For official use only

Proceedings of 66th Annual Maize Workshop

All India Coordinated Research Project on Maize
ICAR- Indian Institute of Maize Research
PAU Campus, Ludhiana 141004
www.iimr.icar.gov.in

Executive Summary

The 66th Annual Workshop of All India Research Project (AICRP) on Maize was held from April 12-13, 2023 at GBPUAT, Pantnagar. The workshop was inaugurated by Dr. M. S. Chauhan, VC, GBPUAT in the presence of Dr. M. P. Pandey, Ex-Vice Chancellor, IGKV, Raipur and BAU, Ranchi Dr. S. K. Pradhan, ADG (FFC), Dr. Sain Dass, Former Director and Chairman, PAMC and other members of PAMC. Dr. H. S. Jat, Director, ICAR-IIMR, Ludhiana presented achievements of AICRP on Maize during 2022-23, the maize scenario *vis-a-vis* challenges and opportunities in India. During 2022-23, 35 maize hybrids have been released and notified for commercial cultivation in different agroecologies in India. Out of 35, 9 biofortified and specialty corn hybrids were notified and released which will help farmers in improving their nutrition and livelihood security. He urged AICRP scientists to publish their research work in high impact factor or NAAS rated journals. Dr. Sain Dass highlighted the impact of single cross maize hybrid over non-remunerative crops that lead to acreage expansion of the crop significantly. He emphasized that signing more MoUs for seed production and marketing, we can help in establishing MSME companies which will facilitate low cost high quality hybrid seed availability to the farmers. Dr. M. P. Pandey has highlighted the growing importance of maize and the need of jour to increase its production significantly. Dr. S. K. Pradhan emphasized on existing challenges and suggested deployment of advanced technologies like genomic-assisted breeding. He also urged maize scientists to work hard to increase maize production to meet the 20% blending target of ethanol by 2025 in India. Advance technologies like DH technology, remote sensing, high thorough put phenotyping etc. must be integrated with maize research to meet our future goals. Dr. M. S. Chauhan, Hon'ble Vice-Chancellor, GBPUAT, Pantnagar and Chief Guest of the function addressing on this occasion highlighted the food and nutritional challenges of the growing population and the diversified research requirement in this direction. He urged maize fraternity to put concerted efforts for combating the adverse effects of global warming and changing climate. Besides increased grain production, he also highlighted the importance of maize as fodder and silage for sustaining milk production.

One day pre-workshop on April 12, 2023 was held to review AICRP centers critically. The Project Advisory and Monitoring Committee (PAMC) constituted by DDG (CS) under the chairmanship of Dr. Sain Dass, Former Director, ICAR-IIMR, Dr. R. K. Pannu, Former Dean, College of Agriculture, CCSHAU, Hisar, Dr. P. Kumar, Former Director (Acting), ICAR-IIMR and Dr. S. K. Guleria, Former Director, HAREC, Bajaura as members reviewed the performance of AICRP centers. The workshop had 10 different sessions including three pre-workshop sessions on April 12, 2023. The PAMC pointed out that the centers located in North Eastern States may conduct trials in pre-kharif season to check the expression of genotypes. Dr. B. S. Vivek of CIMMYT presented the progress report of ICAR-CIMMYT collaborative projects. A Double Haploid (DH) facility of CIMMYT at Kunnigal had been operational and 30 populations submitted by ICAR-IIMR will be used for DH induction. A FAW screening facility funded by the CIMMYT is established and made operational at Winter Nursery Centre (WNC), ICAR-IIMR, Hyderabad. Dr. Mahesh K. Gathala emphasized that sustainable crop diversification and production system is need of the hour. In winter maize areas, intercropping leads to high yields and nutritional security. Optimal placement of fertilizer super granules by pneumatic drill was emphasized to maximize efficient use of fertilizers. Dr. J. C. Sekhar, made a presentation on strengthening and streamlining collaboration under ICAR-CIMMYT and emphasized that seed production of public-bred maize hybrids should be undertaken in a collaborative mode. Collaborative funding project from CIMMYT is required for research on biotic stresses and other emerging areas.

A panel discussion on international partnerships for transforming Maize-Agri-Food system was also held during the workshop to deliberate on how we can achieve the goal of 50 million tonnes (m t) maize production by 2030. In this, eminent scientists, Dr. B. M. Prasanna, Director, Global Maize Program, Dr. Sain Dass, Former Director, ICAR-IIMR, Dr. P. H. Zaidi, CIMMYT, Mr. Anjani Kumar, IFPRI, Mr. Bijender Pal, Bioseeds and Mr. S. Venktesh, Corteva along with Dr. M. L. Jat, ICRISAT participated and. Identification of a low productivity districts and showcasing the available technologies will be key in achieving this goal. ICAR-IARI, New Delhi was adjudged as best AICRP Centre for their contribution during 2021-22 and 2022-23. In the closing ceremony, Dr. M. P. Pandey appreciated the work of AICRP on Maize and was very hopeful that the maize group will soon achieve the target of 50 m t of maize production by 2030. Dr. A. S. Nain, Director Research, GBPUAT, Pantnagar appreciated the efforts of maize community and urged to set a goal to reach global productivity of 6.0 t/ha and expressed that the target set for 2030 maize production is achievable. However, he highlighted about the concerns pertaining to reduced contingencies in AICRP maize. Dr. R. K. Pannu added that the role of agronomists as managers are challenging in maintaining soil fertility. Dr. P. Kumar emphasized on local specific diseases and plant protection research. Dr. Sain Dass congratulated the breeders for the development of high-yielding hybrids and pin pointed the bigger role of scientists in the era of climate change. Dr. H. S. Jat expressed that emphasis should be laid on digital technologies. He congratulated the breeders whose hybrids/varieties have been identified for release in the VIC meeting and informed that 30 out of 31 proposals have been recommended for release. Dr. S. K. Pradhan was very happy with the contribution of the AICRP centers and put emphasis on use of innovative technologies to compete globally in maize production and India has great potential of becoming seed exporter. Dr. M. L. Jat laid emphasis on learning through interaction involving social scientists. He suggested that system science should be the guiding principle in enhancing production and productivity.

During concurrent sessions, the work done in 2022-23 and the work plan for 2023-24 was presented and finalized. The major recommendations of the workshop were as follows:

1. Based on monitoring of *kharif* 2022 and earlier experience, it was suggested that Gossaigaon centre is suitable for *rabi* and pre-kharif, thus the trials have to be constituted accordingly. The same is applicable to Barapani and Imphal.
2. The benchmark and testing protocol of maize entries for high zinc (≥33 ppm) with or without low phytic acid (≤2.5mg/g), high amylose (≥50%) and high amylopectin (≥ 90%) were finalized.
3. The extra early/early hybrids may be promoted in high altitude or hilly areas to enhance productivity and profitability of maize farmers.
4. In the VIC meeting, 30 hybrid/OPV were identified for release. In the AICRP kharif trial, total 106 entries were promoted to next level of testing.
5. Two new trials to standardize the sowing time for spring season maize and weed management were formulated.
6. New management measures recommended for maydis leaf blight (MLB), turcicum leaf blight (TLB), and polysora rust management in maize.
7. Spraying of chlorantraniliprole 18.5% SC @ 0.4 ml or spinetoram 11.7% w/w SC @ 0.5 ml/l or chlorantraniliprole 9.3% + lambdacyhalothrin 4.6% ZC @ 0.5 ml/l or novaluran 5.25% + emamectin benzoate 0.9% w/w SC were effective in the FAW management. Seed treatment with chlorantraniliprole or cyantraniliprole in combination with foliar spray of chlorantraniliprole at 3 weeks after germination were effective against fall armyworm.

8. The use of RDF + 5 t/ha FYM was found at par with 75% RDF + 5 t/ha FYM and thus in long term nutrient doses can be curtailed with organic supplementation for sustainable maize-based cropping system in India.
9. Use of the organic super absorbent FasalAmirt @ 15-20 kg/ha recommended for enhancing yield and net returns of *kharif* maize in Northern Hill Zone (Zone-I) and Central Western Zone.
10. Showcasing the available technologies in low productivity districts of maize requires immediate attention for enhancing the maize production and productivity to meet increasing demand of maize feedstock for ethanol and other industries. The CSR fund may be roped in for it.

DETAILED PROCEEDINGS OF DIFFERENT SESSIONS

April 12, 2023, Wednesday **Pre-workshop**

Session A. Review of AICRP Centers

Chairman	Co-Chairman	Convener	Rapporteurs
Dr. S. K. Pradhan, ADG (FFS), ICAR	Dr. A. S. Nain, Director Research, GBPUAT, Pantnagar	Dr. H. S. Jat, Director, ICAR-IIMR, Ludhiana	Drs. P. L. Soujanya, Chikkappa G. K., S. L. Jat, Bhupender Kumar and Pravin Kumar Bagaria

In this session, review of research results of individual AICRP centers for *kharif* 2022 and *rabi* 2021-22 was carried out. The convener invited the AICRP Centers' In-charges to make the common presentation on the progress report along with significant achievements during *rabi* 2021-22 and *kharif* 2022. The Project Advisory and Monitoring Committee (PAMC) constituted by the Indian Council of Agricultural Research (ICAR) comprises maize experts namely Dr. Sain Dass, Former Director, ICAR-IIMR, Ludhiana as Chairman and Dr. S. K. Guleria, Ex-Regional Director and Senior Maize Breeder (Retired) HAREC, Bajaura (HP), Dr. R. K. Pannu, Former Dean, College of Agriculture, CCSHAU, Hisar and Dr. Pradyuman Kumar, Ex-Director (Acting), ICAR-IIMR, Ludhiana as members of PAMC were present during this session to review the progress of AICRP centers. The major observations/comments of centre-wise presentations are as follows:

1. **Srinagar**: The centre has developed one hybrid which was identified for release. The centre has developed maize value-added products by using the hybrid LQMH 1 and initiated root studies in maize.
   Action point: The centre needs to up-scale their efforts to popularize hybrids from ICAR-IIMR across Jammu and Kashmir to enhance productivity levels. The segregated material for cold tolerance to be shared with maize partners where cold stress is a major concern.
2. **Bajaura**: The centre has developed one composite which was release for Northern Hill Zone. Presently the center is maintaining 414 fixed inbred lines. Six new hybrids have been evaluated under station trials. The centre has identified 7 inbred lines with resistance for Turcicum leaf blight and the centre has attempted 72 new cross combinations.
   Action point: The centre needs to strengthen their germplasm materials and develop productive hybrids for the target ecology**.** It was suggested that TLB resistance lines, data may be generated at least at four locations so that registration case may be submitted to ICAR-NBPGR.
3. **Imphal**: The performance of the centre is not up to the mark. Yield levels are very low. The centre needs to focus on this. The AICRP trials must be conducted under well managed conditions. Since, center does not have their own hybrids, so they must put their best efforts to popularize the hybrids released by other centers.
4. **Barapani**: The centre is maintaining 11 fixed inbred lines. The centre has attempted 72 new cross combinations. The AICRP trials must be conducted under well managed conditions. Since, center does not have their own hybrids, so they must put their best efforts to popularize the hybrids released by other centers.
5. **Gossaigoan**: The centre has evaluated 19 new hybrid combinations under station trial and is maintaining 10 fixed inbred lines.

Action point: Performance of the centre is very unsatisfactory. It was suggested that they may select more germplasm lines from WNC and strengthen the breeding programme of the station.

6. **Ludhiana**: The centre has developed one hybrid PMH 14 which was released during the reporting period. Presently, the centre is maintaining 552 fixed inbred lines out of which two inbred lines were shared with different centers. The centre has attempted 725 new cross combinations. The centre has evaluated 547 new hybrids under station trials and 15 hybrids have been entered in AICRP trials. In addition, one composite variety developed by the centre was released by Central Variety Release Committee (CVRC). The centre has signed MoU with one company for commercialization of PMH 14 hybrid. Inbred lines were also evaluated for water logging and drought stress. Introgression lines developed from different wild progenitors to utilize for biotic and abiotic stresses. Centre has optimized the protocol for chromosomal doubling for double haploid production.
7. **Dholi**: The centre has developed two hybrids which were released for commercial cultivation by State Variety Release Committee (SVRC). The centre has evaluated 82 new hybrid combinations in station trials. In addition, 455 new cross combinations were attempted during the reporting period. The centre is maintaining 680 fixed inbred lines. The centre has contributed three promising hybrids for AICRP testing.
8. **Sabour**: The centre is maintaining 235 fixed inbred lines. There is need to work extensively on hybrid breeding, as the center is not focusing on the same.

   Ranchi: During the period, three hybrids developed by the centre were released by SVRC. **The ce**ntre has conducted station trial comprising of 51 new hybrid combinations, presently; the centre is maintaining 18 fixed inbred lines and one inbred line shared with other centers. The centre has evaluated 44 new hybrids under station trials.
9. **Bhubaneswar**: The centre has contributed one promising hybrid for AICRP testing. The centre has evaluated 192 new hybrids under station trials. Presently, the centre is maintaining 127 fixed inbred lines. In addition, 195 new cross combinations were attempted during the reporting year. to the centre should strengthen the hybrid breeding programme.
10. **Rahuri**: The centre has contributed one promising new hybrid in AICRP testing. The station trial comprising of 101 new hybrid combinations was conducted. In addition, 410 new cross combinations were attempted and 22 inbred lines shared with other centers.
11. **Kolhapur**: The centre has developed two hybrids which were released during the reporting period and contributed four promising new hybrid combinations in AICRP testing. The centre has evaluated 644 new hybrid combinations in station trials and also attempted 210 new cross combinations during the reporting year. Presently, the centre is maintaining 351 fixed inbred lines.
12. **Mandya**: The centre has developed one hybrid which was released at state level and contributed one promising new hybrid combination to multi-location testing under AICRP. The station trial comprising 25 new hybrid combinations was conducted. The centre also attempted 210 new cross combinations during the reporting year. Presently, 682 fixed inbred lines are being maintained. The centre is also working on maize value-added products namely maize *laddu*, milk, maize curd, maize butter milk, maize silk tea etc.

    Action Point: Seed production for released hybrids need to be taken up.
14. **Dharwad**: The centre has developed one hybrid which was identified for release by the variety identification committee during the reporting period; further three hybrids developed at the centre are in different stages of testing under AICRP. The centre has

evaluated 705 new hybrid combinations under station trials. The centre also attempted 396 new cross combinations. Presently, 48 fixed inbred lines are being maintained and one line shared with different AICRP centers.

13. **Coimbatore**: The centre has developed one hybrid resistant to charcoal rot and drought. Eighty-six new hybrid combinations have been evaluated under station trials. Presently, the centre is maintaining 790 fixed inbred lines, out of which 22 inbred lines are shared with different centers. The centre has identified three inbred lines for low phytic acid.
14. **Vagarai**: The centre is maintaining 25 fixed inbred lines. As part of hybrid development programme, one promising entry is being evaluated under AICRP. The centre has evaluated 61 new hybrid combinations under station trials.
15. **Peddapuram:** The centre has contributed five entries for multi-location evaluation under AICRP. Total 318 new hybrid combinations have been evaluated in station trials. The centre has evaluated 318 new hybrid combinations under station trials. Presently, 255 fixed inbred lines are being maintained, out of which15 inbred lines have been shared with different AICRP maize centers.
16. **Banswara**: The centre has contributed one promising hybrid in AICRP testing. Ten new hybrid combinations have been evaluated in station trials. Presently the centre is maintaining 40 fixed inbred lines.

Action Point: Seed production of released hybrids from other centers needs to be taken up.

17. **Ambikapur**: The centre has developed one hybrid in collaboration with the ICAR-IIMR and proposal submitted to SVRC. Further four hybrids developed at the centre are in different stages of testing under AICRP. The centre has evaluated 96 new hybrid combinations in station trials. Presently, the centre is maintaining 99 fixed inbred lines and 21 new inbred lines were developed.
18. **Chhindwara:** The centre has developed three hybrids which were identified for release by the variety identification committee during; further two hybrids developed at the centre are in different stages of testing under AICRP.

Final Recommendations:

The performance of the centers located in Northern Hill Zones (NHZ) and North Eastern Plains Zone (NEPZ), particularly **Imphal**, and **Sabour** centers may be reviewed in terms of quality of AICRP trials data being generated at the centre.

Session B. Presentation of monitoring reports

Chairman	Co-Chairman	Presented by	Rapporteurs
Dr. S. K. Pradhan ADG (FFC), ICAR	Dr. S. K. Guru, HoD, Plant Physiology, GBPUAT, Pantnagar	Dr. Ramesh Kumar, Nodal Officer (AICRP on Maize), ICAR-IIMR, Ludhiana	Drs. Suby S. B., and Sumit Kumar Aggarwal

Dr. Ramesh Kumar, Nodal Officer, AICRP Maize presented the monitoring report. The high rate of trial conduction was appreciated by the Chairman and Co-chairman. Based on monitoring of *kharif* 2022 and earlier experience, it was suggested that Gossaigaon centre is suitable for *rabi* and pre-*kharif* season, thus, the trials have to be constituted accordingly. The very suggestion was given to Barapani and Imphal. DR. S. K. Pradhan, ADG (FFC) suggested that if trial is failed in the first year at one centre, the trial shall not be stopped, but shall complete the term of three years.

Session C. Progress and Plan for ICAR-CIMMYT Collaboration

Chairman	Co-Chairman	Convener	Rapporteurs
Dr. A. K. Joshi, BISA	Dr. Sain Dass, Dr. B. S. Vivek CIMMYT	Dr. J. C. Sekhar, Principal Scientist, WNC, ICAR-IIMR, Hyderabad	Drs. P. L. Soujanya, S. L. Jat, Bhupender Kumar and Suby S. B.

Dr. B. S. Vivek, Principal Scientist, CIMMYT, Hyderabad presented an overview of the 8 projects under ICAR-CIMMYT collaboration on maize improvement. Five stress-tolerant hybrids encompassing drought + water logging (WL) were contributed for AICRP testing through ICAR-IIMR. The DH facility at Kunigal, Karnataka had been operational and 30 populations have been submitted by ICAR-IIMR for DH induction. In addition to this, fall armyworm resistance and economically important diseases such as PFSR were the major highlights of the collaborative work. It was recommended that field and molecular data may be combined during early identification of core lines with heterotic groups in order to facilitate genomic selection in the future.

Dr. Mahesh K. Gathala delivered lecture upon sustainable crop diversification and production systems. He highlighted that N-use efficiency is declining, almost stagnating at 40%. Maize based diversification is the need of hour in rice growing areas, and the promising results of rice-maize cropping system over rice-wheat in the eastern Gangetic plain zone have been highlighted with global warming potentials, carbon credits, and cropping systems performance indicators. In winter maize areas, intercropping leads to high yields and nutritional security. Optimal placement of fertilizer super granules by pneumatic drill was emphasized to maximize efficient use of fertilizer.

Dr. J. C. Sekhar presented the key areas of collaboration between ICAR-IIMR and CIMMYT. Nutritionally enriched maize for food and feed, improved stalk rot resistance, improved agronomy, climate smart maize for resilience, etc., were all highlighted in discussion. Development of moisture stress-tolerant, high-yielding hybrids for rainfed *kharif* maize was discussed in detail. It was emphasized that seed production of public-bred maize hybrids should be undertaken in a collaborative mode. Funding from CIMMYT is required to screen for biotic stresses such as insects and diseases. Major recommendations of the session are as follows:

There is need to further advance the collaboration between ICAR, CIMMYT and BISA on the following projects/work.

1. ICAR-IIMR Ludhiana is working on enriching maize kernels with Fe and Zn also. As part of work, institute developed screening protocols, identified genomic regions with high Fe and Zn content, and evaluated a variety of germplasm and hybrids. In order to further strengthen the breeding programme, ICAR and CIMMYT collaboration is required. The CIMMYT needs to allocate budgets for this and should share the lines with high Fe and or Zn content with ICAR-IIMR and their partners. **Action**: CIMMYT

2. There is a need to improve Post Flowering Stalk Rot (PFSR) resistance in rainfed maize. ICAR-IIMR and its partners have well-defined hot-spot locations for screening. The AICRP-Maize is already working on the same, but there is need of funding provision from CIMMYT for further strengthening this work. **Action**: CIMMYT

3. ICAR-IIMR can be the knowledge partner in Cereal Systems Initiative for South Asia (CSISA) – Phase IV – India project. **Action**: CIMMYT

4. Involvement of RMRSPC, ICAR-IIMR, Begusarai and AICRP centers in eastern Indo Gangatic Plain (IGP) needs to be there for project Rupantar - Transforming Smallholder Food Systems in the Eastern Gangetic Plain with budget and manpower allocation. **Action**: CIMMYT

5. The platforms of Conservation Agriculture (CA) developed at ICAR-IIMR, Ladhowal Farm, Ludhiana on maize and rice system has completed 6 years' maturity and can be used for upstream study under this project. **Action**: CIMMYT and ICAR-IIMR

6. Resource's needs to be allocated to carry out strategic research and generation of new information on regenerative agriculture. **Action**: CIMMYT

7. Need to involve ICAR-IIMR and AICRP-Maize centers actively in Transforming Agri Food Systems in South Asia (TAFSSA). Financial and manpower support needed for the implementation of the project. ICAR-IIMR and AICRP-Maize has biofortified maize hybrids as well as hybrids of baby corn, sweet corn, silage maize and popcorn which can be used in this project. **Action**: CIMMYT and ICAR-IIMR

ICAR-BISA Collaboration

1. Development and deployment of modern tools and techniques to break yield barriers: GWAS, precision genotyping and phenotyping, doubled haploid. **Action**: CIMMYT and ICAR-IIMR

2. Seed production of public-bred maize hybrids and parental lines multiplication. **Action**: CIMMYT and ICAR-IIMR

3. Development of maize hybrids having >10 t/ha yield potential for *kharif* season. **Action**: CIMMYT and ICAR-IIMR

4. Development of moisture stress tolerant high yielding maize hybrid for rainfed *kharif* season. **Action**: CIMMYT and ICAR-IIMR

5. Maize system in CA and climate-smart agriculture to enhance resource use efficiency and ecological sustainability. **Action**: CIMMYT and ICAR-IIMR.

