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ANNUAL REPORT
(2018-19)

Part-II: Rabi 2018-19

अखिल भारतीय समन्वयित अनुसंधान परियोजना
 चारा फसलें एवं उपयोगिता
 (भारतीय कृषि अनुसंधान परिषद)
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**All India Coordinated Research Project on
 Forage Crops & Utilization
 (Indian Council of Agricultural Research)
 ICAR-IGFRI, Jhansi-284 003 (U.P.)**

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 किसानों का हमसफर
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(Indian Council of Agricultural Research)
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Foreword

Livestock is symbolic to wealth and power across civilizations for centuries. India is blessed with diversified type of livestock as well as wide range of fodder crops. The livestock sector alone contributes nearly 25.6% of value of output at current prices of total value of output in agriculture, fishing and forestry. India inhabits 15 percent of world livestock population on 2.4 percent of geographical area, which shows extent of livestock pressure on the available subcontinental resources in comparison to other countries. The production and quality of feed and fodder is pivotal in sustaining the incremental growth of animal husbandry sector. Due to competing land use, area under cultivated fodder crops is static since last two decades because of low priority in comparison to other sectors of agriculture. Thus, only option available is to catalyze horizontal increase in underutilized areas and vertical increase in the forage productivity to meet out the ever increasing demand of the fodder for economic and sustainable livestock production. In present-day scenario, the productivity of cultivated fodder crops is low as they are grown under rainfed condition, minimal allocation of production resources and non-availability of the production techniques to stakeholders involved in the forage resource development. This needs to be tackled by educating the farmers about the production packages of fodder crops like selection of appropriate forage species, varieties and management techniques to sustain forage yield and soil fertility. The country has varied agro climatic conditions as well as farming situation accordingly seasonal deficit of green fodder also differ in different agroclimatic condition. In these circumstances, the objective of improving the suitable varieties and forage productivity is complicated. Each crop has to be dealt with concise manner to accommodate the information on sowing technique, varieties, nutrient management, water management, plant protection, quality attributes and harvesting. AICRP on Forage Crops & Utilization is consistently pursuing the mandate for development of varieties, technique for increasing productivity of cultivated forage crops and grasses of annual and perennial nature and eco-friendly plant protection technologies and also bringing different stakeholders under single umbrella.



I would like to sincerely acknowledge Project Coordinator and entire team of scientists and Technical officers of PC (FC&U) unit who have contributed in the preparation of the Annual Report *Rabi* 2018-19 and helped in achieving the set targets. This Annual Report is a brief compilation of outcome of activities carried out by different centers and result of various trials during the *Rabi* 2018-19.

Dated: 07.08.2019

Place: ICAR-IGFRI, Jhansi

(Vijay K. Yadav)
Director
ICAR-IGFRI
Jhansi-284003

PREFACE

The Annual Report (2018-19), Part II–*Rabi* 2018-19 embodies the results of various research trials conducted with the view to develop and test the technologies for better quality/quantity of forage production in different agro-climatic situations.



This report is the outcome of sincere efforts made by all contributing scientists and staff at the Coordinating Unit and AICRP-FC&U Centres. The trials and activities were successfully conducted as per the technical programme fixed for *Rabi* 2018-19. The report is divided into several chapters, such as Crop Improvement, Crop Production, Crop Protection, Breeder Seed Production etc. The results of multi-locational evaluation of newly developed genetic material for single and perennial forage species are compiled in Crop Improvement chapter. The trials presented in Crop Production chapter focused on optimization of fertilizer levels for forage crop in different cropping system, forage production potential, location specific research on weed management and agronomical trial for AVT-2 entries. The chapter on Crop Protection deals with survey and surveillance for disease-pest in important rabi forage crops *viz.*, Berseem, Oats, Lucerne etc., evaluation of entries in multilocation trials for resistance as well as generation of technologies for pest management. The information on breeder seed production against the DAC indent is provided in Breeder Seed Production chapter. Weather data from coordinating and voluntary centers has been compiled to correlate the growth and yield of forage crops with weather parameters at different sites during crop period. Other chapters include details of in-house breeding activities, other activities etc.

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

My colleagues at Project Coordinating unit, Dr. RK Agrawal, Principal Scientist (Agronomy), Dr. NR Bhardwaj, Scientist (Plant Pathology), Dr. S. Chand, Scientist (Genetics and Plant Breeding) and technical officers, Shri RS Patel and Shri HK Agarwal provided support in analysis and tabulation of data; distribution of seed/planting material conducted at all the locations. Their contributions are thankfully acknowledged.

The administrative support and cooperation received from Dr. VK Yadav, Director, IGFRI during the period is thankfully acknowledged. I also record my sincere thanks to colleagues at IGFRI for their kind support.

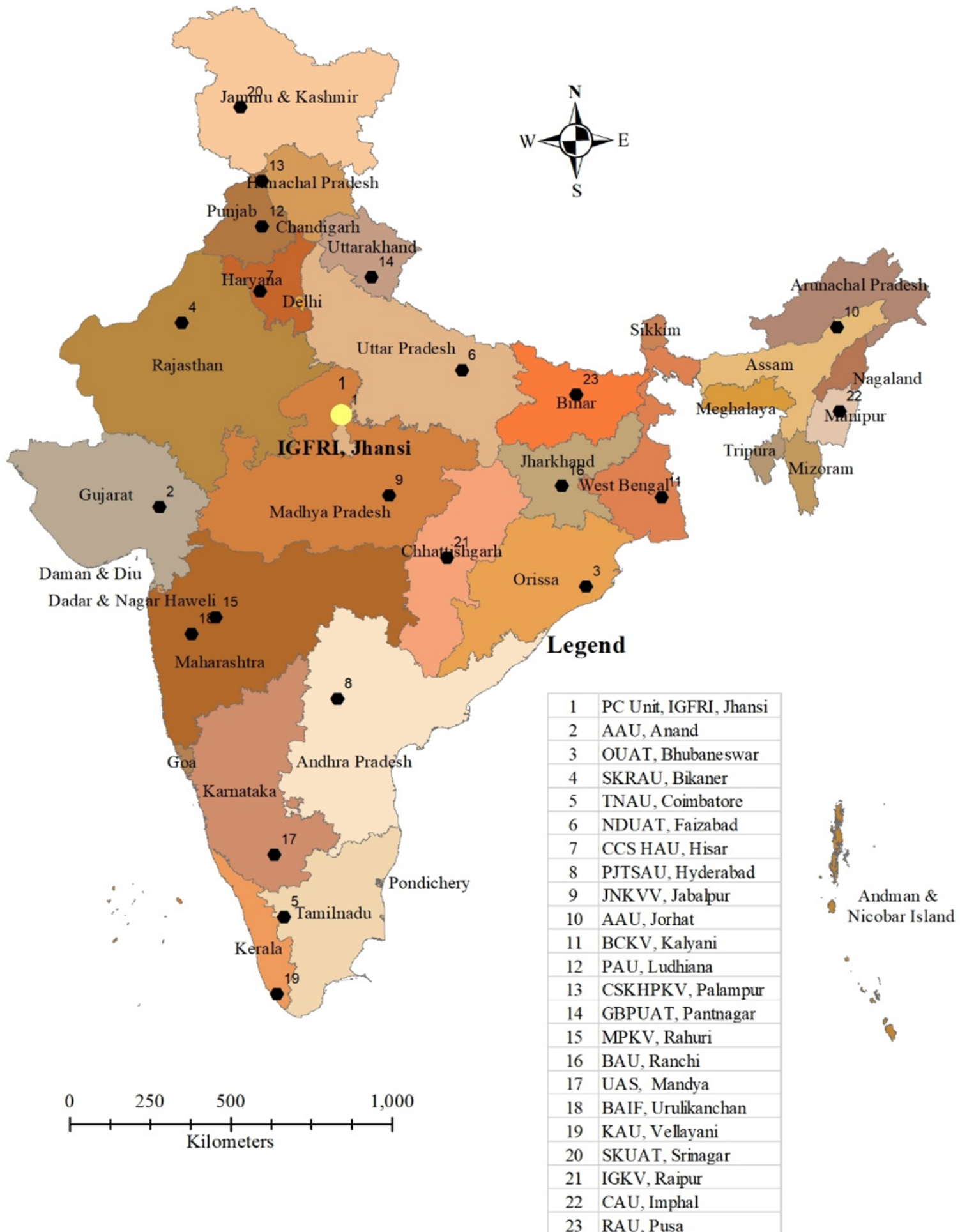
Meeting all the targeted activities would not have been possible without the active leadership, support, guidance and encouragement received from Dr. T Mohapatra, Secretary DARE & DG, ICAR; Dr. AK Singh, DDG (CS); Dr. Dinesh Kumar, ADG (F&FC); Dr. DK Yadava, ADG (seed). Support received in various forms from administrative and technical staffs of F&FC unit of ICAR are also gratefully acknowledged. Each and every one in the team at AICRP on Forage Crops & Utilization gratefully acknowledges their guidance and support.

A handwritten signature in blue ink, appearing to be 'A. K. Roy', written in a cursive style.

A. K. Roy
Project Coordinator

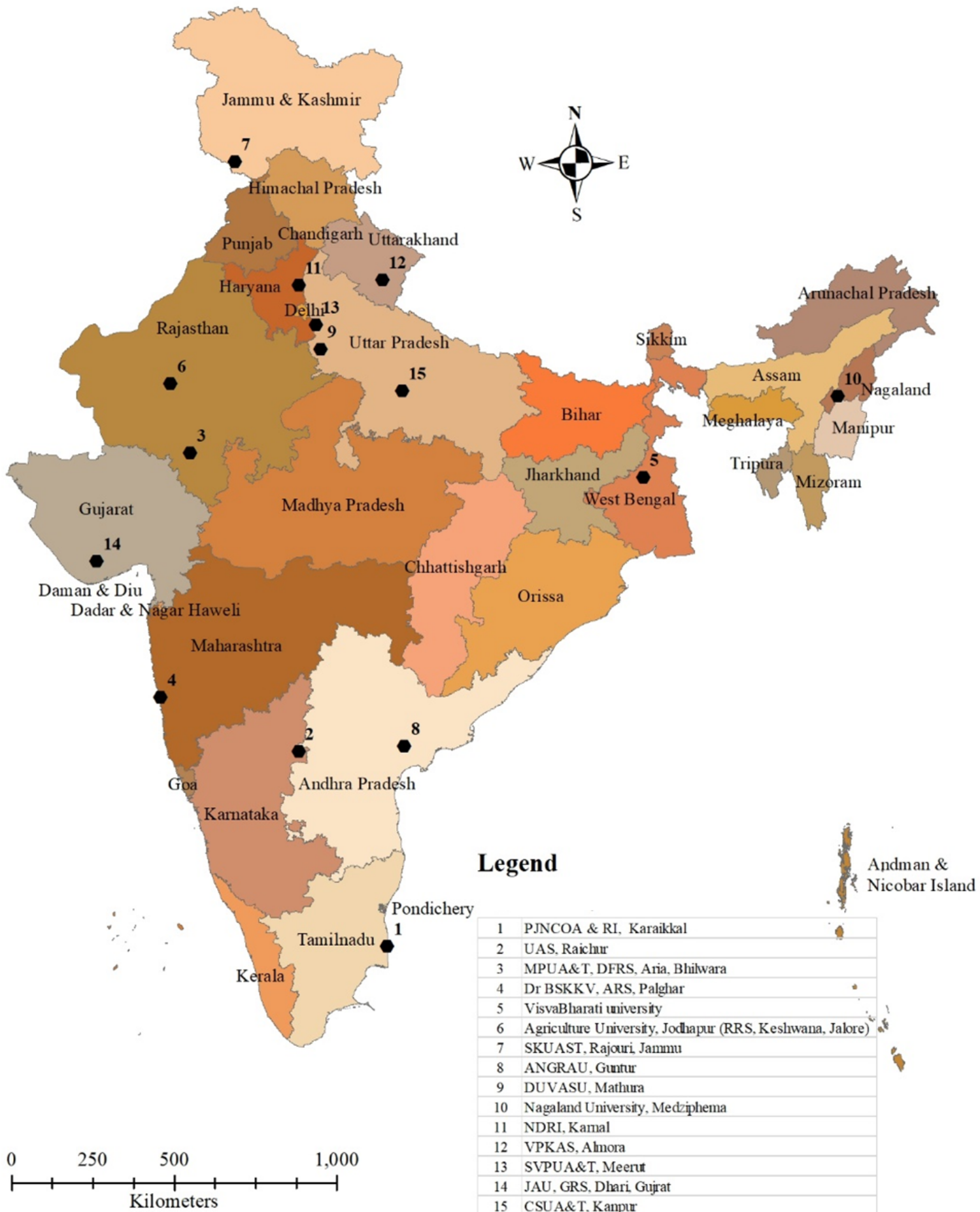
AICRP on Forage crops and Utilization

Cooperating centers



AICRP on Forage crops and Utilization

Voluntary centers



CONTENTS

Executive Summary	
AICRP on Forage Crops & Utilization State-wise Zones and Coordinated Centers and Testing Locations	
AICRP on Forage Crops & Utilization Entries Code with Name and Contributors Rabi-2018-19	

CHAPTER-1: FORAGE CROP IMPROVEMENT		1-99	
BERSEEM		1-14	
1.	IVTB	Initial Varietal Trial in Berseem	1-8
2.	AVTB-1	First Advance Varietal Trial in Berseem	9-14
OAT		15-78	
3.	IVTO (SC)	Initial Varietal Trial in Oat (SC)	15-25
4.	AVTO (SC-1)	First Advanced Varietal Trial in Oat (SC)	26-37
5.	AVTO (SC)-2	Second Advanced Varietal Trial in Oat (SC)	38-49
6.	AVT Oat (SC-2) (Seed)	Second Advanced Varietal Trial in Oat (SC) for Seed	50-51
7.	IVTO (MC)	Initial Varietal Trial in Oat (Multi Cut)	52-59
8.	AVTO-1 (MC)	First Advanced Varietal Trial in Oat (Multi cut)	60-64
9.	IVTO (Dual)	Initial Varietal Trial in Oat (Dual)	65-71
10.	AVTO-1 (Dual)	Advanced Varietal Trial in Oat (Dual)	72-78
LUCERNE		79-82	
11.	VTL (P)-2016-3 rd Year	Varietal Trial in Lucerne (Perennial)-3 rd Year	79-82
VICIA		83-85	
12.	AVT-2 Vicia	Advanced Varietal trial -2 in Vicia	83-84
13.	AVT-2 – Vicia (seed)	Advanced Varietal trial -2 in Vicia (seed)	85
LOLIUM Rye grass		86-88	
14.	AVT-2 Lolium	Advanced Varietal Trial 2 in Rye grass – annual	86-88
15.	AVT-2 Lolium (seed)	Advanced Varietal Trial 2 in Rye grass – annual Seed	88
RED CLOVER		89-91	
16.	VT Red Clover -2016 3 rd Year	Varietal trial in Red clover – Perennial -3 rd Year	89-91
WHITE CLOVER		92	
17.	VT White Clover-2016 3 rd Year	Varietal Trial in White Clover (Perennial) -3 rd Year	92
BAJRA (Multi Cut)		93-99	
18.	IVT Bajra (multi cut)	Initial Varietal Trial in Fodder bajra (multi cut) in summer	93-96
19.	AVT-1 Bajra (Multi cut)	Advanced Varietal Trial-1 in fodder bajra (multi cut) in summer	97-99
CHAPTER-2: FORAGE CROP PRODUCTION		100-182	
A. ON-GOING COORDINATED TRIALS		100-137	
1.	PS-14-AST-4	Studies on the effect of planting geometry of tall fescue grass and seed rates of white clover in wet temperate conditions	100-102
2.	K-15-AST-11 C	Studies on carbon sequestration in perennial grass based cropping systems	103-106
3.	K-15-AST-12 C	Studies on the productivity and carbon sequestration of silvipastoral system in hills of north western Himalayas	107-108
4.	R-15-AST-1	Productivity of oat - lathyrus intercropping system as influenced by integrated nutrient management	109-113
5.	K-16-AST-1	Feasibility of hydroponics fodder production system –A Quantitive and Quantative study	114-117
6.	R-16-AST-1	Enhancing seed productivity of fodder oat in different regions of India under irrigated condition	118-122
7.	R-16-AST-2	Enhancing of seed setting in Lucerne through foliar spray	123-126
8.	R-18-AST-4	Nutrient management for productivity enhancement in dual purpose Oats.	127-134
9.	R-18-AST-5	Studies on effect of varieties and cutting management on productivity, quality and seed production of berseem	135-137

B. LOCATION SPECIFIC TRIALS			138-162
10.	K-15-AST-1L	Studies on Different model for year round Green fodder production under Irrigated condition	138-141
11.	K-16-AST-6	Organic nutrient management in sorghum-berseem cropping sequence for sustainable fodder production	142-143
12.	K-16-AST-8	Resource management in rice-oat cropping system under sodic soils	144-146
13.	K-17-AST-2	Standardization of seed production techniques in fodder Maize	147-149
14.	R-16-AST-3	Effect of nitrogen levels and seed rate on fodder productivity of rye grass (<i>Lolium multiflorum</i>) under rice fallows	150-151
15.	R-16-AST-4	Effect of stubble management and planting density on establishment and productivity of forage oat under zero tillage conditions in rice fallows	152-153
16.	R-17-AST-5	Seed yield maximization in Oat cv. RO-19 (Phule Harita)	154-158
17.	R-18-AST-7	Effect of intercropping on seed setting and seed yield in Lucerne	159-160
18.	R-18-AST-8	Feasibility studies of growing different oat (<i>Avena sativa</i> L.) cultivars as fodder crop on hilly terraces of Nagaland under rainfed condition	161-162
C. AVT-2 BASED AGRONOMY TRIALS			163-182
19.	R-18-AST -1	Effect of N levels on forage yield of promising entries of oat (AVT-2 SC)	163-174
20.	R-18-AST -2	Advanced Varietal Trial Agronomy -2 in Vicia	175-178
21.	R-18-AST -3	Advanced Varietal Trial -2 in Rye grass – annual Agronomy	179-182
CHAPTER-3 : FORAGE CROP PROTECTION			183-210
1.	PPT-1	Survey of pathogens, insect-pests and nematodes associated with Berseem, Lucerne, Oats ecosystems	183-189
2.	PPT-2	Field screening of rabi-breeding materials for resistance to diseases and insect- pests	190-202
3.	PPT -17	To study the pathogenic variability of <i>Blumeria graminis</i> f. sp. <i>avenae</i> on oat	203
4.	PPT- 26	Biological management of oat aphid <i>Rhopalosiphum padi</i> on oats	204
5.	PPT- 30	Biological management of powdery mildew of oats caused by <i>Blumeria graminis</i> f. sp. <i>avenae</i>	205
6.	PPT-31	Eco-friendly pest management techniques in berseem ecosystem	206
7.	PPT- 32	Validation of best treatment of trial entitled "Management of soil borne and powdery mildew diseases in red clover seed crop"	207
8.	PPT- 33	Validation of best treatment of trial entitled "Management of foliar diseases of oat"	208
9.	PPT- 34	Integrated disease management in berseem	209-210
CHAPTER-4 : BREEDER SEED PRODUCTION			211-215
FORAGE TECHNOLOGY DEMONSTRATION			216
TRIBAL SUB PLAN			217-219
MONITORING DETAILS			220
1.	IN HOUSE BREEDING ACTIVITIES		221-236
2.	OTHER ACTIVITIES		237-263
3.	WEATHER REPORT		264-278
APPENDICES			A-B
4.	Appendix-I	Forage Crop Breeding Trials at a Glance	A1
5.	Appendix-II	Forage Crop Production Trials at a Glance	A2
6.	Appendix-III	Forage Crop Protection Trials at a Glance	A3
7.	Appendix-IV	Directory of Scientific Staff Rabi 2018-19	B1-B6

EXECUTIVE SUMMARY

The results of the coordinated multilocation trials conducted on Crop Improvement, Crop Production, Crop Protection as well as the Breeder seed production, technology demonstrations, tribal sub-plan activities of the different forage crops during Rabi 2018-19 at different locations/centers in the country. Weather data are also reported to correlate the growth and yield of forage crops with weather parameters at different sites during crop period. Results of other activities carried out by staff of AICRP units, in house breeding, research guidance, teaching, extension activities etc. were also provided.

A. Forage Crop Improvement

In Rabi 2018-19, Forage crop improvement trials were conducted across the country to identify the suitable entries for different zones and at national level. Various parameters considered included green forage yield, dry matter yield, crude protein yield, crude protein content, ADF, NDF, IVDMD, per day productivity, plant height, leafiness etc. A total of 19 multilocation trials comprising of test entries along with their respective checks were conducted at 34 locations in the country. It included 16 trials under annual and 3 perennial trials. The annual crops include Berseem, Oat (single cut, multicut, dual purpose), Vicia, rye grass, multicut summer bajra whereas under the perennial system, Lucerne, Red Clover and White clover were evaluated. A total of 249 trials were allocated out of which data were received from 238 trials making a success rate of 95.5%. A total of 118 entries including 93 annual and 25 perennial along with national and zonal checks were evaluated.

The results led to identification of promising entries which have recorded their superiority with respect to best zonal/national check. The summarized results of different cultivated annual and perennial forage evaluation trials are as below:

In IVTB Berseem, Six entries along with one national check (Wardan) and three zonal checks in respective zones were evaluated at 20 centres located in four different zones. For GFY, entries JHB-18-2 (11.0%), JHB-18-1 (6.5%), JB-06-11 (6.1%), BM-12 (5.6%), HFB-15-5 (5.1%) in Hill zone, entry JHB-18-1 (9.9%) in NW zone, entry JHB-18-1 (6.1%) in central zone and entry JHB-18-1 (6.5%) at all India level showed superiority of over the best check. For DMY, JHB-18-1 was superior over best check by a margin of 10.2%, 4.1% and 6.0% respectively in NW zone, central zone and at all India level. For crude protein yield, JHB-18-1 (15.4 q/ha) was best performer followed by Wardan (15.1 q/ha). For CP%, entry JHB-18-2 (17.7%) ranked first followed by national check Wardan (17.5%).

In AVTB-1-Berseem, Five entries along with one national check (Wardan) and respective zonal checks were evaluated at 15 centres located in three zones. For GFY, entries JHB-17-2 (10.6%), PC-91 (5.7%), JHB-17-1 (5.6%) and HFB-13-7 (2.8%) in NW zone, entry PC-91 (4.8%) in NE zone were superior over the best check. For DMY, entry JHB-17-2 (10.7%) in NW zone, entry PC-91 (7.0%) in NE zone was superior over the best check. Entry JHB-17-1 ranked first for crude protein content (%).

In IVTO (SC), Oat (single cut) eleven entries along with two national checks and zonal checks for respective zones were evaluated at 29 locations across the five zones. For GFY, in HZ entries UPO-18-1 (8.5%), HFO-806 (8.0%), RO-11-1-3 (7.6%), OL-1874-1 (6.5%), HFO-818 (5.9%); in CZ entry JO-06-23 (11.4%); in SZ entries JO-06-23 (15.6%), OL-1874-1 (15.0%) performed better than best check. At all India level, JO-06-23 (17.8%), OL-1874-1 (15.4%), OL-1876-1 (10.3%), HFO-818 (6.8%), UPO-18-1 (6.6%), RO-11-1-2 (6.5%), RO-11-1-3 (5.7%), JHO-18-1 (5.0%) performed better than the best check. For DMY in HZ entries SKO-241 (10.0%), RO-11-1-3 (5.0%); in CZ entry JO-06-23 (3.9%); in SZ entries

JO-06-23 (20.5%), OL-1874-1 (14.8%) and at all India level JO-06-23 (17.3%), OL-1876-1 (9.9%), OL-1874-1 (9.2%), RO-11-1-3 (6.8%), UPO-18-1 (6.5%), HFO-818 (6.8%), NDO-1802 (5.1%) were superior by margin of more than 5% over the best check. Entries JO-06-23 (18.6%), RO-11-1-3 (12.2%), OL-1874-1 (12.2%), OL-1876-1 (9.3%), HFO-818 (7.8%) showed higher crude protein yield over the best national check. For crude protein content, SKO-241 was best with CP % 9.1 as compared to best check OS-6 (8.2%). For IVDMD, entry RO-11-1-3 (54.2 %) top ranked closely followed by HFO-806 (53.9%) and SKO-241 (53.8%) which were far superior to the best check OS-6 (49.8%).

In **AVTO (SC)-1, Oat (single cut)**, six entries were evaluated against two national checks and respective zonal checks at 27 locations in five zones. For GFY, entries SKO-240 (8.2%), OL-1896 (5.5%) in HZ; OL-1896 (5.9%) in CZ zone exhibited superiority over the best check. At national level, OL-1896 and HFO-529 registered 7.0% and 5.1% superiority, respectively over the best check. For DMY, entries HFO-529 (5.7%), SKO-240 (4.6%) in HZ; JO-05-09 (6.4%) in NW zone exhibited superiority over the best check. At national level, JO-05-09 registered 5.0% superiority. For CPY, JO-05-09 (10.3%) ranked first followed by HFO-718 (8.6%) showing superiority over the best check. For crude protein content, entry JO-05-09, OL-1896 ranked best with 9.1% CP as compared to best check Kent with 8.8% CP. Entry NDO-1501 ranked first for IVDMD%.

In **AVTO (SC) -2 oat (single cut)**, seven entries along with two national checks (OS-6 and Kent) and five zonal checks for respective zones were evaluated at 27 locations across the five zones. For GFY, entries OL-1862 (15.2%), SKO-229 (13.9%), OL-1869-1 (12.4%), OL-1861 (5.3%) in HZ, entries OL-1861 (18.3%), OL-1869-1 (15.6%), OL-1862 (10.7%), HFO-607 (7.9%) in NWZ, entry OL-1861 (7.6%) in NEZ, , entries OL-1861 (10.3%), OL-1862 (6.1%) and JO-05-7 (3.9%) in CZ, entries SKO-229 (8.5%) and OL-1861 (4.0%) in south zone were superior over the best check. At all India level, entries OL-1861 (13.8%), OL-1869-1 (8.3%) and OL-1862 (8.0%) were superior over the best check Kent. For DMY, entries OL-1869-1 (11.4%), SKO-229 (10.6%), OL-1862 (9.2%) in HZ, entries OL-1861 (25.7%), OL-1869-1 (18.2%), HFO-607 (16.5%), OL-1862 (14.9%), HFO-525 (14.0%), JO-05-7 (8.1%) in NW zone, entries OL-1861 (10.2%), OL-1869-1 (8.3%), OL-1862 (5.9%) in NEZ, showed superiority over the best check. At all India level, entries OL-1861 (11.0%), OL-1869-1 (5.8%), HFO-607 (4.5%) performed better than the best check. For crude protein yield, entry OL-1861 was best showing 6.4% superiority over the best check. For crude protein %, check Kent was best. For NDF, ADF and IVDMD entry JO-05-7 was top ranked.

In **AVTO (SC)-2 seed - oat (single cut) seed**, seven entries along with two national checks (OS-6 and Kent) and five respective zonal checks were evaluated at 12 locations across the five zones. For seed yield, entry OL-1862 (5.8%) in NWZ and entry SKO-229 (4.6%) in central zone were superior over the best check. Entry OL-1869-1 ranked first in south zone. At all India level, entries OL-1862 and national check OS-6 jointly ranked first.

In **IVTO-MC-Oat (Multicut)**, nine entries were evaluated against two national checks (RO-19 and UPO-212) at 18 locations in four zones. For GFY, entry HFO-707 (5.6%) in NWZ; entries HFO-707 (9.1%), OL-1882 (8.7%), HFO-716 (7.4%) in central zone and at national level, entry HFO-707 exhibited superiority by a margin of 5% over the best check. For DMY entry HFO-707 (8.7%) in NWZ, entries HFO-716 (18.5 %), HFO-707 (8.1%) in central zone and HFO-707 (6.1%), HFO-716 (5.0 %) at national level exhibited superiority over the best check. Entry HFO-707 ranked first for CPY showing superiority of 5.7% over the best check RO-19. Entry PLP-23 and RO-11-1-4 ranked first and second respectively for CP (%).

In **AVTO-1 (MC) Oat (Multicut)**, four entries were evaluated against two national checks at 18 locations in four zones. For GFY, entry OL-1874 (5.4%) in NWZ; entry JO-05-304 (5.8%) in CZ exhibited superiority over the best national check.

For DMY, entries JO-05-304 (7.8%), OL-1874 (5.4%) in CZ exhibited superiority over the best national check. For quality parameters, national check (UPO-212) ranked first for CPY and crude protein content (%). For IVDMD %, HFO-514 was ranked first.

An **IVTO (DUAL) Oat (Dual) trial** comprising of eight entries along with two national checks (UPO-212 and JHO-822) was conducted at 14 centers located at three zones. For GFY and DMY, entries RO-11-2-6, RO-11-2-2, OL-1766-2, OL-1874-2, JO-11-507, HFO-816 in NWZ; entries OL-1874-2, HFO-816 in NE zone; entries JHO-18-3, RO-11-2-6, OL-1874-2 in CZ and entries RO-11-2-6, OL-1874-2, OL-1766-2, HFO-816, JHO-18-3 at all India level exhibited superiority. Entries OL-1874-2 (27.4%), RO-11-2-2 (20.5%), RO-11-2-6 (20.5%) showed superiority for crude protein yield as compared to best check. Entries OL-1874-2, JHO-18-3 and national check UPO-212 ranked joint first with 10.2 % CP. For ADF%, NDF% and IVDMD (%) entry HFO-810 ranked first. For seed yield, entry HFO-810 ranked first with seed yield of 28.2q followed by check UPO-212 (27.3q/ha) in NW zone. In NE zone, OL-1874-2 (12.9q) followed by HFO-816 (12.5q) were better than the best check JHO-822 (12.4q/ha). In central zone RO-11-2-2 top ranked with 26.3 q followed by check UPO-212 (25.9q).

In **AVTO-1 (D) - Oat (Dual)**, six entries along with two national checks were evaluated at 14 centres located in NW, NE and Central zone. For GFY, entries OL-1876-2 (15.7%), OL-1906 (11.7%), HFO-611 (11.2%), JHO-17-4 (10.5%) and JO-10-506 (7.5%) in NW zone, entries OL-1876-2 (11.1%), JHO-17-4 (10.6%), OL-1906 (7.7%) in NE zone, OL-1876-2 (10.6%) in CZ were superior over the best check. At all India level, entry OL-1876-2 and JHO-17-4 showed superiority of 11.7% and 6.0% respectively over the best check. For DMY, entries OL-1876-2 (22.4%), OL-1906 (19.5%), JHO-17-4 (18.1%), JO-10-506 (17.3%), HFO-611 (9.2%) in NW zone, entry OL-1906 (6.4%) in NE zone showed superiority over the best check. Combining the three zones, OL-1906 was best performer followed by OL-1876-2 showing superiority of 6.4% and 4.5% respectively over the best check JHO-822. For CPY, entry OL-1906 was best showing 13.1% superiority over the best check. For CP content (%), entries OL-1906 and HFO-608 ranked first with 11.0% CP as compared to 10.4 in best check JHO-822. National check ranked first for IVDMD (%). For seed yield, entry JHO-17-4 followed by HFO-611 in NW zone and entries JO-10-506 followed by OL-1906 in Central zone were best performers. Combining the three zones, JO-10-506 ranked first followed by national check UPO-212.

In **VT Lucerne (Perennial) -2016- 3rd year**, data of twelve entries including two national checks were reported by 6 centres in two zones (Central and South zone). For GFY, in south zone, entry Alamdar-51 ranked first followed by TNLC-15 showing superiority of 11.2% and 10.7% over the best check RL-88. Entries BAIF Lucerne-4 (5.6%) and RL-15-1 (5.1%) were superior to best check in south zone. For DMY, entry TNLC-15 was top ranked showing superiority of 13.0% over the best check. For quality parameters, national check RL-88 top ranked for CPY (q/ha). For crude protein, entry Alamdar-51 (19.3%) ranked first as compared to best check Anand-2 (18.6%).

In **AVT-2 VICIA**, five entries were evaluated at four centers. For GFY and DMY, entries JVS-2 and JVS-1 showed superiority over the general mean. For crude protein %, entry JVS-1, JVS-4 and JVS-2 were marginally superior over the general mean. For NDF, ADF and IVDMD entry JVS-3 was top ranked.

In **AVT-2 VICIA (seed)**, five entries were evaluated at four centers. For seed yield, entry JVS-2 ranked first with yield of 10.85q/ha followed by JVS-5 with 10.42 q/ha whereas general mean was 9.55 q/ha. Other three entries performed inferior to the general mean.

In AVT-2 LOLIUM- Rye Grass (Annual), three entries were evaluated along with one check at five centers. For GFY, Palam rye grass-2 (19.2%) followed by PBRG-2 (16.8%) and Palam rye grass -1 (15.3%) showed superiority over the check. Similarly for DMY, entries Palam rye grass-1 (35.8%), Palam rye grass -2 (30.0%) and PBRG-2 (22.9%) were superior over the checks. For CPY (q/ha) entry PBRG-2 ranked first showing 9.5% superiority over the check, For CP%, check PBRG-1 was best.

In AVT-2 LOLIUM Seed- Rye Grass (Annual) Seed, three entries were evaluated along with one check at three centers. For seed yield, entry Palam rye grass-1 was best showing 28.4% superiority over the check. It was closely followed by Palam rye grass-2 showing yield of 7.19 q/ha which was 26.5% superior over the check (5.69 q/ha).

In VT Red Clover 2016- (Perennial) - 3rd Year, Seven entries were evaluated at four locations in Hill zone. The entries are coded and will be decoded after completion of trial. Entry VTRC-1-3 (305.0q) ranked first followed by VTRC-1-6 (290.1 q) for GFY. Entry VTRC-1-3 (49.5q) ranked first followed by VTRC-1-6 (45.9 q) for DMY. For crude protein yield, entry VTRC-1-4 was best with 4.0 q/ha. For crude protein (%), entry VTRC-1-3 ranked first with 21.0% CP followed by VTRC-1-1 with 20.8%.

In VT White Clover 2016: (Perennial)- 3rd Year, Six entries were evaluated at four locations in Hill zone. The entries are coded and will be decoded after completion of trial. Entry VTWC-1-1 ranked first for GFY and DMY. For crude protein yield, entries VTWC-1-1 ranked first followed by VTWC-1-6. For crude protein %, entry VTWC-1-2 (21.7%) ranked first followed by VTWC-1-5 (21.5%).

In IVT Fodder Bajra (Multicut) in Summer, Five entries were evaluated along with 3 checks at seven locations in central and south zone. For GFY, BAIF Bajra-6 showed 8.1% superiority over the best check in CZ. For DMY, BAIF Bajra-5 and BAIF Bajra-6 were marginally superior to best check in CZ. For CPY, entries TSFB-18-1 (4.2%), BAIF Bajra -5 (3.0%), BAIF Bajra -6 (1.5%) were marginally superior over the best check, whereas for crude protein %, TSFB-18-1 ranked first with 10.3 % CP as compared to best check Moti Bajra and BAIF Bajra -1 (9.3%).

In AVT-1 Fodder Bajra (Multicut) in Summer, three entries were evaluated along with 3 checks at seven locations in central and south zone. For GFY, HTBH-4902 and ADV0061 showed 9.0% and 8.5% superiority over the best check in central zone. In south zone entry HTBH-4902 was superior by a margin of 3.7%. Combining both zones, entry HTBH-4902 and entry ADV 0061 were superior by margins of 7.8% and 3.7% respectively. For DMY, entry HTBH-4902 showed superiority of 2.6% in central zone, 8.2% in south zone and 5.6% in combined zones. Entry AFB-37 was superior by margin of 7.4% in south zone and 3.6% in combined zone. For CPY, entries AFB-37 (13.7%), ADV 0061 (7.1%) and HTBH-4902 (6.7%) were superior over the best check. For crude protein %, ADV 0061 ranked first with 9.4 % CP followed by AFB 37 (9.1%) as compared to best check Giant Bajra (9.0%).

B. Forage Crop Production

The forage crop production programme was executed at 22 locations. In total 21 experiments were conducted, out of which 12 were in network (9 coordinated and 3 AVT based) and 9 were in location specific mode. The main emphasis was to increase the system productivity and resource use optimization in forages and forage based cropping systems. In addition to above, the results of hydroponic fodder production, production potential of annual rye grass with berseem in Hill Zone, carbon sequestration potential of perennial grass based cropping and supplementation of forage crops with micronutrients has also been covered.

The results of studies on planting geometry of tall fescue grass and white clover in wet temperate conditions, feasibility of oat - *Lathyrus* intercropping system, techniques for enhancing seed setting and seed productivity of fodder oat and lucerne has also been presented in the chapter.

The chapter also includes results of advanced varietal trials on response of promising entries of different forage species to nutrients. The salient research achievements of the forage crop production trials during Rabi 2018-19 are as follows:

Effect of varieties and cutting management on productivity, quality and seed production of Berseem: The trial started in Rabi 2018-19 Pantnagar & Ranchi with the objective to study the production potential and ideal time of last cut of berseem varieties for higher seed production. Last cut on 2nd march recorded highest seed yield, 1000 seed weight and germination percent of produced seeds,

Carbon sequestration in perennial grass based cropping systems: The trial was initiated at Hyderabad, Coimbatore, Vellayani, Ranchi and Jabalpur with the objective to study the effect of cropping system on yield economics and carbon sequestration potential. On locational mean basis, BN hybrid in paired rows (60/120 cm) + *Sesbania grandiflora* recorded higher GFY, DFY and Total C sequestered.

Enhancing seed setting in Lucerne through foliar spray: The trial was conducted at Coimbatore, Ludhiana, Hyderabad and Bikaner to find out the suitable combination of foliar spray chemicals for higher lucerne seed yield and economy. On locational mean basis Brasinolide 1.0 ppm recorded higher number of pods/plant, number of seeds/pod, seed yield gross returns, net returns and B: C ratio.

Nutrient management for productivity enhancement in dual purpose Oats: The trial was initiated at Kalyani, Jorhat, Imphal, Faizabad, Jabalpur and Anand to find out the effect of nutrient management on forage and grain yields quality and economics of dual purpose Oats. On locational mean basis application of 75% of RDN + Vermicompost @ 2t + PSB application to Soil @ 1.5 kg+ Seed treatment with *Azotobacter* @ 10 g/kg seed+ ZnSO₄ @ 20 kg/ha (basal) + Foliar spray of ZnSO₄ (0.5%) just before flowering recorded maximum GFY, DMY, crude protein content and yield as well as highest test weight and seed yield.

Feasibility of Hydroponics fodder production system-A Quantitative and Qualitative study: The hydroponic study was conducted at Ludhiana and Mandya to study the suitability of maize and cowpea for quality fodder production. Maximum crude protein content was achieved at 11th day at Ludhiana and 13th day at Mandya. ADF and NDF contents significantly increased with delayed harvest and maximum level was at 15th day. Seed rate of 300 gm/sq ft recorded highest green fodder, dry matter and crude protein yields.

Enhancing seed productivity of fodder oat in different regions of India under irrigated condition: This experiment was initiated at Raipur, Jabalpur, Dharwad with the objective to study the effect of crop geometry and nitrogen doses on seed production potential and economics of seed production of oat. On locational mean basis JHO-822 exhibited higher DFY, harvest index, seed yield, net monetary return and B: C ratio. The sowing of oat at 30 cm row spacing for seed production proved better.

Planting geometry of tall fescue grass and seed rates of white clover in wet temperate conditions: The trial was started at Palampur and Srinagar centre to evaluate the productivity, quality and compatibility of tall fescue grass planted at different spacing with variable seed rates of white clover in wet temperate conditions. Planting of tall fescue grass at 30 x 30 cm + white clover @ 3 kg/ha produced higher green, dry forage and crude protein yields.

Productivity and carbon sequestration of silvipastoral system in hills of north western Himalayas: An experiment was started at Palampur and Srinagar centre in to study the system productivity of silvi-pastoral system. On locational mean basis, *Setaria* grass recorded highest green fodder, dry fodder yield, net return and B:C ratio.

Productivity of oat - lathyrus intercropping system as influenced by integrated nutrient management: The experiment was initiated at Kalyani and Ranchi to study the productivity and profitability of food (*Lathyrus*) + forage (oat) intercropping system influenced by integrated nutrient management. Oat + *Lathyrus* (3:2) recorded maximum GFY, CPY and GEFY and also proved most remunerative. Application of 50% N (RDF) + 50% N (vermicompost) recorded significantly higher GFY, CPY and GFEY.

Different models for year round green fodder production under irrigated condition: The Trial was initiated with the objectives to identify suitable and economical year around fodder production system under irrigated situation. The pooled data of three years revealed that, BN Hybrid + Lucerne (2:8), recorded higher green fodder yield, DMY, CPY, net returns Rs. and B: C ratio.

Organic nutrient management in sorghum-berseem cropping sequence for sustainable fodder production: The experiment was initiated in *Kharif* 2016 to study the feasibility of organic nutrient management in sorghum-berseem cropping sequence for sustainable fodder production. Highest green fodder and dry matter yield recorded with 7.5 t vermicompost/ha (5 t in sorghum + 2.5 t in berseem) + bio fertilizer + Green manuring (590.33 q/ha and 136.00 q/ha, respectively).

Resource management in rice-oat cropping system under sodic soils: The field experiment was initiated at Faizabad centre to study the resource management in rice-oat cropping system under sodic soils. The results revealed that RDF (120N:60P₂O₅:40K₂O kg/ha) recorded higher total green forage, gross return, net return and return per rupee investment.

Standardization of seed production techniques in fodder Maize: The field experiment was initiated at Raipur to standardize seed production techniques of fodder maize under Chhattisgarh condition. Results indicated application of 160 kg ha⁻¹ nitrogen recorded significantly higher seed yield, straw yield, gross return, net return and return per rupee invested. The planting geometry of 75 cmX20 cm proved better.

Effect of intercropping on seed setting and seed yield in Lucerne: The experiment was initiated to study the effect of intercropping on seed setting and seed yield in Lucerne. Maximum seed yield and net return were recorded in combination of Dill Intercrop at 1:10 ratio.

Effect of stubble management and planting density on establishment and productivity of forage oat under zero tillage conditions in rice fallows: A field experiment was initiated to study the effect of different height of rice stubble and planting density productivity of forage oat under zero tillage condition in rice fallow. Seed rate of 120 kg ha/ha recorded significantly higher green fodder and crude protein yield. Bending of rice stubble (without cutting) recorded significantly higher green fodder, dry matter and crude protein yield.

Feasibility studies of growing different oat (*Avena sativa L.*) cultivars as fodder crop on hilly terraces of Nagaland under rainfed condition: The experiment was conducted to assess the suitability, growth and yield performance of oat cultivars as fodder crop for the hilly state of Nagaland. The cultivar OS-403 recorded highest green fodder yield and dry matter yield.

Seed yield maximization in Oat cv. RO-19 (Phule Harita): The field trial was conducted with the objectives to study the effect of different levels of silicon dioxide and cutting intervals on lodging and seed yield of oat (RO-19-Phule Harita) and economics.

The application of silicon dioxide @ 400 kg ha⁻¹ recorded significantly higher plant height, seed yield, lower lodging percentage, gross monetary returns, net monetary returns and B:C ratio.

Effect of nitrogen levels and seed rate on fodder productivity of rye grass (*Lolium multiflorum*) under rice fallows: The trial was initiated to optimise the seed rate and nitrogen levels for ryegrass. Rye grass seed at 20 kg/ha recorded higher green fodder, dry matter and crude protein, gross return and net return. Application of 90kg N/ha proved better.

Effect of N levels on forage yield of promising entries of oat (AVT-2 SC): AVT trial on oat was conducted to evaluate seven single cut entries (SKO-229, HFO-607, HFO-525, JO-05-7, OL-1869-1, OL-1861 and OL-1862) along with two national checks namely OS-6 and Kent and five zonal checks viz., SKO-90 (HZ), OL-125 (NWZ), JHO-822 (CZ), JHO-99-2 (NEZ) and JHO-2000-4 (SZ) at 11 locations across the all five zones in the country. In North West zone and North East Zone, entry JO-05-7 was superior for GFY and DMY. In Hill zone, no entry could perform better than checks. In Central zone, entry OL-1861 recorded maximum GFY. In south Zone, entries OL-1861, OL-1862, National check -Kent and Zonal check- JHO-2000-4 recorded higher GFY, but HFO-607 maximum dry matter yield. On all India mean basis, entry JO-05-7 produced maximum GFY, DMY and CP yields. Yields of all the entries improved consistently with increase in level of nitrogen up to 120 kg/ha.

Effect of N levels on forage yield of promising entries of Vicia: A field trial was conducted at three locations in Central Zone (Jabalpur, Rahuri & Raipur) to assess the response of five entries of *Vicia* to graded doses of phosphorus. JVS-4 recorded highest GFY, DFY and CPY. The crop responded to phosphorus upto 60 kg P₂O₅ /ha.

Effect of N levels on forage yield of promising entries of Rye grass: A field trial was conducted in Rabi 2018-19 at three locations in Palampur, Srinagar and Ludhiana to study the response of three entries of *lolium* (*Ryegrass*) to graded doses of nitrogen. PBRG-2, recorded highest GFY, DFY and CPY. Application of 100 kg N/ ha recorded highest GFY, DFY and CPY.

C. FORAGE CROP PROTECTION

Survey of pathogens, insect pests and nematodes associated with Berseem, Lucerne and Oats: The study was carried out with the objectives to record the occurrence and abundance of major diseases and insect-pests in berseem, lucerne and oat.

At Ludhiana, Stem rot on berseem appeared in last week of December. Disease progressed at faster rate till 2nd week of March with maximum disease incidence of 57.33 percent due to favourable weather conditions. Leaf blight of oat appeared in the 1st week of January. Disease development was fast upto end of March with highest disease severity of 45.33 percent. Downy mildew of Lucerne was observed in the first fortnight of January. Disease progressed at faster rate till end of March. The population of green semilooper, *T. orichalcea* started appearing on the berseem genotypes in the first week of April with its highest population observed in the mid April. The population of *H. armigera* appeared on berseem crop in April with its highest peak during first week of May. *Spodoptera exigua* larvae were also recorded in berseem crop during April, with peak incidence in the second fortnight of April. Lucerne var. LLC-5 was infested with lucerne weevil in March with its peak in first week of April. *H. armigera* and *S. exigua* incidence was at its peak in Lucerne during last week of April. Maximum incidence of oat aphids was recorded in the last week of February.

At Rahuri, pea aphid (*Acyrtosiphon pisum*) was noticed on lucerne during 1st week of December, 2018 (5.67 aphids/tiller) and increased steadily at its peak level up to the 3rd week of January, 2019 (26.67 aphids/tiller).

Population of cowpea aphid was observed on Lucerne during 2nd week of December (4.67 aphids/tiller) and reached at its peak during last week of January, 2019 with 15.67 aphids/tiller. Larval population of *Spodoptera litura* started during 1st week of March and reached to its peak during last week of April, 2019. The population of *H. armigera* was noticed on lucerne seed crop during 1st week of April, 2019 and increasing upto last week of April, 2019. Average number of oat aphid (*Rhopalosiphum padi* L.) per tiller recorded from 1st week of December, 2018 to 3rd week Feb., 2019 was in the range of 3.33 to 69.00 aphids/tiller.

At Palampur, during *Rabi* 2018-19 season, oat crop was severely affected by powdery mildew (54% severity), followed by leaf blights (28%), loose smut (4%) and sucking pest (7%). In berseem, low incidence of root rot (4 %), moderate intensity of leaf spot (12%) and defoliating beetles (10 %) was observed. Defoliating beetles (12 %) and leaf spot (15 %) was observed on Lucerne.

At Dharwad, in Lucerne, insect and disease incidence at 15 days interval revealed that aphid population started building from January months onwards and reached peak during second fortnight of February (108 aphids / stem). Among diseases rust was the major one and 25% of disease severity was seen during second fortnight of February.

At Bhubaneswar, in oat, leaf blight (48.6% severity) and root rot (22.4%) were recorded. Maximum leaf defoliators were recorded 4.6/10 plants. In Berseem, leaf spot and blight severity recorded was 38.8% towards 1st week of February, root rot severity was 32.6% during last week of January. Maximum defoliator recorded was 4.2/10 plants in 4th week of January.

At Jhansi, in Berseem incidence of stem rot started from 4th week of January and continued to increase up to third week of February with a maximum disease incidence of 24%. Leaf tip dieback and blight was observed during 1st week of March at a lower level (5%) and it continued to increase upto last week of March with maximum severity of 25 %. In Oat, leaf blight was the major disease and it appeared during third week of January and maximum severity of 55 % was observed during 4th week of February.

Field screening of *rabi*-breeding materials for resistance to diseases and insect- pests

In IVT Berseem, At Ludhiana, All the entries showed moderately resistant disease reaction to stem rot except BB-2 and HFB-15-3. At Palampur, incidence of root rot of berseem was low during the season and all entries were resistant. At Bhubaneswar, all the entries showed moderately resistant to resistant reactions to leaf spot & blight except HFB-15-5 which was moderately susceptible. At Jhansi, all the entries were moderately resistant to stem rot. **In AVT-1 Berseem**, At Ludhiana, entries Wardan, JHB-17-2 and HFB-13-7 were moderately resistant to stem rot and rest of entries was moderately susceptible. At Bhubaneswar, all the entries showed moderately resistant to resistant reactions to leaf spot & blight except JHB-17-2 which was moderately susceptible. At Palampur, all entries were resistant to root rot.

Oat – IVTO SC: At Ludhiana, All the entries showed moderately resistant disease reaction to leaf blight. At Rahuri, HFO-818 and JHO-18-1 were found moderately susceptible, while remaining entries were found highly susceptible to aphids. At Palampur, all entries were susceptible to Powdery mildew except HFO-806 and SKO-96 which were moderately resistant. At Bhubaneswar, all the entries showed moderately resistant to resistant reactions to leaf spot & blight and infestation by leaf defoliators. At Jhansi, all the entries were resistant to moderately resistant to leaf blight except OL-1874-1 and OL-1876-1 which were in low resistance category.

Oat-IVTO MC: At Ludhiana, All entries showed moderately resistant disease reaction except HFO-716 which was found moderately susceptible.

At Rahuri, all the entries were resistant to moderately resistant to aphids except JHO-18-2 and RO-11-1-4, which were moderately susceptible. At Palampur, all entries were susceptible to Powdery mildew except UPO-212 which was moderately resistant. At Bhubaneswar, all the entries were resistant to moderately resistance to leaf blight of oat as well as *Sclerotium* rot and leaf defoliators infesting oat. At Jhansi, all the entries were susceptible to moderately susceptible to Leaf light except JO-06-308 and RO-11-1-4 which were in low susceptible category.

Oat– IVTO Dual: At Ludhiana, all entries were moderately susceptible to leaf blight except OL-1766-2 which showed moderately resistant disease reaction. At Rahuri, all the entries were resistant to moderately resistant except RO-11-2-6, which was moderately susceptible. At Bhubaneswar, all the entries were resistant to moderately resistance to leaf blight of oat as well as *Sclerotium* rot and leaf defoliators infesting oat except UPO-212 was moderately susceptible. At Jhansi, all the entries were in low susceptible to moderately susceptible category to leaf blight except RO-11-2-6 which was susceptible to leaf light.

Oat-AVTOSC-1: At Ludhiana, All entries were found moderately resistant to leaf blight. At Rahuri, all the entries were resistant to moderately resistance to aphids. At Palampur, all entries were moderately resistant to Powdery mildew except OL-1896, OS-6, JO-05-9 and HFO-529 which were found susceptible. At Bhubaneswar, all the entries were resistant to moderately resistance to leaf blight of oat as well as *Sclerotium* rot and leaf defoliators. At Jhansi, all the entries were in moderately resistant to low resistant category to leaf blight except HFO-529 which showed mesothetic reaction to leaf light.

Oat-AVTOSC-2: All entries were found moderately resistant to leaf blight except OS-6 and OL-125 which are moderately susceptible. At Rahuri, all the entries were found susceptible to highly susceptible to aphids. At Palampur, all entries were susceptible to Powdery mildew. At Bhubaneswar, all the entries were resistant to moderately resistance to leaf blight of oat as well as *Sclerotium* rot and leaf defoliators. At Jhansi, most of the entries were in low resistant to mesothetic category to leaf blight except OL-1869-1, OL-1861, JO-05-07 and SKO-229, which showed low susceptible reaction to leaf light.

Oat-AVTO (SC)-2 (Seed): All entries were found moderately resistant to leaf blight except OS-6 and OL-125 which are moderately susceptible. At Rahuri, all the entries were found susceptible to highly susceptible to aphids. At Palampur, most of the entries were susceptible to highly susceptible to Powdery mildew except SKO-90, JO-05-07, OL-1862 and SKO-229, which were moderately resistant.

Oat-AVTO-1 (Dual): At Ludhiana, Entries HFO-608, OL-1906, JO-10-506 and OL-1876-2 were found moderately resistant to leaf blight and rest were moderately susceptible. At Rahuri, All the entries were found resistant to moderately resistant to aphids. At Bhubaneswar, all the entries were resistant to moderately resistance to leaf blight of oat as well as *Sclerotium* rot and leaf defoliators. At Jhansi, most of the entries were in low susceptible to moderately susceptible category to leaf blight.

Oat-AVTO-1 (Multicut): At Ludhiana, All entries were found moderately resistant to leaf blight. At Rahuri, entries HFO-514 and RO-19 were found resistant whereas remaining entries were moderately susceptible to highly susceptible against aphids. At Palampur, all entries were susceptible to Powdery mildew except OL-1874 and RO-19 which were moderately resistant. At Bhubaneswar, all the entries were resistant except PLP-21 which expressed moderate resistance to both leaf blight and root rot. **At Jhansi**, most of the entries were in low susceptible to moderately susceptible category to leaf blight except PLP-21 which showed mesothetic reaction to leaf light.

In VT Lucerne (P)-2016, At Ludhiana, RRB-15-1, AL-62, BAIF Lucerne 4, Anand-2, Alamdar-1, Alamdar-51 and DL-5 showed moderately resistant disease reaction to downy mildew of lucerne. At Rahuri, against Aphids against aphids RL-88 (21.33 aphids/tiller) was found moderately resistant and BAIF Lucerne 4 (26.00 aphids/tiller) was found moderately susceptible, while rest of the entries did not survived.

VT-AVT-2 (*Lolium*) and VT-AVT-2 (*Lolium*) seed: At Palampur, all the entries were resistant to moderately resistant to powdery mildew. At Ludhiana, no disease was observed.

White clover (VTWC): At Palampur, all the entries were susceptible to powdery mildew.

Red clover (VTRC): At Palampur, all the entries were susceptible to powdery mildew.

AVT-2 Vicia (P): At Rahuri, All the entries were found highly susceptible to aphids.

AVT-2 Vicia-Seed: At Rahuri, All the entries were found highly susceptible to aphids.

Disease Management

Pathogenic variability of *Blumeria graminis f. sp. avenae* on oat: At Palampur, Twenty five isolates of *Blumeria graminis f. sp. avenae* were collected during 2017-19 and were maintained under controlled conditions. Out of 347 lines evaluated *in vivo* under field conditions, 10 lines were found to be resistant i.e. PLP-1, JPO-40, OL-1847, OL-1689, OS-6, HFO-864, OS-10 and HFO-125. Among these lines PLP-1 was found to be highly resistant. For refinement of differential set, 347 lines of oat were evaluated at Palampur *in vivo* for powdery mildew under natural epiphytotic conditions. From these 347 lines evaluated, 160 lines were selected for *in vitro* screening with different isolates. Till date 160 lines were screened *in vitro* against 5 isolates and among these lines 47 lines showing different reaction to the isolates were selected and are being screened against 12 isolates. To study the inheritance of powdery mildew resistance, three resistant lines (OL-1847, OG-77 and OL-1689) were selected and crossed with HJ-8 (Susceptible check) in field. The F1 seeds were sown in polyhouse during October and are harvested in May, 2019. These F2 seeds will be evaluated using different isolates to study the inheritance of resistance.

Biological management of oat aphid *Rhopalosiphum padi* on oats: At Rahuri, at 5 days after treatment (DAT), *L. lecanii* @ 7.5 g/lit recorded significantly lower number of survived aphids per tiller (29.00). Similar trend of result was also noticed at 7 DAT. Trend of aphid population in promising treatments were *L. lecanii* @ 7.5g/lit. (6.47), *M. anisopilae* @ 7.5g/lit (7.89), *L. lecanii* @ 5g/lit. (7.92) and *M. anisopilae* @ 5g/lit (11.63). Biopesticides did not affect the activities of coccinellid predators at 5 and 7 days after spray. At Ludhiana and Dharwad, The incidence of aphids on oats was very low or nil, hence the treatments were not imposed.

Biological management of powdery mildew of oats caused by *Blumeria graminis f. sp. avenae* : At Palampur, chemical check i.e, T9 (three foliar spray of hexaconazole @ 0.1%) gave best control of powdery mildew (7.00 % disease severity and 87.65% disease control) with maximum increase (13.5 %) in the seed yield over the check. Among the biological management treatments, T1 (three foliar spray of *Trichoderma viride* @ 0.5%) and T2 (three foliar spray of *T.harzianum* @ 0.5%) were found effective giving 55.29 and 50.00% powdery mildew control with 11.19 and 10.04 % increase in the seed yield respectively over check.

Eco-friendly pest management techniques in berseem ecosystem: Treatment T4 (Soil application of *Trichoderma viride* @ 1kg/25kg FYM/acre + foliar spray of NSE @ 5% + Chickpea as trap crop on border row + Bird perches) exhibited least disease incidence of stem rot (18.25%) with 57.06 percent disease control as compared to control (42.50%) and 25.74 percent increase in green fodder yield.

The number of *H. armigera* larvae per metre row length were minimum in T7 (Farmers practice) followed by T6 (T2+ Sunflower as trap crop on border row + Bird perches) and T4 (Soil application of *Trichoderma viride* @ 1kg/25kg FYM/acre + foliar spray of NSE @ 5% + Chickpea as trap crop on border row + Bird perches).

Validation of best treatment of trial entitled “Management of soil borne and powdery mildew diseases in red clover seed crop”: Integrated management i.e. seed treatment with carbendazim @ 2 g/kg seed followed by three foliar spray of hexaconazole @ 0.1 % gave best management of powdery mildew having 3.3 percent disease severity and 91.2 per cent disease control of powdery mildew and 3.33 % disease incidence with 68.8 % disease control of soil borne disease.

Validation of best treatment of trial entitled “Management of foliar diseases of oat”: At Ludhiana, seed treatment with Carbendazim 50WP @ 2g/kg seed + foliar application of Propiconazole 25 EC @ 1ml/lit after 21 DAS showed minimum disease severity (25.60%) of leaf blight with 39.62 percent control of disease and 444.00 q/ha of GFY and more seed yield over untreated control. At Bhubaneswar, same seed treatment showed minimum leaf blight severity (8.33%) and also 19.4% increase in yield over control.

Integrated disease management in Berseem: At Jhansi, **T9** (Seed treatment with carbendazim @ 0.02 % followed by foliar spray of carbendazim @ 0.01 %) proved best with least incidence of stem rot (10.23 %) and leaf blight (9.74 %) with maximum GFY (410.72 q/ha). Treatment **T9** was at par with **T7** (Seed treatment with *Trichoderma* @ 0.05 % followed by foliar spray of Chitosan @ 0.05 %) having 10.75 % incidence of stem rot and 9.97 % severity of leaf blight along with GFY of 403.44 q/ha and highest seed yield (3.22 q/ha). At Ludhiana, **T6** (Seed treatment with Chitosan @ 0.05 % + foliar spray of Chitosan @ 0.05%) showed least stem rot incidence (18.00%) along with high green fodder yield (641 q/ha) as compared to control (45.33% disease incidence and 490.33 q/ha green fodder yield). At Palampur, it was observed that **T9** proved best with least incidence of root rot (1.33%) and leaf blight (4.33%) with maximum green fodder yield (367.67 q/ha) over the check, which was followed by non-significant difference with **T8** (Seed treatment with carbendazim @ 0.02 % followed by foliar spray of Chitosan @ 0.05 %). At Bhubaneswar, **T9** proved best with least incidence of root rot (6.27 %) and leaf blight (8.37 %) with maximum GFY (164.83 q/ha) over the check. It was followed by non-significant difference with **T8**.

D. Breeder Seed Production

The indent for Breeder Seed Production for **Indent year Rabi 2019-20 and Production year Rabi 2018-19** was received from DAC, GOI for 27 varieties in three forage crops viz., Oat (12), Berseem (12) and Lucerne (3). The total quantity allocated was 352.36 q. comprising of Oat (303.05 q), Berseem (41.91 q) and Lucerne (7.40 q). The overall production was 461.76 q which is 109.4 q (31.05%) higher than the indented target. Besides previous year seed of 42 q of indented varieties and 30.08q seed of 08 Oat and 01 Berseem variety (Newly released) produced this year is also available.

In Oat, the production was 405.5q and 42.00 q of previous year is also available. It makes a total of 447.5q against the allocation of 303.05q - a surplus of 144.55q. There was surplus production in all 12 varieties indented. Besides these, the 27.08q surplus seed of 08 varieties are also available. **In Berseem**, the production was 47.31q against the indent of 41.91q for 12 varieties making a surplus of 5.4q. In three varieties viz., BL-1, Mescavi and JB-5 the production was less than the indent. In other 09 varieties there was surplus or equal production. 3.0q of breeder seed of newly released variety JBSC-1 is also available. **In Lucerne**, the total production was 8.95 q which was 1.55 q or 20.94% higher than the indent of 7.40 q. Out of 3 varieties, the target was met in Anand-2 and Anand -3 whereas in RL-88 there was surplus production of 1.55q.

E. Forage Technology Demonstrations

To popularize the forage production technologies and make the farmers aware about various new fodder crop varieties, total of 535 forage technology demonstrations were allotted to 21 AICRP centres for Rabi crops. It included 70 FTDs to berseem, 70 to lucerne, 250 to oat (Single cut), 60 to oat (Multicut), 05 to cowpea, 70 to other crops viz., laythrus, rye grass, guinea grass, tall fescue, hedge lucerne etc. The centers mobilized the resources of their respective institutions for carrying out the activities. FTDs are being conducted in the new villages every year so that the technologies can be spread in large areas

F. Tribal Sub Plan

TSP activities were carried out in 10 states by AICRP FC&U centers located in various SAUs/ CAU/ NGO on the aspect of forage crops and livestock development. Three broad aspects were covered.

- Capacity building through Training on forage technologies, improved practices, livestock development, animal nutrition and animal health etc.
- Field days, fodder days, livestock health camps etc. General awareness about importance of fodder
- Inputs supply in forms of seeds, fertilizer, small farm equipments, small ruminants, poultries etc. For the upliftment of livestock keepers and farmers of tribal community.

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

Zone	Coordinated Centers				Testing Locations			
	S. N.	Location	Establishment Year	State	S. N.	Location	State/Union Territory	
I. Hill States = 3 Locations = 3	1.	Palampur, CSKHPKV	1970	Himachal Pradesh	1.	Almora, ICAR-VPKAS*	Uttarakhand	
	2.	Srinagar, SKUAS&T-K	2010	Jammu & Kashmir	2.	Rajouri, SKUAST-J	J & K	
II. North West States = 5 Locations = 13	3.	Ludhiana, PAU	1989	Punjab	3.	Bajoura (Kullu)	H P	
	4.	Hisar, CCS HAU	1970	Haryana	4.	Meerut, SVBPUA&T	Uttar Pradesh	
	5.	Pantnagar, GBPUAT	1995	Uttarakhand	5.	Ballowal Sankhari	Punjab	
	6.	Bikaner, SKRAU	1995	Rajasthan	6.	Avikanagar, IGFR-RRS*	Rajasthan	
					7.	Jodhpur, ICAR-CAZRI*	Rajasthan	
					8.	DFRS, Arjla, Bhilwara	Rajasthan	
					9.	Udaipur, MPUAT	Rajasthan	
					10.	Pali-Marwar, ICAR-CAZRI-RRS*	Rajasthan	
					11.	Jaisalmer, ICAR-CAZRI-RRS*	Rajasthan	
					12.	Fatehpur Shekhawati/ARS Sikar	Rajasthan	
					13.	Jalore, SKRAU ARS Keshwana	Rajasthan	
	III. North East States = 8 Locations = 9	7.	Faizabad, NDUAT	1982	Uttar Pradesh	14.	Umiam (Barapani), ICAR Res. Complex for NEH Region*	Meghalaya
		8.	Ranchi, BAU	1970	Jharkhand	15.	Visva Bharti, Shantiniketan Sriniketan	West Bengal
9.		Kalyani, BCKV	1972	West Bengal	16.	Medziphema	Nagaland	
10.		Bhubaneswar, OUAT	1987	Orissa	17.	Sabour, BAU	Bihar	
11.		Jorhat, AAU	1970	Assam				
12.		Imphal, CAU	2010	Manipur				
13.		Pusa, RPCAU	2017	Bihar				

Zone	Coordinated Centers				Testing Locations		
	S.N.	Location	Establishment Year	State	S. N.	Location	State/Union Territory
IV. Central States = 6 Locations = 10	14.	Anand, AAU	1970	Gujarat	18.	Kanpur, CSAU&T	Uttar Pradesh
	15.	Jabalpur, JNKVV	1970	Madhya Pradesh	19.	Jhansi, ICAR-IGFRI*	Uttar Pradesh
	16.	Rahuri, MPKV	1971	Maharashtra	20.	Dhari, JAU	Gujarat
	17.	Urulikanchan, BAIF	1982	Maharashtra	21.	Karjat	Maharashtra
	18.	Raipur, IGKV	2010	Chhattisgarh	22.	Akola, PDKVV	Maharashtra
V. South States = 6 Locations = 7	19.	Mandya, UAS (B)	1986	Karnataka	24.	Dharwad, ICAR-IGFRI-RRS*	Karnataka
	20.	Coimbatore, TNAU	1976	Tamil Nadu	25.	Pudducherry, PJLNCA & RI, Karaikal	Pudducherry
	21.	Vellayani, KAU	1971	Kerala	26.	Tirupati/Guntur, ANGRAU	Andhra Pradesh
	22.	Hyderabad, PJTSAU	1970	Telangana	27.	Raichur, UAS, Raichur	Karnataka
				28.	Mattupetty, KLDB	Kerala	

Summary: Zone = 5, States = 24, Coordinating Centers = 22, Testing Locations = 28

*ICAR Institute

Entries Code for Rabi 2018-19

1. IVTB: Berseem								S. N. Contributor Entry name Code name			
S. N.	Contributor	Entry name	Code name								
1	JNKVV, Jabalpur	JB -06-11	IVTB - 8								
2	PAU, Ludhiana	BM-12	IVTB - 6								
3	IGFRI, Jhansi	JHB-18-1	IVTB - 3								
4	IGFRI, Jhansi	JHB 18-2	IVTB - 1								
5	HAU, Hisar	HFB-15-3	IVTB - 5								
6	HAU, Hisar	HFB-15-5	IVTB - 7								
7	NC	Wardan	IVTB - 2								
8	ZC (HZ)	BL-22	IVTB - 4								
	ZC(CZ)	Bundel Berseem-2	IVTB - 4								
	ZC(NWZ)	Bundel Berseem-2	IVTB - 4								
	ZC(NEZ)	Bundel Berseem-3	IVTB - 4								
2. AVT-1 Berseem								4. AVT Oat (SC)-1			
S. N.	Contributor	Entry name	Code name					S. N.	Contributor	Entry name	Code name
1	PAU, Ludhiana	PC-91	AVT-1B - 2					1	JNKVV, Jabalpur	JO-05-9	AVTO-1-SC - 6
2	IGFRI, Jhansi	JHB-17-1	AVT-1B - 5					2	PAU, Ludhiana	OL-1896	AVTO-1-SC - 4
3	IGFRI, Jhansi	JHB-17-2	AVT-1B - 3					3	HAU, Hisar	HFO-718	AVTO-1-SC - 1
4	HAU, Hisar	HFB-13-7	AVT-1B - 6					4	HAU, Hisar	HFO-529	AVTO-1-SC - 7
5	HAU, Hisar	HFB-14-7	AVT-1B - 4					5	NDUAT, Faizabad	NDO-1501	AVTO-1-SC - 2
6	NC	Wardan	AVT-1B - 1					6	SKUAST-K, Srinagar	SKO-240	AVTO-1-SC - 9
7	ZC (HZ)	BL-22	AVT-1B - 7					7	NC	Kent	AVTO-1-SC - 3
	ZC(NWZ)	Bundel Berseem-2	AVT-1B - 7					8	NC	OS-6	AVTO-1-SC - 5
	ZC(NEZ)	Bundel Berseem-3	AVT-1B - 7					9	ZC (HZ)	SKO-96 (HZ ZC)	AVTO-1-SC - 8
									ZC(CZ)	JHO 2009-1	AVTO-1-SC - 8
							ZC(NWZ)		RO-11-1 (ZC NWZ)	AVTO-1-SC - 8	
							ZC(NEZ)		RO-11-1 (ZC NEZ)	AVTO-1-SC - 8	
								ZC (SZ)	JHO 2010-1	AVTO-1-SC - 8	
3. IVTO (SC) Oat								5. AVT Oat (SC)-2			
S. N.	Contributor	Entry name	Code name					S. N.	Contributor	Entry name	Code name
1	JNKVV, Jabalpur	JO-06-23	IVTO-SC - 4					1	JNKVV, Jabalpur	JO-05-7	AVTO-2-SC - 7
2	PAU, Ludhiana	OL 1874-1	IVTO-SC - 2					2	PAU, Ludhiana	OL-1869-1	AVTO-2-SC - 4
3	PAU, Ludhiana	OL_1876-1	IVTO-SC - 9					3	PAU, Ludhiana	OL-1861	AVTO-2-SC - 6
4	MPKV Rahuri	RO-11-1-2	IVTO-SC - 14					4	PAU, Ludhiana	OL-1862	AVTO-2-SC - 9
5	MPKV Rahuri	RO-11-1-3	IVTO-SC - 13					5	HAU, Hisar	HFO-607	AVTO-2-SC - 8
6	GBPUAT, Pantnagar	UPO-18-1	IVTO-SC - 7					6	HAU, Hisar	HFO-525	AVTO-2-SC - 1
7	IGFRI, Jhansi	JHO 18-1	IVTO-SC - 10					7	SKUAST-K, Srinagar	SKO-229	AVTO-2-SC - 10
8	HAU, Hisar	HFO-806	IVTO-SC - 1					8	NC	Kent	AVTO-2-SC - 3
9	HAU, Hisar	HFO-818	IVTO-SC - 3					9	NC	OS-6	AVTO-2-SC - 2
10	NDUAT, Faizabad	NDO-1802	IVTO-SC - 6					10	ZC (HZ)	SKO-90 (HZ ZC)	AVTO-2-SC - 5
									ZC(CZ)	JHO 822	AVTO-2-SC - 5
									ZC(NWZ)	OL-125 (ZC NWZ)	AVTO-2-SC - 5
									ZC(NEZ)	JHO-99-2 (ZC NEZ)	AVTO-2-SC - 5
								ZC (SZ)	JHO 2000-4	AVTO-2-SC - 5	

6. AVT Oat (SC)-2 (Seed)				9. IVT Oat (Dual)			
S. N.	Contributor	Entry name	Code name	S. N.	Contributor	Entry name	Code name
1	JNKVV, Jabalpur	JO-05-7	AVTO-2-SC-S - 7	1	JNKVV, Jabalpur	JO-11-507	IVTO-D - 7
2	PAU, Ludhiana	OL-1869-1	AVTO-2-SC-S - 4	2	PAU, Ludhiana	OL-1874-2	IVTO-D - 2
3	PAU, Ludhiana	OL-1861	AVTO-2-SC-S - 6	3	PAU, Ludhiana	OL-1766-2	IVTO-D - 1
4	PAU, Ludhiana	OL-1862	AVTO-2-SC-S - 9	4	IGFRI, Jhansi	JHO 18-3	IVTO-D - 4
5	HAU, Hisar	HFO-607	AVTO-2-SC-S - 8	5	MPKV, Rahuri	RO-11-2-2	IVTO-D - 9
6	HAU, Hisar	HFO-525	AVTO-2-SC-S - 1	6	MPKV, Rahuri	RO-11-2-6	IVTO-D - 10
7	SKUAST-K, Srinagar	SKO-229	AVTO-2-SC-S - 10	7	HAU, Hisar	HFO-816	IVTO-D - 5
8	NC	Kent	AVTO-2-SC-S - 3	8	NC	UPO-212	IVTO-D - 8
9	NC	OS-6	AVTO-2-SC-S - 2	9	NC	JHO 822	IVTO-D - 3
10	ZC (HZ)	SKO-90 (HZ ZC)	AVTO-2-SC-S - 5	10	HAU, Hisar	HFO-810	IVTO-D - 6
11	ZC(CZ)	JHO 822	AVTO-2-SC-S - 5	10. AVT-1 Oat (Dual)			
12	ZC(NWZ)	OL-125 (ZC NWZ)	AVTO-2-SC-S - 5	S. N.	Contributor	Entry name	Code name
13	ZC(NEZ)	JHO-99-2 (ZC NEZ)	AVTO-2-SC-S - 5	1	JNKVV, Jabalpur	JO-10-506	AVTO-1-D - 7
14	ZC (SZ)	JHO 2000-4	AVTO-2-SC-S - 5	2	PAU, Ludhiana	OL-1876-2	AVTO-1-D - 8
7. IVTO (MC)				3	PAU, Ludhiana	OL-1906;	AVTO-1-D - 6
S. N.	Contributor	Entry name	Code name	4	IGFRI, Jhansi	JHO-17-4	AVTO-1-D - 2
1	JNKVV, Jabalpur	JO-06-308	IVTO-MC - 8	5	HAU, Hisar	HFO-608	AVTO-1-D - 4
2	PAU, Ludhiana	OL-1895	IVTO-MC - 1	6	HAU, Hisar	HFO-611	AVTO-1-D - 1
3	PAU, Ludhiana	OL-1882	IVTO-MC - 4	7	NC	UPO-212	AVTO-1-D - 3
4	IGFRI, Jhansi	JHO 18-2	IVTO-MC - 5	8	NC	JHO 822	AVTO-1-D - 5
5	HAU, Hisar	HFO-707	IVTO-MC - 3	11. VT Lucerne Perennial – 2016 (3rd Year)			
6	HAU, Hisar	HFO-716	IVTO-MC - 7	S. N.	Contributor	Entry name	Code name
7	MPKV, Rahuri	RO-11-1-4	IVTO-MC - 10	1	NC	RL -88	VTLu -2016- 1
8	MPKV, Rahuri	RO-11-1-5	IVTO-MC - 11	2	AAU, Anand	AL-61	VTLu-2016- 2
9	HPKV, Palampur	PLP-23	IVTO-MC - 6	3	TNAU, Coimbatore	TNLC-15	VTLu -2016- 3
10	NC	UPO-212	IVTO-MC - 2	4	MPKV, Rahuri	RL-15-1	VTLu -2016- 4
11	NC	RO-19	IVTO-MC - 9	5	NC	Anand -2	VTLu-2016- 9
8. AVTO-1 (MC)				6	BAIF, Urulikanchan	BAIF Lucerne 4	VTLu -2016- 8
S. N.	Contributor	Entry name	Code name	7	AAU, Anand	AL-62	VTLu-2016- 7
1	JNKVV, Jabalpur	JO-05-304	AVTO-1-MC - 5	8	SKRAU, Bikaner	RRB-15-1	VTLu -2016- 6
2	PAU, Ludhiana	OL-1874	AVTO-1-MC - 3	9	IGFRI, Jhansi / Dharwad	DL-5	VTLu-2016- 12
3	HAU, Hisar	HFO-514	AVTO-1-MC - 1	10	PJTSAU, Hyderabad	TSL-1	VTLu -2016- 13
4	HPKV, Palampur	PLP -21	AVTO-1-MC - 4	11	Alamdar Seed Ltd.	Alamdar -1	VTLu-2016- 10
5	NC	UPO-212	AVTO-1-MC - 2	12	Alamdar Seed Ltd.	Alamdar -51	VTLu -2016- 11
6	NC	RO-19	AVTO-1-MC - 6				

12. AVT-2 – Vicia			
S. N.	Contributor	Entry name	Code name
1	JNKVV, Jabalpur	JVS-1	AVT-2-VIC - 1
2	JNKVV, Jabalpur	JVS-2	AVT-2-VIC - 2
3	JNKVV, Jabalpur	JVS-3	AVT-2-VIC - 3
4	JNKVV, Jabalpur	JVS-4	AVT-2-VIC - 4
5	JNKVV, Jabalpur	JVS-5	AVT-2-VIC - 5
13. AVT-2 – Vicia (seed)			
S. N.	Contributor	Entry name	Code name
1	JNKVV, Jabalpur	JVS-1	AVT-2-VIC-S - 1
2	JNKVV, Jabalpur	JVS-2	AVT-2-VIC-S - 2
3	JNKVV, Jabalpur	JVS-3	AVT-2-VIC-S - 3
4	JNKVV, Jabalpur	JVS-4	AVT-2-VIC-S - 4
5	JNKVV, Jabalpur	JVS-5	AVT-2-VIC-S - 5
14. AVT-2 Lolium			
S. N.	Contributor	Entry name	Code name
1	CSK HPKV, Palampur	Palam rye grass-2	AVT-2-RG - 3
2	CSK HPKV, Palampur	Palam rye grass-1	AVT-2-RG - 1
3	(NC)	PBRG-1	AVT-2-RG - 4
4	PAU, Ludhiana	PBRG-2	AVT-2-RG - 2
15. AVT-2 Lolium (seed)			
S. N.	Contributor	Entry name	Code name
1	CSK HPKV, Palampur	Palam rye grass-2	AVT-2-RG- S - 3
2	CSK HPKV, Palampur	Palam rye grass-1	AVT-2-RG- S - 1
3	(NC)	PBRG-1	AVT-2-RG- S - 4
4	PAU, Ludhiana	PBRG-2	AVT-2-RG- S - 2
18. IVT Bajra (Multi cut)			
S. N.	Contributor	Entry name	Code name
1	PJTSAU, Hyderabad	TSFB-18-1	IVT MC Bajra - 1
2	PJTSAU, Hyderabad	TSFB-18-2	IVT MC Bajra - 2
3	BAIF, Urulikanchan	BAIF Bajra -5	IVT MC Bajra - 3
4	NC	Giant Bajra	IVT MC Bajra - 4
5	BAIF, Urulikanchan	BAIF Bajra -6	IVT MC Bajra - 5
6	Advanta UPL ltd.	16 ADV 0055	IVT MC Bajra - 6
7	NC	Moti Bajra	IVT MC Bajra - 7
8	NC	BAIF Bajra 1	IVT MC Bajra - 8

19. AVT-1 Bajra (Multi cut)			
S. N.	Contributor	Entry name	Code name
1	NC	Raj Bajra 1	AVT-1 MC Bajra - 1
2	HYtech Seed Ltd.	HTBH-4902	AVT-1 MC Bajra - 2
3	NC	Giant Bajra	AVT-1 MC Bajra - 3
4	AAU, Anand	AFB-37	AVT-1 MC Bajra - 4
5	Advanta UPL ltd.	ADV-0061	AVT-1 MC Bajra - 5
6	NC	Moti Bajra	AVT-1 MC Bajra - 6
Entries Code Agronomy Rabi 2018-19			
R-18-AST -1: AVTO (SC-2) (Agronomy)			
S. N.	Entry name	Code name	
1	SKO-229	AVT-2 SC-1	
2	HFO-607	AVT-2 SC-2	
3	HFO-525	AVT-2 SC-3	
4	Kent (NC)	AVT-2 SC-4	
5	OS-6 (NC)	AVT-2 SC-5	
6	JO-05-7	AVT-2 SC-6	
7	OL-1869-1	AVT-2 SC-7	
8	OL-1861	AVT-2 SC-8	
9	OL-1862	AVT-2 SC-9	
10	SKO-90 (HZ)	AVT-2 SC-10	
11	OL-125 (NWZ)	AVT-2 SC-10	
12	JHO-99-2 (NEZ)	AVT-2 SC-10	
13	JHO-2000-4 (SZ)	AVT-2 SC-10	
14	JHO-822 (CZ)	AVT-2 SC-10	
R-18-AST -2: AVT-2 Vicia (Agronomy)			
S. N.	Entry name	Code name	
1	JVS-1	AVT-2 Vc-1	
2	JVS-2	AVT-2 Vc-2	
3	JVS-3	AVT-2 Vc-3	
4	JVS-4	AVT-2 Vc-4	
5	JVS-5	AVT-2 Vc-5	
R-18-AST -3: AVT-2 Rye grass (Agronomy)			
S. N.	Entry name	Code name	
1	PBRG-1 (NC)	AVT-2 Rg-1	
2	PBRG-2	AVT-2 Rg-2	
3	Palam rye grass -1	AVT-2 Rg-3	
4	Palam rye grass-2	AVT-2 Rg-4	

1. IVTB: INITIAL VARIETAL TRIAL IN BERSEEM

(Reference tables 1.1 to 1.9)

An initial varietal trial in Berseem comprising of six entries along with one national check (Wardan) and three zonal checks in respective zones [BL-22 (HZ), Bundel Berseem-2 (NWZ, CZ) and Bundel Berseem-3 (NEZ)] was conducted at 20 centres located in four different zones (HZ, NWZ, NEZ, CZ) of the country.

For green forage yield (q/ha), entries JHB-18-2 (11.0%), JHB-18-1 (6.5%), JB-06-11 (6.1%), BM-12 (5.6%), HFB-15-5 (5.1%) showed superiority over the best check (BL-22) in Hill zone. In NW zone, entry JHB-18-1 (9.9%) showed superiority over the best check Wardan. In central zone, only one entry JHB-18-1 was superior by a margin of 6.1%. At all India level, only one entry JHB-18-1 showed superiority of 6.5% over the check Wardan. All other entries were below or at par or marginally superior in comparison to best check.

For dry matter yield, JHB-18-1 was superior over best check by a margin of 10.2%, 4.1% and 6.0% respectively in NW zone, central zone and at all India level. Other entries were below par or marginally superior in comparison to the best check.

For per day productivity, entry JHB-18-1 ranked first for both GFY (q/ha/day) and DMY (q/ha/day) followed by national check Wardan. Entry JHB-18-2 ranked first for the character plant height followed by national check Wardan. For the character leafiness all the entries were nearly at par.

In quality parameters, for crude protein yield (q/ha), JHB-18-1 (15.4q/ha) was best performer followed by Wardan (15.1 q/ha). For crude protein percentage, entry JHB-18-2 (17.7%) ranked first followed by national check Wardan (17.5%). For other quality parameters, entry BM-12 ranked first for IVDMD %, ADF % and NDF %.

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

(Reference tables 2.1 to 2.9)

An advanced varietal trial in Berseem comprising of five entries along with one national check (Wardan) and three zonal checks [BB-3 (NE zone), BB-2 (NWZ), BL-22 (HZ)] was conducted at 15 centres located in three zones (Hill, North West and North East). There were 3 locations in Hill, 7 locations in NW and 5 in NE zone.

For green forage yield (q/ha), entries JHB-17-2 (10.6%), PC-91 (5.7%), JHB-17-1 (5.6%) and HFB-13-7 (2.8%) were superior over the best check Wardan in NW zone. In NE zone, entries PC-91 (4.8%) and JHB-17-1 (2.0%) were superior over the best check. Combining the three zones, entry PC-91 was best showing 4.5% superiority over the best check. Entries JHB-17-2, JHB-17-1 and HFB-13-7 also showed marginal superiority over the best check. In Hill zone, the national check Wardan was best performer.

For dry matter yield (q/ha), entry JHB-17-2 was superior over the best check by a margin of 10.7% in NW zone. In NE zone, entries PC-91 and JHB-17-1 were superior by margins of 7.0% and 3.7% respectively over the best check Wardan. In Hill zone and combining three zones, national check Wardan was best. All other entries were below or at par or marginally superior in comparison to best check.

In green and dry forage production potential (q/ha/day), entry PC-91 ranked first. National check Wardan and entry HFB-13-7 ranked first for the character plant height. For leafiness, entry HFB-14-7 ranked first followed by PC-91.

In quality parameters, National check Wardan ranked first for crude protein yield (q/ha) whereas entry JHB-17-1 ranked first for crude protein content (%). For other quality parameters, HFB-13-7 for NDF%, and entry JHB-17-1 for ADF% and IVDMD% 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	Rajo-uri	Alm-ora	Aver-age	Ra-nk	Superi- ority	His-ar	Ludh- iana	Pant-nagar	Mee-rut	Udai-pur	**Bika- ner	Aver-age	Ra-nk	Superi- ority
JHB 18-2	229.9	313.2	500.9	189.8	308.5	1	11.0	560.4	1039.9	825.9	646.3	668.9	156.6	748.3	2	0.5
JHB-18-1	259.9	255.7	531.6	136.0	295.8	2	6.5	602.6	1079.1	858.5	788.9	763.8	82.0	818.6	1	9.9
HFB-15-3	261.1	296.5	395.2	133.5	271.6	7		467.0	1062.8	532.6	687.0	612.8	78.5	672.4	6	
BM-12	248.9	353.7	411.0	159.8	293.3	4	5.6	475.9	1062.1	634.8	723.7	689.1	126.5	717.1	4	
HFB-15-5	249.4	333.6	447.9	137.0	292.0	5	5.1	431.5	1015.4	609.3	622.2	643.7	130.8	664.4	8	
JB-06-11	269.4	280.6	447.9	181.0	294.7	3	6.1	404.1	1026.5	785.2	590.7	665.3	129.0	694.4	5	
Wardan (NC)	223.3	265.4	462.9	129.8	270.3	8		588.2	1029.5	850.0	740.7	514.9	121.8	744.7	3	
BL-22 (ZC-HZ)	272.2	270.4	438.4	130.2	277.8	6										
Bundel Berseem-2 (ZC-NWZ)								555.9	922.1	744.4	642.2	495.6	100.8	672.1	7	
Mean	251.8	296.1	454.5	149.6	288.0			510.7	1029.7	730.1	680.2	631.8	115.7	716.5		
CD at 5%	NS	12.8	3.6	41.0				82.7	40.3	55.4	6.4	86.5	38.1			
CV%	9.6	8.7	5.0	15.5				9.2	10.2	9.4	5.9	7.8	18.8			

Note: ** Not Included in Zonal & all India Average due to low yield of data

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

Entries	North East Zone							
	Kalyani	Ranchi	Faizabad	Pusa	**Bhubaneswar	Average	Rank	Superiority
JHB 18-2	684.2	760.2	361.1	225.0	125.7	507.6	1	0.4
JHB-18-1	595.6	747.2	329.8	276.7	128.5	487.3	4	
HFB-15-3	667.4	611.6	335.8	200.0	131.3	453.7	7	
BM-12	677.3	649.5	344.2	193.3	118.8	466.1	5	
HFB-15-5	611.7	609.7	367.3	223.3	93.8	453.0	8	
JB-06-11	646.5	614.4	355.9	243.3	113.2	465.0	6	
Wardan (NC)	707.1	717.1	393.5	186.7	109.0	501.1	3	
Bundel Berseem-3 (ZC-NEZ)	694.7	681.9	289.3	356.7	100.0	505.7	2	
Mean	660.6	674.0	347.1	238.1	115.0	479.9		
CD at 5%	21.6	59.3	47.7	23.8	1.0			
CV%	14.8	5.0	7.9	10.6	6.9			

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	Urulikan-chan	Rai-pur	Aver-age	Ra-nk	Superi- ority	Aver- age	Ra- nk	Super- iority
JHB 18-2	1008.5	271.3	1004.9	213.2	348.2	569.2	7		547.3	2	1.5
JHB-18-1	1099.2	251.2	984.0	382.4	401.5	623.7	1	6.1	574.7	1	6.5
HFB-15-3	995.9	303.5	1045.1	210.4	341.1	579.2	6		508.8	6	
BM-12	1099.6	307.5	1025.7	177.3	357.4	593.5	2	0.9	532.8	4	
HFB-15-5	1046.4	265.9	902.2	197.7	311.1	544.7	8		501.4	7	
JB-06-11	1051.8	310.3	997.9	205.5	355.6	584.2	4		524.0	5	
Wardan (NC)	939.0	276.4	954.9	340.8	389.6	580.1	5		539.4	3	
Bundel Berseem-2 (ZC-CZ)	1024.8	213.4	1147.8	193.6	360.7	588.1	3				
Mean	1033.1	274.9	1007.8	240.1	358.1	582.8			532.6		
CD at 5%	148.7	54.3	207.4	25.8	67.5						
CV%	8.2	11.5	11.7	6.1	11.0						

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

Entries	Hill Zone						North West Zone						
	Palam-pur	Sri-nagar	Raj-ouri	Alm-ora	Aver-age	Ra-nk	His-ar	Ludh-iana	Pant-nagar	**Bika-ner	Aver-age	Ra-nk	Super-iority
JHB 18-2	46.3	52.1	81.3	40.1	54.9	2	92.5	169.8	109.6	28.0	124.0	2	0.4
JHB-18-1	59.0	45.8	79.5	32.7	54.2	3	110.9	178.1	119.3	15.4	136.1	1	10.2
HFB-15-3	53.1	49.6	73.8	30.8	51.8	6	88.6	173.6	68.1	13.6	110.1	4	
BM-12	49.6	59.4	67.4	36.8	53.3	4	74.9	171.7	79.1	21.9	108.6	5	
HFB-15-5	47.7	55.9	70.6	31.6	51.4	7	76.2	157.4	82.1	22.0	105.2	7	
JB-06-11	48.6	49.4	76.0	34.8	52.2	5	72.8	145.4	96.2	24.4	104.8	8	
Wardan (NC)	42.2	46.9	85.0	27.4	50.4	8	94.1	169.9	106.3	24.1	123.4	3	
BL-22 (ZC-HZ)	57.6	47.8	96.8	35.0	59.3	1							
Bundel Berseem-2 (ZC-NWZ)							100.2	130.6	94.5	18.4	108.4	6	
Mean	50.5	50.9	78.8	33.6	53.4		88.8	162.1	94.4	21.0	115.1		
CD at 5%	NS	3.2	0.6	NA			15.2	29.4	9.4	7.1			
CV%	13.8	6.4	3.6	15.1			9.7	8.7	8.0	19.4			

Note: ** Not Included in zonal & all India Average due to low yield of data

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

Entries	North East Zone						Average	Rank
	Kalyani	Ranchi	Faizabad	Pusa	**Bhubaneswar			
JHB 18-2	129.9	64.7	72.3	67.6	27.7	83.6	2	
JHB-18-1	112.8	61.8	67.5	73.7	28.1	79.0	5	
HFB-15-3	126.8	51.3	70.4	54.0	30.8	75.6	7	
BM-12	129.5	52.2	69.9	53.0	25.5	76.1	6	
HFB-15-5	115.4	48.3	69.8	68.9	22.5	75.6	7	
JB-06-11	121.0	52.3	71.2	73.0	23.7	79.4	4	
Wardan (NC)	134.1	51.6	84.5	54.5	21.3	81.2	3	
Bundel Berseem-3 (ZC-NEZ)	129.2	52.3	59.7	97.3	23.4	84.6	1	
Mean	124.8	54.3	70.7	67.7	25.4	79.4		
CD at 5%	8.4	NS	9.0	6.7	0.2			
CV%	10.6	7.5	7.3	4.5	7.4			

Note: ** Not included in zonal & all India average due to low yield of data

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

Entries	Central Zone							All India			
	Jha-nsi	Rah-uri	Jabal-pur	Urulikan-ghan	Rai-pur	Aver-age	Ra-nk	Superi-riority	Aver-age	Ra-nk	Superi-riority
JHB 18-2	161.4	56.9	146.2	31.7	56.0	90.4	5	4.1	86.1	2	2.4
JHB-18-1	171.1	51.9	142.7	59.4	60.7	97.1	1		89.2	1	6.0
HFB-15-3	161.9	62.6	148.8	34.1	49.1	91.3	4		81.0	6	
BM-12	169.2	64.9	147.4	31.2	49.3	92.4	3		81.6	4	
HFB-15-5	162.5	55.0	127.4	33.2	46.5	84.9	7		78.0	8	
JB-06-11	161.9	65.7	141.8	36.9	55.9	92.4	3		81.4	5	
Wardan (NC)	145.9	57.8	139.2	49.7	57.0	89.9	6		84.1	3	
Bundel Berseem-2 (ZC-CZ)	166.2	43.7	167.4	37.3	51.9	93.3	2				
Mean	162.5	57.3	145.1	39.2	53.3	91.5		83.1			
CD at 5%	26.6	11.3	28.8	4.4	8.3						
CV%	9.4	11.5	11.3	6.3	9.1						

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

Entries	**Bika- ner	His- ar	Ludh- iana	Pant- nagar	Kal- yani	Ran- chi	Faiza- bad	**Bhuban- eswar	Pu- sa	Jha- nsi	Rah- uri	Urulikan- chan	Rai- pur	Aver- age	Ra- nk
JHB 18-2	1.20	4.00	5.68	5.16	5.56	5.80	2.93	2.21	3.50	7.15	2.21	2.51	3.05	4.32	3
JHB-18-1	0.63	4.30	5.90	5.37	4.84	5.70	2.68	2.07	3.60	8.79	2.04	4.50	3.52	4.66	1
HFB-15-3	0.60	3.34	5.81	3.33	5.43	4.70	2.72	2.15	3.49	6.82	2.47	2.48	2.99	3.96	7
BM-12	0.97	3.40	5.80	3.97	5.51	5.00	2.79	2.16	3.38	8.80	2.50	2.09	3.14	4.22	4
HFB-15-5	1.01	3.08	5.55	3.81	4.97	4.70	2.98	1.64	3.22	8.30	2.16	2.33	2.73	3.98	6
JB-06-11	0.99	2.89	5.61	4.91	5.26	4.70	2.89	2.02	3.31	8.22	2.52	2.42	3.12	4.17	5
Wardan (NC)	0.94	4.20	5.63	5.31	5.75	5.50	3.19	2.02	3.46	6.52	2.25	4.01	3.42	4.48	2
Bundel Berseem-2 (ZC-NWZ)	0.78	3.97	5.04	4.65											
Bundel Berseem-3 (ZC-NEZ)					5.65	5.20	2.35	1.82	3.54						
Bundel Berseem-2 (ZC-CZ)										7.82	1.73	2.28	3.16		
Mean	0.89	3.65	5.63	4.56	5.37	5.16	2.82	2.01	3.44	7.80	2.24	2.83	3.14	4.26	

Note: ** Not included in zonal & all India average due to low yield of data

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

Entries	**Bika- ner	His- ar	Ludh- iana	Pant- nagar	Kal- yani	Ran- chi	Faiza- bad	**Bhuban- eswar	Pu- sa	Jha- nsi	Rah- uri	Urulikan- chan	Rai- pur	Aver- age	Ra- nk
JHB 18-2	0.22	0.66	0.93	0.68	1.05	0.49	0.58	0.49	0.60	1.14	0.46	0.37	0.49	0.68	2
JHB-18-1	0.12	0.79	0.97	0.75	0.92	0.48	0.54	0.45	0.63	1.37	0.42	0.70	0.53	0.74	1
HFB-15-3	0.10	0.63	0.95	0.42	1.03	0.39	0.57	0.51	0.45	1.11	0.51	0.40	0.43	0.63	5
BM-12	0.17	0.53	0.94	0.49	1.05	0.40	0.56	0.46	0.44	1.35	0.53	0.37	0.43	0.64	4
HFB-15-5	0.17	0.54	0.86	0.51	0.94	0.37	0.56	0.40	0.57	1.29	0.45	0.39	0.41	0.63	5
JB-06-11	0.19	0.52	0.79	0.60	0.96	0.41	0.57	0.42	0.64	1.26	0.53	0.43	0.49	0.65	3
Wardan (NC)	0.19	0.67	0.93	0.66	1.09	0.40	0.64	0.40	0.49	1.01	0.47	0.58	0.50	0.68	2
Bundel Berseem-2 (ZC-NWZ)	0.14	0.72	0.71	0.59											
Bundel Berseem-3 (ZC-NEZ)					1.05	0.41	0.48	0.42	0.87						
Bundel Berseem-2 (ZC-CZ)										1.27	0.35	0.44	0.46		
Mean	0.16	0.63	0.89	0.59	1.01	0.42	0.56	0.44	0.59	1.23	0.47	0.46	0.47	0.66	

Note: ** Not included in zonal & all India average due to low yield of data

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

Entries	Palam-pur	**Bika-ner	His-ar	Ludh-iana	Kal-yani	Ran-chi	Faiza-bad	**Bhuban-eswar	Rah-uri	Jabal-pur	Urulikan-chan	Rai-pur	Aver-age	Ra-nk	Superi-osity%
JHB 18-2	9.3	5.3	16.6	31.4	18.2	13.4	12.3	4.1	9.8	21.5	6.5	9.1	14.8	3	
JHB-18-1	11.0	2.5	19.3	33.7	14.1	13.5	11.4	4.1	9.0	21.2	12.0	8.7	15.4	1	2.2
HFB-15-3	10.5	2.1	15.4	32.8	18.2	8.8	12.0	4.2	10.3	22.3	7.4	7.1	14.5	4	
BM-12	9.1	3.2	13.1	33.3	17.5	8.4	11.7	3.8	11.8	21.9	6.5	7.5	14.1	5	
HFB-15-5	8.8	3.6	13.9	30.1	15.6	8.0	12.0	3.0	10.3	18.8	6.4	7.0	13.1	7	
JB-06-11	8.8	4.2	13.1	27.5	15.9	8.9	12.3	3.7	12.9	20.9	7.0	8.3	13.6	6	
Wardan (NC)	8.4	4.2	16.4	31.1	18.9	10.9	14.8	3.5	11.6	20.5	9.5	8.5	15.1	2	
BL-22 (ZC-HZ)	11.2														
Bundel Berseem-2 (ZC-NWZ)		3.1	17.8	24.3											
Bundel Berseem-3 (ZC-NEZ)					14.5	8.4	10.2	3.2							
Bundel Berseem-2 (ZC-CZ)									8.2	24.8	7.6	7.0			
Mean	9.6	3.5	15.7	30.5	16.6	10.1	12.1	3.7	10.5	21.5	7.9	7.9	14.4		

Note: ** Not included in zonal & all India average due to low yield of data

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

Entries	Palam-pur	Bika-ner	His-ar	Ludh-iana	Kal-yani	Ran-chi	Faiza-bad	Bhuban-eswar	Rah-uri	Jabal-pur	Urulikan-chan	Rai-pur	Aver-age	Ra-nk
JHB 18-2	21.9	18.8	17.9	18.5	14.0	20.8	17.0	14.6	17.2	14.7	20.5	16.2	17.7	1
JHB-18-1	20.7	16.4	17.5	18.9	12.5	21.9	16.9	14.8	17.3	14.9	20.2	14.3	17.2	4
HFB-15-3	19.6	15.2	17.3	18.9	14.4	17.1	17.0	13.7	16.4	15.0	21.5	14.6	16.7	7
BM-12	19.9	14.4	17.5	19.4	13.5	16.2	16.8	15.0	18.2	14.9	20.8	15.2	16.8	6
HFB-15-5	21.3	16.4	18.2	19.1	13.5	16.6	17.2	13.4	18.8	14.8	19.2	15.1	17.0	5
JB-06-11	21.9	17.2	18.1	18.9	13.2	17.1	17.3	15.4	19.7	14.7	18.9	14.9	17.3	3
Wardan (NC)	18.9	17.2	17.4	18.3	14.1	21.2	17.5	16.5	20.1	14.7	19.1	14.9	17.5	2
BL-22 (ZC-HZ)	20.4													
Bundel Berseem-2 (ZC-NWZ)		17.1	17.7	18.6										
Bundel Berseem-3 (ZC-NEZ)					11.2	16.0	17.1	13.8						
Bundel Berseem-2 (ZC-CZ)									18.8	14.8	20.4	13.5		
Mean	20.6	16.6	17.7	18.8	13.3	18.3	17.1	14.7	18.3	14.8	20.1	14.8	17.2	

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

Contd...

