S	S	S	S	S	R	PMO-2	1:9
3	PMO-3	R	R	R	S	R	R	S	R	R	R	PMO-3	8:2
4	PMO-4	R	R	R	S	R	R	S	R	S	S	PMO-4	6:4
5	PMO-5	S	R	S	S	S	S	R	S	S	S	PMO-5	2:8

B. *Helminthosprium avenae* on oat

Location: Ludhiana, Bhubaneswar and Jhansi

This is the second year of the experiment. In first year collection and isolation of *Helminthiosporium avenae* from different locations were done.

Bhubneshwar and Jhansi

Pathogenicity test and re-isolation :

The result of the pathogenicity test was found to be positive. The pathogen *Helminthosprium avenae* isolated during 1st year was inoculated on healthy oat plants grown on earthen pots for development of leaf blight and leaf spot symptoms under controlled condition. Initial symptoms of disease started developing after 5 to 7 days of inoculation, later on the pathogen was re-isolated and cultures were re-examined.

Characterization of *Helminthosporium* cultures:

The cultural characteristic of the re-isolated pathogen was grayish white during initial stage of growth, which later on changed to dark grey to greenish black in colour. The mycelium comprises of hyphae that are branched, septate and light to dark brown in colour, the younger hyphae are slender colourless and distantly septate but with age it turned brown, became wider with close septation. Conidia were formed at the tip of the conidiophores.

The leaf blight and spot samples were isolated on PDA (Potato dextrose agar) and incubated in BOD incubator at 28±2ºC. No sporulation was observed and only grayish white mycelium was observed under the microscope.

Ludhiana

For determination of the optimum conditions for growth and sporulation of the pathogen and identification of suitable substrate for its mass multiplication, following treatment were applied.

Treatments:

Effect of different media on growth of pathogen: Ten different media were used viz., Potato Dextrose Agar, Oat Meal Agar, Oats Leaf Extract Agar, V-8 Juice Agar, 2% Malt Extract Agar, Malt Extract Peptone Dextrose Agar, Maltose Peptone Agar, Malt Yeast Extract Agar, Yeast Extract Dextrose Agar, Czapek-dox agar. The sterilized Petri dishes containing different sterilized test agar medium was inoculated by placing 5mm mycelial disc of the test pathogen in the centre of the Petri dish. The Petri dishes was incubated at 22±1ºC and observations were recorded.Effect of different temperatures, pH levels and light on the pathogen.

Temperatures: 15, 20, 25, 30 and 35º C

pH: 5, 5.5, 6.0, 7.0 and 7.5

Light: Fluorescent (12/12 hrs), Near UV (254 and 365 nm) (12/12) and Complete darkness (24 hrs) same methodology as given above was followed to determine the optimum temperature and pH for the growth and sporulation of the pathogen.

Suitable substrates for mass multiplication of the pathogen:

Seven substrates were used viz., Oat grains, Rye grains, Barley grains, Wheat grains, Sorghum grains, Maize grains and Bajra grains. Approximately 100 gm of the substrate soaked over night in 250 ml Erlenmeyer flasks was sterilized at 15 psi for 20 minutes for three consecutive days. The flasks were inoculated with 5mm mycelial disc of the test pathogen. The flasks were incubated at 22±1ºC and observations were recorded.

Mycelium growth was recorded without sporulation.

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 population was present in the experimental block and the difference in incidence was not significant between the treatments before the start of experiment. Entomopathogenic fungi namely *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 controlling the aphids (Table 18a and 18b). Treatments with *V .lecanii* or *B. bassiana* combined with *Metarhizium anisopliae* or *Nomuraea rileyi* also controlled the aphids. In these cases, mortality of aphids was purely due to *V. lecanii* or *B.bassiana* and not due to either *Metarhizium.anisoplea* or *Nomuraea.rileyii.* This was evident in the sole treatment of *M. anisopliae* or *N.rileyii*. Both the fungi namely *M.anisopliae* or *N.rileyii* were not causing any mortality to aphids, however, these fungi can be used against beetle pests and lepidopteron pests respectively. Aphid incidence significantly influenced the green forage yield, dry matter yield and seed yield in lucerne. Higher green forage yield, dry matter yield and seed yield were recorded in *V. lecanii* and *B. bassianna* treated plots either sole or in combination. All the entomopathogens are absolutely safe and did not affect adversely on natural enemies especially predators of aphids as well as on pollinators of lucerne (Table 18C).

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

Tr. No	Treatment Foliar Application	Pre count of aphids	Post count after 7 DAS	GFY (q/ha)	DMY (q/ha)	Seed yield (q/ha)
T_1	T1 +*V. lecani* @ $4x10^6$ cfu/ml (2g/l)	102.33	19.66	398.33	92.00	1.99
T_2	T2 +*B. bassianna* @ $4x10^6$ cfu/ml (2g/l)	98.33	20.66	390.00	90.00	1.96
T_3	T3 + *M. anisopliae* $4x10^6$ cfu/ml (2g/l)	104.66	64.33	342.33	88.66	1.73
T_4	T4 +*N. releyi* $4x10^6$ cfu/ml (2g/l)	99.33	62.66	368.33	89.33	1.61
T_5	T1 + T2 (half dose of each)	108.00	19.33	395.00	94.66	1.97
T_6	T1 + T3 (half dose of each)	110.00	32.00	393.66	92.00	1.74
T_7	T1 + T4 (half dose of each)	104.00	30.33	390.00	96.66	1.73
T_8	T2 + T3 (half dose of each)	101.33	30.66	388.00	92.00	7.69
T_9	T2 + T4 (half dose of each)	99.66	34.33	396.33	94.00	1.71
T_{10}	T3 + T4 (half dose of each)	97.33	65.33	346.66	86.66	1.62
T_{11}	Untreated control	101.66	64.66	333.33	72.00	1.40
CV		**8.80**	**5.20**	**4.12**	**6.90**	**0.30**
CD at 5%		**NS**	**3.85**	**15.20**	**7.20**	**0.11**

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 Foliar Application	After first Spray		After second Spray	
		Pre count of predators	Post count of predators after 7 DAS	Pre count of predators	Post count of predators after 7 DAS
T_1	*V. lecani* @ $4x10^6$ cfu/ml (2g/l)	6.00	6.33	5.33	5.66
T_2	*B. bassianna* @ $4x10^6$ cfu/ml 2g/l)	6.33	7.00	6.33	6.00
T_3	*M. anisopliae* $4x10^6$ cfu/ml (2g/l)	6.00	7.66	5.33	5.66
T_4	*N. releyi* $4x10^6$ cfu/ml (2g/l)	7.00	8.33	5.33	5.00
T_5	T1 + T2 (half dose of each)	7.33	7.33	6.33	4.33
T_6	T1 + T3 (half dose of each)	6.00	7.66	7.33	6.00
T_7	T1 + T4 (half dose of each)	7.00	8.00	8.33	7.66
T_8	T2 + T3 (half dose of each)	6.33	6.66	5.66	7.33
T_9	T2 + T4 (half dose of each)	8.66	7.66	6.66	5.33
T_{10}	T3 + T4 (half dose of each)	8.33	7.00	6.33	6.00
T_{11}	Untreated control	8.00	6.33	6.00	5.00
CV		**6.82**	**5.45**	**6.54**	**10.42**
CD at 5%		**NS**	**NS**	**NS**	**NS**

Table PPT18C. Effect of entomopathogenic fungi on the pollinators (Lady bird grub/ tiller) of Lucerne

Tr. No	Treatment Foliar Application	After first Spray		After second Spray	
		Pre count of pollinators	Post count of pollinators after 7 DAS	Pre count of pollinators	Post count of pollinators after 7 DAS
T_1	*V. lecani* @ $4x10^6$ cfu/ml (2g/l)	8.00	8.66	7.33	8.00
T_2	*B. bassianna* @ $4x10^6$ cfu/ml 2g/l)	7.33	8.00	7.00	8.66
T_3	*M. anisopliae* $4x10^6$ cfu/ml (2g/l)	7.33	7.66	8.33	7.66
T_4	*N. releyi* $4x10^6$ cfu/ml (2g/l)	6.66	8.00	7.00	8.66
T_5	T1 + T2 (half dose of each)	8.66	7.33	8.66	8.00
T_6	T1 + T3 (half dose of each)	7.66	8.66	8.00	8.33
T_7	T1 + T4 (half dose of each)	8.00	7.33	7.00	7.66
T_8	T2 + T3 (half dose of each)	7.33	6.66	5.33	8.33
T_9	T2 + T4 (half dose of each)	6.66	8.66	5.66	5.33
T_{10}	T3 + T4 (half dose of each)	8.33	7.99	6.66	7.66
T_{11}	Untreated control	7.66	7.00	8.00	6.66
CV		**9.90**	**9.50**	**9.10**	**10.15**
CD at 5%		**NS**	**NS**	**NS**	**NS**

Rahuri:

At Rahuri, Significant reduction of aphid population per tiller in Lucerne was obtained by foliar spray of *B. bassianna* and *M. anisopliae* 4x10^6 cfu/ml (Table 18d). 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: Foliar application of *N. releyi* 4x10^6 cfu/ml (2g/l)

Table PPT 18D: 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 Foliar Application		No. of aphids/tiller		LBB/ tiller	No. *S. litura* larvae/m^2		No. *H. armigera* larvae/m^2		Yield (q/ha)			ICBR
		Pre-count	7 DAS	7 DAS	Pre-count	7 DAS	Pre-count	7 DAS	GFY	DMY	Seed	
T_1	T1 +V. *lecani* @ 4x10^6 cfu/ml (2g/l)	33.81	8.94	2.13	8.34	9.78	6.95	8.66	126.90	20.30	2.04	4.57
T_2	T2 + *B. bassianna*@ 4x10^6 cfu/ml (2g/l)	33.92	27.04	1.87	8.56	2.11	7.38	2.16	135.77	21.72	2.85	10.79
T_3	T3+ *M. anisopliae* 4x10^6 cfu/ml (2g/l)	34.41	9.40	2.12	9.22	8.78	6.78	5.69	132.57	21.21	2.08	5.12
T_4	T4+ *N. releyi* 4x10^6 cfu/ml (2g/l)	32.91	27.61	2.40	8.00	1.85	7.40	1.84	140.33	22.45	2.94	11.59
T_5	T1 + T2 (half dose of each)	33.36	9.84	2.00	8.78	2.62	7.56	5.81	140.35	22.46	2.12	5.71
T_6	T1 + T3 (half dose of each)	35.90	8.65	2.12	8.45	9.56	7.59	6.05	129.89	20.78	2.05	4.77
T_7	T1 + T4 (half dose of each)	34.55	12.23	2.18	8.34	2.55	8.06	5.94	128.95	20.63	2.20	5.82
T_8	T2 + T3 (half dose of each)	34.11	11.89	1.92	8.67	2.67	8.38	6.08	134.95	21.59	2.15	5.70
T_9	T2 + T4 (half dose of each)	33.78	28.59	1.90	8.23	1.11	7.82	1.67	140.17	22.43	3.03	**12.20**
T_{10}	T3 + T4 (half dose of each)	33.30	13.00	2.16	8.12	2.44	8.20	4.53	134.65	21.54	2.17	5.83
T_{11}	Untreated control	34.66	60.10	2.76	9.11	12.89	8.55	12.67	88.82	14.21	1.47	
SE±		**0.19**	**0.14**	**0.03**	**0.07**	**0.05**	**0.06**	**0.07**	**4.04**	**0.65**	**0.22**	
CD at 5%		**N.S.**	**0.40**	**0.08**	**N.S.**	**0.16**	**N.S.**	**0.20**	**11.95**	**1.91**	**0.64**	

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)

PPT18E: 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	Total cost Rs	Net profit	ICBR
T1	38.08	0.56	7425.96	19728.22	27154.17	4875	22279.17	4.57
T2	46.95	1.38	9154.97	48318.55	57473.52	4875	52598.52	10.79
T3	43.75	0.61	8530.42	21318.62	29849.04	4875	24974.04	5.12
T4	51.51	1.47	10044.00	51351.18	61395.18	4875	56520.18	11.59
T5	51.53	0.65	10047.86	22679.65	32727.51	4875	27852.51	5.71
T6	41.07	0.57	8008.59	20116.95	28125.54	4875	23250.54	4.77
T7	40.13	0.73	7825.40	25419.45	33244.85	4875	28369.85	5.82
T8	46.13	0.68	8994.89	23669.45	32664.35	4875	27789.35	5.70
T9	51.35	1.55	10013.02	54332.48	64345.51	4875	59470.51	**12.20**
T10	45.83	0.70	8936.49	24369.45	33305.94	4875	28430.94	5.83

Green forage Rs. 195/ quintal, Seed Rs. 35000/quintal ,Cost of all entomopathogenic fungi : Rs. 150/ kg
Labour + spray pump charges: Rs. 600/ha

Jhansi

At Jhansi centre, the results revealed that significant reduction of aphid population in Lucerne was obtained by foliar spray of *V. lecani* and *M. anisopliae* $4x10^6$ cfu/ml. However, alfalfa weevil infestation was less. There was no significant difference in the number of sprays.

Hyderabad

No treatments were imposed as the aphid incidence was below economic threes hold level.

CHAPTER-4

BREEDER SEED PRODUCTION

BREEDER SEED PRODUCTION IN FORAGE CROPS (RABI-2013-14)

In Rabi 2013-14, the indent for Breeder Seed Production was received from DAC, GOI for 26 varieties in four forage crops *viz*., Oat (10), Berseem (8), Lucerne (4) and Gobhi Sarson (4). The quantity allocated was 443.37 q and it was assigned to ten Breeder Seed producing centers of the different SAUs/ NGO/ ICAR institutes. Among quantity indented for different forage crops, the maximum was for Oat (402.2 q) followed by Berseem (35.05 q), Lucerne (5.8 q) and Gobhi Sarson (0.32 q).

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 36.70 q (1.65q surplus) and in Gobhi Sarson the production was 0.43 q (0.11 q surplus). However in Oat, the production was 398.3 q (3.9 q deficit) against the allocation of 402.2 q. Similarly in Lucerne, there was 0.50 q deficit in production with respect to 5.8 q allocation. The overall breeder seed production was 2.64 q (0.59 per cent) less as evident from seed production of 440.73 q against the indent for 443.37q (Table BSP 1&2). Some of the reasons for less production of breeder seed in certain varieties were due to damage of crops and non-availability of nucleus seed (Table BSP 2).

Additional Breeder seed production: In addition some of the centers produced breeder seed of different crops as per details given below

Breeder seed production in addition to allocation

S. N.	Producing Center	Crop	Variety	DAC Indent	Allocation as per BSP-1 target	Actual production
1	PAU, Ludhiana	Oat	Kent	-	-	25.0
		Rye Grass	PBRG-1	-	-	0.50
		Metha	M-150	-	-	3.20
2	IGFRI, Jhansi	Oat	JHO-822	-	-	11.5
3	MPKV, Rahuri	Oat	Kent	-	-	9.60
		Berseem	Wardan	-	-	1.26

Non- lifted breeder seed status: The non-lifted seeds of last year production are alos available with the centre as per details below.

Status of Lifting/Non-lifting of Breeder seed of forage cops

S. N.	Producing Center	Crop	Variety	Allocation as per BSP-1 target	Actual production (BSP IV)	Un-lifted quantity	Lifting Agency
1	BAIF, Urulikanchan	Oat	Kent	40.0	31.20	31.20	U.P.
2	PAU, Ludhiana	Berseem	BL-22	0.10	0.10	0.10	SAI
			BL-42	5.0	5.0	5.0	NSC
				4.0	4.0	1.40	SAI
		Oat	Kent	50.0	50.0	10.0	J&K
				5.0	5.0	1.0	SAI
				13.4	13.4	13.4	U.P.

