

**Guidelines
for
Testing Maize
Cultivars
Under AICRP
on
Maize**



Directorate of Maize Research

(Indian Council of Agricultural Research)

Pusa Campus, New Delhi 110 012 (India)

Guidelines for Testing Maize Cultivars
under
All India Coordinated Research
Project (AICRP)



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Contents

S. No.		Page No.
1	Nomination of test entries	1
2	General considerations for inclusion of test entries into AICRP-M Trials	1
3	Major thrusts of AICRP-M	2
4	Mode of evaluation of test entries	2
5	Annexure I	18
6	Annexure II	19
7	Proforma for submission of proposals for identification of crop varieties/hybrids	20
8	Summary of yield data of coordinated varietal trials	21
9	Adaptability to agronomic variables	22
10	Reaction to major diseases	23
11	Reaction to major insects pests	25
12	Data on quality parameters	26
13	Proforma for submission of proposals of crop-variety to central sub-committee on crop standards, notification and release of varieties	27

Acknowledgement

All India Coordinated Research Project for maize (AICRP-M) which was established in 1957 under the name All India Coordinated Crop Improvement Project (AICCRIP) in maize. The AICRP on maize organizes interdisciplinary and inter-institutional co-operative research programmes to find answers to problems of maize production. The present technical bulletin is largely derived from "Guidelines for Crop Variety Testing under All India Coordinated Crop Improvement Project" written by Tandon J.P. and Sharma S.P. and published by Project Coordinator, national Seed Project, Division of seed Science Technology, Indian Agricultural Research Institute, Indian Council of Agricultural Research (ICAR) but, customised for maize cultivar testing. The Directorate of Maize Research duly acknowledges the original authors of the publication of "Guidelines for Crop Variety Testing under All India Coordinated Crop Improvement Project" and ICAR.

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General Guidelines for Testing of Entries under All India Coordinated Research Project (AICRP) on Maize

India is a diverse country with varied climatic and geographical conditions, maize (*Zea mays*) is an important cereal crop of India and due to availability of diversity with respect to agro-climatic conditions, there is an intense need to develop and identify superior maize cultivars *viz.*, single cross hybrid which can perform better under divergent conditions across the country. Keeping these things in mind, whole country has been categorized into five major zones (Table 3) constituting 30 centers (**Annexure I**) for varietal testing under All India Coordinated Research Project on maize (AICRP-M) which was established in 1957 under the name All India Coordinated Crop Improvement Project (AICCIP) on maize. The AICRP on maize organizes interdisciplinary and inter-institutional co-operative research programmes to answer the problems of maize production AICRP operates through collective planning, programming, coordinating, monitoring and testing of newly developed cultivars (test entries) from both public and private sector research and development centres. It involves identification and release of superior cultivars for different agro-climatic zones of the country. The nomination of test entries, general considerations for inclusion of test entries, major thrusts and mode of evaluation, under All India Coordinated Research Project on Maize (AICRP-M) along with procedure for identification and release of cultivars are as follows.

1. Nomination of test entries:

Any public research and development organizations like ICAR institutes, SAUs, or AICRP-M centres of SAUs can nominate their test entries in maize crop for evaluation under AICRP-M trials without any payment. In addition to this National Seed Corporation, State Seed Corporations, private companies with established Research and Development (R&D) units etc. can also nominate their test entries/material subject to the below said guidelines and payment of rupees 60,000 per entry per year of testing.

2. General Considerations for Inclusion of Test Entries into All India Coordinated Research Project on Maize (AICRP-M) Trials:

- (i) The Test entries shall be included into the AICRP-M trials on the basis of data generated in pre-coordinated testing. The entries to be nominated must have undergone critical evaluation/screening in the station/regional trials conducted by the sponsoring breeder/agency. All data generated in the pre-coordinated tests on yield and other important agronomic attributes, reaction to insect-pest and diseases and relevant quality are required to be made available to the AICRP on Maize Coordinator in support of the proposed test entry inclusion in the relevant (*see* Table No. 1) coordinated trials.
- (ii) The entries shall be included on the basis of their superior performance for yield and/or other desirable traits such as resistance/tolerance to key biotic and/or abiotic stress, better quality etc.
- (iii) The entries shall be included on the basis that it must have been characterized by high degree of phenotypic uniformity and genotypic stability.



