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अखिल भारतीय समन्वयित अनुसंधान परियोजना– चारा फसलें एवं उपयोगिता
(भारतीय कृषि अनुसंधान परिषद)

ALL INDIA COORDINATED RESEARCH PROJECT ON FORAGE CROPS & UTILIZATION

(Indian Council of Agricultural Research)

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Proceedings of the National Group Meeting-Rabi-2016-17
Kerala Agricultural University, Vellayani-Thiruvanthapuram
September, 5-6, 2016

परियोजना समन्वयन इकाई
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(चारा फसलें एवं उपयोगिता)
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(Held at Kerala Agricultural University, Vellayani- Thiruvanthapuram during September 5-6, 2016)

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September, 2016

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PREFACE

The National Group Meet, *Rabi* 2016-17 of All India Coordinated Research Project on Forage Crops & Utilization was organized with the objectives to review the accomplishments of programme executed during Rabi 2015-16 at different coordinating and cooperating centers, In-House research activities, Tribal Sub-Plan and Forage Technology Demonstrations (FTDs); and also to formulate technical programme for *Rabi* 2016-17 as well as to discuss future thrust areas for fodder research. The meeting was jointly organized by Indian Council of Agricultural Research, New Delhi and Kerala Agricultural University during September, 5-6, 2016.

The meeting was attended by the scientists engaged in forage research working under coordinating and collaborating centers located at different SAUs, ICAR institutes and NGOs. Representatives of NDDB, Regional fodder stations of DAHD&F, Government of India, seed companies, private companies, state Department of Animal Husbandry and other related departments also participated in the programme and being important stakeholders contributed in the development and refinement of programme and strengthening linkages for future course of action. Members of electronic and print media of the region also participated in the meet.

This compilation contains brief report of National Group Meet, Rabi 2016-17 covering highlights on forage crop improvement, forage production and plant protection technology generated, proceedings of different technical sessions and technical programme for the coming *Rabi* season 2016-17. The National Meet Group members discussed and planned future strategies for improving the forage productivity, quality and nutritive value to address the regional and national forage security for the livestock. The finalized technical programme on forage crop improvement, forage crop production and forage crop protection for *Rabi* 2016-17 have been given in annexure(s).

The successful conductance of the event is attributed to the joint efforts made by the ICAR/IGFRI authorities, authorities of KAU, Thrissur and Vellayani, participating scientists, Principal Investigator and staff of the Project Coordinating Unit and IGFRI, Jhansi. The team of All India Coordinating Research Project on Forage Crops & Utilization sincerely acknowledges their active involvement, suggestions and cooperation for successful organization of the meeting.

We sincerely thank the authorities at ICAR, New Delhi, particularly Director General, Deputy Director General (Crop Science), Assistant Director General (FFC), Dr. Dinesh Kumar, Principal Scientist (FFC) and other members of Crop Science Division for their guidance, support and encouragement. The authorities and organizing committee of KAU, Thrissur and Vellayani are especially thanked for successful and smooth conductance of the meeting.

A.K. Roy
Project Coordinator

ALL INDIA COORDINATED RESEARCH PROJECT
ON FORAGE CROPS & UTILIZATION
(INDIAN COUNCIL OF AGRICULTURE RESEARCH)

SUMMARIZED MAJOR RECOMMENDATIONS AND HIGHLIGHTS

The following varieties of forage oat were identified by the VIC during National Group Meet (*Rabi* -2016-17) of AICRP (Forage Crops)

RO-11-1 (oat single cut): Identified for release for cultivation in the North East (West Bengal, Odisha, Jharkhand, Bihar, eastern UP, Manipur, Assam), North West (Rajasthan, Punjab, Haryana, Uttarakhand), Central zone (Maharashtra, Gujarat, Madhya Pradesh, Chhattisgarh, central UP), South zone (Telengana, Andhra Pradesh, Karnataka, Tamil Nadu) during *rabi* season in irrigated condition under single cut situation. The proposed name is Central Oat RO-11-1.

OL-1804 (oat single cut): Identified for release for cultivation in the North East Zone (West Bengal, Odhisha, Jharkhand, Bihar, eastern UP, Manipur, Assam) during rabi season in irrigated condition under single cut situation. The proposed name is Central Oat OL-1804.

OS-405 (oat single cut): The proposal was submitted by CCS HAU, Hisar for Central and South Zone. The committee identified for release for cultivation in the central zone (Maharashtra, Gujarat, Madhya Pradesh, Chhattisgarh, central UP) during rabi season under irrigated condition under single cut situation. The proposed name is Central Oat OS 405.

OS-403 (oat single cut): The committee identified for release for cultivation in the North West (Rajasthan, Punjab, Haryana, Uttarakhand), during rabi season under irrigated condition under single cut situation. The proposed name is Central Oat OS 403.

OL-1802 (oat multicut): The committee noted its superiority for green forage yield, dry matter yield over the checks. It has also at par or superior crude protein percentage, per day green fodder and dry matter productivity in comparison to all the checks. It is identified for release for cultivation in the central zone (Maharashtra, Gujarat, Madhya Pradesh, Chhattisgarh, central UP) during rabi season under irrigated and multi cut situation. The proposed name is Central Oat OL-1802.

- Breeders were requested to take necessary action and submit the proposals after the completion of trials. All the centers should regularly submit the variety proposals to CVRC after identification of variety in VIC.

- Scientists were advised to properly document the developed breeding material and get the novel germplasm registered with NBPGR.

- Resistant and susceptible checks should be included in the evaluation trial. For selected diseases, screening should be done under epiphytotic conditions.

- Plant Protection scientists should strictly follow the guidelines made during Rabi Forage Group Meet at MPKV, Rahuri.

- Seed treatment with carbendazim @ 2 g/kg and Trichoderma viride @ 5g/kg seed followed by alternate sprays of carbendazim (@ 0.1%) and hexaconazole (@0.05%) is recommended for the management of powdery mildew (*Erysiphe trifolii)* and clover rot (*Sclerotinia trifoliorum*) in the seed crop of white clover.

- All the centers should take utmost care to produce the allocated breeder seed as it is a national commitment. The centers were also advised to communicate the status of excess breeder seed production to the PC, so that steps would be taken up for its disposal.

- Fodder conservation techniques should be popularized by Universities and other government/ NGO institutions for availability of fodder during lean period.

- TSP programme was proposed by AAU, Jorhat; OUAT, Bhubaneswar; JNKVV, Jabalpur; BAIF, Urulikanchan; PJTSAU, Hyderabad; HPKVV, Palampur; SKUAST-K, Srinagar; CAU, Imphal; IGKV, Raipur; KAU, Vellayani; GBPUAT, Pantnagar; BAU, Ranchi which was approved.

- All vacant posts should be immediately filled up. Scientist & were requested to approach their university authorities to fill all the vacant post at the earliest.

- The funds release broadly are under three heads i.e. Grant in aid – Capital, Grant in aid – Salaries, Grant in aid – General. These heads should be strictly followed and expenditure should not jump in any head. The money from one head can not be transferred to other head. In Salaries, please strictly follow the number and nature of posts. No retirement benefits should be charged from AICRP fund.

INAUGURAL SESSION

The National Group Meeting Rabi 2015-16 was formally inaugurated by Professor Dr. P. Rajendran, Hon'ble Vice Chancellor, Kerala Agricultural University. It commenced with lighting the lamps by dignitaries. The inaugural session started with the ICAR song followed by Kerala Agricultural University invocation song by a group of students.

Dr. B. R. Regunath, Dean, College of Agriculture, Vellayani welcomed the dignitaries and the participants and thanked the authorities for extending the opportunity to KAU, Vellayani to host the National Group Meeting Rabi 2016-17 of All India Coordinated Research Project (Forage Crops & Utilization), Jhansi.

Dr. A. K. Roy, Project Coordinator, AICRP-FC&U presented the brief account of AICRP project, fodder scenario in the country He also presented highlights of the activities undertaken by the project during the Rabi 2015-16 and future thrust of the scheme.

Dr. I. S. Solanki, ADG (F&FC), ICAR, stressed that the expansion of acreage under forages is facing competition from other sectors, hence efforts should be made to increase productivity per unit area and per unit time and also explore new niches for enhancing fodder resources. He urged to develop nutritionally superior varieties of forage crops suitable for different cropping sequences.

Dr. Sajan Kurian, Director of Research, Kerala Agricultural University highlighted the activities undertaken by KAU for forage research and put emphasis on the need for suitable technologies for the state and the availability of seed and planting material. The need for more research efforts on the crops suited for tropical and coastal area was highlighted.

Professor P. Rajendran, Hon'ble Vice Chancellor in his inaugural address emphasized on the need of more attention on livestock sector in Kerala as the demand for meat and milk in the state is increasing and state has to import the livestock products from other states. The farmers need cheaper and implementable technologies for getting higher income from their livestock.

Publications including the Annual Report of AICRP Forage Crops, Minimal Descriptors (Forage Crops), 'Crop varieties – Their demand and supply'; 'innovative technologies for sustainable forage production', souvenir by KAU, 'Green fodder production from pearl millet and cowpea in Kharif' by SKRAU and extension bulletin in regional languages by different AICRP centers were released.

The retired and eminent scientists Dr. G. Raghavan Pillai, Dr. Sreekumar, Dr. Sumabai were felicitated at the occasion for their contribution in the field of forage for the state.

Dr. K. Umamaheswaran, ADR, NARP, Southern region, Vellayani, presented vote of thanks

TECHNOLOGIES GENERATED

Varieties identified

Ro-11-1 (oat single cut): Developed by MPKV, Rahuri, the entry was identified for release for cultivation in the North East (West Bengal, Odhisha, Jharkhand, Bihar, eastern UP, Manipur, Assam), North West (Rajasthan, Punjab, Haryana, Uttarakhand), Central zone (Maharashtra, Gujarat, Madhya Pradesh, Chhattisgarh, central UP), South zone (Telengana, Andhra Pradesh, Karnataka, Tamil nadu) during rabi season in irrigated condition under single cut situation. The variety was superior for green forage yield, dry matter yield, crude protein yield, per day green fodder and dry matter productivity and have good leaf stem ratio. It was moderately resistant to leaf blight, resistant to root rot and less susceptible to aphids.

OL-1804 (oat single cut): Developed by PAU Ludhiana, the entry was identified for release for cultivation in the North East Zone (West Bengal, Odhisha, Jharkhand, Bihar, eastern UP, Manipur, Assam) during rabi season in irrigated condition under single cut situation. The entry was superior for green forage yield, dry matter yield, crude protein percentage, crude protein yield, per day green fodder and dry matter productivity with good leaf stem ratio. The entry was resistant to Alternaria leaf blight, Sclerotium root rot and leaf defoliators.

OS-405 (oat single cut): Developed by CCS HAU, Hisar, the entry was identified for release for cultivation in the central zone (Maharashtra, Gujarat, Madhya Pradesh, Chhattisgarh, central UP) during rabi season under irrigated condition under single cut situation The entry was superior for green forage yield, dry matter yield over the checks. It has also at par or superior crude protein percentage, crude protein yield, per day green fodder and dry matter productivity in comparison to all the checks. The entry was moderately resistant to leaf blight.

OS-403 (oat single cut): Developed by CCS HAU, Hisar, the entry was identified for release for cultivation in the North West (Rajasthan, Punjab, Haryana, Uttarakhand), during rabi season under irrigated condition under single cut situation. The entry was superior for green forage yield, dry matter yield crude protein percentage, crude protein yield, per day green fodder and dry matter productivity. The entry was moderately resistant to leaf blight.

OL-1802 (oat multicut): Developed by PAU, Ludhiana for central Zone, The entry was identified for release for cultivation in the central zone (Maharashtra, Gujarat, Madhya Pradesh, Chhattisgarh, central UP) during rabi season under irrigated condition under multi cut situation. The entry was superior for green forage yield, dry matter yield, crude protein yield. It was moderately resistant to leaf blight.

Forage Production Technologies

1. In Central Zone, sowing of Rattan variety of Lathyrus with recommended practices along with 150% of seed rate is recommended for higher production and remuneration under rice based cropping system.
2. In NEZ, sowing of Nirmal variety of Lathyrus through zero seed drill with 150 % of seed rate is recommended for higher productivity and NMR.
3. In Central Zone, Bajra Napier hybrid + (Cowpea- Berseem- Cowpea CS perennial fodder cropping system is recommended as it was most productive and remunerative.
4. At Bikaner, planting of Bajra Napier hybrid + Lucerne perennial intercropping system is recommended

Forage Protection Technologies

1. **White clover:** Seed treatment with carbendazim @ 2 g/kg and *Trichoderma viride* @ 5g/kg seed followed by alternate sprays of carbendazim (@ 0.1%) and hexaconazole (@0.05%) is recommended for the management of powdery mildew (*Erysiphe trifolii)* and clover rot (*Sclerotinia trifoliorum*) in the seed crop of white clover.
2. **Lucerne:** Mixture of *L. lecani* @ $1X10^8$ CFU/g (5 g/lit) + *M. anisopliae* @ $1X10^8$ CFU/g (5 g/lit) or *L. lecani* @ $1X10^8$ CFU/g (5 g/lit) alone as a foliar application is recommended for the control of aphids on Lucerne And foliar application of *N. releyi* @ $1X1^{08}$ CFU/g (5 g/lit) + *B. bassiana* @ $1X1^{08}$ CFU/g (5 g/lit) or *N. releyi* @ $1X1^{08}$ CFU/g (5 g/lit) for the control of lepidopteran pests *(S. litura* and *H. armigera*).

TECHNICAL SESSION I
INTERACTIVE SESSION WITH STAKEHOLDERS

Chairman : Dr. I. S. Solanki, ADG (FFC), ICAR
Co-Chairman : Dr. A. K. Roy, PC (AICRP FC&U)
Rapporteurs : Dr. Rahul Kapoor

At the outset, the chairman welcomed the different stakeholders like fodder growers, forage seed growers, livestock keepers and animal husbandry group. Several stakeholders participated in this interactive session. The following were the feedbacks given by the different stakeholders:

- Low sale price along with the poor marketing facilities of milk were the major problems highlighted by most of the dairy farmers.
- Good quality seed of improved varieties of different forage crops should be made available to large number of the farmers at reasonable price.
- Many farmers informed that with the help of concerted efforts of AICRP (FC&U) scientists of KAU, Vellayani, the forage production has increased considerably and such efforts should be kept going to further sustain the forage production in this region. They appreciated the efforts of KAU scientists in providing them information about varieties and other technologies.
- Extension services should be strengthened and showcasing of new technologies and new fodder crop varieties should be taken up on a large scale so that large number of small dairy farmers may be benefitted.
- Scientists should suggest/develop technologies to overcome the scarcity of fodder during lean period of severe fodder shortage.
- More training camps should be organized in different villages to make the farmers familiar with the advance technologies of fodder production and livestock keeping.
- Farmers also wanted that bank credits may be made available to them. They were advised to approach local government authorities for this.

NDDB Sr. Manager Dr. A. K. Garg suggested that the milk federations and unions must be approached to ameliorate the problem of low sale price along with the poor marketing facilities of milk.

Director, Regional Fodder Station, DADH&F, GOI, gave detailed account of training and seeds of various fodder varieties available at the centres. Farmers can take benefit from their extension activities. The information is also available on their website.

Project coordinator, AICRP (FCU) applauded the role of farmers in giving very useful feedbacks and assured the stakeholders that AICRP centre will provide training and seeds along with package of practices to the farmers and livestock keepers. More training should be organized on topics as per demand of farmers group. The various problems raised will be addressed in the research programme of AICRP (FCU) so as to find out the remedy to the problems being faced by the farmers.

The chairman, in his concluding remarks suggested that the nutritious fodder needs to be supplied to cattle to increase the milk productivity thus the profit of the small farmers. He told farmers to come forward and regularly visit and consult forage scientists of AICRP centers and also officials of government departments so as to reap benefits from various state and central government schemes.
The session ended with vote of thanks.

TECHNICAL SESSION-II
BREEDER SEED PRODUCTION

Chairman : Dr. I. S. Solanki, ADG (FFC), ICAR
BSP report and allocation : Dr. A. K. Roy
Rapporteurs : Dr. R. K. Agrawal

At the outset, the chairman welcomed all the participants. Dr A. K. Roy, Project Coordinator, AICRP FC&U presented the status of Breeder Seed Production in forage crops for Production year *Rabi* 2015-16; Indent year Rabi 2016-17.

In *Rabi* 2015-16, the indent for Breeder Seed Production was received from DAC, GOI for 29 varieties in four forage crops *viz.* oat (14), Berseem (11), Lucerne (3) and Gobhi-Sarson (1). The quantity allocated was 409.13 q and it was assigned to eleven Breeder Seed producing centers of the different SAUs/ NGO/ ICAR institutes.

In Berseem, the production was 50.8 q (4.17 q surplus) against the allocated quantity of 46.63 q. In Oat, the production was 355.63 q (2.12 q deficit) against the allocation of 357.75 q. In Lucerne, there were 0.74 q deficit in production (3.86 q) with respect to 4.60 q allocation. In Gobhi Sarson, the production was 0.20 q against the allocation of 0.15 q (0.05 q surplus). The overall breeder seed production was 410.49 q against the indent of 409.13 q, an excess of 1.36 q

Dr. A. K. Roy also presented BSP-1 allocation for *Rabi* 2016-17 Breeder Seed Production Programme. [Production year 2016-17; Indent year 2017-18]. Seed production was allocated to different centers as per indent of DAC, Government of India. The allocation in different crop and varieties were accepted by the respective centers.

Many centers raised the issue of non-lifting of breeder seed by different organization in Oat crop. It was informed that the matter was discussed in details at high level and now the position has improved since the indenters are now required to deposit a part of final money as an advance amount.

The session ended with vote of thanks to the chair.