6. Scale appropriate mechanization in research and production and it's up scaling in maize. **Action**: CIMMYT and ICAR-IIMR

7. Application of image analysis and remote sensing in mapping maize stresses. **Action**: CIMMYT and ICAR-IIMR

8. Capacity building through training researchers and students in big data analysis and frontier areas of research. **Action**: CIMMYT and ICAR-IIMR.

Day 1: April 13, 2023, Thursday

Session I: Inaugural Session

The inaugural session was chaired by Dr. H. S. Jat, Director ICAR-IIMR and convened by Dr. A. S. Nain, Director Research, GBPUAT. Dr. M. S. Chauhan, VC, GBPUAT was the Chief Guest, and Dr. M. P. Pandey, Ex-Vice Chancellor, IGKV and Birsa Agricultural University and Dr. S. K. Pradhan, ADG (FFC) were the guests of honour during inaugural session. Dr. A. S. Nain delivered the welcome address. The other dignitaries were Dr. Sain Dass Ex-Director ICAR-IIMR and Chairman, PAMC. Progressive farmers of the state also participated in the session. Dr. H. S. Jat presented achievements of AICRP-Maize of 2022-23. He briefed the maize scenario in India, significant achievements made by AICRP-Maize during last one year. He informed the house that ICAR-IIMR has released 16 hybrids and as per DAC indent ICAR-IIMR hybrids have a share of more than 61%. Besides releasing hybrids, AICRP-Maize published research articles in national as well as in international journals. He urged AICRP scientists to publish their research work in high impact factor journals rather than in low rating journals in NAAS rating system. Dr. Sain Dass pointed out the impact of single cross maize over non-remunerative crops that lead to area expansion. He emphasized that signing MoUs for seed production and marketing, helps in establishing MSME companies and this will facilitate low cost high quality hybrid seed to farmers. Dr. M. P. Pandey also highlighted the growing importance of maize. Dr. S. K. Pradhan stressed existing challenges and advised the deployment of advanced technologies like genomic-assisted breeding. He also urged maize scientists to work smart to meet the 20% blending target of ethanol. This will further boost maize production in the country. The advance technologies like DH technology, remote sensing, high thorough put phenotyping etc. must be used to meet future goals of maize production. Publications viz. AICRP-Maize Annual Progress Reports and technical bulletins were released by the dignitaries on dias. Retired maize scientists of GBPUAT, Pantnagar namely, Dr. B. D. Aggarwal, Dr. I. S. Singh, Dr. S. S. Verma and Dr. R. C. Gautam were felicitated by Hon'ble Vice-Chancellor for their valuable contributions. Progressive farmers Sh. Suresh Rana, Sh. Narottan Joshi and Sh. Narender were also felicitated for their best efforts and work. Dr. M. S. Chauhan, stressed the food and nutritional challenges of the growing population and the diversified research required for it. He categorically requests maize fraternity for putting concerted efforts for combating the adverse effects of global warming which we all have been witnessing in every season. The rains are shifting and rainy days also reducing. We have to breed such genotypes which can suit changing climate. Besides enhanced grain production, he also highlighted the importance of maize as good fodder and silage for sustaining our milk production. Dr. Ramesh Kumar, Nodal Officer, AICRP-Maize proposed vote of thanks.

Session II: Review of work during *kharif* 2022 and *rabi* 2021-22

Chairman	Co-Chairmen	Presenters	Rapporteurs
Dr. Sain Dass, Former Director, ICAR-IIMR	Dr. Pradyuman Kumar, Ex-Director (Acting) ICAR-IIMR and Dr. Mahesh Gathala, CIMMYT	Dr. J. C. Sekhar and Dr. N. Sunil, WNC, ICAR-IIMR, Hyderabad Dr. S. B. Singh, Dr. Ramesh Kumar, Dr. A. K. Singh, ICAR-IIMR, Ludhiana Dr. Chikkappa G. K and S. L. Jat, ICAR-IIMR, Delhi	Dr. Suby S. B. ICAR-IIMR, Delhi Dr. Abhijit Das, Dr. Romen Sharma and Dr. Pardeep Kumar, ICAR-IIMR, Ludhiana

I. Trial and nurseries

Dr. N. Sunil presented a brief report on Trials and Nurseries. In *kharif* 2022, 356 maize entries were evaluated in AICRP trials, among them, 249 were contributed by public and 107 by the private sector. Out of 356 entries evaluated in different stages, 196 were in National Initial Varietal Trial (NIVT), 47 in Advanced Varietal Trial-I (AVT-I), 20 in Advance Varietal Trial-II (AVT-II), 43 in Quality Protein Maize (QPM), 13 in baby corn, 18 in sweet corn, 1 in popcorn trials, and 10 in OPV trials (OPV conducted in NHZ only). All normal maize entries were tested under three maturity groups, viz., late, medium and early. During *rabi* 2021-22 total of 114 entries were tested, of which 54 were in NIVT, 28 were in AVT-I, 6 were in AVT-II, 2 in QPM, 13 in popcorn, 3 in baby corn and 8 in sweet corn trials. The success rate of trials was 89% in *kharif* 2022 whereas it was 92% in case *rabi* 2021-22. Apart from this, 100 hybrids of medium maturity group were provided to National Dairy Development Board (NDDB) for fodder/silage trials. Under ICAR and CIMMYT collaborative project, in managed stress trial, 23 hybrids were tested for drought, heat, and water logging conditions during *kharif* 2022.

II. Breeding

A. Field Corn

Dr. S. B. Singh presented the results of field corn breeding trials conducted during *kharif* 2022 and *rabi* 2021-22. During *kharif* 2022, 325 test entries were available for the promotion, of which 82 were promoted for their advanced stages of testing. Out of 325 entries, 207 were in NIVT late, medium, and early, of which 60 were promoted from NIVT, and the remaining 20 were in AVT-I and 2 were in OPV. Out of which 13 entries namely, SMH 4555 (NHZ), CP999, SMH4555 (NWPZ), CP999, SMH4555, DKC 9224, DKC 9236 (NEPZ), JH32487, R8050, PM21111L, DKC 9226 (CWZ), JKMH 4546, KMH 8333 (PZ) and one OPV ADC 4 were promoted to AVT-II. Among 10 OPVs tested, three were promoted to the advanced stages of testing.

Among the 82 entries, 54 were tested in NIVT late and medium, of which 23 entries were promoted to the next stage of testing, 18 were available for promotion in AVT-I, of which eight (8) entries, namely, DKC 8225 (IV 8088) (NWPZ), IV 8155, IMHSB 20R-6, IMHSB 20R-15, DKC 9232 (IV 8214) (NEPZ), DKC 9232 (IV 8214), IV 8155 (CWZ) and PM20209L at AVT-II. During spring 2022, 75 test entries were available for promotion, of which 10 entries were promoted for their advanced stages of testing.

B. QPM

Dr. Ramesh Kumar presented the results of QPM breeding trials. Two trials were conducted for QPM i.e. one in NHZ and another for the other four zones. The QPM combined trial (QPM-I, II and III) was conducted with a few entries. A total of 13 entries were tested in Zone-I (NHZ) with 11 checks. Out of 13 test entries in trial No. 1034, three were Essentially Derived Varieties (EDVs) and remaining 10 were conventionally bred entries. Similarly in trial No. 1066, out of 32 test entries 12 were EDVs and 20 were conventionally bred entries. In trial No. 1034, out of 10 conventionally bred QPM varieties, IQPMH 2102 and IQPMH 2105 were promoted over best performing check (HQPM 4) from AVT-I to AVT-II. Both EDVs namely, FQLPH 20 and FWQH 1 were promoted from QPM-II to QPM-III against their corresponding checks. In addition to these entries, three IDV's FLPH 45 (Low Phytate), FPVH 1 (Pro. A) and FMH 24 (Fe and Zn) were also promoted from QPM-I to QPM-II. In trial No. 1066, out of 32 conventionally bred entries, two entries namely IQPMH 2205 and IQPMH 2204 were promoted in NWPZ (Zone-II) over the best check Pratap QPM Hyb.1; one entry (IQPMH 2205) was promoted in NEPZ (Zone-III) over best check IQMH 203; two entries namely IQPMH 2204 and IQPMH 2205 were promoted in PZ (Zone-IV) over IQMH 203 and four entries namely IQPMH 2203, IQPMH 2204, FQH 160 and JQPM 1 were promoted in CWZ (Zone-V) over the best check HQPM 5 from NIVT to AVT-I for testing

during *kharif*, 2022. One entry IQPMH 2109 was promoted from AVT-I to AVT-II for testing in Zone-II against the best check, Pratap QPM Hyb.1 and two entries namely IQPMH 2108 and IQPMH 2109 were promoted against best check IQPMH 203 in Zone-II for testing during *kharif*, 2022. Among EDV's APQH 4 (Pro. A) was promoted for testing in QPM-III during *kharif* 2023 in Zone-II, III, IV and V. ALPQH 1, another EDV for QPM, Pro A and Low Phytate was promoted in Zone-II, III, IV and V for testing in QPM-III during *kharif*, 2023. The EDV's namely ALQH 9 (low phytate content), APTQH 1 (tocopherol content) and AQWH 4 (high amylopectin) were promoted against their corresponding checks for testing in QPM-III during *kharif*, 2023. Two IDV's namely APH 5 and APH 6 were tested in QPM-I for Pro A and both entries were promoted to QPM-II for testing during *kharif* 2023.

C. Specialty corn

Dr. Chikkappa G. Karjagi presented results on specialty corn breeding trials. Specialty corn trials comprise separate trials of baby corn (BC), sweet corn (SC), and popcorn (PC). There were five specialty corn trials conducted during *kharif* 2022 which comprise two trials each of baby corn (Trial No. 1027 and Trial No. 1064) and sweet corn (Trial No. 1028 and Trial No.1063), and one trial of popcorn (Trial No. 1029). The total number of unique test entries evaluated in baby corn trials was 12 which include 5 each of NIVT and AVT-I and 2 of AVT-II stage. The total number of unique entries in sweet corn trials was 16, which includes 9 in NIVT, 3 in AVT-I and 4 in the AVT-II stage of testing. The popcorn trial contains one test entry.

In baby corn, trial No. 1027, seven entries were tested against three checks (HM-4, CMVL Baby Corn-2 and IMHB 1539); out of these, three are in NIVT (JH 32484, DBCHMS 351 and IBH 11-223) and three (JH 32434, DBCH 350 and JH 32048) are in AVT-I stage of testing. Out of four entries of AVT-I, one entry (IBH 11-227) was a male sterile version i.e. EDV of initial or original baby corn hybrid, IMHB 1539. In trial No. 1064, the trial comprises 12 test entries and three check entries (HM 4, CMVL Baby Corn 2 and ABHS 4-1). Of the test entries, four were in NIVT (JH 32484, IBH 11-223, MBC 22-30 and IBH 11-227), two were in AVT-I (JH 32434 and ABHS 27) and three were in AVT-II (AH 7188, IMHSB 19KB-2 and ABHS4 2). The entry ABHS 27 is an EDV of CMVL Baby Corn 2 and ABHS 4-2 is an EDV of HM 4.

In sweet corn trial No. 1028, the trial comprises six test entries and two checks namely CMVL Sweet Corn 1 and Mishti. Out of six test entries, three entries each in the NIVT (FSCH 194, CP Golden Sweet Super and FSCH 248) and three (FSCH 144, CP Sweet-2 and CPSC 301) in AVT-II stages of testing. Out of three entries of NIVT, one entry CP Golden Sweet Super was promoted to the AVT-I stage based on superiority (10850 kg/ha) over the best check Mishti (10420 kg/ha). Further, in trial No. 1063, the trial comprises 15 test entries and four checks (CMVL Sweet Corn-1, Mishti, ASKH 4 and ASKH 1). The 15 test entries include 11 of NIVT (FSCH-194, ISH 6-2102, ISH 6-2103, ISH 6-2104, ISH 6-2105, ISH 6-2113, ISH 6-2114, CP Golden Sweet Super, CSCH 22002, CSCH 22007 and MSCH-22-25) and two entries each of AVT-I (CSCH 16027 and APSKH1) and AVT-II (FSCH-144 and ISCH 1901). One entry of AVT-I, APSKH 1 is an EDV, enriched with provitamin A of the initial or original variety, ASKH 4.

In case of popcorn trial No. 1029, conducted in NHZ comprises one entry DPCH 312 of NIVT and three check entries namely BPCH 6, DMRHP 1402 and VL Amber Popcorn. Among checks, BPCH 6 was found superior with 3943 kg/ha, whereas the test entry yield was 3892 kg/ha. Thus, the entry was not considered for promotion.

D. Breeder seed production

Dr. Chikkappa G. Karjagi presented the Breeder Seed Production report. The total breeder seed indent received during *kharif* 2021-22 was 74.95 quintals which includes 26.98 quintals of OPVs or composites and 47.00 quintals for parental lines of hybrids. The total quantity of breeder seed produced during the period was 244.75 quintals which included 146 quintals of

OPVs or composites and 98.75 quintals of parental lines of hybrids. There were 13 ICAR/SAUs institutions involved in undertaking the breeder seed production during 2021-22 across 11 states and Union Territories (UTs).

Recommendation:

- The latest released hybrids by public and private sectors should be included as checks in each maturity group, viz., early, medium and late .
- The maize quality traits like zinc and iron testing of AICRP trials should be done in nutrient analysis lab of ICAR-IIMR and another one at referral laboratory under supervision of soil scientist/agronomist.
- The extra early /early hybrids may be promoted in high altitude or hilly areas to enhance farm profitability.
- For seed production, OPV indent of 4-5 kg seeds should not be entertained. Further, after seed production of the indenting quantity, non-lifting is the major issue. Hence, advance payment may be taken from respective agency before seed production of indenting quantity.

III. Crop Production

Dr. A. K. Singh presented the results of crop production. Total 9 trials were conducted in *kharif* 2022 and *rabi* 2021-22, respectively. The major agronomic research trials on maize-based systems were focused on nutrient and planting density optimization for different maturity of pre-released maize hybrids, precision nutrient management and tillage optimization, integrated nutrient management, ecological intensification, weed management, water use efficiency in spring season, optimizing dose of nano-urea, crop residue management in traditional and emerging cropping system and baby corn based intensive cropping system. The major findings are as follows:

1. The use of RDF + 5 t/ha FYM was found at par with 75% RDF + 5 t/ha FYM and thus in long term nutrient doses can be cut with organic supplementation for sustainable maize-based cropping system in India.
2. Use of the organic super absorbent FasalAmirt @ 15-20 kg/ha recommended for enhancing yield and net returns of *kharif* maize in Northern Hill Zone (Zone-I) and Central Western Zone.

Recommendations:

1. The recommended dose of fertilizer should be standardized as per the plant population.
2. A trial should be conducted to standardize the sowing time of maize in spring season.
3. A new trial on weed management in maize systems will be initiated in the kharif 2023.

IV. Crop Protection:

Dr. J.C. Sekhar presented the progress report of plant pathology and entomology trials. Total 83 entries were tested in NHZ whereas; in other zones 285 entries were evaluated during *kharif* 2022 and 114 entries during *rabi* 2021-22. A set of 135 entries were screened for disease resistance during spring 2023.The major findings of plant pathology are as follows:

1. For maydis leaf blight (MLB) management: Azoxystrobin 18.2 w/w + Tebuconazole 18.3% SC (Custodia) @ 0.10% spray at 3 days and 18 days after inoculation.
2. For turcicum leaf blight (TLB) management: Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC (spray) 0.1% at 3 days and 18 days after inoculation.

3. For polysora rust management: Kresoxim methyl 44.3% SC @ 0.10% spray at 3 days and 18 days after inoculation.

Entomology: During *kharif* 2022, *rabi* 2021-22 and spring 2023 screening of maize genotypes for *Chilo partellus*, fall army worm, *Sesamia inference* under artificial inoculation at different locations were done. In addition to this yield loss assessment experiment was also conducted at multilocation to validate the results. The major findings are as follows:

1. Of the 103 entries screened against spotted stem borer, none of the entries was resistant.
2. Among the 103 entries screened against FAW, none of the entries was promising.
3. Seed treatment with Chlorantraniliprole 18.5% SC @ 5.6 mL/kg seed in the combination of foliar spray with Chlorantraniliprole 18.5% SC @ 0.4 mL/L at 3 weeks after germination,Cyantraniliprole 600 FS @ 2.4 mL/kg seed in the combination of foliar spray with Chlorantraniliprole 18.5% SC @ 0.4 mL/L at 3 weeks after germination were effective against FAW.
4. Spraying of Chlorantraniliprole 18.5% SC @ 0.4 mL or Spinetoram 11.7% w/w SC @ 0.5mL/L or Chlorantraniliprole 9.3% + Lambdacyhalothrin 4.6% ZC @ 0.5 mL/L or Novaluran 5.25% + Emamectin benzoate 0.9% w/w SC were effective in the management of FAW.
5. Spraying of recommended insecticide at 7 and 14 DAG or at 10 and 20 DAG were found to be effective in the management of FAW and stem borers.
6. Maize intercropped with cowpea and EPN Spray @ 20 and 40 DAS was effective for the management of FAW
7. Bait + Chlorantraniliprole 18.5 SC @ 5 mL/kg bait followed by Soil + insecticide-chlorantraniliprole 18.5 SC @ 5 mL/kg soil were found to be effective in the management of FAW in both the seasons.
8. Leaf Damage Rating (LDR) scale to categorize maize germplasm for resistance to FAW based on lesion length for Indian conditions.

V. Outreach Programme:

Dr. S. L. Jat presented the progress report of outreach programme. During *kharif* 2022, front line demonstrations (FLDs) were conducted in 151.7 hectares areas which benefit 442 farmers. The overall yield gain over farmers practice was 29.7%. These demonstrations were conducted by using different technologies like hybrid, hybrid + planting method, hybrid + intercropping with pulses, hybrid + integrated pest management (IPM) etc. Similarly, during rabi season also demonstrations were conducted covering 102 ha which benefits 332 farmers and the yield gain during this season was 17% over farmer practice. In addition to this, under Tribal Sub Plan (TSP) demonstrations were conducted in 406 ha with a yield gain of 13.8%, 8.3%, and 40.8% in *rabi*, Spring and *kharif* seasons, respectively. Under capacity building initiative 26 trainings were conducted and 1441 farmers including 321 women were benefitted by these trainings. Six special trainings were organised for scheduled caste farmers, and 422 farmers participated in these trainings. Inputs were distributed to 414 farmers during 2022.

Session III: Concurrent Sessions on Formulation of Work Plan (2022-23)
Plant Breeding Venue: Dr. Rattan Singh Auditorium, GBPUAT, Pantnagar

Chairman	Co-chairman	Conveners	Rapporteurs
Dr. S. K. Pradhan ADG, FFC, ICAR New Delhi	Dr. S. K Guleria Ex Regional Director, HAREC, Bajaura, HP	Dr. S. B. Singh Pr. Scientist, ICAR- IIMR, Ludhiana, Pb	Dr. M. C. Dagla, Dr. Yatish K. R.

The followings points have been discussed and decisions were taken:

1. The entries with high Zn shall be evaluated in field corn trial in the respective maturity group for yield comparison. If the entry is from QPM background then the same will be tested in QPM trial. Trials for biochemical evaluation for 'zinc' would be conducted from first year e.g. NIVT itself at given locations and analysis would also be done from first year itself.
2. Benchmark values for biofortified traits *viz.*, high zinc (≥33 ppm) with or without low phytic acid (≤2.5mg/g), high amylose (≥50%) and high amylopectin (≥ 90%) were fixed for promotion of entries in the trial.
3. The entries with high amylose or amylopectin shall be evaluated in final year QPM trial; the data will be used for identification as per the benchmark.
4. The biofortified trial shall be conducted in association with agronomist.
5. A separate trial for Zn shall be conducted at one location per zone with details as follows:
    - Zone-I: Srinagar
    - Zone-II: ICAR-IIMR, Ludhiana
    - Zone-III: Bhubaneswar
    - Zone-IV: Coimbatore
    - Zone-V: Udaipur
6. Data on Zn and all other quality parameters shall be estimated at ICAR-IIMR, Ludhiana and one referral laboratory.
7. The center wise presentation must have one slide on number of entries contributed and promoted.
8. LQMH 1 has already been included as early check for Zone-I, this may be considered for promotion for early entries instead of Vivek QPM 9 in future.

Details of sampling procedures for iron and zinc trials of hybrids in AICRP trials

- Self-Minimum **5 cobs** per entry in each replication.
- Harvest selfed cobs per entry/replication with **husk**.
- **Soil contact** with harvest must be **avoided**. Preferably put the cobs directly into the cloth bags and put in **non-metallic containers**.
- Dry the selfed cobs with husk **under shade** till ~14% moisture is attained.
- Shell the selfed-cobs using hand on a **polythene sheet/paper** (avoid metal objects to shell).
- **Bulk** the selfed seeds of 5 cobs of each of the entries/replication.
- Select **400-450 selfed grains** randomly per entry/replication.
- Ship the dried seeds in a box to **ICAR-Indian Institute of Maize Research, PAU Campus, Ludhiana 141004, Punjab.**

Procedure for Soil Sampling

- Soil should be taken up at two depth i) 0-15 cm and then from ii) 15-30 cm in each replication.
- Both the soil samples taken at different depth in a replication should be mixed thoroughly.
- The 350-400 g dry sample from each replication should be sent to ICAR-Indian Institute of Maize Research, PAU Campus, Ludhiana 141004, Punjab in a polythene bag non-metallic containers
- The metal contact must be avoided in all the steps.

Crop protection

Venue: Smart Classroom, Department of Livestock Product and Technology, GBPUAT, Pantnagar.

Chairman	Co-chairman	Convener	Rapporteur
Dr. Pradyumn Kumar Ex-Director ICAR-IIMR, New Delhi & Member PAMC	Dr. R. P. Singh, I/c, AICRP-Maize, GBPUAT, Pantnagar	Dr. J. C. Sekhar, WNC, ICAR-IIMR, Hyderabad	Dr. S. B. Suby, Dr. P. Lakshmi Soujanya, Sumit Kumar Aggarwal and Parvin Kumar Bagaria

Total 33 scientists attended the group meeting. Dr. J. C. Sekhar, PI (Crop Protection) welcomed the participants and briefed them about the crop protection plan of work. Dr. Sumit Kumar Aggarwal and Dr. P. L. Soujanya presented the pathology and entomology plan of work for *kharif* 2023, *rabi* 2023-24 and spring 2024, respectively. Details of entomology and pathology experiments finalized are presented in Annexures.