- (iv) The germination and physical purity of the seed supplied for testing though evaluation under AICRP-M trials should be equivalent to minimum seed certification standards of foundation grade of maize crop.
- (v) The test entries shall possess some distinct diagnostic features, making them different/identifiable from the varieties of common knowledge (registered extant variety under Section 2(j)(iii) of PPV & FR Act, 2001).
- (vi) All information about the pedigree/parentage of the entries shall be made available at the nomination stage itself by the breeder concerned. Preference shall be given either at induction stage or while identification and release stage for test entries with diverse parentage if performance level is similar.
- (vii) Submission of required amount of seed under different relevant trials (*See* Table 2) along with contact details including name of contact person, email, fax, etc.
- (viii) Final authority of acceptance of the test entries lies with the coordinator and all the accepted test entries will be tested under AICRP-M trials and shall be subjected to same system of evaluation (*see* mode of evaluation) irrespective of the method followed in the development of the line(s).
- (ix) The Project Directorate (PD) may like to concentrate on germplasm enhancement by undertaking pre-breeding activities and distribute advanced generation/semi-finished elite material *viz.*, *inbred lines* developed for specific purposes to the AICRP-M centres/cooperative centres/voluntary centres/breeders to supplement their efforts. However, they can also nominate test entries/strains for zones/situation for especially for which well developed centers/programmes do not exist.

3. The major thrusts of All India Coordinated Research Project on maize (AICRP-M):

- (i) To constitute, coordinate and organize multi-location variety *viz.*, single cross hybrid, open pollinated variety/synthetics, evaluation trials across different agro-ecological zones of India constituting wide range of situations to assess genotype X environment (G X E) interaction.
- (ii) To generate and analyse adequate data to enable to take decisions in varietal identification and release.
- (iii) To identify and release zone specific or region specific high yield potential varieties which have superior grain yield, quality, resistance to diseases and pests with adaptability over wide range of cultural and regional environments.

4. Mode of evaluation of test entries

- (i) Based on duration of the test entries, there shall be four different trials constituted separately under late, medium, early and extra-early maturity groups.
- (ii) There shall be only one trial under each maturity group for testing both hybrids and open pollinated varieties/synthetics.
- (iii) In the trial, the latest released hybrid for the given zone under each maturity group trial shall be used as check and in case, if any, entry of open pollinated variety/synthetics is there in a trial then, latest released open pollinated variety/synthetics shall be used as additional check.

4.1. Stages of Testing:

Before identification, release and notification, all the varieties (*viz.*, single cross hybrids, open pollinated varieties/synthetics, etc.) have to undergo three years testing in which varieties are evaluated for their *per se*

performance against the recommended checks using various traits. The three tier system of multi-location evaluation involving the following stages is essential for release of variety.

- i. First year: Initial Evaluation Trial (IET)
- ii. Second Year: Advance Evaluation Trial I (AET I)
- iii. Third year: Advance Evaluation Trial II (AET II)

