कार्यवृत्त

राष्ट्रीय समूह बैठक : खरीफ-2023

चौधरी सरवन कुमार हिमाचल प्रदेश कृषि विश्वविद्यालय, पालमपुर

15-16 जून, 2023

PROCEEDINGS

National Group Meeting : *Kharif*-2023

CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur

15-16 June, 2023

अखिल भारतीय समन्वयित अनुसंधान परियोजना चारा फसलें एवं उपयोगिता

(भारतीय कृषि अनुसंधान परिषद)

All India Coordinated Research Project on Forage Crops & Utilization

(Indian Council of Agricultural Research)

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

http://www.aicrponforagecrops.icar.gov.in

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AICRP on Forage Crops and Utilization
Tech. Pub. Number- 04/2023

Proceedings of the National Group Meeting : *Kharif*-2023

(Held at CSKHPKV-Palampur during 15-16 June, 2023)

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June, 2023

PREFACE

The National Group Meet, *Kharif* 2023 of All India Coordinated Research Project on Forage Crops and Utilization' was organized at CSKHPKV, Palampur during 15-16th June 2023 with the objectives to review the accomplishments of technical programme executed during *Kharif* 2022 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 were discussed in detailed. The formulation and finalisation of technical programme for *Kharif* 2023 was finalized and discussion on other future research priorities for the forage crops were organized.

The meeting was attended by the scientists of different AICRP coordinating centres and cooperating centres, officials engaged in forage research and development 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 proceeding report include report of the National Group Meet, *Kharif* 2023 covering highlights on forage crop improvement, forage crop production, forage crop protection and proceedings of different technical sessions. The finalized technical programme on forage crop improvement, forage crop production, forage crop protection and new initiatives for *Kharif* 2023 have been given in annexure. The compilation also include major recommendations, session wise recommendations, and proceedings of Variety Identification Committee meeting and details of different technical sessions.

The successful conductance of the event is outcome of the joint efforts made by the authorities of ICAR, IGFRI and CSKHPKV, Palampur, 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 are highly thankful to the authorities at ICAR, particularly Dr. Himanshu Pathak, Secretary DARE & Director General, ICAR, Dr. T. R. Sharma, Deputy Director General (Crop Science), Dr H. K. Chaudhary, Vice Chancellor, CSKHPKV, Palampur, Dr S K Pradhan, Assistant Director General (Food & Fodder Crops), Dr D K Yadav, Assistant Director General (Seeds), Dr Sunil Kumar, Director, ICAR-IIFSR, Meerut 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. Amaresh Chandra, Director ICAR-IGFRI, Jhansi and Heads of Divisions, scientists, administrative and finance personnel for their constant support.

Date: 20/08/2023

[Vijay K Yadav]
Project Coordinator

AICRP on Forage Crops and Utilization
National Group Meeting –Kharif 2023
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CSKHPKV, Palampur

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AICRP on Forage Crops and Utilization
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Technologies developed and major recommendations

Varieties identified

- **Forage Maize entry DHF-2 :** Developed by G. B. Pant University of Agriculture & Technology, Pantnagar. The entry was identified for release in the states of Punjab, Haryana, Rajasthan, Tarai parts of Uttarakhand, Gujarat, Chhattisgarh, Madhya Pradesh, Maharashtra and Uttar Pradesh.
- **Forage Maize entry AFH-7:** Developed by ICAR-Indian Agricultural Research Institute, New Delhi. The entry was identified for release in Punjab, Haryana, Rajasthan, and Tarai parts of Uttarakhand.
- **Forage Maize entry HQPM-28:** Developed by Chaudhary Charan Singh Haryana Agricultural University, Hisar, the entry was identified for release in the states of Gujarat, Chhattisgarh, Madhya Pradesh, Maharashtra, and Uttar Pradesh.
- **Forage Maize entry PFM-13:** Developed by Punjab Agricultural University, Ludhiana, the entry was identified for release in the states of Gujarat, Chhattisgarh, Madhya Pradesh, Maharashtra, and Uttar Pradesh.
- **Forage Pearl Millet entry 16ADV0111:** Developed by UPL Limited, Hyderabad, the entry was identified for release in the states of Punjab, Haryana, Rajasthan, plain parts of Uttarakhand, Uttar Pradesh, Bihar, Jharkhand, West Bengal, Odisha, Assam, Gujarat, Chhattisgarh, Madhya Pradesh, Maharashtra, Tamil Nadu, Telangana, Andhra Pradesh and Karnataka.
- **Forage Pearl Millet entry FBL-4:** Developed by Punjab Agricultural University, Ludhiana, the entry was identified for release in the states of Punjab, Haryana, Rajasthan, plain parts of Uttarakhand, Tamil Nadu, Telangana, Andhra Pradesh and Karnataka.
- **Forage Pearl Millet entry PHBF-5 :** Developed by Punjab Agricultural University, Ludhiana the entry was identified for release in the states of Punjab, Haryana, Rajasthan, and plain parts of Uttarakhand.
- **Forage Pearl Millet entry TSFB-1610:** Developed by Professor Jayashankar Telangana State Agricultural University, Hyderabad the entry was identified for release in the states of Punjab, Haryana, Rajasthan, and plain parts of Uttarakhand.
- **Forage Pearl Millet entry JPM-18-37:** Developed by Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, the entry was identified for release in the states of Punjab, Haryana, Rajasthan, and plain parts of Uttarakhand.
- **Bajra × Napier Hybrid entry TSBN-15-15:** Developed by Professor Jayashankar Telangana State Agricultural University, Hyderabad the entry was identified for release in the states of Gujarat, Chhattisgarh, Madhya Pradesh, Uttar Pradesh, Maharashtra, Tamil Nadu, Telangana, Andhra Pradesh and Karnataka.
- **Bajra × Napier Hybrid entry BNH-26:** Developed by BAIF, Urulikanchan, the entry was identified for release in the states of Gujarat, Chhattisgarh, Madhya Pradesh, Uttar Pradesh and Maharashtra.

Forage Crop Production Technologies

PGRs and micronutrients for yield and quality improvement in Himachal Pradesh

In Himachal Pradesh, soil application of 5 kg Zn + 2 kg B/ha + triacontanol (10 ppm) as foliar spray at 30 DAS to Forage Sorghum is recommended. It has potential to produce higher green fodder, dry matter and crude protein yield (417.1 q, 107.7 q and 9.7 q/ha respectively). The yield advantage was 20.4, 27.9 and 29.3 % over control, respectively. The technology gave net return of Rs. 70000.00 with B: C ratio of 2.2. It also improved the content of Zn and Boron in fodder (18.3 and 18.2 ppm, respectively) as well as in soil (0.57 and 0.51 ppm, respectively).

PGRs and micronutrients for yield and quality improvement in Karnataka

In Karnataka, soil application of 5 kg Zn + 2 kg B/ha + salicylic acid (100 ppm) as foliar spray at 30 DAS to Fodder Maize is recommended. It has potential to produce high green fodder, dry matter and crude protein yield (503.8 q 129.5 q/ha and 9.9 q/ha, respectively). The yield advantage was 36.3, 46.1 and 66.5% over control (only water), respectively. The technology gave net return of Rs. 63000.00 with B: C ratio of 2.72. It also improved the content of Zn and Boron in fodder (22.7 and 20.3 ppm, respectively as compared to 16.7 and 15.4 ppm in control) as well as in soil (1.08 and 0.43 ppm, respectively).

PGRs and micronutrients for yield and quality improvement in Union territory of J&K

In Union territory of J&K, soil application of 5 kg Zn + 2 kg B/ha + triacontanol (10 ppm) as foliar spray at 30 DAS to Forage Sorghum is recommended. It has potential to produce high green fodder, dry matter and crude protein yield (462.1 q, 115.3 q and 10.40 q/ha respectively). The yield advantage was 23.8, 21.0 and 29.3 % over control, respectively. The technology gave net return of 93000.00 Rs./ha with B: C ratio of 2.02. It also improved the content of Zn and Boron in fodder.

PGRs and micronutrients for yield and quality improvement in Uttar Pradesh

In Uttar Pradesh, soil application of 5 kg Zn + 2 kg B/ha + triacontanol (10 ppm) as foliar spray at 30 DAS to Forage Sorghum is recommended. It has potential to produce high green fodder, dry matter and crude protein yield (562.5 q, 157.4 q and 12.10 q/ha respectively). The yield advantage was 23.8, 21.0 and 33.3 % over control, respectively. The technology gave net return of 96000.00 Rs./ha with B: C ratio of 3.70. The fodder contained 18.56 and 18.2 ppm, Zn and Boron in fodder respectively (on par with control) as well as in soil (0.71 and 0.45 ppm, respectively).

Nitrogen and cutting management forage availability from pearl millet in Chhattisgarh

In Chhattisgarh, during *Kharif* season under rain fed condition, pearl millet variety BAIF Bajra-1 supplemented with 120 kg ha^{-1} nitrogen under three cutting; first cut at 50 days after sowing, second cut at 35 days after first cut and third cut at 50% flowering is recommended. It has potential to produce 620 q green fodder, 155 q dry fodder, 9.32 q CP Yields with 5.30 q green fodder ha^{-1} day^{-1}. It resulted in net monetary return of Rs 64720 with B: C ratio of 3.36. This also improved NPK uptake by the crop by 15.1, 14.9 and 12.7%, (91.17, 26.5 and 54.39 kg $ha^{-1,}$ respectively in TSFB 15-4 with 80 kg N ha^{-1}), as well its content in soil. The relative advantage in green fodder, dry matter and CP yields was 9.9, 9.5 and 17.2% over TSFB 15-4 with 80 kg N ha^{-1}.

Nitrogen and cutting management forage availability from pearl millet in Bihar

In Bihar during *Kharif* season under rain fed conditions, pearl millet variety BAIF Bajra-1 supplemented with 120 kg ha^{-1} nitrogen under two cuts schedule of (first cut at 50 days after sowing and second at 50% flowering) is recommended. It has potential to produce 694 q green fodder, 146 q dry fodder and 11.4 q CP yields ha^{-1}. It resulted in net monetary return of Rs 71433 with B: C ratio of 3.20. This also improved NPK uptake by the crop by 27.7, 34.6 and 28.9% (141.5, 45.0 and 88.8 kg ha^{-1} respectively in TSFB 15-4 with 80 kg N ha^{-1}), as well its content in soil. The relative advantage in green fodder, dry matter and CP yields was 13.1, 17.4 and 21.5%, respectively over TSFB 15-4 with 80 kg N ha^{-1}.

Nitrogen and cutting management forage availability from pearl millet in Punjab

In Punjab, during *Kharif* season under rain fed conditions, pearl millet variety TSFB 15-8 supplemented with 120 kg ha^{-1} nitrogen under three cutting; first cut at 50 days after sowing second cut at 35 days after first cut and third cut at 50% flowering is recommended. It has potential to produce 600.7 q green fodder, 109.2 q dry fodder and 9.4 q CP yields ha^{-1}. It resulted in net monetary return of Rs 90000 and B: C ratio of 3.1. This also improved NPK uptake by the crop by 37.4, 37.3 and 37.2% (133.8, 30.87 and 41.2 kg ha^{-1} respectively in TSFB 15-4 with 80 kg N ha^{-1}), as well its content in soil. The relative advantage in green fodder, dry matter and CP yields was 24.8, 29.5 and 31.2% respectively over TSFB 15-4 with 80 kg N ha^{-1}.

Forage Crop Protection Technologies

Management of leaf blast in forage pearl millet

- Seed treatment with tebuconazole + trifloxystrobin @ 1 g/kg seed + foliar spray of tebuconazole + trifloxystrobin @ 0.4 g/L resulted in higher disease control (38.9%), increased green fodder yield (44.9%) and thus can be recommended for the management of leaf blast in fodder pearl millet in North-West zone.
- Seed treatment with tricyclazole @ 0.6 g/kg seed and foliar spray of same fungicide @ 0.3 g/L resulted in higher disease control (68.1%), increased green fodder yield (24.3%) and thus can be recommended for management of leaf blast in fodder pearl millet in North-East and Hill zone.

Management of invasive insect-pest fall armyworm, *Spodoptera frugiperda* L. on Forage Maize

- Foliar spray of Emamectin benzoate 5 WG @ 0.5g/L resulted in lowest fall armyworm infestation (6.07%), increased green fodder yield (43.48%) and thus can be recommended for the management of fall armyworm in fodder maize in South, North-East and North-West zones.

Major Recommendations

- Development of bio-fortified and nutritionally rich varieties in all forages needs to be given high priority and quality standards for different forage crops should be developed.
- Pre-breeding activities for genetic resource enrichment in different forage crops should be initiated at all the centers.
- Seed production chain needs to be strengthened by developing seed production technologies and seed standards in all important forage crops.
- More focus on dual purpose varieties/ hybrids/multi cut and development of varieties for silage production and its commercialization.
- Varieties and technologies generated under the AICRP should be transferred to the state governments and special efforts needs to be made for their commercialization.
- Brainstorming sessions should be organized and common strategy may be developed to overcome the acute shortage of quality seeds by involving different stakeholder's viz. private companies, dairy cooperatives, NDDB, NSC, SSC, DAC and DADF etc.
- Fodder Technologies including improved varieties, fodder production, protection and post-harvest technologies needs to be disseminated in high fodder deficit districts/ states in collaboration with the government agencies.
- AICRP (Forage crops) centers should explore the possibilities for the collaborations of activities with ongoing AICRP (Integrated farming system) and ensures induction of fodder components in established models.
- Post-harvest technologies should be developed and popularized to meet the demand in lean seasons especially in the hilly areas.
- Forage trees should also be evaluated for various nutritive and anti-nutritional parameters.

INAUGURAL SESSION

All India Coordinated Research Project on Forage Crops and Utilization, Jhansi organized its National Group Meeting Kharif-2023 on 15-16 June, 2023 at CSKHPKV, Palampur. Dr. Tilak Raj Sharma, Deputy Director General (Crop Science), ICAR, graced the occasion as chief guest. Dr. D.K. Yadava, ADG (Seeds), Dr. S.K. Pradhan, ADG (FFC), Dr. Amaresh Chandra, Director (ICAR-IGFRI Jhansi), Dr. Sunil Kumar, Director, (ICAR-IIFSR, Meerut) and Dr. S.P. Dixit, Director Research, (CSKHPKV, Palampur) were present as guests of honour. The inaugural session was chaired by Prof. (Dr.) H.K. Chaudhary, Hon'ble Vice Chancellor, CSKHPKV, Palampur.

Dr S P Dixit, Director Research, CSKHPKV, Palampur welcomed all the dignitaries and participants. He emphasized that special attentions needs to be given in fodder technology research and their dissemination in hilly states looking into acute shortage of green fodder.

Dr Sunil Kumar, Director, ICAR-IIFSR, Meerut emphasized for the close association amongst different AICRPs and institutes specially AICRP (IFS), AICRP (Agro-forestry) and AICRP (Forage Crops). He also suggested that availability of quality seeds and planting material needs to be increased for enhancing fodder production.

Dr Amaresh Chandra, Director IGFRI, Jhansi highlighted the various initiatives taken by IGFRI in developing new technologies and fodder technology adoption. He also emphasized for the mechanization of fodder production and conservation. He also stressed that pasture/ grassland rejuvenation must be on priority in the programmes.

Dr S K Pradhan, ADG (FFC), ICAR emphasized that development of dual purpose varieties in crops like maize, pearl millet and cowpea should be given priority. Efforts should be directed to breed varieties with low anti-nutritional attributes, resilient to changing climate and tolerant to emerging biotic stresses applying Marker Assisted Selection and other genomic tools.

Dr D K Yadav, ADG (Seeds), ICAR called for strengthening seed chain in different crops, incorporation of new varieties under seed indent and availability of quality seeds must be increased. He also urged to forage crop researchers to develop technologies for enhancing seed production in low seed producing crops like grasses. He stressed to take advantages of different programmes being implemented by the Department of Agriculture & Farmers Welfare and Department of Animal Husbandry and Dairying for the strengthening seed production and processing facilities.

Dr H K Chaudhary, Vice-chancellor, CSKHPKV, Palampur appreciated the efforts and contribution made by forage researchers in enhancing fodder production in the country. He stressed for more focussed research on temperate forages and grasslands due their ecological importance in sustaining mountain ecosystem. He opined that participatory research involving private companies, farmers, cooperatives, and seed producers should be explored.

Dr T R Sharma, Deputy Director General (Crop Science) in his address expressed satisfaction on the progress of the project for addressing the new challenges in fodder crops. He suggested for the strengthening of germplasm enhancement, pre-breeding activities, development nutritionally rich fodder crop varieties, multi-cut legume varieties and development of seed standards for all remaining forages.

He stressed that fodder conservation and storage modules needs to be developed for different agro-climatic situations. Inter-institutional linkages and coordination with state and center agencies should strengthened for enhancing quality seed availability. More emphasis needs to be given for the use of MAS and genome editing technologies to expedite the breeding programmes and human resources should be developed. Technologies viz., fodder production and protection should be incorporated in package of practices and better linkages should be developed with the KVKs. He appreciated the efforts made to develop forage gardens and also suggested to increase its number across the nation.

In Project Coordinator's report, Dr. Vijay K Yadav presented the brief introduction, salient achievements and new initiatives. He emphasized that in last few years Golden Jubilee Forage Gardens were established in >50 centers and relevant information have been compiled. He also presented brief report on the achievements of new initiatives.

Ten publications including AICRP FCU Annual Report Kharif 2022, 02 books on "Forage Garden: Innovative Approach for Fodder Technologies Dissemination" and "Nutritional Scenario of Forages in Mid Himalayas" along with several farmers friendly literature in regional languages were released. Certificate of appreciation was presented to centers for their contributions in developing technologies. The superannuating scientist was felicitated.

More than 80 participants from all over the country attended the meeting which included officials from ICAR, Institutes, representatives of private and public sector companies, Ministry of Animal Husbandry and Dairying, officers from state government, scientists of AICRP FCU centers, IGFRI and other ICAR institutes.

TECHNICAL SESSION – I
(Discipline wise review report)

Chairman	Dr. S. K. Pradhan, ADG (FFC), ICAR, New Delhi
Co-chairman	Dr. Amaresh Chandra, Director, IGFRI
Forage crop Improvement	Dr. Subhash Chand
Forage crop Production	Dr. R. K. Agrawal
Forage crop Protection	Dr. Ashlesha Singla
Rapporteurs	Dr. Gayathri G. & Dr. D.K. Banyal

Forage Crop Improvement

Dr. Subhash Chand, Scientist (GPB), PI, Crop Improvement, AICRP on Forage Crops and Utilization presented the results of forage breeding and quality evaluation trials conducted during Kharif 2022. A total of 16 trials in four annual crops (Maize, Pearl millet, Cowpea and Rice bean) and 3 perennial crops (Bajra x Napier hybrid, *Setaria anceps* and *Dicanthium annulatum*) at 32 locations were conducted. A total of 130 entries including 87 annuals and 43 perennials were tested. The summary of the trials is as follows:

In IVT maize, twenty nine entries were tested along with three national checks at 20 locations in five zones. Fourteen entries (ADFM-4; ADFM-5; AFM-23; AH4688; BMC-1853; DFH-2022-1; HPFM-12; IFH10-21 K2; KDFM-8; MAH 15-84; PMC-14; PMC-15; PMC-16; RCRMH2) performed better and can be considered for promotion to AVT-1 in all five zones.

In AVT-1 maize, six entries with three checks were tested at 20 locations in all zones. Four entries (CMH-12-686; FSM2021-1; MFM-18-2; PJHM-1) of AVT-1 performed better and can be considered for promotion to AVT-2.

In AVT-2 maize, four entries with three checks were tested at 19 locations in HZ, NWZ, NEZ and CZ and all four (DFH-2; AFH-7; PFM-13 and HQPM-28) outperformed check varieties in all locations and were recommended for VIC.

In AVT-2 (seed) of maize, same entries were tested and reported.

In IVT pearl millet, seven entries along with two national checks and one zonal check were tested at 19 centers in NE, NW, South and Central zones. Four entries (ADV 2285; JHPM-22-2; JPM-18-74; SBH 002) performed well in NWZ and NEZ and can be considered for promotion to AVT-1.