1. Dr. J. C. Sekhar, PI (Crop Protection), WNC, ICAR-IIMR, Hyderabad
2. Dr. Jawala Jindal, PAU, Ludhiana
3. Dr. Shailender Wale, MPKV, Kolhapur
4. Dr. Sushanth Mahadik, MPKV, Kolhapur
5. Dr. K. Vani Sree, PJTSAU, Hyderabad
6. Dr. K. Jeti, CAU, Imphal
7. Dr. Ramesh Kumar, MPUAT, Udaipur
8. Dr. T. Srinivasan, TNAU, Coimbatore
9. Dr. S. B. Suby, ICAR-IIMR, Delhi
10. Dr. P. Lakshmi Soujanya, WNC, ICAR-IIMR, Hyderabad
11. Dr. Maha Singh Jaglan, CCSHAU, Karnal
12. Dr. Sumit Kumar Aggarwal, ICAR-IIMR, Ludhiana
13. Dr. Parvin Kumar Bagaria, ICAR-IIMR, Ludhiana
14. Dr. Robin Gogoi, ICAR-IARI, New Delhi
15. Dr. Deeksha Joshi, ICAR-IARI, New Delhi
16. Dr. Mallikarjuna N., VC Farm, Mandya
17. Dr. Prema G. V., MARS, UAS, Dharwad
18. Dr. Harleen Kaur, PAU, Ludhiana
19. Dr. Rakesh Devlash, HAREC, Bajaura
20. Dr. H. S. Verma, MMRS, Godhra
21. Dr. R. P. Singh, GBPUAT, Pantnagar
22. Dr. Jadesha, VC Farm, Mandya
23. Dr. B. Mallaiah, MRC, Hyderabad
24. Dr. A. Vijayabhaskar, ARS, Karimnagar
25. Dr. Phool Chand, RCA, Dholi
26. Dr. Harbinder Singh, RRS, Karnal
27. Dr. Nabakishor Nongmaithem, CAU, Imphal
28. Dr. Vivek Shinde, MPKV, Rahuri
29. Dr. V Paranidharan, TNAU, Coimbatore
30. Dr. B. L. Baheti, MPUAT, Udaipur
31. Dr. Arshad Anwar, BAU, Sabour
32. Dr. K. K. Mishra, VPKAS, Almora
33. Mr. P. Bharat Chandra, Peddapuram

The following suggestions emerged from the discussion.

Plant Pathology

1. Speed-up screening for different diseases shall be dropped (*kharif/rabi* 203-24) since observations on basis of two years it will not be feasible to correlate disease reaction of speed-up screening trials with original field screening data. (The results were not consistent for 2 years).
2. Management trials should be conducted for at least three years. The B:C ratio will be calculated and submitted to the Technology Evaluation Committee.
3. Biological control native Trichoderma strain may be utilized for treatment as per respective centre.
4. The data will not be accepted after cut-off time decided by ICAR-IIMR, Ludhiana.
5. The additional fund for evaluation trial under collaborative project of ICAR and CIMMYT to be provided by CIMMYT (Project #15)
6. In survey and surveillance data, high quality photographs of disease must be provided with mentioning the cultivar name.
7. The check inbred/composites (e. g., Surya) check shall be dropped since the seeds were not found good in quality.
8. The coordinated trial of screening for common rust during the spring season is to be dropped (Spring 2024) because of no appearance of common rust disease incidence during spring.

Entomology:

1. The data on screening of maize germplasm against FAW should be taken at 14 and 28 days after infestation.
2. Ear damage is to be noted in the sweet corn screening trial.
3. Good data has come from the Kolhapur centre in yield loss estimation and data need to be generated for different hybrids during *kharif* 2023. Coimbatore shall continue the study for the third year, while Ludhiana centre shall initiate this study during *kharif* 2023.
4. Insecticide management trial for the management of FAW shall be initiated for inbred lines.

Agronomy and outreach

Venue: Heritage Hall, Department of Veterinary Extension and Education

Chairman	**Co-chairman**	**Convener**	**Rapporteur**
Dr. R. K. Pannu, Former Dean, College of Agriculture, CCSHAU, Hisar and member, PAMC	Dr. Mahesh Gathala, CIMMYT	Dr. A. K.Singh ICAR-IIMR, Ludhiana	Dr. S. L. Jat and Dr. Romen Sharma, ICAR-IIMR, Ludhiana

Dr. A. K. Singh welcomed Chairman, co-Chairman and scientists. During this session, agronomy and outreach work plan for *kharif* 2023, *rabi* 2023-24 and Spring 2024 was discussed (attached in annexure). The following recommendations were made from agronomy:

1. The use of RDF + 5 t/ha FYM was found at par with 75% RDF + 5 t/ha FYM and thus in long term nutrient doses can be cut with organic supplementation for sustainable maize based cropping system in India.

2. Use of the organic super absorbent FasalAmirt @ 15-20 kg/ha recommended for enhancing yield and net returns of *kharif* maize in Northern Hill Zone (Zone-I) and Central Western Zone (Zone-V).
3. Two new trials on the weed management and the optimization of sowing time for spring maize were finalized.

For outreach the following decisions were taken:

1. Global Positioning System (GPS) coordinates need to be recorded and reported.
2. Seeds for 10 ha FLD to be arranged for each zone for released /identified cultivars for next 3 years towards popularization.
3. FLD to be monitored along with AICRP monitoring.
4. If seed of selected cultivars not available, change can be made from released varieties of 2020 and onwards.
5. **The training and demonstration programme to be near the catchment areas of grain/dual distilleries for enhancing ethanol production.** The concern industry to be involved in the outreach programme.

Session IV: Finalization and presentation of work plan

Chairman	**Co-Chairman**	**Convener**	**Presenter**	**Rapporteurs**
Dr. Sain Dass, Former Director, ICAR-IIMR	Dr. S. K. Pradhan, ADG (FFC), Mr. Bijender Pal, Bioseeds.	Dr. Ramesh Kumar, & Dr. N. Sunil	Dr. S. B. Singh, Dr. Chikkappa G. K., Dr. A. K. Singh and Dr. Soujanya L. P.	Dr. S. L. Jat, Dr. Suby S. B., Dr. Bhupender Kumar and Dr. Sumit Kumar Agarwal

The respective PI presented the work plan for *kharif* 2023, *rabi* 2023-24 and Spring, 2024. The following PIs presented their work plan:

1. Dr. S. B. Singh: Field corn
2. Dr. Chikkappa G. K.: QPM and Specialty corn
3. Dr. P. L. Soujanya: Crop Protection
4. Dr. A. K. Singh: Agronomy
5. Dr. S. L. Jat: Outreach

The detailed work plans are given as annexures I to V.

Day-2 14th April, 2023, Friday

Session VI: International Partnership for Transforming Maize-Agri Food Systems

Moderator	**Convenor**	**Panellists**	**Rapporteurs**
Dr M. L. Jat, Global Research Program Director Resilient Farm and Food Systems, ICRISAT	Dr J. C. Sekhar, WNC, ICAR-IIMR, Hyderabad	Dr. Sain Dass (Ex-Director, ICAR-IIMR), Dr. B. M. Prasanna, (CIMMYT), Dr. P. H. Zaidi (CIMMYT), Dr. B. S. Vivek (CIMMYT), Dr. Mahesh Gathala (CIMMYT), Mr. Anjani Kumar (IFPRI), Mr. Yaspal Saharawat (IFDC), Mr. Bijendra Pal (Bioseed), Mr. Shiv Kumar (ICAR-NIAP), Mr. Ashish Srivastava (Corteva), and Mr. Bhupender Singh (Roquette)	Dr. Suby S. B., Dr. Chikkappa G. Karjagi and Dr. S. L. Jat, ICAR-IIMR, Delhi

The session was moderated by Dr. M. L. Jat, Global Research Program Director, Resilient Farm and Food Systems, ICRISAT, Hyderabad. He opened the session with a brief introduction to the topic to deliberate on the strategy, approaches and roadmap to achieve 50 million tonnes of maize production in India by 2030. The outcomes of the deliberation are as follows:

The novel tools and techniques like double haploid (DH), genomic selection, genomic prediction and their integration to accelerate genetic gain is critical to enhancing the production and productivity of maize. Further, the deployment of new hybrids with resilience to biotic and abiotic stresses followed by accelerated adoption of varietal turnover can bridge yield gaps. Further, effective plant health management and detection and management of transboundary pests are crucial.

The enhancement of maize yields under rainfed ecology by deploying resilient hybrids under weather volatilities. There is need for strengthening of the genetic base of maize germplasm to develop productive hybrids for fulfilling the requirement of all stakeholders.

In order to enhance rainfed and low-productivity districts, the identification of target districts and deployment of suitable hybrids in partnership with different stakeholders can not only play an important role to achieve the target. There is need to focus to develop high-yielding, stress-resilient, mechanization-ready plant types to achieve the targets faster.

The expansion of maize to non-traditional regions, seasons and other cropping systems like rice in unsustainable ecologies. The adoption of maize in rice fallows and increased role and visibility of public sector bred hybrids in the low productivity areas are crucial and can contribute significantly for achieving the target.

There is a need for systems approach integrating genetic, social and ecological aspects for sustainably enhancing the maize yields and hence, research on maize should be re-oriented on systems rather than maize in isolation.

The crop diversification in Indo-Gangetic Plains (IGP) is required to achieve the target. The eastern Gangetic plain is ahead of its western counterpart in terms of productivity and area under maize, the policy push would further facilitate diversification for area expansion. The establishment of ancillary infrastructure like a drying system would improve the quality of the maize produce. However, the diversification to happen would essentially need a comprehensive plan with a focus on system's approaches at landscape level with value chains and market research. There is a need for a clear targeting of maize systems considering genetic, social, economic, ecological aspects.

Maize have transitioned from a subsistence to commercial crop and hence there is a need for scale appropriate value chain mechanization for maize systems. The promotion of maize for non-conventional products like ethanol and silage would accelerate the expansion of maize area and adoption of high-yielding cultivars. Further, climate-resilient and mechanization-ready products along with subsidies for crop diversification would also contribute to achieving the target.

The role of high fertilizer use efficiency, better agronomy, and complimentary cropping systems in achieving the set target is very important. In this, he highlighted the innovation in fertilizer development to achieve sustainability in production. Innovations in extension, multilateral partnerships in fertilizer research, capacity building and infrastructure development are required in this regard.

The starch produced in India is utilized for baby food production and the production of aflatoxin-free maize would play an important role in enhancing the market value of maize produce.

The role of policies is important for the long-term sustainability of enhanced production and productivity. In order to achieve the targets, there is a need to upscale multi-institutional partnerships in product development, product diversification and value chain. The favourable policies are required for the expansion of maize into non-sustainable cropping systems, buffering maize against price fluctuations, expanding the market by product diversification, etc.

Suggestions/recommendations	Partnership and/policy
Science & innovation	
Accelerating the product development aided by innovative platforms *viz*, DH facility, genetic innovation, policies on sustainability and accelerated adoption of varietal turnover.	Public-Private
Crop improvement for rainfed ecology and products resilient for weather volatilities should be focused.	ICAR-CIMMYT
Based on the demands of the stakeholders, the collaboration needs to be strengthened further, especially in the germplasm base.	Public-Private
Crop-diversification in Indo-Gangetic Plains (IGP) is an opportunity. The eastern Gangetic plain is ahead of its western counterpart; however, policies facilitating diversification are helping the expansion. Expansion of area and seasons and, foray into non-traditional areas like rice fallows.	Policy intervention
Public institutions shall play a big role in productivity enhancement combined with stress resilience in collaboration with private sector.	Public-Private
Policies for buffering maize against price fluctuations, expanding the market by product diversification, etc.	Policy intervention
Focusing on low-productivity districts with available hybrids should be the first step. In addition to high yield and stress resilience, mechanization-ready plant types shall contribute to achieving the targets faster.	Public-Private
Expansion into non-conventional products like ethanol and silage will push area and adoption of productive cultivars. Climate resilient products and expansion of mechanization shall contribute to the target.	Public-Private
Increasing nutrient use efficiency, innovation in fertilizer development, better agronomy, and complimentary cropping systems can contribute greatly to the target.	Research and policy intervention
Zero budget farming is viable only when the consumer is ready to pay the price.	Research and policy intervention
Aflatoxin is one challenge faced by the industry, especially in the baby food segment.	Public-Private
Partnership	
The level of multi-institutional partnership needs up scaling not only for product development but also for product diversification and value chain. Plant health management in terms of policies and strengthening technologies to detect and manage transboundary pests is the need of the hour.	Multi-institutional partnership & policy intervention

Platform needs to be created to enhance multilateral partnerships in fertilizer research and innovation towards sustainably, and capacity and infrastructure building to achieve the same.	Multi-institutional partnership & policy intervention
Increased visibility of public sector hybrids is required in the low productivity areas.	Public-Private
Partnership focusing on establishing drying system, diversification, and popularization of maize fodder.	Public-Private
Partnership to improve districts with productivity < 2t/ha in next 7 years. The partnership is also required to ensure clean feed to poultry to mitigate aflatoxin.	Public-Private
Some multi-national company (MNC) is currently catering to local issues on mechanization in crop production and processing like a planter and silage-making machines. However, crop diversification into non-conventional areas needs policy intervention such as managing subsidies on mechanization.	Policy intervention
In addition to technology, innovation in extension is also needed to achieve the target.	Multi-institutional partnership
There is need to identify a few low productivity districts and showcase the available technologies.	Multi-institutional partnership
A comprehensive plan for scale appropriate mechanization for maize systems	Multi-institutional partnership

The key action points to achieve the target of 50 MT were identified as follows:

1. Effective use of DH facility established by CIMMYT by ICAR and AICRP system to augment Indian maize breeding programme (**ICAR-IIMR, CIMMYT, India**).
2. Identification of districts with lower than the national average productivity for product deployment (**ICAR-IIMR, AICRP centres, Seed Companies**).
3. Integration of maize for ethanol and silage in research and development (**ICAR-IIMR, AICRP centres, Seed Companies**).
4. A comprehensive strategy and plan on crop diversification by optimization of maize cropping/farming systems including crop-livestock integration at landscape level with appropriate value chains and market linkages in selected ecologies of India (**ICAR-IIMR, AICRP centres, CIMMYT, ICRISAT, Animal Husbandry Division of ICAR, Seed Companies**).
5. Collaboration with IFDC to initiate research on increasing the fertilizer use efficacy (**ICAR-IIMR, IFDC, AICRP centres**).
6. Aflatoxin is one of the major challenges which needs a comprehensive strategy. Hence there is a need to develop a mega-project to address the aflatoxin problem in maize. This can be built on co-learning on knowledge and technologies on aflatoxin in other crops such as groundnut (**ICAR-IIMR with CIMMYT, ICRISAT**).
7. Collaboration to bring infrastructure facilities to address climate-resilient agriculture (**CIMMYT, BISA, ICAR-IIMR**).
8. Regular interaction and strategic plan formulation to increase maize production with stakeholders of maize production and value chain (**ICAR-IIMR**)
9. A comprehensive plan for scale appropriate mechanization for maize systems (**ICAR-IIMR, PAU, Private Sector**)

Session VI: Variety Identification Committee (VIC) meeting

Venue: Dean's committee Room, College of Veterinary and Animal Science

The VIC meeting was held in hybrid mode. Dr. T. R. Sharma, DDG (CS), Dr. D. K. Yadava, ADG (Seeds), Dr. Sanjay Kumar Singh, Director, DSR, Mau and Dr. P. K. Singh, Agriculture Commissioner, Government of India attended the meeting online whereas Dr. S. K. Pradhan, ADG (FFC) and other members of VIC along with resource persons attended the meeting offline. Total 32 proposals were received for consideration by VIC. Out of 31 proposals, 30 were identified for release and one proposal QPMH 1 was deferred with the comments that generate one more year data and the proposal may be put for consideration in the next year. The detailed VIC proceedings are attached at Annexure-VI.

Session VII: Closing Ceremony

Venue: Main Hall (Dr. Ratan Singh Auditorium)

Chief Guest	Chairman	Guest of Honour	Guest of Honour	Rapporteur
Dr. M. L. Jat, ICRISAT	Dr. Sain Dass, Former Director, ICAR-IIMR	Dr. S. K. Pradhan, ADG (FFC), ICAR New Delhi	Dr. M. P. Pandey	Dr. Dharam Paul and Dr. Sunil Neelam

The closing ceremony starts with the felicitation of the dignitaries by presenting flower bouquets. This was followed by the presentation of the best AICRP award to ICAR-IARI, New Delhi for their good work during last two years. Eminent maize scientists including Dr. J. P. Shahi who has passed away, was conferred citation posthumously. Dr. S. S. Sharma, Maize Pathologist, MPUAT, Udaipur, Dr. R. N. Gadag, Principal Scientist, ICAR-IARI, New Delhi, Dr. M. C. Komboj, Maize Breeder, RRS, CCSHAU, Karnal were facilitated for their life time achievements on their superannuation. Dr. M. P. Pandey appreciated the group and was very hopeful that the maize group will soon achieve the target of 50 MT of maize production by 2030. Dr. A. S. Nain, Director Research, GBPUAT. Pantnagar appreciated the 7.0 t/ha productivity levels achieved in West Bengal. He brought into notice the productivity of USA, which is 11.0 t/ha and expressed concern that we are unable to reach 4.0 t/ha under *kharif* season. He set a goal that we should be able to reach global productivity of 6.0 t/ha and further added that the 2030 target of 50 MT maize production is achievable. He opined that AICRP was impressive and important for food security, but concerned about reducing contingencies in AICRP. He suggested that area expansion of any crop should involve fallow lands and not at the cost of other crops. He also felt that competitive prices for the farmers need to be ensured. He thanked ICAR-IIMR for organizing the 66th AMW at Pantnagar. Dr. R. K. Pannu, congratulating the breeders for developing new hybrids, and expressed that the role of agronomists as managers are challenging in maintaining soil fertility. He requested fellow scientists to work hard and develop improved package of practice for every hybrid keeping in mind the requirement of the area so that farmers would be able to harvest its maximum potential. Dr. P. Kumar said that emphasis must be given to local specific diseases and new areas were suggested in the plant protection research. He also expressed that 50 MT by 2030 was achievable. Dr. Sain Dass congratulated the breeders for the development of high-yielding hybrids. He pin pointed the bigger role of scientists in era of climate change. Dr. H. S. Jat expressed that emphasis should be laid on digital technologies. He read the proceedings of VIC meeting and congratulated the breeders whose hybrids/varieties have been identified for release. He told that 31 out of 32 proposals have been recommended for

release. Dr. S. K. Pradhan was very happy with the contribution of the centers. He expressed happiness over the experiments being planned especially high Zn/low phytate experiments. He put emphasis on use of innovative technologies to compete globally in maize production. We may become leader in future the way we are able to release hybrids. India has great potential of becoming seed exporter. Dr. M. L. Jat laid emphasis on learning through interaction involving social scientists. He suggested that system science should be the guiding principle in enhancing production and productivity. He felt proud to be associated with the maize family. He congratulated the breeders whose hybrids/varieties have been identified for release. In the end, Dr. R. P. Singh proposed a vote of thanks.