Table BSP 1: Center-wise Breeder Seed Production (q) *Rabi*-2013-14

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	60.1	60.1	60.1	-
		Lucerne	Anand-2	4.0	4.0	4.0	-
			AL-3**	0.8	0.8	0.3	(-) 0.5
			Anand-3**	0.5	0.5	-	-
2.	IGFRI, Jhansi	Oat	Kent***	209.0	209.0	150.9	(-) 58.1
			JHO-851	4.0	4.0	7.5	(+) 3.5
			JHO-99-2	10.0	10.0	12.0	(+) 2.0
			JHO-2000-4	5.0	5.0	4.45	(-) 0.55
		Berseem	Wardan****	7.05	7.05	2.5	(-) 4.55
			Bundel Berseem-3****	4.25	4.25	0.2	(-) 4.05
			Bundel Berseem-2	1.1	1.1	3.0	(+) 1.9
3.	PAU, Ludhiana	Berseem	BL-1	4.2	4.2	4.5	(+) 0.3
			BL-10	5.45	5.45	5.5	(+) 0.05
			BL-42	8.6	8.6	9.0	(+) 0.4
		Gobhi Sarson	GSL 1*	0.02	0.02	-	-
4.	CCS HAU, Hisar	Oat	Haryana Javi-8	12.5	12.5	12.5	-
			OS-6	17.0	17.0	12.75	(-) 4.25
		Berseem	Mescavi	1.75	1.75	2.0	(+) 0.25
5.	JNKVV, Jabalpur	Oat	Kent	26.6	26.6	50.0	(+) 23.4
		Berseem	JB-1	2.65	2.65	10.0	(+) 7.35
6.	GBPUAT, Pantnagar	Oat	UPO-212	2.0	2.0	7.0	(+) 5.0
7.	SKUAST, Srinagar	Oat	Sabjar	24.0	24.0	32.0	(+) 8.0
			Shalimar Fodder Oat-1	11.0	11.0	21.0	(+) 10.0
8.	MPKV, Rahuri	Oat	Phule Harita (RO-19)	6.0	6.0	17.6	(+) 11.6
		Lucerne	RL-88	0.5	0.5	1.0	(+) 0.5
9.	CSK HPKV, Palampur	Gobhi Sarson	HPN-1 (Sheetal)	0.1	0.1	0.12	(+) 0.02
			Him Sarson-1	0.1	0.1	0.17	(+) 0.07
			Neelam	0.1	0.1	0.14	(+) 0.04
10.	BAIF, Urlikanchan	Oat	Kent	15.0	15.0	10.5	(-) 4.5
Total				443.37	443.37	440.73	(-) 2.64

* Nucleus seed was not available with the concerned breeder;
** AL-3 & Anand-3 are same variety
***UP, AH, indent not produced as they did not lift last year,
****Sowing was done in more than required area. Crop was good. However, due to intermittent rain at flowering, there was exceptionally poor seed yield

Table BSP 2: Variety-wise Breeder Seed Production (q) *Rabi* 2013-14

Crop	Name of Variety	DAC Indent	Allocation as per BSP-1 target	Actual production	Production Surplus (+)/ Deficit (-)
1	**Oat**				
	Kent	310.7	310.7	271.5	(-) 39.2
	HJ-8	12.5	12.5	12.5	-
	OS 6	17.0	17.0	12.75	(-) 4.25
	JHO-851	4.0	4.0	7.5	(+) 3.5
	JHO-99-2	10.0	10.0	12.0	(+) 2.0
	JHO-2000-4	5.0	5.0	4.45	(-) 0.55
	UPO-212	2.0	2.0	7.0	(+) 5.0
	Phule Harita	6.0	6.0	17.6	(+) 11.6
	Sabzar	24.0	24.0	32.0	(+) 8.0
	Shalimar Fodder Oat-1	11.0	11.0	21.0	(+) 10.0
	Total	**402.20**	**402.20**	**398.30**	**(-) 3.9**
2	**Berseem**				
	Wardan	7.05	7.05	2.5	(-) 4.55
	Bundel Berseem-2	1.1	1.1	3.0	(+) 1.9
	Bundel Berseem-3	4.25	4.25	0.2	(-) 4.05
	Mescavi	1.75	1.75	2.0	(+) 0.25
	BL 1	4.2	4.2	4.5	(+) 0.3
	BL 10	5.45	5.45	5.5	(+) 0.05
	BL 42	8.6	8.6	9.0	(+) 0.4
	JB 1	2.65	2.65	10.0	(+) 7.35
	Total	**35.05**	**35.05**	**36.70**	**(+) 1.65**
3	**Lucerne**				
	Anand 2	4.0	4.0	4.0	-
	AL-3	0.8	0.8	0.3	(-) 0.5
	Anand-3	0.5	0.5	-	-
	RL-88	0.5	0.5	1.0	(+) 0.5
	Total	**5.80**	**5.80**	**5.30**	**(-) 0.50**
4	**Gobhi Sarson**				
	HPN-1 (Sheetal)	0.1	0.1	0.12	(+) 0.02
	Him Sarson-1	0.1	0.1	0.17	(+) 0.07
	Neelam	0.1	0.1	0.14	(+) 0.04
	GSL-1	0.02	0.02	-	-
	Total	**0.32**	**0.32**	**0.43**	**(+) 0.11**
	G. Total	**443.37**	**443.37**	**440.73**	**(-) 2.64**

All India Coordinated Research Project on Forage Crops

Details of FTDs allocated/conducted in Rabi 2013-14

S. N.	Centre name	Crop-wise FTDs allocated/conducted during Rabi 2013-14					Total
		Berseem	Lucerne	Oat (SC)	Oat (MC)	Others	
1.	Jorhat	--	--		10	-	20
2.	Bhubaneswar.	--	--	10	-	-	10
3.	Kalyani	10	5 (annual)	25	-	-	40
4.	Ranchi	10	--	10	10	10 (oat + berseem)	40
5.	Faizabad	--	--	10	-	-	10
6.	Jabalpur	20	--	10	-	-	30
7.	Anand	--	10 (annual)	10	-	-	20
8.	BAIF Urul.	5	5 (perennial)	15	-	-	25
9.	Rahuri	10	10 (perennial)	-	10	-	30
10.	Bikaner	--	10 (annual)	15	-	-	25
11.	Ludhiana	50	--	-	30	20 Rye grass	100
12.	Hisar	10	--	5	-	-	15
13.	Coimbatore	--	10 (perennial)	-	-	10- cowpea	20
14.	Hyderabad	--	15 (perennial)	15	-	-	30
15.	Mandya	--	10 (perennial)	10	-	-	20
16.	Palampur	--	-	-	15	5- Tall fescue 3- w clover	23
17.	Vellayani	--		-	-	5 cowpea 5 (Guinea) 10 (BNH)	20
18.	Srinagar	--	--	30	-	-	30
19.	Raipur	20	-	5	5	15-Lathyrus	45
20.	Imphal	-	-	5	-	-	5
21.	Palghar	5	5 (perennial)	-	-	5 Rabi Maize	15
22.	Karjat	10	-	10	-	-	20
	Total	**150**	**80**	**195**	**80**	**88**	**593**

Monitoring details of Rabi 2013-14 AICRP-FC trials

Name of Centre	Monitoring Team	Date of monitoring
AAU, Jorhat	Dr. C. K. Kundu	8-9 Feb, 2014
OUAT, Bhubaneswar	Drs R. B. Bhaskar & K. K. Sharma	27-28 Feb, 2014
BCKV, Kalyani	Drs R. B. Bhaskar & K. K. Sharma	24th Feb, 2014
BAU, Ranchi	Drs R. B. Bhaskar & K. K. Sharma	26th Feb, 2014
JNKVV, Jabalpur	Drs. A. K. Mall & P. M. Patel	20-21 Feb, 2014
AAU, Anand	Drs. A. K. Mehta & B. G. Shekara	10th Feb, 2014
BAIF Urulikanchan	Drs. A. K. Mehta & B. G. Shekara	12th Feb, 2014
MPKV, Rahuri	Drs. A. K. Mehta & B. G. Shekara	13th Feb, 2014
RAU, Bikaner	Drs. A. K. Mall, Ritu Mawar and S. R. Kantwa	9th March, 2014
PAU, Ludhiana	Drs. V. K. Sood & S. M. Kumawat	24th March, 2014
CCS HAU, Hisar	Drs. V. K. Sood & U. S. Tiwana	25th March, 2014
TNAU, Coimbatore	Drs. S. R. Kantwa & M. R. Krishnappa	22-23 Feb, 2014
ANGRAU, Hyderabad	Drs. S. R. Kantwa & C. Babu	19-20 Feb, 2014
UAS (ZRS, Mandya)	Drs. S. R. Kantwa & C. Babu	21st Feb, 2014
CSK HPKV, Palampur	Drs. Ansar Ul Haq & Noorul Saleem Khuru	13-14 March, 2014
KAU, Vellayani	Drs. S. R. Kantwa & C. Babu	24th Feb, 2014
IGKV, Raipur	Dr A. K. Mall	22-23 Feb, 2014
CAU, Imphal	Drs. G. B. Das & C. K. Kundu	5-6 Feb, 2014
SKUAST, Kashmir	Drs. V. K. Sood & U. S. Tiwana	11-13 May, 2014

APPENDICES

APPENDIX-I

In House Breeding Activities

AICRP-FC AAU, Anand

Collection of new germplasm:

S. N.	Crop	Total samples	Source
1.	Lucerne	5	*Kutchh* district
2.	Sorghum	8	*Kutchh* district
3.	Grasses	1	*Kutchh* district
4.	Sorghum	11	NDDB, Anand

Breeding activities

Lucerne:

- Germplasm maintenance: 200 Nos.
- Contribution of entries in trial**:**

S. N.	Crop	Name of entry	Name of trial
1.	Lucerne	Anand-25	VTL (P) (*Rabi*-2013-14)
		Anand-26	
2.	Lucerne	Anand-24	VTL (P) (*Rabi*-2011-12)

- 10 F_1 seeds were raised and their self seeds obtained for next generation.
- 9 F_2 progenies were raised and 9 plants were selected on the basis of morphological characters (plant height, tillers, leafiness, short inter node).
- **Segregating materials:**

Sr. No.	Centre	Generation	Bulk made
1	Coimbatore	F_6	5
2	Urulikanchan	F_6	1
3	Anand	F_6	1

Above seven promising (bulk) will be tested in PYT in during *Rabi*-2014.

From Polycross progenies, 25 plant progenies were selected (*rabi*-2012) and materials were sown during *Rabi*-2013-14. From these 25 progenies most promising individual plants (17) were identified. They allowed to random mate by open pollination. The seed of selected promising plants harvested individually.

Forage Maize:

- **Population improvement:** Eight populations were raised in isolated area and allowed them for 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-5 G_1	:	African Tall (Annad)
Cycle-5 G_2	:	J-1006 (Anand)

Nucleus seed production:

Sr. No.	Crop	Quantity (kg.)
1.	Oat var. Kent	400
2.	Lucerne var. Anand-2	12
3.	Lucerne var. AL-3	15

Breeder seed production:

Sr. No.	Crop	Quantity (kg.)*
1.	Oat var. Kent	7510
2.	Lucerne var. Anand-2	300
3.	Lucerne var. AL-3	55

AICRP-FC BAIF, Urulikanchan

Mandate crops: Maize, Pearl millet, Lucerne, Hy. Napier, *Cenchrus* and *Stylosanthes*

Breeding work in Lucerne & Maize undertaken during *Rabi* 2013-14

Lucerne

- **Poly-cross 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. Similarly the center was received crossed seed (F_1) of 75 plants from these three centers. Progeny of 97 F_1's was sown during *Rabi* 2012-13in 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. Total of seventeen cut were obtained from the progenies. Among the best performing progenies, the individual clump selection was done.
- **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. Twenty seven cut were obtained and observations on GFY, DMY, CP%, plant height, inter nodal length, leaf stem ratio & no. of tillers were collected.

Maize

- **National breeding programme:** Under the population improvement programme, F_7 progeny of seed of 16 IPS done from F_6 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. The bulk seed was obtained from the desired plants for further progeny cultivation and station trial.
- **Breeder seed production**: Programme was implemented for Oats variety Kent on 0.80 ha area. The allotment for production of breeder seed was 15 Q and raw seed obtained was 11 Q.

AICRP-FC SKRAU, Bikaner centre

Breeding activities for Lucerne during Rabi-2013-14

- **Variety development:** One lucerne variety RRB-07-1 (Krishna) developed from Bikaner centre was identified for release for North West zone of the country in recently held National Group Meeting of the project at SKRAU, Bikaner on March 8, 2014.
- **Breeding work:** Polycrosses were made among seven selected entries of lucerne. Seed harvested from such crosses will be evaluated in Rabi-2014-15 for further use. Selection of superior plants was also done from the seed material generated from crosses made in previous years.
- **Germplasm:** 25

AICRP-FC TNAU, Coimbatore

Poly cross breeding programme in Lucerne: The poly-crossed seeds obtained from Coimbatore, Anand, Rahuri, BAIF Pune [125 plants (25 x 5 centers)] have been sown in single row of 4 m length spaced at 30 cm along with checks (parents) in an augmented block for further evaluation. All the progenies have been evaluated for green fodder yield and pests and disease incidence against the checks in three harvests made during 22.01.2013, 25.02.2013 and 25.03.2013 respectively. A total of 50 progenies have been selected based on the data and allowed for seed production during summer 2013. The seeds collected from 50 individual plants have been sown in progeny rows on 28.11.2013 for further evaluation. The promising plants in selected progenies have been allowed for random mating by open pollination during summer 2014.

Seed multiplication in Lucerne: Seed multiplication of five promising entries identified from previous Poly cross breeding programme have been taken up during summer 2014 further promotion.

Seed multiplication in Fodder cowpea: Seed multiplication of advanced cultures *viz*., TNFC 0924 and TNFC 0926 have been taken up during summer 2014 further promotion.

AICRP-FC AAU, Jorhat

- Seed multiplication of Maize composites: Development of forage composite maize variety is attempted with fifteen maize germplasm collected from North East India. The seed multiplication was done with the seeds of selected plants.
- Seed multiplication of Maize germplasm.
- Evaluation of Ricebean germplasm**:** Fifteen ricebean entries were evaluated in rice fallow land in the month of November 2013. Harvesting is done in the month of May. Soil testing was also done before sowing and after harvesting of the crop.
- Evaluation of Lathyrus germplasm: Evaluation of fifteen lathyrus germplasm were initiated in Rabi 2011-12 with check entry Nirmal. From the three years data Entry JCL-8 found superior in respect of GFY, DMY and per day productivity.

AICRP-FC ANGRAU, Hyderabad

Germplasm Holding:

Fodder Cowpea:

S N	Crop	Number of Collections	Source
1.	Fodder Cowpea	40	1. NBPGR, Regional Station, Hyderabad 2. RARS, ANGRAU, Tirupathi
2.	Fodder Maize	45	Maize Research centre, ANGRAU, Hyderabad.
3.	Fodder Bajra	16	ICRISAT, Hyderabad.
4.	Napier Lines	10	TNAU, Coimbatore.

- Seed multiplication of APFC 10-1 was taken up to test the entry performance in 3rd year of minikit of the state for *Kharif,* 2014. The 1st& 2nd year minikit feedback from farmers revealed that the entry has shown an average of 7.4 -18.3 per cent 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* 2014.

S. No.	Cross	No.of bulks
1.	CO4 x UPC 625	2
2.	UPC5286 x CS88	1
3.	CO2 x CO5	1
4.	CN 8076 x SK-55	2

- The following crosses in F5 generation were advanced to F6 generation.

S. N.	Cross	S. N.	Cross
1.	CO5 x UPC 5286	6.	B.L X selection local
2.	CO4 x SK-58	7.	CO4 X SK-57
3.	CO2 x CS-88	8.	CO4 X SK-55
4.	NDFC-6 x B.L	9.	CO4 X B.L
5.	CN 8076 x B.L	10.	CO4 X TPTC-1

- During summer 2013-14, twenty germplasm lines obtained from NBPGR, Regional Station, Hyderabad were evaluated.

Fodder Maize:

- F4 population of G1 group (African tall) and G2 group (J1006) were sown during *Kharif*-2013. Further individual plants of desirable characters *i.e* more plant height, broad and lengthy leaves, more no of leaves, early duration etc were selected and allowed for random mating. Seeds harvested from selected plants were bulked to take up further cycles of selection and random mating until desired level of uniformity.
- DHM 117, Hybrid seed multiplication was taken-up during *Rabi* 2013. It was promoted to AVTHM -2 for testing in NEZ and NWZ.
- A total of 20 genotypes, majority of them landraces suitable for fodder purpose were selected from the winter nursery plots of AICRP-Maize, Hyderabad and they will be evaluated during *Kharif* 2014for early duration, high green fodder yield, dry fodder yield, crude protein content and also crude fiber content.
- Among the selected landraces, the taller genotypes about 10 in number will be allowed 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.

Multi-cut bajra:

- The F_4 generations of following cross combinations of Multicut bajra genotypes are being advanced during Rabi 2013-14.

S. N.	Cross
1.	MRB 8 x ICMV 05 555
2.	Giant bajra x MRB-8
3.	Giant bajra x Jakarana
4.	ICMV 05 555 x Giant bajra
5.	Rijco bajra x Giant bajra

- APFB 09-1 was promoted to test in AVTPM-2.The seed multiplication was taken up during Rabi 2013-14.
- APFB 09-1 has been proposed for 2nd year of minikit testing in the state during Kharif 2013 as against the check variety APFB-2.

Bajra Napier hybrids:

- Fifty four 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.

AICRP-FC BAU, Ranchi

Seed Multiplication

- Multiplication of seeds: Oat, Berseem, Lathyrus

Lathyrus

- Local germplasm were collected from different villages of Jharkhand.
- 5 germplasm were maintained

Oat

- Five different fresh crosses were made in Oat.

AICRP FC JNKVV, Jabalpur

- Germplasm holding

Crop	No. of collection
a. Oat	131
b. Berseem	143

Berseem

- To create variability, poly cross nursery programme has been started taking five diverse parents *viz*., Wardan, BL42, Mescavi, UPB110, and JB1 .Tripping has been done is to ensure cross pollination in all possible combination. Selections shall be made in all for fodder traits in coming generation.
- Variety JB-1 has been treated with different doses (six) of gamma rays. Single plant selection and row bulks were done, treatment wise to raise the M_5 generation.
- In Wardan, four superior bulks were selected from M_6population.

Oat

- Under National crossing programme crosses have been attempted with Kent and JO-1 with *Avena sterilis*. Seeds were grown as first filial generation.
- 61 advanced lines were evaluated for different fodder traits.
- No. of crosses made-5
- Segregating material advanced/ handled-44(F_2 onwards)
- Advance breeding lines-53

AICRP-FC SKUAST, Srinagar

Oat:

- **Evaluation of segregating generation**

F3 families of below detailed crosses were evaluated and selections were made among families for further evaluation.

S. N.	Cross Combination
1	SKO-208 X SKO-204
2	SKO-211 X SKO-205
3	SKO-211 X SKO-204
4	SKO-211 X SKO-210
5	SKO-207 X Sabzaar
6	SKO-212 X SKO-209
7	SKO-207 X SKO-205
8	SKO-212 X SKO-204
9	SKO-210 X SKO-207
10	SKO-205 X SKO-204
11	SKO-207 X SKO-204
12	SKO-208 X SKO-205

Selections from Segregating generations:

S. N.	Segregating generations	No. of individual plant selections (IPS) made
1	F 5 (6 crosses)	15 families
2	F 6 (4 crosses)	6 families

- **Barley Programme**

Five advanced breeding lines were selected from 12 dual purpose (fodder and grain) barley lines on the basis of fodder yield, grain yield and reaction to Yellow Rust and will be evaluated over diverse locations to further confirm their yield potential and reaction to diseases.

- **Alfalfa Programme**

Efforts were been made to explore the feasibility of sustainable cultivation of alfalfa (*Medicago falcata*) under temperate climatic conditions of the valley and in this regard M.falcata accessions collected from Drass area of Ladakh were planted at MLRS Manasbal and the crop established well flowered and set seed also, thus opening opportunities of cultivating *M.falcata* under temperate climatic conditions of Kashmir valley. In view of success of M. falcata under valley conditions, more germplasm collections will be made from Drass area of Ladakh this year for initiating a population improvement programme.

AICRP-FC UAS, Mandya

Cowpea: Thirty two crosses were made using 8 lines and 4 testers as parents during *Kharif* 2013, and these crosses were evaluated for forage traits during *Rabi* season 2013-14.

Maize: Two hundred eighty five inbred lines were identified, evaluated for forage traits, and downy mildew diseases resistance during *Rabi* 2013-14.