Entries	Palampur	Srinagar	Bikaner	Hisar	Ludhiana	Pantnagar	Udaipur
JHB 18-2	47.9	57.8	63.5	67.8	46.1	67.7	52.4
JHB-18-1	49.5	45.5	44.0	65.3	47.3	60.7	55.3
HFB-15-3	48.8	59.3	59.0	61.6	43.7	55.0	47.5
BM-12	46.3	54.2	55.5	62.6	46.2	58.0	52.3
HFB-15-5	46.4	60.5	46.0	60.5	48.5	55.3	49.7
JB-06-11	45.4	52.5	59.0	63.1	48.3	65.7	57.7
Wardan (NC)	47.3	52.0	61.5	69.8	48.0	59.7	49.0
BL-22 (ZC-HZ)	44.8	58.5					
Bundel Berseem-2 (ZC-NWZ)			56.5	69.6	45.0	61.3	49.1
Mean	47.1	55.0	55.6	65.0	46.6	60.4	51.6

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

Entries	Kalyani	Ranchi	Faizabad	Bhubaneswar	Pusa	Rahuri	Jabalpur	Urulikanchan	Raipur	Average	Rank
JHB 18-2	90.7	64.3	51.2	67.6	63.0	48.2	60.4	45.3	69.5	60.2	1
JHB-18-1	88.4	54.5	49.4	70.1	68.3	44.0	55.3	52.3	75.7	57.9	4
HFB-15-3	89.3	47.9	51.2	73.2	54.0	44.9	49.5	49.3	70.1	56.5	5
BM-12	88.5	49.4	47.7	61.7	51.3	43.4	50.7	45.2	71.4	55.3	6
HFB-15-5	88.8	45.4	51.8	58.2	50.3	46.5	43.9	48.9	69.9	54.4	7
JB-06-11	88.9	52.1	51.7	65.2	61.0	51.3	48.4	51.9	71.3	58.3	3
Wardan (NC)	91.6	62.8	51.4	59.3	62.0	50.5	52.5	54.5	72.8	59.0	2
Bundel Berseem-3 (ZC-NEZ)	90.1	52.8	49.8	59.1	63.7						
Bundel Berseem-2 (ZC-CZ)						44.1	63.6	46.5	75.3		
Mean	89.5	53.7	50.5	64.3	59.2	46.6	53.0	49.2	72.0	57.4	

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	Bhuban-eswar	Rah-uri	Jabal-pur	Urulikan-chan	Rai-pur	Aver-age	Ra-nk
JHB 18-2	0.40	0.81	0.72	0.88	1.23	0.90	0.78	0.70	1.19	0.57	0.86	0.67	0.68	0.80	1
JHB-18-1	0.44	0.75	0.81	0.77	1.42	0.95	0.73	0.75	1.24	0.56	0.85	0.75	0.37	0.80	1
HFB-15-3	0.39	0.70	0.85	0.92	1.35	0.95	0.75	0.68	1.30	0.55	0.73	0.81	0.39	0.80	1
BM-12	0.40	0.86	0.83	0.78	1.35	0.94	0.81	0.69	1.12	0.49	0.78	0.67	0.36	0.78	2
HFB-15-5	0.44	0.65	0.95	1.05	1.23	0.98	0.83	0.66	0.98	0.50	0.71	0.69	0.40	0.78	2
JB-06-11	0.38	0.70	0.92	1.07	1.27	0.95	0.69	0.70	1.17	0.65	0.70	0.71	0.52	0.80	1
Wardan (NC)	0.43	0.84	0.62	1.00	1.12	0.98	0.67	0.72	1.08	0.59	0.81	0.75	0.34	0.77	3
BL-22 (ZC-HZ)	0.50	0.80													
Bundel Berseem-2 (ZC-NWZ)			0.97	0.66	0.96										
Bundel Berseem-3 (ZC-NEZ)						0.97	0.73	0.73	1.05						
Bundel Berseem-2 (ZC-CZ)										0.54	0.94	0.70	0.35		
Mean	0.42	0.76	0.83	0.89	1.24	0.95	0.75	0.70	1.14	0.56	0.80	0.72	0.43	0.79	

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

Entries	ADF (%)		NDF (%)		IVDMD (%)	
	Ludhiana	Rank	Ludhiana	Rank	Ludhiana	Rank
JHB 18-2	35.1	7	44.6	7	59.3	7
JHB-18-1	34.9	6	43.9	5	62.1	3
HFB-15-3	34.0	4	43.6	4	60.6	5
BM-12	32.9	1	39.4	1	64.3	1
HFB-15-5	33.8	3	42.0	3	62.9	2
JB-06-11	33.1	2	41.3	2	62.0	4
Wardan (NC)	34.3	5	44.1	6	59.7	6
Bundel Berseem-2 (ZC-NWZ)	33.7		42.3		61.7	
Mean	34.0		42.7		61.6	

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

Entries	Hill Zone					North West Zone									
	Palam-pur	Sri-nagar	Rajo-uri	Aver-age	Ra-nk	Pant-nagar	His-ar	Ludh-iana	Udai-pur	Mee-rut	**Jal-ore	**Bika-ner	Aver-age	Ra-nk	Superi-ority%
PC-91	239.8	342.5	364.4	315.5	2	773.9	408.9	942.7	917.5	687.2	54.4	144.8	746.0	2	5.7
JHB-17-2	204.6	265.3	325.2	265.0	7	880.0	553.3	936.3	821.2	715.6	40.0	130.5	781.3	1	10.6
HFB-14-7	178.2	311.5	354.7	281.5	6	759.7	380.0	939.9	677.7	587.8	53.3	93.0	669.0	7	
JHB-17-1	230.5	293.7	359.6	294.6	5	736.1	520.5	819.1	917.6	733.3	48.6	120.9	745.3	3	5.6
HFB-13-7	201.8	325.4	402.5	309.9	3	753.9	386.6	981.0	847.8	661.1	53.3	135.7	726.1	4	2.8
Wardan (NC)	233.7	286.2	428.2	316.1	1	862.5	498.1	833.0	648.1	688.9	46.1	137.3	706.1	5	
BL-22 (ZC-HZ)	233.8	275.1	377.0	295.3	4										
Bundel Berseem-2 (ZC-NWZ)						709.7	509.7	857.9	670.3	627.2	46.1	127.1	675.0	6	
Mean	217.5	299.9	373.1	296.8		782.3	465.3	901.4	785.7	671.6	48.8	127.0	721.3		
CD at 5%	27.5	12.7	2.4			56.1	83.7	45.1	89.6	7.6	NS	26.9			
CV%	7.1	9.7	3.5			7.9	10.0	10.1	6.5	4.3	18.2	11.9			

Note: ** Not included in zonal & all India average due to low yield of data

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

Entries	North East Zone								All India		
	Kal-yani	Ran-chi	Faiza-bad	Pu-sa	**Bhuba-neswar	Aver-age	Ra-nk	Super-iority%	Aver-age	Ra-nk	Superi-ority%
PC-91	667.4	511.5	422.6	300.5	145.4	475.5	1	4.8	548.2	1	4.5
JHB-17-2	670.9	485.4	276.6	238.3	88.6	417.8	6		531.1	3	1.3
HFB-14-7	642.4	505.6	320.5	225.0	131.8	423.4	5		490.3	6	
JHB-17-1	665.5	489.6	383.8	311.6	110.5	462.6	2	2.0	538.4	2	2.7
HFB-13-7	687.3	497.6	334.0	290.0	100.0	452.2	4		530.8	4	1.2
Wardan (NC)	655.7	554.9	367.5	236.7	116.7	453.7	3		524.5	5	
Bundel Berseem-3 (ZC-NEZ)	649.7	469.5	273.5	246.7	98.5	409.8	7				
Mean	662.7	502.0	339.8	264.1	113.1	442.2			527.2		
CD at 5%	9.6	64.4	63.3	28.4	1.2						
CV%	12.5	5.4	10.5	5.7	6.1						

Note: ** Not included in zonal & all India average due to low yield of data

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

Entries	Hill Zone					North West Zone							
	Palam-pur	Sri-nagar	Rajo-uri	Average	Rank	Pant-nagar	His-ar	Ludh-iana	**Jal-ore	**Bika-ner	Average	Rank	Superi- ority%
PC-91	45.3	58.1	170.5	91.3	4	91.1	73.3	152.4	14.4	25.2	105.6	3	10.7
JHB-17-2	42.3	44.9	135.6	74.2	7	118.2	78.6	156.1	9.1	24.4	117.6	1	
HFB-14-7	36.4	52.4	153.6	80.8	6	89.1	65.5	148.8	16.0	15.8	101.1	5	
JHB-17-1	45.4	50.1	163.4	86.3	5	89.1	75.6	124.2	13.8	22.1	96.3	7	
HFB-13-7	39.7	55.0	185.1	93.3	2	94.0	56.1	163.5	13.9	22.8	104.5	4	
Wardan (NC)	51.2	49.2	194.9	98.4	1	116.2	84.5	118.0	13.1	25.2	106.2	2	
BL-22 (ZC-HZ)	49.8	45.3	181.0	92.0	3								
Bundel Berseem-2 (ZC-NWZ)						87.0	93.3	120.1	12.3	23.0	100.1	6	
Mean	44.3	50.7	169.1	88.0		97.8	75.3	140.4	13.2	22.7	104.5		
CD at 5%	NS	3.1	1.1			12.2	11.3	27.2	NS	4.3			
CV%	12.5	5.8	5.3			8.3	8.3	9.6	16.8	10.7			

Note: ** Not included in zonal & all India average due to low yield of data

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

Entries	North East Zone							All India		
	Kal-yani	Ran-chi	Faiza-bad	Pu-sa	**Bhuban-eswar	Average	Rank	Superi- ority%	Average	Rank
PC-91	126.8	50.7	84.5	78.1	28.4	85.0	1	7.0	93.1	2
JHB-17-2	126.4	55.1	52.8	65.0	19.0	74.8	6		87.5	5
HFB-14-7	121.2	57.4	65.7	56.3	28.8	75.1	5		84.6	6
JHB-17-1	125.7	53.3	72.9	77.9	24.4	82.4	2	3.7	87.8	4
HFB-13-7	128.5	52.5	67.0	72.5	19.9	80.1	3	0.8	91.4	3
Wardan (NC)	123.8	62.1	71.6	60.5	25.3	79.5	4		93.2	1
Bundel Berseem-3 (ZC-NEZ)	123.5	54.8	56.0	61.7	22.0	74.0	7			
Mean	125.1	55.2	67.2	67.4	24.0	78.7			89.6	
CD at 5%	2.2	NS	13.1	3.3	0.3					
CV%	8.3	6.9	11.1	5.3	7.0					

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

Entries	Pantnagar	**Bikaner	Hisar	Ludhiana	Kalyani	Ranchi	Faizabad	**Bhubaneswar	Pusa	Average	Rank
PC-91	4.84	1.11	2.92	5.15	5.43	3.90	3.40	2.55	6.03	3.93	1
JHB-17-2	5.50	1.00	3.95	5.12	5.45	3.70	2.22	1.58	5.26	3.75	3
HFB-14-7	4.75	0.72	2.71	5.14	5.22	3.90	2.58	2.40	5.21	3.62	5
JHB-17-1	4.60	0.93	3.72	4.48	5.41	3.80	3.09	1.84	5.86	3.75	3
HFB-13-7	4.71	1.04	2.76	5.36	5.59	3.80	2.69	1.64	5.49	3.68	4
Wardan (NC)	5.39	1.06	3.56	4.55	5.33	4.30	2.96	2.16	5.28	3.84	2
Bundel Berseem-2 (ZC-NWZ)	4.44	0.98	3.64	4.69							
Bundel Berseem-3 (ZC-NEZ)					5.28	3.60	2.20	1.70	5.49		
Mean	4.89	0.98	3.32	4.93	5.39	3.86	2.73	1.98	5.52	3.76	

Note: ** Not included in zonal & all India average due to low yield of data

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

Entries	Pantnagar	**Bikaner	Hisar	Ludhiana	Kalyani	Ranchi	Faizabad	**Bhubaneswar	Pusa	Average	Rank
PC-91	0.57	0.19	0.52	0.83	1.03	0.39	0.68	0.50	0.62	0.66	1
JHB-17-2	0.74	0.19	0.56	0.85	1.02	0.42	0.42	0.34	0.55	0.65	2
HFB-14-7	0.56	0.12	0.47	0.81	0.98	0.44	0.52	0.52	0.48	0.61	4
JHB-17-1	0.56	0.17	0.54	0.68	1.02	0.41	0.58	0.41	0.69	0.64	3
HFB-13-7	0.59	0.18	0.40	0.89	1.04	0.40	0.54	0.33	0.63	0.64	3
Wardan (NC)	0.73	0.19	0.60	0.64	1.00	0.48	0.57	0.47	0.50	0.65	2
Bundel Berseem-2 (ZC-NWZ)	0.54	0.18	0.67	0.66							
Bundel Berseem-3 (ZC-NEZ)					1.00	0.42	0.45	0.38	0.54		
Mean	0.61	0.17	0.54	0.77	1.01	0.42	0.54	0.42	0.57	0.64	

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

Entries	Palam-pur	**Bika-ner	His-ar	Pant-nagar	Ludh-iana	Ran-chi	Kal-yani	Faiza-bad	**Bhuban-eswar	Aver-age	Ra-nk
PC-91	8.9	4.8	13.4	17.5	25.5	10.5	19.1	13.3	4.7	15.5	3
JHB-17-2	7.5	4.5	14.5	20.2	26.7	11.9	19.5	9.7	2.9	15.7	2
HFB-14-7	7.0	3.1	12.2	17.5	23.2	11.6	18.5	11.2	4.3	14.5	5
JHB-17-1	9.3	4.5	13.4	18.3	24.6	10.8	17.3	12.8	3.6	15.2	4
HFB-13-7	7.5	4.6	10.3	16.5	24.9	8.6	17.9	11.0	3.3	13.8	6
Wardan (NC)	9.9	4.4	15.8	20.8	22.9	11.7	19.1	12.1	3.8	16.0	1
BL-22 (ZC-HZ)	9.3										
Bundel Berseem-2 (ZC-NWZ)		3.9	16.9	16.0	22.2						
Bundel Berseem-3 (ZC-NEZ)						9.5	19.5	10.8	3.2		
Mean	8.5	4.3	13.8	18.1	24.3	10.7	18.7	11.6	3.7	15.1	

Note: ** Not included in all India average due to low yield of data

Table 2.6: AVT-1 Berseem: First Advanced Varietal Trial in Berseem: Crude Protein (%)

Entries	Palam-pur	Pant-nagar	Bika-ner	His-ar	Ludh-iana	Kal-yani	Ran-chi	Faiza-bad	Bhuban-eswar	Aver-age	Ra-nk
PC-91	19.5	19.3	19.0	18.3	16.7	15.1	20.8	17.5	16.6	18.1	2
JHB-17-2	17.8	17.1	18.3	18.4	17.1	15.4	21.7	16.8	15.2	17.5	5
HFB-14-7	19.3	19.7	19.7	18.7	15.6	15.3	20.1	17.1	14.9	17.8	3
JHB-17-1	20.4	20.6	20.5	17.7	19.8	13.8	20.3	17.5	14.8	18.4	1
HFB-13-7	19.0	17.5	20.3	18.4	15.2	14.0	16.4	16.5	16.3	17.1	6
Wardan (NC)	19.3	17.9	17.4	18.7	19.4	15.4	18.8	16.9	15.0	17.7	4
BL-22 (ZC-HZ)	18.7										
Bundel Berseem-2 (ZC-NWZ)		18.4	16.7	18.1	18.5						
Bundel Berseem-3 (ZC-NEZ)						15.8	17.3	17.0	14.6		
Mean	19.1	18.6	18.8	18.3	17.5	15.0	19.3	17.0	15.4	17.8	

Table 2.7: AVT-1 Berseem: First Advanced Varietal Trial in Berseem: Plant Height (cm)

Entries	Palam-pur	Sri-nagar	Pant-nagar	Bika-ner	His-ar	Ludh-iana	Udai-pur	Jal-ore	Kal-yani	Ran-chi	Faiza-bad	Bhuban-eswar	Pu-sa	Aver-age	Ra-nk
PC-91	50.3	73.7	57.7	51.0	63.6	49.4	53.4	44.4	91.1	42.9	53.2	75.5	45.7	57.8	2
JHB-17-2	48.0	52.9	59.3	44.0	66.3	45.0	55.7	30.5	91.4	41.5	50.8	67.5	51.3	54.2	5
HFB-14-7	47.9	78.2	63.0	54.0	63.4	50.1	51.9	38.8	89.4	43.3	43.7	74.3	50.0	57.5	3
JHB-17-1	52.2	63.5	58.3	53.0	63.7	43.3	52.8	38.2	89.5	42.0	52.5	65.0	62.3	56.6	4
HFB-13-7	49.6	71.4	59.7	59.0	60.8	52.1	53.0	40.6	91.7	43.5	55.2	68.3	51.3	58.2	1
Wardan (NC)	50.7	59.5	69.0	50.5	69.8	43.8	54.9	42.5	91.3	45.6	53.8	76.2	49.3	58.2	1
BL-22 (ZC-HZ)	49.3	64.7													
Bundel Berseem-2 (ZC-NWZ)			62.7	60.5	72.4	48.7	54.2	33.8							
Bundel Berseem-3 (ZC-NEZ)									89.9	44.2	49.7	64.0	55.0		
Mean	49.7	66.3	61.4	53.1	65.7	47.5	53.7	38.4	90.6	43.3	51.3	70.1	52.1	57.1	

Table 2.8: AVT-1 Berseem: First Advanced Varietal Trial in Berseem: Leaf Stem Ratio

Entries	**Palam-pur	Sri-nagar	Bika-ner	His-ar	Ludh-iana	Kal-yani	Ran-chi	Faiza-bad	Bhuban-eswar	Aver-age	Ra-nk
PC-91	0.49	0.90	0.78	0.83	1.35	0.97	0.72	0.75	1.50	0.98	2
JHB-17-2	0.58	0.77	0.78	0.94	1.40	0.94	0.87	0.76	1.08	0.94	3
HFB-14-7	0.42	0.81	1.04	1.04	1.38	0.95	0.87	0.69	1.43	1.03	1
JHB-17-1	0.47	0.86	0.76	0.80	1.05	0.96	0.89	0.73	1.28	0.92	4
HFB-13-7	0.42	0.75	0.60	0.86	1.42	0.96	0.83	0.85	1.25	0.94	3
Wardan (NC)	0.44	0.68	0.78	0.72	0.95	0.98	0.79	0.72	1.35	0.87	5
BL-22 (ZC-HZ)	0.57	0.72									
Bundel Berseem-2 (ZC-NWZ)			0.83	0.63	0.97						
Bundel Berseem-3 (ZC-NEZ)						0.97	0.83	0.75	1.15		
Mean	0.48	0.78	0.80	0.83	1.22	0.96	0.83	0.75	1.29	0.95	

Table 2.9: AVT-1 Berseem: First Advanced Varietal Trial in Berseem: NDF (%), ADF (%) & IVDMD (%)

Entries	NDF (%)					ADF (%)					IVDMD (%)	
	Pant-nagar	Palam-pur	Ludh-iana	Aver-age	Ra-nk	Pant-nagar	Palam-pur	Ludh-iana	Aver-age	Ra-nk	Ludh-iana	Ra-nk
PC-91	62.0	62.2	43.9	56.0	4	53.9	57.2	33.9	48.3	6	65.2	5
JHB-17-2	63.1	63.8	44.6	57.2	5	52.2	54.2	33.3	46.6	3	65.7	4
HFB-14-7	60.5	61.4	45.2	55.7	3	52.0	53.4	35.1	46.8	4	64.3	6
JHB-17-1	59.7	62.6	41.9	54.7	2	51.5	55.8	30.2	45.8	1	68.2	1
HFB-13-7	60.2	61.2	42.0	54.5	1	51.9	56.2	34.3	47.5	5	64.1	7
Wardan (NC)	62.9	61.8	42.3	55.7	3	53.3	55.4	30.9	46.5	2	68.1	2
BL-22 (ZC-HZ)		62.4					55.4					
Bundel Berseem-2 (ZC-NWZ)	59.9		44.3			51.9		31.6			66.3	3
Mean	61.2	62.2	43.5	55.6		52.4	55.4	32.8	46.9		66.0	

3. IVTO (SC): INITIAL VARIETAL TRIAL IN OAT (SINGLE CUT) **(Reference tables 3.1 to 3.9)**

In **Initial Varietal Trial Oat (single cut) IVTO (SC)**, eleven entries along with two national checks and three zonal checks for respective zones *viz.*, SKO-96 (HZ), RO-11-1 (CZ), OS-403 (NEZ, NWZ, SZ), were evaluated at 29 locations across the five zones.

For GFY, in NWZ, NEZ, the zonal checks were top performer and none of the entry could surpass them in green fodder yield. In HZ, entries UPO-18-1 (8.5%), HFO-806 (8.0%), RO-11-1-3 (7.6%), OL-1874-1 (6.5%), HFO-818 (5.9%) performed better than best check. In CZ, entry JO-06-23 (11.4%); in SZ, JO-06-23 (15.6%), OL-1874-1 (15.0%) performed better. At all India level, JO-06-23 (17.8%), OL-1874-1 (15.4%), OL-1876-1 (10.3%), HFO-818 (6.8%), UPO-18-1 (6.6%), RO-11-1-2 (6.5%), RO-11-1-3 (5.7%), JHO-18-1 (5.0%) performed better than the best check.

For DMY in HZ entries SKO-241 (10.0%), RO-11-1-3 (5.0%); in CZ entry JO-06-23 (3.9%); in SZ entries JO-06-23 (20.5%), OL-1874-1 (14.8%) performed better than best check. At all India level JO-06-23 (17.3%), OL-1876-1 (9.9%), OL-1874-1 (9.2%), RO-11-1-3 (6.8%), UPO-18-1 (6.5%), HFO-818 (6.8%), NDO-1802 (5.1%) were superior by margin of more than 5% over the best check. Other entries were either inferior to or showed marginal superiority over the best national/zonal check.

For fodder production potential (q/ha/day), entry JO-06-23 ranked first for both green and dry matter. Entry OL-1876-1 ranked first for plant height and leafiness.

For quality parameters, entries JO-06-23 (18.6%), RO-11-1-3 (12.2%), OL-1874-1 (12.2%), OL-1876-1 (9.3%), HFO-818 (7.8%) showed higher crude protein yield over the best national check. For crude protein content, SKO-241 was best with CP % 9.1 as compared to best check OS-6 (8.2%). For IVDMD, entry RO-11-1-3 (54.2 %) top ranked closely followed by HFO-806 (53.9%) and SKO-241 (53.8%) which were far superior to the best check OS-6 (49.8%).

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	Rajo-uri	Average	Rank	Super-iority%	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Udai-pur	Mee-rut	Average	Rank
HFO-806	326.7	402.4	183.7	304.3	2	8.0	300.0	261.5	1029.6	822.2	562.9	780.4	626.1	7
OL-1874-1	313.3	414.7	171.5	299.8	4	6.5	488.9	457.8	948.1	670.4	870.1	638.1	678.9	3
HFO-818	330.0	382.3	182.6	298.3	5	5.9	432.1	474.4	940.7	529.6	694.4	656.7	621.3	8
JO-06-23	303.3	376.2	179.6	286.4	9	1.7	420.3	541.5	1018.5	611.1	712.9	773.0	679.6	2
NDO-1802	309.3	377.3	173.3	286.6	8	1.8	372.3	428.2	944.4	588.9	703.6	609.1	607.7	10
UPO-18-1	315.3	385.1	216.3	305.6	1	8.5	338.8	416.3	970.4	629.6	649.9	720.6	620.9	9
OL-1876-1	286.0	336.2	159.6	260.6	14		392.7	407.8	944.4	777.8	840.5	598.1	660.2	4
JHO-18-1	263.3	416.9	154.1	278.1	11		410.6	269.6	900.0	585.2	703.8	757.2	604.4	11
SKO-241	246.0	443.8	189.6	293.1	7	4.1	296.5	250.0	770.4	585.2	353.6	705.2	493.5	14
RO-11-1-3	338.0	376.4	194.8	303.1	3	7.6	368.9	502.6	918.5	748.2	664.7	576.1	629.8	6
RO-11-1-2	302.7	379.9	197.4	293.3	6	4.1	408.9	560.4	929.6	629.6	711.1	574.6	635.7	5
OS-6 (NC)	283.3	355.0	177.5	271.9	12		384.4	344.4	848.1	574.1	601.6	640.6	565.5	12
Kent (NC)	275.3	326.0	187.3	262.9	13		390.3	394.8	881.5	563.0	548.1	588.7	561.1	13
SKO-96 (ZC-HZ)	293.3	360.8	190.9	281.7	10									
OS-403 (ZC-NWZ)							386.2	468.2	1059.3	737.0	705.5	733.5	681.6	1
Mean	299.0	380.9	182.7	287.6			385.1	412.7	936.0	646.6	665.9	668.0	619.0	
CD at 5%	NS	32.9	2.0				82.1	114.2	84.5	40.0	111.8	3.6		
CV%	10.8	10.4	7.3				12.5	16.4	11.2	7.3	10.0	3.6		

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

Entries	North East Zone								Average	Rank
	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa	Faiza-bad	Imp-hal			
HFO-806	256.8	562.3	229.3	321.8	265.0	248.0	320.1	314.7	14	
OL-1874-1	230.5	563.1	397.2	452.0	303.3	317.3	305.9	367.1	6	
HFO-818	263.0	547.2	220.0	391.1	276.7	344.0	279.5	331.6	12	
JO-06-23	189.7	593.5	298.6	426.2	311.7	373.3	309.3	357.5	7	
NDO-1802	250.5	580.7	383.9	364.4	365.0	354.7	320.8	374.3	2	
UPO-18-1	328.5	557.1	234.6	479.1	311.7	357.3	316.9	369.3	4	
OL-1876-1	229.3	542.4	321.3	540.0	288.3	384.0	302.1	372.5	3	
JHO-18-1	252.8	535.1	345.3	414.2	346.7	369.7	308.8	367.5	5	
SKO-241	299.5	539.7	176.0	494.7	298.3	293.3	298.9	342.9	11	
RO-11-1-3	221.5	602.1	273.9	390.2	278.3	369.3	291.0	346.6	9	
RO-11-1-2	309.7	562.9	267.9	268.0	218.3	328.0	308.5	323.3	13	
OS-6 (NC)	343.0	556.1	361.9	307.1	271.7	312.0	296.1	349.7	8	
Kent (NC)	366.5	561.3	244.6	303.5	225.0	400.0	302.1	343.3	10	
OS-403 (ZC-NEZ)	236.8	560.7	402.6	461.3	361.7	392.0	334.1	392.7	1	
Mean	269.9	561.7	296.9	401.0	294.4	345.9	306.7	353.8		
CD at 5%	8.2	11.3	2.7	34.3	13.4	63.3	12.8			
CV%	7.9	14.6	7.2	5.1	4.7	10.9	3.5			

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	Urulikan- chan	Pal- ghar	Ana- nd	Jabal- pur	Rai- pur	Dha- ri	Aver- age	Ra- nk	Superi- ority%
HFO-806	403.0	360.6	622.2	242.5	581.5	497.2	266.7	492.0	433.2	11	2.0
OL-1874-1	507.8	421.2	604.6	260.5	814.8	449.2	274.1	572.2	488.0	2	
HFO-818	488.4	353.1	660.4	278.2	645.9	435.9	387.0	510.2	469.9	5	11.4
JO-06-23	494.3	401.8	766.7	261.3	791.8	597.1	351.9	601.1	533.2	1	
NDO-1802	429.5	353.6	600.7	252.5	451.8	502.5	325.9	526.7	430.4	13	
UPO-18-1	442.5	276.0	590.2	263.4	621.5	487.8	388.9	489.0	444.9	9	
OL-1876-1	422.1	355.4	607.9	223.7	632.6	430.5	403.7	692.0	471.0	4	
JHO-18-1	465.3	331.5	587.1	232.1	582.6	509.2	340.7	580.7	453.7	8	
SKO-241	408.2	253.8	646.0	229.6	265.9	506.5	185.2	525.6	377.6	14	
RO-11-1-3	430.4	328.0	699.9	256.5	698.5	421.2	374.1	438.4	455.9	7	
RO-11-1-2	457.3	390.7	596.5	243.5	619.3	489.2	420.4	468.2	460.6	6	
OS-6 (NC)	406.1	277.3	806.5	219.4	588.9	395.9	314.8	447.0	432.0	12	
Kent (NC)	409.2	312.8	592.0	247.2	589.6	537.2	344.4	524.4	444.6	10	
RO-11-1 (ZC-CZ)	512.8	472.6	623.2	239.3	484.1	486.5	359.3	650.2	478.5	3	
Mean	448.3	349.2	643.1	246.4	597.8	481.9	338.4	537.0	455.3		
CD at 5%	18.8	51.2	136.9	21.0	103.1	100.6	55.7				
CV%	11.2	8.8	12.6		10.3	12.4	9.7				

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

Entries	South Zone							All India			
	Hydera- bad	Man- dya	Coimb- atore	Mattu- petty	**Tiru- pati	Aver- age	Ra- nk	Superi- ority%	Aver- age	Ra- nk	Superi- ority%
HFO-806	569.8	157.6	363.3	434.0	23.1	381.2	5	15.0	423.7	10	3.6
OL-1874-1	621.6	180.7	370.4	596.0	21.8	442.2	2		472.0	2	15.4
HFO-818	625.3	156.8	335.2	400.0	23.4	379.3	6	15.6	436.5	4	6.8
JO-06-23	751.1	195.2	387.0	444.0	39.3	444.3	1		481.5	1	17.8
NDO-1802	518.0	237.4	390.7	285.0	35.1	357.8	8	0.8	428.6	9	4.8
UPO-18-1	492.1	267.8	361.9	296.0	41.0	354.4	9		435.9	5	6.6
OL-1876-1	603.1	252.8	360.7	292.0	56.0	377.2	7	4.8	451.0	3	10.3
JHO-18-1	458.8	199.7	366.7	330.0	25.6	338.8	10		429.2	8	5.0
SKO-241	162.8	57.9	298.1	155.0	11.5	168.5	14	5.7	354.8	13	6.5
RO-11-1-3	447.7	182.6	353.7	359.0	41.0	335.8	11		432.3	7	
RO-11-1-2	506.9	186.3	368.1	489.0	24.0	387.6	3	4.8	435.5	6	
OS-6 (NC)	473.6	231.8	359.3	270.0	23.6	333.7	12		408.8	11	
Kent (NC)	521.7	225.2	371.9	211.0	47.7	332.4	13	4.8	408.7	12	
OS-403 (ZC-SZ)	636.4	184.2	310.4	407.0	45.7	384.5	4				
Mean	527.8	194.0	357.0	354.9	32.8	358.4			430.6		
CD at 5%	147.4	36.9	6.0	3.1							
CV%	15.4	11.3	1.0	0.5							

Note: ** Not included in zonal & All India average due to low yield of data

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	Raj-ourri	Aver-age	Ra-nk	Superi- ority%	Bika- ner	His- ar	Ludh- iana	Pant- nagar	Mee- rut	Aver- age	Ra- nk
HFO-806	52.5	93.3	43.0	63.0	8		81.9	46.5	219.3	152.9	187.2	137.6	13
OL-1874-1	48.1	98.7	36.8	61.2	11		116.8	91.7	216.2	133.4	172.3	146.1	9
HFO-818	60.3	90.1	40.8	63.7	7		135.9	107.4	206.0	108.0	203.6	152.2	5
JO-06-23	55.7	88.3	41.1	61.7	9		105.0	112.3	220.0	139.9	208.7	157.2	3
NDO-1802	55.3	90.4	38.3	61.3	10		109.7	96.2	220.0	100.1	226.6	150.5	6
UPO-18-1	55.0	91.3	54.7	67.0	3	4.4	89.8	80.6	217.4	94.4	255.8	147.6	7
OL-1876-1	51.5	81.8	38.1	57.1	14		115.9	93.5	216.3	180.4	192.6	159.7	2
JHO-18-1	59.3	98.7	34.7	64.2	5	0.1	96.1	45.9	204.3	153.9	209.0	141.8	12
SKO-241	60.0	108.1	43.6	70.6	1	10.0	70.8	58.4	170.3	199.5	236.9	147.2	8
RO-11-1-3	68.1	88.3	45.6	67.3	2	5.0	96.5	115.9	203.9	142.9	224.7	156.8	4
RO-11-1-2	58.7	92.3	49.7	66.9	4	4.4	112.9	128.9	202.7	81.9	185.0	142.3	11
OS-6 (NC)	59.2	82.8	39.7	60.6	12		107.2	52.5	191.7	86.1	199.9	127.5	14
Kent (NC)	54.7	76.1	43.1	58.0	13		110.5	95.0	187.8	101.3	221.3	143.2	10
SKO-96 (ZC-HZ)	59.6	88.3	44.5	64.1	6								
OS-403 (ZC-NWZ)							105.8	101.5	235.2	158.5	264.0	173.0	1
Mean	57.0	90.6	42.4	63.3			103.9	87.6	207.9	131.0	213.4	148.8	
CD at 5%	NS	6.3	0.5				29.3	28.5	52.1	8.1			
CV%	8.3	7.2	7.0				16.5	19.2	12.1	11.7			

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	Super- iority%
HFO-806	49.7	116.5	50.3	72.9	73.2	54.6	73.8	70.1	13	
OL-1874-1	40.0	108.3	87.4	93.4	81.3	68.1	70.9	78.5	5	
HFO-818	50.9	106.8	48.5	83.4	74.9	77.3	76.4	74.0	12	
JO-06-23	34.2	118.3	66.0	83.8	82.1	76.5	71.5	76.0	9	
NDO-1802	47.0	114.6	86.4	93.5	97.4	76.2	64.8	82.8	1	1.5
UPO-18-1	58.4	105.2	50.9	100.6	86.3	78.6	79.0	79.9	4	
OL-1876-1	42.6	106.6	74.2	102.6	81.7	90.1	70.6	81.2	3	
JHO-18-1	45.5	100.5	74.1	79.4	90.8	79.8	65.7	76.5	7	
SKO-241	57.5	104.2	39.2	115.4	78.3	66.0	61.3	74.5	11	
RO-11-1-3	41.7	123.4	65.5	91.0	80.0	76.4	68.3	78.1	6	
RO-11-1-2	58.8	105.6	59.0	62.1	62.2	68.9	70.0	69.5	14	
OS-6 (NC)	64.8	105.9	75.6	80.4	74.7	65.5	67.8	76.4	8	
Kent (NC)	73.1	112.1	51.8	71.3	64.0	88.9	60.8	74.6	10	
OS-403 (ZC-NEZ)	45.4	109.4	91.5	72.3	92.5	90.1	70.4	81.7	2	
Mean	50.7	109.8	65.7	85.9	80.0	75.5	69.4	76.7		
CD at 5%	3.1	5.5	0.6	32.5	3.2	16.2	3.5			
CV%	7.0	9.7	7.4	4.4	4.2	12.7	4.3			

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	Urulikan- chan	Pal- ghar	An- and	Jabal- pur	Rai- pur	Dha- ri	Aver- age	Ra- nk	Super- iority%
HFO-806	77.4	85.7	138.4	42.4	68.0	114.7	80.5	112.7	90.0	10	4.8
OL-1874-1	82.7	64.7	111.5	49.7	124.6	101.1	98.2	126.1	94.8	7	
HFO-818	80.1	78.6	128.2	45.3	96.0	97.5	125.6	116.3	96.0	5	
JO-06-23	117.3	72.6	144.1	50.9	108.8	137.5	130.8	130.7	111.6	1	
NDO-1802	78.0	67.8	128.5	46.1	61.5	117.3	120.4	111.5	91.4	9	
UPO-18-1	86.7	56.7	151.1	47.9	91.3	111.0	125.0	104.7	96.8	4	
OL-1876-1	91.8	70.7	138.5	36.4	88.9	95.4	138.7	148.0	101.0	3	
JHO-18-1	91.7	63.8	130.2	38.5	102.8	117.7	79.2	122.8	93.3	8	
SKO-241	69.6	60.3	131.1	36.4	34.1	117.3	42.2	155.4	80.8	13	
RO-11-1-3	79.2	55.2	171.4	45.7	96.2	102.6	122.8	90.6	95.5	6	
RO-11-1-2	95.2	62.0	87.3	42.9	78.6	111.3	132.8	100.7	88.8	12	
OS-6 (NC)	88.5	59.0	178.2	43.4	88.6	84.2	108.9	100.1	93.9	8	
Kent (NC)	81.3	51.8	107.2	42.2	80.0	125.0	120.2	109.7	89.7	11	
RO-11-1 (ZC-CZ)	103.9	100.7	160.0	39.7	100.5	110.6	100.7	135.4	106.4	2	
Mean	87.4	67.8	136.1	43.4	87.1	110.2	109.0	118.9	95.0		
CD at 5%	12.0	9.9	29.4	5.7	17.5	23.4	18.7				
CV%	7.1	8.7	12.8		11.9	12.6	10.1				

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

Entries	South Zone								All India		
	Hyderabad	Mandya	Coimbatore	Mattupetty	**Tirupati	Average	Rank	Superiority%	Average	Rank	Superiority%
HFO-806	116.9	29.7	81.1	108.5	11.3	84.1	4		89.8	8	0.8
OL-1874-1	132.4	39.0	84.4	149.1	9.2	101.2	2	14.8	97.3	3	9.2
HFO-818	109.9	42.0	76.9	100.5	10.1	82.3	5		95.1	4	6.8
JO-06-23	167.0	55.1	91.7	111.1	17.1	106.2	1	20.5	104.5	1	17.3
NDO-1802	71.8	44.6	93.1	71.2	14.4	70.2	10		93.6	6	5.1
UPO-18-1	70.7	53.6	90.8	74.1	15.4	72.3	8		94.9	5	6.5
OL-1876-1	93.5	46.5	83.1	73.1	18.1	74.0	7		97.9	2	9.9
JHO-18-1	78.5	42.1	83.8	82.5	13.0	71.7	9		91.5	7	2.8
SKO-241	52.9	15.8	70.2	52.3	3.8	47.8	14		85.4	12	
RO-11-1-3	60.6	40.2	81.2	89.8	16.2	68.0	13		95.1	4	6.8
RO-11-1-2	63.8	41.1	87.9	122.3	10.5	78.8	6		89.8	9	0.8
OS-6 (NC)	73.1	46.9	85.6	67.6	8.8	68.3	12		88.1	11	
Kent (NC)	88.2	45.1	89.4	52.8	18.7	68.9	11		89.1	10	
OS-403(ZC-SZ)	135.9	41.3	73.6	101.8	17.4	88.1	3				
Mean	93.9	41.6	83.8	89.8	13.1	77.3			93.2		
CD at 5%	29.7	8.3	2.2	3.8							
CV%	18.7		11.9	1.6	2.5						

Note: ** Not included in zonal & all India average due to low yield of data

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

Entries	Palam-pur	Sri-nagar	Rajo-uri	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa	Faiza-bad
HFO-806	2.56	2.38	1.23	2.86	2.18	8.44	7.15	3.11	6.18	3.10	3.40	4.15	2.36
OL-1874-1	2.52	2.42	1.25	4.66	3.82	7.77	5.88	3.05	6.40	5.44	4.71	4.18	2.99
HFO-818	2.61	2.25	1.22	4.11	3.95	7.71	4.53	3.52	6.22	2.89	4.35	4.16	3.40
JO-06-23	2.36	2.21	1.32	4.00	4.51	8.35	5.31	2.25	6.52	3.98	5.05	4.16	3.58
NDO-1802	2.42	2.22	1.12	3.55	3.57	7.74	5.56	3.34	7.17	5.65	4.59	4.24	3.54
UPO-18-1	2.45	2.26	1.17	3.23	3.47	7.95	5.72	4.38	6.33	3.26	5.28	4.19	3.46
OL-1876-1	2.20	1.98	1.14	3.74	3.40	7.74	6.76	2.70	6.70	4.40	5.89	4.10	3.58
JHO-18-1	1.94	2.44	1.22	3.91	2.24	7.38	4.92	2.97	5.90	4.67	4.44	4.36	3.35
SKO-241	1.83	2.62	1.20	2.82	2.09	6.31	5.04	3.99	5.62	2.35	5.87	4.46	2.82
RO-11-1-3	2.61	2.22	1.27	3.51	4.19	7.53	6.56	2.98	6.84	3.97	4.56	4.14	3.47
RO-11-1-2	2.32	2.24	1.09	3.89	4.67	7.62	5.83	3.73	6.95	3.72	3.07	4.08	3.15
OS-6 (NC)	2.19	2.09	1.15	3.66	2.87	6.95	5.27	4.43	6.86	5.25	3.78	4.14	3.15
Kent (NC)	2.14	1.93	1.19	3.72	3.29	7.23	5.36	4.42	6.93	3.49	3.46	4.14	4.08
SKO-96 (ZC-HZ)	2.18	2.13	1.29										
OS-403 (ZC-NWZ)				3.68	3.90	8.68	6.41						
OS-403 (ZC-NEZ)								2.79	6.37	5.30	4.72	4.29	3.59
Mean	2.31	2.24	1.20	3.67	3.44	7.67	5.74	3.40	6.50	4.11	4.51	4.20	3.32

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

Entries	Jhansi	Rahuri	Urulikanchan	Palghar	Anand	Raipur	Dhari	Hyderabad	Mandya	Coimbatore	Average	Rank
HFO-806	5.17	3.81	6.69	3.73	7.46	3.00	5.41	7.31	2.10	4.60	4.28	12
OL-1874-1	6.60	4.48	5.70	4.01	11.01	3.08	6.45	8.23	2.40	4.63	4.86	2
HFO-818	6.34	3.97	7.10	4.28	7.60	5.03	5.73	7.63	2.10	4.41	4.57	9
JO-06-23	6.59	4.27	7.23	4.02	9.00	4.19	6.73	9.08	2.60	4.66	4.87	1
NDO-1802	5.58	4.42	7.07	3.88	6.36	4.59	6.42	7.73	3.80	5.01	4.76	4
UPO-18-1	5.75	3.12	6.35	4.05	7.97	5.05	5.47	6.27	4.00	4.64	4.60	8
OL-1876-1	5.63	4.12	6.54	3.44	8.01	5.05	7.71	7.91	3.60	4.51	4.82	3
JHO-18-1	6.04	3.67	5.54	3.57	6.55	4.11	6.36	5.88	2.80	4.31	4.29	11
SKO-241	5.44	2.67	6.09	3.53	3.41	2.68	5.14	1.58	0.80	3.51	3.56	13
RO-11-1-3	5.66	3.11	8.23	3.94	8.96	4.45	5.32	6.68	2.60	4.31	4.66	6
RO-11-1-2	5.94	4.56	7.02	3.75	8.60	5.00	5.64	7.35	2.60	4.49	4.67	5
OS-6 (NC)	5.21	3.51	9.49	3.37	7.65	4.43	5.50	7.10	3.50	4.73	4.62	7
Kent (NC)	5.18	3.65	6.96	3.80	7.66	5.07	6.40	6.58	3.40	4.89	4.56	10
RO-11-1 (ZC-CZ)	6.57	5.16	5.88	3.68	5.32	4.28	7.25					
OS-403 (ZC-SZ)								7.90	2.50	3.83		
Mean	5.84	3.89	6.85	3.79	7.54	4.29	6.11	6.95	2.77	4.47	4.55	

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

Contd...

Entries	Sri-nagar	Rajo- uri	Bika- ner	His- ar	Ludh- iana	Pant- nagar	Jor- hat	Kal- yani	Bhuban- eswar	Ran- chi	Pu- sa	Faiza- bad
HFO-806	0.57	0.30	0.78	0.42	1.80	1.33	0.60	1.30	0.68	0.77	0.80	0.51
OL-1874-1	0.57	0.28	1.11	0.77	1.77	1.17	0.53	1.23	1.20	0.97	0.89	0.64
HFO-818	0.54	0.28	1.29	0.90	1.69	0.93	0.68	1.21	0.64	0.93	0.81	0.76
JO-06-23	0.52	0.33	1.00	0.94	1.80	1.21	0.40	1.30	0.88	0.99	0.90	0.73
NDO-1802	0.53	0.24	1.04	0.80	1.80	0.94	0.63	1.41	1.27	1.18	1.05	0.76
UPO-18-1	0.54	0.25	0.86	0.67	1.78	0.85	0.78	1.19	0.71	1.11	1.00	0.76
OL-1876-1	0.48	0.24	1.10	0.77	1.77	1.56	0.50	1.32	1.02	1.12	0.88	0.84
JHO-18-1	0.58	0.28	0.92	0.38	1.67	1.29	0.54	1.10	1.00	0.85	0.96	0.73
SKO-241	0.63	0.26	0.67	0.48	1.40	1.72	0.77	1.08	0.52	1.37	0.78	0.63
RO-11-1-3	0.53	0.29	0.92	0.97	1.67	1.25	0.56	1.40	0.95	1.06	0.88	0.72
RO-11-1-2	0.54	0.23	1.08	1.07	1.66	0.75	0.71	1.30	0.82	0.71	0.70	0.66
OS-6 (NC)	0.50	0.25	1.02	0.44	1.57	0.79	0.84	1.31	1.10	0.99	0.82	0.66
Kent (NC)	0.46	0.26	1.05	0.79	1.54	0.96	0.88	1.38	0.74	0.81	0.75	0.90
SKO-96 (ZC-HZ)	0.52	0.29										
OS-403 (ZC-NWZ)			1.01	0.85	1.93	1.37						
OS-403 (ZC-NEZ)							0.53	1.24	1.20	0.74	0.99	0.82
Mean	0.54	0.27	0.99	0.73	1.70	1.15	0.64	1.27	0.91	0.97	0.87	0.72

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

Entries	Jha- nsi	Rah- uri	Urulikan- chan	Pal- ghar	Ana- nd	Rai- pur	Dha- ri	Hydera- bad	Man- dya	Coimba- tore	Aver- age	Ra- nk
HFO-806	0.99	0.91	1.49	0.65	0.87	0.90	1.22	1.50	0.40	1.03	0.90	10
OL-1874-1	1.07	0.69	1.05	0.76	1.68	1.10	1.41	1.88	0.53	1.06	1.02	4
HFO-818	1.04	0.88	1.38	0.70	1.13	1.63	1.31	1.36	0.55	1.01	0.98	6
JO-06-23	1.56	0.77	1.36	0.78	1.24	1.56	1.46	2.02	0.73	1.11	1.07	1
NDO-1802	1.01	0.85	1.51	0.71	0.87	1.70	1.34	1.08	0.72	1.19	1.03	3
UPO-18-1	1.13	0.64	1.63	0.74	1.17	1.62	1.17	0.91	0.79	1.16	0.98	6
OL-1876-1	1.22	0.82	1.49	0.56	1.13	1.73	1.64	1.23	0.65	1.04	1.05	2
JHO-18-1	1.19	0.71	1.23	0.59	1.16	0.95	1.34	1.01	0.58	0.99	0.91	9
SKO-241	0.93	0.64	1.24	0.56	0.44	0.61	1.52	0.62	0.21	0.83	0.81	10
RO-11-1-3	1.04	0.52	2.02	0.70	1.23	1.46	1.10	0.91	0.57	0.99	0.99	5
RO-11-1-2	1.24	0.72	1.03	0.66	1.09	1.58	1.20	0.93	0.58	1.07	0.92	8
OS-6 (NC)	1.13	0.75	2.10	0.67	1.15	1.54	1.23	1.10	0.71	1.13	0.99	5
Kent (NC)	1.03	0.60	1.26	0.65	1.04	1.77	1.33	1.12	0.68	1.18	0.96	7
RO-11-1 (ZC-CZ)	1.33	1.10	1.51	0.61	1.10	1.20	1.51					
OS-403 (ZC-SZ)								1.69	0.57	0.91		
Mean	1.14	0.76	1.45	0.67	1.09	1.38	1.34	1.24	0.59	1.05	0.97	

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

Entries	Palam-pur	Bika-ner	His-ar	Ludh-iana	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Faiza-bad	Imp-hal	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Rai-pur	Hydera-bad	Man-dya	Coimb-atore	Aver-age	Ran-k	Superi-riority%
HFO-806	4.8	7.4	4.1	20.2	4.6	11.8	4.0	5.4	4.4	6.1	5.4	12.5	7.7	9.5	6.0	9.9	2.1	7.5	7.4	6	3.8
OL-1874-1	4.2	10.7	8.6	18.2	4.0	9.9	7.0	8.2	5.3	5.9	6.4	10.2	11.0	8.1	7.0	9.1	2.7	7.8	8.0	2	12.2
HFO-818	5.4	13.1	8.9	13.0	4.3	12.1	3.9	5.7	6.3	6.2	5.2	10.5	9.7	7.9	7.7	6.9	3.1	8.8	7.7	4	7.8
JO-06-23	5.5	6.4	10.4	18.5	3.3	10.8	5.3	7.1	5.7	5.5	4.6	11.8	10.4	11.6	8.2	13.2	4.3	9.6	8.5	1	18.6
NDO-1802	4.9	7.2	8.1	18.0	4.7	10.5	6.8	8.0	5.8	5.3	5.6	10.5	6.5	9.7	8.6	6.0	3.5	4.5	7.5	5	4.4
UPO-18-1	5.0	4.6	7.1	14.3	5.9	9.9	4.1	7.0	6.3	6.6	3.3	13.3	8.5	9.1	7.6	5.1	4.0	8.7	7.2	7	1.5
OL-1876-1	5.3	8.8	8.1	14.3	4.4	11.8	5.7	7.2	7.9	5.5	4.5	12.8	9.0	7.6	7.4	7.8	3.3	9.1	7.8	3	9.3
JHO-18-1	5.7	7.2	3.8	12.5	4.3	9.6	6.1	6.8	6.2	5.1	3.6	11.7	8.7	9.7	4.9	4.7	3.3	9.9	6.9	10	
SKO-241	5.1	5.5	5.3	16.2	5.8	8.9	3.1	10.1	5.4	5.0	4.5	10.7	4.6	9.7	2.5	5.5	1.5	9.8	6.6	11	
RO-11-1-3	5.8	6.2	10.2	18.4	4.2	10.1	4.8	6.2	5.8	5.4	4.1	16.7	11.5	8.5	7.7	4.9	3.0	10.6	8.0	2	12.2
RO-11-1-2	5.1	9.6	11.2	13.0	6.0	11.4	4.7	4.9	5.4	5.6	4.5	7.3	8.7	9.1	8.4	2.5	2.5	6.5	7.0	9	
OS-6 (NC)	5.5	6.2	4.2	13.0	6.4	11.2	6.4	6.5	5.1	5.6	4.3	14.5	9.3	6.7	7.8	5.0	3.3	7.5	7.1	8	
Kent (NC)	4.8	7.0	8.6	11.3	7.0	8.3	4.3	5.9	7.6	4.9	3.2	7.8	7.4	10.4	8.7	6.4	3.5	9.7	7.1	8	
SKO-96 (ZC-HZ)	5.8																				
OS-403 (ZC-NWZ)		6.8	8.3	15.1																	
OS-403 (ZC-NEZ)					4.1	12.5	7.1	6.8	7.8	5.7											
RO-11-1 (ZC-CZ)											9.5	14.1	8.0	8.9	6.4						
OS-403 (ZC-SZ)																7.3	3.1	11.3			
Mean	5.2	7.6	7.6	15.4	4.9	10.6	5.2	6.8	6.1	5.6	4.9	11.7	8.6	9.0	7.1	6.7	3.1	8.7	7.4		

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

Entries	Palam-pur	Bika-ner	His-ar	Ludh-iana	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Faiza-bad	Imp-hal	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Rai-pur	Hydera-bad	Man-dya	Coimb-atore	Aver-age	Ran-k
HFO-806	9.0	9.0	8.7	9.2	9.4	10.1	8.0	7.4	8.0	8.3	6.3	9.0	11.4	8.3	7.5	8.4	7.0	9.2	8.6	2
OL-1874-1	8.8	9.2	9.2	8.4	10.2	9.2	8.0	8.8	7.8	8.4	9.8	9.1	8.8	8.1	7.1	6.9	7.0	9.2	8.6	2
HFO-818	9.0	9.6	8.3	6.3	8.5	11.3	8.0	6.8	8.2	8.1	6.6	8.2	10.0	8.1	6.2	6.3	7.4	11.4	8.2	6
JO-06-23	9.9	6.1	9.0	8.4	9.9	9.1	8.0	8.5	7.5	7.7	6.3	8.2	9.6	8.4	6.3	7.9	7.9	10.5	8.3	5
NDO-1802	8.8	6.6	8.5	8.2	10.2	9.2	7.8	8.5	7.6	8.2	8.3	8.2	10.6	8.4	7.1	8.4	7.9	4.8	8.2	6
UPO-18-1	9.0	5.2	8.7	6.6	10.2	9.4	8.1	7.0	8.0	8.3	5.9	8.8	9.3	8.2	6.1	7.2	7.4	9.6	7.9	9
OL-1876-1	10.2	7.6	8.7	6.6	10.5	11.1	7.6	7.0	8.8	7.8	6.3	9.2	10.2	8.1	5.3	8.3	7.0	10.9	8.4	4
JHO-18-1	9.6	7.5	8.2	6.1	9.5	9.6	8.2	8.5	7.8	7.8	5.7	9.0	8.6	8.3	6.1	5.9	7.9	11.8	8.1	7
SKO-241	8.5	7.8	9.2	9.5	10.3	8.6	7.9	8.8	8.2	8.2	7.4	8.1	13.5	8.3	6.0	10.4	9.6	14.0	9.1	1
RO-11-1-3	8.5	6.4	8.9	9.0	10.1	8.2	7.4	6.8	7.6	7.9	7.4	9.8	11.9	8.4	6.3	8.1	7.4	13.1	8.5	3
RO-11-1-2	8.8	8.5	8.7	6.4	10.4	10.8	8.0	7.9	7.8	8.0	7.2	8.3	11.1	8.2	6.3	3.9	6.1	7.4	8.0	8
OS-6 (NC)	9.3	5.8	8.2	6.8	10.0	10.6	8.4	8.1	7.8	8.2	7.2	8.2	10.5	7.9	7.1	6.9	7.0	8.8	8.2	6
Kent (NC)	8.8	6.3	9.0	6.0	9.6	7.4	8.3	8.3	8.6	8.0	6.1	7.3	9.2	8.4	7.2	7.2	7.9	10.9	8.0	8
SKO-96 (ZC-HZ)	9.6																			
OS-403 (ZC-NWZ)		6.4	8.2	6.4																
OS-403 (ZC-NEZ)					9.2	11.4	7.7	9.4	8.6	8.0										
RO-11-1 (ZC-CZ)											9.4	8.8	8.0	8.2	6.3					
OS-403 (ZC-SZ)																5.4	7.4	15.3		
Mean	9.1	7.3	8.7	7.4	9.9	9.7	8.0	8.0	8.0	8.1	7.2	8.6	10.2	8.2	6.5	7.2	7.5	10.5	8.3	

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

Contd...

Entries	Palam-pur	Sri-nagar	Rajo-uri	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Udai-pur	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa	Faiza-bad	Imp-hal
HFO-806	115.0	104.6	138.2	120.0	112.9	145.2	134.6	142.6	125.7	161.5	110.9	116.1	120.7	125.8	155.6
OL-1874-1	123.7	101.9	137.2	135.0	146.1	120.4	132.8	159.6	125.9	162.2	169.3	135.7	123.7	117.4	155.2
HFO-818	124.0	92.0	123.0	110.0	136.6	155.6	128.3	158.3	119.9	160.8	94.2	134.8	97.3	123.0	147.6
JO-06-23	104.3	89.4	118.0	90.0	138.6	142.3	120.0	152.7	111.9	163.1	149.7	136.9	103.7	108.0	147.4
NDO-1802	126.3	102.4	99.7	120.0	139.4	149.4	153.0	132.4	112.6	163.8	162.1	139.2	116.7	127.9	152.0
UPO-18-1	120.0	105.9	115.7	100.0	146.0	142.4	144.4	140.0	134.2	161.7	119.2	138.2	114.7	117.4	167.6
OL-1876-1	129.3	100.2	125.0	128.0	140.7	140.1	146.3	156.4	128.9	160.8	145.2	135.6	114.7	138.8	159.9
JHO-18-1	121.0	109.4	119.0	82.0	118.6	138.4	132.4	156.0	120.9	134.2	155.7	125.0	89.3	99.0	145.0
SKO-241	107.0	105.9	117.0	80.0	105.0	152.3	114.2	88.8	103.7	132.2	95.6	96.6	78.3	67.3	114.2
RO-11-1-3	117.3	109.2	97.7	85.0	131.7	132.5	136.4	131.0	110.9	161.2	137.2	134.3	104.7	120.9	134.0
RO-11-1-2	123.3	106.0	117.0	105.0	133.4	156.4	145.0	136.3	114.0	160.9	130.1	134.7	109.0	116.9	145.2
OS-6 (NC)	108.7	101.3	110.3	105.0	131.9	150.1	147.2	156.9	138.6	161.4	157.3	139.3	113.0	119.4	143.6
Kent (NC)	119.3	105.6	117.3	92.0	128.9	152.6	143.7	126.7	151.2	162.0	125.4	138.0	102.0	118.8	137.9
SKO-96 (ZC-HZ)	127.7	101.8	131.7												
OS-403 (ZC-NWZ)				135.0	143.0	140.4	144.7	157.2							
OS-403 (ZC-NEZ)									107.3	161.8	164.5	140.9	113.0	134.6	165.8
Mean	119.1	102.5	119.1	106.2	132.3	144.2	137.4	142.5	121.8	157.7	136.9	131.8	107.2	116.8	147.9

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

Entries	Jha-nsi	Rah-uri	Urulikan-ghan	Pal-ghar	Ana-nd	Jabal-pur	Rai-pur	Dha-ri	Hydera-bad	Tiru-pati	Man-dya	Coimb-atore	Mattu-petty	Aver-age	Ra-nk
HFO-806	81.5	109.2	103.3	113.5	127.1	122.7	128.2	147.0	101.4	38.4	91.1	115.2	100.0	118.1	10
OL-1874-1	97.9	111.8	130.3	112.7	149.3	112.7	141.1	151.3	106.4	57.0	100.2	110.6	100.0	126.0	2
HFO-818	84.7	105.2	121.4	106.4	147.3	116.5	141.9	141.5	93.8	44.7	98.8	112.2	100.0	118.6	8
JO-06-23	100.8	106.1	110.1	122.0	144.1	143.1	141.1	148.8	114.2	42.9	114.9	130.5	100.0	121.2	6
NDO-1802	86.3	109.2	118.5	115.7	125.1	138.2	140.6	132.8	99.5	56.0	115.2	135.2	97.7	123.8	3
UPO-18-1	77.5	110.6	122.0	113.4	124.5	120.0	139.4	137.9	105.2	44.3	110.9	135.0	99.0	121.7	4
OL-1876-1	102.3	128.1	149.3	121.5	131.7	105.3	133.4	164.4	112.9	58.7	116.2	135.0	101.0	128.9	1
JHO-18-1	85.9	101.8	133.4	111.2	154.9	130.0	122.9	133.9	122.1	38.1	94.0	105.0	98.0	117.0	11
SKO-241	75.6	95.0	122.7	115.6	97.9	125.7	103.8	126.1	40.4	37.4	71.9	80.0	100.0	98.2	13
RO-11-1-3	74.3	95.2	115.3	124.5	127.2	140.0	130.9	116.5	92.5	59.8	87.2	122.0	98.7	115.3	12
RO-11-1-2	78.8	105.1	108.0	117.7	133.5	119.3	132.6	124.1	96.9	56.4	85.4	125.5	97.7	118.4	9
OS-6 (NC)	83.7	105.6	110.3	111.7	124.5	104.3	137.5	140.1	99.8	57.1	116.6	129.0	97.7	121.5	5
Kent (NC)	80.7	97.3	101.3	116.0	130.4	137.0	128.9	140.7	102.6	42.8	108.1	140.0	95.0	119.4	7
RO-11-1 (ZC-CZ)	86.8	125.6	132.3	109.4	156.1	114.3	139.9	156.1							
OS-403 (ZC-SZ)									136.1	65.9	97.8	122.0	100.0		
Mean	85.5	107.6	119.9	115.1	133.8	123.5	133.0	140.1	101.7	50.0	100.6	121.2	98.9	119.1	

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

Contd...

Entries	Palam-pur	Sri-nagar	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa	Faiza-bad	Imp-hal
HFO-806	0.66	0.31	0.50	0.61	0.66	0.48	0.81	0.93	0.96	0.32	0.46	0.63	0.43
OL-1874-1	0.61	0.28	0.40	0.39	0.77	0.53	0.68	0.90	1.32	0.39	0.47	0.72	0.26
HFO-818	0.54	0.33	0.29	0.33	0.86	0.45	0.68	0.80	0.89	0.31	0.46	0.76	0.22
JO-06-23	0.65	0.29	0.65	0.30	0.86	0.55	0.67	0.86	1.17	0.31	0.46	0.61	0.28
NDO-1802	0.45	0.36	0.38	0.25	0.80	0.47	1.45	0.90	1.28	0.27	0.47	0.65	0.30
UPO-18-1	0.51	0.41	0.59	0.55	0.66	0.42	1.06	0.94	1.02	0.30	0.46	0.69	0.23
OL-1876-1	0.62	0.33	0.37	0.39	0.90	0.45	1.39	0.96	1.19	0.41	0.37	0.68	0.25
JHO-18-1	0.49	0.29	0.39	0.69	0.66	0.48	1.42	0.97	1.24	0.34	0.41	0.72	0.29
SKO-241	0.62	0.38	0.43	0.34	0.66	0.52	1.03	0.90	0.84	0.35	0.42	0.63	0.32
RO-11-1-3	0.54	0.39	0.48	0.30	0.76	0.47	1.02	0.95	1.14	0.26	0.39	0.69	0.28
RO-11-1-2	0.53	0.37	0.38	0.31	0.76	0.44	0.98	0.88	1.13	0.34	0.38	0.66	0.23
OS-6 (NC)	0.37	0.37	0.35	0.41	0.91	0.54	1.34	0.88	1.27	0.34	0.46	0.68	0.21
Kent (NC)	0.47	0.35	0.41	0.32	0.75	0.31	1.01	0.90	1.08	0.27	0.37	0.62	0.23
SKO-96 (ZC-HZ)	0.46	0.43											
OS-403 (ZC-NWZ)			0.48	0.45	0.86	0.39							
OS-403 (ZC-NEZ)							0.84	0.90	1.37	0.42	0.40	0.70	0.31
Mean	0.54	0.35	0.44	0.40	0.78	0.46	1.03	0.91	1.14	0.33	0.43	0.67	0.27

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

Entries	Rah-uri	Urulikan-chan	Pal-ghar	Ana-nd	Jabal-pur	Rai-pur	Dha-ri	Hydera-bad	Man-dya	Coimb-atore	Mattu-petty	Aver-age	Ra-nk
HFO-806	0.81	0.60	0.56	1.13	0.98	0.55	1.80	0.54	0.43	0.32	1.07	0.69	3
OL-1874-1	0.35	0.51	0.59	0.85	0.92	0.35	1.54	0.71	0.54	0.30	1.07	0.64	7
HFO-818	0.35	0.57	0.68	1.70	0.88	0.54	1.78	0.65	0.48	0.31	1.07	0.66	6
JO-06-23	0.53	0.63	0.78	1.33	1.07	0.40	1.25	0.43	0.50	0.32	1.07	0.67	5
NDO-1802	0.48	0.51	0.83	1.50	0.95	0.51	1.32	0.77	0.44	0.35	1.00	0.70	2
UPO-18-1	0.63	0.57	0.55	1.13	0.99	0.67	1.02	0.73	0.55	0.30	1.07	0.67	5
OL-1876-1	0.58	0.58	0.85	1.38	0.85	0.54	1.68	0.75	0.38	0.35	1.00	0.72	1
JHO-18-1	0.66	0.79	0.79	1.33	0.97	0.38	1.05	0.33	0.51	0.34	1.00	0.69	3
SKO-241	0.62	0.78	0.79	1.94	0.93	0.33	1.23	0.42	0.41	0.36	1.00	0.68	
RO-11-1-3	0.59	0.53	0.72	1.08	0.93	0.41	1.22	0.95	0.50	0.34	1.00	0.66	6
RO-11-1-2	0.59	0.55	0.69	1.08	0.95	0.56	1.90	0.73	0.48	0.31	1.13	0.68	4
OS-6 (NC)	0.50	0.50	0.69	1.22	0.80	0.45	1.17	0.63	0.55	0.34	1.33	0.68	4
Kent (NC)	0.61	0.47	0.67	1.00	1.00	0.48	1.77	0.54	0.45	0.33	1.33	0.66	6
RO-11-1 (ZC-CZ)	0.51	0.81	0.85	1.63	0.91	0.37	0.82						
OS-403 (ZC-SZ)								0.48	0.53	0.32	1.07		
Mean	0.56	0.60	0.72	1.31	0.94	0.47	1.40	0.62	0.48	0.33	1.09	0.68	

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

Entries	NDF (%)		ADF (%)		IVDMD (%)	
	Ludhiana	Rank	Ludhiana	Rank	Ludhiana	Rank
HFO-806	68.1	1	43.0	3	53.9	2
OL-1874-1	69.3	5	42.9	2	52.0	5
HFO-818	70.2	7	45.6	7	50.2	7
JO-06-23	68.7	3	43.7	4	51.9	6
NDO-1802	68.1	1	44.0	5	52.1	4
UPO-18-1	70.6	8	45.9	9	49.6	10
OL-1876-1	72.3	11	45.8	8	50.0	8
JHO-18-1	72.0	12	44.9	6	48.7	12
SKO-241	68.5	2	42.7	1	53.8	3
RO-11-1-3	68.9	4	42.9	2	54.2	1
RO-11-1-2	72.4	10	46.5	11	48.4	13
OS-6 (NC)	69.9	6	44.9	6	49.8	9
Kent (NC)	71.2	9	46.0	10	48.3	14
OS-403 (ZC-NWZ)	73.2	13	45.8	8	49.2	11
Mean	70.2		44.6		50.9	

4. AVTO (SC)-1: FIRST ADVANCED VARIETAL TRIAL IN OAT (SINGLE CUT) (Reference tables 4.1 to 4.9)

In **First Advanced Varietal Trial in Oat (single cut), AVTO (SC)-1**, six entries promoted from IVT were evaluated against two national checks and four zonal checks [SKO-96 (HZ), RO-11-1 (NWZ, NEZ), JHO 2009-1 (CZ) and JHO 2010-1 (SZ)] in respective zones at 27 locations in five different zones.

For GFY, in NWZ, NEZ, SZ, the zonal checks were top performer and none of the entry could surpass them in green fodder yield. Entries SKO-240 (8.2%), OL-1896 (5.5%) in HZ; OL-1896 (5.9%) in CZ zone exhibited superiority over the best check. At national level, OL-1896 and HFO-529 registered 7.0% and 5.1% superiority, respectively over the best check.

For DMY, entries HFO-529 (5.7%), SKO-240 (4.6%) in HZ; JO-05-09 (6.4%) in NW zone exhibited superiority over the best check. At national level, JO-05-09 registered 5.0% superiority. Other entries were either inferior or marginally superior over the best check.

For production potential (q/ha/day) entry OL1896 and HFO-718 top ranked for green and dry matter respectively. For plant height entry HFO-259 and for leafiness entries NDO-1501 and JO-05-09 were best performers.

For quality parameters, for CPY, JO-05-09 (10.3%) ranked first followed by HFO-718 (8.6%) showing superiority over the best check. For crude protein content, entry JO-05-09, OL-1896 ranked best with 9.1% CP as compared to best check Kent with 8.8% CP. For other quality parameters, OL-1896 ranked first followed by JO-05-09 for NDF %. JO-05-09 ranked first for ADF %. JO-05-09 and NDO-1501 ranked first for IVDMD %.

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	Rajo-uri	Average	Rank	Superiority%	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Udai-pur	Average	Rank
HFO-718	193.3	378.5	160.0	244.0	9		320.2	946.7	727.8	591.7	515.0	620.3	4
NDO-1501	200.7	386.3	150.4	245.8	8		222.1	821.9	680.6	680.6	684.4	617.9	5
OL-1896	210.0	434.5	187.3	277.3	2	5.5	208.9	845.8	700.0	702.8	722.0	635.9	3
JO-05-09	224.7	400.2	157.7	260.8	6		421.4	844.4	713.9	691.7	533.1	640.9	2
HFO-529	201.3	417.2	173.7	264.1	3	0.5	231.8	790.5	708.3	702.8	647.0	616.1	6
SKO-240	200.0	459.1	194.2	284.4	1	8.2	447.0	742.8	600.0	666.7	591.5	609.6	7
Kent (NC)	206.0	421.5	160.9	262.8	4		358.1	744.4	633.3	666.7	574.8	595.4	8
OS-6 (NC)	222.7	415.9	146.9	261.8	5		204.6	685.8	622.2	641.7	647.0	560.2	9
SKO-96 (ZC-HZ)	194.0	410.2	144.9	249.7	7								
RO-11-1 (ZC-NWZ)							293.5	861.7	791.7	666.7	716.4	666.0	1
Mean	205.9	413.7	164.0	261.2			300.8	809.3	686.4	667.9	625.7	618.0	
CD at 5%	NS	38.6	2.1				25.0	127.3	58.6	116.3	140.2		
CV%	13.3	11.5	6.2				4.8	9.0	8.4	10.4	12.9		

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

Entries	North East Zone								Average	Rank
	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa	Faiza-bad	Imp-hal			
HFO-718	298.1	501.2	285.0	497.7	385.0	439.7	282.6	384.2	3	
NDO-1501	248.0	520.5	355.0	339.3	340.0	432.1	300.2	362.1	7	
OL-1896	283.0	544.4	383.5	393.0	411.7	375.0	285.8	382.3	4	
JO-05-09	257.5	480.3	315.0	425.0	425.0	388.3	300.6	370.2	6	
HFO-529	308.5	445.2	421.0	529.3	363.3	329.3	301.9	385.5	2	
SKO-240	239.6	349.4	301.0	522.0	316.7	428.3	303.6	351.5	9	
Kent (NC)	221.0	450.3	372.0	354.0	390.0	413.0	307.0	358.2	8	
OS-6 (NC)	204.2	536.5	331.0	451.0	390.0	435.9	289.8	376.9	5	
RO-11-1 (ZC-NEZ)	274.6	529.0	406.5	538.0	428.3	451.1	356.4	426.3	1	
Mean	259.4	484.1	352.2	449.9	383.3	410.3	303.1	377.5		
CD at 5%	4.5	25.6	2.8	55.5	16.1	56.6	10.5			
CV%	5.3	11.4	4.5	7.1	4.2	8.0	2.8			

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

Entries	Central Zone									
	Jha-nsi	Rah-uri	Urulikan- chan	Pal- ghar	Ana- nd	Jabal- pur	Rai- pur	Aver- age	Ra- nk	Superi- ority%
HFO-718	419.3	381.5	529.6	290.7	588.9	435.0	294.3	419.9	8	
NDO-1501	468.1	376.0	502.1	263.0	646.7	375.0	358.2	427.0	6	
OL-1896	543.3	411.5	767.6	328.1	470.6	508.0	347.1	482.3	1	5.9
JO-05-09	491.5	388.4	476.6	318.9	501.7	580.0	352.6	444.2	4	
HFO-529	466.8	401.1	596.6	270.4	678.3	444.0	361.0	459.7	2	0.9
SKO-240	348.4	335.9	510.2	222.6	421.7	389.0	280.4	358.3	9	
Kent (NC)	457.6	360.8	567.3	250.0	562.8	377.0	411.0	426.6	7	
OS-6 (NC)	510.0	366.5	564.7	305.6	547.2	567.0	327.7	455.5	3	
JHO-2009-1 (ZC-CZ)	487.5	355.5	531.2	237.0	630.6	470.0	322.1	433.4	5	
Mean	465.8	375.3	560.6	276.3	560.9	460.6	339.4	434.1		
CD at 5%	10.7	49.8	138.8	39.6	66.5	95.7	55.7			
CV%	6.2	7.7	14.2		6.9	12.0	9.6			

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

Entries	South Zone							All India			
	Hydera- bad	Coimb- atore	Mattu- petty	**Tiru- pati	**Man- dya	Aver- age	Ra- nk	Superi- ority%	Aver- age	Ra- nk	Superi- ority%
HFO-718	488.7	357.2	333.0	32.7	134.9	393.0	6		425.6	4	1.1
NDO-1501	447.0	362.8	397.0	22.2	186.9	402.3	3		422.3	5	0.3
OL-1896	499.8	370.0	322.0	26.1	228.0	397.3	4		450.2	1	7.0
JO-05-09	413.7	372.2	400.0	29.5	216.7	395.3	5		435.0	3	3.4
HFO-529	480.4	371.7	417.0	28.0	186.0	423.0	1	0.5	442.3	2	5.1
SKO-240	441.5	355.6	105.0	11.1	94.1	300.7	9		390.9	8	
Kent (NC)	508.1	360.3	394.0	17.2	184.6	420.8	2		420.9	6	
OS-6 (NC)	416.5	333.9	275.0	19.5	146.9	341.8	8		417.6	7	
JHO-2010-1 (ZC-SZ)	483.1	381.9	300.0	28.8	215.3	388.3	7				
Mean	464.3	362.8	327.0	23.9	177.0	384.7			425.6		
CD at 5%	54.3	5.2	6.8	788.0	36.7						
CV%	6.7	0.8	1.2	8.8	12.0						

Note: ** Not included in zonal & All India average due to low yield of data

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	Rajo-uri	Aver-age	Ran-k	Superi- ority%	Bika- ner	His- ar	Ludh- iana	Pant- nagar	Aver- age	Ran- k	Superi- ority%
HFO-718	37.2	90.8	44.7	57.6	9		103.6	154.3	155.0	131.9	136.2	5	
NDO-1501	39.9	92.1	47.5	59.8	8		37.9	169.5	155.2	159.3	130.5	7	
OL-1896	41.4	105.9	52.5	66.6	3	1.6	35.0	166.8	151.2	151.8	126.2	8	
JO-05-09	45.4	98.3	46.4	63.4	5		113.9	138.9	166.3	171.5	147.7	1	6.4
HFO-529	55.6	100.7	51.4	69.3	1	5.7	48.0	160.9	158.7	156.0	130.9	6	
SKO-240	40.2	110.3	55.3	68.6	2	4.6	132.1	136.6	137.4	162.7	142.2	2	2.4
Kent (NC)	45.1	102.1	49.4	65.5	4		94.4	154.2	138.7	163.3	137.7	4	
OS-6 (NC)	45.4	99.8	43.1	62.7	6		36.2	141.5	140.6	138.6	114.2	9	
SKO-96 (ZC-HZ)	39.9	98.4	41.3	59.9	7								
RO-11-1 (ZC-NWZ)							72.8	166.6	168.6	147.3	138.8	3	
Mean	43.3	99.8	47.9	63.7			74.9	154.4	152.4	153.6	133.8		
CD at 5%	NS	4.4	0.7				24.4	NS	21.1	22.2			
CV%	9.3	6.5	7.4				19.0	14.1	7.1	14.2			

Table 4.2: AVT Oat (SC-1): First Advanced 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	Ran-k	
HFO-718	59.4	95.0	66.5	106.2	104.3	96.7	64.3	84.6	3	
NDO-1501	47.3	100.1	79.2	73.5	92.3	92.8	57.8	77.6	9	
OL-1896	53.8	113.2	83.3	81.9	110.9	84.3	58.0	83.6	5	
JO-05-09	48.8	94.9	69.8	101.3	114.3	85.4	71.2	83.7	4	
HFO-529	57.4	90.0	87.4	113.8	98.8	67.1	69.1	83.4	6	
SKO-240	42.7	63.4	66.7	142.7	87.2	96.3	75.1	82.0	7	
Kent (NC)	41.9	92.1	80.5	82.0	105.5	86.7	68.0	79.5	8	
OS-6 (NC)	40.4	114.5	72.8	102.2	105.5	91.5	69.6	85.2	2	
RO-11-1 (ZC-NEZ)	52.3	106.2	90.2	125.5	115.1	99.2	99.4	98.3	1	
Mean	49.3	96.6	77.4	103.2	103.8	88.9	70.3	84.2		
CD at 5%	2.8	7.9	0.7	5.2	3.8	12.0	5.4			
CV%	7.6	7.5	5.0	6.5	3.8	7.8	6.3			

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

Entries	Central Zone								
	Jha-nsi	Rah-uri	Urulikan- chan	Pal- ghar	Ana- nd	Jabal- pur	Rai- pur	Aver- age	Ra- nk
HFO-718	101.2	83.8	120.9	43.9	97.7	99.7	46.7	84.8	4
NDO-1501	103.6	82.9	68.2	39.2	85.6	83.6	62.7	75.1	8
OL-1896	102.9	94.4	138.2	54.8	56.3	117.5	43.3	86.8	2
JO-05-09	95.7	92.2	105.6	45.9	60.2	136.1	67.1	86.1	3
HFO-529	85.2	90.5	120.2	37.3	84.7	102.0	64.9	83.5	5
SKO-240	79.4	73.7	93.6	32.5	50.6	88.0	45.0	66.1	9
Kent (NC)	86.6	75.6	91.3	40.5	82.6	85.0	76.6	76.9	7
OS-6 (NC)	105.4	85.9	120.7	42.8	83.1	132.5	63.3	90.5	1
JHO-2009-1 (ZC-CZ)	82.6	84.7	113.3	36.6	84.3	108.4	62.5	81.8	6
Mean	93.6	84.8	108.0	41.5	76.1	105.9	59.1	83.6	
CD at 5%	7.9	11.3	25.6	5.2	15.8	21.6	8.8		
CV%	4.6	7.7	13.6		12.0	11.8	8.7		

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

Entries	South Zone						All India				
	Hydera- bad	Coimb- atore	Mattu- petty	**Tiru- pati	**Man- dya	Aver- age	Ra- nk	Super- iority%	Aver- age	Ra- nk	Super- iority%
HFO-718	114.1	86.2	83.4	13.7	27.3	94.6	1	4.2	91.1	2	3.4
NDO-1501	68.7	88.4	99.4	10.8	38.7	85.5	3		84.4	8	
OL-1896	66.5	84.5	80.5	12.8	47.1	77.2	7		88.7	4	0.7
JO-05-09	64.6	88.5	98.7	11.1	50.2	83.9	5		92.5	1	5.0
HFO-529	67.8	80.6	104.3	12.3	36.6	84.2	4		89.7	3	1.8
SKO-240	100.2	84.3	26.3	5.4	21.5	70.3	8		84.3	7	
Kent (NC)	88.0	85.9	98.6	7.7	39.2	90.8	2		88.1	5	
OS-6 (NC)	65.1	76.0	68.8	6.4	26.9	70.0	9		86.9	6	
JHO-2010-1 (ZC-SZ)	76.7	88.7	75.0	12.2	46.2	80.2	6				
Mean	79.1	84.8	81.7	10.3	37.1	81.8			88.2		
CD at 5%	18.5	2.2	5.8	325.0	4.7						
CV%	13.4	1.5	4.1	10.1	7.2						

Note: ** Not included in zonal & all India average due to low yield of data

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

Contd...

Entries	Palam-pur	Sri-nagar	Rajo-uri	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa	Faiza-bad
HFO-718	1.54	2.29	1.48	2.94	7.34	5.92	5.53	3.15	5.69	4.13	5.70	4.04	4.44
NDO-1501	1.54	2.34	1.39	2.04	6.37	5.53	6.36	2.85	6.42	4.86	4.28	3.74	4.32
OL-1896	1.56	2.63	1.67	1.92	6.55	5.69	6.27	2.96	6.19	5.18	4.32	4.32	3.78
JO-05-09	1.71	2.42	1.45	3.87	6.55	5.80	6.01	2.96	5.58	4.32	4.62	4.43	3.88
HFO-529	1.51	2.53	1.58	2.13	6.13	5.76	6.57	3.55	5.06	5.54	5.65	4.04	3.29
SKO-240	1.54	2.78	1.78	4.10	5.76	4.88	5.75	2.50	3.97	3.76	5.31	3.17	4.32
Kent (NC)	1.59	2.55	1.45	3.28	5.77	5.15	6.23	2.54	5.56	5.17	4.30	4.50	4.08
OS-6 (NC)	1.66	2.52	1.39	1.88	5.32	5.06	6.05	2.35	6.10	4.73	5.05	4.08	4.27
SKO-96 (ZC-HZ)	1.45	2.48	1.39										
RO-11-1 (ZC-NWZ)				2.69	6.68	6.44	5.85						
RO-11-1 (ZC-NEZ)								3.16	6.01	5.21	5.33	4.11	4.51
Mean	1.57	2.50	1.51	2.76	6.27	5.58	6.07	2.89	5.62	4.77	4.95	4.05	4.10

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

Entries	Jhansi	Rahuri	Urulikanchan	Palghar	Anand	Raipur	Hyderabad	**Mandya	Coimbatore	Average	Rank
HFO-718	4.56	4.07	5.76	4.47	7.01	3.63	6.19	1.90	4.47	4.49	7
NDO-1501	4.93	4.06	6.36	4.04	8.29	5.27	6.30	2.70	4.59	4.57	4
OL-1896	5.72	4.43	9.72	5.05	5.96	4.51	7.04	3.40	4.51	4.76	1
JO-05-09	5.34	4.15	5.24	4.91	6.52	4.58	5.83	3.20	4.90	4.53	5
HFO-529	4.91	4.56	7.55	4.16	8.70	5.31	6.33	2.80	4.70	4.74	2
SKO-240	3.79	3.60	5.80	3.42	5.41	3.64	5.59	1.30	4.34	4.06	8
Kent (NC)	5.08	4.20	7.18	3.85	7.82	6.04	6.57	2.80	4.68	4.65	3
OS-6 (NC)	5.54	4.25	7.15	4.70	7.71	4.82	5.72	2.20	4.39	4.51	6
JHO-2009-1 (ZC-CZ)	5.03	3.92	6.04	3.65	7.25	4.74					
JHO-2010-1 (ZC-SZ)							6.44	3.20	4.55		
Mean	4.99	4.14	6.76	4.25	7.19	4.73	6.22	2.61	4.57	4.54	

Note: ** Not included in zonal and all India average due to low yield of data

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

Contd...

Entries	Sri-nagar	Rajo-uri	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa	Faiza-bad
HFO-718	0.56	0.41	0.95	1.20	1.27	1.23	0.63	1.10	0.96	1.22	0.91	0.97
NDO-1501	0.57	0.44	0.35	1.32	1.27	1.49	0.54	1.23	1.09	0.93	0.98	0.92
OL-1896	0.64	0.47	0.32	1.29	1.24	1.36	0.56	1.29	1.13	0.90	0.85	0.85
JO-05-09	0.59	0.43	1.05	1.08	1.36	1.49	0.56	1.10	0.96	1.10	0.83	0.85
HFO-529	0.61	0.47	0.44	1.25	1.30	1.46	0.66	1.02	1.15	1.22	0.91	0.64
SKO-240	0.67	0.51	1.21	1.06	1.13	1.40	0.45	0.72	0.83	1.45	1.14	0.97
Kent (NC)	0.62	0.45	0.87	1.20	1.14	1.52	0.48	1.14	1.12	1.00	0.82	0.85
OS-6 (NC)	0.61	0.41	0.33	1.10	1.15	1.30	0.46	1.30	1.04	1.14	0.90	0.89
SKO-96 (ZC-HZ)	0.60	0.40										
RO-11-1 (ZC-NWZ)			0.67	1.29	1.38	1.29						
RO-11-1 (ZC-NEZ)							0.60	1.21	1.16	1.24	0.90	0.99
Mean	0.61	0.44	0.69	1.20	1.25	1.39	0.55	1.12	1.05	1.13	0.92	0.88

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

Entries	Jha-nsi	Rah-uri	Urulikan-chan	Pal-ghar	Ana-nd	Rai-pur	Hydera-bad	Man-dya	Coimb-atore	Aver-age	Ra-nk
HFO-718	1.10	0.89	1.31	0.67	1.16	0.58	1.46	0.39	1.08	0.95	1
NDO-1501	1.09	0.89	0.86	0.60	1.10	0.92	0.97	0.56	1.12	0.92	4
OL-1896	1.08	1.02	1.75	0.84	0.71	0.56	0.94	0.70	1.03	0.93	3
JO-05-09	1.04	0.98	1.16	0.71	0.78	0.87	0.91	0.73	1.16	0.94	2
HFO-529	0.90	1.03	1.52	0.57	1.09	0.95	0.90	0.55	1.02	0.94	2
SKO-240	0.86	0.79	1.06	0.50	0.65	0.58	1.27	0.31	1.03	0.89	5
Kent (NC)	0.96	0.88	1.16	0.62	1.15	1.13	1.13	0.59	1.12	0.95	1
OS-6 (NC)	1.15	0.99	1.53	0.66	1.17	0.93	0.89	0.40	1.00	0.92	
JHO-2009-1 (ZC-CZ)	0.85	0.93	1.29	0.56	0.97	0.92					
JHO-2010-1 (ZC-SZ)							1.02	0.68	1.06		
Mean	1.00	0.93	1.29	0.64	0.98	0.83	1.05	0.55	1.07	0.93	

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

Contd...

Entries	Palam-pur	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Faiza-bad	Imp-hal
HFO-718	3.3	8.8	12.6	23.9	11.5	6.2	9.9	5.3	7.6	8.6	4.8
NDO-1501	3.5	2.5	12.7	23.7	12.5	4.7	9.7	6.6	4.8	8.2	4.5
OL-1896	3.8	2.8	14.4	23.9	15.9	5.3	9.6	7.2	5.6	6.4	4.7
JO-05-09	4.8	10.7	12.1	26.8	15.0	4.9	7.4	5.9	7.1	6.8	5.5
HFO-529	5.3	3.0	13.6	21.7	12.3	6.4	7.7	8.0	7.7	5.2	5.9
SKO-240	4.0	8.9	11.9	19.1	18.5	4.3	5.5	5.6	10.6	7.9	6.0
Kent (NC)	3.6	8.0	13.4	20.7	11.4	4.2	8.5	7.6	6.5	6.9	5.3
OS-6 (NC)	4.4	2.0	12.0	16.7	13.3	4.1	12.0	6.2	8.3	8.0	5.6
SKO-96 (ZC-HZ)	3.5										
RO-11-1 (ZC-NWZ)		6.2	12.8	21.2	15.5						
RO-11-1 (ZC-NEZ)						5.6	9.9	7.6	8.2	8.8	8.0
Mean	4.0	5.9	12.8	22.0	14.0	5.1	8.9	6.7	7.4	7.4	5.6

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

Entries	Rah-uri	Urulikan-ghan	Ana-nd	Jabal-pur	Rai-pur	Hydera-bad	**Man-dya	Coimb-atore	Aver-age	Ra-ank	Superi-ority%
HFO-718	5.5	12.4	10.9	8.1	3.1	8.5	1.2	7.9	8.8	2	8.6
NDO-1501	4.7	4.9	10.3	6.6	3.8	4.2	3.0	8.1	7.6	7	
OL-1896	5.6	10.1	6.8	9.7	3.5	4.9	3.7	11.5	8.4	3	3.5
JO-05-09	6.0	8.3	8.6	11.4	5.9	5.1	3.5	8.9	9.0	1	10.3
HFO-529	5.0	8.0	10.6	8.3	5.0	6.2	1.8	8.5	8.2	4	1.3
SKO-240	4.7	7.8	7.4	7.1	3.7	6.6	1.5	4.8	8.0	6	
Kent (NC)	6.6	7.3	10.2	6.8	5.4	8.5	1.9	3.8	8.0	6	
OS-6 (NC)	6.8	11.9	10.2	11.0	5.6	5.4	2.0	3.0	8.1	5	
JHO-2009-1 (ZC-CZ)	6.1	9.4	8.5	8.8	4.3						
JHO-2010-1 (ZC-SZ)						4.0	3.6	7.4			
Mean	5.7	8.9	9.3	8.6	4.5	5.9	2.5	7.1	8.3		

Note: ** Not included in zonal and all India average due to low yield of data

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

Contd...

Entries	Palam-pur	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Faiza-bad	Imp-hal
HFO-718	8.8	8.5	8.2	15.4	8.8	10.5	10.4	8.0	7.2	8.9	7.5
NDO-1501	8.8	6.6	7.6	15.3	7.9	10.1	9.7	8.4	6.6	8.8	7.7
OL-1896	9.0	8.1	8.6	15.8	10.5	10.1	8.5	8.6	6.8	7.6	8.0
JO-05-09	10.5	9.4	8.7	16.1	8.8	10.3	7.8	8.4	7.0	8.0	7.8
HFO-529	9.6	6.3	8.5	13.7	7.9	11.2	8.6	9.1	6.8	7.8	8.5
SKO-240	9.9	6.7	8.7	13.9	11.4	10.3	8.7	8.4	7.4	8.2	8.0
Kent (NC)	7.9	8.5	8.7	14.9	7.0	10.3	9.2	9.4	7.9	7.9	7.8
OS-6 (NC)	9.6	5.5	8.5	11.9	9.6	10.2	10.5	8.5	8.1	8.7	8.0
SKO-96 (ZC-HZ)	8.8										
RO-11-1 (ZC-NWZ)		8.5	7.7	12.6	10.5						
RO-11-1 (ZC-NEZ)						10.9	9.4	8.4	6.6	8.9	8.1
Mean	9.2	7.6	8.4	14.4	9.1	10.4	9.2	8.6	7.1	8.3	7.9

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

Entries	Rah-uri	Urulikan-ghan	Ana-nd	Jabal-pur	Rai-pur	Hydera-bad	Man-dya	Coimba-tore	Aver-age	Ra-nk
HFO-718	6.6	10.2	11.3	8.2	6.6	7.4	4.4	9.2	8.7	3
NDO-1501	5.7	7.1	12.2	8.0	6.1	6.1	7.9	9.2	8.4	5
OL-1896	5.9	7.3	12.0	8.3	8.1	7.4	7.9	13.6	9.1	1
JO-05-09	6.6	7.9	14.4	8.4	8.8	7.9	7.0	10.1	9.1	1
HFO-529	5.5	6.6	12.5	8.2	7.7	9.2	4.8	10.5	8.6	4
SKO-240	6.3	8.3	14.7	8.1	8.2	6.6	7.0	5.7	8.8	2
Kent (NC)	8.8	8.0	12.4	8.1	7.0	9.6	4.8	4.4	8.6	4
OS-6 (NC)	7.9	9.8	12.4	8.4	8.8	8.3	7.4	3.9	8.7	3
JHO-2009-1 (ZC-CZ)	7.2	8.3	10.2	8.2	6.9					
JHO-2010-1 (ZC-SZ)						5.3	7.9	8.3		
Mean	6.7	8.2	12.4	8.2	7.6	7.5	6.6	8.3	8.7	

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

Contd...

Entries	Palam-pur	Srinagar	Rajouri	Bikar	Hisar	Ludhiana	Pantnagar	Udai-pur	Jorhat	Kalyani	Bhubaneswar	Ranchi	Pusa	Faizabad	Imp-hal
HFO-718	130.7	97.7	123.0	95.0	156.2	134.8	162.3	166.0	122.5	166.9	125.4	140.3	128.3	121.2	149.8
NDO-1501	121.7	109.8	125.0	105.0	165.3	129.6	152.7	135.7	116.6	165.3	146.5	154.3	125.0	112.0	142.8
OL-1896	119.0	100.9	149.3	110.0	163.0	125.4	158.3	150.8	132.5	169.8	154.7	133.3	132.0	119.3	149.4
JO-05-09	112.7	111.0	142.3	105.0	148.6	140.5	145.0	151.1	97.6	165.1	135.2	144.5	122.7	101.0	154.9
HFO-529	131.0	124.1	120.7	102.0	172.9	123.8	165.7	166.6	117.0	164.7	163.9	143.0	130.7	127.0	168.4
SKO-240	119.0	114.5	151.1	123.0	150.4	138.5	151.7	126.2	126.9	130.1	127.5	164.8	111.7	118.8	158.8
Kent (NC)	107.7	103.8	138.6	113.0	152.7	142.2	148.3	156.6	103.0	144.9	151.2	135.9	126.3	123.0	149.0
OS-6 (NC)	123.7	101.5	121.7	95.0	151.9	124.8	155.3	158.3	111.7	170.5	142.6	134.1	130.7	119.5	154.3
SKO-96 (ZC-HZ)	112.7	102.1	116.3												
RO-11-1 (ZC-NWZ)				161.0	136.5	142.7	154.7	164.7							
RO-11-1 (ZC-NEZ)									136.5	166.5	158.2	163.6	129.3	133.0	161.8
Mean	119.8	107.3	132.0	112.1	155.3	133.6	154.9	152.9	118.3	160.4	145.0	146.0	126.3	119.4	154.4

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

Entries	Jhansi	Rahuri	Urulikanchan	Palghar	Anand	Jabalpur	Raipur	Hyderabad	**Tirupati	Mandya	Coimbatore	Mattupetty	Average	Rank
HFO-718	89.9	91.2	92.3	127.7	141.9	128.7	145.0	109.3	44.1	97.0	112.0	100.0	125.2	3
NDO-1501	89.2	102.5	86.7	111.9	129.6	110.2	131.8	100.5	35.6	90.9	104.5	100.0	121.7	7
OL-1896	111.6	87.5	111.5	107.2	130.6	135.3	142.9	102.1	45.3	100.3	120.0	100.0	127.6	2
JO-05-09	108.5	87.8	94.6	128.4	133.3	140.1	137.4	97.8	48.2	97.2	142.5	97.3	124.7	4
HFO-529	101.5	102.4	104.6	114.8	130.9	144.8	144.3	106.3	55.8	101.7	133.2	100.0	131.0	1
SKO-240	92.6	86.4	91.2	120.9	112.9	122.0	142.7	113.1	33.5	72.1	100.7	96.3	121.7	8
Kent (NC)	89.5	103.6	91.3	126.5	115.7	114.2	126.7	106.1	36.4	93.3	106.2	100.0	121.9	6
OS-6 (NC)	114.2	98.4	104.6	122.9	124.5	140.5	142.3	101.3	45.0	91.2	110.4	91.3	124.5	5
JHO-2009-1 (ZC-CZ)	91.2	75.2	90.7	120.3	132.2	134.7	139.4							
JHO-2010-1 (ZC-SZ)								107.2	40.3	94.2	100.6	100.0		
Mean	98.7	92.8	96.4	120.1	128.0	130.1	139.2	104.9	42.7	93.1	114.5	98.3	124.8	

Note: ** Not included in zonal and all India average due to low yield of data

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

Contd...

Entries	Palam-pur	Sri-nagar	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa	Faiza-bad	Imp-hal
HFO-718	0.47	0.40	0.25	0.43	0.84	0.47	0.69	0.88	0.93	0.39	0.44	0.72	0.27
NDO-1501	0.37	0.33	0.38	0.31	0.66	0.39	1.47	0.91	1.24	0.43	0.42	0.73	0.30
OL-1896	0.50	0.31	0.34	0.39	0.86	0.48	0.77	0.86	1.34	0.33	0.47	0.78	0.27
JO-05-09	0.50	0.40	0.25	0.47	0.90	0.53	0.65	0.87	1.18	0.32	0.49	0.66	0.25
HFO-529	0.46	0.35	0.33	0.17	0.75	0.42	0.84	0.89	1.38	0.36	0.44	0.68	0.27
SKO-240	0.37	0.37	0.32	0.34	0.66	0.39	0.66	0.91	0.97	0.36	0.35	0.74	0.34
Kent (NC)	0.34	0.43	0.30	0.34	0.70	0.45	0.85	0.91	1.29	0.36	0.48	0.69	0.27
OS-6 (NC)	0.37	0.34	0.28	0.28	0.70	0.41	1.16	0.93	1.08	0.33	0.45	0.76	0.29
SKO-96 (ZC-HZ)	0.60	0.36											
RO-11-1 (ZC-NWZ)			0.17	0.23	0.80	0.48							
RO-11-1 (ZC-NEZ)							0.75	0.86	1.45	0.52	0.44	0.77	0.27
Mean	0.44	0.37	0.29	0.33	0.76	0.45	0.87	0.89	1.21	0.38	0.44	0.73	0.28

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

Entries	Rah-uri	Urulikan-chan	Pal-ghar	Ana-nd	Jabal-pur	Rai-pur	Hydera-bad	Man-dya	Coimb-atore	Mattu-petty	Aver-age	Ra-nk
HFO-718	0.69	0.48	0.75	0.79	0.81	0.50	0.45	0.27	0.34	1.00	0.58	6
NDO-1501	0.42	0.55	0.73	1.22	0.70	0.54	0.56	0.32	0.32	1.07	0.63	1
OL-1896	0.36	0.53	0.71	1.00	0.88	0.55	0.56	0.32	0.38	1.07	0.61	3
JO-05-09	0.53	0.56	0.75	1.13	0.95	0.55	0.70	0.26	0.33	1.33	0.63	1
HFO-529	0.52	0.59	0.73	1.50	0.82	0.51	0.54	0.36	0.35	1.00	0.62	2
SKO-240	0.53	0.50	0.69	0.72	0.76	0.62	0.25	0.30	0.30	1.00	0.54	7
Kent (NC)	0.47	0.52	0.74	1.38	0.73	0.48	0.52	0.32	0.30	1.00	0.60	4
OS-6 (NC)	0.37	0.58	0.64	1.08	0.91	0.54	0.44	0.30	0.35	1.07	0.59	5
JHO-2009-1 (ZC-CZ)	0.39	0.49	0.86	1.33	0.84	0.58						
JHO-2010-1 (ZC-SZ)							0.45	0.29	0.36	1.07		
Mean	0.48	0.53	0.73	1.13	0.82	0.54	0.50	0.30	0.34	1.07	0.60	

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

Entries	NDF (%)						ADF (%)						IVDMD (%)			
	Ana- nd	Pant- nagar	Ludh- iana	Rah- uri	Aver- age	Ra- nk	Pant- nagar	Rah- uri	Ana- nd	Ludh- iana	Aver- age	Ra- nk	Rah- uri	Ludh- iana	Aver- age	Ra- nk
HFO-718	71.0	64.6	39.3	57.2	58.0	6	56.6	38.2	46.5	22.3	40.9	7	57.4	63.9	60.7	3
NDO-1501	67.0	66.0	39.7	57.1	57.5	4	58.2	36.0	41.5	23.3	39.8	5	59.8	64.1	62.0	1
OL-1896	56.5	66.6	38.4	56.4	54.5	1	58.0	37.4	43.0	22.8	40.3	6	59.4	63.9	61.7	2
JO-05-09	65.5	65.4	38.9	54.8	56.2	2	54.2	35.8	41.5	22.1	38.4	1	59.5	64.4	62.0	1
HFO-529	67.5	63.8	42.1	59.3	58.2	7	55.4	37.9	39.5	23.7	39.1	3	58.2	63.1	60.7	3
SKO-240	69.0	66.0	41.3	55.2	57.9	5	58.6	36.2	40.0	23.1	39.5	4	59.3	61.9	60.6	4
Kent (NC)	65.0	63.8	40.1	60.2	57.3	3	58.4	41.5	43.5	23.2	41.7	8	55.9	62.6	59.3	6
OS-6 (NC)	64.0	64.2	43.2	58.4	57.5	4	57.4	36.2	38.0	24.1	38.9	2	60.3	60.7	60.5	5
JHO-2009-1 (ZC-CZ)	71.0			50.1				32.1	46.0				63.4			
RO-11-1 (ZC-NWZ)		65.4	43.4				56.6			23.9			61.8			
Mean	66.3	65.1	40.7	56.5	57.1		57.0	36.8	42.2	23.2	39.8		59.2	62.9	60.9	

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

(Reference tables 5.1 to 5.9)

In second advanced varietal trial oat (single cut) comprising of seven entries along with two national checks (OS-6 and Kent) and five zonal checks (SKO-90 for HZ, OL-125 for NWZ, JHO-99-2 for NEZ, JHO-822 for CZ and JHO-2000-4 for SZ) for respective zones were evaluated at 27 locations across the five zones. There were 3 locations in HZ, 5 locations each in NWZ and SZ, 7 locations in each NEZ and CZ respectively.

For GFY (q/ha), entries OL-1862 (15.2%), SKO-229 (13.9%), OL-1869-1 (12.4%), OL-1861 (5.3%) were superior over the best check SKO-90 in HZ. In NWZ, OL-1861 (18.3%), OL-1869-1 (15.6%), OL-1862 (10.7%), HFO-607 (7.9%) were superior over the best check Kent. In NEZ, entry OL-1861 (7.6%) was superior over the best check JHO-99-2. In CZ, entries OL-1861 (10.3%), OL-1862 (6.1%) and JO-05-7 (3.9%) were superior over the best check JHO-822. Entries SKO-229 (8.5%) and OL-1861 (4.0%) were superior over the best check JHO-2000-4 in south zone. At all India level entries OL-1861 (13.8%), OL-1869-1 (8.3%) and OL-1862 (8.0%) were superior over the best check Kent.

For dry matter yield (q/ha), entries OL-1869-1 (11.4%), SKO-229 (10.6%), OL-1862 (9.2%) showed superiority over the best check SKO-90 in hill zone. Entries OL-1861 (25.7%), OL-1869-1 (18.2%), HFO-607 (16.5%), OL-1862 (14.9%), HFO-525 (14.0%), JO-05-7 (8.1%) were superior over the best check OS-6 in NW zone. In NEZ, entries OL-1861 (10.2%), OL-1869-1 (8.3%), OL-1862 (5.9%) showed superiority over the best check JHO-99-2. In CZ and SZ, national check (Kent) and zonal check (JHO-2000-4) were top ranked respectively. At all India level, entries OL-1861 (11.0%), OL-1869-1 (5.8%), HFO-607 (4.5%) performed better than the best check.

For green and dry matter productivity (q/ha/day) entry OL-1861 ranked first followed by OL-1869-1. Entry OL-1861 ranked first for plant height followed by HFO-607 whereas entry OL-1862 ranked first for leafiness.

For crude protein yield (q/ha) Entry OL-1861 was best showing 6.4% superiority over the best check. Entries HFO-607 (4.7 and OL 1869-1 also showed superiority to the tune of 4.7% and 3.4% respectively over the best check Kent. For crude protein content (%), national check Kent was best. For NDF, ADF and IVDMD entry JO-05-7 was top ranked.

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

(Reference table 6.1)

In second advanced varietal trial oat (single cut) seed, seven entries along with two national checks (OS-6 and Kent) and five zonal checks (SKO-90 for HZ, OL-125 for NWZ, JHO-99-2 for NEZ, JHO-822 for CZ and JHO-2000-4 for SZ) for respective zones were evaluated at 12 locations across the five zones. There were 2 locations each in HZ, NWZ and SZ, 3 locations each in NEZ and CZ.

For seed yield (q/ha), entry OL-1862 (5.8%) in NWZ and entry SKO-229 (4.6%) in central zone were superior over the best check OL-125 and JHO-822 in their respective zones. Entry OL-1869-1 was ranked first in south zone; and at all India level, entries OL-1862 and national check OS-6 jointly ranked first.

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

Entries	Hill Zone						North West Zone							
	Palam-pur	Sri-nagar	Rajo-uri	Average	Rank	Superiority%	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Udai-pur	Average	Rank	Superiority%
HFO-525	245.3	338.0	196.1	259.8	9		370.9	980.5	769.4	788.9	497.2	681.4	5	3.9
OL-1869-1	313.3	446.1	202.5	320.6	3	12.4	520.5	928.9	950.0	730.6	660.7	758.1	2	15.6
OL-1861	283.3	431.0	187.2	300.5	4	5.3	408.0	923.3	1041.7	705.6	801.0	775.9	1	18.3
JO-05-7	308.7	381.1	195.6	295.1	5	3.4	418.2	793.9	827.8	700.0	494.2	646.8	8	
HFO-607	291.3	358.3	205.4	285.0	7		313.7	826.4	1011.1	719.4	666.3	707.4	4	7.9
OL-1862	310.0	454.7	221.3	328.7	1	15.2	391.2	785.0	1008.3	747.2	699.7	726.3	3	10.7
SKO-229	281.3	489.5	204.2	325.0	2	13.9	335.0	766.7	916.7	641.7	652.5	662.5	6	1.0
OS-6 (NC)	266.7	329.7	178.3	258.2	10		401.1	719.2	800.0	613.9	534.5	613.7	10	
Kent (NC)	274.7	363.0	208.1	281.9	8		493.4	736.1	800.0	580.6	669.2	655.9	7	
SKO-90 (ZC-HZ)	257.3	409.4	189.4	285.4	6									
OL-125(ZC-NWZ)							141.2	775.0	791.7	616.7	753.9	615.7	9	
Mean	283.2	400.1	198.8	294.0			379.3	823.5	891.7	684.4	642.9	684.4		
CD at 5%	NS	32.9	2.5				86.4	136.0	78.1	120.6	137.3			
CV%	11.5	9.7	6.1				13.2	9.6	6.1	10.7	12.4			

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

Entries	North East Zone									
	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa	Faiza-bad	Imp-hal	Average	Rank	Superiority%
HFO-525	230.6	340.2	306.5	375.3	391.7	376.9	290.2	330.2	10	
OL-1869-1	247.7	542.0	332.0	315.7	376.7	489.2	315.5	374.1	3	1.0
OL-1861	310.2	533.7	364.5	485.7	343.3	447.3	305.2	398.6	1	7.6
JO-05-7	281.8	485.7	283.0	421.7	270.0	443.5	306.3	356.0	5	
HFO-607	256.9	518.3	321.0	413.0	296.7	342.6	326.9	353.6	6	
OL-1862	221.6	506.9	353.5	455.0	365.0	395.9	323.8	374.5	2	
SKO-229	203.3	462.2	304.0	409.0	385.0	344.9	296.0	343.5	9	
OS-6 (NC)	273.2	509.0	292.0	308.7	335.0	418.7	299.9	348.1	8	
Kent (NC)	281.6	492.3	275.0	380.0	381.7	310.2	317.5	348.3	7	
JHO-99-2 (ZC-NEZ)	296.6	536.4	385.0	443.3	256.7	357.8	317.3	370.5	4	
Mean	260.4	492.7	321.7	400.7	340.2	392.7	309.9	359.7		
CD at 5%	4.3	22.2	2.6	34.0	25.7	79.9	7.9			
CV%	4.9	7.6	4.7	4.9	7.6	11.9	2.1			

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

Entries	Central Zone									
	Jhansi	Rahuri	Urulikanchan	Palghar	Anand	Jabalpur	Raipur	Average	Rank	Superiority%
HFO-525	674.0	348.0	441.5	258.3	600.0	396.0	283.2	428.7	10	
OL-1869-1	753.9	323.2	516.1	236.1	553.3	609.0	483.1	496.4	4	3.0
OL-1861	772.1	527.9	596.8	224.5	551.6	604.0	441.5	531.2	1	10.3
JO-05-7	818.3	339.7	515.6	235.0	579.4	571.0	444.3	500.5	3	3.9
HFO-607	725.2	333.5	520.3	227.8	586.6	518.0	430.4	477.4	6	
OL-1862	655.8	417.2	639.4	233.2	666.6	520.0	447.0	511.3	2	6.1
SKO-229	712.3	362.1	560.9	211.1	521.6	451.0	508.1	475.3	8	
OS-6 (NC)	714.1	325.3	477.8	272.2	420.0	438.0	555.3	457.5	9	
Kent (NC)	683.0	312.4	466.0	233.3	583.3	562.0	497.0	476.7	7	
JHO-822 (ZC-CZ)	757.3	384.3	543.8	244.4	432.2	548.0	462.3	481.8	5	
Mean	726.6	367.4	527.8	237.6	549.5	521.7	455.2	483.7		
CD at 5%	16.9	58.7	69.5	24.3	98.1	113.0	88.5			
CV%	9.8	9.3	7.6		10.4	12.6	11.4			

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

Entries	South Zone								All India		
	Hydera- bad	Man- dya	Coimb- atore	Mattu- petty	**Tiru- pati	Aver- age	Ra- nk	Superi- ority%	Aver- age	Ra- nk	Superi- ority%
HFO-525	422.1	170.7	359.2	319.0	27.3	317.7	9		414.2	8	
OL-1869-1	424.8	225.3	360.6	378.0	28.5	347.2	7		470.6	2	8.3
OL-1861	488.7	212.8	312.5	550.0	31.4	391.0	2	4.0	494.4	1	13.8
JO-05-7	441.5	214.5	330.6	308.0	32.3	323.6	8		438.8	6	1.0
HFO-607	560.9	172.2	328.9	371.0	48.1	358.2	4		447.8	5	3.0
OL-1862	380.4	186.8	375.8	447.0	50.5	347.5	6		469.6	3	8.0
SKO-229	474.8	242.0	370.3	545.0		408.0	1	8.5	448.1	4	3.1
OS-6 (NC)	427.6	206.2	334.7	267.0	32.3	308.9	10		412.2	9	
Kent (NC)	488.7	214.3	331.9	364.0	28.3	349.7	5		434.6	7	
JHO-2000-4 (ZC-SZ)	444.3	217.1	368.1	475.0	33.1	376.1	3				
Mean	455.4	206.2	347.2	402.4	34.6	352.8			447.8		
CD at 5%	89.6	29.3	4.4	9.9							
CV%	11.4	8.3	0.7	1.4							

Note: ** Not included in zonal & all India average due to low yield of data

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

Entries	Hill Zone						North West Zone						
	Palam-pur	Sri-nagar	Rajo-uri	Aver-age	Ran-k	Superi- ority%	Bika- ner	His- ar	Ludh- iana	Pant- nagar	Aver- age	Ran- k	Superi- ority%
HFO-525	42.0	81.9	52.1	58.7	10		81.0	165.8	163.9	192.5	150.8	5	14.0
OL-1869-1	62.8	110.1	54.7	75.9	1	11.4	119.7	140.0	205.2	160.7	156.4	2	18.2
OL-1861	51.8	105.2	51.4	69.5	4	2.0	104.0	141.6	242.7	177.1	166.4	1	25.7
JO-05-7	52.3	91.0	53.9	65.7	8		104.0	137.3	185.4	145.6	143.1	6	8.1
HFO-607	51.4	91.1	57.5	66.7	6		87.9	156.9	215.4	156.1	154.1	3	16.5
OL-1862	53.3	109.2	60.6	74.4	3	9.2	87.4	131.5	230.9	158.4	152.0	4	14.9
SKO-229	49.8	120.4	55.9	75.4	2	10.6	103.4	126.8	208.1	109.1	136.9	7	3.4
OS-6 (NC)	53.6	81.5	48.7	61.3	9		97.5	132.7	182.4	116.6	132.3	8	
Kent (NC)	49.9	89.3	58.6	66.0	7		104.0	142.4	175.2	96.4	129.5	9	
SKO-90 (ZC-HZ)	51.5	101.4	51.4	68.1	5								
OL-125(ZC-NWZ)							30.0	133.2	178.9	90.7	108.2	10	
Mean	51.8	98.1	54.5	68.1			91.9	140.8	198.8	140.3	143.0		
CD at 5%	NS	6.3	0.7				29.7	NS	24.2	26.6			
CV%	10.3	7.6	6.2				18.7	18.5	6.5	14.1			

Table 5.2: AVT Oat (SC)-2: Second 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%
HFO-525	39.6	63.5	72.3	90.1	98.4	81.4	55.0	71.5	10	
OL-1869-1	50.2	109.5	74.8	67.9	95.5	112.4	83.3	84.8	2	8.3
OL-1861	59.4	102.4	79.1	108.5	87.6	100.6	66.5	86.3	1	10.2
JO-05-7	53.9	95.6	67.1	103.3	68.7	95.3	61.4	77.9	5	
HFO-607	45.5	99.6	71.5	99.8	75.4	71.9	80.3	77.7	6	
OL-1862	36.2	97.5	79.4	108.4	93.3	87.1	78.5	82.9	3	5.9
SKO-229	35.5	90.3	63.0	100.2	97.8	77.5	66.6	75.8	7	
OS-6 (NC)	53.9	98.2	65.4	73.6	86.0	90.0	57.3	74.9	8	
Kent (NC)	49.4	96.8	62.2	89.3	96.6	69.8	59.8	74.8	9	
JHO-99-2 (ZC-NEZ)	58.7	103.6	83.6	99.8	64.7	78.7	59.0	78.3	4	
Mean	48.2	95.7	71.8	94.1	86.4	86.5	66.8	78.5		
CD at 5%	3.0	6.4	0.6	NS	6.2	17.3	2.5			
CV%	7.9	10.2	4.5	5.6	7.2	11.6	3.1			

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

Entries	Central Zone									
	Jha-nsi	Rah-uri	Urulikan- chan	Pal- ghar	Ana- nd	Jabal- pur	Rai- pur	Ave- rage	Ra- nk	Superi- ority%
HFO-525	127.6	77.4	87.9	43.7	87.3	83.3	52.9	80.0	9	0.2
OL-1869-1	114.5	70.5	103.2	40.6	74.1	145.0	85.4	90.5	5	
OL-1861	135.9	122.3	93.4	37.1	85.7	143.3	59.6	96.8	3	
JO-05-7	170.2	75.6	116.8	41.8	77.1	133.3	68.0	97.6	1	
HFO-607	138.4	78.5	97.6	31.9	90.5	119.5	73.4	90.0	6	
OL-1862	107.6	94.7	84.9	35.7	72.8	120.5	65.9	76.9	10	
SKO-229	131.1	84.2	94.9	35.9	66.9	102.5	90.4	86.6	7	
OS-6 (NC)	133.2	77.5	104.1	49.3	60.6	99.0	115.2	91.3	4	
Kent (NC)	131.0	65.8	126.2	37.3	82.3	130.5	108.1	97.3	2	
JHO-822 (ZC-CZ)	140.3	72.4	79.5	40.1	63.4	127.0	76.4	85.6	8	
Mean	133.0	81.9	98.9	39.3	76.1	120.4	79.5	89.2		
CD at 5%	15.2	13.1	15.7	6.9	19.4	24.6	14.9			
CV%	8.9	9.4	9.2		14.9	11.9	11.0			

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

Entries	South Zone							All India		
	Hydera- bad	Man- dya	Coimb- atore	Mattu- petty	**Tiru- pati	Aver- age	Ra- nk	Aver- age	Ra- nk	Superi- ority%
HFO-525	94.6	27.9	76.3	79.8	9.0	69.6	7	84.7	9	
OL-1869-1	59.8	38.3	85.8	94.6	11.3	69.6	7	94.3	2	5.8
OL-1861	70.6	44.9	65.8	137.6	11.3	79.7	5	99.0	1	11.0
JO-05-7	66.0	46.0	68.8	77.1	12.3	64.5	8	90.2	6	1.2
HFO-607	132.6	35.8	79.5	92.8	18.8	85.2	3	93.2	3	4.5
OL-1862	79.1	42.6	91.0	111.8	21.4	81.1	4	91.6	4	2.7
SKO-229	68.8	55.8	92.3	136.3		88.3	2	90.5	5	1.5
OS-6 (NC)	65.7	43.9	74.5	66.7	12.7	62.7	9	85.1	8	
Kent (NC)	88.2	53.6	75.6	91.1	13.1	77.1	6	89.2	7	
JHO-2000-4 (ZC-SZ)	99.8	48.4	85.0	120.4	13.6	88.4	1			
Mean	82.5	43.7	79.5	100.8	13.7	76.6		90.9		
CD at 5%	27.2	9.1	1.9	5.7						
CV%	19.1	12.1	1.4	3.3						

Note: ** Not included in zonal & all India average due to low yield of data

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

Contd...