TECHNICAL SESSION-III
DISCIPLINE WISE REPORT

Chairman : Dr. I. S. Solanki (ADG- FFC, ICAR)
Co-Chairman : Dr. Dinesh Kumar
Rapporteurs : Drs. D. K. Banyal and S. K. Jha

Crop Improvement

- Dr A. K. Roy, Project coordinator presented the result of forage breeding and quality evaluation conducted during *Rabi* 2015-16. Total 15 trials involving 78 in annual and 7 entries in perennials crop were evaluated at 34 locations with the success rate of 90 %. The summary of annual trials is as follows
- **In IVT: Berseem** out of five entries four entries *viz*; HFB-12-4, HFB-12-9, PC-82, JB 05-9 were proposed for promotion to AVT-1 in HZ, CZ and NWZ.
- **In AVT-1:** Berseem out of 11 entries two entries *viz*; JB -4-23 and JB -4-21 were proposed for promotion to AVT-2 in CZ and NWZ.
- **IVT: Oat (SC)** out of 12 entries 7 entries *viz*; HFO-529, OL-1844, JO-04-22, VOS-15-24, HFO-427, JHO-15-1 and SKO-227 were proposed for promotion to AVT-1 in HZ, NEZ, NWZ and SZ
- **AVT-1: Oat (SC)** all the 8 entries *viz*; OS-424, OL-1769-1, OL-1802, SKO-225, JO-04-19, UPO-10-3, OL-1766-1 and OS-432 were proposed for promotion to AVT-2 in HZ, NWZ and CZ
- **The trials** *viz*; AVT-2: Oat (SC) **;** AVT-2 Oat (Seed) **;** AVT -2 Oat (SC) 2013-14 **;** AVT -2: Oat (SC) 2015-16 **;** AVTO-2: Oat (MC) **;**AVTO-2 Seed: Oat (MC) **;** AVTO-2 Oat (MC) **;** VTL(P) (2013) Lucerne- 2016 **,** have completed their testing period.
- **IVTO: Oat (MC)** out of 9 entries five entries *viz*; OL-1842, HFO-514, HFO-417, OL-1866 and JO-04-321 were proposed for promotion to AVTO -1 in HZ and CZ.
- **IVTO Oat (Dual):** all the 3 entries *viz*; OL-1802, NDO-11-01 and OL-1760-1 were proposed for promotion to AVT-1 in NEZ.

Crop Production

- Dr. R. K. Agrawal Principal Scientist and PI (Agronomy) presented the detailed report on 20 experiments conducted at 26 location on different crops and cropping system including nutrient management, planting geometry, round the year fodder production and conservation agronomy. The results of various other experiments were critically discussed and queries raised were responded by concerned scientists and PI Crop production.

Four production technologies were proposed for adaptation as per details below.

i. In Central Zone, sowing of Rattan variety of Lathyrus with recommended practices along with 150% of seed rate is recommended for higher production (90.34 q/ha GFY) and remuneration (Rs 9334/ha) under rice based cropping system.
ii. In NEZ, sowing of Nirmal variety of Lathyrus through zero seed drill with 150 % of seed rate is recommended for higher productivity (119.78 q/ha GFY) and NMR (Rs 11877/ha).
iii. In Central Zone, Bajra Napier hybrid + (Cowpea- Berseem- Cowpea CS perennial fodder cropping system is recommended as it was most productive (1092.4 and 213 q/ha GFY and DMY) and remunerative.
iv. At Bikaner, planting of Bajra Napier hybrid + Lucerne perennial intercropping system is recommended for higher production (861.9 q/ha GFY) and profitability (Rs 90334 with BC ratio of 3.61).

Crop Protection

Dr A. B. Tambe from MPKV Rahuri presented the salient achievements of crop protection. He presented the result of 10 PPT trials conducted at six locations. Two trials were concluded and following recommendation were given.

Recommendations

i. Seed treatment with carbendazim @ 2 g/kg and *Trichoderma viride* @ 5g/kg seed followed by alternate sprays of carbendazim (@ 0.1%) and hexaconazole (@0.05%) is recommended for the management of powdery mildew (*Erysiphe trifolii)* and clover rot (*Sclerotinia trifoliorum*) in the seed crop of white clover.

ii. Mixture of *L. lecani* @ $1X10^8$ CFU/g (5 g/lit) + *M. anisopliae* @ $1X10^8$ CFU/g (5 g/lit) or *L. lecani* @ $1X10^8$ CFU/g (5 g/lit) alone as a foliar application is recommended for the control of aphids on Lucerne And foliar application of *N. releyi* @ $1X1^{08}$ CFU/g (5 g/lit) + *B. bassiana* @ $1X1^{08}$ CFU/g (5 g/lit) or *N. releyi* @ $1X1^{08}$ CFU/g (5 g/lit) for the control of lepidopteran pests *(S. litura* and *H. armigera*).

TECHNICAL SESSION- IV (CONCURRENT)
FORMULATION OF TECHNICAL PROGRAMME
FORAGE CROP IMPROVEMENT

Chairman : Dr. I. S. Solanki (ADG- FFC, ICAR)
Breeding trials formulation : Dr. A. K. Roy
Rapporteurs : Drs. C. Babu and Y. Jindal

At the outset, the chairman welcomed the delegates. Dr. A. K. Roy, PC, presented the highlights of 15 breeding trials conducted during *Rabi* 2015-16 on 3 different forage crops *viz*., Berseem, Oats and Lucerne for finalization of the technical programme for *Rabi* 2016-17. After thorough discussion, following breeding trials were formulated.

Berseem

- Four entries *viz*., JB-05-09, HFB-12-4, HFB-12-9 and PC-82 were promoted to AVTB-1 from IVTB
- Two entries *viz*., JB-04-23 and JB-04-21 were promoted to AVTB-2 from AVTB-1
- Two entries *viz*., JB-04-23 and JB-04-21 will be tested in AVTB-2 (Seeds)

Oats

- From IVTO-SC, seven entries *viz*., HFO-529, OL-1844, JO-04-22, VOS-15-24, HFO-427, JHO-15-1 and SKO-227 were promoted to AVTO-SC-1
- Eight entries *viz*., OS-424, OL-1769-1, OL-1802, SKO-225, JO-04-19, UPO-10-3, OL-1766-1 and OS-432 were promoted from AVTO-SC-1 to AVTO-SC-2.
- Same entries will be tested for their seed yield potential in AVTSC-2 (Seeds)
- Five entries *viz*., OL-1842, HFO-514, HFO-417, OL-1866 and JO-04-321 were promoted to AVTO-MC-1 from IVTO-MC.
- Three entries *viz*., OL-1802, NDO-11-01, OL-1760-1 were promoted to AVTO-1 Dual from IVTO-Dual.

New trials constituted

- IVT on Berseem
- IVT on Oat (single cut)
- IVT on Oat (multicut)
- IVT on Oat (dual)
- VT on Lucerne (perennial)
- VT on Lolium (Rye grass) for hill zone
- VT on Vicia for central zone
- VT on White clover for hill zone (perennial)
- VT on red clover for hill zone (perennial)

General suggestions

- The National check on Berseem *viz*., Mescavi will be removed from IVT and subsequent trials (from *rabi* 2016-17 onwards).
- In Oat (dual), National check, RO-19 will be removed from all trials (from *rabi* 2016-17 onwards).
- The chairman suggested the breeders to visit other centres for making selection from the germplasm collections in order to enrich their collections.

The session was ended with vote of thanks to the chair.

TECHNICAL SESSION- IV (CONCURRENT)
FORMULATION OF TECHNICAL PROGRAMME
FORAGE CROP PRODUCTION

Chairman : Dr. Sheela K.R, Prof & Head, College of Agriculture Vellayani
Convener : Dr. R.K. Agrawal, P.I (PC, unit) Jhansi
Rapporteurs : Dr. B.G. Shekara & Dr. R. Joseph Koireng

Session began with introductory remarks of Dr. Sheela K. R. Prof & Head, College of Agriculture, Vellayani. Dr. R.K. Agrawal, convener welcomed Chairman and all the delegates. Dr. Agarwal, P.I emphasized that while reporting the data, replicated data must be sent along with mean tables. Timely submission of data and check list should be ensured. In order to avoid ambiguity, season for reporting the data for each trial has been mentioned in the technical programme as per suggestion of the Project Coordinator.

Dr. I. S. Solanki, ADG (FFC), ICAR suggested to prepare new sound technical programme which is sustainable, economical, viable and relevant to present situation to enhance fodder productivity and quality. He desired that the results should be published regularly in reputed journal with high impact factors. Scientists should prepare good project and submit them to different funding agencies, like ICAR, DST etc.

On–going results and technical programme were discussed. Two new coordinated trials and two new location specific trials were formulated.

A. Concluding trials

- Study on different models for year round green fodder production under irrigated condition.
- Evaluation of different variety of grass pea as forage crop under different sowing methods in rice based cropping system.

B. New experiments – Four new trials were formulated, two in coordinated mode and two in location specific mode to address local situations.

Coordinated trials

a. Contingent crop plan for fodder oat production in semi arid tropics under irrigated condition. (IGFRI, Dharwad, PJTSAU, Hyderabad and ANGRAU, Tirupathi)
b. Enhancement of seed setting in Lucerne through foliage spray (Coimbatore, Ludhiana, Bikaner)
c. Effect of Nitrogen Levels and seed rate on fodder productivity of Rye Grass (*Lolium multiflorum*) under rice fallows (AAU, Jorhat and OUAT, Bhubaneswar)

Location specific

a. Effect of nitrogen level and seed rate on fodder productivity of Rye grass (AAU, Jorhat)
b. Effect of stubble management and planting density on establishment and productivity of forage lathyrus under zero tillage condition. (CAU, Imphal)

AVT based trials

a. Effect of N levels on forage yield of promising entries of oat (AVT-2 SC) **(HZ**-Palampur, Srinagar; **NWZ**-Ludhiana, Hisar, Pantnagar; **CZ**- Jabalpur, Urulikanchan, Raipur, Anand)
b. Effect of P levels on forage yield of promising entries of berseem (AVTB2-MC**) NWZ**-Bikaner, Hisar, Ludhiana, **CZ**- Rahuri, Jabalpur, Urulikanchan, Raipur

Following recommendations for adoption were proposed

- In Central Zone (Raipur), sowing of Rattan variety of lathyrus with recommended practices along with 150 % of seed rate is recommended for higher production (90 q/ha GFY) and Net monetary returns (Rs 9334/ha) under rice based cropping system.
- In NEZ (Jorhat), sowing of Lathyrus cv Nirmal through behind plough sowing with 150% of seed rate is recommended for higher productivity (120 q/ha GFY) and net monetary returns (Rs 11877/ha).
- In Central Zone, Bajra napier hybrid + cowpea- berseem – cowpea as perennial fodder cropping system is recommended as it was most productive (1092.4 and 213 q/ha GFY and DMY) and remunerative.
- In Central Zone, BN Hybrid + Lucerne based perennial cropping system is recommended which fetched higher net monetary return (Rs 77658/ha) and BC ratio (2.4).
- At Bikaner, planting of Bajra napier hybrid + lucerne perennial intercropping system is recommended for higher production (861.9 q/ha GFY) and profitability (Rs 90334 with BC ratio of 3.61).

Meeting ended with vote of thanks to the Chair.

TECHNICAL SESSION-IV (CONCURRENT)
FORMULATION OF TECHNICAL PROGRAMME
FORAGE CROP PROTECTION (RABI-2016-17)

Chairman : Dr. K. Umamaheshwaran, ADR, NARP (SR), Vellayani
Finalization of Programme : Dr. A. B. Tambe
Rapporteurs : Drs. D.K Banyal and Dr Ravinder Kumar

Forage Scientists of Plant Pathology and Entomology disciplines discussed in detail the achievements of the last *rabi* season along with the ongoing technical programme. The Chairman gave valuable suggestions for further improvement of the technical programme. Based on the discussion and suggestions made by the Chairman, the following recommendations were emerged.

- The trials PPT-1 and PPT-2, A & B will continue as they are of continuous nature.
- PPT-17, PPT-19, PPT 20, PPT 21, PPT 22 and PPT-23 will also continue in the *Rabi 2016-17*.
- Two trials *ie* PPT 24 (validation of disease management in white clovers from Palampur centre) and PPT 25 (Validation of entomopathogenic fungi on insect pest of lucerne from Rahuri centre) were concluded and following recommendation were given.
- One new trial PPT 26 *i.e.* Biological management of oat aphid (*Rhopalosiphum padi*) has been formulated and will be conducted at Ludhiana, Dharwad and Rahuri centres.

Recommendations for adoption

i. Seed treatment with carbendazim @ 2 g/kg and *Trichoderma viride* @ 5g/kg seed followed by alternate sprays of carbendazim (@ 0.1%) and hexaconazole (@0.05%) is recommended for the management of powdery mildew (*Erysiphe trifolii)* and clover rot (*Sclerotinia trifoliorum*) in the seed crop of white clover

ii. Mixture of *L. lecani* @ $1X10^8$ CFU/g (5 g/lit) + *M. anisopliae* @ $1X10^8$ CFU/g (5 g/lit) or *L. lecani* @ $1X10^8$ CFU/g (5 g/lit) alone as a foliar application is recommended for the control of aphids on Lucerne and foliar application of *N. releyi* @ $1X1^{08}$ CFU/g (5 g/lit) + *B. bassiana* @ $1X1^{08}$ CFU/g (5 g/lit) or *N. releyi* @ $1X1^{08}$ CFU/g (5 g/lit) for the control of lepidopteran pests *(S. litura* and *H. armigera*).

The meeting ended with vote of thanks to the Chair

TECHNICAL SESSION-V
REVIEW OF CENTRE WISE ACTIVITIES

Chairman : Dr. I. S. Solanki, ADG (FFC), ICAR
Convener : Dr. A. K. Roy
Rapporteurs : Dr. B.G. Shekara & Dr. M. Shanti

At the outset, chairman welcomed the participants and requested them to present only highlighted activities. He exhorted scientists to come out with good technologies which can be adopted by the farmers.
The various coordinating and cooperative centers including IGFRI presented their activities.

In general the following were the observations made

- The house was informed about QR coding on breeder seed pack started at IGFRI, Jhansi.
- All the centres were advised to communicate the status of excess breeder seed production to PC, so that steps would be taken up for their disposal
- All the centers should take utmost care to produce the allocated breeder seed as it is a national commitment
- Srinagar and Palampur centre should concentrate more on pasture grasses and legumes.
- Technologies for amelioration of hill pastures should also be developed.
- Linkages with other agencies must be strengthened and such activities should also be reported.
- TSP report should be communicated every quarter to the PC unit in prescribed format.
- Itwas advised to check the results time and again before reporting to coordinating unit
- In Agronomy and Plant protection trials; whenever a location specific trial is completed, the center should compile data of 3-4 years and formulate recommendation for discussion in NGM.
- All the centers should take step to regularly submit the variety proposals to CVRC after its identification in VIC
- After the completion of trials, proposals should come to VIC for identification.
- The trial on hydroponics was discussed at length. It was decided that work should be taken up at selected centers to generate data on many factors especially economics and quality aspects.
- The biochemists should take up project on quality aspect of fodder trees and fodder post harvest.

The session ended with vote of thanks.

TECHNICAL SESSION-VI
FTD & TSP FORMULATION

Chairman : Dr. I. S. Solanki (ADG- FFC, ICAR)
Convener : Dr. A. K. Roy
Rapporteurs : Dr. R. K. Agrawal

At the outset, the chairman welcomed all the participants. Dr. R. K .Agrawal presented the status of FTD's allotted to AICRP (FC) centres for *Rabi* 2016-17.

A total of 595 FTD's were allotted to 25 AICRP centres / voluntary for Rabi crops. It included 112 FTDs to berseem, 60 to lucerne, 160 to oat (Single cut), 88 to oat (Multicut), 25 to cowpea, 25 to laythrus.
The following decisions were taken after the discussion.

- All the centres should send results of the demonstrations alongwith beneficiaries' details (farmers).
- Farmers should not be repeated for the same crop and variety in subsequent years.
- As far as possible every year, the target villages and beneficiaries should be changed.
- The data regarding GFY and seed yield etc should be recorded and analyzed before reporting. The report along with good photograph should be send for compilation in annual report.

A total demand for Rs 22 lakhs under TSP was made by different centers for the remaining period of the financial year. PC commented that it will be finalized as per the budget availability under the head.

At the outset, the chairman welcomed all the participants. Dr. R. K .Agrawal presented the status of FTD's allotted to AICRP (FC) centres for *Rabi* 2016-17.

Crop-wise FTDs to be conducted during Rabi 2016-17

S. No.	Centre name	Berseem	Lucerne	Oat (SC)	Oat (MC)	Cowpea	Maize	Other crops	Total
1.	AAU, Jorhat			20					20
2.	OUAT, Bhubaneswar	10		15					25
3.	BCKV, Kalyani	5		15				Lathyrus-15	35
4.	BAU, Ranchi	10		15	15			Lathyrus-10	50
5.	NDUA&T, Faizabad			10					10
6.	JNKVV, Jabalpur	10			5				15
7.	AAU, Anand		5	5					10
8.	BAIF Urulikanchan	5		10					15
9.	MPKV, Rahuri	7			3				10
10.	SKRAU, Bikaner		10	15					25
11.	PAU, Ludhiana	10			20			Rye grass-10	40
12.	CCS HAU, Hisar	20		15	5				40
13.	GBPUA&T, Pantnagar	20		10			20		50
14.	TNAU, Coimbatore		5			5		Guinea -10	20
15.	PJTSAU, Hyderabad		10	10				Desmenthus-15	35
16.	UAS, ZRS Mandya		30			10	30		70
18.	CSK HPKVV, Palampur				10			Tall fescue-5	15
19.	KAU, Vellayani					5		BNH-20	25
21.	IGKV, Raipur	10			10				20
22.	CAU, Imphal				20				20
23.	SKUAST-K, Srinagar			20					20
24.	Karaikal					5			5
25.	ANGRAU, Guntur	5					5	BNH-5, Desmenthus-5	20
Total		112	60	160	88	25	55	95	595

The session ended with vote of thanks to the chair.

Proceedings of the Varietal Identification Committee meeting

The meeting of the varietal identification committee of AICRP on Forage Crops & Utilization was held under the chairmanship of Dr. I. S. Solanki, ADG FFC, ICAR on 5th September, 2016 at Kerala Agricultural University, Thiruvanathapuram, Vellayani.

Nine proposals were submitted by different centers for consideration. Each proposal was discussed thoroughly and following decisions were taken

Entry Ro-11-1 (oat single cut): The proposal was submitted by MPKV, Rahuri for all India except Hill Zone. The committee considered the proposal and noted its superiority for North West zone, North East zone, Central zone and South zone for green forage yield, dry matter yield, crude protein yield, per day green fodder and dry matter productivity over all the checks and also qualifying entries. It is a tall variety with good leaf stem ratio. The entry was moderately resistant to leaf blight, resistant to root rot and less susceptible to aphids. Hence the committee recommends its identification for release for cultivation in the North East (West Bengal, Odhisha, Jharkhand, Bihar, eastern UP, Manipur, Assam), North West (Rajasthan, Punjab, Haryana, Uttarakhand), Central zone (Maharashtra, Gujarat, Madhya Pradesh, Chhattisgarh, central UP), South zone (Telengana, Andhra Pradesh, Karnataka, Tamil nadu) during rabi season in irrigated condition under single cut situation. The proposed name is Central Oat RO-11-1.