AICRP-FC PAU, Ludhiana

- A total of ten local trials were conducted in different fodder crops *viz*., Oats (7), Berseem (1), Lucerne (1) and Ryegrass (1). The details of these trials is given below:

S.N.	Trial	Entries	Promising entries
1.	Multilocation fodder trial in Oats	13+4(c)	OL 1804, OL 1709, OL 1802
2.	Small Scale fodder trial Oats-1	12+4(c)	OL 1835, OL 1837, OL 1831
3.	Small Scale fodder trial Oats-2	12+4(c)	OL 1841, OL 1844, OL 1847,
4.	Dual Purpose Trial in Oats-1	16+3(c)	OL 1769, OL 1758, OL 1809
5.	Germplasm evaluation for dual Purpose in Oats	96+3 (c)	Data being analysed
6.	Seed yield trial in Oats	3 + 3(c)	Data being analysed
7.	Germplasm evaluation for seed yield potential in oats	49	Data being analysed
8.	Local Fodder Trial-Berseem	19+ 2(c)	PC 22, PC 87, PC 75
9.	Local Fodder Trial- Lucerne	6+ 2(c)	Local collection (4) (LC 4),
10.	Local Fodder Trial- Ryegrass	5 + 1(c)	PBRG 1

- One multilocation trial comprising of thirteen entries including checks was conducted at three locations *viz*; Ludhiana, Gurdaspur and Kapurthala to evaluate for high green fodder and dry matter yield along with other quality attributes under multicut conditions.
- New interspecific crosses of cultivated oats (*Avena sativa*) with wild oats species and exotic lines acquired from IGFRI, Jhansi, have been attempted to introgress the useful traits from wild species to cultivated oats..
- A total of one hundred and thirty two crosses have been attempted involving promising genotypes (Table 1).
- Breeding material handled following standard breeding methods and procedures:

S. N.	Generation	Number
1	F_1	124
2	F_2	405
3	F_3	413
4	F_4	816
5	F_5	400
6	F_6	70

- Mutation programme (gamma rays induction) initiated during *Rabi* 2009-10 was carried on this season also and individual plant selections have been made from M_4 generation of OL 9 and Kent mutated material (25 Kr, 50 Kr, 75 Kr and 100 Kr).
- A project entitled "Introgression in oat by developing oat-maize addition (OMA) lines" has been sanctioned by UGC, New Delhi. Attempts were made to make oat x maize crosses along with the standardization of the embryo culture media to develop plants through embryo rescue.
- Maintenance breeding was continued in crops *viz*; Lucerne and Ryegrass.

Germplasm maintained/handled

Crops	Germplasm
Oats	300
Berseem	522
Lucerne	20
Ryegrass	12

- **Polycross programme taken up:**

Berseem: Polycross nursery consisting of nine entries
Ryegrass: Polycross nursery consisting of eight entries

Nucleus seed production:
Nucleus seed produced in Oat (Var. Kent & OL-9), Berseem (Var. BL-10, BL-42, BL-1, BL-22, BL-180), Rye grass (PBRG-1), Metha (Var. ML-150), Lucerne (LLC-5) Senji (Var. Senji safed 76 & YSL 106) and Shaftal (SH-69).

- **Breeder seed production**

In Rabi-2013-14, breeder seed produced in Oat (Var. Kent); Berseem (Var. BL-10, BL-42 & BL-1); Metha (ML-150) and Ryegrass (PBRG-1).

- **Foundation seed production**

In Rabi-2013-14, breeder seed produced in Oat (Var. Kent) and Berseem (Var. BL-10 & BL-42)

AICRP-FC MPKV, Rahuri

- **POLYCROSS PROGRAMME OF LUCERNE:**

The new polycross 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) 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) were identified, tagged and numbered. Selected individual plants were maintained by rooted cuttings in a mother plant clonal nursery

Summer 2014	The promising plants in selected progenies were allowed to random mate by open pollination
	The OP seed of selected promising plants (40-50) were harvested individually. The same will be evaluated in progeny test during rabi 2014-15.
Rabi-2014-15	The OP seed of 49 selected plants will be sown in a single row of 3m length spaced at 30 cm for progeny test (Nov., 2014).
	The 49 progenies will be evaluated for GFY, DMY and pest/disease resistance.
Rabi-2015-16	The best 20-25 progenies out of 49 progenies will be selected during August-September on the basis of GFY , DMY pest/disease resistance data.
	The clones of the mother plants of selected progenies 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).

EVALUATION 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 **(Total of 16th Cuts)**

Entry	Performance	GFY (q/ha)	DMY (q/ha)	CPY (q/ha)	DM %	CP %	Mean pl. ht. (cm)	Inter node length (cm)	No. of tillers/pl.
Progeny	**Min.**	98	16.01	3.36	16.22	16.0	49.06	3.97	8.54
	Max.	986.46	320.39	60.27	39.36	21.44	328.67	5.01	14.87
	Average	440.03	130.21	24.91	29.55	19.12	61.76	4.55	10.65
Check	**Min.**	552.23	159.43	30.69	26.35	18.12	52.85	4.28	9.29
	Max.	859.97	246.27	44.62	30.32	20.44	53.9	4.54	10.91
	Average	714.59	202.36	38.45	28.34	19.12	53.40	4.41	9.96
Experimental Mean		440.53	129.93	24.13	14.38	18.57	59.60	4.41	10.32

GERMPLASM EVLUATION IN LUCERNE:

Sowing Date: 29-11-2011, non replicated, Plot Size: 4.00 x 1.20 m, Fertilizer: 20:150:40 NPK

Entry	Performance	GFY (q/ha)	DMY (q/ha)	CPY (q/ha)	CP (%)	Pl. Ht. (cm)	L/S ratio	NDF (%)	ADF%	IVDMD (%)
Germp	**Min.**	886.07	144.78	28.77	17.89	53.0	0.67	44.58	34.56	56.24
	Max.	2230.93	405.85	83.44	21.08	68.0	1.08	54.26	39.61	63.46
	Average	1644.22	281.96	54.30	19.21	59.45	0.93	50.04	37.85	60.26
Check	**Average**	1734.26	345.05	72.08	20.89	57	0.85	46.48	37.56	62.34
Experimental mean		1689.24	313.51	63.19	20.05	58.23	0.89	48.26	37.71	61.30

Conclusion: On the basis of thirty seven cut data on GFY, DMY and CPY, four germplasm accessions *viz*., RLG-11-13, RLG-11-58, RLG-11-19 and RLG-11-22 were found to be promising. The self seed collected during summer 2014 will be used for evaluation in station trial during Rabi 2014-15.

Crossing programme in oat

Season	Activity
Rabi 2013-14	Crosses attempted: Kent x RO-2013-1 Kent x RO-2013-2
Rabi 2014-15	Growing of F_1
Rabi 2015-16	Growing of F_2 and selection of individual plants
Rabi 2016-17	Growing of F_3 progenies
Rabi 2017-18	Growing of F_4 progenies
Rabi 2018-19	Preliminary Yield Trial (PYT)
Rabi 2019-23	Station and Multilocation Trial

- **Germplasm Maintained :**

S. N.	Crop	Germplasm
3	Sorghum	15
4	Sudan grass	54
5	Lucerne	27

AICRP FC CSKHPKV, Palampur

Germplasm Holding

Crop	No. of collections
Tall Fescue Grass (*Festuca arundinacea)*	41
Rye Grass (*Lolium perenne)*	8
Red Clover (*Trifolium pratense)*	5
White Clover (*Trifolium repens)*	30
Oat (*Avena* spp.)	135

- 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. sativa* x *A. byzantina* were made to create genetic variability and the material is in segregating, backcross and advance generations. About 200 breeding lines have been selected. Eleven promising entries developed through hybridization programme were evaluated in the multi locational station trials. Two entries PLP 14 and PLP 15 are being evaluated in coordinated trials.
- Mapping populations have been developed to identify molecular markers linked to powdery mildew resistance.

Tall Fescue

- Hima 14 has been released during 2013.
- Polycross progenies are under evaluation.
- Evaluation of 32 genotypes against checks revealed superiority of entry Hima 15 for fodder yield and related traits.

Rye Grass

- Seven rye grass populations have been multiplied for further evaluation in the ensuing *Rabi* season.

Lolium x Festuca hybridization

- Four cross combinations of these two grass species have been attempted to develop hybrids.

White clover

- Promising composite populations of white clover namely, PWC-3, PWC-22 and PWC-25 have been multiplied for further evaluation.

Red clover

- Restricted Recurrent Phenotypic Selection (RRPS) have been taken up for developing superior populations and two populations have been developed.

APPENDIX-II

Other Activities
AICRP FC, AAU, ANAND

Publications:
Research Paper: 1
Deore, S. M.; Patel, M. R.; Patel, P. M.; Patel, H. K. and Patel, U. J. 2013. Production potential of forage maize (*Zea mays* L.) – cowpea (*Vigna unguiculata* L.) intercropping system as influenced by row ratios. *Advance Research Journal of Crop Improvement*, 4(2): pp.110-112
Books- 2
Popular articles-2
Pamphlets-5

Student Guided: 1 M.Sc. Plant Breeding

FTD conducted: 58
AICRP : Lucerne (10), Oats (10)
AFDP : Lucerne (14), Oats (24)
Krushi Matotsav-2014: One
All Scientist were involved
Seed / Planting material Sold:

Hybrid Napier	:	52413 rooted slips
Oats	:	915 kg
Lucerne	:	120 kg
Bajra	:	80 kg

Externally Funded Project: One Accelerated Fodder Development Programme

AICRP FC, SKRAU, BIKANER

Awards and honours:
- Dr. S. S. Shekhawat selected as Editorial Board Member of 'Electronic Journal of Plant Breeding' published from Tamil Nadu Agricultural University, Coimbatore for 2014.

Publications (books, research papers, bulletins etc.)
Research papers: Two
Bika, N. K. and Shekhawat, S. S. 2014. Genetic variability study in pearl millet (*Pennisetum glaucum* (L.) R. Br. for green fodder yield and related traits. *Range Mgmt. & Agroforestry.* (Communicated)

Bika, N. K. and Shekhawat, S. S. 2014. Character association study in pearl millet (*Pennisetum glaucum* (L.) R. Br. for green fodder yield and related traits. *Range Mgmt. & Agroforestry.* (Communicated)
Technical articles: 5
Student (s) guided:
- Two M. Sc. (Ag.)
- One Ph. D. students.

FTDs conducted: 25

Meetings/ Workshops organised

1. National Group Meeting of AICRP on Forage Crops for Kharif-2014 was organised at SKRAU, Bikaner during March 7-8, 2014.
2. One Brain Storming Workshop on "Micro-nutrient deficiency in fodder crops in western India" was organised on March 8, 2014 during NGM.

Training conducted for farmers/ NGO/Govt. Officials

1. Farmers were given training for green fodder production during Rabi season on November 23, 2013 at the time of distribution of demonstrations under AICRP on Forage Crops.
2. Dr. S. S. Shekhawat worked as resource person to impart training for three days (May 13-15, 2014) to 23 'Cairn Agri-Fellows', young farmers of Barmer district, on the topic 'Production technology for forage and grasses'. The training was organized at Institute of Agri Business Management, SKRAU, Bikaner and sponsored by Ashwattha Advisors Pvt. Ltd. (a subsidiary of Technoserve India).

Seminar / Symposium: 1 (Precision Farming Technologies for Citrus; during January 23-24, 2014 at SKRAU, Bikaner)

Seed/ planting material sold: 10000 kg green fodder @ Rs. 1.00/ kg

AICRP FC, OUAT, BHUBANESWAR

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

Dash, G. B.; Muduli, K. C. and Misra, R. C. 2013. Micromutational variability and its exploitation for isolating High Fodder Yielding Mutants in Rice Bean. *J. Crop Sci. Biotech,* 16 (2):1-7.

Tripathy, S. K.; Panda, A.; Nayak, P. K.; Dash, S.; Lenka, D.; Kar, R. K.; Senapati, N. and Dash., G. B. 2014. Somaclonal variation for genetic improvement in grass pea. (*Lathyrus sativa* L.) (Accepted). *Legume Research-An International Journal.*

Tripathy, S. K.; Ranjan, R.; Kar, J.; Baisakh, B.; Nayak, P. K.; Swain, D.; Dash, G. B.; Satpathy, P. C. and Das, S. 2014. Seed storage protein profiling: a method to reveal genetic variation in local races and wild forms of mung bean. (Accepted). *Int. Res. J. Biotechnology.*

Tripathy, S. K., Kar, J.; Ranjan, R.; Baisakh, B.; Nayak, P. K.; Swain, D.; Dash, G. B.; Satpathy, P. C. and Das, S. 2014. Genetic variation in mung bean germplasm, morphological diversity of local land races and wild forms of mung bean (Accepted). *The Research on Crops.*

Sarkar, S.; Awasthi, D. P. and Das, S. 2014. *In vivo* and *in vitro* effect of PH level on growth of *Fusarium moniliforme* var *subglutinans* causal organisum of mango malformation. *J. Mycopathol, Res.* 52 (1): 159-161.

Student guided: M.Sc. (Agri.) in Agronomy- 1
FTDs conducted: 10 (*In Rabi season*)
Training conducted for farmers/ NGO/ Govt. officials: 3
Seed/planting material sold

BN hybrid CO 3	1,76,000

AICRP FC, TNAU, COIMBATORE

Awards and honours:

- Dr. A. Velayutham, Professor, (Agron.), AICRP on Forage Crops, TNAU. TNAU Meritorious award during 44th Foundation day on 01.07.2014
- Dr. C. Babu, Professor, (PBG) AICRP on Forage Crops, TNAU. Best Researcher Award by *Malarum Velanmai* (A leading Tamil magazine) on 15.02.2014

Publications

Books: 1

- Babu, C., K.Iyanar and A. Kalamani. 2014. Evolution of high biomass yielding forage grasses and their production technologies. In: Fodder Cultivation Technologies, TANUVAS, 2014. pp. 36-49.

Research Papers

- Babu, C.; Iyanar, K. and Kalamani, A.. 2014. High green fodder yielding new grass varieties. *Electron J Plant Breed*, 5 (2): [Accepted for publication]
- Sathiya Bama, K.; Velayudham, K.; Babu, C.; Iyanar, K. and Kalamani, A. 2013. Enshot of different nutrient sources on fodder yield, Quality and soil fertility status of multicut fodder Sorghum grown soil. *Forage Res.,* 38 (4): pp. 207-212.

Important persons visited to AICRP_FC centre

- Dr. Emanuel Emylyanus Leuver, Belgium
- Dr. Rajashekhar Ingalhalli, UKA Tarsadia University, Bardoli, Surat

Student(s) guided:

- M. Sc. (Agri.) in PBG – 2
- Ph.D in Agronomy- 1

FTDs conducted: 60
Training conducted for farmers/ NGO/ Govt. officials: 5
TV/ Radio talk delivered by AICRP-FC staff/ extension activities: 4

Seed/planting material sold

Forage crops seed production details (2013-14)

S. No.	Forage crops	Total quantity (kg)			
		Breeder seed	Foundation seed	TFL seed	Total
1.	Multicut fodder sorghum CO (FS) 29	322	986	110	1,418
2.	Multicut fodder sorghum CO 31	-	-	166	166
3.	Fodder maize- African tall	850	2,495	1,456	4,801
4.	Fodder cowpea CO (FC) 8	570	767	154	1,491
5.	Lucerne CO 2	-	-	22	22
6.	Hedge Lucerne	-	-	187	187
7.	Subabul	-	-	37	37
	Grand Total	**1,742**	**4,248**	**2,132**	**8,122**

Quantity of planting material produced and supplied (2013-14)

S. No.	Crop	Planting material (Nos.)
1.	BN hybrid CO (CN) 4	**18,25,950**
2.	Guinea grass CO (GG) 3	**32,105**

Externally funded projects: 3

AICRP FC, ANGRAU, HYDERABAD

Publications:

- **Research papers:** 4

Shashikala, T.; Balaji, R.; Naik, M.; Shanti, K. B.; Sunitha Devi; Chandrika, V. and Loka Reddy, K 2014. Forage resources of Andhra Pradesh and Research Technology of Forage Crops. *International Journal of Bio-resource and stress management,* 5(1) Mar 2014. (Accepted)

Shashikala, T.; Balaji, R.; Naik, M.; Shanti, R.; Chandrika, V. and Loka Reddy, K.. 2013 Fodder Performance of different Oat (*Avena sativa L.*,) genotypes under Agro climatic conditions of Telangana state. *Progressive Agriculture,* 14 (1): Accepted.

Shanti, M. Studies on utilization of Biogas poultry manure in crop production. *Progressive Agriculture*, 13 (1): 102-109.

Shanti, M. *et al.* Effect of Biogas poultry manure on soil fertility in cereal-legume based cropping system. International Journal of Bio-resource and Stress Management. (Accepted)

- **Book Chapter** -3
- **Popular articles in vernacular language:** 4
- **Conference proceedings as abstracts:** 8

FTDs conducted: 30

TSP activities - 1.00 lakh

- 10 families of Tellapalli village, Panagal Mandal, Mahaboobnagar Dist. have been identified for forage demonstration during *Rabi*-2013

Training conducted for farmers/NGOs/ govt officials: 3

HRD

Training: Dr. M. Anuradha attended 21 day training programme on "Measurement and management of insecticide resistance" at Dept. of Entomology, ANGRAU, Hyderabad

TV/ radio talk delivered / extension activities: 8

Seed/ planting material sold

Crop / Variety	Seed / Planting material
APBN-1	24,000 slips
CO-4	7,000 slips
Sorghum var. PC-23	94 kgs
Bajra var Giant bajra	21 kgs
Sorghum var SSG-59-3	15 kgs

AICRP FC, CCS HAU, HISAR

Publications (books, research papers, bulletins etc.): 1

Research Paper: 1

M. K. Jat, O. P. Chaudhary, H. D. Kaushik, Y. Jindal and A. S. Tetarwal 2013. Diversity and Abundance of Different Floral Visitors on Eigyption Clover, *Trifolium Alxendranium* L. *Forage Research*, 38 (4)

Student guided: M.Sc.: 1

FTD conducted: 15

AICRP FC, IGKV, RAIPUR

FTDs conducted: 65

AICRP FC, CAU, IMPHAL

Important persons visited to AICRP_FC centre:

- Dr. Swapan Kumar Dutta, Deputy Director General (Crop Science)
- Dr. Dhiraj Singh, Director, Directorate of Rapeseed-Mustard Research, Bharatpur (Raj.)

