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कार्यवृत्त

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PROCEEDINGS

National Group Meeting : *Kharif*-2020

1st June, 2020

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(भारतीय कृषि अनुसंधान परिषद)

All India Coordinated Research Project on Forage Crops & Utilization

(Indian Council of Agricultural Research)

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

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Proceedings of the National Group Meeting : *Kharif*-2020
Held on 1st June, 2020 (Online)

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June, 2020

All India Coordinated Research Project on Forage Crops & Utilization
(Indian Council of Agricultural Research)

PROCEEDINGS
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National Group Meeting : *Kharif*-2020
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Project Coordinating Unit
All India Coordinated Research Project on Forage Crops & Utilization
ICAR-IGFRI, Jhansi-284 003, (U.P.)

June, 2020

PREFACE

The National Group Meet, *Kharif* 2020 of 'All India Coordinated Research Project on Forage Crops and Utilization' was organized with the objectives to review the accomplishments of technical programme executed during *Kharif* 2019 at different Coordinating and Cooperating centres, In-house research activities, Breeder Seed Production, Forage Technology Demonstrations (FTDs), Tribal sub-plan (TSPs) and other activities carried out towards development and promotion of forage resources. The formulation and finalisation of technical programme for *Kharif* 2020 was successfully done during the meet. The meeting was conducted online on 1st June, 2020.

The meeting was attended by the scientists and officials engaged in forage research and development working at Coordinating and Cooperating centres located at different SAUs, CAU, ICAR institutes, NGOs and other institutions. All the important stakeholders contributed in the development and refinement of programme, linkages and collaborations and deciding future course of action in view of the changing agricultural needs of the farmers, livestock keepers and other stakeholders.

This compilation contains concise report of the National Group Meet, *Kharif* 2020 covering highlights on forage crop improvement, forage crop production, forage crop protection and proceedings of different technical sessions. The National Group Meet members discussed and planned future strategies for improving the forage productivity, quality, and soil health to address the regional and national forage security with sustainability for increasing livestock population. The finalized technical programme on forage crop improvement, forage crop production and forage crop protection for *Kharif* 2020 have been given in annexure.

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

We sincerely thank authorities at ICAR, particularly Dr. T. Mohapatra, Director General, ICAR, Dr. T. R. Sharma, Deputy Director General (Crop Science), Dr. Y. P. Singh, Assistant Director General (FFC) and other unit members of Crop Science Division, ICAR for their constant guidance, support and encouragement as well as financial and administrative approval.

We are thankful to Dr. Vijay K. Yadav, Director IGFRI and heads of divisions, scientists, administrative and finance personnel of IGFRI, Jhansi for their constant support.

A.K. Roy

Project Coordinator

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National Group Meeting of ICAR-AICRP on Forage Crops and Utilization
Kharif 2020 held on 1st June 2020 (On line meeting)

Technologies developed

Forage Crop Production Technologies

- **Weed management in forage maize:** In Madhya Pradesh, Chhattisgarh, Maharashtra and Gujarat, application of Topramezone + Atrazine @35g+ 250g a.i. or Tembotrione + Atrazine @120g+ 250g a.i./ha at 20 DAS to forage maize is recommended for weed management in forage Maize. The Topramezone + Atrazine controlled 66.7% weed biomass (73.4% with two hand weeding). The technology yielded 607, 147.5 and 11.1 q/ha green fodder, dry matter and CP yields, respectively and resulted in BC ratio of 3.20. (607.4 q GFY, 146.7 q DMY, 9.8 q CPY and 2.91 B:C ratio with two hand wedding).
- **Weed management in forage maize:** In Jharkhand and east Uttar Pradesh, application of Tembotrione + Atrazine @120g+ 250g a.i. or Topramezone + Atrazine @35g+ 250g a.i./ ha at 20 DAS to forage maize is recommended for weed management. The Tembotrione + Atrazine controlled 84.5 % weed biomass (89.2% with two hand weeding). The technology yielded 466.3, 135.2 and 11.2 q/ha green fodder, dry matter and CP yields, respectively and resulted in BC ratio of 2.36. (504.8 q GFY, 147.4 q, DMY, 12.2 q CPY and 2.10 B:C ratio with two hand wedding).
- **Silivpastoral system:** In Telangana and Andhra Pradesh, the Leucaena based silvipastoral system comprising of APBN-1+ *Desmanthus (as* intercrop) in Leucaena planted at 3 m x 2 m is recommended for higher yield and carbon sequestration. The component crops sequestered 53.49 t total carbon ha^{-1}. Whereas, the total carbon sequestered through soil and crops was to the tune of 55.26 t ha^{-1}. The system yielded 85.20 t green fodder and 18.41 t ha^{-1}.
- **INM in Teosinte + Rice bean intercropping system:** Food – Forage cropping system of Teosinte + Rice bean (3:3 row ratio) – Rice, supplied with 50% RDF though inorganic source and 50% N through vermi-compost is recommended. It produced highest GFEY (854.36 q/ha), CPY (6.90), and B: C ratio (3.06) in comparison to sole teosinte GFEY (760.8 q/ha), CPY (5.17) and B: C ratio (2.52).

Forage Crop Protection Technologies

Following technologies are recommended for management of diseases in fodder crops.

- **Zonate leaf spot disease in fodder Sorghum:** At Palampur, seed treatment with *T. viride* @ 5g/kg + two foliar sprays with propiconazole @ 1g/l at 10 days interval starting from disease onset can be recommended for management of zonate leaf spot disease in fodder Sorghum.
- **Gray leaf spot and anthracnose in fodder Sorghum:** At Ludhiana, seed treatment with *T. viride* @ 5g/kg + one spray each with neem bio -pesticide (Achook) @ 3% and propiconazole @ 1g/l at 10 days interval starting from disease onset can be recommended for management of gray leaf spot and anthracnose disease in fodder Sorghum.
- **Banded leaf and sheath blight in forage maize**: At Palampur and Bhubaneswar, seed treatment with *T. viride* @ 5g/kg seed + two foliar sprays with (tryflosystrobin +tebuconazole) @ 1g/l at 10 days interval starting from disease onset can be recommended for management of Banded leaf and sheath blight in maize.
- **Downy mildew disease in fodder pearl millet :** At Ludhiana, seed treatment with *Bacillus subtilis* @ 5g/kg seed + two foliar sprays of *Bacillus subtilis* @ 5g/l at 10 days interval starting from disease onset can be recommended for management of downy mildew disease in fodder pearl millet.

Major recommendations

- There should be more cohesive interaction among all stakeholders, evaluation of germplasm for various traits and careful selection of parents for breeding programme. More active collaboration with related crop institutes and projects mainly Maize, Sorghum, Pearl Millets etc. for developing comprehensive and adoptable technologies in a synergistic manner.
- Development and use of digital platforms particularly in regional languages for effective dissemination of technologies should be encouraged.
- Critical review of center's performance and their need based resource strengthening should be planned in next EFC.
- There is a need of pre-breeding/ genetic enhancement of different forage crops particularly perennial, range grasses and legumes and effective sharing among the centers. Development of crossing plan to be given utmost attention and targets of making crosses be given to the centres along with sharing of germplasm
- Replacement of old varieties with new high yielding fodder varieties should be done in a phased manner
- In agronomical trials, data recording needs to be more precise especially for OC and micronutrient content in soil / plant. Uniform pattern of statistical parameters should be followed across the centers. In trials on biofortification, the estimation of Zn and Fe should be done with common protocol preferably at one location.
- Three new locations/ voluntary centres were proposed at BHU, Varanasi; BAU, Banda; and SKNAU, Durgapura to expand collaboration with AICRP on Dryland Agriculture and two universities.
- In FTDs, Inputs in form of improved seeds should be provided and farmers should be encouraged to produce seeds to carry out activities in next year also. FTDs should be conducted in the new villages every year so that the technologies can be spread in large areas.
- DAC, Ministry of Agriculture and Farmers Welfare, Government of India should be approached through proper channel for funding for FLDs in fodder crops as being done in other grain crops.
- For TSP, it was advised that allotted budgetshould be utilized strictly as per the guidelines and in the notified TSP districts by Tribal Welfare Ministry. Centres can take help of KVK's and NGO's for effective execution of TSP programme Emphasis should be given to provide seed and planting material of fodder crops especially perennial crops to tribal and poor farmers for enhancing fodder production of the country in TSP activities.

INAUGURAL SESSION

National Group Meeting of ICAR-AICRP on Forage Crops and Utilization

All India Coordinated Research Project on Forage Crops and Utilization, Jhansi organized its National Group Meeting Kharif-2020 through Video Conferencing on 1st June, 2020.

Dr. Trilochan Mohapatra, Secretary (DARE) & DG (ICAR) inaugurated the programme. He welcomed all the participants, congratulated the scientists for entering into the Golden Jubilee Year of the project. He highlighted the need of forage crops technologies to enhance the farmer's income and increase the livestock productivity. He appreciated the technologies and varieties developed during the last 3 years and called for innovations, technology development, their effective dissemination through demonstrations and use of digital platforms particularly in regional languages. He called for critical appraisal of schemes and centers performance, their need based resource strengthening and reorienting them to achieve desired output, as the project is entering into new EFC period. He emphasized the need of effective dissemination of technologies and exhorted the scientific community involved in the project to come out with innovative technologies to increase the income of farmers.

Dr. Tilak Raj Sharma, Deputy Director General (Crop Sciences), ICAR emphasized on pre-breeding in major fodder crops by using the diverse gene pools for developing parental lines with resistance to major biotic and abiotic stresses alongwith high fodder yield and nutritional qualities. He congratulated the project staff for the progress and outlined the celebration themes for Golden Jubilee Year. He called for more active collaboration with related crop institutes and projects mainly Maize, Sorghum, Pearl Millets etc. for developing comprehensive and adoptable technologies in a synergistic manner.

Dr. V. K. Yadav, Director, ICAR-IGFRI, Jhansi stressed on more active collaboration among various stakeholders and detailed about the new initiatives being started by IGFRI to augment the fodder resources in the country.

Dr. A. K. Roy, Project Coordinator, presented the brief introduction of the project, salient achievements during last three year's period and summary of activities carried out during Kharif 2019 as well as new initiatives for future programme.

Twenty publications comprising AICRP annual report and 19 farmers friendly literature in regional /national languages were released by dignitaries. AICRP forage centers of PAU, CCSHAU, CSKHPKV, JNKVV, TNAU, MPKV, IGKV, BAU, BCKV, OUAT, UAS (B) ZARS Mandya and SKRAU were facilitated for development of varieties and technologies during last year. Award for the best performing centre was given to scientists of AICRP Forage Crops, TNAU, Coimbatore center.

More than 100 participants attended the meeting which included Dr. Y. P. Singh, ADG FFC; Dr. D. K. Yadava, ADG seed; Dr. A. K. Tyagi, ADG Animal Nutrition; Dr. V. A. Tonapi, Director IIMR Hyderabad; Dr. Sujay Rakshit, Director IIMR, Ludhiana; Dr. G. R. Chary, Director CRIDA, Hyderabad; Dr. D. K. Agarwal, Director IISS, Mau; Dr. C. Tara Satyavathi, PC Pearl Millet; Directors of Regional Fodder Station, Ministry of Animal Husbandry and Dairying; Dr Digvijay Singh, Sr Manager, NDDB, representatives of private and public sector, scientists of AICRP coordinating centers, voluntary centers and other ICAR institutes. Expert panel included Dr Bhag Mal, Dr. A. K. Tyagi, Dr A. R. Sharma, Dr B. K. Sahoo, Dr. Y. S. Paul and Dr. D. R. Malaviya.

Vote of thanks was presented by Dr. R. K. Agrawal.

TECHNICAL SESSION – I

Discipline-wise report & Technical Programme Formulation – Forage Crop Improvement

Chairman	**Dr. T. R. Sharma, Deputy Director General (Crop Science), ICAR**
Co-chairman	Dr. Y.P. Singh, ADG (FFC), ICAR
Convener	Dr. A. K. Roy, Project Coordinator
Report of Trials kharif 2019	Dr. Subhash Chand
Technical programme kharif 2020	Dr. Subhash Chand
Rapporteurs	Dr. Seuji Bora Neog & Dr. Gayathri G

Hon'ble chairman welcomed the delegates. Dr. Subhash Chand, Scientist and PI (crop improvement) presented the highlights of 14 breeding trials conducted during kharif 2019 on 8 different fodder crops for finalization of technical program for kharif 2020. Entries found promising for forage traits in their evaluations can be nominated for AICRP trials. After extensive discussion, following breeding trials were formulated.

- **IVT fodder maize** trial was constituted with 16 entries contributed by different centres and will be conducted at 23 locations in all zones.
- **AVTM-1:** Two entries AFH-7 and PFM-12 were promoted from IVT to AVTM-1. The trial will be evaluated at 11locations in NW and central zone.
- **IVTPM** trial was constituted with five entries and will be conducted at 19 locations in all zones except HZ.
- **AVTPM-1:** four entries viz., JPM-18-7, Dev-1, 16ADV0055, BAIF Bajra-7 were promoted from IVT to AVTPM-1. Trial will be conducted at 16 locations in four zones.
- **AVTPM-2 and AVTPM-2 (seed):** three entries viz., K-25, ADV 160061, and TSFB-17-7 were promoted from AVTPM-1 to AVTPM-2. Trial will be conducted at 4 locations in case of AVTPM-2 and 3 locations in case of AVTPM-2 (seed) in SZ only.
- **IVTC** trial was constituted with five entries with checks and will be conducted at 28 locations in all five zones.
- **AVTC-1:** four entries viz., VFC-1, C-508, MFC-16-6, and TSFC-18-16 were promoted from IVTC to AVTC-1 and trial will be evaluated at 6 locations in south zone only.
- **AVTC-2 and AVTC-2 (seed):** one entry RFC-2 (RCC-48) was promoted from AVTC-1 to AVTC-2. Trial will be evaluated at 7 locations in case of AVTC-2 and 6 locations for AVTC-2 (seed) in NE zone only.
- **IVT Rice Bean** trial was constituted with six entries and will be conducted at 10 locations in NEZ and central zone.
- **AVT-1 Dinanth Grass:** Four entries viz., BAU-DN-110-18-2, BAU-DN-109-8, BAU-DN-103-18-2 and JHD-19-4 were promoted from IVT to AVTDG-1. Trial will be conducted at 09 locations.
- The perennial trials on *Cenchrus ciliaris*, *Cenchrus setigerus and* Bajra-Napier Hybrid will continue as such in coded form.

Recommendations

- There is a need of pre-breeding/ genetic enhancement of different forage crops particularly perennial, range grasses and legumes.

- Greater focus should be given on germplasm collection of local landraces and wild relatives of crops and to identify the useful genes for transfer in existing varieties
- The germplasm needs to be shared with different AICRP centres to characterize them for various biotic and abiotic stresses.
- All the dual purpose (grain and fodder) crops such as sorghum, maize and bajra should come under single umbrella of AICRP FC&U for varietal evaluation and release of varieties for fodder. Strong and active collaboration among IGFRI, IIMR(Maize), IIMR(Millet), and AICRP forage, AICRP Sorghum, AICRP Maize, AICRP Pearl Millet is required for development and evaluation of material.
- Using old checks such as African Tall of maize, Giant Bajra of pearl millet in breeding evaluation trials may be avoided and instead the recently released superior varieties should be used as checks.
- Concern was raised for the failure of newly developed entries in Maize and Rice bean for promotion to the next stage due to poor yield performance. The breeding programme should be strengthened in these crops.
- It was emphasized that trial success rate must be 100%.
- Development of crossing plan to be given utmost attention and targets of making crosses be given to the centres along with sharing of germplasm
- Breeding for late maturing crop varieties should be taken up to enhance fodder availability especially in lean period (April- June).
- Focus needs to be given on development of nutritional programmes/bio-fortified fodder crop varieties specifically for Fe and Zn, protein and lipid quality improvement and strategies be developed to minimise anti-nutritional factors in fodder crops

The session ended with vote of thanks to the Chairman.