Annexure I

Finalization and presentation of work plan

(Plant Breeding)

Chairman	Co-Chairman	Convener	Rapporteurs
Dr. S. K. Pradhan, ADG FFC	Dr. Sain Das and Mr. Bijender Pal, Bio seeds	Dr. S. B. Singh, Principal Scientist, ICAR-IIMR	Dr. S. L. Jat, Dr. Bhupender Kumar and Dr. Suby S. B., Dr. Sumit Kumar Agarwal

Maize Breeding (*Kharif* 2023; *Rabi* 2023-24 and Spring 2024)

Dr. S. B. Singh presented the work plan of overall maize breeding programme for *kharif* 2023, *rabi* 2023-24 and spring 2024
Detailed on various trials are given below:

Trial kharif 2023	**Entries**					**Mode of operation**
	NHZ	**NWPZ**	**NEPZ**	**PZ**	**CWZ**	
NIVT-Late, Medium, Early, QPM, Baby corn Popcorn and Sweet corn	New entries are invited					Across zones (Except NIVT Late (Rest of the Zones) Popcorn and OPV (Zone-I)
AVT-I: Early Maturity	1	3	-	-	6	Zone specific
AVT-I: Medium Maturity	3	11	15	8	11	Zone specific
AVT-I: –Late Maturity	-	7	11	22	10	Zone specific
AVT-II:Early Maturity	2	3	-	-	3	Zone specific
AVT-II: -Medium Maturity	-	1	1	3	4	Zone specific
AVT-II: Late Maturity	-	2	1	4	3	Zone specific
OPV	2	-	-	-	-	Zone specific
QPM -I-II-III (Early)	2	3	3	2	4	Across the Zones
QPM-I-II-III (Medium-Late)	7	11	8	7	8	Across the Zones
Biofortified -I-II-III	3	-	-	-	-	Across the Zones
EDVs/IDVs	2	5	3	6	7	Across the Zones
Sweet Corn-I-II-III	1	4	4	5	2	Across the Zones
TOTAL	**23**	**50**	**46**	**57**	**58**	**234**

Technical Programme, *Kharif* 2023

Trials	Zone	Entries	Entry Name
NIVT			
Early	All except PZ	-	Yet to Receive
Medium	All Zones	-	Yet to Receive
Late	All except-NHZ	-	Yet to Receive
AVT-I			
Early	NHZ	1	IX 7851
	NWPZ	3	IX 7851, SRMH 99M66, AHD 2008
	NEPZ	-	--
	CWZ	6	OMH 22-4, SRMH 99M66, IX 7851, AHD 2008, AHD 8751, SMH 9099
Medium	NHZ	3	IW 8477, IQ 8624, JH20088,
	NWPZ	11	IW 8477, JKMH 4823, PM 22104, PM 22101, IQ 8624, CP 509, SYN 225721M, IMH2 22K-7, PM 22102, IQ 8393, BH 417189
	NEPZ	15	PM 22101, JH 20088, IW 8477, PM 22102, IMH2 22K-7, SYN 225721M, IQ 8624, PM 22104, IQ 8393, AHD 2077, CP 509, IMH2 22K-4, RCRMH 20, IMH 10-21K2, BH 417189
	PZ	8	KMH 8111, JKMH 4059, PM 22103, PM 22102, IM 36511, IW 8477, IMH2 22K-6, RCRMH 20
	CWZ	11	IM 36511, JH 20088, PM 22102, IQ 8624, KMH 8111
			IQ 8393, PM 22104, SYN 225721M, BH 417189, RCRMH 20, BH 417144
AVT-I			
Late	NWPZ	7	AM 05674, HARLAL 24, PM 22107, SYN 223671L, CP 988, IQ 8701, IX 8699
	NEPZ	11	HARLAL 24, PM 22115, SMH 235, AM 05674, PM 22116, PM 22106, PM 22107, PM 22113, PM 22112, PM 22105, IX 8699
	PZ	22	SMH 235, ADV 7434, SYN 223671L, SUPER 2727, NS 8011, SYN 221610L, PM 22106, SYN 224681L, HARLAL 24, SRMH 999, PM 22108, BIO 9766, KMH 8208, BH 417177, IX 8699, KMH 8206, MFH 22-65, KMH 8388, IQ 8701, HM 22201, BH 417018, VNR 4324
	CWZ	10	SMH 235, NS 8007, ADV 7434, PM 22117, SYN 223671L, HARLAL 24, PM 22108, KMH 8206, MFH 22-65, IQ 8701
AVT-II			
Early	NHZ	2	JH 32662, JH 32652

	NWPZ	3	CP 999,SMH 4555, CP 111
	NEPZ	2	--
	CWZ	3	JH 32487, SMH 4555, AH 8323
Medium	**AVT-II**		
	NHZ	-	-
	NWPZ	1	DKC 9224
	NEPZ	1	DKC 9224,
	PZ	3	JKMH 4546, HM 20105, IMHSB 20K-10
	CWZ	4	DKC 9224, PM 21103M, HM 21204, JKMH 4546
Late	NWPZ	2	PM 21111L, PM 21107L
	NEPZ	2	DKC 9226
	PZ	4	KMH 8333, PM 21107L, BIO 207, ADV 7211
	CWZ	3	R 8050, PM 21111L, DKC 9226
OPV	OPV-I-II-III	2	ADC 4, ADC 3

Technical Programme, *Kharif* 2023

Trials	**Zone**	**Entries**	**Entry Name**
QPM	NHZ	2	IQPMH 2102, IQPMH 2105
	NWPZ	3	IQPMH 2205, IQPMH 2204, IQPMH 2109
	NEPZ	3	IQPMH 2205, IQPMH 2109, IQPMH 2108
	PZ	2	IQPMH 2204, IQPMH 2205
	CWZ	4	IQPMH 2203, IQPMH 2204, FQH 160, JQPM 1
Baby corn	NHZ	4	JH 32484, IBH 11-223, JH 32048, IBH 11-227
	NWPZ	4	JH 32484, IBH 11-227, JH 32434, ABHS 27
	NEPZ	4	JH 32484, IBH 11-223, IBH 11-227, JH 32434
	PZ	5	JH 32484, IBH 11-223, IBH 11-227, JH 32434, ABHS 27
	CWZ	4	JH 32484, IBH 11-223, JH 32434, ABHS 27

Technical Programme, Kharif 2023

Trials	**Zone**	**Entries**	**Entry Name**
Sweet corn	NHZ	1	CP Golden Sweet Super
	NWPZ	4	ISH 6-2104, ISH 6-2105, CP Golden Sweet Super, APSKH1
	NEPZ	4	ISH 6-2105, ISH 6-2113, CP Golden Sweet Super, APSKH1
	PZ	5	ISH 6-2105, ISH 6-2113, ISH 6-2114, CP Golden Sweet Super, APSKH1
	CWZ	2	ISH 6-2105, APSKH1

Pop corn			No Popcorn trial in Zone NWPZ, NEPZ, PZ and CWZ during *kharif* season. The Popcorn trial in these zones will be conducted during *rabi* season
EDVs/IDVs/Biofortified	NHZ	5	FQLPH 20, FWQH 1, FLPH 45 (Low Phytate), FPVH 31(Pro.A), FMH 24 (Fe & Zn)
	NWPZ	6	APQH 4, ALPQH 1, ALQH 9, APTQH 1, APH 5, APH 6
	NEPZ	6	APQH 4, ALPQH 1, ALQH 9, APTQH 1, APH 5, APH 6
	PZ	6	APQH 4, ALPQH 1, ALQH 9, APTQH 1, APH 5, APH 6
	CWZ	7	APQH 4, ALPQH 1, ALQH 9, APTQH 1, AQWH 4, APH 5, APH 6
RF-I-II		-	RF-E-II: PZ, CWZ: Entries of AVT-II trials

Details of Checks (Field corn) to be used in *Kharif* 2023

Maturity Group	Name of check	Zone	Centre Name /Company
Early	BIO 605	1, 4	Bio Seed Research India Pvt. Ltd.
	DKC 7074	2,4,5	Monsanto
	Vivek Hybrid 51	5	ICAR-VPKAS, Almora
	LQMH 1	1	ICAR-IIMR, Ludhiana
Medium	CMH 08-292	2, 3, 4, 5	TNAU, Coimbatore
	BIO 9544	All	Bio Seed Research India Pvt. Ltd.
	LG 34.05	3,4,5	Lima Grain
Late	CMH 08-287	3, 4	TNAU, Coimbatore
	CMH 08-282	5	TNAU, Coimbatore
	BIO 9682	2, 5	Bio Seed Research India Pvt. Ltd.
	NK6240	2, 4	Syngenta India Pvt. Ltd.
	CP 858	2,3	CP Seeds

Details of checks of QPM and specialty corn for Kharif-2023

Corn	Name of Check	Zone	Centre Name /Company
QPM	HQPM 5,	All	RRS, CCSHAU, Uchhani, Karnal
	LQMH 1	1 (Early)	ICAR-IIMR, Ludhiana
	IQMH 202		ICAR-IIMR, Ludhiana
	IQMH 203		ICAR-IIMR, Ludhiana
	Bio 9544 (Normal)		Bio Seed Research India Pvt. Ltd.
Sweet	Misthi	1,2,4	Nuziveedu Seeds Ltd.

Corn	VL Sweet Corn1	1,2,4,5	ICAR-VPKAS, Almora
	ASKH 4	1,2,3,4	ICAR-IARI, New Delhi
Pop corn	BPCH 6	1	PJTC, Hyderabad
	DMRHP 1402,	1	ICAR-IIMR, Ludhiana
	LPCH 3 (IMHP 1540)	3,4,5	ICAR-IIMR, Ludhiana
Pro A	APH 1	All	ICAR-IARI, New Delhi
Baby Corn	VL Baby Corn 1	1,3	ICAR_VPKAS, Almora
	AH 7043	1,3,4,5	ICAR-IARI, RS, Dharwad
	ABSH 1	2	ICAR-IARI, New Delhi
Quantity of seeds required: QPM= 20 kg;			
Sweet Corn =10 kg; Baby Corn= 25 kg; Pop Corn= 2 kg			
The concerned centre bound to provide the seed of relevant check well in time			

Details of Checks to be used in *Rabi* 2023-24			
Maturity Group	**Check Name**	**Zone**	**Company/Centre Name**
Medium	BIO 9544	1,2, 3, 4, 5	Bio seed Research India Pvt. Ltd.
	DHM 117	4	ANGRAU, Guntur
	DMRH 1308	3, 5	ICAR-IIMR, Ludhiana
Late	P3522	2, 3, 4, 5	Pioneer Overseas Corporation
	NMH713	3, 4	Nuziveedu Seeds Ltd.
	KMH25K45	2,4,5	Kaveri Seed Company Ltd
	PM 16202 L	4,5	Corteva
Popcorn	BPCH 6	2,3,4,5	PJTC, Hyderabad
	LPCH3	3,4,5	ICAR-IIMR, Ludhiana
	DMRHP 1402	2,3,4,5	ICAR-IIMR, Ludhiana
QPM	HQPM5 ,	All	RRS, CCSHAU, Uchhani, Karnal
	LQMH 1	1 (Early)	ICAR-IIMR, Ludhiana
	IQMH 202	2	ICAR-IIMR, Ludhiana
	IQMH 203	5	ICAR-IIMR, Ludhiana
	Bio 9544 (Normal)	All	Bioseed Research India Pvt. Ltd.
Baby corn	VL Baby corn 1	1,3	ICAR-VPKAS, Almora
	AH 7043	1,3,4,5	ICAR-IARI, RS, Dharwad
	ABSH 1	2	ICAR-IARI, New Delhi
Sweet Corn	Misthi	1,2,4	Nuziveedu Seeds Ltd.
	VL Sweet Corn1	1,2,4,5	ICAR-VPKAS, Almora
	ASKH 4	1,2,3,4	ICAR-IARI, New Delhi

Quantity seed = 25kg each and Popcorn= 3 kg each

The concerned centre bound to provide the seed of relevant check well in time

Details of Checks to be used in Spring 2023			
Maturity Group	**Check Name**	**Zone**	**Company/Centre Name**
Early	PMH 13	2	PAU, Ludhiana
	Bio 605	2	Bioseeds Research India Pvt. Ltd.
	DKC 7074	2	Monsanto
Late	BIO 9544	2	Bioseeds Research India Pvt. Ltd.
	DKC 9108	2	Monsanto
	P 3522	2	Pioneer Overseas Corporation
	KMH 25K45	2	Kaveri Seed Company Ltd
Quantity of seed required =10 kg each			

Seed requirements of entries for *Kharif* 2023				
S. N.	**Trial**	**Year of testing**	**Seed Quantity (Kg)**	**Mode of conduct**
1	National Initial Varietal Trail (NIVT)	First	3.5 kg/Entry	Across the zones
2	Advance Varietal Trial-I (AVT-I)	Second	6 kg/Entry/Zone	Zone specific
3	Advance Varietal Trial-II (AVT-II)	Third	10 kg/Entry/Zone	Zone specific
4	Baby Corn	1st, 2nd, 3rd	8 kg/ Entry	Across the zones
5	QPM	1st, 2nd, 3rd	7 kg/Entry	Across the zones
6	Sweet Corn	1st, 2nd, 3rd	3.5 kg/ Entry for 1st and 2nd, 6 kg/entry for 3rd year	Across the zones
7	Popcorn	1st, 2nd, 3rd	1.0 kg/Entry for 1stand 2nd, 1.5 kg/entry for 3rd year	Across the zones
8	National Maize Demonstration-Hybrids	--	1.0 kg/Hybrids	Ludhiana
9	National Maize Demonstration-Inbreds	--	0.3 kg/Hybrids	Ludhiana

Seed requirements for *Rabi* 2023-24 and Spring-2024				
S. N.	**Trial**	**Year of testing**	**Seed quantity (Kg)**	**Mode of conduct**
1	Initial Varietal Trail (NIVT)	First	3.5 kg/Entry	Across Zone
2	Advance Varietal Trial-I (AVT-I)	Second	6 kg/Entry/Zone	Across Zone
3	Advance Varietal Trial-II(AVT-II)	Third	10 kg/Entry/Zone	Across Zone
4	QPM	1^{st}, 2^{nd}, 3^{rd}	7 kg/ Entry	Across Zone
5	Popcorn	1^{st}, 2^{nd}, 3^{rd}	2.0 kg/Entry for 1^{st} 2^{nd}, and 3 kg/entry for 3^{rd} year	All zones excluding NHZ

Note: Spring trials will be conducted only in NWPZ

Locations for Various Trials
***Kharif* Season**
NIVT –Early
Zone-I: Almora, Bajaura, Kangra, Srinagar, Imphal and Barapani
Zone-II: Ludhiana, Karnal, Delhi and Pantnagar
Zone-III: Dholi, Sabour, Ranchi, Bhubaneswar and Varanasi
Zone-V: Banswara, Udaipur, Chindwara, Ambikapur and Godhra,
NIVT-Medium
Zone-I: Almora, Bajaura, Kangra, Srinagar, Imphal and Barapani
Zone-II: Ludhiana, Karnal, Delhi and Pantnagar
Zone-III: Dholi, Sabour, Ranchi, Bhubaneswar, Varanasi and Baharaich
Zone-IV: Dharwad, Mandya, Karimnagar, Hyderabad, Coimbatore, Vagarai, Peddapuram, Kolhapur and Rahuri
Zone-V: Banswara, Udaipur, Chindwara, Ambikapur and Godhra
NIVT-Late
Zone-II: Ludhiana, Karnal, Delhi and Pantnagar
Zone-III: Dholi, Sabour, Ranchi, Bhubaneswar, Varanasi and Baharaich
Zone-IV: Dharwad, Mandya, Karimnagar, Hyderabad, Coimbatore, Vagarai, Peddapuram, Kolhapur and Rahuri
Zone-V: Banswara, Udaipur, Chindwara, Ambikapur and Godhra

Locations for Various Trials
***Kharif* Season**

AVT-I-II
NHZ: Almora, Bajaura, Kangra, Srinagar, Rajauri, Barapani, Imphal, KVK,Geku (Arunachal Pradesh), Nagaland University, Dimapur and Dhaulakuan
NWPZ: Ludhiana, Dehradun (GEH, University), Gurdaspur, Kapurthala, Karnal, Delhi, Pantnagar, Jhansi, Banda, Jalandhar (Syngenta), Kannauj (Bioseeds), Hoshiarpur (Corteva).
NEPZ: Dholi, Sabour, Ranchi, Bhubaneswar, Varanasi, Baharaich, Gossaigaon, Risia (CP Seeds) (Baharaich), Mujafarpur (Corteva) , ICAR-IARI, Jharkhand, BISA, Samastipur, and UBKV, Cooch Bihar
PZ: Hyderabad, Karimnagar, Peddapuram, VRDC KSSC Dharwad, Dharwad, ARS Devihosur, Kolhapur, Mandya, Vagarai, Coimbatore, Parbhani, Rahuri, and Buldana
CWZ: Banswara, Chhindwara, Ambikapur, Godhra, Udaipur, Bhiloda, AAR Dahod, RARS Ujjain, ARS Kota, Bilaspur - Chhattisgarh (Monsanto), Anand (Shaktivardhak seeds), Menar, Chittorgarh (Kaveri),

Note: AVT I-II Late Trials will not be conducted in NHZ

Kharif (Early) Trial will not be conducted in Zone-IV (PZ).

Locations for Various Trials *Kharif* Season
QPM: QPM I-II-III

Almora, Bajaura, Kangra, Srinagar, Gossaigoan, Delhi, Ludhiana, Karnal, Pantnagar, Kannauj (Bioseeds), and Hoshiarpur (Corteva),

Dholi, Ranchi, Bhubaneswar, Varanasi, Bahraich, Sabour, ICAR-IARI Jharkhand, Dharwad, Mandya, Karimnagar, Hyderabad, Peddapuram, Coimbatore, Vagarai, Kolhapur, Rahuri, Udaipur, Banswara, Chindwara, Ambikapur, and Godhra.

Note: QPM Quality traits evaluation: ICAR-IARI, New Delhi and ICAR-IIMR, Ludhiana

Sweet Corn I-II-III:

Almora, Bajaura, Kangra, Srinagar, Gossaigoan (Jorhat), Imphal Barapani, Delhi, Ludhiana, Karnal, Pantnagar, Kannauj (Bioseeds), Hoshiarpur (Corteva), Dholi, Ranchi, Bhubaneswar, Varanasi, Bahraich, Sabour, Kalyani, Dharwad, Mandya, Karimnagar, Hyderabad, Peddapuram, Coimbatore, Kolhapur, Rahuri, Udaipur, Banswara, Chindwara, Ambikapur and Godhra

Locations for Various Trials *Kharif* Season
Baby Corn -I-II-III

Almora, Bajaura, Kangra, Srinagar, Gossaigoan (Jorhat), Imphal, Barapani, Delhi, Ludhiana, Karnal, Pantnagar, Kannauj (Bioseeds), Dholi, Ranchi, Bhubaneswar, Varanasi, Bahraich, Sabour, Kalyani, Dharwad, Mandya, Karimnagar, Hyderabad, Peddapuram, Coimbatore, Kolhapur, Rahuri, Udaipur, Banswara, Chindwara, Ambikapur and Godhra

Popcorn-I-II-III

Kharif (NHZ): Almora, Bajaura, Kangra, Srinagar, Imphal, Barapani

Note: Quality data of speciality trials (BC, SC & PC) will be recorded by following centres, viz.,

Zone-I: Srinagar and Almora

Zone II: Ludhiana and Delhi (ICAR-IARI) ;

Zone-III: Varanasi and Dholi; Zone IV: Hyderabad, Mandya, Dharwad and Coimbatore

Zone-V: Udaipur and Godhra.

Locations for Various Trials *Rabi* &Spring Season

Normal Corn

Bahraich, Varanasi, Dholi, Sabour, Begusarai, Ranchi, Kalyani, Kolkata, Bhubaneswar, Dharwad, Mandya, Coimbatore, Hyderabad, Karimnagar, Peddapuram, Rahuri, Kolhapur, Banswara, Godhra, BISA (Pusa), and UBKV Kooch Bihar

QPM Trials

Bahraich, Varanasi, Dehradun (GEH Univ.), Dholi, Sabour, Ranchi, Kalyani, Bhubaneswar, Dharwad, Mandya, Coimbatore, Hyderabad, Karimnagar, Peddapuram, Rahuri, Kolhapur, Parbhani and Buldana have requested for *Rabi* trials

Banswara, Godhra, Udaipur, Ambikapur, Chindwara

Popcorn-I-II-III

Ludhiana, Karnal, Delhi, Pantnagar, Dholi, Ranchi, Bhubaneswar, Varanasi, Bahraich, Sabour, Kalyani, Dharwad, Mandya, Karimnagar, Hyderabad, Peddapuram, Coimbatore, Kolhapur, Rahuri, Udaipur, Banswara, Chindwara, Ambikapur, and Godhra

C. Spring Trials:

Normal and QPM (Early and Medium): Ludhiana, Karnal, Pantnagar, Dehradun (GEH University), Delhi

Note: Ludhiana, Karnal, Delhi and Pantnagar will conduct the trials in spring season only.

Note: Quality data of specialty trials (BC, SC & PC) will be recorded by following centres, viz.; Zone-II: Ludhiana and Delhi (ICAR-IARI) ; Zone-III: Varanasi and Dholi; Zone-IV: Hyderabad, Mandya, Dharwad and Coimbatore; Zone-V: Udaipur and Godhra.

General instructions

- ✓ Last date for receiving seed at WNC, ICAR-IIMR, Rajendranagar, Hyderabad- *Kharif* season-10th May, 2023, for *Rabi*- 10th October, 2023 and for Spring 31st December, 2023.
- ✓ For Zone-I (NHZ): The trials will also be constituted at WNC, Hyderabad by 10th April.
- ✓ Testing Fee (Private/Non-ICAR organizations) – Rs. 75, 000/- + 18% GST/entry/trial. This will be applicable after acceptance of proceeding by ICAR, which will be communicated in due course of time.
- ✓ Demand Draft (DD) should be in favour of Director, ICAR-Indian Institute of Maize Research, Ludhiana, Punjab-141004
- ✓ Seed of all entries must be untreated and graded properly.

✓ Seed and all correspondence must be dispatch to:

Dr. N. Sunil, Principal Scientist
Coordinator-Trials & Nurseries (AICRP on Maize)
Winter Nursery Center, ICAR-IIMR
Rajendranagar, Hyderabad, Telangana-500030.

✓ Breeder who submit the entry must mentioned their contact number and email Id in covering letter for further communication.
✓ Detailed information of entry in attached format must be provided; the superiority (10%) over the zone-specific check in one year data, the female productivity should be given.

Recommendation for Trials

Initial varietal Trials (NIVT-I) (Across the zones):	No. of rows Row length Spacing Replications Fertilizer	2 (net) 4m (net) 60cm × 20 cm in Irrigated Three As per recommendations
Advance varietal Trials-I (Zone specific):	No. of rows Row length Spacing Replications Fertilizer	4 (net) 4m (net) 60cm × 20 cm in Irrigated Three As per recommendations
Advance varietal Trials-II (AVT-II) or (AVT I+II) (Zone specific):	No. of rows Row length Spacing Replications Fertilizer	6 (net) 4m (net) 60cm × 20 cm in Irrigated Three As per recommendations
Specialty corn (QPM/SC/PC/-I-II-III (Across the zone) :	No. of rows Row length Spacing Replications Fertilizer	4m (net) 4m (net) 60cm ×20 cm in Irrigated Three As per recommendations

No. of rows in baby corn trial =2 (net)

Rainfed/OPV: 70 × 25cm; Rep: 3; Rows length: 4m; Row No. 4/Rep.

Promotion criteria for entries to next stage of testing

The test entries will be promoted from first year (NIVT) to second year (AVT-I), second year (AVT-I) to third year (AVT-II) on the basis of the following criteria:

- Entries must be numerically superior over the best check in a zone for yield and should have non-significant differences in yield from the best entry (Rank 1st) of the trial at CD (*P*=0.05).
- In early and medium trials, besides yield, the test entry should not exceed the relevant best check by 2.0 days in days to 50% anthesis.
- In all the trials minimum three locations (CV within limit) data per zone will be required for the promotion of the entry.
- The disease reaction of test entries to the disease of national average will be considered for promotion.

- In specialty corn, *viz*., sweet corn and popcorn, besides yield, the quality parameters were also be considered while promotion. e. g. (SC: TSS ≥15%; PC: Popping Percentaage ≥ 85% and expansion in the ratio of 1:15) .

- In QPM, all entries will be compared with best check except for NHZ (Zone-I) where the test entries found to be early based on days to 50% anthesis criterion will be compared with LQMH 1.

- In addition to the above, the entry should have resistance to moderately resistance response on scale 1-9 for major diseases on national level.

Promotion Criteria for entries to next stage of testing

- For entries with low phytic acid, <2.5 mg/g would be considered as benchmark for promotion of entries. For entries with high α-tocopherols, 12 ppm will be considered as benchmark for promotion of entries. For promotion of QPM entries minimum 8% protein and 0.07% tryptophan in endosperm will be considered as benchmark for promotion of entries. All these benchmarks will be reviewed after two years.

Additional consideration at the time of identification in VIC:

- The entries with negative superiority over best check in final year of testing will not be considered for identification.

- In case of hybrids to be compared with hybrid check the yield superiority must be ≥ 5% for identification (in late maturity) and ≥ 10% for all others.