Student(s) guided: M.Sc. (Agri.) in Agronomy-1

FTDs conducted: 5

Seed/ planting material sold

- Interaction programme with dairy farmers on cultivation practices of fodder oat.
- Interaction with officials from the Department of Veterinary & Animal Husbandry, Govt. of Manipur on *Rabi* fodder crops production technology.

Forage crops seed production details (2013-14)

S. No.	Forage crops	Total quantity (kg)			
		Breeder seed	Foundation seed	TFL seed	Total
1.	Single Cut fodder oat var. JHO-822	-	-	500	500
	Grand Total	**-**	**-**	**500**	**500**

AICRP FC, JNKVV, JABALPUR

Publications:

Bornare, S. S.; Mittra, S. K. and Mehta, A.K.; Madakemohekar, A. H.; Gaur, L. B. and Chavhan, A. S. 2013. Identification of best putative lines based on floral traits in CMS and restorer lines of rice. Crop Improvement (Special issue) 355-56 Int. con on Sustainable Agriculture for Food and Lively-hood Security. Nov. 25-28th 2013.

Gurjar, M. S.; Gontia, A. S.; Mehta, A. K.; Upadhaya, A. and Rao, S. 2013. Evaluation of pearl millet genotypes for physiological efficiency and productivity. JNKVV Res. 46 (2) (In Press)

Important persons visited to AICRP (FC) centres

- Board Members of Vishwa Vidyalaya
- Dr. P. M. Gaur, International Scientist, ICRESAT Hyderabad visited research experiments being conducted under AICPR (FC)on 27th August 2013 and appreciated the intensity of research work.
- Dr Swapan Kumar Datta, DDG (Crop Science), ICAR along with dignitaries visited the ongoing experiments under AICRP on forage crops on 7th September 2013 and appreciated the research activity.

Organized Annual *Rabi* group meet of AICRP on forage crops at JNKVV, Jabalpur (M.P.) during Sept. 7-8, 2013.

AICRP FC KAU, VELLAYANI

Publications:

Research papers: 1

Mareen Abraham, Usha C Thomas and Kamala Nair, 2014. Biofuels for Bio energy. Symposium on 'Bioenergy for sustainable development -The potential role of sugar crops' SBI,Coimbatore, p.126

Popular articles: 1

FTDs conducted: 20

Seed/ planting material sold: Planting material- for Rs. 16,304/-

AICRP FC, BCKV, KALYANI

Publications:

1. Alipatra; Kundu, C. K.; Mandal, M. K.; Banerjee, H. and Bandopadhyay, P. 2013. Yield and quality improvement in fodder oats (*Avena sativa* L.) through split application of fertilizer and cutting management. *Journal of Crop and Weed,* 9(2): 193-195.
2. Basu, B.; Kundu, M.; Md. Hedayatullah; Kundu, C. K.; Bandyopadhyay, P.; Bhattacharya, K. And Sarkar, S. 2014. Mitigation of arsenic in rice through deficit irrigation in field and use of filtered water in kitchen, Int. J. Environ Sci. Technol. DOI 10. 1007/s 13762-014-0568-1
3. Kundu, C. K.; Biswajit Pramanics; Bera, P. S.; Bandopadhyay, P. and Koushik, B. 2014. Bio-efficacy of Different Herbicides for weed Management in transplanted in *Kharif* Rice. *J. Interacad, 18(1): 44-48,*

Organized:

(COBACAS) Co-sponsored by Indian Council of Agricultural Research, New Delhi; National bank for Agriculture and Rural Development (NABARD), Bandra, Mumbai and Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar-736165, West Bengal, India. C. K. Kundu, H Das. Effect of Different Tillage Methods ad Nutrient Management on Yield and Quality of Fodder Oat. PP-2-33

Bulletin: 1

Student(s) guided:

- M. Sc. – 3 completed and one continuing,
- Ph. D. - 2 completed and 4 continuing

FTDs conducted: 40 (Rabi 2013-14)

Training conducted for farmers/NGO/Govt. officials: 5

Seed/planting materials sold: Bidhan Rice bean–1 to NDRI, E.R.S (Kolkata)

Externally funded project: 3 for field crops

AICRP FC, MANDYA

Research paper: 2

Performance of Hybrid Bajra Napier varieties in southern dry zone of Karnataka, 2013, *Forage Res.* 39 (2) 66-69.

Performance of Guinea grass varieties in southern dry zone of Karnataka, 2013, *Forage Res.* 39 (3) 147-149.

Important person Visited:

- Minister of Agriculture, Karnataka state.
- Member of Parliament of Constituency.
- Member of Legislature.
- Vice chancellor, UAS Bangalore.
- Directorate of Extension & Directorate of Research UAS Bangalore.
- Honourable Board Members UAS Bangalore.
- Principle Secretary, Agriculture & Horticulture Karnataka state Government.

Student's guided: 2
FTD conducted: 20
Training Conducted for farmers: 5
TV/Radio talk delivered - 2
Seed/planting materials sold:

- 7.2qt Breeder seed of Fodder Maize variety African tall
- 5qt Breeder seed of Fodder Cowpea variety KBC-2
- 2000 (Root slips) of Hybrid Napier CO-3 to farmers
- 5000 (Root Slips) of Hybrid Napier CO-3

Externally Funded Project: 2

AICRP FC, CSKHPKV, PALAMPUR

Publications:
Research Paper: 2

Katoch, R.; Sethi, A.; Thakur, N. and Murdock, L. L. 2013. RNAi for Insect control: Current Perspective and future Challenges. *Applied Biochemistry and Biotechnology,* 169: 1579-1605.DOI 10.1007/s12010-012-0046-5.

Singh, S.; Katoch, R. and Kapila, R. 2013. Chemotypic variation for essential oils in *Valeriana jatamansi* Jones populations from Himachal Pradesh. *Journal of Essential Oil Research*. 25(2)154-159. **Seminar/ Symposium : 6, Book: Rajan Katoch** (2013). "Concepts in Enzymology". 1st edition, Kalyani Publishers, India.

Student(s) guided:

- M. Sc.–8
- Ph. D.-2

Fodder Technology Demonstrations: Oats=15, Tall fescue grass=5 and White clover =3
TSP activities: 1.0 Lakh
Seed/ planting material sold to farmers/others: Tall fescue grass and white clover seed
Externally funded project- PI=1, Co-PI=3

AICRP FC, SKUAST, SRINAGAR

Publications

Ahmad, M.; Zaffar, G.; Mir, S. D.; Dar, Z. A.; Iqbal, S. and Habib, M. 2014. Genetic analysis for fodder yield and its important traits in oats (*Avena sativa* L.). *Indian Journal of Genetics and Plant Breeding*, 74 (1): 1-3.

Ahmad, M.; Zaffar, G.; Razvi, S. M.; Dar, Z. A.; Khan, M. H. and Ganie, S. A. 2013. Combining ability study in oat (*Avena sativa* L.) for physiological, quality traits, forage and grain yield. *African Journal of Agriculture Research*, 8(43): 5245-5250.

Ahmad, M. and Zaffar, G. 2014. Evaluation of oat (*Avena sativa* L.) genotypes for beta-glucan, grain yield and physiological traits. *Applied Biological Research*, 16 (1): 1-3.

Ahmad, M.; Zaffar, G.; Razvi, S. M.; Mir, S. D.; Rather, M. A. and Dar, Z.A. 2013.Gene action and combining ability for fodder yield and its attributing traits in oats (*Avena sativa* L.). *Scientific Research and Essays*, 8 (48): 2306-2311.

Ahmad, A.; Zaffar, G.; Razvi, S. M.; Mir, S. D. and Rather, M. A. 2013. Stability properties of certain oats genotypes for major grain yielding characteristics. *International Journal of Plant Breeding and Genetics* pp 1-6.

Ahmad, A.; Zaffar, G.; Mir, S. D.; Dar, Z. A.; Dar, S. H.; Iqbal, S.; Bukkhari, S. A..; Khan, G. H. and Gazal, A. 2013. Estimation of correlation coefficient in oats (*Avena sativa* L.) for forage yield, grain yield and their contributing traits. *International Journal of Plant Breeding and Genetics*. pp1-4

Ahmad, M.; Zaffar, G.; Mir, S. D.; Iqbal, S. and Dar, Z. A. 2013. Combining ability studies in oats (*Avena sativa* L.) for seed yield. *Applied Biological Research*, 15(2): 1-6.

Ahmad, M. and Zaffar, G. 2014. Stability analysis for forge yield and its contributing traits in Oats (*Avena sativa* L.).Trends in Bioscience. (Accepted)

Ahmad, M. and Zaffar, G. 2014. Study of heterosis, inter-relationship and path analysis of green fodder yield and its contributing traits in oats (*Avena Sativa* L.). *Research Journal of Agriculture Sciences.* (Accepted)

Student(s) guided: 2
FTDs conducted: 40

TSP activities:

1- Distributed Oats seed, Vermicompost and farm implements to 50 Tribal farmers of Anderwan, Choontwaliwar villages of Ganderbal District under Tribal Sub Plan scheme in the month of November-2013.
2- Organised Forage day for Tribal farmers in the month of April -2014 under Tribal Sub Plan Scheme of AICRP-Forages.

Training conducted for farmers/ NGO/ Govt. officials: 3

TV/Radio talk delivered by AICRP-FC staff/ extension activities: 2

Seed/planting material sold

Forage crops seed production details (2013-14)

S. N.	Forage crops	Total quantity (kg)			
		Breeder seed	Foundation seed	TFL seed	Total
1	Oats	3,200	5,420	2,653	11,273

AICRP FC BAIF, URULIKANCHAN

Publications:

- Popular articles on fodder production technology- 4

FTDs conducted: 20

Orientation of Training participants (farmers/ NGO/ Govt. officials) to AICRP FC Activities: 41 trainings

Narrowcasting of success stories on Fodder Production Technology in Krishidarshan Programme of Doordarshan, Pune -2

TSP activities:

- Lucerne seed nursery developed at 15 farmers field
- Fodder tree (*Hardwikia binnata*) nursery by farmers group: 5000 seedlings
- Training in fodder cultivation to 15 farmers
- Goat Improvement Programme:
  - ✓ Procured 10 bucks of improved breed and distributed to the farmers
  - ✓ Provided five units of Medicine kit- preventive health, vaccination, deworming for goats etc
- Water Resource Development: Provided one 4 HP engine to the 10 participants and PVC pipes to 5 participants as per field situation.

Seed Supply: Sold breeder seed of Oats var. Kent (1550 kg).

AICRP FC ASSAM, JORHAT

Publications

Bora, S.; Bhuyan, R.; Sarma, D. N.; Sharma, K. K. and Bora, A. 2013. Yield, Chemical Composition and In Vitro Nutrient Digestibility of Two Varieties of Congo signal grass as affected by variety and stages of growth. *Indian J. Anim. Nur.*, 30(3): 334-336.

Sharma, K. K. and Bora Neog, S. 2013. Bio Diversity of Forage resources in North East India. In: Souvenir: National Group Meet–Rabi 2013 of AICRP on Forage Crops held at JNKVV, Jabalpur, MP, p 53-59.

Sharma, K. K. and Bora Neog, S. 2013. Food-Forage Cropping system in Assam, Bulletin No 1/13.Pub. by AICRP on Forage Crops, AAU, Joraht, Assam.

Important persons visited to AICRP-FC centre

Dr. K. K.Barua, Former Director, NRC, Yak, Arunachal Pradesh

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

FTDs conducted: 45

TSP activities: Adopted one village in Karbi Anglong District

Training conducted for farmers/NGO/Govt. officials: 7

TV/Radio talk delivered by AICRP-FC staff/extension activities: 2

Seed/planting material sold

Quantity of planting material supplied (2013-14)

S. N.	Crop	Planting material (Nos.)
1.	BN hybrid CO -4,CO-3,CO-2	51260
2.	Setaria Grass Var. PSS-1,Kazungula	62350
3	Para	32000

AICRP FC PAU, Ludhiana

Publications:

Research papers:

Goyal, M.; Bajaj, R. K.; Gill, B. S. and Sohu, R. S. 2013. Combining ability and heterosis studies for yield and water use efficiency in forage sorghum top crosses under normal and water stress environment. *Forage Res*., 39(3): 124-33.

Kapoor, R. and Bajaj, R. K. 2013. Combining ability and heterosis studies in fodder oats (*Avena sativa* L.) for green fodder yield and component traits. *Vegetos,* 26(1) 272-77.

Tiwana, U. S.; Chaudhary, D. P. and Rani Upasana. 2013. Evaluation of cereal fodders and *Sesbania* intercropping through forage productivity, quality, economics and competitive ability under various row proportions. *Progressive Research,* 8 (1): 78-82.

Saini Amandeep and Tiwana, U. S. 2013. Effect of irrigation and nitrogen levels on growth, yield and hydrocyanic acid (HCN) content of forage sorghum (*Sorghum bicolour*) under different cutting management. *Indian J. Ecol,* 40 (1): 40-42.

Tiwana, U. S. and Chaudhary, D. P. 2013. Productivity, economics and quality of bajra + *Sesbania* fodder mixture as influenced by sowing methods and harvesting stage. *Progressive Research,* 8: 150-152.

Bhardwaj, R.; Singh, D. P.; Rani Upasana; Tiwana, U. S. and Bajaj, R. K. 2014 Association studies in cowpea (*Vigna unguiculata* L.). *J Food* Leg, 27(1): 74-76.

Rahul Kapoor 2014. Genetic variability and association studies in guar [*Cyamopsis tetragonoloba* (L.) Taub.] for green fodder yield and quality traits. *Electronic J Plant Breed* **5**(2): 294-99.

Papers presented in Symposia/Workshops: 4

Extension Publications: 6

Students guided: M. Sc. - 5 , Ph.D. - 2

FTDs conducted: 100

TV/Radio talks: TV (2) and Radio (1)

Breeder seed production Rabi 2013-14:

Crop	Variety	Production (q)
Oats	Kent	25.0
Berseem	BL 10	4.50
	BL 42	9.00
	BL 1	4.50
Metha	ML 150	3.20
Ryegrass	PBRG 1	0.50

External funded Projects: 3

AICRPFC, MPKV, Rahuri

Publications:

Pathan, S. H.; Bhilare, R. L. and Damame, S. V. 2011. "Effect of sulphur, molybdenum and boron on forage yield and quality of Lucerne (*Medicago sativa* L.)" *J. of Agriculture Research and Technology,* 36 (2): 301-303.

Pathan, S. H. and Chavan, S. R. 2012. "Response of single cut oat (*Avena sativa* L) genotypes to nitrogen levels under irrigated condition." *J. of Agriculture Research and Technology.* 37 (2): 170-171.

Gaikwad, S. S.; Pathan, S. H. and Kamble, A. B. 2012. "Effect of nutrient management on green forage yield and quality of berseem (*Trifolium alexandrinum* L.)" *J. of Agriculture Research and Technology.* 37 (2): 175-176.

Tambe, A. B. and Sonone, A. H. 2013. IPM at the Cross Roads with Realistic Approach. *Souvenir*, National Group Meet (Rabi) on forage Crops, held at JNKVV, Jabalpur w.e.f. 7-8, Sept., 2013. Pp. 41-44.

Sonane, A. H. and Tambe, A. B. 2013. Livestock Situation and Fodder Wealth in Western Maharahstra. *Souvenir*, National Group Meet (Rabi) on forage Crops, held at JNKVV, Jabalpur w.e.f. 7-8, Sept., 2013. Pp. 25-28.

Pathan, S. H.; Damame, S. V.; Gavit, M. G. and Pardeshi, H.P. 2014. Advances in Forage Production for Livestock Development in Maharashtra. *Souvenir*, National Group Meet (Kharifi) on forage Crops, held at SKRAU, Bikaner, Rajesthan w.e.f. 7-8, March, 2014. Pp. 55-63.

Students Guided:

- M. Sc. (Agri.)
- Plant Breeding: 02
- Entomology: 02
- Biochemistry: 01

FTDs conducted: 30

TSP activities: 12 Beneficiaries (Distributed elite breed of goats, forage seed, set of books on goat nutrition health)

Training conducted for farmers/NGO/Govt. Officials: Two days training of National Initiative of fodder Technology Demonstration (NAFTD) of KVK Scientist of India (60 participants).

TV/Radio talk delivered by AICRP-FC staff/ Extension activities: 03

Seed Production (Rabi-13-14)

S. N.	Crop	Breeder seed (Kg)	Truth full seed (Kg)
1.	Oat (RO-19)	450 kg	250 kg
2.	Kent	-	600 kg
3.	Berseem Wardan	15 kg	100 kg
4.	Lucrne RL-88	-	10 kg

APPENDIX –III

WEATHER REPORT FOR RABI-2013-14

The Weather report of the AICRP-FC coordinating, cooperating and volunteer centres across the different zones during *Rabi* 2013-14 programme have been presented in this section. The weather parameters from 40th Standard Meteorological Week (October 01-07, 2013) to 21st Standard Meteorological Week (May 21-27, 2014) were taken into consideration, which covers the *Rabi* 2013-14 season for all the testing locations for trial conduction [Table MET- 1.1 (a) to 1.4 (p)]. 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 annual and perennial forage crops and their varieties. The weather parameters have also shown close correlation with the incidence and surveillance of insect-pest and diseases of forage crops.

Temperature

In Hill Zone, Srinagar remained the coolest location recording -1.8^{0}C during 46th SMW. Maximum temperature was recorded at Palampur *i.e.* 30.6^{0}C during 18st SMW. The average minimum temperature over the season was recorded lowest at Srinagar. In North-East zone, Imphal recorded the lowest minimum temperature (2.6^{0}C) during 1st SMW and maximum temperature was recorded at Bhubaneswar (42.0^{0}C) during 20th SMW followed by Kalyani (41.3^{0}C) during 17th SMW. Minimum variation for maximum temperature over the season was observed at Jorhat followed by Kalyani. In North-West Zone, Hisar recorded lowest minimum temperature (2.4^{0}C) during 1st SMW and 52nd SMW (3.2^{0}C), whereas, maximum temperature was recorded at Bikaner (43.6^{0}C) during 18th SMW.