In AVTPM- 1 pearl millet, six entries with two national checks and one zonal check were evaluated at 19 locations in four zones (NW, NE, Central and SZ). Based on performance, four entries (ADV175020; FBL-7; FSB2021-1; JPM-18-71) can be considered for promotion to AVTPM-2 in all tested zones.

In AVTPM-2 Pearl millet and AVTPM-2 (seed) pearl millet, five entries with two national and one zonal check were tested across 19 locations in four zones and all five (JPM 18-37; 16ADV0111; TSFB-1610; PHBF-5 and FBL 4) outperformed check varieties in all locations and were recommended for VIC.

In IVT cowpea, ten entries with three checks were tested at 28 locations in all five zones. Four entries (MFC-18-4; PFC-45; UPC-22-1; UPC-22-2) can be considered for promotion to AVT-1 in all zones.

In AVT-1 Cowpea, four entries with three checks were tested at 13 locations in NE and Central zones. None of the entries could perform significantly better than checks.

In IVT-Ricebean, three entries were tested against 2 checks at 10 locations in NEZ and CZ and none were found to be performing significantly better than the checks.

In AVTRB-1 Rice bean, four entries with two checks were tested at 10 locations in NE and Central zones. The entry JOR-21-1 was promoted for AVT-2.
In VTBN (perennial): Bajra Napier Hybrid perennial trial, fourteen entries were tested in 20 locations in all five zones and TSBN-15-15 was found superior to the checks in all five zones.

The perennial trials on *Setaria*, Bajra Napier Hybrid and *Dicanthium annulatum* started in 2022 and are presently in the establishment year and will continue as such in coded form.

Forage Crop Production

Dr. R. K. Agrawal, Principal Scientist & PI (Agronomy) presented the detailed report of 12 experiments (6 coordinated, 2 AVT & 4 location specific) conducted at 63 locations. The results of various experiments were presented and following recommendations were given:

Recommendations from the results of the experiment entitled 'Yield enhancement and bio-fortification of *kharif* forages with PGRs and micronutrients'

1. In Himachal Pradesh, soil application of 5 kg Zn + 2 kg B/ha + triacontanol (10 ppm) as foliar spray at 30 DAS to Forage Sorghum is recommended. It has potential to produce higher green fodder, dry matter and crude protein yield (417.1 q, 107.7 q and 9.7 q/ha, respectively). The yield advantage was 20.4, 27.9 and 29.3 % over control, respectively. The technology gave net return of Rs. 70000.00 with B: C ratio of 2.2. It also improved the content of Zn and Boron in fodder (18.3 and 18.2 ppm, respectively) as well as in soil (0.57 and 0.51 ppm, respectively).
2. In Karnataka, soil application of 5 kg Zn + 2 kg B/ha + salicylic acid (100 ppm) as foliar spray at 30 DAS to Fodder Maize is recommended. It has potential to produce higher green fodder, dry matter and crude protein yield (503.8 q, 129.5 q and 9.9 q/ha, respectively). The yield advantage was 36.3, 46.1 and 66.5% over control (only water), respectively. The technology gave net return of Rs. 63000.00 with B: C ratio of 2.72. It also improved the content of Zn and Boron in fodder (22.7 and 20.3 ppm, respectively as compared to 16.7 and 15.4 ppm in control) as well as in soil (1.08 and 0.43 ppm, respectively).
3. In Union territory of J&K, soil application of 5 kg Zn + 2 kg B/ha + triacontanol (10 ppm) as foliar spray at 30 DAS to Forage Sorghum is recommended. It has potential to produce higher green fodder, dry matter and crude protein yield (462.1 q, 115.3 q and 10.40 q/ha, respectively). The yield advantage was 23.8, 21.0 and 29.3 % over control, respectively. The technology gave net return of 93000.00 Rs./ha with B: C ratio of 2.02. It also improved the content of Zn and Boron in fodder.
4. In Uttar Pradesh, soil application of 5 kg Zn + 2 kg B/ha + triacontanol (10 ppm) as foliar spray at 30 DAS to Forage Sorghum is recommended. It has potential to produce higher green fodder, dry matter and crude protein yield (562.5 q, 157.4 q and 12.10 q/ha, respectively). The yield advantage was 23.8, 21.0 and 33.3 % over control, respectively. The technology gave net return of 96000.00 Rs./ha with B: C ratio of 3.70. The fodder contained 18.56 and 18.2 ppm, Zn and Boron in fodder respectively (on par with control) as well as in soil (0.71 and 0.45 ppm, respectively).

Recommendations from the results of the experiment entitled 'Effect of nitrogen and cutting management on performance of forage pearl millet varieties'

1. In Chhattisgarh during *Kharif* season under rain fed condition, pearl millet variety BAIF Bajra-1 supplemented with 120 kg ha^{-1} nitrogen under three cutting; first cut at 50 days after sowing, second cut at 35 days after first cut and third cut at 50% flowering is recommended. It has potential to produce 620 q green fodder, 155 q dry fodder, 9.32 q CP Yields with 5.30 q green fodder ha^{-1} day^{-1}. It resulted in net monetary return of Rs 64720 with B: C ratio of 3.36. This also improved NPK uptake by the crop by 15.1, 14.9 and 12.7 %, (91.17, 26.5 and 54.39 kg ha^{-1}, respectively in TSFB 15-4 with 80 kg N ha^{-1}), as well its content in soil. The relative advantage in green fodder, dry matter and CP yields was 9.9, 9.5 and 17.2% over TSFB 15-4 with 80 kg N ha^{-1}.
2. In Bihar during *Kharif* season under rain fed conditions, pearl millet variety BAIF Bajra-1 supplemented with 120 kg ha^{-1} nitrogen under two cuts schedule of (first cut at 50 days after sowing and second at 50% flowering) is recommended. It has potential to produce 694 q green fodder, 146 dry fodder and 11.4 q CP yields ha^{-1}. It resulted in net monetary return of Rs 71433 with B: C ratio of 3.20. This also improved NPK uptake by the crop by 27.7, 34.6 and 28.9% (141.5, 45.0 and 88.8 kg ha^{-1} respectively in TSFB 15-4 with 80 kg N ha^{-1}), as well its content in soil. The relative advantage in green fodder, dry matter and CP yields was 13.1, 17.4 and 21.5% respectively over TSFB 15-4 with 80 kg N ha^{-1}
3. In Punjab, during *Kharif* season under rain fed conditions, pearl millet variety TSFB 15-8 supplemented with 120 kg ha^{-1} nitrogen under three cutting; first cut at 50 days after sowing second cut at 35 days after first cut and third cut at 50% flowering is recommended. It has potential to produce 600.7 q green fodder, 109.2 dry fodder and 9.4 q CP yields ha^{-1}. It resulted in to net monetary return of Rs 90000 and B: C ratio of 3.1. This also improved NPK uptake by the crop by 37.4, 37.3 and 37.2% (133.8, 30.87 and 41.2 kg ha^{-1}, respectively in TSFB 15-4 with 80 kg N ha^{-1}), as well its content in soil. The relative advantage in green fodder, dry matter and CP yields was 24.8, 29.5 and 31.2% respectively over TSFB 15-4 with 80 kg N ha^{-1}.

Forage Crop Protection

Dr. Ashlesha Singla, Plant Pathologist (Forage), Forage, Millets and Nutrition Section, Department of Plant Breeding and Genetics, COA, Punjab Agricultural University, Ludhiana presented the salient achievements of eleven experiments conducted at six locations during Kharif 2022. The detailed scenario of diseases and insect pests of forage crops were presented. The resistant entries of pearl millet, cowpea, sorghum, maize, ricebean and other perennial crops were highlighted. The following recommendations emerged after validation of experiments.

Management of leaf blast in forage pearl millet:

- Seed treatment with tebuconazole + trifloxystrobin @ 1 g/kg seed + foliar spray of tebuconazole + trifloxystrobin @ 0.4 g/L resulted in higher disease control (38.9%), increased green fodder yield (44.9%) and thus can be recommended for the management of leaf blast in fodder pearl millet in North-West zone.

- Seed treatment with tricyclazole @ 0.6 g/kg seed and foliar spray of same fungicide @ 0.3 g/L resulted in higher disease control (68.1%), increased green fodder yield (24.3%) and thus can be recommended for management of leaf blast in fodder pearl millet in North-East and Hill zone.

Management of invasive insect-pest fall armyworm, *Spodoptera frugiperda* L. on Forage Maize:

- Foliar spray of Emamectin benzoate 5 WG @ 0.5g/L resulted in lowest fall armyworm infestation (6.07%), increased green fodder yield (43.48%) and thus can be recommended for the management of fall armyworm in fodder maize in South, North-East and North-West zones.

Recommendations:

Crop Improvement:

Instead of proximate analysis, it may be indicated as cell wall analysis. The major nutrients like calcium may be indicated in percentage than in ppm. Quality profiling of germplasm should be undertaken rather than profiling of only released varieties to identify good donors. Pre-breeding activities of different forage crops needs to be strengthened. Genomic regions for high quality in some genotypes should be identified using suitable tools like GWAS. Double Haploids technique can be used in forage crops for studying different genetic studies. There is an urgent need to develop a standard or threshold value of bio fortification for different fodder crops. Animal nutrition scientists should also be consulted while fixing threshold as to know the higher level of nutrients in the feed which the animal would tolerate at the non-toxic level.

Crop Production:

Recommendations based on pooled data of the experiments were presented. The seven recommendations presented were accepted by the house.

Crop Protection:

The percentage of incidence and severity may be indicated in the results. Information on multiple disease/pest resistance/tolerance in a particular genotype may be given so that such accessions may be used as donors in breeding programmes. Residue analysis results also may be carried out as we are feeding this directly to the animals. A scale/ score may be designed for pest as well as disease incidence. It is noticed that all accessions of fodder bajra tested were susceptible to blast, hence more accessions may be tested to identify tolerant/resistant types. Large number of donors in different crops like maize, bajra etc. have already identified by other institutes and can be used as parents in resistance breeding. Crop Protection results may also be recommended as technology after due replicated trials.

The session ended with a vote of thanks to the Chair.

Technical Session- II
Breeder Seed Production

Chairman	:	Dr. D K Yadava, ADG, Seed, ICAR, New Delhi
Co-Chairman	:	Dr. A K Roy, Former PC, AICRP FCU
Rapporteurs	:	Drs. Birendra Prasad & P S Takawale

At the outset Chairman welcomed all the delegated in this important session. He emphasized the importance of nucleus seed in breeder seed production and advised the concerned breeders to produce sufficient quantities of nucleus seed for the multiplication of breeder seed.

Dr. Subhash Chand, PI, Crop Improvement presented variety wise and center wise status of the breeder seed production for various forage crops during *kharif*-2022. The total indent for *kharif*-2022 was 72.02 q for 26 varieties in five forage crops. The breeder seed production was 98 q and was surplus by 25.98 q. Production was surplus in fodder maize (20.98q), fodder pearl millet (6.14 q), and rice bean (0.30 q), however it was deficit in cowpea (1.85q).

The breeder seed indent (indent year: kharif 2024 and production year: *kharif* 2023) was presented which is 148.86 q for 11 forage crops. The indent 2.4 lakh rooted slips of Bajra Napier hybrids was received for the first time. The breeder seed of varieties was allocated to the different AICRP FCU centers with the consent with concerned breeders.

Following are the recommendations during the deliberations:

- Rye grass breeder seed production will be reported during Rabi NGM.
- The indent of 12.50 q of maize variety African Tall allotted to IGFRI, Jhansi was reallocated to BAIF, Urulikanchan.
- Chairman suggested to replace the indent of pearl millet variety CO-8 allocated to TNAU, Coimbatore with newly released variety of same zone.
- In rice bean, RBL-6 variety released by PAU, Ludhiana is a grain type variety and also is very old. It was advised to replace the indent with new variety of same zone.
- Project Coordinator, AICRP FCU advised to take necessary initiative to make the production target of Anjan & Dhaman grass.
- Project Coordinator, AICRP FCU advised to replace PGG-616 variety of Guinea grass since it is very old with new released for the multiplication of breeder seed.
- Until the seed standards are defined of any crop, it should not be brought under seed chain.
- The seed standards of B N hybrid seed are not defined. Hence, the production of breeder seed indent of 2.4 lakh root slips for year 2024 will not be taken up. Project Coordinator, AICRP (FCU) was advised to define standards for B N hybrids.

The session ended with vote of thanks to the Chairman and Co-Chairman.

TECHNICAL SESSION III (Concurrent)
Formulation of Technical Programme
Forage Crop Improvement

Chairman	:	Dr. S.K. Pradhan, ADG (FFC), ICAR, New Delhi
Co-chairman	:	Dr. S.S. Kundu, Ex-Head, ICAR, IGFRI, Jhansi & member PAMC
Rapporteurs	:	Dr. Rahul Kapoor, PAU, Ludhiana; Dr. Salim Khuroo, SKUAST, Srinagar
Convener	:	Dr Vijay K Yadav, Project Coordinator (Forage Crops)

Chairman welcomed all the delegates and suggested brief presentation of technical programme formulation for crop improvement. Dr. Subhash Chand (PI, Plant Breeding) presented on the action taken on the previous recommendation and highlighted the implementation of programme as per the suggestions. Total 17 crop improvement trials (5 perennials and 12 annual) have been formulated in nine crops that includes 6 new trials (2 perennials and 4 annual).

S.N.	Trial	No. of entries	No. of checks	No. of locations	Remark
1.	IVTM	24	3	19	New
2.	AVTM-1	14	3	20	Continued
3.	AVTM-2	4	3	20	Continued
4.	AVTM-2 (Seed)	4	3	12	Continued
5.	IVTPM	12	3	19	New
6.	AVTPM-1 for NWZ & NEZ	4	3	7	Continued
7.	AVTPM-2	4	3	19	Continued
8.	AVTPM-2 (Seed)	4	3	10	Continued
9.	IVTC	8	3	28	New
10.	AVTC-1	4	3	28	Continued
11.	IVT Rice bean	8	2	10	New
12.	AVT-2 Rice bean	1	2	10	Agronomy & Seed trial will be conducted in the next season
13	VT *Stylosanthes seabrana* (P)	7	1	12	New in NWZ, CZ , SZ
14.	VT *Desmanthus virgatus* (P)	4	2	13	New in NWZ, NEZ, CZ , SZ
13.	IVT *Seteria anceps* (P)	3	3	5	At Jorhat and Ludhiana trial didn't establish
15.	VTBN-2022 (P)	15	2	18	At Jorhat and Imphal trial didn't establish
17.	IVT *Dicanthium* (P)	11	3	13	Continued
	Total 17 trials	125			

Following remarks were made during the deliberations:

- Quality, anti-nutritional profiling along with the bio-fortification work needs to be further strengthened by acquiring more germplasm accessions/genotypes from different sources that should include the WCRs and landraces. Furthermore, few centers may also be selected for genotyping work to further escalate this work.

- Due to rising cost of protein based feed there is an urgent need to develop high protein fodder varieties. Digestible dry matter (DDM) and total digestible lignin (TDL) should also be included in the routine quality analysis of breeding evaluation trials.
- New trial of Dinanath grass was proposed and will be conducted only if sufficient numbers of entries are contributed.
- In all the perennial trials, it was suggested to test germination and purity in seeds before their distribution for evaluation as well as uniform population maintenance in all the entries during evaluation.

The session was concluded with the thanks to the chair.

TECHNICAL SESSION III (Concurrent)
Formulation of Technical Programme
Forage Crop Production

Chairman	Dr. Sunil Kumar, Director, ICAR-IIFSR, Meerut
Co-chairman	Dr. S P Dixit, Director Research, CSKHPKV, Palampur
Rapporteurs	Dr. B G Shekara and Dr S K Jha
Convener	Dr. R. K. Agrawal (PI Crop Production, AICRP FCU, IGFRI Jhansi)

Technical programme formulations– Forage crop production session began with introductory remarks of Chairman Dr. Sunil Kumar, Director, ICAR-IIFSR, Meerut and co-chairman Dr. S P Dixit, Director Research, CSKHPKV, Palampur and convener was Dr. R. K. Agrawal, PI Crop Production, IGFRI Jhansi. During the session four new proposals were presented on minor millets as feed and fodder, effect of zinc sulphate and nano zinc on summer fodder sorghum, nano urea on perennial grasses and Biochar on soil health and yield of Bajra Napier hybrid. During presentation, discussion and interaction were made and finally four new proposals and two AVT based experiments on forage Maize and Forage Pearl millet were approved by the house for year Kharif 2023. All approved ongoing experiments will continue as per approved programme. New proposals are as follows:

S. N.	Title	Centers
1.	Evaluation of minor millets for fodder and grain as influenced by nitrogen management under rain fed ecosystem	Dharwad, Mandya , Raipur, Palampur, Pantnagar, Coimbatore
2.	Comparative study of zinc sulphate and nano zinc of summer fodder sorghum	Anand, Imphal, Kalyani, Pantnagar
3.	Studies on effect of Nano urea on Perennial grasses (Bajra Napier Hybrid and Congo signal) Fodder Productivity and quality	AAU, Jorhat
4.	Effect of Biochar on soil health and yield of Bajra Napier hybrid grass	Karaikal, Pondicherry
5.	K-23-AST- (AVTM-2 Agro): Effect of nitrogen levels on forage yield of promising entries of forage maize	NWZ-Ludhiana, Pantnagar, CZ-Anand, Raipur, NEZ-Imphal, Pusa and Ayodhya, HZ - Palampur and Srinagar SZ – Coimbatore , Hyderabad
6.	K-23-AST- (AVTPM-2 Agro): Second Advanced Varietal Trial in Forage Pearl millet	NWZ-Ludhiana, Hisar, NEZ- Pusa, Ranchi, CZ-Anand, Raipur, SZ-Hyderabad, Mandy

During the session following points were made:

- Chairman of the session suggested formulating some experiments on year round fodder production system, climate resilient agriculture and new emerging issues while formulating technical programme.
- Develop agronomic practices which reduces the cost of production and increases the farmers income.
- Farming system module including fodder crops need to be developed for enhancing resource use efficiency.

Trials concluded

K-20-AST-6: Precision nitrogen management for enhancing fodder yield and nitrogen use efficiency in fodder sorghum
K-20-AST-1b (Sub project b): Yield enhancement and bio-fortification of *Kharif* forages with PGRs and micronutrients
K-20-AST-7: Effect of nitrogen and cutting management on performance of forage pearl millet varieties
K-21- AST-5: Screening of high biomass maize lines for silage potential

Session ended with thanks to the chair

TECHNICAL SESSION- III (Concurrent)
Formulation of Technical Programme
Forage Crop Protection

Chairman	**:**	Dr. S.C. Bhardwaj, Ex-Head, IIWBR, Regional Research Centre, Shimla & Member PMAC
Co-Chairman	**:**	Dr. D.K.Banyal, Head Plant Pathology, CSKHPKV, Palampur
Finalization of trials	**:**	Dr. Ashlesha Singla, PAU, Ludhiana
Rapporteurs	**:**	Dr. Sandip Landge and Dr. Premlatha

At the outset, the Chairman welcomed the delegates and Dr. Ashlesha Singla presented the final technical programme for *Kharif* 2023. Based on the discussions and advices of the Chairman and Co-Chairman the following Crop Protection trials were formulated:

1. PPT-1 Monitoring and survey of diseases and insect pests in *Kharif* forage crops will continue as such at all the five locations in *Kharif* 2023.
2. PPT-2 Evaluation of *Kharif* forage crops breeding materials for prevalent diseases and insect pests under natural conditions will continue as such at all the five locations in *Kharif* 2023.
3. PPT- 29 Eco friendly management of zonate leaf spot of sorghum will continue as such at Palampur centre.
4. PPT-30 The trial entitled "Management of root rot and wilt in cowpea" was completed for three years and now will be validated on larger area in Kharif-2023 at Bhubaneswar centre.
5. PPT-31 Estimation of yield losses due to insect-pests in fodder sorghum will continue as such at two locations Rahuri and Coimbatore.
6. PPT-32 Estimation of yield losses due to foliar diseases (anthracnose, gray leaf spot and zonate leaf spot) in fodder sorghum will continue as such at Ludhiana and Palampur centres.
7. PPT-33 Germplasm evaluation programme against diseases and insect-pests in forages under artificial conditions will continue as such in selected hot spot locations.
8. One new trial was formulated and approved for *Kharif* 2023:
    - Non-chemical management of fall armyworm, *Spodoptera frugiperda* (Lepidoptera: Noctuidae) on fodder Maize at Rahuri and Coimbatore

Major recommendations from the Chairman were:

- Fall army worm scales should be modified as per the occurrence.
- Innovative ideas like use of essential oils, botanicals and cropping systems for allelopathic effect to repel insect pests will be incorporated in management programme of insect pests.