Entries	Palam-pur	Sri-nagar	Rajo-uri	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa	Faiza-bad
HFO-525	1.94	2.04	1.82	3.40	7.66	6.26	6.98	2.62	3.54	4.14	3.86	4.37	3.58
OL-1869-1	2.42	2.67	1.76	4.78	7.26	7.72	6.52	2.72	6.95	4.55	3.52	4.21	4.94
OL-1861	2.21	2.60	1.67	3.74	7.21	8.47	6.24	3.41	6.06	4.99	5.02	3.98	4.30
JO-05-7	2.40	2.30	1.88	3.84	6.20	6.73	6.14	3.10	5.52	3.88	4.44	3.23	4.39
HFO-607	2.27	2.19	1.79	2.88	6.45	8.22	6.42	2.86	5.90	4.28	4.46	2.98	3.39
OL-1862	2.37	2.74	1.96	3.59	6.13	8.20	6.55	2.28	5.80	4.84	4.58	4.21	3.88
SKO-229	2.21	2.96	1.86	3.07	5.99	7.58	5.99	2.29	5.93	3.95	4.32	4.30	3.44
OS-6 (NC)	2.10	1.99	1.71	3.68	5.62	6.50	5.96	3.10	5.78	4.36	3.58	4.26	4.06
Kent (NC)	2.12	2.19	1.86	4.53	5.75	6.50	5.75	3.16	6.31	4.04	4.65	4.61	3.10
SKO-90 (ZC-HZ)	1.90	2.47	1.75										
OL-125(ZC-NWZ)				1.30	6.05	6.44	5.87						
JHO-99-2 (ZC-NEZ)								3.26	6.88	5.50	4.82	3.15	3.40
Mean	2.19	2.42	1.81	3.48	6.43	7.26	6.24	2.88	5.87	4.45	4.32	3.93	3.85

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

Entries	Jha-nsi	Rah-uri	Urulikan-ghan	Pal-ghar	Ana-nd	Rai-pur	Hydera-bad	Man-dya	Coimb-atore	Aver-age	Ran-k
HFO-525	7.25	3.70	4.75	3.97	6.98	2.98	5.83	2.40	4.33	4.29	8
OL-1869-1	7.77	4.35	6.45	3.63	7.90	6.53	6.25	3.30	4.19	5.02	2
OL-1861	8.04	6.31	7.02	3.45	7.16	5.45	6.79	3.10	4.01	5.06	1
JO-05-7	8.52	4.18	5.54	3.61	7.43	5.23	5.97	3.10	4.18	4.63	5
HFO-607	7.48	3.85	5.59	3.50	7.07	5.06	8.01	2.50	4.11	4.60	6
OL-1862	7.13	4.49	7.52	3.59	8.77	5.39	5.43	2.60	4.70	4.85	3
SKO-229		4.42	7.01	3.25	6.69	6.20	6.92	3.40	4.69	4.59	7
OS-6 (NC)	7.60	4.40	5.97	4.19	6.00	7.12	6.17	3.00	3.94	4.59	7
Kent (NC)	7.42	3.90	5.48	3.59	7.99	6.54	6.93	3.20	3.91	4.71	4
JHO-822 (ZC-CZ)	8.06	4.76	6.40	3.77	6.26	5.71					
JHO-2000-4 (ZC-SZ)							6.35	3.30	4.60		
Mean	7.70	4.44	6.17	3.66	7.23	5.62	6.47	2.99	4.27	4.70	

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

Contd...

Entries	Sri-nagar	Rajo-uri	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa	Imp-hal	Faiza-bad
HFO-525	0.49	0.48	0.74	1.29	1.34	1.70	0.45	0.70	0.98	0.93	1.10	0.77	0.77
OL-1869-1	0.70	0.48	1.10	1.09	1.68	1.43	0.55	1.40	1.02	0.76	1.06	1.13	1.13
OL-1861	0.66	0.46	0.95	1.11	1.99	1.56	0.65	1.20	1.08	1.12	0.98	0.96	0.96
JO-05-7	0.57	0.52	0.95	1.07	1.52	1.28	0.59	1.09	0.92	1.09	0.80	0.94	0.94
HFO-607	0.55	0.50	0.81	1.23	1.77	1.39	0.51	1.13	0.95	1.08	0.70	0.71	0.71
OL-1862	0.68	0.54	0.80	1.03	1.89	1.39	0.37	1.11	1.09	1.09	1.06	0.85	0.85
SKO-229	0.73	0.51	0.95	0.99	1.71	1.01	0.40	1.16	0.82	1.06	1.06	0.77	0.77
OS-6 (NC)	0.50	0.47	0.89	1.04	1.50	1.13	0.61	1.12	0.98	0.85	0.99	0.87	0.87
Kent (NC)	0.54	0.52	0.95	1.11	1.44	0.95	0.55	1.24	0.91	1.09	1.16	0.69	0.69
SKO-90 (ZC-HZ)	0.62	0.48											
OL-125(ZC-NWZ)			0.28	1.04	1.47	0.86							
JHO-99-2 (ZC-NEZ)							0.64	1.33	1.19	1.08	0.77	0.74	0.74
Mean	0.60	0.50	0.84	1.10	1.63	1.27	0.53	1.15	0.99	1.01	0.97	0.84	0.84

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

Entries	Jha-nsi	Rah-uri	Urulikan- chan	Pal-ghar	Ana-nd	Rai-pur	Hydera- bad	Man-dya	Coim-batore	Aver-age	Ran- nk
HFO-525	1.37	0.82	0.94	0.67	1.02	0.56	1.31	0.40	0.92	0.90	6
OL-1869-1	1.18	0.95	1.29	0.62	1.06	1.03	0.88	0.60	1.00	1.01	2
OL-1861	1.42	1.46	1.10	0.57	1.11	0.93	0.98	0.70	0.84	1.04	1
JO-05-7	1.77	0.93	1.26	0.64	0.99	0.92	0.89	0.70	0.87	0.97	5
HFO-607	1.43	0.91	1.05	0.49	1.09	1.04	1.89	0.50	0.99	0.97	3
OL-1862	1.17	1.02	1.00	0.55	0.96	1.01	1.13	0.60	1.14	0.97	3
SKO-229		1.03	1.19	0.55	0.86	1.07	1.00	0.80	1.17	0.93	5
OS-6 (NC)	1.42	1.05	1.30	0.76	0.87	1.16	0.95	0.60	0.88	0.95	4
Kent (NC)	1.42	0.82	1.49	0.57	1.13	1.12	1.22	0.80	0.89	0.97	3
JHO-822 (ZC-CZ)	1.49	0.90	0.94	0.62	0.92	1.01					
JHO-2000-4 (ZC-SZ)							1.43	0.70	1.06		
Mean	1.41	0.99	1.16	0.60	1.00	0.99	1.17	0.64	0.98	0.97	

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

Contd....

Entries	Palam-pur	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Faiza-bad	Imp-hal
HFO-525	3.7	8.3	15.0	13.3	20.2	3.9	5.9	5.7	6.3	6.5	4.1
OL-1869-1	6.1	8.6	13.3	15.8	15.5	6.0	8.7	6.2	4.8	10.0	6.2
OL-1861	5.0	9.7	12.4	21.8	18.6	6.6	9.6	6.8	8.1	8.9	5.0
JO-05-7	5.0	10.7	12.0	18.4	11.5	5.9	10.2	5.3	6.3	7.8	4.8
HFO-607	4.8	8.8	13.5	19.6	16.4	4.8	8.3	6.0	9.4	5.5	5.9
OL-1862	5.6	4.9	11.5	20.1	16.6	3.7	8.6	6.6	8.5	6.6	5.8
SKO-229	4.8	6.9	11.0	18.5	10.5	3.8	8.7	5.7	7.7	6.0	4.9
OS-6 (NC)	5.8	7.4	11.6	12.4	10.2	5.6	8.5	5.5	7.2	7.3	4.4
Kent (NC)	5.2	9.7	13.1	13.0	11.0	5.4	11.0	5.1	8.2	5.4	4.4
SKO-90 (ZC-HZ)	4.7										
OL-125(ZC-NWZ)		2.7	11.0	16.6	9.5						
JHO-99-2 (ZC-NEZ)						7.6	9.8	7.2	6.5	6.2	4.2
Mean	5.1	7.8	12.4	17.0	14.0	5.3	8.9	6.0	7.3	7.0	5.0

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

Entries	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Rai-pur	Hydera-bad	Man-dya	Coimb-atore	Aver-age	Ra-nk	Superi-riority%
HFO-525	4.4	9.4	8.4	6.2	4.0	7.8	1.2	9.4	7.6	6	
OL-1869-1	5.1	8.1	7.8	12.3	7.5	5.0	2.7	13.6	8.6	3	3.4
OL-1861	9.4	8.2	8.1	12.1	4.0	2.7	3.1	7.8	8.8	1	6.4
JO-05-7	4.1	12.1	8.5	11.2	4.1	5.2	3.6	7.5	8.1	5	
HFO-607	7.2	9.1	7.8	9.7	5.2	11.5	2.3	9.4	8.7	2	4.7
OL-1862	6.6	7.9	7.9	9.8	5.3	6.6	3.0	8.4	8.1	5	
SKO-229	6.6	7.4	8.3	8.2	6.3	4.8	3.9	10.1	7.6	6	
OS-6 (NC)	7.6	8.0	7.3	7.8	9.4	4.9	4.0	6.9	7.5	7	
Kent (NC)	6.2	12.4	9.0	10.9	9.5	6.6	4.2	7.3	8.3	4	
JHO-822 (ZC-CZ)	5.2	6.7	7.2	10.5	5.9						
JHO-2000-4 (ZC-SZ)						7.4	2.7	11.9			
Mean	6.2	8.9	8.0	9.9	6.1	6.3	3.1	9.2	8.1		

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

Contd....

Entries	Palam-pur	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Faiza-bad	Imp-hal
HFO-525	8.8	10.2	9.0	8.1	10.5	10.0	9.4	7.9	7.0	8.0	7.5
OL-1869-1	9.6	7.2	9.5	7.7	9.6	12.1	7.9	8.3	7.0	8.9	7.4
OL-1861	9.6	9.4	8.7	9.0	10.5	11.2	9.4	8.6	7.4	8.8	7.4
JO-05-7	9.6	10.3	8.7	9.9	7.9	11.2	10.7	7.9	6.1	8.2	7.9
HFO-607	9.3	10.1	8.6	9.1	10.5	10.8	8.3	8.4	9.4	7.7	7.3
OL-1862	10.5	5.6	8.7	8.7	10.5	10.4	8.8	8.3	7.9	7.6	7.3
SKO-229	9.6	6.7	8.6	8.9	9.6	10.8	9.6	9.0	7.7	7.8	7.4
OS-6 (NC)	10.8	7.6	8.7	6.8	8.8	10.5	8.7	8.4	9.8	8.1	7.7
Kent (NC)	10.5	9.4	9.2	7.4	11.4	11.0	11.4	8.3	9.2	7.8	7.3
SKO-90 (ZC-HZ)	9.0										
OL-125(ZC-NWZ)		9.1	8.3	9.3	10.5						
JHO-99-2 (ZC-NEZ)						12.9	9.5	8.6	6.6	7.9	7.2
Mean	9.7	8.5	8.8	8.5	10.0	11.1	9.4	8.4	7.8	8.1	7.4

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

Entries	Rah-uri	Urulikan-ghan	Ana-nd	Jabal-pur	Rai-pur	Hydera-bad	Man-dya	Coimb-atore	Aver-age	Ra-nk
HFO-525	5.7	10.7	9.7	7.5	7.5	8.3	4.4	12.3	8.6	4
OL-1869-1	7.2	7.8	10.4	8.5	8.8	8.3	7.0	15.8	8.9	2
OL-1861	7.7	8.8	9.5	8.5	6.7	3.9	7.0	11.8	8.6	4
JO-05-7	5.5	10.4	11.0	8.5	6.1	7.9	7.9	10.9	8.8	3
HFO-607	9.2	9.3	8.5	8.2	7.0	8.7	6.6	11.8	8.9	2
OL-1862	7.0	9.2	10.8	8.2	8.1	8.3	7.0	9.2	8.5	5
SKO-229	7.9	7.8	12.5	8.1	6.9	7.0	7.0	10.9	8.6	4
OS-6 (NC)	9.8	7.7	11.9	7.9	8.2	7.4	9.2	9.2	8.8	3
Kent (NC)	9.4	9.8	11.5	8.3	8.8	7.4	7.9	9.6	9.2	1
JHO-822 (ZC-CZ)	7.2	8.4	11.4	8.3	7.7					
JHO-2000-4 (ZC-SZ)						7.4	5.7	14.0		
Mean	7.7	9.0	10.7	8.2	7.6	7.5	7.0	11.6	8.8	

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

Contd...

Entries	Palam-pur	Sri-nagar	Rajo-uri	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Udai-pur	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa	Faiza-bad	Imp-hal
HFO-525	118.3	104.3	118.9	100.0	154.8	143.3	143.3	144.6	114.8	130.7	145.2	138.5	115.3	116.6	122.0
OL-1869-1	122.0	124.8	138.3	119.0	148.2	148.9	137.0	155.0	136.9	160.9	162.3	141.4	115.3	136.9	161.4
OL-1861	120.7	122.2	150.4	136.0	154.9	165.0	147.0	167.2	151.6	170.4	170.2	153.0	122.3	122.8	160.6
JO-05-7	126.3	130.6	156.3	130.0	155.7	140.3	128.7	132.6	125.5	160.8	130.3	133.7	110.7	110.8	158.0
HFO-607	117.7	124.0	142.5	115.0	150.5	165.2	150.7	170.0	139.4	165.6	153.1	164.7	118.3	126.6	157.0
OL-1862	132.3	123.6	147.6	115.0	160.5	162.0	151.3	173.2	133.6	164.8	166.4	143.9	116.0	122.0	162.2
SKO-229	116.3	128.4	142.3	143.0	157.7	146.7	145.7	167.3	108.2	149.8	142.3	142.1	118.7	107.4	153.6
OS-6 (NC)	114.0	112.5	146.1	90.0	151.7	132.1	136.3	158.8	133.7	163.7	135.2	123.9	128.7	123.7	139.0
Kent (NC)	120.3	109.1	107.7	98.0	149.3	145.7	146.0	126.2	137.1	150.9	127.2	134.7	110.0	88.9	139.6
SKO-90 (ZC-HZ)	110.7	96.0	140.5												
OL-125(ZC-NWZ)				146.0	156.6	133.3	149.0	148.8							
JHO-99-2 (ZC-NEZ)									136.1	155.6	174.3	128.5	106.7	117.2	150.9
Mean	119.9	117.5	139.1	119.2	154.0	148.3	143.5	154.4	131.7	157.3	150.6	140.4	116.2	117.3	150.4

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

Entries	Jha-nsi	Rah-uri	Urulikan-ghan	Pal-ghar	Ana-nd	Jabal-pur	Rai-pur	Hydera-bad	**Tiru-pati	Man-dya	Coimb-atore	Mattu-petty	Aver-age	Ran-k
HFO-525	102.1	81.5	110.1	100.1	136.9	84.8	154.4	71.9	31.8	92.2	112.4	100.0	117.6	9
OL-1869-1	102.0	93.0	97.5	109.5	126.0	150.1	149.8	98.4	50.8	106.2	100.5	100.0	128.5	5
OL-1861	116.3	111.2	117.0	141.0	143.3	146.7	148.8	112.6	49.3	98.1	110.4	100.0	136.9	1
JO-05-7	106.9	98.4	108.7	115.5	138.9	140.0	152.6	97.1	40.3	93.8	115.0	91.0	126.5	6
HFO-607	110.4	115.9	110.2	109.5	142.5	120.5	161.5	110.4	48.5	107.6	117.4	100.0	133.3	2
OL-1862	124.1	93.9	87.0	128.5	126.6	125.6	152.7	106.0	49.4	87.6	116.2	100.0	131.6	3
SKO-229	103.4	96.7	96.7	112.8	126.9	115.4	149.7	91.5		93.9	118.0	100.0	125.9	4
OS-6 (NC)	104.3	95.6	99.1	106.3	130.1	108.9	145.5	117.4	50.9	99.6	84.5	99.0	122.3	7
Kent (NC)	105.5	78.2	98.9	109.8	131.1	137.6	144.8	101.5	36.3	94.3	90.6	99.0	118.5	8
JHO-822 (ZC-CZ)	100.8	95.1	96.7	101.4	122.8	136.6	148.9							
JHO-2000-4 (ZC-SZ)								115.7	44.9	94.5	115.2	100.0		
Mean	107.6	96.0	102.2	113.4	132.5	126.6	150.9	102.3	44.7	96.8	108.0	98.9	126.8	

Note: ** Not included in zonal and all India average due to low yield of data

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

Contd...

Entries	Palam-pur	Sri-nagar	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa	Faiza-bad	Imp-hal
HFO-525	0.49	0.32	0.52	0.43	0.71	0.45	0.55	0.86	1.17	0.31	0.52	0.76	0.33
OL-1869-1	0.64	0.31	0.27	0.69	0.88	0.64	0.54	0.91	1.28	0.18	0.50	0.73	0.21
OL-1861	0.77	0.29	0.31	0.46	0.92	0.47	0.67	0.89	1.37	0.26	0.48	0.72	0.24
JO-05-7	0.79	0.47	0.30	0.52	0.78	0.51	0.68	0.96	0.98	0.32	0.41	0.69	0.25
HFO-607	0.51	0.35	0.25	0.38	0.92	0.45	0.80	0.97	1.24	0.25	0.38	0.65	0.22
OL-1862	0.50	0.31	0.29	0.44	0.90	0.47	0.97	0.96	1.34	0.27	0.50	0.70	0.30
SKO-229	0.54	0.41	0.33	0.40	0.84	0.46	0.64	0.90	1.14	0.25	0.51	0.73	0.26
OS-6 (NC)	0.46	0.36	0.33	0.37	0.75	0.42	0.76	0.97	1.08	0.21	0.51	0.66	0.24
Kent (NC)	0.53	0.30	0.31	0.35	0.72	0.48	0.66	0.87	0.94	0.22	0.40	0.68	0.27
SKO-90 (ZC-HZ)	0.49	0.53											
OL-125(ZC-NWZ)			0.20	0.36	0.72	0.57							
JHO-99-2 (ZC-NEZ)							0.54	0.94	1.40	0.21	0.40	0.68	0.23
Mean	0.57	0.37	0.31	0.44	0.81	0.49	0.68	0.92	1.19	0.25	0.46	0.70	0.26

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

Entries	Rah-uri	Urulikan- chan	Pal-ghar	Ana-nd	Jabal-pur	Rai-pur	Hydera-bad	Man-dya	Coimb- atore	Mattu-petty	Aver-age	Ra-nk
HFO-525	0.58	0.61	0.69	1.22	0.82	0.36	0.54	0.43	0.35	1.07	0.61	4
OL-1869-1	0.74	0.43	0.65	1.00	1.02	0.39	0.53	0.31	0.37	1.00	0.62	3
OL-1861	0.50	0.49	0.75	0.82	0.99	0.43	0.62	0.46	0.31	1.07	0.62	3
JO-05-7	0.43	0.49	0.77	1.33	0.94	0.45	0.62	0.31	0.32	1.00	0.62	3
HFO-607	0.31	0.54	0.86	0.96	0.80	0.63	0.39	0.44	0.32	1.00	0.59	5
OL-1862	0.35	0.66	0.68	1.38	0.83	0.58	0.47	0.38	0.35	1.07	0.64	1
SKO-229	0.42	0.64	0.74	1.38	0.83	0.58	0.75	0.39	0.37	1.00	0.63	2
OS-6 (NC)	0.40	0.76	0.72	1.22	0.86	0.73	0.46	0.37	0.37	1.33	0.62	3
Kent (NC)	0.58	0.62	0.71	1.33	0.88	0.40	0.61	0.41	0.38	1.00	0.59	5
JHO-822 (ZC-CZ)	0.69	0.58	0.61	1.44	0.58	0.33						
JHO-2000-4 (ZC-SZ)							0.32	0.35	0.35	1.07		
Mean	0.50	0.58	0.72	1.21	0.86	0.49	0.53	0.39	0.35	1.06	0.62	

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

Entries	NDF (%)							ADF (%)							IVDMD (%)			
	Ana-nd	Pant-nagar	Rah-uri	Ludh-iana	Palam-pur	Aver-age	Ra-nk	Ana-nd	Pant-nagar	Rah-uri	Ludh-iana	Palam-pur	Aver-age	Ra-nk	Rah-uri	Ludh-iana	Aver-age	Ra-nk
HFO-525	73.0	65.4	61.3	63.4	65.0	65.6	9	39.5	58.6	40.3	37.9	55.8	46.4	7	56.5	55.7	56.1	5
OL-1869-1	64.0	65.8	57.6	64.7	65.8	63.6	2	36.5	58.0	39.4	40.2	54.6	45.7	3	58.4	54.1	56.3	4
OL-1861	64.5	66.0	63.0	61.9	66.2	64.3	5	39.5	54.2	43.1	37.2	54.2	45.6	2	55.4	55.2	55.3	6
JO-05-7	69.5	63.6	56.1	60.6	65.4	63.0	1	37.5	58.6	32.9	35.9	56.0	44.2	1	60.2	56.7	58.5	1
HFO-607	74.0	64.0	60.3	62.2	66.6	65.4	8	38.5	58.2	41.5	36.9	58.2	46.7	8	57.3	56.0	56.7	2
OL-1862	72.0	64.6	62.4	62.9	63.8	65.1	7	39.0	56.0	41.8	38.9	54.6	46.1	6	56.2	54.1	55.2	7
SKO-229	67.0	65.8	57.4	63.8	65.8	64.0	4	40.0	54.6	38.9	38.3	57.2	45.8	4	58.0	54.9	56.5	3
OS-6 (NC)	65.5	66.4	63.2	67.1	62.2	64.9	6	34.0	56.0	39.7	42.3	57.4	45.9	5	57.2	51.9	54.6	8
Kent (NC)	67.5	63.6	58.7	65.2	63.8	63.8	3	40.0	58.2	39.3	39.9	57.6	47.0	9	58.2	52.3	55.3	6
SKO-90 (ZC-HZ)					65.0							53.8						
OL-125(ZC-NWZ)		64.2		60.9					56.6		36.3					54.0		
JHO-822 (ZC-CZ)	67.0		55.4					39.0		33.0					61.2			
Mean	68.4	64.9	59.5	63.3	65.0	64.4		38.4	56.9	39.0	38.4	55.9	45.9		57.9	54.5	56.0	

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

Entries	Hill Zone				North West Zone				
	Palampur	Srinagar	Average	Rank	Hisar	Ludhiana	Average	Rank	Superiority%
HFO-525	25.7	19.6	22.7	7	16.3	30.8	23.6	9	5.8
OL-1869-1	25.3	18.9	22.1	9	17.6	32.6	25.1	8	
OL-1861	29.3	16.4	22.8	6	14.2	28.5	21.4	10	
JO-05-7	29.8	19.2	24.5	3	20.4	30.0	25.2	7	
HFO-607	22.6	21.6	22.1	9	23.3	31.8	27.6	3	
OL-1862	23.9	21.0	22.5	8	27.9	32.7	30.3	1	
SKO-229	25.5	23.8	24.7	2	22.0	32.0	27.0	5	
OS-6 (NC)	26.6	21.7	24.2	4	24.3	29.4	26.9	6	
Kent (NC)	30.8	20.6	25.7	1	27.4	27.5	27.5	4	
SKO-90 (ZC-HZ)	28.2	20.0	24.1	5					
OL-125 (ZC-NWZ)					26.2	31.1	28.7	2	
Mean	26.8	20.3	23.5		22.0	30.6	26.3		
CD at 5%	NS	2.0			7.2	3.4			
CV%	12.1	4.7			18.9	6.5			

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

Entries	North East Zone					Central Zone					
	Ran-chi	Pu sa	Imp-hal	Aver-age	Ra-nk	Rah-uri	Ana-nd	Jabal-pur	Aver-age	Ra-nk	Superi-riority%
HFO-525	32.0	16.7	9.5	19.4	8	23.6	23.05	32.1	26.3	8	4.6
OL-1869-1	32.2	14.0	12.5	19.6	7	20.7	23.61	25.7	23.3	10	
OL-1861	25.6	16.7	8.0	16.8	9	20.1	24.58	27.2	24.0	9	
JO-05-7	36.6	15.0	12.0	21.2	5	20.2	30.55	37.7	29.5	4	
HFO-607	34.4	13.3	16.3	21.4	4	21.6	31.94	29.6	27.7	7	
OL-1862	38.3	15.3	9.2	20.9	6	25.6	28.33	35.7	29.9	3	
SKO-229	31.3	17.0	16.0	21.4	4	22.6	28.89	43.4	31.6	1	
OS-6 (NC)	42.8	14.3	9.0	22.0	3	19.8	26.11	41.6	29.2	5	
Kent (NC)	37.5	17.3	14.0	22.9	2	22.2	18.05	45.5	28.6	6	
JHO-99-2 (ZC-NEZ)	43.4	16.3	13.3	24.4	1						
JHO-822 (ZC-CZ)						21.4	21.94	47.4	30.2	2	
Mean	35.4	15.6	12.0	21.0		21.8	25.7	36.6	28.0		
CD at 5%	13.3	0.9	1.6			4.5	7.6	7.8			
CV%	16.4	5.8	10.9			12.0	17.2	12.4			

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

Entries	South Zone			All India	
	**Mandya	Hyderabad	Rank	Average	Rank
HFO-525	0.04	3.2	10	21.1	6
OL-1869-1	0.10	13.1	1	21.5	5
OL-1861	0.05	5.4	8	19.6	7
JO-05-7	0.07	9.2	5	23.7	3
HFO-607	0.06	10.3	4	23.3	4
OL-1862	0.09	10.6	3	24.4	1
SKO-229	0.07	5.0	9	24.3	2
OS-6 (NC)	0.06	12.5	2	24.4	1
Kent (NC)	0.08	6.9	7	24.3	2
JHO-2000-4 (ZC-SZ)	0.06	8.9	6		
Mean	0.1	8.5		23.0	
CD at 5%	1.1	2.8			
CV%	9.5	19.3			

Note: ** Not included in zonal and all India average due to low yield of data

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

(Reference tables 7.1 to 7.7)

In **Initial Varietal Trial in Oat (Multicut) [IVTO-MC]** nine entries were evaluated against two national checks (RO-19 and UPO-212) at 18 locations in four zones (HZ, NWZ, NEZ, and CZ).

For GFY, entry HFO-707 (5.6%) in NWZ; entries HFO-707 (9.1%), OL-1882 (8.7%), HFO-716 (7.4%) in central zone exhibited superiority over the best national check. At national level, entry HFO-707 exhibited superiority by a margin of 5% over the best check. None of the entry was found superior over the best check (more than 5%) in HZ, NE zone.

For DMY, entry HFO-707 (8.7%) in NWZ; entries HFO-716 (18.5 %), HFO-707 (8.1%) in central zone exhibited superiority over the best national check. At national level, HFO-707 (6.1%), HFO-716 (5.0 %) exhibited superiority over the best check.

For production potential (q/ha/day), entry HFO-707 and OL-1822 ranked first and second respectively for both green and dry matter. For plant height entry HFO-7-7 ranked first with national check RO-19 at second position. For leafiness, PLP-23 was best.

For quality parameters, entry HFO-707 ranked first for CPY showing superiority of 5.7% over the best check RO-19. Entry PLP-23, RO-11-1-4 ranked first and second respectively for crude protein content (%). For ADF %, JHO-18-2 ranked first. For NDF% and IVDMD %, national check (RO-19) ranked first.

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

(Reference tables 8.1 to 8.9)

In **First Advance Varietal Trial in Oat (Multicut) [AVTO-1 (MC)]** four entries were evaluated against two national checks (RO-19 and UPO-212) at 18 locations in four zones (HZ, NWZ, NEZ, and CZ).

For GFY, entry OL-1874 (5.4%) in NWZ; entry JO-05-304 (5.8%) in central zone exhibited superiority over the best national check. None of the entry was found superior over the best check (more than 5%) in HZ, NE zone and at national level. For DMY, entries JO-05-304 (7.8%), OL-1874 (5.4%) in central zone exhibited superiority over the best national check. Other entries were either inferior or showed marginal superiority over the best check for both green and dry matter.

For per day productivity, OL-1874 top ranked for green matter whereas national check was superior for dry matter. For plant height check was best whereas for leafiness entry JO-05-304 was top ranked.

For quality parameters, national check (UPO-212) ranked first for CPY and crude protein content (%). For ADF % OL-1874 ranked first. For NDF%, national check (UPO-212) and for IVDMD %, HFO-514 was ranked first.

Table 7.1: 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	Average	Rank	Superiority%	His-ar	Ludh-iana	Pant-nagar	*Jal-ore	Average	Rank	Superiority%
OL-1895	236.0	274.9	249.6	253.5	11		1164.8	814.6	856.7	140.9	945.4	3	0.2
HFO-707	236.0	311.3	264.0	270.4	8		1146.3	991.5	849.6	159.4	995.8	1	5.6
OL-1882	273.3	356.2	263.5	297.7	1	2.1	988.5	848.1	890.4	137.2	909.0	5	
JHO-18-2	234.7	293.2	251.7	259.9	10		1045.2	832.7	812.2	129.6	896.7	7	
PLP-23	258.0	367.8	258.1	294.6	2	1.1	943.0	947.2	771.9	91.7	887.4	9	
HFO-716	260.7	316.4	279.1	285.4	6		1085.2	895.0	699.3	143.9	893.2	8	
JO-06-308	243.3	341.6	279.5	288.1	5		1105.9	878.5	884.4	107.4	956.3	2	1.4
RO-11-1-4	270.7	344.4	256.0	290.4	4		1196.7	794.6	733.3	108.9	908.2	6	
RO-11-1-5	266.0	297.3	228.4	263.9	9		1022.2	844.4	743.7	120.7	870.1	11	
UPO-212 (NC)	274.0	272.5	291.8	279.4	7		894.1	903.1	843.6	168.5	880.3	10	
RO-19 (NC)	267.3	307.2	300.2	291.6	3		1199.6	852.1	777.8	134.4	943.2	4	
Mean	256.4	316.6	265.6	279.5			1072.0	872.9	805.7	131.2	916.9		
CD at 5%	25.8	16.8	NA				198.3	62.2	119.3	NA			
CV%	11.3	9.4	9.4				10.8	12.1	11.2	23.1			

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

Table 7.1: IVTO (MC): Initial Varietal Trial in Oat (Multi cut): Green Forage Yield (q/ha)

Entries	North East Zone								
	Faizabad	Jorhat	Bhubaneswar	Imphal	Pusa	Ranchi	Average	Rank	Superiority%
OL-1895	277.3	247.4	309.9	321.7	280.0	462.2	316.4	8	
HFO-707	416.0	367.7	349.3	317.1	308.3	437.3	365.9	1	4.0
OL-1882	346.7	285.4	384.6	319.6	365.0	410.2	351.9	3	
JHO-18-2	352.0	294.0	259.3	287.0	300.0	404.4	316.1	9	
PLP-23	336.0	300.7	219.3	284.1	398.3	446.7	330.8	6	
HFO-716	338.7	384.2	331.9	301.3	373.3	399.1	354.8	2	0.8
JO-06-308	349.3	343.4	297.3	291.1	358.3	436.9	346.1	4	
RO-11-1-4	301.3	271.3	393.2	300.4	361.7	401.8	338.3	5	
RO-11-1-5	322.7	302.2	281.3	293.6	297.9	406.7	317.4	7	
UPO-212 (NC)	341.3	263.0	220.6	280.7	315.0	405.3	304.3	10	
RO-19 (NC)	354.7	268.9	403.2	307.7	325.0	452.0	351.9	3	
Mean	339.6	302.6	313.6	300.4	334.8	423.9	335.8		
CD at 5%	55.0	12.0	1.9	12.7	14.5	NS			
CV%	9.5	12.2	4.7	2.5	4.3	8.9			

Table 7.1: IVTO (MC): Initial Varietal Trial in Oat (Multi cut): Green Forage Yield (q/ha)

Entries	Central Zone								All India		
	Jha-nsi	Ana-nd	Jabal-pur	Rah-uri	Urulikan-ghan	Aver-age	Ra-nk	Superi-osity%	Aver-age	Ra-nk	Superi-osity%
OL-1895	403.9	676.2	579.8	493.0	629.1	556.4	6		486.9	8	
HFO-707	375.6	695.5	682.4	625.5	673.6	610.5	1	9.1	532.2	1	5.0
OL-1882	379.3	608.1	693.1	678.5	680.0	607.8	2	8.7	515.9	2	1.8
JHO-18-2	316.7	543.6	618.5	474.2	529.0	496.4	10		461.7	10	
PLP-23	371.2	678.5	677.1	574.4	453.2	550.9	7		487.4	7	
HFO-716	412.2	619.2	665.1	590.4	715.9	600.6	3	7.4	509.8	3	0.6
JO-06-308	402.4	562.2	767.8	439.8	500.2	534.5	8		498.9	6	
RO-11-1-4	358.3	704.4	611.8	575.2	631.7	576.3	4	0.2	500.4	5	
RO-11-1-5	334.2	497.7	570.5	501.7	505.5	481.9	11		453.9	11	
UPO-212 (NC)	273.2	614.8	663.8	540.6	478.4	514.1	9		463.3	9	
RO-19 (NC)	437.5	584.8	711.8	440.5	622.0	559.3	5		506.6	4	
Mean	369.5	616.8	658.3	539.4	583.5	553.5			492.4		
CD at 5%	22.7	112.7	146.3	74.7	150.4						
CV%	13.6	10.7	13.0	8.1	15.0						

Table 7.2: 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	His-ar	Ludh-iana	Pant-nagar	*Jal-ore	Aver-age	Ra-nk	Superi-osity%
OL-1895	46.5	62.5	67.4	58.8	11	163.0	173.5	119.6	31.1	152.0	10	
HFO-707	43.7	71.8	71.3	62.3	10	212.3	217.1	109.3	34.2	179.6	1	8.7
OL-1882	49.6	86.2	58.0	64.6	9	140.1	183.2	133.6	29.7	152.3	9	
JHO-18-2	47.4	69.2	105.7	74.1	4	197.0	188.2	111.2	28.9	165.5	3	0.1
PLP-23	51.8	88.5	72.3	70.8	6	178.9	220.7	95.5	20.9	165.0	5	
HFO-716	56.0	73.0	72.6	67.2	8	173.3	200.5	85.8	30.8	153.2	8	
JO-06-308	51.3	81.0	72.7	68.3	7	207.1	187.1	124.8	23.6	173.0	2	4.7
RO-11-1-4	52.1	81.7	107.5	80.4	2	170.3	180.4	84.1	23.6	144.9	11	
RO-11-1-5	58.5	71.2	100.5	76.7	3	191.8	187.5	89.3	26.0	156.2	6	
UPO-212 (NC)	55.3	63.1	134.2	84.2	1	166.3	205.9	123.5	36.6	165.2	4	
RO-19 (NC)	49.8	74.7	90.1	71.5	5	182.5	195.1	90.0	27.9	155.9	7	
Mean	51.1	74.8	86.6	70.8		180.2	194.5	106.1	28.5	160.3		
CD at 5%	NS	3.2	14.6			NS	31.2	8.6	NA			
CV%	18.2	6.7	9.8			13.9	10.3	7.1	21.3			

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

Table 7.2: IVTO (MC): Initial Varietal Trial in Oat (Multi cut): Dry Matter Yield (q/ha)

Entries	North East Zone							Average	Rank	Superiority%
	Faizabad	Jorhat	Bhubaneswar	Imphal	Pusa	Ranchi				
OL-1895	61.0	44.0	64.1	43.5	65.7	72.2	58.4	11	3.0	
HFO-707	95.6	71.2	68.1	46.5	71.7	69.4	70.4	1		
OL-1882	74.5	52.5	78.3	48.4	83.7	65.1	67.1	5		
JHO-18-2	78.9	57.3	55.0	46.1	70.0	65.2	62.1	9	0.8	
PLP-23	73.9	55.6	45.9	47.7	89.0	61.4	62.3	8		
HFO-716	71.1	72.7	71.9	47.2	86.7	63.9	68.9	3		
JO-06-308	78.5	64.7	64.7	53.1	82.3	70.4	69.0	2	0.8	
RO-11-1-4	66.3	52.7	80.1	43.6	86.7	61.8	65.2	6	0.8	
RO-11-1-5	74.2	57.4	60.2	43.9	85.2	68.6	64.9	7		
UPO-212 (NC)	71.6	51.2	49.1	49.4	72.3	64.3	59.7	10		
RO-19 (NC)	83.3	53.3	86.5	44.8	75.3	67.2	68.4	4	0.8	
Mean	75.4	57.5	65.8	46.8	79.0	66.3	65.1			
CD at 5%	12.1	2.6	0.5	2.9	1.9	NS				
CV%	9.5	6.2	5.4	3.6	2.5	6.7				

Table 7.2: IVTO (MC): Initial Varietal Trial in Oat (Multi cut): Dry Matter Yield (q/ha)

Entries	Central Zone							All India			
	Jha-nsi	Ana-nd	Jabal-pur	Rah-uri	Urulikan-chan	Aver-age	Ra-nk	Superi-osity%	Aver-age	Ra-nk	Superi-osity%
OL-1895	73.3	93.8	129.8	105.2	111.0	102.6	8	8.1	88.0	11	6.1
HFO-707	84.7	91.9	149.2	135.9	122.1	116.8	2		101.9	1	
OL-1882	64.8	94.3	150.8	138.5	104.3	110.5	3		94.5	6	
JHO-18-2	58.2	80.5	132.9	93.3	106.4	94.3	10	2.0	91.9	9	5.0
PLP-23	83.4	96.2	148.4	108.7	83.6	104.1	6		94.2	7	
HFO-716	109.6	89.4	144.7	127.7	168.5	128.0	1		100.9	2	
JO-06-308	87.1	84.1	169.5	91.1	81.5	102.7	7	2.0	97.1	3	1.1
RO-11-1-4	78.3	103.7	133.0	117.0	118.8	110.2	4		95.2	5	
RO-11-1-5	73.0	76.6	123.0	102.7	75.0	90.1	11		90.5	10	
UPO-212 (NC)	45.2	93.2	145.5	110.1	83.7	95.5	9	2.0	93.2	8	1.1
RO-19 (NC)	89.2	90.3	155.6	99.4	105.5	108.0	5		96.0	4	
Mean	77.0	90.4	143.9	111.8	105.5	105.7			94.8		
CD at 5%	16.5	NS	33.3	15.4	28.1						
CV%	9.9	11.5	13.6	8.1	15.5						

Table 7.3: IVTO (MC): Initial Varietal Trial in Oat (Multi cut): Green Forage Yield (q/ha/day)

Entries	Hisar	Ludhiana	Pantnagar	Faizabad	Bhubaneswar	Pusa	Ranchi	Anand	Rahuri	Average	Rank
OL-1895	8.44	6.62	7.02	2.52	3.83	4.50	4.37	5.37	4.68	5.26	5
HFO-707	8.31	8.06	6.91	3.85	4.29	4.50	3.82	5.61	6.13	5.72	1
OL-1882	7.16	6.90	7.29	3.18	4.93	4.30	3.88	5.43	6.78	5.54	2
JHO-18-2	7.57	6.77	6.66	3.22	3.21	4.50	3.90	4.65	4.79	5.03	9
PLP-23	6.83	7.70	6.33	3.14	2.79	4.40	4.11	5.65	5.63	5.18	7
HFO-716	7.86	7.28	5.68	3.13	4.20	4.40	3.47	4.95	5.66	5.18	7
JO-06-308	8.02	7.14	7.25	3.29	3.81	4.40	3.96	4.89	4.44	5.24	6
RO-11-1-4	8.67	6.57	6.21	2.84	4.96	4.20	3.41	6.07	5.50	5.38	3
RO-11-1-5	7.41	6.98	6.14	3.01	3.62	3.90	3.92	4.15	4.95	4.90	10
UPO-212 (NC)	6.48	7.34	7.09	3.13	2.90	4.20	3.92	5.04	5.59	5.08	8
RO-19 (NC)	8.69	6.93	6.48	3.37	5.04	4.40	3.79	4.75	4.24	5.30	4
Mean	7.77	7.12	6.64	3.15	3.96	4.34	3.87	5.14	5.31	5.26	

Table 7.4: IVTO (MC): Initial Varietal Trial in Oat (Multi cut): Dry Matter Yield (q/ha/day)

Entries	Hisar	Ludhiana	Pantnagar	Faizabad	Bhubaneswar	Pusa	Ranchi	Anand	Rahuri	Average	Rank
OL-1895	1.18	1.42	0.98	0.55	0.79	0.74	0.68	0.74	1.00	0.90	7
HFO-707	1.54	1.78	0.89	0.88	0.84	0.86	0.61	0.74	1.33	1.05	1
OL-1882	1.02	1.50	1.09	0.68	1.00	0.93	0.62	0.84	1.38	1.01	2
JHO-18-2	1.43	1.54	0.91	0.72	0.68	0.83	0.63	0.69	0.94	0.93	5
PLP-23	1.30	1.81	0.78	0.69	0.58	0.99	0.57	0.80	1.07	0.95	4
HFO-716	1.25	1.64	0.69	0.65	0.91	1.02	0.56	0.72	1.22	0.96	3
JO-06-308	1.50	1.53	1.02	0.74	0.83	0.76	0.64	0.73	0.92	0.96	3
RO-11-1-4	1.23	1.48	0.71	0.62	1.01	0.94	0.52	0.89	1.12	0.95	4
RO-11-1-5	1.39	1.54	0.74	0.69	0.78	0.84	0.66	0.64	1.01	0.92	6
UPO-212 (NC)	1.20	1.69	1.04	0.65	0.65	0.83	0.62	0.76	1.14	0.95	4
RO-19 (NC)	1.32	1.60	0.75	0.79	1.08	0.86	0.56	0.73	0.96	0.96	3
Mean	1.31	1.59	0.87	0.70	0.83	0.87	0.61	0.75	1.10	0.96	

Table 7.5: 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	Ran-chi	Ana-nd	Jabal-pur	Rah-uri	Urulikan-chan	Aver-age	Ra-nk	Superi-osity%
OL-1895	3.9	13.6	21.0	4.6	2.5	5.3	4.3	4.7	12.8	10.1	6.2	9.2	8.2	9	
HFO-707	4.1	16.7	32.3	7.8	3.8	6.0	4.9	4.9	11.7	12.1	8.9	11.4	10.4	1	5.7
OL-1882	4.6	11.0	27.5	6.0	2.8	6.6	4.6	4.7	11.4	12.1	8.5	9.3	9.1	6	
JHO-18-2	4.1	16.8	31.8	6.5	3.1	4.5	4.3	5.0	10.5	10.5	6.5	9.8	9.5	5	
PLP-23	4.8	14.6	37.1	5.9	2.8	3.8	4.4	5.4	13.6	11.9	9.3	7.8	10.1	2	3.0
HFO-716	5.4	13.3	29.9	5.5	3.7	5.7	4.5	4.2	11.7	11.7	7.5	13.7	9.7	4	
JO-06-308	5.4	15.4	30.7	6.2	3.3	5.1	4.7	5.4	10.4	13.7	6.4	7.0	9.5	5	
RO-11-1-4	5.2	13.9	29.9	5.0	2.7	6.7	3.8	5.7	14.1	10.9	10.2	9.6	9.8	3	
RO-11-1-5	5.3	15.4	24.0	5.8	2.7	4.8	4.0	5.9	9.5	9.6	7.9	6.5	8.4	8	
UPO-212 (NC)	5.1	13.9	27.2	5.6	2.9	3.8	4.5	4.8	12.1	11.5	8.0	7.1	8.9	7	
RO-19 (NC)	5.0	15.2	33.0	6.8	2.8	6.9	4.2	4.3	12.0	12.5	5.7	9.4	9.8	3	
Mean	4.8	14.5	29.5	6.0	3.0	5.4	4.4	5.0	11.8	11.5	7.7	9.2	9.4		

Table 7.6: 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	Ran-chi	Ana-nd	Jabal-pur	Rah-uri	Urulikan-chan	Aver-age	Ra-nk
OL-1895	8.5	8.3	12.1	7.6	10.5	8.3	9.8	6.6	13.7	7.8	5.9	8.3	8.9	9
HFO-707	9.3	7.9	14.9	8.8	11.0	8.8	10.6	7.0	12.7	8.1	6.6	9.3	9.6	4
OL-1882	9.3	7.9	15.0	8.0	11.1	8.4	9.5	7.2	12.2	8.0	6.1	8.9	9.3	7
JHO-18-2	8.8	8.5	16.9	8.2	11.1	8.1	9.4	7.7	13.1	7.9	7.0	9.2	9.7	3
PLP-23	9.3	8.2	16.8	8.0	10.0	8.2	9.3	8.8	14.1	8.0	8.5	9.3	9.9	1
HFO-716	9.6	7.7	14.9	7.7	10.2	7.9	9.6	6.6	13.1	8.1	5.9	8.1	9.1	8
JO-06-308	10.5	7.4	16.4	7.9	10.4	7.9	8.9	7.7	12.4	8.1	7.0	8.5	9.4	6
RO-11-1-4	9.9	7.6	16.6	7.6	10.5	8.4	8.8	9.2	13.6	8.2	8.8	8.1	9.8	2
RO-11-1-5	9.0	8.0	12.8	7.8	9.6	8.0	9.2	8.5	12.4	7.8	7.7	8.7	9.1	8
UPO-212 (NC)	9.3	8.3	13.2	7.8	11.5	7.7	9.1	7.4	13.1	7.9	7.2	8.5	9.3	7
RO-19 (NC)	9.9	8.3	16.9	8.2	10.6	8.0	9.4	6.3	13.3	8.0	5.7	9.0	9.5	5
Mean	9.4	8.0	15.1	8.0	10.6	8.2	9.4	7.5	13.1	8.0	6.9	8.7	9.4	

Table 7.7: IVTO (MC): Initial Varietal Trial in Oat (Multi cut): Plant Height (cm)

Contd...

Entries	Palampur	Srinagar	Hisar	Jalore	Ludhiana	Pantnagar	Faizabad	Jorhat	Bhubaneswar
OL-1895	75.0	114.3	171.8	70.0	122.5	125.0	122.8	72.5	106.2
HFO-707	79.0	120.0	164.9	69.7	125.5	136.7	136.8	86.8	117.1
OL-1882	75.3	116.0	178.4	63.0	139.2	126.0	135.2	76.0	119.2
JHO-18-2	63.3	108.8	147.3	70.2	154.9	100.7	126.0	65.2	98.3
PLP-23	70.0	111.3	158.4	62.0	124.5	98.7	108.2	67.2	94.4
HFO-716	72.3	114.7	171.1	66.5	132.4	113.3	108.9	96.2	108.4
JO-06-308	76.3	121.2	167.4	60.2	144.7	128.0	109.6	83.4	105.4
RO-11-1-4	77.0	110.1	147.4	57.5	132.2	118.7	126.4	63.1	124.5
RO-11-1-5	72.7	99.2	150.0	62.3	134.8	111.7	141.6	68.1	103.2
UPO-212 (NC)	72.0	117.7	185.5	70.5	124.0	120.0	109.0	71.4	89.7
RO-19 (NC)	79.7	121.4	166.2	62.3	134.3	122.7	137.0	71.9	127.7
Mean	73.9	114.1	164.4	64.9	133.5	118.3	123.8	74.7	108.5

Table 7.7: IVTO (MC): Initial Varietal Trial in Oat (Multi cut): Plant Height (cm)

Entries	Imphal	Pusa	Ranchi	Jhansi	Anand	Jabalpur	Rahuri	Urulikanchan	Average	Rank
OL-1895	102.7	113.3	111.6	89.0	118.0	56.4	81.2	91.7	102.6	6
HFO-707	97.3	127.7	121.7	109.4	117.0	75.2	78.8	91.9	109.1	1
OL-1882	98.1	111.0	99.0	89.6	115.1	79.6	80.8	85.8	105.1	3
JHO-18-2	84.9	103.7	92.7	78.0	104.8	62.7	71.5	80.3	94.9	11
PLP-23	86.8	107.7	103.3	99.9	104.1	68.0	83.2	81.7	95.8	10
HFO-716	96.7	112.7	104.5	108.4	110.8	76.2	82.0	93.7	104.0	4
JO-06-308	92.3	108.3	116.7	87.9	108.8	75.9	77.1	84.7	102.8	5
RO-11-1-4	93.9	112.7	104.6	81.8	110.2	63.4	75.3	85.3	99.1	8
RO-11-1-5	86.9	110.3	120.9	77.8	104.7	53.1	70.7	76.9	96.8	9
UPO-212 (NC)	95.4	112.0	127.4	82.7	108.3	65.5	76.3	71.1	99.9	7
RO-19 (NC)	98.5	113.7	125.4	97.2	114.6	68.4	71.8	92.7	106.2	2
Mean	94.0	112.1	111.6	91.1	110.6	67.7	77.1	85.1	101.5	

Table 7.8: IVTO (MC): Initial Varietal Trial in Oat (Multi cut): Leaf Stem Ratio

Entries	Palam-pur	Sri-nagar	His-ar	Ludh-iana	Pant-nagar	Faiza-bad	Jor-hat	Bhuban-eswar	Imp-hal	Pu-sa	Ran-chi	Ana-nd	Jabal-pur	Rah-uri	Urulikan-chan	Aver-age	Ran-k
OL-1895	0.49	0.29	0.57	1.50	0.54	0.69	1.13	1.02	1.34	0.33	0.30	1.44	0.72	1.10	0.70	0.81	5
HFO-707	0.48	0.37	0.57	1.40	0.59	0.70	1.48	1.25	0.98	0.33	0.28	1.08	0.99	0.96	0.75	0.81	5
OL-1882	0.56	0.39	0.58	1.30	0.54	0.76	1.41	1.43	0.97	0.30	0.28	1.27	0.87	1.08	0.90	0.84	4
JHO-18-2	0.49	0.30	0.29	1.10	0.67	0.74	1.29	1.18	1.02	0.32	0.26	1.08	0.79	1.38	0.89	0.79	6
PLP-23	0.49	0.42	0.43	1.20	0.71	0.66	1.54	0.97	1.85	0.32	0.41	1.22	0.84	1.59	0.80	0.90	1
HFO-716	0.65	0.39	0.56	0.90	0.58	0.65	1.19	1.20	1.06	0.32	0.24	1.17	0.93	0.89	0.71	0.76	8
JO-06-308	0.59	0.30	0.43	1.40	0.57	0.72	1.59	1.14	1.45	0.32	0.24	1.04	0.96	1.33	0.73	0.85	3
RO-11-1-4	0.37	0.31	0.47	0.75	0.60	0.77	1.47	1.38	0.74	0.29	0.32	1.38	0.80	0.85	0.60	0.74	10
RO-11-1-5	0.40	0.33	0.34	1.22	0.57	0.72	1.48	1.08	1.20	0.27	0.22	1.27	0.68	1.02	0.74	0.77	7
UPO-212 (NC)	0.53	0.28	0.45	1.20	0.53	0.75	1.18	0.94	2.12	0.29	0.25	1.22	0.87	1.70	0.64	0.86	2
RO-19 (NC)	0.43	0.29	0.58	1.00	0.54	0.75	0.78	1.35	1.13	0.32	0.35	0.96	0.86	1.19	0.70	0.75	9
Mean	0.50	0.33	0.48	1.18	0.59	0.72	1.32	1.18	1.26	0.31	0.29	1.19	0.85	1.19	0.74	0.81	

Table 7.9: IVTO (MC): Initial Varietal Trial in Oat (Multi cut): NDF (%), ADF (%), & IVDMD (%)

Entries	NDF (%)		ADF (%)		IVDMD (%)	
	Ludhiana	Rank	Ludhiana	Rank	Ludhiana	Rank
OL-1895	53.8	9	34.9	10	61.9	9
HFO-707	53.1	8	33.1	7	62.4	8
OL-1882	52.4	6	32.3	4	63.7	3
JHO-18-2	50.1	3	30.7	1	64.1	2
PLP-23	50.7	4	31.7	3	63.6	4
HFO-716	53.0	7	34.6	9	62.4	8
JO-06-308	51.2	5	32.6	6	63.1	6
RO-11-1-4	49.9	2	32.4	5	63.4	5
RO-11-1-5	54.7	11	35.1	11	60.9	10
UPO-212 (NC)	54.2	10	34.1	8	62.6	7
RO-19 (NC)	49.4	1	31.3	2	64.7	1
Mean	52.0		33.0		63.0	

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

Entries	Hill Zone					North West Zone						
	Palampur	Srinagar	Almora	Average	Rank	Hisar	Ludhiana	Pantnagar	*Jalore	Average	Rank	Superiority%
HFO-514	316.6	254.5	327.9	299.7	3	941.9	684.7	551.4	233.4	726.0	3	5.4
OL-1874	323.5	232.6	259.8	272.0	6	924.2	701.5	705.6	181.2	777.1	1	
PLP-21	329.7	269.9	282.9	294.2	4	889.0	634.6	633.3	161.7	719.0	4	
JO-05-304	322.4	282.0	307.2	303.9	2	863.1	578.8	541.7	200.7	661.2	6	
UPO-212 (NC)	326.1	259.1	379.0	321.4	1	833.8	653.5	630.6	227.8	706.0	5	
RO-19 (NC)	280.4	259.0	301.9	280.4	5	894.7	662.0	655.6	242.6	737.4	2	
Mean	316.4	259.5	309.8	295.3		891.1	652.5	619.7	207.9	721.1		
CD at 5%	NS	23.7	59.6			NS	50.1	117.2	NA			
CV%	10.5	7.8	12.7			8.3	9.2	11.4	20.2			

Note: * Not included in zonal and all India average due to CV>20 and also low yield

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

Entries	North East Zone								Central Zone							All India			
	Ran-chi	Pu-sa	Faiza-bad	Jor-hat	Bhuban-eswar	Imp-hal	Aver-age	Ran-ck	Jha-nsi	Ana-nd	Jabal-pur	Rah-uri	Urulikan-chan	Aver-age	Ran-ck	Superi-ority%	Aver-age	Ran-ck	
HFO-514	547.7	266.0	396.8	388.4	367.0	304.4	378.4	3	406.8	473.9	621.0	705.9	424.5	526.4	4	1.3	469.4	3	
OL-1874	566.3	301.0	399.7	350.4	378.5	314.7	385.1	2	419.0	470.6	709.0	721.9	357.4	535.6	2		478.6	2	
PLP-21	555.7	391.0	312.6	299.0	296.5	297.2	358.7	4	388.5	392.8	688.0	664.5	375.9	501.9	5		453.0	6	
JO-05-304	522.3	296.0	282.6	370.1	334.0	277.0	347.0	6	468.5	353.6	806.0	700.8	466.5	559.1	1		5.8	457.2	5
UPO-212 (NC)	493.7	326.0	396.8	319.9	311.0	301.6	358.2	5	420.3	417.8	763.0	659.0	371.8	526.4	4		462.5	4	
RO-19 (NC)	543.3	411.0	376.9	415.4	427.5	312.4	414.4	1	434.8	409.2	613.0	799.9	385.6	528.5	3		481.3	1	
Mean	538.2	331.8	360.9	357.2	352.4	301.2	373.6		423.0	419.7	700.0	708.7	396.9	529.6			467.0		
CD at 5%	46.3	5.4	78.2	10.1	2.4	18.5			17.9	78.9	143.1	109.4	64.2						
CV%	5.3	1.6	14.4	14.5	4.5	4.1			11.9	12.5	13.9	10.2	10.6						

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

Entries	Hill Zone					North West Zone						
	Palampur	Srinagar	Almora	Average	Rank	Hisar	Jalore	Ludhiana	Pantnagar	Average	Rank	Superiority%
HFO-514	59.2	63.8	43.7	55.5	4	184.2	50.8	167.8	85.3	122.0	1	1.3
OL-1874	57.4	58.1	34.6	50.1	6	168.6	39.4	169.8	99.7	119.4	4	
PLP-21	73.4	67.5	37.7	59.5	2	177.7	34.4	151.0	82.4	111.4	5	
JO-05-304	60.0	68.6	49.1	59.3	3	149.2	43.6	139.5	78.7	102.8	6	
UPO-212 (NC)	64.5	66.0	60.6	63.7	1	174.9	50.7	153.6	102.7	120.5	2	
RO-19 (NC)	51.5	64.7	40.3	52.1	5	168.4	51.0	156.9	101.9	119.5	3	
Mean	61.0	64.8	44.4	56.7		170.5	45.0	156.4	91.8	115.9		
CD at 5%	NS	2.4	8.4			NS	NA	21.1	7.9			
CV%	6.6	5.6	12.5			13.0	19.9	8.5	6.1			

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

Entries	North East Zone								Central Zone								All India		
	Ran-chi	Pu-sa	Faiza-bad	Jor-hat	Bhuban-eswar	Imp-hal	Aver-age	Ra-nk	Jha-nsi	Ana-nd	Jabal-pur	Rah-uri	Urulikan-chan	Aver-age	Ra-nk	Super-iority%	Aver-age	Ra-nk	Super-iority%
HFO-514	95.0	53.7	85.3	72.8	79.0	39.9	70.9	2	76.0	85.9	129.2	162.0	71.4	104.9	3	3.6	89.2	1	0.9
OL-1874	85.0	63.7	89.9	62.4	81.1	43.2	70.9	2	80.8	81.9	150.1	160.8	59.0	106.5	2	5.2	88.1	4	
PLP-21	88.6	81.7	68.7	55.9	62.2	40.5	66.3	5	66.2	63.5	149.3	118.4	70.3	93.5	6		82.7	6	
JO-05-304	103.3	62.7	59.4	60.0	73.2	46.6	67.5	4	83.4	64.7	174.4	136.5	86.5	109.1	1	7.8	85.5	5	
UPO-212 (NC)	83.3	68.7	91.2	52.0	67.2	47.0	68.2	3	69.9	70.1	162.1	130.9	73.3	101.3	4		88.3	3	
RO-19 (NC)	79.5	85.7	82.9	74.0	91.9	42.5	76.1	1	77.7	76.7	128.7	139.0	77.7	99.9	5		88.4	2	
Mean	89.1	69.3	79.6	62.9	75.8	43.3	70.0		75.7	73.8	149.0	141.3	73.0	102.5			87.0		
CD at 5%	5.5	2.2	19.7	3.9	0.5	2.6			13.4	NS	30.1	20.9	12.6						
CV%	6.1	3.1	16.4	13.5	4.2	4.0			8.9	14.9	13.7	9.8	11.3						

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

Entries	Hisar	Ludhiana	Pantnagar	Ranchi	Pusa	Faizabad	Bhubaneswar	Anand	Rahuri	Urulikanchan	Average	Rank
HFO-514	6.88	5.23	4.48	4.91	4.77	3.57	4.59	3.98	6.55	4.04	4.90	3
OL-1874	6.75	5.35	5.74	4.91	4.81	3.73	4.75	3.92	6.78	3.40	5.01	1
PLP-21	6.48	4.84	5.19	4.94	4.87	2.89	3.71	3.57	6.39	3.58	4.65	5
JO-05-304	6.30	4.42	4.37	4.71	4.80	2.56	4.23	2.97	6.63	4.44	4.54	6
UPO-212 (NC)	6.05	4.99	5.25	4.65	4.83	3.74	3.90	3.54	6.69	3.54	4.72	4
RO-19 (NC)	6.53	5.05	5.32	4.64	4.88	3.45	5.46	3.30	7.65	3.67	5.00	2
Mean	6.50	4.98	5.06	4.79	4.83	3.32	4.44	3.55	6.78	3.78	4.80	

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

Entries	Hisar	Ludhiana	Pantnagar	Ranchi	Pusa	Faizabad	Bhubaneswar	Anand	Rahuri	Urulikanchan	Average	Rank
HFO-514	1.35	1.28	0.69	0.85	0.58	0.76	0.99	0.72	1.50	0.68	0.94	2
OL-1874	1.23	1.30	0.81	0.74	0.70	0.83	1.02	0.68	1.51	0.56	0.94	2
PLP-21	1.30	1.15	0.67	0.79	0.88	0.63	0.78	0.58	1.14	0.67	0.86	4
JO-05-304	1.08	1.06	0.63	0.93	0.72	0.53	0.93	0.54	1.29	0.82	0.85	5
UPO-212 (NC)	1.30	1.17	0.86	0.78	0.75	0.86	0.84	0.59	1.33	0.70	0.92	3
RO-19 (NC)	1.25	1.20	0.83	0.68	1.00	0.76	1.17	0.62	1.33	0.74	0.96	1
Mean	1.25	1.19	0.75	0.80	0.77	0.73	0.95	0.62	1.35	0.70	0.91	

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

Entries	Palam-pur	His-ar	Ludh-iana	Pant-nagar	Ran-chi	Faiza-bad	Jor-hat	Bhuban-eswar	Imp-hal	Ana-nd	Jabal-pur	Rah-uri	Urulikan-chan	Aver-age	Ra-nk
HFO-514	5.4	14.6	21.5	9.0	6.7	7.0	3.8	6.5	3.8	12.3	10.2	8.2	6.4	8.9	4
OL-1874	5.5	14.4	26.7	10.5	6.3	7.7	3.2	6.7	3.5	10.3	12.1	8.4	5.5	9.3	2
PLP-21	7.9	13.8	22.2	7.9	8.2	5.4	3.2	5.2	3.3	9.6	12.2	10.9	6.8	9.0	3
JO-05-304	5.8	11.9	23.2	7.6	8.0	4.5	3.2	5.9	3.6	8.3	14.2	7.5	7.6	8.5	6
UPO-212 (NC)	6.0	14.8	24.7	11.7	7.3	8.0	2.6	5.5	4.7	9.2	13.1	11.4	6.8	9.7	1
RO-19 (NC)	5.1	13.9	19.8	10.7	6.6	6.6	3.9	7.6	3.7	9.3	10.2	10.3	6.9	8.8	5
Mean	5.9	13.9	23.0	9.5	7.2	6.5	3.3	6.2	3.8	9.8	12.0	9.5	6.6	9.0	

Table 8.6: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): Crude Protein (%)

Entries	Palam-pur	His-ar	Ludh-iana	Pant-nagar	Ran-chi	Faiza-bad	Jor-hat	Bhuban-eswar	Imp-hal	Ana-nd	Rah-uri	Urulikan-cha	Jabal-pur	Aver-age	Ra-nk
HFO-514	9.0	7.9	12.8	10.5	7.0	8.2	10.4	8.2	9.5	14.3	5.0	8.9	8.1	9.2	5
OL-1874	9.8	8.5	15.7	10.5	7.4	8.6	10.3	8.2	8.2	12.6	5.3	9.3	8.3	9.4	3
PLP-21	10.5	7.8	14.7	9.6	9.2	7.8	11.4	8.4	8.1	15.2	9.2	9.7	8.3	10.0	2
JO-05-304	9.4	8.0	16.6	9.6	7.7	7.6	11.0	8.0	7.7	12.9	5.5	8.8	8.4	9.3	4
UPO-212 (NC)	9.6	8.5	16.1	11.4	8.8	8.8	10.3	8.1	10.1	13.2	8.8	9.3	8.3	10.1	1
RO-19 (NC)	9.8	8.2	12.6	10.5	8.3	8.0	10.8	8.2	8.6	12.1	7.4	8.8	8.1	9.4	3
Mean	9.7	8.2	14.8	10.4	8.1	8.2	10.7	8.2	8.7	13.4	6.9	9.1	8.2	9.6	

Table 8.7: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): Plant Height (cm)

Entries	Palam-pur	Sri-nagar	His-ar	Jal-ore	Ludh-iana	Pant-nagar	Ran-chi	Pu-sa	Faiza-bad	Jor-hat	Bhuban-eswar	Imp-hal	Jha-nsi	Ana-nd	Jabal-pur	Rah-uri	Urulikan-cha	Aver-age	Ra-nk
HFO-514	78.9	101.4	161.4	75.5	123.0	117.7	73.0	86.3	145.0	96.0	119.1	96.7	56.6	102.9	61.2	91.8	75.5	97.8	2
OL-1874	78.1	104.4	151.4	63.6	126.5	122.0	75.1	89.0	128.0	108.8	121.9	97.9	46.2	106.5	69.1	85.4	76.6	97.1	3
PLP-21	75.8	100.6	139.4	61.1	117.2	115.7	74.1	87.3	106.4	97.5	107.2	96.0	46.2	126.3	71.7	80.9	71.5	92.6	6
JO-05-304	80.0	98.2	135.4	76.5	115.9	110.7	72.1	90.7	120.2	94.7	115.4	96.5	47.8	99.9	85.1	89.3	71.0	94.1	5
UPO-212 (NC)	77.9	102.1	150.1	69.8	120.0	114.0	69.0	94.0	129.4	102.1	109.3	94.0	47.8	99.5	76.6	83.9	71.9	94.8	4
RO-19 (NC)	75.8	106.0	150.6	75.4	121.5	110.3	74.0	96.0	154.2	118.3	123.6	97.4	56.6	103.9	61.6	89.5	75.1	99.4	1
Mean	77.8	102.1	148.1	70.3	120.7	115.1	72.8	90.6	130.5	102.9	116.1	96.4	50.2	106.5	70.9	86.8	73.6	96.0	

Table 8.8: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): Leaf Stem Ratio

Entries	Palam-pur	Sri-nagar	His-ar	Ludh-iana	Pant-nagar	Ran-chi	Pu-sa	Faiza-bad	Jor-hat	Bhuban-eswar	Imp-hal	Ana-nd	Jabal-pur	Rah-uri	Urulikan-ghan	Aver-age	Ran-k
HFO-514	0.53	0.29	0.63	1.28	0.63	0.28	0.47	0.75	0.75	1.27	1.02	1.56	0.71	1.11	0.63	0.79	3
OL-1874	0.57	0.33	0.54	1.30	0.67	0.31	0.48	0.69	0.74	1.29	1.02	1.56	0.84	0.84	0.66	0.79	3
PLP-21	0.55	0.31	0.43	1.18	0.57	0.35	0.50	0.74	0.75	1.08	1.15	1.78	0.82	1.29	0.79	0.82	2
JO-05-304	0.49	0.28	0.51	0.90	0.67	0.26	0.45	0.70	1.05	1.21	1.14	1.50	0.92	1.62	0.72	0.83	1
UPO-212 (NC)	0.37	0.32	0.41	1.18	0.51	0.22	0.47	0.72	1.05	1.17	1.14	1.70	0.90	1.56	0.64	0.82	2
RO-19 (NC)	0.41	0.28	0.53	0.98	0.61	0.32	0.47	0.68	0.74	1.34	1.06	1.44	0.71	1.14	0.67	0.76	4
Mean	0.49	0.30	0.51	1.14	0.61	0.29	0.47	0.71	0.85	1.23	1.09	1.59	0.82	1.26	0.69	0.80	

Table 8.9: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): NDF (%), ADF (%) & IVDMD (%)

Entries	NDF (%)							ADF (%)							IVDMD (%)			
	Ana-nd	Pant-nagar	Rah-uri	Ludh-iana	Palam-pur	Aver-age	Ran-k	Ana-nd	Pant-nagar	Rah-uri	Ludh-iana	Palam-pur	Aver-age	Ran-k	Rah-uri	Ludh-iana	Aver-age	Ran-k
HFO-514	70.2	64.6	62.1	48.1	65.6	62.1	4	35.3	56.6	37.6	26.6	56.2	42.5	3	59.6	63.1	61.4	1
OL-1874	71.2	63.8	61.6	46.9	63.4	61.4	2	34.8	58.2	37.1	24.1	54.2	41.7	1	59.6	62.8	61.2	2
PLP-21	68.3	69.6	67.8	46.8	65.0	63.5	6	33.3	56.6	43.3	25.1	53.8	42.4	2	55.4	63.1	59.3	3
JO-05-304	66.5	65.0	70.1	45.5	63.8	62.2	5	32.0	55.8	46.7	23.1	54.6	42.4	2	53.4	64.3	58.9	4
UPO-212 (NC)	67.8	65.4	62.8	46.2	64.2	61.3	1	38.7	56.0	38.3	23.9	57.4	42.9	4	58.6	63.8	61.2	2
RO-19 (NC)	64.5	63.6	69.2	47.3	65.2	62.0	3	37.8	57.4	47.3	26.2	56.0	44.9	5	50.8	62.9	56.9	5
Mean	68.1	65.3	65.6	46.8	64.5	62.1		35.3	56.8	41.7	24.8	55.4	42.8		56.2	63.3	59.8	

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

(Reference tables 9.1 to 9.10)

An **Initial Varietal Trial in Oat (Dual) [IVTO (DUAL)]** comprising of eight entries along with two national checks (UPO-212 and JHO-822) was conducted at 14 centers located at three zones (NW, NE and central zones).

For GFY, entries RO-11-2-6 (82.8%), RO-11-2-2 (63.6%), OL-1766-2 (60.2%), OL-1874-2 (42.6%), JO-11-507 (29.5%), HFO-816 (10.8%) in NWZ; entries OL-1874-2 (21.6%), HFO-816 (11.7%) in NE zone; entries JHO-18-3 (17.8%), RO-11-2-6 (15.2%), OL-1874-2 (11.0%) in CZ and, entries RO-11-2-6 (20.6%), OL-1874-2 (19.8%), OL-1766-2 (9.6%), HFO-816 (9.3%), JHO-18-3 (6.4%) at all India level exhibited superiority. Other entries were either at par, marginally superior or inferior to the best check.

For DMY, entries RO-11-2-6 (69.5%), RO-11-2-2 (63.7%), OL-1766-2 (60.7%), OL-1874-2 (54.3%), JO-11-507 (34.7%), HFO-816 (21.8%) in NWZ; entries OL-1874-2 (26.6%), HFO-816 (14.8%), RO-11-2-6 (8.0%), RO-11-2-2 (5.4%) in NE zone; entries JHO-18-3 (17.9%), RO-11-2-6 (14.1%) in CZ were superior to best check. At all India level, RO-11-2-6 (18.1%), OL-1874-2 (17.1%), HFO-816 (6.7%), OL-1766-2 (6.3%) exhibited superiority over the best check.

For quality parameters, entry OL-1874-2 (27.4%), RO-11-2-2 (20.5%), RO-11-2-6 (20.5%) showed higher superiority for crude protein yield as compared to best check. Entries OL-1874-2, JHO-18-3 and national check UPO-212 ranked joint first with 10.2 % CP. For ADF%, NDF% and IVDMD (%) entry HFO-810 ranked first. For plant height entry OL-1766-2 ranked first whereas for leafiness entry HFO-810 was best.

For seed yield, entry HFO-810 ranked first with seed yield of 28.2q followed by check UPO-212 (27.3q/ha) in NW zone. In NE zone, OL-1874-2 (12.9q) followed by HFO-816 (12.5q) were better than the best check JHO-822 (12.4q/ha). In central zone RO-11-2-2 top ranked with 26.3 q followed by check UPO-212 (25.9q).

Table 9.1: IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Green Forage Yield (q/ha)

Entries	North West Zone							North East Zone						
	Ludh-iana	His-ar	Pant-nagar	**Bika-ner	Aver-age	Ra- nk	Superi- ority%	Jor- hat	Bhuban- eswar	Ran- chi	**Faiza- bad	Aver- age	Ra- nk	Superi- ority%
OL-1766-2	159.4	137.0	169.6	52.3	155.3	3	60.2	226.6	242.6	457.8	96.0	309.0	5	3.7
OL-1874-2	202.0	120.7	92.2	70.6	138.3	4	42.6	195.6	288.6	603.1	106.0	362.4	1	21.6
JHO-18-3	113.3	93.7	76.7	37.2	94.6	9		159.9	162.6	452.4	101.3	258.3	9	
HFO-816	134.6	113.7	74.1	53.1	107.5	6	10.8	179.1	263.9	555.5	101.3	332.9	2	11.7
HFO-810	86.1	96.3	56.7	42.7	79.7	10		150.5	254.6	428.4	88.00	277.9	8	
JO-11-507	145.6	105.5	125.6	39.7	125.6	5	29.5	205.8	214.6	510.7	104.0	310.4	3	4.2
RO-11-2-2	170.7	201.1	104.1	72.3	158.6	2	63.6	216.4	190.6	505.8	93.3	304.3	6	2.1
RO-11-2-6	143.5	181.9	206.3	33.0	177.2	1	82.8	131.3	267.3	532.0	90.7	310.2	4	4.1
JHO-822 (NC)	141.9	88.1	55.6	85.1	95.2	8		172.1	233.3	488.4	96.0	297.9	7	
UPO-212 (NC)	127.2	108.9	54.8	41.7	97.0	7		134.5	144.6	472.0	122.7	250.4	10	
Mean	142.4	124.7	101.6	52.8	122.9			177.2	226.3	500.6	101.2	301.4		
CD at 5%	41.3	32.6	32.8	15.3				5.5	2.1	41.2	17.1			
CV%	11.3	15.1	11.2	16.7				7.7	7.0	5.1	9.9			

Note: ** Not included in zonal & all India average due to low yield of data

Table 9.1: IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Green Forage Yield (q/ha)

Entries	Central Zone										All India		
	Jhansi	Rahuri	Urulikanchan	Anand	Jabalpur	Raipur	Average	Rank	Superiority		Average	Rank	Superiority
OL-1766-2	175.4	147.4	289.1	349.6	154.6	322.2	239.7	5	0.2		235.9	3	9.6
OL-1874-2	173.7	147.2	312.5	408.1	114.6	437.0	265.5	3	11.0		257.9	2	19.8
JHO-18-3	286.5	104.6	338.1	259.2	283.9	418.5	281.8	1	17.8		229.1	5	6.4
HFO-816	229.2	98.4	304.0	248.1	165.3	459.3	250.7	4	4.8		235.4	4	9.3
HFO-810	138.3	56.0	345.6	254.8	209.2	407.3	235.2	7			207.0	9	
JO-11-507	74.4	81.3	344.5	235.5	197.2	323.0	209.3	10			213.6	8	
RO-11-2-2	141.7	147.7	313.1	280.7	200.0	185.2	211.4	9			221.4	6	2.8
RO-11-2-6	161.9	171.5	339.2	274.0	240.0	466.7	275.5	2	15.2		259.6	1	20.6
JHO-822 (NC)	143.4	126.1	260.3	276.3	180.0	418.5	234.1	8			215.3	7	
UPO-212 (NC)	178.7	79.8	332.8	257.0	200.0	387.1	239.2	6			206.4	10	
Mean	170.3	116.0	317.9	284.3	194.5	382.5	244.2				228.2		
CD at 5%	18.1	22.2	NA	76.5	43.5	90.8							
CV%	10.6	11.1	17.4	15.7	13.0	13.9							

Table 9.2: IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Dry Matter Yield (q/ha)

Entries	North West Zone							North East Zone						
	Ludh-iana	His-ar	Pant-nagar	**Bika-ner	Aver-age	Ra-nk	Super-iority%	Jor-hat	Bhuban-eswar	Ran-chi	**Faiza-bad	Aver-age	Ra-nk	Super-iority%
OL-1766-2	35.7	26.5	20.4	7.7	27.5	3	60.7	41.0	48.8	83.0	17.7	57.6	6	2.2
OL-1874-2	45.7	22.5	11.1	10.4	26.4	4	54.3	37.6	60.2	116.1	21.8	71.3	1	26.6
JHO-18-3	26.5	17.5	8.4	6.7	17.5	7	2.1	30.4	36.8	81.4	19.7	49.5	9	
HFO-816	31.8	22.6	8.2	8.2	20.9	6	21.8	30.0	56.3	107.6	21.2	64.6	2	14.8
HFO-810	20.1	18.0	6.2	6.7	14.8	10		29.4	54.4	77.7	18.8	53.8	8	
JO-11-507	33.8	20.3	15.1	5.6	23.1	5	34.7	35.8	46.7	90.6	20.8	57.7	5	2.5
RO-11-2-2	36.0	38.7	9.4	10.0	28.0	2	63.7	41.0	37.8	99.3	17.2	59.3	4	5.4
RO-11-2-6	30.3	36.1	20.6	5.6	29.0	1	69.5	23.8	55.6	103.1	17.2	60.8	3	8.0
JHO-822 (NC)	31.1	14.7	5.6	12.6	17.1	8		31.8	49.8	87.3	17.3	56.3	7	
UPO-212 (NC)	27.2	18.8	4.9	7.5	17.0	9		23.9	32.4	85.0	25.7	47.1	10	
Mean	31.8	23.6	11.0	8.1	22.1			32.5	47.9	93.1	19.7	57.8		
CD at 5%	15.2	5.4	2.3	2.3				1.5	0.5	NS	3.3			
CV%	8.5	13.3	7.9	16.5				4.9	7.9	7.0	9.8			

Note: ** Not included in zonal & all India average due to low yield of data

Table 9.2: IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Dry Matter Yield (q/ha)

Entries	Central Zone										All India		
	Jha-nsi	Rah-uri	Urulikan-ghan	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk	Super-iority%	Aver-age	Ra-nk	Super-iority	
OL-1766-2	36.3	28.5	27.9	42.4	29.6	53.2	36.3	6		39.4	4	6.3	
OL-1874-2	36.2	23.6	34.2	49.9	20.9	63.6	38.1	3	1.6	43.5	2	17.1	
JHO-18-3	52.5	18.2	38.7	34.6	55.8	65.2	44.2	1	17.9	38.8	5	4.7	
HFO-816	43.7	18.1	31.2	30.2	31.4	63.8	36.4	5		39.6	3	6.7	
HFO-810	32.4	11.1	42.1	29.8	40.6	57.2	35.5	7		34.9	9		
JO-11-507	26.3	15.6	45.5	30.3	38.1	49.0	34.1	9		37.3	7		
RO-11-2-2	32.7	24.4	30.7	38.0	38.8	32.7	32.9	10		38.3	6	3.2	
RO-11-2-6	35.0	27.7	45.2	33.1	47.0	68.4	42.7	2	14.1	43.8	1	18.1	
JHO-822 (NC)	32.9	22.0	38.9	30.8	34.5	65.8	37.5	4		37.1	8		
UPO-212 (NC)	37.0	15.3	35.6	31.0	38.9	48.6	34.4	8		33.2	10		
Mean	36.5	20.5	37.0	35.0	37.6	56.7	37.2			38.6			
CD at 5%	2.2	4.1	11.4	9.9	8.4	14.4							
CV%	1.3	11.6	17.9	16.5	13.0	14.9							

Table 9.3: IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Green Forage Yield (q/ha/day)

Entries	Ludh-iana	His-ar	**Bika-ner	Pant-nagar	Jor-hat	Bhuban-eswar	Ran-chi	Faiza-bad	Jha-nsi	Rah-uri	Ana-nd	Rai-pur	Aver-age	Ra-nk
OL-1766-2	2.66	2.49	0.74	2.92	3.28	4.41	4.24	1.60	2.19	2.83	5.55	4.18	3.31	3
OL-1874-2	3.37	2.19	0.99	1.59	2.83	5.25	5.17	1.77	2.17	2.83	6.48	6.17	3.62	1
JHO-18-3	1.89	1.71	0.52	1.32	2.32	2.96	4.09	1.69	3.58	2.01	4.11	6.34	2.91	7
HFO-816	2.24	2.07	0.75	1.28	2.60	4.80	5.16	1.69	2.87	1.89	3.94	7.29	3.26	4
HFO-810	1.44	1.75	0.60	0.98	2.18	4.63	4.09	1.46	1.73	1.08	4.04	6.17	2.69	9
JO-11-507	2.43	1.92	0.56	2.16	2.98	3.90	4.64	1.73	0.93	1.56	3.74	4.55	2.78	8
RO-11-2-2	2.85	3.66	1.02	1.79	3.14	3.47	4.24	1.55	1.77	2.84	4.46	3.19	3.00	6
RO-11-2-6	2.39	3.31	0.46	3.56	1.90	4.86	4.72	1.51	2.02	3.30	4.35	6.68	3.51	2
JHO-822 (NC)	2.36	1.60	1.20	0.95	2.49	4.24	4.77	1.60	1.79	2.42	4.39	6.44	3.01	5
UPO-212 (NC)	2.12	1.98	0.59	0.94	1.95	2.63	4.33	2.04	2.23	1.53	4.08	5.52	2.67	10
Mean	2.38	2.27	0.74	1.75	2.57	4.11	4.55	1.66	2.13	2.23	4.51	5.65	3.07	

Note: ** Not included in zonal and all India average due to low yield of data

Table 9.4: IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Dry Matter Yield (q/ha/day)

Entries	Ludh-iana	His-ar	**Bika-ner	Pant-nagar	Jor-hat	Bhuban-eswar	Ran-chi	Faiza-bad	Jha-nsi	Rah-uri	Ana-nd	Rai-pur	Aver-age	Ra-nk
OL-1766-2	0.60	0.48	0.11	0.35	0.59	0.89	0.45	0.29	0.45	0.55	0.67	0.83	0.56	2
OL-1874-2	0.76	0.41	0.15	0.19	0.54	1.09	0.44	0.36	0.45	0.45	0.79	0.99	0.59	1
JHO-18-3	0.44	0.32	0.09	0.15	0.44	0.67	0.43	0.32	0.66	0.35	0.55	1.02	0.49	6
HFO-816	0.53	0.41	0.12	0.14	0.43	1.02	0.48	0.35	0.55	0.35	0.48	1.00	0.52	4
HFO-810	0.34	0.33	0.09	0.11	0.43	0.99	0.46	0.31	0.40	0.21	0.47	0.89	0.45	8
JO-11-507	0.56	0.37	0.08	0.26	0.52	0.85	0.43	0.34	0.33	0.30	0.48	0.76	0.47	7
RO-11-2-2	0.60	0.70	0.14	0.16	0.59	0.69	0.44	0.28	0.41	0.47	0.60	0.51	0.50	5
RO-11-2-6	0.50	0.66	0.08	0.35	0.34	1.01	0.46	0.28	0.44	0.53	0.53	0.99	0.55	3
JHO-822 (NC)	0.52	0.27	0.18	0.09	0.46	0.91	0.47	0.28	0.41	0.42	0.49	1.03	0.49	6
UPO-212 (NC)	0.45	0.34	0.11	0.08	0.35	0.59	0.44	0.42	0.46	0.29	0.49	0.76	0.42	9
Mean	0.53	0.43	0.11	0.19	0.47	0.87	0.45	0.32	0.46	0.39	0.56	0.88	0.50	

Table 9.5: IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Crude Protein Yield (q/ha)

Entries	Ludh-iana	His-ar	**Bika-ner	Jor-hat	Bhuban-eswar	Ran-chi	**Faiza-bad	Rah-uri	Urulikan-ghan	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ran-k	Superi-riority%
OL-1766-2	5.5	2.4	1.2	4.1	4.0	7.3	1.2	2.6	2.7	6.1	2.3	4.2	4.1	3	8.5
OL-1874-2	7.0	2.0	1.6	4.3	4.7	10.7	1.5	2.3	3.6	6.8	1.6	5.1	4.8	1	27.4
JHO-18-3	4.2	1.5	1.0	3.3	2.7	8.5	1.4	2.0	3.5	5.2	4.3	4.7	4.0	4	
HFO-816	3.8	2.2	1.1	3.3	4.3	10.5	1.5	1.9	2.9	4.7	2.4	4.1	4.0	4	
HFO-810	3.2	1.6	0.9	3.2	4.2	5.3	1.3	0.8	4.2	4.5	3.2	4.4	3.5	6	
JO-11-507	4.6	1.8	0.8	3.8	3.5	9.3	1.4	1.7	5.0	4.6	3.1	3.8	4.1	3	8.5
RO-11-2-2	5.0	3.5	1.5	4.6	3.1	10.0	1.1	2.4	3.1	5.6	3.1	6.1	4.6	2	20.5
RO-11-2-6	4.3	3.4	0.6	2.6	4.4	9.1	1.2	2.6	5.0	4.7	3.7	6.1	4.6	2	20.5
JHO-822 (NC)	4.6	1.3	1.6	3.4	3.8	6.9	1.1	1.7	3.5	4.7	2.7	5.3	3.8	5	
UPO-212 (NC)	3.4	1.7	1.3	2.5	2.4	8.3	1.7	1.6	3.5	4.7	3.1	3.7	3.5	6	
Mean	4.6	2.1	1.2	3.5	3.7	8.6	1.3	2.0	3.7	5.2	2.9	4.8	3.8		

Note: ** Not included in zonal and all India average due to low yield of data

Table 9.6: IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Crude Protein (%)

Entries	Ludh-iana	His-ar	Bika-ner	Jor-hat	Bhuban-eswar	Ran-chi	Faiza-bad	Rah-uri	Urulikan-ghan	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ran-k
OL-1766-2	15.4	9.3	16.2	10.2	8.2	8.8	6.9	9.0	9.8	14.3	7.8	5.2	10.1	2
OL-1874-2	15.3	9.0	15.4	11.7	7.9	9.2	6.7	9.8	10.7	13.7	7.7	5.1	10.2	1
JHO-18-3	15.8	8.9	14.8	11.1	7.3	10.5	7.0	10.7	8.9	15.1	8.1	4.5	10.2	1
HFO-816	11.9	9.8	13.9	11.1	7.7	9.8	6.9	10.3	9.4	15.5	7.9	5.1	9.9	3
HFO-810	16.1	8.9	13.7	11.1	7.7	6.8	7.1	7.4	9.9	15.2	8.0	5.3	9.8	4
JO-11-507	13.7	8.7	14.4	10.7	7.5	10.3	6.9	10.9	10.9	15.0	8.0	5.4	10.2	1
RO-11-2-2	13.9	9.2	14.9	11.3	8.3	10.1	6.5	9.8	10.0	14.6	8.0	5.1	10.1	2
RO-11-2-6	14.2	9.6	11.3	11.0	7.9	8.8	6.8	9.4	11.0	14.0	8.1	5.1	9.7	5
JHO-822 (NC)	14.9	8.9	12.7	10.8	7.7	7.9	6.6	7.7	9.1	15.2	8.0	4.8	9.5	6
UPO-212 (NC)	12.6	9.2	17.2	10.8	7.3	9.8	6.7	10.5	9.8	15.2	8.0	5.4	10.2	1
Mean	14.4	9.2	14.4	11.0	7.7	9.2	6.8	9.6	9.9	14.8	7.9	5.1	10.0	

Table 9.7: IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Plant Height (cm)

Entries	Ludh-iana	His-ar	Bika-ner	Pant-nagar	Jor-hat	Bhuban-eswar	Ran-chi	Faiza-bad	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ran-k
OL-1766-2	95.4	136.9	64.0	78.0	99.7	104.1	133.1	170.0	45.7	86.3	112.1	27.6	112.8	97.4	1
OL-1874-2	94.9	132.9	61.0	66.7	96.7	118.2	136.9	147.3	51.5	86.7	111.8	23.3	98.5	94.3	3
JHO-18-3	90.8	133.9	55.0	62.0	90.9	93.1	135.9	128.3	43.3	82.0	103.3	47.6	87.8	88.8	6
HFO-816	86.9	143.2	45.0	62.0	82.3	109.6	130.3	143.0	41.6	76.7	106.1	30.0	99.9	89.0	5
HFO-810	75.4	127.2	40.0	54.7	71.9	107.2	133.5	115.8	32.8	82.5	97.4	39.4	100.4	82.9	10
JO-11-507	102.7	136.6	46.0	64.3	104.5	98.6	131.8	113.3	34.3	80.2	99.6	32.6	96.8	87.8	8
RO-11-2-2	120.0	106.0	76.0	63.7	117.5	95.3	126.7	100.8	51.4	82.0	97.4	35.2	96.0	89.8	4
RO-11-2-6	114.1	140.3	54.0	82.3	78.7	115.4	130.8	136.0	42.8	87.1	104.6	43.6	106.5	95.1	2
JHO-822 (NC)	102.7	120.0	58.0	58.0	90.3	102.7	135.4	102.3	39.6	69.6	103.4	31.6	111.8	86.6	9
UPO-212 (NC)	107.7	136.2	52.0	59.7	83.0	89.6	129.1	121.6	36.4	81.0	101.1	36.1	109.0	87.9	7
Mean	99.1	131.3	55.1	65.1	91.6	103.4	132.4	127.8	41.9	81.4	103.7	34.7	101.9	90.0	

Table 9.8: IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Leaf Stem Ratio

Entries	Ludh-iana	Bika-ner	Pant-nagar	Jor-hat	Bhuban-eswar	Ran-chi	Faiza-bad	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ran-k
OL-1766-2	1.65	0.47	1.53	0.62	1.06	0.25	0.96	1.03	0.85	0.69	0.63	0.50	0.85	6
OL-1874-2	1.56	0.60	1.59	0.64	1.14	0.22	0.90	1.33	0.85	1.13	0.70	0.45	0.93	3
JHO-18-3	1.25	0.56	1.51	0.67	0.85	0.24	0.92	1.38	0.88	0.72	0.82	0.51	0.86	5
HFO-816	1.32	0.67	1.47	0.86	1.20	0.19	0.88	0.67	0.84	1.00	0.68	0.44	0.85	6
HFO-810	1.45	0.56	1.33	0.78	1.11	0.22	0.83	2.28	0.77	1.22	0.77	0.55	0.99	1
JO-11-507	1.50	0.68	1.42	0.75	0.98	0.21	0.85	1.91	0.81	1.08	0.71	0.57	0.96	2
RO-11-2-2	1.80	0.75	1.30	0.56	0.93	0.29	0.88	0.65	0.82	0.59	0.78	0.54	0.82	7
RO-11-2-6	1.24	0.61	1.48	0.71	1.25	0.22	0.92	1.24	0.87	0.54	0.81	0.45	0.86	5
JHO-822 (NC)	1.50	0.67	1.44	0.61	1.02	0.27	0.94	1.25	0.83	1.00	0.72	0.40	0.89	4
UPO-212 (NC)	1.25	0.46	1.39	0.86	0.89	0.24	0.86	2.28	0.81	1.17	0.76	0.58	0.96	2
Mean	1.45	0.60	1.45	0.71	1.04	0.24	0.89	1.40	0.83	0.91	0.74	0.50	0.90	

Table 9.9: IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): NDF (%), ADF (%) & IVDMD (%)

Entries	NDF (%)				ADF (%)				IVDMD (%)	
	Anand	Ludhiana	Average	Rank	Anand	Ludhiana	Average	Rank	Ludhiana	Rank
OL-1766-2	67.0	39.3	53.2	6	33.0	22.3	27.7	5	63.9	3
OL-1874-2	65.0	39.7	52.4	2	33.0	23.3	28.2	8	64.1	2
JHO-18-3	67.0	38.4	52.7	5	28.0	22.8	25.4	3	63.9	3
HFO-816	66.0	43.2	54.6	8	25.5	24.1	24.8	2	60.7	9
HFO-810	65.5	38.9	52.2	1	27.0	22.1	24.6	1	64.4	1
JO-11-507	63.0	42.1	52.6	4	28.5	23.7	26.1	4	63.1	4
RO-11-2-2	67.0	41.3	54.2	7	33.0	23.1	28.1	7	61.9	7
RO-11-2-6	65.0	39.9	52.5	3	33.0	22.9	28.0	6	62.7	5
JHO-822 (NC)	69.0	40.1	54.6	8	27.5	23.2	25.4	3	62.6	6
UPO-212 (NC)	66.0	43.4	54.7	9	34.0	23.9	29.0	9	61.8	8
Mean	66.1	40.6	53.3		30.3	23.1	26.7		62.9	

Table 9.10: IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Seed Yield (q/ha)

Entries	North West Zone						North East Zone					Central Zone							All India		
	Ludhiana	Hisar	Bikaner	Pantnagar	Average	Rank	Jorhat	Bhubaneswar	Faizabad	Average	Rank	Jhansi	Rahuri	Urulikanchan	**Anand	Jabalpur	Raipur	Average	Rank	Average	Rank
OL-1766-2	29.6	22.2	10.3	18.1	20.1	7	11.9	9.7	15.2	12.2	4	13.1	24.2	21.3	2.8	40.3	9.6	21.7	6	18.8	7
OL-1874-2	28.4	16.6	18.1	13.7	19.2	9	14.6	10.1	14.0	12.9	1	13.9	14.3	17.1	3.4	36.1	5.1	17.3	9	16.8	9
JHO-18-3	32.8	26.4	14.1	25.5	24.7	4	14.1	7.7	13.9	11.9	5	17.0	24.0	25.6	2.3	45.3	8.9	24.2	3	21.3	4
HFO-816	30.2	29.7	14.0	26.7	25.1	3	13.4	9.8	14.4	12.5	2	13.7	20.8	25.6	2.1	47.2	6.6	22.8	5	21.0	5
HFO-810	30.5	34.3	21.6	26.3	28.2	1	14.4	9.0	12.3	11.9	5	10.8	24.5	28.8	7.4	44.5	10.5	23.8	4	22.3	1
JO-11-507	24.5	28.2	14.8	27.4	23.7	6	12.6	8.4	13.3	11.4	6	11.9	26.8	39.5	4.7	43.1	6.7	25.6	2	21.4	3
RO-11-2-2	27.6	25.8	13.8	30.0	24.3	5	11.0	7.9	14.5	11.2	7	12.0	23.3	32.0	2.8	37.4	26.9	26.3	1	21.9	2
RO-11-2-6	28.5	15.9	12.7	22.5	19.9	8	11.2	9.1	11.7	10.7	8	13.9	15.1	20.3	1.9	33.1	16.2	19.7	8	17.5	8
JHO-822 (NC)	22.8	17.4	9.9	24.1	18.5	10	14.3	8.5	14.4	12.4	3	10.5	29.1	37.3	3.2	41.3	11.3	25.9	2	20.1	6
UPO-212 (NC)	29.4	31.7	18.9	29.3	27.3	2	9.2	7.1	14.1	10.2	9	15.3	22.1	27.7	7.4	27.4	13.3	21.2	7	20.5	5
Mean	28.4	24.8	14.8	24.4	23.1		12.7	8.7	13.8	11.7		13.2	22.4	27.5	3.8	39.6	11.5	22.8		20.2	
CD at 5%	2.8	7.7	4.6	5.1			1.1	0.04	1.8			7.7	4.6	5.1	1.2	7.4	3.0				
CV%	8.1	17.9	17.9	14.1			5.8	3.2	7.6			4.5	12.0	12.1	18.9	10.9	15.1				

Note: ** Not included in zonal and all India average due to low yield of dat

10. AVTO-1 (DUAL): FIRST ADVANCED VARIETAL TRIAL IN OAT (DUAL) **(Reference tables 10.1 to 10.10)**

An Advanced varietal trial -1 in Oat (Dual) comprising of six entries along with two national checks (UPO-212 and JHO-822) was conducted at 14 centres located in North-West, North East zone and Central zone. There were 4 locations each in NW and NE and 6 locations in Central zone.

Results obtained from different centres revealed that for green forage yield (q/ha), entries OL-1876-2 (15.7%), OL-1906 (11.7%), HFO-611 (11.2%), JHO-17-4 (10.5%) and JO-10-506 (7.5%) were superior over the best check JHO-822 in NW zone. In NE zone, entries OL-1876-2 (11.1%), JHO-17-4 (10.6%), OL-1906 (7.7%), JO-10-506 (4.9%) and HFO-611 (4.0%) were superior over the best check UPO-212. In central zone OL-1876-2 was superior by a margin of 10.6% over the best check JHO-822. At all India level also, entry OL-1876-2 and JHO-17-4, OL-1906 maintained good performance showing a superiority of 11.7%, 6.0% and 4.7% respectively over the best check JHO 822.

For dry matter yield (q/ha), entries OL-1876-2 (22.4%), OL-1906 (19.5%), JHO-17-4 (18.1%), JO-10-506 (17.3%), HFO-611 (9.2%) showed superiority over the best check JHO-822 in NW zone. Entries OL-1906 (6.4%), OL-1876-2 (4.9%), JHO-17-4 (4.3%) and HFO-611 (3.7%) showed superiority over the best check UPO-212 in NE zone. Combining the three zones, OL-1906 was best performer followed by OL-1876-2 showing superiority of 6.4% and 4.5% respectively over the best check JHO-822. Other entries were inferior to or marginally superior over the best check.

For green and dry matter productivity potential (q/ha/day), entry OL-1876-2 followed by JHO-17-4 were best performers. Entry OL-1876-2 ranked first for the character plant height whereas entry HFO-608 was best for leafiness.

For crude protein yield, entry OL-1906 was best showing 13.1% superiority over the best check. For crude protein content (%), entries OL-1906 and HFO-608 ranked first with 11.0% CP as compared to 10.4 in best check JHO-822. National check ranked first for IVDMD (%) whereas for NDF%, entries OL-1906 and JO-10-506 were jointly ranked first. For ADF %, National check JHO-822 and entry HFO-608 were best.

For seed yield (q/ha), entry JHO-17-4 followed by HFO-611 were best performers in NW zone. In Central zone, entries JO-10-506 followed by OL-1906 were best performers. Combining the three zones, JO-10-506 ranked first followed by national check UPO-212.

Table 10.1: AVT-1 Oat (Dual): Advanced Varietal Trial in Oat (Dual): Green Forage Yield (q/ha)

Entries	North West Zone							North East Zone						
	Ludhiana	Bikaner	Pantnagar	Udai-pur	Average	Rank	Superiority%	Jorhat	Bhubaneswar	Ranchi	Faizabad	Average	Rank	Superiority%
HFO-611	138.9	66.2	186.1	135.0	131.5	3	11.2	145.1	187.5	494.0	146.5	243.3	5	4.0
JHO-17-4	136.1	80.6	175.0	131.0	130.7	4	10.5	206.5	239.0	445.3	144.7	258.9	2	10.6
HFO-608	78.3	31.8	119.4	77.4	76.7	8		180.2	172.5	352.3	127.5	208.1	8	
OL-1906	138.1	110.1	164.2	116.4	132.2	2	11.7	160.5	295.0	419.7	133.2	252.1	3	7.7
JO-10-506	150.6	78.4	150.6	129.3	127.2	5	7.5	164.0	261.0	427.0	129.4	245.3	4	4.9
OL-1876-2	143.3	75.8	200.6	127.7	136.8	1	15.7	169.7	284.0	448.7	137.0	259.9	1	11.1
UPO-212 (NC)	125.0	94.4	108.1	124.0	112.9	7		194.7	204.0	404.0	133.2	234.0	6	
JHO-822 (NC)	130.0	96.7	125.0	121.5	118.3	6		188.6	262.0	354.7	129.4	233.7	7	
Mean	130.0	79.2	153.6	120.3	120.8			176.2	238.1	418.2	135.1	241.9		
CD at 5%	43.6	19.6	36.5	12.8				4.0	2.3	39.9	15.1			
CV%	7.5	14.2	11.4	6.1				6.1	5.6	5.0	6.4			

Table 10.1: AVT-1 Oat (Dual): Advanced Varietal Trial in Oat (Dual): Green Forage Yield (q/ha)

Entries	Central Zone									All India		
	Jhansi	**Rahuri	Urulikanchan	Anand	Jabalpur	Raipur	Average	Rank	Superiority%	Average	Rank	Superiority%
HFO-611	165.4	112.5	316.2	372.5	164.0	191.6	241.9	5		208.4	4	2.2
JHO-17-4	163.7	99.0	283.9	443.3	143.0	216.6	250.1	2	0.6	216.0	2	6.0
HFO-608	276.5	62.5	63.3	97.2	185.0	55.5	135.5	8		139.8	8	
OL-1906	128.3	103.6	266.7	340.8	308.0	194.4	247.6	4		213.5	3	4.7
JO-10-506	64.4	126.9	262.9	391.7	206.0	193.0	223.6	6		200.6	6	
OL-1876-2	168.7	149.9	312.4	437.8	185.0	270.7	274.9	1	10.6	227.8	1	11.7
UPO-212 (NC)	133.4	92.2	241.6	343.1	186.0	153.8	211.6	7		188.1	7	
JHO-822 (NC)	219.2	128.7	242.3	367.2	225.0	188.8	248.5	3		203.9	5	
Mean	164.9	109.4	248.7	349.2	200.3	183.1	229.2			208.4	4	2.2
CD at 5%	18.5	18.9	50.8	95.6	45.8	39.8						
CV%	10.5	9.9	11.6	15.6	13.1	12.7						

Note: ** Not included in zonal and all India average due to low yield of data

Table 10.2: AVT-1 Oat (Dual): Advanced Varietal Trial in Oat (Dual): Dry Matter Yield (q/ha)

Entries	North West Zone						North East Zone						
	Ludh-iana	**Bika-ner	Pant-nagar	Aver-age	Ra-nk	Super-iority%	Jor-hat	Bhuban-eswar	Ran-chi	Faiza-bad	Aver-age	Ra-nk	Super-iority%
HFO-611	29.6	11.5	29.8	29.7	5	9.2	26.1	40.7	115.3	31.5	53.4	4	3.7
JHO-17-4	31.0	12.8	33.3	32.1	3	18.1	34.9	49.3	100.2	30.3	53.7	3	4.3
HFO-608	16.9	5.1	21.5	19.2	8		32.6	38.5	76.3	23.5	42.7	8	
OL-1906	32.2	18.0	32.8	32.5	1	19.5	29.1	62.5	100.7	26.6	54.8	1	6.4
JO-10-506	33.7	12.4	30.1	31.9	4	17.3	29.3	56.8	96.1	25.2	51.8	5	0.7
OL-1876-2	30.5	11.6	36.1	33.3	2	22.4	27.3	60.6	98.0	30.1	54.0	2	4.9
UPO-212 (NC)	27.4	15.2	19.5	23.4	7		36.6	45.7	96.3	27.3	51.5	6	
JHO-822 (NC)	29.4	15.3	25.0	27.2	6		34.1	56.6	87.5	24.6	50.7	7	
Mean	28.8	12.7	28.5	28.7			31.3	51.3	96.3	27.4	51.6		
CD at 5%	19.5	4.2	3.2				2.2	0.5	3.7	3.3			
CV%	6.7	18.7	8.4				8.1	5.5	4.5	6.7			

Note: ** Not included in zonal and all India average due to low yield of data

Table 10.2: AVT-1 Oat (Dual): Advanced Varietal Trial in Oat (Dual): Dry Matter Yield (q/ha)

Entries	Central Zone									All India		
	Jha-nsi	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk	Super-iority%	Aver-age	Ra-nk	Super-iority%
HFO-611	41.3	23.4	43.1	42.3	30.5	28.2	34.8	4		40.1	4	
JHO-17-4	41.2	21.4	38.9	48.9	26.1	29.8	34.4	5		40.4	3	0.9
HFO-608	57.5	14.1	7.1	11.9	35.5	8.2	22.4	8		28.6	7	
OL-1906	37.4	22.7	40.6	36.6	60.8	29.7	38.0	1	1.7	42.7	1	6.4
JO-10-506	31.3	25.9	25.2	41.4	40.2	26.1	31.7	6		38.4	5	
OL-1876-2	42.0	28.6	37.2	42.8	35.3	34.2	36.7	3		41.9	2	4.5
UPO-212 (NC)	37.9	19.8	28.8	34.0	35.7	21.0	29.5	7		35.8	6	
JHO-822 (NC)	48.7	25.4	33.1	42.8	44.1	29.9	37.3	2		40.1	4	
Mean	42.2	22.7	31.7	37.6	38.5	25.9	33.1			38.5		
CD at 5%	2.3	3.9	6.4	11.5	8.7	5.6						
CV%	1.3	9.9	11.5	17.5	12.8	12.7						

Table 10.3: AVT-1 Oat (Dual): Advanced Varietal Trial in Oat (Dual): Green Forage Yield (q/ha/day)

Entries	Ludh-iana	**Bika-ner	Pant-nagar	Jor-hat	Bhuban-eswar	Ran-chi	Faiza-bad	Jha-nsi	Rah-uri	Ana-nd	Rai-pur	Aver-age	Ra-nk
HFO-611	2.31	0.93	3.20	2.07	3.41	4.63	2.44	2.07	1.97	5.82	2.95	3.09	5
JHO-17-4	2.27	1.13	3.01	2.95	4.35	4.23	2.41	2.05	1.74	6.93	3.55	3.35	2
HFO-608	1.31	0.45	2.06	2.57	3.14	3.05	2.12	3.46	1.10	1.52	0.91	2.12	8
OL-1906	2.30	1.55	2.83	2.29	5.36	3.97	2.22	1.60	1.82	5.33	2.99	3.07	4
JO-10-506	2.51	1.10	2.59	2.34	4.75	4.16	2.15	0.80	2.23	6.12	2.97	3.06	6
OL-1876-2	2.39	1.07	3.46	2.42	5.16	3.85	2.28	2.11	2.63	6.84	4.16	3.53	1
UPO-212 (NC)	2.08	1.33	1.86	2.78	3.71	3.91	2.22	1.67	1.62	5.36	2.52	2.77	7
JHO-822 (NC)	2.17	1.36	2.15	2.69	4.76	3.48	2.15	2.74	2.26	5.74	2.90	3.10	3
Mean	2.17	1.12	2.65	2.52	4.33	3.91	2.25	2.06	1.92	5.46	2.87	3.01	

Note: ** Not included in all India average due to low yield of data

Table 10.4: AVT-1 Oat (Dual): Advanced Varietal Trial in Oat (Dual): Dry Matter Yield (q/ha/day)

Entries	Ludh-iana	**Bika-ner	Pant-nagar	Jor-hat	Bhuban-eswar	Ran-chi	Faiza-bad	Jha-nsi	Rah-uri	Ana-nd	Rai-pur	Aver-age	Ra-nk
HFO-611	0.49	0.16	0.51	0.37	0.74	1.08	0.52	0.52	0.41	0.66	0.43	0.57	5
JHO-17-4	0.52	0.18	0.57	0.50	0.90	0.95	0.50	0.52	0.38	0.76	0.49	0.61	2
HFO-608	0.28	0.07	0.37	0.47	0.70	0.66	0.39	0.72	0.25	0.19	0.13	0.42	7
OL-1906	0.54	0.25	0.57	0.42	1.14	0.95	0.44	0.47	0.40	0.57	0.46	0.60	3
JO-10-506	0.56	0.17	0.52	0.42	1.03	0.94	0.42	0.39	0.45	0.65	0.40	0.58	5
OL-1876-2	0.51	0.16	0.63	0.39	1.10	0.84	0.50	0.52	0.50	0.67	0.53	0.62	1
UPO-212 (NC)	0.46	0.21	0.34	0.52	0.83	0.93	0.45	0.47	0.35	0.53	0.34	0.52	6
JHO-822 (NC)	0.49	0.22	0.43	0.49	1.03	0.86	0.40	0.61	0.45	0.67	0.46	0.59	4
Mean	0.48	0.18	0.49	0.45	0.93	0.90	0.45	0.53	0.40	0.59	0.41	0.56	

Table 10.5: AVT-1 Oat (Dual): Advanced Varietal Trial in Oat (Dual): Crude Protein Yield (q/ha)

Entries	Ludh-iana	Bika-ner	Pant-nagar	Jor-hat	Bhuban-eswar	Ran-chi	Faiza-bad	Rah-uri	Urulikan-ghan	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk	Super-iority%
HFO-611	3.9	1.6	3.4	3.3	3.4	9.3	2.0	1.9	5.2	6.5	2.3	2.2	3.8	3	
JHO-17-4	4.1	1.6	3.8	3.5	4.3	6.6	2.1	2.0	3.9	7.5	1.9	2.4	3.6	4	
HFO-608	2.4	0.7	2.3	3.9	3.1	8.0	1.5	1.5	0.8	2.4	2.7	0.5	2.5	7	
OL-1906	4.6	2.4	3.4	3.0	5.3	10.8	1.9	2.5	4.7	6.5	4.8	2.6	4.4	1	13.1
JO-10-506	4.2	1.7	3.4	3.0	4.7	7.4	1.7	2.0	2.6	6.8	3.2	2.0	3.5	5	
OL-1876-2	3.9	1.4	3.8	3.1	5.1	7.9	2.1	2.5	4.8	6.6	2.7	2.5	3.9	2	
UPO-212 (NC)	3.8	1.7	2.2	3.9	3.6	7.8	1.9	1.6	2.7	5.4	2.8	1.5	3.2	6	
JHO-822 (NC)	4.3	1.4	2.4	3.7	4.7	8.4	1.6	2.5	4.2	7.0	3.5	2.7	3.9	2	
Mean	3.9	1.6	3.1	3.4	4.3	8.3	1.8	2.1	3.6	6.1	3.0	2.0	3.6		

Table 10.6: AVT-1 Oat (Dual): Advanced Varietal Trial in Oat (Dual): Crude Protein (%)

Entries	Ludh-iana	Bika-ner	Pant-nagar	Jor-hat	Bhuban-eswar	Ran-chi	Faiza-bad	Rah-uri	Urulikan-ghan	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk
HFO-611	13.3	14.2	11.4	12.7	8.4	8.1	6.5	8.3	12.1	15.2	7.7	7.7	10.5	2
JHO-17-4	13.3	12.2	11.4	10.1	8.7	9.6	6.9	9.2	10.1	15.4	7.4	8.1	10.2	4
HFO-608	14.2	14.4	10.5	12.0	8.1	10.5	6.3	10.5	11.6	19.8	7.9	6.3	11.0	1
OL-1906	14.2	13.3	10.5	10.4	8.5	10.7	7.0	10.9	11.6	17.5	8.1	8.8	11.0	1
JO-10-506	12.6	13.5	11.4	10.3	8.3	7.7	6.8	7.9	10.1	16.6	8.1	7.5	10.0	5
OL-1876-2	12.9	12.5	10.5	11.4	8.4	8.1	6.9	8.8	12.9	15.6	7.8	7.2	10.2	4
UPO-212 (NC)	14.0	10.9	11.4	10.7	7.9	8.1	6.8	8.3	9.4	15.9	8.0	7.0	9.9	6
JHO-822 (NC)	14.5	9.2	9.6	11.1	8.3	9.6	6.7	9.8	12.7	16.1	8.1	8.9	10.4	3
Mean	13.6	12.5	10.8	11.1	8.3	9.0	6.7	9.2	11.3	16.5	7.9	7.7	10.4	

Table 10.7: AVT-1 Oat (Dual): Advanced Varietal Trial in Oat (Dual): Plant Height (cm)

Entries	Ludh-iana	Bika-ner	Udai-pur	Pant-nagar	Jor-hat	Bhuban-eswar	Ran-chi	Faiza-bad	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk
HFO-611	108.6	60.0	148.4	100.3	96.2	93.6	132.9	142.0	49.6	76.3	108.6	34.8	85.0	95.1	2
JHO-17-4	106.4	67.0	154.4	76.0	105.8	98.7	131.4	119.0	45.3	78.6	109.6	31.0	89.9	93.3	4
HFO-608	82.4	53.0	80.0	65.7	89.7	91.6	101.9	104.2	40.2	57.9	92.3	35.2	62.9	73.6	8
OL-1906	110.6	55.0	142.2	65.0	90.0	117.5	123.3	117.3	47.4	78.9	111.5	49.8	82.6	91.6	6
JO-10-506	120.1	66.0	139.8	74.7	100.9	103.7	119.9	127.3	61.5	83.5	108.9	31.8	87.6	94.3	3
OL-1876-2	117.4	70.0	150.0	76.7	100.3	109.2	113.9	152.0	56.5	81.9	113.9	38.9	95.7	98.2	1
UPO-212 (NC)	100.1	58.0	145.3	88.3	100.5	96.1	132.8	144.0	46.6	73.7	106.0	37.3	80.2	93.0	5
JHO-822 (NC)	112.4	50.0	147.5	68.0	98.7	100.2	104.0	102.8	52.8	78.0	105.1	42.3	86.1	88.3	7
Mean	107.3	59.9	138.5	76.8	97.8	101.3	120.0	126.1	50.0	76.1	107.0	37.6	83.7	90.9	

Table 10.8: AVT-1 Oat (Dual): Advanced Varietal Trial in Oat (Dual): Leaf Stem Ratio

Entries	Ludh-iana	Bika-ner	Pant-nagar	Jor-hat	Bhuban-eswar	Ran-chi	Faiza-bad	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk
HFO-611	1.48	0.45	0.98	0.89	0.94	0.23	0.92	2.00	0.90	1.27	0.91	0.91	0.99	2
JHO-17-4	1.40	0.69	0.96	1.12	1.03	0.21	0.85	1.53	0.92	1.17	0.77	0.92	0.96	3
HFO-608	0.90	0.92	1.31	0.73	0.89	0.30	0.94	2.25	0.91	1.22	0.81	1.22	1.03	1
OL-1906	1.25	0.63	0.89	0.73	1.27	0.17	0.94	1.34	0.82	1.00	1.00	0.75	0.90	8
JO-10-506	1.48	0.75	0.95	0.89	1.18	0.16	0.88	0.89	0.86	1.22	0.88	0.81	0.91	7
OL-1876-2	1.40	0.67	0.81	0.84	1.24	0.25	0.85	1.25	0.84	1.38	0.79	0.71	0.92	6
UPO-212 (NC)	1.20	0.68	1.00	0.77	0.98	0.16	0.86	1.57	0.90	1.33	0.82	1.05	0.94	4
JHO-822 (NC)	1.30	0.57	0.98	0.71	1.09	0.18	0.90	1.83	0.79	1.08	0.97	0.77	0.93	5
Mean	1.30	0.67	0.99	0.84	1.08	0.21	0.89	1.58	0.87	1.21	0.87	0.89	0.95	

Table 10.9: AVT-1 Oat (Dual): Advanced Varietal Trial in Oat (Dual): NDF (%), ADF (%) & IVDMD (%)

Entries	NDF (%)					ADF (%)					IVDMD (%)			
	Pant-nagar	Rah- uri	Ludh- iana	Aver- age	Ra- nk	Pant- nagar	Rah- uri	Ludh- iana	Aver- age	Ra- nk	Rah- uri	Ludh- iana	Aver- age	Ra- nk
HFO-611	65.4	54.3	43.9	54.5	5	59.6	32.8	28.3	40.2	5	62.3	60.2	61.3	6
JHO-17-4	66.2	56.6	44.1	55.6	6	60.0	34.8	27.9	40.9	6	61.6	59.6	60.6	7
HFO-608	65.8	54.6	42.9	54.4	4	56.6	29.7	26.4	37.6	1	64.5	61.3	62.9	3
OL-1906	63.4	52.4	43.1	53.0	1	55.8	30.6	27.3	37.9	3	63.2	61.9	62.6	4
JO-10-506	63.8	50.5	44.8	53.0	1	57.6	28.6	28.2	38.1	4	67.5	58.9	63.2	2
OL-1876-2	65.4	59.2	43.9	56.2	7	58.6	37.3	27.9	41.3	7	58.7	59.1	58.9	8
UPO-212 (NC)	65.4	53.2	43.0	53.9	2	55.4	31.3	26.3	37.7	2	63.7	61.2	62.5	5
JHO-822 (NC)	64.2	52.9	42.3	53.1	2	57.2	30.6	25.1	37.6	1	65.4	62.2	63.8	1
Mean	65.0	54.2	43.5	54.2		57.6	32.0	27.2	38.9		63.4	60.6	62.0	

Table 10.10: AVT-1 Oat (Dual): Advanced Varietal Trial in Oat (Dual): Seed Yield (q/ha)

Entries	North West Zone						North East Zone					Central Zone								All India	
	Ludh- iana	Udai- pur	Bika- ner	Pant- nagar	Aver- age	Ra- nk	Jor- hat	Bhuban- eswar	Faiza- bad	Aver- age	Ra- nk	Jha- nsi	Rah- uri	Urulikan- chan	Ana- nd	Jabal- pur	Rai- pur	Aver- age	Ra- nk	Aver- age	Ra- nk
HFO-611	32.8	33.1	14.7	21.7	25.6	2	13.4	6.7	9.5	9.8	6	17.9	20.8	21.3	6.3	22.3	10.7	16.6	7	17.8	6
JHO-17-4	33.1	33.0	16.5	23.9	26.6	1	14.9	6.2	13.8	11.6	2	20.7	26.2	25.9	3.6	17.0	13.5	17.8	5	19.1	4
HFO-608	26.5	12.3	16.4	20.0	18.8	8	12.6	5.9	10.7	9.7	8	8.6	21.3	24.4	9.3	28.6	12.7	17.5	6	16.1	7
OL-1906	31.0	30.3	15.9	17.8	23.8	6	11.9	6.9	10.7	9.8	7	22.2	29.2	33.9	3.4	25.6	17.8	22.0	2	19.7	3
JO-10-506	28.4	32.7	16.5	20.0	24.4	5	14.6	7.7	11.9	11.4	3	19.1	26.1	26.7	7.7	46.2	18.3	24.0	1	21.2	1
OL-1876-2	25.4	27.8	11.7	15.7	20.1	7	14.3	7.8	10.5	10.8	4	12.0	13.6	16.0	3.8	22.0	8.9	12.7	8	14.6	8
UPO-212 (NC)	30.1	29.1	17.9	21.9	24.8	4	14.4	6.3	15.2	12.0	1	20.7	24.6	21.3	7.9	40.0	12.9	21.2	3	20.2	2
JHO-822 (NC)	30.7	35.5	13.4	21.1	25.2	3	9.2	8.2	12.2	9.9	5	18.8	21.9	22.1	4.7	25.6	22.6	19.3	4	18.9	5
Mean	29.8	29.2	15.4	20.3	23.7		13.1	6.9	11.8	10.6		17.5	23.0	24.0	5.8	28.4	14.7	18.9		18.4	
CD at 5%	3.2	5.0	4.8	4.4			1.1	0.1	1.9			5.8	4.7	5.1	2.0	5.0	3.4				
CV%	7.6	9.8	18.2	14.2			6.2	5.7	9.2			3.3	11.6	12.1	19.8	10.2	13.6				

11. VT Lucerne (P) -2016: VARIETAL TRIAL IN LUCERNE (Perennial) - 2016 – 3RD YEAR

(Reference tables 11.1 to 11.6)

The trial was established in 2016 and in third year data of twelve entries including two national checks were reported by 6 centres in two zones (Central and South zone). As the trial is completed, the entries are now decoded.