TECHNICAL SESSION-II

BREEDER SEED PRODUCTION

Chairman	**Dr. Bhag Mal, Former Director IGFRI and Ex-Regional Coordinator, South Asia, Biodiversity International.**
BSP-IV report production kharif 2019	Dr. Subhash Chand, Scientist AICRP FC&U
BSP -1 Allocation for 2020Kharif	Dr. Subhash Chand, Scientist AICRP FC&U
Rapporteurs	Dr.Yogendra Kumar & Dr. Kalyan Jana

Honourable chairman welcomed the delegates. Dr. Subhash Chand, Scientist and PI (crop improvement) presented the breeder seed production data of production year kharif 2019 (indent year-kharif 2020)

Production report: Indent year kharif 2020 and Production year kharif 2019:

In kharif-2019, the indent for breeder seed production (Indent year kharif-2020) was received from DAC&FW, government of India for 11 varieties of four forage crops such as fodder maize, fodder Bajra, and fodder rice bean and fodder cowpea. The total indent for breeder seed production was 71.83q. The indent was allotted to eight SAU_S /ICAR/NGO institutes. Among the quantity allotted for different forage crops, maximum was for maize (59.51q) followed by cowpea (10.15q), pearl millet (1.67q) and rice bean (0.50q).

The final Breeder seed production report (BSP-IV) received from different centres as well as availability of previous year available seed revealed that the overall production was higher in forage maize, forage pearl millet, forage rice bean, and forage cowpea.

Crop wise scenario indicates that as compared to allocation in maize, the final production was 44.27q surplus, in pearl millet, although, production was 2.13q surplus but Giant Bajra was 0.5q deficit. In cowpea, production was 0.53q surplus. The overall breeder seed production (110.95q) and previous year availability (7.93q) was 118.88q as against the indent of 71.83q (39.58% higher than the indent). PAU, Ludhiana and IGFRI, Jhansi has also produced breeder seed of different varieties as the total of 3.50q.

DAC indent for production year Kharif 2020 (Indent Year Kharif 2021) was received for total of 89.59q comprising of 67.84q for 4 varieties of fodder maize; 3.65q for 9 varieties of pearl millet and 18.1q for 10 varieties of cowpea. The indent was allocated to different centres and accepted by them. The indents were allotted to 06 centres for maize, 06 centres for pearl millet, and 08 centres for cowpea.

Recommendations

- Proper allocation/ distribution/ utilization of breeder seed in fodder crops should be ensured.
- Production of high amount of seed for range grasses and legumes.
- Development of seed standard and production technologies in fodder crops need to be undertaken.
- Development of rolling plan for forage crops seed production needs to be developed.
- Mis-match in seed indent and production for different varieties needs to be addressed.
- Replacement of old varieties with new high yielding fodder varieties should be done in a phased manner

The session ended with vote of thanks to the Chairman.

TECHNICAL SESSION-III

Discipline-wise report & Technical Programme Formulation –Forage Crop Production

Chairman	**Dr. A. R. Sharma, Director Research RLB CAU, Jhansi**
Co-chairman	Dr. Y.P. Singh, ADG (FFC), ICAR
Convenor	Dr. A. K. Roy, Project Coordinator
Report of Trials kharif 2019	Dr. R. K. Agrawal
Technical programme for kharif 2020	Dr. R. K. Agrawal
Rapporteurs	Dr. S D Kumar & Dr S K Jha

Discipline-wise report and technical programme formulation–Forage Crop Production began with introductory remarks of Chairman, Dr. A.R. Sharma, Director Research, RLBCAU, Jhansi and Co-chairman Dr. Y.P. Singh, ADG (FFC), ICAR. Dr. R.K. Agrawal, P.I. AICRP-FC&U (Agronomy) presented the results of experiments conducted during *Kharif* 2019. He also presented the recommendations made by different centers on forage crop production for various agro-ecological regions. New proposals on plant growth regulators, silage production, water management, micronutrient management, organic fodder production, precision nitrogen management, bio-fortification and cutting management were proposed for *Kharif* 2020 and onwards. Following recommendations emerged out of completed trials:

- **Weed management in forage maize:**In Madhya Pradesh, Chhattisgarh, Maharashtra and Gujarat, application of Topramezone + Atrazine @35g+ 250g a.i. or Tembotrione + Atrazine @120g+ 250g a.i./ha at 20 DAS to forage maize is recommended for weed management in forage Maize. The Topramezone + Atrazine controlled 66.7% weed biomass (73.4% with two hand weeding). The technology yielded 607, 147.5 and 11.1 q/ha green fodder, dry matter and CP yields, respectively and resulted in BC ratio of 3.20. (607.4 q GFY, 146.7 q DMY, 9.8 q CPY and 2.91 B:C ratio with two hand wedding)
- **Weed management in forage maize:** In Jharkhand and east Uttar Pradesh, application of Tembotrione + Atrazine @120g+ 250g a.i. or Topramezone + Atrazine @35g+ 250g a.i./ ha at 20 DAS to forage maize is recommended for weed management. The Tembotrione + Atrazine controlled 84.5 % weed biomass (89.2% with two hand weeding). The technology yielded 466.3, 135.2 and 11.2 q/ha green fodder, dry matter and CP yields, respectively and resulted in BC ratio of 2.36. (504.8 q GFY, 147.4 q, DMY, 12.2 q CPY and 2.10 B:C ratio with two hand wedding).
- **Silivpastoral system:** In Telangana and Andhra Pradesh, the Leucaena based silvipastoral system comprising of APBN-1+ *Desmanthus (as* intercrop) in Leucaena planted at 3 m x 2 m is recommended for higher yield and carbon sequestration. The component crops sequestered 53.49 t total carbon ha^{-1}. Whereas, the total carbon sequestered through soil and crops was to the tune of 55.26 t ha^{-1}. The system yielded 85.20 t green fodder and 18.41 t ha^{-1}.
- **INM in Teosinte + Rice bean intercropping system:** Food – Forage cropping system of Teosinte + Rice bean (3:3 row ratio) – Rice, supplied with 50% RDF though inorganic source and 50% N through vermi-compost is recommended. It produced highest GFEY (854.36 q/ha), CPY (6.90), and B: C ratio (3.06) in comparison to sole teosinte GFEY (760.8 q/ha), CPY (5.17) and B: C ratio (2.52).

Recommendations

- Data recording needs to be more precise as the values on OC and nutrient content in soil / plant in many cases seems to be unlikely.
- Statistical parameters need to be clearly presented. Data transformation for weed count data should be done before statistical analysis. Results need to be explained based on ANOVA. Interaction effects in multi-factor experiments should be highlighted in the concluding year.
- In trials on biofortification, the estimation of Zn and Fe should be done with common protocol preferably at one location.
- A more realistic economic analysis should be done based on a structured proforma, so that comparisons across locations can be made.
- Fertilizer levels in all nutrient management experiments (RDF) should be based on soil-test values, not just the blanket recommendation.
- AICRP trials provide multi-year multi-location data. A more detailed pooled analysis can be done to generate quality information for publication in highly rated journals at the conclusion of the experiment.
- Three new locations/ voluntary centres were proposed at BHU, Varanasi; BAU, Banda; and SKNAU, Durgapura to expand collaboration with AICRP on Dryland Agriculture and two universities.

The session ended with vote of thanks to the Chairman.

TECHNICAL SESSION-IV

Discipline-wise report & Technical Programme Formulation –Forage Crop Protection

Chairman	**Dr. Y. S. Paul, Former Head and Dean CSK HPKV Palampur**
Co-chairman	Dr. Y.P. Singh, ADG (FFC), ICAR
Report of Trials 2019 kharif	Dr. N. R. Bhardwaj
Technical programme for kharif 2020	Dr. N. R. Bhardwaj
Rapporteurs	Dr. Ashlesha & Dr. Sandip Langde

Forage crop protection session began with introductory remarks of Chairman, Dr. Y. S. Paul, Former Head and Dean CSK HPKV Palampur and Co-chairman Dr. Y.P. Singh, ADG (FFC), ICAR. Dr. N. R. Bhardwaj, P.I. (crop protection) presented the results of experiments conducted during *Kharif* 2019. He also presented the recommendations made by different centers on forage crop protection for different locations. New location specific proposals on management of zonate leaf spot in sorghum, management of root rot and wilt in cowpea and estimation of yield losses due to insect-pests in fodder sorghum were proposed for *Kharif* 2020 and onwards.

Three trials were validated on large area and following recommendations emerged:

- At Palampur, seed treatment with *T. viride* @ 5g/kg + two foliar sprays with propiconazole @ 1g/l at 10 days interval starting from disease onset can be recommended for management of zonate leaf spot disease in fodder SOrghum.
- At Ludhiana, seed treatment with *T. viride* @ 5g/kg + one spray each with neem bio -pesticide (Achook) @ 3% and propiconazole @ 1g/l at 10 days interval starting from disease onset can be recommended for management of gray leaf spot and anthracnose disease in fodder Sorghum.
- At Palampur and Bhubaneswar, seed treatment with *T. viride* @ 5g/kg seed + two foliar sprays with (tryflosystrobin + tebuconazole) @ 1g/l at 10 days interval starting from disease onset can be recommended for management of Banded leaf and sheath blight in maize
- At Ludhiana, seed treatment with *Bacillus subtilis* @ 5g/kg seed + two foliar sprays of *Bacillus subtilis* @ 5g/l at 10 days interval starting from disease onset can be recommended for management of downy mildew disease in fodder Pearl millet.

Recommendations

- The trial PPT-1 (Monitoring of diseases and insect pests in Kharif forage crops ecosystem), should be divided into two parts. First part should be conducted at the main station with the objective of developing weather based prediction models and second part should be about survey of diseases and insect-pests in farmers fields so that spatial distribution of major diseases and insect-pests can be assessed.
- In trial PPT-2, title should be modified as screening under natural conditions does not reflect resistance. The basis of selection of hot spot areas should be clearly mentioned.
- In PPT-28, the treatments in the protected plots should be well tested ones so that the crop remains pest free.
- Before going to field trials especially involving biocontrol agents or plant based extracts, lab experimentation is must and the lab facilities need to be created if not available. Lab as well as pot experiments should form the basis for field experimentation.
- There should be toxicity studies of organic inputs before their experimentation in the fields.
- Single location trials should be treated as station trials, however they can be under the supervision of Project coordinating unit for better results.
- Waiting period must be taken care of while spraying of plant protection chemicals.

The session ended with vote of thanks to the Chairman.

TECHNICAL SESSION- V

FTD & TSP FORMULATION

Chairman	**Dr. V. K. Yadav, Director IGFRI**
Co-chairman	Dr. Y.P.Singh, ADG (FFC), ICAR
Convener	Dr. A. K. Roy, Project Coordinator
Rapporteurs	Dr. Maninder Kaur, Dr. R. Katoch

At the outset, the chairman welcomed all the participants. He discussed with scientists of AICRP (FC &U) Coordinating and Cooperating centres for allotting FTD for *Kharif* 2020. A total of 623 FTD's were proposed to be allotted to AICRP (FC&U) centres during *Kharif* 2020 for the crops *viz*., BxN hybrid, forage sorghum, forage rice bean, forage cowpea, forage maize, forage pearl millet, setaria and guinea grass and congo-signal grass etc. Out of 623 FTD's, 253 were allocated to BN hybrid, 30 to rice bean, 100 to maize, 75 to pearl millet, 40 to cowpea, 50 to forage sorghum, 25 to congo-signal grass and 45 to other forage crops. (Annexure for details)

Regarding FTDs, it was emphasized that;

- The FTDs should be more advisory based rather than input based. Inputs in form of improved seeds should be provided and farmers should be encouraged to produce seeds to carry out activities in next year also.
- FTDs should be conducted in the new villages every year so that the technologies can be spread in large areas
- There is budget constraint and centres should use the resources of their respective institutions for carrying out the activities.

TSP programme

- Various centres put forth demand for TSP activities and fund.
- It was advised that allotted amount should be spend strictly as per the guidelines and in the notified TSP districts by Tribal Welfare Ministry.
- Centres can take help of KVK's and NGO's for effective execution of TSP programme
- Centres can use the budget for technology demonstration on fodder production and conservation, livestock development and distribution of small tools to tribal rural people.
- The emphasis should be to include supply of rooted slips and seed of forage crop under the programme.

All the centres need to provide following information regarding FTDs and TSPs

- The list of beneficiaries and their details including mobile number.
- Area covered under the programme and the relevant data on yields.
- Efforts should be made to collect data on vertical and horizontal transfer of technologies.

TECHNICAL SESSION-VI

PLENARY SESSION

Chairman	**Dr. T. R. Sharma, Deputy Director General (Crop Science), ICAR**
Co-Chairman	Dr. Y.P.Singh, ADG (FFC), ICAR
Convener	Dr. A. K. Roy, PC
Rapporteurs	Dr. R. K. Agrawal & Dr. Rahul Kapoor

Plenary session was chaired by Dr. T. R. Sharma, Deputy Director General (Crop Sciences), ICAR. Rapporteurs of different sessions presented the salient recommendations. Chairman stressed upon need of more cohesive interaction among all stakeholders, evaluation of germplasm for various traits and careful selection of parents for breeding programme. He also highlighted the need of providing seed and planting material of fodder crops especially perennial crops to tribal and poor farmers for enhancing fodder production of the country.

Following recommendations were finalized after detailed interaction and discussion

- There should be more cohesive interaction among all stakeholders, evaluation of germplasm for various traits and careful selection of parents for breeding programme.
- Emphasis should be given to provide seed and planting material of fodder crops especially perennial crops to tribal and poor farmers for enhancing fodder production of the country in TSP activities.
- Development and use of digital platforms particularly in regional languages for effective dissemination of technologies should be encouraged.
- Critical review of center's performance and their need based resource strengthening should be planned in next EFC.
- More active collaboration with related crop institutes and projects mainly Maize, Sorghum, Pearl Millets etc. for developing comprehensive and adoptable technologies in a synergistic manner.
- There is a need of pre-breeding/ genetic enhancement of different forage crops particularly perennial, range grasses and legumes and effective sharing among the centers. Development of crossing plan to be given utmost attention and targets of making crosses be given to the centres along with sharing of germplasm
- Breeding for late maturing crop varieties should be taken up to enhance fodder availability especially in lean period (April- June). Work on bio-fortified fodder crop should also be taken up along with strategies be developed to minimise anti-nutritional factors in fodder crops
- Development of rolling plan for forage crops seed production needs to be developed.
- Mis-match in seed indent and production for different varieties needs to be addressed.
- Replacement of old varieties with new high yielding fodder varieties should be done in a phased manner
- In agronomical trials, data recording needs to be more precise especially for OC and micronutrient content in soil / plant.