The session ended with vote of thanks to the Chair.

Technical Session- IV
Review of Centre-wise Activities

Chairman	:	Dr. S.K. Pradhan, ADG (FFC)
Co- Chairman	:	Dr. Amaresh Chandra, Director, IGFRI, Jhansi
Convener	:	Dr. V.K. Yadav, Project Coordinator, AICRP(FCU), IGFRI, Jhansi
Rapporteurs	:	Dr. B.G. Shivakumar and Dr. Kalyan Jana

The meeting began with the introductory remarks by Dr. V.K. Yadav. Dr. S.K. Pradhan, ADG (FFC) in his initial remarks suggested the presenters to concentrate on breeding materials, germplasm collections, generation of new material, genotyping and phenotyping of the material and publications emanating from the work.

Twenty AICRP (FCU) Centers presented their ongoing forage activities during kharif 2022, however there were no representative from the RPCAU, Pusa, Bihar and CAU, Imphal, Manipur centers. All the Centers made their presentation as per the suggestions of the Chairman covering the staff position, year of establishment and various activities carried during the last *kharif* and earlier years. However, there were some specific suggestions for the improvement of activities at different centers.

It was suggested to involve students in forage research activities such as *in-situ* hybridization and standardization of tissue culture activities at CSKHPKV, Palampur. The house appreciated the activities of mutation breeding, use of SSR markers and developmental activities towards herbicide resistant oats at PAU, Ludhiana. The CCS HAU, Hisar Centre could not present the data as the experiments were affected by heavy rains in the last year. It was suggested to have a more robust breeding activities at that Centre. The house suggested basic studies and further strengthening of breeding activities at GBPUAT, Pantnagar. The SKRAU, Bikaner was suggested to make good publications. The house expressed its displeasure at the lacking of breeding activities at ANDUAT, Ayodhya; BAU, Ranchi and OUAT, Bhubaneshwar. It was suggested to study the lignin, hemicellulose content and digestibility parameters in 'Bao' rice used as dual purpose fodder crop at AAU, Jorhat center. The BAIF, Urulikanchan informed the house about the "Standardization of protocol for drought tolerance in maize". The house appreciated this. The KAU, Vellayani was suggested to further strengthen the *Stylosanthes* spp. evaluation work and exploring the possibility of multi-cut *Vigna stipulacea*. The presentation made by PJTSAU, Hyderabad was appreciated and it was suggested to explore the seed production potential in Napier grasses to make it suitable as bio-fuel plantation crop with increasing interest from the industry. The ZARS–Mandya center was suggested to provide entries of fodder field bean to AICRP (FCU) trials to explore the high fodder potential.

In the concluding remarks, Dr. Amaresh Chandra, Director, IGFRI Jhansi and Co-Chairman, appreciated all the presentations in general. However, he suggested to improve particularly the breeding activities in some of the stations where it was observed to be weak. Dr. S.K. Pradhan, ADG (FFC) and Chairman, too appreciated the presentation of the stations. He emphasized to strengthen the breeding material, basic studies, students' involvement and registration of the genetic material at the earliest for the benefit of other workers.

The session ended with vote of thanks by Dr. V.K. Yadav.

TECHNICAL SESSION- V
FTD & TSP FORMULATION

Chairman	:	Dr. S. K. Pradhan, ADG (FFC), ICAR
Co-Chairman		Dr. S. S. Kundu, EX Head, PAR Div. , IGFRI, jhansi
Presentation	:	Dr. R. K. Agrawal
Rapporteurs	:	Drs. Maninder Kaur and Rajan Katoch

Dr R. K. Agarwal presented in details the various activities carried out by the centres under Development Action Plan for Scheduled Caste (DAPSC), Scheduled Tribal Component (DAPSTC). He highlighted that DAPSC was implemented in 8 districts of 06 states and 913 farmers. In addition, Action Plan for North Eastern Hill (NEH) was implemented in the two states of NEH i.e., Manipur and Assam. The Scheduled Tribal Component (DAPSTC) was implemented in 27 districts of 13 states/ UTs. Total 3132 beneficiaries were benefitted from the programme in *Kharif*–2022. The activities included distribution of root slips/ cutting of BN Hybrid, and poultry chicks/ ducklings, testing soil samples, plant, water, feed, fodder and livestock, trainings and awareness programs, field days, field demonstrations, literature distribution and input distribution (seed, fertilizers, pesticides and battery operated sprayers).

FTD conducted in Kharif-2022

A total of 750 FTD's were conducted during *Kharif* 2022 on BN hybrid, forage sorghum, rice bean, cowpea, maize, forage pearl millet, guinea grass and Congo-signal grass etc. Out of 750 FTD's, 310 were allocated on BN hybrid, 15 on rice bean, 130 on maize, 90 on pearl millet, 35 on cowpea, 50 on forage sorghum, 60 on guinea grass, 40 on hedge lucerne and remaining on other forage crops.

FTD Allocation for Kharif-2023

A total of 720 FTD's were allotted to AICRP (FC&U) centers for conducting during *Kharif* 2023 on BN hybrid, forage sorghum, rice bean, cowpea, maize, forage pearl millet, *Setaria*, guinea grass and congo-signal grass etc. Out of 720 FTD's, 300 were allocated on BN hybrid, 30 on ricebean, 145 on maize, 45 on pearl millet, 30 on cowpea, 105 on forage sorghum, 30 on *Setaria* grass, 20 on Guinea grass and 15 on other forage crops.

Tribal Sub Plan

Centre wise proposed TSP activities for Kharif 2023 – Number of beneficiaries

Centre	**BN hybrid**	**Rice bean**	**Maize**	**Bajra**	**Cow pea**	**Sorghum**	**Guinea grass**	**Setaria**	**Other**	**Total**
Jorhat	15	5						10		**30**
Bhubaneswar	10		5	5						**15**
Kalyani	20	20	10							**50**
Ranchi	20		20			20				**60**
Ayodhya	10			10						**20**
Jabalpur	5	5	5							**15**
Anand	15			10		10				**35**
Urulikanchan	15			5	5					**25**
Bikaner	20						Cluster bean 10			**30**
Pusa	10						10			**20**

Ludhiana	75									**75**
Hyderabad	25		20	15	10					**70**
Mandya	10		10		10	10	10			**50**
Palampur								20		**20**
Srinagar			40							**40**
Imphal	10		10			10				**30**
Raipur			15			10				**25**
Vellayani	30				5					**35**
Pantnagar			15			15				**30**
Coimbatore	10					10	Desmenthus5			**25**
Hisar						20				**20**
Total	300	30	145	45	30	105	**20**	**30**	**15**	**720**

Recommendations

- Poor/needy farmers to be made beneficiaries which would also solve the purpose of doubling the farmers' income.
- The FTDs/TSPs with respect to Grassland Management should be undertaken in order to improve their productivity as well as enrichment of natural flora.

The following decisions were taken after discussion

- TSP progress report should be submitted every quarter by the centres in the given proforma.
- Funds will be allocated as per availability from the council.

NEH Plan

Proposed activities for Rabi 2021-22 under NEH component

NEH	**Trainings/ capacity building**	**Input distribution**	**Others (Demonstrations)**
Imphal	2	50	50

- NEH progress report should be submitted every quarter by the centres in the given proforma.
- Funds will be allocated as per availability from the council.

The session ended with vote of thanks to the chairman.

TECHNICAL SESSION-VI
New initiatives for Forage Research (Pre breeding and bio fortification)

Chairman	Dr. S. K. Pradhan ADG, (CC & FFC)
Co-chairman	Dr .V. K. Yadav, PC, AICRP FCU
Rapporteurs	Drs. A. K. Jha and Subhash Chand

In the new initiatives for forage research session, one lecture was delivered by Dr. Firoj Hossain, Principal Scientist, Division of Genetics, IARI–New Delhi on development of bio-fortified varieties in maize for high quality of grain and its use in fodder. During the presentation, he presented journey of QPM maize, MAS based QPM Hybrids, White Maize O2+O16, vitamins of Carotenes, QPM + Pro vitamin A+Vit. E, Bio-availability of Fe and Zn, source of tillering in maize with TART, Corn grass with CG1, Multi cut option in maize, tassel replace, high density planting with low angle and dual purpose sweet corn. During the session, chairman of the session suggested formulating some experiments on bio-fortified varieties of maize crops and dual purpose crops.

Session ended with thanks to the chair

TECHNICAL SESSION-VII

Scientific, Administrative and financial issues

Chairman	:	Dr. S. K. Pradhan, ADG (FFC)
Co-Chairman	:	Dr. Vijay K Yadav, Project Coordinator (Forage Crops)
Rapporteurs	:	Dr. Subhash Chand

The session started with brief address of chairman regarding the policies of council and appreciative remark on output of AICRP FCU. He appreciated the progress made by the AICRP FCU in last five years.

During the discussion following recommendations were suggested:

- Testing fee for private companies may be enhanced from Rs 60,000/- entry/ year to Rs 100,000/- entry/ year + GST (as applicable).
- The registration fee for the scientists from ICAR-IGFRI, Jhansi for participating in National Group Meetings of AICRP (Forage Crops) should be permitted and institute may reimburse such payments to the concerned.
- The centers were told to submit Utilization Certificates immediately so that the budget received from ICAR may be released to the centers.
- Centers were also clearly advised not to recruit or post any personnel of the higher scale against the sanctioned posts of lower scale.

The session ended with vote of thanks to the chair

TECHNICAL SESSION-VIII
PLENARY SESSION

Chief Guest	:	Prof. (Dr.) H. K Chaudhary, Vice Chancellor, CSKHPKV, Palampur
Chairman	:	Dr S K Pradhan, ADG (FFC), ICAR
Co-chairman	:	Dr Amaresh Chandra, Director, ICAR-IGFRI, Jhansi
Convener	:	Dr Vijay K Yadav, Project Coordinator (Forage Crops & Utilization)
Rapporteurs	:	Dr. R. K. Agrawal & Dr. Rahul Kapoor

All the rapporteurs presented the recommendations made during various technical sessions which were accepted after discussion and modifications. The important recommendations are given in the report at the end of each session.

The chairman welcomed all the participants and expressed satisfaction over the successful completion of various technical session during the two days meeting.

Chief Guest of the session suggested for exploring possibility of speed breeding or off season rapid generation advancement. He also suggested that suitable varieties of perennial grasses should be developed and popularized. He emphasized on the need of extending the technologies to the stakeholders. Knowledge on pastoral and grassland should be given more priority and it should be passed on to the stakeholders.

Dr Vijay K Yadav presented the proceedings of Varietal Identification Committee meeting, in which 11 varieties were identified for release. The house congratulated the team of scientists and organizations for their hard work to develop these varieties.

Vote of thanks was presented by Dr Vijay K Yadav, project Coordinator.

The meeting ended with vote of thanks to the chair.

Proceedings of Varietal Identification Committee Meeting

The meeting of the Varietal Identification Committee of AICRP on Forage Crops and Utilization was held under the Chairmanship of Dr T. R. Sharma, Deputy Director General (Crop Science), ICAR, New Delhi on 15th June, 2023 at 10:00 AM in the Vice-Chancellor Committee Room of CSKHPKV, Palampur.
Following members were present in the meeting.

1	**Dr T. R. Sharma**, Deputy Director General (Crop Science), ICAR, New Delhi	**Chairman**
2	**Dr S. K. Pradhan,** Assistant Director General (Food & Fodder Crops), ICAR	Member
3	**Dr D. K. Yadava,** Assistant Director General (Seed), ICAR	Member
4	**Dr Sunil Kumar,** Director, ICAR-IIFS, Modipuram, Meerut, UP	Member
5	**Dr S. P. Dixit,** Director Research, CSKHPKV, Palampur, HP	Member
6	**Dr A. K. Roy**, PS & Ex Project Coordinator (Forage Crops), ICAR-AICRP (FCU)	Member
7	**Dr S. C. Bhardwaj,** Member PAMC & Emeritus Scientist, ICAR-IIWBR, RS Shimla	Member
8	**Dr S S Kundu**, Member PAMC, & Ex-Head Animal Nutrition, ICAR-NDRI, Karnal	Member
9	**Dr VK Sood,** Head, Deptt. of Genetics & Plant Breeding, CSKHPKV, Palampur	Member
10	**Dr Ajay Kumar Yadav,** Director, DAHD-RFS, Chennai	Member
11	**Dr Naresh, Kaushal,** Deputy Director, Animal Husbandry, Govt. of HP	Member
12	**Sri Rajesh Sood,** Addl. Director Agriculture, Govt. HP	Member
13	**Dr Gopal Gharde**, Crystal Production Pvt. Ltd., Hyderabad	Member
14	**Dr Vijay K Yadav**, Project Coordinator, AICRP (Forage Crops)	Member Secretary

Dr. R. K. Agarwal, PI Agronomy, **Dr. Subhash Chand,** PI Plant Breeding, AICRP coordinating unit were present in the meeting to assist the committee.

15 proposals in three crops were presented before the committee and after deliberations and discussions following decisions were taken.

Forage Maize entry AFH-7: The proposal was submitted by IARI, New Delhi for North West Zone. The committee considered the proposal and found that the entry has shown superiority over the national and zonal checks for GFY, DMY, as well as per day productivity. The entry showed a resistant to moderately resistant reaction against leaf blight in the proposed zones. It was also responsive to nitrogenous fertilizer. Therefore, it was identified for release in the North West Zone comprising states of Tarai region of Uttarakhand, Punjab, Haryana, and Rajasthan.

Forage Maize entry DFH-2: The proposal was submitted by GBPUA&T, Pantnagar for North West and Central Zone. The committee considered the proposal and found that the entry has shown superiority over the national and zonal checks for GFY, DMY, CPY, as well as per day productivity.

The entry showed a resistant to moderately resistant reaction against leaf blight in the proposed zones. It was also responsive to nitrogenous fertilizer. Therefore, it was identified for release in the North West Zone comprising states of Tarai region of Uttarakhand, Punjab, Haryana and Rajasthan; Central Zone comprising states of Chhattisgarh, Madhya Pradesh, Maharashtra, and Uttar Pradesh.

Forage Maize entry PFM-13: The proposal was submitted by PAU, Ludhiana for Central Zone. The committee considered the proposal and found that the entry has shown superiority over the best national and zonal checks for GFY, DMY, CPY, as well as per day productivity. The entry showed a resistant to moderately resistant reaction against leaf blight in the proposed zones. It was also responsive to nitrogenous fertilizer. Therefore, it was identified for release in the Central zone comprising states of Chhattisgarh, Madhya Pradesh, Maharashtra, and Uttar Pradesh.

Forage Maize entry HQPM-28: The proposal was submitted by CCS HAU, Hisar for Central Zone. The committee considered the proposal and found that the entry has shown superiority over the best national and zonal checks for GFY, DMY, CPY, as well as per day productivity and seed yield was as good as best national check. The entry showed a resistant to moderately resistant reaction against leaf blight in the proposed zones. It was also responsive to nitrogenous fertilizer. Therefore, it was identified for release in the Central zone comprising states of Chhattisgarh, Madhya Pradesh, Maharashtra, and Uttar Pradesh.

Pearl Millet entry 16ADV0111: The proposal was submitted by Advanta Enterprises Limited for North West, North East, Central and South Zone. The committee considered the proposal and found that the entry has shown superiority over the best national and zonal checks for GFY and DMY in NWZ; GFY, DMY, and CPY in NEZ; GFY, DMY and per day productivity in CZ; and GFY, DMY, CPY and per day productivity in SZ. The entry showed a resistant to moderate resistant reaction against leaf blast in NEZ, CZ, and SZ, whereas was found susceptible in NWZ along with checks. It was also responsive to nitrogenous fertilizer. Therefore, it was identified for release in the North West Zone comprising states of Punjab, Haryana, Rajasthan; North East Zone includes Eastern Uttar Pradesh, Bihar, Jharkhand, Odisha; Central zone comprising states of Gujarat, Chhattisgarh, Madhya Pradesh, Maharashtra, and Uttar Pradesh and South Zone comprising states of Tamil Nadu, Telangana, Andhra Pradesh, and Karnataka.

Pearl Millet entry FBL-4: The proposal was submitted by PAU, Ludhiana for North West and South Zone. The committee considered the proposal and found that the entry has shown superiority over the best national and zonal checks for GFY and DMY in NWZ; GFY, DMY, CPY and per day productivity in SZ. The entry showed a resistant to moderate resistant reaction against leaf blast in SZ, whereas was found susceptible in NWZ along with checks. It was also responsive to nitrogenous fertilizer. Therefore, it was identified for release in the North West Zone comprising states of Punjab, Haryana, Rajasthan; and South Zone comprising states of Tamil Nadu, Telangana, Andhra Pradesh, and Karnataka.

Pearl Millet entry PHBF-5: The proposal was submitted by PAU, Ludhiana for North West and South Zone. However, committee considered the proposal for NWZ only where entry has shown superiority over the best national and zonal checks for GFY, DMY, ADF and NDF. The entry was found susceptible to leaf blast disease in NWZ along with checks.

It was also responsive to nitrogenous fertilizer. Therefore, it was identified for release in the North West Zone comprising states of Punjab, Haryana, and Rajasthan.

Pearl Millet entry TSFB-1610: The proposal was submitted by PJTSAU, Hyderabad for North West Zone. The committee considered the proposal and found that the entry has shown superiority over the best national and zonal checks for GFY, DMY, ADF and NDF. The entry was found susceptible to leaf blast disease in NWZ along with checks. It was also responsive to nitrogenous fertilizer. Therefore, it was identified for release in the North West Zone comprising states of Punjab, Haryana, and Rajasthan.

Pearl Millet entry JPM-18-37: The proposal was submitted by JNKVV, Jabalpur for North West Zone. The committee considered the proposal and found that the entry has shown superiority over the best national and zonal checks for GFY, DMY, and GFY per day productivity. The entry was found susceptible to leaf blast disease in NWZ along with checks. It was also responsive to nitrogenous fertilizer. Therefore, it was identified for release in the North West Zone comprising states of Punjab, Haryana, and Rajasthan.

Bajra-Napier Hybrid entry TSBN-15-15: The proposal was submitted by PJTSAU, Hyderabad for North East, Central and South Zone. However, committee considered the proposal for Central and South Zone where the entry has shown superiority over the best national and zonal checks for GFY, DMY, CP% and CPY. Disease and insect pests were observed in traces and were non-significant. Therefore, it was identified for release in the Central Zone comprising states of Gujarat, Chhattisgarh, Madhya Pradesh, Maharashtra, and Uttar Pradesh and South Zone comprising states of Tamil Nadu, Telangana, Andhra Pradesh, Kerala and Karnataka.

Bajra-Napier Hybrid entry BNH-26: The proposal was submitted by BAIF, Urulikanchan for Central Zone. The committee considered the proposal where the entry has shown superiority over the best national and zonal checks for GFY, DMY, and CPY as well as per day productivity. Disease and insect pests were observed in traces and were non-significant. Therefore, it was identified for release in the Central Zone comprising states of Gujarat, Chhattisgarh, Madhya Pradesh, Maharashtra and Uttar Pradesh.

Bajra-Napier Hybrid entry TSBN-15-8: The proposal was submitted by PJTSAU, Hyderabad for North West Zone. However, the committee did not find it suitable to release in this zone.

Bajra-Napier Hybrid entry Pant Sel-1: The proposal was submitted by GBPUA&T, Pantnagar for North East Zone. However, the committee did not find it suitable to release in this zone.