Entry OL-1804 (oat single cut): The proposal was submitted by PAU Ludhiana for North East Zone. The committee considered the proposal and noted its superiority for green forage yield, dry matter yield, crude protein percentage, crude protein yield, per day green fodder and dry matter productivity over all the checks. It is a leafy variety with good leaf stem ratio. The entry was resistant to Alternaria leaf blight, Sclerotium root rot and leaf defoliators. Hence the committee recommends its identification for release for cultivation in the North East Zone (West Bengal, Odhisha, Jharkhand, Bihar, eastern UP, Manipur, Assam) during rabi season in irrigated condition under single cut situation. The proposed name is Central Oat OL-1804.

Entry OS-405 (oat single cut): The proposal was submitted by CCS HAU, Hisar for Central and South Zone. The committee noted its superiority for green forage yield, dry matter yield over the checks. It has also at par or superior crude protein percentage, crude protein yield, per day green fodder and dry matter productivity in comparison to all the checks. The entry was moderately resistant to leaf blight. Its performance in south zone was not significantly better than the checks. Hence the committee recommends its identification for release for cultivation in the central zone (Maharashtra, Gujarat, Madhya Pradesh, Chhattisgarh, central UP) during rabi season under irrigated condition under single cut situation. The proposed name is Central Oat OS 405.

Entry OS-403 (oat single cut): The proposal was submitted by CCS HAU, Hisar for North West Zone. The variety was earlier considered and was identified for North East and South zones. It was recommended earlier to generate additional data for North West zone. The committee noted its superiority for green forage yield, dry matter yield crude protein percentage, crude protein yield, per day green fodder and dry matter productivity in comparison to all the checks. The entry was moderately resistant to leaf blight. Hence the committee recommends its identification for release for cultivation in the North West (Rajasthan, Punjab, Haryana, Uttarakhand), during rabi season under irrigated condition under single cut situation. The proposed name is Central Oat OS 403.

Entry OL-1802 (oat multicut): The proposal was submitted by PAU, Ludhiana for central Zone. The committee noted its superiority for green forage yield, dry matter yield over the checks. It has also at par or superior crude protein percentage, per day green fodder and dry matter productivity in comparison to all the checks. The entry was also superior for crude protein yield. It was moderately resistant to leaf blight. Considering the fact that for last several years no variety is identified for oat multicut, the committee recommends its identification for release for cultivation in the central zone (Maharashtra, Gujarat, Madhya Pradesh, Chhattisgarh, central UP) during rabi season under irrigated condition under multi cut situation. The proposed name is Central Oat OL-1802.

Entry TNLC-24 (Lucerne perennial): The proposal was submitted by TNAU, Coimbatore for south Zone. The committee observed the superiority against the checks for green fodder, dry matter, crude protein yield. However, the data on seed yield and pathological observations were not provided. The committee recommends its retesting along with checks for one year to generate additional data on seed yield and insect-pest, disease aspects. The committee also observed that since the variety is developed by polycross method involving other centres, hence credit should be given to scientists of other centres also.

OL-1760 (Oat single cut): The proposal was submitted by PAU, Ludhiana for South Zone. The committee considered the proposal and found that data on pathological aspect is not sufficient, hence the entry along with checks should be retested in south zone to generate data on pathological and insect-pest aspect.

Entry OS-406 (oat single cut): The proposal was submitted by CCS HAU, Hisar for Central and South Zone. The committee observed that although the entry has superiority in green fodder and dry matter yield over the checks, however, it is not better than the qualifying entry RO-11-1. For seed yield and disease reactions, the performance of the entry is also not satisfactory. The committee did not recommend its release.

Entry BAIF-Lucerne-3 (Lucerne perennial): The proposal was submitted by BAIF, Urulikanchan for North-West Zone. The committee observed that the variety is not consistent in performance and hence did not recommend for release.

(A. K. Roy)
Member secretary

(I.S. Solanki)
Chairman

TECHNICAL SESSION-VII
PGR/BREEDING/PRODUCTION/PROTECTION ISSUES

Chairman : Dr. I.S. Solanki, ADG (FFC), ICAR, New Delhi
Co-Chairman : Dr. N. V. Naidu, Director of Research, ANGRAU, Guntur (A.P.)
Rapporteurs : Drs. Santosh Jha & P. S. Takawale

At the outset, the chairman welcomed the delegates. In this session, Dr. A K Roy, PC, presented the long term analysis of AICRP on Forage Crops trial data for four decades of Berseem, Oats, Cowpea, Maize and Pearl millet for two decades.

- Inconsistent trend of entries for GFY & DMY in IVT trials of Berseem over the years in all the zones was observed. In AVT-1 Berseem trials mean performance of different entries for GFY & DMY was slightly improving in NEZ, consistent in CZ.
- Significant gain over the years in IVT, AVT-1 & AVT-2 of single cut and multicut varieties of oat for GFY and DMY was observed in HZ, CZ, NWZ, SZ and All India
- Significant gain in IVT Pearl millet in NEZ (30 %) and NWZ (20%). For AVT-1 pearl millet, significant gain in NEZ, NWZ, SZ and at All India was observed.
- Significant gain in NWZ, CZ, SZ and All India for IVT, AVT of cowpea and maize.

Recommendations:

- There should be free germplasm exchange among the centers. For exploration and collection of germplasm, proper planning with due consultation and involvement of NBPGR should be done. The germplasm should be shared among the centres.
- New entries in multilocation trials should be contributed only after getting them properly evaluated in the station trials.
- The material generated under the national breeding programme, should be shared among the participating centers and due credit should be given to the respective center.
- Enrich the germplasm of mandatory crops through exploration and import of germplasm.
- Send the entries and suitable donors of forage crops for Registration to NBPGR.
- The breeders should visit to the germplasm nursery of other centers.
- Exchange the segregating material to other centers to explore the performance under different agroclimatic conditions.
- Share information on the varieties /production /protection technologies generated for forage crops under AICRP Forage Crops and also at state level to Project Coordinating Unit for compilation.
- Plant Protection scientists should strictly follow the guidelines developed during Rabi Forage Group Meet at MPKV, Rahuri.
- Seeds of released and notified varieties should be deposited with NBPGR.
- Advance breeding lines should be evaluated for various parameters including disease and quality.
- Proposals for varieties identified by Varietal Identification committee should be submitted to CVRC within one month.
- Efforts should be made by different institutions to increase the breeder seed demand by popularizing the varieties so that forage seed replacement rate be increased.

The session was ended with vote of thanks to the chair.

TECHNICAL SESSION-VIII
SCIENTIFIC, ADMINISTRATIVE AND FINANCIAL ISSUES

Chairman : Dr. I. S. Solanki (ADG- FFC, ICAR)
Convener : Dr. A. K. Roy
Rapporteurs : Dr. Ansar Ul Haq

The session started with welcome note by the chairman, he ask the delegates to raise any issue which they feel will help them in better discharge of duties as well as any constraints being felt by them.

Following general and specific points emerged out of discussion

Scientific

- Scientists were advised to properly document the developed breeding material and get it registered with NBPGR.
- The scientists were advised for exchange of crosses and segregating materials.
- All the information, regarding the technologies developed / generated should be sent to the coordinating unit.
- Seeds for trials should always be sent timely as per deadline set in the NGM.

Administrative

- Issue of fund utilization under TSP grant was raised. The centers were advised to strictly follow the guidelines of TSP as available on ministry website and circulated by Project coordinating unit.
- All vacant posts should be immediately filled up. Chairman requested all the scientist to approach their university authorities to fill all the vacant post at the earliest
- Centers should be prompt in responding to the various queries of PC unit as they needs to be compiled for urgent responses to ICAR/ Ministry/ Other departments/ Parliament questions etc.

Financial

Sri M. K. Mulani, Finance and Accounts officer, IGFRI, Jhansi informed the house about various audit points to be followed by each center

- Utilization certificate (UC) of previous financial year should be submitted before 15th April, while Audited Utilization Certificate (AUC) should be submitted before 15th September.
- First release of fund will be made only after receiving UC, whereas funds in excess of 50% of sanctioned grant will be made after receiving AUC.
- AUC should be signed by statutory auditors or Chartered accountants. If signed by chartered accountants, please make sure that they are empanelled either by CAG or State AG, or state government or University.
- The release are made under broadly three heads, Grant in aid – Capital, Grant in aid – Salaries, Grant in aid – Contingencies. These heads should be strictly followed and expenditure should not jump in any head. The money form one head can not be transferred to other head.
- In Salaries, please strictly follow the number and nature of posts. No retirement benefits should be charged from AICRP fund.

The meeting ended with vote of thanks to the chair.

TECHNICAL SESSION
PLENARY SESSION

Chairman : Dr. I. S. Solanki, ADG (FFC), ICAR
Co-Chairman : Dr. Sajan Kurian, Director of Research, Kerala Agricultural University
Co-Chairman : Dr. N. V. Naidu, Director of Research, ANGRAU, Guntur (A.P.)
Convener : Dr. A. K. Roy, Project Coordinator
Rapporteur : Dr. R. K. Agrawal

The proceedings and recommendations of the various technical sessions were presented by the respective rapporteurs, which were approved with suitable modifications after discussion and suggestions.

Dr. I. S. Solanki, Assistant Director General, Food and Fodder Crops, ICAR in his address thanked the University and the Vice Chancellor for agreeing to hold the meeting at Kerala Agricultural University, Vellayani- Thiruvanthpurm. He expressed his thanks to University authorities and the dedicated team especially Drs Mareen Abraham and Usha Thomas for successfully organizing the meeting and taking all care of the participants during the meeting. He stressed upon the importance of forage crops in agricultural scenario through out the country and especially for Kerala and southern India.

Dr. Sajan Kurien, Director Research, KAU, stressed upon the need of research on the location specific problem. He pointed out that Kerala is deficit in milk and meat production and has to depend on other states to meet the demand. The need to focus research on high yielding varieties of forage crops and availability of seeds and technologies was highlighted. He thanked ICAR for holding the meeting at this University.

Project Coordinator Dr. A. K. Roy thanked ICAR, KAU for giving permission and sanction to hold the meeting. He thanked Vice chancellor and his team of University staff for all the facilities, logistics for smooth conductance of the meeting. He was especially thankful to the university staff particularly Drs Mareen Abraham and Usha Thomas for their all round care in terms of food, accommodation, transport, logistics.

Annexure A

AICRP ON FORAGE CROPS & UTILIZATION
FINALIZED TECHNICAL PROGRAMME
FORAGE BREEDING TRIALS - RABI 2016-17

Abbreviations: HZ-Hill zone, **NWZ**-North-west zone, **NEZ**-North-east zone, **CZ**-Central zone, **SZ**-South zone

1. IVT Berseem: Initial Varietal Trial in Berseem

Number of entries	5 + 1 NC + 1 ZC
Contributors	JNKVV (1), PAU (1), IGFRI (1), HAU (2)
National checks	Wardan
Zonal checks	BL-22 (HZ), Bundel Berseem-2 (CZ & NWZ), Bundel Berseem-3 (NEZ)
Design	RBD with 3 replications
Plot size	3.0 x 3.0 m
Spacing	Row to row-30 cm (each plot accommodating 10 rows of 3 m length)
Seed rate	22 g per plot (approx. 25 Kg/ha)
Seed requirement	2.0 Kg/entry from each contributor & 0.75 Kg for each zonal check
Fertilizer	N-20 Kg, P_2O_5 80 Kg/ha
Locations (21)	**HZ-** Palampur, Srinagar, Rajouri **NWZ**-Pantnagar, Bikaner, Hisar, Ludhiana, Jalore, Meerut & Udaipur, **NEZ-**Kalyani, Ranchi, Faizabad, Bhubaneswar, Pusa **CZ**- Jhansi, Rahuri, Jabalpur, Urulikanchan, Palghar, Raipur

2. AVT-1 Berseem: First Advance Varietal Trial in Berseem

Number of entries	4 + 2 NC + 1 ZC
Entries name	JB-05-09, HFB-12-4, HFB-12-9, PC-82
National checks	Wardan & Mescavi (2)
Zonal checks	Bundel Berseem-2 (CZ & NWZ), BL-22 (HZ)
Design	RBD with 3 replications
Plot size	3.0 x 4.0 m
Spacing	Row to row-30 cm (each plot accommodating 10 rows of 3 m length)
Seed rate	30 g per plot (approx. 25 Kg/ha)
Seed requirement	2.0 Kg/entry from each contributor & NC; 0.5 kg for BL-22; 2.0 Kg for BB-2
Fertilizer	N-20 Kg, P_2O_5 80 Kg/ha
Locations (15)	**HZ -** Palampur, Srinagar, Rajouri **NWZ**-Bikaner, Hisar, Ludhiana, Jalore, Meerut & Udaipur **CZ**- Jhansi, Rahuri, Jabalpur, Urulikanchan, Palghar, Raipur

3. AVT-2 Berseem: Second Advance Varietal Trial in Berseem

Number of entries	2 + 2 NC + 1 ZC
Entries name	JB-04-23, JB-04-21
National checks	Wardan & Mescavi (2)
Zonal checks	Bundel Berseem-2 (CZ & NWZ),
Design	RBD with 4 replications
Plot size	3.0 x 4.0 m
Spacing	Row to row-30 cm (each plot accommodating 10 rows of 3 m length)
Seed rate	30 g per plot (approx. 25 Kg/ha)
Seed requirement	1.5 Kg/entry from each contributor & NC & ZC
Fertilizer	N-20 Kg, P_2O_5 80 Kg/ha
Locations (12)	**NWZ**-Bikaner, Hisar, Ludhiana, Jalore, Pantnagar, Meerut & Udaipur **CZ**- Jhansi, Rahuri, Jabalpur, Urulikanchan, Raipur

4. AVT-2 Berseem (seed) Second Advance Varietal Trial in Berseem (seed)

Number of entries	2 + 2 NC + 1 ZC
Entries name	JB-04-23, JB-04-21
National checks	Wardan & Mescavi (2)
Zonal checks	Bundel Berseem-2 (CZ & NWZ),
Design	RBD with 4 replications
Plot size	3.0 x 4.0 m
Spacing	Row to row-30 cm (each plot accommodating 10 rows of 3 m length)
Seed rate	30 g per plot (approx. 25 Kg/ha)
Seed requirement	1.5 Kg/entry from each contributor & NC & ZC
Fertilizer	N-20 Kg, P_2O_5 80 Kg/ha
Locations (7)	**NWZ**-Bikaner, Hisar, Ludhiana, **CZ**- Jhansi, Rahuri, Jabalpur, Urulikanchan

4A. AVT-2 Berseem (agronomy) Second Advance Varietal Trial in Berseem Agronomy

Number of entries	2 + 2 NC + 1 ZC
Entries name	JB-04-23, JB-04-21
National checks	Wardan & Mescavi (2)
Zonal checks	Bundel Berseem-2 (CZ & NWZ),
Design	RBD - 3 replications total 5x3x3 = 45 plots **3 levels of P_2O_5 (60, 80 & 100 kg/ha)**
Plot size	4 x 3 m
Spacing	Row to row-30 cm (each plot accommodating 10 rows of 4 m length)
Seed rate	30 g per plot (approx. 25 Kg/ha)
Seed requirement	2.5 kg / entry
Fertilizer	N- 20 kg/ha as basal 3 levels of P_2O_5 (60, 80 & 100 kg/ha)
Locations (7)	**NWZ-**Bikaner, Hisar, Ludhiana, **CZ-** Jhansi, Rahuri, Jabalpur, Urulikanchan

5. IVT Oat (SC) Initial Varietal Trial in Oat (Single cut)

Number of entries	9 + 2 NC +1 ZC
Contributors	JNKVV(1), PAU (3), HAU (2), NDUAT (1), GBPUAT (1), SKUAST –K (1)
National checks	Kent & OS-6
Zonal check	SKO-90 (HZ), OL-125 (NWZ), JHO-99-2 (NEZ), OS-377 (CZ), JHO-2000-4 (SZ)
Design	RBD with 3 replications
Plot size	3.0 x 3.0 m
Spacing	Row to row 25 cm (each plot accommodating 12 rows of 3 m length)
Seed rate	90 g per plot (approx. 100 Kg/ha)
Seed requirement	10.0 Kg/entry from each contributor & 3.5 Kg for each zonal check
Fertilizer	N- 80 Kg, P_2O_5 -40 Kg/ha
Locations (30)	**HZ**-Palampur, Srinagar, Rajouri **NWZ**-Bikaner, Jalore, Hisar, Ludhiana, Pantnagar, Udaipur, Meerut **NEZ**-Jorhat, Kalyani, Bhubaneswar, Ranchi, Pusa, Faizabad, Imphal **CZ**-Jhansi, Rahuri, Urulikanchan, Palgarh, Kanpur, Anand, Jabalpur, Raipur **SZ**-Hyderabad, Tirupati/ Guntur, Mandya, Coimbatore (Ooty), Mattupetty

6. AVT Oat (SC)-1 First Advanced Varietal Trial in Oat (Single cut)

Number of entries	7 + 2 NC +1 ZC
Entries name	HFO-529, OL-1844, JO-04-22, VOS-15-24, HFO-427, JHO-15-1, SKO-227
National checks	Kent and OS-6
Zonal checks	OL-125 (NWZ), JHO-99-2 (NEZ), JHO-2000-4 (SZ)
Design	RBD with 3 replications
Plot size	4.0 x 3.0 m
Spacing	Row to row-25 cm (each plot accommodating 12 rows of 4 m length)
Seed rate	120 g per plot (approx. 100 Kg/ha)
Seed requirement	10.0 Kg/entry from each contributor & 4.0 Kg for each zonal check
Fertilizer	N- 80 Kg, P_2O_5-40 Kg/ha
Locations (21)	**HZ** Palampur, Srinagar, Rajouri **NWZ**- Bikaner, Jalore, Hisar, Ludhiana, Pantnagar, Udaipur, **NEZ**-Jorhat, Kalyani, Bhubaneswar, Ranchi, Pusa, Faizabad, Imphal **SZ**-Hyderabad, Mandya, Coimbatore (Ooty), Karaikal, Mattupetty