- In case of comparison of hybrid with composite as a check yield superiority in hybrid over composite should be ≥ 20%.

New Recommendations:

- The entries with high Zn in normal genetic background shall be evaluated in field corn trial in the respective maturity group for yield comparison. However high Zn with QPM or with any other bio-fortified traits shall be evaluated in bio-fortified trials for the yield comparison with the relevant checks.

- The entries with high amylose or amylopectin shall be evaluated in QPM trial.

- Benchmarks values for biofortified traits viz., high zinc (≥33 ppm) with or without low phytic acid (≤2.5mg/g), high amylose (≥50%) and high amylopectin (≥ 90%) were fixed for promotion of entries in the trial.

- The bio-fortified trial will be conducted in association of agronomist.

- A separate trials for Zn shall be conducted at one location per zone as follows and Zn data of all the locations would be utilized for promotion/identification of the entries in any of the zone (s):

  Zone-I: Srinagar

  Zone-II: ICAR-IIMR, Ludhiana

  Zone-III: Bhubaneswar

Zone-IV: Coimbatore

Zone-V: Udaipur

- Data on Zn shall be estimated at ICAR-IIMR, Ludhiana and one referral laboratory (ICAR-IIMR may select the other suitable referral laboratory)
- Since, LQMH 1 has already been recommended and added as a short duration check in QPM from last year, therefore in the promotion criteria, the Vivek QPM-9 should be replaced with LQMH 1 for comparing short duration entries of QPM Trials.
- The center wise presentation must have one slide on number of entries contributed and promoted.
- Plant protection work plan was presented by Dr. Soujanya L. P. Recommendations on pesticide spraying on FAW at 7 and 14 DAG and 10 and 20 DAG need to be tested further for inbreds and hybrids separately.

Annexure-II

WORK PLAN OF MAIZE ENTOMOLOGY
Kharif 2023, *Rabi* 2023-2024 and Spring 2024

***Kharif* 2023**

MET 1. Evaluation of maize entries against spotted stem borer *Chilo partellus* (Swinhoe) under artificial infestation (AVT I and II)

Entries to be tested: Grain Corn -Early, Medium, Late; OPV, QPM, Sweet Corn and Baby Corn.
Locations: Dholi, Karnal, Hyderabad and Kolhapur
Number of entries: to be decided by Nodal Officer, AICRP-Maize
Number of rows: 1, Row length: 2.0 m; Replication: 2; Spacing: 75 × 20 cm/60 × 25 cm
Date of infestation: Release of 10-12 neonate larvae into the whorl of maize plant 12 days after germination.
Observations: Leaf injury rating on a 1-9 scale at 35 days after infestation (Sarup *et al.*,1997). The resistant, moderately resistant and susceptible entries are defined by LIR 1-3, >3-6 and >6-9 respectively.

MET 2. Evaluation of maize entries against fall armyworm *Spodoptera frugiperda (*J.E. Smith) under artificial infestation (AVT I and II)

Entries to be tested: Grain Corn - Early, Medium, Late; OPV, QPM, Sweet Corn, and Baby Corn.
Locations: Coimbatore, Imphal, Ludhiana, Hyderabad, Kolhapur and Udaipur
Number of entries: to be decided by Nodal Officer, AICRP-Maize
Row length: 2.0 m; Replication: 2; Spacing: 75 × 20 cm or 60 × 25 cm and Number of rows: 1
Date of infestation: Release of 10-15 neonates into the whorl of the plant at the V_5 stage
Observation: Whorl feeding injury rating on 1-9 scale (Soujanya *et al.*, 2022) at 14 and 28 days after infestation.
Ear damage rating on a 1-9 scale at harvest to be recorded in sweet corn trial (Davis Score)

MET 3. Evaluation of maize inbred lines against *C. partellus* under artificial infestation

Locations: Dholi, Karnal and Kolhapur
Number of entries: to be decided
Row length: 2.0m, Replications: 2, Design: RBD, Spacing:75 × 20 cm or 60 × 25 cm
Date of infestation: Release of 10-12 neonate larvae into the whorl of maize plant at 12 days after germination.
Observations: Leaf injury rating (LIR) on a 1-9 scale at 35 days after infestation.

MET 4. Evaluation of inbred lines against *S. frugiperda* under artificial infestation

Locations: Coimbatore, Ludhiana, Hyderabad and Udaipur
Number of entries: to be decided
Row length: 2.0m
Replications: 2, Design: RBD, Spacing: 75 ×20 cm or 60 × 25 cm
Methodology: Release of 15-20 neonates/plant at the V_5 stage
Observation: Whorl feeding injury rating on 1-9 scale (Soujanya *et al.*, 2022) at 14 and 28 days after infestation.

MET 5. Monitoring of fall armyworm, *Spodoptera frugiperda* by pheromone traps with NBAIR slow–releasing dispenser (Tablet formulation)

Locations: Ambikapur, Coimbatore, Ludhiana, Hyderabad, Kolhapur and Udaipur, Dholi, Imphal, Delhi, Godhra, Kalyani, Pantnagar, Peddapuram, Rahuri, and Vagarai
Selected two locations at each centre
Number of traps per location: 4/acre

Time of installation of traps: commencing from the time of sowing /from 1st June, 2021
Data to be recorded: Number of months per trap at weekly intervals throughout the season as per SMW (preferably once in 3 days to identify the species trapped) & daily weather data on RH- min. & max.: T-min. & max.: wind speed, rainfall & sunshine hours. While reporting data give coordinates of the location of traps.

MET 6. Monitoring of *Helicoverpa armigera* by pheromone traps

Locations: Dholi, Karnal, Imphal and Udaipur
Number of traps per location: 4/acre
Two locations at each centre
Time of installation of traps: 6-leaf stage
Recording of observations and change of lure: change lure once in two weeks, and take weekly observation until harvest.
Data to be recorded: Number of months per trap at weekly intervals as per SMW and the stage of the crop at the time of observation V8, V9, VT, R1, R2, etc. The purpose is to know which stage of crop growth attracts the moths which will help to manage it as per recommendation in a workshop.

MET 7. Evaluation of insecticides as seed treatment and spray for the management of fall armyworm (3rd year)

Locations: Coimbatore, Ludhiana, Hyderabad, Kolhapur, Karnal and Udaipur
Cultivar to be used: Notified hybrid
Number of treatments: 12, Number of replications: 3, Number of rows/treatment: 5, Row length: 3.0 m
Observations:
Tag 20 plants/plot (leaving border rows) record the number of plants infested and record Davis Score of tagged plants before spraying and days after each spray.
Record phytotoxicity symptoms if any, ear damaged rating at harvest based on 1 -9 Davis Scale and grains yield kg/plot at 12% moisture.

S. N.	Treatments
1	Cyantraniliprole 19.8% + Thiomethoxam 19.8% @ 6 mL/kg seed
2	Cyantraniliprole 600 FS @ 2.4 mL
3	Chlorantraniliprole (Lumivia) as seed treatment @ 5.6 mL/kg seed
4	Cyantraniliprole 19.8% + Thiomethoxam 19.8% @ 6 mL/kg seed and spray at 3 weeks after germination
5	Cyantraniliprole 600 FS @ 2.4 mL and spray at 3 weeks after germination
6	Chlorantraniliprole (Lumivia) as seed treatment @ 5.6 mL/kg seed and spray at 3 weeks after germination
7	Cyantraniliprole 19.8% + Thiomethoxam 19.8% @ 6 mL/kg seed and spray at 4 weeks after germination
8	Cyantraniliprole 600 FS @ 2.4 mL and spray at 4 weeks after germination
9	Chlorantraniliprole (Lumivia) as seed treatment @ 5.6 mL/kg seed and spray at 4 weeks after germination
10	Chlorantraniliprole 18.5% SC 0.4 mL/L spray at 10 % foliar damage or Davis score 3.0
11	Chlorantraniliprole 18.5% SC 0.4 mL/L spray at 20 % foliar damage or Davis score 3.0
12	Untreated control

MET 8. Evaluation of Indigenous Technology Knowledge (ITK) practice for the management of fall armyworm, *Spodoptera frugiperda* in Kharif maize (2nd year)

Locations: Imphal, Ludhiana, Godhra, Kolhapur, Karnal and Dholi
Cultivar to be used: Notified hybrid
Number of treatments: 10, Number of replications: 3, Number of rows/treatments: 5
Row length: 3.0 m, Application method: Around 0.5g/ whorl of V_6 stage plants (6 fully opened leaves)
Observations: To be recorded on 20 pre-determined plants/plot
Pre-treatment count –percent plants infested and whorl feeding injury on 1-9 scale
Post-treatment count –per cent plants infested and Davis scores at 7, 14, 21 days after each application
Ear damage rating at harvest based on 1-9 Davis Scale and grain yield/plot at 12% moisture

S. N.	Treatment	Dose	Percent plant infestation (day after germination)					Grain yield (q/ha)
			Pre-treatment	7	14	21	42	
T1	Soil	15 kg/acre (~0.5g/plant						
T2	Soil + insecticide (Chlorantaniliprole 18.5 SC)	5 mL/kg soil						
T3	Soil + Lime	8:2 (800 + 200 g lime)						
T4	Soil + Bt	25g Bt/kg soil						
T5	Soil + *Mentarhiziumanisopliae*	65g/kg soil						
T6	Soil + *Beauveriabassiana*	65g/kg soil						
T7	Sand	~0.5g/plant						
T8	Bait + Chlorantaniliprole 18.5 SC)	5 mL/kg bait (bait- 600 g soil + 130 g jiggery + 70 g sand + 200 mL water)						
T9	Chlorantaniliprole 18.5 SC)	0.4 mL/L spray						
T10	Untreated control	-						

MET 9. Management of fall armyworm through non-chemical methods (2nd Year)

Locations: Coimbatore, Ludhiana, Hyderabad, Kolhapur, Dholi and Karnal
Intercrops: Pigeon pea / Cowpea/ Groundnut/ Rice bean/ Red amaranth
Nematode formulation: NBAIR H38 @ 20g/L
Design: RBD, Replication: 3
Observations: Percent infestation, Davis Score at 7 and 14 days after spraying
Record ear damage by rating scale in 5 randomly selected ears/plot and plot yield

T. No.	Treatments
T1	Maize + Intercrop 1
T2	Maize + Intercrop 2
T3	Maize + Intercrop 1 + EPN Spray @ 20 and 40 DAS
T4	Maize + Intercrop 1 + EPN Spray @ 20 DAS
T5	Maize + Intercrop 2 + EPN Spray @ 20 and 40 DAS
T6	Maize + Intercrop 2 + EPN Spray @ 20 DAS
T7	Maize-Solo Crop + EPN Spray @ 20 and 40 DAS
T8	Maize-Solo Crop + EPN Spray @ 20 DAS
T9	Maize-Solo Crop + EPN Spray @ 40 DAS
T10	Untreated Control (Solo Maize)

MET 10. Study on pest succession of insect pests in *kharif* sown maize

Locations: Coimbatore, Ludhiana, Hyderabad, Kolhapur, Dholi and Karnal and Udaipur
Number of cultivars: one susceptible, Number of rows: 10, Row length: 3m
Method of observation: Weekly observations on the occurrence of various insect pests and Natural enemies on a minimum of 1 tagged plants/row will be observed during the cropping season (as per SMW, Table-4)

Pest succession table

SMW No.						
Insect	Plant 1	Plant 2	Plant 3	Plant 4	Plant 5	Plant No.
No. of FAW						
Davis Score						
No. of Chilo						
Chilo LIR						
Aphid						
Any other pests (Sesamia)						
No. of Chaffer beetls (record species)						
Cob borer (record species)						
Cob damage score						
Termite damage						
Coccinellid						
Any other natural enemy						

MET 11. Study on incidence of *Chilo partellus* and *Spodoptera frugiperda* in *kharif* sowing maize in relation to plant age and meteorological factor

Objective: To develop a pest incidence prediction model for mmaize-growingecologies
Locations: Coimbatore, Ludhiana, Hyderabad, Kolhapur, Udaipur, Karnal, Imphal and Dholi
Number of cultivars: one susceptible, Number of rows: 5, Row length: 3 m
Number of sowings: At least 6 sowing dates from the start of the crops season for *C. partellus* (*Kharif*) and *S. frugiperda* (*Kharif* and *Rabi*)
Methodology to accommodate Chilo and / or FAW
Record date of germination: Observations on 8th day of germination and every week till the grain-filling stage to be recorded
Total number of plants and No. of infested plants

Record the no. of larvae and the species –FAW/*Chilo/Sesamiaetc*. Record no. of natural enemies & genus/ species. This can be done by dissecting 10% of the infested plants since most of them hide in the whorl.
Score infested plants in 3rd and 5th week of infestation –LIR if Chilo & Davis Scale if FAW (take representative photographs)
Record tassel/ ear infestation
Record ear damage by rating scale in 5 randomly selected ears/plot
Data table for sowing No.1 for cultivar No.1

Date of sowing: 27.06.2021, Date of germination: 1st July, 2021 Genotype : Notified hybrid						
Date of observation (weekly intervals from the date of germination N	Total number of plants at the starts of each observation	No. of infested plants	A total number of larvae/infested recover from 10% of infested plants in the second week 2 plants if the no. of infested plants is 16)	No. of dead hearts	No.of plants with tassel damage	No. Of plants with ear damage
08.07.2023	75	10				
15.07.2023	75	16	91 No. of chilo No. of FAW- Any other pests Spider- Rove beetle- Coccinellid- Any other-			
22.07.2023	73	10		Dead plants by Chilo- by FAW- By cutworm/any other		
29.07.2023		4		-do-		
05.08.2023		3		-do-		
12.08.2023		0		-do-		
19.08.2023		0				
26.08.2023		0			No. of chilo in tassel- FAW- Any other	No. of FAW/cob borer sp. intassel- any other
02.09.2023		0				Davis Score of ear damage & the inset presenting cob Plant No. 1 Plant

						No.2 Plant No.3 Plant No.4 Plant No.5

MET 12. Estimation of yield loss and the economic threshold for FAW validation

Locations: Coimbatore, Ludhiana and Kolhapur

Treatment: 1. Emamectin Benzoate 0.5% SG spray at V_5 stage,

4. Chlorantraniliprole 18.5 SC at V_5 stage,
5. 3. Control

Replications: 5

Data recording: The yield of 20 plants of each Davis Score- Tag 20 plants of each Davis Score at two-time points at V_6 and VT. Tagging can be done from any treatments. Record the grain yield of individual plants (g/cob) under each Davis Score.

Davis Score of entire plot- Record Davis Score two times only, at six-leaf stage (V_6) and the tasseling stage (VT- when>50% of the tassels emerge out of leaf whorl).

Plot yield: kg/plot

Table: .Data table for the yield of tagged plants

	Yield (g) of V_6 tagged plant No.1-20						
Davis Score	1	2	3	4	5	…..	20
1							
2							
3							
4							
5							
6							
7							
8							
9							

	Yield (g) of V_6 tagged plant No.1-20						
Davis Score	1	2	3	4	5	…..	20
1							
2							
3							
4							
5							
6							
7							
8							
9							

Rabi 2023-24

MET 13. Evaluation of maize entries against spotted stem borer/pink stem borer under artificial infestation for AVT-I & AVT-II

Locations: Kolhapur and Hyderabad

Number of entries: to be decided, Row length: 2.0 m; Replication: 2; Spacing:75 × 20 cm/60 × 25 cm and Number of rows: 1, Date of infestation: 12 days after germination; Release of 10-12 neonate larvae/ plants; Observation: Leaf injury rating on 1-9 scale at 35-40 days after infestation (Reddy *et al.*, 2003)

MET 14. Evaluation of maize entries against fall armyworm under artificial infestation for AVT-I & AVT-II

Locations: Coimbatore, Hyderabad and Kolhapur

Number of entries: to be decided

Row length: 2.0 m; Replication: 2; Spacing: 75 × 20 cm/60 × 25 cm and Number of rows: 1

Observation: Whorl feeding injury rating on 1-9 scale (Soujanya *et al.*, 2022) at 14 and 28 days after infestation.

Ear damage rating on 1-9 scale at harvest in sweet corn trial (Davis score)

MET 15. Evaluation of inbred lines against pink stem borer, *Sesamia inferens* under artificial infestation

Locations: Hyderabad

Number of entries: to be decided, Design: Augmented; Row length: 2.0 m; Replication: 2; Spacing: 75 × 20 cm/60 × 25 cm and Number of rows: 1

Date of infestation: 12 days after germination; Release of 10-12 neonate larvae/plants

Observation: Leaf injury rating on a 1-9 scale at 35-40 days after infestation (Reddy *et al*., 2003)

MET 16. Evaluation of maize inbred lines against fall armyworm *Spodoptera frugiperda* (J.E. Smith) under artificial infestation

Locations: Coimbatore and Kolhapur

Number of Entries: to be decided, Design: Augmented

Row length: 2.0 m; Replication: 2; Spacing: 75 × 20 cm/60 × 25 cm and Number of rows: 1

Observation: Whorl feeding injury rating on 1-9 scale (Soujanya *et al.*, 2022) at 14 and 28 days after infestation.

MET 17. Evaluation of seed treatment against fall armyworm (Second Year)

Locations: *Rabi* 2023-2024 Dholi

Cultivar to be used: Notified hybrid

Number of treatments: 7, Number of replications: 3, Number of rows/treatment: 5, ow length: 3.0 m.

Observations: Tag 20 plants/plot (leaving border rows) a record the number of plants infested and Record Davis score of tagged plants at 7,14, 21, 28 DAG

Record phytotoxicity symptoms if any,

Record grain yield/plot at 12% moisture

Ear damaged rating at harvest based on 1 -9 Davis Scale and grains yield kg/plot at 12% moisture

S. N.	Insecticide	Dose mL/kg seed
T1	Cyantraniliprole 19.8% + Thiamethoxam 19.8%	6.0 mL
T2	Cyantraniliprole 600 FS	2.4 mL
T3	Chlorantraniliprole (Lumivia 50 FS)	5.6 mL
T4	Thiamethoxam 300 FS	8.0 mL
T5	Imidacloprid 600 FS	8.0 mL
T6	Chlorantraniliprole 18.5 SC* (spray standard check)	0.5 mL/L
T7	Untreated Control	-

MET 18. Evaluation of bio-pesticides/bioagents against fall armyworm *rabi* 2023-2024 (2nd year)

Locations: Coimbatore, Hyderabad, Dholi and Kolhapur
Cultivar to be used: Notified hybrid
Number of treatments: 12, Number of replications: 3, Number of rows/treatment: 5
Row length: 3.0 m, Spray to be given at Davis Score 3
Observations: to be recorded on 20 ore- determined plants/plot
Pre-treatment count – per cent plants infested and Davis score
Post-treatment count for per cent plants infested and Davis score at 10 days after each spray.
Ear damaged rating at harvest based on 1 -9 Davis scale and grains yield kg/plot at 12% moisture

S. N.	Treatment	Dose
1	EPN *H.indica* NBAIR H38	20 g/L
2	*Pseudomonus fluorescens* (*Pf* DWD 2%)	20 g/L
3	NBAIR Bt 25 2 %	2 mL/L
4	*Metarhizium anisopliae* NBAIR 45, 0.5%	5 g/L
5	*Beauveria bassiana* NBAIR-Bb45, 0.5%	5 g/L
6	SpfrNPV (NBAIRI)	2 mL/L
7	NSKE 5%	5 mL/L
8	Neem formulation 1500 ppm	5 mL/L
9	Chlorantaniliprole 18.5% SC	0.4 mL/L
10	Emamectin Benzoate 5% SG	0.4 g/L
11	Commercial *Bt* formulation	6 mL/ kg seed treatment
12	Untreated Control	-

MET 19. Evaluation of Indigenous Technology Knowledge (ITK) practice for the management of fall armyworm, *Spodoptera frugiperda* in rabimaize (2nd year)

Locations: Rahuri, Hyderabad and Godhra
Cultivar to be used: Notified hybrid
Number of treatments:10, Number of replications: 3, Number of rows/treatments: 5
Row length: 3.0 m, Application method: Around 0.5g/ whorl of V_6 stage plants (6 fully opened leaves)
Observations: To be recorded on 20 pre-determined plants/plot
Pre-treatment count –per cent plants infested and whorl feeding injury on 1-9 scale
Post-treatment count –per cent plants infested and Davis scores at 7, 14, 21 days after each application.

Ear damage rating at harvest based on 1-9 Davis scale and grain yield/plot at 12% moisture

S. N.	Treatment	Dose	Percent plant infestation (day after germination)					Grain yield (q/ha)
			Pre-treatment	7	14	21	28	
T1	Soil	15 kg/acre (~0.5g/plant)						
T2	Soil + insecticide (Chlorantaniliprole 18.5% SC)	5 mL/kg soil						
T3	Soil + Lime	8:2 (800 + 200 g lime)						

T4	Soil +Bt	25 g Bt/kg soil						
T5	Soil+ *Mentarhizium anisopliae*	65 g/kg soil						
T6	Soil + *Beauveria bassiana*	65 g/kg soil						
T7	Sand	~0.5 g/plant						
T8	Bait + Chlorantaniliprole 18.5% SC)	5 mL/kg bait (bait- 600 g soil + 130 g jaggery + 70 g sand + 200 mL water)						
T9	Chlorantaniliprole 18.5% SC)	0.4 mL/L spray						
T10	Untreated control	-						

Spring 2024

MET 20. Evaluation of maize entries against *Atherigona* sp. under natural infestation for AVT-I and II using fish meal technique

Locations: Karnal and Ludhiana
Number of entries: to be decided by PI Breeding
Row length: 4.0 m, Number of rows: 1, Replications: 2
Method of infestation: Natural (Fish meal technique) at the time of sowing
Date to be recorded: Number of dead hearts formed at 21 and 28 days after germination.
Shoot fly damage rating scale (Sharma *et al*., 1992):

Rated visually on a 1-9 scale (1 = <10%; 2 = 11-20%; 3 = 21-30%; 4 = 31-40%; 5 = 41-50%; 6 = 51-60%; 7 = 61-70%; 8 = 71-80%; and 9 = >80% plants with dead hearts).