In Central Zone, Kanpur recorded the lowest minimum temperature (5.1^{0}C) during 2nd SMW. The maximum temperature was recorded at Raipur (42.8^{0}C) during 20th SMW followed by Jhansi (41.8^{0}C) during 21st SMW 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 observed at Urulikanchan and Rahuri locations. In South zone, the lowest minimum temperature was also recorded at Hyderabad (7.5^{0}C) during 50th SMW and 51st SMW (8.8^{0}C). The maximum temperature was recorded at Hyderabad *viz.,* 39.6^{0}C and 38.3^{0}C during 21st and 20th SMW, respectively. Coimbatore 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 (818.7 mm) as compared to Palampur (683.8 mm), In North- East Zone, Bhubaneswar received highest rainfall (997.8 mm) followed by Ranchi (563.1mm) and lowest being with Imphal (62.4 mm). The maximum number of rainy days was recorded at Jorhat (33 days) followed by Kalyani (32 rainy days) and lowest being with Faizabad (12 rainy days).

In North-West Zone, Pantnagar received highest rainfall (436 mm) in 18 rainy days followed by Ludhiana (239.0 mm in 23 rainy days). Bikaner received lowest rainfall (59.9 mm) in just 4 rainy days followed by Hisar (150 mm). In Central Zone, maximum rainfall (286 mm) was recorded at Jhansi followed by Raipur (234 mm) and lowest being with Anand (47 mm). Maximum number of rainy days was observed at Jhansi (22) followed by Raipur (19 rainy days) and lowest being with Urulikanchan (6RD). In South Zone, Vellayani received maximum rainfall (849.8 mm) in 47 rainy days followed by Hyderabad (447 mm in 20 RD) and lowest total rainfall was with Dharwad (317.8 mm in 13 RD). In the zone the well distribution of rainfall was observed at Vellayani and Mandya (evident from rainy days).

Relative Humidity

In Hill Zone, the morning, afternoon and average RH was recorded higher at Srinagar compared to Palampur through at the season and it indicated that Srinagar is more humid than Palampur. In North-East Zone, maximum RH of 99.4% was recorded at Faizabad during morning hours in 2nd SMW followed by 98.3 % at Jorhat during 52nd SMW. The minimum RH during morning and afternoon hours was recorded at Faizabad (58.5% in 15th SMW) and Bhubaneswar (34.0% in 49th SMW), respectively. However, the average RH was recorded highest at Bhubaneswar (95.5%) followed by Kalyani (91.4%) during 43rd 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 (46.2%) during 17th SMW, whereas, highest morning RH was recorded at Hisar (99 %) during 3rd & 9th SMW. In the same zone the maximum afternoon RH was recorded at Hisar (84%) during 3rd SMW.

In Central Zone, maximum RH in morning hours (100 %) was recorded at Urulikanchan and Anand during 42nd SMW and lowest RH (12.9%) in afternoon was observed at Jabalpur centre 17th SMW. In South Zone, the maximum RH (98%) was recorded in the morning hours at Vellayani during 49th SWM. The minimum fluctuation in the morning RH was recorded at Mandya. The lowest afternoon RH was recorded at Dharwad (19.1%) during 13th SMW.

Sunshine hours

In Hill Zone, sunshine hours were recorded maximum at Palampur (10.6 h during 17th SMW) followed by 10.4 h in 18th SMW at the same location. In the same zone, over the season the maximum sunshine were also recorded higher at Palampur (6.6h) as compared to Srinagar (4.2h). In North-West Zone, sunshine hours were recorded highest at Ludhiana (12.2 and 12 h in 17th and 20th SMW, respectively) followed by Pantnagar (11.6 h in 17th SMW). On mean basis over the season Bikaner recorded maximum sunshine hours (7.9 h) followed by Hisar (7.1h) and lowest being with Pantnagar (6.3h). In North-East Zone, Ranchi recorded maximum sunshine hours (9.8 h) followed by Imphal (9.7 h). Maximum average sunshine hours over the season were recorded at Ranchi (8.0 h) followed by Kalyani (7.1 h) and Imphal (7.0h) and lowest being with Faizabad (5.2 h). Faizabad experienced lowest sunshine hours (more cloudiness) over the season as compared to other locations.

In Central Zone, the maximum sunshine hours were recorded at Anand (11.1 h in 21st SMW). On mean basis over the season the maximum sunshine hours was recorded at Anand (8.7 h) followed by Jabalpur (7.7h) and Jhansi (7.6 h) and lowest being with Kanpur (6.3 h). In South Zone, maximum sunshine hours were recorded at Coimbatore (10.2 and 10.1 h in 6th and 12 SMW, respectively). On mean basis over the season, Hyderabad recorded maximum sunshine hours (7.7 h) followed by Coimbatore (7.2h) and lowest being with Mandya (7.0 h).

Table Met-1.1 (a): Temperature (^{0}C) during crop growth period, Rabi 2013-14

Met Week	Hill Zone				North West Zone							
	Srinagar		Palampur		Bikaner		Pantnagar		Ludhiana		Hisar	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
40	29.1	11.86	24.6	15.9	35.6	22.3	30.3	23.1	32.1	24.0	31.3	23.6
41	23.8	12.73	24.2	16.7	34.7	22.0	31.2	22.1	30.6	23.3	32.0	23.6
42	23.7	5.13	25.3	12.6	35.9	18.2	30.4	20.1	32.8	18.6	33.2	19.0
43	21.7	3.06	23.6	11.4	34.6	15.1	30.2	16.8	30.7	16.9	31.4	16.3
44	15.1	2.3	22.8	9.7	33.3	13.1	30.2	18.8	28.1	13.8	30.3	14.2
45	13.9	2.3	19.6	7.5	27.1	10.8	27.9	16.2	24.7	11.9	24.7	12.7
46	15.6	-1.8	20.6	6.3	26.7	9.3	27.1	9.0	25.7	8.1	25.2	8.0
47	16.3	0.9	21.5	7.0	29.5	9.5	26.0	9.9	26.3	9.5	27.2	9.2
48	14.3	3.6	21.2	6.5	30.1	11.3	26.4	9.5	26.3	9.4	27.8	8.8
49	12.6	2.2	20.0	5.8	27.8	12.4	25.7	8.2	24.5	8.1	25.4	7.9
50	10.8	3.4	18.8	4.8	27.8	11.0	23.2	7.4	22.1	8.1	24.1	7.2
51	7.6	0.9	16.0	4.2	20.5	8.4	21.6	8.5	15.1	9.6	18.2	10.1
52	8.2	1.7	15.7	3.1	20.1	10.6	18.9	6.1	17.3	3.9	18.3	3.2
1	3.4	2.6	15.4	3.3	19.7	3.9	17.1	5.9	16.8	3.8	16.9	2.4
2	4.0	1.4	13.8	4.2	18.7	3.5	16.1	7.5	17.8	6.0	18.5	3.3
3	7.9	2.5	15.2	4.9	18.8	4.0	17.4	9.3	15.7	8.2	16.4	6.5
4	3.1	0.1	16.5	5.3	20.6	5.8	17.5	9.2	18.9	8.9	18.3	8.8
5	4.6	1.6	17.9	6.6	26.1	8.6	16.2	9.4	18.4	9.7	21.0	8.6
6	6.2	0.3	13.7	4.6	23.0	9.2	22.5	8.9	18.3	8.0	20.6	7.9
7	10.0	1.7	13.0	2.6	23.2	8.4	20.0	7.0	18.3	6.6	19.5	5.5
8	10.8	1.3	17.4	5.6	26.0	9.1	22.2	10.2	21.8	8.8	21.9	8.5
9	10.5	2.1	15.1	6.2	25.9	11.3	23.4	11.2	21.3	8.9	21.9	8.7
10	9.7	1.2	17.2	7.8	27.8	14.6	24.9	10.3	23.8	11.4	22.5	9.0
11	8.8	1.6	21.3	9.1	30.1	11.4	27.8	14.1	26.3	12.6	24.9	11.0
12	13.5	5.1	20.5	9.2	32.7	16.4	28.7	14.2	26.2	13.5	28.3	12.3
13	13.9	5.0	21.7	10.8	31.8	18.1	31.2	14.8	28.0	14.6	28.0	15.7
14	13.3	6.9	23.2	11.2	36.2	18.4	32.5	15.1	28.8	15.1	31.2	14.3
15	17.8	4.6	23.6	11.7	37.6	19.6	33.3	15.4	32.6	15.1	33.3	16.4
16	15.1	6.2	22.8	11.3	36.4	20.0	32.5	15.4	31.0	16.7	32.8	18.4
17	22.9	6.9	27.2	14.5	39.8	21.3	37.5	17.7	37.2	19.5	37.6	18.6
18	25.0	8.9	30.6	17.9	43.6	22.6	37.0	20.5	39.2	23.5	40.2	22.6
19	21.7	9.6	28.3	15.8	38.8	22.9	37.0	20.7	35.7	21.6	36.9	21.1
20	19.9	8.9			36.5	19.2	36.6	20.5	35.2	21.2	34.5	20.9
21	23.3	7.8			41.6	24.2	38.6	22.9	38.8	23.4	39.8	22.8

Table Met-1.1 (b): Temperature (^{0}C) during crop growth period, Rabi 2013-14

Met Week	North East Zone											
	Ranchi		Faizabad		Bhubaneswar		Jorhat		Imphal		Kalyani	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
40	25.7	19.6	29.8	23.5	31.7	23.9	32.4	25.6	29.2	19.9	32.3	24.9
41	26.0	19.6	30.6	23.5	31.4	23.9	30.0	21.7	29.1	17.5	31.4	24.9
42	26.1	18.9	28.9	21.6	32.1	23.2	31.2	23.0	32.5	19.5	33.0	24.5
43	24.5	18.7	31.1	18.7	26.7	21.8	29.5	20.5	27.6	17.7	28.3	22.8
44	26.9	13.4	29.6	17.3	31.2	19.1	27.2	18.7	26.7	14.1	32.8	19.7
45	24.1	10.7	27.7	14.0	30.3	18.8	27.8	15.0	27.9	10.4	29.9	18.5
46	23.2	9.0	27.3	11.5	28.8	16.7	28.0	12.3	28.0	8.4	29.7	14.8
47	24.6	9.7	26.0	10.4	29.8	17.9	27.4	12.4	27.3	8.7	28.9	14.6
48	22.6	8.2	26.6	9.6	29.8	19.0	27.2	13.6	27.5	10.2	29.4	15.4
49	20.8	5.2	27.2	8.5	28.1	13.9	27.4	13.2	25.8	8.3	27.6	14.0
50	22.1	5.3	24.7	7.8	28.5	14.3	23.6	11.6	23.4	7.2	27.3	11.6
51	24.3	8.1	22.4	9.1	29.7	13.7	22.0	8.5	20.6	3.6	28.2	11.0
52	22.0	7.0	21.7	7.6	29.1	14.1	22.0	8.5	21.0	4.5	24.8	11.4
1	23.0	6.4	19.3	6.2	28.8	15.1	22.7	10.2	23.0	2.6	24.2	10.1
2	20.2	5.6	15.5	5.9	28.7	15.6	21.8	9.3	22.5	3.0	23.8	10.0
3	23.6	7.6	17.1	8.2	29.0	15.7	24.3	9.5	24.2	7.0	23.1	11.6
4	21.3	5.9	20.7	9.5	29.1	14.7	25.9	11.2	24.6	5.7	25.5	10.3
5	22.7	6.2	18.2	8.8	29.0	13.7	26.0	9.5	25.9	3.9	26.2	9.2
6	25.8	11.3	25.8	10.2	34.5	17.3	23.7	12.2	24.0	4.3	30.7	14.1
7	21.9	8.4	20.6	8.6	31.1	18.7	21.8	13.1	22.4	8.2	26.2	13.9
8	24.7	9.6	23.4	10.3	30.7	15.9	26.3	12.2	22.2	7.1	29.1	14.1
9	23.2	13.2	24.0	13.0	32.5	19.4	26.3	12.2	26.6	7.8	29.3	16.5
10	25.7	11.7	26.3	11.2	31.2	18.9	27.0	14.7	26.2	8.5	31.6	15.6
11	28.6	14.5	30.2	11.5	35.3	21.2	28.0	13.4	28.7	7.1	35.1	19.0
12	32.3	14.1	31.8	13.6	36.6	23.3	30.5	15.8	28.8	11.1	34.6	20.1
13	33.8	18.0	34.8	15.7	39.7	23.8	28.9	16.6	27.6	13.8	37.6	23.3
14	35.0	17.7	35.8	14.9	38.8	23.9	28.0	19.4	28.2	14.3	37.7	24.6
15	34.6	17.9	36.6	14.9	38.3	23.3	30.3	17.9	28.9	14.3	38.4	23.8
16	34.8	18.0	35.8	16.7	40.1	24.4	30.7	19.1	31.8	13.7	40.4	24.8
17	37.0	19.3	39.2	20.8	41.2	26.0	32.5	20.3	32.5	14.6	41.3	25.7
18	36.6	18.6	38.8	22.4	40.3	25.1	34.1	20.5	30.8	17.5	35.8	23.8
19	35.1	21.5			39.1	25.9	29.3	21.0	27.6	16.8	39.0	27.1
20	37.1	21.1			42.0	26.7	26.9	21.3	28.0	19.2	41.1	28.2
21	36.2	22.3			37.9	25.1	31.4	22.8	32.0	20.1	36.9	27.6

Table Met-1.1 (c): Temperature (^{0}C) during crop growth period, Rabi 2013-14

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			32.9	25.0	28.9	22.9	31.9	21.2	32.0	20.5	30.1	24.1	29.1	23.1
41			31.2	23.7	29.7	21.8	31.1	20.0	31.4	21.4	30.2	23.3	30.9	22.9
42			36.0	23.1	30.1	18.4	32.0	20.1	24.1	32.2	30.7	21.4	32.6	20.1
43			35.0	19.4	29.4	18.8	31.2	19.6	31.1	17.3	28.8	22.6	31.6	16.7
44			34.4	17.9	30.7	15.4	31.4	16.8	33.3	18.4	30.5	17.3	32.6	14.3
45	26.9	10.5	33.7	18.9	28.9	12.7	32.4	14.3	31.8	16.4	30.0	16.7	28.2	12.7
46	26.5	7.4	30.5	16.0	26.0	8.9	31.8	13.5	30.0	14.5	27.5	13.2	26.0	8.8
47	26.9	7.8	31.8	14.9	27.9	9.2	30.7	11.3	28.2	12.5	30.3	16.7	27.6	9.5
48	26.7	8.9	32.0	16.7	27.8	9.1	31.2	15.3	26.2	18.5	30.0	15.6	27.8	10.4
49	25.7	6.8	31.0	13.7	26.3	8.5	29.0	13.5	30.6	16.9	28.1	11.8	26.1	8.6
50	24.5	7.1	30.1	11.1	25.9	7.1	28.7	7.4	24.9	15.9	27.7	9.8	26.3	8.7
51	22.7	8.5	28.6	10.1	26.0	7.5	29.5	9.6	23.8	18.4	28.1	11.7	24.2	9.5
52	20.3	6.5	23.5	12.4	24.5	11.0	29.1	13.9	23.6	21.2	28.3	12.7	19.9	7.8
1	18.5	6.3	26.4	13.1	23.5	11.1	28.8	12.2	28.4	12.7	28.6	13.6	17.8	8.7
2	17.3	5.1	26.2	11.1	22.2	10.2	29.5	12.3	29.5	11.7	27.8	14.1	18.2	7.1
3	17.5	7.8	26.3	11.2	22.2	12.3	29.7	13.6	27.6	10.9	29.0	16.1	16.9	8.7
4	19.3	8.5	24.6	15.5	22.3	10.6	29.0	14.8	21.4	13.5	28.2	13.7	17.9	9.3
5	19.0	7.2	30.3	13.2	23.7	5.6	28.5	11.2	28.4	15.9	28.8	10.1	22.2	7.6
6	23.5	8.4	29.6	12.6	28.0	10.0	31.8	11.2	24.4	14.1	31.7	14.8	25.4	8.7
7	19.7	7.0	27.7	12.6	23.9	9.5	28.0	10.3	31.1	10.5	28.9	15.4	20.6	6.6
8	22.7	7.8	29.9	15.1	25.5	12.2	31.1	15.2	32.9	11.6	28.9	14.6	21.9	9.5
9	23.7	10.2	30.4	13.5	25.5	14.3	30.8	13.6	33.8	8.4	27.9	17.7	23.4	11.8
10	26.8	9.5	33.5	16.8	26.6	11.9	29.4	16.6	30.9	9.2	27.5	17.5	27.1	10.4
11	29.8	11.9	36.3	18.6	30.5	12.6	33.7	18.7	31.0	10.8	33.3	19.5	29.8	13.3
12	31.3	14.1	35.6	16.9	34.0	13.4	36.0	17.0	36.3	12.8	36.4	19.4	32.7	13.0
13	34.0	15.3	37.3	20.9	36.4	17.6	36.9	18.7	35.9	16.4	38.4	22.2	34.3	15.9
14	36.8	16.0	38.4	21.1	37.4	18.5	37.5	18.4	37.7	12.0	38.5	22.4	36.7	16.6
15	36.5	15.6	38.1	19.2	37.4	17.8	37.2	17.9	32.3	17.1	38.5	22.4	37.1	14.8
16	35.0	16.0	38.2	23.4	37.7	20.6	37.8	21.1	35.4	15.0	37.8	23.4	36.3	18.2
17	39.8	18.5	41.5	24.3	39.7	19.9	38.7	21.6	36.6	16.8	41.1	25.1	39.5	18.9
18	39.1	21.0	40.3	24.5	40.6	24.2	39.1	22.5	36.4	17.9	40.1	25.6	41.5	22.0
19	40.0	20.8	40.1	25.3	38.5	24.5	37.7	22.7	38.7	20.7	38.8	26.0	40.3	22.2
20	39.1	21.4	38.4	26.2	39.5	22.3	36.9	22.3	37.9	23.6	42.1	27.6	38.7	22.0
21			41.7	26.4	41.2	24.8	39.3	23.1	34.9	23.0	10.8	27.1	41.8	22.8