- Uniform pattern of statistical parameters should be followed across the centers. In trials on biofortification, the estimation of Zn and Fe should be done with common protocol preferably at one location.
- A more realistic economic analysis should be done based on a structured proforma, so that comparisons across locations can be made.
- Fertilizer levels in all nutrient management experiments (RDF) should be based on soil-test values, not just the blanket recommendation.
- Three new locations/ voluntary centres were proposed at BHU, Varanasi; BAU, Banda; and SKNAU, Durgapura to expand collaboration with AICRP on Dryland Agriculture and two universities.
- In FTDs, Inputs in form of improved seeds should be provided and farmers should be encouraged to produce seeds to carry out activities in next year also. FTDs should be conducted in the new villages every year so that the technologies can be spread in large areas.
- DAC, Ministry of Agriculture and Farmers Welfare, Government of India should be approached through proper channel for funding for FLDs in fodder crops as being done in other grain crops.
- For TSP, it was advised that allotted amount should be utilized strictly as per the guidelines and in the notified TSP districts by Tribal Welfare Ministry. Centres can take help of KVK's and NGO's for effective execution of TSP programme

AICRP on Forage Crops and Utilization
Technical Programme Crop Improvement
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Annexure A

1. IVTM: Forage Maize (New)

Entries	:	16+ 2(NC) + 1 hybrid check [CO(HM)8]
Entries	:	**MFM-21** (Mandya); **PMC-11, PMC-12, PMC-13** (MPUAT, Udaipur); **KDFM-5, KDFM-6 (SKUAST-K, Srinagar); VL-117** (VPKAS Almora); **IMHSB-20F-1, IMHSB-20F-2, IMHSB-20F-3** (RMRSPC, ICAR-IIMR); **ADFM-1** (ICAR-IARI, Dharwad); **DFH-3** (GBPUA&T Pantnagar); **MF-2020** (RPCAU, Dholi); **HQPM 28** (CCSHAU,RS Karnal), **PFM-13** (PAU, Ludhiana), **HPFM-10** (SCK HPKV, Palampur)
Checks	:	African Tall, J-1006, IIMR hybrid COHM-8
Design	:	RBD with 3 replications
Plot size	:	4 m x 1.8 m accommodating 4 m long 6 rows at 30 cm
Seed rate	:	50 Kg/ha (36g/Plot)
Fertilizers	:	80:40 kg/ha (N:P) 40:40 kg/ha (N:P) basal+ 40 N after 30 days
Seed	:	3.0 Kg/entry and 3.0 Kg/ NC
Locations (23)	:	**HZ**-Palampur, Srinagar; Rajouri, Almora ; **NWZ**-Ludhiana, Hisar, Udaipur, Pantnagar, Jalore ; **NEZ**-Ayodhya, Bhubaneswar, Ranchi, Pusa, Imphal; **CZ**- Raipur, Jabalpur, Rahuri, Uralikanchan, Jhansi; **SZ**-Hyderabad, Coimbatore, Mandya, Karaikal

2. AVTM-1: Forage Maize (NWZ and CZ)

Entries	:	2+2 (NC) + 1 hybrid check [CO(HM)8]
Entries	:	**AFH-7**(ICAR-IARI New Delhi); **PFM-12**(PAU Ludhiana)
Checks	:	African Tall, J-1006 &IIMR hybrid COHM-8
Design	:	RBD with 5 replications
Plot size	:	4 m x 3 m accommodating 4 m long 10 rows at 30 cm
Seed rate	:	50 Kg/ha (60g/Plot)
Fertilizers	:	80:40 kg/ha (N:P) 40:40 kg/ha (N:P) basal+ 40 N after 30 days
Seed	:	3.5 Kg/entry and 3.5 Kg/NC
Locations (11)	:	**NWZ**-Ludhiana, Hisar, Udaipur, Pantnagar, Jalore; **CZ**-Anand, Raipur, Jabalpur, Rahuri, Uralikanchan, Jhansi

3. IVTPM: Forage Pearl millet (New)

Entries	:	5+ 1 (NC) + 2 (ZC)
Entries	:	**JPM 18-37** (JNKVV, Jabalpur); **FBL 4, PHBF-5** (PAU, Ludhiana); **16ADV0111** (Advanta ltd), **TSFB-1610** (PJTSAU, Hyderabad)
Checks	:	RBB-1 (Rajasthan check) , Giant Bajra (NC), BAIF Bajra 1 (CZ), AFB-3 (NWZ), APFB-9-1 (NEZ), Moti Bajra (SZ)
Design	:	RBD with 3 replications
Plot size	:	4 m x 1.8 m accommodating 4 m long 6 rows at 30 cm
Seed rate	:	12 Kg/ha (9 g/Plot)
Fertilizers	:	40:20 kg/ha (N:P) basal
Seed	:	1 Kg/entry; 1 Kg/NC and 0.25 Kg/ZC
Locations (19)	:	**NWZ**-Ludhiana, Hisar, Bikaner, Jalore, Avikanagar; **NEZ**-Ayodhya, Pusa, Bhubaneswar, Ranchi; **CZ**-Anand, Raipur, Jabalpur, Rahuri, Uralikanchan, Jhansi; **SZ**-Coimbatore, Hyderabad, Mandya, Raichur

4. AVTPM-1: Forage Pearl millet (NWZ, NEZ, CZ and SZ)

Entries	:	4 + 1 (NC) + 2 (ZC)
Entries	:	**JPM-18-7**(JNKVV, Jabalpur);**Dev-1**(Crystal Corp Ltd); **16ADV0055**(Advanta ltd);**BAIF Bajra-7** (BAIF, Urulikanchan)
Checks	:	RBB-1 (Rajasthan check) , Giant Bajra (NC), BAIF Bajra 1 (CZ), AFB-3 (NWZ), APFB-9-1 (NEZ), Moti Bajra (SZ)
Design	:	RBD with 4 replications
Plot size	:	4 m x 3 m accommodating 4 m long 10 rows at 30 cm
Seed rate	:	12 Kg/ha (15g/Plot)
Fertilizers	:	40:20 kg/ha (N:P) basal
Seed	:	1.0 Kg/entry; 1.0 Kg/NC and 0.50 Kg/ZC
Locations (16)	:	**NWZ**-Ludhiana, Hisar, Bikaner, Avikanagar;**NEZ**- Pusa, Bhubaneswar, Ranchi;**CZ**-Anand, Raipur, Jabalpur, Rahuri, Uralikanchan, Jhansi; **SZ**-Coimbatore, Hyderabad, Mandya

5. AVTPM-2: Forage Pearl millet (SZ)

Entries	:	3+ 1 (NC) + 1 (ZC)
Entries	:	**K-25**(Kanchan Ganga Seeds);**ADV 160061** (Advanta Seeds ltd);**TSFB-17-7**(PJTSAU, Hyderabad)
Checks	:	Giant Bajra (NC), Moti Bajra (SZ)
Design	:	RBD with 4 replications
Plot size	:	4 m x 3 m accommodating 4 m long 10 rows at 30 cm
Seed rate	:	12 Kg/ha (15g/Plot)
Fertilizers	:	40:20 kg/ha (N:P) basal
Seed	:	0.50 Kg/entry; 0.50 Kg/NC and 0.50 Kg/ZC
Locations (4)	:	**SZ**-Coimbatore, Hyderabad, Mandya, Raichur

5A (Agronomy) - AVTPM-2-1: Second Advanced Varietal Trial in Forage Pearl millet (Agronomy)

Entries N	**:**	3+ 1 (NC) + 1 (ZC)
Entries Name	**:**	**K-25** (Kanchan Ganga Seeds); **ADV 160061** (Advanta Seeds ltd); **TSFB-17-7 (**PJTSAU, Hyderabad)
Checks	**:**	Giant Bajra (NC), Moti Bajra (SZ)
N Levels		Four (0, 30, 60, 90 kg/ha)
Design & Replications	**:**	RBD with 3 replications
Plot size	**:**	4 m x 3 m accommodating 4 m long 10 rows at 30 cm
Seed rate	**:**	12 Kg/ha (15g/Plot)
Fertilizers	**:**	40:40 kg/ha (P:K) basal
Total plots	**:**	60
Seed requirement/entry /Centre	**:**	180g/ centre
Locations	**:**	Coimbatore, Hyderabad, Mandya

6. AVTPM-2 (seed): Forage Pearl millet (SZ)

Entries	:	3+ 1 (NC) + 1 (ZC)
Entries	:	**K-25**(Kanchan Ganga Seeds);**ADV 160061** (Advanta Seeds ltd);**TSFB-17-7 (**PJTSAU, Hyderabad)
Checks	:	Giant Bajra (NC), Moti Bajra (SZ)
Design	:	RBD with 4 replications
Plot size	:	4 m x 3 m accommodating 4 m long 10 rows at 30 cm
Seed rate	:	12 Kg/ha (15g/Plot)
Fertilizers	:	40:20 kg/ha (N:P) basal
Seed	:	0.30 Kg/entry; 0.25 Kg/NC and 0.30 Kg/ZC
Locations (3)	:	**SZ**-Coimbatore, Hyderabad, Mandya,

7. IVTC: Forage Cowpea (New)

Entries	:	5 + 2 (NC) + 1 (ZC)
Entries	:	**MFC-16-2, MFC-16-7, MFC-16-8**(ZARS Mandya); **HFC17-9** (HAU, Hisar); **UPC-20-1** (GBPUA&T, Pantnagar)
Checks	:	**National checks:** Bundel Lobia-1, UPC-5286, **Zonal checks:** Bundel Lobia-2 (NWZ), UPC-622 (HZ), UPC-628 (NEZ), UPC-9202 (CZ) & MFC-09-1 (SZ)
Design	:	RBD with 3 replications
Plot size	:	4 m x 1.8 m accommodating 4 m long 6 rows at 30 cm
Seed rate	:	35.0 kg/ha (26 g/plot)
Fertilizers	:	20:40 kg/ha (N:P) basal
Seed	:	3.0 Kg/entry; 3.0 Kg/NC and 0.75 Kg/ZC
Locations (28)	:	**HZ**-Palampur, Srinagar, Rajouri; **NWZ**-Ludhiana, Hisar, Pantnagar, Bikaner, Udaipur, Jalore; **NEZ**-Ayodhya, Bhubaneswar, Ranchi, Jorhat, Kalyani, Imphal, Pusa; **CZ**-Anand, Rahuri, Urulikanchan, Jhansi, Raipur, Meerut; **SZ**-Coimbatore, Vellayani, Mandya, Hyderabad, Dharwad & Raichur

8. AVTC-1: Cowpea (SZ)

Entries	:	4 + 2 (NC) + 1 (ZC)
Entries	:	**VFC-1**(KAU, Vellayani); **C-508**(IGFRI RRS Dharwad); **MFC-16-6**(ZARS, Mandya);**TSFC-18-16**(PJTSAU, Hyderabad)
Checks	:	**National checks:** Bundel Lobia-1, UPC-5286;**Zonal checks:** MFC-8-14 (SZ)
Design	:	RBD with 3 replications
Plot size	:	4 m x 3 m accommodating 4 m long 10 rows at 30 cm
Seed rate	:	35.0 kg/ha (42 g/plot)
Fertilizers	:	20:40 kg/ha (N:P) basal
Seed	:	1.0 Kg for entry, NC and 1.0 kg for ZC
Locations (6)	:	**SZ**-Coimbatore, Vellayani, Mandya, Hyderabad, Dharwad& Raichur

9. AVTC-2: Cowpea (NEZ)

Entries	:	1 + 2 (NC) + 1 (ZC)
Entries	:	**RFC-2 (RCC-48)**(IGKV, Raipur)
Checks	:	**National checks:** Bundel Lobia-1, UPC-5286;**Zonal checks:**UPC-628 (NEZ)
Design	:	RBD with 5 replications
Plot size	:	4 m x 3 m accommodating 4 m long 10 rows at 30 cm
Seed rate	:	35.0 kg/ha (42 g/plot)
Fertilizers	:	20:40 kg/ha (N:P) basal
Seed	:	1.8 Kg for entry, NC and ZC
Locations (7)	:	**NEZ-** Faizabad, Bhubaneswar, Ranchi, Jorhat, Kalyani, Imphal, Pusa;

9 A (Agronomy) AVTC-2: Second Advanced Varietal Trial in Cowpea (Agronomy)

Entries	:	1 + 2 (NC) + 1 (ZC) = 4
Entries Name	:	**RFC-2 (RCC-48)** (IGKV, Raipur)
Checks	:	Bundel Lobia-1, UPC-5286; **Zonal checks:** UPC-628 (NEZ)
P Levels		Three (30, 60 & 90 kg/ha)
Design	:	RBD with 3 replications
Plot size	:	4 m x 3 m accommodating 4 m long 10 rows at 30 cm
Seed rate	:	35 kg/ha (42g/plot)
Fertilizers	:	20:40 kg/ha (N:K) basal
Seed requirement	:	42 g/plot
Total plots	:	81
Seed requirement	:	378 g/ entry /Centre
Seed requirement/ entry	:	1.5 kg (each entry/ check)
Locations	:	Faizabad, Kalyani, Imphal, Pusa;

10. AVTC-2 (seed): Cowpea (NEZ)

Entries	:	1 + 2 (NC) + 1 (ZC)
Entries	:	**RFC-2 (RCC-48)**(IGKV, Raipur)
Checks	:	**National checks:** Bundel Lobia-1, UPC-5286;**Zonal checks:** UPC 628 (NEZ)
Design	:	RBD with 5 replications
Plot size	:	4 m x 3 m accommodating 4 m long 10 rows at 30 cm
Seed rate	:	35.0 kg/ha (42 g/plot)
Fertilizers	:	20:40 kg/ha (N:P) basal
Seed	:	1.8 Kg for entry, NC and ZC
Locations (6)	:	**NEZ-** Bhubaneswar, Ranchi, Jorhat, Kalyani, Imphal, Pusa;

11. IVT Rice bean (New)

Entries	:	6 + 2 (NC)
Entries	:	**JRBJ 11-6, JRBJ-11-7** (JNKVV, Jabalpur);**JOR-20-1, JOR-20-2**, **JOR-20-3** , **JOR-20-4** (AAU, Jorhat)
Checks	:	Bidhan-2, Bidhan-3
Design	:	4 m x 1.8 m accommodating 4 m long 6 rows at 30 cm
Plot size	:	RBD with 3 replications
Seed rate	:	35.0 kg/ha (26 g/plot)
Fertilizers	:	20:40 kg/ha (N:P) basal
Seed	:	1.2 Kg/entry and NC
Locations (10)	:	Kalyani, Ranchi, Bhubaneswar, Jorhat, Pusa, Vellayani, Jabalpur, Raipur, Imphal & Palghar (Dapoli)

12. AVT-1 Dinanath Grass

Entries	:	4 + 1 (NC)
Entries	:	**BAU-DN-110-18-2, BAU-DN-109-8, BAU-DN-103-18-2**(BAU, Ranchi); **JHD-19-4** (IGFRI, Jhansi)
Checks	:	Bundel Dinanath-1, Bundel Dinanath-2
Design	:	4 m x 3 m accommodating 4 m long 10 rows at 30 cm
Plot size	:	RBD with 4 replications
Seed rate	:	4 kg/ ha (4.8 g/plot)
Fertilizers	:	20:40 kg/ha (N:P) basal
Seed	:	0.25 kg / entry and NC
Locations (9)	:	Kalyani, Ranchi, Bhubaneswar, Jorhat, Pusa, Jabalpur, Imphal, Jhansi, Mandya

13. VT *Cenchrus ciliaris*-2019 (continue) perennial

Entries	:	6+ 3 (NC)
Entries	:	**RCCB-05, RCCB-06** (SKRAU, Bikaner); **RCC-2016-8** (MPKV, Rahuri); **IG-96-414, IG-67-1263** (IGFRI RRS Avikanagar);**CAZRI-327** (CAZRI, Jodhpur)
Checks	:	IGFRI 3108, CAZRI 75,IGFRI-67-365
Design	:	4 m x 3 m accommodating 4 m long 10 rows at 30 cm
Plot size	:	RBD with 3 replications
Seed rate	:	5kg/ha (6g/plot)
Fertilizers	:	20:40 kg/ha (N:P) basal
Seed	:	0.4 kg/entry + check
Locations (15)	:	**NWZ-** Ludhiana, Hisar, Bikaner, Jodhpur, Avikanagar; **CZ-** Anand, Rahuri, Uralikanchan, Jhansi, Jabalpur, Raipur; **SZ-** Coimbatore, Mandya, Hyderabad, Dharwad

14. VT *Cenchrus setigerus*-2019 (continue) perennial

Entries	:	4 + 3 (NC)
Entries	:	**RCSB-08, RCSB-09** (SKRAU, Bikaner); **IG-97-433, IG-97-447** (IGFRI RRS Avikanagar)
Checks	:	**CAZRI-76 + TNCS-265, IG-96-706**
Design	:	RBD with 3 replications
Plot size	:	4 m x 3 m
Seed rate	:	6 kg/ ha (8 g per plot)
Fertilizers	:	20:40 kg/ha (N:P) basal
Seed	:	0.5 kg / entry & check
Locations (14)	:	**NWZ-** Hisar, Bikaner, Jodhpur, Avikanagar; **CZ-** Anand, Rahuri, Uralikanchan, Jhansi, Jabalpur, Raipur; **SZ-** Coimbatore, Mandya, Hyderabad, Dharwad

15. VT BxN Bajra Napier Hybrid-2019 (continue) perennial

Entries	:	14+ 2 (NC)
Entries	:	**VBN-1** (KAU, Vellyani); **PBN-402, PBN-407, PBN-408** (PAU, Ludhiana); **RBN-214-48, RBN-2016-95** (MPKV, Rahuri); **TNCN-1534, TNCN-1536** (TNAU, Coimbatore); **BNH-26** (BAIF, Uralikanchan); **TSBN-15-8, TSBN-15-15**(PJTSAU, Hyderabad); **IGFRI BN 2013-7, IGFRI BN 2013-8** (ICAR-IGFRI, Jhansi), **Pant Sel-1**(GBPUAT, Pantnagar)
Checks	:	BNH-10,CO(BN)-5
Design	:	RBD with 3 replications
Plot size	:	4 m x 3 m (50 rooted slips)/60 x 50 cm
Seed rate	:	42 rooted slips/rep/entry
Fertilizers	:	150:50:40 kg N, P_2O_5, K_2O/ha in split doses
Seed	:	1000 rooted slips/entry
Locations (20)	:	**HZ**-Palampur, Almora; **NWZ**-Ludhiana, Hisar, Bikaner;**NEZ**-Bhubaneswar, Ranchi, Jorhat; **CZ**-Anand, Rahuri, Uralikanchan, Jhansi, Raipur, Jabalpur, Palghar (Dapoli); **SZ**-Coimbatore, Mandya, Hyderabad, Vellayani & Dharwad