4.1.1. Initial Evaluation Trials (IET)

- A. **Constitution of trial:** These trials would be conducted with the new entries along with specified number of check varieties.
- B. **Number of entries:** The number of entries (inclusive of checks) shall not exceed to an extent where appropriate design of experiment is difficult to follow.
- C. **Checks:** A minimum of three check varieties *viz.*, single cross hybrids, comprising of the following shall be used.
 - (i) **National check:** Variety being grown over a wide range of environments for a fairly a long period of time. It would serve as the yardstick to measure the extent of improvement made over time and across the country/regions.
 - (ii) **Zonal check:** The latest released variety for zone and ecology
 - (iii) **Local check:** A variety popularly grown in a given region ecology /environment.
 - (iv) **Additional check:** May be included, wherever felt necessary but their number should be limited.
 - (v) **Qualifying check:** Are the co-entries in the same trial and being tested for the same period.
 - (vi) The national check shall remain same for long period
 - (vii) Except the latest variety check i.e. the zonal check and the qualifying checks, all other checks shall not be changed over the period of testing of a given test entry/set of entries.
- D. **Source and quality of seed of entries:** Certified/foundation/breeder grade seed shall be used in trials. In case of non availability of seed of these grades, the agency responsible for maintenance/multiplication as indicated below shall ensure that the quality of seed supplied conforms to the minimum seed (maize) certification standards.
 - (i) **Test entries:** The breeder/sponsoring agency would supply the seed and ensure that it conforms to germination and physical purity standards equivalent to minimum seed certification standards of foundation grade seed of maize.
 - (ii) **National/Long term checks:** To be arranged by the concerned Coordinator, Zonal Coordinator.
 - (iii) **Zonal checks:** The seeds of latest released variety *viz.*, single cross hybrid to be made available by the concerned breeder/coordinator/zonal coordinator.

(iv) **Local checks:** Seeds of local check to be supplied by zonal coordinator/cooperating breeder.

E. Plot size number of replication and field layout: The following points need to be remembered.

- (i) The trials shall be laid out in such a manner so as enable detection of minimum difference of 5-10% in yield, significant at 5% level.
- (ii) The plot size and number of replications shall be decided by the maize coordination unit on the basis of experience gained from the past trials over the years, so as to reduce the experimental error to the minimum possible.
- (iii) Plot size and number of replications shall be uniformly same at all the test locations for the crop concerned.
- (iv) An appropriate field plot design shall be adopted as per advice from the project/workshop decision.
- (v) The experiment shall be laid out in a well drained and leveled field. As far as possible all replications shall be accommodated in the same field.

F. Management of the crop: Cultural practices shall be clearly defined at the time of trial constitution and specified by the coordinator. Appropriate date(s) of sowing, seed rate, depth of sowing, row and plant spacing, fertilizer dose and schedule, weed management and use of herbicides, water management, diseases and insect pests management (if needed) etc. shall be strictly adhered to all the test sites as per specified instructions supplied along with the trials.

G. Test locations: The coordinating unit may add some centres on request. But, broadly it will follow the below points.

- (i) Same set of IET for each specified situation shall be grown across zones all over the country in various regions, where the crop is predominantly grown. The test centres shall be identified by Project Directorate in the workshop. Test locations could be ICAR Institutes/SAUs Main or Regional Research Centres/Zonal Research Centres/State Govt. Centres, where a multi-disciplinary team of scientists is positioned and adequate operational facilities exist to carry out the coordinated trials as per instructions.
- (ii) Every effort should be made to have maximum number of test sites and there should be at least three trial sites in each zone where the crop is important. Additional test locations should be decided on the basis of existence of well developed centres and predominance of the crop.
- (iii) The trial centres shall be well spread over the cropping region and clustering of trial sites in any region shall be avoided.

H. Monitoring of the trials: All the trials at all the locations shall be monitored by a team of scientists to be deputed by the Project Director. The monitoring team shall have the following minimum composition:

PD /PI /Zonal Coordinator	Team Leader
Breeder	Member
Agronomist Member	
Pathologist /Entomologist	Member
Scientist of any other specified discipline	Member

- (i) The team shall record observations on the quality of trial and the conduct as per specified norms and comment on reliability of the data likely to be generated.
- (ii) The monitoring team shall record observations on uniformity within the test plots, crop stand, disease and insect-pest incidence, bird damage etc. and any other feature having a bearing on quality of data generated and attributable to the crop management aspects.
- (iii) The monitoring team shall also indicate an estimate of yield of the trial on the basis of their observations.