Table Met-1.1 (d): Temperature (^{0}C) during crop growth period, Rabi 2013-14

Met Week	South Zone									
	Coimbatore		Vellayani		Hyderabad		Mandya		Dharwad	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
40	32.4	20.9	30.5	22.6	30.5	22.0	29.6	17.0	27.5	20.0
41	32.3	22.3	30.6	23.3	31.1	20.8	30.1	18.2	29.2	19.4
42	31.4	22.2	30.7	23.7	31.8	17.7	30.4	19.5	30.1	19.3
43	29.8	21.3	30.7	23.0	26.3	19.4	29.5	18.9	27.7	19.9
44	31.1	22.6	30.7	23.6	30.1	17.5	29.5	19.4	29.3	17.7
45	29.1	22.4	30.9	23.7	28.5	14.3	28.6	16.4	28.8	15.9
46	28.7	21.6	30.3	23.4	27.8	11.4	28.4	15.5	28.0	14.0
47	30.4	22.1	30.6	23.7	28.4	15.1	29.6	16.6	29.4	15.3
48	30.3	22.7	30.8	23.0	28.4	14.8	29.1	16.2	29.6	17.5
49	29.8	19.6	30.9	22.8	27.6	11.2	27.2	13.6	28.5	13.3
50	29.9	20.1	30.3	22.6	29.1	7.5	29.1	12.3	28.7	11.7
51	23.6	19.2	31.2	21.7	28.1	8.8	27.1	11.4	28.3	11.2
52	23.7	19.3	31.0	20.2	27.1	11.0	27.8	11.9	28.1	12.9
1	30.1	18.3	30.9	21.5	28.4	11.1	29.2	11.4	28.9	13.2
2	30.0	20.5	29.0	22.3	29.4	12.8	29.8	12.8	30.4	14.3
3	30.8	20.9	31.0	21.8	29.1	13.8	28.9	14.6	30.3	15.8
4	29.9	19.9	31.3	21.8	27.9	14.4	29.0	13.4	29.0	15.5
5	30.8	19.1	31.4	21.9	28.6	14.6	29.9	12.9	29.1	14.7
6	33.2	16.9	30.7	20.2	33.1	14.8	32.0	11.3	32.6	15.2
7	33.0	21.5	31.4	22.8	30.9	17.3	30.9	17.1	29.4	14.5
8	31.8	22.4	31.5	23.8	30.6	18.9	30.5	19.4	31.4	17.7
9	32.8	22.8	31.9	23.1	30.4	18.7	30.8	18.3	32.1	17.4
10	32.6	23.2	31.9	23.4	27.6	20.1	30.1	16.7	31.4	17.1
11	34.2	20.5	32.4	21.4	33.4	20.0	32.0	11.6	35.3	18.4
12	36.3	23.3	33.0	24.1	36.8	21.1	34.2	15.8	36.1	19.8
13	36.2	21.4	33.0	22.2	38.1	20.7	34.4	14.7	37.0	20.7
14	36.7	25.1	32.4	24.5	38.1	19.8	34.9	19.1	36.9	21.6
15	35.9	24.2	32.0	24.2	37.6	22.2	34.0	18.7	36.7	19.9
16	35.9	24.2	32.0	25.0	36.0	22.3	33.9	19.1	35.4	20.6
17	36.6	25.8	32.8	24.4	38.2	23.3	34.0	20.2	36.5	22.6
18	36.4	25.9	32.2	23.8	38.1	24.0	35.5	19.5	35.5	20.9
19	31.2	23.8	30.7	24.3	34.4	23.2	30.7	19.8	32.7	20.6
20	35.0	23.9	32.5	25.1	38.3	23.0	34.5	19.9	34.7	20.8
21	34.3	24.4			39.6	25.0	34.5	20.0	32.6	22.0

Table MET -1.2 (e): Rainfall (RF, mm) and Rainy days (RD, No.) during crop growth period, Rabi 2013-14

Met Week	Hill Zone		North West Zone						
	Srinagar	Palampur	Bikaner		Pantnagar		Ludhiana		Hisar
	RF	RF	RF	RD	RF	RD	RF	RD	RF
40	7.8	84.8	1.0	0	6.8	1	22.4	1	4.0
41	6.6	49.8	0.0	0	79.6	2	1.8	0	2.5
42	12.5	16.6	0.0	0	0.0	0	0.0	0	0.0
43	9.9	0.0	0.0	0	0.0	0	0.0	0	0.0
44	10.6	0.0	0.0	0	6.8	1	12.0	1	0.0
45	12.0	30.6	0.0	0	0.0	0	4.6	0	9.4
46	5.8	0.0	0.0	0	0.0	0	0.0	0	0.0
47	6.6	0.0	0.0	0	0.0	0	0.0	0	0.0
48	3.9	0.0	0.0	0	0.0	0	0.0	0	0.0
49	8.8	0.0	0.0	0	0.0	0	0.0	0	0.0
50	7.0	0.0	0.0	0	0.0	0	0.0	0	0.0
51	7.4	30.6	0.0	0	0.0	0	10.4	1	0.0
52	10.2	4.6	0.0	0	10.2	1	2.8	1	0.0
1	48.2	14.6	0.0	0	1.6	0	0.0	0	0.0
2	22.2	1.4	0.0	0	3.6	0	0.0	0	0.0
3	0.0	1.8	0.0	0	105.8	2	26.1	2	0.0
4	95.2	53.4	0.0	0	1.4	0	29.4	1	2.0
5	4.4	4.6	0.0	0	0.0	0	1.0	0	0.0
6	28.1	54.8	0.0	0	2.0	0	2.8	0	4.1
7	25.0	66.8	0.0	0	93.2	2	6.1	2	1.5
8	6.0	25.6	0.0	0	0.0	0	16.0	1	3.1
9	5.8	47.0	0.0	0	81.4	4	13.6	2	3.8
10	116.6	15.2	0.0	0	0.0	0	4.0	1	11.3
11	103.0	39.4	0.0	0	12.8	1	16.0	1	13.3
12	19.8	63.6	0.0	0	0.0	0	9.9	1	1.1
13	38.0	8.8	0.0	0	0.0	0	3.3	1	21.3
14	66.4	6.3	5.4	1	2.2	0	2.4	0	8.5
15	20.4	0.4	0.0	0	0.6	0	0.6	0	0.0
16	42.0	49.3	9.5	1	10.2	2	28.0	3	7.9
17	0.0	0.6	0.0	0	0.0	0	0.0	0	0.0
18	0.2	6.2	0.0	0	14.4	1	3.0	1	15.5
19	30.6	7.0	32.0	1	3.4	1	12.8	2	37.5
20	22.2		12.0	1	0.0	0	0.0	0	3.0
21	15.5		0.0	0	0.0	0	10.0	1	0.5

Table MET -1.2 (f): Rainfall (RF, mm) and Rainy days (RD, No.) during crop growth period, Rabi 2013-14

North East Zone											
Met Week	Ranchi		Faizabad		Bhubaneswar		Jorhat		Imphal	Kalyani	
	RF	RD	RF	RD	RF	RD	RF	RD	RF	RF	RD
40	159.1	3	3.6	2	50.5	6	9.9	4	2.5	46.6	7
41	264.9	3	3.1	1	298.4	5	2.0	0	4.8	85.8	5
42	14.6	1	0.0	0	14.2	2	3.7	2	0.1	31.6	4
43	21.0	2	0.0	0	357.0	7	0.0	0	4.0	76.5	5
44	0.0	0	0.0	0	0.0	0	6.7	2	2.3	0.0	0
45	0.0	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
47	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0	0
48	0.0	0	0.0	0	0.5	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
50	0.0	0	0.0	0	0.0	0	1.0	0	0.0	0.0	0
51	0.0	0	0.0	0	0.0	0	0.0	0	0.2	0.0	0
52	0.0	0	0.4	0	0.0	0	0.0	0	0.0	0.0	0
1	10.2	1	2.1	0	0.0	0	4.8	1	0.0	0.0	0
2	8.0	1	6.0	1	0.0	0	0.0	0	0.0	0.0	0
3	0.0	0	56.2	1	0.0	0	0.5	0	0.0	0.0	0
4	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
6	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0	0
7	6.2	1	7.4	2	21.8	1	36.1	4	0.3	28.5	2
8	4.0	1	17.7	2	0.0	0	0.0	0	4.1	0.0	0
9	30.9	2	15.3	2	27.2	1	0.0	0	0.0	0.0	0
10	16.0	1	0.0	0	26.0	2	0.0	0	0.0	0.0	0
11	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0	0
12	0.0	0	0.0	0	0.0	0	0.0	0	3.1	26.2	2
13	0.0	0	0.0	0	0.0	0	11.5	2	0.9	0.0	0
14	0.0	0	0.0	0	0.0	0	56.1	4	2.3	0.0	0
15	0.0	0	0.0	0	0.0	0	1.5	0	1.5	0.0	0
16	2.0	0	17.0	1	9.4	1	19.5	1	0.2	0.0	0
17	0.0	0	0.0	0	0.0	0	1.7	0	1.2	0.0	0
18	11.8	2	0.0	0	0.0	0	8.3	1	3.6	24.9	3
19	0.0	0	0.0	0	26.2	1	72.7	6	15.8	3.0	1
20	0.0	0	0.0	0	0.0	0	58.3	4	15.5	2.8	1
21	14.4	2	0.0	0	166.6	3	7.0	2	0.0	11.8	2

Table MET -1.2 (g): Rainfall (RF, mm) and Rainy days (RD, No.) during crop growth period, Rabi 2013-14

Central Zone														
Met Week	Kanpur		Anand		Jabalpur		Rahuri		Urulikanchan		Raipur		Jhansi	
	RF	RD	RF	RD	RF	RD	RF	RD	RF	RD	RF	RD	RF	RD
40			1.4	0	69.0	3	28.2	1	19.0	2	45.2	5	102.0	3
41			18.7	3	18.4	2	65.8	3	0.0	0	8.6	1	5.6	1
42			0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
43			0.0	0	16.4	1	5.2	1	0.0	0	32.6	2	0.0	0
44			0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
45	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	2.8	1
46	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
47	0.0	0	0.0	0	0.0	0	41.8	1.0	0.0	0	0.0	0	0.0	0
48	0.0	0	0.0	0	0.0	0	0.0	0	22.0	1	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	0
50	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
52	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	22.6	2
1	11.2	2	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	8.4	2
2	19.0	4	0.0	0	18.0	1	0.0	0	0.0	0	0.0	0	1.2	0
3	67.2	1	7.4	1	6.8	1	0.0	0	0.0	0	0.0	0	7.8	1
4	8.4	1	9.2	1	0.0	0	0.0	0	0.0	0	0.0	0	35.2	2
5	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.8	0
6	1.2	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
7	13.6	2	0.0	0	12.0	2	0.0	0	0.0	0	20.4	2	9.4	1
8	12.0	2	0.0	0	17.0	1	0.0	0	0.0	0	18.6	1	29.2	2
9	10.0	2	0.0	0	47.0	3	0.6	0	7.0	1	45.8	3	28.2	2
10	0.0	0	0.0	0	1.8	0	32.8	3	17.4	1	2.4	0	0.0	0
11	0.0	0	0.0	0	2.6	1	0.8	0	13.2	1	2.0	0	5.4	1
12	10.6	1	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.8	0
13	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
14	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	2.8	1	0.0	0
15	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	2.8	1	0.0	0
16	4.4	1	4.6	1	0.0	0	0.0	0	0.0	0	18.0	1	15.0	2
17	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.2	0	1.6	0
18	0.0	0	0.0	0	0.0	0	3.6	1	0.0	0	2.4	0	1.4	0
19	0.0	0	6.0	1	0.0	0	0.0	0	0.0	0	0.0	0	4.8	1
20	0.0	0	0.0	0	10.6	1	0.0	0	0.0	0	0.0	0	0.0	0
21			0.0	0	0.0	0	0.0	0	0.0	0	32.2	2	3.8	1

Table MET -1.2 (h): Rainfall (RF, mm) and Rainy days (RD, No.) during crop growth period, Rabi 2013-14

South Zone										
Met Week	Coimbatore		Vellayani		Hyderabad		Mandya		Dharwad	
	RF	RD	RF	RD	RF	RD	RF	RD	RF	RD
40	0.0	0	13.4	2	2.0	0	0.0	0	10.2	0
41	10.0	2	22.8	2	18.0	2	0.0	0	0.0	0
42	93.4	4	7.0	2	11.2	1	86.0	3	17.9	1
43	34.6	2	54.4	3	222.0	6	30.0	2	47.3	3
44	29.6	3	62.0	4	0.0	0	3.4	1	0.0	0
45	0.5	0	3.2	0	0.0	0	0.0	0	0.0	0
46	5.1	1	46.3	3	0.0	0	5.2	1	0.0	0
47	25.9	2	58.1	2	28.8	2	47.8	2	0.0	0
48	3.2	1	49.8	2	2.2	0	1.4	0	2.2	0
49	7.6	1	1.4	0	0.0	0	0.0	0	0.0	0
50	14.0	1	26.0	1	0.0	0	0.0	0	0.0	0
51	0.0	0	47.0	1	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
1	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
2	0.0	0	28.0	2	0.0	0	0.0	0	0.0	0
3	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
5	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
7	0.0	0	3.0	1	0.0	0	0.0	0	0.0	0
8	0.2	0	18.0	2	0.0	0	0.8	0	0.0	0
9	0.0	0	25.0	1	32.6	2	16.0	2	0.0	0
10	0.0	0	0.0	0	24.2	3	20.0	2	10.2	1
11	0.0	0	0.0	0	0.0	0	0.0	0	1.2	0
12	0.0	0	6.5	1	0.0	0	0.0	0	0.0	0
13	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
14	0.0	0	19.0	2	1.0	0	1.0	0	1.2	0
15	17.4	1	32.0	2	61.6	1	4.8	1	0.0	0
16	0.0	0	18.0	3	10.0	1	14.4	1	36.2	2
17	0.0	0	45.5	2	0.0	0	0.0	0	0.6	0
18	0.0	0	131.1	5	0.0	0	62.2	3	52.4	2
19	62.4	3	132.3	4	32.0	2	42.6	2	67.8	2
20	0.2	0	0.0	0	1.4	0	33.4	1	61.4	1
21	40.2	1			0.0	0	30.4	1	9.2	1

Table MET- 1.3 (i): Relative humidity (M = Morning, AN = Afternoon, AV = Average; %) during crop growth period, Rabi 2013-14

Met Week	Hill Zone					
	Srinagar			Palampur		
	M	AN	AV	M	AN	AV
40	86.3	78.5	82.4	93.3	82.6	88.0
41	89.7	83.1	86.4	88.6	88.1	88.4
42	93.3	72.1	82.7	78.6	60.3	69.5
43	89.0	85.0	87.0	86.1	66.6	76.4
44	89.4	72.3	80.9	72.7	43.9	58.3
45	91.0	69.3	80.1	71.6	53.1	62.4
46	91.6	50.0	70.8	60.2	38.0	49.1
47	82.7	54.7	68.7	65.0	47.7	56.4
48	85.4	63.1	74.3	73.0	45.3	59.2
49	80.6	73.9	77.2	66.6	40.9	53.8
50	88.3	70.7	79.5	74.0	44.6	59.3
51	82.9	61.0	71.9	82.6	53.4	68.0
52	84.3	62.4	73.4	75.9	53.9	64.9
1	86.3	87.5	86.9	74.1	54.9	64.5
2	89.7	83.1	86.4	77.7	55.7	66.7
3	93.3	72.1	82.7	77.4	59.7	68.6
4	89.0	85.0	87.0	69.7	59.1	64.4
5	89.4	72.3	80.9	71.9	54.4	63.2
6	91.0	69.3	80.1	83.9	67.7	75.8
7	91.6	50.0	70.8	69.4	55.9	62.7
8	82.7	54.7	68.7	79.4	52.4	65.9
9	85.4	63.1	74.3	81.7	64.3	73.0
10	80.6	73.9	77.2	65.7	62.7	64.2
11	88.3	70.7	79.5	64.7	48.1	56.4
12	82.9	61.0	71.9	63.0	52.0	57.5
13	84.3	62.4	73.4	58.4	49.3	53.9
14	87.9	75.6	81.7	59.4	63.0	61.2
15	74.4	53.9	64.1	52.0	34.0	43.0
16	81.3	73.4	77.4	62.6	45.3	54.0
17	73.4	49.2	61.3	50.7	35.3	43.0
18	83.0	50.2	66.6	59.7	41.0	50.1
19	81.3	58.7	70.0	62.0	47.7	54.9
20	87.0	59.1	73.1			
21	80.0	52.2	66.1			

Table MET- 1.3 (j): Relative humidity (M = Morning, AN = Afternoon, AV = Average; %) during crop growth period, Rabi 2013-14