Seed Requirement of the Check Varieties and entries for Kharif 2020 Trials

SN	Crop	Variety	Quantity (in kg)	Institution
1.	Maize	African Tall	**Total 9.5 kg** [IVT-3.0 + AVT1 – 6.5]	MPKV, Rahuri
		J-1006	**Total 9.5 kg** [IVT-3.0 + AVT1 – 6.5]	PAU, Ludhiana
		IIMR COHM-8	**Total 9.5 kg** [IVT-3.0 + AVT1 – 6.5]	IIMR, Ludhiana
2.	Pearl Millet	RBB-1	**Total 2.0kg** [IVT-1.0 + AVT1 -1.0]	SKRAU, Bikaner
		Giant Bajra	**Total 3.35 kg** [IVT-1.0 + AVT1- 1.0 + AVT2- 0.5 + seed- **0.25** + agronomy- 0.6]	MPKV, Rahuri
		BAIF Bajra-1	**Total 0.75 kg** [IVT-0.25 + AVT1-0.50]	BAIF, Uralikanchan
		AFB-3	**Total 0.75 kg** [IVT-0.25+ AVT1-0.50]	AAU, Anand
		APFB-9-1	**Total 0.75 kg** [IVT-0.25+ AVT1-0.50]	PJTSAU, Hyderabad
		Moti Bajra	**Total 2.15 kg** [IVT-0.25 + + AVT1-0.50 +AVT2-0.50 + seed **0.30** + agronomy-0.60]	PJTSAU, Hyderabad
3.	Cowpea	Bundel Lobia-1	**Total 9.2 kg** [IVT-3.0 + AVT1 – 1.0 + AVT2- 1.8 + seed- 1.8 + agronomy-1.6]	IGFRI, Jhansi
		UPC-5286	**Total 9.2 kg** [IVT-3.0 + AVT1 – 1.0 + AVT2- 1.8 + seed- 1.8 + agronomy-1.6]	GBPUAT, Pantnagar
		Bundel Lobia-2	**Total 0.75 kg**[IVT -0.75]	IGFRI, Jhansi
		UPC-622	**Total 0.75 kg**[IVT -0.75]	GBPUAT, Pantnagar
		UPC-628	**Total 6.0 kg**[IVT-0.75+ AVT2-1.8+ seed-1.8 + agronomy-1.6]	GBPUAT, Pantnagar
		UPC-9202	**Total 0.75 kg**[IVT-0.75]	GBPUAT, Pantnagar
		MFC-09-1	**Total 0.75 kg**[IVT -0.75]	ZARS Mandya
		MFC-08-14	**Total 1.0 kg**[AVT1- 1.0]	ZARS Mandya
4.	Rice Bean	Bidhan-2	**Total 1.20 kg**[IVT -1.20]	BCKV, Kalyani
		Bidhan-3	**Total 1.20 kg**[IVT -1.20]	BCKV, Kalyani
5.	Dinanath	Bundel Dinanath-1	**Total 0.25kg**[AVT1-0.25]	IGFRI, Jhansi
		Bundel Dinanath -2	**Total 0.25 kg**[AVT1-0.25]	IGFRI, Jhansi

Seed requirement for entries

1.	Fodder Maize	**IVT**	3.0 kg/entry
		AVT-1	6.5 kg/entry
2.	Fodder Pearl millet	**IVT**	1.0 kg/ entry
		AVT-1	1.0 kg/ entry
		AVT-2	0.5 kg/entry
		AVT-2 (seed)	0.3 kg/entry
		AVT-2 (agronomy)	0.6 kg/entry
3.	Fodder Cowpea	**IVT**	3.0 kg /entry
		AVT-1	1.0 kg /entry
		AVT-2	1.8 kg /entry
		AVT-2 (seed)	1.8 kg /entry
		AVT-2 (agronomy)	1.6 kg/entry
4.	Fodder Rice bean	**IVT**	1.20 kg/ entry
5.	Dinanath Grass	**AVT-1**	0.25 kg/ entry

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Annexure B

Ongoing trials

K-17-AST-1: Studies on performance of top feeds under varied planting geometry with and without intercrop

Locations (3): Mandya, Coimbatore and Vellayani **Data reporting:** Kharif
Year of start and duration: Kharif 2019 Three years **Concluding year:** 2022

Preamble

In southern parts of the country, the population of small ruminants is comparatively higher, particularly in rainfed pockets. In these regions, it is difficult for farmers to feed green fodder for maintenance and survival of the small ruminant enterprises. Sheep and goat require less feeds and fodder and have more affinity towards top feeds which are rich in crude protein, ash and other minerals. The farmers are cultivating top feeds on farm bunds without practicing proper management causing low productivity as well as high mortality of shrub species. Hence, present investigation was undertaken to standardize planting geometry and cropping system for sustainable and intensive fodder production of different top feeds.

Objectives

- To standardize optimum plant population for higher green forage yield and quality.
- To study the performance of different plant species as top feed under sole and intercropping system.

Experimental details

Main plot: Cropping system x Top feeds (6)
Cropping system (2)
1. Sole crop 2. Intercrop (Napier Bajra Hybrid)

Top feeds (3)
1. Agase (*Sesbania grandiflora*)
2. Erythrina (*Erythrina indica*)
3. Drumstick (*Moringa oleifera*)

Subplot: Planting geometry (3)
1. 2 m x 1 m
2. 2 m x 0.5m
3. Paired system (between pairs - 2m, within pairs -1 m)
4.

Design	:	Split plot	**Plot size**	:	6 m x 4 m
Replication	:	3	**Treatments**	:	18

Observations to be recorded

- Green fodder and dry matter yield
- Crude protein content and yield
- Economic analysis
- Quality analysis
- Soil pH, OC, available N, P, K before and after completion of experiment.

Note: Top feed species should be harvested at 75 cm height.

K-18-AST-3: Bio-fortification of annual cereal fodder crops for enhancing zinc and iron content

Locations (5): Bikaner, Ludhiana, Anand, Hisar, Ayodhya	**Data reporting:** Kharif
Year of Start and duration: Kharif 2019, Two years	**Concluding year:** 2020

Preamble

More than two billion of global population is malnourished particularly in India. Micronutrients deficiency among the people of every age is very common. Agronomic bio-fortification is a feasible and cost-effective means of delivering micronutrients to people who have limited access to diverse diets and other micronutrient interventions. Bio-fortification of crops can increase the levels of micronutrients in final product through application of micronutrients as foliar, soil application, seed priming and seed coating. Hence, the study on bio-fortification of fodder through agronomical manipulation is proposed.

Objectives

- To study the effect of micronutrient application on growth, yield and quality of fodder of annual cereal crops.
- To assess the effect of micronutrient application on soil health and economics.

Technical programme

Fodders crops (2)

1. Maize (var. African Tall)
2. Sorghum (var. SSV 74)

$ZnSO_4$ / $FeSO_4$ levels (7)

1. Control (only rec. NPK dose)
2. 10 kg $ZnSO_4$ /ha as basal + 1% $ZnSO_4$ foliar spray at 45 DAS
3. 10 kg $FeSO_4$ /ha as basal + 1% $FeSO_4$ foliar spray at 45 DAS
4. 10 kg $ZnSO_4$ +10 kg $FeSO_4$ /ha as basal + 1% $ZnSO_4$ +1% $FeSO_4$ as foliar spray at 45 DAS
5. 20 kg $ZnSO_4$ /ha as basal + 1% $ZnSO_4$ foliar spray at 45 DAS
6. 20 kg $FeSO_4$ /ha as basal + 1% $FeSO_4$ foliar spray at 45 DAS
7. 20 kg $ZnSO_4$ +20 kg $FeSO_4$ /ha as basal + 1% $ZnSO_4$ + 1% $FeSO_4$ as foliar spray at 45 DAS

Experimental details

Fertilizers	90:40:40 kg N:P_2O_5;K_2O /ha *	**Design**	RBD
Spacing	30 x 10 cm	**Replication**	3
Plot size	4.0 m x 3.6 m	**Treatment combinations**	2 x 7= 14

Observations to be recorded

- Plant height, biomass/plant and green and dry matter yield
- Number of days for harvesting (50% flowering)
- CP and CF content
- Zn and Fe content in soil before and after harvest
- Zn and Fe content in plant at harvest
- Economic analysis

Note

- 29 kg gypsum/ha to be applied in the control treatment (only rec. NPK dose) to balance the sulphur supplementation in other treatment plots.
- Composite samples of soil and plant in coded form to be analyzed for Zn and Fe at PAU, Ludhiana. PI of trial at centres will ensure to send proper samples timely to Ludhiana centre.
- *In low or high nutrient content soils, the RDF should be adjusted using 25% higher or lower dose of concerned nutrient.
- A uniform dose of NPK as per the soil-test values will be applied in all treatments.

K-18-AST-2: Studies on organic source of nutrients on forage yield and quality of rice bean-oat system under irrigated situation

Locations (5): Jorhat, Imphal, Kalyani Ranchi, Pusa	**Data reporting:** Rabi
Year of start and duration: Rabi 2019-20, four years	**Concluding year:** Rabi 2022-23

Preamble

Due to improved purchasing power and health consciousness, organic milk is becoming more popular and fetching higher price. This has potential to improve the economic condition of rural poor. Organic green forage is the base for organically produced milk and other livestock products. Organic manure also improves soil fertility in terms of organic carbon and microbial count. Ricebean is a drought tolerant forage-cum-pulse crop, also serves as a good cover crop. Hence, study on low-cost organic nutrient management is proposed for ricebean-oat system under irrigated condition.

Objectives

- To compare the effect of nutrient sources on yield, quality and economics of fodder production system.
- To assess the changes in physico-chemical and biological properties of soil under different nutrient sources.

Treatment details

T_1	100% RDN through inorganic fertilizers
T_2	100% RDN through FYM
T_3	75% RDN through FYM+ 25% RDN through vermicompost
T_4	75% RDN through FYM + 25% RDN through bio-compost
T_5	50% RDN through FYM + 50% RDN through vermicompost
T_6	50% RDN through FYM + 50% RDN through bio-compost
T_7	75% RDN of T_2 (through FYM only)
T_8	75% RDN of T_3 (56% through FYM + 19% through vermicompost)
T_9	75% RDN of T_4 (56% through FYM + 19% through bio-compost)
T_{10}	75% of T_5 (37.5% through FYM + 37.5% through vermicompost))
T_{11}	75% of T_6 (37.5% through FYM + 37.5% through vermicompost))
T_{12}	50% RDN through FYM+ 25% RDN through vermicompost + 25% RDN through poultry manure at 30 DAS

Note

- Organic manures will be applied based on N equivalent considering soil test values.
- Nutrient requirement - oat 90:60:40 kg N:$P_2O_5$$K_2O$/ha, rice bean 20:60 kg N:P_2O_5/ha (adjust the doses based on soil test values)
- Calculate requirement of both crops; apply organic nutrients equivalent to 55 kg N/ha to rice bean and equivalent to 55 kg N/ha oats before sowing allowing sufficient time for decomposition.
- In treatment T1, (RDN through inorganic fertilizers) 20 kg nitrogen application will be applied to rice bean and 90 kg to oat. In treatments T2 to T12 (RDN through organic sources), 55 kg N/ha or 75% of it, as per treatment will be applied to rice bean and 55 kg N/ha or 75% of it as per treatment will be applied to Oat.
- The study will be in fixed plots to account for the direct, residual and cumulative effects of the treatments.

Experimental details

Crop	**:**	Rice bean - oat	**Variety**	**:**	Bidhan rice bean- 2 & JHO-822
Plot size	**:**	4 m x 5 m	**Spacing**	**:**	30 cm x 10 cm- for both the crops
Design	**:**	RBD	**Replications**	**:**	3

Observations to be recorded

Growth and yield parameters: Plant height, leaf : stem ratio, GFY, DMY, CPY, ash, carbohydrates and fibre content

Soil properties: Organic carbon, EC, available N, P, K, microbial biomass carbon content in soil at initial and after harvest of the oat.

Economics: Gross returns, net returns, B:C ratio

New Proposals

K-20-AST-1: studies on efficacy of micronutrient and plant growth regulators

K-20-AST-1a (Sub project a): Response of fodder crops to micronutrient management

Locations	Rahuri, Bikaner, Imphal, Ranchi and BUAT, Banda
Year of start & duration	*Kharif* 2020, 3 years
Concluding year & season	2023

Preamble

Low productivity of livestock is mainly due to the poor feed and fodder availability. There is acute deficiency of micronutrients in different soils of various regions, which causes not only low yields but also poor quality of the fodder. Production potential of fodder crops can be enhanced with micronutrient management. Adequate supply of micronutrients is essential for higher yield and quality of fodder crops. Hence, the study on agronomic biofortification of fodder is proposed.

Objectives

- To study the effect of micro nutrient management on growth, yield and quality of forage.
- To assess the economics of forage production as influenced by micro nutrient management.

Treatments

T_1	Absolute control (no fertilizer application)
T_2	RDF (100:50:50 N:P_2O_5:K_2O kg ha^{-1}) (based on soil test)
T_3	GRDF (100:50:50 N:P_2O_5:K_2O kg ha^{-1} + FYM 5 t ha^{-1})
T_4	GRDF + soil application of government notified multi-micronutrient grade I @ 25 kg ha^{-1}
T_5	GRDF + two foliar sprays of government notified multi-micronutrient grade II @ 1% at 30 and 45 DAS.
T_6	GRDF + soil application of government notified multi-micronutrient grade I @ 25 kg ha^{-1} + two foliar sprays of grade II @ 1% at 30 and 45 DAS.

Crop	**:**	**Maize -** Rahuri **BN hybrid -** Bikaner, Imphal, Ranchi	**Design**	**:**	RBD
Plot size	**:**	4 m x 5 m	**Replications**	**:**	3
Spacing	**:**	75 cm x 50 cm BN Hybrid and 30 cm x10 cm for maize			

Observations:

- Plant population 15 DAS
- Plant height, number of leaves, stem girth
- Dry matter content, leaf: stem ratio
- GFY, DFY, CP content and yield
- IVDMD, NDF, ADF
- Economics
- Nutrient status in soil (macro & micro) Initial and after harvest

Composition of Government notified multi-micronutrient mixture Grade I and Grade II

	Multi-micronutrient mixture Grade I		Multi-micronutrient mixture Grade II	
Sr. No.	**Micronutrient**	**Content (%)**	**Micronutrient**	**Content (%)**
1	Zink (Zn)	3.0	Zink (Zn)	5.0
2	Iron (Fe)	2.5	Iron (Fe)	2.0
3	Manganese (Mn)	1.0	Manganese (Mn)	1.0
4	Boron (B)	1.0	Boron (B)	1.0
5	Copper (Cu)	0.5	Copper (Cu)	0.5
6	Molybdenum (Mo)	0.1		

K-20-AST-1b (Sub project b): Yield enhancement and bio-fortification of *kharif* forages with PGRs and micronutrients

Locations	Palampur, Srinagar, Mandya and Ayodhya
ear of start & duration	Kharif 2020, 3 years
Concluding year & season	2023

Preamble

About 43% and 18% of Indian soils have been reported to be deficient in Zn and B status, respectively spread in pockets in different states of the country. Zinc is known to improve the metabolism of the plant and yield; whereas boron is improves the productivity by triggering source and sink relationship. Boron deficiency affects vegetative and reproductive growth of plants, resulting in inhibition of cell expansion and death of meristem. Plant growth regulators and micronutrients in minute quantities play an important role in enhancing growth and development of plants. PGRs like salicylic acid and tricontonal are easily available in the market and are in use with other crops. Therefore, it is proposed to assess the effect PGRs and micronutrients (Zinc and boron) on productivity of forages.