MET 21. Evaluation of inbred lines against shoot fly under natural infestation

Locations: Karnal and Ludhiana
Entries: to be decided, Design: Augmented, Row length: 4.0 m, Number of rows:1, Replications:1
Method of infestation: Natural (Fish meal technique)
Data to be recorded: Number of dead hearts formed at 21 and 28 days after germination.
Shoot fly damage rating scale (Sharma *et al*., 1992):

Note: Along with your reports, submit excel sheets of raw data for analysis.

Screening AICRP trials against the major insect pests at different hot spot locations under artificial infestation during 2023

S. N.	Insect Pest	Season	Hot spot locations
1	Spotted stem borer, *Chilo partellus* Swinhoe	*Kharif*	Dholi, Karnal, Hyderabad and Kolhapur
2	Fall armyworm, *Spodoptera frugiperda* (J.E.Smith)	*Kharif*	Coimbatore, Imphal, Ludhiana, Hyderabad, Kolhapur and Udaipur
3	Pink stem borer, *Sesamia inferens* Walker	*Rabi*	Hyderabad
	Spotted stem borer, *Chilo partellus* Swinhoe	*Rabi*	Kolhapur

4	Fall armyworm, *Spodoptera frugiperda* (J.E.Smith)	*Rabi*	Coimbatore, Hyderabad and Kolhapur
5	Shoot fly, *Atherigona* spp. (Natural using fish meal technique)	Spring	Karnal and Ludhiana

Screening techniques against major insect pests of maize

Rating	Description
1	Plants showing no infestation
2	1-2 leaves with pinholes
3	3-4 leaves with holes
4	1/3 leaves showing infestation
5	Half the number of the leaves with infestation
6	2/3 leaves with infestation symptoms and the holes becoming windows
7	Leaves with long window and plant growth is stunted
8	Almost all leaves displaying heavy infestation and plant growth is stunted
9	Dead heart formed

1. **Leaf Injury rating scale for spotted stem borer,*Chilo partellus* (Sarup *et. al*., 1977)**

The resistant, moderately resistant and susceptible entries are defined by LIR 1-3, >3-6 and >6-9 respectively

2. Leaf Injury rating scale for pink stem borer, *Sesamia inferens* (Reddy *et. al*., 2003)

Rating	Description
1.	Apparently healthy plant
2.	Plant with parallel, oval or oblong holes, slightly bigger than pins ized (2-3 mm) on1-2 leaves
3.	Plant with more elongated holes (4-5 mm or matchstick head sized) or shot holes on1-2 leaves
4.	Plant with injury (oval holes, shot holes and slits of 1-4 cm) in about 1/3 of total number of Leaves and midrib damage on1-2 leaves
5.	Plantswithabout50%leafdamage,oblongholes,shotholes,slitsandstreaksof5-10cms andmidribdamageonleaves
6.	Plants with a variety of leaf injuries to about two thirds of the total number of leaves (ragged appearance) or one or two holes or slits at the base of the stem (>10cm streaks are observed)
7.	Plants with every type of leaf injury and almost all the leaves damaged (ragged or crimpled appearance), with tassel stalk boring or circular dark ring at the base of stem
8.	Plants with stunted growth in which all the leaves are damaged
9.	Plants with dead heart

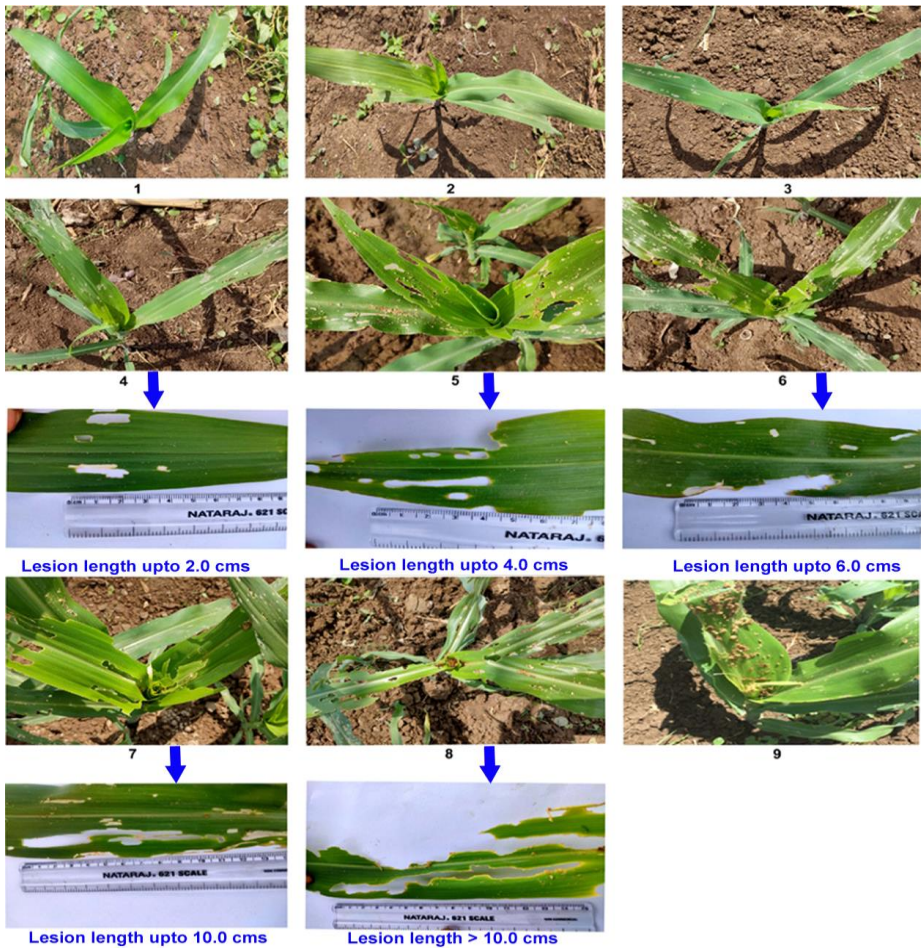
The resistant, moderately resistant and susceptible entries are defined by LIR 1-3, >3-6 and >6-9 respectively.

3A. Leaf Damage Rating (LDR) scale to categorize maize germplasm for resistance to FAW (Modified from Davis and Williams, 1992; Ni *et al*., 2011)

Rating	Description/Symptoms
1	Healthy plant/No damage/ Visible symptoms
2	Few short /pin size holes/scraping on few leaves (1-2)
3	Short/pin size holes/scraping on several leaves (3-4)
4	Short/pin size holes/scraping on several leaves (5-6) and a few long elongated lesions (1-3 Nos) up to 2.0 cm length present on whorl and or adjacent fully opened leaves
5	Several holes with elongated lesions (4-5 Nos) up to 4.0 cm length and uniform/ irregular shaped holes present on whorl and or adjacent fully opened leaves
6	Several leaves with elongated lesions (6-7 Nos) up to 6.0 cm length and uniform/irregular shaped holes present on whorl and adjacent fully opened leaves
7	Several long lesions (>7 Nos) up to 10 cm length and uniform/ irregular shaped holes common on one-half of the leaves present on whorl and adjacent fully opened leaves
8	Several long lesions > 10 cm length and uniform/ irregular shaped holes common on one half to two-thirds of leaves present on whorl and adjacent fully opened leaves
9	Complete defoliation of whorl of the plant

(Soujanya *et al.*, 2022)

Fig 1. Leaf Damage Rating (LDR) scale to categorize maize germplasm for resistance to FAW



3B. A rating scale for ear damage caused by FAW where FAW is already present on plants (Davis and Williams, 1992)

Score	Damage symptoms/Description	Response
1	No damage to the ear	Resistant
2	Damage to a few kernels (<5) or less than 5% damage to an ear	Resistant
3	Damage to a few kernels (6-15) or less than10% damage to an ear	Resistant
4	Damage to16-30 kernels or less than15% damage to an ear	Moderately Resistant
5	Damage to 31-50 kernels or less than25% damage to an ear	Moderately Resistant
6	Damage to 51-75 kernels or more than 35% but less than 50% Damage to an ear	Susceptible
7	Damage to 76-100 kernels or more than 50% but less than 60% Damage to an ear	Susceptible
8	Damage to >100 kernels or more than 60% but less than 100% Damage to an ear	Susceptible
9	Almost100% damage to an ear	Susceptible

4. Modified Rating scale of Sharma *et al.* (1992) for shoot fly screening in maize

S. N.	Damage symptoms/ Description	Response#
1.	<10% plants with dead hearts	Resistant
2.	>10-30% plants with dead hearts	Moderately Resistant
3.	>30-50% plants with dead hearts	Moderately susceptible
4.	>50-70% plants with dead hearts	Susceptible
5.	>70 % plants with dead hearts	Highly Susceptible

Response observed in maize

Annexure-III

WORK PLAN OF PLANT PATHOLOGY & NEMATOLOGY
(*Kharif* 2023, *Rabi* 2023-24 and Spring 2024)

MPT 1. Disease screening of NIVT, AVT, QPM, specialty corn, OPV and Rainfed (AVTs only) under artificially created epiphytotics (All centres)

Entries in NIVT and AVT will be clubbed to constitute as Early, Medium, Late where QPM entries will also be included. Specialty corn (BC and SC) will be clubbed into one. If entries in one trial comes out to be unmanageable trials will splitted into two.

Hot spot locations:

S. No.	Zone	Disease	Locations
1.	Zone-I: North Hill Zone (NHZ)	TLB	Almora, Larnoo, Bajaura, Barapani (AVTs and Speciality corn) and Imphal
		BLSB, BSR	Dhaulakuan
2.	Zone-II: North West Plain Zone (NWPZ)	MLB	Delhi, Karnal and Ludhiana
		BLSB	Delhi, Karnal and Pantnagar
		BSR	Pantnagar
		ChR	Ludhiana
3.	Zone-III: North East Plain Zone (NEPZ)	MLB	Dholi
4.	Zone-IV: Peninsular Zone (PZ)	TLB	Dharwad, Mandya and Rahuri
		BLSB	Peddapuram
		ChR	Coimbatore and Hyderabad
		SDM	Mandya
5.	Zone-V: Central Western Zone (CWZ)	FSR, CLS, RDM, MCN*	Udaipur

*** Udaipur centre will screen all the trials type except NIVT for cyst nematode with two replications each entry**

Resistant and Susceptible Checks

Resistant Checks				
S. N.	**Genotype**	**Name of Company / Contributor**	**Name of Disease**	**Seed Quantity**
1.	ADV 7022	Advanta Ltd.	MLB, TLB, BLSB, CLS, BSR, ChR, FSR, CR, SDM, RDM, PFSR	6 kg
2.	VAMH 12014	TNAU, Coimbatore	MLB, TLB, BLSB, CLS, BSR, ChR, FSR, CR, MCN, RDM	6 kg
3.	HT 5109, SKV - 50	Mandya	TLB	6 kg
Susceptible Checks				
1.	RCRMH 4-1 (Medium)	UAS, Raichur	MLB, BLSB, CLS, BSR, CR, SDM, RDM, MCN	6 kg
2.	HT 5402	Mandya	TLB	6 kg
3.	CM 202	VC Farm Mandya/WNC	TLB	2 kg
4.	CM 600	Pantnagar/WNC	MLB, BLSB, ChR, BSR	2 kg

5.	30B07	Mandya	FSR	2 kg

MLB:-Maydis leaf blight; **TLB:**-Turcicum leaf blight; **BLSB:**-Banded leaf sheath blight; **ChR:**-Charcoal Rot; **PR:**-Polysora Rust; **FSR:**-Fusarium Stalk Rot, **BSR:**-Bacterial Stalk Rot; **SDM: -** Sorghum Downy Mildew; **RDM: -** Rajasthan Downy Mildew, **MCN: -** Maize Cyst Nematode

Observations: Record all the disease screening data with following details:

Season	:	*Kharif*	Replication	:	2
Date of sowing	:		No. of rows/ rep	:	1
Date of inoculation	:		Row length	:	2.0 m
Name of susceptible check	:		Date of observation	:	
Name of resistant check	:		Date of harvesting	:	

General observations to be taken care of while screening under artificially created disease epiphytotics:

- Follow uniform method of disease screening under sick plot/artificial created disease epiphytotics as described in Technical Bulletin on "Mass Screening Techniques for resistance to maize diseases" available on ICAR-IIMR and Krishi Portal websites. Grain culture technique for inoculum production should be uniformly followed for creation of TLB, MLB, CLS, BLSB epiphytotics by all hot spot locations.

MPT 2. Disease screening of maize inbred lines under artificially created epiphytotics

Following ICAR-CIMMYT trials would be conducted at centres mentioned against each trial:

S. No.	**AICRP-Centre**	**Diseases**	**Collaborator**	**#Entries**	**#Reps**	**Total rows**
1	Ludhiana (Spring 2024)	ChR	Dr. Harleen Kaur	100	2	200
2	Larnoo	TLB	Dr. Zahoor Dar	100	2	200
3	Udaipur	FSR	Dr. S. S. Sharma	100	2	200
4	Pantnagar	BSR	Dr. R. P. Singh	100	2	200
5.	Mandya	TLB	Dr. Mallikarjuna	100	2	200
6.	Mandya	SDM	Dr. Jadesha	100	2	200
7.	Hyderabad	ChR	Dr. Mallaiah	100	2	200
8.	Peddapuram	BLSB	Mr. Bharat	100	2	200
9.	Dharwad (*Rabi* 2023-24)	ChR	Dr. Prema	100	2	200

MPT 3. Assessment of avoidable yield losses due to major diseases of maize

These trials will be conducted at following locations using paired plot technique (Le Clerg, 1973) with ten replications under sick plot/ artificially created epiphytotic.

Locations: FSR (Ludhiana-Spring 2024, Mandya-*Rabi* 2023-24), TLB (Mandya-*Kharif* 2023)

Centre	:	Hybrid	: Susceptible Cultivar (Centre will provide name while sending data)
Season	:		
Treatments	: 2	Plot size	: 5 Rows of 3 meter each
Replications	: 10	Date of Observation	:
Date of Sowing	:	Date of Harvesting	:

Replication	Treatment	Disease Incidence (%)	PDI	Yield (q/ha)	Yield loss (%)
R1	Protected				
	Unprotected				
R2	Protected				
	Unprotected				
R10	Protected				
	Unprotected				
Mean					
Disease control (%)					
Avoidable yield losses (%)					
T Test Value					

Note: Assessment of yield losses by paired plot technique the data should be analyzed, by 't' test and not by RBD. Follow 't' test statistical analysis. All centres which conducted screening for multiple years will compile and send to PI well in advance before workshop or as and when requested.

MPT 4. Trap nursery trial for disease incidence

The trial will be conducted to find out the occurrence of disease and/or any new disease on a set of maize inbred lines (10 lines) susceptible to different diseases at various locations. A special care has to be taken in observing the incidence of viral diseases, if any.

Locations: Almora, Bajaura, Coimbatore, Delhi, Dharwad, Dhaulakuan, Dholi, Hyderabad, Imphal, Karnal, Kalyani, Ludhiana, Mandya, Pantnagar, Peddapuram, Rahuri, Sabour and Udaipur (18 Centres)

Plot size: 2 rows of 2.0 m length

Observations:

A. Disease score /incidence (%) of should be recorded in following format:

S. N.	Entry Name	Germination (%)	Disease score/ Incidence (%) (Natural condition)	Remarks
1.	CM 400			
2	CM 500			
3	CM 501			
4	CM 600			
5	BML 6			
6	BML 7			
7	Surya			
8	Early Composite			
9	LM 14			
10	IIMR SBT POOL			

B. Weekly disease prevalence* – Record weekly disease prevalence data of trap nursery of **most susceptible lines** for use in development of disease forecasting model in the following format:

Week	Entry Name	Disease name	Disease score/ Incidence (%) (Natural condition)	Remarks
1.	A			
2.	A			

* Mean disease score and percent disease index (PDI) of foliar diseases should be given.

MPT 5. Disease survey and surveillance in different maize growing areas (All centres)

Survey and surveillance will be done in the mandated maize growing areas of the centre. During survey and surveillance of diseases, scoring should be done along with the incidence of disease in prescribed proforma.

Locations: Bajaura, Coimbatore, Delhi, Dharwad, Dhaulakuan, Dholi, Hyderabad, Imphal, Kalyani, Karnal, Ludhiana, Mandya, Pantnagar, Peddapuram, Rahuri, Udaipur and Sabour (17 centres)

Observations:

- Mean disease score for calculating PDI should strictly be followed.
- Weather data of locations may be given with disease prevalence.
- Weather data should be recorded in following format and give its correlation.
- Include diseases scoring, disease severity and incidence as and when applied to a particular disease.

S. N.	Station Name	Month	Temperature (ºC)		Rainfall of Month (mm)		R.H (%)		Sunshine Hours
			Min	Max			Min	Max	

Note: Every centre will notify disease wise free areas of their state.

Every centre will mention name of variety/hybrid with good quality of photographs.

MPT 6. Efficacy of fungicides/chemicals in control of maize diseases

Locations: Udaipur (CLS, MLB, RDM), Karnal (MLB), Delhi (MLB, ChR), Kalyani (MLB), Dharwad (TLB), Rahuri (TLB), Hyderabad (Chr), Imphal and Mandya (Polysora rust), Pant Nagar (MLB/BLSB), Mandya (FSR)

Centre	:	Hybrid	: *
Season	:	Design	: RBD
Treatments	: 8	Plot size	: 6 Rows of 3 meter each
Replications	: 3	Date of Observation	:
Date of Sowing	:	Date of Harvesting	:

* Surya (Udaipur), Punjab Sweet Corn-1 (Karnal), Punjab Sweet Corn-1 (Delhi), Kaveri 50-(Kalyani), PSM1-(Pantnagar), GH0727 (Dharwad)

T1	Kresoxim methyl 44.3% SC @ 0.10% spray at 3 days and 18 days after inoculation
T2	Zineb75% WP @ 0.20% spray at 3 days and 18 days after inoculation
T3	Thiram 75% WS only seed treatment @ 0.20%
T4	Azoxystrobin 18.2 w/w +Difenoconozole11.4% w/w SC @ 0.10% pray at 3 days and 18 days after inoculation
T5	*Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC @ 0.20% spray at 3 days and 18 days after inoculation
T6	Pyraclostrobin 133g/L + Epoxiconazole 50g/L SE @ 0.15% at 3 days and 18 days after inoculation
T7	Protected check (Mancozeb 75% WP @ 0.20% spray at 3 days and 18 days after inoculation)
T8	Untreated Control (Water spray)

*** Include Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC if available in market.**

ChR (Delhi, Ludhiana)

Treatments
Seed treatment with *Trichoderma viride* @10 g/kg seed
Soil application of vermicompost enriched with *T. viride* (2 x 109 cfu/g) @ 250 kg/ha
Foliar application of humic acid @ 5mL/L at knee high stage
Foliar application of Chitosan @ 5 mL/L at 35 DAS and 45 DAS
Foliar application of Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC @0.1% at knee high stage
Standard check Hexaconazole
Control
CD (P ≤0.01)
CV %

Trials which are conducted for two years with same cultivar and treatment it may be conducted for one more year (pooled data of three years should be provided)

MPT 7. Studies on racial pattern for TLB and MLB of maize in India

Mode of experiment: Lab/Pots

Locations: TLB: Dharwad, Mandya, Peddapuram and Kalyani, Larnoo, Imphal and Rahuri; Replication-3

Inbred: 3resistant (R) and 3 susceptible (S)

MLB: Delhi and Kalyani

(Seeds will be provided from Mandya/WNC, Hyderabad)

(Respective locations will test their own isolate for disease reaction; Centre will observe morphology and aggressiveness as well of collected isolates)

MPT 8. Disease screening of *rabi* (2023-24) and spring 2024 maize hybrids

Evaluation of maize hybrids of the coordinated trials of Rabi maize (NIVT and AVTs) against major diseases will be done under artificially created epiphytotics at following hot spot locations.

S. No.	Zone	Disease	Locations
1.	**NWPZ (**North West Plain Zone**)**	ChR	Ludhiana (Spring 2024)
2.	**NEPZ (**North East Plain Zone**)**	TLB	Dholi, Sabour, Kalyani
		MLB	Kalyani
3.	**PZ (**Peninsular Zone**)**	ChR	Coimbatore, Dharwad, Hyderabad, Rahuri
		TLB	Mandya, Peddapuram
		SDM	Mandya
		FSR	Mandya
4.	**CWZ (**Central Western Zone**)**	FSR	Udaipur

Resistant and Susceptible Checks

Resistant Check				
1.	DKC 9165 (IM 8119) Late	Monsanto India Ltd.	TLB, ChR	2 kg
2.	PM 14205L (Late)	PHI Seeds Pvt. Ltd.	TLB, ChR	2 kg
3.	BLH 102 (Medium)		TLB, ChR	2 kg
4.	PM 142096M (Medium)	PHI Seeds Pvt. Ltd.	TLB, ChR	2 kg

5.	DMRH 1301 (Medium)	IIMR Ludhiana	TLB, ChR, SDM	2 kg
6.	Bio 9544 (Medium)	Bioseeds Research India Pvt. Ltd.	TLB, ChR, SDM	2 kg
7.	HQPM 1		C. Rust	
8.	ADV 7022	Advanta Ltd.	FSR	2 kg
Susceptible Check				
9.	HT 5402	Mandya	TLB,	2 kg
10.	Kaveri 50	Kaveri Seeds/Hyderabad	MLB, ChR, C. Rust	2 kg
11.	HM 4		C. Rust	2 kg
12.	CM 600	Pantnagar	MLB	2 kg
13.	African Tall	Mandya	SDM	2 kg
14.	30B07	Mandya	FSR	2 kg

MLB:-Maydis Leaf Blight; **TLB:-**Turcicum Leaf Blight; **BLSB:-**Banded Leaf Sheath Blight, **ChR:-**Charcoal Rot; **CR:-**Common Rust; **PR:-**Polysora Rust; **FSR:-**Fusarium Stalk Rot **BSR:-**Bacterial Stalk Rot; **SDM: -** Sorghum Downy Mildew; **RDM: -** Rajasthan Downy Mildew

Observation: Record the disease screening data in following format:

Season	:	*Kharif*	Replication	:	2
Date of sowing	:		No. of rows/ rep	:	1
Date of inoculation	:		Row length	:	2.0 m
Name of susceptible check	:		Date of observation	:	
Name of resistant Check	:		Date of harvesting	:	

Special Note:

1. The data which are observed for multiple year will be analyzed as in pool as well as for a particular year (All concerned centre will compile and send with proper analysis pattern)

Annexure – IV

Work Plan of Maize Agronomy Trial (MAT)

Kharif 2023, *Rabi* 2023-24 and Spring 2024

MAT-1. Performance of pre release genotypes under varying nutrient levels in *kharif/rabi*/spring season

Objective: To study the response of pre-release genotypes to different planting density and NPK levels with their interactions.