Met Week	North West Zone											
	Bikaner			Pantnagar			Ludhiana			Hisar		
	M	AN	AV	M	AN	AV	M	AN	AV	M	AN	AV
40	82.0	47.4	64.7	82.0	67.0	74.5	89.0	63.0	76.0	89.0	63.0	76.0
41	78.0	39.4	58.7	90.0	61.0	75.5	95.0	67.0	81.0	92.0	59.0	75.5
42	61.8	29.4	45.6	91.0	63.0	77.0	89.0	35.0	62.0	87.0	37.0	62.0
43	57.5	24.7	41.1	88.0	55.0	71.5	91.0	38.0	64.5	95.0	37.0	66.0
44	61.8	17.2	39.5	85.0	53.0	69.0	87.0	37.0	62.0	89.0	37.0	63.0
45	75.5	34.5	55.0	90.0	56.0	73.0	91.0	44.0	67.5	91.0	51.0	71.0
46	59.8	21.1	40.5	93.0	38.0	65.5	92.0	29.0	60.5	96.0	37.0	66.5
47	53.8	26.8	40.3	93.0	42.0	67.5	93.0	39.0	66.0	92.0	38.0	65.0
48	57.4	20.2	38.8	92.0	49.0	70.5	91.0	39.0	65.0	92.0	38.0	65.0
49	64.5	25.8	45.2	94.0	42.0	68.0	93.0	44.0	68.5	91.0	43.0	67.0
50	60.0	28.4	44.2	93.0	49.0	71.0	93.0	50.0	71.5	94.0	44.0	69.0
51	75.4	43.8	59.6	92.0	59.0	75.5	97.0	83.0	90.0	97.0	78.0	87.5
52	61.0	25.7	43.4	94.0	65.0	79.5	93.0	44.0	68.5	94.0	43.0	68.5
1	66.0	25.0	45.5	97.0	74.0	85.5	94.0	52.0	73.0	95.0	59.0	77.0
2	70.0	38.0	54.0	96.0	79.0	87.5	93.0	51.0	72.0	96.0	52.0	74.0
3	69.7	45.5	57.6	94.0	73.0	83.5	96.0	75.0	85.5	99.0	84.0	91.5
4	77.5	48.5	63.0	94.0	79.0	86.5	98.0	66.0	82.0	98.0	78.0	88.0
5	71.5	25.8	48.7	96.0	72.0	84.0	96.0	72.0	84.0	98.0	72.0	85.0
6	69.2	25.4	47.3	92.0	60.0	76.0	95.0	64.0	79.5	97.0	65.0	81.0
7	64.0	35.5	49.8	95.0	58.0	76.5	93.0	61.0	77.0	95.0	63.0	79.0
8	58.2	35.7	47.0	91.0	55.0	73.0	93.0	59.0	76.0	92.0	66.0	79.0
9	53.8	38.2	46.0	90.0	48.0	69.0	92.0	62.0	77.0	99.0	70.0	84.5
10	55.8	33.4	44.6	88.0	46.0	67.0	88.0	57.0	72.5	96.0	64.0	80.0
11	68.7	40.0	54.4	87.0	46.0	66.5	93.0	51.0	72.0	92.0	66.0	79.0
12	78.7	42.0	60.4	83.0	39.0	61.0	89.0	52.0	70.5	89.0	42.0	65.5
13	72.1	43.3	57.7	87.0	32.0	59.5	89.0	43.0	66.0	86.0	54.0	70.0
14	63.5	18.4	41.0	82.0	31.0	56.5	84.0	43.0	63.5	88.0	38.0	63.0
15	53.7	34.0	43.9	72.0	22.0	47.0	77.0	30.0	53.5	72.0	31.0	51.5
16	72.2	34.5	53.4	75.0	29.0	52.0	79.0	42.0	60.5	79.0	50.0	64.5
17	46.2	29.5	37.9	67.0	19.0	43.0	70.0	36.0	53.0	57.0	22.0	39.5
18	52.1	23.1	37.6	62.0	30.0	46.0	63.0	26.0	44.5	58.0	25.0	41.5
19	53.1	51.2	52.2	63.0	26.1	44.6	61.0	38.0	49.5	73.0	37.0	55.0
20	72.7	49.2	61.0	67.0	23.0	45.0	69.0	33.0	51.0	77.0	36.0	56.5
21	58.8	35.4	47.1	59.0	28.0	43.5	49.0	28.0	38.5	58.0	27.0	42.5

Table MET- 1.3 (k): Relative humidity (M = Morning, AN = Afternoon, AV = Average; %) during crop growth period, Rabi 2013-14

North East Zone																		
Met	Ranchi			Faizabad			Bhubaneswar			Jorhat			Imphal			Kalyani		
Week	M	AN	AV	M	AN	AV	M	AN	AV	M	AN	AV	M	AN	AV	M	AN	AV
40	84.4	68.1	76.3	89.8	69.1	79.5	96.0	76.0	86.0	83.0	79.0	81.0	89.3	71.4	80.4	98.0	79.9	88.9
41	84.6	65.6	75.1	88.2	72.4	80.3	97.0	81.0	89.0	92.0	70.0	81.0	91.4	70.0	80.7	96.0	83.3	89.6
42	84.1	70.7	77.4	94.1	70.5	82.3	95.0	75.0	85.0	94.0	73.0	83.5	87.9	60.7	74.3	96.9	75.1	86.0
43	81.9	67.9	74.9	79.2	59.5	69.4	98.0	93.0	95.5	93.0	69.0	81.0	92.9	75.4	84.2	97.4	85.3	91.4
44	82.9	69.7	76.3	86.8	61.0	73.9	91.0	44.0	67.5	96.0	69.0	82.5	89.0	55.6	72.3	94.7	57.4	76.1
45	82.0	72.0	77.0	89.0	53.5	71.3	91.0	54.0	72.5	96.0	58.0	77.0	87.9	53.1	70.5	74.6	58.6	66.6
46	83.4	72.1	77.8	85.7	48.4	67.1	79.0	50.0	64.5	97.0	55.0	76.0	87.9	47.7	67.8	80.4	49.9	65.1
47	74.6	56.4	65.5	89.0	43.8	66.4	82.0	53.0	67.5	95.0	55.0	75.0	82.0	47.7	64.9	79.7	53.4	66.6
48	75.9	59.6	67.8	85.4	55.5	70.5	87.0	53.0	70.0	95.0	59.0	77.0	82.9	52.4	67.7	81.0	58.6	69.8
49	68.4	46.6	57.5	81.2	51.1	66.2	75.0	34.0	54.5	96.1	59.4	77.8	85.4	47.7	66.6	83.6	58.6	71.0
50	67.1	49.4	58.3	84.5	53.0	68.8	84.0	37.0	60.5	97.6	60.6	79.1	88.9	49.1	69.0	83.4	55.1	69.3
51	70.1	51.1	60.6	91.8	53.8	72.8	96.0	37.0	66.5	97.6	60.6	79.1	84.9	49.1	67.0	83.7	62.1	72.9
52	70.6	47.9	59.3	83.2	60.5	71.9	92.0	40.0	66.0	98.3	67.1	82.7	91.0	52.0	71.5	87.4	58.4	72.9
1	80.1	66.9	73.5	92.4	58.8	75.6	94.0	47.0	70.5	98.0	62.3	80.1	89.4	43.9	66.7	82.3	60.6	71.4
2	82.6	70.0	76.3	99.4	76.4	87.9	90.0	45.0	67.5	96.7	58.6	77.6	87.9	41.1	64.5	84.9	58.3	71.6
3	83.4	69.7	76.6	95.5	70.7	83.1	90.0	49.0	69.5	95.0	55.7	75.4	85.6	46.6	66.1	92.0	73.1	82.6
4	82.9	67.0	75.0	89.0	66.1	77.6	94.0	41.0	67.5	96.6	52.1	74.4	88.3	43.1	65.7	84.1	59.3	71.7
5	82.6	67.1	74.9	96.0	73.1	84.6	93.0	35.0	64.0	94.3	61.7	78.0	88.6	34.4	61.5	89.7	56.6	73.1
6	82.6	63.7	73.2	85.0	48.8	66.9	92.0	33.0	62.5	95.1	68.7	81.9	86.1	40.6	63.4	83.4	44.6	64.0
7	83.7	62.1	72.9	85.1	56.5	70.8	90.0	53.0	71.5	94.3	50.0	72.1	79.9	45.0	62.5	84.4	54.3	69.4
8	83.0	49.7	66.4	87.8	56.4	72.1	91.0	55.0	73.0	94.3	50.0	72.1	91.7	56.4	74.1	85.1	54.4	69.8
9	85.4	62.1	73.8	90.1	57.7	73.9	94.0	62.0	78.0	92.4	59.4	75.9	84.6	43.7	64.2	85.9	56.6	71.2
10	83.6	48.3	66.0	78.8	45.8	62.3	93.0	66.0	79.5	91.4	49.3	70.4	85.9	42.6	64.3	85.1	44.0	64.6
11	83.1	63.6	73.4	74.2	42.1	58.2	89.0	40.0	64.5	87.1	46.4	66.8	82.0	38.4	60.2	82.6	43.3	62.9
12	83.0	68.6	75.8	71.1	38.2	54.7	88.0	48.0	68.0	88.6	50.4	69.5	81.1	41.1	61.1	87.3	50.0	68.6
13	84.0	58.0	71.0	63.5	36.5	50.0	90.0	35.0	62.5	90.9	66.7	78.8	83.3	50.9	67.1	86.7	41.2	63.9
14	83.6	67.9	75.8	64.5	35.1	49.8	91.0	43.0	67.0	87.4	53.7	70.6	83.3	50.9	67.1	88.4	40.9	64.6
15	82.4	69.1	75.8	58.5	30.5	44.5	81.0	37.0	59.0	87.7	52.1	69.9	86.4	57.9	72.2	86.0	36.6	61.3
16	83.4	65.6	74.5	71.4	39.1	55.3	90.0	38.0	64.0	88.6	49.9	69.2	78.1	58.9	68.5	83.1	35.3	59.2
17	83.4	63.9	73.7	61.2	36.1	48.7	89.0	42.0	65.5	88.0	47.6	67.8	76.3	46.4	61.4	86.9	37.4	62.1
18	82.6	66.1	74.4	68.7	35.2	52.0	83.0	42.0	62.5	94.4	76.6	85.5	85.9	52.3	69.1	86.7	58.4	72.6
19	80.9	51.1	66.0				84.0	50.0	67.0	93.6	82.7	88.1	87.0	71.1	79.1	84.7	49.1	66.9
20	80.7	51.4	66.1				87.0	35.0	61.0	91.4	69.6	80.5	88.7	71.3	80.0	87.0	38.9	62.9
21	84.0	62.6	73.3				92.0	55.0	73.5	93.1	70.3	81.7	76.9	56.4	66.7	88.1	65.3	76.7

Table MET- 1.3 (l): Relative humidity (M = Morning, AN = Afternoon, AV = Average; %) during crop growth period, Rabi 2013-14

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	98.0	71.0	84.5	95.0	77.0	86.0	82.0	58.0	70.0	98.9	62.9	80.9	95.0	75.0	85.0	94.0	83.0	88.5
41	98.0	74.0	86.0	93.0	72.0	82.5	77.0	57.0	67.0	99.5	65.4	82.5	89.0	71.0	80.0	92.0	67.0	79.5
42	100.0	44.0	72.0	95.0	50.0	72.5	75.0	46.0	60.5	100.0	54.7	77.4	91.0	56.0	73.5	90.0	52.0	71.0
43	82.0	36.0	59.0	94.0	60.0	77.0	68.0	56.0	62.0	99.4	36.1	67.8	96.0	73.0	84.5	91.0	47.0	69.0
44	94.0	45.0	69.5	91.0	36.0	63.5	63.0	48.0	55.5	99.5	41.3	70.4	92.0	38.0	65.0	82.0	35.0	58.5
45	88.0	43.0	65.5	93.0	36.0	64.5	65.0	28.0	46.5	97.7	25.7	61.7	91.0	37.0	64.0	87.0	52.0	69.5
46	77.0	41.0	59.0	93.0	35.0	64.0	69.0	27.0	48.0	95.5	26.4	61.0	91.0	36.0	63.5	88.0	56.0	72.0
47	83.0	36.0	59.5	86.0	30.0	58.0	66.0	28.0	47.0	92.0	24.4	58.2	87.0	40.0	63.5	87.0	37.0	62.0
48	79.0	42.0	60.5	88.0	30.0	59.0	72.0	36.0	54.0	91.4	32.7	62.1	83.0	35.0	59.0	8.7	41.0	24.9
49	92.0	40.0	66.0	91.0	33.0	62.0	72.0	38.0	55.0	93.4	22.1	57.8	91.0	31.0	61.0	88.0	43.0	65.5
50	95.0	38.0	66.5	89.0	30.0	59.5	74.0	25.0	49.5	70.0	27.6	48.8	90.0	27.0	58.5	89.0	37.0	63.0
51	95.0	40.0	67.5	91.0	34.0	62.5	55.0	28.0	41.5	91.9	35.0	71.7	90.0	34.0	62.0	89.0	55.0	72.0
52	76.0	51.0	63.5	90.0	44.0	67.0	67.0	34.0	50.5	93.3	39.1	71.4	93.0	40.0	66.5	91.0	70.0	80.5
1	95.0	52.0	73.5	90.0	56.7	73.4	66.0	37.0	51.5	79.4	31.2	55.3	90.0	40.0	65.0	92.0	78.0	85.0
2	91.0	49.0	70.0	94.3	58.1	76.2	59.0	34.0	46.5	80.4	28.7	54.6	90.0	47.0	68.5	91.0	70.0	80.5
3	93.0	54.0	73.5	94.9	67.6	81.3	54.0	34.0	44.0	85.9	24.6	55.3	89.0	46.0	67.5	91.0	79.0	85.0
4	97.0	67.0	82.0	91.0	60.7	75.9	67.0	39.0	53.0	85.0	32.6	58.8	87.0	38.0	62.5	92.0	76.0	84.0
5	94.0	42.0	68.0	92.6	34.1	63.4	59.0	31.0	45.0	86.1	29.3	57.7	86.0	28.0	57.0	92.0	58.0	75.0
6	87.0	42.0	64.5	90.9	39.1	65.0	54.0	20.0	37.0	84.3	25.6	55.0	85.0	33.0	59.0	89.0	49.0	69.0
7	94.0	45.0	69.5	88.0	40.9	64.5	54.0	27.0	40.5	91.1	26.0	58.6	83.0	39.0	61.0	92.0	61.0	76.5
8	90.0	43.0	66.5	93.1	55.4	74.3	56.0	30.0	43.0	86.1	24.1	55.1	86.0	41.0	63.5	93.0	69.0	81.0
9	86.0	33.0	59.5	92.2	58.2	75.2	51.0	33.0	42.0	87.1	19.0	53.1	91.0	61.0	76.0	90.0	63.0	76.5
10	79.0	38.0	58.5	87.4	41.2	64.3	77.0	45.0	61.0	82.1	18.7	50.4	88.0	44.0	66.0	85.0	48.0	66.5
11	82.0	25.0	53.5	84.1	44.6	64.4	59.0	30.0	44.5	67.7	14.0	40.9	89.0	38.0	63.5	85.0	42.0	63.5
12	80.0	29.0	54.5	78.7	27.4	53.1	41.0	20.0	30.5	71.1	18.6	44.9	74.0	21.0	47.5	79.0	33.0	56.0
13	62.0	27.0	44.5	76.7	20.3	48.5	39.0	20.0	29.5	79.0	17.4	48.2	67.0	24.0	45.5	81.0	31.0	56.0
14	70.0	23.0	46.5	55.0	15.9	35.5	36.0	19.0	27.5	77.0	16.7	46.9	59.0	17.0	38.0	71.0	26.0	48.5
15	79.0	31.0	55.0	56.9	16.6	36.8	46.0	17.0	31.5	84.4	14.7	49.6	58.0	23.0	40.5	71.0	22.0	46.5
16	86.0	43.0	64.5	60.9	26.0	43.5	59.0	26.0	42.5	84.1	26.3	55.2	67.0	28.0	47.5	74.0	37.0	55.5
17	66.0	21.0	43.5	50.3	12.9	31.6	46.0	20.0	33.0	66.7	19.1	42.9	58.0	18.0	38.0	65.0	31.0	48.0
18	75.0	36.0	55.5	37.4	19.0	28.2	52.0	21.0	36.5	74.7	15.4	45.1	53.0	23.0	38.0	60.0	29.0	44.5
19	70.0	30.0	50.0	48.0	23.9	36.0	65.0	22.0	43.5	84.0	21.9	53.0	59.0	27.0	43.0	58.0	23.0	40.5
20	73.3	37.8	55.6	51.7	19.0	35.4	65.0	25.0	45.0	76.7	19.7	48.2	43.0	16.0	29.5	51.0	27.0	39.0
21	72.0	29.6	50.8	47.3	19.0	33.2	61.0	23.0	42.0	77.4	20.0	48.7	54.0	30.0	42.0	55.0	30.0	42.5

Table MET- 1.3 (m): Relative humidity (M = Morning, AN = Afternoon, AV = Average; %) during crop growth period, Rabi 2013-14

Met Week	South Zone												
	Coimbatore	Vellayani			Hyderabad			Mandya			Dharwad		
	M	M	AN	AV	M	AN	AV	M	AN	AV	M	AN	AV
40	82.0	94.0	74.4	84.2	84.0	63.0	73.5	87.0	54.0	70.5	90.1	78.4	84.3
41	85.0	91.4	75.4	83.4	87.0	62.0	74.5	88.0	55.0	71.5	89.0	72.3	80.7
42	94.0	92.1	79.9	86.0	87.0	53.0	70.0	91.0	52.0	71.5	88.6	65.1	76.9
43	92.0	95.0	70.9	83.0	96.0	81.0	88.5	93.0	55.0	74.0	89.9	80.3	85.1
44	89.0	93.9	80.1	87.0	87.0	56.0	71.5	91.0	59.0	75.0	82.4	59.0	70.7
45	87.0	97.0	76.9	87.0	84.0	49.0	66.5	89.0	54.0	71.5	80.6	54.8	67.7
46	90.0	97.7	78.3	88.0	84.0	37.0	60.5	90.0	55.0	72.5	68.3	48.0	58.2
47	91.0	97.3	78.1	87.7	89.0	58.0	73.5	90.0	57.0	73.5	69.6	48.1	58.9
48	88.0	97.3	75.4	86.4	90.0	51.0	70.5	90.0	57.0	73.5	79.7	56.7	68.2
49	85.0	98.6	69.9	84.3	77.0	37.0	57.0	94.0	51.0	72.5	68.6	44.3	56.5
50	92.0	96.7	69.6	83.2	86.0	27.0	56.5	79.0	56.0	67.5	54.1	36.0	45.1
51	86.0	97.7	72.0	84.9	81.0	35.0	58.0	91.0	51.0	71.0	62.0	35.3	48.7
52	86.0	96.6	59.1	77.9	87.0	40.0	63.5	90.0	39.0	64.5	72.0	44.4	58.2
1	87.0	94.9	77.6	86.3	86.3	41.3	63.8	92.5	46.5	69.5	72.3	42.3	57.3
2	83.0	94.4	77.4	85.9	81.0	35.0	58.0	89.7	53.8	71.8	65.3	35.1	50.2
3	81.0	94.1	76.1	85.1	87.0	41.0	64.0	89.1	50.6	69.9	68.3	41.7	55.0
4	84.0	94.1	76.1	85.1	83.0	46.0	64.5	82.7	47.6	65.2	62.7	34.6	48.7
5	82.0	92.3	68.6	80.5	86.0	33.0	59.5	91.4	37.1	64.3	60.1	32.4	46.3
6	71.0	95.1	68.9	82.0	82.0	26.0	54.0	87.4	25.6	56.5	41.4	25.1	33.3
7	81.0	92.0	72.0	82.0	72.0	32.0	52.0	77.9	42.6	60.2	59.3	33.3	46.3
8	81.0	90.6	70.6	80.6	76.0	40.0	58.0	88.0	38.9	63.4	63.3	35.7	49.5
9	81.0	92.3	68.6	80.5	84.0	49.0	66.5	87.8	38.8	63.3	60.3	30.6	45.5
10	80.0	90.4	66.9	78.7	90.0	49.0	69.5	86.0	42.0	64.0	65.1	40.3	52.7
11	73.0	93.0	63.4	78.2	77.0	29.0	53.0	79.8	41.3	60.6	42.0	19.7	30.9
12	72.0	93.7	69.1	81.4	71.0	27.0	49.0	80.6	48.4	64.5	59.7	25.1	42.4
13	70.0	89.1	64.0	76.6	73.0	28.0	50.5	84.9	24.9	54.9	59.3	19.1	39.2
14	76.0	89.9	75.3	82.6	76.0	31.0	53.5	91.0	40.5	65.7	65.3	37.1	51.2
15	83.0	91.0	69.6	80.3	73.0	42.0	57.5	83.1	32.1	57.6	48.6	27.3	38.0
16	84.0	90.7	73.3	82.0	82.0	37.0	59.5	84.3	32.9	58.6	68.4	46.0	57.2
17	83.0	94.0	76.6	85.3	77.0	36.0	56.5	75.8	30.7	53.2	76.6	36.3	56.5
18	76.0	93.1	83.3	88.2	70.4	36.3	53.4	80.6	40.8	60.7	66.2	44.5	55.4
19	90.0	92.0	84.4	88.2	71.6	41.9	56.8	86.5	45.6	66.1	77.3	47.1	62.2
20	85.0	88.3	72.6	80.5	62.7	31.1	46.9	81.6	43.2	62.4	75.1	43.9	59.5
21	86.0				61.3	29.0	45.2	82.3	42.1	62.2	80.6	63.7	72.2