7. AVT Oat (SC)-2 Second Advanced Varietal Trial in Oats (Single cut)

Number of entries	8+ 2 NC +1 ZC
Entries name	OS-424, OL-1769-1, OL-1802, SKO-225, JO-04-19, UPO-10-3, OL-1766-1, OS-432
National checks	Kent & OS-6
Zonal check	SKO-90 (HZ), OL-125 (NWZ), JHO-822 (CZ),
Design	RBD with 3 replications
Plot size	4.0 x 3.0 m
Spacing	Row to row-25 cm (each plot accommodating 12 rows of 4 m length)
Seed rate	120 g per plot (approx. 100 Kg/ha)
Seed requirement	8.0 Kg/entry from each contributor & 4.0 Kg for each zonal check
Fertilizer	N-80 Kg, P_2O_5-40 Kg/ha
Locations (16)	**HZ** Palampur, Srinagar, Rajouri **NWZ**-Bikaner, Jalore, Hisar, Ludhiana, Pantnagar, Udaipur **CZ**-Jhansi, Rahuri, Urulikanchan, Palghar, Anand, Jabalpur, Raipur

7A. AVT Oat (SC)-2 Agronomy

Number of entries	8+ 2 NC +1 ZC
Entries name	OS-424, OL-1769-1, OL-1802, SKO-225, JO-04-19, UPO-10-3, OL-1766-1, OS-432
National checks	Kent and OS-6
Zonal check	SKO-90 (HZ), OL-125 (NWZ), , JHO-822 (CZ),
Design	Split plot with 3 replications total plots = 11x3x3 = 99 **with 3 N levels (40, 80, 120 kg N/ha) split dose**
Plot size	4.0 x 3.0 m
Spacing	Row to row-25 cm (each plot accommodating 12 rows of 4 m length)
Seed rate	100 g per plot (approx. 80 Kg/ha)
Seed requirement	12.0 Kg/entry from each contributor & 4.0 Kg for each zonal check
Fertilizer	P_2O_5-40 Kg/ha basal with 3 N levels (40,80,120 kg N/ha) split dose
Locations (9)	**HZ** Palampur, Srinagar **NWZ**- Hisar, Ludhiana, Pantnagar **CZ**- Urulikanchan, Anand, Jabalpur, Raipur

8. AVT Oat (SC)-2 (Seed) Second Advanced Varietal Trial in Oats (SC) for Seed

Number of entries	8 + 2 NC +1 ZC
Entries name	OS-424, OL-1769-1, OL-1802, SKO-225, JO-04-19, UPO-10-3, OL-1766-1, OS-432
National checks	Kent and OS-6
Zonal check	SKO-90 (HZ), OL-125 (NWZ),, JHO-822 (CZ)
Design	RBD with 3 replications
Plot size	4.0 x 3.0 m
Spacing	Row to row-25 cm (each plot accommodating 12 rows of 4 m length)
Seed rate	100 g per plot (approx. 80 Kg/ha)
Seed requirement	2.5 Kg/entry from each contributor & 1.25 Kg for each zonal check
Fertilizer	N-80 Kg, P_2O_5-40 Kg/ha
Locations (7)	**NWZ**-Hisar, Pantnagar, **CZ**-Jhansi, Jabalpur, Rahuri H**Z**-Palampur, Srinagar

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

Number of entries	7 + 3 NC
Contributors	JNKVV (1), PAU (3), HPKVV (1), HAU (2)
National checks	Kent, UPO-212 and RO-19
Design	RBD with 3 replications
Plot size	3.0 x 3.0 m
Spacing	Row to row-25 cm (each plot having 12 rows of 3.0 m length)
Seed rate	90 g per plot (approx. 100 Kg/ha)
Seed requirement	6.5 Kg/entry from each contributor & 6.5 Kg for each national check
Fertilizer	N-80 Kg, P_2O_5-40 Kg/ha
Locations (18)	**HZ** Palampur, Srinagar, Almora **NWZ** Pantnagar, Hisar, Jalore, Ludhiana **NEZ** Ranchi, Pusa, Faizabad, Jorhat, Bhubaneswar, Imphal **CZ** Jhansi, Anand, Jabalpur, Rahuri, Urulikanchan

10. AVTO-1 (MC) First Advanced Varietal Trial in Oat (Multi cut)

Number of entries	5 + 3 NC
Entries name	OL-1842, HFO-514, HFO-417, OL-1866, JO-04-321
National checks	Kent, UPO-212 and RO-19
Design	RBD with 3 replications
Plot size	4.0 x 3.0 m
Spacing	Row to row-25 cm (each plot having 12 rows of 4.0 m length)
Seed rate	120 g per plot (approx. 100 Kg/ha)
Seed requirement	4.0 Kg/entry from each contributor & 2.0 Kg for each national check
Fertilizer	N-80 Kg, P_2O_5-40 Kg/ha
Locations (8)	**HZ** Palampur, Srinagar, Almora **CZ** Jhansi, Anand, Jabalpur, Rahuri, Urulikanchan

11. IVT Oat (Dual) Initial Varietal Trial in Oat (Dual)

Number of entries	9 + 2 NC
Entries name	JNKVV (1), PAU (3), MPKV (3), HAU (2)
National checks	UPO-212 and JHO-822
Design	RBD with 3 replications
Plot size	3.0 x 3.0 m
Spacing	Row to row 25 cm (each plot accommodating 12 rows of 3 m length)
Seed rate	90 g per plot (approx. 100 Kg/ha)
Seed requirement	7.0 Kg/entry from each contributor & 7.0 Kg for each national check
Fertilizer	N-80 Kg, P_2O_5-40 Kg/ha
Locations (18)	**HZ**-Palampur, Srinagar **NWZ**-Bikaner, Hisar, Ludhiana, Pantnagar, Udaipur **NEZ**-Jorhat, Bhubaneswar, Ranchi, Faizabad **SZ -** ANGRAU **CZ**-Jhansi, Rahuri, Urulikanchan, Anand, Jabalpur, Raipur

12. AVT-1 Oat (Dual) Advanced Varietal Trial in Oat (Dual)

Number of entries	3 + 3 NC
Entries name	OL-1802, NDO-11-01, OL-1760-1
National checks	RO-19, UPO-212 and JHO-822
Design	RBD with 4 replications
Plot size	3.0 x 4.0 m
Spacing	Row to row 25 cm (each plot accommodating 12 rows of 3 m length)
Seed rate	120 g per plot (approx. 100 Kg/ha)
Seed requirement	3.0 Kg/entry from each contributor & 3.0 Kg for each national check
Fertilizer	N-80 Kg, P_2O_5-40 Kg/ha
Locations (4)	**NEZ**-Jorhat, Bhubaneswar, Ranchi, Faizabad

13. VT Lucerne (P)-2016 Varietal Trial in Lucerne (Perennial)-1st year

Number of entries	10 + 2 NC
Contributors	BAIF (1), TNAU (1), Anand (2), SKRAU (1), MPKV (1), PJTSAU (1), IGFRI (1), Alamdar (2)
National checks	Anand-2, RL-88
Design	RBD with 3 replications
Plot size	4.0 x 3.0 m
Spacing	Row to row 30 cm (each plot accommodating 10 rows of 4.0 m length)
Seed rate	30.0 g per plot (Approx. 25 kg/ha)
Seed requirement	1.75 kg/entry from each contributor 1.75 kg for each national check
Fertilizer	N-20kg, P_2O_5-80 kg/ha
Locations (13)	**NWZ**- Ludhiana, Bikaner, Jalore, Udaipur **CZ**- Rahuri, Urulikanchan, Anand, Raipur **SZ**- Hyderabad, Coimbatore, Mandya, Tirupati, Dharwad

14. IVT – Vicia Initial Varietal trial in Vicia

Number of entries	5
Contributors	JNKVV (5)
National checks	General mean
Design	RBD with 4 replications
Plot size	3.0 x 3.0 m
Spacing	Row to row 30 cm (each plot accommodating 10 rows of 3.0 m length)
Seed rate	36.0 g per plot (Approx. 40 Kg/ha)
Seed requirement	0.75 Kg/entry
Fertilizer	N-20Kg, P_2O_5-40 Kg/ha
Locations (4)	Jhansi, Jabalpur, Rahuri & Raipur

15. VT Lolium -2016 Varietal trial in Rye grass – annual

Number of entries	5 + 1
Contributors	Palampur (2), PAU (1), Advanta (2) + 1 NC
National checks	PBRG-1
Design	RBD with 4 replications
Plot size	4.0 x 3.0 m
Spacing	Row to row 30 cm (each plot accommodating 10 rows of 4.0 m length)
Seed rate	10 kg/ha (12g/plot)
Seed requirement	300 g
Fertilizer	N-90 Kg/ha, P_2O_5-60 Kg/ha (45 Kg N at the time of sowing and remaining in equal splits after each cut)
Locations (5)	Palampur, Srinagar, Almora, Bajaura (Kullu), Ludhiana

16. VT Red Clover -2016 Varietal trial in Red clover – Perennial -1st year

Number of entries	6 + 1 check
Contributors	IGFRI (6)
National checks	PRC-3
Design	RBD with 4 replications
Plot size	4.0 x 3.0 m
Spacing	Row to row 30 cm (each plot accommodating 10 rows of 4.0 m length)
Seed rate	10-12kg/ha (15g/plot)
Seed requirement	300 g per entry and check
Fertilizer	N-40 Kg/ha, P_2O_5-40 Kg/ha
Locations (4)	HZ-Palampur, Srinagar, Bajaura (Kullu), Almora

17. VT White Clover -2016 Varietal trial in White clover – Perennial -1st year

Number of entries	5+1 Check
Contributors	Palampur -2, IGFRI (3)
National checks	Palampur Composite
Design	RBD with 4 replications
Plot size	4.0 x 3.0 m
Spacing	Row to row 30 cm (each plot accommodating 10 rows of 4.0 m length)
Seed rate	5 kg/ha (7.5 g/plot)
Seed requirement	150 g
Fertilizer	N-40 Kg/ha, P_2O_5-40 Kg/ha
Locations (4)	HZ-Palampur, Srinagar, Bajaura (Kullu), Almora

18. Repeat AVT Oat (SC)-2 Second Advanced Varietal Trial in Oats (Single cut) Repeat 14-15

Number of entries	9+ 2 NC +1 ZC
Entries name	UPO-12-1, JHO-2012-2, RSO-59, RSO-60, SKO-190, OS-405, JHO-2012-1, OL-1760, JO-04-14
National checks	Kent & OS-6
Zonal check	JHO-2000-4 (SZ)
Design	RBD with 3 replications
Plot size	4.0 x 3.0 m
Spacing	Row to row-25 cm (each plot accommodating 12 rows of 4 m length)
Seed rate	120 g per plot (approx. 100 Kg/ha)
Seed requirement	1.5 Kg/entry & national check & zonal check
Fertilizer	N-80 Kg, P_2O_5-40 Kg/ha
Locations (10)	**SZ**-Hyderabad, Mandya, Coimbatore (ooty),

19. VT Repeat Lucerne (P)-2013 Varietal Trial in Lucerne (Perennial)-1st year

Number of entries	5 + 2 NC
Entries name	Anand -25, TNLC -14, RL-10-2, ALP-1-1 (Baif Lucerne -3), Anand 26
National checks	Anand-2, RL-88
Design	RBD with 4 replications
Plot size	4.0 x 3.0 m
Spacing	Row to row 30 cm (each plot accommodating 10 rows of 4.0 m length)
Seed rate	30.0 g per plot (Approx. 25 kg/ha)
Seed requirement	0.5 kg/entry from each contributor and national check
Fertilizer	N-20kg, P_2O_5-80 kg/ha
Locations (3)	**SZ**- Hyderabad, Coimbatore, Mandya

Annexure B

AICRP ON FORAGE CROPS
FINALIZED TECHNICAL PROGRAMME
FORAGE CROP PRODUCTION TRIALS - RABI 2016-17

PS-13-AST-2: Performance of perennial fodder sorghum (*sorghum bicolor* cv. COFS- 29) as influenced by planting geometry and cutting intervals under irrigated conditions)

Location (3): Dharwad, Raipur and Bikaner **Data reporting:** Rabi
Year of start: Rabi 2013-14 **Concluding year:** Rabi 2017

Objectives:

- To study the effect of planting geometry on growth and yield
- To study the effect of cutting intervals on growth and yield
- To study the interactive effect of planting geometry and cutting intervals on growth and yield

Year : Rabi 2013-14 **Design** : FRBD **Replications** : Three
Plot size : 4.0 m x 3.6 m **Seed rate** : 10 kg/ha

Treatments:

A. Planting geometry: 30 cm inter-row spacing, 2. 45 cm inter-row spacing, 3. 60 cm inter-row spacing
B. Cutting interval: 45 days, 2. 60 days, 3. 75 days, 4. 90 days
Observations to be recorded: All observations will be recorded at each cut

Plant height	Number of tillers/m row length	Leaf: stem ratio
Dry matter /m row length	Green fodder yield/ha	DFY/ha
Crude protein (%),	Crude fibre (%),	HCN content at each harvest

R-13-AST-1: Yield Potential of cereals with forage legumes under pure stand and mixtures

Locations: Srinagar
To be continued as per previously approved programme

PS-14-AST-2: Impact of Mg and B on nutrient uptake, quality and yield of bajra napier hybrid

Location (1): Vellayani **Data reporting:** Rabi
Year of start: 2014 **Concluding year:** Rabi 2017

Objective: to assess the influence of Mg and B nutrition on the performance of bajra napier hybrid

Technical details:

Design: Factorial RBD **Number of replication**:- Three **Plot size:** 4 m x 4 m **Duration**: 3 years

Treatments:-

A. Field condition (2)

1. Open situation 2. Coconut garden

B. Nutrient levels (5)

1. POP recommendation (200:50:50 kg NPK/ha and 25 t/ha of Farm yard manure) + $MgSO_4$,80 kg/ha+ Borax, 10 kg/ha
2. POP(200:50:50 kg NPK/ha and 25 t/ha of Farm yard manure) + $MgSO_4$, 80kg/ha
3. POP (200:50:50 kg NPK/ha and 25 t/ha of Farm yard manure) +Borax, 10 kg/ha
4. POP alone((200:50:50 kg NPK/ha and 25 t/ha of Farm yard manure)
5. POP without FYM (200:50:50 kg NPK/ha)

POP- Package of practices recommendation, Kerala (200:50:50 kg NPK/ha and 25 t/ha of FYM
General recommendation for deficient soils in Kerala is 80 kg/ha of Mg SO_4 and 10 kg/ha of Borax.

Observations

A. Biometric characters: Plant height at harvest (cm), Leaf /stem ratio
B. Yield characters: Green fodder yield (q/ha), Dry fodder yield (q/ha)
C. Quality characters: Crude protein content (%), Crude fibre content (%)
D. Nutrient studies

- **Soil analysis:** pH, EC, organic carbon, Mg, B and NPK status before and after the conduct of the experiment
- **Plant analysis:** N, P, K, Mg and B.

E. Light intensity studies

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

Location (2): Palampur and Srinagar **Data reporting:** Rabi
Year of start: Rabi 2014-15 (1st year establishment) **Concluding year:** Rabi 2019

Objectives:

- To evaluate the productivity, quality and compatibility of tall fescue grass + white clover mixture
- To estimate soil NPK and soil organic carbon (SOC) storage under different treatments

Technical details:

Design: Randomized block design **Year of start**: Rabi 2014-15 **Duration**: Three years
Replications: Three **Plot size**: 3.60 m x 3.60 m

Treatments (11 including sole stand of tall fescue and white clover):

(A) Spacing of tall fescue grass -3*

(a) 20 cm x 30 cm (b) 30 cm x 30 cm (c) 40 cm x 40 cm

(B) White clover seed rate (Kg/ha)-3**

(a) 1.0 (b) 2.0 (c) 3.0

All possible combination of A and B plus sole stand of Tall fescue grass at 30 cm x 30 cm spacing, and white clover @ 6 kg/ha sowing by broadcast.

Note: (*Tall fescue seedling will be established through transplanting; ** Seed of white clover will be over sown by broadcast after transplanting of tall fescue grass)

Observations to be recorded:

- Plant height (cm); L/S ratio; Per cent proportion of each species (on dry weight basis)
- GFY, DMY, CPY (q/ha) CP Content
- Competition functions net returns (Rs/ha) and benefit cost ratio
- Soil NPK, pH, total soil organic carbon storage (Tonnes carbon/ha) before start of the experiment and after completion of the experiment in each season

CS-14-AST-1: Studies on intensive fodder cropping systems for yield maximization

Location: Raipur **Data reporting:** Rabi
Year of start: 3 years from Kharif 2014 **Concluding year:** Rabi 2017

Objectives:

- To find out the appropriate cropping system for maximum fodder production
- To study the effect of cropping systems on soil fertility, nutrient use and water use efficiency

Treatments:

1. BN Hybrid + Lucerne	**2.** Setaria + Lucerne
3. BN Hybrid + Cowpea (summer) / Lucerne (winter)	**4.** Setaria + Cowpea (summer)/ Lucerne (winter)
5. BN Hybrid + Berseem (winter)	**6.** Setaria + Berseem (winter)
7. BN Hybrid + Cowpea (summer)/ Berseem (winter)	**8.** Setaria + Cowpea (summer)/ Berseem (winter)

Year: Summer/Kharif 2014 **Design** : RBD **Replications**: Three
Plot size (Gross): 6.0 m x 5.0 m **Duration**: Three years

Observations to be recorded:

- **Growth attributes:** Plant height, Leaf: stem ratio
- **Yield:** GFY, DMY and CPY
- **Economics:** Cost of cultivation, Net returns and BC ratio
- **System productivity:** Equivalent yields
- **Other yearly observations:** WUE, NUE, soil fertility after crop cycle

CS-14-AST-2: Study of intensive annual fodder crop based cropping system

Location: Raipur **Data reporting:** Rabi
Year of start: 3 years from 2014 **Concluding year:** Rabi 2017

Objectives

- To find out the appropriate system for maximum fodder production
- To study effect of maximum forage production on soil fertility, nutrient use efficiency, and water use efficiency.

Treatment details

1. Sorghum multi cut + Cowpea (2:1) - Lucerne
2. Maize + Cowpea (2:1) - Lucerne
3. Pearl millet multi cut + Cowpea (2:1) - Lucerne
4. Maize + Rice bean (2:1) – Berseem – Sorghum multi cut + Cowpea (2:1)
5. Maize + Rice bean (2:1) – Oat multi cut - Sorghum multi cut + Cowpea (2:1)
6. Pearl millet multi cut + Rice bean (2:1) –Oat multi cut – Maize + Cowpea (2:1)
7. Pearl millet multi cut + Rice bean (2:1) – Berseem – Maize + Cowpea (2:1)
8. Pearl millet multi cut + Rice bean (2:1) – Berseem – Sorghum multi cut + Cowpea (2:1)
9. Pearl millet multi cut + Rice bean (2:1) – Oat multi cut – Sorghum multi cut + Cowpea (2:1)

Technical details:

Year of start: Kharif 2014 **Design:** Randomized block design **Replication:** Three
Plot size: Gross plot size- 6m x 5m = 30m^2 **Duration**: Three years

Note- The recommended package of practices for all crops or according to main crop will be adopted.