For green fodder production (q/ha), check RL-88 ranked first in central zone. In south zone, entry Alamdar-51 ranked first followed by TNLC-15 showing superiority of 11.2% and 10.7% over the best check RL-88. Entries BAIF Lucerne-4 (5.6%), RL-15-1 (5.1%), AL-61 (2.4%), TSL-1 (1.8%), DL-5 (1.2%) were also superior to best check in south zone. Combining both zones all entries were marginally superior or inferior to the best check.

For dry matter yield (q/ha) entry TNLC-15 was top ranked showing superiority of 13.0% over the best check. Other entries like DL-5, Alamdar-51, RL-15-1, AL-61 showed marginal superiority over the best check. At central zone or combining both zones, national check RL-88 was best performer.

For fodder production potential, BAIF Lucerne -4 for green fodder and dry matter production potential (q/ha/day) was top ranker. It was followed by national check RL-88. For growth parameters, TSL-1 ranked first for plant height while for leaf stem ratio, entry AL-62 was superior.

For quality parameters, national check RL-88 top ranked for CPY (q/ha). For crude protein entry Alamdar-51 (19.3%) ranked first as compared to best check Anand-2 (18.6%). For ADF %, NDF % and IVDMD % entry RL-15-1 ranked first followed by entry DL-5.

12. AVT-2 VICIA: SECOND ADVANCED TRIAL IN VICIA

(Reference tables 12.1 to 12.5)

In second advanced trial on Vicia, five entries were evaluated at four centers. For green fodder yield, JVS-2 (335.7q) and JVS-1 (322.7q) showed superiority over the general mean (317.5q). Similarly for dry matter yield, JVS-2 (68.6q), JVS-1 (66.0q) showed superiority over the general mean (65.4q).

For fodder production (q/ha/day), entry JVS-2 ranked first for both green fodder and dry matter. For crude protein yield (q/ha) entry JVS-1 and JVS-2 showed superiority of 9.8% and 3.2% respectively over the general mean. For crude protein %, entry JVS-1, JVS-4 and JVS-2 were marginally superior over the general mean. For plant height and leafiness, entry JVS-1 was top ranked. For NDF, ADF and IVDMD entry JVS-3 was top ranked.

13. AVT-2 VICIA (seed): SECOND ADVANCED TRIAL IN VICIA (seed)

(Reference tables 13.1)

In second advanced trial on Vicia seed, five entries were evaluated at four centers. For seed yield, entry JVS-2 ranked first with yield of 10.85q/ha followed by JVS-5 with 10.42 q/ha whereas general mean was 9.55 q/ha. Other three entries performed inferior to the general mean.

Table 11.1: VT Lucerne (P)-2016: Varietal Trial in Lucerne (Perennial)-3rd Year: Green Forage Yield (q/ha)

Entries	Central Zone				South Zone							All India		
	Rah- uri	Urulikan- chan	Aver- age	Ra- nk	Hydera- bad	Coimb- atore	Man- dya	Dhar- wad	Aver- age	Ra- nk	Superi- ority%	Aver- age	Ra- nk	Superi- ority%
AL-61	92.0	471.0	281.5	8	234.4	1095.7	818.8	625.8	693.7	5	2.4	556.3	7	
TNLC-15	48.7	504.5	276.6	9	366.5	1272.2	686.9	671.9	749.4	2	10.7	591.8	5	
RL-15-1	398.7	979.8	689.2	3	349.9	1100.0	780.3	616.9	711.8	4	5.1	704.3	2	0.3
RRB-15-1	8.1	116.5	62.3	11	73.9	494.7	669.9	595.0	458.4	12		326.4	12	
AL-62	39.6	774.8	407.2	5	154.4	467.5	893.0	614.7	532.4	9		490.7	9	
BAIF Lucerne-4	662.3	723.3	692.8	2	374.9	1161.3	700.2	623.1	714.9	3	5.6	707.5	1	0.7
Alamdar-1	9.6	75.8	42.7	12	83.0	818.6	510.1	644.4	514.0	11		356.9	11	
Alamdar-51	170.4	702.7	436.5	4	402.6	1187.3	771.2	650.8	753.0	1	11.2	647.5	4	
DL-5	34.8	534.9	284.9	7	266.6	1014.1	801.5	660.3	685.6	7	1.2	552.0	8	
TSL-1	120.6	561.2	340.9	6	302.7	1029.7	742.5	683.1	689.5	6	1.8	573.3	6	
RL-88 (NC)	523.1	981.9	752.5	1	344.3	994.3	687.4	683.1	677.3	8		702.3	3	
Anand-2 (NC)	78.5	432.9	255.7	10	274.9	404.2	797.2	602.5	519.7	10		431.7	10	
Mean	182.2	571.6	376.9		269.0	920.0	738.3	639.3	641.6			553.4		
CD at 5%	40.0	96.2			23.4	25.7	108.43	23.5						
CV%	13.0	9.9			5.1	1.7	7.08	2.2						

Table 11.2: VT Lucerne (P)-2016: Varietal Trial in Lucerne (Perennial)-3rd Year: Dry Matter Yield (q/ha)

Entries	Central Zone				South Zone							All India	
	Rah- uri	Urulikan- chan	Aver- age	Ra- nk	Hydera- bad	Coimb- atore	Man- dya	Dhar- wad	Aver- age	Ra- nk	Superi- ority%	Aver- age	Ra- nk
AL-61	20.1	125.8	72.9	7	47.6	251.6	174.6	170.9	161.2	5	0.8	131.8	7
TNLC-15	9.5	131.2	70.4	9	74.6	304.1	158.1	185.6	180.6	1	13.0	143.8	4
RL-15-1	91.6	213.2	152.4	3	68.8	253.6	165.2	169.8	164.3	2	2.8	160.4	3
RRB-15-1	1.7	27.5	14.6	11	15.0	114.1	136.1	166.0	107.8	11		76.7	12
AL-62	8.5	172.4	90.5	5	30.0	107.1	193.2	179.4	127.4	8		115.1	9
BAIF Lucerne-4	146.7	177.4	162.1	2	76.4	266.0	122.4	174.4	159.8	6		160.5	2
Alamdar-1	2.1	14.1	8.1	12	16.0	188.7	107.3	166.2	119.5	10		82.4	11
Alamdar-51	38.2	152.2	95.2	4	81.9	282.4	134.8	150.6	162.4	4	1.6	140.0	5
DL-5	7.4	136.2	71.8	8	61.0	232.2	175.2	182.9	162.8	3	1.9	132.5	6
TSL-1	25.9	136.6	81.3	6	60.6	235.3	155.5	175.7	156.8	7		131.6	8
RL-88 (NC)	120.1	255.4	187.7	1	65.3	229.7	154.8	189.6	159.8	6		169.1	1
Anand-2 (NC)	17.9	101.3	59.6	10	54.9	93.6	163.2	167.0	119.7	9		99.7	10
Mean	40.8	136.9	88.9		54.3	213.2	153.4	173.2	148.5			128.6	
CD at 5%	9.0	22.7			7.2	6.2	29.2	12.7					
CV%	13.0	9.7			7.8	1.7	9.2	4.3					

Table 11.3: VT Lucerne (P)-2016: Varietal Trial in Lucerne (Perennial)-3rd Year: Green Forage Yield (q/ha/day) & Dry Matter Yield (q/ha/day)

Entries	GFY (q/ha/day)				DMY (q/ha/day)			
	Rahuri	Dharwad	Average	Rank	Rahuri	Dharwad	Average	Rank
AL-61	0.28	2.09	1.19	7	0.06	0.57	0.32	5
TNLC-15	0.15	2.24	1.20	6	0.03	0.62	0.32	5
RL-15-1	1.23	2.06	1.65	3	0.28	0.57	0.43	3
RRB-15-1	0.02	1.98	1.00	11	0.01	0.55	0.28	7
AL-62	0.12	2.05	1.09	10	0.03	0.60	0.31	6
BAIF Lucerne-4	2.05	2.08	2.07	1	0.45	0.58	0.52	1
Alamdar-1	0.03	2.15	1.09	10	0.01	0.55	0.28	7
Alamdar-51	0.53	2.17	1.35	4	0.12	0.50	0.31	6
DL-5	0.11	2.20	1.15	8	0.02	0.61	0.32	5
TSL-1	0.37	2.28	1.33	5	0.08	0.59	0.34	4
RL-88 (NC)	1.62	2.28	1.95	2	0.37	0.63	0.50	2
Anand-2 (NC)	0.24	2.01	1.13	9	0.06	0.56	0.31	6
Mean	0.56	2.13	1.35		0.13	0.58	0.35	

Table 11.4: VT Lucerne (P)-2016: Varietal Trial in Lucerne (Perennial)-3rd Year: Crude Protein Yield (q/ha) & Crude Protein (%)

Entries	Crude Protein Yield (q/ha)							Crude Protein (%)						
	Rahuri	Urulikan- chan	Coimb- atore	Man- dya	Dhar- wad	Aver- age	Ra- nk	Rahuri	Urulikan- chan	Coimb- atore	Man- dya	Dha- rwad	Aver- age	Ra- nk
AL-61	3.6	22.6	51.9	28.4	32.1	27.7	6	18.2	18.0	20.6	16.2	18.8	18.3	5
TNLC-15	1.7	21.7	68.3	25.2	41.4	31.7	4	18.4	16.6	22.5	16.0	22.3	19.1	2
RL-15-1	16.8	36.0	53.7	27.5	25.2	31.8	3	18.4	16.9	21.2	16.6	14.9	17.6	10
RRB-15-1	0.3	5.1	24.3	20.4	28.5	15.7	12	16.8	18.4	21.3	15.0	17.2	17.7	9
AL-62	1.3	30.5	22.5	25.0	25.9	21.0	9	15.5	17.7	21.0	12.9	14.4	16.3	11
BAIF Lucerne-4	25.7	32.4	57.8	17.6	34.3	33.6	2	17.5	18.3	21.7	14.4	19.7	18.3	5
Alamdar-1	0.4	2.4	42.7	16.7	33.5	19.1	11	19.6	17.2	22.6	15.6	20.1	19.0	3
Alamdar-51	7.2	28.6	65.9	22.5	28.3	30.5	5	18.8	18.8	23.3	16.6	18.8	19.3	1
DL-5	1.4	24.6	47.1	26.8	31.2	26.2	8	18.8	18.1	20.3	15.3	17.1	17.9	8
TSL-1	4.9	25.2	47.4	18.1	37.7	26.6	7	19.0	18.4	20.2	11.6	21.4	18.1	7
RL-88 (NC)	19.4	46.7	49.4	21.6	39.8	35.4	1	16.2	18.3	21.5	14.0	21.0	18.2	6
Anand-2 (NC)	3.7	18.2	20.0	21.1	33.6	19.3	10	20.8	18.0	21.4	12.9	20.1	18.6	4
Mean	7.2	24.5	45.9	22.6	32.6	26.6		18.2	17.9	21.5	14.8	18.8	18.2	

Table 11.5: VT Lucerne (P)-2016: Varietal Trial in Lucerne (Perennial)-3rd Year: Plant Height (cm) & Leaf Stem Ratio

Entries	Plant Height (CM)					Leaf Stem Ratio				
	Rahuri	Urulikanchan	Mandya	Average	Rank	Rahuri	Urulikanchan	Mandya	Average	Rank
AL-61	46.3	80.1	68.0	64.8	7	1.38	0.78	0.61	0.92	3
TNLC-15	46.4	80.1	62.8	63.1	9	1.24	0.81	0.42	0.82	9
RL-15-1	47.6	89.9	65.1	67.5	4	1.38	0.78	0.47	0.88	5
RRB-15-1	38.3	60.8	66.3	55.1	12	1.50	0.79	0.55	0.95	2
AL-62	42.4	79.2	75.7	65.8	6	1.53	0.83	0.72	1.03	1
BAIF Lucerne-4	49.0	89.6	66.1	68.2	2	1.27	0.83	0.45	0.85	7
Alamdar-1	39.6	77.4	61.6	59.6	11	1.12	0.74	0.45	0.77	10
Alamdar-51	45.4	85.6	67.2	66.0	5	1.27	0.81	0.53	0.87	6
DL-5	42.4	78.2	67.8	62.8	10	1.38	0.84	0.54	0.92	3
TSL-1	48.6	88.7	68.0	68.4	1	1.08	0.77	0.40	0.75	11
RL-88 (NC)	48.6	92.6	63.3	68.1	3	1.27	0.81	0.58	0.89	4
Anand-2 (NC)	47.9	80.6	64.5	64.3	8	1.17	0.86	0.50	0.84	8
Mean	45.2	81.9	66.4	64.5		1.30	0.80	0.52	0.87	

Table 11.6: VT Lucerne (P)-2016: Varietal Trial in Lucerne (Perennial)-3rd Year: ADF (%), NDF (%) & IVDMD (%)

Entries	ADF (%)		NDF (%)		IVDMD (%)	
	Rahuri	Rank	Rahuri	Rank	Rahuri	Rank
AL-61	31.7	10	45.7	10	62.3	11
TNLC-15	30.4	9	43.2	7	65.2	9
RL-15-1	22.8	1	34.2	1	70.4	1
RRB-15-1	28.2	7	42.6	6	66.2	8
AL-62	27.3	4	43.5	8	67.2	5
BAIF Lucerne-4	34.4	12	43.2	7	63.2	10
Alamdar-1	27.8	6	42.1	5	67.9	4
Alamdar-51	27.4	5	41.7	4	66.7	6
DL-5	23.6	2	37.9	2	70.3	2
TSL-1	29.4	8	43.7	9	66.4	7
RL-88 (NC)	32.9	11	46.2	11	62.3	11
Anand-2 (NC)	26.5	3	40.8	3	68.6	3
Mean	28.5		42.1		66.4	

Table 12.1: AVT-2 Vicia: Second Advanced Varietal Trial in Vicia: Green Forage Yield & Dry Matter Yield (q/ha)

Entries	Green Forage Yield (q/ha)							Dry Matter Yield (q/ha)						
	Jabalpur	Rahuri	Raipur	Jhansi	Average	Rank	Superiority%	Jabalpur	Rahuri	Raipur	Jhansi	Average	Rank	Superiority%
JVS-1	409.1	317.1	255.8	308.7	322.7	2	1.6	80.6	77.2	49.4	56.7	66.0	2	0.9
JVS-2	398.7	304.2	227.8	412.2	335.7	1	5.7	76.0	80.6	44.7	73.0	68.6	1	4.8
JVS-3	400.7	289.6	202.8	362.8	313.9	3		77.2	71.0	40.7	68.6	64.4	4	
JVS-4	392.4	265.4	191.8	370.4	305.0	5		78.5	70.2	38.6	71.1	64.6	3	
JVS-5	397.6	288.5	211.0	344.4	310.4	4		77.2	77.3	41.0	58.9	63.6	5	
Mean	399.7	293.0	217.8	359.7	317.5			77.9	75.3	42.9	65.7	65.4		
CD at 5%	75.3	47.2	28.9	14.6				13.7	12.2	5.1	12.2			
CV%	12.2	10.5	9.0	7.3				11.9	10.5	8.1	19.8			

Table 12.2: AVT-2 Vicia: Second Advanced Varietal Trial in Vicia: Green Forage Yield (q/ha/day) & Dry Matter Yield (q/ha)

Entries	GFY (q/ha/day)					DMY (q/ha/day)				
	Rahuri	Raipur	Jhansi	Average	Rank	Rahuri	Raipur	Jhansi	Average	Rank
JVS-1	3.06	2.75	3.83	3.21	3	0.75	0.53	0.70	0.66	4
JVS-2	2.98	2.68	5.49	3.72	1	0.79	0.53	0.97	0.76	1
JVS-3	2.82	2.39	4.70	3.30	2	0.69	0.48	0.89	0.69	3
JVS-4	2.54	2.66	4.70	3.30	2	0.67	0.54	0.90	0.70	2
JVS-5	2.79	2.27	4.36	3.14	4	0.75	0.44	0.75	0.65	5
Mean	2.84	2.55	4.62	3.34		0.73	0.50	0.84	0.69	

Table 12.3: AVT-2Vicia: Second Advanced Varietal Trial in Vicia: Crude Protein Yield (q/ha) & Crude Protein (%)

Entries	Crude Protein Yield (q/ha)					Superiority%	Crude Protein (%)				
	Rahuri	Raipur	Jabalpur	Average	Rank		Rahuri	Raipur	Jabalpur	Average	Rank
JVS-1	12.7	7.8	12.2	10.9	1	9.8	16.4	15.8	14.5	15.6	1
JVS-2	12.9	7.1	10.7	10.2	2	3.2	16.0	15.9	14.2	15.3	3
JVS-3	10.9	6.1	11.0	9.3	5		15.3	14.8	14.4	14.8	4
JVS-4	11.4	6.1	11.1	9.5	4		16.2	15.8	14.3	15.4	2
JVS-5	11.5	6.3	11.0	9.6	3		14.9	15.2	14.5	14.8	4
Mean	11.9	6.7	11.2	9.9			15.7	15.5	14.4	15.2	

Table 12.4: AVT-2 Vicia: Second Advanced Varietal Trial in Vicia: Plant Height (cm) & Leaf Stem Ratio

Entries	Plant Height (cm)						L/S Ratio					
	Jabalpur	Rahuri	Raipur	Jhansi	Average	Rank	Jabalpur	Rahuri	Raipur	Jhansi	Average	Rank
JVS-1	129.7	63.2	58.5	97.8	87.3	1	0.69	0.94	0.31	0.51	0.61	1
JVS-2	118.9	55.2	53.9	85.7	78.4	4	0.62	0.69	0.40	0.44	0.54	3
JVS-3	123.8	53.8	54.3	84.0	79.0	3	0.64	0.75	0.35	0.67	0.60	2
JVS-4	117.0	56.6	46.5	85.5	76.4	5	0.63	0.68	0.31	0.45	0.52	4
JVS-5	127.6	50.4	60.0	90.1	82.0	2	0.63	0.63	0.29	0.61	0.54	3
Mean	123.4	55.8	54.6	88.6	80.6		0.64	0.74	0.33	0.54	0.56	

Table 12.5: AVT-2 Vicia: Second Advanced Varietal Trial in Vicia: ADF (%), NDF (%) & IVDMD (%)

Entries	ADF (%)		NDF (%)		IVDMD (%)	
	Rahuri	Rank	Rahuri	Rank	Rahuri	Rank
JVS-1	33.5	5	44.2	4	61.2	5
JVS-2	32.9	4	45.1	5	62.8	4
JVS-3	29.8	1	40.1	1	66.7	1
JVS-4	31.8	3	42.6	3	64.2	3
JVS-5	30.8	2	41.2	2	64.6	2
Mean	31.8		42.6		63.9	

Table 13.1: AVT-2 Vicia Seed: Advanced Varietal Trial in Vicia: Seed Yield (q/ha)

Entries	Seed Yield (q/ha)					Average	Rank
	Jabalpur	Raipur	**Rahuri	**Jhansi			
JVS-1	9.16	8.67	0.46	0.02		8.92	3
JVS-2	10.89	10.8	0.71	0.03		10.85	1
JVS-3	9.47	7.89	0.74	0.03		8.68	5
JVS-4	9.47	8.31	0.63	0.03		8.89	4
JVS-5	10.63	10.21	0.65	0.03		10.42	2
Mean	9.92	9.18	0.64	0.03		9.55	
CD at 5%	1.98	1.38	0.10	0.01			
CV%	13.14	10.17	9.85	1.99			

Note: ** Not included in zonal and all India average due to low yield of data

14. AVT-2 LOLIUM: SECOND ADVANCED VARIETAL TRIAL IN RYE GRASS (ANNUAL)

(Reference tables 14.1 to 14.5)

In Advanced Varietal Trial-2 on Lolium (rye grass), three entries were evaluated along with one check at five centers. For green fodder yield, Palam rye grass-2 (19.2%) followed by PBRG-2 (16.8%) and Palam rye grass -1 (15.3%) showed superiority over the check. Similarly for dry matter, entries Palam rye grass-1 (35.8%), Palam rye grass -2 (30.0%) and PBRG-2 (22.9%) were superior over the checks. Thus all three entries were far superior to the check. For both green and dry fodder production potential (q/ha/day) PBRG-2 ranked first followed by Palam rye grass-2 and Palam rye grass-1. Entry Palam rye grass -1 ranked first for plant height and for leafiness PBRG-2 ranked first.

For CPY (q/ha) entry PBRG-2 ranked first showing 9.5% superiority over the check, For CP%, check PBRG-1 was best, whereas for ADF %, NDF%, IVDMD %, check PBRG-1 ranked first followed by PBRG-2.

15. AVT-2 LOLIUM SEED: SECOND ADVANCED VARIETAL TRIAL IN RYE GRASS (ANNUAL) SEED

(Reference table 15.1)

In Advanced Varietal Trial-2 seed on Lolium (rye grass), three entries were evaluated along with one check at three centers. For seed yield, entry Palam rye grass-1 was best showing 28.4% superiority over the check. It was closely followed by Palam rye grass-2 showing yield of 7.19 q/ha which was 26.5% superior over the check (5.69 q/ha). Entry PBRG-2 was at par with check showing yield of 5.72 q/ha.

Table 14.1: AVT-2 Lolium-2016: Advanced Varietal Trial-2 in Rye grass (Annual): Green Forage Yield (q/ha) & Dry Matter Yield (q/ha)

Entries	GFY (q/ha)								DMY (q/ha)							
	Palam-pur	Sri-nagar	Alm-ora	Baja-ura	Ludh-iana	Aver-age	Ra-nk	Super-iority (%)	Palam-pur	Sri-nagar	Alm-ora	Baja-ura	Ludh-iana	Aver-age	Ra-nk	Superi-arity%
Palam rye grass-1	320.0	379.1	377.6	657.1	846.7	516.1	3	15.3	74.7	68.4	105.7	114.2	99.9	92.6	1	35.8
PBRG-2	272.8	309.7	370.5	586.5	1074.2	522.7	2	16.8	57.9	56.6	81.5	94.0	128.8	83.8	3	22.9
Palam rye grass-2	292.2	363.4	382.9	696.8	934.2	533.9	1	19.2	55.7	67.3	91.9	120.8	107.4	88.6	2	30.0
PBRG-1 (NC)	276.5	324.2	367.3	455.6	815.0	447.7	4		58.0	61.9	44.1	76.9	100.2	68.2	4	
Mean	290.4	344.1	374.6	599.0	917.5	505.1			61.6	63.6	80.8	101.5	109.1	83.3		
CD at 5%	34.4	14.4	NA	79.0	63.0				10.1	2.5	12.0	14.3	7.31			
CV%	8.6	6.8	10.5	8.2	7.7				11.9	5.8	10.7	8.8	7.2			

Table 14.2: AVT-2 Lolium-2016: Advanced Varietal Trial-2 in Rye grass (Annual): GFY (q/ha/day) & DMY (q/ha/day)

Entries	GFY (q/ha/day)		DMY (q/ha/day)	
	Ludhiana	Rank	Ludhiana	Rank
Palam rye grass-1	5.22	3	0.62	3
PBRG-2	6.63	1	0.79	1
Palam rye grass-2	5.76	2	0.66	2
PBRG-1 (NC)	5.03	4	0.61	4
Mean	5.66		0.67	

Table 14.3: AVT-2 Lolium-2016: Varietal Trial-2 in Rye grass (Annual): Crude Protein Yield (q/ha) & Crude Protein (%)

Entries	Crude Protein Yield (q/ha)					Crude Protein (%)			
	Palampur	Ludhiana	Average	Rank	Superiority%	Palampur	Ludhiana	Average	Rank
Palam rye grass-1	7.7	13.3	10.5	4		11.4	13.3	12.3	3
PBRG-2	6.3	19.3	12.8	1	9.5	10.9	15.0	12.9	2
Palam rye grass-2	6.1	15.9	11.0	3		11.0	14.8	12.9	2
PBRG-1 (NC)	6.6	16.8	11.7	2		10.3	16.8	13.6	1
Mean	6.7	16.3	11.5			10.9	15.0	12.9	

Table 14.4: AVT-2 Lolium-2016: Advanced Varietal Trial-2 in Rye grass (Annual): Plant Height (cm) & Leaf Stem Ratio

Entries	Plant Height (cm)						Leaf Stem Ratio				
	Palampur	Srinagar	Bajaura	Ludhiana	Average	Rank	Palampur	Srinagar	Ludhiana	Average	Rank
Palam rye grass-1	67.7	77.5	77.9	41.1	66.0	1	0.36	1.27	2.27	1.30	2
PBRG-2	55.8	65.1	72.1	39.8	58.2	4	0.48	1.36	2.35	1.40	1
Palam rye grass-2	64.2	80.9	74.9	41.3	65.3	2	0.32	1.22	2.22	1.25	3
PBRG-1 (NC)	60.9	69.1	71.7	39.2	60.2	3	0.44	1.17	2.29	1.30	2
Mean	62.2	73.1	74.2	40.4	62.4		0.40	1.26	2.28	1.31	

Table 14.5: AVT-2 Lolium-2016: Advanced Varietal Trial-2 in Rye grass (Annual): ADF (%), NDF (%) & IVDMD (%)

Entries	ADF (%)				NDF (%)				IVDMD (%)	
	Ludhiana	Palampur	Average	Rank	Ludhiana	Palampur	Average	Rank	Ludhiana	Rank
Palam rye grass-1	33.0	51.8	42.4	4	44.2	54.6	49.4	4	62.0	4
PBRG-2	31.9	52.2	42.1	2	41.7	55.8	48.8	2	63.2	2
Palam rye grass-2	32.4	52.0	42.2	3	43.9	54.0	49.0	3	62.4	3
PBRG-1 (NC)	30.7	51.8	41.3	1	42.3	53.8	48.1	1	66.1	1
Mean	32.0	52.0	42.0		43.0	54.6	48.8		63.4	

Table 15.1: AVT-2 Lolium (Seed): Advanced Varietal Trial-2 in Rye grass Annual (Seed): Seed Yield (q/ha)

Entries	Seed Yield (q/ha)						Superiority (%)
	Palampur	Srinagar	Ludhiana	Average	Rank		
Palam rye grass-1	9.55	7.25	5.10	7.30	1	28.4	
PBRG-2	6.05	6.68	4.43	5.72	3	0.6	
Palam rye grass-2	8.44	8.13	5.01	7.19	2	26.5	
PBRG-1 (NC)	5.80	6.36	4.90	5.69	4		
Mean	7.46	7.11	4.86	6.48			
CD at 5%	1.41	0.68	0.45				
CV%	13.78	6.40	6.75				

16. VT Red Clover 2016: VARIETAL TRIAL IN RED CLOVER (Perennial) - 2016 – 3RD YEAR

(Reference tables 16.1 to 16.4)

In perennial trial on Red clover, seven entries were evaluated at four locations in Hill zone of the country. The entries are coded and will be decoded after completion of trial. Entry VTRC-1-3 (305.0q) ranked first followed by VTRC-1-6 (290.1 q) for green fodder yield. Similarly for dry fodder yield, entry VTRC-1-3 (49.5q) ranked first followed by VTRC-1-6 (45.9 q). For crude protein yield, entry VTRC-1-4 was best with 4.0 q/ha followed by VTRC-1-4 and VTRC-1-7 with yield of 3.9q/ha.

For crude protein (%), entry VTRC-1-3 ranked first with 21.0% CP followed by VTRC-1-1 with 20.8%. For plant height entry VTRC-1-4 and for leaf stem ratio entry VTRC-1-3 ranked first. For ADF % entry VTRC-1-3 and for NDF% entry VTRC-1-7 ranked first.

17. VT White Clover 2016: VARIETAL TRIAL IN WHITE CLOVER (Perennial) - 2016 – 3RD YEAR

(Reference tables 17.1 to 17.3)

In perennial trial on Red clover, six entries were evaluated at four locations in Hill zone of the country. The entries are coded and will be decoded after completion of trial. Entry VTWC-1-1 ranked first for green fodder yield and dry fodder yield showing yield of 206.2 q and 31.1q/ha respectively. It was followed by entry VTWC-1-5 with yield of 199.0 and 29.1 q/ha for green and dry matter respectively.

For crude protein yield, entries VTWC-1-1 ranked first followed by VTWC-1-6. For crude protein %, entry VTWC-1-2 (21.7%) ranked first followed by VTWC-1-5 (21.5%). For plant height and leaf stem ratio, first rank was obtained by VTWC-1-2. For ADF%, entry VTWC-1-5 and VTWC-1-1 ranked joint first. For NDF%, entry VTWC-1-3 was best performer.

Table 16.1: VT Red Clover-2016: Varietal Trial in Red Clover (Perennial)-3rd Year: Green Forage Yield & Dry Matter Yield (q/ha)

Entries	GFY (q/ha)						DMY (q/ha)					
	Palampur	Srinagar	Bajaura	**Almora	Average	Rank	Palampur	Srinagar	Bajaura	**Almora	Average	Rank
VTRC-1-1	85.3	163.5	566.5	22.3	271.8	3	18.3	27.9	88.3	4.7	44.8	3
VTRC-1-2	89.6	191.4	474.0	27.5	251.7	7	18.0	35.1	69.0	4.7	40.7	7
VTRC-1-3	92.0	232.5	590.4	7.2	305.0	1	18.8	37.9	91.9	1.3	49.5	1
VTRC-1-4	87.8	213.7	489.1	25.3	263.5	5	20.4	31.3	75.2	4.6	42.3	6
VTRC-1-5	82.3	174.3	554.5	30.8	270.3	4	17.5	28.0	83.6	5.6	43.0	4
VTRC-1-6	86.0	200.7	583.7	25.0	290.1	2	19.8	31.0	87.0	4.3	45.9	2
VTRC-1-7	85.9		426.2	31.5	256.1	6	19.8		65.2	5.7	42.5	5
Mean	87.0	196.0	526.3	24.2	272.6		18.9	31.9	80.0	4.4	44.1	
CD at 5%	NS	11.3	44.2	6.1			NS	2.0	6.3	1.2		
CV%	15.4	7.3	5.7	14.0			18.2	3.7	5.3	14.7		

Note: ** Not included in zonal and all India average due to low yield of data

Table 16.2: VT Red Clover-2016: Varietal Trial in Red Clover (Perennial) -3rd Year: Crude Protein Yield (q/ha) & Crude Protein (%)

Entries	Crude Protein Yield (q/ha)		Crude Protein (%)	
	Palampur	Rank	Palampur	Rank
VTRC-1-1	3.8	3	20.8	2
VTRC-1-2	3.6	4	19.9	3
VTRC-1-3	3.9	2	21.0	1
VTRC-1-4	4.0	1	19.7	4
VTRC-1-5	3.4	5	19.5	5
VTRC-1-6	3.8	3	19.0	6
VTRC-1-7	3.9	2	19.9	3
Mean	3.8		20.0	

Table 16.3: VT Red Clover-2016: Varietal Trial in Red Clover (Perennial) -3rd Year: Plant Height (cm) & Leaf Stem Ratio

Entries	Plant Height (cm)					Leaf Stem Ratio			
	Palampur	Srinagar	Bajaura	Average	Rank	Palampur	Srinagar	Average	Rank
VTRC-1-1	45.3	39.8	55.0	46.7	5	0.66	1.60	1.13	5
VTRC-1-2	46.3	41.9	50.7	46.3	7	0.76	1.68	1.22	3
VTRC-1-3	47.3	48.0	49.5	48.3	3	0.73	1.81	1.27	1
VTRC-1-4	41.5	50.3	55.4	49.1	1	0.67	1.78	1.23	2
VTRC-1-5	43.3	38.6	57.4	46.4	6	0.78	1.53	1.16	4
VTRC-1-6	45.8	43.1	51.9	46.9	4	0.77	1.67	1.22	3
VTRC-1-7	45.3		52.6	48.9	2	0.80			
Mean	45.0	43.6	53.2	47.5		0.74	1.68	1.20	

Table 16.4: VT Red Clover-2016: Varietal Trial in Red Clover (Perennial) -3rd Year: ADF (%) & NDF (%)

Entries	ADF (%)		NDF (%)	
	Palampur	Rank	Palampur	Rank
VTRC-1-1	51.8	2	59.4	4
VTRC-1-2	52.4	4	57.6	2
VTRC-1-3	51.4	1	59.4	4
VTRC-1-4	52.2	3	60.0	5
VTRC-1-5	51.8	2	58.0	3
VTRC-1-6	52.6	5	57.6	2
VTRC-1-7	57.8	6	56.2	1
Mean	52.9		58.3	

Table 17.1: VT White Clover-2016: Varietal Trial in White Clover (Perennial)-3rd Year: Green Forage Yield & Dry Matter Yield (q/ha)

Entries	Green Forage Yield (q/ha)						Dry Matter Yield (q/ha)					
	Palampur	Srinagar	Almora	Bajaura	Average	Rank	Palampur	Srinagar	Almora	Bajaura	Average	Rank
VTWC-1-1	73.8	160.0	118.8	472.0	206.2	1	17.9	25.8	27.3	53.4	31.1	1
VTWC-1-2	69.0	198.2	110.7	359.7	184.4	3	15.6	28.5	25.5	40.5	27.5	3
VTWC-1-3	70.6	157.6	60.4	399.6	172.1	6	15.3	24.7	13.3	49.1	25.6	6
VTWC-1-4	61.5	164.5	99.0	377.4	175.6	5	14.0	25.1	21.8	42.9	25.9	5
VTWC-1-5	70.6	176.1	111.9	437.5	199.0	2	15.4	26.5	24.6	49.8	29.1	2
VTWC-1-6	73.4	186.0	89.0	386.7	183.7	4	17.6	27.6	19.6	43.9	27.2	4
Mean	69.8	173.7	98.3	405.5	186.8		15.9	26.4	22.0	46.6	27.7	
CD at 5%	NS	8.4	20.9	40.1			NS	1.8	4.7	4.6		
CV%	14.3	6.2	14.0	6.6			15.5	3.8	14.0	6.6		

Table 17.2: VT White Clover-2016: Varietal Trial in White Clover (Perennial) -3rd Year: Crude Protein Yield (q/ha), Crude Protein (%) Plant Height (cm) & Leaf Stem Ratio

Entries	Crude Protein Yield (q/ha)		Crude Protein (%)		Plant Height (cm)					Leaf Stem Ratio	
	Palampur	Rank	Palampur	Rank	Palampur	Srinagar	Bajaura	Average	Rank	Srinagar	Rank
VTWC-1-1	3.8	1	20.8	5	16.0	33.7	36.8	28.8	5	1.54	4
VTWC-1-2	3.3	3	21.7	1	18.3	43.1	34.2	31.9	1	1.66	1
VTWC-1-3	3.2	4	21.3	3	19.0	29.4	32.7	27.0	6	1.57	3
VTWC-1-4	2.8	5	19.9	6	18.5	34.8	34.9	29.4	4	1.59	2
VTWC-1-5	3.3	3	21.5	2	17.5	36.3	39.1	31.0	2	1.47	5
VTWC-1-6	3.7	2	21.0	4	18.5	38.3	33.6	30.1	3	1.57	3
Mean	3.4		21.0		18.0	35.9	35.2	29.7		1.6	

Table 17.3: VT White Clover-2016: Varietal Trial in White Clover (Perennial) -3rd Year: ADF (%) & NDF (%)

Entries	ADF (%)		NDF (%)	
	Palampur	Rank	Palampur	Rank
VTWC-1-1	47.4	1	57.6	3
VTWC-1-2	48.6	3	58.4	5
VTWC-1-3	47.6	2	55.6	1
VTWC-1-4	49.0	5	56.0	2
VTWC-1-5	47.4	1	58.2	4
VTWC-1-6	48.0	4	58.4	5
Mean	48.0		57.4	

18. IVT BAJRA (MULTICUT): INITIAL VARIETAL TRIAL IN FODDER BAJRA (MULTICUT) IN SUMMER

(Reference tables 18.1 to 18.7)

In Initial Varietal Trial on summer Bajra multicut, five entries were evaluated along with 3 checks (Giant Bajra, Moti Bajra, BAIF Bajra 1) at seven locations in central and south zone.

For green forage yield (q/ha), BAIF Bajra -6 showed 8.1% superiority over the best check BAIF Bajra -1 in central zone. In south zone and both combined zone the check was superior. Entry TSFB-18-2 was at par to check in south zone. For dry matter yield (q/ha), BAIF Bajra -5 and BAIF Bajra -6 were marginally superior to best check in central zone. In south and combined zones respectively, checks were superior.

For fodder production potential, both GFY and DMY, entry BAIF Bajra -5 ranked first followed by national check Giant Bajra. For Crude protein Yield (q/ha), entries TSFB-18-1 (4.2%), BAIF Bajra -5 (3.0%), BAIF Bajra -6 (1.5%) were marginally superior over the best check BAIF Bajra -1. Whereas for crude protein %, TSFB-18-1 ranked first with 10.3 % CP followed by TSFB-18-2 (9.4%) as compared to best check Moti Bajra and BAIF Bajra -1 (9.3%). For Plant height, check BAIF Bajra-1 and for leafiness entry BAIF Bajra-6 were best.

19. AVT-1 BAJRA (MULTICUT): FIRST ADVANCED VARIETAL TRIAL IN FODDER BAJRA (MULTICUT) IN SUMMER

(Reference tables 19.1 to 19.7)

In First Advanced Varietal Trial on summer Bajra multicut, three entries were evaluated along with 3 checks (Giant Bajra, Moti Bajra, Raj Bajra 1) at seven locations in central and south zone.

For green forage yield (q/ha), HTBH-4902 and ADV0061 showed 9.0% and 8.5% superiority over the best check Moti Bajra in central zone. In south zone entry HTBH-4902 was superior by a margin of 3.7%. Combining both zones, entry HTBH-4902 and entry ADV 0061 were superior by margins of 7.8% and 3.7% respectively. Entry AFB-37 showed marginal superiority over best check in both zones and combined zones.

For dry matter yield (q/ha), entry HTBH-4902 showed superiority of 2.6% in central zone, 8.2% in south zone and 5.6% in combined zones. Entry AFB-37 was superior by margin of 7.4% in south zone and 3.6% in combined zone.

For fodder production potential, both GFY and DMY, entry HTBH-4902 ranked first followed by national check Moti Bajra. For Crude protein yield (q/ha), entries AFB-37 (13.7%), ADV 0061 (7.1%) and HTBH-4902 (6.7%) were superior over the best check.

For crude protein %, ADV 0061 ranked first with 9.4 % CP followed by AFB 37 (9.1%) as compared to best check Giant Bajra (9.0%). For Plant height, national check and for leafiness entry ADV 0061 was best.

Table 18.1: IVT Bajra (Multi cut): Initial Varietal Trial in Fodder bajra (multi cut) in summer: Green Forage Yield (q/ha)

Entries	Central Zone							South Zone						All India	
	Rah- uri	Urulikan- chan	Ana- nd	Jabal- pur	Aver- age	Ra- nk	Superi- ority%	Hydera- bad	Man- dya	Vella- yani	Aver- age	Ra- nk	Superi- ority%	Aver- age	Ra- nk
TSFB-18-1	588.3	606.2	996.3	589.9	695.2	7		523.6	352.1	316.0	397.2	6		567.5	8
TSFB-18-2	543.1	707.5	929.6	566.3	686.6	8		657.9	364.8	329.0	450.6	1	0.3	585.5	7
BAIF Bajra-5	733.5	905.2	1071.8	508.0	804.6	3		607.0	300.5	394.0	433.8	4		645.7	3
BAIF Bajra-6	831.5	709.2	1215.7	739.8	874.0	1	8.1	671.8	383.7	274.0	443.2	3		689.4	2
16 ADV 0055	606.1	714.9	1290.3	576.0	796.8	4		588.4	295.6	315.0	399.7	5		626.6	5
Giant Bajra (NC)	841.9	738.6	973.6	609.3	790.8	5		685.7	304.7	357.0	449.1	2		644.4	4
Moti Bajra (NC)	764.4	767.2	842.1	648.2	755.5	6		444.8	368.5	283.0	365.4	7		588.3	6
BAIF Bajra-1 (NC)	681.1	720.6	1145.4	687.0	808.5	2		616.2	459.3					718.3	1
Mean	698.7	733.7	1058.1	615.6	776.5			599.4	353.7	324.0	419.9			633.2	
CD at 5%	99.4	46.9	261.3	125.3				83.5	23.6	7.6					
CV%	8.1	11.1	14.1	11.6				7.9	6.6	1.3					

Table 18.2: IVT Bajra (Multi cut): Initial Varietal Trial in Fodder bajra (multi cut) in summer: Dry Matter Yield (q/ha)

Entries	Central Zone							South Zone					All India	
	Rah- uri	Urulikan- chan	Ana- nd	Jabal- pur	Aver- age	Ra- nk	Superi- ority%	Hydera- bad	Man- dya	Vella- yani	Aver- age	Ra- nk	Aver- age	Ra- nk
TSFB-18-1	141.1	120.3	158.2	126.0	136.4	7		114.6	77.6	78.4	90.2	4	116.6	7
TSFB-18-2	114.6	126.9	148.6	120.0	127.5	8		147.0	67.9	82.1	99.0	1	115.3	8
BAIF Bajra-5	176.9	184.4	172.1	106.6	160.0	1	2.3	129.3	53.4	97.6	93.4	2	131.5	3
BAIF Bajra-6	157.6	128.7	192.4	159.3	159.5	2	2.0	148.0	63.0	68.2	93.1	3	131.0	4
16 ADV 0055	141.6	139.4	214.3	122.7	154.5	5		131.8	52.9	79.1	87.9	5	126.0	5
Giant Bajra (NC)	175.3	162.4	157.2	130.4	156.3	4		152.1	54.9	90.0	99.0	1	131.7	2
Moti Bajra (NC)	188.1	167.2	131.3	139.0	156.4	3		99.9	61.3	71.2	77.5	6	122.6	6
BAIF Bajra-1 (NC)	145.2	116.5	171.2	147.9	145.2	6		126.1	103.0				135.0	1
Mean	155.0	143.2	168.2	131.5	149.5			131.1	66.8	80.9	91.4		126.2	
CD at 5%	22.8	9.1	46.6	26.0				22.6	5.6	4.3				
CV%	8.4	11.0	15.8	11.3				9.8	8.3	2.9				

Table 18.3: IVT Bajra (Multi cut): Initial Varietal Trial in Fodder bajra (Multi cut) in summer: Green Forage Yield (q/ha/day) & Dry Matter Yield (q/ha/day)

Entries	GFY (q/ha/day)					DMY (q/ha/day)				
	Rahuri	Anand	Vellayani	Average	Rank	Rahuri	Anand	Vellayani	Average	Rank
TSFB-18-1	5.12	8.37	7.28	6.92	5	1.23	1.33	1.79	1.45	5
TSFB-18-2	4.72	7.81	7.26	6.60	7	1.00	1.25	1.81	1.35	6
BAIF Bajra-5	6.38	9.01	8.74	8.04	1	1.54	1.45	2.21	1.73	1
BAIF Bajra-6	7.23	10.22	6.19	7.88	3	1.37	1.62	1.53	1.51	4
16 ADV 0055	5.27	10.84	6.96	7.69	4	1.23	1.80	1.76	1.60	3
Giant Bajra (NC)	7.32	8.18	8.19	7.90	2	1.52	1.32	2.07	1.64	2
Moti Bajra (NC)	6.65	7.08	6.41	6.71	6	1.64	1.10	1.62	1.45	5
BAIF Bajra-1 (NC)	5.92	9.63				1.26	1.44			
Mean	6.08	8.89	7.29	7.39		1.35	1.41	1.83	1.53	

Table 18.4: IVT Bajra (Multi cut): Initial Varietal Trial in Fodder bajra (Multi cut) in summer: Crude Protein Yield (q/ha)

Entries	Rahuri	Urulikanchan	Anand	Jabalpur	Hyderabad	Mandya	Average	Rank	Superiority%
TSFB-18-1	14.0	11.2	23.8	10.4	4.8	8.5	12.1	1	4.2
TSFB-18-2	10.0	11.0	19.4	9.8	3.7	8.6	10.4	8	
BAIF Bajra-5	17.0	14.3	21.7	8.6	4.3	5.9	12.0	2	3.0
BAIF Bajra-6	14.0	11.3	23.2	13.3	3.8	5.2	11.8	3	1.5
16 ADV 0055	8.5	12.0	26.8	10.0	3.0	5.5	11.0	7	
Giant Bajra (NC)	16.1	14.2	19.0	10.6	4.1	5.1	11.5	5	
Moti Bajra (NC)	14.0	14.8	16.2	11.3	4.2	7.3	11.3	6	
BAIF Bajra-1 (NC)	9.5	10.8	19.7	12.2	4.5	13.0	11.6	4	
Mean	12.9	12.4	21.2	10.8	4.1	7.4	11.5		

Table 18.5: IVT Bajra (Multi cut): Initial Varietal Trial in Fodder bajra (Multi cut) in summer: Crude Protein (%)

Entries	Rahuri	Urulikanchan	Anand	Jabalpur	Hyderabad	Mandya	Average	Rank
TSFB-18-1	9.9	9.3	14.8	8.3	8.5	10.9	10.3	1
TSFB-18-2	8.8	8.7	13.1	8.2	5.2	12.7	9.4	2
BAIF Bajra-5	9.6	7.7	12.5	8.1	7.0	10.9	9.3	3
BAIF Bajra-6	8.9	8.8	12.1	8.3	5.7	8.3	8.7	5
16 ADV 0055	6.0	8.6	12.5	8.1	4.4	10.5	8.4	6
Giant Bajra (NC)	9.2	8.8	12.1	8.1	5.5	9.2	8.8	4
Moti Bajra (NC)	7.4	8.9	12.2	8.1	7.2	11.8	9.3	3
BAIF Bajra-1 (NC)	6.6	9.2	11.5	8.2	7.7	12.7	9.3	3
Mean	8.3	8.7	12.6	8.2	6.4	10.9	9.2	

Table 18.6: IVT Bajra (Multi cut): Initial Varietal Trial in Fodder bajra (Multi cut) in summer: Plant Height (cm)

Entries	Rahuri	Urulikanchan	Jabalpur	Anand	Vellayani	Mandya	Average	Rank
TSFB-18-1	98.5	69.2	151.3	136.1	136.0	160.8	125.3	3
TSFB-18-2	98.3	82.8	144.6	142.3	89.0	156.5	118.9	7
BAIF Bajra-5	105.3	86.5	140.0	143.7	131.0	81.5	114.7	8
BAIF Bajra-6	97.6	70.3	168.1	152.1	122.0	122.7	122.1	5
16 ADV 0055	102.1	92.2	154.8	148.6	126.0	122.7	124.4	4
Giant Bajra (NC)	103.2	91.8	157.3	161.6	118.0	94.7	121.1	6
Moti Bajra (NC)	98.5	94.1	154.7	142.2	109.0	166.2	127.5	2
BAIF Bajra-1 (NC)	110.9	74.5	162.2	145.9		170.0	132.7	1
Mean	101.8	82.7	154.1	146.6	118.7	134.4	123.3	

Table 18.7: IVT Bajra (Multi cut): Initial Varietal Trial in Fodder bajra (Multi cut) in summer: Leaf Stem Ratio

Entries	Rahuri	Urulikanchan	Anand	Jabalpur	Vellayani	**Mandya	Average	Rank
TSFB-18-1	1.13	0.68	1.13	0.67	0.58	0.23	0.84	5
TSFB-18-2	1.07	0.67	1.27	0.55	0.88	0.25	0.89	3
BAIF Bajra-5	0.95	0.66	1.06	0.51	0.74	0.30	0.78	6
BAIF Bajra-6	1.04	0.75	1.79	0.85	0.82	0.25	0.87	4
16 ADV 0055	1.13	0.70	1.10	0.60	0.72	0.17	1.05	1
Giant Bajra (NC)	1.15	0.70	0.98	0.65	0.88	0.26	0.85	5
Moti Bajra (NC)	0.81	0.59	0.89	0.68	0.84	0.26	0.76	7
BAIF Bajra-1 (NC)	1.06	0.73	1.08	0.75		0.39	0.91	2
Mean	1.04	0.69	1.16	0.66	0.78	0.26	0.87	5

Note: ** Not included in zonal and all India average due to low yield of data

Table 19.1: AVT-1 Bajra (Multi cut): Advanced Varietal Trial-1 in Fodder bajra (multi cut) in summer: Green Forage Yield (q/ha)

Entries	Central Zone							South Zone						All India		
	Rah- uri	Urulikan- chan	Ana- nd	Jabal- pur	Aver- age	Ra- nk	Superi- ority%	Hydera- bad	Man- dya	Vella- yani	Aver- age	Ra- nk	Superi- ority%	Aver- age	Ra- nk	Superi- ority%
HTBH-4902	791.6	789.5	1078.8	518.6	794.6	1	9.0	926.3	372.0	358.0	552.1	1	3.7	690.7	1	7.8
AFB-37	713.2	738.1	871.2	614.4	734.2	3	0.8	825.1	435.2	344.0	534.8	2	0.4	648.7	3	1.2
ADV 0061	819.5	782.2	874.7	685.3	790.4	2	8.5	737.2	395.7	355.0	496.0	6		664.2	2	3.7
Raj Bajra-1 (NC)	721.6	740.5	841.3	520.7	706.0	6		917.3	303.0	330.0	516.8	4		624.9	6	
Giant Bajra (NC)	861.6	657.8	787.5	581.1	722.0	5		962.3	270.2	365.0	532.5	3		640.8	4	
Moti Bajra (NC)	841.4	783.4	821.5	468.6	728.7	4		854.8	294.1	400.0	516.3	5		637.7	5	
Mean	791.5	748.6	879.2	564.8	746.0			870.5	345.0	358.7	524.7			651.2		
CD at 5%	104.3	27.3	178.9	94.6				122.2	28.0	9.3						
CV%	8.7	7.3	13.5	11.3				9.2	5.4	1.7						

Table 19.2: AVT-1 Bajra (Multi cut): Advanced Varietal Trial-1 in Fodder bajra (multi cut) in summer: Dry Matter Yield (q/ha)

Entries	Central Zone							South Zone						All India		
	Rah- uri	Urulikan- chan	Ana- nd	Jabal- pur	Aver- age	Ra- nk	Superi- ority%	Hydera- bad	Man- dya	Vella- yani	Aver- age	Ra- nk	Superi- ority%	Aver- age	Ra- nk	Superi- ority%
HTBH-4902	166.6	217.5	174.7	110.6	167.3	1	2.6	226.9	73.7	89.5	130.0	1	8.2	151.4	1	5.6
AFB-37	170.0	188.4	162.0	132.0	163.1	2	0.04	203.4	97.1	86.9	129.1	2	7.4	148.5	2	3.6
ADV 0061	177.6	167.4	136.2	148.1	157.3	4		190.0	79.1	89.0	119.4	4		141.1	4	
Raj Bajra-1 (NC)	167.6	206.4	168.2	110.0	163.0	3		214.9	53.0	83.4	117.1	6		143.3	3	
Giant Bajra (NC)	165.2	148.0	124.9	124.9	140.7	6		221.7	47.5	91.5	120.2	3		132.0	6	
Moti Bajra (NC)	161.6	190.8	130.1	98.7	145.3	5		204.1	51.9	100.6	118.9	5		134.0	5	
Mean	168.1	186.4	149.4	120.7	156.1			210.2	67.1	90.2	122.5			141.7		
CD at 5%	22.2	7.0	31.6	22.7				NS	6.4	6.3						
CV%	8.8	7.5	14.1	11.66				14.6	6.3	4.6						

Table 19.3: AVT-1 Bajra (Multi cut): Advanced Varietal Trial-1 in Fodder bajra (multi cut) in summer: Green Forage Yield (q/ha/day) & Dry Matter Yield (q/ha/day)

Entries	GFY (q/ha/day)					DMY (q/ha/day)				
	Rahuri	Anand	Vellayani	Average	Rank	Rahuri	Anand	Vellayani	Average	Rank
HTBH-4902	6.88	9.07	8.19	8.05	1	1.45	1.47	2.07	1.66	1
AFB-37	6.20	7.32	7.63	7.05	5	1.48	1.36	1.93	1.59	2
ADV 0061	7.13	7.35	7.75	7.41	3	1.54	1.14	1.87	1.52	4
Raj Bajra-1 (NC)	6.27	7.07	7.17	6.84	5	1.46	1.41	1.81	1.56	3
Giant Bajra (NC)	7.49	6.62	7.82	7.31	4	1.44	1.05	1.97	1.49	5
Moti Bajra (NC)	7.32	6.90	8.99	7.74	2	1.41	1.09	2.27	1.59	2
Mean	6.88	7.39	7.93	7.40		1.46	1.25	1.99	1.57	

Table 19.4: AVT-1 Bajra (Multi cut): Advanced Varietal Trial-1 in Fodder bajra (multi cut) in summer: Crude Protein Yield (q/ha)

Entries	Rahuri	Urulikanchan	Anand	Jabalpur	Vellayani	Hyderabad	Mandya	Average	Rank	Superiority%
HTBH-4902	13.8	18.6	20.9	8.9	5.5	6.4	8.6	11.8	3	6.7
AFB-37	13.9	16.4	20.3	10.8	4.2	10.1	12.4	12.6	1	13.7
ADV 0061	15.4	14.8	17.7	12.0	5.4	7.7	9.9	11.9	2	7.1
Raj Bajra-1 (NC)	11.0	17.5	20.7	8.5	5.5	8.6	5.7	11.1	4	
Giant Bajra (NC)	16.1	12.9	15.1	10.0	5.6	8.9	5.2	10.5	5	
Moti Bajra (NC)	11.5	16.6	15.5	7.7	6.6	9.2	5.3	10.3	6	
Mean	13.6	16.1	18.4	9.7	5.5	8.5	7.9	11.4		

Table 19.5: AVT-1 Bajra (Multi cut): Advanced Varietal Trial-1 in Fodder bajra (multi cut) in summer: Crude Protein (%)

Entries	Rahuri	Urulikanchan	Anand	Jabalpur	Vellayani	Hyderabad	Mandya	Average	Rank
HTBH-4902	8.3	8.6	12.0	8.0	6.2	5.3	11.6	8.6	4
AFB-37	8.2	8.7	12.6	8.2	4.8	8.8	12.8	9.1	2
ADV 0061	8.7	8.9	13.0	8.1	6.1	8.3	12.5	9.4	1
Raj Bajra-1 (NC)	6.6	8.5	12.3	7.7	6.6	7.3	10.8	8.5	5
Giant Bajra (NC)	9.7	8.7	12.2	8.0	6.2	7.5	11.0	9.0	3
Moti Bajra (NC)	7.1	8.7	12.0	7.8	6.6	8.0	10.2	8.6	4
Mean	8.1	8.7	12.3	8.0	6.1	7.5	11.5	8.9	

Table 19.6: AVT-1 Bajra (Multi cut): Advanced Varietal Trial-1 in Fodder bajra (multi cut) in summer: Plant Height (cm)

Entries	Rahuri	Urulikanchan	Jabalpur	Anand	Vellayani	Mandya	Average	Rank
HTBH-4902	125.7	114.6	150.7	140.8	135	138.7	134.2	5
AFB-37	129.2	124.0	165.1	154.1	138	142.9	142.2	2
ADV 0061	117.6	89.7	170.2	152.0	136	144.3	135.0	4
Raj Bajra-1 (NC)	137.3	140.4	138.0	154.9	136	161.5	144.7	1
Giant Bajra (NC)	118.0	110.8	159.5	156.2	136	148.8	138.2	3
Moti Bajra (NC)	110.4	123.1	130.1	152.6	139	148.7	134.0	6
Mean	123.0	117.1	152.3	151.8	136.7	147.5	138.1	

Table 19.7: AVT-1 Bajra (Multi cut): Advanced Varietal Trial-1 in Fodder bajra (multi cut) in summer: Leaf Stem Ratio

Entries	Rahuri	Urulikanchan	Anand	Jabalpur	Vellayani	Mandya	Average	Rank
HTBH-4902	0.84	0.82	0.99	0.65	0.67	0.24	0.70	4
AFB-37	0.61	0.63	1.36	0.76	0.72	0.22	0.72	3
ADV 0061	0.79	0.76	1.13	0.84	0.83	0.22	0.76	1
Raj Bajra-1 (NC)	0.72	0.49	1.22	0.60	0.66	0.24	0.66	6
Giant Bajra (NC)	0.93	0.70	1.16	0.72	0.71	0.23	0.74	2
Moti Bajra (NC)	0.77	0.59	1.18	0.53	0.71	0.28	0.68	5
Mean	0.78	0.67	1.17	0.68	0.72	0.24	0.71	

FORAGE CROP PRODUCTION

The forage crop production programme was executed at 22 locations in five zones. In total 21 experiments were conducted, out of which 12 were in network (9 coordinated and 3 AVT based) and 9 were in location specific mode. The main emphasis was to increase the system productivity and resource use optimization in forages and forage based cropping systems. In addition to above, the results of hydroponic fodder production, production potential of annual rye grass with berseem in Hill Zone, carbon sequestration potential of perennial grass based cropping and supplementation of forage crops with micronutrients has also been covered. The results of studies on planting geometry of tall fescue grass and white clover in wet temperate conditions, feasibility of oat - *Lathyrus* intercropping system, techniques for enhancing seed setting and seed productivity of fodder oat and lucerne has also been presented in the chapter.

The results of trials on Organic nutrient management, Seed yield maximization and standardization of seed production techniques for fodder maize etc. has also been compiled in the chapter. The chapter also includes results of advanced varietal trials on response of promising entries of different forage species to nutrients. The salient research achievements of the forage crop production trials during Rabi 2018-19 are as follows:

A. COORDINATED TRIALS

PS-14-AST-4: Studies on planting geometry of tall fescue grass and seed rates of white clover in wet temperate conditions

[Table Reference: PS-14-AST-4 (a)-(d)]

Locations: Palampur and Srinagar

An experiment was started during *Rabi* 2014-15 at Palampur and Srinagar centre in coordinated mode to evaluate the productivity, quality and compatibility of tall fescue grass planted at different spacing with variable seed rates of white clover in wet temperate conditions. All possible combinations of three spacing of fescue grass (20cm x 30cm; 30 cm x 0 cm and 40 cm x 40 cm) and three seed rate of white clover (1.0, 2.0 and 3.0 kg/ha) with sole stand of tall fescue grass (30cm x 30 cm) and white clover (6kg/ha sown by broadcast) were evaluated in randomised block design. In treatments comprised of tall fescue grass + white clover the legume was over sown by broadcast in tall fescue after transplanting of this grass.

The results indicated that, the performance of crops in terms of growth and herbage yield was better at Srinagar than Palampur. The response of treatments was similar at both the locations. T₆ tall fescue grass at 30 x 30 cm + white clover @ 3 kg/ha produced higher green, dry forage and crude protein yields and was closely followed by T₅ planting of tall fescue grass at 30 x 30 cm + white clover @ 2 kg/ha. T₆ produced 15.5 % and 20.0 % more green forage over sole tall fescue grass and white clover, respectively. The respective increase in dry forage yield was 20.2 %, 48.4 %. In terms of crude protein yield T₁₁ was followed by T₈, T₈, T₇ and T₆. At Palampur higher net returns and B: C ratio was observed in T₁. Inclusion of white clover in the system resulted in an improvement in soil nitrogen content.

Code	Treatments	Code	Treatments
T ₁	TFG 20x30 cm + WC 1.0 Kg/ha	T ₇	TFG 40x40 cm + WC 1.0 Kg/ha
T ₂	TFG 20x30 cm + WC 2.0 Kg/ha	T ₈	TFG 40x40 cm + WC 2.0 Kg/ha
T ₃	TFG 20x30 cm + WC 3.0 Kg/ha	T ₉	TFG 40x40 cm + WC 3.0 Kg/ha
T ₄	TFG 30x30 cm + WC 1.0 Kg/ha	T ₁₀	Sole TFG 30 x 30 cm
T ₅	TFG 30x30 cm + WC 2.0 Kg/ha	T ₁₁	Sole WC 6.0 kg/ha
T ₆	TFG 30x30 cm + WC 3.0 Kg/ha		
TFG- Tall fescue grass		WC- White clover	

Table PS-14-AST-4 (a): Effect on planting geometry of tall fescue grass and white clovers on growth of species in wet temperate condition

Treatment	Mean plant height (cm) of tall fescue grass			Mean plant height (cm) of White clover			Mean L:S (Palampur)		Mean % proportion of species (Palampur)	
	Palampur	Srinagar	Mean	Palampur	Srinagar	Mean	TFG	WC	TFG	WC
T ₁	59.80	87.40	73.60	26.80	39.80	33.30	1.58	1.88	65.7	34.3
T ₂	60.10	73.80	66.95	26.90	45.70	36.30	1.75	1.82	52.3	47.7
T ₃	59.40	91.20	75.30	26.80	49.30	38.05	1.84	1.89	52.4	47.6
T ₄	57.40	74.60	66.00	26.70	53.80	40.25	1.59	1.92	62.3	37.7
T ₅	57.80	81.50	69.65	27.80	48.60	38.20	1.78	1.89	54.6	45.4
T ₆	61.80	82.60	72.20	26.70	55.80	41.25	1.92	1.94	51.7	48.3
T ₇	56.70	83.20	69.95	29.40	51.50	40.45	1.63	1.94	56.4	43.6
T ₈	56.80	77.80	67.30	28.40	47.60	38.00	1.65	1.99	52.4	47.6
T ₉	56.30	74.60	65.45	28.60	55.30	41.95	1.71	1.96	49.8	50.2
T ₁₀	52.20	73.50	62.85	-	-	-	1.77	-	100	0
T ₁₁	-	-	-	24.80	51.60	38.20	-	1.91	0	100
SE(m) ±	1.41	1.60	-	1.52	1.10	-	0.02	0.03	4.2	2.3
C.D. (P=0.05)	4.23	4.63	-	4.34	3.24	-	0.21	NS	12.3	6.8

TFG- Tall fescue grass, WC- White clover

Table PS-14-AST-4 (b): Effect on planting geometry of tall fescue grass and white clovers on yield, quality and economics of species in wet temperate condition

Treatment	Green fodder yield (q/ha)			Dry fodder yield (q/ha)			Mean Crude protein yield (q/ha)			Mean crude protein content (%)			Net returns (Rs./ha)	B:C Ratio
	Palampur	Srinagar	Mean	Palampur	Srinagar	Mean	Palampur	Srinagar	Mean	Palampur	Srinagar	Mean		
T ₁	301.24	341.50	321.37	72.30	85.60	78.95	10.77	9.67	10.22	14.90	11.30	13.10	71952	3.91
T ₂	296.45	353.60	325.03	68.18	80.80	74.49	10.84	9.62	10.23	15.90	11.90	13.90	69506	3.58
T ₃	291.23	362.80	327.02	61.16	88.90	75.03	10.03	11.73	10.88	16.40	13.20	14.80	67989	3.51
T ₄	298.46	352.80	325.63	65.66	83.40	74.53	10.70	10.34	10.52	16.30	12.40	14.35	70097	3.61
T ₅	301.45	372.60	337.03	69.33	93.40	81.37	11.65	11.96	11.81	16.80	12.80	14.80	70523	3.54
T ₆	276.78	384.60	330.69	60.89	99.70	80.30	10.29	13.16	11.73	16.90	13.20	15.05	63118	3.17
T ₇	296.78	342.50	319.64	68.26	82.40	75.33	10.85	9.56	10.21	15.90	11.60	13.75	70801	3.88
T ₈	288.24	348.60	318.42	60.53	85.60	73.07	10.17	11.81	10.99	16.80	13.80	15.30	67068	3.46
T ₉	272.34	345.20	308.77	51.74	81.60	66.67	9.00	10.53	9.77	17.40	12.90	15.15	62283	3.21
T ₁₀	255.67	316.70	286.19	58.44	75.30	66.87	5.79	8.66	7.23	9.90	11.50	10.70	60641	3.78
T ₁₁	254.45	296.70	275.58	45.45	62.80	54.13	8.86	10.93	9.90	19.50	17.40	18.45	59981	3.67
SE(m) ±	4.98	4.40	-	2.61	0.98	-	0.39	0.31	-	0.3	0.22	-	-	-
C.D. (P=0.05)	14.64	12.72	-	7.67	2.89	-	1.14	0.98	-	0.9	0.63	-	-	-

Table PS-14-AST-4 (c): Effect on planting geometry of tall fescue grass and seed rate of white clovers on soil properties (Palampur)

Treatment	N (kg/ha)	P (kg/ha)	K (kg/ha)	pH	Total soil organic carbon (t/ha)
T ₁	235	19	269	5.6	7.66
T ₂	245	21	259	5.6	7.66
T ₃	256	19	272	5.7	7.67
T ₄	241	21	273	5.6	7.64
T ₅	254	22	272	5.7	7.70
T ₆	265	23	268	5.7	7.62
T ₇	242	21	267	5.5	7.72
T ₈	266	20	271	5.7	7.71
T ₉	269	21	272	5.7	7.69
T ₁₀	216	22	274	5.6	7.69
T ₁₁	269	21	270	5.6	7.42
Initial value	212	17	242	5.7	7.34

Table PS-14-AST-4 (d): Effect on planting geometry of tall fescue grass and seed rate of white clovers on soil properties (Srinagar)

Treatment	N (kg/ha)	P (kg/ha)	K (kg/ha)	pH	Total soil organic carbon (t/ha)
T ₁	241	21	278	6.5	7.42
T ₂	247	18	273	6.2	7.46
T ₃	252	19	271	6.3	7.52
T ₄	243	20	281	6.6	7.62
T ₅	252	18	278	6.8	7.55
T ₆	257	19	280	6.2	7.64
T ₇	245	20	276	6.3	7.72
T ₈	253	21	278	6.5	7.68
T ₉	260	19	280	6.6	7.76
T ₁₀	235	17	275	6.7	7.33
T ₁₁	268	19	276	6.3	7.28
Initial value	232	15	263	6.3	7.23

K-15-AST-11 C: Studies on carbon sequestration in perennial grass based cropping systems

[Table Reference: K-15-AST-11 C (a)-(f)]

Locations: Hyderabad, Coimbatore, Vellayani, Ranchi, Jabalpur

A trial was initiated at five centres (Hyderabad, Coimbatore, Vellayani, Ranchi and Jabalpur) with the objective to study the effect of cropping system on fodder yield, quality, economics and carbon sequestration potential. The treatments included T₁ -BN hybrid at recommended spacing, T₂- Guinea grass at recommended spacing, T₃- BN hybrid in paired rows (60/120 cm) + Fodder cowpea (Kharif) - Lucerne (Rabi), T₄ -BN hybrid in paired rows (60/120 cm) + *Desmanthus* (Perennial), T₅- BN hybrid in paired rows (60/120 cm) + *Sesbania grandiflora*, T₆ -Guinea grass in paired rows (60/120 cm) + Fodder cowpea (Kharif) - Lucerne (Rabi), T₇ - Guinea grass in paired rows (60/120 cm) + *Desmanthus* (Perennial), T₈ -Guinea grass in paired rows (60/120 cm) + *Sesbania grandiflora*. Cowpea was included instead of lucerne in treatment T₂ and T₆ at Kerala (Vellayani). Treatments were replicated thrice in randomised block design.

The third year, results indicated that on locational mean basis, treatment T₅- BN hybrid in paired rows (60/120 cm) + *Sesbania grandiflora*, (1859.9 q green and 502.1 q dry matter/ha) proved superior to all treatments. This was closely followed by T₃- BN hybrid in paired rows (60/120 cm) + Fodder cowpea (Kharif) - Lucerne (Rabi) and T₄ -BN hybrid in paired rows (60/120 cm) + *Desmanthus* (Perennial), which remained on par with each other but significantly superior to other treatments. The treatment T₂- Guinea grass at recommended spacing recorded lowest yield (1353.8 q green and 401.8 q dry matter/ha). As regards to crude protein yields also T₅ BN hybrid in paired rows (60/120 cm) + *Sesbania grandiflora* proved superior to other treatments. Among the centres, higher biomass and crude protein yields were recorded at Coimbatore. The treatment T₅ BN hybrid in paired rows (60/120 cm) + *Sesbania grandiflora* also recorded higher gross monetary returns. However, T₃- BN hybrid in paired rows (60/120 cm) + Fodder cowpea (Kharif) - Lucerne (Rabi) recorded significantly higher BC ratio over rest of the treatment. In terms of total carbon dioxide sequestered by different systems, T₅ was significantly superior to other treatments recording 246.8 (q/ha/yr Total C sequestered).

T ₁ -BN hybrid
T ₂ - Guinea grass
T ₃ - BN hybrid+ Lucerne
T ₄ - BN hybrid+Desmanthus
T ₅ -BN hybrid+Sesbania (Agati)
T ₆ -Guinea grass+ Lucerne
T ₇ - Guinea grass+Desmanthus
T ₈ -Guinea grass + Sesbania (Agati)

Table K-15-AST-11 C (a): Total biomass yields of perennial grass based cropping systems

Treatments	Total green fodder yield (q/ha)						Total Dry matter yield (q/ha)					
	Coimbatore	Hyderabad	Ranchi	Vellayani	Jabalpur	Mean	Coimbatore	Hyderabad	Ranchi	Vellayani	Jabalpur	Mean
T ₁	3165.0	1308.1	613.7	1953.7	1642.0	1736.5	686.0	304.3	182.2	498.2	745.9	483.3
T ₂	2484.3	856.7	461.3	1948.8	1018.0	1353.8	516.3	255.2	136.9	487.1	613.5	401.8
*T ₃	3205.3	1159.4	811.3	2082.7	1589.0	1769.5	695.3	209.1	253.5	520.5	711.1	477.9
T ₄	3282.3	1176.7	667.7	2013.0	1483.0	1724.5	712.3	215.3	209.6	503.0	711.1	470.3
T ₅	3534.7	1520.5	670.2	2034.2	1540.0	1859.9	798.0	330.6	210.8	503.9	667.2	502.1
*T ₆	2616.3	754.4	583.3	2017.7	1157.0	1425.7	544.0	202.0	183.6	504.2	639.8	414.7
T ₇	2670.0	794.5	546.4	1944.7	1100.0	1411.1	558.0	210.1	171.6	492.0	600.2	406.4
T ₈	2993.7	1079.0	487.3	1985.7	1084.0	1525.9	621.0	283.3	153.2	496.3	601.2	431.0
SE(m) ±	129.0	22.6	14.62	1.17	103.30		26.33	12.8	7.55		28.41	
C.D. (P=0.05)	261.3	74.5	44.76	20.114	412.03		54.33	41.2	23.13	NS	87.99	
CV (%)			4.18		14.63				6.97		16.93	

Table K-15-AST-11 C (b): Total crude protein yield of perennial grass based cropping systems

Treatments	Total Crude Protein Yield (g/ha)				
	Coimbatore	Hyderabad	Jabalpur	Vellayani	Mean
T ₁	94.0	18.1	54.0	49.3	53.9
T ₂	45.3	14.2	40.6	49.1	37.3
*T ₃	97.3	13.2	53.3	39.2	50.8
T ₄	100.7	15.0	52.5	35.9	51.0
T ₅	117.0	28.4	51.2	43.2	60.0
*T ₆	52.0	11.7	43.3	33.6	35.2
T ₇	54.7	13.8	41.4	32.0	35.5
T ₈	68.3	25.9	43.9	32.4	42.6
SE(m) ±	4.30	1.6	1.07	0.131	
C.D. (P=0.05)	8.80	4.8	3.28	2.252	
CV (%)			15.23		

Table K-15-AST-11 C (c): Growth parameters of grasses in perennial grass based cropping systems

Treatments	Plant height (cm)				No. of tillers/ m ²				Leaf stem ratio			
	Hydera- bad	Coimb- atore	Vella- yani	Mean	Hydera- bad	Coimb- atore	Vella- yani	Mean	Hydera- bad	Coimb- atore	Vella- yani	Mean
T ₁	91.2	191.3	158.0	146.8	46.0	42.3	151.0	79.8	0.50	0.88	1.45	0.94
T ₂	97.4	179.2	136.3	137.6	42.2	57.4	153.0	84.2	0.48	0.79	1.40	0.89
*T ₃	89.5	189.6	158.7	145.9	43.3	39.8	287.0	123.4	0.51	0.86	1.16	0.84
T ₄	86.9	185.2	159.0	143.7	42.5	36.4	210.0	96.3	0.53	0.82	1.22	0.86
T ₅	90.2	183.2	181.0	151.5	47.8	36.1	269.0	117.6	0.58	0.81	1.32	0.90
*T ₆	89.2	177.1	147.3	137.9	40.4	56.1	242.0	112.8	0.48	0.71	1.32	0.84
T ₇	91.5	173.2	150.0	138.2	39.2	53.1	191.0	94.4	0.46	0.69	1.36	0.84
T ₈	97.3	170.3	158.3	142.0	42.2	51.3	182.0	91.8	0.52	0.67	1.39	0.86
SE(m) ±	5.20	8.07	0.38		2.70	2.12	0.29		0.05	0.03		
C.D. (P=0.05)	NS	16.43	6.55		NS	4.36	4.98		NS	0.06	NS	

Table K-15-AST-11 C (d): Cost of cultivation and gross monitory returns of perennial grass based cropping systems

Treatments	Cost of cultivation				GMR				
	Hydera- bad	Vella- yani	Coimb- atore	Mean	Vella- yani	Coimb- atore	Hydera- bad	Ran- chi	Mean
T ₁	57650	315000	138489	170379	585900	525724	186500	61365	339872.3
T ₂	46550	305000	125802	159117	584400	355729	102,560	46133	272205.6
*T ₃	59,200	274000	141004	158068	624600	522290	175,500	87624	352503.5
T ₄	57850	260000	140761	152870	603600	528814	180,400	72108	346230.5
T ₅	61100	258000	140074	153058	610200	536112	228,950	72378	361910
*T ₆	45450	270000	119937	145129	605100	363829	98,420	63000	282587.3
T ₇	44940	250000	120300	138413	583200	374029	112,500	59011	282185.1
T ₈	51400	240000	121387	137595	595500	373498	159,300	52632	295232.5
SE(m) ±	385						2715	1563.1	
C.D. (P=0.05)	1040						8150	4787.3	
CV (%)								4.21	

Table K-15-AST-11 C (e): Gross monitory returns and B: C ratio in perennial grass based cropping systems

Treatments	NMR					B: C ratio				
	Vella-yani	Coimb-atore	Hydera-bad	Ran-chi	Mean	Vella-yani	Coimb-atore	Hydera-bad	Ran-chi	Mean
T ₁	270900	387235	128850	51365	209588	1.86	3.8	3.24	5.14	3.51
T ₂	279400	229927	56010	36133	150368	1.91	2.83	2.2	3.61	2.64
*T ₃	350600	381286	116300	76124	231078	2.28	3.7	2.96	6.62	3.89
T ₄	343600	388053	122550	60608	228703	2.32	3.76	3.12	5.27	3.62
T ₅	352200	396038	167850	60878	244242	2.37	3.83	3.75	5.29	3.81
*T ₆	335100	243892	52970	51500	170866	2.24	3.03	2.17	4.48	2.98
T ₇	333200	253729	67560	47511	175500	2.33	3.11	2.5	4.13	3.02
T ₈	355500	252111	107900	41132	189161	2.48	3.08	3.1	3.58	3.06
SE(m) ±			1950					0.07	0.14	
C.D. (P=0.05)			6785					0.20	0.42	
CV (%)									5.03	

Table K-15-AST-11 C (f): Total carbon sequestered by crops (7 cuts) during the year (q/ha)

Treatments	Grass		Inter crop (legume component)		Lucerne (q/ha/yr)	Total C sequestered			Mean
	Coimbatore	Hyderabad	Coimbatore	Hyderabad	Coimbatore	Coimbatore	Vellayani	Hyderabad	
T ₁	295.7	171				295.7	205.1	171	223.9
T ₂	222.7	143				222.7	204.7	143	190.1
T ₃	291.3	115	11.4	2	14.1	300.0	218.7	117	211.9
T ₄	289.3	113	51.8	8		306.7	211.3	121	213.0
T ₅	294.3	146	145.7	39		342.7	211.7	186	246.8
T ₆	220.3	111	24.8	2	16.6	234.3	211.8	114	186.7
T ₇	220.3	108	58.9	10		240.0	206.7	118	188.2
T ₈	216.3	112	150.7	47		266.3	208.5	159	211.3
SE(m) ±	10.43	1.2				12.30		1.0	
C.D. (P=0.05)	21.43	3.8				25.17	NS	3.01	

K-15-AST-12C:-Studies on the productivity and carbon sequestration of silvipastoral system in hills of north western Himalayas

[Table Reference: K-15-AST-12C (a)-(c)]

Locations: Palampur and Srinagar

An experiment was started during *Kharif* 2015 at Palampur and Srinagar centre in coordinated mode to study the system productivity and organic matter input to soil through silvi-pastoral system. Two tree species {*Grewia*- (at Palampur) *Salix*- (at Srinagar) and Mulberry} in main plot and four range species treatments (*Setaria* grass var. PSS-1, tall fescue grass var. Hima-14, white clover var. PLP composite, tall fescue grass+ white clover, local species) in sub plots were evaluated in split plot design. The data was recorded of complete crop year 2018-19. The effect of tree species on total green, dry forage and crude protein yields of forage species was significant only at Srinagar centre. Among range species on locational mean basis, highest green fodder and dry fodder yield was obtained with the planting of *Setaria* grass followed by tall fescue grass+ white clover. Minimum herbage yield was obtained in white Clover. Similar effect on crude protein yield was observed.

Tree species had no significant effect on net returns and B: C ratio. However, *Setaria* grass resulted in highest return and B:C ratio at both locations. No appreciable effect of treatments on total organic carbon was observed.

Table K-15-AST-12C (a): Effect of tree and range species on green, dry and crude protein yields (q/ha)

Treatment	Green fodder yield			Dry fodder yield			Crude protein yield		
	Palampur	Srinagar	Mean	Palampur	Srinagar	Mean	Palampur	Srinagar	Mean
A. Tree species									
Grewia/ Salix*	225.88	279.08	252.48	52.60	57.78	55.19	6.72	6.68	6.70
Mulberry	231.10	302.73	266.92	53.76	66.02	59.89	6.62	7.36	6.99
SE(m) ±	3.76	6.20		2.84	1.44		1.96	1.23	
C.D. (P=0.05)	NS	18.12		NS	4.32		NS	NS	
B. Range species									
Setaria grass	584.24	493.96	539.10	140.64	107.73	124.19	17.03	13.12	15.08
Tall fescue grass	177.81	297.12	237.46	39.77	64.41	52.09	4.65	8.02	6.34
White clover	114.23	165.41	139.82	28.84	31.70	30.27	2.07	1.87	1.97
Tall fescue grass + white clover	187.54	339.11	263.33	40.17	75.55	57.86	6.44	6.90	6.67
Local scpecies	78.63	158.95	118.79	16.47	30.14	23.30	3.16	5.17	4.17
SE(m) ±	7.21	12.90		3.01	3.06		4.02	2.58	
C.D. (P=0.05)	21.55	37.68		8.91	9.07		11.81	7.68	
C. Interaction: Tree X range spp.									
	NS	NS		NS	NS		NS	NS	

*Palampur- Grewia; Srinagar- Salix

Table K-15-AST-12C (b): Effect of tree and range species on economics and soil organic carbon

Treatment	Net Returns (Rs/ha)			B:C Ratio			Total soil organic carbon (t/ha)		
	Palampur	Srinagar	Mean	Palampur	Srinagar	Mean	Palampur	Srinagar	Mean
A. Tree species									
Grewia/ Salix*	61204	64352	62778	11.92	10.42	11.17	6.34	7.63	6.99
Mulberry	62769	68702	65736	12.39	12.98	12.69	6.38	7.06	6.72
SE(m) ±	486	-		0.14	0.93		-	-	
C.D. (P=0.05)	NS	NS		NS	NS		-	-	
B. Range species									
Setaria grass	166071	128612	147342	23.07	17.53	20.30	6.61	7.18	6.90
Tall fescue grass	44943	58442	51693	6.81	9.42	8.12	6.50	7.92	7.21
White clover	31668	37318	34493	17.59	12.30	14.95	6.27	6.98	6.63
Tall fescue grass + white clover	47862	72650	60256	7.25	10.92	9.09	6.27	7.43	6.85
Local scpecies	166071	128612	147342	23.07	17.53	20.30	6.61	7.18	6.90
SE(m) ±	696	-		0.19	1.95		-	-	
C.D. (P=0.05)	2095	NS		0.59	5.81		-	-	
C. Interaction: tree X range spp.									
	NS	NS		NS	NS		NS	NS	

R-15-AST-1: Productivity of oat - lathyrus intercropping system as influenced by integrated nutrient management.

[Table Reference: R-15-AST-1 (a)-(g)]

Location: Kalyani and Ranchi

The field experiment was initiated at Kalyani, and Ranchi from Rabi 2015-16 to study the productivity and profitability of food (*Lathyrus*) + forage (oat) intercropping system influenced by integrated nutrient management. The experiment was laid out in split plot design with three replications. The treatments consisted of crops in the main plot: T₁-sole oat, T₂- sole *Lathyrus*, T₃- oat + *Lathyrus* (3:2) and T₄- oat + *Lathyrus* (3:3). Integrated nutrient management was assigned in the sub plot: F₁- RDF (inorganic), F₂- 50% N (RDF) + 50% N (FYM) and F₃-50% N (RDF) + 50% N (vermicompost). Oat cv. OS-6 and *Lathyrus* Cv. Nirmal were used for the study.

The mean over the location indicated that, T₃ – oat + *Lathyrus* (3:2) recorded maximum GFY, CPY and GEFY (309.69, 8.25 and 321.35q/ha). However, in with respect to DFY (90.68), (6.023 q) T₁ – Sole oat recorded significant superiority over other treatments. Among three cropping system, T₃ proved most remunerative recording net monetary returns of Rs.64958/ha and B: C ratio of 2.34 on locational mean basis. Among the centres, maximum green and dry matter productivity was recorded at Ranchi. Recommended dose of fertilizers i.e.80, 40 and 40 kg ha N, P₂O₅ and K₂O per hectare, respectively were applied for the study and part of it was supplied by other sources in different treatments. On location mean basis, F₃-50% N (RDF) + 50% N (vermicompost) recorded significantly higher GFY (335.87 q), CPY (7.45 q), and GFEY (302.99q/ha). In case of DFY, F₃ and F₁ remained at par with each other but significantly superior to F₂. However in monetary parameters, F₁- RDF (inorganic) proved better, recording higher net monetary returns (Rs. 30626 and B: C ratio 2.15

Table R-15-AST-1 (a): GFY and DMY of oat and lathyrus as influenced by intercropping system and integrated nutrient management

Intercropping system	GFY (q/ha)							DMY (q/ha)						
	Oat		Lathyrus		Total			Oat		Lathyrus		Total		
	Kal-yani	Ran-chi	Kal-yani	Ran-chi	Kal-yani	Ran-chi	Mean	Kal-yani	Ran-chi	Kal-yani	Ran-chi	Kal-yani	Ran-chi	Mean
T ₁ – Sole oat	223.6	337	0	0	223.6	337	280.3	37.7	114.22	0	29.44	37.7	143.66	90.68
T ₂ – Sloe Lathyrus	0	0	102.8	134.78	102.8	134.78	118.79	0	0	15.1	16.51	15.1	16.51	15.81
T ₃ – oat + Lathyrus (3:2)	219.4	282.89	45.2	71.89	264.6	354.78	309.69	36.1	90.44	6.5	21.37	42.6	111.81	77.21
T ₄ – oat + Lathyrus (3:3)	163.3	209.34	59.3	90.56	222.6	299.9	261.25	26.5	62.67	8.1	0.15	34.6	62.82	48.71
SE(m) ±	0.82	6.45	1.4	0.97	--			0.32	2.78	0.24	0.62	0		
C.D. (P=0.05)	2.41	25.18	4.1	3.79	--			0.94	10.84	0.71		0		
Integrated nutrient management														
F ₁	189.2	292.11	68.7	100	257.9	392.11	325.01	31.1	94.44	9.8	22.6	40.9	117.04	78.97
F ₂	204.4	262.78	58.8	93	263.2	355.78	309.49	33.7	85.44	7.9	21.45	41.6	106.89	74.25
F ₃	213.3	274.33	80.1	104	293.4	378.33	335.87	35.4	87.44	11.8	23.34	47.2	110.78	78.99
SE(m) ±	1.26	5.68	1.2	2.14	--			0.23	1.72	0.21	0.58	0		
C.D. (P=0.05)	3.7	17.56	3.5	6.63	--			0.67	5.32	0.62	1.81	0		

Table R-15-AST-1 (b): CP content and yield of oat and lathyrus as influenced by intercropping system and INM

Intercropping system	Crude Protein (%)					Crude Protein Yield (q/ha)					Plant Population	
	Oat	Lathyrus	Total		Mean	Oat	Lathyrus	Total		Mean	Oat	Lathyrus
	Kalyani	Kalyani	Kalyani	Ranchi		Kalyani	Kalyani	Kalyani	Ranchi		Ranchi	Ranchi
T ₁ – Sole oat	9.86	--	9.86	10.06	9.96	3.81	--	3.81	10.34	7.08	33.34	
T ₂ – Sloe Lathyrus	--	18.6	18.6	14.82	16.71	--	2.82	2.82	3.93	3.38	----	17.58
T ₃ – oat + Lathyrus (3:2)	8.88	16.4	25.3	12.55	18.93	3.31	1.10	4.41	12.09	8.25	35.00	17.34
T ₄ – oat + Lathyrus (3:3)	7.89	13.7	21.6	13.18	17.39	2.20	1.15	3.35	9.73	6.54	34.20	16.59
SE(m) ±	0.18	0.28	--	0.009		0.14	0.21	--	0.23		0.80	0.15
C.D. (P=0.05)	0.52	0.82	--	0.03		0.41	0.62	--	0.79		NS	NS
Integrated nutrient management												
F ₁	8.1	16.5	12.3	12.5	12.40	2.7	1.60	4.3	9.41	6.7	36.82	12.22
F ₂	8.2	14.5	11.35	12.64	12.00	2.84	1.16	4.0	8.71	6.36	35.95	17.08
F ₃	10.8	17.7	14.25	12.82	13.54	3.67	2.1	5.77	9.13	7.45	35.65	17.08
SE(m) ±	0.19	0.35	--	0.26		0.22	0.18	--	0.26		0.68	0.22
C.D. (P=0.05)	0.56	1.03	--	0.83		0.65	0.53	--	0.80		NS	NS
CV (%)				7.37					9.96			

Table R-15-AST-1 (c): Plant height and L: S ratio of oat and lathyrus intercropping system at Kalyani

Intercropping system	Plant height (cm) at harvest						L:S Ratio	
	Oat			Lathyrus			Oat	Lathyrus
	Kalyani	Ranchi	Mean	Kalyani	Ranchi	Mean	Kalyani	Kalyani
T ₁ – Sole oat	129.6	137.67	133.6	--	---		0.80	--
T ₂ – Sloe Lathyrus	--	----		103.5	98.22	100.9	--	1.52
T ₃ – oat + Lathyrus (3:2)	129.7	135.34	132.5	80.2	90.22	85.2	0.83	1.49
T ₄ – oat + Lathyrus (3:3)	125.1	131.33	128.2	92.3	90.00	91.2	0.77	1.47
SE(m) ±	0.34	0.34		1.3	1.84		--	--
C.D. (P=0.05)	0.99	1.50		3.82	7.17		--	--
Integrated nutrient management								
F ₁	125.9	152.14	139.0	87.6	85.67	86.6	0.79	1.48
F ₂	125.6	123.17	124.4	94.9	90.23	92.6	0.74	1.47
F ₃	131.3	134.17	132.7	93.6	102.56	98.1	0.88	1.52
SE(m) ±	0.42	2.48		0.48	1.96		--	--
C.D. (P=0.05)	1.23	7.69		1.41	6.07		--	--
CV (%)		6.39			7.33			

Table R-15-AST-1 (d): Grain, stover yield and harvest index of oat and lathyrus at Kalyani

Treatments	Oat			Lathyrus		
	Seed yield (q/ha)	Stover yield (q/ha)	Harvest Index	Seed yield (q/ha)	Stover yield (q/ha)	Harvest Index
Intercropping system (T)						
T ₁	14.2	31.5	31.0	--	--	--
T ₂	--	--	--	7.72	14.0	35.4
T ₃	9.1	20.5	30.7	3.36	6.1	35.5
T ₄	7.9	19.1	29.5	4.27	8.1	34.4
SE(m) ±	0.09	0.37	--	0.12	0.07	--
C.D. (P=0.05)	0.26	1.08	--	0.35	0.20	--
CV (%)	4.23	2.97	--	5.82	3.81	--
Integrated nutrient management (F)						
F ₁	7.6	14.9	33.4	4.41	8.1	35.3
F ₂	11.0	26.1	29.6	5.00	9.0	35.6
F ₃	12.7	30.0	29.7	5.93	10.6	35.7
SE(m) ±	0.11	0.42	--	0.08	0.13	--
C.D. (P=0.05)	0.32	1.23	--	0.23	0.38	--
CV (%)	6.28	7.14	--	5.84	5.32	--

Table R-15-AST-1 (e): LER and oat green forage equivalent yield (q/ha) of oat and lathyrus intercropping system

Treatments	LER			Oat GFEY (q/ha)		
	Kalyani	Ranchi	Mean	Kalyani	Ranchi	Mean
Intercropping system (T)						
T ₁	1.00	1.00	1.00	223.5	337.00	280.25
T ₂	1.00	1.00	1.00	134.6	156.12	145.36
T ₃	1.08	1.35	1.22	279.3	363.39	321.35
T ₄	1.12	1.27	1.20	241.2	311.21	276.21
SE(m) ±					7.82	
C.D. (P=0.05)					26.99	
Integrated nutrient management (F)						
F ₁	1.10	1.28	1.19	284.9	303.46	294.18
F ₂	1.42	1.25	1.34	282.1	278.65	280.38
F ₃	1.66	1.41	1.54	312.3	293.68	302.99
SE(m) ±		0.04			5.36	
C.D. (P=0.05)		0.12			16.59	
CV (%)		10.76			6.36	

Table R-15-AST-1 (f): Production economics of oat and lathyrus intercropping system

Intercropping system	Cost of Cultivation (Rs./ha)			GMR (Rs./ha)			NMR (Rs./ha)			B:C ratio		
	Kalyani	Ranchi	Mean	Kalyani	Ranchi	Mean	Kalyani	Ranchi	Mean	Kalyani	Ranchi	Mean
T ₁	26,100	33502	29,801	54,720	67400	61,060	28,620	33898	31,259	2.09	2.01	2.05
T ₂	21,000	29534	25,267	40,638	33422	37,030	19,638	3888	11,763	1.93	1.13	1.53
T ₃	23,725	31914	27,820	57,238	72677	64,958	33,513	40763	37,138	2.41	2.28	2.34
T ₄	24,580	30351	27,466	55,543	62241	58,892	30,963	31890	31,427	2.25	2.05	2.15
SE(m) ±						1744		1744				
C.D. (P=0.05)						6020		6020				
Integrated nutrient management (F)												
F ₁	23,075	28597	25,836	51,718	61205	56,462	28,643	32608	30,626	2.24	2.14	2.19
F ₂	21,860	30143	26,002	54,887	55729	55,308	33,027	25586	29,307	2.51	1.85	2.18
F ₃	24,060	35236	29,648	58,700	59871	59,286	34,640	24635	29,638	2.43	1.70	2.06
SE(m) ±						561		561			0.02	
C.D. (P=0.05)						1684		1684			0.07	

Table R-15-AST-1(g): Effect of oat-lathyrus intercropping system and INM on soil fertility parameters after harvest at Kalyani

Treatments		Soil parameters			Available nutrient in soil (kg/ha)		
		pH	EC (dsm ⁻¹)	OC (%)	N	P	K
T ₁	F ₁	6.75	0.14	0.47	170.5	23.1	158.1
	F ₂	6.60	0.15	0.48	172.3	25.2	171.2
	F ₃	6.55	0.13	0.49	170.1	25.7	175.5
T ₂	F ₁	6.81	0.14	0.50	175.2	26.7	168.2
	F ₂	6.64	0.14	0.51	180.4	27.5	169.4
	F ₃	6.63	0.13	0.52	181.5	25.2	184.5
T ₃	F ₁	6.52	0.15	0.53	178.4	26.7	178.1
	F ₂	6.71	0.16	0.52	179.2	27.2	179.2
	F ₃	6.67	0.15	0.57	178.1	28.4	185.7
T ₄	F ₁	6.53	0.13	0.56	175.2	25.5	187.2
	F ₂	6.75	0.16	0.56	180.1	28.1	179.5
	F ₃	6.67	0.15	0.57	181.2	30.2	187.2
Initial		6.58	0.14	0.49	198.2	42.5	211.4

K-16-AST-1: Feasibility of Hydroponics fodder production system-A Quantitative and Qualitative study

[Table Reference: K-16-AST-1 (a)-(d)]

Location: Mandya, Ludhiana

The hydroponic study was conducted at Ludhiana and Mandya to study the suitability of maize and cowpea for fodder quality fodder production under hydroponics fodder production system. The treatments included two fodder crops (maize and cowpea), three seed densities (200, 300 and 400g per square feet) and four harvest stages (9, 11, 13, 15 days after growth). Treatments were replicated thrice. In maize, plant height increased with advancement of growth and maximum height was observed at 15th day of growth which was at par with 13th day of growth. On locational mean basis, total hydroponic green weight (kg/kg of seed) varied from 4.53 to 5.19 and maximum yield was achieved at 11th day of growth. Highest dry matter yield was also achieved at 11th day. Nutritional quality of hydroponically grown maize crop varied with age of plant. As regards to Crude protein content maximum level achieved was at 11th day at Ludhiana and 13th day at Mandya. Both ADF and NDF contents significantly increased with delayed harvest and maximum level was at 15th day at all seed rates at Ludhiana. As regards to density of seeds, seed rate of 300 gm /sq ft recorded highest green fodder, dry matter and crude protein yields at both the locations. The difference in CP content at varying seed density was not significant at Mandya, whereas at Ludhiana higher CP content was recorded with 300 gm / sq ft seed density. ADF and ash content were higher at higher densities.

In cowpea crop, plant height increased with the age of the plant. Green fodder yield did not show any significant change due to day of growth or seed density. But dry matter content was highest at 9th day. Crude protein content varied from 37.18- 39.27% and maximum level was achieved at 11th day stage. ADF, NDF and ash content increased with advancement of growth and maximum level was found at 15th day. No significant variation was noticed in quality parameters at different seed densities.

Table K-16-AST-1 (a): Yield (per kg seed) and quality of fodder maize grown under hydroponic production system

Treatments	Green fodder (kg)			Dry matter yield (kg)			DM (%)	Crude protein Yield (kg)			Crude protein content (%)		
	Man-dya	Ludh-iana	Mean	Man-dya	Ludh-iana	Mean	Ludh-iana	Man-dya	Ludh-iana	Mean	Man-dya	Ludh-iana	Mean
Harvest stage													
9 th day	4.88	5.4	5.14	0.45	0.52	0.49	9.7	0.049	0.08	0.06	10.53	15.5	13.02
11 th day	4.87	5.5	5.19	0.50	0.54	0.52	9.8	0.058	0.08	0.07	11.33	15.3	13.32
13 th day	5.04	4.7	4.87	0.52	0.38	0.45	8.1	0.063	0.05	0.06	11.96	13.9	12.93
15 th day	4.45	4.6	4.53	0.41	0.38	0.40	8.2	0.044	0.04	0.04	10.29	10.9	10.60
SE(m) ±	0.08			0.01	0.05			0.002			0.35		
C.D. (P=0.05)	0.22	NS		0.04	0.02		0.42	0.006	0.004		1.02	1.97	
Seed rate (g/ sq ft)													
200	4.92	4.8	4.86	0.49	0.43	0.46	9.0	0.058	0.06	0.06	11.39	13.9	12.65
300	4.85	5.5	5.18	0.48	0.51	0.50	9.3	0.055	0.08	0.07	11.15	14.3	12.73
400	4.66	4.9	4.78	0.44	0.42	0.43	8.6	0.048	0.06	0.05	10.54	13.6	12.07
SE(m) ±	0.07			0.01	0.01			0.002	0.001		0.30		
C.D. (P=0.05)	0.19	0.35		0.04	NS		NS	0.005	0.002		NS	1.1	
Interaction													
SE(m) ±	0.13			0.02	0.08			0.003	0.002		0.60		
C.D. (P=0.05)	NS	NS		NS	NS		NS	NS	NS		NS	0.89	

Table K-16-AST-1 (b): Yield (per kg seed) and quality of fodder cowpea grown under hydroponic production system

Treatments	Green fodder (kg)			Crude protein content (%)			Dry matter yield (kg)	DM (%)	Crude protein Yield (kg)
	Man-dya	Ludh-iana	Mean	Man-dya	Ludh-iana	Mean	Man-dya	Ludh-iana	Man-dya
Time of Harvest									
9 th day	4.61	4.4	4.51	29.26	45.5	37.38	0.46	8.7	0.137
11 th day	4.23	4.6	4.42	31.33	47.2	39.27	0.41	8.9	0.129
13 th day	4.92	4.1	4.51	32.29	46.0	39.15	0.52	8.5	0.168
15 th day	4.3	3.8	4.05	29.86	44.5	37.18	0.41	8.3	0.121
SE(m) ±	0.07			0.57	0.99		0.01		0.005
C.D. (P=0.05)	0.20	0.36		1.67	2.91		0.03	0.36	0.015
Seed rate (g/ sq ft)									
200	4.63	4.10	4.37	30.79	44.65	4.63	0.47	8.3	0.143
300	4.57	4.40	4.49	30.92	46.38	4.57	0.46	9.0	0.143
400	4.35	4.10	4.23	30.28	46.35	4.35	0.43	8.6	0.130
SE(m) ±	0.06			0.49			0.01		0.004
C.D. (P=0.05)	0.17	0.4		NS	0.48		0.03	0.21	NS
Interaction									
SE(m) ±	0.12			0.99			0.02		0.009
C.D. (P=0.05)	NS	NS		NS	0.97		NS	0.09	NS

Table K-16-AST-1 (c): Growth and quality parameters of maize and cowpea grown under hydroponic production system at Ludhiana

Treatments	Maize			Cowpea		
	ADF (%)	NDF (%)	Plant Height (cm)	ADF (%)	NDF (%)	Plant Height (cm)
Time of Harvest						
9 th day	17.8	38.1	28.2	18.3	32.9	25.6
11 th day	23.8	46.9	31.7	23.7	41.4	27.2
13 th day	30.2	51.3	32.9	27.2	43.7	29.7
15 th day	32.4	51.6	33.7	28.2	46.4	28.2
C.D. (P=0.05)	3.12	3.75	0.2	1.03	2.33	NS
Seed rate (g/ sq ft)						
200	26.2	44.2	31.6	23.95	39.925	27.6
300	26.8	47.4	31.8	25.35	41.625	28.0
400	25.2	49.4	31.5	23.7	41.775	27.5
C.D. (P=0.05)	3.11	2.22	0.35	0.76	1.23	0.25
Interaction						
C.D. (P=0.05)	1.53	3.1	0.11	2.1	1.11	NS

Table K-16-AST-1(d): Interaction effect of harvest stage and seed rate on GFY and HCN content at Ludhiana

Harvest stage (Days)	GFY(kg/kg seed)			HCN (ppm)		
	200 g/sqft	300 g/sqft	400 g/sqft	200 g/sqft	300 g/sqft	400 g/sqft
9 th day	2.4	3.1	2.6	290.3	313.2	321.2
11 th day	2.7	3.4	2.7	287.4	295.4	290.9
13 th day	2.6	3.1	2.4	256.2	244.1	234.9
15 th day	2.2	2.9	2.0	213.5	203.4	210.0
Seed rate			0.41			2.41
Harvest stage			NS			1.82
Interaction			NS			1.01

R-16-AST-1: Enhancing seed productivity of fodder oat in different regions of India under irrigated condition

[Table Reference: R-16-AST-1 (a)-(f)]

Location: Raipur, Jabalpur, Dharwad

This experiment was initiated at three centres during Rabi 2016-17 with the objective to study the effect of crop geometry and nitrogen doses on seed production potential and economics of seed production of oat varieties. The treatments included two varieties i.e., JHO -822 and RO – 19, two row spacing i.e., 30 and 45 cm and three Nitrogen doses i.e., 80, 100 and 120 kg/ha. The treatments were replicated thrice in factorial Randomised block design. 1st cut was taken after 45 DAS then crop was left for seed production. The nitrogen was applied 50% at basal + 50 % after 1st cut.