Bajra-Napier Hybrid entry IGFRI BN 2013-7: The proposal was submitted by ICAR-IGFRI–Jhansi for North West Zone. However, the committee did not find it suitable to release in this zone.

Bajra-Napier Hybrid entry PBN-408: The proposal was submitted by PAU, Ludhiana for North West Zone. However, the committee did not find it suitable to release in this zone.

Note: Abbreviations used: GFY = Green Fodder Yield; DMY = Dry Matter Yield; CPY = Crude Protein Yield; CP = Crude protein

Annexure A

AICRP on Forage Crops and Utilization
Technical Programme Crop Improvement Kharif 2023

1. IVTM: Forage Maize (New)

Entries	:	24 + 2(NC) + 1 hybrid check [CO(HM)8]
Entries	:	**FSM 2023-1, FSM 2023-2** (Foragen); **KDFM-9** (SKUAST, Srinagar); **NMF-40F** (Nuzivedu); **CMH 15-005, TMFMH 2125** (TNAU, Coimbatore); **JHFM-23-1**, **JHFM-23-2**, **JHFM-23-3** (IGFRI, Jhansi); **DFH 2023-1, DFH 2023-2** (GBPUAT, Pantnagar); **JH 20088, JH 17026** (PAU, Ludhiana); **MFM-18-27** (ZARS, Mandya); **GK 3122, GK 3237, GK 3270, GK 3271** (Ganga Kaveri seeds); **AH-4152, AH-4673, AFH-8, AFH-9** (IARI, New Delhi); **BAIF Maize 8** (BAIF, Urulikanchan), **AH-8178** (RRS-IARI, Dharwad)
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 (19)	:	**HZ**-Palampur, Srinagar; Rajouri; **NWZ**-Ludhiana, Hisar, Pantnagar; **NEZ**-Ayodhya, Bhubaneswar, Ranchi, Pusa, Imphal; **CZ**- Raipur, Jabalpur, Rahuri, Uralikanchan, Jhansi; **SZ**-Hyderabad, Coimbatore, Mandya

2. AVTM-1: Forage Maize (HZ, NWZ, NEZ, CZ, and SZ)

Entries	:	14 +2 (NC) + 1 hybrid check [CO(HM)8]
Entries	:	**ADFM-4** (Dharwad), **ADFM-5** (Dharwad), **AFM-23** (AAU, Anand), **AH4688** (IARI, Delhi), **BMC-1853** (Akola Maharashtra), **DFH-2022-1** (GBPUAT, Pantnagar), **HPFM-12** (CSK HPKV, Palampur), **IFH10-21 K2** (IIMR, Ludhiana), **KDFM-8** (SKUAST-K, Srinagar), **MAH 15-84** (UAS ZARS Mandya), **PMC-14** (MPUAT, Udaipur), **PMC-15** (MPUAT, Udaipur), **PMC-16** (MPUAT, Udaipur), **RCRMH2** (SCH, Raichur)
Checks	:	African Tall, J-1006 & IIMR hybrid COHM-8
Design	:	RBD with 3 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	:	4.5 Kg/entry and 4.5 Kg/NC
Locations (20)	:	**HZ**-Palampur, Srinagar, Rajouri, Almora; **NWZ**-Ludhiana, Hisar, Pantnagar; **NEZ**-Ayodhya, Bhubaneswar, Ranchi, Pusa, Imphal; **CZ**- Raipur, Jabalpur, Rahuri, Uralikanchan, Jhansi; **SZ**-Hyderabad, Coimbatore, Mandya

3. AVTM-2: Forage Maize (HZ, NWZ, NEZ, CZ and SZ)

Entries	:	4 + 2 (NC) + 1 hybrid check [CO(HM)8]
Entries	:	**CMH-12-686** (TNAU, Coimbatore), **FSM2021-1** (Foragen Seeds), **MFM-18-2** (UAS ZARS, Mandya), **PJHM-1** (IARI, Delhi)
Checks	:	African Tall, J-1006 &IIMR hybrid COHM-8
Design	:	RBD with 3 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	:	4.5 Kg/entry and 4.5 Kg/NC
Locations (20)	:	**HZ**-Palampur, Srinagar, Rajouri, Almora; **NWZ**-Ludhiana, Hisar, Pantnagar; **NEZ**-Ayodhya, Bhubaneswar, Ranchi, Pusa, Imphal; **CZ**- Raipur, Jabalpur, Rahuri, Uralikanchan, Jhansi; **SZ**-Hyderabad, Coimbatore, Mandya,

4. AVTM-2 (Seed): Forage Maize (HZ, NWZ, NEZ, CZ, and SZ)

Entries	:	4+2 (NC) + 1 hybrid check [CO(HM)8]
Entries	:	**CMH-12-686** (TNAU, Coimbatore), **FSM 2021-1** (Foragen Seeds), **MFM-18-2** (UAS ZARS, Mandya), **PJHM-1** (IARI, Delhi)
Checks	:	African Tall, J-1006 &IIMR hybrid COHM-8
Design	:	RBD with 3 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	:	3.0 Kg/entry and 3.0 Kg/NC
Locations (12)	:	**HZ**-Palampur, Srinagar; **NWZ**-Ludhiana, Hisar, **NEZ**-Ranchi, Pusa, Imphal; **CZ**-Raipur, Uralikanchan, Jhansi; **SZ**-Hyderabad, Mandya

5. IVTPM: Forage Pearl millet (New)

Entries	:	12 + 2 (NC) + 1 (ZC)
Entries	:	**FBL-9, FBL-10** (PAU, Ludhiana), **FSFBH-502** (Foragen), **JHPM-23-1, JHPM-23-2** (IGFRI, Jhansi**), IIMR-FB-MC-2022-1, IIMR-FB-MC-2022-2** (IIMR, Hyderabad), **SBH 105** (Rasi seed), **ADV-2386** (Advanta seed), **Pusa 1803, Pusa 2101** (IARI, New Delhi), **JPM-18-82** (JNKVV, Jabalpur)
Checks	:	RBB-1 (NC) , 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, Urulikanchan, Jhansi; **SZ**-Coimbatore, Hyderabad, Mandya, Raichur

6. AVTPM-1: Forage Pearl millet (NWZ and NEZ)

Entries	:	4 + 2 (NC) + 1 (ZC)
Entries	:	**ADV 2285** (Advanta Seed), **JHPM-22-2** (IGFRI, Jhansi), **JPM-18-74** (JNKVV, Jabalpur), **SBH 002** (Rasi Seeds)
Checks	:	RBB-1 (NC), Giant Bajra (NC), AFB-3 (NWZ), APFB-9-1 (NEZ)
Design	:	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	:	40:20 kg/ha (N:P) basal
Seed	:	0.50 Kg/entry; 0.50 Kg/NC and 0.25 Kg/ZC
Locations (7)	:	**NWZ**-Ludhiana, Hisar, Bikaner, Avikanagar; **NEZ**-Pusa, Bhubaneswar, Ranchi

7. AVTPM-2: Forage Pearl millet (NWZ, NEZ, CZ and SZ)

Entries	:	4 + 2 (NC) + 1 (ZC)
Entries	:	**ADV175020** (Advanta seed Pvt. Ltd.), **FBL-7** (PAU, Ludhiana), **FSB2021-1** (Foragen Seeds), **JPM-18-71** (JNKVV, Jabalpur)
Checks	:	RBB-1 (NC), Giant Bajra (NC), AFB-3 (NWZ), APFB-9-1 (NEZ), BAIF Bajra 1 (CZ), Moti Bajra (SZ)
Design	:	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	:	40:20 kg/ha (N:P) basal
Seed	:	1.0 Kg/entry; 1.0 Kg/NC and 0.30 Kg/ZC
Locations (19)	:	**NWZ**-Ludhiana, Hisar, Bikaner, Jalore, Avikanagar; **NEZ**-Ayodhya, Pusa, Bhubaneswar, Ranchi; **CZ**-Anand, Raipur, Jabalpur, Rahuri, Urulikanchan, Jhansi; **SZ**-Coimbatore, Hyderabad, Mandya, Raichur

8. AVTPM-2 (seed): Forage Pearl millet (NWZ, NEZ, CZ and SZ)

Entries	:	4+ 2 (NC) + 1 (ZC)
Entries	:	**ADV175020** (Advanta seed Pvt. Ltd.), **FBL-7** (PAU, Ludhiana), **FSB2021-1** (Foragen Seeds), **JPM-18-71** (JNKVV, Jabalpur)
Checks	:	RBB-1 (NC), Giant Bajra (NC), AFB-3 (NWZ), APFB-9-1 (NEZ), BAIF Bajra 1 (CZ), Moti Bajra (SZ)
Design	:	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	:	40:20 kg/ha (N:P) basal
Seed	:	0.6 Kg/entry; 0.6 Kg/NC and 0.20 Kg/ZC
Locations (10)	:	**NWZ**-Ludhiana, Hisar, Bikaner; **NEZ**-Ayodhya, Pusa; **CZ**-Raipur, Jabalpur; **SZ**-Coimbatore, Hyderabad, Mandya

9. IVTC: Forage Cowpea (New)

Entries	:	8 + 2 (NC) + 1 (ZC)
Entries	:	**PFC 48, PFC 50** (PAU, Ludhiana), **BL-23-1, BL-23-2, BL-23-3** (IGFRI, Jhansi), **MFC-18-10** (ZARS, Mandya), **UPC 23-1, UPC 23-2** (GBPUA&T, Pantnagar)
Checks	:	**National checks:** UPC-8705, 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 (27)	:	**HZ**-Palampur, Srinagar, Rajouri; **NWZ**-Ludhiana, Hisar, Pantnagar, Bikaner, Jalore; **NEZ**-Ayodhya, Bhubaneswar, Ranchi, Jorhat, Kalyani, Imphal, Pusa; **CZ**-Anand, Rahuri, Urulikanchan, Jhansi, Raipur, Meerut; **SZ**-Coimbatore, Vellayani, Mandya, Hyderabad, Dharwad & Raichur

10. AVTC-1: Cowpea (HZ, NWZ, NEZ, CZ and SZ)

Entries	:	4 + 2 (NC) + 1 (ZC)
Entries	:	**MFC-18-4** (UAS ZARS, Mandya), **PFC-45** (PAU, Ludhiana), **UPC-22-1** (GBPUAT, Pantnagar), **UPC-22-2** (GBPUAT, Pantnagar)
Checks	:	**National checks:** Bundel Lobia-1, UPC-5286; **Zonal checks:** UPC-622 (HZ), Bundel Lobia-2 (NWZ), UPC-628 (NEZ), UPC-9202 (CZ) & MFC-09-1 (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	:	4.0 Kg/entry; 4.0Kg/NC and 1.0 Kg/ZC
Locations (27)	:	**HZ**-Palampur, Srinagar, Rajouri; **NWZ**-Ludhiana, Hisar, Pantnagar, Bikaner, Jalore; **NEZ**-Ayodhya, Bhubaneswar, Ranchi, Jorhat, Kalyani, Imphal, Pusa; **CZ**-Anand, Rahuri, Urulikanchan, Jhansi, Raipur, Meerut; **SZ**-Coimbatore, Vellayani, Mandya, Hyderabad, Dharwad & Raichur

11. IVT Rice bean

Entries	:	8 + 2 (NC)
Entries	:	**JRBJ-12-14, JRBJ-12-22** (JNKVV, Jabalpur), **BRB1-L6P1, BRB1-L4P5** (BCKV, Kalyani), **JOR-23-1, JOR-23-2** (AAU, Jorhat), **OURB-24, OURB-23** (OUAT, Bhubaneshwar)
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	:	1.0 Kg/entry and NC
Locations (10)	:	Kalyani, Ranchi, Bhubaneswar, Jorhat, Pusa, Vellayani, Jabalpur, Raipur, Imphal, Karjat (Dapoli)

12. AVT-2 Rice bean

Entries	:	1 + 2 (NC)
Entries	:	**JOR-21-1** (AAU, Jorhat)
Checks	:	Bidhan-2, Bidhan-3
Design	:	4 m x 3 m accommodating 4 m long 6 rows at 30 cm
Plot size	:	RBD with 7 replications
Seed rate	:	35.0 kg/ha (42 g/plot)
Fertilizers	:	20:40 kg/ha (N:P) basal
Seed	:	3.5 Kg/entry and NC
Locations (10)	:	Kalyani, Ranchi, Bhubaneswar, Jorhat, Pusa, Vellayani, Jabalpur, Raipur, Imphal, Karjat (Dapoli)

13. *VT Stylosanthes seabrana* 2023 (New): perennial

Entries	:	7 + 1 (NC)
Entries	:	**IGFRI-2523, IGFRI-2534, IGFRI-104710, IGFRI-11595** (IGFRI RRS, Dharwad), **RS-10-4, RS-10-7, RS-20-41** (MPKV, Rahuri)
Checks	:	Phule kranti
Design	:	RBD with 3 replications
Plot size	:	4 m x 1.8 m accommodating 4 m long 6 rows at 30 cm
Seed rate	:	6 Kg/ha (5 g/Plot)
Fertilizers	:	Basal 20:60:40 kg/ha (N:P:K)
Seed	:	0.20 Kg/entry and 0.20 Kg/ NC
Locations (11)	:	Jhansi, Dharwad, Rahuri, Vellayani, Coimbatore, Hisar, Bikaner, Jabalpur, Raipur, Mandya, Hyderabad

14. VT *Desmanthus Virgatus* (New): Perennial

Entries No.	:	4 + 2 check
Entries Name	:	**RHDV-19-4, RHDV-19-10, RHDV-19-11, RHDV-19-13** (MPKV, Rahuri)
Check	:	TND 1308 (TNAU, Coimbatore), TSLH-1 (PJTSAU, Hyderabad)
Design	:	RBD with 4 replications
Plot size	:	4 x 3 m (6 rows of 4.0 m at 50 cm)
Spacing	:	50 cm x solid stand (continuous sowing)
Seed rate	:	20 Kg/ha (25g/plot)
Fertilizers	:	Basal: 25 : 40 : 20 kg N, P2O5, K2O/ha
Seed requirement	:	1.6 Kg/entry and 1.6 Kg/check
Locations (13)	:	NWZ- Bikaner, Udaipur, Pantnagar NEZ- Jorhat, Kalyani, Bhubaneshwar CZ- Rahuri, Anand, Jhansi SZ Hyderabad, Coimbatore, Mandya, Vellayani.
Seed treatment	:	To get better germination seeds must be treated in mild hot water for 30 minutes. After hot water treatment, seeds should be soaked in fresh water for overnight. Seeds should be shade dried before sowing.
Harvest	:	First harvest at 90 days after sowing and subsequent harvests at 50 /60 days intervals.

15. VT Setaria grass (Continue)

Entries	:	3 + 3 (NC)
Entries		**S-7, S-10, S-30** (CSKHPKV, Palampur)
Checks	:	PSS-1, S-18, S-25
Design	:	RBD with 4 replications
Plot size	:	3m x 1.6m
Seed rate	:	30 cm slip to slip and 40 cm row to row No. of rows per plot=4 ; No. of hills per row=10; Root slips per hill =3 By rooted slips with the onset of monsoon
Fertilizers	:	NPK 60:40:30 Kg/ha at the time of sowing and 30N after each cut
Seed	:	200 root slips of each entry
Locations (5)	:	Palampur, Bajaura (Kullu), Almora, Ballowal Sankhri (PAU), Jorhat

16. VT B X N Hybrid 2022 (Continue)

Entries	:	15+ 2 (NC)
Entries	:	**BNH- 32, BNH-55, BNH- 58, BNH-68** (BAIF, Uralikanchan), **BBN-22-1; BBN-22-2; BBN-22-3** (IGFRI, Jhansi), **RBN-2017-35, RBN-2018-5, RBN-2016-61** (MPKV, Rahuri), **PBN 421, PBN 422, PBN 423** (PAU, Ludhiana), **TNCN 2117** (TNAU, Coimbatore), **BAU-BN-101** (BAU, Ranchi)
Checks	:	BNH-11,CO (BN)-6
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	:	1200 rooted slips/entry
Locations (18)	:	**HZ**-Palampur; **NWZ**-Ludhiana, Hisar, Bikaner; **NEZ**-Bhubaneswar, Ranchi, Jorhat; Imphal; **CZ**-Anand, Rahuri, Uralikanchan, Jhansi, Raipur, Jabalpur; **SZ**-Coimbatore, Mandya, Hyderabad, Vellayani

17. *VT Dichanthium annulatum* 2022 (Continue)

Entries	:	11+ 3 (NC)
Entries	:	**Marvel-12-4, Marvel-12-11, Marvel 21-09** (MPKV, Rahuri), **JHD-22-1, JHD-22-2, JHD-22-3, JHD 22-7, JHD 22-5, JHD 22-6** (IGFRI Jhansi), **MGS-6, MGS 7** (AAU Anand)
Checks	:	GMG-1, JHD 2013-2, Phule Marvel-1 (Marvel 09-4)
Design	:	RBD with 3 replications
Plot size	:	4 m x 3 m (70 rooted slips)/50 x 50 cm
Seed rate	:	72 rooted slips/rep/entry
Fertilizers	:	60:30:20 kg N, P_2O_5, K_2O/ha in split doses
Seed	:	1000 rooted slips/entry
Locations (13)	:	**NEZ**-Bhubaneswar, Ranchi, Jorhat; Imphal, **CZ**-Anand, Rahuri, Urulikanchan, Jhansi, Raipur, Jabalpur, **SZ**-Coimbatore, Mandya, Hyderabad

Annexure B

AICRP on Forage Crops and Utilization
Technical Programme Crop Production
Kharif 2023

New proposals *Kharif*-2023

K-23-AST-1: Minor millets for fodder and grain as influenced by nitrogen management under rainfed ecosystem

Centres: Raipur, Mandya, Coimbatore, IGFRI, SRRS- Dharwad, RARS, Rajouri

Preamble: Millets are traditional grains grown and consumed in the Indian subcontinent .They are highly tolerant to drought and other extreme weather conditions and considered tough crops in terms of growth requirements as they withstand harsh climatic factors such as unpredictable climate and nutrient-depleted soils [Sharma and Ortiz, 2000]. Although the millets have been studied in depth with regard to grain related aspects, the studies on fodder aspects have received lesser attention. They are used to feed house hold animals both as green and dry fodder to a great extent in resource poor conditions (Bandyopadhy *et al*., 2009; Khulbe *et al.*, 2015). Millet straw makes good fodder and contains up to 61% total digestible nutrients. The millet fodder also contains good amount of protein and digestible fibre (Yadav and Yadav, 2013).There is a need to study and highlight these crops as source of green and dry fodder, as these crops are often grown in resource poor conditions and form major source of fodder for the animals in adverse climatic conditions. Under rainfed conditions nitrogen nutrition determines the crop performance. Increase in grain and fodder yield was observed with the increasing fertilizer doses. The fodder quality parameters showed improvement at higher doses of fertilizer (Yadav and Yadav, 2013). Hence this study is proposed for consideration.

Objectives:

- To evaluate green and dry fodder production potential of popular minor millets under varying levels of nitrogen nutrition.
- To know the impact of nitrogen nutrition on quality of green and dry fodder and economics of production

Experimental details:

Design: Split plot	**Plot size**: 3.6m X 4.0 m
Spacing: 30 cm between rows	**Replications**: 3
Fertilizer: N as per the treatments, P&K @20 kg/ha	**No. of treatments**: 12
Year of Start: Kharif 2023	**Duration of trial**: 2 Years

Treatments Details:

A. Main plots (Millets)- 3

1. Finger millet (*Eleusine coracana*)
2. Barnyard millet (*Echinochloa frumentacea*)
3. Brown top millet (*Brachiaria ramosa*) **or** Little millet (*Panicum sumatrense*)

B. Sub plots (Nitrogen levels)- 4

1. 0 kg N/ha
2. 20 kg N/ha
3. 40 kg N/ha
4. 60 kg N/ha

Observations to be recorded:

A. Growth parameters:

- Plant height (cm)
- No. of tillers/half meter row length
- Leaf: stem ratio

B. Yield parameters

- Green fodder yield (q/ha) at 50% flowering
- Fodder yield (q/ha) at physiological maturity
- Grain yield (q/ha) at physiological maturity

C. Quality parameters

- Crude protein content and yield
- Crude fiber content and yield
- Ash content (%)

D. Nutrient uptake by crop and nitrogen use efficiency

- Available N,P and K status in soil before and after experimentation

E. Economics

- Gross expenditure (Rs/ha)
- Gross returns (Rs/ha)
- Net returns (Rs/ha)
- B:C ratio

Methodology:

- The millet crops will be raised under rainfed conditions following local recommended package of practices.
- At 50 % flowering half of the plot will be harvested for green fodder and all the observations to be recorded.
- The remaining half of the plot will be retained for dual purpose (grain and fodder yield) and all the observations will be recorded at harvest.
- Analysis of data will be done separately for green fodder purpose and for both grain yield and fodder purpose (dual purpose).