Observations

- Green fodder yield (q/ha)
- Dry fodder production (q/ha)
- Green fodder yield per day (q/ha)
- Dry fodder production per day (q/ha)
- Crude protein content
- Crude protein yield
- Plant height (cm)
- Leaf : stem ratio
- Economics Cost of cultivation
- Net return, B:C ratio

K-14-AST-3: Study of intercropping system of Pigeon pea with different annual fodder crops

Locations (2): Ranchi and Raipur	**Data Reporting:** Rabi
Year of start: Kharif 2014	**Concluding year:** Rabi 2017

Objectives:

- To find out the appropriate inter cropping system for maximum yield of pigeon pea as well as biomass of fodder.
- To find out the best economics for different intercropping system.

Experiment details

Year of start: Kharif 2014 **Design:** Randomized block design **Replication:** Three
Plot size: Gross plot size- 6m x 5m = 30m^2 **Duration**: Three years

Technical details (Additive series two row of pigeon pea at 45 cm)

1. Pigeon pea + Sorghum (2:1)
2. Pigeon pea + Maize (2:1)
3. Pigeon pea + Pearl millet (2:1)
4. Pigeon pea + Soybean (2:1)
5. Pigeon pea + Rice bean (2:1)
6. Pigeon pea + Cowpea (2:1)
7. Pigeon pea + Cluster bean (2:1)

Note- The recommended package of practices for all crops or according to main crop will be adopted.

Observations

- Green fodder yield (q/ha)
- Dry fodder production (q/ha)
- Green fodder yield per day (q/ha)
- Dry fodder production per day (q/ha)
  Nutrient use efficiency
- Soil pH, organic carbon, available nitrogen
- Crude protein content
- Crude protein yield
- Plant height (cm)
- Leaf : stem ratio
- Economics: Cost of cultivation, Net return, B:C ratio

Other related yearly observation

R-14-AST-1-: Studies on the production potential feasibility of annual rye grass with berseem in hill zone

Locations (2): Palampur and Srinagar	Data Reporting: Rabi
Year of Start: Rabi 2014	Concluding year: Rabi 2017

Objectives:

- To explore the possibilities of rye grass cultivation with or without berseem in the hill region.
- To evaluate the effect of different seeding ratio of rye grass with berseem on productivity and quality of forage
- To estimate the effect on soil NPK and soil organic carbon (SOC) storage under different treatments.

Technical details:

Design: Randomized block design **Replications**: Three **Year of start**: Rabi 2014-15
Plot size: 3.0 m x 3.0 m **Duration**: Three years

Treatment (13)

(a) Rye grass genotypes * (3)

(i) Punjab Rye grass-1 (ii) Kashmir collection (iii) Seed from 'ATMA' (HP)

(b) Seed rate of ratio of rye grass: Berseem

(i) 100:0 (ii) 75:25 (iii) 50:50 (iv) 25:75

All possible combination of A and B plus sole stand of berseem sown by broadcast.
(Crops will be sown by broadcast)

Observations:

- Plant height (cm); L:S ratio; Per cent proportion of each species (on dry weight basis)
- GFY, DMY and CPY (q/ha) and CP content (%)
- Competition functions (Sole berseem and Punjab Rye grass will be considered as standard check for computation of competition functions)
- Net returns (Rs/ha) and benefit cost ratio
- Soil NPK , pH, Total soil organic carbon storage (Tonnes carbon /ha) before start of the experiment and after completion of the experiment in each season

R-14-AST-2-: Effect of cutting and nutrient management on growth, yield and quality of oat

Location (1): Imphal	Data Reporting: Rabi
Year of Start: Rabi 2014-15	Concluding year: Rabi 2017

Objectives:

- To study the effect of cutting management on green fodder and grain yield
- To study the economics of the system

Experimental details

Design: FRBD	**Replication**: 3
Duration: Three year	**Year of start:** Rabi 2014-15
Plot Size: 4x3 m^2	**Variety:** JHO-822

Treatment details:

(A) Cutting Management: 3	(B) Nutrient Levels: 04
(i) C1: No cutting (Seed)	(i) N_1: RDF (N, P_2O_5 & K_2O @ 80: 40:40)
(ii) C2: Single cut (60 DAS) + Seed	(ii) N_2: 75% NPK of RDF + 5 t FYM/ha
(iii) C3: Three cut (60, 90 & 120 DAS)	(iii) N_3: 50% NPK of RDF + 7.5t FYM/ha
	(iv) N_4: 25% NPK of RDF + 10t FYM/ha

* N will be given in four splits doses (40% as basal, 20% at 30 DAS, 20% at 60 DAS and 20% at 90 DAS).

Observation to be recorded:

- Plant height (cm)
- Leaf stem ratio
- GFY & DMY (q/ha)
- Grain or seed and straw yield (q/ha)
- Crude protein content (%)
- Crude protein yield (q/ha)
- Gross and net return (Rs./ha)
- Benefit cost ratio.
- Soil fertility status before and after cropping season.

R-14-AST-3: Studies on the effect of additives on silage quality of different grasses

Location (1): Vellayani	Data Reporting: Rabi
Year of Start: Rabi 2014	Concluding year: Rabi 2016

Objective

- To select ingredients with a view to get nutritive and palatable silage

Technical details

Design: CRD **Replication:** Three **Year of start:** 2014-15 **Duration:** One year

Treatments:-

(a) **Fodder crops-2 -** 1. Hybrid Napier 2. Guinea grass

(b) Silage Additives-5

1. Urea 1%. 2. Urea 2% 3. Urea 1% + Jaggery 1%
4. Tapioca flour 1%. 5. Jaggery 2%.

Observations to be recorded:

- Fresh silage/pit, dry matter content (%)
- Palatability, pH, silage colour,
- **Nutrient analysis**.- Total digestible nitrogen content, Digestible crude protein, fibre, micronutrients
- Economics

Note: The experiment will be carried out in pits of 0.83m³ size. The pits will be insulated from climatic factors and the trial will to be carried out in two seasons in a year.

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

Location (1): Mandya	Data Reporting: Rabi
Year of Start: Kharif 2015	Concluding year: Rabi 2019

Objectives:

- To identify the sustainable cropping system with respect to soil fertility and crop productivity.
- To study the different combinations of perennial and seasonal fodder crops for productivity.
- To study economics of different models.

Experimental Details:

Duration: Three years	Design: RBD
Replications: 4	Plot size : Gross : 4.80 x 5.00 m
No. of treatments: 6	Year of Start: Kharif 2015

Treatments	Kharif	Rabi	Summer
T_1	Fodder Maize + Cowpea (3:1)	Fodder Oat + Lucerne (3:1)	Pearl millet + Cowpea (3:1)
T_2	Fodder Sorghum + Cowpea (3:1)	Fodder Maize +Cowpea (3:1)	Pearl millet + Cowpea (3:1)
T3	B N hybrid +Cowpea (2:8)	B N hybrid +Cowpea (2:8)	B N hybrid + Cowpea (2:8)
T_4	B N hybrid + Lucerne (2:8)	Year round	
T_5	B N hybrid + Desmanthus (2:8)	Year round	
T_6	B N hybrid + *Sesbania sps.*(2:8)	Year round	

Note: B N hybrid will be raised in the paired row method (between pair 2.4 m & with in pair 0.6 m)

Observations to be recorded:

a. Plant height (cm) at the time of harvest
b. Green forage yield (q/ha)
c. Dry matter yield (q/ha)
d. Crude protein content (%) and yield (q/ha)
e. Economics of the system (net returns, B:C ratio)
f. Soil N, P, K, OC, PH and EC before sowing and after completion of the sequence

K-15-AST-2 L: Performance of napier bajra hybrids as influenced by nature of vegetative propagules

Location (1): IGFRI, RRS, Dharwad	**Data Reporting:** Rabi
Year of Start: 2015	**Concluding year:** Rabi 2018

Objectives:

- To study the establishment pattern in napier bajra hybrids through different vegetative propagules.
- To study the influence of vegetative propagules on fodder productivity.
- To work out the economics of vegetative propagules in napier bajra hybrids.

Experimental Details:

Design: Split-Plot design
Main plots: Hybrids
Replications: Three
Sub plots: Vegetative propagules
Plot size: 4 m x 3.6 m
Spacing: 60 cm x 60 cm

Treatments

I. Hybrids: 3	II. Planting material: 4
1. DHN 6 (Sampoorna)	1. Rooted slip 1 eyed
2. Co (BN)- 5	2. Rooted slip 2 eyed
3. IGFRI 7	3. Stem cutting 1 eyed
	4. Stem cutting 2 eyed

Observations to be recorded:

Growth

- No. of established plants at 30, 45, 60, 75 DAT
- No. of tillers at 60, 75, 90 DAT
- Height of tillers at 60, 75, 90 DAT
- Dry matter/hill (g) at 60, 75, 90 DAT
- Days to flowering
- No. of cuts (at 50% flowering) /annum

Yield

- GFY & DFY (t/ha/annum)
- Volume (cubic meter) & weight (kg) of planting material/ha

Quality

- Crude protein content (%) and yield (t/ha) at each cut

K-15-AST-3 L: Studies on Integrated nutrient management in Fodder Rice bean

Location (1): Imphal	Data Reporting :Rabi
Year of Start: 2015	Concluding year: Rabi 2018

Objectives:

- To assess effect of chemical fertilizer and poultry manure on productivity of fodder rice bean and soil health.
- To work out the economics.

Experimental Details:

Design : RBD
Plot Size : 4X3
Seed rate : 35 kg/ha
Replications: 3
Spacing: 30 cm (R-R)
Duration: 03 years

Treatments			
T_1	100% RDF	T_2	75% RDF for phosphorus + 1 tonne Poultry manure
T_3	75% RDF for phosphorus + 2 tonne Poultry manure	T_4	50% RDF for phosphorus + 1 tonne Poultry manure
T_5	50% RDF for phosphorus + 2 tonne Poultry manure	T_6	25% RDF for phosphorus + 1tonne Poultry manure
T_7	25% RDF for phosphorus + 2 tonne Poultry manure		

Observation to be recorded:

I. Growth and yield parameters	II. Quality	III. Economics	IV. Soil health
Plant height	Crude protein content (%)	Cost of cultivation	Available NPK content inbeing and of each year
Leaf Stem ratio	Crude protein yield (kg/ha)	Net return	
Green forage yield (q/ha)	Dry matter yield (q/ha)	BC ratio	

K-15-AST-7L: Screening of genotypes of fodder bajra and oat under sodic soil.

Location (1): Faizabad	Data Reporting: Rabi
Year of Start: Kharif 2015	Concluding year: Kharif 2017

Objective:

- To identify promising genotypes of bajra and oat for fodder production under sodic soil of eastern UP.

Experimental detail:

Design : RBD	**Replication** : Three	**Plot Size** : 4m x 5m

Treatment:

Kharif
Bajra genotypes: Eight

Rabi
Oat genotypes: Eight

Observations to be recorded:

a. Plant height (cm) at 50% flowering, green forage yield, dry mater yield, CP%, CP yield and leaf: stem ratio for both the crops.
b. Soil properties: Initial OC%, EC, pH, Exchangeable Na% and available NPK (kg/ha).

K-15-AST-9 C: Development of climate resilient production technologies on productivity and economics of food - fodder based cropping systems

Locations: (4) Pantnagar, Ranchi, Kalyani, Jabalpur	**Data Reporting:** Rabi
Year of Start: 2015	**Concluding year:** Rabi 2020

Objectives

- To study the effect of climate change on productivity and profitability of food– fodder based cropping systems.
- To find out the suitable climate resilient production technology for higher profitability of grain – fodder based cropping systems.

Experimental detail:

Duration of the experiment	: 03 years	**Replication**	: 04
Design	: Split Plot Design	**Plot Size**	: 3m x 5 m

Main plot: (Climate Resilient technology): 04
1. Zero tillage- (All the crops)
2. Minimum tillage single pass of cultivator + sowing with seed drill.
3. Conventional tillage
4. Zero tillage- minimum tillage- Zero tillage.
Sub plot (Cropping systems): 04
1. Rice (upland) – Berseem - Maize + Cowpea
2. Maize (Baby corn) – Berseem – Sorghum (Fodder)
3. Maize (Baby corn) – Wheat – Rice bean (Fodder)
4. Sorghum (Fodder) – Berseem – Maize (Baby Corn)

Observation to be recorded:

a. Growth attributes of all crops of the system
b. Green forage yield
c. Dry Forage yield
d. Economic yield,
e. Quality parameters (CP content and yield, NDF and ADF)
f. Residual soil fertility status of the systems at beginning and end of each crop cycle.
g. Forage equivalent yield of the systems,
h. Economics of the systems.

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

Locations: Hyderabad, Coimbatore, Vellayani, Ranchi, Jabalpur & Anand	**Data Reporting:** Rabi
Year of Start: 2015	**Concluding year:** Rabi 2019

Objectives:

- To study the effect of cropping system on carbon sequestration
- To study the effect of cropping system on Fodder yield, quality, Soil fertility & economics

Experimental Details:

Design : RBD **Replications**: 3 **Period** : Three years

Treatments

T_1	BN hybrid at recommended spacing
*T_2	Guinea grass at recommended spacing
T_3	BN hybrid in paired rows (60/120 cm) + Fodder cowpea (Kharif) - Lucerne (Rabi)
T_4	BN hybrid in paired rows (60/120 cm) + *Desmanthus* (Perennial)
T_5	BN hybrid in paired rows (60/120 cm) + *Sesbania grandiflora*
*T_6	Guinea grass in paired rows (60/120 cm) + Fodder cowpea (Kharif) - Lucerne (Rabi)
T_7	Guinea grass in paired rows (60/120 cm) + *Desmanthus* (Perennial)
T_8	Guinea grass in paired rows (60/120 cm) + *Sesbania grandiflora*

*T2 and T6 cowpea included instead of lucerne at Kerala (Vellayani)

Observations to be recorded

Soil

- Pre sowing analysis – EC, pH, OC, NPK
- Post harvest analysis – EC, pH, OC, NPK

Growth and yield parameters

- Plant height, No. of tillers/ m^2, Leaf length, Leaf breadth, Leaf stem ratio
- Green fodder yield, Dry matter yield
- Root weight, Root volume (After the end of three years)

Quality parameters

- Crude protein, Crude protein yield, Crude fibre

Economics

- Net return, B:C ratio

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

Locations (3): Palampur and Srinagar	**Data Reporting:** Rabi
Year of Start: Establishment Year	**Concluding year:** Rabi 2019

Objectives:

- To study the system productivity and organic matter input to soil through silvipastoral system

Experimental Details:

- **Design:** Spilt plot **Replications:** 3 **Period:** Three years

Treatments:

Main plot treatments: Trees species

- Salix (3 m x 3m)
- Morus (3m x 3m)

Sub plot Treatments: Range species

- Setaria grass (var. S-18) (30cm x 30 cm)
- Fescue grass (var. Hima-14) (30 cm x 30 cm)
- White clover (var. Palampur Composite) (Broadcast)
- Fescue grass + White clover (Fescue grass at 30 cm x 30 cm spacing and with broadcasting of white clover)
- Local system (Natural grasses cover)

Replications: Three

Note: Salix and Morus will be planted at 3 m x 3m spacing, White clover seed rate in sole stand 6 kg/ha and in mixed stand 3 kg/ha

Observations:

Soil:

- Pre sowing analysis – EC, pH, OC, NPK
- Post harvest analysis – EC, pH, OC, NPK
- Monthly OM content in 0-30 cm soil surface

Growth and yield parameters

- Fresh and dry weight (g/m^2)
- Green and dry fodder yield (q/ha)
- Root weight (after the end of five years)
- Root volume (after the end of five years)

Quality parameters

- Crude protein and crude fibre contents (%)
- Crude protein and crude fibre yield (q/ha)

Economics

- Net return
- B:C ratio

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

Locations (4): Kalyani, Ranchi, Imphal, Bhubaneswar	**Data Reporting:** Rabi
Year of Start: Rabi 2015	**Concluding year:** Rabi 2018

Objectives

- To assess the productivity of food-forage intercropping system on rice fallows
- To study the profitability of food-forage intercropping system influenced by INM

Treatment details

A. Intercropping system (*Rabi* season) (Main plot)

T_1 = Sole oat **T_2 =** Lathyrus **T_3 =** Oat + Lathyrus (3:2) **T_4 =** Oat + Lathyrus (3:3)

B. Integrated Nutrient Management (sub plot)

F_1 = RDF (inorganic) **F_2 =** 50% N of RDF + 50% N through FYM

F_3 = 50 % N of RDF + 50% N through Vermicompost

Year of start: Rabi 2015-16 **Design** : Split Plot Design (SPD)

No of replications: 3 **Total treatment** : 12

Seeds will be treated with Rhizobium and PSB culture in all the treatments.

Observations to be recorded

Soil physico- chemical properties before sowing and after harvest of crop

Growth and yield attributes and yield of oat

(i) Plant height and plant population (ii) Green forage and dry matter yield

Growth and yield attributes and yield of legume

(i) Plant height and plant population (ii) Stover yield, Green Forage and Dry Matter Yield

Productivity of cropping system:-

Land Equivalent Ratio (LER) Green Forage Equivalent Yield Harvest Index

Quality Parameters: Crude protein content and crude protein yield

Economic analysis: Gross return, Net return and B: C ratio

R-15-AST-2: Productivity of oat - pea intercropping system as influenced by integrated nutrient management.

Location: Jorhat	**Data Reporting:** Rabi
Year of Start: Rabi 2015	**Concluding year:** Rabi 2018

Objectives

- To assess the productivity of food-forage intercropping system on rice fallows
- To study the profitability of food-forage intercropping system influenced by INM

TECHNICAL DETAILS

A. Intercropping system (*Rabi* season) (Main plot)

T_1 = Sole oat T_2 = Sole pea T_3 = Oat + pea (3:2) T_4 = Oat + pea (3:3)

B. Integrated Nutrient Management (sub plot)

F_1= RDF (inorganic)
F_2= 50% N of RDF+50%N through FYM
F_3= 50% N of RDF+50%N through Vermicompost

Year of start: Rabi 2015-16 **Design**: Split Plot Design (SPD)
No of replications: 3 **Total treatment**: 12
Seeds will be treated with Rhizobium and PSB culture in all the treatments.