Main-plot: Fertility levels (N:P_2O_5: K_2O kg/ha)

1. **RDF**
2. **125% RDF**
3. **150% RDF**

Sub-plot: Genotypes (as per AVT-II trial + checks)

Design: Split plot Replications: 3 Plot Size: >10 m^2

Note: A minimum of 350 g seed per entry per location & 3 location per zone needed for generation of agronomy data.

Locations:

NHZ: Bajaura, Gossaingaon, Imphal and Almora
NWPZ: Ludhiana, Karnal, Pantnagar and Delhi
NEPZ: Bahraich, Kalyani, Varanasi, Bhubaneswar, Ranchi and Dholi
PZ: Dharwad, Coimbatore, Kolhapur, Karimnagar, Hyderabad, Peddapuram and Vagarai
CWZ: Ambikapur, Chhindwara, Godhra, Banswara and Udaipur

(Details of the MAT-1 at each centre will be communicated one month in advance)

Note: Split N application in MAT 1

- Nitrogen to be applied in **three equal splits** at basal, knee high and tasseling stage in kharif season.
- Nitrogen to be applied in **four equal splits** in all MAT 1(f) at basal, knee high, pre-tasseling and tasseling stage in rabi season.

The data on disease and insect in MAT-1 and other trial to be recorded and reported by pathologist and entomologist, wherever applicable.

Observations to be recorded in MAT 1 field corn/QPM:

1. Plant population at 25 DAS and at harvest (thousands/ha)
2. Plant height at harvest (cm)
3. Days to 50% tasseling
4. Days to 50% silking
5. Number of cobs (thousands/ha)
6. 100-seed weight (g)
7. Grain yield at 15% moisture content (kg/ha)
8. Stover yield sun dry basis (kg/ha)
9. Insect-pest and disease incidence **(by subject expert)**
10. Net return and B:C ratio

Observations to be recorded in MAT 1 <u>Popcorn</u>:

1. Plant population at 25 DAS and at harvest (thousands/ha)
2. Plant height at harvest (cm)
3. Number of cobs (thousands/ha)
4. Days to 50% tasseling
5. Days to 50% silking
6. 100-seed weight (g)
7. Grain yield (kg/ha)
8. Stover yield (kg/ha)
9. Insect-pest and disease incidence**(by subject expert)**
10. Net returns and B:C ratio

Observations to be recorded in MAT 1 <u>Sweet Corn</u>:

1. Plant population at 25 DAS and at harvest (thousands/ha)
2. Number of cobs (thousands/ha)
3. Plant height at harvest (cm)
4. Days to 50% tasseling
5. Days to 50% silking
6. Green Cob yield (kg/ha)
7. Green fodder yield (kg/ha)
8. Insect-pest and disease incidence, ifany
9. Net returns and B:C ratio

Observations to be recorded in MAT 1 <u>Baby Corn</u>:

1. Plant height at harvest (cm)
2. Plant population at 25 DAS and at harvest (thousands/ha)
3. Days to first picking
4. Number of pickings
5. Baby corn yield with husk in each picking (kg/ha)
6. Baby corn yield without husk in each picking (kg/ha)
7. Green fodder yield (kg/ha)
8. Insect-pest and disease incidence **(by subject expert)**
9. Net returns and B:C ratio

MAT-2: Nutrient management in maize-wheat-green gram cropping system under different tillage practices

Objective: To find out effective nutrient and tillage practices for yield maximization in intensified cropping system

Tillage practices (Main-plots)	**Nutrient management (Sub-plots)**
1. Zero till 2. Conventional Till 3. Permanent bed	1. 33% RDN + GS (sub surface banding* (SSB) at KH (knee high) and surface banding at TS) 2. RDF (SSB at KH and surface banding at TS) 3. SSNM based on nutrient expert(SSB at KH and surface banding at TS)

Design: Split Plot Replications: Three Sub-plot size: 50 m^2

Locations: Pantnagar, Dholi and Udaipur

***Sub-surface banding at around 5 cm depth at KH stage. However, at tasseling stage surface banding is to be followed.**

Observations to be recorded:

1. Plant population (thousands/ha) in maize and mungbean at harvest
2. Effective tillers of wheat per square meter
3. Plant height (cm) at harvest of all crops
4. Yield attributes and yield of all crops
5. Days to reproductive stage of each crop
6. Days to maturity of each crop
7. System productivity
8. Stover/straw yields of all crops (kg/ha)
9. Net returns and B:C ratio
10. N, P and K uptake by all crops
11. Insect-pest and disease incidence **(by subject expert)**
12. Initial and final (after completion of three year cropping sequence) physical and chemical parameters of soil

MAT-3: Nutrient management in rice-maize -maize cropping system under different tillage practices

Objective: To find out effective nutrient and tillage practices for yield maximization in emerging cropping system

Tillage practices (Main-plots)	Nutrient management (Sub-plots)
1. Zero till 2. Conventional Till 3. Permanent bed	1. 33% RDN + GS (sub surface banding* (SSB) at KH and surface banding at TS) 2. RDF (SSB at KH and surface banding at TS) 3. SSNM based on nutrient expert(SSB at KH and surface banding at TS)

Design: Split Plot Replications: three Sub-plot size: 50 m^2
Locations: Dholi, Kalyani

***Sub-surface banding at around 5 cm depth at KH stage. However, at tasseling stage surface banding is to be followed.**

Observations to be recorded:

1. Plant population (thousands/ha) in maize at harvest
2. Effective tillers of rice per square meter
3. Plant height (cm) at harvest of all crops
4. Yield attributes and yield of all crops
5. Days to reproductive stage of each crop
6. Days to maturity of each crop
7. System productivity
8. Stover/straw yields of all crops (kg/ha)
9. Net returns and B: C ratio
10. N, P and K uptake by all crops
11. Insect-pest and disease incidence **(by subject expert)**
12. Initial and final (after completion of three year cropping sequence) physical and chemical parameters of soil

MAT-4: Nutrient management in maize based rainfed cropping systems under different tillage practices

Objective: To find out effective nutrient and tillage practices for yield maximization in rainfed cropping system

Tillage practices (Main-plots)	Nutrient management (Sub-plots)
1. Zero till 2. Conventional Till 3. Permanent bed	1. 33% RDN + GS (sub surface banding* (SSB) at KH and surface banding at TS) 2. RDF (SSB at KH and surface banding at TS) 3. SSNM based on nutrient expert(SSB at KH and surface banding at TS)

Design: Split Plot Replications: three Sub-plot size: 50 m^2
Locations: Maize-Oat/mustard cropping system-Srinagar, Banda, Chhindwara, Banswara

***Sub-surface banding at around 5 cm depth at KH stage. However, at tasseling stage surface banding is to be followed.**

Observations to be recorded:

1. Plant population in maize, chickpea and mustard at harvest
2. Plant height (cm) of all crops at harvest
3. Yield attributes and yield of all crops
4. Days to reproductive stage of each crop
5. Days to maturity of each crop
6. System productivity
7. Stover/straw yields (kg/ha)
8. Net returns and B:C ratio
9. N, P and K uptake by all crops
10. Insect-pest and disease incidence **(by subject expert)**
11. Initial and final (after completion of three year cropping sequence) physical and chemical parameters of soil

MAT-5: Long term trial on integrated nutrient management in maize system

Objective: To assess the long-term effect of integrated nutrient management in maize system
Location:
Maize –wheat: Pantnagar and Banswara
Maize-mustard/-chickpea : Chindwara and Dharwad **; Greengram-maize:** Peddapuram
Maize alone: Karimnagar, Kolhapur, Ambikapur, Bhubneshwar, Coimbatore and Srinagar

Treatment details*:

T1	Unmanured
T2	100% RDF
T3	75% RDF+ legume intercropping (for economic produce) with FYM 5 t/ha + Azatobactor
T4	50% RDF + legume intercropping (for economic produce) with FYM 5 t/ha + Azatobactor
T5	FYM 10t/ha + Azatobactor
T6	Maize + legume intercropping(for economic produce) with FYM 10 t/ha +

	Azatobactor
T7	100% RDF + 5 t/ha FYM
T8	75% RDF + 5 t/ha FYM
T9	50% RDF + 5 t/ha FYM
T10	100% RDF + 5 kg Zn/ha
T11	FYM 5 t/ha (state practice)

Design: RBD Replications: 3 Plot Size: 15 m^2

***Important note:**

- In treatment T1, T5, T6 and T11 it is advised not to use any of the agrochemicals and instead manual weeding, biopesticides should be used, and it is desirable to go for crop residue recycling, if any.
- The experiment to be conducted on the fixed site over the years.

Observations to be recorded:

1. Soil chemical, physical and biological parameters before start of the experiment
2. Soil chemical, physical and biological parameters after completion of every cropping cycle.
3. Disease and insect incidence monitoring
4. Weed dynamics study
5. Plant population (thousands/ha) in maize at harvest
6. Effective tillers of wheat per square meter
7. Plant height (cm) at harvest of all crops
8. Yield attributes and yield of all crops
9. Days to reproductive stage of each crop
10. Days to maturity of each crop
11. System productivity
12. Stover/straw yields of all crops (kg/ha)
13. Net returns and B: C ratio of each crop and cycle
14. N, P, K and micronutrient content and uptake by crops
15. Insect-pest and disease incidence, if any

MAT-6: Efficacy of nano urea in maize systems

Objective: To evaluate efficacy of nano urea based nutrient management in maize cropping system.

Locations:

Maize-wheat: Pantnagar, Bajaura, Karnal, Ludhiana, Ranchi, Udaipur and Banswara

Maize-oat: Srinagar

Maize-mustard: Ambikapur, Bhubneshwar, Imphal, Bahraich, Chhindwara and Chitrakoot

Maize-chickpea: Dharawad

Rice-maize: Dholi, Kalyani, Gossaigaon and Puducherry

Maize alone: Vagarai, Arbhavi, Buldana, Kolhapur, Coimbatore, Peddapuram, Karimangar and Hyderabad

	Treatments	**1st Application (Basal)**	**2nd Application 25-30 DAS**	**3rd Application 40-45 DAS**

T1	Control (only PK)			
T2	RDN (3 split N application)	1/3rd N as basal	1/3rd N band placement by urea	1/3rd N band placement by urea
T3	75% RDN (3 split N application)	1/3rd N as basal	1/3rd N band placement by urea	1/3rd N band placement by urea
T4	50% RDN (3 split N application)	1/3rd N as basal	1/3rd N band placement by urea	1/3rd N band placement by urea
T5	T3 + Nano urea one spray		Nano urea @ 1250 mL/ha spray	
T6	T3 + Nano urea two spray		Nano urea @ 1250 mL/ha spray	Nano urea @ 1250 ml/ha spray
T7	T4 + Nano urea one spray		Nano urea @ 1250 mL/ha spray	
T8	T4 + Nano urea two spray		Nano urea @ 1250 mL/ha spray	Nano urea @ 1250 ml/ha spray
T9	1/3rd RDN basal + nano urea two spray		Nano urea @ 1250 mL/ha spray	Nano urea @ 1250 ml/ha spray
T10	2/3rd RDN + one nano urea spray	1/3rd RDN as basal	1/3rd RDN as band placement by urea	Nano urea @ 1250 ml/ha spray
T11	1/3rd RDN basal + 2% urea two foliar spray		Urea @ 2% foliar spray(500 litre water)	Urea @ 2% foliar spray(600 litre water)
T12	2/3rd RDN + one urea foliar spray	1/3rd RDN as basal	1/3rd RDN as band placement by urea	Urea @ 2% foliar spray(600 litre water)

Design: RBD **Replications**: 3 **Plot size**: >15 m^2

Observations to be recorded:
For crop:

1. Plant population at 25 DAS and at harvest of each crop (thousands/ha)
2. Days to reproductive stage of each crop
3. Days to maturity of each crop
4. 100-seed weight (g)
5. No. of cobs (thousands/ha)
6. Cob yield (kg/ha)
7. Grain yield of individual crops (kg/ha)
8. System productivity as maize equivalent yield (kg/ha)a
9. Insect pest and disease incidence, if any
10. Economics: Net return and B:C ratio of individual crop and system
11. Protein content in grain and N content in stover/straw
12. Initial and post-harvest soil properties after each crop (pH, EC, OC, Available NPK)
13. Nitrogen use efficiency indicators, PFP (Partial Factor Productivity), AE (Agronomic Efficiency), RE (Recovery Efficiency), PNB (Partial Nutrient Balance)
14. Phytotoxic effects on crops, if any

MAT-7: Crop residue management in traditional and emerging maize systems

Objectives

- To study the effect of bio inoculants on ease of residue management in maize systems.
- To study the effect of decomposed residues on nutrient availability in maize systems.

In collaboration with Department of Microbiology, College of Agriculture, PJTSAU; NBDC, Ghaziabad and ICAR-IARI, New Delhi.

Treatments

Main-plots: (Residue management)

M1: Residue removal
M2: Residue incorporation
M3: Residue incorporation + spray of microbial consortium on residue
M4: Zero-tillage + residue retention and spray of microbial consortia on residue*

Sub-plots: Nutrient management (2)

N1:100% RDF of NPK
N2: 100% RDN &P and 50% RDK

Design: Strip plot Replication: 3 Sub Plot size: >50 m^2

***To be omitted for maize-potato system**

Locations:

Soybean-maize: Hyderabad, Banswara and Chhindwara
Maize-maize: Karimnagar and Vagarai
Rice-maize or maize-rice: Dholi, Kalyani, Gossaingaon and Peddapuram
Maize-wheat: Pantnagar and Banswara**;** **Greengram-maize:** Peddapuram
Spring maize-green manure/rice-potato: Karnal, Ludhiana and Baharaich
Maize-chickpea: Dharwada

Observations to be recorded:

1. Plant height (cm) at harvest
2. Effective tillers of rice and wheat at harvest
3. Number of cobs (thousand/ha) in maize
4. Days to reproductive stage of each crop
5. Days to maturity of each crop
6. 100-seed weight (g)
7. Grain yield (kg/ha) of all crops in the cropping system
8. Stover yield (kg/ha) of all crops in the cropping system
9. Insect-pest and disease incidence, termite incidence in crops
10. Assessment of weed population
11. Net returns and B:C ratio
12. Amount of residue applied in each crop and treatment (t/ha)
13. Initial and post-harvest soil properties after each crop (pH, EC, OC, Available NPK)
14. Nutrient use efficiency indicators, PFP (Partial Factor Productivity), AE (Agronomic Efficiency), RE (Recovery Efficiency), PNB (Partial Nutrient Balance)

MAT-8: Enhancing water use efficiency in spring maize

Objectives: To find out best planting and residue application method on water use efficiency in spring maize.

Centers: Karnal, Ludhiana, Pantnagar, Bahraich

Treatment details:

Factor A: Planting method

1. Conventional till flat planting
2. Zero-till flat planting
3. Ridge slope planting (1/2 of ridge height)
4. Bed planting

Factor B: Residue management

1. Without mulching
2. With organic mulching (6 t/ha)

Design: FRBD Replication: 3 Sub Plot size: >50 m^2

Observations to be recorded:

1. Plant height (cm) at harvest.
2. Number of cobs (thousand/ha) in maize.
3. Days to reproductive stage.
4. Days to maturity.
5. 100-seed weight (g).
6. Grain yield (kg/ha)
7. Stover yield (kg/ha)
8. Insect-pest and disease incidence.
9. Assessment of weed population at Knee high, tasseling and at harvest.
10. Net returns and B: C ratio.
11. Initial and post-harvest soil properties after each crop (pH, EC, OC, Available NPK).
12. N, P, and K uptake in grain, straw/stover by all the component crops.
13. Water-use and water-use efficiency
14. Nutrient use efficiency indicators, PFP (Partial Factor Productivity), AE (Agronomic Efficiency), RE (Recovery Efficiency), PNB (Partial Nutrient Balance).

MAT-9: Enhancing sustainability of baby corn based intensive cropping system

Objectives:

- To study effect of different baby corn cropping system on productivity
- To develop sustainable baby corn based intensive cropping system for enhanced profitability and soil health.

Locations: Karnal (1-10 Treatments) and **Kalyani**(1-7 Treatments)

Treatments:

1. Continuous baby corn with famers practice
2. Continuous baby corn with RDF
3. Continuous baby corn with RDF + green manuring once a year
4. Continuous baby corn with 5 t/ha FYM/year + RDF
5. Continuous baby corn with 10 t/ha FYM/year + RDF
6. Continuous baby corn with 15 t/ha FYM/year + RDF
7. Continuous baby corn with 20 t/ha FYM/year + RDF
8. Short duration paddy: baby corn intercropped with fenugreek : baby corn with 10 t/ha FYM/year + RDF
9. Baby corn : wheat: baby corn +/-green manuring with10 t/ha FYM/year + RDF
10. Baby corn: potato: baby corn+/- green manuring with 10 t/ha FYM/year + RDF

Design: RBD Replications: 3 Plot size: 25 m^2

Observations to be recorded:

1. Plant population per ha initial and at harvest
2. No. of picking for baby corn
3. Picking period (days)
4. Fresh weight of baby corn per plot with husk (kg/ha)
5. Fresh weight of baby corn per plot without husk (kg/ha)
6. Days to reproductive stage of each crop
7. Days to maturity of each crop
8. Grain yield (kg/ha) of all crops in the cropping system
9. Stover yield (kg/ha) of all crops in the cropping system
10. System yield (kg/ha)
11. Cost of cultivation, Net returns and B:C ratio of system
12. Insect-pest and disease incidence
13. Assessment of weed population
14. Initial and post-harvest soil properties after each cropping year (pH, EC, OC, Available NPK)
15. N, P and K uptake in grain, straw/stover by all the component crops

MAT-10: Weed management in maize systems

Objective:

1. To find out effective wee management options in maize system.
2. Accounting residual effect of herbicide on succeeding crops in traditional and emerging maize-based cropping systems.

Maize-wheat: Pantnagar, Bajaura, Karnal, Ludhiana, Ranchi, Dholi, Udaipur and Baharaich
Maize-oat: Srinagar
Maize-mustard: Ambikapur, Bhubneshwar, Karimnagar, Imphal and Chhindwara
Rice-maize: Dholi, Kalyani and Gossaigaon
Soybean-maize: Dharwad, Kolhapur, Banswara and Coimbatore
Rabi maize-pulse: Peddapuram
Maize-pulse: Vagarai
Maize-chickpea: Chitrakoot, Hyderabad, Dharwad and Udaipur

T1	Weedy check
T2	Weed-free check
T3	Atrazine 500 g/ha + hand weeding at 25-30 DAS
T4	Pyroxasulfone @ 127 g/ha + hand weeding at 25-30 DAS
T5	Atrazine 500 g/ha fb halosulfuronmethyl @ 67 g/ha at 25-30 DAS
T6	Atrazine 500 g/ha fb tembotrione @ 120 g/ha at 25-30 DAS
T7	Atrazine 500 g/ha fb topramezone @ 25 g/ha at 25-30 DAS
T8	Atrazine 500 g/ha fb mesotrione + atrazine @ 300 g/ha at 25-30 DAS
T9	Pyroxasulfone @ 127 g/ha fb halosulfuronmethyl @ 67 g/ha at 25-30 DAS
T10	Pyroxasulfone @ 127 g/ha fbtembotrione @ 120 g/ha at 25-30 DAS
T11	Pyroxasulfone @ 127 g/ha fb topramezone @ 25 g/ha at 25-30 DAS
T12	Pyroxasulfone @ 127 g/ha fbmesotrione + atrazine @ 300 g/ha at 25-30 DAS

Design: RBD **Replications**: 3 **Plot size**: 15 m^2

Observations to be recorded:

For crop:

1. Plant population at 25 DAS and at harvest (thousands/ha)
2. No. of cobs (thousands/ha)
3. Cob yield (kg/ha)
4. Maize grain yield (kg/ha)
5. System productivity as maize equivalent yield
6. Insect pest and disease incidence, if any
7. Economics: Net return and B:C ratio
8. Phytotoxic effects on crops, if any

For weeds:

1. No. of grassy, broadleaf weeds and sedges/m^2 at 50 DAS and at harvest.
2. Weed dry matter at harvest/m^2 of grassy, broadleaf weeds and sedges separately.

MAT-10: Optimization of sowing window for spring maize

Objective: To find out best sowing window for enhancing yield and water use efficiency of spring maize.

Centers: Ludhiana, Karnal, Pantnagar, Bahraich and Delhi

Treatment details (planting dates):

1. 10^{th} February
2. 17^{th} February
3. 24^{th} February
4. 3^{rd} March
5. 10^{th} March
6. 17^{th} March
7. 24^{th} March
8. 31^{st} March
9. 7^{th} April
10. 14^{th} April

Design: RCBD **Replication:** 03 **Plot size:** 20 m^2

Observations to be recorded:

1. Plant population 25 DAS and at harvest (thousands/ha)
2. Plant height (cm) of maize
3. Days to 50% silking
4. Days to maturity
5. Yield attributes and yield of maize
6. Maize equivalents of crop and cropping system (kg/ha)
7. Stover yield of maize (kg/ha)
8. Net returns and B: C ratio
9. Amount of water applied (M3)
10. Water productivity

11. Insect-pest and disease incidence, if any

Instructions on conduct and reporting:

- Data should be submitted in prescribed format as per the decided treatment combination order in proceedings only otherwise data will not be included in the report.
- The official communication Emails is dmragronomy@gmail.com
- The last date for submission of research data will be up to **31stDecember** for *kharif* and up to **31st August** for *rabi* season. Data received after these dates will not be included in report.
- **Inclusion of Metadata** of each trial like cropping history; date of sowing and harvesting; crop management; irrigation; weed management; irrigation and daily meteorological data on sunshine hours; relative humidity; temperature and rainfall.

Other research priorities:

1. Survey of the farmers field for the farmer practices (FP) for cultivation of *kharif*, *rabi* and specialty corn practices in the various states.