Note: The trial should be conducted in nitrogen deficit soil.

K-23-AST-2: Comparative study of zinc sulphate and nano zinc of summer fodder sorghum

Centres: Anand, Kalyani, Pantnagar, Imphal

Preamble: Livestock production is the backbone of Indian Agriculture contributing 7 percent to national gross domestic product and source of employment and ultimate livelihood for 70 percent of the population in rural area (Sulthana *et.al.*, 2015). Fodder maize is most nutritious and palatable *kharif* and *rabi* fodder which is considered good for milch animal. Zinc is very important micronutrient for human health, high fertilizer application and intensive cropping has led to deficiency in micronutrients. Zinc regulates metabolism and influence multifaceted development of body (Shanti *et.al*., 2020). Zn has vital role in stabilization RNA, DAN, ribosomes and is improved in the immune system of animals, deficiency of which affects the health and milk production severely (Kumar *et.al.*, 2017). Deficiency in soil will lead to poor yield as well as quality of fodder.

Objectives:

- To evaluate the effects of soil and foliar application of Zn on growth, yiels and fodder quality of summer fodder sorghum.
- To work out the zinc use efficiency and economics in summer fodder sorghum.

Experimental details:

Design: RCBD	**Plot size**: 3.60 × 5.00 m
Spacing: 30 cm between rows	**Replications**: 3
Fertilizer: 80-40-0 kg NPK/ha	**No. of treatments**: 10
Variety: Gujarat Anand Forage Sorghum 11 (GAFS 11)	**Duration of trial**: 2 Years
Year of Start: Kharif 2023	

Treatments Details:

1. RDF (80-40-0 NPK kg/ha)
2.RDF *fb* water spray
3.RDF + seed treatment with $ZnSO_4$ (10 ml/kg seed)
4.RDF + Soil application of $ZnSO_4$ 8 kg /ha
5.RDF *fb* foliar application of 0.5 % $ZnSO_4$
6.RDF *fb* foliar application of 500 ppm nano Zn
7.RDF + seed treatment with $ZnSO_4$ (10 ml/kg seed) *fb* foliar application of 0.5% $ZnSO_4$
8.RDF + seed treatment with $ZnSO_4$ (10 ml/kg seed) *fb* foliar application of 500 ppm nano Zn
9.RDF + Soil application of $ZnSO_4$ 8 kg /ha *fb* foliar application of 0.5% $ZnSO_4$
10.RDF + Soil application of $ZnSO_4$ 8 kg /ha *fb* foliar application of 500 ppm nano Zn

Note: ***Water and Foliar spray at 30 and 45 DAS***

Observations to be recorded:

A. Growth parameters:

- Plant height (cm)
- Leaf: stem ratio

B. Yield parameters

- Green fodder yield (q/ha) at full flowering
- Dry matter yield (q/ha)

C. Quality parameters

- Crude protein content and yield
- Crude fiber content and yield
- Ash content (%)

D. Nutrient uptake by crop and zinc content in plant

- Available N,P and K and Zn status in soil before and after experimentation

E. Economics

- Gross expenditure (Rs/ha)
- Gross returns (Rs/ha)
- Net returns (Rs/ha)
- B:C ratio

Note:

1. Trial should be conducted in zinc deficit soil.
2. Composition of nano zinc need to be furnished

K-23-AST-3: Effect of Nano urea on Perennial grasses (Hybrid Napier and Congo-signal) in terms of Fodder Productivity and quality

Location: AAU, Jorhat

Objectives:

1. To evaluate the different concentration of nano urea on green fodder yield and quality.
2. To work out the economic analysis

Experimental Details:

Treatments:

A. Crops: a. Hybrid Napier
b. Congo signal

B. Nitrogen doses

1. Control (Only P & K apply)
2. RDN 120 kg/ha
3. 75% recommended dose of N + Nano @ 2ml/lit of water
4. 75% recommended dose of N + Nano @ 4 ml/lit of water
5. 75% recommended dose of N + Nano @ 6 ml/lit of water
6. 75% recommended dose of N + urea (2% Spray)

Notes: Nitrogen will be apply 40 kg/ha as basal and 30 kg/ha as after each cut. There will be 4 cut taken in a year.)
Fertilizer Dose: $N:P_2O_5:K_2O$ 120:50:30 kg/ha
No. of Treatment: 12
Duration of trial: 3 years
Plot Size: 4mX4m
Design: RBD
Spacing: 75 cm X 40 cm
Replication: 3
Total No. of Plot: 36

Observation to be recorded

A. Growth parameters:

a. Plant height (cm)
b. Number of tiller/clump
c. No. of Leaves per clump
d. Leaf : stem ratio

B. Yield and Quality

a. Green Fodder Yield(q/ha) at each cut
b. Dry matter Yield (q/ha)
c. Per day Productivity

C. Quality parameters:

a. Crude Protein content & yield
b. Crude fiber content and yield

D. Nutrient uptake by crop:

a. Available N,P and K status in soil before and after experimentation

E. Economics:

a. Gross expenditure (Rs/ha)
b. Gross return (Rs/ha)
c. Net returns (Rs/ha)
d. B:C ratio

K-23-AST-4: Effect of Biochar on soil health and yield of Bajra Napier hybrid grass

Centres: Vellayani, Urulikanchan and PJNCoA, Karaikal, (Pondicherry**)**

Preamble: Intensive cultivation without soil protection has caused serious soil degradation in arable land and further degradation of soil quality resulting in low crop yield and this process has been severely accelerated by soil erosion in slope fields. Biochar, as a carbon-rich amendment material, has been widely used to improve soil properties, reduce nutrient loss, and promote agricultural production. This has attracted much attention in various fields and is considered an effective measure to solve the crisis of soil degradation and sustain soil quality and ultimately to improve crop yields. Bajra Napier hybrid is a widely cultivated perennial fodder grass to meet out the green fodder requirement of the cattle population. Application of biochar to the soil may help to increase the yield of perennial fodder grass through improvement in soil health and nutrient status.

Objectives:

- To optimize the optimum dosage of biochar for higher green forage yield and quality in BXN Hybrid
- To know the effect of biochar application on soil health and economics of production

Crop:

Vellayani: Karaikal: Bajra Napier hybrid
BAIF, Uralikanchan: Maize- berseem cropping system

Experimental details:

Design: RBD	**Plot size:** 6 m x 5 m
Spacing: 60cm x 50 cm	**Replications:** 3
No. of treatments: 10	**Variety:** Co-5
Duration of trial: 3 Years	**Year of Start:** Kharif 2023

Treatments Details:

1. Absolute Control (No RDF and No Biochar)
2. RDF as per the POP
3. Biochar 2.5 t ha^{-1}
4. Biochar 5 t ha^{-1}
5. Biochar 7.5 t ha^{-1}
6. Biochar 10 t ha^{-1}
7. Biochar 2.5 t ha^{-1}+ RDF
8. Biochar 5 t ha^{-1}+ RDF
9. Biochar 7.5 t ha^{-1}+ RDF
10. Biochar 10 t ha^{-1}+ RDF

Observations to be recorded:

A. Growth parameters

1. Plant height – 30, 60 DAP and at every harvest
2. Leaf Stem Ratio - 30, 60 DAP and at every harvest
3. No. of tillers per clump at every harvest

B. Yield parameters

1. Green fodder yield (q $ha^{-1}year^{-1}$)
2. Dry matter yield (q $ha^{-1}year^{-1}$)
3. Crude protein yield (q ha^{-1})at every harvest

C. Soil Physical properties

1. Bulk density
2. Particle density
3. Porosity

D. Soil Chemical properties

Soil analysis - Initial and final (pH, EC, N, P, K and Organic carbon)

E. Economic Analysis

1. Gross return (Rs. ha^{-1})
2. Net return (Rs. ha^{-1})
3. Benefit cost ratio

Note: Nutrient composition of Biochar need to be furnished

AVT-2 Based Trials

K-23-AST-5: (AVTM-2 Agro): Effect of nitrogen levels on forage yield of promising entries of forage maize

Centres

NWZ-Ludhiana, Pantnagar,
CZ-Anand, Raipur**,**
NEZ-Imphal, Pusa and Ayodhya,
HZ -Palampur and Srinagar
SZ – Coimbatore, Hyderabad

Objective:
To study the response of promising entries of fodder maize to nitrogen levels

Entries No.	:	4 + 2 (NC) + 1 hybrid check [CO(HM)8]= 7
Entries Name	:	CMH-12-686 (TNAU, Coimbatore), FSM2021-1 (Foragen Seeds), MFM-18-2 (UAS ZARS, Mandya), PJHM-1 (IARI, Delhi)
Checks	:	African Tall, J-1006 & IIMR hybrid COHM-8
N Levels		60, 100 and 140 kg N/ha (half N as basal and half N after 30 DAS)
Fertilizers	:	60:40 kg/ha (P:K) basal
Design	:	FRBD with 3 replications
Plot size	:	4 m x 3 m accommodating 4 m long 10 rows at 30 cm
Total plots	:	63
Seed rate	:	50 kg/ha (60g/plot)
Seed requirement/entry /Centre	:	540 gm per center

Observations:

- Plant population/m^2 at15 DAS and harvest, Plant height and Leaf: stem ratio at harvest
- Green fodder and dry matter yields(q/ha),Green fodder productivity/day/ha
- Crude protein content and crude protein yield(q/ha)
- Agronomic Optima and Agronomic Maxima

K-23-AST-6: (AVTPM-2 Agro): Second Advanced Varietal Trial in Forage Pearl millet

Centres:
NWZ-Ludhiana, Hisar
NEZ- Pusa, Ranchi
CZ-Anand, Raipur
SZ- Hyderabad, Mandya

Objective:
To study the response of promising entries of Forage Pearl millet to nitrogen levels

Entries No.	:	4 + 2 (NC) + 1 (ZC)= 7
Entries Name	:	ADV175020 (Advanta seed Pvt. Ltd.), FBL-7 (PAU, Ludhiana), FSB2021-1 (Foragen Seeds), JPM-18-71 (JNKVV, Jabalpur)
Checks	:	RBB-1 (NC), Giant Bajra (NC), AFB-3 (NWZ), APFB-9-1 (NEZ), BAIF Bajra 1 (CZ), Moti Bajra (SZ)
N Levels		Three (40,80,120 kg/ha)
Design & Replications	:	FRBD 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		63
Seed requirement/entry		135g/ centre

Observations:

- Plant population/m^2 at15 DAS and harvest, Plant height and Leaf: stem ratio at harvest
- Green fodder and dry matter yields(q/ha),Green fodder productivity/day/ha
- Crude protein content and crude protein yield(q/ha)
- Agronomic Optima and Agronomic Maxima

Ongoing Projects

K-22-AST-1: Yield maximization in fodder maize through micro-nutrients and bio-fertilizers

Locations (6)	:	Mandya, Ayodhya, Ranchi, Coimbatore, Jabalpur	Data of reporting	:	*Kharif*
Year of start and duration	:	*Kharif*-2022 Two years	Concluding year	:	2023

Objectives:

- To study the efficacy of micro-nutrients and bio-fertilizers on green forage yield and quality
- To work out the economics

Treatments

T_1	:	Recommended NPK Only (150:26:33 NPK kg/ha*)
T_2	:	FYM (10 t/ha)
T_3	:	Recommended NPK + FYM (10 t/ha)
T_4	:	Recommended NPK + FYM (10 t/ha) + Bio-fertilizer consortium (BFC) 5 kg/ha
T_5	:	75% Recommended NPK + FYM (10 t/ha) + Bio-fertilizer consortium (BFC) @ 5 kg/ha
T_6	:	50 % Recommended NPK + FYM (10 t/ha) + Bio-fertilizer consortium (BFC) @ 5 kg/ha
T_7	:	Recommended NPK + FYM (10 t/ha) + Micronutrients mixtures @ 0.5% (20 & 40 DAS)
T_8	:	Recommended NPK + FYM (10 t/ha) + Micronutrients mixtures @ 1% (20 & 40 DAS)
T_9	:	Recommended NPK + FYM (10 t/ha) + Micronutrients mixtures @ 0.5% (20 & 40 DAS) + BFC (5 kg/ha)
T_{10}	:	Recommended NPK + FYM (10 t/ha) + Micronutrients mixtures @ 1% (20 & 40 DAS) + BFC (5 kg/ha)
T_{11}	:	Absolute control (no fertilizer)

Plot Size	:	3.6 m × 3.0 m	No. of treatments	:	11
Replications	:	Three	Design	:	RCBD
Fertilizer Dose	:	150:26:33 NPK kg/ha	Spacing	:	30 cm × 10 cm

Observations to be recorded

A. **Fodder**

- Plant height (cm)
- Leaf stem ratio
- Green forage yield (q/ha)
- Dry matter yield (q/ha)
- Crude protein yield (q/ha)
- Economics (Gross returns, Net returns & B:C ratio)
- Micronutrients content in green fodder on dry weight basis

A. **Soil Properties**

- OC (%), N, P, K & micronutrients and Microbial biomass before the start and after experimentation

Bio-fertilizer consortium

Note:

- For uniformity, Mandya centre will provide bio-fertilizers consortia, which contain following microbes (N-Fixing (*Azotobacter*), P solublizer (*Bacillus megaterium*) & K solubilizer (*Frateuria aurantia*), PGPR-(*Pseudomonas fluorescens*), Bio control agent (*Trichoderma*) Solubilizing bacteria).
- While spraying micronutrients add citric acid and KOH @ the rate of 2.5g l^{-1} of water to adjust the pH (6.0 to 6.5)
- 500 l water /ha to be used for spraying micronutrients
- The recommended package of the respective state may be followed
- prepare multi micronutrient mixtures from commercial product for treatment $T_{7,}$ $T_{8,}$ T_{9} & T_{10} as per following

- **Micronutrients mixtures**

S. No	Micronutrients	Concentration (%)	Source
1	Zn	4.2	$ZnSo_4$ .7 H_2O (21% Zn)
2	Mn	3.1	$MnSo_4$ (30.5% Mn)
3	Fe	5.7	$FeSo_4$ (19.1% Fe)
4	Cu	2.4	$CuSo_4$ (24% Cu)
5	Boron	1.7	Boric acid (17%)
6	Mo	0.13	NH_4Mo (52%)

R-19 AST 5: Standardization of Magnesium nutrition in Bajra Napier Hybrid

Location (1)	Vellayani	**Data reporting**	Rabi
Year of Start	Rabi 2020 -21	**Period**	3 years

Objective:
To assess the impact of varying doses and frequency of application of $MgSO_4$ on the growth, yield and quality attributes of hybrid Napier.

Treatment details:

$MgSO_4$ levels (M)- 3	**Frequency of Application (F)-3**
M_1- 80 kg/ha	F_1- 2 (once in 6 months)
M_2- 100 kg/ha	F_2- 3 (once in 4 months)
M_3- 120 kg/ha	F_3- 4 (once in 3 months)
Control (only RDF: 25t FYM + 200:50:50 kg NPK)	

Crop	Bajra Napier hybrid	**Variety**	**Suguna**
Design	Factorial RBD	Replications	3
Plot size	4 x 4m	Period	3 years

Observations:

✓ **Growth and Yield attributes**
- Plant height at each harvest (cm)
- Leaf: stem ratio at each harvest
- Number of tillers per hill at each harvest
- Green fodder yield (t/ha)
- Dry fodder yield (t/ha)

✓ **Quality characters**
- Crude protein content (%)
- Crude fibre content (%)

✓ **Nutrient Analysis**

Soil analysis: pH, EC, Organic carbon, Mg, and NPK status before and after the conduct of the experiment

Plant analysis: N, P, K and Mg

✓ **Economics of cultivation**
- Benefit: cost ratio

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

Location (1)	**Vellayani**
Year of Start & Duration	*Kharif* 2020, 3 years

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

Design	Split plot	**Replication**	3
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-22-AST-2: Enhancing the productivity and quality of fodder maize/ pearl milltet through nano-urea

Locations (15)

HZ - Srinagar

NEZ - Imphal, Pusa Ranchi and Kalyani

NWZ - Ludhiana, Pantnagar, Bikaner and Hisar

CZ - Raipur Urulikanchan Anand, Banda

SZ - Mandya and Vellayani

Year of start and duration	:	*Kharif*-2022, Two years	**Data of reporting**	:	*Kharif*

Objectives:

1. To study the different concentrations of nano-urea on growth, yield, and quality of fodder maize
2. To study the effect of nano-urea on nitrogen use efficiency
3. To study the relative economics

Experimental details

Treatments

T_1	:	Control (without N)
T_2	:	RDF (N:P:K @150:26:33 kg/ha)
T_3	:	RDF (N:P:K @150:26:33 kg/ha)
T_4	:	75% recommended dose of N + Nano-urea @ 2 ml/litre of water
T_5	:	50% recommended dose of N + Nano-urea @ 2 ml/litre of water
T_6	:	75% recommended dose of N + Nano-urea @ 4 ml/litre of water
T_7	:	50% recommended dose of N + Nano-urea @ 4 ml/litre of water
T_8	:	75% recommended dose of N + Nano-urea @ 6 ml/litre of water
T_9	:	50% recommended dose of N + Nano-urea @ 6 ml/litre of water
T_{10}	:	50 % recommended dose of N + Urea (2 % spray)

Plot Size	:	3.0 m × 4.0 m	**Treatments**	:	10
Replications	:	Three	**Design**	:	RCBD
Fertilizer Dose	:	150:26:33 NPK kg/ha	**Spacing**	:	30 cm × 10 cm

Observations to be recorded

- Plant height (cm)
- Leaf : Stem ratio
- Dry matter accumulation (%)
- Green fodder yield (q/ha)
- Dry fodder yield (q/ha)
- Crude protein content (%)
- ADF (%)
- NDF (%)
- Economics (Gross returns, net returns and B:C ratio)
- Soil nutrient status before start and after experimentation
- Nutrient content in plants

Annexure C

ICRP on Forage Crops and Utilization
Technical Programme Crop Protection
Kharif 2023

New proposals *Kharif*-2023

PPT 36: Non-chemical management of fall armyworm, *Spodoptera frugiperda* (J E Smith) (Lepidoptera: Noctuidae) on fodder maize

Locations: Rahuri, Coimbatore

Objective: Non-chemical management of fall army worm, *Spodoptera frugiperda* L. on forage maize

1. To study the non-chemical management of fall armyworm on maize.
2. To study the abundance of natural enemies

Variety: African Tall
Design : RCBD

Treatment Details

	Name of the Treatment	**Dose**
T1	*Metarhizium anisopliae*	5 g/L
T2	*Metarhizium riley* (*Nomuria*)	5 g/L
T3	*Beauveria bassiana*	5 g/L
T4	Azadiractin 10000ppm	2 ml/L
T5	Pheromone trap	10/acre
T6	*Trichogramma pretiosum*	8 cards/ha, (2.5 lakh eggs/ha)
T7	Mix cropping maize + cowpea	(1:1)
T8	Mix cropping maize + field bean	(1:1)
T9	Mix cropping maize + Bajra	(1:1)
T10	Untreated control	--

Method of recording observations

1. Number of infested plants per plot will be recorded at weekly interval per cent damage will be recorded on five randomly selected plants at an interval of seven days during the crop period.
2. Number of infested plants before spray and 3, 7 & 10 days after spray will be recorded
3. Green Fodder Yield (q/ha)

PPT 37: Variability studies of *Pyricularia grisea* – a causal agent of pearl millet leaf blast

Locations: Palampur, Ludhiana and Bhubaneswar

Preamble:

Pearl millet (*Pennisetum glaucum* (L.) R. Br., syn. *Cenchrus americanus* (L.) Morrone), a C4 grass, is a highly cross-pollinated. Pearl millet accounts for more than half of the total millet production in the world. Pearl millet is one of the major cereals as well as fodder crops grown worldwide. It is grown in arid, sub-tropical and low rainfall areas. Pearl millet is grown in hardy conditions as it is tolerant to salinity or drought that prevents the production of major cereals. In India, it is grown in a 7.13 million hectares area with 8.06 million tons of annual production (Anonymous, 2017). It is an important fodder crop of the rainy season after sorghum and maize with high biomass and crude protein content as well as high palatability. In India, pearl millet leaf blast disease was reported initially in 1953 and after that it is sporadically reported on some of the cultivars. Since the year 2000 the leaf blast is becoming more serious and is now gaining increasing importance due to its high and widespread incidence across the pearl millet cultivating states in India and other Pearl Millet growing geographies.