Observations to be recorded
Soil physico- chemical properties before sowing and after harvest of crop
Growth and yield attributes and yield of oat

1. Plant height and plant population 2. Green forage and dry matter yield

Growth and yield attributes and yield of pea

1. Plant height and plant population 2. Stover yield, Green Forage and Dry Matter Yield

Productivity of cropping system:-

1. Land Equivalent Ratio (LER) **2.** Green Forage Equivalent Yield **3.** Harvest Index
Quality Parameters: Crude protein content and crude protein yield
Economic analysis: Gross return, Net return and B: C ratio

R-15-AST-3: Response of phosphogypsum to various cultivars of fodder oat in sodic soil.

Location: NDUA&T, Faizabad	**Data reporting:** Rabi
Year of Start: Rabi 2015	**Concluding year:** Rabi 2017

Objectives

- To workout impact of different levels of phosphogypsum on growth and yield parameters of fodder oat.
- To study the effect of phosphogypsum on soil properties.
- To workout the economics of each treatment.

TECHNICAL DETAILS
Treatments: 12
Oat cultivars: 3 (NDO-1, NDO-2 & NDO-711)
Levels of phosphogypsum (sulphur): 4
1- Control, **2- 125** kg/ha (20kg S /ha) **3-** 250 kg/ha (40kg S /ha) **4-** 375kg/ha (60kg S /ha)

Design: RBD **Replications:** Three **Plot size:** 4x3m
Observations to be recorded

- Days to 50%flowering, Plant height, Plant population $m^{-2,}$
- Leaf stem ratio, Green forage yield, Dry matter yield, DM%,
- Crude protein yield, CP%, per day Productivity (q/ha/day)
- Soil physico-chemical properties before and after harvest of crop.

R-15-AST-4: Study on lucerne + oats /sarson fodder production system at variable seed rates of mixed crop under irrigated condition

Location: Bikaner	**Data reporting:** Rabi
Year of Start: Rabi 2015	**Concluding year:** Rabi 2018

Objectives

- To find out optimum seed rate of oats/ sarson mixed cropping for long term stable green fodder.
- To work out the economics of different treatments.

TECHNICAL DETAILS

Treatment

T1	100 % Seed rate lucerne (20kg/ha)	T6	T1+40 kg/ha oats
T2	100 % Seed rate oats (100 kg/ha)	T7	T1+0.625 kg/ha Sarson
T3	T1+10 kg/ha oats	T8	T1+1.250 kg/ha Sarson
T4	T1+20 kg/ha oats	T9	T1+1.880 kg/ha Sarson
T5	T1+30 kg/ha oats	T10	T1+2.50kg/ha Sarson

Design : RBD
Replications : Three
Plot size : 5.0m x 3.5 m, Net 4.0 m x 2.5 m
Varieties : Oats- Kent/UPO-212, Lucerne- T-9/Anand Lucerne-2,
Fertilizer:

- 20 kg N, 40kg P_2O_5, 20 kg K_2O, 12.5 kg $ZnSO_4$ as basal, and
- 20 kg N in two equal splits at 30 DAS and after first cut for GF
- Foliar sprays of 0.5% $ZnSO_4$ 10 days after first cut and 10 days thereafter.

Cutting management: first cut at 50-55DAS and next cut 35-40 days' intervals.

R-15-AST-5: Effect of Zinc and Boron on seed production potentiality of oat under red and lateritic soil of West Bengal

Location: Visva-Bharati, Sriniketan, West Bengal	**Data reporting:** Rabi
Year of Start: Rabi 2015	**Concluding year:** Rabi 2018

Objectives

- To study the seed production potentiality of oats as influenced by Zn and B application
- To study the seed quality of oats as influenced by Zn and B
- To study economics of oats seed production as influenced by Zn and B application

TECHNICAL DETAILS

Treatments			
T1- Control (No Zn and No B)	**T5-** Borax@5 kg/ha	**T9-** $ZnSO_4$@ 15 kg/ha+ Borax @10 kg/ha	**T13-** ZnSO4 @ 20 kg/ha + Borax @ 15 kg/ha
T2- $ZnSO_4$@ 15 kg/ha	**T6-** Borax@10 kg/ha	**T10-** $ZnSO_4$@ 15 kg/ha + Borax @15 kg/ha	**T14-** ZnSO4 @ 25 kg/ha + Borax @ 5 kg/ha
T3- $ZnSO_4$@ 20 kg/ha	**T7-** Borax@15 kg/ha	**T11-** $ZnSO_4$@ 20 kg/ha+ Borax @5 kg/ha	**T15-** ZnSO4 @ 25 kg/ha + Borax @ 10 kg/ha
T4- $ZnSO_4$@ 25 kg/ha	**T8-** $ZnSO_4$@ 15 kg/ha + Borax@5 kg/ha	**T12-** ZnSO4 @20 kg/ha + Borax @ 10 kg/ha	**T16-** ZnSO4 @ 25 kg/ha + Borax @ 15 kg/ha

Oats variety: JHO-822 **Year**: Rabi 2015-16 **Design**: RBD
Replications: Three **Plot size**: 4.0 m x 3.0 m **Duration**: Three years

Observations to be recorded

Plant height (cm) Plant population/m length Leaf: stem ratio
Seed yield (t/ha) Straw yield (t/ha)
Seed quality: Test wt., seed viability, L:S ratio, seed germination, crude protein % and crude protein yield.
Economics: Gross return, net return, B:C ratio

R-15-AST-6: Evaluation of sowing window suitable for forage oats cultivation in the coastal region of Pudducherry

Location: Puducherry	Data reporting: Rabi
Year of Start: Rabi 2015	Concluding year: Rabi 2018

Objectives

- To explore the feasibility of introducing a new forage crop during *Rabi* season in the coastal region of Puducherry
- To find out the sowing window suitable for forage oats cultivation during *Rabi* season in the coastal region of Puducherry

TECHNICAL DETAILS

Treatment Combinations (8)

1. Sowing of Kent on October Second Fortnight
2. Sowing of Kent on November First Fortnight
3. Sowing of Kent on November Second Fortnight
4. Sowing of Kent on December First Fortnight
5. Sowing of JHO- 2000-4 on October Second Fortnight
6. Sowing of JHO- 2000-4 on November First Fortnight
7. Sowing of JHO- 2000-4 on November Second Fortnight
8. Sowing of JHO- 2000-4 on December First Fortnight

Design: RBD **Replications:** 3

Biometric Observations

1. Plant height (cm) **2.** Leaf stem ratio **3.** Days to harvesting
4. Dry fodder yield (q/ha) **5.** Green fodder yield (q/ha) **6.** Per day productivity (q/ha/day)

R-15-AST-7: Standardization of seed rate of berseem with rye grass under mixed cropping system

Location: NDRI, Karnal	Data reporting: Rabi
Year of Start: Rabi 2015	Concluding year: Rabi 2017

Objectives

- To study the effect of different seed rate on growth and yield of berseem and ryegrass
- To estimate the quality of berseem and rye grass fodder
- To work out the economics of berseem and rye grass as mixed crops

TECHNICAL DETAILS

Treatments

1. Sole Berseem (seed rate@25 kg/ha)
2. Sole Ryegrass (seed rate @8kg/ha)
3. Mixed crops with 50 % seed rate (B+RG)
4. With 100%+25% (B+RG)
5. With 75%+25% (B+RG)
6. With 50%+25% (B+RG)
7. With 100%+25% (RG+B)
8. With 75%+25% (RG+B)
9. With 50%+25% (RG+B)

Replications: 3 **Design:** RBD **Gross plot Size:** 5.0m x 3.5m

Observations to be recorded

1. Plant height (cm) 2. Leaf: Stem ratio 3. Green fodder yield (q/ha)
4. Dry matter yield (q/ha) 5. Crude protein (q/ha) 6. Economics of both crops

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

Locations (4): Hyderabad, Vellayani, Mandya and Ludhiana	**Data Reporting:** Rabi
Year of Start: 2016 for three years	**Concluding year:** Rabi 2019

Objectives:

- ✓ To evaluate the suitability of different crops for growing under Hydroponics system
- ✓ To find out ideal seed rate and cutting interval for quality biomass production
- ✓ To quantify the fodder quality in Hydroponics terms of proximate factors in various crops at different stages of harvest
- ✓ To study the economics of the system

Experimental Details:

Treatments

- Crops: (3) Maize, Sorghum and Cowpea
- Seed rate: (3) 200g, 300g and 400g per square feet
- Time interval for harvest (4): 9 days, 11days, 13 days and 15days
- Design & Replications : CRD & Three

Observations to be recorded

1. Seed to GFY multiplication ratio in terms of GFY according to crop wise intervals of harvest, crop wise
2. GFY at different harvest intervals
3. Yields at different seed rates and managerial/handling issues if any
4. Quality viz., Dry matter percent, crude protein, ADF, NDF, EE, ash content and **enzymes present** at different stages of harvest
5. Diseases or pest noted if any.
6. Economics of the system

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

Location (1): CCS, HAU, Hissar	Data Reporting: Rabi
Year of Start:2016	Concluding Year: Rabi 2021

Objectives:

- To study the effect of organic sources of nutrients on yield and quality of forage in sorghum- Berseem cropping system.
- To study the influence of organic sources of nutrients on soil fertility.
- To work out the economics

EXPERIMENTAL DETAILS

Design : RBD **Replication(s):** Three **Variety:** Sorghum HJ 541 and Berseem HB 1
Crop sequence: sorghum (single cut) – Berseem **Plot size:** 12x8 = 96 sq
Duration: 5 years **No of Treatments :** 9

Treatment details:

T_1: Recommended dose of fertilizers through inorganic source (75 kg N + 15 kg P2O5/ha:N in two splits i.e. 50 kg at sowing an 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

T_2: 20 t FYM/ha (15 t in sorghum and 5 t/ha in berseem)
T_3: 20 t FYM/ha (15 t in sorghum + 5 t in berseem) + biofertilizer
T_4: 20 t FYM/ha (15 t in sorghum + 5 t in berseem) + Green manuring
T_5: 20 t FYM/ha (15 t in sorghum + 5 t in berseem) + biofertilizer + Green manuring
T_6: 7.5 t vermicompost/ha (5 t in sorghum + 2.5 t in berseem)
T_7: 7.5 t vermicompost/ha (5 t in sorghum + 2.5 t in berseem) + biofertilizer
T_8: 7.5 t vermicompost/ha (5 t in sorghum + 2.5 t in berseem) + Green manuring
T_9: 7.5 t vermicompost/ha (5 t in sorghum + 2.5 t in berseem) + biofertilizer + Green manuring

Observations to be recorded:

Growth:

- Plant height (cm)
- No. of tillers per hill
- Leaf stem ratio
- Days to 50% Flowering

Yield and quality:

- Green fodder yield (q/ha)
- Dry matter yield (q/ha)
- Crude protein yield (q/ha)
- Dry matter (%)
- Crude protein (%)

Quality studies: Crude protein, Crude fibre and IVDMD

Economics: Net monetary returns & benefit cost ratio

Soil studies: physico-chemical properties of soil before sowing and after harvest, microbial population before starting and after completion of trial

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

Location: NDUAT, Faizabad	Data Reporting: Rabi
Year of Start: kharif 2016	Concluding Year: Rabi 2019

Objectives:

- To study the effect of organic sources of nutrients on yield and quality of forage in Rice- Oat cropping system.
- To study the influence of integrated resource management on soil fertility.
- To work out the economics

EXPERIMENTAL DETAILS

Design: RCBD **Replication(s):** Three **Crop sequence:** Rice-Oat

Plot size: 4 x 3 M **Duration:** 4 years **No of Treatments:** 8

Treatment details:

T_1: Control
T_2: RDF 120 Kg N:60Kg P_2O_5:40 KgK_2O:25 Kg $ZnSO_4$/ha
T_3: 75 % RDF+25%N substitution through bio: compost (press mud)
T_4: 75 % RDF + 25%N substitution through green manuring (dhaincha)
T_5: 75 % RDF + 25%N substitution through crop residue
T_6: 50% RDF+ 50%N substitution through bio: compost (press mud)
T_7: 50% RDF + 50%N substitution through green manuring (dhaincha)
T_8: 50% RDF + 50%N substitution through crop residue

Note: All the treatments will be applied in rice and oat crop will be grown with recommended fertilizer dose.

Observations to be recorded:

Growth:

- Plant height (cm)
- No. of tillers per hill/m row length
- Leaf stem ratio
- Days to 50% Flowering

Yield and quality:

- Green fodder yield (q/ha)
- Dry matter yield (q/ha)
- Crude protein yield (q/ha)
- Dry matter (%)
- Crude protein (%)
- Grain Yield (q/ha)
- Straw Yield (q/ha)
- Harvest Index (%)

Economics: Net monetary returns & benefit cost ratio

Soil Properties: OC %, EC, p^H, Exchangeable Na% available NPK (Kg/ha)

New trials A. Coordinated trials:

R-16-AST-1: Contingent crop plan for fodder oat production in semi arid tropics under irrigated condition.

Objectives

- To identify a suitable time of sowing and establish a relationship with climatic factors on productivity
- To identify a optimum plant population for higher seed and fodder yield
- To study the interactive effect of time of sowing and seed rate on fodder and seed yield of oat

Experimental details

Main plot Treatment (Time of sowing-4)

1) First fortnight of October
2) Second fortnight of October
3) First fortnight of November
4) Second fortnight of November

Sub plot Treatment (Seed rate-2)

S_1- 80 Kg/ha S_2 - 100 Kg/ha

Sub-sub plot Treatment (variety- 2)

V_1- JHO-822 V_2 – Kent

Experimental Details

Crop	:	Oats	Replications	:	3
Duration	:	2 Years	Season	:	Rabi-2016-17
Design	:	Split Plot	Gross Plot Size	:	24 x 3.0 m
Treatments	:	16	Net Plot Size	:	6.0 x 3.0 m

Observations to be recorded:

▪ Days to germination	▪ No. of grains/spike
▪ No. of tillers/ m row at 45 DAS and at harvest	▪ Spike length (cm)
▪ GFY/m row (kg) at 45 DAS and at harvest	▪ Test weight (g)
▪ DMY/m row(kg) at 45 DAS and at harvest	▪ Grain yield/m row
▪ DMY/(t/ha) at 45 DAS and at harvest	▪ Grain yield (kg/ha)
▪ CPY (t/ha) at 45 DAS and at harvest	

Centers: IGFRI, Dharwad, PJTSAU, Hyderabad and ANGRAU, Tirupathi

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

Objectives

- To identify the combination of suitable foliar spray for improving seed set in Lucerne
- To study the impact of foliar spray on seed yield and economics of Lucerne.

Experimental Details

Crop	:	Lucerne	**Replications**	:	2	**Duration**	: 3 Years
Season	:	Rabi-2016-17	**Design**	:	FRCBD	**Gross Plot Size**	: 4.0 x 3.0 m

Treatment Details – Treatments: 30

Factor I : Time of Spray: 3

T_1 : Before flower primordia initiation (20-25 days after cutting)
T_2 : Flowering (10 days after first spray)
T_3 : Before flower primordia initiation and flowering

Factor II : Foliar spray

F1 **:** Boric acid 0.3 %
F2 : $ZnSO_4$ 0.25 %
F3 : K_2SO_4 1.0 %
F4 : MAP 1.0 %
F5 : NAA 40 ppm
F6 : Salicylic acid 100 ppm
F7 : Mepiquat chloride 500 ppm
F8 : TNAU Pulse wonder 1.0 %
F9 : Brasinolide 1.0 ppm
F10 :Control (No foliar spray)

Observations to be recorded

- No. of branches
- Dry matter yield (t/ha/yr)
- Fertility ratio
- No. of days taken for maturity
- Yield parameters (Number of pods per plant, Number of seeds per pod and 1000 seed weight)
- Seed yield (kg/ha)
- Seed quality (germination, seedling vigour index, crude protein content)
- Economics (Cost of cultivation, Gross return, Net return and B:C ratio)

Centers: TNAU, Coimbatore, PAU, Ludhiana and SKRAU, Bikaner

R-16-AST-3: Effect of Nitrogen Levels and seed rate on fodder Productivity of Rye Grass *(Lolium multiflorum)* under rice fallows.

Objectives:

1) To study the effect of Nitrogen (N) levels on fodder productivity and quality of Rye grass.
2) To find out the optimum seed rate for higher productivity and quality.

Experimental Details

Crop	:	Rye grass	**Replications**	:	3	**Duration**	:	3 Years
Season	:	Rabi-2016-17	**Design**	:	Split Plot	**Gross Plot Size**	:	4.0 x 3.0 m
Treatments	:	12	**Variety**	:	PRG-1			

A) Main Plot (Seed rate-3)

- Seed rate of 10 kg/ha
- Seed rate of 15 kg/ha
- Seed rate of 20 kg/ha

B) Sub Plot (Nitrogen Levels-4)

- 0 kg N/ha
- 30 Kg N/ha
- 60 Kg N/ha
- 90kg/ha

Observations to be recorded:

A. Soil Physico- Chemical properties at sowing and at harvest of the crop

B. Growth and yield attributes

1) Plant height (cm)
2) Number of tillers/m^2
3) Green forage yield
4) Dry Matter Yield

C. Quality parameters

1) Crude protein Content
2) Crude protein Yield

D. Economic analysis

1) Cost of cultivation
2) Gross returns
3) Net returns
4) B:C ratio

Center: AAU, Jorhat and OUAT, Bhubaneshwar

B. Location specific

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.

Objectives:

1) To study the effect of stubble management practices on fodder productivity and quality of Lathyrus.
2) To find out the optimum seed rate for higher productivity and quality.

Experimental Details

Crop	**:**	Lathyrus	**Replications**	**:**	3	**Duration**	**:**	3 Years
Season	**:**	Rabi-2016-17	**Design**	**:**	Split Plot	**Gross Plot Size**	**:**	4.0 x 3.0 m

Treatments: 12

A) Main Plot (Stubble Management-4)

- Rice stubble at 10 cm above ground level
- Rice stubble at 25 cm above ground level
- Rice stubble at 40 cm above ground level
- Bending of rice stubbles (without cutting)

B) Sub Plot (Seed rate-3)

- 40 Kg N/ha
- 50 Kg N/ha
- 60 kg/ha

Observations to be recorded:

A. Soil Physico- Chemical properties at sowing and at harvest of the crop

B. Growth and yield attributes

- Plant height (cm)
- Number of tillers/m^2
- Green forage yield
- Dry Matter Yield

C. Quality parameters

Crude protein Yield Crude protein Content

D. Economic analysis

Cost of cultivation Gross returns Net returns B: C ratio

Center: CAU, Imphal

R-16-AST-5: Seed yield maximization in Oat *cv.* RO-19 (Phule Harita).