Table MET -1.4 (n): Sunshine at AICRP-FC trial locations during crop growth period, *Rabi* 2013-14

Met Week	Hill Zone		North West Zone			
	Srinagar	Palampur	Bikaner	Pantnagar	Ludhiana	Hisar
40	8.0	4.4	8.2	4.2	4.8	6.9
41	7.9	1.2	8.4	6.7	2.1	5.8
42	7.4	8.4	9.3	5.5	9.1	8.9
43	7.0	8.0	9.1	8.0	5.2	6.8
44	6.8	8.0	8.7	5.5	5.7	7.7
45	6.5	5.9	6.0	3.9	4.1	3.4
46	6.3	9.4	9.5	1.9	8.8	7.9
47	6.5	8.9	9.2	2.1	7.3	7.9
48	5.4	9.4	9.0	4.6	8.0	8.0
49	5.2	7.4	8.9	8.7	6.1	7.8
50	3.2	8.9	8.3	6.6	5.5	15.0
51	2.6	6.4	3.0	2.7	0.2	2.0
52	2.0	8.7	9.6	4.6	7.1	6.8
1	0.0	5.9	7.7	3.1	5.4	4.4
2	0.9	2.5	6.3	2.6	4.7	5.5
3	2.5	4.5	3.5	3.0	2.5	2.3
4	0.1	6.6	4.5	1.6	6.1	2.8
5	0.3	6.1	6.9	2.2	2.7	4.2
6	1.8	2.9	6.5	5.6	5.0	6.0
7	5.9	6.2	8.7	6.7	6.5	6.5
8	2.9	7.3	8.6	6.3	7.1	6.4
9	1.8	4.8	7.8	6.2	6.0	6.1
10	2.6	4.4	8.4	7.6	11.7	5.7
11	2.2	5.0	8.8	9.1	9.3	7.9
12	1.9	4.6	8.6	7.9	7.3	8.8
13	3.2	6.6	7.9	7.6	10.1	5.5
14	0.9	6.6	9.6	10.4	8.8	9.1
15	6.1	8.3	9.5	9.4	9.9	9.5
16	3.2	5.5	7.6	7.4	8.9	8.8
17	7.7	10.6	9.0	11.6	12.2	10.4
18	7.2	10.4	7.4	9.5	7.7	9.3
19	5.1	7.4	7.4	9.1	7.5	7.8
20	3.6		7.1	10.6	12.0	9.6
21	7.8		11.0	10.7	10.8	10.5

Table MET -1.4 (o): Sunshine at AICRP-FC trial locations during crop growth period, *Rabi* 2013-14

Met Week	North East Zone					
	Ranchi	Faizabad	Bhubaneswar	Jorhat	Imphal	Kalyani
40	4.2	3.8	3.5	1.8	2.7	3.9
41	3.3	3.6	2.6	7.1	4.2	4.0
42	6.2	4.2	3.4	5.1	8.2	6.7
43	4.0	6.7	0.5	5.4	2.5	1.9
44	9.2	4.6	5.0	3.5	6.9	8.4
45	8.6	5.8	4.2	8.1	8.7	8.9
46	9.8	5.7	4.4	8.9	8.4	8.7
47	9.4	6.0	3.3	8.9	8.7	7.2
48	9.0	5.4	3.0	8.1	8.1	7.0
49	9.1	6.5	4.0	5.6	8.6	6.4
50	9.4	4.1	3.3	4.3	8.1	7.3
51	8.1	0.8	4.5	4.3	6.4	4.4
52	9.8	3.6	4.5	3.6	6.2	6.2
1	8.2	4.4	3.8	4.8	8.1	5.7
2	6.3	0.4	3.3	6.9	8.1	5.4
3	8.5	2.0	3.4	7.0	8.2	4.1
4	8.3	3.1	6.7	4.7	8.3	7.6
5	8.9	2.5	6.4	3.7	8.9	7.7
6	9.2	7.1	7.6	3.6	8.0	8.1
7	4.7	4.3	6.3	7.7	5.8	6.2
8	7.9	5.0	8.9	7.7	6.6	8.0
9	4.7	5.2	7.7	4.1	7.5	6.2
10	6.4	7.0	7.1	6.5	7.6	8.9
11	8.6	7.6	7.7	6.0	7.3	8.0
12	9.2	6.4	8.0	5.2	7.9	7.8
13	8.9	8.0	8.1	4.3	6.7	9.1
14	9.7	8.1	7.8	5.1	6.7	8.6
15	9.4	7.5	7.4	6.8	6.1	8.7
16	9.7	6.7	8.6	6.5	7.7	8.6
17	9.7	8.5	9.0	6.0	9.7	9.5
18	8.8	7.2	9.0	2.4	6.7	7.8
19	7.7		8.9	4.7	3.1	8.7
20	9.7		8.3	4.6	5.7	9.6
21	8.2		5.6	4.9	6.6	6.1

Table MET -1.4 (p): Sunshine at AICRP-FC trial locations during crop growth period, *Rabi* 2013-14

Met Week	Central Zone					South Zone		
	Anand	Jabalpur	Raipur	Jhansi	Kanpur	Coimbatore	Hyderabad	Mandya
40	6.3	6.6	4.2	2.7		9.0	4.8	4.8
41	5.1	5.5	3.5	5.9		7.3	6.4	4.7
42	8.9	8.3	8.6	8.8		5.8	8.1	3.2
43	10.0	6.8	2.1	8.7		4.2	1.4	3.6
44	8.4	8.3	8.9	8.8		8.1	7.4	7.2
45	7.6	7.8	8.2	7.4	6.0	5.7	7.2	8.1
46	8.2	7.8	7.6	8.2	5.8	2.4	8.1	4.1
47	9.6	8.8	7.3	8.9	5.7	6.3	5.8	7.3
48	9.0	8.3	8.4	9.0	6.4	4.7	6.3	7.3
49	8.4	7.7	8.5	8.3	5.7	6.7	8.5	7.6
50	9.1	8.6	9.0	8.8	4.5	5.5	9.6	7.8
51	8.8	8.0	8.0	6.2	1.5	6.9	9.3	9.2
52	3.9	5.4	6.5	3.6	3.6	7.5	8.5	8.4
1	5.1	4.7	6.9	2.8	3.6	8.8	8.5	9.0
2	7.0	5.3	5.4	3.5	2.6	6.3	8.6	9.0
3	7.9	3.6	4.6	3.1	0.6	7.3	8.3	7.7
4	5.3	4.7	7.0	3.0	3.2	7.9	7.5	9.1
5	9.7	9.6	9.5	6.6	3.4	9.2	8.2	8.6
6	9.8	9.4	8.7	8.9	8.3	10.2	9.7	8.1
7	8.7	7.7	6.6	6.0	5.1	8.2	8.6	7.4
8	8.1	6.5	8.7	5.6	5.0	5.0	8.4	7.6
9	8.4	6.3	6.6	6.2	5.5	6.7	7.7	6.5
10	9.8	7.5	4.9	9.3	8.1	6.3	4.8	6.6
11	9.8	7.9	7.5	9.5	9.1	9.9	8.3	8.4
12	10.1	8.5	9.0	10.2	8.9	10.1	8.8	8.2
13	10.0	8.6	7.7	9.6	9.0	9.9	8.6	8.6
14	9.8	9.3	8.6	9.9	9.7	9.3	8.4	7.1
15	9.9	9.3	6.8	10.4	8.7	6.8	6.6	3.3
16	9.8	9.0	9.1	8.5	7.8	8.6	7.4	6.5
17	10.9	9.5	9.7	10.8	10.1	6.9	8.3	4.8
18	10.5	9.6	9.4	10.5	8.5	6.4	8.5	5.9
19	10.8	7.6	8.3	10.2	9.1	4.4	8.1	6.3
20	9.8	8.6	9.2	9.8	10.0	8.8	9.5	8.1
21	11.1	10.2	7.5	10.2		7.3	7.5	7.9

Met. Week		Met. Week	
40	Oct. 01-Oct. 07, 2013	**5**	Jan. 29-Feb-04, 2014
41	Oct. 08-Oct. 14, 2013	**6**	Feb. 05-Feb-11, 2014
42	Oct. 15-Oct 21, 2013	**7**	Feb. 12-Feb.-18, 2014
43	Oct. 22-Oct. 28, 2013	**8**	Feb. 19-Feb. 25, 2014
44	Oct. 29-Nov. 04, 2013	**9**	Feb. 26-Mar. 04, 2014
45	Nov. 05-Nov. 11, 2013	**10**	Mar. 05-Mar. 11, 2014
46	Nov. 12-Nov. 18 2013	**11**	Mar. 12-Mar. 18, 2014
47	Nov. 19-Nov. 25, 2013	**12**	Mar. 19-Mar. 25, 2014
48	Nov. 26-Dec. 02 2013	**13**	Mar. 26-Apr. 01, 2014
49	Dec. 03-Dec. 09, 2013	**14**	Apr. 02-Apr. 08, 2014
50	Dec. 10-Dec. 16, 2013	**15**	Apr. 09-Apr.-15, 2014
51	Dec. 17-Dec. 23, 2013	**16**	Apr. 16-Apr. 22, 2014
52	Dec. 24-Dec. 31, 2013	**17**	Apr. 23-Apr.29, 2014
1	Jan. 01-Jan 07, 2014	**18**	Apr. 30-May. 06, 2014
2	Jan. 08-Jan. 14, 2014	**19**	May 07-May. 13, 2014
3	Jan. 15-Jan 21, 2014	**20**	May. 14-May 20, 2014
4	Jan. 22-Jan. 28, 2014	**21**	May. 21-May. 27 2014

APPENDIX IV: FORAGE CROP BREEDING TRIALS AT A GLANCE (*Rabi*: 2013-14)

S. No	Location	Berseem		Oat (Single cut)						Oat (Multi cut)			Lathyrus				Lucerne	
		Trial -1 IVTB	Trial 2 AVT-1(SC)	Trial 3 IVTO (SC)	Trial 4 AVTO (SC)-1	Trial 5 AVT0 (SC)-2	Trial 6 AVTO (SC)-2 (Seed)	Trial -7 AVTO (SC)-2 (R)	Trial 8 AVTO (SC)-2 (Seed) (R)	Trial 9 IVTO (MC)	Trial 10 AVTO-1 (MC)	Trial 11 IVTO (D)	Trial 12 IVT La	Trial 13 AVT La-1	Trial 14 AVT La-2	Trial 15 AVTLa -2 (Seed)	Trial 16 VT Lucerne (P)-2011	Trial 17 VT Lucerne (P)-2013
Zone	Trial No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
HZ 1.	Palampur	DR		DR	DR	DR	DR	DR	DR	DR	DR	DR						
2.	Srinagar	DR		DR	DR	DR	DR	DR	DR	DR	DR	DR						
3.	Almora									DR	DR							
NWZ 4.	Pantnagar	DNR		DNR	DR	DR	DR	DR	DR	DNR	DNR	DNR						
5.	Ludhiana	DR	DR	DR	DR	DR		DR		DR	DNR	DR						DR
6.	Hisar	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR					DR	DR
7.	Jalore	DR		DR	DR	DR		DR		DR	DR	DNR						DR
8.	Udaipur	DR		DR	DR	DR				DR	DR	DR						DR
9.	Meerut	DNR		DR	DR	DR		DR										
10.	Bikaner	DR	DR	DR	DR	DR		DR				DR					DR	DR
NEZ 11.	Kalyani	DR		DR	DR	DR		DR					DR	DR	DR	DR		
12.	Ranchi	DR		DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR		
13.	Faizabad	DR		DR	DR	DR		DR		DR	DR	DR						
14.	Bhubaneswar	DR		DR	DR	DR		DR		DR	DR	DR	DR	DR	DR	DR		
15.	Pusa	DR		DR	DR	DR		DR		DR	DR		DR	DR	DR			
16.	Jorhat			DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR		
17.	Imphal			DR	DR	DR		DR		DR	DR							
18.	Barapani																	
CZ 19.	Jhansi	DR	DR	DR	DR	DR	DR	DR	DR		DR	DR	DNR	DNR	DNR	DNR		
20.	Rahuri	DR	DR	DR	DR	DR		DR		DR	DR	DR					DR	DR
21.	Jabalpur	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR		
22.	Urulikanchan	DR	DR	DR	DR	DR		DR		DR	DR	DR					DR	DR
23.	Karjat		DR		DR	DR						DR						
24.	Kanpur	DR		DR	DR	DR		DR					DR	DR	DR			
25.	Anand			DR	DR	DR		DR		DR	DR	DR					DNR	DR
26.	Raipur	DR		DR	DR	DR						DR	DR	DR				DR
27.	Palgarh	DR		DR														
SZ 28.	Hyderabad			DR	DR	DR	DR	DR									DR	DR
29.	Mandya			DR	DR	DR	DR	DR	DR									DR
30.	Coimbatore			DR	DR	DR		DR									DR	DR
31.	Dharwad																DR	
	Total	19/21	8/8	26/27	27/27	27/27	10/10	24/24	9/9	18/19	18/19	17/19	8/9	8/9	7/8	5/6	7/8	12/12

DR-Data reported, DNR-Data not reported, Data Reporting and Success (%) =95.4%

APPENDIX V: FORAGE CROP PRODUCTION TRIALS AT A GLANCE: (*Rabi*-2013-14)

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	AST -19	AST -20	AST - 7(K)	AST -9 (K)	Total llo- tted	Total DR &TC/ allotted
HILL ZONE																								
Almora					DR																		1	1/1
Palampur	DR				DR												DR						3	3/3
Srinagar					DR							TC					DR		DR				4	4/4
NORTH WEST ZONE																								
Hisar	TNC				DR												DR						3	2/3
Pantnagar	DR					DR											DR						3	3/3
Bikaner					DR			DR						DR				TC					4	4/4
Ludhiana	DR				DR	DR									TC								4	4/4
NORTH EAST ZONE																								
Faizabad	DR									DR													2	2/2
Ranchi	DR					DR										DR	DR				DR		5	5/5
Kalyani	DR						DR									DR	DR						4	4/4
Bhubaneswar	DR			DR	DR											DR					DR		5	5/5
Jorhat	DR			DR	DR											DR	DR					DR	6	6/6
Imphal							DR																1	1/1
Shillong									TNC														1	0/1
CENTRAL ZONE																								
Jabalpur	DR	DR			DR	DR										DR	DR				DR		7	7/7
Rahuri	DR				DR	DR		DR															4	4/4
Urulikanchan	DR				DR	DR		DR															4	4/4
Anand	DR				DR			DR															3	3/3
Jhansi																DR	DR						2	2/2
Raipur		DR			DR	DR										DR		TC		*		DR	6	6/6
SOUTH ZONE																								
Hyderabad	DR		DR																				2	2/2
Mandya	DR		DR								DR						DR						4	4/4
Coimbatore	DR												DR				DR						3	3/3
Vellayani	DR																						1	1/1
Dharwad			DR															TC					2	2/2
Total (DR & TC)	16	2	3	2	13	7	2	4	0	1	1	1	1	1	1	7	11	3	1		3	2	84	82/84

DR- Data reported; TC-Trial conducted; TNC-Trial not conducted; Success (%) of data reporting/trial conducted= 82/84*100= 97.6 %

*Trial will be started in summer/*Kharif* 2014.

APPENDIX –VI: FORAGE CROP PROTECTION TRIALS AT A GLANCE (*Rabi*: 2013-14)

Locations/Trials	PPT-1	PPT-2A	PPT-2B	PPT-12	PPT-17	PPT-18	Total	Success rate (%)
Bhubaneswar	A	A	A		A		**4**	
	DR	DR	DR		DR		**4**	100
Dharwad	A	A				A	**3**	
	DR	DR				DR	**3**	100
Hisar		A					**1**	
		DR					**1**	100
Hyderabad	A	A				A	**3**	
	NR	DR				DR	**2**	67
Jhansi	A	A	A		A	A	**5**	
	DR	DR	DR		DR	DR	**5**	100
Ludhiana	A	A	A		A		**4**	
	DR	DR	DR		DR		**4**	100
Palampur	A	A	A	A	A		**5**	
	DR	DR	DR	DR	DR		**5**	100
Rahuri	A	A				A	**3**	
	DR	DR				DR	**3**	100

Abbreviations: A = Trial allotted; DR = Data Reported; NR =Not reported

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