I. Data to be generated

- (i) In addition to data on produce of economic importance, observations would be recorded on agronomic features like days to flowering, maturity, plant height, lodging, shelling percentage; reaction to important diseases and insect-pests; easily measurable grain quality attributes such as grain color, grain weight, grain-appearance etc. The characters on which data shall be recorded would be specified in advance by the workshop/PD.
- (ii) Additional data under artificial test conditions and hot spots for important diseases and insect-pest shall be generated by the concerned discipline scientists by organizing separate set screening nurseries/trials.
- (iii) The Project Director will supply to each test centre a set of Performa/data books with details for recording of various observations as also the standard scale of measurement for each character along with the list of standard descriptors.
- (iv) All the AICRP-M centres shall record observations strictly according to guideline provided and ensure the supply of one set data books to the coordinator by the specified date.

J. Processing of data: All the data received at the coordination cell by the respective AICRP-M centres shall be critically examined to decide whether the data is fit for inclusion in the statistical processing or not.

- (i) The trial data may be considered for discarding or further processing at this stage on the following basis.
 - a. Recommendations of the monitoring team.
 - b. Suggestions by the zonal coordinator/concerned breeder.

- c. Any other serious flaw in data recording/reporting.
- (ii) All the trials considered acceptable on the above basis may be statistically analyzed and examined for the following before pooling of the results.
- a. **General yield levels:** In case of irrigated situation, trials with extremely low yield normally attributable to poor crop management, or exceptionally high yields which can be considered unrealistic and presumably arising out of various types of errors, may be discarded. In case of trials under restrictive environments such as rainfed, salt affected, water logged conditions etc., this criteria should not be applied and all trials where the check entries have produced reasonable yield should be considered for analysis irrespective of the overall poor trial average yield/extremely poor performance of test entries.
 - b. **Coefficient of Variation (C.V.) levels:** Irrigated trials showing highly erratic behavior of genotypes over replications, resulting in non acceptable high C.V. Levels arising from extremely heterogeneous fields, hazards like bird/animal/hail damage may be discarded. In case of trials in rainfed/restrictive environments, all trials showing significant genotypic differences and reasonable yield level for the checks should be considered.
 - c. **Erratic performance of checks:** Trials, where performance of the checks is low and unrepresentative of the general trial performance, may not be considered.
- (iii) Data from all the trials qualifying on the above criteria may be pooled, analyzed for stability etc. and included in the result books.
- (iv) The data on ancillary characters may be compiled/summarized appropriately and presented in the result books. Means and ranges may be given.
- (v) Data generated in additional trials/nurseries by other disciplines may be appropriately analyzed and presented in the result books.
- K. Norms for promotion of entries to second year of testing:** The test entries will be promoted across all the zones from IET to AET I if a test entry is showing superior performance over best check in at least one zone. The objective of evaluating test entries across all the zone in AET I is to give sufficient opportunity for a test entry for one more additional year.
- (i) The promotion of entries from IET to AET I would be strictly based on the overall performance/merits of the test entries in at least one zone. The following criteria would be followed for this purpose:
 - (ii) Outstanding performances for yield/main produce of economic importance of the entry {by a margin of 5% (Late maturity group) to 10% (Medium, early and extra-early maturity group)} over the best performing check within the zone and with no compromise of other features *viz.*, late maturity, late (>CD5%) silking, late (>CD5%) anthesis, susceptible to pests etc.

OR

(iii) Significant superiority of main produce of economic importance over the best performing check in combination with specific favourable attribute such as high degree of resistance to diseases and insect-pests relevant to the region along with acceptable produce quality characters.

OR

(iv) Yield/main produce of economic importance *at par* with the best performing check but significant superiority in some important specific feature such as disease/insect- pest resistance/or some specific quality trait.

OR

(v) Yield marginally lower than the best performing check but outstanding in one or more strategic feature relevant to the crop/such as specific industrial product property, export quality, nutritional superiority etc. which will result in higher cash return/per unit area to the cultivator/country.

4.1.2. Advance Evaluation Trials (AET-I)

A. **Constitution of trials:** AET-I shall be constituted in the same manner as that of IET but the test entries are the one which have promoted on the basis of criteria specified earlier, from the IET in at least one zone.