Blast disease is caused by fungal organism *Pyricularia grisea* (T.T. Hebert) M.E. Barr. Hot humid weather especially during rainy days is the most conducive conditions for the pathogen to grow and spread. Management of diseases through resistant cultivars is the most economical and relevant way of controlling pearl millet blast mainly by resource poor and marginal farmers, who cannot afford to control blast disease by the application of chemical and pesticides. Chemical control of plant pathogens is most effective and yet the use of chemicals is not generally desired due to certain disadvantages viz., ground water pollution, residues on food crops, effect on non-target organisms. Besides, their continuous use leads to the resurgence of resistant races of the pathogen under selection pressure. Use of resistant cultivars is the best alternative to overcome yield losses caused by *P. grisea*. It can overcome resistance within two to three years after the release of resistant cultivars widely and thus made breeding for resistance a constant challenge. There is a need to have clear understanding of the biology of the pathogen. However, such studies are very limited with the pearl millet blast pathosystems.

Objectives:

- Collection of different isolates of *Pyricularia grisea*
- To study cultural, molecular, and pathogenic variability of *Pyricularia* grisea

1st year:

- Collection of disease samples and isolation of the pathogen isolates

2nd year

- Morphological and cultural parameters of *Pyricularia* isolates
- Virulence of the pathogen isolates

3rd year

- Molecular characterization of *Pyricularia* isolates using markers
- Pathogenic variability of *Pyricularia grisea* using a set of host differentials

Methodology:

1st year:

- Collection of disease samples: Diseased samples will be collected from 10 different locations per centre. The pathogen isolation will be cultured on media for isolation. These isolates will be purified and maintained for further studies.

2nd year

- Morphological characterization: *Pyricularia* isolates will be characterized based on morphological features such as colour of the fungus, type of growth of the fungus, smooth or rough surface and compressed or raised margins and surface pigmentation will be recorded for *P. grisea* isolates.
- Pathogenicity testing and virulence of isolates: Pathogenicity will be tested on susceptible pearl millet line based on the virulence of isolates and will be assessed by measuring the lesion length or disease severity on susceptible variety. The isolates will be categorized into different groups.

3rd year

- Pathogenic variability of *Pyricularia grisea* using a set of host differentials

Pathogenic variability will be studied among isolates of *P. grisea* based on their reaction on a set of host differentials. A set of host differential will be procured from ICRISAT, Hyderabad. Blast severity will be recorded 8 days after inoculation using a 1-9 progressive scale (Sharma et al., 2013). Based on the reaction type (avirulent reaction = score $\leq$ 3.0 (no lesion to small necrotic spots) on a differential line, and virulent reaction = score $\geq$ 4.0 (typical blast lesions) on 1-9 scale), isolates will be grouped in different pathogenic groups/pathotypes.

- Genetic variability of *Pyricularia* isolates will be studied by Molecular characterization of different isolates using molecular markers

On Going Progamme

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

Locations: Bhubaneswar, Palampur, Rahuri, Coimbatore 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, Pearl millet, Cowpea, perennial grasses
Palampur	Sorghum, Maize, Pearl millet, Cowpea
Jhansi	Sorghum, Maize, Pearl millet, Cowpea
Rahuri	Sorghum, Maize, Pearl millet, Cowpea, perennial grasses
Bhubaneswar	Sorghum, Maize, Pearl millet, Cowpea, Ricebean
Coimbatore	Sorghum, Maize, Pearl millet, Cowpea, perennial grasses

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, Coimbatore, 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 andinsect pests under natural conditions

Locations: Bhubaneswar, Palampur, Rahuri, Coimbatore, 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 are given below:

Location	Disease and insect-pests to be evaluated in different crops				
	Maize	**Pearl millet**	**Cowpea**	**Ricebean**	**Perennia lgrasses**
Ludhiana	Maydis leaf blight	Blast, downy mildew	Yellow mosaic virus, aphids	-	Leaf spots and blight
Palampur	Turcicum Leaf blight, Banded leaf and sheath Blight	Blast	Root rot/wilt complex, Leafspot, 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 andblight
Rahuri	Leaf blight, fall armyworm	-	Yellow mosaic virus, aphids	-	leaf spot and blight
Coimbatore	*Turcicum* leaf blight, fall armyworm	Blast, downy mildew	Yellow mosaic virus, aphids	-	leaf spot andblight

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

Location: Rahuri, Coimbatore

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 daysafter 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 managementof 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) byshootfly 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.
- Fodder quality attributes viz., Crude protein (%), ADF (%), NDF (%) in different treatments at the time of harvesting.
- Green fodder yield (q/ha) in different treatments.
- Percent Yield loss in different treatments.

PPT-32: Estimation of yield losses due to foliar diseases (anthracnose, gray leaf spot andzonate leaf spot) in fodder sorghum

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

Treatments:
T1: Seed treatment with carbendazim (2g/kg) + foliar spray of propiconazole @ 1ml/l at 20 and 35 daysafter emergence (DAE)
T2: Seed treatment with carbendazim (2g/kg) + foliar spray of propiconazole @ 1ml/l at 20 DAE
T3: Seed treatment with carbendazim (2g/kg) + foliar spray of propiconazole @ 1ml/l at 35 DAE
T4: Foliar spray of propiconazole @ 1ml/l at 20 and 35 DAE
T5: Foliar spray of propiconazole @ 1ml/l at 20 DAE
T6: Foliar spray of propiconazole @ 1ml/l at 35 DAE
T7: Seed treatment with carbendazim (2g/kg)
T8: Control

Treatment information:
- Seed treatment with carbendazim (2g/kg) for managing seed borne inoculum.
- Foliar spray at 20 and 35 DAE of propiconazole @ 1ml/l for the management of foliar diseases (anthracnose, gray leaf spot and zonate leaf spot) for managing air borne inoculum.

Observations:
- Disease severity (%) of respective disease on 10 randomly selected plants per replication per treatment at 5 days interval starting from 10 days after emergence till crop harvesting.
- AUDPC and rate of infection in different treatments.
- Fodder quality attributes viz., Crude protein (%), ADF (%), NDF (%) in different treatments at the time of harvesting.
- Green fodder yield (q/ha) in different treatments.
- Percent quantitative and qualitative yield loss in different treatments.

PPT-34: Eco friendly management of leaf spots (anthracnose, gray leaf spot and zonate leaf spot) of forage sorghum

Location: Ludhiana
Design: RCBD **Variety:** SL 44 **Plot size:** 3 x 3 m^2 **Replications:** 3

Treatments
T1: Foliar spray of organic product 1 (100 ml/l)
T2: Foliar spray of organic product 2 (100 ml/l)
T3: Foliar spray of organic product 3 (100 ml/l)
T4: T1 + T2
T5: T2 + T3
T6: T3 + T1
T7: Foliar spray of CaCl2 (0.5mg/l)
T8: Foliar spray of KNO3 (15mg/l)
T9: Foliar spray of T7 and T8
T10: Recommended check (Seed treatment with *Trichoderma viride* @ 5g/kg seed + One spray each with neem bio -pesticide (Achook) @ 3% and propiconazole @ 1g/l)
T11: Control
***The composition of organic products:**
Organic product -1 = fermented butter milk
Organic product -2 = neem extract in water
Organic product -3 = neem extract in cow urine

Number of sprays: 3
Sprays schedule: 1st spray will be given at 20 days after germination
2nd and 3rd spray will be given at 10-15 days interval
Observations:
- Disease severity (%) of Anthracnose, Gray leaf spot and zonate leaf spot on 10 randomly selected plants per replication per treatment at 5 days interval starting from 10 days after emergence till crop harvesting.
- AUDPC and rate of infection in different treatments.
- Green fodder yield (q/ha) in different treatments.

PPT-35: Evaluation of different fodder crops for enhancing natural enemies and managing insect pests in fodder sorghum

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

Variety: Fodder sorghum (Single cut: Co 32/location specific single cut variety), Fodder maize (African tall), fodder pearl millet (Giant Bajra) and Fodder cowpea (TN FC 0926).

Treatments

T1: Fodder sorghum (main crop) + Fodder cowpea as a border crop (two rows of fodder cowpea on two sides of plot as border)

T2: Fodder sorghum and Fodder cowpea as a mix crop in paired row system (Two rows of fodder sorghum and two rows of fodder cowpea)

T3: Fodder sorghum (main crop) + Fodder maize as a border crop (two rows of fodder maize on two sides of plot as border)

T4: Fodder sorghum and Fodder Maize as a mix crop in paired row system (Two rows of fodder sorghum and two rows of fodder maize)

T5: Fodder sorghum (main crop) + Fodder pearl millet as a border crop (two rows of fodder pearl millet on two sides of plot as border)

T6: Fodder sorghum and Fodder pearl millet as a mix crop in paired row system (Two rows of fodder sorghum and two rows of fodder pearl millet)

T7: Fodder sorghum as a sole crop (with Farmers Practice of Seed treatment with Thiamethoxam 30 FS @ 2g/kg of seed and spray of Azadirachtin 3000 ppm @ 2ml/ lit of water for management of shootfly; Emamectin benzoate 5 WG @ 0.5g /lit of water for management of fall armyworm and spray of imidacloprid 17.8 SL @ 0.3ml/lit of water for management of aphids

T8: Control (Fodder sorghum as a sole crop without any farmers practice)

Target pests: Shoot fly, Fall army worm and aphids

Observations on main crop, intercrop and border crop: (Insect Pest population)

- Per cent damage (in terms of deadhearts) by shootfly at 5 days interval (Fodder sorghum, maize, cowpea and pearl millet)
- Number of larva and adults of armyworm on five randomly selected plant and % damage by armyworm at 5 days interval.(Fodder sorghum, maize, cowpea and pearl millet)
- Number of nymphs and adults of aphids on five randomly selected plants at 5 days interval (Fodder sorghum, cowpea, maize and pearl millet)

Observation on main crop, intercrop and border crop: (Natural enemies and parasitoids population):

- Number of larvae and adults of coccinellid beetles on five randomly selected plants at 5 days interval (Fodder sorghum, cowpea, maize and pearl millet).
- Number of parasitized larvae of fall armyworm on five randomly selected plants at 5 days interval (Fodder sorghum, cowpea, maize and pearl millet).
- Observation on any other natural enemies if present.
- Green fodder yield in different treatments.

PPT-33: Germplasm evaluation programme against diseases and insect-pests in forages

Objective: To identify potential resistance donors for their further use in forage breeding programme.

Details of crop, disease/insect-pest and place of screening

Crop	Disease	Place of screening	Germplasm contributing centres
Maize	Maydis leaf blight	Ludhiana	Hyderabad, Srinagar, Mandya, Ludhiana, BAIF
	Turcicum leaf blight	Palampur, Mandya	
	Downy mildew	Mandya	
	Fall armyworm	Coimbatore, Rahuri	
Cowpea	Root rot/wilt	Palampur, Bhubaneshwar	Mandya, Pantnagar, Hyderabad, Coimbatore
	Defoliators, Yellow mosaic virus	Coimbatore, Rahuri, Ludhiana	
Pearl millet	Blast	Ludhiana	Bikaner, Anand, Hyderabad, Hisar

Design: Augmented design

Crop: Maize

- Number of entries/lines: 25 germplasm lines per centre
- Paired rows for each germplasm in 3 m rows.
- 30 cm row to row and 10 cm plant to plant distance.
- Fertilizers: 80:40 kg/ha (N:P) 40:40 kg/ha (N:P) basal+ 40 N after 30 days
- **Seed:** 100 g per entry
- **Contributing centres:** Hyderabad, Srinagar, Mandya, Ludhiana, BAIF

Crop: Cowpea

- Number of entries/lines: 25 germplasm lines per centre
- paired rows for each germplasm in 3 m rows.
- 30 cm row to row and 10 cm plant to plant distance.
- Fertilizers: 20:40 kg/ha (N:P) basal
- **Seed:** 50 g per entry
- **Contributing centres:** Mandya, Pantnagar, Hyderabad, Coimbatore

Crop: Pearl millet

- Number of entries/lines: 25 germplasm lines per centre
- paired rows for each germplasm in 3 m rows.
- 30 cm row to row and 10 cm plant to plant distance.
- Fertilizers: 40:20 kg/ha (N:P) basal
- **Seed:** 20 g per entry
- **Contributing centres:** Bikaner, Anand, Hyderabad, Hisar

Observations: Disease severity/pest damage reaction of each line/entry at 50% flowering stageas per the rating scales.

Annexure D

Technical Programme
New Initiative Projects
Kharif 2023

K-21- AST-5: Screening of high biomass maize lines for silage potential

Locations: PAU, Ludhiana; NDDB, Anand; PJTSAU, Hyderabad; IGKV, Raipur; BHU South campus Mirzapur and BCKV, Kalyani
Duration: 2 year
Objectives:

- To screen high biomass maize lines / released cultivars for silage potential.
- To assess fermentation characteristics and nutritional quality of silage of the selected maize lines

Lines: African tall, J-1006, TSFM 15-5 (PJTSAU) J 1007 (state release from PAU), KDFM – 5 (state release from SKUAST- K); centers can use any local material/ hybrid which is popular in silage making in their area.
Technical programme
The 5 high biomass germplasm lines will be screened at milk, dough and dent stages during *kharif* 2021 for the following observations:
Observations:
Ist year
Agronomic parameters

- Plant height, Number of leaves/plant, Leaf length, Leaf breadth,
- Days to tasselling, silking and harvesting

Plant Quality parameters

- Dry matter percent, Total soluble sugars, CP content, CF content, GFY, DFY, IVDMD (if possible) or DMD.

Silage quality parameters

- pH, Ammonical – N, Dry matter percent, Total soluble sugars, CP content , ADF, NDF, Lactic acid content
- Other silage quality parameters

IInd year

- The better performing lines will be repeated for confirmation and validation of results. Suitable recommendation will be made.

Note

- Planting to be done in 10x10 m plots (or in four plots of 5X5m) for each variety using standard agronomic practice for forage production.
- Silage is to be prepared from maize harvested at three different stages ;(milk, dough and dent stages). Accordingly harvesting to be done three times from each variety (not multicut). Harvesting each time from different lines of each variety.
- Silage to be made from harvested material using standard practice. If needed 1-2 days of wilting may be done for fodder harvested at milk stage
- Common protocol for silage can be worked out by consultation. It may be explained in Zoom meeting if needed.
- Three to five kg capacity bags to be used
- If a centre wants to include any additional varieties, they can do so.

Project: Quality and anti-quality profiling of forage varieties and advanced breeding lines

Objective:

- Identifying parent materials for future crosses to introgress quality traits. .
- To identify the range of quality parameters for developing biofortified lines
- Identifying biofortified varieties/ introgression of quality traits into released varieties.

Materials: Released varieties, advanced breeding lines from different centers. 25-30 lines in each crop.

Crop	Forage	Grain	Anti quality	Testing Centers
Maize	CP, NDF, ADF, Hemicellulose, ADL,Ash, **Macro-minerals** (Ca,K, Na, P, S, Mg), **Micro-minerals** (Cu,Fe, Mn, Zn, B)	CP, CF, Total carbohydrate, **Macro-minerals** (Ca, K, Na, P, S, Mg), **Micro-minerals** (Cu, Fe, Mn, Zn, B)	-	Rahuri and Ludhiana
Cowpea			-	Hyderabad, Rahuri
Pearl millet			Oxalate in forage, oxalate, phytic acid in grains	Hyderabad, Anand
BN hybrid		-	Oxalate,nitrate	Rahuri, Anand
Napier lines		-	Oxalate, nitrate, NPN	Rahuri, Hyderabad

Maize:

- Released varieties + 5 advanced breeding lines each from BAIF, Ludhiana, Srinagar, Rahuri
- Crop will be grown at Jhansi, Rahuri and Ludhiana in augmented design in three rows of 4 m at 50 cm apart. Harvesting of one line will be done at 50% flowering, 1 lines at maturity.
- Nutrient data analysis will be done from both 50% flowering biomass and from seed.

Cowpea:

- Released varieties from Ludhiana Coimbatore, Rahuri, Pantnagar, Raipur + 5 advanced breeding lines from Pantnagar, Mandya
- Crop will be grown at Jhansi, Mandya and Vellayani in augmented design in three rows of 4 m at 50 cmapart Harvesting of one line will be done at 50% flowering, 1 lines at maturity.
- Nutrient data analysis will be done from both 50% flowering biomass and from seed.

Pearl millet:

- Released varieties from Hyderabad, Ayodhya, Anand, Bikaner, BAIF and other centres + 5 advanced breeding lines from Hyderabad, Anand , BAIF, Ayodhya
- Crop will be grown at Hyderabad, Anand and Jhansi in augmented design in three rows of 4 m at 50cm apart Harvesting of one line will be done at 50% flowering, 1 lines at maturity.
- Nutrient data analysis will be done from both 50% flowering biomass and from seed.

Napier and BxN hybrid:

- Released varieties of BxN hybrid as available in Rahuri, Anand and Hyderabad centres will be evaluated. Total samples 25. One cut data (second cut after monsoon onset will be utilized.
- For Napier 10 lines which are being used in crossing as male parent will be analyzed. Cut at 50% flowering will be analyzed.

Project AICRP forage- NBPGR collaboration programme: Evaluation of Dolichos (*Lablab purpureus*) germplasm for various traits.

Objective:

- To evaluate germplasm lines for identifying potential donors for various desirable traits
- To rejuvenate seeds and sharing among other centers.
- To develop suitable cultivars for forage traits/ dual purpose traits

Material:

- UAS (B) ZARS Mandya has nearly 700 germplasm/ advance breeding lines. NBPGR, New Delhi will supply nearly 1300 germplasm lines. All these lines will be evaluated at Mandya center and suitable germplasm with desirable traits will be identified for future use. The data will be shared with NBPGR and other centers. The germplasm as per demand of centers will also be shared.

Design: Augmented design.

Year: 2021-22 & 2022-23

Project (PPT-33): Germplasm evaluation programme against diseases and insect-pests in forages

Objective: To identify potential resistance donors for their further use in forage breeding programme.

Details of crop, disease/insect-pest and place of screening

Crop	Disease	Place of screening	Germplasm contributing centers
Maize	Maydis leaf blight	Ludhiana	Jhansi, Ludhiana
	Turcicum leaf blight	Palampur, Mandya, Larnoo (J&K)	
	Downy mildew	Mandya	
	Fall armyworm	Coimbatore, Rahuri	
Cowpea	Root rot/ wilt	Palampur, Bhubaneshwar	Jhansi, Ludhiana, Rahuri, Coimbatore, Mandya
	Defoliators, Yellow mosaic virus	Coimbatore, Rahuri	
Pearl millet	Blast	Ludhiana	Jhansi, Ludhiana, Rahuri, Hyderabad

Design: Augmented design

Crop: Maize

- Number of entries/lines: 25 germplasm lines per centre
- Paired rows for each germplasm in 3 m rows.
- 30 cm row to row and 10 cm plant to plant distance.
- Fertilizers: 80:40 kg/ha (N:P) 40:40 kg/ha (N:P) basal+ 40 N after 30 days
- **Seed:** 100 g per entry
- **Contributing centres:** Hyderabad, Srinagar, Mandya, Ludhiana, BAIF

Crop: Cowpea

- Number of entries/lines: 25 germplasm lines per centre
- Paired rows for each germplasm in 3 m rows.
- 30 cm row to row and 10 cm plant to plant distance.
- Fertilizers: 20:40 kg/ha (N:P) basal
- **Seed:** 50 g per entry
- **Contributing centres:** Mandya, Pantnagar, Hyderabad, Coimbatore

Crop: Pearl millet

- Number of entries/lines: 25 germplasm lines per centre
- Paired rows for each germplasm in 3 m rows.
- 30 cm row to row and 10 cm plant to plant distance.
- Fertilizers: 40:20 kg/ha (N:P) basal
- **Seed:** 20 g per entry
- **Contributing centres:** Bikaner, Anand, Hyderabad, Hisar

Observations: Disease severity/pest damage reaction of each line/entry at 50% flowering stageas per attached rating scales.