The results indicated that as regards to GFY and straw yield at first cut, variety RO-19 was better than JHO-822 at on locational mean basis. However in terms of DFY, JHO -822 was better. JHO-822 exhibited higher harvest index, seed yield, net monetary return (Rs.62985/ha) and B: C ratio (2.71). The sowing of oat at 30 cm row spacing for seed production proved better over row spacing of 45 cm. It recorded higher GFY (188.9q/ha), DFY (35.15q/ha), seed yield (46.77q/ha), net returns (Rs.552303/ha) and B: C ratio (2.42). The application of nitrogen recorded linear improvement in growth and yield parameters up to 120 kg/ha. Application of 120kg N/ha recorded 16.9, 16.22 and 21.8% higher GFY, DFY and seed yield respectively over 80kg N/ha. It (120 kg N/ha) also resulted in higher net return (Rs.59335/ha) and B: C ratio (2.55) on locational mean basis.

Table R-16-AST-1(a): Productivity (q/ha) of fodder oat

Varieties	GFY 1 st cut (45 DAS)				DMY 1 st cut (45 DAS)				Seed Yield (q/ha)			
	Raipur	Jabalpur	Dharwad	Mean	Raipur	Jabalpur	Dharwad	Mean	Raipur	Jabalpur	Dharwad	Mean
V1-JHO-822	73.66	87.16	35.83	173.0	8.15	16.06	76.6	33.60	30.0	31.8	8.31	48.30
V2-RO-19	108.61	57.86	40.90	191.8	6.93	12.26	85.9	35.03	15.9	24.3	9.47	44.97
SE(m) ±	1.7	3.48	0.39		0.11	1.61	0.3		0.23	0.8	0.13	
C.D. (P=0.05)	5	7.72	2.39		0.33	2.11	1.8		0.66	0.02	0.77	
Crop Geometry												
S ₁ .30 cm	95.15	76.66	39.50	188.9	7.29	14.76	83.4	35.15	22.4	24.6	9.33	46.77
S ₂ .45 cm	87.11	68.36	37.23	175.9	7.79	13.56	79.2	33.52	23.5	23.5	8.45	43.83
SE(m) ±	1.703	2.48	0.49		0.11	1.71	1.1		0.23	0.75	0.10	
C.D. (P=0.05)	4.495	4.72	1.92		0.33	2.41	4.2		0.67	0.17	0.38	
Nitrogen doses												
N ₁ . 80 kg/ha	86.31	66.06	35.38	168.7	6.97	13.26	74.9	31.71	20.8	22.8	7.87	40.77
N ₂ .100 kg/ha	91.99	72.86	38.50	183.3	7.85	14.06	81.4	34.44	22.8	23.7	8.99	45.47
N ₃ . 120 kg/ha	95.1	78.66	41.21	195.3	7.8	15.16	87.5	36.82	25.3	25.7	9.80	49.67
SE(m) ±	86.31	66.06	0.74		6.97	13.26	74.9		20.8	22.8	0.11	
C.D. (P=0.05)	6.117	5.51	2.21		0.41	1.14	4		0.813	1.16	0.33	
CV (%)			66.5				57.5				4.25	

Table R-16-AST-1(b): Straw yield and yield attributes of fodder oat

Treatments	Straw Yield (q/ha)				Harvest Index (%)				Plant Height at 1 st cut (45 DAS)			
	Raipur	Jabalpur	Dharwad	Mean	Raipur	Jabalpur	Dharwad	Mean	Raipur	Jabalpur	Dharwad	Mean
Varieties												
V1-JHO-822	98.36	89.40	33.22	73.7	23.40	25.80	25.67	24.96	65.20	50.46	124.0	79.9
V2-RO-19	102.53	109.10	34.92	82.2	13.50	12.70	27.54	17.91	74.77	47.16	142.0	88.0
SE(m) ±	1.11	0.31	0.25		--	0.8	0.16		0.57	1.86	1.0	
C.D. (P=0.05)	3.27	1.485	1.49		--	0.012	0.99		1.67	2.87	3.0	
Crop Geometry												
S ₁ .30 cm	96.2	98.30	39.95	78.2	18.50	19.70	23.26	20.49	70.55	47.26	0.0	81.6
S ₂ .45 cm	104.69	100.20	28.19	77.7	18.30	18.80	29.94	22.35	69.41	50.36	127.0	85.9
SE(m) ±	1.11		0.30		--		0.23		0.57	2.48	138.0	
C.D. (P=0.05)	3.27	1.2	1.20		--	1.2	0.90		1.67	4.73	1.0	
Nitrogen doses												
N ₁ . 80 kg/ha	94.07	96.00	31.68	73.9	17.80	19.00	25.30	20.70	66.19	47.66	125.0	79.6
N ₂ .100 kg/ha	99.4	99.40	34.46	77.8	18.50	19.00	26.69	21.40	70.40	48.56	134.0	84.3
N ₃ . 120 kg/ha	107.87	102.40	36.07	82.1	18.90	19.80	27.82	22.17	73.36	50.26	139.0	87.5
SE(m) ±	1.36	1.13	0.33		--	0.50	0.53		0.70	0.55	2.0	
C.D. (P=0.05)	4.00	3.40	1.00		--	1.50	1.60		2.05	1.66	5.0	
CV (%)			3.39				6.94				4.60	

Table R-16-AST-1(c): Economics of fodder oat in different regions

Varieties	Gross Return (Rs./ha)				Net Return (Rs./ha)				Cost of cultivation (Rs./ha)			B: C Ratio			
	Rai-pur	Jabal-pur	Dhar-wad	Mean	Rai-pur	Jabl-pur	Dhar-wad	Mean	Rai-pur	Jabal-pur	Mean	Dhar-wad	Rai-pur	Jabal-pur	Mean
V1-JHO-822	94325	92055	94442	93607	64363	64650	59942	62985	29962	28403	40450	1.74	3.15	3.24	2.71
V2-RO-19	58763	57202	105966	73977	28400	30197	71466	43354	30362	2800	25505	2.07	1.94	2.01	2.01
SE(m) ±	613.61	89	1037		613	89	1037		--			0.03			
C.D. (P=0.05)	1800	2891	6309		1800	2695	6309		--			0.18			
Crop Geometry															
S ₁ .30 cm	74623	76401	106534	85853	44461	49196	72034	55230	30162	28203	37865	2.09	2.47	2.71	2.42
S ₂ .45 cm	78465	72856	93874	81732	48302	45651	59374	51109	30162	28203	36491	1.72	2.60	2.58	2.30
SE(m) ±	613	916	780		613	857	780		--			0.02			
C.D. (P=0.05)	1800	2691	3063		1800	2691	3063		--			0.09			
Nitrogen doses															
N ₁ . 80 kg/ha	70214	70637	91745	77532	40356	43636	57445	47146	29858	27999	35001	1.67	2.35	2.52	2.18
N ₂ .100 kg/ha	76378	73721	100904	83668	46216	46465	66404	53028	30162	28254	37148	1.92	2.53	2.61	2.35
N ₃ . 120 kg/ha	83040	79527	107963	90177	52573	52169	73263	59335	30467	28356	39386	2.11	2.73	2.80	2.55
SE(m) ±	751	1236	1297		751	1124	1297		--			0.04			
C.D. (P=0.05)	2204	3365	3888		2204	3397	3888		--			0.11			
CV (%)			4.48				6.84					6.84			

Table R-16-AST-1(d): Growth and yield attributes of fodder oat at harvest

Varieties	Plant Height (cm)				No of Tillers m ⁻¹ row length				No of Panicle m ⁻¹ row length		
	Raipur	Jabalpur	Dharwad	Mean	Raipur	Jabalpur	Dharwad	Mean	Raipur	Jabalpur	Mean
V1-JHO-822	131.90	153.74	67.17	117.60	177.70	100.70	50.85	109.75	168.40	82.70	125.55
V2-RO-19	140.00	123.80	71.84	111.88	181.00	94.70	39.92	105.21	173.00	89.20	131.10
SE(m) ±	0.79	0.56	0.62		0.96	1.65	1.35		1.3	1.45	
C.D. (P=0.05)	2.30	1.68	3.76		2.83	4.95	8.23		3.7	4.35	
Crop Geometry											
S ₁ .30 cm	134.80	137.60	68.10	113.50	175.40	91.80	43.18	67.49	166.10	82.90	124.50
S ₂ .45 cm	137.10	139.60	70.91	115.87	183.30	103.60	47.59	75.60	175.30	89.10	132.20
SE(m) ±	0.79	0.69	0.64		0.96	1.71	1.09		1.262	1.46	
C.D. (P=0.05)	2.30	2.07	2.50		2.83	5.13	4.28		3.701	4.38	
Nitrogen doses											
N ₁ . 80 kg/ha	131.70	132.10	67.76	110.52	169.30	85.20	40.92	98.47	160.10	74.90	117.50
N ₂ .100 kg/ha	135.60	136.90	69.57	114.02	177.60	95.70	46.11	106.47	168.70	82.40	125.55
N ₃ . 120 kg/ha	140.60	140.60	71.18	117.46	191.20	105.80	49.13	115.38	183.20	94.30	138.75
SE(m) ±	0.96	0.81	0.67		1.18	1.80	0.86		1.545	1.71	
C.D. (P=0.05)	2.82	2.43	2.02		3.46	5.40	2.58		4.533	5.13	
CV (%)			3.36				6.58				

Table R-16-AST-1(e): Yield attributes of fodder oat in different regions

Varieties	Panicle length (cm)			Panicle weight (g)			Filled Grains per panicle (No)		
	Raipur	Jabalpur	Mean	Raipur	Jabalpur	Mean	Raipur	Jabalpur	Mean
V1-JHO-822	34.70	35.40	35.05	3.86	4.94	4.40	49.80	62.70	56.25
V2-RO-19	39.90	32.90	36.40	4.36	5.08	4.72	61.50	78.70	70.10
SE(m) ±	0.3	0.28		0.06	0.40		1.4	1.49	
C.D. (P=0.05)	0.9	0.84		0.16	1.20		4.0	4.74	
Crop Geometry									
S ₁ .30 cm	36.60	33.50	35.05	4.01	4.89	4.45	55.20	69.10	62.15
S ₂ .45 cm	38.00	34.80	36.40	4.20	5.13	4.67	56.00	72.30	64.15
SE(m) ±	0.29	0.32		0.06	0.50		1.38	NS	
C.D. (P=0.05)	0.86	0.96		0.16	1.50		NS		
Nitrogen doses									
N ₁ . 80 kg/ha	35.60	31.20	33.40	3.95	2.68	3.32	52.70	62.30	57.50
N ₂ .100 kg/ha	37.60	32.00	34.80	4.09	2.90	3.50	53.90	68.30	61.10
N ₃ . 120 kg/ha	38.70	33.00	35.85	4.28	3.17	3.73	60.30	75.20	67.75
SE(m) ±	0.36	0.46		0.07	0.55		1.69	2.01	
C.D. (P=0.05)	1.06	1.38		0.20	1.65		4.94	6.03	

Table R-16-AST-1(f): Quality and Yield attributes of fodder oat at harvest in different regions

Varieties	Unfilled Grains per panicle (No)			1000- grain weight			CPY(q/ha)	CP (%)
	Raipur	Jabalpur	Mean	Raipur	Jabalpur	Mean	Dharwad	Dharwad
V1-JHO-822	3.20	16.90	10.05	62.80	29.90	46.35	1.94	5.86
V2-RO-19	14.50	7.80	11.15	54.20	32.00	43.10	2.06	5.90
SE(m) ±	0.53	0.70		1.2	0.55		0.02	0.01
C.D. (P=0.05)	1.5	2.1		3.5	1.65		0.10	NS
Crop Geometry								
S ₁ .30 cm	8.40	10.80	9.60	58.90	31.00	44.95	2.33	5.82
S ₂ .45 cm	9.30	13.90	11.60	58.10	31.90	45.00	1.67	5.93
SE(m) ±	0.53	0.72		1.20	NS		0.02	0.02
C.D. (P=0.05)	NS	2.16		N/A			0.06	0.07
Nitrogen doses								
N ₁ . 80 kg/ha	7.90	8.50	8.20	57.50	29.80	43.65	1.83	5.77
N ₂ .100 kg/ha	8.20	8.90	8.55	57.50	30.30	43.90	2.03	5.91
N ₃ . 120 kg/ha	10.50	13.40	11.95	60.40	31.00	45.70	2.14	5.95
SE(m) ±	0.64	0.69		1.46	NS		0.02	0.02
C.D. (P=0.05)	1.89	2.07		N/A			0.06	0.05

R-16-AST-2: Enhancing seed setting in Lucerne through foliar spray

[Table Reference: R-16-AST-2 (a)-(e)]

Location: Coimbatore, Ludhiana, Hyderabad and Bikaner

A trial was conducted at four centres (Coimbatore, Ludhiana, Hyderabad and Bikaner) to find out the suitable combination of foliar spray chemicals, their effect on seed yield, vigour and economics of production of Lucerne. The eight treatments included seven chemicals namely; T₁: ZnSO₄ 0.25 %, T₂:K₂SO₄ 1.0 %, T₃: MAP 1.0 %, T₄: Salicylic acid 100 ppm, T₅: Mepiquat chloride 500 ppm T₆: TNAU Pulse wonder 1.0 %, T₇: Brasinolide 1.0 ppm and T₈ control i.e. no spray.

The treatments were replicated thrice in randomised block design. The results indicated, that on locational mean basis treatment T₇: Brasinolide 1.0 ppm and T₁ ZnSO₄ 0.25 % remained at par with each other but proved superior to the treatment these recorded higher number of pods/plant, number of seeds/pod and seed yield. No remarkable difference was observed in number of days taken for maturity and 1000 seed weight in different treatments. The treatment T₇: Brasinolide 1.0 ppm also recorded gross returns (Rs 103971/ha), net returns (Rs.63383/ha) and B: C ratio (2.40).

T ₁ : ZnSO ₄ 0.25 %
T ₂ : K ₂ SO ₄ 1.0 %
T ₃ : MAP 1.0 %
T ₄ : Salicylic acid 100 ppm
T ₅ : Mepiquat chloride 500 ppm
T ₆ : TNAU Pulse wonder 1.0 %
T ₇ : Brasinolide 1.0 ppm
T ₈ :Control (No foliar spray)

Table R-16-AST-2 (a): Effect of foliar spray on yield attributes of Lucerne

Treatments	No. of days taken to maturity				No. of pods per plant					No. of seeds per pod				
	Coimbatore	Hyderabad	Bikaner	Mean	Coimbatore	Bikaner	Hyderabad	Ludhiana	Mean	Coimbatore	Bikaner	Hyderabad	Ludhiana	Mean
T ₁	92.6	175.0	156.3	141.3	77.4	53.27	35	156.7	80.6	5.02	4.07	10.00	4.17	5.82
T ₂	93.4	179	154	142.1	68.4	42.07	32	158.7	75.3	4.79	3.07	9.00	4.18	5.26
T ₃	90.2	172	154.67	139.0	70.3	46.13	36	155.7	77.0	4.63	3.27	11.00	3.64	5.64
T ₄	93.4	176	153.67	141.0	73.5	47.53	34	141.7	74.2	4.56	3.40	9.30	3.84	5.28
T ₅	91.6	173	154.33	139.6	70.9	42.8	37	155	76.4	4.46	3.47	10.30	3.63	5.47
T ₆	91.3	176	152.67	140.0	79.8	46.6	33	112	67.9	4.93	3.53	9.00	3.98	5.36
T ₇	92.4	178	154.33	141.6	81.2	53.4	39	163	84.2	5.07	4.40	10.60	4.27	6.09
T ₈	92.7	181	150	141.2	59.6	39.27	30	119	62.0	4.32	3.33	8.00	3.54	4.79
SE(m) ±	1.95	1.12	1.26		3.75	1.82	0.73	3.83		0.19	0.15	0.49	0.12	
C.D. (P=0.05)	NS	3.44	3.83		7.68	5.51	2.25	11.9		0.41	0.46	1.52	0.4	

Table R-16-AST-2 (b): Effect of foliar spray on yield attributes and seed yield of Lucerne

Treatments	Seed yield (kg/ha)					1000 seed weight (g)					Seed vigour index
	Coimbatore	Hyderabad	Bikaner	Ludhiana	Mean	Coimbatore	Bikaner	Hyderabad	Ludhiana	Mean	Ludhiana
T ₁	232.0	182.2	33.7	162.5	152.6	3.49	3.01	3.04	3.25	3.20	427.7
T ₂	203.7	177.5	21.1	166.7	142.2	3.44	2.85	3.19	3.22	3.18	439.3
T ₃	189.6	190.0	20.4	150.0	137.5	3.46	2.68	3.08	3.15	3.09	428
T ₄	190.6	172.2	22.2	151.1	134.0	3.51	2.73	3.16	3.12	3.13	365.1
T ₅	188.1	197.4	21.5	156.4	140.9	3.61	2.7	3.06	3.08	3.11	340.4
T ₆	236.5	170.8	28.3	150.3	146.5	3.71	2.93	2.98	3.08	3.18	361.6
T ₇	243.2	218.3	34.9	167.5	166.0	3.62	3.1	3.34	3.26	3.33	435.6
T ₈	157.2	159.6	21.5	142.2	120.1	3.42	2.7	2.92	3.14	3.05	366.3
SE(m) ±	9.12	1.62	1.25			0.24	0.14	0.04			
C.D. (P=0.05)	18.43	4.97	3.80	15.1		NS	0.44	0.12	NS		44.4

Table R-16-AST-2: (c). Effect of foliar spray on seed fertility ratio of Lucerne

Treatments	Fertility Ratio		
	Coimbatore	Bikaner	Mean
T ₁	35.02	66.42	50.72
T ₂	31.94	59.08	45.51
T ₃	29.21	61.15	45.18
T ₄	30.20	66.11	48.16
T ₅	29.91	64.94	47.43
T ₆	36.84	66.63	51.74
T ₇	40.00	67.87	53.94
T ₈	24.31	66.67	45.49
SE(m) ±	1.54	1.22	
C.D. (P=0.05)	3.19	3.69	

Table R-16-AST-2: (d). Effect of foliar spray on economics (Rs/ha) of Lucerne production

Treatments	Cost of Cultivation					Gross return				
	Coimbatore	Hyderabad	Bikaner	Ludhiana	Mean	Coimbatore	Hyderabad	Bikaner	Ludhiana	Mean
T ₁	43942	61,080	18956	36505	40121	174011	118,430	32432	56871	95436
T ₂	44186	60,420	18906	36945	40114	152797	115,375	28793	58333	88825
T ₃	44621	60,800	18956	37095	40368	142226	123,500	29119	52500	86836
T ₄	44421	61,500	19106	36456	40371	142941	111,941	29634	52889	84351
T ₅	45002	61,400	19006	37930	40835	141101	128,321	29446	54736	88401
T ₆	45182	61,350	18906	37430	40717	177341	111,009	32047	52597	93249
T ₇	44216	61,450	19006	37680	40588	182400	141,873	32987	58625	103971
T ₈	43117	60,100	18456	36430	39526	117900	103,740	28617	49778	75009
SE(m) ±		405.6	--	-			1,056	831		
C.D. (P=0.05)		N/A	--				3,234	2520	5271	

Table R-16-AST-2: (e). Effect of foliar spray on economics of Lucerne

Treatments	Net Return (Rs./ha)					B:C Ratio				
	Coimbatore	Hyderabad	Bikaner	Ludhiana	Mean	Coimbatore	Hyderabad	Bikaner	Ludhiana	Mean
T ₁	130069	57,350	13476	20366	55315	4.0	1.9	1.7	1.6	2.3
T ₂	108611	54,955	9887	21388	48710	3.5	1.9	1.52	1.58	2.1
T ₃	97605	62,700	10163	15405	46468	3.2	2.03	1.54	1.42	2.0
T ₄	98520	50,441	10528	16433	43981	3.2	1.82	1.55	1.45	2.0
T ₅	96099	66,921	10440	16806	47567	3.1	2.09	1.55	1.44	2.0
T ₆	132159	49,659	13141	15167	52532	3.9	1.81	1.7	1.41	2.2
T ₇	138184	80,423	13981	20945	63383	4.1	2.31	1.74	1.56	2.4
T ₈	74783	43,640	10161	13348	35483	2.7	1.72	1.55	1.37	1.8
SE(m) ±		1,189	831				0.02	0.04		
C.D. (P=0.05)		3,641	2520	5271			0.07	0.13	0.1	

R-18-AST-4: Nutrient management for productivity enhancement in dual purpose Oats.
[Table Reference: R-18-AST-4 (a)-(n)]

Location: Kalyani, Jorhat, Imphal, Faizabad, Jabalpur, Anand

The trial was initiated at six centres (Kalyani, Jorhat, Imphal, Faizabad, Jabalpur and Anand) to find out the effect of nutrient management on forage and grain yields, forage quality and production economics of dual purpose Oats in Rabi 2018-19. The treatments included **T₁** – Control, **T₂**-RDF (N: P₂O₅: K₂O -80:40:40 kg/ha), **T₃**-75% of RDN + Vermicompost @ 2t/ha, **T₄**-**T₃** + PSB (Soil) @ 1.5 kg/ha, **T₅**-**T₄** + Seed treatment with *Azotobactor* @ 10 g/kg seed, **T₆**-**T₅** + ZnSO₄ @ 20 kg/ha (soil application as basal), **T₇** -**T₅** + ZnSO₄ @ 15 kg/ha (soil application as basal), at just before flowering and **T₉**-**T₇** + Foliar spray of ZnSO₄ (0.5%) at just before flowering treatments were replicated thrice in Randomized Block Design. The 1st cut was taken after 55 DAS then crop left for seed production. 50% nitrogen was applied at basal + 25% after 40 DAS + 25 % after 1st cut. The crop was sown at 25 cm X 5 cm spacing using 80kg seed per hectare.

The first year results indicated that among the nine treatments, **T₈**- 75% of RDN + Vermicompost @ 2t + PSB application to Soil @ 1.5 kg+ Seed treatment with *Azotobactor* @ 10 g/kg seed+ ZnSO₄ @ 20 kg/ha (soil application as basal) + Foliar spray of ZnSO₄ (0.5%) just before flowering proved the best. It recorded maximum GFY, DMY, crude protein content and yield as well as highest test weight and seed yield. This was closely followed by **T₄**, **T₅**, **T₇** and **T₉**, which remained at par with each other. **T₈**- 75% of RDN + Vermicompost @ 2t + PSB application to Soil @ 1.5 kg+ Seed treatment with *Azotobactor* @ 10 g/kg seed+ ZnSO₄ @ 20 kg/ha (soil application as basal) + Foliar spray of ZnSO₄ (0.5%) just before flowering also recorded Maximum net monetary return and BC RS (59477) Ratio (3.05)

Table R-18-AST-4 (a): Effect of Nutrient management on green fodder yield of dual purpose oat

Treatments	Green Fodder Yield (q/ha)						
	Anand	Faizabad	Kalyani	Jabalpur	Imphal	Jorhat	Mean
T ₁	243.00	14.40	13.30	163.30	34.33	100.27	94.77
T ₂	421.00	49.20	48.10	198.10	102.83	146.23	160.91
T ₃	390.00	65.50	60.50	210.50	107.33	154.63	164.74
T ₄	469.00	72.40	66.60	216.60	110.17	156.90	181.95
T ₅	460.00	76.60	69.50	219.50	112.75	160.63	183.16
T ₆	388.00	85.80	77.50	227.50	113.17	168.03	176.67
T ₇	426.00	79.10	73.10	223.10	119.33	162.13	180.46
T ₈	469.00	90.60	78.50	228.50	129.92	171.13	194.61
T ₉	421.00	80.50	74.30	224.30	122.25	169.13	181.91
SE(m) ±	32.2	3.32	1.14	1.14	1.90	1.847	
C.D. (P=0.05)	96.47	9.98	3.42	3.42	4.03	5.762	
C.V.%	13.60	8.45	6.52	6.52	3.12	5.03	

Table R-18-AST-4(b): Effect of Nutrient management on dry matter yield of dual purpose oat

Treatments	Dry Matter Yield (q/ha)						
	Anand	Faizabad	Kalyani	Jabalpur	Imphal	Jorhat	Mean
T ₁	25.60	2.69	2.46	32.46	3.56	18.03	14.13
T ₂	47.50	9.49	8.89	38.89	10.40	26.33	23.58
T ₃	45.80	12.46	11.20	41.20	11.81	27.83	25.05
T ₄	55.30	14.50	12.32	42.32	11.63	28.23	27.38
T ₅	51.80	14.79	12.85	42.85	11.39	28.93	27.10
T ₆	48.70	16.57	14.33	44.33	12.35	30.27	27.76
T ₇	51.30	15.27	13.52	43.52	14.31	29.17	27.85
T ₈	62.80	17.51	14.52	44.52	13.96	30.77	30.68
T ₉	55.00	15.54	13.74	43.74	11.97	30.43	28.40
SE(m) ±	4.15	0.56	0.18	0.18	0.38	0.333	
C.D. (P=0.05)	12.45	1.68	0.54	0.54	0.81	1.039	
C.V.%	14.59	7.09	5.74	5.74	5.87	6.54	

Table R-18-AST-4 (c): Effect of Nutrient management on crude protein content of dual purpose oat

Treatments	Crude Protein (%)						Mean
	Anand	Faizabad	Kalyani	Jabalpur	Imphal	Jorhat	
T ₁	9.34	7.81	7.7	8.02	9.7	6.59	8.19
T ₂	11.64	9.1	10.9	11.22	9.1	7.56	9.92
T ₃	10.76	9.73	11.7	12.02	12.53	8.03	10.80
T ₄	12.81	9.94	12.3	12.62	6.63	8.18	10.41
T ₅	12.46	10.56	12.8	13.12	7.53	7.56	10.67
T ₆	10.97	11.72	13.8	14.12	8.57	7.88	11.18
T ₇	11.14	11.24	13.1	13.42	6.5	8.21	10.60
T ₈	13.94	11.76	14.3	14.62	6.1	8.83	11.59
T ₉	12.28	11.37	13.3	13.62	8.37	8.1	11.17
SE(m) ±	0.75	0.28	0.07	0.07	0.22	0.182	
C.D. (P=0.05)	2.24	0.85	0.21	0.21	0.47	0.569	
C.V.%	11.06	4.78	4.63	4.63	4.58	5.65	

Table R-18-AST-4 (d): Effect of Nutrient management on crude protein yield of dual purpose oat

Treatments	Crude Protein Yield (q/ha)						Mean
	Anand	Faizabad	Kalyani	Jabalpur	Imphal	Jorhat	
T ₁	2.45	0.21	0.18	0.50	0.34	1.19	0.81
T ₂	5.58	0.86	0.96	1.28	0.95	1.99	1.94
T ₃	5.03	1.23	1.31	1.63	1.48	2.24	2.15
T ₄	7.09	1.39	1.52	1.84	0.77	2.31	2.49
T ₅	6.45	1.56	1.65	1.97	0.86	2.19	2.45
T ₆	5.44	1.94	1.98	2.30	1.06	2.39	2.52
T ₇	5.71	1.72	1.77	2.09	0.93	2.39	2.44
T ₈	8.80	2.06	2.10	2.42	0.85	2.72	3.16
T ₉	6.63	1.76	1.82	2.14	1.00	2.56	2.65
SE(m) ±	0.70	0.04	0.06	0.06	0.03	0.038	
C.D. (P=0.05)	2.09	0.12	0.18	0.18	0.06	0.117	
C.V.%	20.42	5.11	5.71	5.71	5.51	2.91	

Table R-18-AST-4 (e): Effect of Nutrient management on seed yield of dual purpose oat

Treatments	Seed Yield (q/ha)						
	Anand	Faizabad	Kalyani	Jabalpur	Imphal	Jorhat	Mean
T ₁	8.33	6.51	6.68	13.68	7.18	2.09	7.41
T ₂	9.13	12.50	11.50	18.50	11.65	13.05	12.72
T ₃	10.19	13.10	12.60	19.60	12.12	15.71	13.89
T ₄	10.93	13.80	12.90	19.90	12.74	16.52	14.47
T ₅	10.19	14.20	13.60	20.60	13.07	16.20	14.64
T ₆	8.90	15.40	15.50	22.50	13.82	18.37	15.75
T ₇	11.60	14.50	14.40	21.40	14.29	17.57	15.63
T ₈	14.81	16.70	16.60	23.60	16.80	19.07	17.93
T ₉	14.59	14.80	15.70	22.70	15.30	18.18	16.88
SE(m) ±	8.4	0.48	0.32	0.32	0.58	0.351	
C.D. (P=0.05)	2.53	1.43	0.96	0.96	1.24	1.051	
C.V.%	13.32	6.13	5.71	5.71	7.79	6.21	

Table R-18-AST-4 (f): Effect of Nutrient management on straw yield of dual purpose oat

Treatments	Straw Yield (q/ha)						
	Anand	Faizabad	Kalyani	Jabalpur	Imphal	Jorhat	Mean
T ₁	66.43	27.21	28.30	35.30	31.70	13.39	33.72
T ₂	87.77	53.12	51.60	58.60	58.75	30.71	56.76
T ₃	82.43	56.06	56.60	63.60	58.44	41.30	59.74
T ₄	90.02	59.47	57.60	64.60	60.78	42.97	62.57
T ₅	91.00	61.77	59.10	66.10	61.73	46.91	64.44
T ₆	82.52	67.30	62.80	69.80	63.10	52.59	66.35
T ₇	87.69	62.93	60.20	67.20	63.17	51.32	65.42
T ₈	100.67	72.97	64.50	71.50	63.27	56.12	71.51
T ₉	97.91	64.67	63.10	70.10	65.15	53.19	69.02
SE(m) ±	4.23	2.46	1.12	1.12	1.01	0.762	
C.D. (P=0.05)	12.70	7.36	3.36	3.36	2.14	2.377	
C.V.%	8.39	7.31	7.44	7.44	2.99	7.23	

Table R-18-AST-4 (g): Effect of Nutrient management on plant height of dual purpose oat at harvest

Treatments	Plant Height at harvest						Mean
	Anand	Faizabad	Kalyani	Jabalpur	Imphal	Jorhat	
T ₁	85.30	107.40	115.20	115.20	66.89	78.70	94.78
T ₂	88.00	120.20	121.50	121.50	74.56	126.40	108.69
T ₃	91.00	123.50	124.40	124.40	75.56	144.50	113.89
T ₄	92.30	126.60	127.20	127.20	76.22	168.20	119.62
T ₅	89.50	127.20	127.50	127.50	77.78	172.17	120.28
T ₆	86.90	130.80	131.20	131.20	84.00	176.47	123.43
T ₇	90.30	128.90	128.90	128.90	82.22	173.60	122.14
T ₈	112.00	134.20	133.80	133.80	83.67	182.03	129.92
T ₉	106.80	131.40	131.70	131.70	84.44	179.00	127.51
SE(m) ±	4.79	4.50	0.64	0.64	2.64	2.182	
C.D. (P=0.05)	14.37	13.51	1.92	1.92	5.61	6.809	
C.V.%	8.87	6.22	4.72	4.72	5.84	7.24	

Table R-18-AST-4 (h): Effect of Nutrient management on growth parameters of dual purpose oat

Treatments	Plant Height at 55 DAS			No. of Tillers /plant		
	Faizabad	Kalyani	Mean	Anand	Jorhat	Mean
T ₁	48.20	60.10	54.15	54.33	131.00	92.67
T ₂	72.10	82.10	77.10	60.33	175.00	117.67
T ₃	74.50	85.70	80.10	61.27	179.00	120.14
T ₄	75.30	86.30	80.80	61.80	187.00	124.40
T ₅	76.60	91.30	83.95	61.67	182.00	121.84
T ₆	79.80	94.60	87.20	66.20	203.00	134.60
T ₇	77.90	91.80	84.85	63.27	211.00	137.14
T ₈	78.40	92.50	85.45	76.20	220.00	148.10
T ₉	77.30	90.00	83.65	70.60	207.00	138.80
SE(m) ±	3.30	0.82		3.53	4.097	
C.D. (P=0.05)	9.89	2.42		10.58	12.783	
C.V.%	7.81	7.52		9.56	8.35	

Table R-18-AST-4 (i): Effect of Nutrient management on seed yield attributes of dual purpose oat

Treatments	Panicle length (cm)					Panicle weight (g)				
	Faizabad	Jabalpur	Kalyani	Imphal	Mean	Faizabad	Jabalpur	Kalyani	Imphal	Mean
T ₁	27.20	27.23	26.80	29.14	27.59	4.40	4.63	4.20	4.96	4.55
T ₂	31.40	31.83	31.40	29.72	31.09	6.40	6.73	6.30	5.25	6.17
T ₃	32.50	33.03	32.60	30.18	32.08	7.70	7.63	7.20	5.30	6.96
T ₄	34.40	33.23	32.80	30.28	32.68	8.10	8.13	7.70	5.82	7.44
T ₅	34.70	33.63	33.20	30.70	33.06	8.80	8.63	8.20	6.32	7.99
T ₆	35.80	34.53	34.10	32.26	34.17	9.30	9.03	8.60	6.96	8.47
T ₇	34.80	33.93	33.50	32.71	33.74	8.90	8.83	8.40	7.12	8.31
T ₈	37.40	35.83	35.40	35.20	35.96	9.80	9.83	9.40	7.84	9.22
T ₉	35.20	34.23	33.80	34.38	34.40	9.00	9.53	9.10	7.34	8.74
SE(m) ±	0.94	0.11	0.11	0.60		0.28	0.05	0.05	0.09	
C.D. (P=0.05)	2.00	0.33	0.33	1.27		0.86	0.15	0.15	0.19	
CV (%)	4.86	5.63	5.63	3.29		6.21	8.42	8.42	2.49	

Table R-18-AST-4 (j): Effect of Nutrient management on seed yield attributes of dual purpose oat

Treatments	No. of grains /panicle					1000 seed weight (g)				
	Faizabad	Jabalpur	Kalyani	Imphal	Mean	Faizabad	Kalyani	Jabalpur	Imphal	Mean
T ₁	34.40	35.63	35.20	37.67	35.73	42.60	45.20	45.63	38.13	42.89
T ₂	42.20	42.23	41.80	43.33	42.39	43.20	46.10	46.53	38.73	43.64
T ₃	44.50	44.13	43.70	48.00	45.08	44.30	46.60	47.03	38.92	44.21
T ₄	47.80	48.13	47.70	51.33	48.74	45.80	47.30	47.73	39.03	44.97
T ₅	48.60	48.63	48.20	56.33	50.44	47.20	48.10	48.53	39.19	45.76
T ₆	52.40	52.13	51.70	57.33	53.39	48.10	49.30	49.73	39.74	46.72
T ₇	49.80	50.63	50.20	57.67	52.08	47.50	48.70	49.13	40.16	46.37
T ₈	56.20	55.93	55.50	60.67	57.08	48.70	49.60	50.03	41.37	47.43
T ₉	50.70	53.03	52.60	58.33	53.67	47.80	48.80	49.23	40.22	46.51
SE(m) ±	1.34	0.42	0.42	1.00		2.06	1.72	1.72	0.55	
C.D. (P=0.05)	4.02	1.26	1.26	2.12		NS	NS	NS	1.17	
CV (%)	4.91	4.83	4.83	3.31		7.73	6.84	6.84	2.41	

Table R-18-AST-4 (k): Production economics and B: C ratio

Treatments	Cost of C. (Rs./ha)			Mean	GMR (Rs./ha)					Mean
	Faizabad	Jabalpur	Kalyani		Faizabad	Kalyani	Jabalpur	Imphal	Jorhat	
T ₁	17175	18156	15,156	16829	26784	38,225	34200	51532	21799	34508
T ₂	21385	26085	25,085	24185	56088	69,875	46250	81742	82961	67383
T ₃	25670	27050	27,050	26590	61724	77,735	49000	84984	98159	74320
T ₄	25870	27275	27,275	26807	65796	80,250	49750	88763	102570	77426
T ₅	25155	27560	27,560	26758	68428	84,335	51500	90994	101737	79399
T ₆	27355	28850	28,850	28352	74880	95,405	56250	94884	113912	87066
T ₇	27055	28260	28,260	27858	69992	88,985	53500	98454	109178	84022
T ₈	28003	29,320	29,320	28881	80708	1,01,225	59000	113123	118075	92727
T ₉	27703	28720	28,720	28381	71565	95,955	56750	104208	113149	88325

Table R-18-AST-4 (l): Production economics and B: C ratio

Treatments	NMR (Rs./ha)						B-C ratio					
	Faizabad	Kalyani	Jorhat	Jabalpur	Imphal	Mean	Faizabad	Kalyani	Jabalpur	Imphal	Jorhat	Mean
T ₁	9609	23069	9299	16044	13132	14231	1.56	2.52	1.88	1.34	1.74	1.81
T ₂	34703	44790	67361	20165	36743	40752	2.62	2.78	1.77	1.82	5.32	2.86
T ₃	36054	50685	80649	21950	21644	42196	2.40	2.87	1.81	1.34	5.61	2.81
T ₄	39926	52975	83040	22475	25378	44759	2.54	2.94	1.82	1.40	5.25	2.79
T ₅	42273	56775	82067	23940	27109	46433	2.63	3.06	1.87	1.42	5.17	2.83
T ₆	47525	66555	91242	27400	30399	52624	2.75	3.30	1.95	1.47	5.03	2.90
T ₇	42937	60725	87258	25240	33519	49936	2.59	3.14	1.89	1.52	4.98	2.82
T ₈	52705	71905	95205	29680	47888	59477	2.88	3.45	2.01	1.73	5.16	3.05
T ₉	43865	67235	91029	28030	38673	53766	2.58	3.34	1.98	1.59	5.12	2.92

Table R-18-AST-4 (m): Effect of Nutrient management on soil fertility parameters after harvest

Treatments	Faizabad							Kalyani						
	pH	EC (dsm ⁻¹)	OC (%)	Available nutrient in soil (kg/ha)				pH	EC (dsm ⁻¹)	OC (%)	Available nutrient in soil (kg/ha)			
				N	P	K	Zinc (mg Kg ⁻¹)				N	P	K	Zn (mg Kg ⁻¹)
T ₁	8.7	0.86	0.23	119.7	15.7	240	0.44	6.84	0.15	0.46	130.6	20.2	128.1	0.21
T ₂	8.6	0.85	0.24	125.8	16.5	255	0.45	6.88	0.16	0.50	160.3	28.2	151.3	0.27
T ₃	8.5	0.83	0.25	131.2	16.9	262	0.46	6.87	0.14	0.51	162.1	30.8	165.6	0.53
T ₄	8.5	0.83	0.26	132.4	17.4	265	0.47	6.84	0.16	0.51	165.3	31.6	167.8	0.58
T ₅	8.6	0.84	0.26	133.3	17.6	268	0.47	6.75	0.15	0.52	170.6	31.4	168.4	0.61
T ₆	8.5	0.83	0.25	134.6	18.3	272	0.52	6.82	0.16	0.53	175.8	32.6	174.6	2.32
T ₇	8.6	0.84	0.26	133.5	17.5	267	0.49	6.78	0.16	0.52	168.4	30.5	168.2	1.74
T ₈	8.5	0.83	0.26	135.8	18.7	277	0.53	6.82	0.15	0.54	178.3	33.2	180.3	2.42
T ₉	8.6	0.83	0.26	134.2	17.7	271	0.49	6.76	0.14	0.55	172.1	31.4	176.8	1.86
Initial	8.7	0.86	0.23	119.8	15.6	241	0.44	6.88	0.16	0.48	194.5	40.6	198.7	0.33

Table of R-18-AST-4 (n): Effect of Nutrient management on soil fertility parameters after harvest

Treatments	Jabalpur						Imphal					
	pH	EC (dsm ⁻¹)	OC (%)	Available nutrient in soil (kg/ha)			pH	OC (%)	Available nutrient in soil (kg/ha)			
				N	P	K			N	P	K	Zn (mg kg ⁻¹)
T ₁	7.72	0.47	0.46	230.6	18.2	328.1	5.40	1.10	232.7	12.6	152.7	1.12
T ₂	7.76	0.48	0.50	260.3	16.2	351.3	5.80	1.28	243.8	14.1	161.8	1.18
T ₃	7.75	0.46	0.51	262.1	18.8	365.6	5.70	1.30	249.8	14.9	171.7	1.26
T ₄	7.72	0.48	0.51	265.3	18.6	367.8	5.50	1.32	253.3	15.2	182.3	1.30
T ₅	7.63	0.47	0.52	270.6	19.4	368.4	5.70	1.41	260.8	15.8	190.2	1.32
T ₆	7.7	0.48	0.53	275.8	18.6	374.6	5.40	1.42	273.4	16.3	192.3	2.18
T ₇	7.66	0.48	0.52	268.4	19.5	368.2	5.38	1.52	263.9	16.8	210.2	1.71
T ₈	7.7	0.47	0.54	278.3	18.2	352.3	5.42	1.62	278.6	18.2	221.3	2.20
T ₉	7.64	0.46	0.55	272.1	16.4	376.8	5.30	1.71	271.3	17.3	218.6	1.82
Initial							5.80	1.10	270.0	18.8	226.3	1.11

R-18-AST-5: Studies on effect of varieties and cutting management on productivity, quality and seed production of berseem

[Table Reference: R-18-AST-5 (a)-(d)]

Location: Pantnagar and Ranchi

The trial was started in Rabi 2018-19 at two centres (Pantnagar & Ranchi) with the objective to study the production potential of berseem varieties and to find out the ideal time of last cut of berseem for higher seed production. The treatments involved two varieties of berseem and cutting management i.e., date of last cut 15th February, 02 March, 17 March and 1 April (3 cutting). The treatments were replicated thrice in split plot design.

In the first year, the results indicated that among varieties in terms of yields, except GFY at Ranchi, no significant difference was noted. The growth parameters and quality parameters also did not exhibit any significant difference due to varietal effect. As regards to seed yields, 1000 seed weight and seed filling, 3 cut with last at on 1st April proved better for high biomass yields. However last cut on 2nd march recorded highest seed yield, 1000 seed weight and germination percent of produced seeds. The last cut on 1st April recorded highest monetary benefits (NMR Rs. 154010 and B:C ratio 6.55)

Table R-18-AST-5 (a): Effect of varieties and cutting management on growth parameters of berseem

S N	Treatment	No. of plants/m row			Plant height (cm)			L:S ratio		
		Pant-nagar	Ran-chi	Mean	Pant-nagar	Ran-chi	Mean	Pant-nagar	Ran-chi	Mean
A. Varieties										
1	BL-10	100	21.58	60.79	44	32	38	0.78	0.63	0.71
2	HB-2	162	21.66	91.83	44	36	40	0.75	0.57	0.66
SE(m)±		2.61	0.21		0.74	0.65		0.004	0.01	
C.D (P=0.05)		17	NS		NS	4.24		0.02	NS	
B. Cutting management/ Last cut on										
1	15 February (2 cut)	116	21.33	68.67	38	46	42	0.87	0.66	0.77
2	2 March (3 cut)	133	22	77.5	36	34	35	0.76	0.61	0.69
3	17 March (3 cut)	152	21.66	86.83	47	32	39.5	0.74	0.57	0.66
4	1 April (3 cut)	124	21.5	72.75	56	18	37	0.69	0.56	0.63
SE(m) ±		6.32	0.66		0.5	0.56		0.02	0.02	
C.D. (P=0.05)		20	NS		1.56	1.74		0.05	0.07	

Table R-18-AST-5 (b): Effect of varieties and cutting management on productivity and monetary returns of berseem

Varieties	Green fodder yield (q/ha)			Dry matter yield (q/ha)			Pantnagar			
	Pantnagar	Ranchi	Mean	Pantnagar	Ranchi	Mean	Germination count (%)	Gross return Rs/ha)	Net return (Rs/ha)	B:C ratio
BL-10	394	371	382.5	58.42	79	211.8	73.33	144351	117101	5.26
HB-2	426	394	410.0	55.46	82	224.7	71.83	149439	122189	5.45
SE(m) ±	10.78	1.92		6.86	2.57		1.58	5506	5506	0.20
C.D. (P=0.05)	NS	12		NS	NS		NS	NS	NS	NS
Cutting management/Last cut										
15 February (2 cut)	246	256	251.0	31.90	54	43.0	66.83	87886	62136	3.41
2 March (3 cut)	373	364	368.5	48.15	78	63.1	77.50	146638	118888	5.29
17 March (3 cut)	477	428	452.5	74.76	92	77.5	72.17	171297	143547	6.17
1 April (3 cut)	544	483	513.5	72.96	101	87.0	73.83	181760	154010	6.55
SE(m) ±	15	3.37		6.70	1.45		1.72	3725	3725	0.13
C.D. (P=0.05)	47	10.57		20.88	4.52		5.35	11604	11604	0.42
Interaction	NS			NS			NS	NS	NS	NS

Table R-18-AST-5 (c): Effect of varieties and cutting management on seed production and seed quality of berseem

S N	Treatment	1000 seed weight (g)			Seed yield (kg/ha)			Filled seed (%)	Unfilled Seed (%)
		Ranchi	Pantnagar	Mean	Ranchi	Pantnagar	Mean	Pantnagar	Pantnagar
A.	Varieties								
1	BL-10	2.35	2.92	2.64	118.0	174.0	146.0	59.17	40.83
2	HB-2	3.44	2.79	3.12	121.0	146.0	133.5	41.67	58.33
	SE(m) ±	0.03	0.03		2.3	18.0		4.54	4.54
	C.D. (P=0.05)	NS	NS		NS	NS		NS	NS
B	Cutting management/ Last cut								
1	15 February (2 cut)	2.56	2.62	2.59	139.0	95.0	117.0	44.17	55.83
2	2 March (3 cut)	2.41	3.42	2.92	145.0	230.0	187.5	51.67	48.33
3	17 March (3 cut)	2.29	2.59	2.44	124.0	191.0	157.5	52.5	47.5
4	1 April (3 cut)	2.32	2.80	2.56	69.0	125.0	97.0	53.33	44.67
	SE(m) ±	0.03	0.07		2.24	12.0		2.39	2.39
	C.D. (P=0.05)	0.09	0.22		6.98	380		NS	NS
	Interaction		0.35			8.80		18.75	18.75

Table R-18-AST-5 (d): Effect of varieties and cutting management on quality of berseem

Treatment	No. of flowers/plant	Crude protein content (%)			Nitrogen Content (%)	Crude protein Yield (q/ha)		
		Pantnagar	Ranchi	Mean		Pantnagar	Ranchi	Mean
A. Varieties	Pantnagar	Pantnagar	Ranchi	Mean	Pantnagar	Pantnagar	Ranchi	Mean
BL-10	45	19.78	14.17	17.0	3.17	78.15	5.63	41.89
HB-2	41	19.61	14.19	16.9	3.13	82.96	5.82	44.39
SE(m) ±	2.5	0.05	0.009		0.004	3.88	0.17	
C.D. (P=0.05)	NS	NS	NS		0.23	NS	NS	
B. Cutting management/ Last cut								
15 February (2 cut)	55	19.47	14.60	17.0	3.12	47.77	3.93	25.85
2 March (3 cut)	40	19.72	14.31	17.0	3.15	73.58	5.59	39.59
17 March (3 cut)	36	20.01	14.19	17.1	3.19	95.30	6.51	50.91
1 April (3 cut)	39	19.59	13.62	16.6	3.14	105.57	6.87	56.22
SE(m) ±	1.9	0.10	0.08		0.02	1.84	0.10	
C.D. (P=0.05)	06	0.32	0.27		NS	5.75	0.32	
Interaction	NS	S			S	NS		

B. Location Specific Trials

K-15-AST-1L: Studies on different models for year round green fodder production under irrigated condition

[Table Reference: K-15-AST-1L (a)-(g)]

Location: Mandya

The Trial was initiated during kharif-2015 with the objectives to identify suitable and economical year around fodder production system under irrigated situation. The experiment was laid out in randomized block design with four replication and six treatments (two seasonal and four around the year). The treatments included T₁: Fodder Maize + Cowpea (3:1)- Fodder Oat + Lucerne (3:1)-Pearl millet + Cowpea (3:1), T₂: Fodder Sorghum + Cowpea (3:1)-Fodder Maize +Cowpea (3:1)-Pearl millet + Cowpea (3:1), T₃: B N hybrid +Cowpea (2:8) -year round, T₄: B N hybrid + Lucerne (2:8) year round, T₅: B N hybrid +*Desmanthus* (2:8) year round, T₆: B N hybrid +*Sesbania sp.* (2:8) year round. The pooled data of three years results revealed that, year around fodder production system of BN Hybrid + Lucerne (2:8), recorded higher green fodder yield (1695.8 q/ha), DMY of (377.6 q/ha), CPY (39.88 q/ha), net returns Rs. (1,46,464/ha) and B:C ratio of (3.0) followed by B N hybrid +Cowpea (2:8) recorded green fodder yield (1603.1 q/ha), DMY of (352.6 q/ha), CPY (33.88 q/ha), net returns Rs. (1,34,515/ha) and B:C ratio of (2.99).

Table K-15-AST-1 (a): Yield and Economics of different models of year round fodder production during *Kharif* -2018

Cropping systems		GFY(q/ha)	DMY (q/ha)	DM (%)	Gross returns (Rs/ha)	Net returns (Rs/ha)	B:C Ratio
T1	Fodder Maize + Cowpea (3:1)	554.23	118.25	20.60	65900	43815	2.98
T2	Fodder Sorghum + Cowpea (3:1)	427.99	93.20	22.21	52100	31036	2.47
T3	B N hybrid +Cowpea (2:8)	632.36	134.80	21.58	84500	61542	3.68
T4	B N hybrid + Lucerne (2:8)	605.72	130.68	21.86	82300	58881	3.51
T5	B N hybrid + <i>Desmanthus</i> (2:8)	495.99	105.96	20.71	59400	38703	2.86
T6	B N hybrid + <i>Sesbania sps.</i> (2:8)	565.84	115.08	20.85	71900	49789	3.25
SE(m)±		26.31	6.08	0.50	-	-	-
C.D (P=0.05)		79.31	18.32	1.50	-	-	-

Table K-15-AST-1 (b): Yield and Economics of different models of year round fodder production during *Rabi* -2018

Cropping systems		GFY (q/ha)	DMY (q/ha)	DM (%)	Gross returns (Rs/ha)	Net returns (Rs/ha)	B:C Ratio
T1	Fodder Oat + Lucerne (3:1)	235.68	40.84	15.15	28400	12203	1.76
T2	Fodder Maize +Cowpea (3:1)	410.05	86.14	21.83	49100	28925	2.43
T3	B N hybrid +Cowpea (2:8)	520.45	109.75	19.31	67900	47497	3.32
T4	Year round	547.07	125.66	22.33	73100	51903	3.44
T5	Year round	442.80	96.08	20.37	52400	34412	2.91
T6	Year round	476.22	101.15	21.50	58600	39533	3.07
SE(m)±		22.40	5.65	0.87			
C.D (P=0.05)		67.53	17.04	2.61			

Table K-15-AST-1 (c): Yield & Economics of different models of year round fodder production during *summer*-2018

Cropping systems		GFY (q/ha)	DMY (q/ha)	DM (%)	Gross returns (Rs/ha)	Net returns (Rs/ha)	B:C Ratio
T1	Pearl millet + Cowpea (3:1)	405.73	92.60	22.56	50000	29865	2.48
T2	Pearl millet + Cowpea (3:1)	386.88	88.49	22.53	48200	28137	2.40
T3	B N hybrid + Cowpea (2:8)	497.33	110.67	23.36	63800	44625	3.32
T4	Year round	500.00	114.98	21.60	66200	46502	3.36
T5	Year round	406.20	90.77	21.80	48300	31235	2.83
T6	Year round	437.58	100.87	22.74	53000	35002	2.94
SE(m)±		21.23	6.80	0.68			
C.D (P=0.05)		64.01	20.50	2.05			

Table K-15-AST-1 (d): Total yield & Economics of different models of year round fodder production (Pooled data of all the season)

Cropping systems		GFY (q/ha)	DMY (q/ha)	DM (%)	Gross returns (Rs/ha)	Net returns (Rs/ha)	B:C Ratio
T1	Fodder Maize + Cowpea (3:1)- Fodder Oat + Lucerne (3:1)-Pearl millet + Cowpea (3:1)	1195.64	251.70	19.44	144300	85883	2.41
T2	Fodder Sorghum + Cowpea (3:1)-Fodder Maize +Cowpea (3:1)-Pearl millet + Cowpea (3:1)	1224.92	267.82	22.19	149400	88098	2.43
T3	B N hybrid +Cowpea (2:8)- year round	1650.13	355.23	21.41	216200	153664	3.44
T4	B N hybrid+Lucerne (2:8)Year round	1652.80	371.31	21.93	221600	157286	3.44
T5	B N hybrid + <i>Desmanthus</i> (2:8)Year round	1344.99	292.82	20.96	160100	104350	2.87
T6	B N hybrid + <i>Sesbania sp.</i> (2:8)Year round	1479.64	317.11	21.70	183500	124324	3.09
SE(m)±		29.36	9.54	0.57	-	-	-
C.D (P=0.05)		88.49	28.76	1.71	-	-	-

Table K-15-AST-1 (e): Total yield & Economics of different models of year round fodder production (Pooled data three years: 2015-16 to 2018-19)

Cropping systems		GFY (q/ha)			Mean	DMY (q/ha)			Mean
		2016	2017	2018		2016	2017	2018	
T1	Fodder Maize + Cowpea (3:1)- Fodder Oat + Lucerne (3:1)-Pearl millet + Cowpea (3:1)	971.1	1170.3	1195.6	1112.3	215.1	265.49	251.7	244.1
T2	Fodder Sorghum + Cowpea (3:1)-Fodder Maize +Cowpea (3:1)-Pearl millet + Cowpea (3:1)	1150.7	1302.27	1224.9	1226.0	269	294.28	267.823	277.0
T3	B N hybrid +Cowpea (2:8)- year round	1491.7	1667.35	1650.1	1603.1	321.6	380.94	355.227	352.6
T4	B N hybrid+Lucerne (2:8)Year round	1679.3	1755.3	1652.8	1695.8	367.6	393.75	371.311	377.6
T5	B N hybrid + <i>Desmanthus</i> (2:8)Year round	1245.3	1331.59	1345	1307.3	271.1	305.12	292.82	289.7
T6	B N hybrid + <i>Sesbania sp.</i> (2:8)Year round	1384	1513.3	1479.6	1459.0	316	334.17	317.105	322.4
SE(m)±		42.1	61.7	29.36	25.82	11.3	13.7	9.54	5.68
C.D (P=0.05)		126.8	186.1	88.49	82.44	34.1	41.4	28.76	18.13

Table K-15-AST-1 (f): Economics of different models of year round fodder production (Pooled data three years) 2015-16 to 2018-19

Treatments	Gross returns (Rs/ha)			Mean	Net returns (Rs/ha)			Mean	B:C Ratio			
	2016	2017	2018		2016	2017	2018		2016	2017	2018	Mean
T1	115820	128688	144300	129603	70330	72763	85883	76325	2.5	2.25	2.41	2.39
T2	129808	144675	149400	141294	81578	86929	88098	85535	2.7	2.51	2.43	2.55
T3	196740	194835	216200	202592	129390	120492	153664	134515	2.9	2.63	3.44	2.99
T4	234050	206535	221600	220728	154475	127632	157286	146464	2.9	2.65	3.44	3.00
T5	149570	147423	160100	152364	81675	79217	104350	88414	2.2	2.18	2.88	2.42
T6	178560	174558	183500	178873	104725	103175	124324	110741	2.4	2.45	3.09	2.65

Table K-15-AST-1 (g): Crude Protein yield of different models of year round fodder production at Mandya

Cropping systems		CPY (q/ha)			Total
		<i>Kharif</i>	<i>Rabi</i>	<i>Summer</i>	
T1	Fodder Maize + Cowpea (3:1)- Fodder Oat + Lucerne (3:1)-Pearl millet + Cowpea (3:1)	9.90	3.68	8.61	22.19
T2	Fodder Sorghum + Cowpea (3:1)-Fodder Maize +Cowpea (3:1)-Pearl millet + Cowpea (3:1)	7.69	8.67	7.80	24.17
T3	B N hybrid +Cowpea (2:8)- year round	14.09	9.60	10.18	33.88
T4	B N hybrid+Lucerne (2:8)Year round	15.15	12.44	12.28	39.88
T5	B N hybrid + <i>Desmanthus</i> (2:8)Year round	8.49	9.23	8.18	25.90
T6	B N hybrid + <i>Sesbania sp.</i> (2:8)Year round	10.61	10.20	9.87	30.68
SE(m)±		0.50	0.65	0.57	1.29
C.D (P=0.05)		1.50	1.96	1.70	3.88

K-16-AST-6 : Organic nutrient management in sorghum-berseem cropping sequence for sustainable fodder production

[Table Reference: K-16-AST-6 (a)-(b)]

Location: Hisar

The experiment was initiated in *Kharif* 2016 to study the feasibility of organic nutrient management in sorghum-berseem cropping sequence for sustainable fodder production. The treatments included T₁: Recommended dose of fertilizers through inorganic source (75 kg N + 15 kg P₂O₅/ha; N in two splits i.e. 50 kg at sowing and 25 kg after one month, full dose of phosphorus as basal dose, Berseem : 25 kg N + 70 kg P₂O₅/ha both at the time of sowing; T₂: 20 t FYM/ha (15 t in sorghum and 5 t/ha in berseem); T₃: 20 t FYM/ha (15 t in sorghum + 5 t in berseem) + biofertilizer; T₄: 20 t FYM/ha (15 t in sorghum + 5 t in berseem) + Green manuring; T₅: 20 t FYM/ha (15 t in sorghum + 5 t in berseem) + biofertilizer + Green manuring; T₆: 7.5 t vermicompost/ha (5 t in sorghum + 2.5 t in berseem); T₇: 7.5 t vermicompost/ha (5 t in sorghum + 2.5 t in berseem) + biofertilizer; T₈: 7.5 t vermicompost/ha (5 t in sorghum + 2.5 t in berseem) + Green manuring and T₉: 7.5 t vermicompost/ha (5 t in sorghum + 2.5 t in berseem) + bio fertilizer + Green manuring. The treatments were replicated thrice in Randomised Block Design. For single-cut forage sorghum, HJ- 541 variety was used during *Kharif*. Berseem crop (HB-1) was taken during *Rabi* season.

Data presented in following table reveal that during *Kharif*, 2018, highest green fodder and dry matter yield of sorghum were recorded with 7.5 t vermicompost/ha (5 t in sorghum + 2.5 t in berseem) + bio fertilizer + Green manuring (590.33 q/ha and 136.00 q/ha, respectively) which were significantly higher than 20 t FYM/ha (15 t in sorghum and 5 t/ha in berseem) and 7.5 t vermicompost/ha (5 t in sorghum + 2.5 t in berseem) in respect of GFY and T₂, T₃ and T₆ in respect of DMY. During *Rabi* 2018-19, highest green fodder and dry matter yield of berseem (total five cuts) were recorded with T₉ (783.53 q/ha and 130.35 q/ha, respectively) which were significantly higher than T₂, T₃, T₆ and T₇. Maximum total green fodder yield of the cropping sequence was recorded with T₉ (1373.86 q/ha) followed by T₅ and T₈.

Table K-16-AST-6 (a): Effect of organic nutrient management on productivity sorghum-berseem cropping sequence

Treatment	Sorghum					Berseem (Total five cuts)					Leaf stem ratio
	No. of tillers/m row length	Plant height (cm)	Yield (q/ha)		Leaf: stem ratio	No. of tillers/m ²	Plant height (cm)	Yield (q/ha)		Total GFY (sorghum + berseem)	
			Green fodder	Dry matter				Green fodder	Dry matter		
T ₁	10.43	248.78	545.33	120.33	0.207	616.9	60.10	732.92	122.03	1278.25	0.754
T ₂	8.53	226.33	476.33	106.00	0.160	565.9	56.17	568.74	87.46	1045.07	0.729
T ₃	9.80	230.00	534.33	116.67	0.190	593.7	59.53	658.31	104.93	1192.64	0.738
T ₄	10.50	250.78	572.00	127.67	0.200	617.9	60.70	736.63	123.33	1308.63	0.758
T ₅	11.40	259.78	580.00	134.67	0.210	657.4	62.50	772.45	128.45	1352.45	0.778
T ₆	8.77	228.33	509.00	113.00	0.177	585.1	58.60	628.32	98.59	1137.32	0.734
T ₇	10.40	249.89	556.00	125.67	0.183	599.6	60.13	685.24	110.40	1241.24	0.749
T ₈	10.53	252.78	574.00	130.00	0.200	650.7	60.77	743.98	125.04	1317.98	0.760
T ₉	11.63	262.22	590.33	136.00	0.207	659.6	62.80	783.53	130.35	1373.86	0.834
SE(m)±	0.61	5.40	22.36	5.74	0.016	16.76	1.24	19.88	4.00		0.034
C.D (P=0.05)	1.83	16.32	67.62	17.36	NS	50.67	3.75	60.10	12.08		NS

Table K-16-AST-6 (b): Economic analysis (Rs/ha) of sorghum-berseem cropping sequence

Treatment	Cost of cultivation	Gross returns	Net returns	B:C ratio
T ₁	103832	159775	55943	1.54
T ₂	105778	130619	24841	1.23
T ₃	105931	149104	43173	1.41
T ₄	112478	163534	51056	1.45
T ₅	112631	169067	56436	1.50
T ₆	127714	142164	14450	1.11
T ₇	127867	155169	27301	1.21
T ₈	134414	164772	30359	1.23
T ₉	134567	171721	37154	1.28

K-16-AST-8: Resource management in rice-oat cropping system under sodic soils.

[Table Reference: K-16-AST-8 (a)-(c)]

Location: Faizabad

The field experiment was initiated during *Kharif* 2016 at Faizabad centre to study the resource management in rice-oat cropping system under sodic soils. The eight treatments comprised of viz.; control, RDF (120N:60P₂O₅:40K₂O kg/ha), combination of 75% RDF and 50% RDF with 25% N and 50% N substitution through pressmud, dhaincha and crop residue, respectively. The treatments were laid out in Randomized Block Design and replicated thrice. The soil of experimental field was sodic and poor in fertility (pH - 9.1, E.C.- 0.97dsm⁻¹, ESP-32.7%, Organic Carbon-0.23%, Available N- 115.4 kg, P -15.6 kg and K-240.0 kg/ha), silty loam in texture and saline in reaction. The paddy crop var. Sarjoo-52 was transplanted on July 24, 2018 and fertilized as per treatment while fodder oat was sown on 10th Nov.2018 and was fertilized with recommended dose of nutrients. The results revealed that the values of grain and straw yields of paddy were significantly higher with RDF and being *at par* with 75% RDF+25% N through dhaincha. Non significant response was recorded for harvest index of paddy. The lowest value was observed with control for all the growth and yield parameters pertaining to paddy crop. The integrated nutrient applied to paddy crop did not affected the GFY, DMY & CPY of the succeeding fodder oat under rice-oat cropping system during first, second and third year of experimentation. Total green forage yield, gross return, net return and net return per rupee investment were observed higher with RDF followed by 75% RDF+25% N through dhaincha under rice – oat cropping system during the year 2018-19. Observations recorded on physico-chemical properties of soil after harvest of the fodder oat during third year of experimentation showed consistent increase in available nitrogen and phosphorous with 75% RDF+25% N through dhaincha over control. Subsequent decrease in pH, EC and ESP as well as increase in Organic Carbon content was observed through organic substitution over its initial values.

Table K-16-AST-8 (a): Effect of integrated nutrient management on fodder production under rice-oat cropping system

S.N.	Treatment	Rice yield (q/ha)		Harvest index (%)	Oat (q/ha)			Total yield (q/ha)	
		Grain	Straw		GFY	DMY	CPY	Green Forage	Oat Forage equivalent
1	Control	17.50	26.41	39.85	468.70	105.45	8.32	637.26	168.56
2	RDF(120N:60P ₂ O ₅ :40K ₂ O kg/ha)	41.26	54.40	43.13	496.40	118.14	9.45	887.91	391.51
3	75% RDF+25% N through pressmud	33.60	45.61	42.42	485.30	114.04	9.12	805.11	319.81
4	75% RDF+25% N through dhaincha	40.15	53.28	42.97	494.20	117.62	9.41	875.43	381.23
5	75% RDF+25% N through crop residue	31.80	45.29	41.25	483.50	113.14	9.05	787.77	304.27
6	50% RDF+50% N through pressmud	31.40	44.87	41.17	484.90	112.98	9.04	785.45	300.55
7	50% RDF+50% N through dhaincha	32.90	46.38	41.50	493.20	117.38	9.39	807.63	314.43
8	50% RDF+50% N through crop residue	29.86	43.66	40.61	479.40	110.26	8.82	765.95	286.55
SE(m)±		2.64	3.38	2.71	32.39	6.70	0.56	38.50	15.51
C.D (P=0.05)		5.66	7.25	NS	N.S.	N.S.	N.S.	82.59	33.26
CV%		10.01	9.20	7.97	8.17	7.23	7.68	5.94	6.16

Table K-16-AST-8 (b): Monetary return as influenced by integrated nutrient management under rice-oat cropping system

S.N.	Treatment	Cost of cultivation (Rs.)			Gross return (Rs.)	Net return (Rs.)	Net return/ rupee investment
		Rice	Oat	Total			
1	Control	33877	19851	53728	125716	71988	2.34
2	RDF(120N:60P ₂ O ₅ :40K ₂ O kg/ha)	40355	19851	60206	173456	113250	2.88
3	75% RDF+25% N through pressmud	44200	19851	64051	157662	93611	2.46
4	75% RDF+25% N through dhaincha	41585	19851	61436	171072	109636	2.78
5	75% RDF+25% N through crop residue	43835	19851	63686	154372	90686	2.42
6	50% RDF+50% N through pressmud	48107	19851	67958	153950	85992	2.27
7	50% RDF+50% N through dhaincha	42815	19851	62666	158252	95586	2.53
8	50% RDF+50% N through crop residue	47315	19851	67166	150204	83038	2.24
SE(m)±		-	-	-	-	-	-
C.D (P=0.05)		-	-	-	-	-	-
CV%		-	-	-	-	-	-

Table –K-16-AST-8 (c): Effect of integrated nutrient management on physico-chemical properties of soil after harvest of fodder oat under rice-oat cropping system

S.N.	Treatment	Available nutrients (kg/ha)			pH value	EC dSm ⁻¹	Exchangeable sodium (%)	O.C. (%)
		N	P	K				
1	Control	115.6	15.7	242	9.1	0.97	32.8	0.23
2	RDF(120N:60P ₂ O ₅ :40K ₂ O kg/ha)	124.5	16.4	256	9.0	0.96	31.4	0.24
3	75% RDF+25% N through pressmud	126.6	17.1	260	8.8	0.93	29.4	0.28
4	75% RDF+25% N through dhaincha	131.2	17.8	264	8.7	0.90	28.8	0.34
5	75% RDF+25% N through crop residue	124.8	16.5	255	8.9	0.92	31.0	0.26
6	50% RDF+50% N through pressmud	125.2	16.6	258	8.7	0.90	30.2	0.30
7	50% RDF+50% N through dhaincha	130.7	17.4	261	8.6	0.88	28.6	0.35
8	50% RDF+50% N through crop residue	121.6	16.3	252	8.8	0.91	29.8	0.26
	Initial value	115.4	15.6	240	9.1	0.97	32.7	0.23
SE(m)±		5.03	0.74	12.31	-	-	-	-
C.D (P=0.05)		10.80	1.60	NS	-	-	-	-
CV%		4.93	5.71	5.89	-	-	-	-

K-17-AST-2: Standardization of seed production techniques in fodder Maize

[Table Reference: K-17-AST-2 (a)-(d)]

Location: Raipur

The field experiment was initiated during *Rabi* 2017-18 to standardize seed production techniques of fodder maize under Chhattisgarh condition. The objective was to study the seed production potentiality of fodder maize (variety Africa Tall) and economics of seed production. The treatments comprised of four nitrogen levels viz., 0, 80, 120 and 160 kg ha⁻¹ and four planting geometry of 50, 60 and 75 cm row to row. Thus different combinations of four nitrogen levels and three planting geometry making total twelve treatment combinations were tested for higher seed yield. The treatment were replicated thrice in randomized block design in factorial arrangement.

The result indicated that the application of 160 kg ha⁻¹ nitrogen recorded significantly higher seed yield (24.41q/ha) with the 159.32q/ha straw yield. The gross return (Rs88251), net return (Rs 50880) and return per rupee invested (2.36) was maximum with the application of 160 kg nitrogen ha⁻¹. The planting geometry of 75 cm X 20 cm recorded significantly higher seed yield (20.6q/ha) with the 124.2q/ha straw yield. The gross return (Rs73200), net return (Rs 37905) and return per rupee invested (2.04) was maximum with planting geometry of 75 cm X 20 cm. The gross return (Rs100650), net return (Rs 63529) and return per rupee invested (2.7) was maximum with the combination of 160kg ha⁻¹ nitrogen with 75 cm X20 cm planting geometry. The yield attributing parameters like plant height, no of cob per plant, cob length (cm), cob girth (cm), no of grain per cob weight and 100 seed weight was also higher in this combination.

Table K-17-AST-2 (a): Yield and economics of fodder maize grown for seed production

Nutrient (Kg ha ⁻¹)	Yield (q/ha)		Harvest index (%)	Cost of cultivation	Gross Return	Net return	B: C Ratio
	Seed	Straw					
N ₁ 0	9.05	106.39	7.87	31628	38639	7011	1.22
N ₂ 80	14.65	144.22	9.37	36327	59048	22721	1.63
N ₃ 120	21.23	152.20	12.42	36852	78478	41626	2.13
N ₄ 160	24.41	159.32	13.53	37371	88251	50880	2.36
SE(m)±	0.50	2.39	0.28		1484	1484	0.04
C.D (P=0.05)	1.46	7.00	0.81		4351	4351	0.12
Spacing (cm)							
S ₁ 50	13.95	154.63	8.09	35795	58400	22605	1.61
S ₂ 60	17.45	142.73	10.60	35545	66712	31168	1.85
S ₃ 75	20.60	124.25	13.70	35295	73200	37905	2.04
SE(m)±	0.43	2.07	0.24		1285	1285	0.04
C.D (P=0.05)	1.27	6.06	0.70		3768	3768	0.10
Interaction Nutrient X Spacing	2.53	12.12	1.41		7537	S	0.21

Table K-17-AST-2 (b): Yield and yield attributes at harvest of fodder maize grown for seed production

Nutrient (Kg ha ⁻¹)	Plant population		No of cob Per plant	Cob length (cm)	No of grain Per cob	Cob weight (g)	100 seed weight (g)
	Per m row at 15 DAS	Per m row at Harvest					
N ₁ 0	4.90	4.69	0.84	15.7	358	116	25.3
N ₂ 80	4.97	4.70	1.10	17.9	439	148	29.0
N ₃ 120	4.91	4.65	1.12	18.5	463	159	29.1
N ₄ 160	4.88	4.72	1.18	19.0	479	169	31.9
SE(m)±	0.06	0.05	0.04	0.24	6.38	3.81	0.36
C.D (P=0.05)	NS	NS	0.11	0.70	18.70	11.18	1.07
Spacing (cm)							
S ₁ 50	4.94	4.71	1.02	17.0	409	135	27.6
S ₂ 60	4.87	4.61	1.02	17.8	421	146	28.8
S ₃ 75	4.92	4.75	1.15	18.5	474	163	30.1
SE(m)±	0.06	0.04	0.03	0.21	5.52	3.30	0.31
C.D (P=0.05)	0.16	0.12	0.09	0.60	16.19	9.68	0.92
Interaction Nutrient X Spacing	NS	NS	NS	NS	NS	NS	NS

Table K-17-AST-2 (c): Growth parameters of fodder maize grown for seed production

Nutrient (Kg ha ¹)	Plant height (cm)			Number of leaves		
	60DAS	80 DAS	Harvest	40 DAS	60DAS	80 DAS
N ₁ 0	179.5	260.6	266.4	8.3	11.1	10.8
N ₂ 80	237.8	314.3	324.1	9.6	13.0	11.8
N ₃ 120	258.2	320.2	337.3	9.6	13.3	12.0
N ₄ 160	266.1	326.8	343.8	9.9	13.6	12.7
SE(m)±	4.07	4.78	4.43	0.17	0.24	0.19
C.D (P=0.05)	11.93	14.01	12.99	0.51	0.69	0.57
Spacing (cm)						
S ₁ 50	228.7	282.7	300.9	9.1	12.5	11.4
S ₂ 60	235.4	313.2	321.2	9.4	12.6	11.7
S ₃ 75	242.1	320.5	331.6	9.6	13.2	12.3
SE(m)±	3.52	4.14	3.84	0.15	0.20	0.17
C.D (P=0.05)	10.34	12.13	11.25	0.44	0.60	0.49
Interaction Nutrient X Spacing	228.7	282.7	NS	NS	NS	NS

Table K-17-AST-2 (d): Interaction effect of nitrogen dose and spacing on of maize seed production

Nutrient (Kg ha ¹)	seed yield (q/ha)				straw yield (q/ha)				on net return (Rs)			
	S1	S2	S3	Mean	S1	S2	S3	Mean	S1	S2	S3	Mean
N1	7.7	9.3	10.2	9.05	109.4	107.4	102.3	106.39	3217	7841	9974	7011
N2	12.8	15.3	15.9	14.65	164.3	143.0	125.4	144.22	19656	24481	24025	22721
N3	15.6	21.7	26.4	21.23	166.9	155.5	134.2	152.20	27398	43388	54093	41626
N4	19.8	23.5	29.9	24.41	177.9	165.0	135.1	159.32	40150	48961	63529	50880
Mean	14.0	17.5	20.6		154.6	142.7	124.3		22605	31168	37905	
		N	S	NXS		N	S	NXS		N	S	NXS
	SE(m)±	0.50	0.43	0.86	SE(m)±	2.39	2.07	4.13	SE(m)±	1483.66	1284.89	2569.78
	C.D (P=0.05)	1.46	1.27	2.53	C.D (P=0.05)	7.00	6.06	12.12	C.D (P=0.05)	4351.43	3768.45	7536.89

R-16-AST-3: Effect of nitrogen levels and seed rate on fodder productivity of rye grass (*Lolium multiflorum*) under rice fallows.

[Table Reference: R-16-AST-3 (a) - (b)]

Location: Jorhat

The trial was initiated in Rabi 2017-18 to optimise the seed rate and nitrogen levels for ryegrass. The treatments included three seed rates i.e. 10 kg, 15 kg and 20 kg/ha and four nitrogen levels i.e., 0 kg (No nitrogen), 30 Kg, 60 Kg and 90kg N/ha. The treatments were replicated thrice in split-plot design. Rye grass variety PRG-1 was used for the study.

The result indicated that among in three seed rates, rye grass seed at 20 kg/ha was better. It yielded higher green fodder (326.89q/ha), dry matter (63.34q/ha) and crude protein (5.39q/ha). Rye grass sowing at 20 kg/ha seed rate also recorded higher gross (Rs. 32689/ha) net return (Rs. 17699/ha) and B: C Ratio (2.12)

Table R-16-AST-3 (a): Productivity of Rye Grass (*Lolium multiflorum*) under rice fallow

Treatments				Gross Income (Rs./ha)	Net Income (Rs./ha)	B: C Ratio
	GFY (q/ha)	DMY (q/ha)	Crude Protein Yield (q/ha)			
Main Plots (Seed Rate-3)						
S ₁	270.13	52.47	4.26	27013	12023	1.77
S ₂	274.04	53.06	4.50	27404	12414	1.79
S ₃	326.89	63.34	5.39	32689	17699	2.12
SE(m)±	4.272	0.805	0.081			
C.D (P=0.05)	14.377	2.709	0.272			
Sub Plots (Nitrogen level -4)						
N ₀	156.26	29.89	2.13	15626	3126	1.25
N ₁	276.80	53.70	4.38	27680	13520	1.96
N ₂	337.76	65.56	5.68	33776	17706	2.10
N ₃	390.60	76.02	6.69	39060	21830	2.27
SE(m)±	3.699	0.697	0.070			
C.D (P=0.05)	12.451	2.346	0.235			
Interaction S X N						
SE(m)±	7.399	1.394	0.140			
C.D (P=0.05)	24.902	4.692	0.471			
CV (%)	14.414	4.289	5.134			

Table R-16-AST-3 (b): growth and quality of Rye Grass (*Lolium multiflorum*) under rice fallow

Treatments	Plant height			Crude Protein (%)		
	First cut	Second cut	Third cut	First cut	Second cut	Third cut
Main Plots (Seed Rate-3)						
S ₁	38.20	42.06	71.23	7.24	8.34	7.68
S ₂	52.04	58.48	66.05	7.61	8.76	8.07
S ₃	56.95	60.09	69.16	7.51	8.78	8.08
SE(m)±	0.717	0.781	1.187	0.055	0.082	0.076
C.D (P=0.05)	2.413	2.629	3.997	0.186	0.275	0.255
Sub Plots (Nitrogen level -4)						
N ₀	35.53	39.84	59.31	6.51	7.60	6.99
N ₁	47.28	52.29	67.99	7.42	8.60	7.92
N ₂	54.59	59.11	73.23	7.80	9.11	8.39
N ₃	58.86	62.93	74.71	8.10	9.19	8.46
SE(m)±	0.621	0.676	1.028	0.048	0.071	0.066
C.D (P=0.05)	2.090	2.277	3.461	0.161	0.238	0.221
Interaction S X N						
SE(m)±	1.242	1.353	2.057	0.095	0.141	0.131
C.D (P=0.05)	4.180	4.554	6.922	NS	NS	NS
CV (%)	4.384	4.377	5.177	2.219	2.839	2.864

R-16-AST-4: Effect of stubble management and planting density on establishment and productivity of forage oat under zero tillage conditions in rice fallows

[Table Reference: R-16-AST-4 (a)]

Location: Imphal

The trial was actually initiated in Rabi 2016-17. But it was suggested to change from Lathyrus crop to Oat as due to heavy winter rainfall during the early copping period the lathyrus is most affected in the region (Proc Rabi 2018-19, HAU, and Hisar)*. Trial was restarted the changed crop to Oat. A field experiment was initiated during Rabi 2018-19 at CAU, Imphal, to study the effect of different height of rice stubble and planting density on establishment and productivity of forage oat under zero tillage condition in rice fallow. The experiment consisted of three seed rates (80, 100 and 120 kg ha⁻¹) and four different Stubble height (10 cm, 25 cm, 40 cm and bending of rice stubble) laid out in Randomized block design with three replications. Seed rate of 120 kg ha⁻¹ recorded significantly higher green fodder yield (200.98 q ha⁻¹), crude protein yield (4.68 q t ha⁻¹) and tallest plant (114.78 cm). Among stubble management, Bending of rice stubble (without cutting) recorded significantly higher green fodder yield (262.93 q ha⁻¹), dry matter yield (53.08 q ha⁻¹), crude protein yield (4.16 q ha⁻¹), No. Of tillers m⁻² (188.11) and plant height (115.19 cm) respectively. In, economic point of view also, treatment T₄S₃ combination (bending of rice stubble + 120 kg/ha seed rate) gave the highest net return of Rs. 27310.

* **Recommendation:** In trial R-16-AST-4: Effect of stubble management and planting density on establishment and productivity of forage lathyrus under zero tillage condition in rice fallows, it was suggested to change from Lathyrus crop to Oat, as due to heavy winter rainfall during the early copping period the lathyrus is most affected in the region - Proc Rabi 2018-19, HAU, and Hisar

Table R-16-AST-4 (a): stubble management and planting density on establishment and productivity of forage oat under zero tillage conditions in rice fallows

Treatment	Green forage yield (q/ha)	Dry matter yield (q/ha)	Crude protein yield (q/ha)	Crude protein content (%)	Plant height (cm)	No. of tillers/m ²	Gross return (Rs./ha)	Net return (Rs./ha)	B:C ratio
A. Rice Stubble Management									
T1	120.19	23.85	3.80	7.55	110.37	141.55	24038	-1238	-0.05
T2	164.35	34.65	2.63	7.60	110.45	164.78	32870	7594	0.30
T3	213.36	43.14	3.34	7.75	114.37	175.22	42672	17396	0.69
T4	262.93	53.08	4.16	7.81	115.19	188.11	52586	27310	1.08
SE(m)±	1.72	0.48	0.07	0.08	1.71	0.64	344	344	0.01
C.D (P=0.05)	5.95	1.66	0.23	NS	5.91	2.22	1191	1191	0.05
B. Seed rate									
S1	179.22	35.58	2.74	7.69	110.25	169.67	35844	11768	0.49
S2	190.42	40.32	3.03	7.47	112.75	167.59	38085	12809	0.51
S3	200.98	40.14	4.68	7.87	114.78	165.00	40195	13719	0.52
SE(m)±	1.15	0.54	0.04	0.04	1.56	0.64	230	230	0.01
C.D (P=0.05)	3.45	1.61	0.12	0.13	4.68	1.92	690	690	0.03
C. Interaction									
Rice Stubble Management at Seed rate level									
SE(m)±	2.55	1.00	0.09	0.10	3.07	1.23	510	510	0.02
C.D (P=0.05)	8.17	3.11	0.30	0.33	9.64	3.84	1635	1635	0.06
Seed rate at Rice Stubble Management									
SE(m)±	2.30	1.08	0.08	0.09	3.12	1.28	460	460	0.02
C.D (P=0.05)	6.90	3.23	0.24	0.26	9.37	NS	1380	1380	0.06

R-17-AST-5: Seed yield maximization in Oat cv. RO-19 (Phule Harita)

[Table Reference: R-17-AST-5 (a)-(d)]

Location: Rahuri

A field trial was conducted with the objectives to study the effect of different levels of silicon dioxide and cutting intervals on lodging and seed yield of oat (RO-19-Phule Harita) and economics of different treatments. The treatments comprised of different combinations of Levels of Silicon dioxide; S₁- 0 (Control), S₂- 200, S₃- 300 and 400 Kg ha⁻¹ and Cutting management; C₁- No cutting, C₂- 45 and C₃ - 55 Days after sowing. The treatments were replicated thrice in randomized block design. The application of silicon dioxide @ 400 kg ha⁻¹ recorded significantly higher plant height (111.61 cm). However, it was at par with silicon dioxide application @ 300kg ha⁻¹. As regards to cuts, the no cut recorded significantly higher plant height (108.47 cm). However, it was at par with cutting at 45 DAS. However, it was at par with cutting at 45 DAS. As regards to seed productivity, application of silicon dioxide @ 400kg ha⁻¹ recorded significantly higher seed yield (16.67 q ha⁻¹), GFY yield (236.56 q ha⁻¹), but it was at par with silicon dioxide application @ 300kg ha⁻¹. The lodging percentage was significantly lower in application of silicon dioxide @ 400 kg ha⁻¹ while, it was at par with silicon application @ 300 kg ha⁻¹ and 200 kg ha⁻¹. The cutting of oat at 45 DAS recorded significantly higher seed yield (17.91 q ha⁻¹). The treatment C₃ (cut at 55 DAS) recorded lower lodging percentage (45.75 %). The gross monetary returns (Rs. 98,356 ha⁻¹), Net monetary returns (Rs.61,014 ha⁻¹) with B:C ratio (2.61) were obtained with application of silicon dioxide @ 400 kg ha⁻¹. The treatment C₂ (cut at 45 DAS) recorded significantly higher gross monetary returns (Rs. 1,17,485 ha⁻¹), Net monetary returns (Rs.82,963 ha⁻¹) with B:C ratio (3.33).

Pooled results: (2016-17 to 2018-19)

On the basis of pooled results of three years (2016-17 to 2018-19), it was observed that, application of silicon dioxide @ 400 kg ha⁻¹ recorded significantly higher plant height (113.77 cm). However, it was at par with silicon dioxide application @ 300 kg ha⁻¹. As regards to Effect of cutting it was observed that, no cut treatment recorded significantly higher plant height (110.70 cm). However, it was at par with cutting at 45 DAS. Cutting of oat at 45 DAS recorded significantly higher seed yield (16.59q ha⁻¹). While, oat cut at 55 DAS recorded higher green forage yield (326.27 q ha⁻¹). Cut at 45 DAS recorded significantly higher gross monetary returns (Rs. 1, 13,934 ha⁻¹), Net monetary returns (Rs.79, 335 ha⁻¹) with significantly higher B:C ratio (2.65).

Application of silicon dioxide @ 400 kg ha⁻¹ recorded significantly higher seed yield (15.78 q ha⁻¹), green forage yield (235.31 q ha⁻¹). However, these are at par with silicon dioxide application @ 300 kg ha⁻¹. Higher gross monetary returns (Rs. 94,403 ha⁻¹), Net monetary returns (Rs. 58,406 ha⁻¹) with B:C ratio (2.58) were obtained with application of silicon dioxide @ 400 kg ha⁻¹. However, B:C ratio was at par with application of silicon dioxide @ 300 and 200 kg ha⁻¹.

Conclusion

On the basis of three years pooled data it was concluded that, application silicon dioxide @ 300 kg ha⁻¹ and cutting of crop at 45 DAS and left for seed gives higher oat seed yield.

Table R-17-AST-5 (a): Effect of Oat cv. RO-19 (Phule Harita) on growth and yield

Treatment	Plant population/ m row length	Plant height (cm)	Panicle length (cm)	Yield (q ha ⁻¹)		Lodging (%)	(%Lignin content straw)
				Seed	Straw		
Levels of Silicon dioxide (kg ha⁻¹)							
S ₁ - 0 (Control)	111.37	98.30	28.49	14.48	82.27	51.22	8.41
S ₂ - 200	108.74	101.31	29.53	15.13	103.17	47.11	10.20
S ₃ -300	110.00	107.34	30.16	15.74	105.48	42.22	12.67
S ₄ - 400	107.22	111.61	30.98	16.67	108.57	41.33	12.78
SE(m)±	2.90	2.81	0.47	0.41	3.30	1.44	0.20
C.D (P=0.05)	NS	8.10	1.36	1.19	9.51	4.15	0.57
Cutting management (DAS)							
C ₁ -No cutting	110.08	108.47	30.90	13.15	106.07	48.83	10.41
C ₂ - 45	110.47	105.80	29.72	17.91	96.04	45.83	10.98
C ₃ - 55	107.44	99.65	28.75	15.46	97.51	41.75	11.66
SE(m)±	2.51	2.44	0.41	0.36	2.86	1.25	0.17
C.D (P=0.05)	NS	7.02	1.18	1.03	8.23	3.60	0.49
Interaction S x C							
SE(m) ±	5.02	4.87	0.82	0.71	5.72	2.50	0.34
SE(m)±	NS	NS	NS	NS	NS	NS	NS
C.D (P=0.05)	7.95	8.06	4.77	7.97	9.91	9.51	5.40

Table R-17-AST-5 (b): Effect of Oat cv. RO-19 (Phule Harita) on yield and soil properties

Treatment	Green forage yield (q ha ⁻¹)	Seed germination (%)	Cost of Cultivation	Gross Monetary Returns	Net Monetary Returns	B:C ratio
			(Rs. ha ⁻¹)			
Levels of Silicon dioxide (kg ha⁻¹)						
S ₁ - 0 (Control)	190.56	86.44	34041	81552	47511	2.36
S ₂ - 200	215.14	87.11	35025	85463	53757	2.40
S ₃ -300	225.40	86.56	36016	92291	56274	2.54
S ₄ - 400	236.56	87.11	37342	98356	61014	2.61
SE(m)±	6.09	0.72		2116	2116	0.06
C.D (P=0.05)	17.56	NS		6095	6095	0.17
Cutting management (DAS)						
C ₁ -No cutting	0.00	86.58	33570	40185	6615	1.20
C ₂ - 45	322.73	87.00	35499	117485	82963	3.33
C ₃ - 55	328.02	86.83	37749	110577	74339	2.97
SE(m)±	7.04	0.62		1832	1832	0.05
C.D (P=0.05)	20.27	NS		5278	5278	0.15
Interaction S x C						
SE(m) ±	12.19	1.24		3664	3664	0.10
SE(m)±	NS	NS		NS	NS	NS
C.D (P=0.05)	9.73	2.47		7.05	11.63	7.02

Table R-17-AST-5 (c): Effect of Oat cv. RO-19 (Phule Harita) on growth and yield (Pooled data of 2016-17 to 2018-19)

Treatment	Plant population/ m row length	Plant height (cm)	Panicle length (cm)	Yield (q ha ⁻¹)			Lodging (%)	Lignin content in straw (%)
				Seed	Straw	Green fodder		
Levels of Silicon dioxide (kg ha⁻¹)								
S ₁ - 0 (Control)	111	99.23	28.64	13.03	81.62	190.04	51.26	8.55
S ₂ - 200	109	103.18	29.74	14.20	103.23	213.15	46.15	10.39
S ₃ -300	110	108.42	30.41	14.92	106.77	224.35	42.48	12.84
S ₄ - 400	107	113.77	30.92	15.78	109.38	235.31	41.41	12.96
SE(m)±	2.99	2.89	0.47	0.40	3.65	7.36	1.53	0.20
C.D (P=0.05)	NS	8.34	1.34	1.16	10.51	21.19	4.40	0.57
Cutting management (DAS)								
C ₁ -No cutting	110	110.70	30.88	12.69	106.92	0.00	48.75	10.54
C ₂ - 45	110	107.13	29.85	16.59	95.29	320.87	44.97	11.08
C ₃ - 55	107	100.62	29.05	14.18	98.55	326.27	42.25	11.95
SE(m)±	2.59	2.51	0.40	0.35	3.16	6.37	1.32	0.17
C.D (P=0.05)	NS	7.22	1.16	1.01	9.10	18.35	3.81	0.49
Interaction S x C								
SE(m)±	5.19	5.01	0.81	0.70	6.32	12.74	2.65	0.34
C.D (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS
CV (%)	8.21	8.18	4.68	8.37	10.92	10.23	10.12	11.19
								5.30

Table R-17-AST-5 (d): Effect of Oat cv. RO-19 (Phule Harita) on monetary return and soil properties (Pooled data of 2016-17 to 2018-19)

Treatment	Seed germination (%)	Cost of Cultivation	Gross Monetary Returns	Net Monetary Returns	B:C ratio	Soil pH at Harvest	Soil EC (dsm ⁻¹)	Soil OC-with soil	Available nutrients in soil after harvest (kg ha ⁻¹)		
									N	P	K
Levels of Silicon dioxide (kg ha⁻¹)											
S ₁ - 0 (Control)	86.19	33141	77105	43963	2.29	8.30	0.34	0.35	134	22.20	255
S ₂ - 200	86.52	34125	85221	51096	2.45	8.61	0.34	0.35	152	21.10	273
S ₃ -300	86.41	35116	89643	54527	2.53	8.66	0.35	0.36	194	20.35	280
S ₄ - 400	86.89	35997	94403	58406	2.58	8.61	0.36	0.36	225	0.27	292
SE(m)±	0.70	--	2167	2167	0.06	0.11	0.01	0.01	2.88	0.78	3.38
C.D (P=0.05)	NS	--	6244	6244	0.18	NS	NS	NS	8.31		9.72
Cutting management (DAS)											
C ₁ -No cutting	86.11	32336	38060	5723	1.18	8.58	0.34	0.35	185	16.07	280
C ₂ - 45	87.17	34599	113934	79335	3.29	8.56	0.35	0.35	179	21.60	276
C ₃ - 55	86.22	36849	107785	70936	2.92	8.50	0.36	0.36	165	23.44	269
SE(m)±	0.61	--	1877	1877	0.05	0.09	0.01	0.01	2.50	0.23	2.92
C.D (P=0.05)	NS	--	5407	5407	0.15	NS	NS	NS	7.19	0.68	8.42
Interaction S x C											
SE(m)±	1.22		3754	3754	0.11	0.18	0.01	0.01	4.99	0.47	5.85
C.D (P=0.05)	NS		NS	NS	NS	NS	NS	NS	NS	NS	NS
CV (%)	2.44		7.51	12.50	7.54	3.69	6.73	4.87	4.91	3.83	3.68

R-18-AST-7: Effect of intercropping on seed setting and seed yield in Lucerne

[Table Reference: R-18-AST-7 (a)]

Location: Bikaner

The experiment was initiated in *Rabi* season of 2018-19 to study the effect of intercropping on seed setting and seed yield in Lucerne at Agricultural Research Station, SKRAU, Bikaner on sandy soil with the objectives-(i) To find out suitable crop as intercrop for seed setting in Lucerne through improving microclimate (ii) To find out effect of intercropping of Lucerne through improving pollinators (iii) To improve seed yield in Lucerne. The treatments included T₁: Control (without intercrop); T₂: Bajra Intercrop at (1:5); T₃: Bajra Intercrop at (1: 10); T₄: Bajra Intercrop at (1:15); T₅: Dill Intercrop at (1:5); T₆: Dill Intercrop at (1: 10); T₇: Dill Intercrop at (1:15); T₈: Mustard Intercrop at (1:5); T₉: Mustard Intercrop at (1: 10) and T₁₀: Mustard Intercrop at (1:15). These were replicated thrice in randomized block design. Sowing was done on November 13-14, 2018 and harvested on April 21-25, 2019 using recommended seed rates. Fertilizers @ 20 kg N, 40 kg P₂O₅, and 20 kg K₂O as basal were drilled at sowing. Further 20 kg N in two equal splits at 30DAS and after first cut (50-55 DAS) for green fodder was broadcasted. The result in Table reveal that seed setting was better in the combination of dill intercrop with Lucerne and gave highest seed yield as compared to other combinations. The maximum seed yield as well as net return were found in combination of Dill Intercrop at 1:10 ratio (62.59 kg seed and Rs. 46493 /ha, respectively).

Table R-18-AST-7 (a): Effect of intercropping on yield attributes, yield and economics of lucerne

Treatment	No. of branches per plant	No. of pods per plant	No. of seeds per pod	1000 seed weight (g)	Seed yield (kg/ha)	Economics (Rs/ha)			
						Cost of Cultivation	Gross return	Net return	B:C Ratio
Control (Single lucerne)	5.53	40.60	3.13	2.89	42.84	17956	45777	27821	2.55
Bajra Intercrop at (1:5)	5.80	40.73	3.80	2.85	42.06	18021	47516	29495	2.64
Bajra Intercrop at (1: 10)	5.40	39.47	3.73	2.88	51.99	17986	50382	32396	2.80
Bajra Intercrop at (1:15)	6.20	42.20	4.27	2.76	50.07	17966	50530	32564	2.81
Dill Intercrop at (1:5)	5.00	51.13	5.40	3.10	61.79	19531	65956	46425	3.38
Dill Intercrop at (1: 10)	5.20	50.33	4.93	3.04	62.59	18996	65489	46493	3.45
Dill Intercrop at (1:15)	6.20	47.73	4.73	3.00	60.20	18476	56731	38255	3.07
Mustard Intercrop at (1:5)	4.07	32.27	3.07	2.65	20.50	19516	48090	28574	2.46
Mustard Intercrop at (1: 10)	5.27	36.60	3.33	2.80	25.09	18986	43854	24868	2.31
Mustard Intercrop at (1:15)	5.60	39.60	4.13	2.89	29.95	18466	38921	20455	2.11
SE(m)±	0.31	2.09	0.27	0.09	2.74	--	1815	27821	0.10
C.D (P=0.05)	0.92	6.22	0.79	0.28	8.14	--	5393	29495	0.29

R-18-AST-8: Feasibility studies of growing different oat (*Avena sativa L.*) cultivars as fodder crop on hilly terraces of Nagaland under rainfed condition.

[Table Reference: R-18-AST-8 (a)-(b)]

Location: SASRD, Medziphema, Nagaland University

The experiment was conducted during Rabi 2018 -19 to assess the suitability, growth and yield performance of oat cultivars as fodder crop for the hilly state of Nagaland. The treatments included six oat varieties tested under standard package of practices. It was observed that among the cultivars highest plant height was noted in OS-403 (72.69cm) and lowest in cultivar OS-346 (57.24cm). The green fodder yield and dry matter yield variation were significant. The cultivar OS-403 recorded highest green fodder yield (148q/ha) followed by WJ-8 (143.11q/ha), similar was the trend for dry matter yield. The lowest green fodder yield was noted with OS-346 (88q/ha). The variation in crude protein content (%) and crude protein yield (q/ha) was non significant among the cultivars studied.

Soil samples were analyzed before sowing and after harvesting the crops. It was found that no significant differences were observed in different soil parameters except available phosphorous.

Finally it can be concluded that among the different fodder oat cultivars, OS-403 is most suitable followed by WJ-8 for the agro-climatic condition of Nagaland.

Table R-18-AST-8 (a): Growth and yield of Oat varieties

Oat varieties	Plant height (cm) DAS			GFY	DMY	Crude Protein	Crude Protein Content (%)
	30	60	Harvest				
	Yield (q/ha)						
OS-346	9.78	25.23	57.24	88.00	16.58	1.58	9.57
OS-403	10.20	24.75	72.69	148.00	27.97	2.59	9.20
WJ-8	10.82	28.48	72.43	143.11	27.22	2.73	10.06
OS-6	9.75	24.03	66.93	131.17	24.40	2.15	8.81
OS-7	10.68	26.50	69.92	121.00	22.39	2.23	9.94
OS-377	9.10	20.85	64.96	124.67	23.96	2.28	9.51
SE(m)±	0.65	1.99	4.19	10.51	2.04	0.22	0.35
C.D (P=0.05)	NS	NS	NS	39.15	7.59	NS	NS
CV (%)	11.18	13.77	10.78	14.45	14.86	17.19	6.38

Table R-18-AST-8 (b) Soil physio-chemical properties (before sowing and after harvest)

Treatments	Before sowing					After harvest				
	Soil pH	Org. C.	Avail. Nutrients (kg/ha)			Soil pH	Org.C.	Avail. Nutrients (kg/ha)		
			N	P	K			N	P	K
OS-346	4.73	1.30	207.28	19.34	225.15	4.60	1.04	183.42	19.89	218.41
OS-403	6.60	1.31	206.18	18.33	222.19	4.47	0.98	186.03	18.18	215.28
WJ-8	4.53	1.42	203.17	19.25	219.18	4.50	1.01	177.03	20.33	214.46
OS-6	4.87	1.45	203.85	19.91	212.81	4.73	1.03	175.86	20.93	217.88
OS-7	4.77	1.42	200.98	17.89	215.43	4.63	1.01	178.44	19.07	212.21
OS-377	4.67	1.28	203.46	18.74	217.81	4.50	0.97	180.97	18.69	209.96
CV (%)	2.59	9.29	1.63	5.63	3.42	2.81	4.42	4.02	3.22	4.63
SE(m)±	0.07	0.07	1.92	0.61	4.30	0.07	0.02	4.18	0.36	5.74
C.D (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	1.35	NS

C. AVT-2 Trials

R-18-AST-1: Effect of N levels on forage yield of promising entries of oat (AVT-2 SC)

[Table Reference: R-18-AST-1 (a)-(m)]

Location (11)

HZ: Palampur, Srinagar

NWZ: Hisar, Ludhiana

NEZ: Imphal, Ranchi, Kalyani

CZ: Urulikanchan, Jabalpur

SZ: Mandya, Hyderabad

AVT trial on oat was conducted in all five regions of the country. In the trial seven single cut entries (SKO-229, HFO-607, HFO-525, JO-05-7, OL-1869-1, OL-1861 and OL-1862) along with two national checks namely OS-6 and Kent and five zonal checks *viz.*, SKO-90 (HZ), OL-125 (NWZ), JHO-822 (CZ), JHO-99-2 (NEZ) and JHO-2000-4 (SZ) were evaluated at 11 locations across the all five zones in the country.

In North West zone, for GFY and DMY entry JO-05-7 (797.0 q green and 181.25 q dry matter/ha, respectively) was superior to other entries as well as national checks. JO-05-7 recorded 2.8 and 7.5 % higher green fodder and dry matter yield over best check Kent. It was followed by HFO-607, which was at par with national check Kent. Significantly higher CPY (15.2 q) was recorded by National check – Kent followed by entry JO-05-7 (13.5 q) and HFO-607 (13.35 q).

In North East Zone also, entry JO-05-7 recorded highest GFY (475.8q/ha) which was at par with national check Kent. As regard to DFY, entry HFO-607 recorded maximum dry matter (86.89 q), which was at par with entry JHO-05-7 and national check OS-6. In terms of CPY, entry HFO-607 (7.27q/ha), JHO-05-7 (7.11q/ha) and national check OS-6 (7.29q/ha) recorded maximum CPY which was significantly superior is other entries but remained on par with each other.

In Hill zone, no entry could perform better than Zonal or national checks in terms of GFY, DFY or CP yields.

In Central zone, for GFY, entry OL-1861 recorded maximum GFY (541.39 q/ha) but remained on par with entry JO-05-7 (532.7q/ha) and zonal check- JHO-822 (534.6q/ha). As regards to DFY, zonal check JHO-822 proved best recorded 121.89 q dry matter/ha. However, entry JO-05-7 (117.8q/ha) remained on par with JHO-822. This was closely followed by entry OL-1862. In terms of CPY, JO-05-7 recorded maximum CP yield (9.61q/ha) followed by zonal check JHO-822 and OL 1862.

In south Zone, entries OL-1861, OL-1862, National check -Kent and Zonal check- JHO-2000-4 recorded higher GFY than other entries. However, in terms of DFY HFO-607 recorded maximum dry matter yield (62.30q/ha), which was at par with JO-05-7, OL-1861, OL-1862 National check Kent and Zonal check JHO-2000-4. As regards to CP yields, entries OL-1862, OL-1861 and HFO - 607 recorded significant superiority recording 4.54, 4.21 and 4.19 q CPY/ha.