Objectives:

1. To study the effect of different levels of calcium silicate on lodging and seed yield of oat.
2. To study the effect of different levels of cutting on lodging and seed yield of oat.
3. To study the combined effect of different levels of calcium silicate and cutting on lodging and seed yield of oat.
4. To study the economics of different treatments.

Experimental Details

Crop	:	Oat RO-19 (Phule Harita)	**Replications**	:	3
Duration	:	3 Years	**Season**	:	Rabi-2016-17
Design	:	FRBD	**Plot size : Gross:** 4x 3m	:	**Net :** 3.40 x 2.40 m
Treatments	:	12			

Seed rate : 100 Kg ha^{-1} **Spacing** : 30 cm apart

Fertilizer dose : 120:50:40 Kg N; P_2O_5 :K_2O ha^{-1}

Treatment details:

A) Levels of Calcium silicate (Kg ha^{-1})

S_1- 0 (Control)
S_2- 200
S_3- 300
S_4- 400

B) Cutting management (DAS)

C_1- No cutting
C_2- 45
C_3 - 55

Note:

1. FYM will be applied @ 3 ton FYM Kg ha^{-1} before sowing of crop.
2. Calcium silicate will be applied as a basal dose.
3. Nitrogen will be applied in two equal splits for no cutting management treatment (C_1) *i.e.* at basal & 30 DAS and in case of cutting after 45 DAS (C_2) and 55 DAS (C_3) in three equal splits *i.e.* at basal, 30 DAS & after 1st cut.
4. Total quantity of P_2O_5 & K_2O will be applied in all the treatments as a basal dose only.

Observations to be recorded:

1. Initial plant count and
2. Plant height at 50 % flowering.
3. Panicle length.
4. Lodging (%) at harvest
5. Seed yield (q ha^{-1})
6. Seed germination (%)
7. Lignin content (%) in straw.
8. Soil analysis at initial & after harvest of crop for available N,P,K, pH, EC and OC content.

Location: MPKV, Rahuri

AVT Based trials

R-16-AST -6: Effect of N levels on forage yield of promising entries of oat (AVT-2 SC)

Objective: To study the effect of nitrogen levels and promising entries on yield and quality of oat

Year	: Rabi 2016-17	**Design**	: Split plot
Replications	: Three	**Plot size**	: 4 m x 3 m
Seed rate	: 100 g/plot (80 kg/ha)	**Spacing**	: R x R-25 cm
Treatments	: Combinations: 11 x 3=33	**Total plots**	: 11x3x3=99

Treatment details:
Main plot:
(A) Entries : 8+2+1 (Entries-9, NC (2) and ZC (1)
Entries (11) :OS-424, OL-1769-1, OL-1802, SKO-225, JO-04-19, UPO-10-3, OL-1766-1, OS-432
National checks: (2): Kent, OS-6
Zonal checks (1): SKO-90 (HZ), OL-125 (NWZ), JHO-822 (CZ)

Sub-plot: (B) N- levels: 3 (40, 80, and 120 kg N /ha) (Split application of nitrogen)
Observations to be recorded:

- Tiller number /m row length at harvest
- Growth parameters (Plant height (cm) and leaf: stem ratio)
- Green fodder, dry fodder yields (q/ha)
- Crude protein content (%) and CP yield (q/ha)

Seed requirement: Testing entry/national check: **12.0 kg,** Zonal check**: 3.5 kg**

Locations (9): HZ-Palampur, Srinagar; **NWZ**-Ludhiana, Hisar, Pantnagar; **CZ**- Jabalpur, Urulikanchan, Raipur, Anand

R-16-AST 7: Effect of P levels on forage yield of promising entries of Berseem (AVTB2-MC)

Objective: To see the effect of phosphorus levels and promising entries on yield and quality of berseem
Year: Rabi 2016-17 **Design**: Split plot **Replications**: Three
Plot size: 4 m x 3 m **Seed rate**: 30 g per plot (approx. 25 Kg/ha) **Spacing**: R x R-25 cm
Treatments: Combinations: 5x 3=15 Total plots: 5x3x3=45
Spacing: Row to row-30 cm (each plot accommodating 10 rows of 4 m length)
Fertilizer: 20 Kg N/ha as basal

Treatment details:
Main plot:
(A) Entries : 2+2+1 (Entries-2, NC (2) and ZC (1) Entries (2) :JB-04-23, JB-04-21
National checks: (2): Wardan & Mescavi **Zonal checks (1):** Bundel Berseem-2 (CZ & NWZ),
(B) P_2O_5-levels (3): (60, 80 and 100 Kg /ha)

Observations to be recorded

- Plant population/ m row length
- Growth parameters (Plant height and Leaf: stem ratio)
- Green fodder, dry matter and crude protein yield (q/ha)

Note: 1st Cut has to be taken at 60 Days after sowings
Seed requirement: Testing entry/national check/ Zonal check: **2.5 kg,**

Locations (7) : NWZ-Bikaner, Hisar, Ludhiana, **CZ**- Rahuri, Jabalpur, Urulikanchan, Raipur

Annexure C

AICRP ON FORAGE CROPS & UTILIZATION
TECHNICAL PROGRAMME OF PLANT PROTECTION TRIALS
RABI- 2016-17

PPT1: MONITORING OF PATHOGENS AND INSECT-PESTS ASSOCIATED WITH BERSEEM, LUCERNE AND OAT ECOSYSTEM

Locations: Hyderabad, Ludhiana, Rahuri, Dharwad and Palampur

Observation: Occurrence of pathogens and insect pests should be recorded at weekly intervals after the appearance of the pests. The data on disease and insect pest incidence/severity should be correlated with the weather parameters.

PPT2 A: FIELD SCREENING OF *RABI* BREEDING TRIALS FOR RESISTANCE TO DISEASES AND INSECT-PESTS

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

PPT2 B: EVALUATION OF BERSEEM ENTRIES FOR RESISTANCE TO ROOT AND STEM ROT DISEASE UNDER SICK PLOT

Location: Ludhiana

PPT 17: TO STUDY THE PATHOGENIC VARIABILITY OF *Bulmeria graminis* f. sp. *avenae* on oat

Location: Palampur

Observation: Characterization of pathogenic virulence.

PPT19: MANAGEMENT OF SOIL BONRE DISEASES IN CLOVER SEED CROPS

Locations: Ludhiana

Design: RBD **Replication:** 3 **Plot size:** 2 x 2 m^2

- **T_1 :** Soil application of *Trichoderma* @ 5kg per hectare
- **T_2 :** Soil application of *Pseudomonas fluorescens* @ 5kg per hectare
- **T_3 :** Seed treatment with carbendazim@ 2 g/kg seed
- **T_4 :** Apply FYM @ 60 kg/ha to the plots
- **T_5 :** Apply neem seed powder @ 50 kg/hectare
- **T_6 :** Spray of NSK@ 5 % before disease appearance
- **T_7 :** Spray of carbendazim @ 1.0 kg/ha
- **T_8 :** Untreated control

Observations:

- Disease incidence of soil bone diseases
- Seed yield (q/ha)

PPT20: MANAGEMENT OF SOIL BONRE AND POWDERY MILDEW DISEASES IN RED CLOVER SEED CROP

Location: Palampur

Design: RBD **Replication:** 3 **Plot size:** 2 x 2 m^2

Treatments:

T_1 : Seed treatment with *Trichoderma* @ 5g/kg seed
T_2 : Seed treatment with Carbendazim@ 2 g/kg seed
T_3: T_1 + Three foliar spray of *Trichoderma* @ 0.5%
T_4: T_2 + Three foliar spray of *Trichoderma* @ 0.5%
T_5: T_1 + Three foliar spray of Wettable sulphur@ 0.3%
T_6 : T_2 + Three foliar spray of Wettable sulphur@ 0.3%
T_7 : T_1 + Three foliar spray of Hexaconazole @ 0.1 %
T_8 : T_2 + Three foliar spray of Hexaconazole @ 0.1 %
T_9 : T_1 + One spray each of *Trichoderma,* wettable sulphur and hexaconazole
T_{10} : T_2 + One spray each of *Trichoderma,* wettable sulphur and hexaconazole
T_{11} : Control

Observations:

- Disease severity of powdery mildew
- Disease incidence of soil bone diseases
- Seed yield (q/ha)

PPT 21: MANAGEMENT OF FOLIAR DISEASES OF OAT.

Locations: Ludhiana and Bhubaneswar

Design: RBD **Replication:** 3 **Treatment:** 7

Treatments:

- **T_1:** Seed Treatment with Carbendazim 50 WP @ 2.0 g /kg of seed
- **T_2:** Seed Treatment with *Trichoderma viride* (CFU 10^6 / gm of formulation) *5 g* /kg of seed
- **T_3:** Seed Treatment with *T. viride* (CFU 10^6 / gm of formulation) *5 g* /kg of seed + foliar sprays of *T. viride* @ 0.5% at 21 DAS
- **T_4:** T_1 + Foliar application of Carbendazim 12 % + Mancozeb 63 % WP @ 1 g / lit after 21 DAS
- **T_5:** T_2 + Foliar application of Carbendazim 12 % + Mancozeb 63 % WP @ 1 g / lit after 21 DAS
- **T_6:** T_1 + Foliar application of Propiconazole 25 EC @ 1 ml / lit after 21 DAS
- **T_7:** T_2 + Foliar application of Propiconazole 25 EC @ 1 ml / lit after 21 DAS
- **T_8:** Untreated

Observations:

- Incidence and severity of diseases will be recorded.
- Yield at 50 % flowering

PPT 22: STUDIES ON BIOLOGICAL MANAGEMENT OF *SPODOPTERA LITURA* IN RELATION WITH DIFFERENT TIME OF APPLICATION ON LUCERNE UNDER FIELD CONDITION

Locations: Rahuri, Hyderabad and Dharwad

Objective:

- To find out effectiveness of different entomopathogenic fungi in combination with *SlNPV* against *S. litura* on Lucerne
- To study the efficacy of biopesticides against *S. litura* at different time of application

Crop: Lucerne/Berseem **Variety:** RL-88/BL 42 **Plot size:** 3 x 4 m^2
Replication: 03 **Design:** Split plot design
Treatments:

A) Main treatments (Biopesticides)

- **T_1:** Foliar application of *B. bassiana* @ $1X10^8$ CFU/g (5 g/lit)
- **T_2:** Foliar application of *N. releyi* @ $1X10^8$ CFU/g (5 g/lit)
- **T_3:** Foliar application of *SlNPV* @ 1ml/lit
- **T_4:** T_1+T_3
- **T_5:** T_2+T_3
- **T_6:** $T_1+T_2+T_3$
- **T_7:** Untreated control

B) Sub treatments (Time of application)

- Foliar application at 8 am
- Foliar application at 8 pm
- Foliar application at 4 pm

Observations:

- Precount and post treatment count of *S.litura* larvae at 5 & 7 DAS
- GFY and DMY (q/ha)
- Economics

PPT23: BIOLOGICAL CONTROL OF *HELICOVERPA ARMIGERA* ON LUCERNE/ BERSEEM SEED CROP

Locations: Rahuri, Ludhiana, Dharwad and Hyderabad
Objective: To find out effectiveness of different entomopathogenic fungi in combination with *HaNPV* against *H. armigera* on Lucerne seed crop
Crop: Lucerne **Variety:** RL-88 **Plot size:** 3 x 4 m^2
Replication: 03 **Design:** RBD
Treatments:
T_1: Foliar application of *B. bassiana* @ $1x10^8$ CFU/g (5 g/lit)
T_2: Foliar application of *N. rileyi* @ $1x10^8$ CFU/g (5 g/lit)
T_3: Foliar application of *HaNPV* @ 1ml/lit
T_4: T_1+T_3
T_5: T_2+T_3
T_6: $T_1+T_2+T_3$
T_7: Untreated control
Observations:

- Precount and post treatment count of larvae will be taken at 5 &7 DAS
- Honey bee activities will be monitored 12 hrs after treatment
- Seed yield (q/ha)
- Economics

***Bioagents will be supplied by Rahuri centre**

PPT26: BIOLOGICAL MANAGEMENT OF OAT APHID *Rhopalosiphum padi* ON OAT

Locations: Rahuri, Ludhiana, Dharwad

Objective:

- To find out effectiveness of different biopesticides for the control oat aphid.
- To study the effect of biopesticides on natural enemies

Crop: Oat **Variety:** Kent **Plot size:** 3 x 4 m^2

Replication: 03 **Design:** RBD

Treatments:

- **T_1:** Foliar application of *L.lecani* @ $1X10^8$ CFU/g (5 g/lit)
- **T_2:** Foliar application of *L. lecani* @ $1X10^8$ CFU/g (7.5 g/lit)
- **T_3:** Foliar application of *M. anisopliae* @ $1X10^8$ CFU/g (5 g/lit)
- **T_4:** Foliar application of *M. anisopliae* @ $1X10^8$ CFU/g (7.5 g/lit)
- **T_5:** Commercial neem product (Azadirachtin – 10000 ppm) @ 2ml/lt
- **T_6:** NSE @ 5%
- **T_7:** Untreated control

Observations:

- Precount and post treatment count of larvae will be taken at 5 &7 DAS
- Natural enemy count
- Green fodder yield(q/ha)
- Economics

***Bioagents will be supplied by Rahuri centre and the seeds of oat variety Kent will be supplied by Ludhiana centre.**

Annexure D

ALL INDIA COORDINATED RESEARCH PROJECT ON FORAGE CROPS & UTILIZATION
(Indian Council of Agricultural Research)
NATIONAL GROUP MEET: *Rabi 2016-17*

Date: September 5-6, 2016 **Venue:** KAU Campus Vellayani, Kerala

PROGRAMME

September 5, 2016

08:00-10:00	**REGISTRATION**

10:00-11:00	**INAUGURATION**
ICAR song, University Invocation Song and Lighting of Lamp	
Chief Guest	Dr. I.S.Solanki, ADG(FFC), ICAR, NewDelhi
Chairman	Prof. (Dr).P. Rajendran, VC, KAU, Thrissur, Kerala
Welcome	Dr.B.R.Reghunath, Dean, CoA, Vellayani
Project Coordinator's Report	Dr. A. K. Roy, Project Coordinator
Introductory Remarks	Dr. Sajan Kurian, Director Research, KAU, Kerala
Remarks of Chief Guest	Dr. I.S.Solanki, ADG(FFC), ICAR, NewDelhi
Release of publications, Presentation of Memento & Felicitation	
Chairman's Address	Prof.(Dr.) P. Rajendran, VC, KAU, Thrissur, Kerala
Vote of Thanks	Dr. K. Umamaheswaran, ADR,NARP(SR), Vellayani
11:00-11:15	**High Tea**

11:15-12:45 TECHNICAL SESSION-I: INTERACTIVE SESSION WITH STAKEHOLDERS	
Chairman	Dr. I.S.Solanki, ADG(FFC), ICAR, NewDelhi
Different stakeholders like Animal husbandry group, livestock keepers, dairy personnel, fodder growers, forage seed growers will present their expectations and problems in the interaction meeting.	
Rapporteurs	Dr. Rahul Kapoor

12:45-13:30 TECHNICAL SESSION-II: BREEDER SEED PRODUCTION	
Chairman	Dr. I. S. Solanki, ADG (FFC), ICAR
BSP Report & Allocation	Dr. A. K. Roy, PC
Rapporteurs	Dr. R. K. Agrawal
13:30-14:00	**LUNCH**

14:00-15:00 TECHNICAL SESSION-III: DISCIPLINEWISE REPORT	
Chairman	Dr. I.S.Solanki, ADG(FFC), ICAR, NewDelhi
Forage crop Improvement	Dr. A. K. Roy, PC
Forage crop Production	Dr. R. K. Agrawal
Forage crop Protection	Dr. A. B. Tambe
Rapporteurs	Dr. D. K. Banyal & Dr. S. K. Jha

15:00-18:00 TECHNICAL SESSION-IV (concurrent sessions) FORMULATION OF TECHNICAL PROGRAMME	
TECHNICAL SESSION-IV (Concurrent)–FORAGE CROP IMPROVEMENT	
Chairman	Dr. I.S.Solanki, ADG(FFC), ICAR, NewDelhi
Rapporteurs	Dr. C. Babu & Dr. Y. Jindal
Finalization of varietal trials	Dr. A. K. Roy, PC

TECHNICAL SESSION-IV (Concurrent)–FORAGE CROP PRODUCTION	
Chairman	Head, Crop Production Division, KAU, Kerala
Rapporteurs	Dr. B. G. Sekhara & Dr. Joseph Koering
Finalization of trials	Dr. R. K. Agarwal

TECHNICAL SESSION-IV (Concurrent)–FORAGE CROP PROTECTION	
Chairman	Head, Crop Protection Division, KAU, Kerala
Rapporteurs	Dr. D. K. Banyal & Dr. Tambe
Finalization of trials	Dr. A.B. Tambe
16:30-16:45	**Tea**

18:00 - 19:30	**VARIETAL IDENTIFICATION COMMITTEE MEETING**

September 6, 2016

8:-30- 12:00	**TECHNICAL SESSION V: REVIEW OF CENTRE-WISE ACTIVITIES**
Chairman	Dr. I. S. Solanki, ADG (FFC), ICAR
Convener	Dr. A. K. Roy, Project Coordinator (FCU)
Rapporteurs	Dr. B. G. Sekhara & Dr. M. Shanti
Hill Zone	CSK HPKV Palampur ; SKUAT (K) Srinagar; VPKAS Almora
North West Zone	PAU Ludhiana, CCS HAU Hisar, GBPUAT Pantnagar, SKRAU, Bikaner, IGFRI-RRS Avikanagar, CAZRI Jodhpur, SKRAU-RRS Jalore, MPUAT Udaipur, DWR (dual purpose barley) Karnal
North East Zone	NDUAT, Faizabad ; BAU Ranchi ; BCKV Kalyani; OUAT Bhubaneswar ; AAU Jorhat ; CAU Imphal ; RAU Pusa
Central Zone	AAU Anand ; JNKVV Jabalpur ; IGFRI Jhansi ; MPKV Rahuri ; BAIF Urulikanchan ; IGKV Raipur ; CSAUAT Kanpur ; Dhari/Dapoli
South Zone	PJTSAU Hyderabad ; UAS (B) ZRC Mandya ; TNAU Coimbatore ; KAU Vellayani ; IGFRI-RRS; Dharwad

September 6 2016

12:00-12:30	**TECHNICAL SESSION-VI: FTD & TSP FORMULATION**
Chairman	Dr. I. S. Solanki, ADG (FFC), ICAR
Convener	Dr. A. K. Roy, Project Coordinator
Rapporteurs	Dr. R. K. Agrawal
10:30-10:45	Tea