Maize: Leaf Blight (MLB/TLB):

Rating	Description	PDI (%)	Score	Disease reaction
1	Very slight to slight infection, one or two to few scattered lesions on lower leaves	0-20.0	≤1.0	Resistant
2	Light infection, moderate number of lesions on lower leaves only	20-40.0	≥1.0≤2.0	Moderately Resistant
3	Moderate infection, abundant lesions on lower leaves, few on middle leaves	40-60.0	≥2.0≤3.0	Moderately susceptible
4	Heavy infections abundant on lower and middle leaves, extending to upper leaves	60-80.0	≥3.0≤4.0	Susceptible
5	Very heavy infection, lesions abundant on almost all leaves, plants prematurely dry or killed by the disease	80-100.0	≥4.0≤5.0	Highly susceptible

Maize: Fall armyworm (Leaf damage rating scale)

Rating	Explanation/definition of damage	% Damage	Reaction
0	No visible leaf damage;	0-40	Resistant (0- 4)
1	Only pin-hole damage		
2	Pin-hole and small circular hole damage to leaves		
3	Pinholes, small circular lesions and a few small elongated (rectangular shaped) lesions of up to 1.3 cm in length present on whorl andfurl leaves.		
4	Several small to mid-sized 1.3 to 2.5 cm in length elongated lesions present on a few whorl and furl leaves		
5	Several large elongated lesions greater than 2.5 cm in length present on a few whorl and furl leaves and/or a few small- to mid-sized uniform to irregular shaped holes (basement membrane consumed) eaten from the whorl and/or furl leaves.	40-70	Moderately susceptible(4.1-7)
6	Several large elongated lesions present on sever-al whorl and furl leaves and/ or several large uniforms to irregular shaped holes eaten from furl and whorl leaves.		
7	Many elongated lesions of all sizes present on several whorl and furl leavesplus several large uniform to irregular shaped holes eaten from the whorl and furl leaves.		
8	Many elongated lesions of all sizes present on most whorl and furl leaves plus many mid- to large-sized uniform to irregular shaped holeseaten from the whorl and furl leaves.	71-100	Susceptible (7.1- 9)
9	Whorl and furl leaves almost totally destroyed		

Maize: Polyspora rust:

Rating	Description	Disease reaction
1	Very slight-to-slight infection, one or two to few scattered pustules on lower leaves only	R
2	Moderate number of pustules on lower leaves only (light infection)	MR
3	Abundant pustules on lower leaves; few on middle	MS
4	Abundant pustules on lower and middle leaves, extending to upper leaves	S
5	Abundant pustules on all leaves, plant may dry prematurely or killed by the disease.	HS

Sorghum downy mildew:

Rating	Description	Disease reaction
1	No infection	R
2	Light infection, a few scattered to moderate number of stripes on lower leaves	MR
3	Moderate infection, abundant stripes on lower leaves and few on middle leaves	MS
4	Heavy infection, stripes abundant leaves lower and middle leaves extending to upper leaves	S
5	Very heavy infection, stripes abundant on all leaves. No cob formation. Plant may killed prematurely	HS

Cowpea Root rot/wilt complex

Rating scale	Description (Infected plants)	Reaction
1	0	Immune
2	0-5 %	Resistant
3	5-10 %	
4	11-20 %	Moderately resistant
5	21-40 %	Moderately susceptible
6	41-60 %	Susceptible
7	61-80 %	Highly susceptible
8	81-90 %	
9	91-100 %	

Cowpea Yellow mosaic virus

Rating scale	Percent infection	Symptoms	Reaction
0	All plants free of virus symptoms	Complete absence of symptoms	HR
1	1-10 % infection	Small yellowish spots scattered on some leaves	R
2	11-20 % infection	Yellowish bright spots common on leaves, easy to observe	MR
3	21-30% infection	Yellowish bright specks common on leaves, easy to observe with larger patches of symptoms	MS
4	30-50% infection	Bright yellow specks or spots on all leaves, minor stunting of plants and less number of pods	S
5	50 % and more infection	Yellowing or chlorosis of all leaves on whole plant, shortening of internode, severe stunting of plants with no yield or few flowers and deformed pods produced withsmall, immature and shriveled seeds	HS

Cowpea Defoliators

Rating scale	Foliar damage (%)	Reaction
1	no damage	Immune
2	1-20	R
3	21-40	MR
4	41-60	MS
5	>60 complete damage	susceptible

Pearl millet Blast disease

Rating	Description	Reaction
1	No lesion to small brown specks of pin head size	HR
2	large brown specks	R
3	small, roundish to slightly elongated, necrotic gray spots, about 1-2mm in diameter with a brown margin	
4	Typical blast lesions, elliptical,1-2cm long, usually confined to the area between main veins, covering<2% of the leaf area	MR
5	Typical blast lesions covering<10% of the leaf area	
6	Typical blast lesions covering 10-25% of the leaf area	S
7	Typical blast lesions covering 26-50% of the leaf area	
8	Typical blast lesions covering 51-75% of the leaf area and many leaves dead	HS
9	>75% leaf area covered with lesions and most leaves dead	

Annexure E

AICRP on Forage Crops and Utilization
Breeder Seed Allocation

National (DAC) indent for forage crops Breeder Seed Production (BSP-1)
Year of indent: Kharif-2024 **Year of Production:** Kharif-2023

Crop: Fodder Cowpea

SN	Variety	Year of Release	Centre	DAC indent (q)	Allocation (q)	Indenter (q)
1	Vijaya (APFC-10-1)	2016	PJTSAU, Hyderabad	0.65	0.65	NDDB (0.65)
2	MFC-09-3	2021	UAS-ZARS Mandya	2.00	2.00	KVSSL (2.0)
3	CO 9	2018	TNAU Coimbatore	1.00	1.00	DADH (1.0)
4	TNFC 0926	2017	TNAU Coimbatore	2.00	2.00	KVSSL (2.0)
5	Bundel Lobia - 4 (IL-1177)	2015	ICAR-IGFRI, Jhansi	2.50	2.50	KVVSL (2.0), NDDB (0.50)
6	UPC-628	2010	GBPUAT, Pantnagar	0.50	0.50	NDDB (0.50)
			Total	**8.65**	**8.65**	

Crop : Fodder Maize

SN	Variety	Year of Release	Center	DAC indent (q)	Allocation (q)	Indenter (q)
1	CG Makka Chari-1 (IAFM 2015-48)	2021	IGKV, Raipur	10.0	10.0	NAFED (10.0)
2	J-1007 (PFM 10)	2021	PAU, Ludhiana	21.0	21.0	NAFED (2.0), KVSSL (10.0), NDDB (2.00), PB (6.0), NSAI (1.0)
3	J-1006	1992	PAU, Ludhiana	28.50	28.50	DADH (3.0), NDDB (2.0), NAFED (4.0), KVSSL (2.0), NSC (2.0), PB (6.0), NSAI (9.50)
4	TSFM 15-5	2019	PJTSAU, Hyderabad	5.20	5.20	KVVSL (5.0), NDDB (0.10), TN (0.10)
5	Pratap Makka Chari-6	2009	MPUAT, Udaipur	5.0	5.0	KVSSL (5.0)
6	African Tall Composite	1983	MPKV, Rahuri	40.50	28.00	DADH (3.0), NAFED (7.0), KK (0.04), KVSL (2.0), NDDB (7.55), NSC (20.0), TG (0.10), NSAI (0.03)
			BAIF, Urilikanchan		12.50	
			Total	**110.2**	**110.2**	

Crop : Fodder Pearl Millet

SN	Variety	Year of Release	Center	DAC indent (q)	Allocation (q)	Indenter (q)
1	TSFB 15-8	2020	PJTSAU, Hyderabad	0.60	0.60	KVSS (0.50), TN(0.10)
2	TSFB 15-4	2019	PJTSAU, Hyderabad	0.80	0.80	KVSS (0.50), DADH (0.20), TN (0.10)
3	TSFB 15-5	2020	PJTSAU, Hyderabad	0.10	0.10	TN (0.10)
4	TSFB 17-7	2022	PJTSAU, Hyderabad	0.30	0.30	KVSSL (0.30)
5	TSFB 18-1	2022	PJTSAU, Hyderabad	1.30	1.30	KVSSL (0.30), NDDB (1.0)
6	Moti Bajra (APFB-09-1)	2016	PJTSAU, Hyderabad	2.55	2.55	NAFED (2.0), KVSSL (0.50), NSAI (0.05)
7	BAIF Bajra-1	2008	BAIF, Uralikanchan	**2.95**	**2.95**	DADH (0.60), NAFED (2.0), KVSSL (0.30), NSAI (.05)
8	BAIF BAJRA-5	2022	BAIF, Uralikanchan	0.60	0.60	KVSSL (0.10), NDDB (0.50)
9	BAIF BAJRA-6	2022	BAIF, Uralikanchan	0.90	0.90	KVSSL (0.10), NDDB (0.80)
10	BAIF Bajra-7	2022	BAIF, Uralikanchan	0.30	0.30	KVSSL (0.30)
11	PCB 165 (GBL 2)	2021	PAU, Ludhiana	0.02	0.02	PB (0.02)
12	FBC 16	2007	PAU, Ludhiana	0.74	0.74	DADH (0.20), NSC (0.30), PB (0.04), NSAI (0.20)
13	Gujarat Anand Forage Bajra 4 (GAFB 4)	2019	AAU, Anand	0.20	0.20	NDDB (0.15), NSAI (0.05)
14	Raj Bajra-1(RBB-1)	2016	SKRAU, Bikaner	1.10	**1.10 + 0.10 +1.20**	NDDB (0.50), KVSSL (0.50), RJ (0.10) NSAI (0.10)
15	Raj Bajra Chari -2*	1987	SKRAU, Bikaner	0.10	**0.0 (No NS)**	NSAI (0.10) (RBB 1)
16	Avika Bajra Chari (AVKB–19)	2009	ICAR-IGFRI, Jhansi	2.20	2.20	DADH (0.20), NAFED (2.00)
17	CO 8	-	TNAU Coimbatore	0.40	0.40	DADH (0.40)
18	HC-20 (HMP 9102)	2002	CCS HAU, Hisar	0.20	0.20	DADH (0.20)
			Total	**15.36**	**15.36**	

*In the place of Raj Bajra Chari 2, additional quantity of variety RBB 1 has been allotted.

Crop: Rye Grass

S.N.	Variety	Year of Release	Center	DAC indent (q)	Allocation (q)	Indenter (q)
1	PBRG-2	2020	PAU, Ludhiana	2.00	2.00	KVSS (2.00)
2	Palam Rye Grass	2020	CSK HPKV, Palampur	2.00	2.00	KVSS (2.00)

Crop: Fodder Rice Bean (Red Bean)

SN	Variety	Year of Release	Center	DAC indent (q)	Allocation (q)	Indenter (q)
1	Bidhan-1 (BC-15/K-1	2001	BCKV, Kalyani	0.50	0.50	KVSSL (0.50)
2	Bidhan Rice Bean-2 (KRB-4	2019	BCKV, Kalyani	2.00	2.00	DADH (1.50), KVSSL (0.50)
3	Bidhan Rice Bean-3 (KRB-19)	2016	BCKV, Kalyani	1.00	1.0	KVSSL (1.00)
4	Jawahar Rice bean 1	2011	JNKVV, Jabalpur	0.50	0.50 + 0.50 = 1.0	KVSSL (0.50)
5	Jawahar Rice bean 05-4 (Jawahar Rice bean-2)	2019	JNKVV, Jabalpur	1.00	1.0	KVSSL (1.00)
6	JRBJ 05-2	2016	JNKVV, Jabalpur	1.00	1.0	KVSSL (1.0)
7	RBL-6*	2001	PAU, Ludhiana	0.50	No NS	KVSSL (0.50)
			Total	6.50	6.50	

*No Nucleus seed is available for the variety RBL 6 and replaced with the variety Jawahar Rice bean 1 on the consent of the indenter.

Crop: Sen Ghas

SN	Variety	Year of Release	NS from	DAC indent (q)	Allocation (q)	Indenter (q)
1	Bundel Sen Ghas 1 (IGS 9901)	2007	ICAR-IGFRI, Jhansi	0.05	0.05	KVSSL (0.05)
				0.05	0.05	

Crop: Anjan Grass

SN	Variety	Year of Release	Center	DAC indent (q)	Allocation (q)	Indenter (q)
1	Bundel Anjan-4 (IG 67-365 *	2020	ICAR-IGFRI, Jhansi	0.40	0.40 (0.10)*	KVSSL (0.05)
2	CAZRI Anjan-358 (CAZRI 358)	2018	ICAR-CAZRI, Jodhpur	0.20	0.20	KVSSL (0.20)
3	CAZRI Anjan 2178 (CAZRI 2178)**	2018	ICAR-CAZRI, Jodhpur	0.20	No NS**	KVSSL (0.20)
4	RCC-10-6	2018	MPKV, Rahuri	0.20	0.20	KVSSL (0.20)
			Total	1.00	0.50	

* Due to limited availability of NS seeds of Bundel Anjan 4 quantity agreed to produce .10q
**Due to No availability of the Nucleus seed CAZRI Anjan 2178 (CAZRI 2178), production cannot be taken

Crop: Dhaman Grass

SN	Variety	Year of Release	Center	DAC indent (q)	Allocation (q)	Indenter (q)
1	Bundel Dhaman 1 *	2019	ICAR-IGFRI, Jhansi	0.50	0.50 (0.10)*	KVSSL (0.05)
2	Marwar Dhaman (CAZRI 76)	1985	ICAR-CAZRI, Jodhpur	0.50	No NS	KVSSL (0.20)
3	Bimaner Dhaman (RCCB-2)	2016	SKRAU, Bikaner	0.20	0.20	KVSSL (0.20)
4	TNCS 265 AS CO 2	2019	TNAU, Coimbatore	0.50	0.50	KVSSL (0.20)
			Total	1.70	0.80	

Crop : Sewan Grass

SN	Variety	Year of Release	Center	DAC indent (q)	Allocation (q)	Indenter (q)
1	CAZRI Sewan 1*	2018	ICAR-CAZRI, Jodhpur	0.25	No NS*	KVSSL (0.25)
2	RLSB 11-50	2016	SKRAU, Bikaner	0.25	0.25	KVSSL (0.25)
			Total	0.50	0.50	

***Production of the variety CAZRI Sewan 1 cannot be taken due to non-availability of Nucleus seed of the variety**

Crop Name: Guinea Grass

SN	Variety	Year of Release	Center	DAC indent (q)	Allocation (q)	Indenter (q)
1	Dharwad Guinea Grass-1 (DGG-1) (RSDGG-1)	2016	ICAR-IGFRI, Jhansi	0.35	0.35	KVSSL (0.35)
2	Bundel Guinea-2 (JHGG04-1)	2009	ICAR-IGFRI, Jhansi	0.15	0.15	KVSSL (0.15)
3	Bundel Guinea-1 (JHGG 96-5)	2005	ICAR-IGFRI, Jhansi	0.15	0.15	KVSSL (0.15)
4	PGG-616**	2001	PAU, Ludhiana	0.10	No NS	KVSSL (0.10)
			Total	0.75	0.65	

*Production of the variety PPG 616 cannot be taken due to non-availability of Nucleus seed of the variety

Crop: Dinanath Grass

SN	Variety	Year of Release	Center	DAC indent (q)	Allocation (q)	Indenter (q)
1	Bundel Dinanath 2	1989	ICAR-IGFRI, Jhansi	0.15	0.15	KVSSL (0.15)
				0.15	0.15	

Crop Name: Bajra Napier Hybrid

SN	Variety	Year of Release	Center	DAC indent (rooted slips Nos.)	Allocation (rooted slips)	Indenter (q)
1	BNH 10 (BAIF NAPIER HYB 10)	2015	BAIF, Urulikanchan	40000	**No Breeder Seed can be produced due to non-availability of Breeder Seed Standard.**	KVSSL (40000)
2	BNH 11 (BAIF NAPIER HYB 11)	2020	BAIF, Urulikanchan	40000		KVSSL (40000)
3	BNH 14 (BAIF NAPIER HYB 14)	2020	BAIF, Urulikanchan	40000		KVSSL (40000)
4	PBN 351	2019	PAU, Ludhiana	40000		KVSSL (40000)
5	PBN 342	2018	PAU, Ludhiana	40000		KVSSL (40000)
6	CO 6 (TNCN 1280)	2019	TNAU, Coimbatore	40000		KVSSL (40000)
Total			240000	240000		

Annexure F

ICAR-AICRP ON FORAGE CROPS & UTILIZATION
(Indian Council of Agricultural Research)

NATIONAL GROUP MEET: *Kharif 2023*

ALL INDIA COORDINATED RESEARCH PROJECT ON FORAGE CROPS AND UTILIZATION (INDIAN COUNCIL OF AGRICULTURAL RESEARCH)	
NATIONAL GROUP MEET– *Kharif 2023*	
Date: 15-16 June, 2023	***Venue: CSK HPKV Palampur, H.P.***
LIST OF PARTICIPANTS	

List of Participants for NGM Scheduled at CSKHPKV, Palampur, Himachal Pradesh

S. N.	Name	Organization
1.	Dr. T. R. Sharma	DDG (Crop Science), ICAR, New Delhi
2.	Dr. D. K. Yadava	ADG (Seed), ICAR, New Delhi
3.	Dr. S. K. Pradhan	ADF (Food & Fodder Crops), ICAR, New Delhi
4.	Dr. Amaresh Chandra	Director, ICAR-IGFRI, Jhansi
5.	Dr. Sunil Kumar	Director, ICAR-IIFSR, Meerut
6.	Dr. Vijay Kr. Yadav	Project Coordinator, IGFRI, Jhansi
7.	Dr. S. C. Bhardwaj	Emeritus Scientist (Expert), Regional Station, ICAR-IIWBR, Shimla
8.	Dr. S. S. Kundu	Ex. Head, Plant Animal Relationship Division (Expert), IGFRI
9.	Dr. A. K. Roy	Former Project Coordinator, ICAR, IGFRI, Jhansi
10.	Dr. Rajiv Kumar Agarwal	PS & PI (Agronomy), ICAR, IGFRI, Jhansi
11.	Dr. Subhash Chand	IGFRI, Jhansi (PI, Crop Improvement)
12.	Dr. Ratnakar Patel	IGFRI, Jhansi
13.	Dr. P. Mahadevu	ZARS, V.C. Farm, Mandya
14.	Dr. Sunil Verma	IGKV, krishak nagar Raipur
15.	Dr. R. C. Bairwa	ARS, SKRAU, Bikaner
16.	Dr. Yogendra Prasad	Deptt. of Genetics & Plant Breeding, BAU, Ranchi
17.	Dr. Mahendra Singh	GBPUAT, Pantnagar
18.	Dr. S. K. Jha	IGKV, Krishaknagar, Raipur
19.	Mr. Pranjit Bharali	Assam Agricultural University, Jorhat
20.	Dr. D. P. Gohil	Anand agricultural University, Anand
21.	Dr. Nitesh Litoriya	Anand agricultural University, Anand
22.	Dr. Hiren K Patel	Anand agricultural University, Anand
23.	Dr. A. D. Rathod	Anand agricultural University, Junagarh
24.	Mr. R. V. Kale	BAIF Development Research Foundation, Central Research Station, Urulikanchan Pune
25.	Mr. P. S. Takawale	BAIF Development Research Foundation, Central Research Station, Urulikanchan Pune
26.	Dr. Sharu S.R.	Regional Agricultural Research station (SZ) KAU, Vellayani, Thiruvanthapuram
27.	Dr. Gayathri G.	Regional Agricultural Research station (SZ) KAU, Vellayani, Thiruvanthapuram