2. Zone-wise and national level publications shall be brought out on the experiment completed on nutrient management, tillage management, density, weed management, biofertilizers, etc. For this zone coordinators decided as NHZ (Dr. F. Rasool), NWPZ (Dr. Narender Kumar), NEPZ (Dr. Sonali Biswas), PZ (Dr. S. R. Salkinkop) and CWZ (Dr. G. Mahajan).

Annexure – V

Work PLAN OF OUTREACH PROGRAMME 2023-24

(Nodal email: totdmr12@gmail.com)

Summary

Programme	FLD (ha)	Trainings
NFSM FLD	1400	-
TSP	440	35
SCSP	190	9
NEH	100	14
Potential yield platforms	48	-
Total	**2178**	**58**

Note: All the demonstrations and trainings to be focused near to grain/dual distilleries for to develop catchment area near the ethanol production units.

A. Frontline demonstrations (total: 300 ha) 2023-24

Allocation of FLDs is as follows:

Implementing centre	Allocation		Season	Key Aspect/s	Preferred Cultivars*
	Area (ha)	Fund (lakh Rs.)			
AAU, Gossaingaon	50	2.925	*Rabi/ post kharif*	Hybrid maize/ zero-till maize	CP 333 (2022)/ CP 838(2022)
CAU, Imphal	30	1.755	*Spring/ Kharif*	QPM/ Hybrid maize/ FAW management/ Weed management	DMRH1308, LQMH-1
VPKAS, Almora	10	0.585	*Kharif*	Hybrid maize	VLQPM Hybrid 63/61 (2022)
SKUAST, Srinagar	30	1.755	*Kharif*	Hybrid maize/weed management	Shalimar QPMH-1 (2021)/ Shalimar Maize Composite-8(2022)
GBPUAT, Pantnagar	20	1.170	Spring	Hybrid maize	DKC9108 and Pant Sankar Makka 5
IIMR, Ludhiana	50	2.925	*Kharif /rabi/* spring	Hybrid maize/ weed management/ zero-till maize	PMH-13 (2021)/ CP858 (2021)/IMH 222/223(2022)
PAU, Ludhiana	20	1.170	*Kharif*/spring	Hybrid maize/weed/FAW management	PMH13(2021)
CCSHAU,	50	2.925	*Kharif/Spr*	Weed management/	DRONA/ CP858

Implementing centre	Allocation		Season	Key Aspect/s	Preferred Cultivars*
	Area (ha)	Fund (lakh Rs.)			
Karnal			*ing*	Hybrid maize	(2020)
BCKV, Kalyani	50	2.925	*Rabi*	Zero-till maize/ Weed management	DMRH1301
BHU, Varanasi	10	0.585	*Kharif*	Hybrid maize/Ridge planting/ Weed management	DKC7204(2022)/ Malaviya Swarn Makka- 1(2021)
DrRPCAU, Dholi	100	5.850	*Kharif / rabi*	QPM/ Weed management	CP858 (2020)
RMRSPC, Begusarai	100	5.850	*Kahrif /Rabi*	Hybrid maize/ Weed management/intercropping/ ridge planting	DMRH1308
MPKV, Kolhapur	100	5.850	*Kharif*	Hybrid maize/insect/weed management	-
PJTSAU, Karimnagar	100	5.850	*Rabi*	Intercropping, residue management, mechanization, hybrid maize	-
ANGRAU, Peddapuram	100	5.850	*Kharif / Rabi*	Weed management /Disease management	PAC751, CP838
TNAU, Coimbatore	100	5.850	*Kharif / Rabi*	Hybrid maize/FAW management	CMH 12-686 (2021)
UAS, Dharwad	100	5.850	*Rabi /kharif*	Hybrid maize/weed management / FAW management/	GPMH- 1101 (2021)/ ADV 759(2021)
UAS, Mandya	50	2.925	*Kharif*	FAW management/ Hybrid maize	NUZI 260(2021)
WNC, IIMR, Hyderabad	20	1.170	*Rabi*	FAW management	-
TNAU, Vagarai	50	2.925	Rabi/ kharif	Weed management/hybrid maize	-
AAU, Godhara	70	4.095	*Kharif /Rabi*	Hybrid maize/ Weed management/biofertilizer	GAYMH3/GAWMH2 (2018)
JNKVV, Chhindwara	50	2.925	Kharif/ rabi	Hybrid maize/ weed management/intercropping /liquid biofertilizer	P 3392 (2021)
MPUAT, Banswara	70	4.095	*Kharif /Rabi*	Intercropping/ weed management/ hybrid maize	PRMH1010 (2021)
MPUAT, Udaipur	50	2.925	*Kharif*	QPM/ FAW management/	PRMH1010 (2021)

Implementing centre	Allocation		Season	Key Aspect/s	Preferred Cultivars*
	Area (ha)	Fund (lakh Rs.)			
				intercropping/ weed management	
RLBCAU, Jhansi	20	1.170	*Kharif*	Hybrid maize/ FAW or weed management	CP858 (2020)/DKC 7204(2022)
Administrative charges (IIMR)		2.100			
Total	1400	84.000			

*Any alternative cultivar should be less than 3 years old.
*IPM module on FAW and INM to be emphasized.

- All the FLD to be monitored along with AICRP monitoring, without monitoring data will not be accepted.
- The left over balance of the previous year may also be approved for utilization for the conduct of FLD during 2023-24 which will be deducted while release to particular centre for current year as per AUC. The centre may also utilize the money from other heads so that until release of FLD fund this programme to be effectively implemented.

A2: Fund bifurcation for FLD:

Component	Rs/ha
Cost of critical inputs (seeds/ biofertilizers/PP chemicals[@]/ herbicides) to supplement the cultivation charges	5100
Organization of Field Day	250
Display board and publicity material (posters/pamphlets/leaflets etc.)	250
Visit of scientists excluding TA/DA, but hiring of Taxi/POL etc.	300*
Contingencies/typing of results/ minutes etc.	100
Total	6000

@ Plant Protection Chemicals
*Nodal FLD implementing Institute/Directorate will retain 50% of the amount for effective monitoring of FLDs across the country.
*Hence, centre will receive Rs 5850 per ha for organizing FLD.

A3: Reporting of FLD:
Annexure I

- **Détails of the inputs distributed (to be given 15 days after input distribution)**
- **Name of the implementing agency ……**

S. N.	State	Districts	Village	Name of the farmers with father/ husband name	Gender (M/F/ T)	Category (SC/ST/ OBC/ General)	Contact No.	Aadhar No.	FLDs (ha)	New technology given	Input given (Name, price and quantity)	Latitude	Longitude

- ❖ Geo-tagging needs to be done for all FLDs.
- ❖ Varieties which are within 3 years either of own production or SAUs sources be used (5 years for problematic areas *viz*, hills, saline and alkaline soils etc.)
- ❖ Reasons for yield gap between FLDs and farmers' practice should be mentioned.
- ❖ Cluster approach of l0 hectares.

Annexure II

- **FLD performance (to be given 15 days after harvest of the crop, before December 31, 2023)**
- **Name of the implementing agency: ……**

Name of the farmer	Address (name of village, sub-division, district)	Aadhar no.	FLD technology	Area (ha)	Check / Farmer practice details	Yield (q/ha)		Net returns ('000 Rs/ha)		Yield gains (%)	Net return gain (Rs/ha)	Rejected/ accepted by farmers (Give rating 1-10) with reasons if any
						FP	FLD	FP	FLD			

- ➢ Report on Field Day with photographs
- ➢ Report on monitoring with photographs
- ➢ Good quality photographs (3-4 no.) will be required along with final report

B: Tribal Sub Plan (TSP) /STC: 2023-24

Centre	Aspiration district/s	Budget (Rs. in lakhs)	FLDs (ha)	Training (No.)	Main aspect
SKUAST, Srinagar	Tribal district	2.0	20	1	Improve cultivar of maize
AAU, Godhra (GJ)	Narmada and tribal districts	4.00	30	3	Weed management /GAWMH 2/ GAYMH 3/ biofertilizer/ QPM/intercropping
IGKVV, Ambikapur (Chhattisgarh)	Bastar, Sukma, Kanker, Dantewada, Kondagaon, Narayanpur,Korba,	4.00	30	3	Upland rice vs maize; QPM/Hybrid maize/weed management/ridge planting

Centre	Aspiration district/s	Budget (Rs. in lakhs)	FLDs (ha)	Training (No.)	Main aspect
	Rajandgaon				
JNKVV, Chhindwara (M.P.)	Barwani and tribal districts	4.00	30	3	Upland rice vs maize; QPM/ Hybrid, maize/intercropping/weed management
MPUAT, Banswara	Tribal districts	4.00	30	3	
MPUAT, Udaipur	Tribal districts	6.00	50	3	
OUAT, Bhubneshwar (Odisha)	Rayagada, Koraput and tribal districts	4.00	30	3	Upland rice vs maize, QPM
BAU, Ranchi (Jharkhand)	Chanho, Mandar, Burmu	6.00	50	3	Upland rice vs hybrid maize/QPM
BCKV, Kalyani	Tribal districts	4.00	30	3	Hybrid, maize/intercropping, Upland rice vs maize
GBPUAT, Pantnagar	Tribal districts	1.50	10	1	Summer rice vs hybrid maize
PJTSAU, Hyderabad	Tribal districts	1.50	10	2	Mechanization/ Hybrid maize/ weed management
TNAU, Vagarai	Tribal districts	2.30	20	1	Hybrid maize/weed management
PJTSAU, Karimnagar	Tribal districts	2.00	20	1	Hybrid maize/weed management/bio-fertilizer
AAU, Gossaigaon	Tribal districts	2.30	20	1	Hybrid maize/weed management
DrRPCAU, Dholi	Tribal district	2.30	20	1	Hybrid maize/weed management
ANGRAU, Peddapuram	Alluri, Manyam Parvathipuram and tribal district	5.10	40	3	Hybrid maize/weed management/ zero-tillage
Total		**55**	**440**	**35**	

- Plough/ seed drill/ intercultural implement; sprayer, seed, organic manures/ fertilizers/ biofertilizers/ biopesticides, agrochemicals; storage bins
- ₹ 9000/- per ha for FLDs and ₹ 40-50 thousands/training; rest and saving for input distribution and others.

TSP Activities

- Capacity building and training (each training of at least 25 farmers)
- Seed: production, storage, bank and village
- Infrastructure for grain storage

- Demonstrations on the poultry and goat production
- Interventions and demonstrations for post-harvest technologies/primary processing
- Demonstrations on integrated farming
- Linkage to Gramin Retail Infrastructure
- Study of agriculture and allied production and management system, marketing and value addition

❖ Programme to be implemented preferably in mentioned aspirational districts only.
❖ Allocation will be on the basis of BE 2023-24
❖ Need to finish all activities by December 2023

C : Scheduled Cast Sub Plan (SCSP) 2023-24

Centre	Budget (Rs. in lakhs)	FLDs (ha)	Training (No.)	Aspects
PJTSAU, Karimnagar	1.5	10	1	Mechanization/ Weed management/ Stress resilient hybrid/Hybrid maize
PJTSAU, Hyderabad	1.5	10	1	
BCKV, Kalyani	2.5	25	1	Hybrid maize/ QPM/ Upland rice *vs.* Maize
DGKVKRMA, Sargarchi, WB	2.5	25	1	
TNAU, Coimbatore	3.0	20	1	
MPKV Kolhapur /Rahuri	2.5	25	1	
RLBCAU, Jhansi	2.5	25	1	Hybrid maize/ Intercropping/ Weed management
JNKV Chhindwara	2.5	25	1	
BAU, Ranchi	2.5	25	1	Hybrid maize/ Intercropping/ Weed management
Total	**21**	**190**	**9**	

D: NEH programme

Name of the collaborator	Budget (Rs. in Lakhs)	FLDs (ha)	Training (No.)	Aspects
RARS, Gossaingaon	5.0 (10)	30	6	QPM/hybrid maize/sweet corn; FAW management; research on germplasm and cropping system; upland/jhumland rice vs hybrid maize
CAU, Imphal (Manipur, Arunchal Pardesh and Mizoram)	5.0 (10)	30	4	Sweet corn/QPM/hybrid maize/ FAW management; upland/jhumland rice vs hybrid maize
CAU, Barapani , Meghalaya	6.0 (10)	40	4	
Total	**17.0 (30)**	**100**	**14**	

*Figure parentheses is total budget for the year. Atleast the budget outside parenethiss to be used for upscaling activities, iff need full can also be used.

TSP/SCSP/NEH Reporting (Quarterly basis)

Output 1 (Farm material distribution) : Number of farmers benefitted /individual farmers / farm families benefitted/ supply of farm inputs/ seeds/ farm tools/ honey production/ pollinators boxes/ inputs for / bio-fertilizer/biopesticides etc.

S. N.	Description	Unit	Q1/Q2/Q3/Q4 Targets	Q1/Q2/Q3/Q4 Achievements

Output 2 (knowledge and skill dissemination): Number of demonstration trials/ field days/ kisan goshdhis/ trainings/ plant protection technology demonstration/ biofertilizer/ biopesticides technology

S. N.	Description	Unit	Q1/Q2/Q3/Q4 Targets	Q1/Q2/Q3/Q4 Achievements

TSP/SCSP/NEH reporting (Annual)

Annexure-I: Beneficiary details of the TSP training programme

S. N.	Date	Place	Topic	Address of beneficiary	Expenditure incurred	ST population benefitted (No.)

Annexure-II: Report on input distribution programme.

S. N.	State	Districts	Name of the farmer with address	Aadhar No	Contact number	Input given (Name and quantity)	Total price of the inputs (Rs)

- Please complete whole money spent by 31st November 2023.

TSP/SCSP reporting (Annexure)

Annexure-II: Report on the FLD under TSP/SCSP/NEH Programme

Name of the farmer	Address (name of village	Aadhar no.	FLD technology	Area (ha)	Check / Farmer practi	Yield (q/ha)	Net returns (‘000 ₹/ha)	Yield gains (%)	Net return gain (₹/h	Rejected/ accepted by farmers

	, sub-division, district)				ce details	FP	FLD	FP	FLD		a)	(Give rating 1-10) with reasons if any

- ❖ Good quality photograph (5-7) for each activity required along with final report
- ❖ It is desired to give information on activity in print and electronic media

D: Potential yield realization of maize-based cropping systems in Punjab and Haryana

- ICAR-IIMR and CIMMYT-BISA in active collaboration with stakeholders in ecosystems (State Departments, Private Companies, CHC, NGOs/SHGs/ aggregators/ dryer/machinery manufacturer)
- Cluster approach
- Farmers have harvested over 35 q/acre in Punjab during *kharif* season
- It is to be replicated in more field
- Proven technology package will be compared and validated in villages of selected blocks/districts having
  - low maize/rice productivity,
  - water crisis,
  - soil texture issues etc.
- Kandi belt along with Ludhiana and Jalandhar districts of Punjab, priority areas during the current year.
- Evidence and data on key performance indicators on traditional *vs.* new cropping systems
  - *System yield,*
  - *Economic returns*
  - *Water/electricity*
  - *Environmental footprints*
- Size of the demonstrations: one-acre land preferably
- Nearby conventional rice-based systems to be taken as a check
- Year-round presence at the demonstration platform; whole cropping system is planned for demonstration

❖ **Potential pockets**

Cropping system	**District/block**	**No of validation trials**
Maize-wheat-mungbean or maize-mustard-mungbean	Nawanshahar	25
Maize-wheat-mungbean with CA	Hoshiarpur, Ludhiana	50
Maize-wheat-mungbean with CA	Jalandhar	25
Maize-wheat-mungbean with CA	Ambala, Karnal, Kurukshetra	50

- Operations: Planting, herbicide spray, earthing up, pesticide spray, harvesting, drying, market linkages
- High-yielding stable long duration hybrids with proven performance during *Kharif* : DRONA, CP 858, DKC 9164
- Family labour very high, the mechanization will be focused for sowing, inter-culture, harvesting and drying with the available latest machinery
- Four hybrids (Public + CIMMYT + Private) in 3 places

E: Problem/constraint identification

- Agro-ecosystem challenges for maize crops
- Typology of the farmers (Socio-economic, bio-physical etc.) : will be done/used as with ICAR-IIFSR
- Variety, soil, weeds, diseases/ pest, water, climate etc.
- Traditions/attitudes of farmers
- Knowledge gap
- Input availability
- Yield gap
- Cost and return of maize crops
- Access to technical advice/credit
- Problem in institutional arrangement
- Marketing challenges

F: Baseline survey and impact assessment

- **Baseline survey of farmers:**
  - Household characteristics (e.g., age, education, family size, experiences, access to credit etc.)
  - Farm characteristics (land holding, irrigated area, cropping pattern, area under different crops, topography etc.)
  - Maize system (area, seed source, variety, irrigated area, cultivation practices, mechanization, preferences etc.)
  - Economics (yield, production, net income, cost of cultivation etc.)
  - Post-harvest management/marketing (storage, processing, marketing and IT channels etc.)
  - Problem / constraint face
- **Impact assessment :-**
  - Success stories and survey base
  - Impact of technology(ies) adoption, training programmes etc.
  - Indicators: Yield, income, increase in knowledge etc.

G: Documentation of Success Stories of Maize Technologies

(One by one) – **At least one success story from each aspect** on given topic from each state covering various aspects. The same aspect should not be repeated from same state.

- ✓ Maize as for grain production
- ✓ QPM and poultry rearing farming
- ✓ QPM and piggery/fishery/other livestock farming
- ✓ Seed production
- ✓ Specialty corn: (Sweet corn)
- ✓ Specialty corn: (Baby corn)
- ✓ Specialty corn: (Pop corn)

- ✓ Maize for fodder/silage production
- ✓ Maize based intercropping system/Sequential maize based cropping system
- ✓ One story from each state if possible on secondary dissemination of the intervention (i.e. where it has been adopted where we did not directly intervene but farmer to farmer dissemination, where first farmer was our target beneficiary)

1. **Title:**
2. **Contributors:**
3. **Farmers details**

Name of Farmer	:	Mr. T. Sataban	
Age	:	55	
Address	:	Khurai village, Imphal East	
Education	:	Graduate	
Land holdings	:	1.00 ha	
Geographical Coordinates	:	Latitude – 24º83' N, Longitude - 93º97' E	
Altitude		773 m	

4. Introduction/Challenge

Start with the challenge, problem, issue or opportunity that the systems has aimed to address. (250-300 words): following points may kindly be incorporated

- ✓ What is existing cropping system?
- ✓ Why its need to be change?
- ✓ What is yield gap?
- ✓ What is income from existing system?
- ✓ Soil fertility status (from soil health card/analysed from lab before adoption)
- ✓ Marketing channels
- ✓ Technological and social problems
- ✓ Need of the diversification of cropping system/HYVs

5. Initiative and rationale of the technology:

Describe what the systems researchers have done to address the challenge. Showcase the research strategy and timeline of actions. How were different research users engaged in or consulted in the research process? Specify who benefitted from the research and how is the research knowledge that was produced being used now by different beneficiaries (farmer, community, policy maker, private sector, university, etc.) to change their practice, policy, investments, etc. **(250-300 words words)**

Table 1. Participatory demonstration

State	Name of District	Name of Village	No. of farmers covered under demonstration	Area covered under demonstration (ha)

Table 2. Capacity building programme

State	Name of District	Name of Village	No. of farmers covered under demonstration	Area covered under demonstration (ha)

6. Details of Technology/Methodology: Details methodology and package and practices as clear-cut intervention as we have done in Transfer of Technology (TOT) or Participatory demonstration (it should be in simple term, use flow chart, bullets wherever possible). **(200-250 words)**

7. Key result/insight/interesting fact: productivity, economics, and employment generation and soil quality observation **(support with one simple table and graph (bar diagram or pie chart etc.)**

Describe the key result/insight/interesting fact stemming from the research. What were the key research outputs such as recommendations, models, trials, research papers, etc.? Provide evidence of this result/outcome by giving links to scientific journal articles, reports, and other references that document the research. **(200-300 words)**

8. Impacts: On cropping intensity, livelihood, Adoptability, local demand etc.

Provide a short summary of the actual change (on knowledge, attitude, skills, practice, or policy) that took place and how this could lead to large-scale impact at system level and significant progress towards Identified Deliverable Outputs/Outcomes. Provide quantitative measures, where possible and use simple graphs or tables to illustrate a point. **(200-250 words)**

9. Interview of 1-2 farmers and take photographs of interview

10. Lessons Learned

- ✓ What did you learn in this process? What was difficult or challenging?
- ✓ How did you overcome the challenges faced?
- ✓ If you were to do it all over again, what would you do differently? **(150 - 200 words)**

10. Convergence/linkages: Acknowledge who ever organizations, KVKs, SHGs, Line Department contributed.

11. Constraints for larger adoption

12. **Supporting Quotes and Images**

First person accounts or account of a community or group: Please provide 3-4 quotes of 50-words each from different people that bring a different perspective to the story (including name of person, who they are/position, location). These could be account from a single beneficiary or a group of people who talk about how the systems research has made a tremendous difference in their livelihood, community, behaviours/attitudes, policies, investment, etc. **(150 - 200 words)**

Photo: Provide 2-3 quality photographs, with a **10–20 word caption**. The photograph should capture the person/people/landscape in the story context.

भारतीय कृषि अनुसंधान परिषद
INDIAN COUNCIL OF AGRICULTURAL RESEARCH
कृषि भवन, नई दिल्ली – 110001
KRISHI BHAWAN, NEW DELHI-110001

Dr Ishwar Singh
Pr. Scientist (FFC)

Ph: 011 23389597/23046690
Email: isingh.icar@gmail.com

F. No. 18-8/2018-CS-FFC

Dated: 31.05.2023

To,

The Director
ICAR-IIMR
Ludhiana

Subject: Proceedings and recommendations of 66th Annual Maize Workshop held during 12th to 14th April, 2023 at GBPUA&T, Pantnagar-regarding.

Sir,

Kindly refer to your email letter No. IIMR/LDH/2022-23/436/2 dated 16.05.2023 regarding above cited subject. In this context, the approval of Competent Authority is conveyed herewith for the submitted proceedings and recommendations of the 66th Annual Maize Workshop and VIC of AICRP on Maize held on 12th to 14th April, 2023 at GBPUA&T, Pantnagar **for further follow up action.**

Yours faithfully

31/05/23

(Ishwar Singh)