12:30-13:00	**TECHNICAL SESSION VII:PGR/breeding/production/protection issues**
Chairman	Dr. I. S. Solanki, ADG (FFC), ICAR
Convener	Dr. A. K. Roy, PC
Rapporteurs	Dr. Santosh Jha & Dr P Takwale
Summary and analysis of 35 years data and interaction; Future programme/thrust areas/identification	

13:00-13:30	**TECHNICAL SESSION-VIII:** Scientific, Administrative and financial issues
Chairman	Dr. I. S. Solanki, ADG (FFC), ICAR
Convener	Dr. A. K. Roy, Project Coordinator (FCU)
Rapporteur	Dr. Ansar Ul Haq

13:30-14:30	**Lunch**

15:00-17:00	**TECHNICAL SESSION-IX: PLENARY SESSION**
Chairman	Dr. I. S. Solanki, ADG FFC, ICAR
Co-Chairman	Dr. Sajan Kurien, DR,KAU
Co-Chairman	Dr. N. V. Naidu, DR, ANGRAU
Convener	Dr. A. K. Roy, PC
Rapporteurs	Drs. R. K. Agrawal & Dr. P. Mahadevu

Presentation of the recommendations by respective rapporteurs	
Technical session – I Interactive session with stakeholders	Dr. Rahul Kapoor
Technical session – II Breeder Seed Production	Dr. R. K. Agrawal
Technical session – III Discipline-wise presentation	Dr. S. K. Jha
Technical session - IV Forage Crop Improvement	Dr. C. Babu
Technical session - IV Forage Crop Production	Dr. B. G. Sekhara
Technical session – IV Forage Crop Protection	Dr. D. K. Banyal
Technical session – V Centre wise activities	Dr. M. Shanti
Technical session – VI FTD & TSP formulation	Dr. R. K. Agrawal
Technical session-VII PGR/breeding/production/protection issues	Dr. P. Takwale
Technical session – VIII – Scientific/ administration/ financial issues	Dr. Ansar Ul Haq
Varietal Identification Committee Meeting Report	Dr. A. K. Roy
Co chairman's remarks	Dr. Sajan Kurien, DR, KAU
Co-chairman's remarks	Dr. N. V. Naidu, DR, ANGRAU
Chairman's Remarks	Dr. I. S. Solanki, ADG (FFC), ICAR
Vote of Thanks	Dr. A. K. Roy

Annexure E

List of Participants

SN	Name	Designation
Kerala Agricultural University		
1	Dr.P.Rajendran	Vice Chancellor, KAU
2	Dr.Sajan Kurien	Director of Research, KAU
3	Dr.B.R.Reghunath	Dean, CoA, KAU, Vellayani
4	Dr. K. Umamaheswaran	Assoc. Director of Research, NARP, CoA,Vellayani
5	Dr. Thomas Biju Mathew	Assoc. Director of Research (PPRAL),KAU
6	Dr.V.B.Padmanabhan	ADE, CoA, Vellayani
7	Dr.V.S.Devadas	Assoc. Director of Research (seeds),KAU
8	Dr.Mercy George	Assoc. Director of Research (M&E),KAU
9	Dr.Sheela .K.R	Professor & Head, Dept. of Agronomy, CoA, Vellayani
10	Dr.Arya, K	Professor & Head, Dept. of Plant Breeding & Genetics, CoA, Vellayani
11	Dr.Girijadevi L	Professor & Head, Dept.of Agrl. Meteorology, CoA, Vellayani
12	Dr.Lulu Das	Professor & Head, AICRP on Mushroom,CoA, Vellayani
13	Dr.Sumam George	Professor & Head, Dept. of SS & AC, CoA, Vellayani
14	Dr.Mini C	Professor & Head, Dept of Processing Technology, CoA, Vellayani
15	Dr.Lekshmi.S	Professor(Agronomy), CoA, Vellayani
16	Dr. Sajitha Rani S	Professor(Agronomy) , CoA, Vellayani
17	Dr. Elizabeth K Syriac	Professor(Agronomy), CoA, Vellayani
18	Smt. Sharu S	Assistant Professor(Agronomy), CoA, Vellayani
19	Dr. Lekha Rani	Professor(Agronomy), CoA, Vellayani
20	Dr.Shalini Pillai	Professor(Agronomy), CoA, Vellayani
21	Dr.Ameena M	Assistant Professor(Agronomy), CoA, Vellayani
22	Dr. Rajasree S	Professor(Agronomy) ,CoA, Vellayani,
23	Dr. Kumari O Swadija	Professor(Agronomy), CoA, Vellayani
24	Dr. Sheeba Rebecca Issac	Professor(Agronomy), CoA, Vellayani
25	Dr.Beena Thomas	Assistant Professor(PB&G), CoA, Vellayani
26	Dr.Lekha Rani S	Professor(PB& G), CoA, Vellayani
27	Dr. Usha Kumari K	Professor(SS&AC), CoA, Vellayani
28	Dr. Sudharmai Devi	Professor(SS&AC), CoA, Vellayani
29	Dr. Manorama Thampatti	Professor(SS&AC), CoA, Vellayani
30	Dr.P.B. Usha	Professor(SS&AC), CoA, Vellayani
31	Dr.Usha Mathew	Professor(SS&AC), CoA, Vellayani
32	Dr.Sheela V L	Professor, Dept. of Pomology & Floriculture, CoA, Vellayani
33	Dr. Simi S	Assistant Professor, Dept. of Pomology & Floriculture, CoA, Vellayani
34	Dr. Nisha M.S	Assistant Professor, AICRP on Nematodes, CoA, Vellayani
35	Dr. Amritha V.S	Assistant Professor, AICRP on Honey Bees, CoA, Vellayani
36	Dr. Ambily Paul	Assistant Professor, AINP on Pesticide Residues, CoA, Vellayani
37	Dr. Sreedaya G.S	Assistant Professor, Dept. of Agrl. Extension, CoA, Vellayani
38	Dr.Kishore Kumar S	Professor ,Dept. of Agrl. Extension, CoA, Vellayani
39	Dr. Seema S	Professor, Dept. of Agrl. Extension, CoA, Vellayani
40	Dr. Elsamma Job	Professor ,Dept. of Agrl. Economics, CoA, Vellayani
41	Dr. Manoj T.I	Professor(PE), CoA, Vellayani
42	Dr. Reji Rani O P	Assistant Professor, AINP on Pesticide Residues, CoA, Vellayani
43	Dr. Babu Mathew	Professor & Head, Instructional Farm, CoA, Vellayani
44	Dr. Kamala Nair	Professor (Pl.Pathology), Instructional Farm, CoA, Vellayani
45	Dr.Suma Bai, I	Professor(Retd), Dept. of Plant Breeding & Genetics
46	Dr.G.Raghavan Pillai	Professor(Retd), Dept. of Agronomy
47	Dr. Sreekumar	Professor(Retd), Dept. of Plant Breeding & Genetics
48	Dr.Dhalin,D	Assistant Professor, Dept. of Agrl.Engineering, CoA, Vellayani
49	Dr.Joy M	Associate Professor(Pl.Pathology), CoA, Vellayani
50	Dr.Allan Thomas	Assistant Professor(Agrl.Extn), CoA, Vellayani

51	Dr.Thomas George	Professor, AINP on Pesticide Residue, CoA, Vellayani
52	Dr.Sreekala G.S	Assistant Professor(Hort), CoA, Vellayani
53	Dr.Deepa S.Nair	Assistant Professor(Hort), CoA, Vellayani
54	Dr.Geethalekshmi	Assistant Professor(Hort), CoA, Vellayani
55	Dr.Aparna, B	Assistant Professor (SS&AC), CoA, Vellayani
56	Dr.Jayalekshmi V.G	Professor(PB), CoA, Vellayani
57	Sri. Shajikumar	AO, NARP(SR), Vellayani
58	Sri.Kiran	Assistant Grade, NARP(SR), Vellayani
ICAR & inter related institutes		
59	Dr.I.S.Solanki	ADG(seeds), ICAR
60	Dr.Dinesh Kumar	Principal scientist
61	Dr.Yogender Kumar	Director i/c, Regional Fodder station, J&K
62	Dr.P.P.Singh	Director i/c, Regional Fodder station, Hisar
63	Dr. Santhosh M	Director i/c, Regional Fodder station, Suratgarh
IGFRI, Jhansi and AICRP coordinating unit		
64	Dr. A. K. Roy	Project Coordinator, AICRP on FCU, IGFRI, Jhansi
65	Dr. Rajiv Agrawal	Principal Scientist & PI(Agronomy), AICRP on FCU
66	Dr. V.K.Yadav	Head, ST division, IGFRI, Jhansi
67	Dr. Tejveer Singh	Scientist(Genetics), IGFRI, Jhansi
68	Dr. Madan Das	Principal scientist , IGFRI,Jhansi
69	Dr. Vijay D	Senior Scientist, IGFRI, Jhansi
70	Dr. B.G. Sivakumar	Principal Scientist(Agronomy), IGFRI, Dharwad
71	Dr. Narendra Kulkarni	Senior Scientist, IGFRI, Dharwad
72	Sri. Mulani	Officer i/c(Finance), IGFRI, Jhansi
73	Sri O. N. Arya, Jhansi	CTO, IGFRI
AICRP coordinating centres		
74	Dr. P. Mahadevu	Sr. Breeder & OIC, UASZARS, VC Farm, Mandya-571 405 (Karnataka)
75	Dr. B. G. Shekara	Scientist (Agronomy), UASZARS, VC Farm, Mandya-571 405 (Karnataka)
76	Dr. M. R. Krishnappa	Main research station, hebbal, Bengaluru
77	Mr Nagesh Chikkarugi,	STA, UASZARS, VC Farm, Mandya-571 405 (Karnataka)
78	Dr.(Mrs.) Suchismita Tripathy	Senior Agronomist , OUAT, Bhubaneswar-751 003 (Orissa)
79	Mrs. Pravasini Behera	Jr. Pathologist, OUAT,Bhubaneswar-751 003 (Orissa)
80	Dr. H. P. Parmar	Research Scientist (FC), Anand Agril. University, Anand-388 110 (Gujrat)
81	Dr. P. M. Patel	Scientist (Agronomy), Anand Agril. University, Anand-388 110 (Gujrat)
82	Mr. P.S. Takawale	BAIF Development Research Foundation, Urulikanchan, Pune
83	Mr. S. D. Patil	BAIF Development Research Foundation, Urulikanchan, Pune
84	Dr. Naveen Kumar	Principal Scientist (Agronomy) & OIC, CSKHPKV, Palampur-176 062
85	Dr. V. K. Sood	Principal Scientist (Plant Breeding), CSKHPKV, Palampur-176 062
86	Dr. D. K.Banyal	Principal Scientist (Plant Pathology), CSKHPKV, Palampur-176 062
87	Dr. Rajan Katoch	Asstt. Biochemist, CSKHPKV, Palampur-176 062
88	Dr. M. S. Pal	Professor Agronomy,G.B. Pant University of Agril. & Tech., Pantnagar
89	Dr. J. S. Verma	Professor, (PBG), G.B. Pant University of Agril. & Tech., Pantnagar
90	Dr. Mrs. Ashisan Tuti	Plant Breeder & OIC, BAU, Kanke, Ranchi
91	Mr. Birendra Kumar	Jr. Agronomist, BAU, Kanke, Ranchi
92	Dr. S. S. Shekhawat	Prof. (PBG) & OIC, SKRAU, Bikaner
93	Dr. S. M. Kumawat	Prof. (Agronomy), Prof. (PBG) & OIC, SKRAU, Bikaner
94	Dr. Mareen Abraham	Professor (PB), CoA, Vellayani
95	Dr.Usha C. Thomas	Assistant Professor (Agronomy), CoA, Vellayani
96	Dr. T. Shashikala	Principal Scientist (PB) ,PJTSAU, Rajendra nagar, Hyderabad
97	Dr. M. Anuradha	Senior Scientist (Entomology), ,PJTSAU, Rajendra nagar, Hyderabad
98	Dr. R. Susheela	Senior Scientist (Agronomy), ,PJTSAU, Rajendra nagar, Hyderabad
99	Dr. M. Shanti	Senior Scientist ,PJTSAU, Rajendra nagar, Hyderabad
100	Dr. Kalyan Jana	Agronomist & Officer In Charge, BCKV, Kalyani

101	Dr. Sutanu Sarkar	Assistant Professor(PB &G) ,BCKV, Kalyani
102	Dr. C. Babu	Assoc. Prof (PB) & OIC , TNAU, Coimbatore
103	Dr. S. D. Sivakumar	Asst. Prof. (Agronomy), TNAU, Coimbatore
104	Dr. Yogesh Jindal	Asstt. Sci. (PB), CCSHAU, Hisar
105	Dr. R. S. Sheoran	Asstt. Sci, CCSHAU, Hisar
106	Dr. D. S. Phogat	Asstt. Sci. , CCSHAU, Hisar
107	Dr. Ramesh Singh Yadav	Jr.Sci.(Agronomy), N.D. University of Agril. & Tech., Kumarganj, Faizabad
108	Dr. U. S. Tiwana	Forage Agronomist & OIC AICRP –FC, PAU, Ludhiana
109	Dr. Rahul Kapoor	Sr. Forage Breeder, PAU, Ludhiana
110	Dr. Meenakashi Goyal	Asstt. Biochemist, PAU, Ludhiana
111	Dr. Harpreet Kaur Oberoi	Asstt. Nutritionist (F.E.), PAU, Ludhiana
112	Dr. Devinder Pal Singh	Asstt. Plant Breeder, PAU, Ludhiana
113	Dr. Ravinder Kumar	Asstt. Entomologist, PAU, Ludhiana
114	Dr. A. K. Mehta	Pr. Scientist (PB) & OIC, JNKV, Jabalpur
115	Dr. S. K. Biliaya	Principal Scientist (PB), JNKV, Jabalpur
116	Dr. K. K. Sharma	Principal Scientist (Agronomy) & OIC, Assam Agril. University, Jorhat
117	Dr. (Mrs) S. Bora Neog	Principal scientist (PB), Assam Agril. University, Jorhat
118	Dr. A. H. Sonane	Sr. Forage Breeder & OIC AICRP –FC, MPKV, Rahuri
119	Dr. A. B. Tambe	Sci. (Entomology), MPKV, Rahuri
120	Dr. S.V. Damame	Scientist (Bio Chemistry), MPKV, Rahuri
121	Sri H. P. Pardeshi	Jr. Res. Asst, MPKV, Rahuri
123	Dr. Ansar-ul-Haq	Agronomist, SKUAST-K, Srinagar
124	Mr. R. Joseph Koireng	Jr. Agronomist (Agronomy), CAU, Imphal
125	Dr. Mahendra Gawai	Jr. Rice Breeder, BSKVARS, Karjat, Raigad
126	Dr. S. K. Jha	Scientist (Agronomy), IGKV, Raipur
127	Dr. Ramesh Yadav	Agronomist, NDUAT, Kumarganj, Faizabad
128	Dr. V. V. Ansodariya	Assoc. Research Scientist, (Plant Breeding), JAU, Dhari
129	Dr. J. K. Bisht	Pl. Sci. (Agron.) & OIC Forage Research, VPKAS, Almora 263 601
Collaborating centres		
130	Dr. S. Mala	Pandit J.L.N. College of Agril. & Research Institute, Karaikal (Puducherry)
131	Sri A. Balasubramanian	Technical official, Regional fodder station,Hassarghatta
132	Dr. M. D. Khanpara	Pearl Millet Research Station Junagadh Agricultural University, Jamnagar-361 006
133	Dr. P. K. Mukherjee	Senior Scientist, Agronomy , Indian Veterinary Research Institute, Bareilly
134	Dr. N. V. Naidu	Director Research ,ANGRAU, Guntur
135	Dr. G.Krishna Reddy	Principal Scientist(Agronomy), ANGRAU, Guntur
Cooperatives /Boards		
136	Dr. A. K. Garg	Sr. Manager (PS-AH), NDDB, Anand, Gujarat
137	Dr.Jyothish kumar	Deputy Director, KLD Board, Kerala
138	Smt. Dhanya Ganesh	Asst. Manager (Fodder development), KLD Board, Kerala
139	Sr.C.M. Karutha Pandy	AGM, FACT, Cochin, Kerala
140	Smt. Alitta Maria	Asst. Manager (Agron), FACT, Cochin, Kerala
Progressive Farmers		
141	Sri. Sasi,T,	Saranya Bhavan, Mulayara,Vellanad
142	Sri. Biju,	D.S, Nandanam, Mampazhakara, Perumpazhuthoor
143	Sri. Ajith	panayamvilakom, chaykottukonam
144	Sri.R.S.Arun Dev	Kizhakkepada veedu, Thalayal, Balaramapuram
145	Smt. Jayasree, B.	Krishnapriya, Kadukkarakonam, Koovalassery
146	Sri. Biju	Snehasayoojyam, Puliyarakonam
147	Sri.K.K.Ratheesh	Mangareth puthen veedu, Monammoodu
148	Sri.Gokulan Nair	Gokulam, Navaikulam
149	Smt. Merlin Ansthas	Jubilee Dairy, Vettuthura
150	Smt. Sindhu C R	Thulasivila, Nedumbrakonam, Kilimanoor
151	Sri. Anuroop	Anuroop Bhavan, Payattuvila, Uchakada
152	Smt. Latha Devi	Sivaganga, Verranakavu
153	Sri. Ajith	President, Ayiroor APCOS, Perumkadavila

Glimpses of Media Coverage

Annexure F

THE HINDU ● FRIDAY, SEPTEMBER 2, 2016

THIRUVANANTHAPURAM

CITY 3

Around 100 to attend meet on forage crops

THIRUVANANTHAPURAM: As many as 100 delegates from agricultural research centres across the country are expected to participate in the national group meeting of the All India Coordinated Research Project on forage crops and utilisation to be held here on September 5 and 6. The meeting will highlight the importance of forages in nutritional security. Officials from the Kerala Livestock Development Board, Dairy Development Board and Kerala Feeds will participate in an interface session with dairy farmers. — Special Correspondent

THE HINDU ● MONDAY, SEPTEMBER 5, 2016

THIRUVANANTHAPURAM

CITY 3

ENGAGEMENTS

Kerala Agricultural University and ICAR, New Delhi: Inaugural function of NGM-Rabi 2016 of All India Co-ordinated Research Project on forage crops and utilization, Conference Hall, Hotel Kingsway, Chacka, 9 a.m.

News Telecast from Doordarshan Kendra, Thiruvananthapuram at 5.45 pm on 08-09-2016 in 'Agricultural News of 'Krishidarshan' Programme

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