B. **Number of test entries:** The number of entries can vary depending upon the number of promoted entries based on the superior performance prescribed earlier.

C. **Checks**

D. **Source and quality of seed**

E. **Management of Trials**

F. **Test locations**

G. **Monitoring of the trials**

H. **Plot size, number of replications and field layout**



Same as given under IET

(i) Plot size for AET-I shall be larger than IET so as to make more realistic estimates of yield performance and reduce the inadequacies/errors of measurements inherent in small plots. Therefore, the plot size for AET-I double than the IET and estimates of sampling errors there from an average yield recorded.

(ii) The design of experiment to be followed shall be RCBD with 3-4 replications *or* any other suitable design so as to enable detection of specified minimum yield differences among the entries as stated earlier.

I. **Data to be generated:** The data on plant stand, height, days to flowering and maturity, economic yield shall be recorded at all the centres.

(i) **Additional data to be generated at AET-I stage:** Data on insect pest resistance and other

ancillary characters, shall be recorded only at the centres where facilities exist and as specified by PD/workshop.

- (ii) Data on biochemical and processing quality parameters shall be generated from selected sites in specified laboratories.
- (iii) All data shall be generated using scales and procedures as specified by PD/workshop.
- (iv) Data on field reaction to important diseases/insect pests shall be recorded under artificial epiphytotic conditions by the concerned disciplines at appropriate locations including hot spots. Data on pathotype/biotype variation, the level of virulence etc shall be generated.
- (v) At AET-I stage each entry shall be critically described by the breeder and also by PD units using standard descriptors for maize crop. For this work cooperation of Seed Technology Research Centres shall be obtained. The Project Director shall arrange to send seed samples of test entries under AETs to Project Coordinator, Seed Technology.

J. Processing of data: Procedure shall be same as specified for IET

K. Promotion of entries to AET-II: The norms specified under IET shall be followed at this stage also but here onwards the entries will be promoted at zone level.

4.1.3. Advance Evaluation Trials (AET-II)

A. Constitution of Trial: Shall be constituted separately for each recognized agro ecological zone by the entries promoted from AET-I on the basis of criteria specified earlier

B. Number of test entries: The number of entries can vary depending upon the number of promoted entries based on the superior performance prescribed earlier.

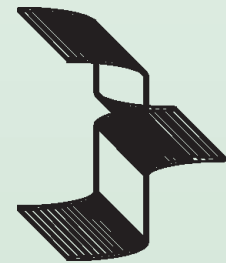
C. Checks

D. Source and quality of seed

E. Management of Trials

F. Test locations: The number of trial sites shall be more than that of IET/AET-I in a given zone. In addition to the IET/AET-I test centres this trial if possible it should be conducted at other centres which shall include zonal research stations of the state agricultural universities / regional research centres of ICAR Institutes / Agric. Colleges / KVKs / agriculture experimental centres of the department of Agriculture research farms of the participating private sector organization including NGOs with adequate facilities.

- (i) The trial sites shall be well distributed in the region, where the crop is important and the number of sites shall relatively be more in regions with larger area under the crop.
- (ii) The minimum number of test locations from which data of acceptable quality should be generated



Same as given
under IET/
AET-I

shall not be less than 4 per zone per season and preferably many more.

- (iii) In case for any reason, the number of locations from which data of acceptable quality are received falls less than 4 in a zone, the number of seasons/years of testing shall be increased to maintain minimum test standards.
- (iv) In case of critical environments/ difficult testing situations such as rainfed, salt affected soils / water logged conditions etc., the number of test centres producing data of acceptable quality may be reduced to a minimum of 3 per season/year and number of testing years increased.
- (v) Co-operators from the private sector with established R & D units may be involved in the conduct of the trial however their involvement may be restricted to locations where test locations with public sector organizations are not available.

G. Monitoring of the trials

The monitoring procedure shall be the same as given for IET. However, more than one team/sub-teams may be constituted to cover as many centres as possible.