Objectives

1. To assess the effect of PGRs and micronutrients on herbage yield and quality of produce
2. to study the effect of treatments on soil properties and economics of production

Treatments (12)

T_1: Tricontanol 10 ppm at 30 DAS (foliar spray)
T_2: Salicylic acid 100 ppm at 30 DAS (foliar spray)
T_3: 5 kg Zn/ha soil application
T_4: 2 kg B/ha soil application
T_5: 5 kg Zn + 2 kg B/ha soil application
T_6: 5 kg Zn/ha soil application + triacontanol 10 ppm at 30 DAS foliar spray
T_7: 5 kg Zn/ha soil application + salicylic acid 100 ppm at 30 DAS foliar spray
T_8: 2 kg B/ha soil application + triacontanol 10 ppm at 30 DAS foliar spray
T_9: 2 kg B/ha soil application + salicylic acid 100 ppm at 30 DAS foliar spray
T_{10}: 5 kg Zn + 2 kg B/ha soil application + triacontanol 10 ppm at 30 DAS foliar spray
T_{11}: 5 kg Zn + 2 kg B/ha soil application + salicylic acid 100 ppm at 30 DAS foliar spray
T_{12}: Water spray at the time of PGR application (PGR are also to be applied 15 days after cut in multicut crops; Zn and B to be applied at the time of sowing; Crop will be raised with recommended package of practices)

***In treatments, where zinc is not applied equal amount of sulphur (sulphate given with 5 kg Zn) to be compensated through gypsum**

Crop:

- **Palampur:** Forage sorghum hybrid
- **Srinagar, Ayodhya:** Forage sorghum
- **Mandya:** Maize

Replications	**:**	Three	**Design**	**:**	Randomized Block Design
Fertilizer Dose	**:**	As per recommendation	**Spacing**	**:**	30 cm x 10 cm

Observations

- **Growth and Yield:** Plant height at 45 DAS and at harvest; leaf : stem ratio; green and dry fodder yields
- **Quality:** Crude protein content and yield; ADF and NDF content and yield; Zn and B content
- **Soil :** pH, NPK, Zn and B contents (before and after experimentation) (in 2020 and 2023)

K-20-AST-1c (Sub project c): Efficacy of plant growth regulators on forage yield and quality of maize-oat cropping system

Locations (6)	Uralikanchan, Srinagar, Pusa, Raipur, Hisar, Ranchi, Durgapura
Year of start & duration	2020-21, 3 years
Concluding year & season	Rabi 2022-2023

Preamble

In India, only 4% of the total cultivated area is under fodder production. To increase the fodder availability, it is required to increase the area under the fodder cultivation by 8-10% or the productivity per unit area. Use of various plant growth regulators is one of the ways to increase productivity and break yield plateau. The plant growth regulators play an important role in increasing growth characters like plant height, leaf area index, green and dry biomass. Hence, the study on efficacy of different plant growth regulators on forage yield and quality of fodder maize-oat cropping system is proposed.

Objectives

- To find out effect of different plant growth regulators on forage yield and quality of maize and oat
- To assess the economic feasibility of plant growth regulators

Treatments

- T_1: Triacontanol @ 10 ppm
- T_2: Triacontanol @ 20 ppm
- T_3: Mepiquat chloride @ 200 ppm
- T_4: Mepiquat chloride @ 300 ppm
- T_5: Salicylic acid 100 ppm
- T_6: Salicylic acid 200 ppm
- T_7: NAA @ 20 ppm
- T_8: Whip Super 4 g a.i./ha
- T_9 - GA_3 200 ppm
- T_{10} - GA_3 400 ppm
- T_{11}: Control- spray of water

Note: The spray of growth promoter be made at 30 DAS

Cropping System: Maize–Oat	
Replications	**:** Three
Design	**:** Randomized Block Design
Gross plot	: 4 m x 3 m
Fertilizer Dose	**:** Recommended dose (considering suitable correction in low or high nutrient availability soils)

Observation:

- Plant height, number of leaves and L:S ratio at 30 DAS and at harvest
- Green fodder yield, Dry matter, crude protein content and yield
- NDF, ADF content
- Economics

Note

- The crops should be grown under standard package of practice. The RDF should be adjusted as per soil test values.
- The treatments T1-T11 will be applied to both the crops
- This study to be conducted in a cropping system mode. Results to be reported in Rabi report)
- It is a fixed plot study

K-20-AST-2: Precision water management in Bajra Napier hybrid to improve water use efficiency

Locations	Coimbatore, Rahuri and Varanasi
Year of start & duration	Kharif 2020, 3 Years
Concluding year & season	2022

Preamble: Bajra Napier hybrid grass has been acclaimed as the highest forage yielder with high water demand (1800-2000 mm). Decline in soil moisture status cause a negative effect on the growth and green fodder yield of this crop. Average annual per capita availability of water is expected to decline to about 1,341 m^3 by 2025 and 1,140 m^3 by 2050. This is likely to aggravate the availability of water for fodder production as well. Hence, precision irrigation management is essential for enhancing water use efficiency in high water demanding crops like bajra napierhubrid.

Objectives:

- To identify suitable irrigation method and nitrogen level to obtain higher green fodder yield of bajra napier hybrid
- To work out the saving in water and nitrogen use and economics.

Treatment details

Main plot: Method of irrigation (4)

M_1: Surface drip irrigation
M_2: Sub-surface drip irrigation
M_3: Surge irrigation at 5 cm depth
M_4: Surge irrigation at 4 cm depth
M_5: Flood irrigation at 5 cm depth (Convention)

Subplot: N levels (3) (Please mention if this N will also be applied through drip - ?)

S_1: 50% RDN
S_2: 75% RDN
S_3: 100% RDN

Crop & variety	**:**	NB Hybrid- CO (BN) 5	**Treatments**	**:**	15
RDN/ha	**:**	Basal:150:50:50 kg N:P_2O_5:K_2O/ha + 75 kg N / ha per cut	**Design**	**:**	Strip plot
Plot size	**:**	20 m^2	**Replication**	**:**	3

Observations:

- Green and dry matter yield
- Crude protein content and yield
- Nitrogen uptake and nitrogen use efficiency
- Water requirement
- Water economy and water use efficiency
- Economics: Cost of cultivation, gross and net returns, B:C ratio

Note:

- The irrigation to be applied equal to 125% PE in M_1 and M_2, in rest treatments as per quantity mentioned
- Irrigation interval: M_1 and M_2 - 3 days,
  M_3 - M_5- 10 days in winter, 7 days in summer
- Measurement of irrigation water through water metre in M_3 - M_5 and calculation based on discharge rate and time taken in irrigation in M_1 and M_2 treatments
- In all treatments urea to be source of nitrogen
- Cutting interval 55 days

K-20-AST-3: Optimizing the feedstuffs for air evacuating method of silage production in polybags

Locations	Coimbatore and Jorhat
Year of Start & Duration	Kharif 2020, 2 years
Concluding year & Season	2020- 2022

Preamble

Low productivity of livestock can be attributed to chronic shortage of quality feed and fodders especially during lean season and period of monsoon failures. Though good quantity green fodders are available during the monsoon season but these are not utilized properly due to low shelf-life (2-3 days), insufficient storage infrastructure and inadequate technical knowhow. Polybag ensiling has proved to be state of the art technology due to its ease, low cost, and low or no aerobic spoilage during storing period. Hence, the study on optimizing the feedstuffs for air evacuating method of silage production in polybags is proposed.

Objectives

- To identify suitable fodder crops and additives for air evacuating method of silage production in polybags.
- To study the effect of different feedstuffs and additives on quality of silage.

Treatments

Fodder crops (4)

T_1 - BN hybrid grass (CO BN- 5)

T_2 - Fodder maize (African Tall)

T_3 - Perennial fodder sorghum (CO-31)

T_4 - Guinea grass (CO GG-3)

Method and additives (4)

F_1 - Air evacuation method without additives

F_2 – Air evacuation method with additives (molasses 1%)

F_3 – Manual compaction method without additives

F_4 – Manual compaction method with additives (molasses 1%)

***Air evacuation method: Removal of air in poly bags using vacuum machines**

- **Design** **:** RBD
- **Treatments** : 16
- **Replication** : 3
- **Polybag capacity** : 20 kg
- **Polybag thickness** : 450 micron

Observations:

A. Yield: Fresh silage yield, dry matter content, temperature, moisture content (before and after storage)

B. Quality parameters: pH, crude protein content, crude fibre content, Ash, acetic acid, lactic acid, propionic acid, butyric acid, digestible dry matter, dry matter intake after ensiling

C. Feeding assessment: Palatability, IVDMD and degradability analysis

D. Economic analysis

Note:

Use standard protocol for silage preparation

Apply additive on fresh weight basis

Analyses to be done immediately after opening the bag by collecting samples from different layers of bag

K-20-AST-4: Organic fodder production for sustainable yields, quality and soil health

K-20-AST-4a-c (Sub project a-c): Organic nutrient management for soil health and sustainability of round the year fodder production system

Locations	Palampur, Jorhat and Ayodhya
Year of start & duration	Kharif 2020, 5 years
Concluding year & Season	2020-2025

Preamble

Forage-based cropping systems are high-input demanding and mainly grown under inorganic nutrition conditions. However, high cost of fertilizers and concern about soil exhaustion, environmental deterioration and nutritional imbalance arising from continuous use of inorganic fertilizers, necessitate the research on other sources of nutrition. Organic nutrient management can help in arresting the decline in productivity through correction of deficiency of secondary and micro nutrients and improving the physical and biological health of the soil as well. Recently, a concept of "Natural Farming" embedding farming *with* nature and *without* chemicals has been promoted. In this system, soil is supplemented with the inoculums like *Beejamrut* and *Jeevamrut*to accelerate the propagation of existing soil micro flora. The information on the comparative performance of organic and natural farming systems nutrient on the productivity of forage-based cropping system is not available; therefore, the present study is being proposed.

Objectives

- To study the effect of organic systems of nutrition on forage yield and quality constituents.
- To study the effect of treatments on soil properties and economics of production.

Treatments:

Cropping system:

- **Palampur :** Sorghum hybrid + Pearl millet hybrid - Annual rye grass (with two rows of Setaria grass on both side of field boundaries)
- **Jorhat:** BN Hybrid and Congo signal grass
- **Ayodhya:** Sorghum-oat

Organic nutrient sources

- T_1 - FYM @10 t/ha
- T_2- Natural farming with mulch
- T_3- Natural farming without mulch
- T_4 - FYM @ 5 t/ha basal + natural farming (T_2)
- T_5- FYM @ 5 t/ha basal + natural farming (T_3)
- T_6- FYM @ 5 t/ha + foliar application of compost tea
- T_7 – Control
  - **Natural farming:** *Beejamrit* (seed treatment with *beejamrit*); basal application of *Ghana jeevamrit* @500 kg/ha; mulching @10 t/ha; Foliar application of 10% *Jeevamrit*4 weeks after sowing and after each cut i.e. 10 days after cut in Kharif and 15 days after cut in rabi crops.
  - Foliar application of compost tea 4 weeks after sowing and after each cut i.e. 10 days after cut in Kharif and 15 days after cut in rabi crops.
  - All the treatments will be imposed during specify ?

Design: Randomized block design **Replications**: 3

Observations:

- **Soil studies:** Soil pH, organic carbon, available NPK, microbial population before and after completion of the experiment (each year)
- **Crop studies:** Emergence count at 15 DAS, plant height at each cut and green and dry fodder yields
- **Quality:** Crude protein content and yield; ADF and NDF content
- **Economics**
- **Sustainability analyses**

Note: Trial should be conducted in organic block. It is a fixed plot study.

K-20-AST-4d (Sub project d): Optimizing production technology for sustainable organic fodder production and soil health

Locations	Pantnagar
Year of Start & Duration	Kharif 2020, 4 years
Concluding year & Season	2024

Preamble

The significance of organic fodder has gained importance due to chemical farming and its high residue content in the final product. It is suggested that organic products are safe, tasty, full of essential amino acids and even economical. It has also been reported that traditional organic farming either of *Rishi krishi*, biodynamic, natural farming, *panchgavyakrishi* or modern organic farming are equally good or even better than chemical farming. Hence, it is proposed to develop technologies for sustainable organic fodder production and soil health.

Objectives:

- To find out the effect of different components of organic cultivation on forage yield and quality.
- To assess the economic feasibility and sustainability of different organic farming systems.

Treatments:

Cropping systems (3)

C_1	Sorghum – berseem - maize+ cowpea
C_2	B N hybrid + (cowpea - berseem –ricebean)
C_3	Maize (sweet corn) – berseem + mustard – maize (sweet corn)

Organic production systems (4)

OP_1	Organic farming: Vermicompost @ 5 t/ha
OP_2	Zero budget natural farming : '*Bijamruta'* (seed treatment) '*Jivamruta'* (soil treatment) and foliar spray
OP_3	Panchgavya Krishi: Bio enhencer i.e.*'Panchgavya'*@ 4% foliar spray
OP_4	Rishi krishi: '*Amritpani'* and 'virgin soil'

Plot size	:	4.2 m x 5.0 m	**Design**	:	RBD
Treatments	:	12	**Replication**	:	3
Spacing	:	70 cm x 40 cm BN Hybrid and 30 cm x10 cm seasonal crops			

Note:

- The experiment shall be carried out at organic block at Crop Research Centre, Pantnagar
- **OP_1: Organic farming:** NPK through vermicompost(2.2%N, 1.2% P_2O_5 and 0.6% K_2O) shall be used @ 5 t/ha for sorghum and maize and 1.5 t/ha for berseem. Vermicompost shall be applied to meet out the N requirement of the crop.
- **OP_2: Zero budget Natural farming:** '*Bijamruta'* (seed treatment) '*Jivamruta'* (soil treatment as basal and foliar spray @ 10% at 30 DAS in seasonal crops and after each cut in BN hybrid)
- **OP_3: Panchgavya Krishi:** Use of bio enhancer i.e.*'Panchgavya* @ 4% foliar spray
- **OP_4: Rishi krishi:** '*Amritpani'* and 'virgin soil'(37.5 kg of virgin rhizosperic soil collected from beneath of Banyan tree (*Ficusbenghalensis*) should be spread over one hectare and the soil is enriched with 500 lit Amritpani. 200 lit Amritpaniis prepared by mixing 250 g ghee with 10 kg of cow dung followed by 500 g honey and diluted with 200 lit of water)

Please refer the following for detailed methodology

Organic Agriculture (Concept, Scenario, Principals and Practices). National Centre of Organic Farming, Department of Agriculture and Cooperation, Govt. of India, Ghaziabad, Uttar Pradesh)

Observations:

- **Soil studies:** Soil pH, organic carbon , available NPK , microbial population before and after completion of the experiment
- **Growth attributes:** Plant stand at 20 DAS and at harvest; plant height at pre-flowering stage for single cut and before harvest of each cut for multicut crop; number of plants / shoots/m row length; L:S ratio
- **Fodder yield:** Green and dry matter yield
- **Quality studies:** Crude protein content and yield
- **Economics:** Cost of cultivation, gross returns, net returns and B:C ratio

K-20-AST-5: Evaluation of promising fodder grass varieties under shade conditions

Locations	Vellayani
Year of Start & Duration	Kharif 2020, 3 years
Concluding year & Season	2023

Preamble

In Kerala, the most viable option to expand the area under fodder cultivation is to grow high-yielding fodder crops that fit well with existing homestead or tree-based farming systems by adopting the best management practices. It is a known fact that reduced light penetration affects the growth and quality of crops. The extent of reduction in yield and quality depends on the amount of shade and the degree of shade adaptation of the plant species. Hybrid Napier and guinea grass are the popular fodder grasses among small farmers of Kerala because of the high yield potential and nutritive quality. Most cultivars of fodder grasses express high yield potential when grown under open conditions with irrigation. In this context, this study is proposed to assess the influence of different shade levels on the growth, quality and yield of promising fodder grass varieties.

Objectives

To assess the influence of different shade levels on the growth, quality and yield of promising fodder grass varieties

Treatments

Main plot: Shade levels (3)

S_1- 0% (Open)
S_2- 25% shade
S_3- 50% shade

Subplot: Varieties (5)

V_1-Suguna (BN hybrid)
V_2-Susthira (BN hybrid)
V_3- CO-3 (BN hybrid)
V_4- CO-5 (BN hybrid)
V_5– CO GG-3 **(guinea grass)**
25 and 50 % shade will be established used shade nets.