28.	Dr. S. Mala	Karaikal UT Puducherry
29.	Dr. Amit Kumar Jha	JNKVV, Jabalpur
30.	Dr. Pushpendra Yadav	JNKVV, Jabalpur
31.	Dr. Pardeep	IIMR, Ludhiana
32.	Dr. S.A. Landge	AICRP on Forage Crops & Utilization, MPKV, Rahuri
33.	Dr. B.R.Najan	AICRP on Forage Crops & Utilization, MPKV, Rahuri
34.	Dr. L.N.Tagad	Grass Breeding Scheme, MPKV, Rahuri
35.	Dr. B.G. Shekara	AICRP on forage crop, ZARS, V.C. Farm, Mandya
36.	Dr. A. S. Godara	ARS, SKRAU, Bikaner
37.	Dr. Arun Kumar	Deptt. of Agronomy , Banda University of Agriculture & Technology, Banda
38.	Dr. S Rani	Deptt. of Forage Crops, TNAU, Coimbatore
39.	Dr. K. Premalatha	Deptt. of Forage Crops, TNAU, Coimbatore
40.	Dr. Kalyan Jana	Deptt. of Agronomy, BCKV, Mohanpur, Nadia-WB
41.	Dr. Rahul Kapoor	Forage Section, Department of PBG, PAU, Ludhiana
42.	Dr. Birendra Prasad	GBPUA&T, Pantnagar
43.	Dr. N. K. Singh	GBPUA&T, Pantnagar
44.	Dr. J. K. Bisht	ICAR- VPKAS, Almora
45.	Dr. RVT BalazziiNaaiik	PJTSAU, Hyderabad
46.	Dr. T. Sukruth Kumar	PJTSAU, Hyderabad
47.	Dr. T. Shashikala	PJTSAU, Hyderabad
48.	Dr. P.P. Singh	Regional Fodder Station, Hisar
49.	Dr. Arabinda Dhal	OUAT, Bhubaneshwar
50.	Dr. K. N. Ganesan	Deptt. of Forage Crops, TNAU, Coimbatore
51.	Dr. Satyawan Arya	CCS HAU, Hisar
52.	Mr. Brijendra Koli	Director, Regional Fodder Station , Suratgarh
53.	Mr. Banvir Singh	Director, Regional Fodder Station , Hyderabad
54.	Dr. Ajay Kumar Yadav	Regional, Forage Station, Alamadhi, Chennai
55.	Dr. Seouji	AAU, Jorhat
56.	Dr. Maninder Kaur	Punjab Agricultural University, Ludhiana
57.	Dr. Meenakshi Goyal	Punjab Agricultural University, Ludhiana
58.	Dr. Yogesh Jindal	CCS HAU, Hisar
59.	Dr. Gopal Gharde	Crystal Crop Protection, Aurangabad
60.	Mr. K. Bramareswara Rao	Rasi Seeds (P) Ltd. Telangana
61.	Mr. M. Chakrapani	Rasi Seeds (P) Ltd. Telangana
62.	Dr. Aditya Sharma	Advanta Ltd. (A UPL Group Company)
63.	Dr. Shiv Kumar	ICAR-IGFRI, RRS, Dharwad
64.	Dr Noorul Saleem Khuroo	DARS Rangreth SKUAST K Shalimar
65.	Dr. Shambhoo Prasad	Directorate of Research, ANDUAT, Ayodhya
66.	Dr. Rajesh Kumar	Directorate of research, ANDUAT, Ayodhya
67.	Dr. Firoz Hossain	ICAR-IARI, New Delhi
68.	Dr. P. Shashi Kumara	ICAR-IGFRI, Jhansi
69.	Dr. Brijesh Kumar Mehta	ICAR-IGFRI, Jhansi
70.	Dr. R. B. Dubey	AICRP, Maize Udaipur
71.	Dr. Vignesh Muthusamy	ICAR-IARI, New Delhi
72.	Dr. Raj kumar U. Zunjare,	ICAR-IARI, New Delhi
73.	Dr. V. K. Sood	CSKHPKV, Palampur
74.	Dr. Birendra Kumar	BAU, Ranchi, Jharkhand

75.	Dr. Ashlesha	PAU, Ludhiana
76.	Dr. Maneet Rana	ICAR-IGFRI, Jhansi
77.	Dr. Rajan Katoch	CSKHPKV, Palampur
78.	Dr. D. K. Banyal	CSKHPKV, Palampur
79.	Dr. Naveen Kumar	CSKHPKV, Palampur
80.	Dr. Sudesh Randotra	IGFRI, RRS, Palampur
81.	Dr. Surinder Pal	IGFRI, RRS, Palampur

Annexure G

ICAR- AICRP ON FORAGE CROPS & UTILIZATION
(Indian Council of Agricultural Research)
NATIONAL GROUP MEET: *Kharif 2023*

Date: 15-16 June, 2023 **Venue:** CSKHPKV, Palampur

TENTATIVE PROGRAMME

15/06/2023

08:00-9:30	**REGISTRATION**

9:30-11:00	**INAUGURATION**
Chief Guest	Dr. T.R. Sharma, DDG (CS), ICAR, New Delhi
Chairman	Dr. H K Chaudhary, Hon'ble Vice Chancellor, CSKHPKV, Palampur
Guest of Honour	Dr. S K Pradhan, ADG FFC), ICAR, New Delhi
Guest of Honour	Dr D K Yadav, ADG, Seeds, ICAR New Delhi
Guest of Honour	Dr. Amaresh Chandra, Director, ICAR-IGFRI, Jhansi
Welcome Address	Dr S P Dixit, Director Research, CSKHPKV, Palampur
Project Coordinator's Report	Dr. V K Yadav, Project Coordinator
Remarks	Dr. Amaresh Chandra, Director, ICAR-IGFRI, Jhansi
Remarks	Dr. S K Pradhan, ADG FFC), ICAR, New Delhi
Remarks	Dr D K Yadav, ADG, Seeds, ICAR New Delhi
Felicitation, awards Release of publications	Dignitaries
Chairman's Address	Prof. (Dr. H K Chaudhary, Hon'ble Vice Chancellor, CSKHPKV, Palampur
Chief Guest 's Address	Dr. T.R. Sharma, DDG (CS), ICAR, New Delhi
Vote of Thanks	Dr. Naveen Kumar, OIC AICRP FC&U center CSKHPKV, Palampur
11:00-11:30	**High Tea**

11:30-13:00 TECHNICAL SESSION-I: DISCIPLINEWISE REVIEWREPORT	
Chairman	Dr. S K Pradhan, ADG FFC), ICAR, New Delhi
Co-chairman	Dr. Amaresh Chandra, Director, ICAR-IGFRI, Jhansi
Convener	Dr V K Yadav
Forage crop Improvement	Dr A K Roy/ Dr Subhash Chand
Forage crop Production	Dr. R. K. Agrawal
Forage crop Protection	Dr. Ashlesha Singla
Rapporteurs	Dr. Gayathri G & Dr. D K Banyal

13:00-13:30 TECHNICAL SESSION-III: BREEDER SEED PRODUCTION	
Chairman	Dr D K Yadav, ADG, Seeds, ICAR New Delhi
Co-chairman	Dr. A K Roy, Former Project Coordinator (AICRP-FCU)
BSP Report & Allocation	Dr. Subhash Chand
Rapporteurs	Dr. Birendra Prasad & Dr P S Takawale
13:30-14:00	**LUNCH**

14:00-16:00 TECHNICAL SESSION-IV (concurrent sessions) - FORMULATION OF TECHNICAL PROGRAMME	
TECHNICAL SESSION-IV (Concurrent)–FORAGE CROP IMPROVEMENT	
Chairman	Dr. S K Pradhan, ADG FFC), ICAR, New Delhi
Co-Chairman	Dr Amaresh Chandra, Director, ICAR-IGFRI, Jhansi
Rapporteurs	Dr. Brijesh Mehta & DR S V Damame
Finalization of varietal trials	Dr. A K Roy/ Dr Subhash Chand

14:00-16:00TECHNICAL SESSION-IV (Concurrent)–FORAGE CROP PRODUCTION	
Chairman	Dr Sunil Kumar, Director, ICAR-IIFSR, Meerut
Co-Chairman	Dr S P Dixit, Director Research, CSKHPKV, Palampur
Rapporteurs	Dr B G Sekara, Dr S K Jha
Finalization of trials	Dr. R. K. Agrawal

14:00-16:00TECHNICAL SESSION-IV (Concurrent)–FORAGE CROP PROTECTION	
Chairman	Dr S C Bhardwaj, Ex-Head, IIWBR Regional Research Centre, Shimla & Member PMAC
Co-Chairman	Dr D K Banyal, Head, Plant Pathology, CSKHPKV, Palampur
Rapporteurs	Dr. Sandip Langde, Dr Prem Latha
Finalization of trials	Dr. Ashlesha Singla
16:00-16:15	**Tea**

16:15-18:00	**TECHNICAL SESSION V: REVIEW OF CENTRE-WISE ACTIVITIES**
Chairman	Dr. S K Pradhan, ADG (CC& FFC), ICAR, New Delhi
Co-Chairman	Dr. Amaresh Chandra, Director, ICAR-IGFRI, Jhansi
Convener	Dr. V K Yadav, Project Coordinator (FCU)
Rapporteurs	Dr B G Shiva Kumar & Dr Kalyan Jana
Hill Zone	CSK HPKV Palampur ; SKUAST (K) Srinagar
North West Zone	PAU Ludhiana, CCS HAU Hisar, GBPUAT Pantnagar, SKRAU, Bikaner
East &North East Zone	ANDUAT, Ayodhya ; BAU Ranchi ; BCKV Kalyani; OUAT Bhubaneswar ; AAU Jorhat ; CAU Imphal ; RPCAU Pusa
Central Zone	AAU Anand ; JNKVV Jabalpur ; MPKV Rahuri ; BAIF Urulikanchan ; IGKV Raipur
South Zone	PJTSAU Hyderabad ; UAS (B) ZRS Mandya ; TNAU Coimbatore ; KAU Vellayani
18:00 - 19:00	**VARIETAL IDENTIFICATION COMMITTEE MEETING**

16/06/2023

9:00-10:30	**TECHNICAL SESSION V: REVIEW OF CENTRE-WISE ACTIVITIES – contd.**

10:30-11:00	**TECHNICAL SESSION-VI: FTD & TSP FORMULATION**
Chairman	Dr. D K Yadava, ADG (Seeds)
Co-Chairman	Dr S S Kundu, Ex Head, ICAR-IGFRI, Jhansi & Member PAMC
Convener	Dr. R. K. Agrawal, PS AICRP forage
Rapporteurs	Dr. P Mahadevu & Dr Rajan Katoch
11:00-11:15	**Tea**

11:15-12:45	**TECHNICAL SESSION VII:** New **initiatives for Forage Research** (Pre Breeding & Bio-fortification)
Chairman	Dr. T.R. Sharma, DDG (CS), ICAR, New Delhi
Co-Chairman	Dr. S K Pradhan, ADG (CC& FFC), ICAR, New Delhi
Convener	Dr. V K Yadav PC (FCU)
Rapporteurs	Dr. Amit Jha & Dr Subhash Chand
03 lectures on various aspects and panel discussion :Dr P Kaushal, Dr A K Roy, Dr S P Singh, Dr Feroz Hossain, Dr N K Singh, Dr Sunil Kumar, Dr	

12:45-13:30	**TECHNICAL SESSION-VIII:** Scientific, Administrative and financial issues
Chairman	Dr. S K Pradhan (FFC), ICAR, New Delhi
Convener	Dr. V K Yadav, Project Coordinator (FCU)
Rapporteur	Dr. Balaji, Dr Hiren Patil
13:30-14:30	**Lunch**

14:30-17:00	**TECHNICAL SESSION-IX: PLENARY SESSION**
Chief Guest	Dr. T.R. Sharma, DDG (CS), ICAR, New Delhi
Chairman	Prof. (Dr. H K Chaudhary, Hon'ble Vice Chancellor, CSKHPKV, Palampur
Co-Chairman	Dr.S K Pradhan, ADG (CC& FFC), ICAR, New Delhi
Co-Chairman	Dr D K Yadav, ADG (Seeds), ICAR, New Delhi
Co-Chairman	Dr. Amaresh Chandra, Director, ICAR-IGFRI, Jhansi
Convener	Dr V K Yadav, Project Coordinator (FCU)
Rapporteurs	Dr. R. K. Agrawal & Dr. Rahul Kapoor
Presentation of the recommendations by respective Rapporteurs	
Varietal Identification Committee Meeting Report	Dr.V K Yadav
Co chairman's remarks	Dr. Amaresh Chandra
Co-Chairman's Remarks	Dr. S K Pradhan
Chairman's Remarks	Dr. T.R. Sharma
Vote of Thanks	Dr. V K Yadav

Annexure H

Glimpses of Media Coverage and photographs

हिमाचल

पशुधन का पहले सोचो, फिर फसलों की करें तैयारी: कुलपति प्रो. चौधरी

चारा वृक्ष के रोपण की आवश्यकता, दो दिवसीय राष्ट्रीय संगोष्ठी संपन्न

सवेरा न्यूज/जसवंत कठियाल

पालमपुर 16 जून : चौधरी सरवन कुमार हिमाचल प्रदेश कृषि विश्वविद्यालय में अखिल भारतीय समिन्वत अनुसंधान की चारा फसलें व उपयोगिता पर दो दिवसीय राष्ट्रीय संगोष्ठी शुक्र वार को सम्पन्न हुई। समापन सत्र की अध्यक्षता करते हुए कुलपति प्रो.एच.के. चौधरी ने वैज्ञानिकों से आह्वान किया कि जब गुणवत्ता पूर्ण चारा पूरा होगा तभी सभी का गुजारा होगा। इसके लिए चारा फसलों को लेकर पहले कार्य करें फिर फसलों को देखें। उन्होंने विशेषज्ञों से कहा कि अपने शोध में शोध विद्यार्थियों को भी साथ रखें। इतना ही नहीं शोध के लिए अन्य संस्थानों को भी शामिल करते हुए उन्हें भी अपने साथ जोडे।

कृषि विवि पालमपुर में अखिल भारतीय समिन्वत अनुसंधान की चारा फसलें व उपयोगिता पर दो दिवसीय राष्ट्रीय संगोष्ठी के समापन पर मंच पर वीसी व अन्य।

प्रो. चौधरी ने कहा कि चारा तैयार करने में प्रबंधन की कमी है। किसानों को जाग्रत करने की आवश्यकता है। लैंटाना की जगह चारा फसलों को तैयार करने के लिए वैज्ञानिक पहल करते हुए शोध करें। इस कार्य में अभियान चलाते हुए स्थानीय प्रशासन और जनता की मदद को लिया जा सकता है। पौधारोपण में भी चारा फसलों के वृक्षों को आने वाले बरसात में लगाए जाने की जरूरत पर कुलपति प्रो. एच.के.चौधरी ने अहमियत जताई। कार्यक्रम के दौरान अनुसंधान निदेशक डाक्टर एसपी दीक्षति, आईसीएआर, आईजीएफआरआई के निदेशक डाक्टर अमरेश चंद्र, एडीजी, एफएफसीआई, आईसीएआर डाक्टर एसके प्रधान ने भी अपने विचार व्यक्त किए। दो दिनों तक चली संगोष्ठी में विभिन्न सत्रों में जो निष्कर्ष सामने आए उसे वैज्ञानिकों ने सभी के सामने रखा। संगोष्ठी के आयोजन सचिव व प्रसार शिक्षा निदेशक डाक्टर नवीन कुमार ने जानकारी देते हुए बताया कि भारतीय कृषि अनुसंधान परिषद,नई दिल्ली और भारतीय चारागाह अनुसंधान संस्थान , झांसी के सहयोग से आयोजित दो दिवसीय संगोष्ठी में देश के विभिन्न विश्वविद्यालयों और आईसीएआर संस्थानों से लगभग सौ विशेषज्ञों ने अपनी उपिस्थति दर्ज करवाई। आईसीएआर के शीर्ष अधिकारी और विश्वविद्यालय के विशेषज्ञ चारा उत्पादन के विभिन्न मुद्दों को सामने रखते हुए देश में उत्पादकता और उन्नत चारे को लेकर मंथन किया।

चारा फसलों को लेकर कार्य करें : प्रो. एचके चौधरी

दो दिवसीय राष्ट्रीय संगोष्ठी संपन्न, कहा–चारा वृक्ष के पौधरोपण की आवश्यकता

जोगिंद्र राणा, पालमपुर

चौसकु हिमाचल प्रदेश कृषि विश्वविद्यालय में अखिल भारतीय समन्वित अनुसंधान की चारा फसलें व उपयोगिता पर दो दिवसीय राष्ट्रीय संगोष्ठी शुक्रवार को संपन्न हुई। समापन सत्र की अध्यक्षता करते हुए कुलपति प्रो.एच.के. चौधरी ने वैज्ञानिकों से आह्वान किया कि जब गुणवत्ता पूर्ण चारा पूरा होगा तभी सभी का गुजारा होगा। इसके लिए चारा फसलों को लेकर पहले कार्य करें, फिर फसलों को देखें। उन्होंने विशेषज्ञों से कहा कि अपने शोध में शोध विद्यार्थियों को भी साथ रखें। इतना ही नहीं शोध के लिए अन्य संस्थानों को भी शामिल करते हुए उन्हें भी अपने साथ जोड़ें।

प्रो. चौधरी ने कहा कि चारा तैयार करने में प्रबंधन की कमी है। किसानों को जाग्रत करने की आवश्यकता है। हमें चारा फसलों पर व्यापक कार्य करते हुए पशुधन के लिए आगे आना होगा, तभी धन-धान्य से परिपूर्ण होंगे। उन्होंने विशेषज्ञों से कहा कि लैंटाना ने चारागाहों को पूरी तरह से अपनी चपेट

में लिया हुआ है। लैंटाना की जगह चारा फसलों को तैयार करने के लिए वैज्ञानिक पहल करते हुए शोध करें। इस कार्य में अभियान चलाते हुए स्थानीय प्रशासन और जनता की मदद को लिया जा सकता है।

चारा वृक्षों की पहचान करते हुए उसे सामने लेकर आए। पौधारोपण में भी चारा फसलों के वृक्षों को आने वाले बरसात में लगाए जाने की जरूरत पर कुलपति प्रो. एच.के.चौधरी ने अहमियत जताई। कार्यक्रम के दौरान अनुसंधान निदेशक डॉक्टर एसपी दीक्षित, आईसीएआर, आईजीएफआरआई के निदेशक डाक्टर अमरेश चंद्र, एडीजी, एफएफसीआई, आईसीएआर डाक्टर एसके प्रधान ने भी अपने विचार व्यक्त किए। दो दिनों तक चली संगोष्ठी में विभिन्न सत्रों में जो निष्कर्ष सामने आए, उसे वैज्ञानिकों ने सभी के सामने रखा। संगोष्ठी के आयोजन सचिव व प्रसार शिक्षा निदेशक डॉक्टर नवीन कुमार ने बताया कि भारतीय कृषि अनुसंधान परिषद (आईसीएआर), नई दिल्ली और भारतीय चारागाह अनुसंधान संस्थान (आईजीएफआरआई), झांसी के सहयोग से आयोजित दो दिवसीय संगोष्ठी में देश के विभिन्न विश्वविद्यालयों और आईसीएआर संस्थानों से लगभग सौ विशेषज्ञों ने अपनी उपस्थिति दर्ज करवाई। आईसीएआर के शीर्ष अधिकारी और विश्वविद्यालय के विशेषज्ञ चारा उत्पादन के विभिन्न मुद्दों को सामने रखते हुए देश में उत्पादकता और उन्नत चारे को लेकर मंथन किया।


NATIONAL GROUP MEET
Kharif 2023
ALL INDIA COORDINATED RESEARCH PROJECT