H. Plot size, number of replications and field layout:

- (i) Plot size for AET-II shall be larger than AET-I so as to make still more realistic estimates of yield performance and reduce the inadequacies/errors of measurements inherent in small plots. Therefore, the plot size for AET-II 50% more than the AET-I and estimates of sampling errors there from an average yield recorded.
- (ii) The design of experiment to be followed shall be RCBD with 3-4 replications *or* any other suitable design so as to enable detection of specified minimum yield differences among the entries as stated earlier.

I. Data to be generated: In addition to generation of data recorded in the previous trials IET and AET-I, more elaborate data shall be generated which include:

- (i) *Additional data to be generated at AET-II stage:* Response to agronomic variables such as different dates of sowing, population densities in terms of spacing, levels of fertilization and irrigation etc., as recorded from exclusive trials conducted at selected centres by the agronomists. Response of new strains to weedicides may also be studied. Additional Research disciplines such as agronomy, physiology, soils science etc., as per crop needs may be involved at appropriate stage for evaluation of features relevant to the discipline. These discipline groups may constitute and conduct separate set of trials to generate relevant data.
- (ii) Reaction to additional diseases and insect-pests of relatively lesser importance to the crop including nematodes viruses and bacteria. Attempt should also be made to identify; genes responsible for resistance / tolerance in the new strains.
- (iii) Intensive evaluation for crop specific quality parameters shall be done including oil recovery / processing properties/ will be worked out in laboratories where such facilities exist and specified by PD/workshop.

- (iv) Response to relevant abiotic stresses and other important characters shall be recorded with the help of concerned Projects Directors/ Cooperators from respective disciplines.
- (v) Seed Technology centres shall work for preparing descriptors important for seed certification/ varietal registration for plant variety protection.
- (vi) Additional information on farmer / consumer / market acceptance shall be generated through verification trials, on farm trials.

J. Processing of data: same as in IET and AET I

4.2. List of Important characters on which data should be recorded

A. Grain yield (kg/ha)

B. Agronomic features

- (i) Plant height (cm)
- (ii) Ear placement height (cm)
- (iii) Days to 50% pollen shedding
- (iv) Days to 50% silking
- (v) Days to 75% brown husk
- (vi) Total plant stand/plot
- (vii) Total number of plants bearing cobs

C. physiological characteristics

- (i) Plant type in a scale of 1-5. 1 is the best desirable plant while 5 is the poorest

D. Ear aspects

- (i) Cob size, length, girth, etc.
- (ii) Husk tightness: cover extending beyond the tip is desirable and rated in the scale of 1-5. (1 good to 5 poor)
- (iii) Moisture of (5 cobs) grains at harvest

E. Diseases and insect pests

- (a) Major diseases
 - (i) Maydis leaf blight (Ration scale of 1-5)
 - (ii) Turcicum leaf blight (-do-)
 - (iii) Downy mildew (%)
 - (iv) Physoderma (1-5 scale)
 - (v) Stalk rot (%)

- a. Pre- flowering stalk rot
- b. Post- flowering stalk rot
- (vi) Rust in rabi and kharif maize
- (b) Major insect pests
 - (i) Stem borer (%)
 - a. *Chilo partellus*
 - b. *Sesamia inferens* – rabi
 - (ii) Thrips

F. General Quality parameters

- (i) Protein content (%)
- (ii) Lysine (%)
- (iii) Tryptophan (%)
- (iv) Starch (%)
 - a. Amylose (%)
 - b. Amylopectin (%)
- (v) Oil content (%)
- (vi) Chapati making properties

G. Milling processing quality

- (i) Shelling (%)
- (ii) Embryo weight (%)

H. Standard descriptors

- (i) Plant type (very tall/ tall/ medium/ short and very short)
- (ii) Plant height (cm)
- (iii) Ear placement height (cm)
- (iv) Seedling vigour (1-5)
- (v) Days to 50% pollen shed
- (vi) Days to 50% silking
- (vii) Days to 75% brown husk
- (viii) Leaf colour (dark green/ green/ pigmented margin or pigmented vein)
- (ix) Stem (thick, thin)