Design	**:**	Split plot	**Replication**	**:**	5
Treatments	**:**	15	**Spacing**	**:**	60 cm x 60 cm
Plot size	**:**	3 m x 3 m			

Observations:

- **Growth and Yield attributes:** Plant height, leaf area, number of tillers, leaf : stem ratio, leaf chlorophyll content at each harvest , Light intensity at the top, middle and bottom of the canopy at harvest, Green fodder and dry matter yield
- **Quality characters:** Crude protein content, crude fibre content, oxalate content
- **Soil analysis-** pH, EC, OC, available N, P and K before and after the experiment (in 2020 and 2023)
- **Economics**

K-20-AST-6: Precision nitrogen management for enhancing fodder yield and nitrogen use efficiency in forages

Locations	Dharwad, Palampur, Srinagar and Mandya
Year of start & duration	Kharif 2020, 2 years
Concluding year	2022

Preamble

Fodder grasses are highly responsive to nitrogen application in terms of growth, quality and yield. Fertilizer nitrogen is a common input used by farmers in different agro-climatic conditions in India with varied use efficiency (30-50%). Nitrogen exhibits high synergistic effect in combination with water and other inputs. Application of inadequate dose of nitrogen results in yield reduction and application in excess leads to increased cost of cultivation and environmental pollution. Hence, the present study on precision management of nitrogen for efficient management and increasing NUE is proposed.

Objectives

- To estimate the effect of applied nitrogen using precision tools on crop growth and fodder
- To develop basis for fertilizer recommendation using the precision tools
- To work out the economics of different nitrogen management treatments

Treatments

T_1	No N
T_2	50 kg N/ha (40% N basal) + remaining based on SPAD meter critical value of 40
T_3	50 kg N/ha (40% N basal) + remaining based on SPAD meter critical value of 50
T_4	50 kg N/ha (40% N basal) + remaining based on LCC 4
T_5	50 kg N/ha (40% N basal) + remaining based on LCC 5
T_6	100 kg N/ha (40% N basal) + remaining based on SPAD meter critical value of 40
T_7	100 kg N/ha (40% N basal) + remaining based on SPAD meter critical value of 50
T_8	100 kg N/ha (40% N basal) + remaining based on LCC 4
T_9	100 kg N/ha (40% N basal) + remaining based on LCC 5
T_{10}	150 kg N/ha (40% N basal) + remaining based on SPAD meter critical value of 40
T_{11}	150 kg N/ha (40% N basal) + remaining based on SPAD meter critical value of 50
T_{12}	150 kg N/ha (40% N basal) + remaining based on LCC 4
T_{13}	150 kg N/ha (40% N basal) +remaining based on LCC 5
T_{14}	As per recommended package of practices (50% N as basal, remaining 50% at 30 days after sowing)

Note

- P & K are common for all treatment as per recommendation.
- In SPAD and LCC, the nitrogen will be applied after taking SPAD reading or matching with leaf colour chart at 30 & 60 DAS
- SDAD meter or LCC reading to be taken before 9.00 AM on healthy on flag leaf (topmost fully open leaf) free from insect /disease
- At each application 30 kg N to be applied

Crop:

Palampur: Forage sorghum hybrid

Srinagar, Dharwad and Mandya: Maize

Design	:	Randomized block design	**Replications**	:	Three
Plot size	:	4 m x 3.6 m	**Spacing**	:	30 cm x 10 cm

Observations

- **Growth and yield:** Plant height (cm), number of leaves / plant, leaf : stem ratio, fresh & dry weight of plant at cut; green fodder and dry matter yield
- **Quality:** Nitrogen content in plant; nitrogen uptake; crude protein content and yield; nitrogen use efficiency; soil available nitrogen after harvest, net returns and B:C ratio

K-20-AST-7: Effect of nitrogen and cutting management on performance of forage pearlmillet varieties

Locations	Hyderabad, Raipur, Pusa, Ludhiana and Jabalpur, BHU, Varanasi
Year of start & duration	Kharif 2020, 2 years
Concluding year	2022

Preamble

In *Kharif* season farmers cultivate maize, bajra or sorghum as annual forage crop, as single cut harvested between 65 and 75 days, leaving land vacant for rest of the season or beyond. At that time, soil is moist and it is not possible to prepare field for second crop. Harvest from single cut crop is obtained in bulk, which may pose storage issue before the farmer. But, multicut crop/ variety occupies land and extends the forage availability for longer period. Majority of recommended fodder pearlmillet varieties have been released based on their single cut performance, but now the farmers are preferring 3-4 cuts in according to their need. Nitrogen plays an important role in increasing all the growth and growth attributing characters which finally leads to increased green fodder yield. Therefore, nitrogen enhances the photosynthesis, biomass accumulations as well as quick regeneration.

Objectives

- To explore the possibility of prolonging quality fodder availability period
- To study the effect of nitrogen and cutting management on yield and economics of new pearlmillet varieties

Treatment

Main plot: Varieties of fodder Bajra (4)

1. TSFB 15-4
2. TSFB 15-8
3. Moti Bajra
4. BAIF Bajra-1

Subplot: Nitrogen levels (2)

1. 80 kg/ha
2. 120 kg/ha

Cutting management (2)

1. **Three cuts :** 1st at 50 DAS, 2nd cut at 30 days after 1st cut, 3rd cut at 50% flowering
2. **Four cuts :** 1st at 50 DAS, 2nd, 3rd and 4th cuts with 30 days interval

Nitrogen management

Three cut: 40% basal + 30% after 1st cut + 30% after 2st cut

Four cut: 40% basal + 20% after 1st cut + 20% after 2st cut+20% after 3st cut

Season	:	*Kharif* (2020)	**Replication**	:	3
Design	:	Split Plot (Varieties in main plot and nitrogen levels x cutting management in subplot)			
Spacing	:	30 cm	**Gross plot size**	:	4 m x 3 m

Observations:

- Plant height, number of shoots/tillers, leaf : stem ratio, green fodder yield, dry matter yield, crude protein content and yield
- NPK uptake by crop
- Economics
- Soil fertility status (before and after completion of trial i.e., in 2020 and 2022)

AVT-2 Trials

K-20-AST-8 – (AVTPM-2-1): Second Advanced Varietal Trial in Forage Pearl millet (AVT-2 Agronomy)

Locations: South Zone -Coimbatore, Hyderabad, Mandya **Data Reporting :** *Kharif*

Year of Start: 2020 (1 year) **Concluding Year:** *Kharif* 2020

Entries No.	**:**	3+ 1 (NC) + 1 (ZC)
Entries Name	**:**	**K-25** (Kanchan Ganga Seeds); **ADV 160061** (Advanta Seeds ltd); **TSFB-17-7 (**PJTSAU, Hyderabad)
Checks	**:**	Giant Bajra (NC), Moti Bajra (SZ)
N Levels		Four (0, 30, 60, 90 kg/ha)
Design & Replications	**:**	RBD with 3 replications
Plot size	**:**	4 m x 3 m accommodating 4 m long 10 rows at 30 cm
Seed rate	**:**	12 Kg/ha (15g/Plot)
Fertilizers	**:**	40:40 kg/ha (P:K) basal
Total plots	**:**	60
Seed requirement/entry /Centre	**:**	180g/ centre
Seed requirement/entry/all Centre	**:**	for entry and NC = 540 g for 3 centres

Observations:

- Plant population/m^2, Plant height and Leaf: stem ratio
- Green fodder and dry matter yields (q/ha)
- Crude protein content and crude protein yield (q/ha)
- Per day green and dry matter productivity
- Agronomic Optima and Agronomic Maxima

K-20-AST-9 AVTC-2: Second Advanced Varietal Trial in Cowpea (AVT-2 Agronomy)

Locations **NEZ-** Faizabad, Kalyani, Imphal, Pusa;	**Data Reporting :***Kharif* **Year of Start:** 2020 **Concluding Year:***Kharif* ,2020

Entries No.	:	1 + 2 (NC) + 1 (ZC) = 4
Entries Name	:	**RFC-2 (RCC-48)** (IGKV, Raipur)
Checks	:	Bundel Lobia-1, UPC-5286; **Zonal checks:** UPC-628 (NEZ)
P Levels		Three (30, 60 & 90 kg/ha)
Design	:	RBD with 3 replications
Plot size	:	4 m x 3 m accommodating 4 m long 10 rows at 30 cm
Seed rate	:	35 kg/ha (42g/plot)
Fertilizers	:	20:40 kg/ha (N:K) basal
Seed requirement	:	42 g/plot
Total plots		81
Seed requirement		378 g/ entry /Centre
Seed requirement/entry/all Centre		1.5 kg (each entry/ check)

Observations:

- Plant population/m^2, Plant height and Leaf: stem ratio
- Green fodder and dry matter yields (q/ha)
- Crude protein content and crude protein yield (q/ha)
- Per day productivity
- Agronomic Optima and Agronomic Maxima

Following suggestions were made for further strengthening of the technical programme:

- Basic soil parameters should be given at the bottom of the table to understand the soil type and response expected.
- A preamble should be given at the beginning of the experiment, indicating its importance / purpose of the study.
- Fertilizer levels in all nutrient management experiments should be based on soil-test values, not just the vague / blanket recommendation.
- In an experiment, try to have a treatment of farmers' practice and the current recommendation (so as compare the advantage of the new intervention).
- In studies on organic farming, the direct, residual and cumulative effects of treatments should be worked out on crop yield and soil health. How many years it took under OF to reach the yields levels obtained under INM. Economic / quality analysis in such trials is important.
- Statistical analysis of the data should be done more efficiently and valid interpretations should be made.
- Present experiments on PGRs, micronutrients, organic cultivation, precision N management at different locations together under a common title. Location-specific trials at 1-2 locations may be categorized as 'Station Trials'.
- Estimation of quality parameters including the content of micronutrients for all centres should be done based on coded samples preferably at a single location only.
- A trial on conservation agriculture in a major fodder-based system of the region may be proposed at each centre, which should be maintained on a long-term basis.
- Limit the number of experiments and give more emphasis on quality data and research publications, besides application of the developed technology on large areas on-station and adoption on farmers' fields.

Annexure C

AICRP on Forage Crops and Utilization
Technical Programme Crop Protection
Kharif 2020

PPT-1: Monitoring of diseases and insect pests in *Kharif* forage crops

Locations: Bhubaneswar, Jhansi, Palampur, Rahuri and Ludhiana

- **Part-1: Monitoring of diseases and insect-pests in kharif forage crops at the main station**

Location	Crops to be evaluated
Ludhiana	Sorghum, Maize, Pearlmillet, Cowpea, perennial grasses
Palampur	Sorghum, Maize, Pearlmillet, Cowpea
Jhansi	Sorghum, Maize, Pearlmillet, Cowpea
Rahuri	Sorghum, Maize, Pearlmillet, Cowpea, perennial grasses
Bhubaneswar	Sorghum, Maize, Pearlmillet, Cowpea, Ricebean

Plot size: 4x4 m^2 per crop **Replication:** 4 per crop
Methodology: Disease/insect-pest progression on kharif forages starting from date of appearance till crop maturity at weekly interval on 10 randomly selected plants/replication/crop using standard rating scale and calculation of disease severity/incidence/insect damage. Observation should be recorded in each plot and mean value should be provided.

- **Part-2: Survey of diseases and insect-pests in kharif forage crops**

Locations: Bhubaneswar, Jhansi, Palampur, Rahuri and Ludhiana
Methodology: Disease/insect-pest incidence on kharif forages during the peak season on 15 locations/farmer's field surrounding the center. Data must be recorded either as presence or absence of disease/insect-pest in a particular crop. If it is absent mark it as '0' and if it is present, then note the percent severity/incidence/insect-pest damage along with name of crop, disease/insect-pest, date of observation and name of location.

PPT-2: Evaluation of *Kharif* forage crops breeding materials for prevalent diseases and insect pests under natural conditions

Locations: Bhubaneswar, Palampur, Rahuri, Jhansi, Raichur and Ludhiana
Crops: Maize, Pearl millet, Cowpea, Rice bean and perennial grasses

Methodology
In this trial, screening of various contributed entries along with national and zonal checks for their reaction to diseases and insect pests under natural conditions using standard disease/insect-pest rating scales will be done. Data must be recorded from breeding trials planted at different locations. Details of the crops and diseases/insect-pest to be evaluated in a particular crop at each centre is given below:

Location	Disease and insect-pests to be evaluated in different crops				
	Maize	**Pearlmillet**	**Cowpea**	**Ricebean**	**Perennial grasses**
Ludhiana	leaf blight	Blast, downy mildew	Yellow mosaic virus, aphids	-	Leaf spots and blight
Palampur	Leaf blight, Banded leaf and sheath blight	Blast	Root rot/wilt complex, Leaf spot, defoliators	-	Leaf spot, blight, powdery mildew
Bhubaneswar	Leaf blight, Banded leaf and sheath blight	Blast, defoliators	Root rot/wilt complex, defoliators, yellow mosaic virus	Root rot, yellow mosaic virus, defoliators	Leaf spot and blight
Rahuri	Leaf blight, fall armyworm	-	Yellow mosaic virus, aphids	-	leaf spot and blight
Jhansi	Leaf blight, fall armyworm	Blast	defoliators	-	leaf spot and blight
Raichur	-	Blast	Powdery mildew	-	-

PPT-25: Non chemical management of *Helminthosporium* leaf blight in fodder maize

Location: Ludhiana **Design:** RBD **Replication:** 3 **Plot size:** 3x3 m^2
Treatments
T1: Two foliar spray of *Pseudomonas fluorescens* @ 10g/L at 10 days interval
T2: Two foliar spray of *Bacillus subtilis* @ 10g/L at 10 days interval
T3: Two foliar spray of *Meliaazedarach* @ 3.0% at 10 days interval
T4: Two foliar spray of *Murrayakoenigii* @ 3.0% at 10 days interval
T5: Two foliar spray of chitosan @ 0.05% at 10 days interval
T6: Two foliar spray of mancozeb @ 0.25% at 10 days interval
T7: Control

Note: First spray should be given at the onset of disease symptoms.
Observations:
- *Helminthosporium* leaf blight severity.
- Green Fodder Yield (q/ha)

PPT-26: Management of leaf blast in forage pearl millet

Locations: Ludhiana, Jhansi, Bhubaneswar and Palampur
Design: RBD **Replication:** 3 **Plot size:** 3x2 m^2 **Variety:** Giant Bajra
Treatments
T1: Seed treatment with carbendazim @ 2.0g/kg seed
T2: Seed treatment with tebuconazole + trifloxystrobin @ 1 g/kg seed
T3: Seed treatment with chitosan @ 0.05%
T4: Seed treatment with neem seed extract @ 5%
T5: Seed treatment with tricyclazole @ 0.6 g/kg seed
T6: T1+ foliar spray of carbendazim @ 0.5 g/L
T7: T2+ foliar spray of tebuconazole + trifloxystrobin @ 0.4g/L
T8: T3+ foliar spray of chitosan @ 0.05%
T9: T4+ foliar spray of neem seed kernel extract @ 5%
T10: T5+ foliar spray of tricyclazole @ 0.3 g/L
T11: Control
Observations:
- Leaf blast severity in each treatment at 7 days interval starting from disease onset.
- AUDPC and rate of infection in different treatments.
- Green Fodder yield (q/ha) in different treatments.

Note: In treatments T6 to T10, one foliar spray will be given just at disease initiation and second spray should be given need based (preferably at 15 days after first one).

PPT-27: Management of invasive insect-pest fall army worm, *Spodoptera frugiperda* L. on Forage Maize

Locations: Rahuri, Dharwad, Jhansi, Ludhiana and Bhubaneswar
Design: RBD **Replication:** 3 **Plot size:** 4x3 m^2 **Variety:** African Tall

Treatments:
T1: Foliar spray of Emamectin benzoate 5 WG @ 0.5gL
T2: Foliar spray of Chlorpyriphos 20 EC @ 2 mL /L
T3: Foliar spray of *Metarhizium anisopliae* @ 5g /L
T4: Foliar spray of *Metarhizium anisopliae* @ 7.5g /L
T5: Foliar spray of *Beauveria bassiana* @ 5g /L
T6: Foliar spray of *Beauveria bassiana* @ 7.5g /L
T7: Foliar spray of *Nomuraea releyi* @ 5g /L
T8: Foliar spray of *Nomuraea releyi* @ 7.5g /L
T9: Foliar spray of Azadiractin 10000 ppm @ 2mL /L
T10: Control

Observations:
- Percent plant damage before spray and 3, 7 & 10 days after spray.
- Green Fodder yield (q/ha) in different treatments.