On all India mean basis, entry JO-05-7 produced maximum GFY (483.9 q/ha) and DFY (100.52 q/ha). The entry also recorded higher CP yields among all entries but remained on par with national check- Kent. It was followed by Kent (481.3q/ha) in terms of GFY as well as DFY. The growth performance and yields of all the entries improved consistently with increase in level of nitrogen up to 120 kg/ha (501.8 green, 103.97 q dry matter and 8.57 q crude protein/ha)

Table- R-18-AST-1 (a): Effect of nitrogen levels on green fodder yields (of promising entries of Oat (AVTO-2-SC))

Entries	Green Fodder Yield (q/ha)																Mean	Overall mean
	Hill zone			North West zone			North East Zone				Central zone			South zone				
	Palam-pur	Sri-nagar	Mean	His-ar	Ludh-iana	Mean	Imp-hal	Ran-chi	Kal-yani	Mean	Urulikan-ghan	Jabal-pur	Mean	Man-dya	Hydera-bad			
SKO-229	226.6	319.6	273.1	395.6	816.3	606.0	386.6	455.0	501.6	447.7	519.7	463.8	491.7	181.1	338.5	259.8	418.6	
HFO-607	207.9	301.6	254.7	535.1	893.0	714.1	386.0	420.0	463.7	423.2	470.5	448.6	459.6	276.3	342.7	309.5	431.4	
HFO-525	236.4	319.9	278.1	497.4	771.7	634.6	411.7	391.0	432.4	411.7	516.6	454.0	485.3	261.4	341.6	301.5	421.3	
JO-05-7	235.5	361.3	298.4	589.4	1004.6	797.0	388.8	494.0	544.5	475.8	562.7	502.8	532.7	279.7	359.3	319.5	483.9	
OL-1869-1	236.2	306.9	271.5	493.5	678.5	586.0	389.7	385.0	425.0	399.9	564.2	434.0	499.1	231.7	332.3	282.0	407.0	
OL-1861	223.0	351.7	287.4	477.6	865.8	671.7	425.9	392.0	433.3	417.1	563.7	518.9	541.3	284.1	373.9	329.0	446.4	
OL-1862	232.2	347.8	290.0	439.0	840.1	639.6	416.8	408.0	450.4	425.1	542.5	503.5	523.0	286.8	369.8	328.3	439.7	
Kent (NC)	245.1	387.0	316.0	640.5	910.4	775.5	391.7	487.0	536.2	471.6	547.9	498.9	523.4	288.8	360.4	324.6	481.3	
OS-6 (NC)	232.6	385.6	309.1	585.4	753.2	669.3	405.9	443.0	489.1	446.0	531.0	460.9	496.0	233.2	362.5	297.8	443.9	
SKO-90 (HZ)	256.2	390.3	323.2															
OL-125 (NWZ)				482.1	757.6	619.9												
JHO-99-2 (NEZ)							384.8	339.0	375.4	366.4								
JHO-822 (CZ)											564.6	504.5	534.6					
JHO-2000-4 (SZ)														264.2	380.2	322.2		
SE(m) ±	6.17	6.35		27.2	19.4		28.53	2.78	3.42		21.51	20.56		6.40	9.2			
C.D. (P=0.05)	18.30	18.57		81.5	57.8		84.75	8.34	10.26		NA	60.63		19.01	NS			
Nitrogen level (Kg/ha)																		
N ₁ 30 Kg	181.4	290.7	236.0	440.8	722.7	581.8	367.0	283.0	314.1	321.4	489.9	394.8	442.4	186.7	347.1	266.9	365.3	
N ₂ 60 Kg	220.6	345.6	283.1	497.5	798.7	648.1	396.5	386.0	426.3	402.9	519.9	448.1	484.0	238.8	357.5	298.1	421.4	
N ₃ 90 Kg	256.3	368.4	312.4	552.2	878.1	715.2	407.7	474.0	522.3	468.0	546.9	533.0	539.9	289.0	361.2	325.1	471.7	
N ₄ 120 kg	274.4	384.0	329.2	563.6	917.0	740.3	424.0	543.0	598.0	521.7	596.7	540.0	568.4	320.4	358.7	339.6	501.8	
SE(m) ±	2.83	2.60		13.4	7.9		110.83	2.12	4.32		11.65	12.3		4.29	NS			
C.D. (P=0.05)	8.00	7.61		38.1	22.2		313.46	6.00	12.84		33.06	36.52		12.13	6.6			
Interaction: V X N levels																		
SE(m) ±	8.96	9.60			25.0				32.77			36.87	16.54		13.56	6.2		
C.D. (P=0.05)	25.32	28.05			70.1				92.93			106.88	48.63		38.35	NS		

Table- R-18-AST-1 (b): Effect of nitrogen levels on dry matter yields of promising entries of Oat (AVTO-2-SC)

Entries	Dry Matter Yield (q/ha)															Mean	Overall mean
	Hill zone			North West zone				North East Zone			Central zone			South zone			
	Palampur	Srinagar	Mean	Hisar	Ludhiana	Mean	Imp-hal	Ranchi	Kalyani	Mean	Urulikanchan	Jabalpur	Mean	Mandya	Hyderabad		
SKO-229	44.18	74.78	59.48	117.20	147.60	132.40	92.28	79.00	64.70	78.66	101.12	89.56	95.34	37.97	64.30	51.14	82.97
HFO-607	40.32	70.35	55.34	153.30	182.90	168.10	90.17	94.00	76.50	86.89	105.28	85.06	95.17	57.49	67.10	62.30	92.95
HFO-525	44.15	76.66	60.41	140.50	137.20	138.85	86.71	83.00	66.60	78.77	119.94	87.72	103.83	55.49	62.80	59.15	87.34
JO-05-7	46.29	84.57	65.43	168.10	194.40	181.25	92.62	89.00	74.00	85.21	140.22	95.52	117.87	56.59	64.40	60.50	100.52
OL-1869-1	45.55	71.66	58.61	133.70	125.70	129.70	92.00	76.00	61.60	76.53	130.36	85.93	108.15	47.60	58.80	53.20	84.45
OL-1861	42.08	82.01	62.05	130.00	171.90	150.95	99.58	80.00	65.90	81.83	108.01	101.26	104.64	58.78	64.90	61.84	91.31
OL-1862	44.55	83.79	64.17	124.00	157.80	140.90	98.02	81.00	66.60	81.87	127.53	96.67	112.10	58.40	62.10	60.25	90.95
Kent (NC)	47.21	90.66	68.94	176.00	161.40	168.70	86.39	89.00	71.80	82.40	126.69	93.35	110.02	59.38	63.50	61.44	96.85
OS-6 (NC)	45.15	93.80	69.48	166.80	140.90	153.85	92.37	94.00	72.90	86.42	112.38	88.68	100.53	45.88	63.00	54.44	92.35
SKO-90 (HZ)	49.98	92.77	71.38														
OL-125 (NWZ)				131.50	143.40	137.45											
JHO-99-2 (NEZ)							93.09	71.00	59.30	74.46							
JHO-822 (CZ)											146.66	95.39	121.03				
JHO-2000-4 (SZ)														53.19	67.50	60.35	
SE(m) ±	1.19	2.16		5.36	4.0		7.38	0.83	0.68		5.01	7.31		1.39	1.71		
C.D. (P=0.05)	3.54	6.32		16.1	12.0		21.92	2.49	2.04		15.00	21.63		4.14	NS		
Nitrogen level (Kg/ha)																	
N ₁ 30 Kg	34.91	70.10	52.51	125.30	132.00	128.65	79.20	53.00	43.30	58.50	106.40	77.66	92.03	34.16	60.50	47.33	74.23
N ₂ 60 Kg	42.66	85.67	64.17	143.40	147.00	145.20	89.51	81.00	66.50	79.00	106.25	85.32	95.79	47.14	62.00	54.57	86.95
N ₃ 90 Kg	49.63	88.42	69.03	152.50	163.50	158.00	95.43	97.00	80.40	90.94	135.58	101.30	118.44	60.72	64.30	62.51	98.98
N ₄ 120 kg	52.59	84.22	68.41	155.30	182.80	169.05	105.15	103.00	84.30	97.48	139.05	103.37	121.21	70.30	63.60	66.95	103.97
SE(m) ±	0.55	0.90		2.74	2.3		42.72	0.86	0.52		2.66	6.3		1.03	NS		
C.D. (P=0.05)	1.54	2.65		7.77	6.4		120.83	2.43	1.56		7.60	18.21		2.92	2.0		
Interaction: V X N levels																	
SE(m) ±	1.73	3.38			7.2		12.13				8.47	6.24		3.27	2.66		
C.D. (P=0.05)	4.90	9.54			20.2		34.35				24.55	18.54		9.23			

Table- R-18-AST-1 (c): Effect of nitrogen levels on crude protein yield of promising entries of Oat (AVTO-2-SC)

Entries	Crude Protein Yield (q/ha)																Mean	Overall mean
	Hill zone			North West zone			North East Zone			Central zone			South zone					
	Palam pur	Sri-nagar	Mean	His-ar	Ludh-iana	Mean	Imp-hal	Ran-chi	Kal-yani	Mean	Uruli kanchan	Jabal-pur	Mean	Man-dya	Hydera-bad			
SKO-229	4.17	5.78	4.98	10.7	10.1	10.4	5.66	6.78	5.71	6.05	8.81	6.06	7.44	2.53	4.4	3.47	6.43	
HFO-607	3.69	5.38	4.54	14.5	12.2	13.35	5.67	8.53	7.6	7.27	9.11	5.94	7.53	4.38	4.0	4.19	7.36	
HFO-525	4.23	6.03	5.13	12	12.2	12.1	5.48	7.49	5.53	6.17	10.49	6.15	8.32	2.97	4.5	3.74	7.01	
JO-05-7	4.35	6.53	5.44	14.8	12.2	13.5	5.84	8.3	7.2	7.11	12.99	6.23	9.61	4.34	3.6	3.97	7.85	
OL-1869-1	4.22	6.47	5.35	11.7	8.9	10.3	5.81	6.86	5.8	6.16	12.87	6.06	9.47	2.71	3.7	3.21	6.83	
OL-1861	3.99	5.59	4.79	11.4	12.2	11.8	6.25	7.19	6.33	6.59	8.9	6.41	7.66	3.61	4.8	4.21	6.97	
OL-1862	4.06	6.76	5.41	10.9	11.5	11.2	6.07	8.13	6.3	6.83	12.45	5.84	9.15	4.96	4.2	4.58	7.38	
Kent (NC)	4.45	7.86	6.16	16.6	13.8	15.2	5.45	8.33	6.1	6.63	11.33	6.08	8.71	3.89	3.8	3.85	7.97	
OS-6 (NC)	4.11	8.51	6.31	14.3	11.4	12.85	5.75	9.33	6.8	7.29	10.4	5.78	8.09	2.68	4.1	3.39	7.56	
SKO-90 (HZ)	4.79	6.5	5.65															
OL-125 (NWZ)				12.4	10.3	11.35												
JHO-99-2 (NEZ)							5.83	6.41	5.54	5.93								
JHO-822 (CZ)											12.26	6.23	9.25					
JHO-2000-4 (SZ)														3.85	3.8	3.83		
SE(m) ±	0.12	0.19		0.55	0.31		0.48	0.11	0.05		0.44	0.63		0.1	0.4			
C.D. (P=0.05)	0.35	0.58		1.63	0.93		1.43	0.34	0.15		1.32	2.14		0.31	NS			
Nitrogen level (Kg/ha)																		
N ₁ 30 Kg	2.93	5.21	4.07	11	8.8	9.9	4.94	4.76	3.64	4.45	8.18	5.11	6.65	2.15	3.6	2.88	5.48	
N ₂ 60 Kg	3.87	6.76	5.32	12.7	10.6	11.65	5.62	7.34	5.92	6.29	9.85	5.66	7.76	3.41	4	3.71	6.88	
N ₃ 90 Kg	4.85	7.21	6.03	13.8	12.2	13	5.99	8.87	7.75	7.54	12.88	6.58	9.73	4.07	4.5	4.29	8.06	
N ₄ 120 kg	5.18	6.98	6.08	14.1	14.3	14.2	6.57	9.98	8.35	8.3	12.93	6.96	9.95	4.74	4.2	4.47	8.57	
SE(m) ±	0.06	0.08		0.27	0.17		2.73	0.09	0.04		0.23	0.63		0.07	0.4			
C.D. (P=0.05)	0.18	0.24		0.77	0.47		7.72	0.25	0.12		0.66	1.85		0.21	NS			
Interaction: V X N levels																		
SE(m) ±	0.19	0.30			0.53		0.78				0.74	0.61		0.23	0.3			
C.D. (P=0.05)	0.57	0.88			1.49		NS				2.14	1.34		0.65	NS			

Table R-18AST-1(d): Interaction effects of nitrogen levels and promising entries on green and dry fodder yields of oat (AVTO-2 -SC) at Palampur

Entries	Green fodder yield (q/ha)				
	N levels (kg/ha)				
	30	60	90	120	Mean
SKO-229	177.42	209.72	255.30	263.84	226.57
HFO-607	135.93	187.15	231.48	276.81	207.85
HFO-525	183.07	235.33	256.67	270.46	236.38
JO-05-7	202.88	236.10	243.33	259.48	235.45
OL-1869-1	161.52	230.82	265.49	286.82	236.16
OL-1861	187.20	204.87	236.45	263.59	223.03
OL-1862	185.49	214.27	250.82	278.12	232.17
Kent (NC)	220.83	244.30	253.48	261.83	245.11
OS-6 (NC)	170.86	207.48	273.08	279.03	232.61
SKO-90 (HZ)	188.85	235.78	296.82	303.51	256.24
Mean	181.40	220.58	256.29	274.35	
	V	N	VXN		
SEm±	6.17	2.83	8.95		
CD at 5%	18.30	8.00	25.32		
	Dry Fodder yield (q/ha)				
SKO-229	33.77	42.01	50.89	50.04	44.18
HFO-607	25.92	36.68	44.80	53.89	40.32
HFO-525	34.60	42.29	49.16	50.36	44.15
JO-05-7	39.76	44.94	48.75	51.72	46.29
OL-1869-1	30.63	44.01	52.04	55.51	45.55
OL-1861	36.44	38.72	42.69	50.49	42.08
OL-1862	34.54	41.97	48.41	53.31	44.55
Kent (NC)	43.25	47.15	48.58	49.84	47.21
OS-6 (NC)	34.23	41.36	51.79	53.20	45.15
SKO-90 (HZ)	35.94	47.24	59.17	57.57	49.98
Mean	34.91	42.66	49.63	52.59	
	V	N	VXN		
SEm±	1.19	0.55	1.73		
CD at 5%	3.54	1.54	4.90		

Table R-18 AST-1(e): Interaction effect of nitrogen levels and different entries on Green fodder yield (q/ha) of Oat (AVT-2SC) at Srinagar

Entries	Nitrogen Levels (Kg/ha)				Mean
	30	60	90	120	
SKO-229	268.50	321.50	335.60	352.80	319.60
HFO-607	245.60	302.60	321.50	336.80	301.63
HFO-525	275.60	312.50	335.60	355.80	319.88
JO-05-7	295.65	368.52	382.45	398.50	361.28
OL-1869-1	268.50	292.80	325.60	340.80	306.93
OL-1861	295.60	345.80	372.60	392.80	351.70
OL-1862	287.54	345.65	372.58	385.50	347.82
Kent (NC)	308.52	398.42	415.23	425.63	386.95
OS-6 (NC)	342.50	382.90	401.50	415.60	385.63
SKO-90 (HZ)	318.45	385.36	421.52	435.65	390.25
Mean	290.65	345.61	368.42	383.99	
	V		N	E x N	
SEm±	6.35		2.60	9.60	
CD at 5%	18.57		7.61	28.05	

Table R-18AST-1(f): Interaction effect of nitrogen levels and promising entries on Dry fodder yield (q/ha) of Oat (AVT-2SC) at Srinagar

Entries	Nitrogen Levels (Kg/ha)				Mean
	30	60	90	120	
SKO-229	63.10	78.77	80.54	76.70	74.78
HFO-607	57.72	74.14	77.16	72.39	70.35
HFO-525	64.77	81.56	80.54	79.77	76.66
JO-05-7	69.48	90.29	91.79	86.71	84.57
OL-1869-1	63.10	71.74	78.14	73.66	71.66
OL-1861	69.47	84.72	89.42	84.41	82.01
OL-1862	72.57	89.68	89.42	83.48	83.79
Kent (NC)	72.50	97.61	99.66	92.87	90.66
OS-6 (NC)	86.49	93.81	96.36	98.55	93.80
SKO-90 (HZ)	81.84	94.41	101.16	93.66	92.77
Mean	70.10	85.67	88.42	84.22	
	V		N	E x N	
SEm±	2.16		0.90	3.26	
CD at 5%	6.32		2.65	9.54	

Table R-18AST-1(g): Interaction effect of nitrogen levels and different entries on Crude Protein yield of Oat (AVT-2SC) at Srinagar and Palampur

Entries	Srinagar					Palampur				
	Nitrogen Levels (Kg/ha)					Nitrogen Levels (Kg/ha)				
	30	60	90	120	Mean	30	60	90	120	Mean
SKO-229	4.61	5.99	6.36	6.14	5.78	2.77	4.03	4.94	4.94	4.17
HFO-607	3.98	5.63	6.10	5.79	5.38	2.12	3.11	4.30	5.23	3.69
HFO-525	4.86	6.52	6.36	6.38	6.03	3.04	3.96	4.89	5.04	4.23
JO-05-7	5.00	6.77	7.34	7.02	6.53	3.26	4.19	4.82	5.13	4.35
OL-1869-1	5.36	6.46	7.19	6.85	6.47	2.51	3.87	5.00	5.49	4.22
OL-1861	4.52	5.76	6.26	5.82	5.59	3.09	3.63	4.23	5.00	3.99
OL-1862	5.44	7.17	7.33	7.10	6.76	2.82	3.58	4.65	5.17	4.06
Kent (NC)	5.80	8.39	8.87	8.36	7.86	3.67	4.39	4.80	4.93	4.45
OS-6 (NC)	7.35	8.44	8.87	9.36	8.51	2.81	3.51	4.97	5.16	4.11
SKO-90 (HZ)	5.16	6.42	7.38	7.02	6.50	3.16	4.41	5.87	5.74	4.79
Mean	5.21	6.76	7.21	6.98		2.93	3.87	4.85	5.18	
	V		N	E x N		V	N	VXN		
SEm±	0.19		0.08	0.30		0.12	0.06	0.20		
CD at 5%	0.58		0.24	0.88		0.35	0.18	0.57		

Table R-18AST-1(h): Interaction effect of nitrogen levels and promising entries on Dry fodder yield (q/ha) of Oat (AVT-2SC) at Mandya

Varieties	Green Forage Yield (q/ha)					Dry matter yield (q/ha)					
	Nitrogen levels(Kg/ha)					Nitrogen levels(Kg/ha)					Mean
	30	60	90	120	Mean	30	60	90	120		
SKO-229	146.93	175.53	196.07	205.97	181.13	27.20	35.53	42.33	46.80	37.97	
HFO-607	176.93	254.13	322.45	351.67	276.30	31.27	49.77	70.70	78.23	57.49	
HFO-525	213.73	224.90	268.73	338.33	261.42	38.43	46.83	59.80	76.90	55.49	
JO-05-7	207.30	261.73	322.87	326.77	279.67	38.27	52.20	66.60	69.30	56.59	
OL-1869-1	172.57	201.17	257.13	295.97	231.71	31.60	39.23	54.83	64.73	47.60	
OL-1861	199.73	261.23	324.30	351.23	284.12	37.45	54.60	62.45	80.63	58.78	
OL-1862	193.62	276.42	303.49	373.45	286.75	34.57	49.37	68.03	81.63	58.40	
Kent (NC)	192.17	252.63	331.97	378.53	288.83	37.08	50.19	68.48	81.76	59.38	
OS-6 (NC)	172.73	218.50	274.77	266.60	233.15	31.83	42.47	53.67	55.57	45.88	
JHO-2000-4 (SZ)	191.73	261.50	287.83	315.63	264.17	33.87	51.20	60.27	67.43	53.19	
Mean	186.74	238.77	288.96	320.42		34.16	47.14	60.72	70.30	-	
	Varieties	Nitrogen	Interaction			Varieties	Nitrogen	Interaction			
			V X N	N X V				V X N	N X V		
SEm±	6.40	4.29	13.56	13.37		1.39	1.03	3.27	3.15		
CD at 5%	19.01	12.13	38.35	37.83		4.14	2.92	9.23	8.92		

Table- R-18-AST-1 (i): Effect of nitrogen levels on per day productivity of promising entries of Oat (AVTO-2-SC)

Entries	Green Forage Yield (q/ha/day)				Dry matter Yield (q/ha/day)				
	Palam pur	His-ar	Ludhiana	Mean	Palam pur	His-ar	Ludhiana	Mean	Overall mean
SKO-229	1.64	3.27	6.60	3.84	0.32	0.97	1.20	0.83	2.33
HFO-607	1.48	4.42	7.40	4.43	0.29	1.27	1.50	1.02	2.73
HFO-525	1.76	4.11	7.70	4.52	0.33	1.16	1.40	0.96	2.74
JO-05-7	1.62	5.29	7.50	4.80	0.31	1.45	1.30	1.02	2.91
OL-1869-1	1.69	4.84	7.50	4.68	0.33	1.38	1.40	1.04	2.86
OL-1861	1.73	4.87	7.90	4.83	0.34	1.39	1.50	1.08	2.96
OL-1862	1.66	4.08	5.50	3.75	0.32	1.11	1.00	0.81	2.28
Kent (NC)	1.62	3.95	7.00	4.19	0.30	1.07	1.40	0.92	2.56
OS-6 (NC)	1.72	3.63	6.80	4.05	0.33	1.02	1.30	0.88	2.47
SKO-90 (HZ)	1.83				0.36				
OL-125 (NWZ)		3.98	6.10			1.09	1.20		
JHO-99-2 (NEZ)									
JHO-822 (CZ)									
JHO-2000-4 (SZ)									
SE(m) ±	0.04	0.23	0.2		0.01	0.04	0.03		
C.D. (P=0.05)	0.13	0.67	0.5		0.03	0.13	0.10		
Nitrogen level (Kg/ha)									
N ₁ 30 Kg	1.31	3.64	6.10	3.68	0.25	1.04	1.10	0.80	2.24
N ₂ 60 Kg	1.60	4.11	6.70	4.14	0.31	1.19	1.20	0.90	2.52
N ₃ 90 Kg	1.83	4.56	7.40	4.60	0.35	1.26	1.40	1.00	2.80
N ₄ 120 kg	1.96	4.66	7.80	4.81	0.38	1.28	1.50	1.05	2.93
SE(m) ±	0.02	0.11	0.1		0.01	0.02	0.02		
C.D. (P=0.05)	0.06	0.32	0.2		0.02	0.06	0.05		
Interaction: V X N levels									
SE(m) ±	0.07		0.2		0.01		0.06		
C.D. (P=0.05)	0.18		0.6		0.04		0.17		

Table- R-18-AST-1 (j): Effect of nitrogen levels on crude protein content of promising entries of Oat (AVTO-2-SC)

Entries	Crude Protein (%)													
	Hill zone			North West zone			North East Zone				South zone			Overall mean
	Palam pur	Sri-nagar	Mean	His-ar	Ludh-iana	Mean	Imp-hal	Ran-chi	Kal-yani	Mean	Man-dya	Hydera-bad	Mean	
SKO-229	9.35	7.70	8.57	9.06	6.80	7.93	7.75	8.57	8.82	8.38	6.34	6.80	6.57	7.92
HFO-607	9.00	7.60	8.38	9.42	6.70	8.06	7.87	8.99	9.90	8.92	7.65	5.90	6.78	8.13
HFO-525	9.50	7.85	8.72	8.57	8.90	8.74	7.90	8.99	8.30	8.40	5.68	7.20	6.44	8.11
JO-05-7	9.41	7.70	8.55	8.80	6.30	7.55	7.89	9.26	9.70	8.95	7.54	5.60	6.57	8.02
OL-1869-1	9.00	9.00	9.13	8.75	7.00	7.88	7.89	8.99	9.34	8.74	5.80	6.30	6.05	8.04
OL-1861	9.33	6.80	8.14	8.73	7.10	7.92	7.84	8.91	9.60	8.78	6.02	7.50	6.76	8.00
OL-1862	9.13	8.05	8.58	8.82	7.20	8.01	7.74	9.95	9.40	9.03	8.31	6.80	7.56	8.38
Kent (NC)	9.41	8.63	9.03	9.38	8.50	8.94	7.88	9.31	8.50	8.56	6.56	6.10	6.33	8.25
OS-6 (NC)	9.00	9.05	9.08	8.52	7.90	8.21	7.78	9.97	9.23	8.99	5.80	6.50	6.15	8.21
SKO-90 (HZ)	9.50	6.98	8.28											
OL-125 (NWZ)				9.42	7.10	8.26								
JHO-99-2 (NEZ)							7.83	8.97	9.34	8.71				
JHO-2000-4 (SZ)											7.10	5.70	6.40	
SE(m) ±	0.16	0.10		0.10	0.04		0.27	0.03	0.07		0.09	0.7		
C.D. (P=0.05)	NS	0.32		0.29	0.12		NS	0.08	0.21		0.27	NS		
Nitrogen level (Kg/ha)														
N ₁ 30 Kg	8.38	7.42	7.91	8.81	6.70	7.76	7.84	9.03	8.40	8.42	6.21	6.00	6.11	7.64
N ₂ 60 Kg	9.06	7.89	8.48	8.88	7.30	8.09	7.84	9.04	8.90	8.59	7.13	6.50	6.82	8.06
N ₃ 90 Kg	9.76	8.15	8.96	9.01	7.50	8.26	7.85	9.07	9.64	8.85	6.64	7.10	6.87	8.30
N ₄ 120 kg	9.86	8.28	9.07	9.08	7.90	8.49	7.82	9.63	9.91	9.12	6.74	6.70	6.72	8.43
SE(m) ±	0.08	0.04		0.05	0.02		0.68	0.02	0.06		0.07	0.5		
C.D. (P=0.05)	0.22	0.13		0.13	0.07		NS	0.06	0.18		0.20	NS		
Interaction: V X N levels														
SE(m) ±	0.25	0.16			0.08		0.22				0.22	0.4		
C.D. (P=0.05)	NS	0.49			0.21		NS				0.63	NS		

Table- R-18-AST-1 (k): Effect of nitrogen levels on plant height of promising entries of Oat (AVTO-2-SC)

Entries	Plant Height (CM)														Overall Mean
	Hill zone			North West zone			North East Zone			Central zone		South zone			
	Palam pur	Sri-nagar	Mean	His-ar	Ludh-iana	Mean	Imp-hal	Ran-chi	Kal-yani	Mean	Jabal-pur	Man-dya	Hydera-bad	Mean	
SKO-229	125.2	77.1	101.2	114.8	141.0	127.9	137.0	125.0	136.8	132.9	106.1	91.8	89.8	90.8	114.5
HFO-607	114.6	85.1	99.9	142.3	124.0	133.2	138.6	128.0	142.9	136.5	113.4	89.1	92.0	90.6	117.0
HFO-525	118.4	85.8	102.1	141.1	119.0	130.1	147.0	79.0	143.7	123.2	111.2	90.6	95.1	92.9	113.1
JO-05-7	127.6	100.3	114.0	148.1	134.0	141.1	144.5	134.0	156.8	145.1	120.4	95.5	98.3	96.9	125.9
OL-1869-1	119.7	106.3	113.0	137.5	138.0	137.8	144.0	121.0	134.3	133.1	111.0	93.3	85.7	89.5	119.1
OL-1861	124.8	105.9	115.4	125.2	141.0	133.1	137.8	124.0	145.7	135.8	119.8	92.3	96.3	94.3	121.3
OL-1862	117.7	105.6	111.7	120.9	135.0	128.0	134.0	83.0	133.5	116.8	114.6	87.9	95.1	91.5	112.7
Kent (NC)	121.6	108.3	115.0	151.6	128.0	139.8	152.9	131.0	154.9	146.3	118.7	100.4	94.7	97.6	126.2
OS-6 (NC)	107.8	80.0	93.9	145.7	121.0	133.4	140.6	132.0	149.7	140.8	116.1	97.6	94.8	96.2	118.5
SKO-90 (HZ)	126.4	100.7	113.6												
OL-125 (NWZ)				127.7	138.0	132.9									
JHO-99-2 (NEZ)							141.4	92.0	132.9						
JHO-822 (CZ)										122.1	116.1				
JHO-2000-4 (SZ)												95.3	89.7	92.5	
SE(m) ±	1.9	2.8		3.0	2.0		15.3	1.3	1.1		1.5	1.8	6.7		
C.D. (P=0.05)	5.6	8.3		9.1	5.0		45.4	3.9	3.2		3.5	5.3	2.1		
Nitrogen level (Kg/ha)															
N ₁ 30 Kg	103.6	67.4	85.5	126.5	129.0	127.8	130.7	102.0	117.4	116.7	98.6	75.8	91.8	83.8	104.3
N ₂ 60 Kg	120.5	93.7	107.1	134.4	131.0	132.7	141.7	110.0	137.6	129.8	112.7	90.6	92.0	91.3	116.4
N ₃ 90 Kg	125.7	106.9	116.3	139.8	133.0	136.4	146.9	118.0	155.4	140.1	121.8	99.8	93.5	96.7	124.1
N ₄ 120 kg	131.7	114.0	122.9	141.2	134.0	137.6	147.8	130.0	162.1	146.6	125.8	107.3	94.1	100.7	128.8
SE(m) ±	1.1	1.2		1.7	1.0		42.4	0.9	0.6		1.6	1.1	NS		
C.D. (P=0.05)	3.1	3.4		4.9	2.0		120.1	2.5	1.9		4.5	3.1	1.3		
Interaction: V X N levels															
SE(m) ±	3.45	4.3			2.0		13.4				1.1	3.4	12.3		
C.D. (P=0.05)	9.8	12.6			NS		38.0				3.1	NS	4.1		
CV (%)											8.1				

Table- R-18-AST-1 (I): Effect of nitrogen levels on Leaf Stem ratio of promising entries of Oat (AVTO-2-SC)

Entries	Leaf Stem ratio												
	Hill zone			North West zone			North East Zone				Central zone	South zone	Overall Mean
	Palam pur	Sri-nagar	Mean	His-ar	Ludh-iana	Mean	Imp-hal	Ran-chi	Kal-yani	Mean	Jabal-pur	Hydera-bad	
SKO-229	0.66	0.28	0.47	0.29	1.06	0.67	0.26	1.07	1.08	0.80	0.71	0.48	0.65
HFO-607	0.34	0.34	0.34	0.42	1.34	0.88	0.25	0.62	0.54	0.47	0.75	0.49	0.57
HFO-525	1.49	0.28	0.89	0.41	2.13	1.27	0.29	0.77	0.80	0.62	0.70	0.43	0.81
JO-05-7	0.36	0.33	0.35	0.48	1.35	0.91	0.27	0.66	0.61	0.51	0.76	0.49	0.59
OL-1869-1	0.49	0.36	0.43	0.40	1.11	0.76	0.29	1.09	1.10	0.83	0.67	0.52	0.67
OL-1861	1.32	0.34	0.83	0.34	1.20	0.77	0.28	0.89	0.90	0.69	0.81	0.49	0.73
OL-1862	0.52	0.34	0.43	0.32	1.30	0.81	0.27	0.72	0.70	0.56	0.73	0.43	0.59
Kent (NC)	2.23	0.35	1.29	0.54	1.55	1.04	0.25	0.76	0.80	0.60	0.77	0.51	0.86
OS-6 (NC)	0.35	0.46	0.41	0.46	1.94	1.20	0.27	0.57	0.55	0.46	0.72	0.46	0.64
SKO-90 (HZ)	0.63	0.37	0.50										
OL-125 (NWZ)				0.40	1.35	0.87							
JHO-99-2 (NEZ)							0.26	0.65	0.62	0.51			
JHO-822 (CZ)											0.71		
JHO-2000-4 (SZ)												0.53	
SE(m) ±	0.03	0.006		0.034	0.09		0.02	0.03	0.02		0.025		
C.D. (P=0.05)	0.07	0.02		0.102	0.26		0.06	0.10	0.06		0.075		
Nitrogen level (Kg/ha)													
N ₁ 30 Kg	0.69	0.32	0.51	0.32	1.24	0.78	0.26	0.81	0.83	0.63	0.65	0.46	0.62
N ₂ 60 Kg	0.81	0.34	0.58	0.40	1.33	0.86	0.27	0.72	0.69	0.56	0.69	0.48	0.64
N ₃ 90 Kg	0.91	0.35	0.63	0.45	1.48	0.96	0.27	0.77	0.72	0.59	0.78	0.51	0.69
N ₄ 120 kg	0.96	0.36	0.66	0.45	1.68	1.07	0.27	0.83	0.80	0.63	0.80	0.48	0.74
SE(m) ±	0.01	0.002		0.017	0.03		0.09	0.03	0.03		0.01	NS	
C.D. (P=0.05)	0.03	0.008		0.048	0.08		0.27	NS	0.09		0.03	1.2	
Interaction: V X N levels													
SE(m) ±	0.03	0.01			0.09		0.03				0.01		
C.D. (P=0.05)	0.10	NS			0.25		0.08				0.03		
CV (%)											4.2		

Table- R-18-AST-1 (m): Effect of nitrogen levels on number of tillers of promising entries of Oat (AVTO-2-SC)

Entries	Tillers per meter row length							
	Hill zone	North West zone			North East Zone			South zone
	Palam pur	His-ar	Ludh-iana	Mean	Ran-chi	Kal-yani	Mean	Hydera-bad
SKO-229	79.5	59.2	61.3	60.25	119	118.1	118.6	137.1
HFO-607	78.9	68.4	71.5	69.95	118	115.0	116.5	135.7
HFO-525	88.3	68.3	69.6	68.95	122	115.1	118.6	139.5
JO-05-7	88.5	70.0	63.2	66.60	137	117.0	127.0	147.5
OL-1869-1	92.3	67.6	59.9	63.75	120	118.3	119.2	140.6
OL-1861	92.6	66.3	59.2	62.75	120	116.0	118.0	147.0
OL-1862	91.2	66.3	60.5	63.40	120	118.0	119.0	143.6
Kent (NC)	85.5	70.9	65.2	68.05	133	118.5	125.8	141.8
OS-6 (NC)	93.6	69.5	69.1	69.30	126	121.3	123.7	144.1
SKO-90 (HZ)	92.3							
OL-125 (NWZ)		67.0	62.1	64.55				
JHO-99-2 (NEZ)					115	120.0	117.5	
JHO-2000-4 (SZ)								147.5
SE(m) ±	1.54	0.76	1.4		0.60	0.63		NS
C.D. (P=0.05)	4.58	2.27	4.2		1.80	1.81		0.04
Nitrogen level (Kg/ha)								
N ₁ 30 Kg	72.59	61.8	62.8	62.30	121	95.00	106.6	140.3
N ₂ 60 Kg	87.93	66.9	63.4	65.15	124	115.21	115.1	142.1
N ₃ 90 Kg	94.98	69.9	64.7	67.30	124	125.44	120.3	143.1
N ₄ 120 kg	97.80	70.7	65.7	68.20	123	135.10	126.8	143.8
SE(m) ±	0.90	1.05	0.5		0.80	0.48		NS
C.D. (P=0.05)	2.53	2.98	1.3		NS	1.44		0.02
Interaction: V X N levels								
SE(m) ±	2.84		1.5					NS
C.D. (P=0.05)	8.02		NS					0.08

R-18-AST-2: Advanced Varietal Trial Agronomy -2 in Vicia

[Table Reference: R-18-AST-2 (a)-(c)]

Locations: CZ: Jabalpur, Rahuri & Raipur

A field trial was conducted in Rabi 2018-19 at three locations in Central Zone (Jabalpur, Rahuri & Raipur) to assess the response of five entries of *Vicia* to graded doses of phosphorus. Since there is no released variety in the crop, general mean was taken as check. The entries included JVS-1, JVS-2, JVS-3, JVS-4 and JVS-5 and tested under three phosphorus levels i.e., 40, 60 and 80 kg P₂O₅ per hectare. The treatments were replicated thrice in Completely Randomised Block Design. All the plots received 20 kg nitrogen per hectare as basal dose.

The results indicated among the entries JVS-4 recorded highest GFY (260.4 q/ha), DFY (55.73q/ha) and CPY (10.36/ha). It was 6.2, 14.2 and 19.08 % higher than general mean, in terms of green, dry matter and crude protein yields, respectively. The entry also recorded higher GFY, DFY (q/ha/day), as well as crude protein content. The crop responded to phosphorus upto 60 kg P₂O₅ /ha. As there was no significant increase in the yields beyond 60 kg P₂O₅ /ha level. The interaction between entries X phosphorus level was nonsignificant.

Table- R-18-AST-2 (a): Effect of phosphorus levels on green fodder, dry matter and crude protein yields of promising entries of Vicia

Entries	GFY (q/ha)				DMY (q/ha)				CPY (q/ha)			
	Jabal-pur	Rah-uri	Rai-pur	Mean	Jabal-pur	Rah-uri	Rai-pur	Mean	Jabal-pur	Rah-uri	Rai-pur	Mean
JVS-1	323.6	187.1	207.1	239.3	35.56	56.97	44.70	45.74	5.15	9.78	9.30	8.08
JVS-2	334.0	192.6	203.6	243.4	39.82	69.63	40.80	50.08	5.70	12.45	8.70	8.95
JVS-3	332.8	151.3	208.5	230.9	38.45	53.14	40.50	44.03	5.46	8.37	8.60	7.48
JVS-4	335.1	200.0	246.2	260.4	38.54	70.66	58.00	55.73	5.49	12.79	12.80	10.36
JVS-5	338.6	177.6	241.6	252.6	38.02	54.91	52.40	48.44	5.47	8.93	11.50	8.63
SE(m) ±	20.0	4.49	1.64		5.6	0.76	0.79		0.89	0.12	0.17	
C.D. (P=0.05)	60.23	12.85	4.78		15.7	2.16	2.29		2.24	0.35	0.49	
Level of P₂O₅ (kg ha⁻¹)												
40 Kg/h	282.9	191.9	214.4	229.7	31.00	64.17	44.70	46.62	4.40	11.80	9.60	8.60
60 Kg/ha	351.5	177.5	222.1	250.4	40.60	61.24	47.50	49.78	5.80	10.42	10.10	8.77
80 Kg/ha	364.0	175.8	227.7	255.8	42.60	57.78	49.70	50.03	6.10	9.17	10.80	8.69
SE(m) ±	30.0	4.02	1.27		4.3	0.68	0.61		0.79	0.11	0.13	
C.D. (P=0.05)	90.6	11.48	3.70		12.8	1.93	1.78		2.21	0.31	0.38	
Interaction: V X N levels												
SE(m) ±	22.5	8.99			3.3	1.51			0.68	0.25		
C.D. (P=0.05)	66.8	NS	NS		10.12	NS	NS		1.18	NS	NS	
CV (%)	6.2				13.9	4.29			12.67	4.07		

Table R-18-AST-2 (a-1): Interaction effect of Entries and phosphorus levels on green fodder yield (q/ha) of promising entries of Vicia at Raipur

Entries	P ₁ (40)	P ₂ (60)	P ₃ (80)	Mean
JVS-1	200.5	207.0	213.9	207.1
JVS-2	196.0	204.4	210.4	203.6
JVS-3	201.5	209.7	214.4	208.5
JVS-4	238.9	247.4	252.4	246.2
JVS-5	234.9	242.3	247.6	241.6
Mean	214.4	222.1	227.7	
Factors		C.D.	SE(m)	
Entries		4.777	1.64	
Level of P₂O₅		3.7	1.271	
Interaction E X P		N/A	2.841	

Table R-18-AST-2 (a-2): Interaction effect of Entries and phosphorus levels on dry matter yield (q/ha) of promising entries of Vicia at Raipur

	P ₁ (40)	P ₂ (60)	P ₃ (80)	Mean
JVS-1	42.7	44.7	46.6	44.7
JVS-2	37.3	40.9	44.2	40.8
JVS-3	37.6	41.0	43.0	40.5
JVS-4	55.7	57.7	60.6	58.0
JVS-5	50.1	53.0	54.1	52.4
Mean	44.7	47.5	49.7	
Factors		C.D.	SE(m)	
Entries		2.292	0.787	
Level of P₂O₅		1.776	0.61	
Interaction E X P		NS	1.364	

Table- R-18-AST-2 (b): Effect of phosphorus levels on growth of promising entries of Vicia

Entries	Plant population/m row length	Plant Height (cm)				Leaf Stem Ratio				
	Rah- uri	Jabal- pur	Rah- uri	Rai- pur	Mean	Jabal- pur	Rah- uri	Rai- pur	Mean	
JVS-1	10.22	118.89	61.38	105.6	95.29	0.32	0.66	0.61	0.53	
JVS-2	10.56	115.78	63.38	96.9	92.02	0.34	0.90	0.55	0.60	
JVS-3	10.56	118.22	47.20	99.6	88.34	0.36	0.62	0.59	0.52	
JVS-4	10.22	115.78	66.42	122.9	101.70	0.35	0.92	0.69	0.65	
JVS-5	10.67	101.22	60.76	118.9	93.63	0.35	0.64	0.64	0.54	
SE(m) ±	0.24	0.04	1.22	2.07		0.025	0.01	0.01		
C.D. (P=0.05)	NS	0.12	3.50	6.03		0.075	0.03	0.03		
Level of P₂O₅ (kg ha⁻¹)										
40 Kg/h	10.07	113.5	63.48	104.5	93.83	0.31	0.79	0.60	0.57	
60 Kg/ha	10.47	114.3	59.01	110.0	94.44	0.35	0.75	0.61	0.57	
80 Kg/ha	10.80	114.1	56.99	111.8	94.30	0.37	0.71	0.64	0.57	
SE(m) ±	0.21	0.05	1.09	1.60		0.01	0.01	0.01		
C.D. (P=0.05)	NS	0.15	3.13	4.67		0.03	0.03	0.02		
Interaction: V X N levels										
SE(m) ±	0.47	0.03	2.45			0.01	0.02			
C.D. (P=0.05)	NS	0.09	NS			0.03	NS			
CV (%)		8.4				10.9				

Table- R-18-AST-2 (c): Per day productivity and quality of Vicia entries under different phosphorus levels

Entries	GFY (g/ha/day)	DMY (g/ha/day)	Crude protein (%)			No. of Branch/plant
	Rai- pur	Rai- pur	Rah- uri	Rai- pur	Mean	Rai- pur
JVS-1	2.01	0.43	17.09	20.9	19.00	4.42
JVS-2	2.08	0.42	17.82	21.3	19.56	4.41
JVS-3	2.13	0.41	15.68	21.3	18.49	4.16
JVS-4	2.39	0.56	18.24	22.0	20.12	4.54
JVS-5	2.30	0.50	16.26	21.9	19.08	4.42
SE(m) ±	0.02	0.01	0.18	0.14		0.15
C.D. (P=0.05)	0.05	0.02	0.51	0.41		NS
Level of P₂O₅ (kg ha⁻¹)						
40 Kg/h	2.11	0.44	18.38	21.4	19.89	4.27
60 Kg/ha	2.19	0.47	16.91	21.3	19.11	4.34
80 Kg/ha	2.24	0.49	15.77	21.8	18.79	4.57
SE(m) ±	0.01	0.01	0.16	0.11		0.12
C.D. (P=0.05)	0.04	0.02	0.45	0.32		NS
Interaction: V X N levels						
SE(m) ±			0.35			
C.D. (P=0.05)			NS			

R-18-AST-3: Advanced Varietal Trial-2 in Rye grass Annual Agronomy

[Table Reference: R-18-AST-3 (a)-(e)]

Location: Palampur, Srinagar, Ludhiana

A field trial was conducted in Rabi 2018-19 at three locations in Palampur, Srinagar and Ludhiana to study the response of three entries of *lolium* (*Ryegrass*) to graded doses of nitrogen.

The entries included PBRG-2, Palam rye grass -1 and Palam rye grass-2 and PBRG-1 (National check). These were tested under three nitrogen levels i.e., 60, 80 and 100 kg per hectare. The treatments were replicated thrice in Completely Randomised Block Design. All the plots received 40 kg P₂O₅ per hectare as basal dose.

The results indicated among the entries PBRG-2, recorded highest GFY (561.54 q/ha), DFY (90.46q/ha), and CPY (8.27/ha). It was 15.61, 13.66 and 6.7% higher than PBRG-1 (National check) respectively in terms of green, dry matter and crude protein yields.

The crop responded significantly to nitrogen upto highest dose i.e., 100 kg N /ha. Application of 100 kg N/ ha recorded highest GFY (592.02 q/ha), DFY (96.24q/ha), and CPY (10.02/ha), which was 33.5, 32.5 and 68.4/% higher over 60 kg N /ha. The interaction between entries X nitrogen level was significant for GFY, DFY and CP yields.

Table- R-18-AST-3 (a): Effect of nitrogen levels on green fodder, dry matter and crude protein yields of promising entries of annual rye grass

Entries	GFY (q/ha)				DMY (q/ha)				CPY (q/ha)			
	Palam pur	Sri-nagar	Ludh-iana	Mean	Palam pur	Sri-nagar	Ludh-iana	Mean	Palam pur	Sri-nagar	Ludh-iana	Mean
PBRG-2	508.91	292.81	882.90	561.54	102.37	54.92	114.10	90.46	14.66	8.90	1.26	8.27
Palam rye grass -1	424.23	339.39	803.60	522.41	91.36	64.03	105.00	86.80	12.90	10.16	1.38	8.15
Palam rye grass-2	432.95	299.72	858.70	530.46	87.35	54.96	113.20	85.17	13.60	8.73	1.74	8.02
PBRG-1 (NC)	433.81	331.78	691.70	485.76	90.87	60.79	87.10	79.59	12.37	9.31	1.56	7.75
SE(m) ±	3.55	4.29	12.9		0.74	1.22	1.7		0.13	0.21	0.07	
C.D. (P=0.05)	12.27	12.53	38.0		2.54	3.58	5.1		0.45	0.62	0.21	
Nitrogen level (kg/ha)												
60 kg/ha	350.08	296.53	683.50	443.37	75.46	54.53	87.90	72.63	9.24	7.49	1.11	5.95
80 kg/ha	471.30	320.96	827.00	539.75	95.80	59.89	107.10	87.60	13.29	9.88	1.37	8.18
100 kg/ha	528.55	330.30	917.20	592.02	107.71	61.62	119.40	96.24	17.62	10.46	1.97	10.02
SE(m) ±	4.94	3.09	11.2		1.04	0.88	1.5		0.18	0.15	0.08	
C.D. (P=0.05)	14.80	9.02	32.9		3.11	2.57	4.4		0.55	0.44	0.24	
Interaction: V X N levels												
SE(m) ±	9.88	6.86	22.4		2.07	2.01	3.0		0.37	-	0.14	
C.D. (P=0.05)	29.61	20.05	NS		6.21	5.83	NS		1.11	NS	0.41	
CV (%)	5.97		4.8				5.0				16.4	

Table- R-18-AST-3 (b): Interaction effect of nitrogen levels and Rye grass entries on green fodder, matter and crude protein yields at Palampur

Entries	Green fodder yield (q/ha)				Dry Fodder yield (q/ha)				Crude protein yield (q/ha)			
	N levels (kg/ha)				N levels (kg/ha)				N levels (kg/ha)			
	60	80	100	Mean	60	80	100	Mean	60	80	100	Mean
AVT-2-RG-Ag-1	345.4	452.5	503.6	433.8	78.15	94.13	100.32	90.87	9.06	12.65	15.40	12.37
AVT-2-RG-Ag-2	417.3	520.0	589.5	508.9	86.50	103.73	116.89	102.37	10.57	14.38	19.02	14.66
AVT-2-RG-Ag-3	328.1	434.4	510.2	424.2	72.17	89.67	112.25	91.36	8.54	12.09	18.06	12.90
AVT-2-RG-Ag-4	309.6	478.3	511.0	433.0	65.02	95.65	101.37	87.35	8.80	14.03	17.99	13.60
Mean	350.1	471.3	528.6		75.46	95.80	107.71		9.24	13.29	17.62	
	V	N	VXN		V	N	VXN		V	N	VXN	
SEm±	3.55	4.94	9.88		0.74	1.04	2.07		0.13	0.18	0.37	
CD at 5%	12.27	14.80	29.61		2.54	3.11	6.21		0.45	0.55	1.11	

Table- R-18-AST-3 (c): Interaction effect of nitrogen levels and Rye grass entries on Green Fodder Yield (q/ha) at Srinagar

Entries	Nitrogen Levels (Kg/ha)			Mean
	60	80	100	
PBRG-2	276.52	296.50	305.40	292.81
Palam rye grass -1	312.56	348.50	357.12	339.39
Palam rye grass-2	288.50	301.25	309.42	299.72
PBRG-1 (NC)	308.52	337.58	349.25	331.78
Mean	296.53	320.96	330.30	
	E	N	E x N	
SEm±	4.29	3.09	6.86	
CD at 5%	12.53	9.02	20.05	

Table- R-18-AST-3 (d): Interaction effect of nitrogen levels and Rye grass entries on Dry Fodder Yield (q/ha) at Srinagar

Treatment	Nitrogen Levels (Kg/ha)			Mean
	60	80	100	
Entries				
PBRG-2	51.25	56.23	57.28	54.92
Palam rye grass -1	58.12	65.48	68.50	64.03
Palam rye grass-2	53.29	55.50	56.10	54.96
PBRG-1 (NC)	55.44	62.35	64.58	60.79
Mean	54.53	59.89	61.62	
	E	N	E x N	
SEm±	1.22	0.88	2.01	

Table- R-18-AST-3 (d): Growth and quality of rye grass entries under different Nitrogen levels

Entries	Plant Height (cm)			Leaf Stem ratio			Crude protein (%)			
	Palam pur	Sri-nagar	Mean	Palam pur	Sri-nagar	Mean	Palam pur	Sri-nagar	Ludhiana	Mean
PBRG-2	53.50	62.40	57.95	1.77	1.16	1.47	13.90	16.14	16.90	15.65
Palam rye grass -1	55.10	71.20	63.15	1.29	1.25	1.27	14.00	15.77	16.10	15.29
Palam rye grass-2	52.80	65.23	59.02	1.26	1.20	1.23	15.20	15.87	16.90	15.99
PBRG-1 (NC)	51.80	73.03	62.42	0.95	1.22	1.09	13.40	15.19	16.70	15.10
SE(m) ±	0.27	1.06		0.01	0.006		0.32	0.72	0.5	
C.D. (P=0.05)	0.94	3.12		0.04	0.02		1.13	NS	NS	
Nitrogen level (Kg/ha)										
60 Kg/h	44.10	59.08	51.59	1.02	1.17	1.10	12.30	13.75	15.20	13.75
80 Kg/ha	54.60	70.10	62.35	1.39	1.22	1.31	13.90	16.50	16.80	15.73
100 Kg/ha	61.30	74.73	68.02	1.53	1.24	1.39	16.20	16.98	17.90	17.03
SE(m) ±	0.48	0.74		0.02	0.004		0.19	0.50	0.4	
C.D. (P=0.05)	1.44	2.18		0.06	0.014		0.74	NS	1.2	
Interaction: V X N levels										
SE(m) ±		-			-			-	0.8	
C.D. (P=0.05)	NS	NS		NS	NS		NS	NS	NS	
CV (%)									8.3	

FORAGE CROP PROTECTION

PPT-1: Survey of pathogens, insect-pests and nematodes associated with Berseem, Lucerne, Oats ecosystems

Objective: To record the occurrence and abundance of major diseases and insect-pests in Berseem, Lucerne and Oat.

Locations: Ludhiana, Rahuri, Palampur, Dharwad, Jhansi, Bhubaneswar

Ludhiana

At Ludhiana, the occurrence and abundance of major diseases of berseem, lucerne and oat was recorded at weekly intervals and percent disease incidence or severity was calculated (Table Ludhiana PPT1a) as explained below.

- **Stem rot of Berseem:** Stem rot on berseem appeared in last week of December. Disease progressed at faster rate till 2nd week of March with maximum disease incidence of 57.33 percent due to favourable weather conditions. (Table Ludhiana PPT1a).
- **Leaf blight of Oat:** Leaf blight of oat appeared in the 1st week of January. Disease development was fast upto end of March with highest disease severity of 45.33 percent. (Table Ludhiana PPT1a).
- **Downy mildew of Lucerne:** Downy mildew of Lucerne was observed in the first fortnight of January. Disease progressed at faster rate till end of March. Highest disease severity was 40.00 percent (Table Ludhiana PPT1a).

Entomological observations: At Ludhiana, population dynamics of major insect pests was studied throughout the cropping season on different *rabi* forages during 2018-19. The population of green semilooper, *T. orichalcea* started appearing on the berseem genotypes in the first week of April with its highest population observed in the mid April. The population of *H. armigera* appeared on berseem crop in April with its highest peak during first week of May, 2019. *Spodoptera exigua* larvae were also recorded in berseem crop during April, with peak incidence in the second fortnight of April (Table Ludhiana PPT1b). Lucerne var. LLC-5 was infested with lucerne weevil in March with its peak in first week of April. *H. armigera* and *S. exigua* incidence was at its peak in Lucerne during last week of April 2019. Incidence of black aphids was highest in mid-March (Table Ludhiana PPT1c). Very low incidence of aphids was observed in oat varieties and it appeared in the end of February 2019. No incidence was observed in March-April. Maximum incidence of oat aphids was recorded in the last week of February 2019 (Table Ludhiana PPT1d).

Table Ludhiana PPT1a: Survey of diseases associated with Berseem, Lucerne and Oat ecosystems

Crop/ variety	Disease	Percent Disease Incidence / Severity (Date of observation)															
		27/12/ 18	03/01/ 19	10/01/ 19	17/01/ 19	24/01/ 19	31/01/ 19	07/02/ 19	14/02/ 19	21/02/ 19	28/02/ 19	07/03/ 19	14/03/ 19	21/03/ 19	28/03/ 19	04/04/ 19	11/04/ 19
Berseem	Stem Rot	*10.00	13.67	16.00	22.20	28.50	35.33	38.34	41.43	43.63	45.33	47.90	50.20	53.67	55.00	56.80	57.33
Oat	Leaf Blight		*4.67	9.40	13.47	17.00	20.00	22.60	25.23	26.27	29.43	32.37	34.66	36.73	40.97	43.67	45.33
Lucerne	Downy Mildew			*6.80	11.40	14.83	17.53	18.67	21.00	24.63	26.33	27.93	31.87	35.00	38.33	40.00	

*DOA: Date of appearance

Table Ludhiana PPT1b: Population dynamics of insect pests associated with rabi forages: Incidence of lepidopteran insect pests in different varieties of berseem

Variety	No. of <i>T. orichalcea</i> larvae per m row length								Mean
	6.4.19	13.4.19	20.4.19	27.4.19	4.5.19	11.5.19	18.5.19	25.5.19	
BL-10	0.33	0.66	0.66	0.66	0.33	0.33	0	0	0.55
BL-42	0.66	1.00	0.66	0.66	0.33	0.00	0	0	0.72
No. of <i>H. armigera</i> larvae per m row length									
BL-10	1.66	2.33	3.33	7.00	10.00	6.00	2.66	1.00	4.25
BL-42	2.00	2.66	3.66	6.00	9.33	5.66	2.33	0.66	4.04
No. of <i>Spodoptera exigua</i> larvae per m row length									
BL-10	0.33	0.33	0.66	1.33	0.66	0.66	0.33	0	0.53
BL-42	0.33	0.33	1.00	1.00	0.66	0.66	0.33	0	0.53

Table Ludhiana PPT1c: Incidence of insect pests in Shaftal and Lucerne

Var	No. of Lucerne weevils per plant										
	8.3.19	15.3.19	22.3.19	29.3.19	6.4.19	13.4.19	20.4.19	27.4.19	4.5.19	11.5.19	Mean
Lucerne LLC-5	1.33	2.00	2.16	2.66	3.00	2.66	2.33	1.66	0.66	0.33	1.88
Shaftal 69	1.33	2.00	2.00	2.33	1.66	1.33	1.00	0.66	0.33	0.00	1.26
No. of <i>H. armigera</i> larvae per m row length											
LLC- 5	0	0	0.33	0.66	1.33	1.66	2.00	2.66	1.66	0.66	1.09
No. of <i>Spodoptera exigua</i> larvae per m row length											
LLC-5	0	0	0	0	0	0.33	0.66	1.83	0.33	0.33	0.35
No. of black aphids per plant											
Shaftal 69	8	14	4	4	0	0	0	0	0	0	3.0

Table Ludhiana PPT1d: Incidence of oat aphid in different varieties of oats

Variety	No. of aphids per tiller								Mean
	01.02.19	08.02.19	15.02.19	22.02.19	01.03.19	08.03.19	15.03.19	22.03.19	
OL-10	1.33	2.00	4.33	4.66	4.66	4.33	3.33	1.33	3.24
Kent	2.66	2.66	3.66	4.66	3.33	3.66	2.66	1.00	3.04

Rahuri

Lucerne

Aphids: The population of pea aphid (*Acyrtosiphon pisum*) was noticed on lucerne during 1st week of December, 2018 (5.67 aphids/tiller) and increased steadily at its peak level up to the 3rd week of January, 2019 (26.67 aphids/tiller). Thereafter the decreasing trend of pea aphid population was noticed upto 2nd week of February, 2019 (3.00 aphids/tiller). After that the population of pea aphid disappeared from the crop. Population of cowpea aphid was observed on Lucerne during 2nd week of December (4.67 aphids/tiller) and reached at its peak during last week of January, 2019 with 15.67 aphids/tiller. Thereafter decreasing trend of aphid population was observed and it disappeared on 2nd week of February, 2019. During the aphid infestation, population of predatory lady bird beetles was observed from moderate to high level. (1.00 to 2.67 grubs/tiller) (Table Rahuri PPT1a).

Lepidopteran pests: The *Spodoptera litura* become a major and regular pests on Lucerne during summer season. Larval population was noticed during 1st week of March, 2019 with 1.67 larva/m². Thereafter, population increased steadily and reached to its peak (11.00 larvae/m²) during last week of April, 2019. After that the population of *S. litura* declined and recorded minimum (2.67) during 3rd week of May, 2019. The population of *H. armigera* was noticed on lucerne seed crop during 1st week of April, 2019 (2.33 larva/m²) and showed increasing trend upto last week of April, 2019 with highest population of 5.67 larvae/m². After that population declined and was minimum during 3rd week of May, 2019 (2.67 larvae/m²) (Table Rahuri PPT1a).

Oat

Aphid: Periodic abundance of oat aphid (*Rhopalosiphum padi* L.) was observed during the investigation. The data on average number of aphids per tiller recorded from 1st week of December, 2018 to 3rd week Feb., 2019 was in the range of 3.33 to 69.00 aphids/tiller. Initial population of oat aphid was noticed during 1st week of December, 2018 (3.33 /tiller). The population increased at faster rate and reached its peak (69.00 aphids/tiller) during the last week of January, 2019. Then it started declining and recorded nil at last observation period (Table Rahuri PPT1b).

Natural enemies

C. carnea

The population of *C. carnea* was observed in the range of 1.33 to 2.00 per tiller throughout the crop period. The maximum population was noticed during the severe infestation of aphids on oat.

Coccinellid predators

The initial population of lady bird beetle grubs was recorded during last week of December, 2018 with 1.00 grub/tiller. The population of the grubs increased very slowly with its maximum (2.00 grubs/tiller) level during last week of January, 2019. Thereafter the population of the grubs started decreasing and disappeared during last week of February, 2019.

Diseases: No disease incidence was recorded on oat crop throughout the crop period.

Berseem

In berseem crop, no insect-pests and diseases were observed throughout the crop period.

Table Rahuri PPT1a: Population dynamics of insect pests associated with *rabi* forages: Incidence of insect pests in Lucerne

Date	No. aphids/tiller				Lady bird beetle grubs/tiller	No. of larvae/m ²	
	Pea aphid	Cowpea aphid	Spotted aphid	Total		<i>S. litura</i>	<i>H. armigera</i>
05/12/2018	5.67	0.00	0.00	5.67	0.0	0.00	0.00
12/12/2018	7.33	4.67	0.00	12.00	0.0	0.00	0.00
19/12/2018	8.00	4.67	0.00	12.67	0.0	0.00	0.00
26/12/2018	13.33	9.67	0.00	23.00	1.33	0.00	0.00
02/01/2019	17.00	11.33	0.00	28.33	1.67	0.00	0.00
09/01/2019	20.67	12.67	0.00	33.32	2.33	0.00	0.00
16/01/2019	26.67	15.33	0.00	42.00	2.33	0.00	0.00
23/01/2019	21.33	15.67	0.00	37.00	2.67	0.00	0.00
30/01/2019	12.67	11.00	0.00	23.67	2.67	0.00	0.00
6/02/2019	8.67	3.33	0.00	12.00	2.00	0.00	0.00
13/02/2019	3.00	0.00	0.00	3.00	2.00	0.00	0.00
20/02/2019	0.00	0.00	0.00	0.00	1.33	0.00	0.00
27/02/2019	0.00	0.00	0.00	0.00	1.00	0.00	0.00
7/03/2019	0.00	0.00	0.00	0.00	0.00	1.67	0.00
14/03/2019	0.00	0.00	0.00	0.00	0.00	3.00	0.00
21/03/2019	0.00	0.00	0.00	0.00	0.00	3.00	0.00
28/03/2019	0.00	0.00	0.00	0.00	0.00	4.33	0.00
4/04/2019	0.00	0.00	0.00	0.00	0.00	5.00	2.33
11/04/2019	0.00	0.00	0.00	0.00	0.00	8.67	4.67
18/04/2019	0.00	0.00	0.00	0.00	0.00	9.33	4.67
25/04/2019	0.00	0.00	0.00	0.00	0.00	11.00	5.67
02/05/2019	0.00	0.00	0.00	0.00	0.00	9.33	5.00
9/05/2019	0.00	0.00	0.00	0.00	0.00	5.00	3.33
16/05/2019	0.00	0.00	0.00	0.00	0.00	2.67	1.00

Table Rahuri PPT1b: Population dynamics of insect pests associated with *rabi* forages: Incidence of insect pests in Oat

Date	No. aphids/tiller	Natural enemies/tiller		
		<i>C. carnea</i>	Lady Bird Beetle grubs	Syrphid fly larvae
05/12/2018	3.33	0.00	0.00	0.00
12/12/2018	3.67	0.00	0.00	0.00
19/12/2018	8.00	0.00	0.00	0.00
26/12/2018	8.67	0.00	1.00	0.00
02/01/2019	12.33	1.33	1.00	0.00
09/01/2019	20.67	1.67	1.33	0.00
16/01/2019	32.00	1.67	1.33	0.00
23/01/2019	47.67	2.00	1.67	0.00
30/01/2019	69.00	2.00	2.00	0.00
6/02/2019	40.67	1.00	1.67	0.00
13/02/2019	31.67	1.33	2.00	0.00
20/02/2019	14.33	0.00	1.67	0.00
27/02/2019	0.00	0.00	0.00	0.00

Dharwad: In Lucerne, insect and disease incidence at 15 days interval revealed that aphid population started building from January months onwards and reached peak during second fortnight of February (108 aphids / stem) and started declining after second fortnight of April and reached nil in May month (Table 1). Among diseases rust was the major one and 25% of disease severity was seen during second fortnight of February. Disease intensity was almost nil during May month.

Table Dharwad PPT1: Population dynamics of insect pests associated with *Lucerne*

Period	No of aphids on stem/plant	Rust (disease severity in %)
I Fortnight of October	0	0
II Fortnight of October	0	0
I Fortnight of November	0	0
II Fortnight of November	0	0
I Fortnight of December	0	0
II Fortnight of December	0	0
I Fortnight of January	8	10
II Fortnight of January	10	10
I Fortnight of February	88	15
II Fortnight of February	108	20
I Fortnight of March	90	25
II Fortnight of March	30	10
I Fortnight of April	22	5
II Fortnight of April	6	0
I Fortnight of May	0	0
II Fortnight of May	0	0

Palampur: At Palampur, during *Rabi* 2018-19 season, oat crop was severely affected by powdery mildew (54% severity), followed by leaf blights (28%), loose smut (4%) and sucking pest (7%). In berseem, low incidence of root rot (4 %), moderate intensity of leaf spot (12%) and defoliating beetles (10 %) was observed. Defoliating beetles (12 %) and leaf spot (15 %) was observed on Lucerne (Table Palampur PPT-1).

Bhubaneswar: At Bhubaneswar, diseases and insect-pests were recorded on oat and Berseem. In oat, leaf blight (48.6% severity) and root rot (22.4%) were recorded. Maximum leaf defoliators were recorded 4.6/10 plants. In Berseem, leaf spot and blight severity recorded was 38.8% towards 1st week of February, root rot severity was 32.6% during last week of January. Maximum defoliator recorded was 4.2/10 plants in 4th week of January (Table Bhubaneswar PPT-1).

Jhansi: At Jhansi, in Berseem incidence of stem rot started from 4th week of January with small lesions indicative of early infection and continued to increase up to third week of February with a maximum disease incidence of 24%. Disease development was favoured by low temperature and high humidity. Leaf tip dieback and blight was observed during 1st week of March at a lower level (5%) and it continued to increase upto last week of March with maximum severity of 25 %. In Oat, leaf blight was the major disease and it appeared during third week of January and maximum severity of 55 % was observed during 4th week of February (Table Jhansi PPT-1).

Table Palampur PPT-1: Survey of pathogen and insect pests associated with berseem, Lucerne and oat ecosystem

Crop	Diseases/ Insect-Pests	Date of observations (% Disease/pest severity)									
		6.3.19	13.3.19	20.3.19	27.3.19	3.4.19	10.4.19	17.4.19	24.4.19	1.5.19	Max.
Oats	Powdery mildew	5	10	20	25	35	40	45	54	-	54
	Leaf blights	7	10	12	15	20	25	25	26	28	28
	Loose smut	-	-	-	-	-	3	3	4	4	4
	Aphids & Thrips	5	5	6	7	7	-	-	-	-	7
Berseem	Root rot	4	4	4	4	4	-	-	-	-	4
	Leaf spot	-	-	3	5	7	10	10	12	-	12
	Defoliating beetles	-	-	-	3	5	7	10	10	-	10
Lucerne	Leaf spot	5	7	9	12	14	15	15	15	-	15
	Defoliating beetles	-	-	5	7	8	10	12	12	-	12

Table Bhubaneswar PPT-1: Survey of pathogen and insect pests associated with berseem and oat ecosystem

	01/12/18	8/12/18	15/12/18	22/12/18	29/12/18	05/01/19	12/01/19	19/01/19	26/01/19	02/02/19
Oat										
Leaf blight (% disease severity)	-	-	-	12.4	18.8	28.2	33.6	38.2	40.4	48.6
Root rot (%)	-	-	6.2	11.6	17.2	20.8	22.4	-	-	-
Leaf defoliators (No./10 Plants)	-	-	2.2	3.2	4.6	4.2	4.4	4.6	4.0	-
Berseem										
Leaf spot & blight (% disease severity)	-	-	4.4	8.6	14.4	18.8	24.0	28.2	32.0	38.8
Root rot (%)	-	-	4.0	10.0	12.4	18.2	22.6	30.2	32.6	-
Leaf defoliators (No./10 Plants)	-	-	1.8	2.0	3.0	3.2	3.8	4.0	4.2	-

Table Jhansi PPT-1: Survey of pathogens associated with berseem and oat ecosystem

	Date of observation										
	15.1.19	22.1.19	29.1.19	5.2.19	12.2.19	19.2.19	26.2.19	5.3.19	12.3.19	19.3.19	26.3.19
Oat											
Leaf blight (% disease severity)	5	10	15.5	21	35.5	50	55	40	-	-	-
Berseem											
Leaf tip dieback and blight (% disease severity)	-	-	-	-	-	-	-	5	12	20	25
Stem rot (% disease incidence)	-	5	11	15	20	24	15	-	-	-	-

PPT-2: Field screening of *rabi*-breeding materials for resistance to diseases and insect- pests

BERSEEM

IVTB: Initial Varietal Trial in Berseem

At Ludhiana, All the entries showed moderately resistant disease reaction to stem rot except BB-2 and HFB-15-3. All the entries showed moderate population of lepidopteran caterpillars with non-significant differences. **At Rahuri**, insect-pests and diseases were not observed throughout the crop period. **At Palampur**, incidence of root rot of berseem was low during the season and all entries were resistant. **At Bhubaneswar**, JHB-18-2, JHB-18-1, HFB-15-3 and JB-06-11 showed resistant reactions to leaf spot & blight and others expressed moderately resistant reaction. However, the entry HFB-15-5 was found moderately susceptible. **At Jhansi**, all the entries were moderately resistant to stem rot.

AVTB-1: First Advanced Varietal Trial in Berseem

At Ludhiana, Entries Wardan, JHB-17-2 and HFB-13-7 were found moderately resistant to stem rot and rest of entries were moderately susceptible. All the entries showed moderate population of lepidopteran caterpillars with non-significant differences. **At Bhubaneswar**, Wardan, PC-91, HFB-14-7 and JHB-17-1 were resistant, HFB-13-7 and BB-3 were moderately resistant whereas JHB-17-2 expressed moderately susceptible reaction to leaf spot & blight. **At Palampur**, incidence of root rot of berseem was low during the season and all entries were resistant.

Table: Disease –pest tolerance in IVT Berseem trial

Entries	Ludhiana			Palampur (Root rot)		Bhubaneswar			Jhansi	
	Stem rot incidence (%)	Reaction	<i>H. armigera</i> / m row length	% incidence	Reaction	Leaf spot & Blight	Reaction	Leaf defoliators	Stem rot incidence (%)	Reaction
JHB-18-2	28.17	MR	1.66	8	R	8.33	R	2.54	20.37	MR
Wardan (NC)	30.47	MR	1.66	8	R	26.67	MR	3.74	19.26	MR
JHB-18-1	21.20	MR	2.00	5	R	6.26	R	1.47	18.89	MR
BB-2 (ZC-CZ)									20.37	MR
BB-2 (ZC-NWZ)	34.23	MS	1.66							
BL-22 (ZC-HZ)				5	R					
BB-3 (ZC-NEZ)						35.62	MR	4.42		
HFB-15-3	36.63	MS	1.33	5	R	4.54	R	1.34	17.41	MR
BM-12	22.27	MR	2.00	5	R	14.67	MR	3.54	16.67	MR
HFB-15-5	20.73	MR	1.66	6	R	45.67	MS	4.67	15.93	MR
JB-06-11	21.70	MR	1.33	9	R	10.42	R	3.34	15.56	MR

Table: Disease –pest tolerance in AVT-1 Berseem trial

Entry	Ludhiana			Palampur		Bhubaneswar		
	Stem rot (% incidence)	Reaction	Larvae of <i>H. armigera</i> / m row length	Root rot (% incidence)	Reaction	Leaf spot & blight severity (%)	Disease reaction	Leaf defoliators (no./10 plants)
Wardan (NC)	30.15	MR	1.33	5	R	5.62	R	2.33
PC-91	31.18	MS	1.66	5	R	3.33	R	1.74
JHB-17-2	22.85	MR	1.66	5	R	35.62	MS	4.24
HFB-14-7	40.90	MS	1.66	6	R	3.67	R	1.86
JHB-17-1	35.45	MS	1.33	7	R	11.33	R	3.36
HFB-13-7	20.22	MR	1.33	9	R	24.62	MR	3.67
BB-2 (ZC-NWZ)	34.30	MS	1.66					
BL-22 (ZC-HZ)				7	R			
BB-3 (ZC-NEZ)						28.33	MR	3.74

OAT

IVTO (SC): Initial Varietal Trial in Oat (Single Cut)

At Ludhiana, All the entries showed moderately resistant disease reaction to leaf blight. Incidence of aphids was low and differences were non-significant. **At Rahuri**, HFO-818 and JHO-18-1 were found moderately susceptible, while remaining entries were found highly susceptible to aphids. **At Palampur**, all entries were susceptible to Powdery mildew except HFO-806 and SKO-96 which were moderately resistant. **At Bhubaneswar**, the entries OL-1874-1, OS-6, NDO-1802, JHO-18-1 and OS-403 were found resistant to leaf blight as well as *Sclerotium* rot and infestation by leaf defoliators. Rest of the entries expressed moderate resistance to blight, rot & leaf defoliators. **At Jhansi**, all the entries were resistant to moderately resistant to leaf light except OL-1874-1 and OL-1876-1 which were in low resistance category.

IVTO-MC: Initial Varietal Trial in Oat (Multi Cut)

At Ludhiana, All entries showed moderately resistant disease reaction except HFO-716 which was found moderately susceptible. Incidence of aphids was very low and differences among entries were non-significant. **At Rahuri**, all the entries were resistant to moderately resistant to aphids except JHO-18-2 and RO-11-1-4, which were moderately susceptible. **At Palampur**, all entries were susceptible to Powdery mildew except UPO-212 which was moderately resistant. **At Bhubaneswar**, all the entries were resistant to moderately resistance to leaf blight of oat as well as *Sclerotium* rot and leaf defoliators infesting oat. **At Jhansi**, all the entries were susceptible to moderately susceptible to Leaf light except JO-06-308 and RO-11-1-4 which were in low susceptible category.

IVTO (DUAL): Initial Varietal Trial in Oat (Dual)

At Ludhiana, All entries were moderately susceptible to leaf blight except OL-1766-2 which showed moderately resistant disease reaction. Incidence of aphids was very low and differences among entries were non-significant. **At Rahuri**, all the entries were resistant to moderately resistant except RO-11-2-6, which was moderately susceptible. **At Bhubaneswar**, all the entries were resistant to moderately resistance to leaf blight of oat as well as *Sclerotium* rot and leaf defoliators infesting oat except UPO-212 which gave moderate susceptible reaction to leaf blight, root rot and defoliators. **At Jhansi**, all the entries were in low susceptible to moderately susceptible category to leaf blight except RO-11-2-6 which was susceptible to leaf light.

Table: Disease –pest tolerance in IVT oat (SC) trial:

Entries	Bhubaneswar				Ludhiana			Palampur		Jhansi		Rahuri	
	Leaf blight Severity (%)	Reaction	<i>Sclerotium</i> root rot (%)	Leaf defoliators (no./10 plants)	Leaf Blight Severity (%)	Reaction	No. of Aphid s/tiller	Powdery mildew severity (%)	Reaction	Leaf blight Severity (%)	Reaction	No. of Aphids / tiller	Reaction
HFO-806	10.54	MR	6.2	9.13	16.13	MR	3.00	25	MR	16.67	R	101.33	HS
OL 1874-1	3.33	R	2.3	1.56	18.17	MR	2.33	50	S	31.11	LR	143.22	HS
HFO-818	14.67	MR	5.8	8.32	21.53	MR	3.33	30	S	18.89	R	32.33	MS
JO-06-23	12.33	MR	7.3	5.33	24.57	MR	2.66	30	S	17.41	MR	133.45	HS
OS-6 (NC)	5.67	R	2.2	2.32	15.60	MR	2.33	40	S	15.93	R	172.78	HS
NDO-1802	4.87	R	4.1	2.34	25.63	MR	3.33	40	S	16.30	R	185.11	HS
UPO-18-1	15.55	MR	7.3	9.32	24.03	MR	3.00	30	S	22.59	MR	48.22	HS
Kent (NC)	14.03	MR	9.3	8.67	21.73	MR	3.00	30	S	16.67	R	49.55	HS
OL-1876-1	10.67	MR	6.8	4.42	28.77	MR	2.33	50	S	35.56	LR	44.34	HS
JHO 18-1	5.87	R	2.6	3.32	26.47	MR	3.33	30	S	21.11	MR	35.00	MS
RO-11-1 (ZC-CZ)										15.56	R	83.67	HS
SKO-96 (ZC-HZ)								25	MR				
OS-403 (ZC-NWZ, NEZ)	3.42	R	4.2	1.42	18.00	MR	2.66						
SKO-241	18.90	MR	8.8	8.67	19.00	MR	2.00	30	S	16.30	R	84.22	HS
RO-11-1-3	12.87	MR	7.2	4.33	25.00	MR	2.33	40	S	17.78	R	62.67	HS
RO-11-1-2	14.33	MR	9.3	7.13	26.33	MR	2.66	50	S	18.89	R	62.33	HS

Table: Disease –pest tolerance in IVT oat (MC) trial

Entries	Bhubaneswar				Ludhiana			Palampur		Jhansi		Rahuri	
	Leaf blight Severity (%)	Reaction	<i>Sclerotium</i> root rot (%)	Leaf defoliators (no./10 plants)	Leaf Blight Severity (%)	Reaction	No. of Aphids/tiller	Powdery mildew severity (%)	Reaction	Leaf blight Severity (%)	Reaction	No. of Aphids / tiller	Reaction
OL-1895	6.13	R	4.42	3.74	16.70	MR	2.66	35	S	72.59	S	7.00	R
UPO-212 (NC)	16.67	MR	8.34	5.33	27.40	MR	3.00	25	MR	74.07	S	18.44	MR
HFO-707	5.13	R	3.33	3.52	30.43	MR	3.33	40	S	80.00	S	15.78	MR
OL-1882	2.33	R	1.34	1.34	17.80	MR	2.66	35	S	76.30	S	8.33	R
JHO-18-2	15.33	MR	7.33	4.67	21.83	MR	2.66	30	S	61.85	MS	27.67	MS
PLP-23	18.54	MR	9.13	5.33	21.17	MR	2.33	30	S	65.56	MS	15.45	MR
HFO-716	3.33	R	2.34	2.54	32.53	MS	3.00	40	S	64.81	MS	15.56	MR
JO-06-308	9.67	R	4.42	4.42	26.23	MR	3.33	35	S	58.52	LS	19.00	MR
RO-19 (NC)	2.67	R	1.67	2.54	19.27	MR	3.33	45	S	79.63	S	11.89	MR
RO-11-1-4	2.67	R	1.34	1.47	27.63	MR	3.33	40	S	59.63	LS	28.89	MS
RO-11-1-5	11.11	MR	5.33	4.42	30.00	MR	3.00	40	S	66.67	MS	19.33	MR

Table: Disease –pest tolerance in IVT oat (Dual) trial

Entries	Bhubaneswar				Ludhiana			Jhansi		Rahuri	
	Leaf blight Severity (%)	Reaction	<i>Sclerotium</i> root rot (%)	Leaf defoliators (no./10 plants)	Leaf Blight Severity (%)	Reaction	No. of Aphids/ tiller	Leaf blight Severity (%)	Reaction	No. of Aphids/ tiller	Reaction
OL-1766-2	12.33	MR	8.33	5.23	28.33	MR	2.66	69.26	MS	8.11	R
OL-1874-2	3.33	R	3.13	1.33	42.67	MS	2.66	67.41	MS	17.22	MR
JHO-822 (NC)	17.14	MR	7.67	6.13	39.50	MS	2.33	62.96	MS	18.45	MR
JHO-18-3	18.23	MR	11.67	6.33	45.45	MS	2.66	54.44	LS	9.22	R
HFO-816	5.67	R	4.24	3.52	40.74	MS	2.33	50.74	LS	19.44	MR
HFO-810	8.87	R	3.24	3.67	43.52	MS	2.33	52.59	LS	19.78	MR
JO-11-507	17.27	MR	8.26	6.13	39.22	MS	2.66	54.44	LS	15.33	MR
UPO-212(NC)	32.13	MS	12.34	7.87	35.26	MS	3.00	64.44	MS	19.33	MR
RO-11-2-2	22.13	MR	9.13	7.67	39.92	MS	3.33	59.63	LS	14.45	MR
RO-11-2-6	4.42	R	4.33	2.67	42.17	MS	2.66	78.52	S	23.60	MS

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

At Ludhiana, All entries were found moderately resistant to leaf blight. Incidence of aphids was low and differences were non-significant. **At Rahuri**, all the entries were resistant to moderately resistance to aphids. **At Palampur**, all entries were moderately resistant to Powdery mildew except OL-1896, OS-6, JO-05-9 and HFO-529 which were found susceptible. **At Bhubaneswar**, all the entries were resistant to moderately resistance to leaf blight of oat as well as *Sclerotium* rot and leaf defoliators. **At Jhansi**, all the entries were in moderately resistant to low resistant category to leaf blight except HFO-529 which showed mesothetic reaction to leaf light.

AVTO (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut)

At Ludhiana, All entries were found moderately resistant to leaf blight except OS-6 and OL-125 which are moderately susceptible. Incidence of aphids was low and differences were non-significant. **At Rahuri**, All the entries were found susceptible to highly susceptible to aphids. **At Palampur**, all entries were susceptible to Powdery mildew. **At Bhubaneswar**, all the entries were resistant to moderately resistance to leaf blight of oat as well as *Sclerotium* rot and leaf defoliators. **At Jhansi**, most of the entries were in low resistant to mesothetic category to leaf blight except OL-1869-1, OL-1861, JO-05-07 and SKO-229, which showed low susceptible reaction to leaf light.

AVTO (SC)-2 (Seed): Second Advanced Varietal Trial in Oat (Single Cut) for seed

At Ludhiana, All entries were found moderately resistant to leaf blight except OS-6 and OL-125 which are moderately susceptible. Incidence of aphids was low and differences were non-significant. **At Rahuri**, All the entries were found susceptible to highly susceptible to aphids. **At Palampur**, most of the entries were susceptible to highly susceptible to Powdery mildew except SKO-90, JO-05-07, OL-1862 and SKO-229, which were moderately resistant.

Table: Disease –pest tolerance in AVT-1 oat (SC) trial

Entries	Bhubaneswar				Ludhiana			Palampur		Jhansi		Rahuri	
	Leaf blight Severity (%)	Reaction	<i>Sclerotium</i> root rot (%)	Leaf defoliators (no./10 plants)	Leaf Blight Severity (%)	Reaction	No. of Aphids/tiller	Powdery mildew severity (%)	Reaction	Leaf blight Severity (%)	Reaction	No. of Aphids/ tiller	Reaction
HFO-718	10.13	MR	6.33	4.32	28.00	MR	3.00	20	MR	31.11	LR	9.00	R
NDO-1501	8.68	R	4.56	2.87	20.50	MR	2.33	25	MR	30.74	LR	17.87	MR
Kent (NC)	8.97	R	5.33	2.23	17.97	MR	3.33	20	MR	27.04	MR	18.11	MR
OL-1896	6.33	R	4.14	2.53	15.67	MR	2.66	40	S	30.37	LR	9.47	R
OS-6 (NC)	8.46	R	6.46	3.12	25.53	MR	2.00	35	S	32.22	LR	9.89	R
JO-05-9	12.78	MR	8.33	3.76	26.80	MR	2.33	30	S	20.74	MR	17.56	MR
HFO-529	4.33	R	3.33	1.45	26.00	MR	2.66	40	S	50.00	M	17.91	MR
JHO-2009-1 (ZC-CZ)										37.04	LR	8.22	R
SKO-96 (ZC-HZ)								20	MR				
RO-11-1 (ZC-NWZ, NEZ)	3.67	R	4.67	1.96	29.77	MR	3.00						
SKO-240	16.33	MR	8.89	4.13	18.00	MR	2.00	15	MR	28.52	MR	9.78	R

Table: Disease–pest tolerance in AVT-2 oat (SC) trial

Entries	Bhubaneswar				Ludhiana			Palampur		Jhansi		Rahuri	
	Leaf blight Severity (%)	Reaction	<i>Sclerotium</i> root rot (%)	Leaf defoliators (no./10 plants)	Leaf Blight Severity (%)	Reaction	No. of Aphids/tiller	Powdery mildew severity (%)	Reaction	Leaf blight Severity (%)	Reaction	No. of Aphids/tiller	Reaction
HFO-525	8.97	R	4.32	4.13	22.47	MR	3.00	30	S	39.63	LR	55.78	S
OS-6 (NC)	9.64	R	5.67	4.33	31.48	MS	2.66	35	S	40.37	M	57.00	S
Kent (NC)	13.33	MR	6.33	4.67	17.19	MR	3.00	30	S	38.89	LR	51.11	S
OL-1869-1	5.67	R	2.42	2.96	27.45	MR	2.00	40	S	52.96	LS	70.78	HS
JHO-822 (ZC-CZ)										33.70	LR	65.55	S
SKO-90 (ZC-HZ)								30	S				
OL-125 (ZC- NWZ)					33.50	MS	2.33						
JHO-99-2 (ZC-NEZ)	3.33	R	1.34	1.34									
OL-1861	4.13	R	2.34	1.58	16.93	MR	2.00	45	S	50.74	LS	74.78	HS
JO-05-07	12.67	MR	7.96	4.13	25.11	MR	2.33	40	S	59.63	LS	63.78	S
HFO-607	6.13	R	3.42	3.52	28.07	MR	3.00	30	S	41.11	M	65.33	S
OL-1862	4.67	R	2.76	2.64	19.30	MR	3.33	40	S	35.56	LR	86.00	HS
SKO-229	8.33	R	5.33	4.67	27.78	MR	2.66	35	S	50.65	LS	88.45	HS

Table: Disease –pest tolerance in AVTO (SC)-2 (Seed) trial

Entries	Ludhiana			Palampur		Rahuri	
	Leaf Blight Severity (%)	Reaction	No. of Aphids/tiller	Powdery mildew severity (%)	Reaction	No. of Aphids/ tiller	Reaction
HFO-525	23.80	MR	3.00	55	HS	57.78	S
OS-6 (NC)	31.82	MS	3.00	60	HS	59.00	S
Kent (NC)	18.85	MR	3.00	60	HS	53.11	S
OL-1869-1	28.45	MR	2.33	60	HS	72.78	HS
JHO-822 (ZC-CZ)						67.55	S
SKO-90 (ZC-HZ)				25	MR		
OL-125 (ZC- NWZ)	35.17	MS	2.66				
OL-1861	18.59	MR	2.33	55	HS	76.78	HS
JO-05-07	27.45	MR	2.66	25	MR	65.78	S
HFO-607	29.40	MR	3.00	30	S	67.33	S
OL-1862	20.30	MR	3.33	25	MR	88.00	HS
SKO-229	29.78	MR	3.00	25	MR	90.45	HS

AVTO-1 (DUAL): First Advanced Varietal Trial in Oat (Dual)

At Ludhiana, Entries HFO-608, OL-1906, JO-10-506 and OL-1876-2 were found moderately resistant to leaf blight and rest were moderately susceptible. Incidence of aphids was very low and differences among entries were non-significant. **At Rahuri**, All the entries were found resistant to moderately resistant to aphids. **At Bhubaneswar**, all the entries were resistant to moderately resistance to leaf blight of oat as well as *Sclerotium* rot and leaf defoliators. **At Jhansi**, most of the entries were in low susceptible to moderately susceptible category to leaf blight.

AVTO (MC)-1: First Advanced Varietal Trial in Oat (Multi Cut)

At Ludhiana, All entries were found moderately resistant to leaf blight. Incidence of aphids was low and differences were non-significant. **At Rahuri**, entries HFO-514 and RO-19 were found resistant whereas remaining entries were moderately susceptible to highly susceptible against aphids. **At Palampur**, all entries were susceptible to Powdery mildew except OL-1874 and RO-19 which were found moderately resistant. **At Bhubaneswar**, All the entries were found to be resistant except PLP-21 which expressed moderate resistance to both leaf blight and root rot. **At Jhansi**, most of the entries were in low susceptible to moderately susceptible category to leaf blight except PLP-21 which showed mesothetic reaction to leaf light.

Table: Disease –pest tolerance in AVTO-1 (Dual) trial

Entries	Bhubaneswar				Ludhiana			Jhansi		Rahuri	
	Leaf blight Severity (%)	Reaction	<i>Sclerotium</i> root rot (%)	Leaf defoliators (no./10 plants)	Leaf Blight Severity (%)	Reaction	No. of Aphids/ tiller	Leaf blight Severity (%)	Reaction	No. of Aphids/ tiller	Reaction
HFO-611	13.33	MR	6.43	5.06	40.15	MS	2.33	59.63	LS	8.55	R
JHO-17-4	4.67	R	5.13	3.14	36.17	MS	2.00	56.30	LS	9.67	R
UPO-212 (NC)	8.33	R	6.33	4.33	41.43	MS	2.33	62.22	MS	7.89	R
HFO-608	15.15	MR	8.14	5.87	26.80	MR	2.00	60.74	MS	14.00	MR
JHO-822 (NC)	3.64	R	3.13	2.67	31.20	MS	2.33	61.48	MS	8.78	R
OL-1906	2.32	R	1.33	1.67	26.57	MR	2.00	55.56	LS	16.89	MR
JO-10-506	3.33	R	2.13	2.33	28.93	MR	2.33	57.41	LS	18.89	MR
OL-1876-2	2.87	R	1.67	1.67	28.63	MR	2.00	70.00	MS	19.22	MR

Table: Disease –pest tolerance in AVTO-1 (MC) trial

Entries	Bhubaneswar				Ludhiana			Palampur		Jhansi		Rahuri	
	Leaf blight Severity (%)	Reaction	<i>Sclerotium</i> root rot (%)	Leaf defoliators (no./10 plants)	Leaf Blight Severity (%)	Reaction	No. of Aphids /tiller	Powdery mildew severity (%)	Reaction	Leaf blight Severity (%)	Reaction	No. of Aphids / tiller	Reaction
HFO-514	3.33	R	3.42	3.67	29.45	MR	2.66	45	S	63.70	MS	16.33	MR
UPO-212 (NC)	3.67	R	3.67	4.13	24.82	MR	3.00	50	S	52.59	LS	28.89	MS
OL-1874	2.67	R	2.76	2.64	27.04	MR	2.33	25	MR	68.52	MS	49.89	S
PLP-21	14.87	MR	8.13	5.23	23.08	MR	2.66	30	S	48.89	M	87.11	HS
JO-05-304	4.13	R	4.33	4.67	21.15	MR	2.66	30	S	53.70	LS	29.11	MS
RO-19 (NC)	2.33	R	1.34	1.58	25.75	MR	2.33	25	MR	68.89	MS	19.22	MR

VT Lucerne (P) -2016: Varietal Trial in Lucerne (Perennial) - 2016 – 3rd Year

At Ludhiana, RRB-15-1, AL-62, BAIF Lucerne 4, Anand-2, Alamdar-1, Alamdar-51 and DL-5 showed moderately resistant disease reaction to downy mildew of lucerne while others were moderately susceptible to downy mildew. All entries showed non-significant variation for Lucerne weevil and *H. armigera* population. **At Rahuri**, against aphids RL-88 (21.33 aphids/tiller) was found moderately resistant and BAIF Lucerne 4 (26.00 aphids/tiller) was found moderately susceptible, while rest of the entries did not survived and aphids were not recorded.

Table: Disease –pest tolerance in VT Lucerne trial

Entry	Rahuri	Ludhiana			
	No. of Aphids/ tiller	Lucerne weevil/ plant	<i>H. armigera</i> / m row length	Downy mildew severity (%)	Disease Reaction
RL-88 (NC)	21.33	2.00	2.33	31.33	MS
AL-61	NS*	2.00	2.00	40.67	MS
TNLC-15	NS	2.83	2.00	31.50	MS
RL-15-1	NS	1.83	1.66	31.67	MS
RRB-15-1	NS	2.00	1.66	25.50	MR
AL-62	NS	2.00	2.00	26.83	MR
BAIF Lucerne 4	26.00	2.00	2.00	30.67	MR
Anand-2 (NC)	NS	2.66	2.66	22.87	MR
Alamdar-1	NS	2.00	2.33	24.13	MR
Alamdar-51	NS	2.66	1.66	21.43	MR
DL-5	NS	1.66	2.33	14.17	MR
TSL-1	NS	2.66	2.33	31.43	MS

NS*: entries not survived

VT – AVT-2 (*Lolium*): At Palampur, all the entries were resistant to moderately resistant to powdery mildew. **At Ludhiana**, no disease was observed.

Table: Disease –pest tolerance in AVT-2 (*Lolium*) trial

Palampur				
S. No.	Entries	Powdery mildew		
		% Disease severity	Disease Rating	Disease Reaction
1	Palam rye grass-1	9	3	R
2	PBRG-2	22	5	MR
3	Palam rye grass-2	8	5	R
4	PBRG-1 (NC)	18	7	MR

VT – AVT-2 seed (*Lolium*): At Palampur, all the entries were resistant to moderately resistant to powdery mildew. **At Ludhiana**, no disease was observed.

Table: Disease –pest tolerance in AVT-2 seed (*Lolium*) trial

Palampur				
S. No.	Entries	Powdery mildew		
		% Disease severity	Disease Rating	Disease Reaction
1	Palam rye grass-1	5	3	R
2	PBRG-2	19	5	MR
3	Palam rye grass-2	7	3	R
4	PBRG-1 (NC)	21	5	MR

White clover (VTWC): At Palampur, in VTWC, all the entries were susceptible to powdery mildew.

Table: Disease –pest tolerance in VT-White Clover trial

S. No.	Entries	Powdery mildew		
		% Disease severity	Disease Rating	Disease Reaction
1	PWC-25	30	7	S
2	PWC-26	26	7	S
3	JHWC-16-1	27	7	S
4	JHWC-16-3	29	7	S
5	Palampur Composite (NC)	27	7	S
6	JHWC-16-2	35	7	S

Red clover (VTRC): At Palampur, in VTRC, all the entries were susceptible to powdery mildew.

Table: Disease –pest tolerance in VT-Red Clover trial

S. No.	Entries	Powdery mildew		
		% Disease severity	Disease Rating	Disease Reaction
1	IGFRI-RC-2016- 1	26	7	S
2	IGFRI-RC-2016- 4	28	7	S
3	PRC- 3 (NC)	29	7	S
4	IGFRI-RC-2016- 6	30	7	S
5	IGFRI-RC-2016- 5	27	7	S
6	IGFRI-RC-2016- 2	28	7	S
7	IGFRI-RC-2016- 3	27	7	S

AVT-2 Vicia (P): Advance varietal trial in *Vicia* (perennial)

At Rahuri, All the entries were found highly susceptible to aphids.

Table: Disease –pest tolerance in AVT-2 Vicia trial

S. No.	Name of Entry	Number of aphids/twig	Reaction
1	JVS-1	71.25	HS
2	JVS-2	70.75	HS
3	JVS-3	69.17	HS
4	JVS-4	65.25	HS
5	JVS-5	68.25	HS

AVT-2 Vicia-Seed: Advanced Varietal Trial-2 in *Vicia* (Seed)

At Rahuri, All the entries were found highly susceptible to aphids.

Table: Disease –pest tolerance in AVT-2 Vicia (seed) trial

S. No.	Name of Entry	Number of aphids/twig	Reaction
1	JVS-1	84.67	HS
2	JVS-2	87.58	HS
3	JVS-3	88.67	HS
4	JVS-4	87.67	HS
5	JVS-5	88.08	HS

PPT-17: To study the pathogenic variability of *Blumeria graminis* f. sp. *avenae* on oat

Location: Palampur

Twenty five isolates of *Blumeria graminis* f. sp. *avenae* were collected during 2017-19 and were maintained under controlled conditions. The reaction of these isolates will be recorded by detached leaf method under *in vitro* as infection types i.e. 0-4 under stereo zoom microscope. The above infection types will be employed for studying the pathogenic variability.

Screening of Oat germplasm against *Blumeria graminis* f. sp. *avenae*: Total of 347 lines were screened *in vivo* under field conditions during 2017-18 and 2018-19 using scale given by Mayee and Datar (1986), out of 347 lines evaluated, 10 lines were found to be resistant i.e. PLP-1, JPO-40, OL-1847, OL-1689, OS-6, HFO-864, OS-10 and HFO-125. Among these lines PLP-1 was found to be highly resistant.

Refinement of Differential set: The previous selected differential set will be refined and for refinement, 347 lines of oat were evaluated at Palampur *in vivo* for powdery mildew under natural epiphytotic conditions. Disease level was very high reaching up to 80 per cent severity in susceptible checks. From these 347 lines evaluated, 160 lines were selected for *in vitro* screening with different isolates. For screening *in vitro*, the seedlings of the selected oat germplasm were grown in aluminium trays. The aluminium trays were divided into 40 blocks and each block was sown with the germplasm line. The trays were shifted to cages after 7 days of sowing and were dusted uniformly with the inoculum. The readings were taken 15 days after inoculation using 0-4 scale given by Banyal (1995) by both visual and stereo-microscopic observation. Till date 160 lines were screened *in vitro* against 5 isolates and among these lines 47 lines showing different reaction to the isolates were selected and are being screened against 12 isolates.

Study of inheritance of Powdery mildew in oat: To study the inheritance of powdery mildew resistance three resistant lines (OL-1847, OG-77 and OL-1689) were selected and crossed with HJ-8 (Susceptible check) in field and F1 seeds were harvested. The F1 seeds were sown in polyhouse during October and are harvested in May, 2019. The plants were harvested and threshed individually and these F2 seeds will be evaluated using different isolates to study the inheritance of resistance.

Name of the Cross	Number of crosses made	Recovered F1 seeds
HJ8 X OL-1847	1000	75
HJ-8 X OG-77	1000	69
HJ8 X OL-1689	1000	55

PPT-26: Biological management of oat aphid *Rhopalosiphum padi* on oats

Location: Rahuri, Ludhiana and Dharwad

Crop: Oat

Variety: Kent

Plot size: 3 x 4 m²

Replication: 3

Design: RBD

Treatments:

T1: Foliar application of *L.lecani* @ 1x10⁸ CFU/g (5 g/lit)

T2: Foliar application of *L. lecani* @ 1x10⁸ CFU/g (7.5 g/lit)

T3: Foliar application of *M. anisopliae* @ 1x10⁸ CFU/g (5 g/lit)

T4: Foliar application of *M. anisopliae* @ 1x10⁸ CFU/g (7.5 g/lit)

T5: Commercial neem product (Azadirachtin – 10000 ppm) @ 2ml/lit

T6: NSE @ 5%

T7: Untreated control

Results: At **Rahuri**, Precount of aphids and coccinellids were non-significant. At 5 days after treatment, *L. lecanii* @ 7.5 g/lit recorded significantly lower number of survived aphids per tiller (29.00). However, it was at par with *L. lecanii* 5g/lit, *M. anisopiliae* @ 7.5 g/lit and *M. anisopiliae* @ 5 g/lit. Similar trend of result was also noticed at 7 days after treatment. Trend of aphid population in promising treatments were *L. lecanii* @ 7.5g/lit. (6.47), *M. anisopiliae* @ 7.5g/lit (7.89), *L. lecanii* @ 5g/lit. (7.92) and *M. anisopiliae* @ 5g/lit (11.63). Among the treatments there were found non-significant differences for coccinellid predators. Biopesticides did not affected the activities of coccinellid predators at 5 and 7 days after spray (Table PPT-26).

At Ludhiana, The incidence of aphids on oats was very low at the centre, hence the treatments were not imposed.

At Dharwad- Aphids incidence was not observed, hence the treatments were not imposed.

Table PPT-26: Biological management of oat aphid *Rhopalosiphum padi* on oats

Sr. No.	Treatments	Rahuri							GFY (Q/ha)
		Dose	Pre count	Av. No. of aphids/tiller days after 1st spray		Av. No. of LBB grubs/tiller			
				5 DAT	7 DAT	Pre count	5 DAT	7 DAT	
1	<i>L. lecanii</i> 1.5 % WP	5 gm/lit.	45.14 (6.75)*	32.45 (5.74)	7.92 (2.90)	1.30 (1.34)	1.70 (1.48)	1.95 (1.56)	468.73
2	<i>L. lecanii</i> 1.5 % WP	7.5 gm/lit.	45.25 (6.76)	29.00 (5.43)	6.47 (2.64)	1.23 (1.32)	1.70 (1.48)	1.97 (1.57)	472.08
3	<i>Metarrhizium anisopilae</i> 1.5 % WP	5 gm/lit.	45.74 (6.79)	35.48 (5.99)	11.63 (3.47)	1.30 (1.34)	1.77 (1.51)	1.99 (1.58)	467.73
4	<i>Metarrhizium anisopilae</i> 1.5 % WP	7.5 gm/lit.	44.24 (6.68)	30.00 (5.52)	7.89 (2.88)	1.37 (1.37)	1.83 (1.53)	1.90 (1.55)	468.83
5	Azadirachtin 10000 ppm	2ml /lit	45.88 (6.81)	33.57 (5.84)	18.59 (4.37)	1.37 (1.37)	1.83 (1.53)	1.86 (1.53)	461.87
6	Neem Seed extract (NSE)	5 %	45.44 (6.77)	32.33 (5.73)	16.40 (4.11)	1.23 (1.32)	1.90 (1.55)	1.89 (1.54)	461.10
7	Untreated control		44.63 (6.71)	47.10 (6.90)	55.87 (7.51)	1.43 (1.39)	1.77 (1.51)	1.90 (1.55)	441.03
	SE ±		1.77	0.08	0.15	0.04	0.04	0.03	2.97
	CD at 5%		N.S.	0.24	0.44	N.S.	N.S.	N.S.	8.68

*Figures in parenthesis indicates transformed values

DAT: Days after treatment

PPT-30: Biological management of powdery mildew of oats caused by *Blumeria graminis* f. sp. *avenae*

Location: Palampur

Treatments: 10

Replications: 3

Design: RBD

Plot size: 3x2 m²

Treatments:

T1: Three foliar spray of *Trichoderma viride* @ 0.5%

T2: Three foliar spray of *Trichoderma harzianum* @ 0.5%

T3: Three foliar spray of *Pseudomonas flourescens* @ 0.5%

T4: Three foliar spray of extract of *Eupatorium adenophorum* @ 10%

T5: Three foliar spray of Azadirachtin 3000 ppm @ 0.3%

T6: Three foliar spray of NSE 5%

T7: Three foliar spray of Eucalyptus @ 10%

T8: Three foliar spray of Vitex @ 0.1%

T9: Three foliar spray of hexaconazole @ 0.1% (Chemical control)

T10: Control

Results: The experiment was conducted to manage the powdery mildew through biological management in oat crop. It was observed that chemical check i.e, T9 (three foliar spray of hexaconazole @ 0.1%) gave best control of powdery mildew (7.00 % disease severity and 87.65% disease control) with maximum increase (13.5 %) in the seed yield over the check. Among the biological management treatments T1 (three foliar spray of *Trichoderma viride* @ 0.5%) and T2 (three foliar spray of *Trichoderma harzianum* @ 0.5%) were found effective giving 55.29 and 50.00 % powdery mildew control with 11.19 and 10.04 % increase in the seed yield respectively over check. Minimum disease control and minimum increase in the yield was provided by treatments T3 and T5 respectively.

Table PPT-30: Biological management of powdery mildew of oats caused by *Blumeria graminis* f. sp. *avenae*

Treatment	Powdery mildew		Seed Yield	
	% Severity	% reduction over control	(q/ha)	% increase over control
T1	25.33 (31.23)*	55.29	19.27 (26.04)	11.19
T2	28.33 (32.59)	50.00	19.07 (25.89)	10.04
T3	38.33 (38.25)	32.35	18.17 (25.22)	4.85
T4	26.33 (30.86)	53.53	18.00 (25.10)	3.87
T5	30.66 (33.62)	45.89	17.80 (24.95)	2.71
T6	34.66 (36.06)	38.83	17.83 (24.98)	2.89
T7	27.33 (31.52)	51.76	18.20 (25.25)	5.02
T8	25.33 (30.20)	55.29	18.30 (25.32)	5.60
T9	7.00 (15.24)	87.65	19.67 (26.32)	13.50
T10	56.66 (46.91)	0.00	17.33 (24.60)	0.00
CD (5%)	2.30	-	0.66	-

*Values in parenthesis are transformed values

PPT-31: Eco-friendly pest management techniques in berseem ecosystem

Location: Ludhiana

Design: RBD

Replication: 3

Plot size: 5x5 m²

Treatments:

T1: Seed treatment with *Trichoderma viride* @ 5 g/kg + foliar spray of NSE @ 5%

T2: Soil application of *Trichoderma viride* @ 1kg/25kg FYM/acre + foliar spray of NSE @ 5%

T3: T1+ Chickpea as trap crop on border row + Bird perches

T4: T2 + Chickpea as trap crop on border row + Bird perches

T5: T1+ Sunflower as trap crop on border row + Bird perches

T6: T2+ Sunflower as trap crop on border row + Bird perches

T7: Farmer's Practice (Spray of Bavistin on fodder as well as seed crop + Malathion on fodder crop and Chlorantraniliprole 18.5 SC on seed crop)

T8: Control

Results: The experiment was conducted for the evaluation of eco-friendly disease and pest management techniques in berseem. The results presented in table PPT-31 showed that T4 (Soil application of *Trichoderma viride* @ 1kg/25kg FYM/acre + foliar spray of NSE @ 5% + Chickpea as trap crop on border row + Bird perches) exhibited least disease incidence of stem rot (18.25%) with 57.06 percent disease control as compared to control (42.50%) and 25.74 percent increase in green fodder yield. Likewise, treatments T2 (Soil application of *Trichoderma viride* @ 1kg/25kg FYM/acre + foliar spray of NSE @ 5%) and T₆ (T2+ Sunflower as trap crop on border row + Bird perches) also provided 54.71 and 52.94 percent disease control with more than 24 percent increase in green fodder yield as compared to untreated control. The number of *H. armigera* larvae per metre row length were minimum in T7 (Farmers practice) followed by T6 (T2+ Sunflower as trap crop on border row + Bird perches) and T4 (Soil application of *Trichoderma viride* @ 1kg/25kg FYM/acre + foliar spray of NSE @ 5% + Chickpea as trap crop on border row + Bird perches). More number of *H. armigera* larvae and natural enemies were observed on sunflower as compared to chickpea.

Table PPT-31: Evaluation of eco-friendly disease and pest management techniques in berseem

Treatments	Stem rot Incidence (%)	Disease Control (%)	<i>H. armigera</i> larvae/ m row length in berseem	<i>H. armigera</i> larvae/ plant on trap crop	Natural enemies per metre row length on berseem		GFY (q/ha)	% increase over control	Seed Yield (q/ha)
					Coccinellids	Spiders			
T ₁	26.5	37.65	4.33	-	3	1	538	14.47	2.73
T ₂	19.25	54.71	5.00	-	3	1	602	28.09	3.11
T ₃	28.25	33.53	4.00	1.66	3.33	1.33	520	10.64	2.63
T ₄	18.25	57.06	3.83	1.66	3.66	1.33	591	25.74	3.25
T ₅	29	31.76	4.00	2.00	4	1.33	510	8.51	2.41
T ₆	20.00	52.94	3.50	2.00	4	1.33	585	24.47	3.03
T ₇	21.75	48.82	2.00		2	0.66	543	15.53	2.89
T ₈	42.5	-	7.50		3.66	1.33	470		2.27
CD (P=0.05)	2.537		0.42	-		NS	1.091		NS
SE ±(m)	0.857						0.368		0.366
CV	6.794			-			0.541		-

PPT-32: Validation of best treatment of trial entitled “Management of soil borne and powdery mildew diseases in red clover seed crop”

Location: Palampur

Plot size: 100 m²

Treatments:

T1: Seed treatment with *Trichoderma* @ 5g/kg seed + three foliar spray of *Trichoderma* @ 0.5%

T2: Seed treatment with carbendazim @ 2 g/kg seed+ three foliar spray of hexaconazole @ 0.1 %

T3: Control

Results: The experiment was conducted to manage the powdery mildew and soil borne diseases in the seed crop of red clover. It was observed that integrated management i.e. seed treatment with carbendazim @ 2 g/kg seed followed by three foliar spray of hexaconazole @ 0.1 % gave best management of powdery mildew having 3.3 percent disease severity and 91.2 per cent disease control of powdery mildew and 3.33 % disease incidence with 68.8 % disease control of soil borne disease. The data on yield were not recorded as it was the establishment year of the red clover crop.

Table PPT-32: Validation of best treatment of trial entitled “management of soil borne and powdery mildew diseases in red clover seed crop”

Treatment	% Severity /Incidence				Seed yield	
	Powdery mildew	% control	Soil borne	% control	Q/ha	% increase
T ₁ = Seed treatment with <i>Trichoderma</i> @ 5g/kg seed + Three foliar spray of <i>Trichoderma</i> @ 0.5%	20.33	46.00	5.33	50.10	Data was not recorded as this is 1 st and establishment year	
T ₂ = Seed treatment with carbendazim @ 2 g/kg seed+ Three foliar spray of hexaconazole @ 0.1 %	3.33	91.15	3.33	68.80		
T ₃ =Control	37.67	-	10.67	-		
CD (5%)	3.39	-	2.00	-		

PPT-33: Validation of best treatment of trial entitled “Management of foliar diseases of oat”

Location: Ludhiana and Bhubaneswar

Plot size: 100 m²

Treatments:

T1: Seed treatment with Carbendazim 50WP @ 2g/kg seed + foliar application of Propiconazole 25 EC @ 1ml/lit after 21 DAS

T2: Seed treatment with *Trichoderma viride* (CFU 10⁶/gm of formulation) @ 5g/kg of seed + foliar application of Propiconazole 25 EC @ 1ml/lit after 21 DAS

T3: Untreated control

Results: The experiment was conducted for the management of foliar diseases of oats at Ludhiana and Bhubaneswar. The results at Ludhiana showed that the seed treatment with Carbendazim 50WP @2g/kg seed + foliar application of Propiconazole 25 EC @ 1ml/lit after 21 DAS showed minimum disease severity (25.60%) of leaf blight with 39.62 percent control of disease and 444.00 q/ha of green fodder yield and more seed yield followed by seed treatment with *Trichoderma viride* (CFU 10⁶/gm of formulation) @ 5g/kg of seed + foliar application of Propiconazole 25 EC @ 1ml/lit after 21 DAS (30.20 percent severity with 28.77 percent disease control and 27.46 percent increase in green fodder yield over untreated control).

At Bhubaneswar treatment T1 (Seed treatment with carbendazim 50WP @ 2g/kg seed + foliar application of Propiconazole 25EC @ 1ml/l after 21DAS) showed minimum leaf blight severity of 8.33% and also 19.4% increase in yield over control followed by seed treatment with *Trichoderma viride* (CFU 10⁶/gm of formulation) @ 5g/kg of seed + foliar application of Propiconazole 25EC @ 1ml/l after 21DAS, which recorded 11.67% disease severity and 8.9% increase in yield over control.

Table PPT-33: Validation of best treatment of trial entitled “Management of foliar diseases of oat”

Treatments	Ludhiana					Bhubaneswar			
	Leaf Blight Severity (%)	Disease control (%)	Green Fodder Yield (q/ha)	Percent Increase	Seed Yield (q/ha)	Leaf Blight Severity (%)	Disease control (%)	Green Fodder Yield (q/ha)	Percent Increase
T1	25.60	39.62	444	35.78	26.86	8.33	74.2	286.67	19.4
T2	30.20	28.77	416.8	27.46	23.19	11.67	63.9	261.33	8.9
T3	42.40	-	327	-	22.76	32.33	-	240.07	-
CD (P=0.05)	1.311		13.417		0.326	2.621		13.466	
SE ±(m)	0.396		4.051		0.081	0.841		4.322	
CV	2.704		2.288		0.823	12.76		4.353	

PPT-34: Integrated disease management in berseem

Location: Jhansi, Ludhiana, Bhubaneswar, Palampur

Design: RBD

Replication: 3

Plot size: 3x2 m²

Treatments:

T1: Seed treatment with Chitosan @ 0.05 %

T2: Seed treatment with *Trichoderma* @ 0.05 %

T3: Seed treatment with carbendazim @ 0.02 %

T4: Seed treatment with Chitosan @ 0.05 % + *Trichoderma* @ 0.05%

T5: Seed treatment with Chitosan @ 0.05 % + carbendazim @ 0.01%

T6: T1 + foliar spray of Chitosan @ 0.05%

T7: T2+ foliar spray of Chitosan @ 0.05 %

T8: T3 +foliar spray of Chitosan @ 0.05 %

T9: T3 + foliar spray of carbendazim @ 0.01 %

T10: Control

Results:

At Jhansi, it was observed that T9 (Seed treatment with carbendazim @ 0.02 % followed by foliar spray of carbendazim @ 0.01 %) proved best with least incidence of stem rot (10.23 %) and leaf blight (9.74 %) with maximum green fodder yield (410.72 q/ha). Seed yield was 2.86 q/ha in T9. Treatment T9 was at par with T7 (Seed treatment with *Trichoderma* @ 0.05 % followed by foliar spray of Chitosan @ 0.05 %) having 10.75 % incidence of stem rot and 9.97 % severity of leaf blight along with green fodder yield of 403.44 q/ha and highest seed yield (3.22 q/ha) among all treatments (Table PPT-34).

At Ludhiana, T6 (Seed treatment with Chitosan @ 0.05 % + foliar spray of Chitosan @ 0.05%) showed least stem rot incidence (18.00%) along with high green fodder yield (641 q/ha) as compared to control (45.33% disease incidence and 490.33 q/ha green fodder yield). Similarly, treatments T8 (Seed treatment with carbendazim @ 0.02 % + foliar spray of Chitosan @ 0.05%) and T7 (Seed treatment with *Trichoderma* @ 0.05 % + foliar spray of Chitosan @ 0.05%) provided 21.77 and 23.20 percent stem rot incidence high green fodder yield of 597.67 and 597.17 q/ha, respectively (Table PPT-34).