- (x) Number of nodes/ inter- nodes
- (xi) Leaf angle (acute/ obtuse)
- (xii) Leaf senescence (green after maturity)
- (xiii) Ear size (large/ medium/ short)
- (xiv) Husk cover (loose/ tight, well-extended or up to the tip only)
- (xv) Tassel (large/ medium/ small, loose/ compact/ colour- green/ purple/ light)
- (xvi) Anthers (colour-green/ pale yellow/ pigmented glumes etc.)
- (xvii) Silk colour (green/ purple/ light)
- (xviii) Kernel colour (yellow/ orange/ white/ creamy white)
- (xix) Kernel appearance (Flint/ semi-flint/ dent/ semi-dent/ flint with caps,)

4.3. List of Characters for which data should be recorded at the Initial Evaluation Trial (IET)

- (i) Fresh cob yield (kg/plot)
- (ii) Plant stand/plot (%)
- (iii) Moisture % (5 cobs /replication)
- (iv) Plant height (cm)
- (v) Ear placement height (cm)
- (vi) Days to 50% pollen shed
- (vii) Days to 50% silking
- (viii) Days to 75% brown husk
- (ix) Plant aspects
- (x) Ear aspects
- (xi) Reaction to diseases and pests
- (xii) Grain type and colour
- (xiii) Moisture percentage
- (xiv) Shelling percentage

4.4. List of characters on which data should be recorded at the Advance Evaluation Trial (AET)

All characters on which data to be recorded at IET and testing against pests under artificial infestation at centres and selected hot spots for major insect pests.

4.5. List of characters/variable on which additional data should be generated at final stage of testing

- (i) Response to fertilizers levels and plant density

- (ii) Problems related to Hybrid seed production
- (iii) Rigorous testing against diseases and pests under artificial inoculations/ infestations at centers and selected hot spots for major diseases and insect pests.

4.6. Plot size and number of replications

- IET (Initial Evaluation Trial): 2 rows of 5 meters length with minimum of 2 replications
- AET-I (Advance Evaluation Trial-1st year): 4 rows of 5 meters with 3 replications
- AET-II (Advance Evaluation Trial 2nd year): 6 rows of 5 meters with 3 replications

4.7. Data collection in Specialty corns (QPM, Sweet corn, Popcorn and Baby corn)

Before recording the data/observation one must self at least 5 plants in each entry of QPM, Sweet corn and Popcorn trials. Only the selfed seeds should be used for taking observations on quality parameters. In case of baby corn, one should harvest the baby corn after 2-3 cm of silk emergence. Further detasseling is one of the important activities in baby corn trial so timely detassling in all the entries of the baby corn trials should be ensured. Ears should be covered with silk bags so that pollen from other plants does not fall on the silk of baby corn. Assured irrigated condition is required for baby corn and sweet corn Trials to assess their performance.

4.8. List of Important characters on which data should be recorded (QPM, Sweet corn, Popcorn and Baby corn)

A. QPM

- (i) Total protein content (%)
- (ii) Lysine (%)
- (iii) Tryptophan content (%)

B. Sweet corn

- (i) Brix reading of total soluble sugars (TSS) at 19 to 21 days after self pollination at least five random plants in each entry
- (ii) Green ear yield after 21 days of anthesis (both green ear with husk and without green husk should be taken) the observations should be adjusted to 80% moisture.