PPT-28: Assessment of crop losses due to diseases and insect-pests in forage Cowpea

Locations: Ludhiana, Palampur, Rahuri, Bhubaneswar and Jhansi
Design: Paired plot design **Replication:** 7
Plot size: 5 x 5 m^2 **Variety:** Bundel Lobia-1
Treatments: 2 **T1:** Protected **T2:** Unprotected
Observations
- Severity/incidence of different diseases (Root-rot, Anthracnose, Yellow mosaic virus, leaf blight) and insect-pests (defoliators and aphids) as per standard disease/pests specific rating scale in both protected and unprotected plots starting from date of appearance till crop maturity at weekly interval.
- Green fodder yield in protected as well as unprotected plots.

Note: All the package of practices will be same in protected and unprotected plots except following disease/insect-pests management practices in protected plots:

For management of root rot and foliar diseases (anthracnose and leaf blight) of forage cowpea:
- Seed treatment with tebuconazole 2DS @ 1g/kg seed + NSKP (50 g/kg seed) followed by two foliar sprays of 0.1 per cent propiconazole at 15 day interval.

For management of defoliators in forage cowpea:
- Two foliar sprays of *B. bassiana* @ 5g/L ($1x10^7$cfu/ml)

For management of sucking pests and yellow mosaic virus incidence:
- Two sprays of imidacloprid 17.8 SL @ 0.3 ml/lit at 15 days interval followed by two sprays of *Verticillium lecani* @ 5 g/L at 10 days interval.

Note:
- Seed treatment with tebuconazole 2DS @ 1g/kg seed + NSKP (50 g/kg seed) is must. Application of management practices in standing crop should be done right at the start of disease/pests attack initiation in protected plots.
- Effort be made for need based application of disease/pest management practices in protected plots.

PPT- 29: Eco friendly management of Zonate leaf spot of Sorghum

Location: Palampur
Treatments: 9 **Replications:** 3 **Design:** RBD **Plot size:** 3x2 m^2
Treatments:

T1	**:**	Three foliar spray of *Trichoderma viride* @ 0.5%
T2	**:**	Three foliar spray of *Psuedomonas flourescens* @ 0.5%
T3	**:**	Three foliar spray of Jeevamrit @ 10%
T4	**:**	Three foliar spray of Tamarlassi @ 10%
T5	**:**	Three foliar spray of extract of eupatorium ark @ 10%
T6	**:**	Three foliar spray of Azadirachtin 3000 ppm @ 0.3%
T7	**:**	Three foliar spray of Panchgavya @ 10%
T8	**:**	Three foliar spray of propiconazole @ 0.1% (Chemical control)
T9	**:**	Control

***Sprays will be given at 7 days interval starting from disease appearance.**
Observations:

- Disease severity (%) at 7 days interval starting from disease onset.
- AUDPC and rate of infection in different treatments
- Green Fodder Yield (q/ha)

PPT-30: Management of root rot and wilt in cowpea

Location: Bhubaneswar
Treatments: 8 **Replications:** 3 **Design:** RBD **Plot size:** 3x2 m^2
Treatments:

T1	**:**	Soil application of *T. viride* @ 4 kg/ha enriched in FYM @ 250 kg/ha as basal + seed treatment with *Trichoderma viride*@ 5g/kg seed
T2	**:**	Soil application of *T. viride* @ 4 kg/ha enriched in FYM @ 250 kg/ha as basal + seed treatment with *Pseudomonas fluorescens*@ 5g/kg seed
T3	**:**	Soil application of *T. viride* @ 4 kg/ha enriched in FYM @ 250 kg/ha as basal + seed treatment with *Bacillus subtilis*@ 5g/kg seed
T4	**:**	Soil application of *T. viride* @ 4 kg/ha enriched in FYM @ 250 kg/ha as basal + seed treatment with *Aspergillus niger*@ 5g/kg seed
T5	**:**	Soil application of *T. viride* @ 4 kg/ha enriched in FYM @ 250 kg/ha as basal + seed treatment with chitosan @ 0.05%
T6	**:**	Soil application of *T. viride* @ 4 kg/ha enriched in FYM @ 250 kg/ha as basal + seed treatment with neem seed extract @ 5%
T7	**:**	Soil application of *T. viride* @ 4 kg/ha enriched in FYM @ 250 kg/ha as basal + seed treatment with tebuconazole 2DS @ 1g/kg seed
T8	**:**	Control

Observations:

- Germination percentage
- Root rot and wilt incidence at weekly interval starting from disease onset
- AUDPC and rate of infection in different treatments
- Green fodder yield (q/ha)

PPT-31: Estimation of yield losses due to insect-pests in fodder sorghum

Location: Rahuri
Treatments: 8 **Replications:** 3 **Design:** RBD **Plot size:** 4x4 m^2

Treatments:

T1	**:**	Seed treatment with Thaimethoxam 30 FS @ 2g/kg of seed + spray at 7, 15, 25, 40, 75, 90 days after emergence (DAE)
T2	**:**	Seed treatment with Thaimethoxam 30 FS @ 2g/kg of seed + spray at 7, 15, 25 and 75 DAE
T3	**:**	Seed treatment with Thaimethoxam 30 FS @ 2g/kg of seed + spray at 7, 15, 40 and 90 DAE
T4	**:**	Seed treatment with Thaimethoxam 30 FS @ 2g/kg of seed + spray at 7, 15, 25 and 40 DAE
T5	**:**	Seed treatment with Thaimethoxam 30 FS @ 2g/kg of seed + spray at 7, 15, 75 and 90 DAE
T6	**:**	Seed treatment with Thaimethoxam 30 FS @ 2g/kg of seed + spray at 25, 40, 75 and 90 DAE
T7	**:**	Seed treatment with Thaimethoxam 30 FS @ 2g/kg of seed
T8	**:**	Control

Treatment information:

- Spray at 7 and 15 DAE of Azadirachtin 3000 ppm @ 2ml/ lit of water for management of shootfly
- Spray at 25 and 40 DAE of Emamectin benzoate 5 WG @ 0.5g /lit of water for management of fall armyworm
- Spray at 75 and 90 DAE of imidacloprid 17.8 SL @ 0.3ml/lit of water for management of aphids

Observations:

- Number of larva and adults of shootfly on five randomly selected leaves per plant (5 plants will be randomly selected/plot) and % damage (in terms of deadhearts) by shootfly at 5 days interval starting from pest emergence till pest presence.
- Number of larva and adults of armyworm on five randomly selected leaves per plant (5 plants will be randomly selected/plot) and % damage by armyworm at 5 days interval starting from pest emergence till pest presence.
- Number of nymphs and adults on five randomly selected plants and % damage by aphids at 5 days interval starting from pest emergence till pest presence.
- Green fodder yield (q/ha) in different treatments.
- Percent Yield loss in different treatments.

Annexure D

AICRP on Forage Crops & Utilization
National (DAC) indent for forage crops Breeder Seed Production (BSP-1)

Year of indent: Kharif-2021 **Year of Production:** Kharif-2020

[in quintals (Q)]

SN	Location	Name of variety	DAC Indent (q)	Quantities to be produced (q) BSP 1	Organization for whom seed is to be produced
MAIZE FODDER					
1	MPUAT, Udaipur	Pratap Makka Chari-6	0.50	0.50 q	0.50 (NDDB)
2	PAU, Ludhiana	J-1006	29.00	29.00	6.00 (PB), 4.50 (DADH), 2.90 (NDDB), 1.50 (NSC), 14.10 (SAI)
3	PJTSAU, Hyderabad	TSFM-15-5	2.0	2.0	1.50 (NDDB), 0.50 (NSC)
4	MPKV, Rahuri	African Tall Composite	36.34	15.94	11.50 (DADH), 0.24 (KK), 8.40 (NDDB), 12.00 (NSC) & 4.20 (SAI)
	IGFRI Jhansi			12.00	
	BAIF, Urulikanchan			8.40	
		Total	**67.84**	**67.84**	
BAJRA FODDER					
5	BAIF, Urulikanchan	BAIF Bajra-1	1.50	1.50	0.10 (NSC), 0.04 (PB),
6	PAU, Ludhiana	FBC-16	0.14	0.14	0.10 (NDDB), 0.20 (NSC), 0.20 (SAI)
7	PJTSAU, Hyderabad	TSFB-15-8	0.20	0.20	0.20 (NDDB),
8	PJTSAU, Hyderabad	TSFB-15-4	0.50	0.50	0.50 (NDDB),
9	PJTSAU, Hyderabad	Moti Bajra (APFB-09-1)	0.60	0.60	0.10 (NDDB), 0.50 (DADH)
10	IGFRI, Jhansi	AVIKA BAJRA CHARI (AVKB-19)	0.12	0.12	0.12 (NDDB)
11	ANDUAT, Ayodhya	NDFB-3	0.50	0.50	0.50 (NDDB)
12	CCS HAU, Hisar	HC-20 (HMP 9102)	0.05	0.05	0.05 (NDDB)
13	PAU, Ludhiana	PCB-165	0.04	0.04	0.04 (PB),
		Total	**3.65**	**3.65**	
COWPEA FODDER					
14	UAS (B) ZARS Mandya	MFC-09-1	1.70	1.70	1.20 (NDDB), 0.50 (NSC),
15	ICAR-IGFRI, Jhansi	Bundel Lobia -4	0.70	0.70	0.70 (NSC)
16	ICAR-IGFRI, Jhansi	Bundel Lobia -2	2.50	2.50	2.50 (DADH)
17	PJTSAU, Hyderabad	Vijaya	1.30	1.30	1.30 (NDDB),
18	GBPUAT, Pantnagar	UPC-625	0.50	0.50	0.50 (NDDB),
19	PAU, Ludhiana	CL-367	0.40	0.40	0.40 (PB)
20	GBPUAT, Pantnagar	UPC-4200	0.50	0.50	0.50 (NDDB),
21	UAS (B) ZARS Mandya	C-152	2.00	2.00	2.00 (NSC)
22	TNAU, Coimbatore	TNFC-09-26	0.50	0.50	0.50 (NSC)
23	ICAR-IGFRI, Jhansi	EC-4216	8.00	3.00	7.0 (DADH), 1.00 (UP)
	BAIF, Urulikanchan			3.00	
	MPKV, Rahuri			2.00	
		Total	**18.10**	**18.10**	
		Grand Total	**89.59**	**89.59**	

Institute wise allocation for breeder seed production

Institute /SAU/NGO	Crop	Variety	Quantity in Quintals (Q)
MPUAT, Udaipur	Maize Fodder	Pratap Makka Chari -6	0.50
PAU, Ludhiana	Bajra fodder	FBC-16	0.14
	Maize Fodder	J-1006	29.00
	Bajra fodder	PCB-165	0.04
	Cowpea fodder	CL-367	0.40
MPKV, Rahuri	Maize fodder	African Tall composite	15.94
	Cowpea fodder	EC 4216	2.00
PJTSAU, Hyderabad	Maize Fodder	TSFM-15-5	2.00
	Bajra fodder	TSFB-15-8	0.20
	Bajra fodder	TSFB-15-4	0.50
	Bajra fodder	Moti Bajra (APFB-09-1)	0.60
	Cowpea fodder	Vijaya	1.30
UAS(B) ZARS Mandya	Cowpea fodder	MFC-09-1	1.70
	Cowpea fodder	C-152	2.00
BAIF, Uralikanchan	Maize fodder	African Tall composite	8.40
	Bajra fodder	BAIF Bajra 1	1.50
	Cowpea fodder	EC 4216	3.00
ICAR-IGFRI, Jhansi	Cowpea fodder	EC 4216	3.00
	Cowpea fodder	Bundel Lobia -2	2.50
	Cowpea fodder	Bundel Lobia -4	0.70
	Maize fodder	African Tall composite	12.00
	Bajra fodder	Avika Bajra Chari (AVKB-19)	0.12
CCS HAU, Hisar	Bajra fodder	HC-20 (HMP 9102)	0.05
ANDUAT, Ayodhya	Bajra fodder	NDFB-3	0.50
GBPUAT, Pantnagar	Cowpea fodder	UPC-625	0.50
	Cowpea fodder	UPC-4200	0.50
TNAU, Coimbatore	Cowpea fodder	TNFC-09-26	0.50
		Total	**89.59**

Annexure E

FTDs allotted to different centres for conducting during Kharif 2020

Centre	BN hybrid	Rice bean	Maize	Pearl millet	Cowpea	Sorghum	Congo signal grass	Setaria	Other	**Total**
Jorhat	10						25	5		**40**
Bhubaneswar	5		5							**10**
Kalyani	10	10	10							**30**
Ranchi	20	10	20							**50**
Ayodhya	5			10						**15**
Jabalpur	5	5	5							**15**
Anand	10			10						**20**
Urulikanchan	10			10	5					**25**
Bikaner	5			10					Guar 5	**20**
Ludhiana	100									**100**
Hyderabad	20			15	5	5			Desmanthus 5	**50**
Mandya	10		5		5	10				**30**
Rahuri	5									**5**
Palampur	10							20		**30**
Srinagar			25							**25**
Imphal	3	5	15			10				**33**
Raipur			10			15				**25**
Vellayani	15				5		5			**25**
Pantnagar			5	5	5	10				**25**
Coimbatore	10				10				Guinea Grass 5	**25**
Hisar				15	5				Teosinte 5	**25**
Total	**253**	**30**	**100**	**75**	**40**	**50**	**30**	**25**	**20**	**623**

Annexure F

ICAR- ALL INDIA COORDINATED RESEARCH PROJECT ON FORAGE CROPS & UTILIZATION
(Indian Council of Agricultural Research)
NATIONAL GROUP MEET: *Kharif 2020*

Date: 1st June, 2020 **Venue:** On line Zoom or CISCO webex platform

TENTATIVE PROGRAMME

10:00-11:00	**INAUGURATION**
Chairman	**Dr. T. Mohapatra, Secretary DARE and Director General, ICAR**
Co-Chairman	Dr. T.R. Sharma, DDG (CS), ICAR
Welcome Address	Dr. A. K. Roy, Project Coordinator
Project Coordinator's Report	Dr. A. K. Roy, Project Coordinator
Remarks	Dr. V.K. Yadav, Director, ICAR-IGFRI, Jhansi
Remarks	Dr. Y.P.Singh, ADG (FFC), ICAR
Remarks	Dr. T.R.Sharma, DDG (CS), ICAR
Chairman's Address	Dr. T. Mohapatra, Secretary DARE and Director General, ICAR
Vote of Thanks	Dr. R K Agrawal, PI Agronomy AICRP

11:00-12:00 TECHNICAL SESSION-I: DISCIPLINE-WISE REPORT & Technical Programme Formulations – Forage Crop Improvement	
Chairman	**Dr. T. R. Sharma, Deputy Director General (Crop Science), ICAR**
Co-chairman	Dr. Y.P. Singh, ADG (FFC), ICAR
Convener	Dr. A. K. Roy, Project Coordinator
Report of Trials kharif 2019	Dr. Subhash Chand
Technical programme for kharif 2020	Dr. Subhash Chand
Rapporteurs	Dr. Seuji Bora Neog & Dr. Gayathri G

12:00-12:20 TECHNICAL SESSION-II: BREEDER SEED PRODUCTION	
Chairman	**Dr. Bhag Mal, Former Director IGFRI and regional coordinator, South Asia, Biodiversity International.**
Co-Chairman	Dr. D. K. Yadava, ADG (Seed), ICAR
BSP-IV report production kharif 2019	Dr. Subhash Chand, Scientist AICRP FC&U
BSP -1 Allocation for 2020Kharif	Dr. Subhash Chand, Scientist AICRP FC&U
Rapporteurs	Dr.Yogendra Kumar &Dr. Kalyan Jana