At Palampur, it was observed that T9 (Seed treatment with carbendazim @ 0.02 % followed by foliar spray of carbendazim @ 0.01 %) proved best with least incidence of root rot (1.33%) and leaf blight (4.33%) with maximum green fodder yield (367.67 q/ha) over the check, which was followed by non-significant difference with T8 (Seed treatment with carbendazim @ 0.02 % followed by foliar spray of Chitosan @ 0.05 %) having 2% incidence of root rot and 4.67 % severity of leaf blight along with green fodder yield of 362.67 q/ha. Minimum disease control and green fodder yield was recorded in T2 (Seed treatment with *Trichoderma* @ 0.05 %) (Table PPT-34).

At Bhubaneswar, T9 (seed treatment with Carbendazim @0.02% followed by foliar spray of carbendazim @0.01%) proved best with least incidence of root rot (6.27 %) and leaf blight (8.37 %) with maximum green fodder yield (164.83 q/ha) over the check. It was followed by non-significant difference with T8 (Seed treatment with carbendazim @ 0.02 % followed by foliar spray of Chitosan @ 0.05 %) having 7.47 % incidence of root rot and 9.46 % severity of leaf blight along with green fodder yield of 158.10 q/ha. However with respect to root rot and wilt T5 (seed treatment with both Chitosan @ 0.05% and Carbendazim @ 0.02%) was found best with disease incidence of 3.17% followed by T4 (seed treatment with Chitosan @ 0.05% and *Trichoderma* @ 0.05%) having disease incidence of 5.70% compared to untreated control (15.8%) (Table PPT-34).

Table PPT-34: Integrated disease management in berseem

Treatments	Jhansi				Ludhiana			Palampur			Bhubaneswar		
	Stem rot Incidence (%)	Leaf blight severity (%)	Green Fodder Yield (q/ha)	Seed Yield (q/ha)	Stem rot Incidence (%)	Green Fodder Yield (q/ha)	Seed Yield (q/ha)	Root rot incidence (%)	Leaf blight severity (%)	Green Fodder Yield (q/ha)	Leaf spot & blight severity (%)	Root rot and wilt (%)	Green Fodder Yield (q/ha)
T ₁	11.89	17.83	346.28	2.53	28.93	560.67	4.17	4.00	15.00	345.00	34.70	12.00	125.27
T ₂	12.59	17.39	352.61	2.87	30.40	547.43	3.85	6.33	15.33	342.00	35.10	12.83	130.60
T ₃	12.96	17.66	365.44	3.06	34.13	518.67	3.51	1.67	10.00	352.33	32.43	7.30	132.83
T ₄	12.55	14.50	387.66	2.87	28.30	580.00	4.70	2.67	11.67	349.67	33.01	5.70	140.57
T ₅	12.22	14.14	377.27	2.73	29.17	563.83	4.26	2.00	8.67	364.00	27.94	3.17	145.47
T ₆	11.18	10.59	364.50	3.05	18.00	641.00	5.81	3.67	6.33	355.33	12.53	12.23	138.50
T ₇	10.75	9.97	403.44	3.22	23.20	597.17	5.00	6.67	7.00	360.00	20.98	10.87	136.60
T ₈	11.37	12.10	385.50	2.22	21.77	597.67	5.12	2.00	4.67	362.67	9.46	7.47	158.10
T ₉	10.23	9.74	410.72	2.86	27.57	582.83	4.70	1.33	4.33	367.67	8.37	6.27	164.83
T ₁₀	21.11	28.23	321.97	2.48	45.33	490.33	3.26	9.67	16.67	338.33	38.68	15.80	123.73
CD (P=0.05)	2.179	1.20	2.24	NS	2.441	1.400	NS	1.69	1.56	15.33	13.87	5.59	5.18
SE ±(m)	0.733	0.406	0.749	0.79	0.815	0.467	0.587				4.58	1.85	1.71
CV	10.01	4.62	0.349	16.54	4.924	0.143	-						

Forage Crops Breeder Seed Production

[Indent year Rabi 2019-20]
[Production year Rabi 2018-19]
(Table Reference: Tables BSP 1, 2, 3)

The indent for Breeder Seed Production was received from DAC, GOI for 27 varieties in three forage crops *viz.*, Oat (12), Berseem (12) and Lucerne (3). The total quantity allocated was 352.36 q. The production target was assigned to different Breeder Seed producing centres of the SAUs/ NGO/ ICAR institutes. Among quantity indented for different forage crops, the maximum was for Oat (303.05 q) followed by Berseem (41.91 q) and Lucerne (7.40 q).

The final Breeder Seed Production Report (BSP-IV) received from different seed producing centres revealed that in all three crops Berseem, Oat & Lucerne the overall breeder seed production was more than the allocated quantity. The overall production was 461.76 q which was 109.4 q (31.05%) higher than the indented target. Out of 25 varieties indented, only in 03 varieties the production was less than indent. Besides previous year seed of 42 q of indented varieties and 30.08q seed of 08 Oat and 01 Berseem variety (Newly released) produced this year is also available.

In Oat, the production was 405.5q and 42.00 q of previous year is also available. It makes a total of 447.5q against the allocation of 303.05q making a surplus of 144.55q. Thus the production was 102.45 q or 33.81% higher than the indent. The total indent was for 12 varieties and in all cases there was surplus production. The indent was allocated to 08 centers in 07 states and all produced surplus or equal seeds. IGFRI, Jhansi; GBPUAT, Pantnagar; PAU, Ludhiana; HAU, Hisar; MPKV, Rahuri; JNKVV, Jabalpur were net surplus producers whereas BAIF, Uralikanchan; AAU, Anand achieved the target. Besides these, the 27.08q surplus seed of 08 varieties are also available.

In Berseem, the production was 47.31q against the indent of 41.91q making a surplus of 5.4q. There was indent of 12 varieties and were allocated to 4 centers located in 4 different states. In three varieties *viz.*, BL-1, Mescavi and JB-5 the production was less than the indent. In other 09 varieties there was surplus or equal production. 3.0q of breeder seed of newly released variety JBSC-1 is also available. Center wise scenario indicates that IGFRI, Jhansi was net surplus producers whereas PAU, Ludhiana; CCS HAU Hisar; JNKVV Jabalpur were net deficit breeder seed producer in Berseem.

In Lucerne, the target of (7.40 q) was allotted to two centers in two states. The total production was 8.95 q which was 1.55 q or 20.94% higher than the indent. MPKV Rahuri was net surplus producer whereas AAU, Anand achieved the target. Out of 3 varieties, the target was met in Anand-2 and Anand -3 whereas in RL-88 there was surplus production of 1.55q.

The overall breeder seed production was 461.76 q and considering the previous year seed of 42.00 q thus making a total of 503.76 q against the indent of 352.36 q (Table BSP 1 & 2) which is 151.4 q surplus. There was surplus breeder seed available in many centers of other improved varieties (Table BSP 3)

Table BSP 1: Centre wise Breeder Seed Production (q) during Rabi 2018-19

[Indent Rabi 2019-20]
[Production year Rabi 2018-19]

Oat

SN	Producing centre	Variety	Allocation as per DAC	Allocation BSP-I	Production	Non-lifted seed available	Surplus/ Deficit
1.	Punjab						
	PAU, Ludhiana	OL-10	13.00	13.50	20.00	-	(+) 7.00
		OL-11	0.50	-	3.50	-	(+) 3.00
		Kent	30.00	30.00	40.00	-	(+) 10.00
2.	Maharashtra						
	BAIF, Uralikanchan	Kent	30.00	30.00	30.00	-	-
	MPKV, Rahuri	RO-19	5.00	5.00	24.90	-	(+) 19.90
		Kent	20.00	20.00	11.10	42.00	(+) 33.10
3.	Gujarat						
	AAU, Anand	Kent	50.00	50.00	50.00	-	-
4.	Uttarakhand						
	GBPUAT, Pantnagar	UPO-212	31.50	31.50	40.00	-	(+) 8.50
5.	Uttar Pradesh						
	IGFRI, Jhansi	JHO-2000-4	5.00	5.00	8.00	-	(+) 3.00
		JHO-99-2	1.50	1.50	2.50	-	(+) 1.00
		JHO-822	35.00	35.0	65.00	-	(+) 30.00
		Kent	63.35	63.35	75.00	-	(+) 11.65
6.	Haryana						
	CCS HAU, Hisar	OS-377	2.30	2.30	11.30	-	(+) 9.00
		OS-6	5.00	5.00	10.25	-	(+) 5.25
		Haryana Javi -8	8.40	8.40	9.05	-	(+) 0.65
7.	Madhya Pradesh						
	JNKVV, Jabalpur	JO-03-93	2.50	2.50	5.00	-	(+) 2.50
		Total	303.05	303.05	405.5	42.00	(+) 144.45

- Variety OL 11 was not notified till BSP-1 hence the demand was added to OL-10 in BSP-1

Table BSP 1: Centre wise Breeder Seed Production (q) during Rabi 2018-19—Contd...

Berseem

SN	Producing centre	Variety	Allocation as per DAC	Allocation BSP-I	Production	Non-lifted seed available	Surplus/ Deficit
1.	Punjab						
	PAU, Ludhiana	BL-42	6.98	6.98	7.50	-	(+) 0.52
		BL-180	0.40	0.40	0.80	-	(+) 0.40
		BL-10	6.10	6.10	6.30	-	(+) 0.20
		BL-1	6.00	6.00	-	-	(-) 6.00
BL-43		0.48	0.48	3.00	-	(+) 2.52	
2.	Uttar Pradesh						
	IGFRI, Jhansi	BB-2 (JHB 146)	2.20	2.20	4.10	-	(+) 1.90
		BB-3	0.50	0.50	4.50		(+) 4.00
Wardan		8.55	8.55	12.50		(+) 3.95	
3.	Haryana						
	CCS HAU, Hisar	H. Berseem-2	1.40	1.40	1.60	-	(+) 0.20
Mescavi		7.30	7.30	5.50		(-) 1.80	
4.	Madhya Pradesh						
	JNKVV, Jabalpur	JB-5	1.00	1.00	0.51	-	(-) 0.49
JB-1		1.00	1.00	1.00	-	-	
Grand Total			41.91	41.91	47.31		(+) 5.4

Note : For BSP-1

- Berseem Bundel 1.00 q indent form MP has been added to Bundel Berseem -2. There is no such variety known as Berseem Bundel whereas Berseem Bundel 2 is notified for MP.
- Pusa Giant indent of 0.10q has been added to Wardan as it is old variety and not in cultivation.
- BL-43 is not notified yet hence PAU is requested to produce 0.48q extra seed of BL 42

For BSP-IV

- BL-1 Production failed at PAU due to infestation of field with wild Persian clover.

Table BSP 1: Centre wise Breeder Seed Production (q) during Rabi 2018-19—Contd...

Lucerne

SN	Producing centre	Variety	Allocation as per DAC	Allocation BSP-I	Production	Surplus/ Deficit
1.	Maharashtra					
	MPKV, Rahuri	RL-88	0.40	0.40	1.95	(+) 1.55
2.	Gujarat					
	AAU, Anand	Anand-2	6.40	6.40	6.40	-
		Anand-3	0.60	0.60	0.60	-
Total			7.40	7.40	8.95	(+) 1.55

Table BSP 2: Variety wise breeder seed production (q) during Rabi 2018-19

[Indent Rabi 2019-20]

[Production year Rabi 2018-19]

Crop	S N	Variety	Produced by	Notification Year	Allocation as per DAC	Allocation BSP-1	Production	Non-lifted seed available	Surplus (+) / Deficit (-)
Oat	1	OL-10	PAU, Ludhiana	2014	13.00	13.50	20.00	-	(+) 7.00
	2	OL-11			0.50	-	3.50	-	(+) 3.00
	3	Kent	PAU, Ludhiana	1975	193.35	30.00	40.00	-	(+) 54.75
			BAIF, Uralikanchan			30.00	30.00	-	
			AAU, Anand			50.00	50.00	-	
			MPKV, Rahuri			20.00	11.10	42.00	
			IGFRI, Jhansi			63.35	75.00	-	
	4	RO-19 (Phule Harita)	MPKV, Rahuri	2007	5.00	5.00	24.90	-	(+) 19.90
	5	JO-03-93	JNKVV, Jabalpur	2015	2.50	2.50	5.00	-	(+) 2.50
	6	UPO-212	GBPUAT, Pantnagar	1990	31.50	31.50	40.00	-	(+) 8.50
	7	JHO-2000-4	IGFRI, Jhansi	2006	5.00	5.00	8.00	-	(+) 3.00
	8	JHO-99-2		2005	1.50	1.50	2.50	-	(+) 1.00
	9	JHO-822		1989	35.0	35.0	65.00	-	(+) 30.00
10	OS-377	CCS HAU, Hisar	2015	2.30	2.30	11.30	-	(+) 9.00	
11	OS-6		1982	5.00	5.00	10.25	-	(+) 5.25	
12	Haryana Javi -8		1998	8.40	8.40	9.05	-	(+) 0.65	
		Total			303.05	303.05	405.5	42.00	(+) 144.55

- Variety OL 11 was not notified till BSP-1 hence the demand was added to OL-10 in BSP-1

Table BSP 2: Variety wise breeder seed production (q) during Rabi 2018-19.....Contd.

Crop	S N	Variety	Produced by	Notification Year	Allocation as per DAC	Allocation BSP-1	Production	Non-lifted seed available	Surplus (+) / Deficit (-)
Bers eem	1	BL-42	PAU, Ludhiana	2007	6.98	6.98	7.50	-	(+) 0.52
	2	BL-180		2006	0.40	0.40	0.80	-	(+) 0.40
	3	BL-10		1985	6.10	6.10	6.30	-	(+) 0.20
	4	BL-1		1978	6.0	6.0	-	-	(-) 6.00
		BL-43		2019	0.48	0.48	3.00	-	(+) 2.52
	5	BB-2 (JHB 146)	IGFRI, Jhansi	1997	2.20	2.20	4.10	-	(+) 1.90
	6	BB-3		2001	0.50	0.50	4.50	-	(+) 4.00
	7	Wardan		1982	8.55	8.55	12.50	-	(+) 3.95
	8	H. Berseem-2	CCS HAU, Hisar	2006	1.40	1.40	1.60	-	(+) 0.20
	9	Mescavi		1975	7.30	7.30	5.50	-	(-) 1.80
	10	JB-5		2005	1.0	1.0	0.51	-	(-) 0.49
		JB-1		1982	1.0	1.0	1.0	-	-
		Total			41.91	41.91	47.31		(+) 5.4

Note for BSP-1

- Berseem Bundel 1.00 q indent from MP has been added to Bundel Berseem -2. There is no such variety known as Berseem Bundel whereas Berseem Bundel 2 is notified for MP.
- Pusa Giant indent of 0.10q has been added to Wardan as it is old variety and not in cultivation.
- BL-43 is not notified yet hence PAU is requested to produce 0.48q extra seed of BL 42

Table BSP 2: Variety wise breeder seed production (q) during Rabi 2018-19.....Contd.

Crop	SN	Variety	Produced by	Notifi- cation Year	Allocation as per DAC	Allocat ion BSP-1	Produc tion	Non- lifted seed	Surplus (+) / Deficit (-)
Lucerne	1	RL-88	MPKV, Rahuri	1996	0.40	0.40	1.95	-	(+) 1.55
	2	Anand-2	AAU, Anand	1984	6.4	6.40	6.40	-	-
	3	AL-3 (Anand Lucerne - 3	AAU, Anand	2009	0.60	0.60	0.60	-	-
	Total					7.40	7.40	8.95	-

Table BSP -3: Surplus breeder seed available

SN	Producing centre	Crop	Variety	Allocation BSP-I	Production	Surplus
1	PAU, Ludhiana	Metha	M-150	-	0.50	(+) 0.50
2	JNKVV, Jabalpur	Oat	JO-1	-	6.88	(+) 6.88
3		Oat	JO-03-91	-	5.00	(+) 5.00
4		Oat	Kent	-	5.00	(+) 5.00
5	MPKV, Rahuri	Oat	Phule Surabhi	-	3.10 + 0.60	(+) 3.70
6	IGFRI Jhansi	Oat	JHO 851	-	0.50	(+) 0.50
7		Oat	JHO 99-1	-	0.50	(+) 0.50
8		Oat	JHO 2010-1		5.50	(+) 5.50
9		Oat	JHO 2009-1		2.00	(+) 2.00
10		Berseem	JBSC-1		3.00	(+) 3.00

Non- lifted seeds of previous year

SN	Producing centre	Crop	Variety	Non-lifted seed
1	MPKV, Rahuri	Oat	Kent	42.00
2		Oat	Phule Surabhi	0.60

FORAGE TECHNOLOGY DEMONSTRATIONS

To popularize the forage production technologies and make the farmers aware about various new fodder crop varieties, total of 535 forage technology demonstrations were allotted to 21 AICRP centres for Rabi crops. It included 70 FTDs to berseem, 70 to lucerne, 250 to oat (Single cut), 60 to oat (Multicut), 05 to cowpea, 70 to other crops viz., laythrus, rye grass, guinea grass, tall fescue, hedge lucerne etc. The centers mobilized the resources of their respective institutions for carrying out the activities. FTDs are being conducted in the new villages every year so that the technologies can be spread in large areas

Crop wise FTDs allotted during Rabi 2018-19

S N	Centre	Bers-eem	Lucerne	Oat (SC)	Oat (MC)	Cow-pea	Other crops	Total
1.	AAU, Jorhat			20				20
2.	OUAT, Bhubaneswar			25			Rye grass: 25	50
3.	BCKV, Kalyani	05		10			Lathyrus: 10	25
4.	BAU, Ranchi	10		30				40
5.	NDUAT, Faizabad			10				10
6.	JNKVV, Jabalpur	10		05				15
7.	AAU, Anand		10	5				15
8.	BAIF, Urulikanchan		05	15				20
9.	MPKV, Rahuri	10		10				20
10.	SKRAU, Bikaner		10	15				25
11.	PAU, Ludhiana			20	20			40
12.	CCS HAU, Hisar	20		10	10			40
13.	GBPUAT, Pantnagar	10		10			Berseem + oat IC : 10	30
14.	TNAU, Coimbatore		05			05	Guinea grass: 05	15
15.	PJTSAU, Hyderabad		10	05			Hedge lucerne: 10	25
16.	ZRS, UAS (B), Mandya		30	20				50
17.	CSK HPKV, Palampur				15		Tall Fescue: 05	20
18.	KAU, Vellayani						BNH: 15	15
19.	IGKV, Raipur	05			05			20
20.	CAU, Imphal			10	10			10
21.	SKUA& T, Srinagar			30				30
Total		70	70	250	60	05	70	535

Tribal Sub-plan (TSP) activities (2018-19)

TSP activities were carried out in 10 states by AICRP FC&U centers located in various SAUs/ CAU/ NGO on the aspect of forage crops and livestock development. Three broad aspects were covered.

- Capacity building through training on forage technologies, improved practices, livestock development, animal nutrition and animal health etc.
- Field days, fodder days, livestock health camps etc. General awareness about importance of fodder
- Inputs supply in forms of seeds, fertilizer, small farm equipments, small ruminants, poultries etc. for the upliftment of livestock keepers and farmers of tribal community.

The center-wise activity in brief is given below.

CSKHPKV, Palampur- Forty farmers' families of Sapairu village of district Kangra was selected. Inputs like UMM bricks, mineral mixture, sickles and weedicide were supplied to the selected farmers. Feedback was taken regarding performance of improved grass species and their production technologies on farmers' own lands as well as on one-hectare Lantana and Eupatorium infested community land in Karnarthu village. Appreciable improvement in forage production per unit has been observed. These interventions have resulted in Increase in herbage yield to the tune of about 90-100q/ha over the existing system accompanied by better animal health and productivity as well as improvement in family income. Keeping in view, the performance of improved species, more and more families are now interested and adopting demonstrated technologies. Root slips of NBH, Setaria grasses and tall fescue grasses have been reserved for distribution to the selected families in ensuing rainy season.

MPKV, Rahuri - Selection of 30 tribal beneficiaries farmers in the village Bokalzar, Post. Dhanrat district Nandurbar were done. Fodder oat variety Phule Surabhi and small implements like Cycle Hoe distributed to 30 families along with technical knowhow.

CAU, Imphal - Ninety tribal families in Lamphou Pasma village, Japhou village, Chandel Christian village in district Chandel of Manipur were selected. Fodder seed (rice bean, Fodder maize, sorghum, Oat), Napier hybrid cuttings, fertilizers (SSP, Urea, MOP) were distributed. Training cum demonstration programme on "Green fodder production throughout the year" and "Preservation of green fodder through silage" organized. Three training cum demonstration programme was conducted at Chandel districts, Manipur. During the programme 90 tribal dairy farmers were benefitted with fodder seeds, fertilizers and Napier hybrid cutting.

SKUAST-K, Srinagar: Fifty families under cold arid regions of district Kargil, Ladakh were selected. A Tribal Forage Day was organised on 17th October, 2018 at Mattayn village of Drass Kargil. Thirty beneficiaries of village Mattayn Drass of district Kargil benefitted by providing improved varieties of Oats SKO-90 and SKO-96 seed. Erection of chain link fencing at three demonstration plots was done to make the area self sufficient in seed production.

IGKV, Raipur: 52 Training/ Capacity building programme organized with 2493 participants. It involved 14 TSP District/KVK. Two Awareness camp/Exhibitions were organized with 181

participants. 20 Front Line Demonstrations were held. Procurement of Implements like Improved sickle (120), Crum Chick feed, Kadak Nath Chick (1500), Feeder Sudan sorghum grass (16Pkt), Knapsack sprayer for the distribution among the tribal farmers for the livelihood

BCKV, Kalyani: Maize (cv. J1006), *Moringa* seeds, Sorghum sudan, Rice bean (cv. Bidhan Ricebean-1 and Bidhan rice bean-2), Hybrid maize (cv. Disha), Coix (cv. Bidhan Coix-1), Lathyrus (cv. Prateek & Ratan), Toria (cv. B-54), Oats (cv. Kent), Berseem (cv. Wardan) seeds, planting materials (cuttings) of Bajra-Napier Hybrid (CO 3, CO 4 & CO 5) along with *rhizobium* culture, insecticides and fungicides were distributed alongwith technical know how. 60 farmers families were benefitted

BAIF, Uralikanchan: Activities under the financial support from Tribal Sub Plan were implemented in two villages namely Khandbara & Radikalam in Nandurbar district of Maharashtra It was need based and participatory programme. Being a hilly terrain area the farmers cultivate maize, sorghum, minor millets and pulses in *kharif* season while very small area is under *rabi* season crops due to non availability of irrigation facility. Two meetings were conducted with villagers one each in Khandbara & Radikalam villages separately to identify the needs of the farmers. During the discussion, some of the problems like increased cost on crop cultivation, no green fodder availability for cattle and scarcity of irrigation water during the winter were listed by the farmers. It was told by the farmers that if some support for lift irrigation and small implements is made available, then farmers can lift the water from the water source and use it for cultivation of crops during the *rabi* season and it will be an income generating activity for them. Identified 4 farmers user group one from each village to undertake the activity. Total no. of participating farmers was forty five. Demonstrated the cultivation of Berseem as rabi season fodder crop at 18 farmers field. Supplied 45 units of Mogi harrow and solar operated spray pump, one each to individual farmer and demonstrated the benefit of its use. Survey of the area for water resource, installation of water lifting pumps, cultivation of crop to be taken under irrigation was done. Meetings were conducted with participating farmers to decide the guidelines for use of common facilities of water lifting scheme among the participating farmers. Procured 4 diesel pump of 5 HP capacity and 1200 m PVC pipes of 3” diameter and were supplied to four groups of 10 farmers. Technical support in fodder cultivation was given to the farmers through field visits. Total farmers benefitted out of this programme were 45 in two villages.

AAU, Jorhat: Ten Fodder nurseries were established. Fodder Oat (var- JHO-99-2) grown in 2 ha of land covering 40 families. 20 sprayers distributed to 2 groups of farmers with 3-4 farmers in each groups. 8 motorized chaff cutters have been distributed to 8 groups of farmers. Two training programme were organized. 68 farm families were benefitted in Baksa district of Assam.

GBPUAT, Pantnagar: Two hundred farmers in villages namely Maduri, Salmata, Kanpura and Matiha, Jawarhar nagar in U S Nagar District and villages Basani, Dogra and Mora in Nainital District were selected. Total number of Forage demonstrations organized was 201. In Spring/Summer 2018, 77 demonstrations comprising of 66 in Sorghum and 11 in maize were organized. During Kharif 2018, 57 demonstrations including 50 in Sorghum and 07 in cowpea and during Rabi Season 2018-19, 67 demonstrations in oat were organized.

BAU, Ranchi: Thirty demonstrations in Chanho Block of Ranchi district during kharif 2018 were organized. Twenty Four demonstrations in Chanho Block and Eleven demonstrations in Mander Block of Ranchi district during Rabi 2018-19. Field day was organized on 31st Aug.2018 at BAU, Campus. Three Kisan Gosthi & Farmer's training organized on 06th March at Bokaro, 08th March at Dhanbad & 14th March at Kanke, Ranchi. Total beneficiaries were 1005 farmers.

PJTSAU Hyderabad: Identified 15 tribal families in Gangapur village in Utnoor mandal in Adilabad district in Telangana State with high tribal population. Seeds of different forage crops such as jowar, bajra, maize, cowpea and Lucerne and Hedge Lucerne, Bajra-Napier hybrid BN-1 slips were provided to the selected farmers. 2.0 HP power operated chaff cutter will also be supplied to the village to meet chaff cutting needs.

Location and Beneficiary Details

SN	State	District	Village	ST Farmers/ families benefitted
1	Himachal Pradesh	Kangra	Sapairu	40
2	Uttarakhand	US Nagar	Madpuri	77
			Salmata and Kanpura Jawahar nagar	57
		Nainital	Basani and Dogra	67
3	Manipur	Chandel	Lamphou Pasna, Japhou, Chandel Christian	90
4	Chhattisgarh	Rajnandgoan	Mokhla Rajnandgaon, <i>Kektitola, A. chowki, Mohla, Rajnandgaon, Murethitola</i>	151
		Dhamtari	Dhamtari, kurud, Magarload, Nagri	103
		Gariyaband	Gariyaband	200
		Kanker	Kanker, Chrama, Narharpur, Koyalibeda Durgukundal	200
		Narayanpur	Narayanpur	203
		Jagdapur	Jagdapur	200
		Dantewada	Geedam, KUWAKONDA, Katekalayan	216
		Bijapur	Bijapur	101
		Sukma	Sukma	74
		Korea	Sonhat, Manendragad, Baikunthpur, Khadgaon	200
		Ambikapur	Lundra, Udaypur, Ambikapur, Lakhanpur, Sitapur, Sontarai, Sarmana, Odgi, Surajpur, Premnagar Bhayathan, Ramanunjnagar	201
		Mainpat	Mainpat	218
		Jashpur	Kansabel, Pathalgaon,, Kunkuri	200
Balrampur	Balrampur	200		
5	Telangana	Adilabad	Gangapur	15
6	J&K	Kargil	Mattayn and Pandrass	140
7	Assam	Baksa	Charaimari, Kachukata, Uttar , Gandhibari, Balishia, Majaguri, Baregaon, Salmara	658
8	Jharkhand	Ranchi	Chano, Mander	1005
9	West Bengal	Bankura	Nachna, Dhangori, Jugda, Kalikapur, Kelati,	39
		Purulia	Kundatar, Ajadhya, Chiknobagan, Birgram, Kudlung, Tikartar, Kudna, Teliabhasha, Puranodih, Sindraidih, Madla, Bagandih, Kendghntu, Gobindapur, Saparambera,	40
10	Maharashtra	Nandurbar	Radikalam, Khandbara	45
11	Maharashtra	Nandurbar	Bokalzar	30

Monitoring Details of Rabi 2018-19 of AICRP (FC&U) Trials

S. N.	Centre	Monitoring Team	Date of Monitoring
1	AAU, Jorhat	Drs. Yogendra Prashad and Joseph Koireng	5-6 th Feb., 2019
2	BCKV, Kalyani	Drs. Rahul Kapoor and Birendra Kumar	29 th Jan., 2019
3	BAU, Ranchi	Drs. Rahul Kapoor and Kalyan Jana	28 th Jan., 2019
4	NDUAT, Faizabad	Drs. U.S Tiwana and Yogesh Jindal	14 th -15 Feb., 2019
5	JNKVV, Jabalpur	Drs. P. Mahadevu and Mukesh Chaudhary	12 th -13 th Feb., 019
6	AAU, Anand	Drs. P. S. Takawale and R. V. Kale	19 th Jan. 2019
7	BAIF, Urulikanchan	Drs. A. K. Mehta and B. G. Shivkumar	4 th - 5 th Feb., 2019
8	MPKV, Rahuri	Drs. A. K. Mehta and B. G. Shivkumar	5 th -6 th Feb., 2019
9	RAU, Bikaner	Drs. D. P. Gohil and H. K. Patel	3 rd -4 th Feb., 2019
10	PAU, Ludhiana	Drs. Rajan Katoch and Naveen Kamboj	12 th Feb., 2019
11	CCS, HAU, Hisar	Drs. R.C. Bairwa and S. S. Shekhawat	7 th Feb., 2019
12	GBPUA&T, Pantnagar	Dr. N. R. Bhardwaj	12 th Feb., 2019
13	TNAU, Coimbatore	Drs. Mareen Abraham and Usha C Thomas	8 th Feb., 2019
14	ANGRAU, Hyderabad	Drs. Naveen Kumar and V. K. Sood	19 th Feb., 2019
15	RPCAU, Pusa	Drs. Birendra Kumar and Yogendra Prashad	8-9 th Feb., 2019
16	CSK HPK, Palampur	Drs. M. S. Pal and N. R. Bhardwajth	4 th -5 th Apr., 2019
17	IGKV, Raipur	Drs. A.H. Sonone and A. B. Tambe	28 th -29 th Feb., 2019
18	KAU, Vellayani	Dr. A. K. Roy	10 th Dec., 2018
19	UAS (ZARS), Mandya	Dr. A. K. Roy	11 th -12 th Dec., 2018

Forage In-house Breeding Activities Rabi 2018-19

AICRP (FC&U), PAU, Ludhiana

Varieties developed in last 4 years: 11

Year	Crop	Varieties developed	Features
2014-15	Oats	OL 10	It is a multicut (2 cuts) variety recommended for irrigated areas of Punjab. Its plants are tall with profuse tillering and leafy growth. The leaves are longer and broader. Its fodder quality is superior to checks OL 9 and Kent. On an average, it yields about 680 quintals of green fodder per ha and has high seed yield.
2015-16	Oats	OL 1804	It is a single cut variety of oats recommended for North East Zone comprising of states viz; West Bengal, Odisha, Jharkhand, Bihar, Eastern Uttar Pradesh, Manipur and Assam. Its average GFY is 400q/ha.
		OL 1802	It is a multicut variety of oats recommended for Central Zone comprising of states viz; Central Uttar Pradesh, Maharashtra, Gujarat, Chhattisgarh and Madhya Pradesh. Its average green fodder yield is 560q/ha.
	Bajra Napier Hybrid	PBN 346	It is a Bajra Napier hybrid recommended for irrigated areas of Punjab state. Its plants have long, smooth, non-hairy and broad leaves. The fodder yield and silage quality of this variety is better than PBN 233. It yields 1750 quintal of green fodder per ha.
2016-17	Oats	OL 11	It is a single cut variety recommended for irrigated areas of Punjab state. Its fodder quality is superior to OL 9 and Kent. On an average, it yields about 600 quintals of green fodder and 21 quintals of seed per ha.
		OL 1760	It is a single cut variety of oats recommended for South Zone comprising of states viz; Tamil Naidu, Telangana, Andhra Pradesh and Karnataka. On an average, it yields about 360 quintals of green fodder per ha. Its fodder quality is better than the checks OS 6 and Kent.
		OL 1769-1	It is a single cut variety of oats recommended for Central Zone comprising of states viz; Uttar Pradesh, Maharashtra, Gujarat, Chhattisgarh and Madhya Pradesh. On an average, it yields about 500 quintals of green fodder per ha.
		OL 1802-1	It is a single cut variety of oats recommended for North West Zone comprising of states viz; Punjab, Haryana, Rajasthan, Uttarakhand and Western Uttar Pradesh. Its average green fodder yield is 540 q/ha.
	Bajra Napier Hybrid	PBN 342	It is a Bajra Napier hybrid recommended for NWZ, NEZ and SZ comprising of states viz; Punjab, Haryana, Rajasthan, Odisha, Assam, Tamil Naidu and Karnataka. The fodder yield quality of this variety is better than national checks viz; PBN 233 and CO 3. Its average green fodder yield is 1100q/ha
2017-18	Berseem	BL 43	It is a quick growing and tall variety of Berseem with more number of tillers recommended for irrigated areas of Punjab state. It supplies superior quality green fodder of 1000 quintals per acre up to first week of June and gave good seed yield.
	Oats	OL 12	It is a single cut variety recommended for irrigated areas of Punjab state. Its fodder quality is superior to OL 9, OL 11 and Kent. On an average, it yields about 638 quintals of green fodder and 22.5 quintals of seed per acre.

PGR status (evaluated/ maintained):

- Germplasm maintained/ handled (680) including Oats (580) and Berseem (100)

Entries contributed in AICRP (FCU) breeding Trials during Rabi 2018-19 - (19)

Crop	Proposed in trial	Name of entry
Oat	IVTO-Dual	OL 1766-2, OL 1874-2
	IVTO-SC	OL 1876-1, OL 1874-1
	IVTO-MC	OL 1895, OL 1882
	AVTO-SC-1	OL 1896
	AVTO-1 Dual	OL 1876-2, OL 1906
	AVTO-2-SC	OL 1861, OL 1862, OL 1869-1
	AVTO-2-SC (seed)	OL 1861, OL 1862, OL 1869-1
	AVTO-1-MC	OL 1874
Berseem	AVTB-1	PC 91
	IVTB	BM 12
Rye grass	AVT-Lolium	PBRG 2

OATS

Station and Multilocation Trials: A total of seven evaluation trials (5 station and 2 multi-location) were conducted. The promising entries identified on yield basis are given below:

SN	Description of the Trial	Promising entries
1.	Multilocation Fodder Trial in oats-multi cut	OL 1874-1, OL 1882, OL 1924, OL 1888
2.	Multilocation Fodder Trial in oats—Single cut	OL 1874, OL 1862, OL 1869-1 OL 1926, OL 1896
3.	Advance trial-Multi cut-I	OL 1929, OL 1917, OL 1918, OL 1919
4.	Station trial Oats-Multi cut-II	OL 1957, OL 1959, OL 1960, OL 1949
5.	Station trial Oats -Single cut	OL 1874, OL 1862, OL 1869-1 OL 1926, OL 1896

Germplasm Collection, Maintenance and Evaluation: A total of 580 germplasm lines were maintained following standard breeding procedures.

Hybridization: A total of One hundred sixty crosses have been attempted involving promising genotypes and exotic germplasm accessions.

Breeding material handled

Generation	Number of progenies handled	Generation	Number of progenies handled
F ₁	100	F ₂	130
F ₃	450	F ₄	850
F ₅	550	F ₆	150
Total	2230		

Berseem

- Two evaluation trials (1 station and 1 multi-location) were conducted and two promising entries PC 91, BM 12 were identified on yield basis.
- A total of 25 Polycross progenies were maintained and evaluated.

Nucleus Seed Production (Q)

Crop	Variety	Nucleus seed	Crop	Variety	Nucleus seed
Oats	Kent	1.50	Berseem	BL 10	0.50
	OL 9	0.30		BL 42	0.50
	OL 10	1.00		BL 1	0.10
	OL 11	0.80		BL 22	0.10
	OL 12	0.90		BL 180	0.30
Ryegrass	PBRG1	0.30			

Besides the recommended varieties, seed of advanced lines and selected elite material was also produced in oats, berseem and lucerne.

AICRP (FC&U), UAS (B), ZARS, Mandya

Cowpea

Crossing Programme: (DOS: 29-01-2019) Evaluation of F₃ generation

- 282 lines of (MFC -09-1 x BL -1) and 149 lines of (EC – 170578 – 1-1 x KBC-9) parents were evaluated in F₃ generation.

Forwarding of F₂ generation: (DOS: 20-07-2018) The following crosses were forwarded to F₃ generation.

S.N.	Cross combination	S.N.	Cross combination
1.	MFC-09-1 x BL-1	5.	EC-170578-1-1 x BL-1
2.	KBC-9 x BL-1	6.	Goa Local x KBC-2
3.	EC-170578-1-1 x KBC-9	7.	KBC-9 x MFC-09-13
4.	Goa Local x EC-170578-1-1		

Promising genotypes selected for forwarding to F₄ generation

SN	Genotypes	SN	Genotypes	SN	Genotypes
1.	18-50-3-1	7.	18-50-3-11	13.	18-50-4-10
2.	18-50-3-9	8.	18-50-3-11	14.	18-50-4-19
3.	18-50-3-9	9.	18-50-3-11	15.	18-50-4-27
4.	18-50-3-9	10.	18-50-3-11	16.	18-50-4-35
5.	18-50-3-9	11.	18-50-4-9	17.	18-50-4-35
6.	18-50-3-11	12.	18-50-4-9	18.	18-50-4-38

Multiplication and maintenance of elite breeding material

SN	Genotype	SN	Genotype	SN	Genotype
1.	MFC-08-14	8.	MFC-09-12	15.	MFC-09-20
2.	MFC-09-1	9.	MFC-09-13	16.	MFC-09-21
3.	MFC-09-3	10.	MFC-09-14	17.	MFC-09-22
4.	MFC-09-6	11.	MFC-09-15	18.	MFC-09-17
5.	MFC-09-7	12.	MFC-09-24	19.	MFC-09-8
6.	MFC-09-23	13.	MFC-09-18	20.	MFC-09-9
7.	MFC-09-11	14.	MFC-09-19	21.	MFC-09-16

Maize

Evaluation of different seed colour inbred lines for fodder traits (DOS: 26.01.2019)

- White seeded fodder type genepools : 08
- Orange seeded fodder type genepools : 34
- Yellow seeded fodder type genepools : 09

Generation and Evaluation of new crosses with selected disease resistant maize inbred lines

F₁ Generation

1	5-12-1 x p-12	9	1-85-1 x CAL 1443
2	CM 202 x African Tall	10	1-105-6 x CML 451
3	CAL 1443 x MAI-8	11	5-16-14 x CML 451
4	(P-12 x MAI-8) x African Tall	12	1-106-6 x CML 451
5	African Tall x CML 451	13	1-19-5 x CML 451
6	MAI 316 x African Tall x CML 451	14	(African Tall x CAL 1443) x CML 451
7	P-8 x MAI -8 x African Tall	15	P-8 x 1-50-7
8	1-85-1 x P-8		

Forwarding and Evaluation of F₃ Generation (DOS: 26.01.2019)

Crosses	No. of population	Crosses	No. of population
MAI 316 x African Tall	07	MAI 8 x African Tall	04
MAI 13 x African Tall	04	MAI 298 x African Tall	03
MAI 2 x African Tall	03	MAI 11 x African Tall	04
MAI 715 x African Tall	08	MAI 12 x African Tall	02

Evaluation of F₂ generation (DOS: 26.10.2018): F₂ generation of (African Tall X CML 1443) and (J1006 X CML 1443) were evaluated

- The MAI lines serial No. 1 to 12 are resistant inbreds obtained from AICRP on Maize, Mandya center.
- CAL 1443 is an inbred line obtained from CIMMYT good with fodder traits i.e. more no. of leaves with broad and stay green type.
- CM 202, P 8 & P 12 are best combiners with good combining ability and hence used as testers in the breeding programme.

Generation of new crosses for improving disease resistance and development of inbreds with good fodder traits (DOS: 20-07-2018)

- Method: L X T, Lines: 50 lines, Testers: 4 (P8, P12, CAL1443 and CM202)
- **Remarks:** Crop is harvested and observation being recorded.

AICRP (FC&U), CCS HAU, Hisar

❖ Station Trials

SN	Name of the trial	No. of Entries	Promising genotypes
1.	Progeny Row Trial –SC	21+3	PRT-3&4
2.	Progeny Row Trial –MC	21+3	PRT-11&22
3.	Small Scale Trial-SC	10+2	HFO-909 & 1002
4.	Small Scale Trial-MC	12+2	HFO-915 & 921
5.	Large Scale Trial-SC	14+2	HFO-607 & 718
6.	Large Scale Trial-MC	15+1	HFO-809 & 716
7.	Large Scale Trial-Dual	14+2	HFO-903 & 904
Berseem			
1.	Progeny Row Trial	12+4	PRT-B, HFB 16-2
2.	Small Scale Trial	8+4	HFB 15-3 & 15-6
3.	Large Scale Trial	8+4	HFB 14-3 & 14-5

❖ Breeding material

Generation	No. of Crosses	Generation	No. of Crosses
F1	40	F4	18
F2	48	F5	33
F3	71	F6	43

❖ Maintenance of wild oat species: 16

❖ Germplasm maintenance: Oat (300), Berseem (120)

❖ Nucleus/Breeder seed production

Crop: Oat	Quantity (Q)	Crop: Berseem	Quantity (Q)
HJ-8	20.0	Mescavi	1.5
OS-6	3.0	HB-1	2.0
OS-403	6.0	HB-2	5.0
OS-377	6.0		

AICRP (FC&U), TNAU, Coimbatore

Crop varieties released by CVRC during 2018-19: (3)

- **BN hybrid - CO-6:** Developed by using Fodder cumbu CO 7 x Napier grass FD 459 parents. Released by CVRC in 2019 for Punjab, Haryana, Rajasthan, Maharashtra, Gujrat, Uttar Pradesh, Madhya Pradesh and Chhattisgarh. Higher green fodder yield, dry matter yield and crude protein yield.
- ***Cenchrus setigerus* - CO 2:** Derivative of selection from *Kangayam* local, released for Tamil Nadu, Karnataka, Telangana and Andhra Pradesh. Superiority for GFY and DMY over the national check. Higher digestibility.
- ***Desmanthus virgatus* - CO 2:** Derivative of Gamma ray mutant of CO-1, released for Punjab, Rajasthan, Maharashtra, Gujarat, Uttar Pradesh, Tamil Nadu, Karnataka, West-Bengal, Telangana and Kerala. Superior (12.91 %) for GFY, 15.15% for DMY, 12.79% for CPY and 3.71% for CP over the national check CO-1.

Interspecific hybridization in Lucerne

- Seeds of two wild species of Lucerne such as *Medicago falcata* and *M. truncatula* were collected from Leh and Ladakh regions J&K through SKUAST, Srinagar. These two species will be raised in glass house for effecting inter-specific hybridization with *M. sativa*.

Mutation breeding in Lucerne

- The seeds of Lucerne variety CO 2 have been irradiated with gamma ray @ 100, 200 and 300 Gy and EMS treated @ 0.1, 0.2, 0.3 and 0.4% with the objective of creating variability. The treated seeds are being evaluated during *rabi* 2018-19.

AICRP (FC&U), JNKVV, Jabalpur

Germplasm holding: Oat (117) + Berseem (104)

Berseem

- To create variability, poly cross nursery programme has been started taking five diverse parents viz., Wardan, BL 42, Mescavi, UPB 110, and JB 1. Tripping has been done to ensure cross pollination in all possible combination. Selections shall be made in all for fodder traits in coming generation.
- Variety JB5 has been treated with different doses (five) of gamma rays. Single plant selection and row bulks were done, treatment wise to raise the M₂ generation³
- In Wardan, five superior bulks were selected from mutated population.

Oat

- Under National crossing programme crosses have been attempted with Kent and JO1 with *Avena sterilis*. Seeds were grown as fourth filial generation.
- 53 advanced lines were evaluated for different fodder traits.
- No. of crosses made - 11
- Segregating material advanced/ handled - 34 (F₂ onwards)
- Advance breeding lines - 56

AICRP (FC&U), NDUAT, Faizabad

Variety Developed

- **NDO-1101 (Narendra Jayee-1101):** One new dual purpose oat variety NDO-1101(Narendra Jayee- 1101) was released by S.V.R.C., Lucknow in 2018 and recommended for cultivation under normal and salt affected soils of whole U.P.

Germplasm collection, evaluation & maintenance

SN	Crop	New collections	Sources of collection	Total collections
1.	oat	05	Barabanki , Ghazipur, Raebareli & Sultanpur	170
2.	Berseem	04	Barabanki , Ghazipur, Raebareli & Sultanpur	24

Breeding Programme in oat: Twelve new crosses were made during Rabi 2018-19

SN	Cross combinations	SN	Cross combinations
1	NDO1802 x <i>Avena sterilis</i>	7	NDO 1101x <i>Avena sterilis</i>
2	NDO1802 x LC-6	8	NDO 1101 x LC-6
3	NDO1802 x LC-7	9	NDO 1101 x LC-7
4	NDO711 x <i>Avena sterilis</i>	10	NDO 952 x <i>Avena sterilis</i>
5	NDO711 x LC-6	11	NDO 952 x LC-6
6	NDO711 x LC-7	12	NDO 952 x LC-7

Segregating generations: Advance lines-11

Generation	lines	Generation	lines	Generation	lines
F1	12	F3	14	F5	07
F2	16	F4	11	F6	05

One station trial viz., VT Station on Forage oat was conducted. Fourteen genotypes were tested against two checks viz., NDO-1 and NDO-2.

AICRP (FC&U), SKRAU, Bikaner

Variety development: One Lucerne variety RRB-07-1 (Krishna) developed from Bikaner centre has been released and notified for North West zone of the country in 2016.

Breeding work: Seeds obtained from polycross made during Rabi-2017-18 were evaluated during Rabi-2018-19. Superior plants were selected to make better composite population. New polycross were made among ten selected entries of lucerne. Seed harvested from such crosses will be evaluated in Rabi-2019-20 for further use. Selection of superior plants was also done from the seed material generated from crosses made in previous years.

Germplasm: 25

Seed multiplication: Seed of newly developed variety Krishna of lucerne from Bikaner centre was further multiplied to take its seed production on a large isolated area in future for distribution to farmers.

AICRP (FC&U), AAU, Anand

Lucerne

- Germplasm maintenance: 281 Lines
- New Germplasm collection: 1

Population improvement: two populations each consisting of four genotypes were raised and maintained:

Population-1 (ALC-I)	Population-2 (ALC-II)
Kutchhi-1	BAIF-1
TNCO-3 (TN)	AL-3
AL-3 (AND)	Krishna
TSLU-14-3 (Hyd)	Anand-2

Crossing programme

SN	Cross combination	SN	Cross combination
1.	CO-1 x CO-2	2.	NDDB (Super sanic) x Banaras
3.	BAIF-1 x Anand-2	4.	TNFD x Alamdar-51
5.	Kutchhi x AL-3	6.	TNCO-3 x TSLu-14-3

Segregating materials

Generation	Sown	Selected IPS	Generation	Sown	Selected IPS
F ₁	25 (Polycross)	25	F ₆	38 (Polycross)	59
	10 (Regular)	10		21 (Regular)	40
F ₃	16	39	F ₇	13	9
F ₄	38	103			

Maize

Crossing programme

S.N.	Cross combination	S.N.	Cross combination
1.	AFM-4 x African Tall	2.	AFM-5 x African Tall
3.	AFM-5 x Pratap Makka-Chari	4.	AFM-4 x Pratap Makka-Chari

Population improvement: Four populations each consisting of five genotypes were raised and maintained:

Population-1 (AFMC-1)	Population-2 (AFMC-2)	Population-3 (AFMC-3)	Population-4 (AFMC-4)
AFM-1	AFM-5	Pratap Makka Chari	GWC-0803
AFM-2	AFM-6	GWQPM-68-3	GWC-0609
AFM-3	AFM-7	GWC-0320	Narmada Moti
AFM-4	AFM-8	GWC-0801	GWC-0400
African Tall	African Tall	African Tall	African Tall

Maintained eight populations viz. AFM-1, 2, 3, 4, 5, 6, 7 & 8.

AICRP (FC&U), BAU, Ranchi

- ❖ **Station Trial of Oat (Dual):** Out of ten entries tested along with national checks (UPO-212), the entry RSO-60 (466.7 q/ha) were found significantly superior. Entry HFO-619 (453.3 q/ha) and BAU-O-101 (396.7 q/ha) were found significantly superior with second national check i.e Kent.
- ❖ **Station Trial of Lathyrus:** Out of ten entries tested the varietal differences were found significantly superior with national check i.e Ratan (190.0 q/ha). The entry BL-5 was reported maximum for GFY (234.0 q/ha) followed by BL-1 (225.0 q/ha) and at par with national check Nirmal (203.5 q/ha) for GFY.
- ❖ **Maintenance of oat germplasm line:** 50 germplasm lines were sown on Rabi 2018-19 for maintenance.
- ❖ **New Crosses made in Oat**

SN	Cross combination	SN	Cross combination
1.	OL-1871 x UPO-212	2.	(HFO-60 x UPO-212) x Kent
3.	RSO-60 x RO-19	4.	(JHO-13-14 x UPO-212) x RO-19
5.	UPO-212 x OL-1871	6.	(HFO-619 x UPO-212) x OL-1871
7.	HFO-619 x OL-1871	8.	(JHO-10 x JHO-2000-4) x OL-1769

- ❖ **Segregating generation of Oat**
 F₂: The following four F₂ population were planted and 40-50 single plant selected from each population were made:
 - i. HFO-619 x UPO-212
 - ii. RSO-60 x UPO-212
 - iii. SKO-170 x OL-1871
 - iv. JHO 13-14 x UPO-212
- ❖ F₄: The following four F₃ population were planted and 20-25 single plant selected from each population were made:
 - i. JHO-10 x JHO-2000-4
 - ii. UPO-12-1 x UPO-10-3
 - iii. RSO-59 x OS-6
 - iv. OS-377 x JHO-10
- ❖ F₇: F₆ population were planted and 15 single plant were selected and remaining plants were bulked
 - i. Kent x JHO-13-14
 - ii. JHO 13-14 x UPO-212
 - iii. JHO 99-2 x OS-403
- ❖ **Lathyrus:** 31 germplasm lines were sown during rabi 2018-19 for maintenance.
- ❖ **Maize:** 45 germplasm lines were sown during rabi 2018-19 for maintenance.
- ❖ **Research project sanctioned during 2019-20:** One Project approved for three years.

Title of the project	PI	Budget	Funding Agency	Status
Technology Integration for Doubling Farm Income through Demonstration and Training of Innovative Technologies in District of Jharkhand	PI: Dr. A. K. Singh Co-PI: Dr. Yogendra Prasad	50.00 Lakhs	DBT	Dumka and Palamau for Field demonstraion & training for Doubling Farm Income

AICRP (FC&U), PJTSAU, Hyderabad

Germplasm Holding

SN	Crop	Collections (no.)	Source
1.	Fodder Cowpea (<i>Vigna unguiculata</i>)	60	1. NBPGR, Regional Station, Hyderabad 2. RARS, ANGRAU, Tirupathi 3. Local collections
2.	Fodder Maize(<i>Zea mays</i>)	30	1. Winter Nursery, DMR, Hyderabad 2. NBPGR, New Delhi
3.	Fodder Bajra <i>Pennisetum glaucum</i> <i>Pennisetum Orientale</i>	56 48 8	ICRISAT, Hyderabad.
4.	Napier Lines (<i>Pennisetum purpureum</i>)	15	TNAU, Coimbatore.
5	Lucerne (<i>Medicago sativa</i>)	12	collections from Gujarat and Maharashtra
6	Hedge lucerne	8	Local Collections
7	Perennial Sorghum	4	Local collection
8	Para grass	3	<i>Bracharia mutica</i> , <i>B. brizantha</i> , <i>B. ruzizivensis</i>

Fodder Maize:

Development of Inbred lines in Forage Maize:

Kharif 2016	<ul style="list-style-type: none"> Inbreeding programme was initiated for development of inbred lines using African tall as source population. Ear to row planting was taken up. Selfing and sib mating was done in the selected plants (selection criteria is more plant height, early duration) in each progeny. This completes the first cycle of inbreeding.
Kharif 2017	<ul style="list-style-type: none"> Selfed and sib mating plants were raised separately in ear to row progeny. Selfing was carried out in selected plants in selfed progenies Sib mating was done in full sib families.
Rabi 2017-18	<ul style="list-style-type: none"> Selfing in selfed population was done.
Rabi 2018-19	<ul style="list-style-type: none"> Sib mating was done in full sib families.

Forage cowpea

- 15 New cowpea germplasm lines were sown for seed multiplication.
- Seed multiplication of TSFC 18-16 has been taken up.

Forage sorghum:

- 14 Fodder sorghum hybrids were developed using 7 lines and 2 testers. Among 14 hybrids 6 are red kernel genotypes and 8 are white kernel genotypes

SN	Cross combination	Kernel colour	SN	Cross combination	Kernel colour
1	ICSA 389 X SSG59-3	Red	8	ICSA 425 X SSG 59-3	White
2	ICSA 627 X SSG 59-3	Red	9	ICSA 469 X SSG 59-3	White
3	IS 2848A X SSG 59-3	Red	10	ICSA 474 X SSG 59-3	White
4	ICSA 389 X PC-6	Red	11	ICSA 422 X PC- 6	White
5	ICSA 627 X PC-6	Red	12	ICSA 425 X PC-6	White
6	IS 2848A X PC-6	Red	13	ICSA 469 X PC-6	White
7	ICSA 422 X SSG 59-3	White	14	ICSA 474 X PC-6	White

AICRP (FC&U), CSKHPKV, Palampur

Germplasm Holding

Crop	Number of collections
Tall Fescue Grass (<i>Festuca arundinacea</i>)	58
Rye Grass (<i>Lolium perenne</i>)	8
Red Clover (<i>Trifolium pratense</i>)	9
White Clover (<i>Trifolium repens</i>)	58
Oat (<i>Avena</i> spp.)	337

Generation of breeding material

Oat

- Sixty elite genotypes of oat were evaluated for dual purpose, powdery mildew resistance and β glucan content. Genotypes KRR-AK-26, JPO-46, JPO-38 and IG-03-205 were found resistant to powdery mildew and superior for forage yield, quality traits.
- For β -glucan content, eleven genotypes viz., EC-528883, HFO-52, HJ-8, JPO-18, JPO-19, JPO-46, JPO-44, JPO-38, K-353, IG-03-203 and PLP-14 were found superior as compared to the best check Kent (4.30%).
- Forty different crosses among diverse genotypes involving *Avena sativa* x *A. sativa* and *A. sativa* x *A. sterilis* and *A. sativa* x *A. byzantine* were made to create genetic variability and the materials are in segregating, backcross and advance generations. About 250 breeding lines have been selected. Promising entries were evaluated in station trials. Seed of three promising entries have been multiplied.
- Segregation pattern of powdery mildew disease indicated that resistance was governed by a single dominant gene in HJ-8 x PLP-1, HJ-8 x EC-528896, HJ-8 x JPO-46, HJ-8 x *A. sterilis* and HJ-8 x KRR-AK-26 cross combinations.
- Wide crosses of cultivated oat with diploid & tetraploid spp. were attempted to introgress desirable alien chromatin. Sixty-two embryos were rescued and cultured. Colchicine treatment was given to the regenerated plantlets and transferred to pots for hardening.
- While comparing the karyotype of different *Avena* species, it was observed that in tetraploid (*A. barbata* and *A. murphii*) and hexaploid species (*A. sterilis* and *A. sativa*) the number of sat chromosomes and sub terminal chromosomes were just the same as that in the diploids (*A. strigosa*) thus indicated that some chromosomes of *A. strigosa* may be present in these tetra and hexaploid species. The most striking feature of the hexaploid karyotype was 10 sub terminal chromosomes while in diploid and tetraploid species only two sub terminal chromosomes were present thus indicating the unknown sources of different genomes.

Tall Fescue Grass

- Polycross progenies derived from different diverse genotypes viz., Hima-4, Sel.-8, Hima-1, Sel.-49, Sel.-85, Sel.-88, EC-178181, Hima-3 and Sel.-48 were evaluated for various forage attributes so as to identify good general combiners for development of synthetic variety.

Lolium x Festuca hybridisation

- Perennial rye grass (*Lolium perenne*) were crossed with Tall fescue grass (*Festuca arundinacea*) to develop F₁ hybrids. Hybridity was confirmed using SSR markers.

White clover

- Seed of four populations namely, PWC-3, PWC-22, PWC- 25 and PWC-26 was multiplied. Two entries have been contributed in Coordinated trials.

Red clover

- Restricted Recurrent Phenotypic Selection has been taken up for developing superior populations.

AICRP (FC&U), BCKV, Kalyani

Germplasm maintained

crop	Total number of lines
Rice bean	250
Lathyrus	5

- Five (5) germplasm lines of lathyrus were evaluated against checks *viz.*, Ratan (BIO L 212) as Large Scale Trial (LST) on production of green forage cum seed production as dual purpose.

Seed Production:

Crop	Variety	Nucleus seed	Breeder seed
Rice bean	Bidhan Rice bean 1	8.5 kg	50 kg
	Bidhan Rice bean 2	6.5 kg	120 kg
	Bidhan Rice bean 3	5.5 kg	20 kg

TFL seed production

- Oat (cv. Kent) – 30 kg
- Lathyrus (cv. Ratan: BIO L 212) – 30 kg
- Lathyrus (cv. Prateek) – 50 kg
- Berseem (cv. Wardan) – in process

Management of BN hybrid during *rabi*, 2018-19

- BN hybrid (CO-3) : 6850 cuttings (Approx.)
- BN hybrid (CO-4) : 7730 cuttings (Approx.)
- BN hybrid (CO-4) : 4580 cuttings (Approx.)

Study on gamma ray induced mutagenesis in Bidhan Rice Bean 1:

M 2 generation

Design: RBD

Replication: 3

To find out any morphological mutants in regards to forage quality (high protein or fibre), photo insensitivity, early flowering, bushy types (without the trailing habit) *etc* or any other agro-economic traits. Variants serving dual purpose character (seed + green forage) could be a good finding which may be of two types- (i) Green forage yielder after proper harvesting of seeds: in that case early flowering mutants will be selected; (ii) Green forage yielder before the harvesting of the seeds, here late flowering may be selected. The selected plants from the M1 generation will be evaluated in the M2 and M3 generations for confirmed selection of desired mutants.

Development of production technology

Performance of grass pea (cv. prateek) on residual fertility status after harvesting of de-topping maize

AICRP (FC&U), GBPUA&T, Pantnagar

Oat

Germplasm maintenance: A total of 314 oat germplasm lines comprising indigenous, exotic and improved genetic stocks have been planted and maintained during the season.

Crossing block: 56 advance lines and 42 exotic lines were planted for crossing and maintenance.

Evaluation of generations

Generation	No. of lines	Generation	No. of lines
F ₁	9	F ₇	140
F ₄	128	F ₈	78
F ₅	152	F ₉	24
F ₆	123		

Multiplication of advanced lines/released varieties

Advanced lines						Released varieties	
SN	Genotypes	SN	Genotypes	SN	Genotypes	SN	Genotypes
1.	UPO-05-1	2.	UPO-12-2	3.	UPO-18-2-1	1.	UPO-94
4.	UPO-06-2	5.	UPO-16-1	6.	UPO-18-2-1	2.	UPO-212
7.	UPO-09-1	8.	UPO-16-1	9.	UPO-18-2-2	3.	UPO-6-1
10.	UPO-09-2	11.	UPO-16-2	12.	UPO-18-3	4.	JHO-822
13.	UPO-09-3	14.	UPO-16-3	15.	UPO-18-4-1	5.	Kent
16.	UPO-10-1	17.	UPO-16-4	18.	UPO-18-4-2		
19.	UPO-10-2	20.	UPO-18-1-1	21.	UPO-18-4-3		
22.	UPO-10-3	23.	UPO-18-1-2	24.	UPO-18-4-4		
25.	UPO-11-1	26.	UPO-18-1-3	27.	UPO-18-5		

Multiplication of Berseem cv. UPB-110: For the purpose of nucleus seed production berseem variety UPB-110 have been multiplied in isolated plot.

New crosses in Oat: Nine

SN	Crosses	SN	Crosses
1.	UPO-261 x UPO-272	6.	UPO-276 x EC-246207
2.	UPO-04-4 x UPO-272	7.	(Gophor // UPO-212 // UPO-212)-3-1-1 (OX-865) x (Portal) Kent // UPO-212) – 3 – 2 – 1(OX-864)
3.	EC-2424177 x EC-8	8.	(UPO-201 x UPO-247) – 1 – 5 x UPO - 253
4.	EC-48 x (Portal) Kent // UPO-212) – 3 – 2 – 1 (OX-864)	9.	Gophor // UPO-212 // UPO-212)-3-1-1 (OX-865) x EC-108
5.	UPO-216 (OX-291) Portal/India x OX-766		

Basic and Breeder Seed Production: Breeder seed of UPO 212 (40.0 q.) was produced as per BSP – I (31.5 q) received from the PC (FCU), IGFRI, Jhansi.

State varietal trial: One State varietal trial of oat was conducted during Rabi 2018-19.

AICRP (FC & U), MPKV, Rahuri

Development of Dual Purpose Fodder Oat: During *rabi*, 2018-19, eighty-four individual F₁ plants were selected and harvested individually from twenty-six crosses of forage Oat (Dual). The 84 F₂ progenies will be grown and evaluated during *rabi*-2019-20 for green forage yield and seed yield potential.

SN	Cross	F ₃	SN	Cross	F ₃
1	RO- 11 - 1- 3 x P. Surabhi	4	14	RO- 11 - 1- 13 x RSO-8	3
2	RO- 11 - 1- 4 x P. Surabhi	5	15	RO- 11 - 2- 2 x RSO-8	4
3	RO- 11 - 1- 6 x P. Surabhi	5	16	RO- 11 - 2- 8 x RSO-8	5
4	RO- 11 - 1- 8 x P. Surabhi	4	17	RO- 11 - 2- 11 x RSO-8	4
5	RO- 11 - 1- 12 x P. Surabhi	4	18	RO- 11 - 2- 12 x RSO-8	3
6	RO- 11 - 1- 3 x P. Harita	2	19	RO- 11 - 1- 13 x P. Surabhi	3
7	RO- 11 - 1- 4 x P. Harita	5	20	RO- 11 - 2- 2 x P. Surabhi	3
8	RO- 11 - 1- 6 x P. Harita	1	21	RO- 11 - 2- 8 x P. Surabhi	4
9	RO- 11 - 1- 8 x P. Harita	1	22	RO- 11 - 2- 11 x P. Surabhi	1
10	RO- 11 - 1- 12 x P. Harita	3	23	RO- 11 - 2- 12 x P. Surabhi	1
11	RO- 11 - 1- 3 x Kent	5	24	RO- 11 - 1- 13 x P. Harita	3
12	RO- 11 - 1- 4 x Kent	2	25	RO- 11 - 2- 2 x P. Harita	3
13	RO- 11 - 1- 6 x Kent	5	26	RO- 11 - 2- 8 x P. Harita	1

Hybrid Napier: Seventeen Bajra x Napier crosses were effected during Rabi-2018-19. These 17 crosses will be sown during *Kharif*, 2019 for isolating heterotic clones for green forage yield and other attributes.

	Female	Male		Female	Male
1.	Giant Bajra	FD-444	10.	Giant Bajra	FD-472-1
2.	Giant Bajra	FD-468-1	11.	Giant Bajra	FD-453
3.	Giant Bajra	GBN-2001-1	12.	Giant Bajra	FD-477-2
4.	Giant Bajra	GBN-2001-3	13.	Giant Bajra	PT-1890 X 443-317
5.	Giant Bajra	GBN-2001-4	14.	Giant Bajra	FD-407-1
6.	Giant Bajra	GBN-2001-6	15.	Giant Bajra	FD-472-2
7.	Giant Bajra	GBN-2001-7	16.	Giant Bajra	FD-436
8.	Giant Bajra	GBN-2001-8	17.	Giant Bajra	FD-477-1
9.	Giant Bajra	FD-482			

Germplasm maintenance

SN	Crop	Nos.	SN	Crop	Nos.
1.	Oat	44	8.	Napier (<i>Pennisetum purpureum</i> L)	33
2.	Maize	74	9.	Guinea grass (<i>Panicum maximum</i> L)	11
3.	Marvel (<i>Dichanthium spp.</i>)	48	10.	Madras Anjan (<i>Cenchrus spp.</i>)	44
4.	Dongari (<i>Chrysopogon fulvus</i>)	13	11.	Rhodes grass (<i>Chloris gayana</i>)	7
5.	Butterfly pea (<i>Clitoria ternatea</i>)	25	12.	Dinanath (<i>Pennisetum pedicellatum</i>)	5
6.	Moshi (<i>Iseilema wightii</i>)	3	13.	Ber (<i>Ischaemum aristatum</i>)	3
7.	Stylo (<i>Stylosanthes spp.</i>) [<i>S. seabrana</i> : 35; <i>S. scabra</i> : 5; <i>S. viscosa</i> : 1; <i>S. seca</i> : 1; <i>S. hamata</i> : 2]	44			
	Total			354	

AICRP (FC&U), BAIF, Urulikanchan

Lucerne

Polycross progeny evaluation programme: New cycle of polycross was initiated in *Rabi* 2016-17. The cross seed (F₁) obtained from eight genotypes namely BAL08-1, RLG 08-1, ALS-11, BAL08-6, RLG 08-10, ALS-2, BAIF lucerne-1 and Alamdar-51 was sown in 30 x 10 cm distance along with parental lines. The progenies were evaluated for GFY, DMY, CPY etc. Identified nineteen IPs from the progenies for further evaluation.

Germplasm collection: Two accessions were collected from Kutch and Jamnagar district of Gujarat and the total availability of Lucerne germplasm at Center is fifty-four.

Evaluation of germplasm: The germplasm (48 accessions) collected from different parts of Maharashtra, Gujarat and Rajasthan state and three check varieties namely RL 88, Anand-2 and Co-1 were sown in Randomized Block Design. All the accessions will be evaluated for growth, forage yield, quality traits and perenniality. Out of 48 accessions, 2 accessions were annual types. The data for 46 accessions on yield, quality and growth parameters was generated for thirteen cut.

Chemical mutagenesis : Experiments were carried out on standardization of LD 50 dose of Ethyl Methane Sulphonate (EMS) on seeds of Lucerne and 0.5, 1.0, 1.5, 2.0 and 2.5 % EMS concentrations were used. Among those 0.8 and 1.0 % EMS dose were found to be giving ~50% germination. The mutated seeds were grown to develop M1 plants.

Population improvement programme: BAIF Lucerne-4 is grown for improvement and evaluation for forage yield and quality parameters.

Evaluation of Maize x Teosinte crosses

Progeny of 21 IPS from F₃ generation was grown for progeny study in F₄ generation. The objectives are to develop the tillering ability, increase leaf stem ratio and dual cut fodder maize variety. Ten IPs were made from F₄ progenies.

B×N hybrid Evaluation

A station trial was established in randomized block design for evaluation of the progeny of four clumps in comparison with BNH-10 for yield and quality parameters. The trial was continued and data for seven cut was generated for yield, quality and growth characters.

AICRP (FC&U), KAU, Vellayani

BN Hybrid: Five cultures are being evaluated for three years for yield and quality.

Fodder cowpea: Eight diverse parents were selected for hybridization -CO-8, IC-97767, MFC-09-1, IC-1061, IT-38956-1, IC-39916, IT-37154999-38 and Pant Lobia-2. Dendrogram was prepared using molecular diversity analysis using four primers. Hybridization of the 8 parents were done in half diallele fashion. 28 cross combinations and 8 parents were evaluated of which CO-8 x IT-37154999-38, MFC-09-1 x IT-37154999-38, IC-97767 x IT-37154999-38 and IC-97767 x Pant Lobia-2 were the best cross combinations. F₃ evaluation was carried out through compact family block design and the study is in progress

Evaluation of Stylosanthes cultures for yield and quality (2019-2021): The experiment at two places (KAU, Vellayani and KLDB, Dhoni) was started with the objective to identify high yielding stylosanthes types for Kerala

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

Germplasm maintained: Out of 371 lines, a total of 185 germplasm lines were maintained following standard breeding procedures.

SN	Crop	No. of accessions	Source /Area
1.	Oats	221	USDA,VIR, Japan, Czech Republic, Canada, Romania, Australia
2.	Alfalfa	70	USDA, Canada, USA, Ladakh
3.	Caragana arborescence	10	USA, Uzbekistan, China, Russian Federation
4.	Prongs	08	Zanaskar, Akchimal, Sankoo of Cold arid regions of Ladakh
5.	Barley	42	Italy, Drass, Kargil and Leh
6.	Red clover	12	Institute For Agricultural and Fisheries Research (ILVO), Plant Sciences Unit Belgium
7.	White clover	06	
8.	Perennial ryegrass	02	
	Total	371	

Oats

Evaluation of advanced generation: F6 families of below detailed bi-parental crosses were evaluated and selections made among families for further studies.

SN	Cross Combination	SN	Cross Combination	SN	Cross Combination
1	SKO-208 X SKO-204	3	SKO-212 X SKO-209	5	SKO-210 X SKO-207
2	SKO-207 X Sabzar	4	SKO-212 X SKO-204	6	SKO-207 X SKO-204

Selections from Segregating generations

SN	Segregating generations	No. of individual plant selections (IPS) made
1	F 4 (8 crosses)	20 families
2	F 5 (3 crosses)	10 families

Seed Production (Quintals):

Crop	Variety	Breeder Seed	Foundation Seed	Total
Oats	SKO -90	32.0	--	32.00
	SKO -96	17.0	3.5	20.50
	SKO -20	27.0	5.4	32.40
	SKO -108	0.15	-	0.15
	Sabzaar	-	14.0	14.00

Besides the recommended varieties, seed production of advanced lines and selected elite material was also produced in Oats.

AICRP (FC&U), AAU, Jorhat

Ricebean

- **Evaluation of Ricebean germplasm for rabi season:** Suitable entries selected for *rabi* season were grown and evaluated for their fodder yield and quality.

Lathyrus

- **Evaluation of Lathyrus germplasm:** Seven selected promising entries were grown and evaluated for fodder yield and quality.
- **Hybridization programme in Lathyrus:** A diallel cross was made in *rabi* 2016-17 among four selected local germplasm lines and the test entries Nirmal, Prateek, Ratan and Madhuri without reciprocal to develop a forage lathyrus variety with high biomass yield, quality, disease resistance and low BOAA content. In *rabi* 2017-18 promising entries were selected and were evaluated in *rabi* 2018-19 season.
- **Mutation breeding programme:** M₄ progenies were evaluated.

AICRP (FC&U), IGKV, Raipur

Oat

- Germplasm maintenance and evaluation: 42
- Cross attempted for F₁'s in between released varieties with specific breeding design.

Evaluation of F₁ crosses (DOS: 10/12/2018)

SN	Cross Combination	SN	Cross Combination	SN	Cross Combination
1	OS-409 x RO-19	3	OS-409 x OS-6	5	OS-409 x JHO-822
2	OL-10 x RO-19	4	ROS-8 x OS-6		

Lathyrus

- Crossing Block Date of sowing 10 -11-2017
 - Parents Used: Mahateora (M), Pusa-24 (P), Ratan (R), BK-5 (B), Nirmal (N), RLK-1950 (R₂) {with different objectives}
- F₃ 's planted in Rabi 2018-19 Date of sowing 20-11-2016
- (M x B), (M x N), (M x P), (P x R), (P x R₂)
 - Cross attempted in (Parteek & Mahateora and vise versa) {Color and Pod size inheritance objectives}

Generation	Cross	Date of sowing
F ₃	Mahateora x RLK-1950	06-12-2018
F ₃	Pusa x RLK-1950	06-12-2018
F ₃	Mahateora x PUSA-24	08-12-2018
F ₃	Mahateora x BK-05	08-12-2018
F ₃	Mahateora x Nirmal	08-12-2018
F ₃	Pusa-24 X Prateek	08-12-2018
F ₃	Pusa-24 X BK-05	08-12-2018

Lathyrus: Germplasm evaluation validation in *Rabi* 2018 and identification for forage type. 139 Germplasm accessions procured from AICRP on MuLLaRP, IGKV were sown on 29-11-2018. They belong to three groups - Low ODAP, Late Flowering, Broad Leaf Group.

- **BRNS, BARC, Mumbai (M.H.), Funded Project;** Title: Gamma ray mutagenesis for delayed flowering (65-75 days) and increased leaf stem ratio of Lathyrus., (Parteek & Mahateora) with Budget: 21 Lac approx.
- Establishment of Broom Grass germplasm from Koandagaon and Narayanpur Districts of Bastar - 24/8/2018
- Rice Bean M₁ generation planted for seed harvesting of M₂ generation - 26/7/2018
- Stylo M₁ generation planted for seed harvesting of M₂ generation -- 26/7/2018

Other Activities Rabi-2018-19

AICRP (FC&U), PAU, Ludhiana

Awards and Honours: Awarded (Team award) appreciation certificate for development of three oat varieties viz; OL 1769-1, OL 1802-1 and OL 1760, during NGM (Kharif 2019) held at IGKV, Raipur.

Research papers in journals

- Kaur Rajvir, Kapoor Rahul, Vikal Yogesh and Kaur Kamalpreet (2018). Assessing genetic diversity in dual purpose oat (*Avena sativa* L.) cultivars based on morphological and quality traits. *Int. J. Curr. Microbiol. App. Sci.* **7(5)**: 1574-1586.
- Kapoor Rahul, Singh Tarvinder Paland, Khosla Gaurav (2018). Biotechnological Interventions in Forage Crops-A Review. *Int. J. Curr. Microbiol. App. Sci.* **7(7)**: 1574-1586.
- Kaur Sukhdeep, Bhardwaj Rachana D, Kapoor Rahul and Grewal Satvir Kaur (2019). Biochemical characterization of oat (*Avena sativa* L.) genotypes with high nutritional potential. *LWT - Food Sci. and Tech.* **110**: 32-39.
- Kaur Arshpreet, Kapoor Rahul, Vikal Yogesh and Kalia Anu (2019). Production of Interspecific Hybrids between Pearl Millet [*Pennisetum glaucum* (L.) R. Br.] × Napier Grass [*Pennisetum purpureum* (K.) Schum] and their Characterization. *Int. J. Curr. Microbiol. App. Sci.* **8 (4)**: 1308-1313.
- Kaur H and Goyal M (2019). Salicylic acid priming enhances low temperature stress tolerance in Egyptian clover (*Trifolium alexandrinum* L.) by influencing antioxidant system. *Indian Journal of Experimental Biology* (accepted).
- Dhillon AK, Sharma N, Dosanjh NK, Goyal M and Mahajan G (2018). Variation in the nutritional quality of rice straw and grain in response to different nitrogen levels. *Journal of Plant nutrition.* **41 (15)**.
- Kaur H, Goyal M and Singh DP (2018). Comparative evaluation of cowpea (*Vigna unguiculata* L.) genotypes for nutritional quality and antioxidant potential. *Range Mgmt & Agroforestry.* **39**: 260-268.
- Kumar R, Kumar P, Kaur Y, Chikkappa GK, Chaudhary DP, Goyal M, Tiwana US (2018). Evaluation of maize hybrids for fodder and grain purposes. *Range Management and Agroforestry.* **39**: 182-90
- Goyal M (2018). Oxalate accumulation in fodder crops and impact on grazing animals –A review. *Forage Research.* **44 (3)**:152-158.
- Atri Ashlesha and Singh Harpreet (2019). Influence of weather variables on the development of pearl millet downy mildew. *Journal of Agro meteorology.* **21 (1)**: 76-79.
- Atri Ashlesha, Singh Narinder and Oberoi Harpreet (2019). Influence of seed priming on the development of pearl millet downy mildew (*Sclerospora graminicola*). *Indian Phytopathology* <https://doi.org/10.1007/s42360-019-00129-6>.
- Atri Ashlesha, Oberoi Harpreet and Kumar Parminder (2019). Rhizospheric *Trichoderma* isolates as potential biocontrol agent for southern leaf blight pathogen (*Bipolaris maydis*) in fodder maize. *Proceedings of the Indian National Science Academy.* (Accepted)

Papers presented in Symposia/Workshops

- Tiwana US, Kaur M, Singh S and Goyal M (2018). Influence of different herbicides on forage yield and quality of oats (*Avena sativa* L.). ISWS Golden Jubilee International Conference Weeds and Society: Challenges and Opportunities held at ICAR Directorate of Weed Research, Jabalpur, India on 21-24 Nov. 2018.
- Kumari A, Goyal M and Kumar R (2019). Responsive elements in sorghum against shoot fly infestation. XIV Agricultural Science Congress. Innovations for Agricultural Transformation held at NASC complex, Pusa, New Delhi on 22-23 Feb. 2019.

Book chapters: 2

- Kapoor Rahul (2018). Addressing animal nutrition through wide hybridization in forage crops. In: Fodder crops, Approaches for value addition and enhancing income. Y Jindal, A K Chhabra, A K Roy (Eds.). Pp. 104-114, Earth Vision Publications, India (ISBN: 978-93-84922-77-1).
- Tiwana US, Oberoi HK, Goyal M and Singh J (2019). Management of anti-nutritional components through agronomic manipulations in forage crops. In: Y Jindal, A K Chhabra, A K Roy (Eds.). Fodder crops-approaches for value addition & enhancing income. Earth Vision Publication, Hisar, India pp 179-185 (ISBN: 978-93-84922-77-1).

Extension publications: 2

- Singh DP, Kaur M, Goyal M and Sohu RS (2019). Pashu avaste santulit khuraak laimeeshratchariyan di kaashatkaro. *Bahumantavi Kheti* 02: 33-34.
- Dhillon Navjot K and Kapoor Rahul (2018). Certified seeds add value to crops. *Punjab Advance*. Dec.: 28-30.

Varietal Notification information

- Kapoor Rahul and Sohu RS (2018). Notification of crop varieties and registration of germplasm, Oat Variety-OL 1802. *Indian J. Genet. and Pl. Breed.* **78(2)**: 279.
- Kapoor Rahul and Sohu RS (2018). Notification of crop varieties and registration of germplasm, Oat Variety-OL 1804. *Indian J. Genet. and Pl. Breed.* **78(2)**: 279-80.
- Kapoor Rahul and Sohu RS (2018). Notification of crop varieties and registration of germplasm, Bajra Napier Hybrid-PBN 342. *Indian J. Genet. and Pl. Breed.* **78(2)**: 283.
- Kapoor Rahul and Sohu RS (2019). Notification of crop varieties and registration of germplasm, Oat Variety-OL 1802-1. *Indian J. Genet. and Pl. Breed.* **79(1)**: 111-112.
- Kapoor Rahul and Sohu RS (2019). Notification of crop varieties and registration of germplasm, Oat Variety-OL 1769-1. *Indian J. Genet. and Pl. Breed.* **79(1)**: 112.
- Kapoor Rahul and Sohu RS (2019). Notification of crop varieties and registration of germplasm, Oat Variety-OL 1760. *Indian J. Genet. and Pl. Breed.* **79(1)**: 112-113.

Students guided: M. Sc.: 3 Ph.D.: 1

Lectures delivered -5

TV/Radio talks: Radio: 2

Details of seed/Planting material sold to farmers during Rabi 2018-19:

Crop	Variety	TL (q)	C/S(q)	F/S(q)	B/S(q)
Berseem	BL 1	-	-	-	1.25
	BL 10	18.55	42.10	-	15.20
	BL 42	8.5	60.23	6.25	8.25
	BL 43	12.40	-	-	-
	BL 180	-	-	-	1.00
Oats	OL 9	-	-	-	1.00
	OL 10	52.60	-	-	25.00
	Kent	5.60	18.45	-	75.00
	OL 11	6.50	32.45	-	3.56
	OL 12	25.00	-	-	-
Rye grass	PBRG 1	8.25	-	-	0.35
Total		137.4	153.23	6.25	129.36

External funded Projects: (1)

Project/Scheme Name	Funding Agency	Amount	PI/Co-PI
Breeding for development of baby corn hybrids	ICAR-Indian Institute of Maize Research, Ludhiana	1,09,59,000	Dr. Meenakshi Goyal

AICRP (FC&U), UAS (ZARS), Mandya

Research papers in journals

Shekara BG, Prakash P, Mahadevu P, Manasa N and Chikkarugi NM (2018). Agro-techniques for enhancing green forage yield and quality in Signal Grass (*Bracharia ruziziensis*) under rain fed ecosystem, *Res. Jr. of Agril. Sci.* **10(1)**: 18-21.

Extension Folders in Kannada

- Suitable forage crops for sheep and Goat farming-2018
- Hydroponics fodder Production-2018
- Annexure for knowing body weight of cross bred cows-2018.

Important persons visit to AICRP-FC centre

- Shri. N H Shivashankar Reddy, Hon'ble Minister of Agriculture, Govt of Karnataka.
- Shri. D C Thamanna, Hon'ble Minister of Transport, Govt of Karnataka.
- Shri. C S Puttaraju, Hon'ble Minister of Minor irrigation, Govt of Karnataka
- Boards Members of UAS, GKVK, Bengaluru.
- Vice chancellor. UAS, GKVK, Bengaluru.
- Director of Research, UAS, GKVK, Bengaluru.
- Managing Director CADA, Govt of Karnataka

Training conducted for farmers/ NGO/ Govt. officials:

- 01-Training programme & 01-Field days

Meetings / Workshop/Winter School

- Attended the *Rabi* NGM of AICRP (FC&U), at HAU, Hisar September, 7-9th, 2018.
- Attended the *Kharif* NGM on AICRP (FC&U), at IGKV, Raipur, February, 26th -27th 2019.

Student(s) guided:

- M.Sc. (Agri.) in GPB – 2
- M. Sc. (Agri.) in Agronomy- 2
- Ph.D. (Agri.) in Agronomy- 1

TV/ Radio talk delivered by AICRP-FC staff/ extension activities: 2

FTDs conducted: 50

Seed/ planting material sold

S. No.	Crops	Root Slips Sold (In Lakhs)
1	Napier Bajra Hybrid (Co-3)	0.20
2	Napier Bajra Hybrid (BNH-10)	0.15
3	Guinea grass (JHGG-08-1)	0.26
4	Rhodes grass (Selection)	0.12
5	Signal grass (Selection)	0.14

Quality seed production for the year 2018-19

SN	Crop	Variety	Class of seed	production (q)
1	Forage Cowpea	MFC-09-1	FS	10.0
2	Forage Cowpea	MFC-08-14	FS	10.0

Externally funded projects: 2

- ✓ Augmenting Fodder Production and establishing fodder seed bank at University of Agricultural Sciences, Bangalore (2013-14) (RKVY project) with budget outlay of **100 lakhs. (RKVY projects)**
- ✓ Accelerating green fodder production through establishment of model demonstration and multiplication units in southern Karnataka with budget outlay of **25 lakhs. (Dept. of animal husbandry and veterinary services, GOK)**

AICRP (FC&U), TNAU, Coimbatore

Awards and Honours: Three ‘Appreciation Certificates’ from ICAR-IGFRI, Jhansi for the release of three forage varieties (Fodder Sorghum CO 31, Fodder cowpea TNFC 0926 & CO 9) at National/state level during the period from 2016-2018 in the NGM, Rabi 2017-18 held at CCS HAU, Hisar on 07.09.2018 & 08.09.2018

Research articles: 5

- Adlin S, Babu C and Sumathi P (2018). Genetic variability studies for yield and quality components in *Cenchrus* grass (*Cenchrus* spp.). *Forage Res.* **44 (3)**: 176-178.
- Jolad Rajesh, Sivakumar S D, Babu C and Sritharan N (2018). Performance of Different Crops under Hydroponics Fodder Production System. *Madras Agric. J.* **105 (1-3)**: 50-55.
- Swathi L, Babu C, Iyanar K, Prabakaran AJ and Saravanan NA (2018). Assessing the chromosomal stability during cell division in the interspecific hybrids of pearl millet × Napier grass hybrid CO (BN) 5. *Journal of Pharmacognosy and Phytochemistry.* **7(5)**: 962-964.
- Swathi L, Babu C, Iyanar K, Sivakumar U and Prabakaran AJ (2019). Doubling of chromosomes of pearl millet napier hybrids and preliminary screening based on stomatal characteristics. *Electron J Plant Breed.* **10 (1)**: 47 - 57.
- Thomas Anusha Mariam, Babu C and Iyanar K (2018). Genetic variability and association studies in pearl millet for green fodder yield and quality traits. *Electron J Plant Breed.* **9 (3)**: 1263 - 1271.

Book chapters: 1

Babu C, Sivakumar S D and Pavithra N(2018). Sustainable Fodder Production Under Integrated Watershed Management Programme for Up-liftment of Rural Livelihood in Tamil Nadu. Training manual on “Advances in Integrated Watershed Management for Rural Livelihood” organized by ICAR-IISWC, Ooty, Tamil Nadu.

Student(s) guided: M.Sc. (Agri.) in PBG – 2; Ph.D. in PBG - 1

No. of FTDs conducted: 20

Details of seed/ planting material sold

S N	Crop/ variety	Class of seeds	Quantity produced	Quantity supplied	Balance	Expected production (2019-20)	Total quantity
I	SEEDS (kg)						
1.	Multicut Fodder sorghum CO (FS) 29	BS	145.00	Nil	145.00	145.00	290.00
		TFL	416.50	416.50	Nil	500.00	500.00
2.	Fodder sorghum CO 31	BS	100.00	-	100.00	300.00	400.00
		TFL	50.00	2.35	47.65	300.00	347.65
3.	Maize African tall	TFL	246.00	69.500	176.50	500.00	676.50
4.	Fodder cowpea CO 9	TFL	50.00	10.75	39.25	200.00	239.25
5.	<i>Desmanthus</i>	TFL	300.00	30.900	269.10	300.00	569.10
6.	Agathi	TFL	100.00	48.600	51.400	200.00	251.40
	Total		1407.5	578.60	828.90	2445.00	3273.9
II	PLANTING MATERIAL (Nos.)						
1.	CN hybrid CO (BN) 5 stem cuttings		3,22,013	3,22,013	50,000	15,00,000	15,50,000
2.	Guinea grass CO (GG) 3 rooted slips		2,150	2,150	5,000	10,000	15,000
	Total		3,24,163	3,24,163	55,000	15,10,000	15,65,000

Externally funded project: 2

- Hatsun chair Assistant Professor scheme (HCS) in Plant Breeding and Genetics funded by Hatsun Agro Product Ltd., Chennai for five years from 2018-19.
- Establishment of biotech KISAN hub at TNAU, Coimbatore funded by DBT, New Delhi with a budget of Rs. **86.63 lakhs** for two years (2018-2020).

AICRP (FC&U), AAU, Anand

Research Paper in journal

Rathod DD, Patel KP, Ramani VP, Patel KC and Rathod PH (2018). Crop yields and soil properties as affected by integrated use organic and inorganic inputs in wheat-fodder maize cropping. Paper presented in 83rd Annual Convention of Indian Society of Soil Science & National Seminar on *Developments in Soils-2018* held during November 27-30 at AAU, Anand, Gujarat.

Book published

Patel PM, Patel HK, Shah SN, Patel AP and Patel MV (Eds) (2018). *Sajiv kheti "Prakruti naa Sathvare"* (2018). Published by AAU, Anand. ISBN No. 978-93-5300-881-5

Patel KP, Ramani VP, Rathod PH, Patel KC, Kumar Dileep, Patel BK, Parmar JK and Jadav NJ (Eds.) (2018). Souvenir of 83rd Annual Convention and National Seminar of Indian Society of Soil Science, New Delhi at AAU, Anand held during November 27-30, 2018. pp. 1-269.

Patel KP, Ramani VP, Rathod PH, Patel KC, Kumar Dileep, Patel BK, Parmar JK and Jadav NJ (Eds.) (2018). Special Publication on Research & Developments in Soil Science, 83rd Annual Convention and National Seminar of Indian Society of Soil Science, New Delhi at AAU, Anand held during November 27-30, 2018. pp. 1-188. ISBN #978-93-5346-075-4

Book Chapters

Patel HK (2018). *Gujarat maa Sajiv kheti naa ayamoo*. In: *Sajiv kheti* book (Patel P M, Patel H K, Shah S N, Patel A P and Patel M V, Eds) published by Directorate of Extension Education, AAU, Anand. ISBN No. 978-93-5300-881-5

Patel HK (2018). Environmental safety by organic farming. In: *Sajiv kheti* book published by Directorate of Extension Education, AAU, Anand. ISBN No. 978-93-5300-881-5

Patel HK (2018). Organic farming integrated area management. In: *Sajiv kheti* book published by Directorate of Extension Education, AAU, Anand. ISBN No. 978-93-5300-881-5

Patel HK (2018). Soil-crop nutrient management in organic farming. In: *Sajiv kheti* book published by Directorate of Extension Education, AAU, Anand. ISBN No. 978-93-5300-881-5

Patel HK (2018). Role of various cakes in organic farming. In: *Sajiv kheti* book published by Directorate of Extension Education, AAU, Anand. ISBN No. 978-93-5300-881-5

Patel HK (2018). Vermicompost. In: *Sajiv kheti* book published by Directorate of Extension Education, AAU, Anand. ISBN No. 978-93-5300-881-5

Patel HK (2018). Role of mulching in organic farming. In: *Sajiv kheti* book published by Directorate of Extension Education, AAU, Anand. ISBN No. 978-93-5300-881-5

Patel HK (2018). Non-chemical weed management in organic farming. In: *Sajiv kheti* book published by Directorate of Extension Education, AAU, Anand. ISBN No. 978-93-5300-881-5

Popular articles

Patel HK, Patel PM, Desai DH and Padheriya DR (2018). Grasscharana pakoni adhyatan kheti padhdhati. Pashupalan: Bamni aavakno strot. p. 69.

Gohil DP, Patel HK and Padheriya DR (2018). Rajkana pakni vagyanik kheti padhdhati. Krushigovidhya. November issue. p. 46.

Gohil DP, Patel HK, Rathod PH and Padheriya DR (2018). Grasscharana pakoni adhunic kheti. Pashu Aahar ane tenu vyavsthapan. p. 106.

HRD programmes attended

- H. K. Patel participated in ICAR sponsored 21 days training programme on Recent Advances and Innovation in Modern Organic Agriculture, during September 05-25, 2018 at MPUA&T, Udaipur, Rajasthan.
- P. H. Rathod participated in a week short course (From August 6-10, 2018) on *Promotion of Organic Farming for Sustainable Agriculture* at Extension Education Institute, Anand Agricultural University, Anand, Gujarat, India.

Seminar/Symposia attended

- Dr. D.P. Gohil and Dr. H.K. Patel Monitored AICRP center, RAU, Bikaner during 3 & 4 February, 2019 for Rabi trials/ research activities.
- H. K. Patel and P. H. Rathod attended 83rd Annual Convention of Indian Society of Soil Science and National Seminar on Developments in Soil Science-2018 at Anand Agricultural University, Anand on November 27-30, 2018.

Teaching Courses

- GP 505(1+1): Mutagenesis and Mutation Breeding
- GP-511 (2+1): Breeding for cereals, forage and sugarcane.
- Agron 602 (2+0): Crop Ecology
- PGS-506 (1 + 0): Disaster Management
- e-Course-3 (1+0) Usefulness of disaster management in Agriculture, Distance Education at IDEA, AAU, Anand

FTD conducted: Lucerne (Anand-2): 7, Oat (Kent): 10

Externally funded project:1

- Quality Seed Production in Fodder Crop" under Fodder Development Programme-RKVY.

Extension activities

- Participated in "Kishan Kalyan Mahotsav-2018" programme and delivered lectures on for dissemination of Forage technology.
- Delivered lectures in short term training programme of women organized by the Department of RBRU, AAU, Anand.
- Lectures in *Kharif* Pre-seasonal training under T & V programme.
- Delivered lectures in short term refreshers training course organized by the EEI, AAU, Anand.
- Deliver lecture in training programme for Recent managemental practices for crops and animals for farmer of Pali Rajasthan, Extension Education Institute, AAU, Anand on November 2018 under ATMA project.
- Delivered lecture in training programme for recent management practices for crops and animals for farmer of Barmer, Rajasthan, Extension Education Institute, AAU, Anand on Dec.-2018 under ATMA project.
- Lecture delivered on "Quality seed production in forage crops" in Diploma course in Agricultural Extension Services for Input Dealers at IDEA, ATIC, AAU, Anand on dt: 12.10.2018
- Lecture delivered on "Aadunik vaigyanik Kheti" in the two days' district level seminar on – Masala ane Sugandhit Pakoni Kheti, MIDH sponsored at M&APRS, AAU, Anand on dt: 29.01.2019.

Dignitaries visited at MFRS, AAU, Anand

SN	Name of Dignitaries	Date of Visit	Details
1.	Dr. P.S. Takawale & Dr. R.V. Kale	19/01/2019	For Monitoring of <i>Rabi</i> -2019 trial
2.	Dr. K. B. Kathiria	17/01/2019	To monitor research activities

Seminar / Symposia / Conference / Training

- Dr. P. H. Rathod -NGM *Rabi*-2018 held at CCHAU, Hisar September 7-8, 2018.
- Dr. D.P. Gohil, Dr. H.K. Patel, Dr. P. H. Rathod -8th Convention of BACA Alumni Association and Open Forum discussion on "Prospects of Artificial Intelligence in Agriculture" AAU, Anand February 16, 2019
- Dr. D.P. Gohil, Dr. H.K. Patel, Dr. P. H. Rathod - NGM *Kharif*-2019 held at IGKV, Raipur, Chhattisgarh February 26-27, 2019

AICRP (FC&U), BAIF, Urulikanchan

Abstract

Published in Souvenir of National symposium on “Forage and Livestock based technological innovations for doubling farmers’ income” held at Dharwad during 13-14, December 2018.

- Takawale PS, Kauthale VK, Kale, RV. (2018). Effect of different forage cropping systems on green forage yield and economics under irrigated condition of western Maharashtra.
- Kale RV and Takawale PS (2018). Seed priming techniques improve germination, forage yield and economics of fodder Maize.
- Singh VK, Takawale PS and Kale RV. (2018). Response of phosphorus on different cowpea varieties for seed yield production in Sambalpur district of Odisha.
- Jade SS, Takawale PS, Bahulikar RA (2018). Confirmation of interspecific hybrids between pearl millet (*Pennisetum glaucum* {L.} R.Br.) x Napier grass (*Pennisetum purpureum* Schumach.) using ISSRs.

Important persons visit

- Dr. Monideep Das, Assam Livestock Development Agency, Govt. of Assam
- Dr. Vallabhbai Kathiria, Formar Chairman, Gauseva and Gauchar Vikas Board, Gujarat
- Dr. Sreekant Sahoo, NDDB, Gujarat
- Dr. S. S. Hiremath, Karnataka Milk Union, Karnataka
- Dr. P. M. Haldankar, Director of Research, BS KKV, Dapoli
- Dr. Sanjay M. Gajmer, CEO, Sikkim Livestock Development Board, Sikkim

TSP activities: Total farmers benefited were 45 distributed in four groups spread in two villages.

- Two villages Khandbara & Radikalam in Nandurbar district of Maharashtra were selected to implement the need based and participatory programme. Being a hilly terrain area, the farmers cultivate maize, sorghum, minor millets and pulses in *kharif* season while very small area is under *rabi* season crops due to non-availability of irrigation facility. Two meetings were conducted with villager’s one in each village separately to identify the needs of the farmers. During the discussion, some of the problems like increased cost on crop cultivation, no green fodder availability for cattle and scarcity of irrigation water during the winter were listed by the farmers. It was told by the farmers that if some support for lift irrigation and small implements is made available, then farmers can lift the water from the water source and use it for cultivation of crops during the *rabi* season and it will be an income generating activity for them. Considering the needs, following activities were planned and implemented under TSP.
 1. Identified 4 farmer’s user group with forty-five participating farmers to undertake the activity.
 2. Demonstrated the cultivation of Berseem as *rabi* season fodder crop at 18 farmers field.
 3. Supplied 45 units of Mogi harrow and solar operated spray pump, one each to individual farmer and demonstrated the benefit of its use.
 4. Survey of the area for water resource, installation of water lifting pumps, cultivation of crop to be taken under irrigation was done
 5. Meetings were conducted with participating farmers to decide the guidelines for use of common facilities of water lifting scheme among the participating farmers.
 6. Procured 4 diesel pump of 5 HP capacity and 1200 m PVC pipes of 3” diameter and were supplied to four groups of 10 farmers.
 7. Technical support in fodder cultivation was given to the farmers through field visits.

Training conducted: Under the component of capacity building of dairy farmers of RKVY project, the training of 323 dairy farmers was conducted in “Fodder production and preservation techniques”.

TV/Radio talks: 3

Workshop / Training/ Meeting Attended: 1

Planting material sold: (BNH-10): 1.77 lakhs stem cutting

FTDs conducted: 20; Oat (15) and Berseem (5)

AICRP (FC&U), KAU, Vellayani

Publications

- Ishrath PK and Thomas Usha C. (2018). Effect of cutting intervals and additives on quality silage production from hybrid Napier. *Range Mgmt & Agroforestry*. **39(2)**:307-313.
- Thomas Sruthy Liz and Thomas Usha C. (2019). Innovative techniques in fodder production- A review. *Forage Res.* **44(4)**. pp.217-223.
- Praveena VS, Abraham Mareen and Kumar Vijayaraghava (2019). Genetic Divergence Studies in Fodder Cowpea (*Vigna unguiculata*) using D² statistics. *Forage Res.* **44(4)**. pp.230-236.
- Anita MR, Lakshmi S, Roy Stephen and Rani T Sajitha. (2018). Physiology of fodder cowpea varieties as influenced by soil moisture stress levels. *Range Mgmt & Agroforestry*. **39(2)**:197-206.

Book chapter, with ISBN Number

- Thomas Usha C, Ishrath PK, Ajmal Fayique C and Thomas Sruthy Liz (2019). Fodder Production Technology for Kerala Home Gardens. *Tactics of being an Agripreneur: - Learning the Rope ISBN 978-93-88020-48-0*. Satish Serial Publishing House. pp-143-160.

Seminar/Symposium/ Conference papers-3

- George C, Abraham M and Sivan S (2019). Breeding of leguminous fodder crops. In Abstracts of National Seminar on Sustainable Agriculture., 6-7, April. AIASA, College of Agriculture, Padannakkad.
- George C, Abraham M and Ankitha MO (2019). Variability analysis in Horse gram (*Macrotyloma uniflorum* Lam. Verdc.) for fodder yield. In Abstracts of Farmers orientation towards climate change and upgrading to sustainable agriculture – Focus 2019, 23-24, Feb. National College, Trichi.
- George C, Abraham M and Ankitha MO (2019). Biometric characterization and fodder yield quantification of horse gram (*Macrotyloma uniflorum*) genotypes. In Abstracts of National conference on Biodiversity and Plant Genetic Resource Conservation for Future, 15-16 March, College Agriculture, UAHS, Shivamogga, Karnataka.

Student(s) guidance

- PhD in agronomy- 1 Ph.D. in Plant Breeding and Genetics – 3
- M.Sc. (Agri.) in Plant Breeding and Genetics – 3 M.Sc. (Agri.) in Agronomy-2

Teaching- Courses Handled

Dr. Usha C Thomas-

- B. Sc. (Ag) Courses-Irrigation and water management, Agronomy of Fodder and forage crops, Field Crops II

Dr. Beena Thomas

- B. Sc.(Ag) courses- Methods of Plant Breeding, Fundamentals of Plant Breeding, Intellectual property Rights, Crop Improvement-1
- PG courses- Advanced Plant Breeding Systems, Principles of Plant Breeding, Breeding of Tropical Crops

Projects

- Dr. Beena Thomas is the Principal Investigator of State Plan Project on ‘Development and Evaluation of Anthurium Hybrids’.
- Dr. Usha C Thomas is the Co- PI of the EAP entitled ‘Biodiversity sensitization programme on the diverse wetland ecosystem of Kerala’, funded by State wetland authority of Kerala.

Trainings/conference participated – Dr. Usha C Thomas participated in three day training on ‘Applied statistics and data analysis for science and society’ during 14 to 16 March, 2019 at CoA, Vellayani.

Revolving Fund - University has sanctioned a RF scheme on 'Planting material production in fodder crops' on 11/04/2019.

Varieties for state release: IET, CYT and farm Trial results of following two in-house trials were presented in the university variety release meeting held on 7.05.09.

- Evaluation of Guinea grass cultures for yield and forage quality
- Evaluation of BN hybrid cultures for yield and forage quality

The committee has recommended one variety each of BN hybrid and guinea grass for presentation in the state variety release committee meeting

Farm Trial

Title-Impact of Mg nutrition in Bajra Napier hybrid

Season: 2018-19

Objective: To assess the influence of Mg nutrition on the performance of Bajra Napier Hybrid in the southern districts of Kerala

Location: Southern Kerala

Number of districts: 3 (Thiruvananthapuram, Kollam and Pathanamthitta)

Number of farmers: 3x3

Treatments

1. KAU Package of practice (POP) recommendation + MgSO₄, 80 kg/ha,
2. KAU Package of practice recommendation (200:50:50 kg NPK/ha and 25 t/ha of FYM)

AICRP (FC&U), SKRAU, Bikaner

Seminar/ Symposium/ Workshop

- Dr SS Shekhawat attended National Brainstorming Workshop of AICRP on Pearl Millet organized at SKRAU, Bikaner and worked as Co-Chairman of the Session on "Development of breeding material of pearl millet" on May 22, 2019.
- Dr SS Shekhawat participated in district level Workshop of RKVY on "Exploring entrepreneurship potential for farm women in animal husbandry in Rajasthan" at SKRAU, Bikaner.

Student (s) guided and teaching work

- Dr.SS Shekhawat -One PhD students as Major Adviser and taught three PG courses (PBG-521: Plant Genetic Resources and Seed Technology; PBG-522: Principles of Quantitative Genetics; PBG-625: Advances in Breeding of Major Field Crops).
- Dr. RC Bairwa: Students guiding for M. Sc. (Ag.); Hostel Warden

FTDs conducted: 13; 12 for lucerne and 1 for oat

Training conducted for farmers/ NGO/Govt. Officials

- Farmers were given training for green fodder production in Rabi season in November, 2018 at the time of distribution of demonstrations under AICRP on Forage Crops.

Fodder/ seed/ planting material sold

Green fodder sale: 45.85 quintals @ Rs. 200 per quintal = Rs. 9170/-

Important persons visited to AICRP- FC center

- Dr. D. P. Gohil and Dr. H. K. Patel of Anand Agricultural University, Anand visited for monitoring on February 25, 2018.

Work in other projects

Dr. R. C. Bairwa: PI in RKVY Project on Water Productivity of Dil crop

Other activities of Dr. S. S. Shekhawat

- University Head of Department of Plant Breeding and Genetics, SKRAU, Bikaner.
- A member of Academic Council of SKRAU, Bikaner.
- Breeder In charge of seed production at KVK, Abusar, Jhunjhunu.

AICRP (FC&U), MPKV, Rahuri

Research paper

- Joshi S, Ramya RS, Novik O, Pawar SA, Hole UB and Tambe AB (2019). Redescription of *Palvinaria indica* Avasthi and Shafee, 1985 (Hemiptera: Coccoomorpha: Coccidae) with new host and distribution records. *Zootaxa*. **45 (I)**: 133-138.
- Wagh VR, Sonone AH and Damame SV (2018). Assessment of genetic variability, correlations and path coefficient analysis in forage oat (*Avena sativa* L.) *Forage Res.* **44 (3)**: 172-175.
- Damame SV, Gate DV and Surana PP (2018). Evaluation of F₁ B x N hybrids between giant bajara and napier grass for sugars, minerals and oxalic acid. *AGRES- International e-Journal* **7 (3)**: 336-342.

Technical Publications

- Damame SV, Diware RA and Naik RM (2019). Biochemical evaluation of lucerne (*Medicago sativa* L.) 'National Food and Nutritional Security Conclave' XIV convention of the Indian society of Agricultural Biochemists, Kanpur held at MPKV, Rahuri (MS) on 25-27 Feb. 2019. Pp-60.
- Damame SV, Naik RM and Kale AA (2019). Effect of water stress on osmolyte accumulation and P₅Cs activity in *rabi* sorghum genotypes under field condition. 'National Food and Nutritional Security Conclave' XIV convention of the Indian society of Agricultural Biochemists, Kanpur held at MPKV, Rahuri (MS) on 25-27 Feb. 2019. Pp-112.
- Damame SV, Naik RM and Lokhande PK (2019). Effect of water stress on antioxidative enzymes and nitrate reductase activity in *rabi* sorghum genotypes under field condition. 'National Food and Nutritional Security Conclave' XIV convention of the Indian society of Agricultural Biochemists, Kanpur held at MPKV, Rahuri (MS) on 25-27 Feb. 2019. Pp-113.
- Kale AA, Jadhav SS, Damame SV and Kachare DP (2019). Evaluation of biochemical parameters from the promising chickpea genotypes differing in seed coat color. 'National Food and Nutritional Security Conclave' XIV convention of the Indian society of Agricultural Biochemists, Kanpur held at MPKV, Rahuri (MS) on 25-27 Feb. 2019. Pp-163.

Popular articles

- Damame Shivaji and Gore Sarika (2018). "Chara pikatil Anna ghatak" 'Bhusanvardhan' December, Page No.8.

Visits

- Dr. A. K. Mehta (JNKV, Jabalpur) and Dr. B. G. Shiva Kumar (Dharwad)

Students Guided:

Plant Breeding	Prof. A. H. Sonone	: 01 M. Sc. (Agri.) students
Entomology	Dr. A. B. Tambe	: 01 M. Sc. (Agri.) student
Biochemistry	Dr. S. V. Damame	: 01 M. Sc. (Agri.) student

FTDs conducted: 21; (11 Berseem (Wardan) + 10 Oat (P. Surabhi/ RO-11-1))

Tribal Sub Plan: Activities at Village Boklazer, Tal. Navapur, Dist- Nandurbar during *rabi* season of the year 2018-19 are as below:

SN	Particulars	Quantity	No. of beneficiaries
1	Oat cv. Phule Surbhi seed	300 kg.	30
2	Cycle hoe (manually operated)	30 nos.	30

Radio talk delivered: 01

Lectures to farmers in training programme: 04

Seed Production (rabi-18-19) Yield (Qtl)

Crop	Nucleus	Breeder	Truthful
Oat/ P. Harita	0.80	4.30	4.30
Oat/ P. Surabhi	1.20	4.40	4.00
Oat/ Kent		13.50	
Berseem/ Vardan			2.68
Sorghum /Ruchira	0.20	0.30	6.00
Lucerne/RL-88	0.29	0.90	

Visits of farmers and Govt. Staff of Agril. Department of Maharashtra State

- No. of Farmers visited to farm during *Rabi* 2018-19 : 247
- No. of Govt. officers/staff visited to farm during *Rabi* 2018-19 : 14

Externally funded project:

- **Establishment of fodder cactus demonstration block and germplasm** with special grant of Rs. 1.92 lakh from Hon. Vice Chancellor, MPKV, Rahuri.
- **Laboratory testing of forage quality during rabi 2018-19**

SN	Company	Particulars	Testing fee (Rs.)
1	Ajeet Seeds Ltd., Aurangabad.	Fodder quality of 30 sorghum hybrids.	Rs. 15,000/-

AICRP (FC&U), NDUAT, Faizabad**Publications**

Pal P, Kumar S, Zaidi SFA, Yadav RS, Chandra S, Bharose R and Chand R (2018). Response of phosphogypsum to various cultivars of fodder oat (*Avena sativa* L.) in sodic soils. *Multilogic in Science* VIII Spl(E):350-352.

Nand V, Gupta RK, Yadav RS, Singh KD, Yadav RK and Srivastav AK (2018). Impact of integrated nutrient management (INM) on growth of Berseem (*Trifolium alexandrinum* L.) at various cutting stages. *Journal of Phamacognosy and Phytochemistry* **Spl 4**:254-258.