12:20-13:20 TECHNICAL SESSION-III: DISCIPLINE-WISE REPORT & Technical Programme Formulations – Forage Crop Production	
Chairman	**Dr. A. R. Sharma,Director Research RLB CAU, Jhansi**
Co-chairman	Dr. Y.P. Singh, ADG (FFC), ICAR
Convenor	Dr. A. K. Roy, Project Coordinator
Report of Trials kharif 2019	Dr. R. K. Agrawal
Technical programme for kharif 2020	Dr. R. K. Agrawal
Rapporteurs	Dr. S D Kumar & Dr S K Jha

13:20-14:15	**LUNCH**

14:15-15:00 TECHNICAL SESSION-IV: DISCIPLINE-WISE REPORT & Technical Programme Formulations – Forage Crop Protection	
Chairman	**Dr. Y. S. Paul, Former Head and Dean CSK HPKV Palampur**
Co-chairman	Dr. Y.P. Singh, ADG (FFC), ICAR
Convenor	Dr. A. K. Roy, Project Coordinator
Report of Trials 2019 kharif	Dr. N. R. Bhardwaj
Technical programme for kharif 2020	Dr. N. R. Bhardwaj
Rapporteurs	Dr. Ashlesha & Dr. Sandip Langde

15:00-15:15	TECHNICAL SESSION- V: FTD & TSP FORMULATION
Chairman	**Dr. V. K. Yadav, Director IGFRI**
Co-chairman	Dr. Y.P.Singh, ADG (FFC), ICAR
Convener	Dr. A. K. Roy, Project Coordinator
Rapporteurs	Dr. Maninder Kaur, Dr. R. Katoch

15:30-17:00	TECHNICAL SESSION-VI : PLENARY SESSION
Chairman	**Dr. T. R. Sharma, Deputy Director General (Crop Science), ICAR**
Co-Chairman	Dr. Y.P.Singh, ADG (FFC), ICAR
Convener	Dr. A. K. Roy, PC
Rapporteurs	Dr. R. K. Agrawal & Dr. Rahul Kapoor
Presentation of the recommendations by respective Rapporteurs	
Remarks	Dr. Y. P. Singh, ADG (FFC), ICAR
Remarks	Dr. D. K. Yadava, ADG (Seed), ICAR
Remarks	Dr. V. K. Yadav, Director, IGFRI ,Jhansi
Chairman's Remarks	Dr. T. R. Sharma, DDG (CS), ICAR
Vote of Thanks	Dr. A. K Roy

Expert panel

1. Dr. Bhag Mal
Ex Director IGFRI and Biodiversity International coordinator for SE Asia.
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2. Dr. A. K. Tyagi
Asstt. Director General, Animal Nutrition
ICAR, New Delhi
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3. Dr. Y.S. Paul
Ex Professor and Dean,
College of Agriculture, CSKHPKV, Palampur
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4. Dr. D. R. Malaviya
Principal Scientist and Head, CI Division, IISR, Lucknow.
e mail: drmalaviya47@rediffmail.com

5. Dr. B. K. Sahoo
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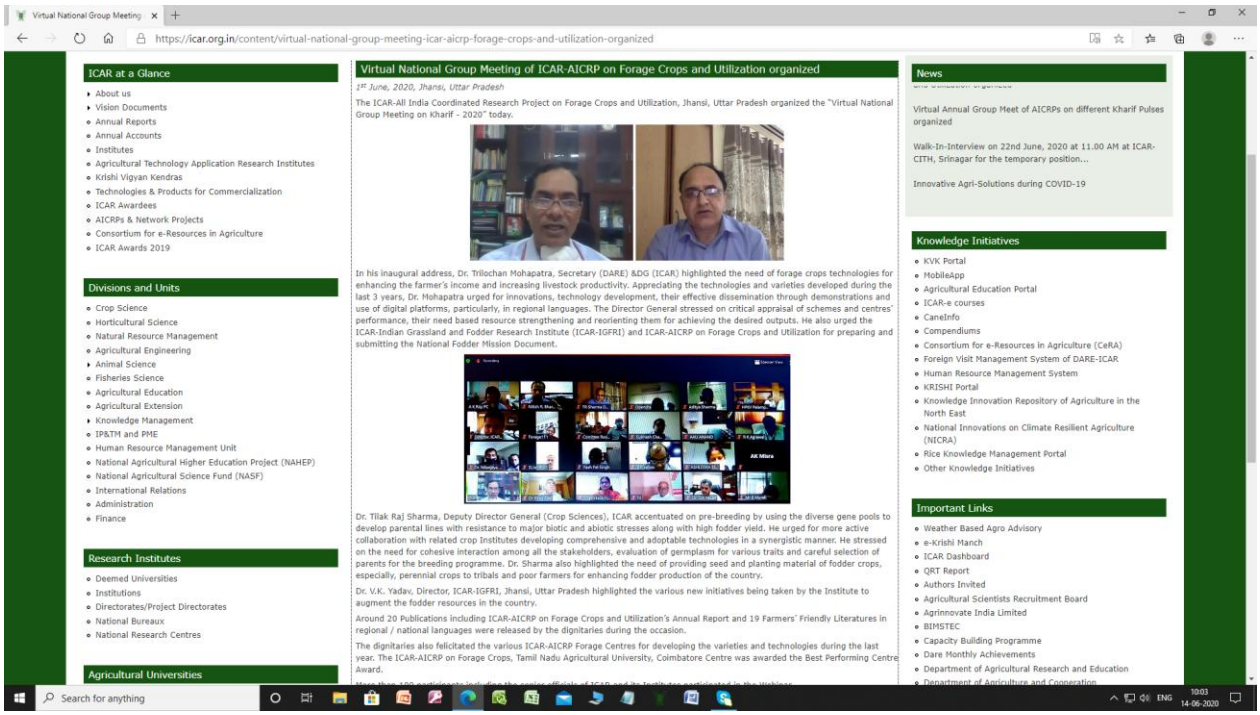
Glimpses of Media Coverage

Annexure G



Annexure H

ALL INDIA COORDINATED RESEARCH PROJECT ON FORAGE CROPS AND UTILIZATION
(INDIAN COUNCIL OF AGRICULTURAL RESEARCH)
NATIONAL GROUP MEET– Kharif - 2020
On line video conference
Date: 1st June, 2020

List of participants

1.	Dr. T. Mohapatra, Secretary, DARE & Director General, I.C.A.R.
2.	Dr. T. R. Sharma, DDG (Crop Science), I.C.A.R.
3.	Dr. Y. P. Singh, ADG (FFC), I.C.A.R.
4.	Dr. D. K. Yadava, ADG (Seeds), I.C.A.R.
5.	Dr. A. K. Tyagi, ADG (Animal Nutrition), ICAR
6	Director, RFS, P.O. Cattle Farm Avadi, Alamadhi, Chennai 600 052
7	Director, Regional Fodder Station, Hisar 125 002
8	Director, Regional Fodder Station, District-Rangareddy-501510, Telangana
9	Director, Regional Fodder Station, Kalyani, Distt. Nadia (W.B.)-741251
10	Director, Regional Fodder Station, Dhamrod, Ankaleshwar, Gujarat.
11	Director, Regional Fodder Station, Camp Office, 618/A, Gandhinagar, Jammu 180 004 (J&K)
12	Director, CFSPF, Regional Fodder Station Hessarghatta, Bangalore North Bangalore 560 088
13	Director, Regional Fodder Station, Suratgarh-335 804 (Rajasthan)
14	Dr. A. R. Sharma, Director Research, Rani Laxmi Bai Central Agricultural University, Jhansi
15	Dr. D. S. Phogat, Scientist, (Plant Breeding) , Head Forage Section, CCS HAU, Hisar
16	Dr. Naveen Kamboj, Asstt. Scientist (Agronomy), CCS HAU, Hisar
17	Dr. Meenakshi, Asstt. Scientist (Plant Breeding), CCS HAU, Hisar
18	Dr. A. S. Godara OIC, AICRP-FC&U, SKRAU, Bikaner
19	Dr. R. C. Bairwa, Asstt. Prof. (Agro.) , SKRAU, Bikaner
20	Dr. Ramesh Yadav, Agronomist & OIC, AICRP-FC, ANDUAT, Ayodhya
21	Dr. M. S. Pal, Prof. Agronomy & OIC, AICRP-FC, GBPUAT, Pantnagar
22	Dr. Birendra Prasad , Plant Breeding, GBPUAT, Pantnagar
23	Dr. Yogendra Prasad, Jr. Scientist, Plant Breeding, BAU, Ranchi
24	Dr. Birendra Kumar, Jr. Scientist (Agronomy), BAU, Ranchi
25	Dr. K. K. Sharma, Pr. Scientist (Agronomy) & OIC, AICRP-FC, AAU, Jorhat
26	Dr. S. Bora Neog, Pr. Sci. (Plant Breeding), AAU, Jorhat
27	Dr. Naveen Kumar, Sr. Agronomist & OIC, AICRP-FC, CSK HPKV, Palampur
28	Dr. V. K. Sood, Sr. Forage Breeder, CSK HPKV, Palampur
29	Dr. R. Katoch, Sci. (Biochemistry), CSK HPKV, Palampur
30	Dr. D. K. Banyal, Sr. Sci. (Plant Pathology) , CSK HPKV, Palampur
31	Dr. A. K. Mehta, Sr. Forage Breeder & OIC, AICRP-FC, JNKVV, Jabalpur
32	Dr. AmitJha, Jr. Scientist (Agronomy), JNKVV, Jabalpur
33	Dr. T. Sashikala, Sr. Scientist (Plant Breeding) & OIC, AICRP –FC, PJTSAU, Hyderabad
34	Dr. B. Murali, Scientist (Agronomy) , PJTSAU, Hyderabad
35	Dr. K. Shailaja, Scientist (Biochemistry) , PJTSAU, Hyderabad
36	Dr. Usha C Thomas, Astt. Professor (Agronomy) OIC AICRP –FC, KAU Vellayani
37	Dr Gayathri. G., Astt. Professor (Plant Breeding), KAU Vellayani
38	Dr. P. Mahadevu, Sr. Breeder & OIC AICRP –FC, UAS (B), ZARS Mandya
39	Dr. B. G. Shekara, Scientist (Agronomy), UAS (B), ZARS Mandya
40	Dr. P.P. Surana, Sr. Forage Breeder & OIC AICRP –FC, MPKV, Rahuri
41	Dr Sandip Langde, Entomologist, MPKV, Rahuri
42	Dr. S.V. Damame, Scientist (Bio Chemistry), MPKV, Rahuri
43	Dr. Niteen Janardan Danawale, Scientist (Agronomy), MPKV, Rahuri
44	Dr. D. P. Gohil, Research Scientist & OIC, AICRP-FC, AAU, Anand
45	Dr. Hiren kumar Kantilal Patel, Assistant Research Scientist, AAU, Anand
46	Dr. Rathod Paresh kumar Himmatlal, Soil Science/Biochemistry, AAU, Anand
47	Dr. Rahul Kapoor, Sr. Forage Breeder, PAU, Ludhiana
48	Dr. Meenakashi Goyal, Asstt. Biochemist, PAU, Ludhiana
49	Dr. Ashesha Dhingra, Astt. Plant Pathology, PAU, Ludhiana
50	Dr Maninder Kaur, Agronomist, PAU, Ludhiana

51	Dr. C. Babu, Assoc. Prof (PB)& OIC AICRP –FC, TNAU, Coimbatore
52	Dr. S. D. Sivakumar, Asstt. Prof. (Agronomy) , TNAU, Coimbatore
53	Dr. Kalyan Jana, Agronomist & OIC AICRP –FC, BCKV, Kalyani
54	Dr. Sutanu Sarkar, Plant Breeder, BCKV, Kalyani
55	Mr. P.S. Takawale, Forage Breeder & OIC, AICRP –FC, BAIF, Uralikanchan
56	Mr. R. V. Kale, Scientist (Agronomy) , Uralikanchan
57	Dr. Noor Saleem Khuroo, Sr. Scientist (PB), SKUAST-K, Srinagar
58	Dr Zahida Scientist (Agronomy)), SKUAST-K, Srinagar
59	Dr. S.K. Jha (Agronomy) & OIC, AICRP-FC, IGKV, Raipur
60	Dr Sunil Verma, Scientist (Plant Breeding), , IGKV, Raipur
61	Mr. R. Joseph Koireng, Jr. Agronomist (Agronomy) & OIC, AICRP-FC, CAU, Imphal
62	Dr. Nilanjay, Scientist (Plant Breeding), RPCAU, Pusa
63	Dr. Gangadhar Nanda, Assistant Professor (Agronomy) , RPCAU, Pusa
64	Dr. Arabinda Dhal, Jr. Pathologist & OIC, AICRP-FC, OUAT, Bhubaneswar
65	A. S. Dhane, Jr. Entomologist / Forage scientist, BSKKV, Palghar
66	SK Gupta,Senior Scientist (Pearl millet Breeding), ICRISAT
67	Dr. J. K. Bisht, PS (Agronomy), VPKAS, Almora
68	Dr Anjali Kak, Principal Scientist, NBPGR, New Delhi
69	Dr. M. P. Rajora, Principal Scientist (PB), CAZRI, Jodhpur
70	Dr. Sujoy Rakshit, Project Director, IIMR, Ludhiana
71	Dr S.L. Jat, Scientist (Agronomy) , IIMR, Ludhiana
72	Dr. Vilas A Tonapi, Director, IIMR, Hyderabad
73	Dr Venkatesh Bhat , Principal Scientist , IIMR, Hyderabad
74	Dr. G Chary, Director ICAR-CRIDA, Hyderabad
75	Dr D K Agarwal, Director ICAR-IISS, Mau
76	Dr. Tara C Satyavathi , Project Coordinator , AICPMIP, Mandor
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78	Dr. Aditya Sharma, Advanta India Limited, Secunderabad 500 009 (Telengana)
79	Dr BhuvanParihar, JK Agri. Genetics Limited 1 Hyderabad 500 016 (Telengana)
80	Dr Rajan Gupta, Rasi Seeds Pvt. Ltd, Bengaluru
81	Ch. Mahanand, Kanchan Ganga Seeds,
82	Dr ASN Reddy, SIRA Seeds, Krithika Layout opp. Image garden, Bengaluru
83	Dr. Ravindra babu, Principal Breeder-Maize, Nuziveedu Seeds Ltd, Kandlakoya, Hyderabad
84	Dr.Bhag Mal, Ex Director IGFRI, *Trust for Advancement of Agricultural Sciences (TAAS)*
85	Dr. D. R. Malaviya, Principal Scientist and Head, CI Division, IISR, Lucknow.
86	Dr. B. K. Sahoo, Dean, Institute of Agricultural Sciences, Siksha 'O'Anusandhan University, Bhubaneswar
87	Dr. A. K. Tyagi, Asstt. Director General, Animal Nutrition, ICAR, New Delhi
88	Dr. Y.S. Paul, Ex Professor and Dean, College of Agriculture, CSKHPKV, Palampur
89	Dr. V. K. Yadav, Director, IGFRI, Jhansi
90	Dr. R V Kumar Head, Grassland and Silvi-pasture Management Division, IGFRI, Jhansi
91	Dr S. Ahmad Head, Crop Improvement Division, IGFRI, Jhansi
92	Dr A K Mishra Head, Plant Animal Relationship Division, IGFRI, Jhansi
93	Dr Sunil Kumar Head, Crop Production Division, IGFRI, Jhansi
94	Dr Khem Chand, Head, Social science Division, IGFRI, Jhansi
95	Dr P K Pathak, Head, FM&PHT, IGFRI, Jhansi
96	Dr Geetanjali Sahay, PS, Genetics and Plant Breeding, IGFRI, Jhansi
97	Dr Tejveer Singh, PS, Genetics and Plant Breeding, IGFRI, Jhansi
98	Dr. Suheel A Dand, In charge IGFRI RRS Srinagar
99	Dr S S Meena, In charge IGFRI RRS Avikanagar
100	Dr B G Shivakumar, In-charge IGFRI RRS Dharwad
101	Dr K Sridhar, PS Genetics and Plant Breeding, IGFRI RRS Dharwad
102	Dr. A. K. Roy, Project Coordinator, AICRP Forage, Jhansi
103	Dr. R. K. Agrawal, Principal Scientist (Agronomy) , AICRP Forage, Jhansi
104	Dr. Nitish Ratan Bhardwaj, Scientist (Pl. Pathology) , AICRP Forage, Jhansi
105	Dr. Subhash Chand, Scientist (Plant Breeding) , AICRP Forage, Jhansi