Kumar M, Singh RP, Pandey VK, Singh A, Singh V, Tiwari A and Yadav RS (2018). Effect of nitrogen levels and weed management practices on weed flora, yield and nutrient uptake by wheat grown in zero-till condition. *International Journal of Chemical Studies*. **6(6)**:2084-2087.

Participation in Seminar/Symposia: 2**Linkage with departments:**

- Department of Animal Husbandry, N D U A T, Faizabad.
- Department of Agroforestry, N D U A T, Faizabad.

Courses taught:

- Agron 221(V) - (B.Sc. Ag.)- Crop production technology (Rabi crops)
- Agron 624- (Ph. D.) –Management of saline and alkali soils

Guided student:

- **M.Sc.(Ag.) Student:** 4
- **Ph.D. student:** 2

FTD conducted: Forage oat-NDO-1 -10; Radio Talks - 2

AICRP (FC&U), CCS HAU, Hisar

Awards and recognition: CCS HAU Hisar scientists were felicitated during the NGM *Kharif* held at IGKV, Raipur, Feb 26-27, 2019

Varieties released / Identified: during last 5 years

Crop	Variety	Status
Sorghum	HJ-541	<ul style="list-style-type: none"> Released and notified for Haryana State in 2014 vide. Notification no. [S.O. 1146(E) dated 24.04.2014]
	HC-713	<ul style="list-style-type: none"> Identified for cultivation in the states of TN, Karnataka and Maharashtra in 2019.
Berseem	HB-2	<ul style="list-style-type: none"> Released and notified for Haryana State in 2014 vide Notification no. [S.O. 1146(E) dated 24.04.2014]
Oats	OS 377	<ul style="list-style-type: none"> Released and notified for cultivation in Central Zone [Notification no. [S.O. 268 (E) dated 28.1.2015].
	OS 403	<ul style="list-style-type: none"> Released and notified for cultivation in North-East, North-West and South Zone [Notification no. [S.O.E.No1379(E) dated 27.3 2018].
	O S 405	<ul style="list-style-type: none"> Identified in 2017 for cultivation in central Zone of India
	OS 424	<ul style="list-style-type: none"> Identified in 2017 for cultivation in Hill Zone of India
	OS427	<ul style="list-style-type: none"> Identified in 2018 for cultivation in South Zone of India

National Group Meet / Workshops/ krishi mela organized:

- National Group Meet of AICRP (FFC&U) on *rabi* forage crops, Sept. 7-8, 2018.
- Annual Group Meeting of AICRP on Sorghum, May 28-30, 2019.
- One-day workshop on Digital Field Book on Dec. 10, 2018.
- *Rabi* Krishi Mela 2018 organized at CCS HAU, Hisar Centre and Farmers taking keen interest in Sorghum crop at forage stall

Research papers: 9

- Kumari T, Jindal Y and Kumari P (2018). Characterization of oat (*Avena sp*) genotypes for morphological traits. *Forage Research* **43** (4): pp. 261-265.
- Satpal, Sheoran RS, Tokas J and Jindal Y (2018). Quality, yield and economics of oat (*Avena sativa* L.) genotypes for fodder under different nitrogen levels. *International Journal of Chemical Studies* **6** (1): 1987-1991.
- Satpal, Tokas J, Kumar Anil and Ravi Kumar S (2018). Potential productivity and radiation use efficiency of multi-cut forage sorghum [*Sorghum bicolor* (L.) Moench] genotypes. *J. Agrometeorol.* **20** (Spl Issue): 364-36.
- Satpal, Tokas J, Duhan BS and Neelam (2018). Fodder quality and nutrient uptake of sorghum as influenced by different fertilizer levels. *Multilogic in Science*. Vol. VIII Special Issue (C): 127-129.
- Poonia A, Phogat DS, Bhuker A and Chhavikant (2018). Study of character association and path coefficient analysis for quantitative and qualitative traits in multi-cut oat. *Journal of Pycnogy and Phytochemistry* **7** (4): 77-83
- Poonia A, Phogat DS, Bhuker A and Chhavikant (2018). Evaluation of morphological and quality parameters in forage oat. *Journal of Pycnogy and Phytochemistry* **7** (4): 786-790.
- Sheoran HS, Kakar R, Kumar Nand Seema (2019). Impact of organic and conventional farming practices on soil quality: a global review. *Applied Ecology and Environmental Research*, **17**(1): 951-968.

Book chapter: 1

- Jattan Minakshi, Kumari Nisha and Avtar Ram (2018). Proteomics: A study towards stress tolerance in crop plants. In: Crop improvement for sustainability. Astral International Pvt. Ltd., Delhi. Pp 449-480.

Abstract

- Jindal Yogesh and Tokas Jayanti (2018). Performance of cereal fodder crops as compared to fodder Triticale in semi-arid region of North West Haryana in India. In: 2nd International Conference on “Triticale and Wheat Biology, Breeding and Production” held from June 25-28, 2018 at East Anatolian Agricultural Research Institute, Erzurum, Turkey.
- Kumar Pankaj, Kumar Anil, Raj Kushal, Avtar Ram, Singh Ram and Jattan Minakshi (2018). Revealing the population structure of *Rhizoctonia solani* AG-1 IA isolates causing sheath blight of rice in different agro-climatic zones of Haryana, India. In: International Conference on “Role of Soil and Plant Health in Achieving Sustainable Development Goals” at Bangkok, Thailand held from November 21-25, 2018. P 87.
- Poonia Atman and Phogat DS (2019). Importance of multipurpose oats (*Avena sativa* L.) and their nutritional benefits. In: International Symposium on “Innopreneurship: A need of sustainable Agriculture” organized by CCS HAU, Hisar held from Feb. 2-3, 2019. P 129
- Phogat D S and Poonia Atman (2019). Principal component analysis in fodder oat (*Avena sativa* L.). In: International Symposium on “Innopreneurship: A need of sustainable Agriculture” organized by Directorate of Research, CCS HAU, Hisar held from Feb. 2-3, 2019. P 130.
- Avtar Ram, Singh Vivek K, Jattan Minakshi, Kumari Nisha, Rathore Vineeta and Sheoran RK (2019). Diversity analysis using microsatellite DNA markers in Indian mustard. In: International Symposium on “Innopreneurship: A need of sustainable Agriculture” organized by Directorate of Research, CCS HAU, Hisar held from Feb. 2-3, 2019. P 13
- Kumar Neeraj, Avtar Ram, Yadav Neelam R, Jattan Minakshi and Rani Babita (2019). Molecular diversity analysis using SSRs in A and R lines of *Ogura* CMS system in Indian mustard. In: International Symposium on “Innopreneurship: A need of sustainable Agriculture” organized by Directorate of Research, CCS HAU, Hisar held from Feb. 2-3, 2019. P 65
- Kumar Naveen, Kamboj BR and Thakral SK (2019). Effect of nitrogen scheduling on growth indices and productivity of wheat under rice residue retained situation. International Symposium on Innopreneurship: A need of Sustainable Agriculture” organized by Directorate of Research, CCS HAU, Hisar held from Feb. 2-3, 2019. P 277

Seed production of released varieties of different fodder crops: 30 quintal

Courses under teaching

Course No.	Course title	Name of the teacher
GP 102	Fundamentals of Genetics	Dr. Minakshi
GP 301	Principles of Biotechnology	Dr. Minakshi
GP 504	Population Genetics	Dr. Minakshi
GP 403	Heterosis Breeding in Crop Plants	Dr. Y. Jindal
Agron. 509	Agronomy of Fodder & Forage Crops	Dr. Naveen Kumar

Ph.D. /M.Sc. Students being supervised

Student	Degree	Research Title	Guide
Arpit Gaur	Ph.D.	Genome Wide Association Mapping for Stem Water Soluble Carbohydrate under Drought Stress Conditions in Bread Wheat	Dr. Y. Jindal
Deepak Kaushik	M.Sc.	Genetic Diversity and Path Analysis in Sorghum for Fodder and Grain Yield	Dr. Y. Jindal
Atman Poonia	M.Sc.	Morpho-biochemical and molecular evaluation of oat (<i>Avena sativa</i> L.) genotypes	Dr. D.S. Phogat
Pankaj Kumar	M.Sc.	Characterization of Oat (<i>Avena sativa</i> L.) Genotypes for Morphological and Biochemical traits.	Dr. D.S. Phogat

FARMERS TECHNOLOGY DEMONSTRATIONS OATS (2018-19) – 12 for OS-403 vis a vis OS -6. It showed 5% increase in yield in VPO Balawas, Distt. Hisar; Local vis a vis HJ-8. HJ-8 showed 5.31% superiority over the check local.

AICRP (FC&U), IGKV, Raipur

Award and Honour: Certificate of appreciation to Dr S.K.Jha & Dr Mayuri Sahu for excellent outreach activities towards promotion of forage crops *Kharif 2018* bay AICRP-Forage Crops

Research papers

Sahu Mayuri (2019). Path analysis in cowpea (*Vigna unguiculata* (L.) Walp.) *International Journal of Chemical Studies*. **7(1)**:912-914.

Jha SK and Tiwari Nitish (2018). Evaluation of intensive fodder cropping system for round the year green fodder production in Chhattisgarh. *Forage Rec.* **44(2)**: pp.115-118.

Porte Chancal, Jha SK and Dwivedi SK (2019). Nitrogen use efficiency in African tall fodder maize (*Zea mays* L.) as affected by nitrogen levels and planting geometry *International Journal of Chemical Studies* 2019; **7(2)**: 1163-1167.

Book chapters

Sahu Mayuri, Jha SK, Nanda HC and Chandrakar Deepak K (2018). Forage Lathyrus: Scope and Constraint. *Fodder Crops: Approaches for Value Addition & Enhancing Income*, pp. 93-103.

Jha SK and Sahu Mayuri (2018). Hydroponics Fodder Production: An Alternative Technology for Round the year Green Fodder. *Fodder Crops: Approaches for Value Addition & Enhancing Income* pp.163-170.

Jha SK and Sahu Mayuri (2018). Fodder and livestock scenario, constraints and opportunity for prosperity of Chhattisgarh livestock sector. NGM, Kharif 2018 Coimbatore pp 62-65.

Extension packages

- “*Hare Chare Ke Liye Jowar Lagae*” SK Jha, Nitish Tiwari and Chancal Porte *Krishak Jagat*
- “*Chhattisgarh me Chara Utpadan Avashyakta awam Sambawna*” S. K. Jha *Krishak Samridhi* pp 66-67.
- “*Hare Chare se Silage avam hey Kaise baneye*” S.K.Jha and Chancal Porte *Chhattisgarh Kheti* pp 32-33.

Leaflets

- Eight leaflets on fodder production and hydroponic fodder production published for distribution.

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

- Lecture delivered to farmers and agricultural developmental officers
- TV Talk on Sub title: “*Chhattisgarh me Hare Chare ki Sambhawana*” in Programme *Krishi Darshan*” Live Telecast date: 5.30 p.m. on date 31-10-2018
- *Krishi darshan* (BC) main Specialist hetu, recording date 24-01-2019 Broadcast date: 15-02-2019
- “C. G. main hara chara Ki sambhavanaye” BC Sjeev Phone Main Specialist hetu. Broadcast date: 20-02-2019
- “Chhattisgarh main hara chara sambhavanaye” in Programme “BC Sjeev Phone main Specialist hetu. Broadcast date: 31-10-2018

Extension packages

- Generated *package of practices of fodder crops production under Chhattisgarh Condition* and published for Extension workers
- Published package of practices of fodder crops production in *university annual diary in 2018*
- Published package of practices of fodder crops production in *Krishi Yug Panchang in 2018*
- Demonstrated the fodder *production technology in Agriculture Museum* at IGKV, Raipur
- Developed *computer based programme* of fodder production technology for demonstration in museum
- *Training for SMS, PC of KVK's* on fodder production
- Training for *REO, ADO, DDA of C.G. Govt Agriculture department* on fodder production
- Stat policy draft on round the year fodder production submitted to Chhattisgarh government for *Gothan Development*

Linkage with other programmes and institutes

- AICRP (Dry Land), CARS, Jagdalpur, Bastar (Chhattisgarh)
- AICRP(IFS)
- KVK's of Chhattisgarh

Externally Funded Projects

(Rs In Lakhs)

SN	Projects	Title	PI	Funding source	Budget
1	AGRON -8	Standardization of oat seed production	SK Jha	VV fund	0.5
2.	AGRON-42	Hydroponics fodder production, evaluation, standardization and demonstration under Chhattisgarh condition.	SK Jha	VV fund	3.0
3.	RKVY (Skill Development)	Training on Hydroponic production	SK Jha	State Government	3.90
4.	Adhoc project	Gamma ray mutagenesis for delayed flowering (65-75 days) and increased leaf stem ratio of Lathyrus. (Parteek & Mahateora)	Mayuri Sahu	BRNS, BARC, Mumbai	21.0

Teaching

Dr S. K.Jha

- PG - AGRON -501- Modern Concept in crop production (3+0)
- UG- AGRO- 5121 Agricultural Water Management (1+1)

Dr. Mayuri Sahu

- PhD-GP-605- Advances in Plant Breeding systems- (2+0)
- PG - GP 503- Principles of Plant Breeding- (2+1)
- NCC Officer cum Care Taker for; 8th CG Girl's BN, CoA, Raipur

Research Guidance

Subject	No of student registered
DrS.K.Jha	PG: Major advisor- 2, Co-advisor -6 Ph. D.: Major advisor- 2
Dr.MayuriSahu	PG: Major advisor- 2 , Co-advisor -2 Ph. D.: Co Major advisor- 1

National Group Meet -Kharif 2019

- Conducted National Group Meet -Kharif 2019 of AICRP-Forage Crops during 26-27 February, 2019

Fodder Seed production

Crop	Category	Quantity (q)
Maize A.Tall	Foundation	28
Oat Kent	Foundation	10
Perennial sorghum COFS-29	TL	0.5

Initiated foundation and certified seed production programme in 2016-17. Incorporated fodder seed production programme in university. Fodder seed production programme at different seed farms and KVK.

AICRP (FC&U), PJTSAU, Hyderabad

Honours and awards

- Awarded certificate of appreciation as best performing AICRP on FCU centre for the rabi 2017-18 during National Group Meet Rabi 2018 at CS HAU Hisar Haryana.

Research articles

- Soujanya T, Shashikala T and Umakanth AV (2018). Heterosis studies in sweet sorghum (*Sorghum bicolor* L.) for fodder yield and yield attributing traits. *Forage Res.* **43 (4)**: 255-260.
- Soujanya T, Shashikala T and Umakanth AV (2018). Correlation and Path Analysis in Sweet Sorghum [*Sorghum bicolor* (L.) Moench] Hybrids for Green Fodder Yield and Its Components. *Bulletin of Environment, Pharmacology and Life Sciences*, **7 (8)**: 52-56.

Abstract

Shanti M, Shashikala T, Susheela R, Anuradha M, Murali M and Shailaja K (2018). Hydroponics fodder production – An appraisal of yield and quality parameters. Souvenir and abstracts published by RMSI and ICAR-IGFRI, Jhansi, National Symposium, Dec 13th -14th 2018, pp. 91.

Tribal Sub Plan

- Identified 15 Tribal farmer families as beneficiaries in Gangapur (village), Utnur (mandal) of Adilabad (Dist) in Telangana State. Farmers will be provided with improved seeds/slips and package of practices for enhancing fodder production. The improved varieties include APBN-1 cuttings in Hybrid Napier and Hedge Lucerne seed. Literature related to forage production technology were distributed and created awareness about importance of growing fodder crops and its utilization.

HRD

- Sri B. Murali - 10 days short course -3rd to 12th October 2018 at ICAR-IIOR Hyderabad
- Dr. K. Shailaja - 28th November to 18th December 2018 winter school of 21 days at NAARM Hyderabad.
- Guest Lectures : 05

Conferences/meeting/training participation:

- 26.02.2019 to 27.02.2019: Participated in NGM, Kharif, 2019 held at IGKV, Raipur.
- 28th – 29th Jan 2019: Dr. K. Shailaja Scientist (SSAC), attended training programme on “People-centric Development” at EEI, Rajendranagar.
- 29th March - 2nd April 2019: Participated in Pre – ZREAC meetings of respective disciplines at RARS, Palem.
- 16th & 18th April 2019: Participated in ZREAC meetings at Khammam and Hyderabad
- 22nd December 2018 Dr. T. Shashikala Seminar on sustainability of small farmers in the changing agricultural scenario, organised by Retired ICAR Employees Association held at University Auditorium, PJTSAU, Hyderabad
- 3rd - 4th OCT, 2019: Participated in Pearl millet field day.
- 16th October Dr. T. Shashikala participated in Meeting on Certified fodder seed production in state of Telangana
- 19th January, 2019 Dr. T. Shashikala- IOTs in Agriculture held at University Auditorium, PJTSAU, Hyderabad
- 5th March 2019, Sri. B. Murali, Dr. K. Shailaja participated in Indo- German Seed Sector Project Presentations at Hyderabad.
- 14th March, 2019, Dr. T. Shashikala Attended Guest lecture on “Mechanisation of field maintenance breeding-Experiences in Germany” and “Seed Processing – Soya bean, peas and other legumes incl. Seed treatment at Hyderabad

No. of Students guidance - M. Sc. (GPB): 1 by Dr. T. Shashikala

Radio talks/TV Programmes

SN	Scientist	Title of programme	Channel	Telecast Date
1	T. Shashikala	Vesavilo pasugrasalakorathanu adhigaminchutaku suchanulu	DD Yadagiri	15.02.2019 Phone in In Live Programme
2	T. Shashikala	Vesaviki anuvaina pasugrasa pantalu	DD Yadagiri	14.02.2019 Recorded
3	B. Murali	Vesaviki anuvaina pasugrasala sagu	T-SAT	25.03.2019 live program
4	T. Shashikala	Rabi pasugrasala sagu melakuvalu	DD yadagiri	10.10.2018 Rythunestam phone in live

Important persons visited:

- Dr. Anuradha, University Head, Dept of Genetics & Pl. breeding on 27-09-2018
- Dr. M. Venkata Ramana ADR RARS Palem visited our center on 16-10-2018
- Dr. B. Joseph, University Head Agronomy and AD, Ag College, Palem, Nagar Kurnool dist. on 01-11-2018
- Dr. A.K.Roy, Project Coordinator, AICRP-FCU, IGFRI, Jhansi on 26-27 October 2018
- Dr. Rajeev Agrawal, P I Agronomy, AICRP-FCU, IGFRI, Jhansi on 29-11-2018

TECHNICAL GUIDANCE TO FARMERS:

- To farmers: A number of farmers visited this station and technical guidance was given by the Scientists on various aspects of forage crops.
- Through telephone: 252 phone calls were attended during the period under report about various aspects of forage production.

EXTENSION ACTIVITIES:

- T&V Meetings: Every month this meeting was attended by Head, Forage breeder and suitable suggestions had been given for forage related problems.
- Visits to FTD farmer fields.
- Attended 275 telephone calls from farmers on fodder technology
- Sri B Murali Scientist (Agronomy) has been participating in Village Adoption programme with AGROMET Services and Rice Research Center scientists ARI Rajendranagar Hyderabad
- Dr. K. Shailaja Scientist (Biochemistry) has been participating Village Adoption programme with Maize Research Center ARI Rajendranagar Hyderabad

AICRP (FC&U), CAU, Imphal

Extension Activities: Fodder Oat seed, chemical fertilizers etc. were supply to FTDs beneficiaries. Any type of fodder seed (seasonal, perennial, perennial cutting etc.) are made available at the AICRP on Forage Crops & Utilization, CAU, Imphal Centre. Scientist and staff of AICRP on Forage crops of CAU Imphal centre are also actively involved in many activities in the Directorate of Research office of CAU, Imphal

- Agri-Fare : 1
- Farmers' Field Day : 1
- Resource person : 3
- Interaction programme : 3

Lectures delivered on

- "Strategies for round the year fodder availability for feeding of dairy animals in NEH region with special reference to Manipur" organized by Dairy Voluntary organization of Manipur.
- "Issues and strategies for development of dairy farmers of Manipur" organized by Manipur Milk Producers' Co-operative Union Ltd.
- Invite as an expert during CAU, Agri Fair, 2018-19 at COA, CAU, Imphal

FTDs conducted in Rabi Season 2018-19

Crop (variety)	No. of FTDs conducted	Yield farmers practice (Approx.)	Improved (range) yield
Oat var. JHO-822	10	345q/ha	400q/ha

TSP activity

Physical Achievement during 2018-19	
Number of individuals/families/colonies/villages benefited	Type of assets created
90 nos. of families from 3 different villages of Chandel District, Manipur were benefited	Fodder rice bean seed, Fodder maize seed, sorghum, Napier hybrid cuttings, plant protection chemicals

M. Sc. /Ph. D. students guided as Co-guide Ph. D. (Agri.) -01

Germplasm maintained

Crop	No. of accessions	Source area
Rice bean	30	Imphal East, Imphal West, Thoubal, Bishnupur, Senapati, Churachandpur and Myanmar
Maize	25	Tamenglong, Ukhrul, Senapati imphal east and Churachandpur
Perennial fodder crops		
Napier hybrid	4	IGFRI, Jhansi, AAU, Jorhat, TNAU, Coimbatore, BAIF, Pune
Setaria	1	IGFRI, Jhansi and AAU, Jorhat
Signal	1	AAU, Jorhat

Inputs supplied

- Fodder maize and rice bean seed, chemical fertilizers etc. were supply to FTDs beneficiaries.
- Any type of fodder seed (seasonal, perennial, perennial cutting etc.) are made available at the AICRP on Forage Crops & Utilization, CAU, Imphal Centre.

University Assigned Activities

- Assigned as Co-PI in the Project Sustainable Livelihood Development of Farmers under Farmers FIRST Programme component.
- Assigned as Co-PI in the Project "Agricultural Development Action Plan for Schedule Caste Farmers in Selected Villages of Manipur, under DAPSC Programme of CAU, Imphal.

AICRP (FC&U), GBPUAT, Pantnagar

Publications in Journals

Pal MS and Joshi Garima (2019). Effect of integrated nutrient and picking management on yield, quality and sensory evaluation of baby corn (*Zea mays* L.). *Journal of Crop and Weed*.**14 (3):** 123.129.

Negi Harshita, Prasad Birendra, Kumar Anil and Kumar Sumit (2019). Simple correlation and phenotypic path co-efficient analysis in Oat germplasm. *International Journal of Chemical Studies*.**7(3):** 1174-1178.

Book chapters/Book published

Pal MS (2019). Efficient fodder production systems for availability of green fodder round the year. CAFT Training on 'Tactical Response Farming for Climate Resilience' from Jan 8 to 28, 2019 at Department of Agronomy, Pantnagar.

Pal MS (2018). Integrated farming system for rainfed agriculture. Key note lecture was delivered in a National Conference on Sustainable Management of Rainfed Agriculture, organized at ITM University, Gwalior on 16-17 Nov. 2018.

Popular articles: 1

Pal MS, Bahuguna A and Singh Shwatank Pratap (2018). Multipurpose Bichhu Grass (*Urtica dioica*). *Indian Farmers' Digest***51 (09):** 17-20.

TSP-Forage Crops: 68 fodder demonstrations on Oat

- Total scheduled tribes dominated 4 villages i.e. Madpuri, Salmata (U S Nafgar) & Basani and Dogra (Nainital) were selected in Uttarakhand state.
- In Rabi and spring/summers, total 68 fodder demonstrations on Oat var. UPO 212.

FTD conducted : 20 (10 Oat and 10 Berseem)

Farmers' Meetings : 04

Group discussions : 05

Radio Talks : 05

Teaching courses/Guidance of students/Participation in seminars

SN	Scientist Name	Nos. of Courses	students	Seminar participation
1	Dr Mahendra Singh Pal	02	02	02
2	Dr J S Verma	02	02	02
3	Dr B Prasad	02	05	02
	Total	06	09	06

Income generated

SN	Crop	Variety	Quantity	Rate of Breeder seed/q	Total earn (in rupees)
1	Oat	UPO-212	52.5 q	7250	380625.00
2	Cowpea	UPC-8705	0.4 q	12,900	5160.00
			Total		385785

Additional Duties

- Dr. M S Pal: Joint Director Extension
- Dr. B Prasad: Assoc. Director, Seed Production

AICRP (FC&U), CSK HPKV Palampur

Recognitions & Awards: Dr. Naveen Kumar- Reviewer Excellence Award – *Agricultural Science Digest*.

Research paper

- Katoch R, Tripathi A and Sood, Surbhi (2018). Possibilities of non-conventional feed resources in livestock feeding. *Forage Res.* **44(3)**: 141-151.
- Sharma Ankita, Sood V K, Prakash Jay and Chaudhary H K(2018). Genetic variability, character association and path analysis for forage yield and quality traits of tall fescue germplasm under north western Himalayas. *Range Mgmt. & Agroforestry* **39 (1)**: 22-28
- Sharma A, Sharma GD, Kumar N, Chahal A and Sankhyan NK (2019). Studies on the performance of promising varieties of oat (*Avena sativa* L.) under different cutting regimes in mid hill conditions of Himachal Pradesh. *J. Pharmacognosy and Phytochemistry* **8 (2)**: 728-731
- Shweta, Katoch R and Kumari M. (2018). Proximate and anti-nutritional composition of underutilized and common *Vigna* species of Himachal Pradesh. *Bull Env Pharmacol Life Sci* **6**: 24-31.

Book chapters

- Kumar N, Sood VK, Banyal DK and Katoch R (2018). Improvement of pasture and grassland forage base in North Western Indian Himalayas- strategies and option. In: *Fodder crops: Approaches for value addition and enhancing income* (Eds: Jindal, Y., Chhabra, A K and Roy A K). Earth Vision Publication (ISBN: 978-93-84922-77-1). Pp 146-152.
- Katoch R, Kumar N, Sood VK and Banyal DK (2018). Nutritional security perspective in Indian livestock sector. In: *Fodder crops: Approaches for value addition and enhancing income* (Eds: Jindal, Y., Chhabra, A K and Roy A K). Earth Vision Publication (ISBN: 978-93-84922-77-1). Pp 171-178.

Symposium/ conferences

- Banyal DK (2018). Characterization of *Erysiphe pisi* virulences causing pea powdery and genetics of resistance (lead lecture) in National Symposium on “Alternative Approaches in Plant Health Management for Enhancing Farmers’ Income” at UHF Solan on November 2-3, 2018. Page 1.
- Thakur A, Banyal DK and Singh A (2018). Management of leaf spot (*Cercospora canescens*) and powdery mildew (*Erysiphe polygoni*) of cowpea with fungicides in National Symposium on “Alternative Approaches in Plant Health Management for Enhancing Farmers’ Income” at UHF Solan on November 2-3, 2018. Page 94.
- Sharma SK, Katoch S, Dhiman S, Banyal DK and Sharma PN (2018). Bio-efficacy and phytotoxicity study of coordinated molecule – flupyrram 200 + tebuconazole 200-400 SC against anthracnose and angular leaf spot of common bean in National Symposium on “Alternative Approaches in Plant Health Management for Enhancing Farmers’ Income” at UHF Solan on November 2-3, 2018. Page 96.
- Malannavar AB and Banyal DK (2018). Effect of date of sowing on the incidence of diseases and nematodes in cowpea and their management in National Symposium on “Alternative Approaches in Plant Health Management for Enhancing Farmers’ Income” at UHF Solan on November 2-3, 2018. Page 99.

Participation in symposiums and conferences

- Dr. D K Banyal: - National Symposium on “Alternative Approaches in Plant Health Management for Enhancing Farmers’ Income” at UHF Solan on November 2-3, 2018.
- Drs. Naveen Kumar, V K Sood and D K Banyal: - 4th International Group Meet on “Wheat Productivity Enhancement through Climate Smart Practices” at CSKHPKV Palampur; February, 14-16, 2019.
- Dr. Naveen Kumar: -National Conference on Organic & Natural Farming- A Tool for Sustainable & Economic Development; at CSK HPKV Palampur, May 28-29, 2019.

Courses Taught

Course No	Course Title	Cr. Hr.
Agron 3613	Diseases of Field and Medicinal Crops	2+2
Agron 510	Agroforestry and Agrostology	2+1
Biochem.602	Advanced Mol. Biology	2+0=2
Biochem.504	Enzymology	2+1=3
GP 509	Biotechnology for Crop Improvement	2+1=3
GP 608	Advances in Breeding of Major Field Crops	2+0= 2
LPM 121	Livestock production and Management	1+1
PI Path 511	Chemicals in Plant Disease Management	2+1=3
PI Path 507	Diseases of Field and Medicinal Crops	2+2=3

Other activities

Project Monitoring	:	AICRP (FC) of Rabi 2018-19 at ANGRAU, Hyderabad
Students guidance	:	M Sc. - 10 , Ph. D. 10- (as major advisor) ; 51 (Member advisory committee)
Forage technology consultations	:	6
Lectures delivered	:	17 to farmers and development officers
Radio talk	:	1
Tribal Sub plan:	:	– Jersey Breeding Farm, Department of Animal Husbandry (HP)- Development of 3 ha lantana infested land into productive pasture
Linkage with other programme and institutes	:	– IVRI Regional Research Station Palampur – AICRP (IFS) – AICRP (Agroforestry)
Ad hoc Projects	:	– Scientists are associated in 7 Ad hoc projects as PI and Co PIs
Resource generation	:	– Approx. Rs.5.00 lakh

AICRP (FC&U), JNKVV, Jabalpur

Publications: 2

Kujur Monica Jyoti, Bilaiya SK, Mehta AK and Meena V (2017). Genetic divergence in fodder ricebean (*Vigna umbellata*) *Forage Research* **43 (2)**: 106-109.

Gupta Kavita and Mehta AK (2018). Estimation of Proline content in advance mutant lines of Oat (*Avena sativa* L.) under water stress condition. *Int. J. Chemical Studies* **6 (5)**: 2165-2167.

Important Persons visit

- Shri Sachin Yadav, Agriculture minister and Shri Lakhan Singh Yadav minister for Veterinary and Animal husbandry.
- Board Members of Vishwa Vidyalaya.
- Dr. P. M. Gaur International Scientist, ICRISAT Hyderabad.
- Scientists Drs. Y Jindal. (HAU, Hisar) and US Tiwana (PAU, Ludhiana)
- Scientists Drs. P Mahadevu (UAS, Bengaluru) and Dr M Choudhary (IGFRI, Jhansi)
- Dr. Mangla Rai Ex, DG-ICAR
- Director, ICAR- Indian Institute of Weed Science. Jabalpur

Students guided: M. Sc. - 1

FTDs conducted: Berseem JB1, JB5 = 10; Oat JO1, Kent = 5

TSP activity: 32 demonstration of different fodder crops at tribal block of Dindori (M.P.) and forage crop related literature were distributed to farmers.

TV/Radio talks: Radio talks = 1

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

Publications

- Ansarul Haq S, Joseph Korieng K, Shiekh TA, Bahar FA, Dar Khurshid A, Raja Waseem, Wani Rayees A and Khuroo NS (2018). Yield and Quality of Winter Cereal-Legume Fodder Mixtures and their Pure Stand under Temperate Conditions of Kashmir Valley, India. *International Journal of Current Microbiology and Applied Sciences*. **7 (2)**: 3626-3631.
- Mehraj U, Abidi I, Ahmad M, Gulzaffar, Dar ZA, Haq Ansarul, Lone AA, Rather MA and Mir MA (2018). Genotype x environment interaction for forage yield and its components in oats (*Avenasativa L.*). *Electronic Journal of Plant Breeding*. **8(1)**: 157-162.
- Ansarul Haq, Raja Waseem, Hussain Ashaq, Tahir A. Shiekh, Alam Intikhab and Nazir A. Teli (2018). Direct and residual effect of organic and chemical sources of nutrients on fodder sorghum-fodder oat cropping sequence. *Agricultural Reviews* (accepted).

Abstracts in Seminar/ Symposia

- Ansarul Haq S, Zaffar G, Shiekh TA, Khurshid A Dar, Bahar FA, Khuroo NS, Raja Waseem and Habib Mehfuza (2018). Cropping System Studies in Fodder Maize with Legume Intercropping under Temperate Conditions of Kashmir. National Conference on Innovative Technological Interventions for Doubling Farmers Income held at SKUAST-Jammu from 8-10th February, 2018. P 96.
- Ansarul Haq S, Zaffar G, Shiekh TA, Khurshid A Dar, Bahar FA, Anwar Bhat M, Raja Waseem, Khuroo NS and Habib Mehfuza (2018). Effect of Varying Seed Rate of Forage Legumes on Productivity of Fodder Maize under Kashmir Conditions. National Conference on Innovative Technological Interventions for Doubling Farmers Income held at SKUAST-Jammu from 8-10th February, 2018. P 108.

Forage Technology Demonstration Programme

- During *Rabi* 2018-19, twenty numbers of FTD's were conducted on Fodder oats of Kashmir and Ladakh regions through concerned KVKs under TSP programme.

TV/Radio talks delivered

Title	Media	Year/month	Speaker
Oats Seed production management	Radio talk	May-2018	Syed Ansar-ul Haq

Extension publications/review articles

Topic	Authors
Oats (<i>Avena sativa L.</i>)-Potential fodder crop in Kashmir valley.	S. Ansarul Haq, G. zaffar, , N.S. Khuroo and T.A. Shiekh
Alfalfa-An important forage Crop in cold arid region of Ladakh.	S. Ansar-ul-Haq., Gul Zaffar, Shahida Iqbal and Mehfuza habib

Training programme/Field days

District	No. of participants	Date	Venue
Kargil	30	08-10-2018	Mattayn Drass

AICRP (FC&U), AAU, Jorhat

Research Papers

- Dutta Deka, S, Sharma KK, Bordoloi N and Das J (2018). Organic crop production: An analysis of impact of shivyog modality of agriculture on growth and yield of crops. *Journal of Pharmacognosy and Phytochemistry*. **7(2)**: 1840-1846.
- Chongloi K Levish and Sharma KK (2018). Quality attributes of pea and oat in an intercropping system in rice fallows as influenced by integrated nutrient management. *Journal of Pharmacognosy and Phytochemistry*. **7(1S)**: 476 – 481.
- Srinivasan R, Kantwa Sitaram, Sharma KK, Choudhury M, Prasad M and Radhakrishnan A (2018). Development and evaluation of phosphate solubilizing microbial inoculants for fodder production in problem soils. *Range Management and Agroforestry*. **39 (1)**: 77-86

Book chapters: 2

- Sahrma KK and Bora Neog S (2018). Forage Resources and prospects for enhancing productivity in Assam, Fodder Crops – Approaches for value addition and enhancing income. Edited by Jindal Y, Chabra AK and Roy AK Published by AICRP on Forage crops, IGFRI, Jhansi.
- Sahrma KK and Bora Neog S (2018). Prospect of Lathyrus as forage legume Forage Resources and prospects for enhancing productivity in Assam, Fodder Crops – Approaches for value addition and enhancing income. Edited by Jindal Y, Chabra AK and Roy AK Published by AICRP on Forage Crops, IGFRI, Jhansi.

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

No. of FTDs conducted: 40

TSP activities: Adopted 2 villages in TSP district Baksa, Assam in North Bank Plain Zone.

Training conducted for farmers/ NGO/ Govt. officials: 4

TV/ Radio talk delivered by AICRP-FC staff/ extension activities: 2

Details of seed/ planting material sold

SN	Forage crops	Total quantity (kg)		
		Total Slips (No)	Foundation seed	TFL seed
1.	Hybrid Napier CO-4,CO-5	3.00 lakh		
2.	Setaria Kazungula,PSS-1	1.35 lakh	-	
3.	Rice bean Var. Shyamalima		20 kg	
4.	Oat Var. Kent and JHO 822			3.00 q
	Grand Total	4.35 lakh	20.00 Kg	3.00 q

New Variety Developed during last 3 years

Crop	Variety	Year of identification	Breeding methods	Area of adoption	Specific features
Rice bean	Madhuri	2016	Pure line selection	Assam	High green and dry matter yields, high quality characters and tolerant to insect pest and diseases in rice fallow both as relay and sole crop. Tolerant to drought and cold

Externally funded projects: 1

Optimization resources for identification of potential sorghum forage hybrids using genomic selection	Department of Biotechnology, Govt of India	As Co PI	2017 Continuing
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AICRP (FC&U), BAU, Ranchi

Research Publication

Prasad Yogendra, Singh D N, Kumar Birendra and Kumar Kamleshwar (2018). Challenges of Fodder Production in Jharkhand. Fodder Crop-Approaches for value Addition & Enhancing Income. Chapter 26, pp-225-227.

Popular Articles

- Prasad Yogendra, Prakash Surya and Kumar Birendra (Oct. 2018). *Jharkhand me Hara Chara ki Unnat Kheti*.
- *Gunwakta sampan beejutpadan ka mahatav* published in Phatari Krishi, Sept.-December, 2018, PP-11-12.

Training

- Yogendra Prasad, “Maintenance Breeding and Assured Quality seed production in dual purpose crops and grasses” 11th September to 1st October, 2018
- Birendra Kumar, Recent advances in pressurized irrigation system for enhancing water use efficiency. October 30th 2018 to November 08, 2018 at OUAT, Bhubaneswar.

Extension

- Twenty-Four Demonstration conducted on Berseem & Oats in Chanho Block and Eleven Demonstration in Mander Block of Ranchi district during Rabi 2018-19. All demonstration was conducted successfully during rabi 2018-19.
- Under farmer’s training programme three Kissan Gosthi organized on 06th March 2019 at Bokaro, 08th March 2019 at Dhanbad and 14th March 2019 at Kanke, Ranchi, Total beneficiaries were 124.

Association in Adhoc Project: PI: Dr. A. K. Singh, Co-PI: Dr. Yogendra Prasad - Technology Integration for Doubling Farm Income through Demonstration and Training of Innovative Technologies in District of Jharkhand funded by DBT for Rs 50 Lakhs

Important persons visit:

- Field Visited on 17th Sept. 2018 by Dr. A. K. Roy, and Dr. Khem Chand.
- Monitoring team visit on 28th Jan. 2019 Dr. Rahul Kapoor, PAU and Dr. Kalyan Jena, BCKV

Participation in Workshop:

- Participated in 30th AGM of AICRP on small millet from 7-8 March 2019 at BAU, Ranchi.
- Participated in 49th AGM of AICRP on soybean from 16th-18th March 2019 at BAU, Ranchi.

AICRP (FC&U), BCKV, Kalyani

Research papers

Mondal K, Jana K, Koireng RJ, Koli B, Sarkar S and Khan R (2018). Oats based cropping system: Important for sustainable livelihood and nutritional security. *Fodder crops: Approaches for value addition & Enhancing income* (ISBN: 978-93-84922-77-1) - Souvenir, National Group Meet, Rabi-2018-19, AICRP on Forage Crops and Utilization held at CCS HAU, Hisar, Haryana, September 7-8, 2018: 49-54.

Book chapters

Jana K, Puste AM, Banerjee J, Sarkar S and Koireng RJ (2018). Forage Production and Climate Change. *Forage Crops of the World*, Vol. 1 (e-ISBN: 978-1-351-16736-9) Major Forage Crops, 371-382, Published by Apple Academic Press. Inc. Distributed by CRC Press, a member of Taylor & Francis Group.

Poddar R, Jana K, Kundu C K and Das H (2018). Job's Tear (Coix). *Forage Crops of the World*, Vol. 1 (e-ISBN: 978-1-351-16736-9) Major Forage Crops, 371-382, Published by Apple Academic Press. Inc. Distributed by CRC Press, a member of Taylor & Francis Group.

Popular articles: 4 (in Bengali)

Student(s) guided: M. Sc. (Ag.) in Agronomy – 2Ph. D. in Agronomy- 4

Courses taught: Agronomy of fodder and forage crops and other courses

FTDs conducted: 50 units (*Rabi*, 2018-19).

TSP activities 79 tribal farmers of Taaldangra block (Gram Panchayet: Bibarda, Harmasra, Khalogram) of Bankura district and Bagmundi block (Gram Panchayet: Baghmundi, Ajodhya, Birgram, Sindhri) and Block Manbazar-II (Gram Panchayet: Dighi) of Puruliadistrict of West Bengal (Red & laterite zone i.e. western part) were benefitted by different field activities organized under TSP Programme of AICRP on FC & U, BCKV, Kalyani centre. *Moringa* seeds, Hybrid maize (cv. Disha), Lathyrus (cv. Prateek), Toria (cv. B-54), Oats (cv. Kent), Berseem (cv. Mescavi) seeds, planting materials (cuttings) of Bajra-Napier Hybrid (CO 3, CO 4 & CO 5) along with *rhizobium* culture, insecticides and fungicides were distributed among selected tribal farmers. The Oats (cv. Kent), Berseem (cv. Mescavi), *Moringa* seeds, Lathyrus (cv. Prateek) and Chickpea (cv. Jaki 9218) has been introduced at Taaldangra block of Bankura and Bagmundi block & Manbazar –II block of Purulia district under red and laterite zone (western part) of West Bengal. Tribal farmers' meet cum demonstrations on improved cultivation practices of fodder & forage crops in Red & Laterite Zone of West Bengal was conducted successfully under this TSP programme for socio-economic condition uplift of tribal farmers/families.

Farmers' Meeting: 3 (Three)

Multiplication and management of Guinea grass & Plantation of Drum stick plants (*Moringa*)

Externally Funded Project: 2 (Private Company)

Ad-hoc Project Funded by ATMA, Govt. of West Bengal: Enhancement of Pulses Production in drought prone areas of West Bengal (2018-19)

Participation in seminar/farmers' meeting etc:

- Farmers' Meet on forage production technology with tribal families at Baghmundi block of Purulia district and Taaldangra block of Bankura district (red and laterite zone) under TSP.

- Participated as CO-PI and delivered PPT in Programme Planning Meeting of Adaptive Research under Govt. of WB. - ICARDA Project at Pulses & Oilseed Research Station, Berhampore.
- Participated as resource person and delivered lecture with PPT on “Water Management in Early Vegetables” in Five Days Residential Training Programme, organized by FACC, BCKV at Lake Hall, BCKV & sponsored by Dept. of Agriculture, Govt. of West Bengal
- Participated as resource person and delivered lecture with PPT on Management of Betel Vine cultivation at SAMETI-WB at Ramakrishna Mission, Narendrapur.
- Participated as resource person in 8th *krishi mela* at Ramakrishna Mission, Kamarpukur, Hooghly and delivered a speech with power point presentation (PPT) on “Diversification of intensive cropping system”.

Awareness development on ‘seed production’ of forage crops: Seed production of lathyrus (cv. Prateek) and Oats (cv. Kent) by farmers for their own uses as seed for the next year.

Transfer of technology

- Distributed the seeds of berseem (cv. Mescavi) and lathyrus (cv. Prateek) to the resource poor farmers for popularizing as an under canopy legume crop in nutrient enrichment and fodder production in the litchi, mango, banana and guava orchards.
- Introduced berseem and oats as green forage crop and grasspea as ‘*paira*’ crop in Taaldangra block area in jangal mahal area of Bankura district and Baghmundi block of Purulia district under red and laterite zone of West Bengal.
- Given trainings to the farmers, SHGs of different districts of West Bengal.
- Participated in Agricultural Fair (*Krishi Mela*) conducted by KVK (Nadia) at Gayeshpur under BCKV for dissemination of forage technology.
- Distributions of leaflets on forage crops among the farmers for dissemination of technology.
- Distributed the planting material (cuttings) of BN hybrid (Variety: CO 3, CO 4 & CO 5) to the resource poor farmers in Bankura, Purulia, Paschim Medinipur in Western Part of West Bengal and Nadia, North-24 PGS, Hooghly and Burdwan districts etc.
- Provide the seeds of oats, lathyrus and berseem to UBKV, Pundibari, Coochbehar for research & experimental purposes.
- Provide seeds of lathyrus (cv. Prateek) for research and experimental purpose to AICRP on FC & U, CAU, Imphal, Manipur and different Institutes.
- Distributed hybrid maize seed (cv. Disha) to the resource poor tribal farmers for popularizing as baby corn cum green forage/ green cob cum green forage as well as grain cum stover production

Other activities:

- Act as external examiner for the subject ‘Organic farming’ (AGR-405) of UBKV, Coochbehar.
- Participated in the RAWE programme on “Farming System Analysis and Farm Improvement Plan” of under graduate students; B. Sc. (Ag.), Faculty of Agriculture, BCKV.
- All India Radio Talk Delivered- Participated in ‘*Krishi*’ programme of Akashvani, Kolkata on ‘Forage production programme through-out the year’.
- Act as reviewer of research papers in Journal of Agriculture and Technology, UBKV, Pundibari & another in Journal of Crop and Weed, BCKV, Mohanpur, Nadia, West Bengal-741252.
- Monitoring the AICRP on FC & U-BAU, Ranchi Centre, Jharkhand during rabi-2018-19.

AICRP (FC&U), OUA&T, Bhubaneswar

Publications

Seminar/symposium: 1

Behera P, Dash B, Panda NK and Dhal A (2018). Studies on Management of Foliar Diseases of Forage Oat. In National Symposium on “New Dimensions in Plant Protection-A Step towards Food and Nutritional Security and Environmental Safety, 27-28 Oct 2018, OUAT, Bhubaneswar.

Production of planting materials:

- Hybrid Napier Bajra root slips: 58,000
- Guinea Grass root slips: 30,000
- Himidicola Root Slips: 20,000
- (Sold to farmers, Forest Department and other agencies)

Linkages and collaborations with other agencies/Departments

1. Directorate of Animal Husbandry & Veterinary Services, Govt. of Odisha
2. Department of Forest & Environment, Govt. of Odisha
3. ICARDA
4. KVKs of OUAT

Externally funded projects operating and sanctioned

Partnership with ICARDA funded project

- “Spineless Cactus and Grass pea feeding to ruminants for sustenance of production”, funded by ICARDA”. Agencies: Dept. of Animal Nutrition, CVSAH, OUAT and AICRP on Forage Crops & Utilization, OUAT, Bhubaneswar; PI: Prof. Niranjan Panda, Dept. of Animal Nutrition, Co PI: Dr. Arabinda Dhal, OIC

Distinguished visitors, date and purpose of visit

Name of the visitor	Date of visit	Purpose of visit
Dr. S.K. Jha & Dr. Mayuri Sahu IGKV, Raipur	30 th & 31 st Aug 2018	Monitoring of Kharif 2018 experiments

WEATHER REPORT RABI 2018-19

The weather report of the AICRP-FCU Coordinating centers, Voluntary centers and Headquarter across the different zones during *Rabi* 2018-19 have been presented in this section. The weather parameters prevalent during 40th Standard Meteorological Week (SMW) (October 01-07, 2018) to 21st SMW (May 21-27, 2019) were taken into consideration, which covers the *Rabi* season, 2018-19 for all the testing/ experimenting locations for trial conduction (Tables M1 to M13) and depicted (Figs. M1 to M3). During the reporting period, weather variations are clearly visible in maximum and minimum temperature, relative humidity, rainfall, rainy days and sunshine hours in different agro-climatic zones, which had varied impact on establishment, growth, yield and quality of different annual and perennial forage crops and their varieties and also having close correlation with the incidence and surveillance of insect-pest and diseases of forage crops.

Temperature

In Hill zone, Srinagar was the coolest location recording -6.8°C during 52nd SMW. Maximum temperature was recorded at Almora (32.9°C) during 19th SMW. The mean T_{Min} over the season was recorded lowest at Srinagar (2.3°C). Whereas, the highest mean T_{Max} was recorded at Almora (23.6°C). In North-East zone, Ranchi centre recorded the lowest minimum temperature (2.2°C) during 3rd SMW. The highest maximum was also recorded at Faizabad (40.5°C) during 17th SMW. The higher mean T_{Max} was recorded at Bhubaneswar (31.3°C) and lowest mean T_{min} was recorded at Imphal (9.9°C). In North-West zone, Hisar recorded lowest minimum temperature (1.9°C) during 52nd SMW, whereas, maximum temperature was recorded at Bikaner (42.7°C) during 16th SMW. The higher mean T_{max} was noted at Bikaner (31.1°C); whereas, lowest mean T_{min} was noted at Pantnagar (11.4°C). In Central zone, Jhansi and Jabalpur recorded the lowest minimum temperature (4.8°C) during 51st SMW, whereas the maximum temperature was recorded at Anand (41.7°C) during 17th SMW. The higher mean T_{max} and lower mean T_{min} was recorded at Urulikanchan and Jhansi (33.7 and 12.4°C , respectively). In South zone, the lowest minimum and maximum temperature was recorded at Hyderabad (5.5°C during 1st SMW and 42.0°C during 21st SMW, respectively). The higher mean T_{max} and lower mean T_{min} was also recorded at Hyderabad (33.6 and 15.0°C , respectively). Least variation in minimum and maximum temperature was recorded 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 received substantial amount of rainfall especially J & K, Tamil Nadu and Andhra Pradesh as evident from the rainfall data presented in tables (M1 to M13). In Hill zone, Palampur received higher rainfall (605.4 mm) as compared to other centres in the zone. Almora received lowest rainfall (288.9 mm in 32 rainy days). In North-East zone, Jorhat centre received highest rainfall (710.5 mm in 55 rainy days) followed by Imphal (273.6 mm) and lowest being at Kalyani (82.5 mm). In North-West zone, Ludhiana received highest rainfall (217.7 mm in 13 rainy days) followed by Hisar (96.6 mm). Bikaner centre received lowest rainfall (46.1 mm) in 6 rainy days. In Central zone, maximum rainfall and maximum number of rainy days (125.2 mm, 10 days) was recorded at Raipur followed by Jabalpur (51.8 mm) and lowest being at Jhansi (32.8 mm). In South zone, Vellayani received maximum rainfall (507.0 mm) in 25 rainy days followed by Coimbatore (216.9 mm in 21 days).

Relative Humidity

In Hill zone, higher average RH during morning hours was recorded at Rajouri (88.1%). In afternoon hours Srinagar centre recorded higher RH2 (57.7%) followed by Palampur. In North-East zone, maximum average RH of 94.9 % during morning hours was recorded at Jorhat during followed by Bhubaneswar (93.0%). The average minimum RH during afternoon hours was recorded at Bhubaneswar (45.5 %) and Imphal (45.7 %) respectively. In North-West zone, higher average RH of the season during morning hours was recorded at Ludhiana (86.3 %) and Pantnagar (84.0 %) and in afternoon higher RH was recorded at Pantnagar (48.5%) and Hisar (43.8%). The lowest RH during morning as well as evening hours was recorded at Bikaner (75.6 & 40.8%, respectively). In Central zone, maximum RH in morning hours was recorded at Anand (78.9%) and Jabalpur (78.2%). The mean afternoon RH varied in limited range of 40.8 to 48.5% at all the centers in the zone. In South zone, maximum average RH of the season in morning and evening hours (89.6 and 75.4%) was recorded at Mandya. The lowest average RH (74.4 & 39.5%) in morning and evening hours, respectively, was recorded at Dharwad. In the tables RH1 and RH2 refers to morning and afternoon RH respectively.

Sunshine hours

In Hill zone, maximum average sunshine hours were recorded at Almora (7.2 hours/ day) and Palampur (6.7) followed by Rajouri (6.1). This indicates the weather was fairly clear during the period. In North-West zone, higher average sunshine hours were recorded at Bikaner (7.2). Lowest average sunshine hours were recorded at Hisar (6.0) in the zone. In North-East zone, maximum average sunshine hours were recorded at Ranchi (7.6) followed by Imphal (7.4) and lowest at Jorhat (4.9). In Central zone, maximum average sunshine hours were recorded at Anand (9.3) followed by Raipur (7.3). In South zone, maximum average sunshine hours were recorded at Hyderabad (8.1) and lowest at Mandya (6.8). It is evident from the above that among all the zones, central zone remained the brightest recording highest number of sunshine hours in a day.

Std. Week No.	Period	Std. Week No.	Period
40	01-07 Oct, 2018	05	29-04 Feb, 2019
41	08-14 Oct, 2018	06	05-11 Feb, 2019
42	15-21 Oct, 2018	07	12-18 Feb, 2019
43	22-28 Oct, 2018	08	19-25 Feb, 2019
44	29-04 Nov, 2018	09	26-04 March, 2019
45	05-11 Nov, 2018	10	05-11 March, 2019
46	12-18 Nov, 2018	11	12-18 March, 2019
47	19-25 Nov, 2018	12	19-25 March, 2019
48	26-02 Dec, 2018	13	26-01 April, 2019
49	03-09 Dec, 2018	14	02-08 April, 2019
50	10-16 Dec, 2018	15	09-15 April, 2019
51	17-23 Dec, 2018	16	16-22 April, 2019
52	24-31 Dec, 2018	17	23-29 April, 2019
01	01-06 Jan, 2019	18	30-06 May, 2019
02	07-14 Jan, 2019	19	07-13 May, 2019
03	15-21 Jan, 2019	20	14-20 May, 2019
04	22-28 Jan, 2019	21	21-27 May, 2019

Table M 1: Meteorological data in Hill zone during crop growth period of Rabi 2018-19

Std. Week no.	PALAMPUR						ALMORA						
	Temperature (C)		Humidity (%)		Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		Rainfall (mm)	No. of Rainy days	Sunshine hrs
	Max.	Min.	RH1	RH2			Max.	Min.	RH1	RH2			
40	26.6	14.0	69	53	2.0	8.9	28.9	13.4	73.4	44.4	0.0	-	8.7
41	25.6	12.4	72	48	2.0	7.6	26.3	17.6	84.4	42.3	0.0	-	7.6
42	25.2	11.9	81	62	0.0	9.5	27.6	13.7	75.7	41.4	0.0	-	8.7
43	23.6	10.1	53	42	0.0	9.5	26.4	3.6	76.9	41.9	0.0	-	9.0
44	22.6	10.5	71	57	23.8	6.3	25.3	4.4	78.8	42.9	22.5	1	9.1
45	20.4	7.3	75	50	1.0	7.3	24.2	2.8	84.9	44.5	0.0	-	7.3
46	19.7	7.6	75	56	22.0	5.0	23.5	4.9	83.3	46.7	0.0	-	7.2
47	21.0	7.0	70	49	0.0	8.7	24.6	4.4	92.0	34.9	0.0	-	7.7
48	20.1	7.1	83	55	0.0	6.4	23.2	5.2	97.0	40.5	0.0	-	6.4
49	17.1	4.9	75	57	0.0	7.4	21.9	1.6	91.1	43.3	0.0	-	6.5
50	14.9	4.5	69	50	6.2	4.9	16.1	-0.8	85.5	49.3	0.0	-	6.7
51	17.9	3.6	65	42	0.0	9.2	20.5	-3.1	82.0	29.0	0.0	-	7.8
52	14.9	1.5	71	40	0.0	8.0	19.5	-3.4	88.5	41.3	0.0	-	7.2
1	13.9	4.0	64	60	27.8	3.4	19.4	-1.7	71.9	34.8	0.0	-	6.4
2	14.4	3.0	80	51	7.4	5.4	19.7	-1.4	82.2	33.4	0.0	-	7.4
3	16.9	5.5	59	52	0.0	5.3	20.9	-0.1	88.3	31.9	22.5	1	6.3
4	12.1	1.6	75	57	71.2	3.6	12.2	2.0	95.5	67.9	17.5	4	2.8
5	13.9	3.7	65	53	49.0	5.1	18.6	1.2	86.1	37.1	0.0	-	6.2
6	15.7	4.3	68	55	104.0	4.7	17.3	3.9	82.0	54.1	30.8	2	5.0
7	16.1	6.4	75	71	59.0	3.0	17.8	5.6	94.2	57.0	39.9	5	4.2
8	15.7	6.3	80	57	82.0	3.7	18.5	5.6	98.9	50.3	8.0	2	5.8
9	13.7	4.6	72	61	24.2	4.9	15.6	5.5	93.7	56.6	37.4	5	4.5
10	17.7	5.6	73	53	4.0	7.4	22.9	4.1	99.0	37.9	10.0	1	7.9
11	17.8	6.8	68	49	18.8	4.9	22.9	5.8	90.1	38.6	11.7	2	5.1
12	21.6	9.0	58	45	3.4	6.1	23.8	5.4	93.2	38.1	0.0	-	8.3
13	24.1	11.5	59	45	1.0	7.6	28.1	8.4	85.4	35.5	0.0	-	9.4
14	27.3	13.7	57	39	4.2	9.7	27.7	9.7	85.6	38.5	1.8	1	7.9
15	26.4	14.3	55	40	0.0	6.3	30.3	10.1	88.1	32.0	0.0	-	9.7
16	22.7	11.8	73	63	40.2	5.7	25.4	10.1	87.7	58.0	68.5	4	4.7
17	29.3	15.4	49	36	13.0	9.9	32.0	11.6	79.6	38.6	0.0	-	10.4
18	28.9	14.8	39	30	1.0	8.3	32.1	11.6	76.2	33.5	5.3	1	8.8
19	30.6	18.4	49	35	2.0	10.1	32.9	9.8	65.4	28.1	8.5	2	9.0
20	27.4	15.1	64	50	36.4	6.0	31.6	10.8	89.0	32.9	4.5	1	6.9
Mean/Total	20.5	8.4	67.0	50.4	605.6	6.7	23.6	5.5	85.6	41.7	288.9	32	7.2

Table M 2: Meteorological data in Hill zone during crop growth period of Rabi 2018-19

Std. Week No.	SRINAGAR						RAJOURI					
	Temperature (C)		Humidity (%)		Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2			Max.	Min.	RH1	RH2		
40	25.3	7.1	70.5	48.2	0.0	8.2	29.8	13.1	88	43	0.0	8.0
41	23.6	8.6	82.4	49.3	4.0	7.8	28.1	9.7	89	36	3.4	8.3
42	18.6	4.2	72.6	42.4	0.0	6.3	27.8	8.8	87	29	0.0	7.8
43	21.2	1.8	74.7	57.1	0.0	7.2	27.5	6.6	86	28	0.0	9.0
44	20.5	3.1	72.4	61.1	7.0	6.4	23.8	8.3	86	52	42.6	2.9
45	10.3	2.1	86.4	65.3	5.0	4.2	22.9	5.1	89	35	0.0	7.1
46	13.3	1.9	87.5	70.5	8.0	2.7	20.4	4.9	87	46	10.8	5.4
47	12.2	2.4	80.3	54.0	8.6	2.1	23.9	3.9	89	36	0.0	7.2
48	13.3	-2.5	84.1	53.3	0.0	1.2	23.3	3.9	89	44	0.0	6.7
49	10.8	-4.2	89.8	75.0	0.0	1.1	21.0	2.7	87	41	0.0	5.3
50	6.4	-2.0	82.4	72.2	2.4	1.1	18.2	2.1	90	50	18.2	5.0
51	9.1	-5.4	84.3	60.5	0.0	0.8	21.8	-1.1	96	35	0.0	8.2
52	8.5	-6.8	88.3	65.1	0.0	2.3	18.9	-2.3	99	41	0.0	6.5
1	9.8	-2.0	92.0	73.2	23.0	3.5	15.3	1.0	93	42	10.0	2.8
2	6.5	-4.1	90.7	49.3	30.0	3.7	16.1	1.7	91	37	5.6	4.0
3	4.1	-4.9	90.2	72.5	22.0	2.6	16.2	0.1	95	47	8.4	2.2
4	4.1	-2.2	95.3	80.4	20.0	3.3	14.6	0.9	95	49	69.2	4.9
5	3.7	-5.1	88.0	64.3	18.0	1.1	15.1	1.7	94	47	13.6	3.1
6	3.8	-1.4	88.5	68.3	25.0	2.8	16.4	3.0	90	47	81.2	4.3
7	2.6	-0.5	89.1	73.0	32.3	1.7	16.3	5.6	85	54	9.8	2.6
8	4.1	-2.1	88.7	42.3	24.5	3.1	17.5	4.2	88	51	63.2	6.0
9	6.2	1.1	82.3	62.4	13.8	3.2	14.7	5.5	89	64	48.4	3.6
10	9.4	3.5	80.0	50.0	12.0	4.3	18.6	5.4	87	46	11.8	5.8
11	14.0	3.0	80.4	64.2	3.0	5.1	21.0	5.4	88	37	0.0	5.2
12	12.8	3.5	78.1	56.3	5.6	6.3	21.7	6.5	87	39	32.0	5.8
13	21.3	5.2	60.4	32.1	4.0	9.6	27.5	8.4	84	23	0.0	8.4
14	22.0	8.4	64.3	40.1	0.0	10.3	30.2	10.6	86	28	0.0	9.3
15	18.4	7.2	80.3	60.0	30.8	6.4	29.8	12.5	86	33	5.2	8.7
16	22.5	11.1	83.8	66.2	7.0	8.5	26.3	11.4	88	44	28.4	6.6
17	28.0	11.3	66.5	45.4	10.0	11.9	30.7	12.6	83	43	4.2	8.7
18	23.7	9.4	65.2	40.4	13.0	12.3	30.3	12.1	83	31	0.0	7.3
19	23.0	11.1	62.3	35.2	3.0	10.4	32.0	13.4	79	39	5.4	7.9
20	22.1	10.6	65.4	48.2	30.5	12.5	29.4	14.2	81	41	25.2	6.4
21	23.6	9.4	72.3	53.2	15.0	12.3	31.0	14.7	82	44	9.8	7.3
Mean/ Total	13.7	2.3	80.3	57.7	377.5	5.5	22.9	6.4	88.1	41.2	506.4	6.1

Table M 3: Meteorological data in North West zone during crop growth period of Rabi 2018-19

Std. Week No.	HISAR							BIKANER					Sunshine hrs	
	Temperature (C)		Humidity (%)		No. of Rainy	Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy days		Rainfall (mm)
	Max.	Min.	RH1	RH2				Max.	Min.	RH1	RH2			
40	34.4	20.0	90	40	0	0	7.9	39.5	22.1	51	20	0	0.0	9.4
41	32.5	17.9	86	43	0	0	6.8	36.4	19.0	62	22	0	0.0	9.0
42	33.4	16.5	73	30	0	0	7.1	35.5	17.3	56	22	0	0.0	8.0
43	31.4	14.4	84	36	0	0	7.1	35.7	16.7	53	23	0	0.0	9.7
44	31.0	15.4	92	44	0	0	2.1	30.4	9.9	62	25	0	0.0	9.9
45	27.4	10.1	90	41	0	0	3.3	31.1	12.0	72	31	0	0.0	8.0
46	27.5	12.7	91	53	0	0	3.5	30.4	10.9	75	27	0	0.8	8.6
47	27.4	10.9	87	44	0	0	5.8	29.7	10.0	73	29	0	0.8	8.1
48	27.2	9.4	93	46	0	0	5.5	28.3	8.7	65	29	0	0.0	9.0
49	24.9	7.5	96	45	0	0	5.1	21.7	5.8	88	42	0	0.0	7.6
50	21.0	7.7	91	57	0	0	3.6	24.3	1.8	74	28	0	0.0	9.5
51	20.7	2.0	93	50	0	0	6.3	26.6	3.0	78	30	0	0.0	8.1
52	19.8	1.9	94	49	0	0	4.4	22.8	5.9	88	36	0	0.0	5.4
1	18.9	5.7	95	66	0	0	3.3	22.5	5.6	86	34	0	0.0	6.8
2	19.3	5.6	93	60	0	0	4.4	24.6	6.3	80	32	0	0.0	7.6
3	20.4	4.9	90	55	0	0	5.0	18.8	5.7	94	46	0	2.5	6.0
4	18.2	4.8	99	63	1	6.5	4.6	20.9	4.5	83	41	0	0.2	7.3
5	17.1	5.3	96	65	0	0	3.9	22.7	6.6	87	37	0	0.0	8.7
6	21.0	6.9	92	56	0	0	5.7	25.1	9.6	76	36	0	0.0	7.3
7	20.0	9.7	94	67	0	0	3.1	24.2	9.9	82	42	0	0.0	6.9
8	22.2	9.0	89	50	0	0	5.6	24.2	9.5	79	37	0	1.6	7.1
9	20.9	8.0	93	53	2	14.8	5.8	27.5	10.5	72	29	0	0.2	9.3
10	24.2	8.5	88	38	0	0	8.2	27.7	10.1	76	35	0	0.0	7.6
11	24.9	9.1	91	48	0	0	6.1	33.1	15.0	61	35	0	0.0	8.4
12	28.9	11.8	80	42	0	0	7.2	37.9	18.3	67	34	0	0.0	1.2
13	32.6	13.5	81	28	0	0	7.3	41.6	22.2	89	80	0	0.0	-
14	36.0	16.0	74	28	1	7.3	8.0	39.2	23.3	96	88	1	13.4	-
15	36.9	20.0	69	27	0	0	7.0	34.6	19.6	80	55	2	17.6	1.7
16	32.9	17.2	81	37	2	8.2	7.2	42.7	25.0	86	86	0	0.0	10.4
17	40.7	20.6	56	19	0	0	8.5	41.8	24.6	85	90	0	0.0	10.9
18	40.1	20.8	48	23	0	0	9.3	41.0	26.2	64	54	2	7.6	10.5
19	40.5	21.7	48	20	0	0	7.9	38.1	23.0	56	32	0	1.4	10.1
20	35.7	20.5	82	37	5	59.8	8.3	38.1	23.0	56.0	32.1	0	1.4	10.1
21	37.9	23.3	62	29	0	0	8.1	41.8	25.7	75.1	34.0	0	0.0	10.4
Mean/ Total	27.9	12.0	84.1	43.8	11.0	96.6	6.0	31.1	13.5	74.4	39.5	5	47.5	8.1

Table M 4: Meteorological data in North West zone during crop growth period of Rabi 2018-19

Std. Week No.	LUDHIANA							PANTNAGAR						
	Temperature (C)		Humidity (%)		No. of Rainy Days	Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy Days	Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2				Max.	Min.	RH1	RH2			
40	32.5	20.5	93	47	0	0.0	9.6	32.3	18.5	84	60	0	0.0	9.1
41	30.8	18.6	85	40	0	0.0	8.0	30.9	17.1	83	61	1	2.0	7.3
42	31.7	16.0	88	33	0	0.0	8.9	30.7	14.3	87	59	0	0.0	7.8
43	26.2	14.2	90	35	0	0.0	8.1	29.6	12.0	90	51	0	0.0	8.3
44	29.6	16.2	89	44	0	2.6	2.1	29.9	13.7	87	54	1	4.2	7.1
45	27.1	11.0	90	33	0	0.0	6.5	27.5	11.7	94	54	0	0.0	7.7
46	26.4	11.5	91	36	0	0.0	6.3	26.5	11.8	92	63	0	0.0	6.5
47	27.2	10.8	88	31	0	0.0	8.3	26.3	10.5	93	53	0	0.0	7.7
48	25.7	10.1	93	34	0	0.0	5.7	25.8	10.7	95	61	0	0.0	6.4
49	22.6	7.7	95	43	0	0.0	4.8	23.9	7.8	93	61	0	0.0	6.2
50	20.3	7.4	93	50	0	0.0	4.7	22.6	6.6	95	60	0	0.8	6.3
51	20.3	3.6	93	39	0	0.0	6.3	22.5	5.0	97	51	0	0.0	6.8
52	18.4	2.8	95	42	0	0.0	5.5	20.3	3.9	97	52	0	0.0	6.7
1	18.2	6.7	92	53	0	2.0	2.2	21.3	6.0	91	60	0	0.0	6.0
2	19.8	6.0	90	44	0	2.0	5.1	21.7	5.7	94	57	0	0.0	5.8
3	19.3	6.2	91	48	1	46.4	4.0	21.7	5.7	93	53	0	0.0	6.1
4	17.2	5.9	94	53	1	15.6	7.6	20.5	8.6	88	57	2	14.2	0.8
5	19.0	6.2	93	52	0	0.0	4.7	20.9	7.0	93	63	0	0.0	6.1
6	19.5	8.4	92	59	2	68.4	4.7	21.3	9.1	95	6	2	15.0	4.7
7	19.8	10.6	91	62	2	16.4	2.4	22.7	10.8	94	4	2	12.0	4.8
8	21.1	10.3	91	58	1	5.4	6.8	24.3	11.4	92	64	1	3.2	4.6
9	20.0	9.6	89	55	2	11.4	6.7	21.5	9.0	92	69	3	6.8	5.7
10	22.7	10.0	87	50	0	1.4	8.2	26.0	8.9	5	50	0	0.0	9.4
11	24.6	10.7	90	45	0	0.0	7.5	27.8	11.9	0	47	1	2.6	6.4
12	26.9	12.9	87	42	0	0.0	7.5	30.7	11.7	85	41	0	0.0	9.1
13	31.1	14.7	88	38	0	0.0	10.0	32.3	15.5	85	50	0	0.0	7.7
14	34.3	18.3	83	33	0	0.0	9.4	33.3	18.0	70	43	0	0.0	8.4
15	35.0	19.9	70	31	1	6.6	7.1	35.7	17.3	74	32	1	3.2	9.2
16	31.3	18.1	77	37	1	31.2	8.9	33.2	17.8	72	37	2	11.2	7.7
17	39.3	21.9	58	19	1	3.8	10.4	38.3	20.0	63	25	0	0.0	10.1
18	37.7	21.3	42	15	1	4.5	9.9	39.1	21.1	60	18	0	0.0	9.9
Mean/ Total	25.7	11.9	86.7	42.0	13.0	217.7	6.7	27.1	11.6	81.7	48.9	16.0	75.2	7.0

Table M 5: Meteorological data in Central zone during crop growth period of Rabi 2018-19

Std. Week No.	URULIKANCHAN					JHANSI					
	Temperature (C)		Humidity (%)	No. of Rainy days	Rainfall (mm)	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)
	Max.	Min.	RH1			Max.	Min.	RH1	RH2		
40	34.3	22.0	62.6	0	0.0	35.8	20.0	80	36		0.0
41	34.8	22.6	57.6	0	0.0	34.6	18.3	79	36		0.0
42	33.4	22.3	61.6	0	0.0	34.8	15.9	76	36		0.0
43	34.1	21.5	48.1	0	0.0	33.6	14.9	75	38		0.0
44	32.1	20.8	49.2	0	0.0	32.1	14.5	78	43		0.0
45	32.8	20.1	51.6	0	0.0	29.4	11.1	79	47		0.0
46	31.7	18.5	49.2	0	0.0	30.9	11.9	83	46		0.0
47	29.9	19.3	50.9	0	0.0	30.2	11.4	81	51		0.0
48	29.2	17.2	48.0	0	0.0	26.5	9.8	81	44		0.0
49	30.8	20.8	59.1	0	0.0	25.7	8.1	78	43		0.0
50	28.3	18.3	53.5	0	0.0	22.9	7.0	87	46		0.0
51	27.8	16.6	55.7	0	0.0	22.8	4.8	90	49		0.0
52	27.6	15.3	50.2	0	0.0	21.9	4.8	91	56		0.0
1	29.8	14.8	47.2	0	0.0	23.6	5.8	88	48		0.0
2	29.8	15.5	49.4	0	0.0	21.2	5.1	88	52		0.0
3	29.7	17.4	50.7	0	0.0	22.9	4.8	90	45		0.0
4	27.6	16.6	54.6	0	0.0	21.4	8.2	90	55	1	3.8
5	29.2	17.3	49.2	0	0.0	21.5	5.9	89	58		0.0
6	29.5	16.3	48.8	0	0.0	22.0	7.7	89	57		0.0
7	34.8	22.7	47.2	0	0.0	23.5	9.5	90	45	1	12.4
8	36.2	23.3	43.1	0	0.0	27.3	11.0	83	47	1	4.0
9	32.7	20.0	50.8	0	0.0	23.1	9.4	89	52		0.0
10	35.1	21.8	55.3	0	0.0	26.4	11.7	82	44	2	6.2
11	36.4	22.9	45.6	0	0.0	28.0	12.3	80	43		0.0
12	37.6	23.2	45.2	0	0.0	32.2	14.4	75	38		0.0
13	39.2	26.1	48.3	0	0.0	35.6	16.4	63	33		0.0
14	39.1	26.1	47.8	0	0.0	38.9	17.1	62	32		0.0
15	39.2	26.5	51.6	0	0.0	40.1	19.7	65	30		0.0
16	37.1	25.4	56.1	0	0.0	34.2	17.4	76	41	2	6.4
17	40.9	29.1	46.4	0	0.0	42.0	21.1	53	29		0.0
18	38.5	25.6	48.7	0	0.0	41.6	22.7	46	30		0.0
19	38.8	26.0	49.2	0	0.0	41.5	21.8	44	29		0.0
20	39.0	26.4	49.7	0	0.0	40.5	21.7	45	31		0.0
21	38.9	26.4	49.9	0	0.0						
Mean/ Total	33.7	21.3	50.9	0.0	0.0	30.0	12.6	77.1	42.7	7.0	32.8

Table M 6: Meteorological data in Central zone during crop growth period of Rabi 2018-19

Std. Week No.	ANAND						RAHURI						Sunshine hrs
	Temperature (C)		Humidity (%)		Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	
	Max.	Min.	RH1	RH2			Max.	Min.	RH1	RH2			
40	37.3	22.3	86	43	0	9	34.0	21.5	67	43	-	0	7.8
41	37.2	20.4	89	35	0	9	34.0	18.4	55	30	-	0	8.8
42	37.2	19.8	91	33	0	9	33.5	18.6	50	30	-	0	8.2
43	36.8	16.7	89	26	0	9.8	34.4	16.8	46	30	-	0	8.5
44	35.5	17.4	78	29	0	9.9	31.7	14.4	58	39	-	2	9.4
45	34.3	14.6	85	32	0	9.6	33.1	16.8	59	37	-	0	8.1
46	34.5	14.4	88	35	0	9.3	32.5	12.9	43	23	-	0	9.9
47	34.4	16.1	89	38	0	9.2	31.7	16.3	61	46	-	0	7.7
48	30.9	13.9	82	40	0	8.1	30.1	11.3	58	32	-	0	9.2
49	30.1	13.6	87	45	0	7.1	30.3	15.0	60	35	-	0	6.6
50	28.1	11.1	82	39	0	8.6	28.1	11.3	55	35	-	0	5.6
51	27.7	9.1	85	35	0	9.3	26.5	9.0	64	36	-	0	9.1
52	24	7.1	70	25	0	8.3	27.8	8.9	51	30	-	0	8
1	28.7	8.2	87	31	0	9.3	29.3	8.8	42	23	-	0	9.1
2	26.5	9.4	83	37	0	9.1	28.5	8.9	57	28	-	0	8.2
3	29.7	10.7	88	37	0	9.5	29.4	11.3	58	31	-	0	8.3
4	25.5	10.7	86	39	0	9.2	27.2	10.3	60	42	-	0	6.8
5	26.9	10.9	76	37	0	9.3	27.7	10.4	53	29	-	0	7.7
6	27.5	10.1	88	34	0	8.2	27.8	9.0	54	29	-	0	8.3
7	30.7	12.7	84	34	0	9.4	31.8	14.1	55	28	-	0	8
8	32	14.1	89	39	0	9.8	34.6	15.9	50	24	-	0	9.6
9	31.6	15.2	70	32	0	9.2	31.9	13.0	47	20	-	0	9.7
10	31.1	14.6	79	30	0	9.1	33.3	14.1	45	20	-	0	9.2
11	32.5	15.4	68	21	0	9.5	35.5	15.9	51	16	-	0	8.6
12	35.9	17.5	71	26	0	9.8	36.4	16.1	46	15	-	0	8.9
13	39.3	19.7	71	32	0	9.7	39.3	18.8	40	13	-	0	8.9
14	39.6	21.6	88	33	0	9.9	39.7	19.9	38	14	-	0	9.2
15	40.2	22.2	69	26	0	10.4	40.4	21.2	35	13	-	0	9
16	36.6	21.1	65	33	0	9.2	37.1	19.2	45	19	1	4.4	9.4
17	41.7	24.4	57	21	0	11.2	41.2	24.0	32	12	-	0	10.5
18	39.2	24.4	76	34	0	10.6	39.1	20.7	37	16	-	0	10.3
19	38.6	23.7	70	36	0	11.1	39.3	21.7	44	17	-	0	10.5
20	21.9	14.6	44	17	0	6.4	40.0	21.8	34	14	-	0	10.8
21							41.2	25.6	38	16	-	0	10.9
Mean/ Total	32.8	15.7	79.1	32.8	0	9.3	33.5	15.6	49.6	26.0	1.0	6.4	8.8

Table M 7: Meteorological data in Central zone during crop growth period of Rabi 2018-19

Std. Week No.	JABALPUR						RAIPUR						
	Temperature (C)		Humidity (%)		Rainfall (mm)	No. of Rainy Days	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2			Max.	Min.	RH1	RH2			
40	34.2	19.8	89	54	0.0	0	34.0	23.8	91	44	0	0.0	8.0
41	32.0	18.0	86	61	0.0	0	32.4	22.8	87	51	0	0.0	7.1
42	32.7	17.8	86	53	0.0	0	33.4	21.3	89	40	0	0.0	8.5
43	31.9	14.7	85	53	0.0	0	32.9	18.9	86	48	0	0.0	8.3
44	30.5	15.1	88	46	0.0	0	31.0	19.6	86	49	0	0.0	9.3
45	29.0	10.9	85	29	0.0	0	32.3	17.7	84	34	0	0.0	8.5
46	30.5	9.0	82	35	0.0	0	31.5	14.4	86	29	0	0.0	9.1
47	29.7	9.9	84	30	0.0	0	31.4	15.3	88	29	0	0.0	7.9
48	27.0	8.2	84	34	0.0	0	29.3	13.6	90	35	0	0.0	7.0
49	25.6	9.0	86	34	0.0	0	28.2	14.3	85	39	0	0.0	4.2
50	24.4	7.9	83	43	0.0	0	27.4	15.7	85	49	0	0.0	1.6
51	22.3	4.8	77	37	0.0	0	22.1	11.0	93	56	2	47.2	4.8
52	22.8	4.8	76	31	0.0	0	25.2	8.5	87	26	0	0.0	7.5
1	25.0	6.6	77	37	0.0	0	27.4	8.5	88	28	0	0.0	6.6
2	22.9	6.4	84	43	0.0	0	27.1	10.2	87	34	0	0.0	6.1
3	23.9	5.3	72	27	0.0	0	28.1	9.2	85	21	0	0.0	6.8
4	23.8	7.4	79	40	4.3	1	26.3	14.3	85	53	2	23.6	4.0
5	24.4	7.1	79	35	0.0	0	26.4	9.5	87	24	0	0.0	8.2
6	26.2	9.9	69	36	1.0	0	28.8	12.5	81	36	1	3.4	7.6
7	26.2	10.7	78	47	5.4	1	30.2	13.6	84	34	1	9.0	8.3
8	29.9	13.7	77	40	0.0	0	33.1	17.0	81	30	0	0.0	9.1
9	26.9	12.6	78	43	0.8	0	31.0	17.3	72	36	0	0.2	7.8
10	28.9	11.7	82	36	12.0	1	33.3	17.6	70	32	0	0.0	8.9
11	31.6	14.7	85	49	5.4	1	35.6	21.6	72	33	0	0.0	6.8
12	32.5	13.4	79	29	0.0	0	34.5	19.8	80	28	1	9.2	8.4
13	36.5	15.4	76	22	0.0	0	38.2	20.6	64	19	1	10.8	8.7
14	38.8	17.7	57	17	0.0	0	39.7	23.4	50	18	0	0.0	8.3
15	39.9	19.8	52	20	0.0	0	40.8	24.5	47	20	0	0.0	8.3
16	34.6	18.4	74	36	22.9	2	38.0	24.1	61	27	1	11.2	9.0
17	40.2	19.8	66	23	0.0	0	42.0	26.3	45	15	0	0.0	10.1
18							40.8	26.2	60	26	1	10.6	8.2
19							40.7	26.8	42	12	0	0.0	9.3
20							42.8	27.5	39.7	14.9	0	0.0	10.3
21							44.2	29.4	41	18	0	0.0	9.8
Mean/ Total	29.5	12.0	78.5	37.3	51.8	6.0	32.9	18.1	75.3	32.0	10.0	125.2	7.7

Table M 8: Meteorological data in North East zone during crop growth period of Rabi 2018-19

Std. Week No.	JORHAT							RANCHI					
	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2				Max.	Min.	RH1	RH2		
40	30.6	23.0	97	69	1	4.0	5.8						
41	28.7	21.3	97	78	3	12.8	3.6						
42	29.0	19.8	94	71	0	0.6	4.6	25.9	15.2	86.9	68.3	0	9.1
43	30.7	18.9	97	61	0	0.0	7.1	26.5	15.4	87	67.9	0	8.9
44	28.9	18.1	95	65	0	0.0	6.1	27.9	17.9	87	68.4	0	7.5
45	25.9	16.1	98	66	1	19.3	5.7	28.7	17.5	84.9	68.6	0	8.1
46	26.4	15.6	98	70	2	13.1	4.9	26.1	13.6	84.4	68.6	0	9
47	25.6	13.3	98	67	0	0.0	6.4	24.9	10.9	83.7	69	0	8.8
48	26.9	11.9	99	60	0	0.0	7.7	25.5	7.5	84.6	68.3	0	8.7
49	25.9	11.1	98	59	0	0.0	7.2	25.6	5.8	84.9	68	0	8.3
50	26.4	9.7	95	53	0	0.0	6.9	24.8	7.7	86.1	69.1	0	5.8
51	22.7	12.9	99	77	2	29.6	4.1	21.4	4.0	84.6	69.4	13.5	5.3
52	24.2	9.7	98	65	0	0.0	7.5	17.8	2.3	85.3	69.1	0	10
1	23.3	8.2	95	61	0	0.6	7.7	19.8	3.7	86	68	0	8.6
2	24.1	9.1	96	62	1	6.6	7.5	21.4	4.0	82	68	0	7.8
3	25.4	8.1	96	57	0	0.0	7.4	20.6	2.2	84	66	0	8.5
4	25.9	10.3	93	61	0	0.0	6.4	25.6	8.2	85	69	2	4.7
5	25.0	10.2	94	58	1	3.5	6.1	22.7	4.5	86	68	0	8.4
6	25.8	12.1	95	60	1	9.2	5.8	26	9.9	84	68	4.2	7.7
7	27.2	12.2	90	59	1	8.2	5.6	25.7	8.3	84	68	0	8.8
8	21.3	14.2	98	76	4	17.9	1.5	28.4	13.6	85	68	0	8.6
9	24.5	12.2	95	61	1	5.3	4.6	25.4	11.7	86	69	6.2	4.9
10	23.5	15.1	94	68	3	18.5	2.5	26.6	14.6	86	67	0	7.5
11	29.0	17.3	90	58	0	0.0	3.3	27.4	13.8	85	69	30.7	5.2
12	26.8	15.8	90	63	5	34.3	3.8	28.5	14.3	85	68	8.2	7.6
13	29.3	17.5	90	61	3	21.9	4.3	33.6	16.1	83	72	0	8.1
14	24.7	18.2	93	74	3	28.0	3.3	36.8	17.6	86	69	4	8.9
15	29.7	19.7	93	64	2	27.9	5.2	34.9	20.1	86	68	0	8.4
16	30.2	20.0	91	71	1	44.1	4.3	35.5	23	86	68	19.7	6.6
17	32.4	21.4	89	68	1	32.5	4.6	37.6	25	85	68	0	9.3
18	25.9	21.1	98	83	5	192.2	1.7	36.1	22.9	85	69	31.8	0
19	26.1	20.6	96	84	4	51.6	1.5						
20	28.3	21.2	95	79	6	52.9	1.9						
21	28.4	22.5	93	80	4	75.9	1.4						
Mean/ Total	26.7	15.5	94.9	66.7	55	710.5	4.9	27.2	12.1	85.1	68.4	120.3	7.6

Table M 9: Meteorological data in North East zone during crop growth period of Rabi 2018-19

Std. Week No.	IMPHAL							KALYANI						
	Temperature (C)		Humidity (%)		Rainfall (mm)	No. of Rainy days	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2				Max.	Min.	RH1	RH2			
40	31.1	18.8	91	53	0.0	0	8.0	35.4	25.3	92	53	--	0.0	9.1
41	28.2	18.0	89	63	24.2	2	5.0	30.1	23.5	94	74	4	11.0	3.7
42	25.9	15.9	91	68	82.6	3	5.0	33.9	21.8	94	57	--	0.0	8.8
43	28.6	14.7	86	40	0.0	0	9.0	32.5	19.9	92	51	--	0.0	7.7
44	25.1	15.9	90	71	12.3	3	5.0	30.6	21.7	93	60	4	10.4	6.3
45	26.2	12.6	88	64	0.4	1	7.0	30.7	19.5	91	48	--	0.0	6.8
46	26.4	10.8	87	51	0.0	0	9.0	30.8	18.2	92	45	--	0.0	7.4
47	24.7	8.1	86	41	0.0	0	8.0	29.1	15.9	91	43	--	0.0	6.3
48	25.4	5.9	84	33	0.0	0	10.0	28.8	16.2	91	47	--	0.0	6.1
49	24.3	7.2	86	41	0.0	0	8.0	26.2	12.5	93	44	--	0.0	5.1
50	23.7	6.4	90	42	1.5	1	8.0	26.7	13.2	88	43	--	0.0	5.4
51	21.8	11.4	92	66	22.8	3	3.0	21.4	12.4	96	65	3	18.4	4.9
52	22.6	6.0	87	43	0.0	0	9.0	23.1	8.3	94	41	--	0.0	7.8
1	22.0	3.6	92	40	0.0	0	8.9	24.6	8.6	92	42	--	0.0	7.6
2	23.3	4.4	92	37	0.0	0	9.2	24.8	9.6	91	44	--	0.0	7.3
3	23.7	4.1	90	40	0.0	0	8.9	24.7	9.3	90	41	--	0.0	6.3
4	24.0	3.9	92	31	0.0	0	9.4	27.4	12.1	89	44	--	0.0	6.2
5	24.3	6.8	92	37	3.4	1	6.9	25.5	10.8	88	42	--	0.0	7.3
6	25.2	4.0	89	27	0.0	0	9.6	27.5	12.8	91	39	--	0.0	5.2
7	26.3	6.9	89	37	0.0	0	7.8	28.0	12.9	89	41	--	0.0	8.1
8	24.4	8.9	85	41	0.2	1	6.4	31.5	16.1	90	36	--	0.0	8.7
9	22.9	11.1	88	60	20.1	4	4.0	25.4	15.7	95	65	4	11.0	5.4
10	23.1	9.4	87	42	16.0	4	6.4	29.2	18.5	93	49	0	0.3	6.0
11	25.6	9.2	81	38	0.1	1	6.9	33.7	22.6	92	48	0	0.5	7.1
12	27.8	13.5	84	47	12.9	2	6.0	33.9	21.5	90	38	1	2.5	8.0
13	28.5	12.1	83	37	7.0	3	8.1	33.7	21.8	92	51	0	0.1	8.0
14	28.3	12.9	85	47	27.1	4	8.4	32.7	22.4	93	65	3	7.6	5.9
15	26.9	14.4	86	55	9.8	4	4.7	33.8	24.1	91	63	2	10.9	7.1
16	31.0	16.3	86	44	25.6	2	7.9	35.2	24.2	88	51	0	0.2	8.1
17	30.7	13.9	81	41	7.6	1	8.1	36.2	24.7	89	51	0	1.6	9.4
18								33.7	26.0	88	66	2	7.9	6.2
Mean/ Total	25.7	10.2	87.6	45.9	273.6	40.0	7.4	29.7	17.5	91.4	49.9	23.0	82.4	6.9

Table M 10: Meteorological data in North East zone during crop growth period of Rabi 2018-19

Std. Week No.	BHUBANESWAR							FAIZABAD						
	Temperature (C)		Humidity (%)		Rainy days	Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		Rainy days	Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2				Max.	Min.	RH1	RH2			
40	35.1	25.4	94	55	0	0.0	7.5	34.4	21.6	88	55	0	0.0	9.3
41	30.7	23.3	96	72	4	230.4	3.4	32.4	21.0	89	57	0	0.0	8.3
42	33.4	22.5	94	56	0	0.0	7.5	33.8	17.6	83	48	0	0.0	8.4
43	33.0	20.6	92	53	1	3.6	8.7	32.0	15.4	86	56	0	0.0	8.5
44	30.0	21.8	94	63	1	2.8	6.7	31.9	15.5	90	50	0	0.0	8.7
45	32.3	21.7	93	58	0	0.0	7.2	28.6	12.7	92	45	0	0.0	7.4
46	31.7	17.7	91	42	0	0.0	7.2	28.6	13.1	93	51	0	0.0	7.2
47	31.5	17.5	94	44	0	0.0	7.5	27.9	9.6	93	43	0	0.0	7.1
48	30.0	15.6	91	39	0	0.0	7.7	26.8	11.1	92	49	0	0.0	6.8
49	28.8	15.6	91	45	0	0.0	5.5	25.1	8.5	93	49	0	0.0	6.3
50	28.8	16.1	91	42	0	0.0	5.3	24.2	7.6	93	45	0	0.0	6.2
51	24.3	14.1	89	60	2	11.1	4.6	23.1	5.0	94	48	0	0.0	6.8
52	26.2	10.3	88	33	0	0.0	7.3	21.0	3.6	94	46	0	0.0	7.3
1	27.5	10.2	95	33	0	0.0	7.8	22.3	5.4	93	51	0	0.0	5.6
2	28.6	12.7	97	38	0	0.0	6.8	22.0	5.8	93	51	0	0.0	6.1
3	29.0	13.2	98	36	0	0.0	6.3	22.7	5.1	94	42	0	0.0	6.9
4	29.7	16.1	95	41	0	0.0	6.5	20.6	10.6	93	60	3	41.0	4.2
5	28.3	11.5	91	34	0	0.0	6.5	21.9	7.1	95	55	0	0.0	7.5
6	32.3	15.2	93	32	0	0.0	7.4	22.4	8.9	93	57	2	9.0	4.4
7	32.0	16.0	93	37		1.5	8.1	21.8	9.1	93	61	0	2.0	3.7
8	36.2	21.2	96	36		0.5	8.5	25.6	11.3	86	52	1	2.5	6.9
9	32.0	21.0	91	50	1	22.6	6.9	22.9	10.1	93	53	0	0.0	6.8
10	33.6	22.9	93	49	1	2.5	6.7	26.9	11.9	87	47	0	0.0	9.2
11	36.0	23.9	95	51	1	4.3	6.9	30.0	12.7	87	36	0	0.0	5.2
12	36.2	22.8	90	43		0.3	7.3	32.3	12.8	86	35	0	0.0	9.5
13	37.5	24.9	93	42	0	0.0	7.7	34.1	17.4	85	40	1	5.0	8.9
14								34.6	18.9	80	42	0	2.0	8.5
15								36.7	21.3	75	39	0	0.0	9.4
16								34.7	19.2	84	50	0	0.0	8.0
17								40.5	23.3	76	30	0	0.0	9.6
Mean/ Total	31.3	18.2	93.0	45.5	11.0	279.6	6.9	28.1	12.4	89.0	48.1	7.0	61.5	7.3

Table M 11: Meteorological data in South zone during crop growth period of Rabi 2018-19

Std. Week No.	HYDERABAD							VELLAYANI						
	Temperature (C)		Humidity (%)		No. of Rainy Days	Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2				Max.	Min.	RH1	RH2			
40	32.6	18.6	91.1	46.7	0	0.0	8.1	31.5	24.7	92	85	3	48.3	3.0
41	33.4	16.2	79.3	34.3	0	0.0	7.1	30.7	24.3	93	80	3	134.6	2.8
42	32.1	18.4	89.7	46.7	2	43.2	6.3	32.0	24.5	91	77	5	90.6	5.2
43	32.2	14.9	87.4	32.0	0	0.0	7.2	31.4	24.2	94	76	1	11.3	4.8
44	30.1	14.4	87.0	43.4	0	0.0	8.0	31.8	24.3	93	77	2	71.5	6.7
45	32.7	14.4	88.6	34.1	0	0.0	8.9	31.1	24.3	94	79	3	59.2	3.1
46	32.1	12.7	80.6	31.6	0	0.0	8.8	31.7	23.8	92	73	1	51.2	5.0
47	31.1	15.0	89.0	41.1	0	0.0	7.2	31.6	24.1	93	74	3	51.8	7.6
48	29.4	9.5	87.3	40.6	0	0.0	9.0	31.9	23.7	93	72	-	-	6.6
49	29.1	15.7	91.0	53.0	0	0.0	4.3	31.9	23.7	93	74	2	17.2	6.2
50	28.7	15.6	89.0	48.4	1	11.2	3.0	32.2	23.8	94	74	1	26.1	6.5
51	24.6	12.4	91.9	56.9	0	2.4	4.3	32.0	22.9	92	72	-	2.2	6.9
52	28.7	8.7	89.3	32.3	0	0.0	8.4	31.9	23.5	93	72	1	6.0	8.0
1	28.7	5.5	87.7	30.0	0	0.0	9.2	32.0	19.6	92	67	-	-	8.8
2	29.3	7.6	93.6	37.4	0	0.0	8.4	27.1	20.7	92	69	-	-	8.7
3	29.6	8.0	89.6	39.9	0	0.0	8.6	32.2	20.9	92	68	-	-	7.8
4	28.7	12.9	87.6	55.1	2	25.2	6.3	32.0	21.2	92	67	-	-	9.3
5	27.0	9.4	94.6	47.9	0	0.0	8.0	32.5	22.1	93	64	-	2.4	9.6
6	30.4	13.4	81.0	46.6	0	0.0	8.8	32.8	24.3	89	68	-	0.5	8.2
7	32.4	14.1	89.9	48.7	0	2.0	9.6	33.3	24.1	87	64	-	-	9.5
8	34.9	16.3	78.6	44.6	0	0.0	9.8	35.3	23.4	87	61	-	-	9.7
9	34.1	16.8	85.6	52.1	0	0.0	8.7	34.4	24.2	85	62	-	-	9.3
10	36.0	14.5	81.6	48.6	0	0.0	9.1	34.6	24.8	85	60	-	-	9.4
11	37.2	16.4	71.4	51.0	0	0.0	8.8	34.4	24.4	85	61	-	-	9.2
12	36.9	18.6	79.7	36.6	0	0.0	8.5	34.2	24.8	85	61	-	-	9.2
13	38.9	17.9	71.0	23.0	0	1.0	8.4	34.8	25.4	86	62	-	-	8.9
14	39.1	17.7	75.6	33.1	1	12.8	7.7	35.2	26.0	85	62	-	-	9.4
15	39.1	18.0	77.0	40.1	0	0.6	8.4	35.0	25.9	78	62	-	-	9.3
16	38.1	18.4	74.9	42.7	2	28.8	9.6	34.9	25.6	82	67	2	11.0	7.7
17	39.1	18.7	63.3	22.4	0	0.0	9.4	35.1	25.6	85	64	1	6.7	8.3
18	40.6	20.1	55.3	31.1	0	0.0	8.7	34.0	25.9	83	67	1	15.8	6.5
19	40.9	20.6	51.6	23.4	0	1.2	8.8	34.3	26.2	80	67	-	-	9.2
20	41.1	20.4	63.7	28.0	1	7.8	10.0	34.5	26.2	81	67	-	-	9.3
21	42.0	23.0	60.7	30.0	0	0.0	9.5	34.5	26.5	87	73	2	83.5	6.9
Mean/ Total	33.6	15.1	81.0	39.8	9.0	136.2	8.1	32.9	24.1	88.8	69.1	31.0	689.9	7.5

Table M 12: Meteorological data in South zone during crop growth period of Rabi 2018-19

Std. Week No.	COIMBATORE							MANDYA						
	Temperature (C)		No. of Rainy days	Rainfall (mm)	Humidity (%)		Suns hine hrs	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs
	Max.	Min.			RH1	RH2		Max.	Min.	RH1	RH2			
40	29.9	22.7	4	66.0	89	70	4.7	31.4	19.1	93	75	3	32.6	4.3
41	30.9	22.4	1	12.9	89	59	6.0	31.2	19.1	94	79	2	29.6	6.2
42	30.2	22.5	4	72.7	90	68	6.4	31.4	19.1	95	78	3	37.9	6.7
43	30.1	21.3	0	0.0	88	50	9.4	31.9	19.4	94	81	0	0.0	8.9
44	29.7	21.1	3	26.6	90	64	6.4	31.5	19.4	90	79	0	0.0	6.5
45	29.7	21.5	0	0.0	89	56	7.5	31.6	19.1	90	78	0	0.0	7.8
46	30.2	20.5	2	8.3	89	56	6.6	31.5	18.9	93	77	0	0.0	8.4
47	29.0	22.6	3	17.7	88	67	5.0	31.2	19.2	89	76	0	0.0	5.8
48	27.8	20.8	1	4.5	89	62	5.6	31.3	18.8	92	78	0	0.0	5.9
49	29.4	22.1	1	4.0	89	58	5.4	31.0	18.7	92	78	0	3.8	4.1
50	30.8	20.5	0	0.0	88	50	4.5	30.6	18.4	90	77	0	0.0	2.7
51	30.5	20.0	0	0.0	88	53	4.0	30.1	18.4	88	79	0	0.0	3.8
52	29.8	20.7	1	0.0	88	51	4.9	30.2	19.0	90	76	0	0.0	4.1
1	28.7	17.3	0	0.0	89	37	8.7	29.2	16.7	92	77	0	0.0	5.7
2	29.9	16.4	0	0.0	87	39	8.3	29.4	15.9	90	78	0	0.0	5.6
3	29.9	16.3	0	0.0	89	37	7.3	31.5	17.3	91	77	0	0.0	7.6
4	30.6	19.9	0	0.0	88	49	7.3	31.2	17.6	90	81	0	0.0	8.1
5	30.4	20.6	0	0.0	87	50	6.3	31.0	17.9	90	71	0	0.0	7.9
6	32.5	23.0	0	0.0	82	52	5.7	31.6	19.0	90	73	0	0.0	7.9
7	33.2	22.1	0	0.0	87	48	9.6	31.9	19.2	81	71	0	0.0	9.1
8	34.4	20.1	0	0.0	82	32	10.3	32.5	20.1	87	79	0	0.0	9.3
9	35.0	22.4	0	0.0	84	44	8.9	32.0	19.8	90	77	0	0.0	7.3
10	35.8	23.8	0	0.0	87	49	9.1	32.8	20.8	89	79	0	0.0	8.1
11	34.9	22.5	0	0.0	76	33	10.3	33.7	20.1	85	81	0	0.0	8.9
12	35.9	24.0	0	0.0	81	44	9.8	33.4	21.1	90	88	0	0.0	7.9
13	36.8	23.6	0	0.0	83	34	10.0	34.1	21.9	87	82	0	0.0	7.9
14	37.0	24.1	0	0.0	85	39	9.8	34.2	21.3	91	87	0	0.8	7.6
15	37.5	24.6	0	0.0	82	40	10.2	35.4	22.4	87	48	0	0.0	7.9
16	36.8	24.4	1	4.2	87	43	8.4	35.9	22.9	80	47	2	28.2	8.7
17								34.1	21.8	80	38	0	0.0	6.2
18								35.0	24.0	97	91	0	1.4	4.0
Mean/ Total	32.0	21.5	21.0	216.9	86.6	49.4	7.5	32.1	19.6	89.6	75.4	10.0	134.3	6.8

Table M 13: Meteorological data in South zone during crop growth period of Rabi 2018-19

Std. Week No.	DHARWAD					
	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)
	Max.	Min.	RH1	RH2		
40	32.5	19.8	77.3	60.0	3	13.8
41	32.4	19.6	83.0	49.4	0	0.4
42	30.1	19.3	82.7	71.7	3	62.6
43	32.1	16.8	60.0	55.9	0	0.0
44	30.4	15.9	60.6	43.6	0	0.0
45	31.9	17.1	63.3	34.7	0	0.0
46	31.2	15.6	59.0	32.3	0	0.0
47	29.9	17.9	79.4	56.7	2	34.4
48	29.2	12.9	60.0	40.0	0	0.0
49	29.7	17.2	77.4	54.9	1	38.4
50	29.4	15.1	76.6	54.1	0	0.0
51	27.1	13.2	71.0	51.9	0	0.0
52	28.7	13.3	60.1	43.4	0	0.0
1	29.1	12.4	45.3	24.0	0	0.0
2	30.4	12.6	61.6	26.3	0	0.0
3	29.9	12.7	52.9	26.9	0	0.0
4	29.5	14.0	79.4	40.4	0	0.0
5	28.9	14.0	66.6	35.0	0	0.0
6	32.0	14.9	53.1	34.4	0	0.0
7	32.7	16.2	53.3	25.7	0	0.0
8	35.0	17.8	51.7	16.6	0	0.0
9	34.0	16.0	51.4	17.1	0	0.0
10	35.4	16.4	60.3	22.3	0	0.0
11	35.7	19.7	54.1	20.6	0	0.0
12	36.4	19.6	53.1	23.0	0	0.0
13	36.2	21.6	76.7	41.0	0	0.4
14	36.9	19.9	68.4	38.6	2	29.5
15	37.4	21.2	71.9	39.0	3	13.6
16	36.5	20.6	58.3	33.4	0	0.0
17	38.5	21.9	72.9	33.1	1	11.0
18	34.5	20.7	76.3	44.9	0	0.0
19	36.8	21.3	64.6	39.7	0	0.0
20	38.9	21.6	74.9	25.7	0	0.0
21	37.6	21.8	78.1	49.9	1	16.2
Mean/Total	32.9	17.4	65.7	38.4	16.0	220.3

APPENDIX-I: FORAGE CROPS BREEDING TRIALS AT A GLANCE: (RABI-2018-19)

Rabi-2018-19		Tr.-1	Tr.-2	Tr.-3	Tr.-4	Tr.-5	Tr.-6	Tr.-7	Tr.-8	Tr.-9	Tr.-10	Tr.-11	Tr.-12	Tr.-13	Tr.-14	Tr.-15	Tr.-16	Tr.-17	Tr.-18	Tr.-19	Total
Zone	Location	IVTB	AVT-1 B	IVTO (SC)	AVTO (SC-1)	AVTO (SC-2)	AVTO (SC-2) (Seed)	IVTO (MC)	AVTO-1 (MC)	IVTO (Dual)	AVT-1 Oat (Dual)	VT Lucerne (P)- 2016-3 rd year	AVT-2 Vicia	AVT-2- Vicia (Seed)	AVT-2 Lolium (Annual)	AVT-2 Lolium (Seed)	VT Red Clover- 2016 (P) 3 rd year	VT White Clover- 2016 (P)- 3 rd Year	IVT Bajra (Multi cut)	AVT-1 Bajra (Multi cut)	
1 (HZ)	Palampur	DR	DR	DR	DR	DR	DR	DR	DR						DR	DR	DR	DR			12/12
2	Srinagar	DR	DR	DR	DR	DR	DR	DR	DR						DR	DR	DR	DR			12/12
3	Almora	DR						DR	DR						DR		DR	DR			6/6
4	Rajouri	DR	DR	DR	DR	DR															5/5
5	Bajoura (Kullu)														DR		DR	DR			3/3
6 (NWZ)	Bikaner	DR	DR	DR	DR	DR				DR	DR	TF									7/8
7	Jalore		DR					DR	DR			TF									3/4
8	Hisar	DR	DR	DR	DR	DR	DR	DR	DR	DR	TF										9/10
9	Ludhiana	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	TF			DR	DR					12/13
10	Pantnagar	DR	DR	DR	DR	DR	TF	DR	DR	DR	DR										9/10
11	Udaipur	DR	DR	DR	DR	DR					DR	TF									6/7
12	Meerut	DR	DR	DR																	3/3
13 (CZ)	Jhansi	DR		DR	DR	DR		DR	DR	DR	DR		DR	DR							10/10
14	Rahuri	DR		DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR					DR	DR	14/14
15	Urulikanchan	DR		DR	DR	DR		DR	DR	DR	DR	DR							DR	DR	11/11
16	Anand			DR	DR	DR	DR	DR	DR	DR	DR	TF							DR	DR	10/11
17	Jabalpur	DR		DR	DR	DR	DR	DR	DR	DR	DR		DR	DR					DR	DR	13/13
18	Raipur	DR		DR	DR	DR				DR	DR	TF	DR	DR							8/9
19	Palghar			DR	DR	DR															3/3
20	Dhari			DR																	1/1
21 (NEZ)	Jorhat			DR	DR	DR		DR	DR	DR	DR										7/7
22	Kalyani	DR	DR	DR	DR	DR															5/5
23	Bhubaneswar	DR	DR	DR	DR	DR		DR	DR	DR	DR										9/9
24	Ranchi	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR										10/10
25	Pusa	DR	DR	DR	DR	DR	DR	DR	DR												8/8
26	Faizabad	DR	DR	DR	DR	DR		DR	DR	DR	DR										9/9
27	CAU Imphal			DR	DR	DR	DR	DR	DR												6/6
28	Sabour	DNR						DNR													0/2
29 (SZ)	Hyderabad			DR	DR	DR	DR					DR							DR	DR	7/7
30	Mandya			DR	DR	DR	DR					DR							DR	DR	7/7
31	Coimbatore			DR	DR	DR						DR									4/4
32	Mattupetty/ Vellayani			DR	DR	DR													DR	DR	5/5
33	Tirupati/Guntur			DR	DR	DR						TF									3/4
34	Dharwad											DR									1/1
Total Location		20/21	15/15	29/29	27/27	27/27	12/13	18/19	18/18	14/14	14/15	6/13	4/4	4/4	5/5	3/3	4/4	4/4	7/7	7/7	238/249

Abbreviations: DR= Data Reported: TF= Trial Failed, Success Index (%) =95.5 (%)

APPENDIX-II: FORAGE CROP PRODUCTION TRIALS AT A GLANCE: (RABI-2018-19)

Location	K-15-AST-12C	PS-14-AST-4	R-15-AST-1	K-16-AST-1	R-16-AST-1	R-16-AST-2	R-16-AST-3	R-16-AST-4	K-15-AST-1L	R-17-AST-5	K-16-AST-6	K-16-AST-8	K-17-AST-2	R-18-AST-4	R-18-AST-5	R-18-AST-7	R-18-AST-8	R-18-AST-1	R-18-AST-2	R-18-AST-3	Total
Hill Zone																					
Palampur	DR	DR																DR		DR	4/4
Srinagar	DR	DR																DR		DR	4/4
North West zone																					
Hisar										DR								DR			2/2
Pantnagar															DR						1/1
Bikaner						DR										DR					2/2
Ludhiana				DR		DR												DR		DR	4/4
North East zone																					
Faizabad											DR		DR								2/2
Ranchi	DR		DR												DR			DR			4/4
Kalyani			DR											DR					DR		3/3
Jorhat							DR							DR							2/2
Imphal								DR						DR				DR			3/3
Medziphema																	DR				1/1
Central Zone																					
Jabalpur	DR				DR									DR				DR	DR		5/5
Rahuri										DR											1/1
Urulikanchan																		DR	DR		2/2
Anand														DR							1/1
Raipur					DR								DR							DR	3/3
South Zone																					
Hyderabad	DR					DR													DR		3/3
Coimbatore	DR					DR															2/2
Mandya				DR					DR										DR		3/3
Vellayani	DR																				1/1
Dharwad					DR																1/1
Total (DR & TC)	7/7	2/2	2/2	2/2	3/3	4/4	1/1	1/1	1/1	1/1	1/1	1/1	1/1	6/6	2/2	1/1	1/1	11/11	3/3	3/3	54/54

DR- Data reported; DNR-Data not reported; Success (%) of data reporting/trial conducted – 100%

APPENDIX –III: FORAGE CROP PROTECTION TRIALS AT A GLANCE (RABI- 2018-19)

Locations/Trials	PPT-1	PPT-2	PPT-17	PPT-26	PPT-30	PPT-31	PPT-32	PPT-33	PPT-34	Total
(HZ)										
Palampur	DR	DR	DR		DR		DR		DR	6/6
(NWZ)										
Ludhiana	DR	DR		DR		DR		DR	DR	6/6
(NEZ)										
Bhubaneswar	DR	DR						DR	DR	4/4
(CZ)										
Rahuri	DR	DR		DR						3/3
Jhansi	DR	DR							DR	3/3
(SZ)										
Dharwad	DR	DNR		DR						2/3
Total	6/6	5/6	1/1	3/3	1/1	1/1	1/1	2/2	4/4	24/25

Abbreviations: DR = Data Reported; DNR =Data not reported; **Data Reporting (%) ;(24/25) = 96 (%)**

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