C. Popcorn

- (i) Popping percentage
- (ii) Popping volume

D. Baby corn

- (i) The number of baby corn per plant at least in five random plants per entry
- (ii) Baby corn yield (both with husk and without husk)

Table 1. Details of trials in each maturity group

Stage of Testing	No. of years	Number of rows with 75cm X 20cm spacing between R-R and P-P respectively						
		Late (>100)	Medium (85-100)	Early (75-85)	Extra Early (<75)	QPM	Popcorn	Sweet Corn
IET	01	2(TR61)	2(TR62)	2(TR63)	2(TR64)	4	4	4
AETI	01	4(TR65)	4(TR66)	4(TR67)	4(TR68)	4	4	4
AETII	01	6(TR69)	6(TR70)	6(TR71)	6(TR72)	4	4	4
Replications	—	3	3	3	3	3	3	3
Pathology and Nematology	01	2	2	2	2	2	2	2
Pathology, Nematology and Entomology	02	2(TR75)	2(TR76)	2(TR77)	2(TR78)	2	2	2
Replications	—	2	2	2	2	2	2	2
Agronomy	01	Late	Medium	Early	Extra Early	QPM	Popcorn	Sweet Corn

Table 2. The requirement of seed quantity of test entries under different trials

Stage of testing	Quantity of seed (Untreated only) need to be submitted
IET	3.0 kgs
AET-I	6.0 kgs
AET-II	6.0 kgs per zone
Sweet corn and popcorn	3.0 kgs

Table 3. Agro- Climatic Zones

Zone	States Covered under the Zone
Zone IA	Jammu and Kashmir, Sikkim
Zone IB	Jammu and Kashmir, Uttarakhand, Himachal Pradesh and Meghalaya
Zone II	Jammu and Kashmir, Punjab, Haryana, Delhi, Uttar Pradesh, Uttarakhand
Zone III	Assam, Bihar, Jharkhand, Orissa, Uttar Pradesh
Zone IV	Karnataka, Andhra Pradesh, Tamil Nadu, Maharashtra
Zone V	Rajasthan, Madhya Pradesh, Chhattisgarh, Gujarat

4.9. Variety Identification Procedure

Superior eligible test entries shall be identified in the Annual Maize Workshop/group meeting for presentation to the Central Sub-Committee on Crop Standards Release and Notification. This shall be done by a committee called “Variety Identification Committee” constituted in advance of Annual Maize Workshop/group meeting with the approval of the Deputy Director General (Crop Science).

DDG (CS) or his nominee	Chairman
Director of Research of SAU of the region	Member
Agriculture Commissioner (Dept. of Agric.)	Member
One Director of Agriculture (state govt.)	Member
One representative of Seed organization (NSC,SFCI,SSC)	Member
Representative of maize-based Processing/manufacturing industry	Member
One representative of private seed agencies	Member
Two eminent scientists Members	Member
Project Coordinator (Seed Tech)	Member
Project Director / Project Coordinator	Member secretary

The Principal investigators of different research disciplines shall assist the committee in the capacity of resource persons and will not have voting right. The committee members shall be informed well in advance of the meeting by Project Director.

4.9.1. Process of identification

- (i) **Eligibility for identification:** The candidate variety shall become eligible for identification on fulfilling the following minimum requirements:
- (a) Three years of yield data from co-ordinated trials under given ecology (rainfed/irrigated) etc.
 - (b) At least two year data on disease and pest reaction generated at hot spot/artificial epiphytotic conditions under the coordinated project, and
 - (c) At least one year data on agronomic performance with special reference to response to dates of sowing/planting, population density, fertilizer and irrigation levels.
 - (d) Availability of enough pure seed for planting 5 ha. In case of non-availability of seed, in specified quantity, the identification process may be postponed to later stage, at the most by one year.
 - (e) Availability of Pure/nucleus seed of high quality with the breeder for producing breeder seed in at least for 0.5 ha area. The nucleus seed should have been produced as prescribed for each crop.

- (ii) **Compilation of data:** The data from three years of co-ordinated testing of the candidate variety shall be compiled by the concerned breeder/institute in the prescribed proforma (**Annexure II**) and submitted to Project Directorate 15 days prior to the workshop. In case, the concerned breeder is not able to propose the entry for some unavoidable reasons, the Project Director may make proposals considering the importance of the material.
- (iii) **Presentation of proposal:** Project Director shall present the release proposals to the committee highlighting the characteristics of the candidate variety and related PIs may be asked to clarify specific points by the Committee. The Committee may ask the Project Director not to participate in decision making in case the Project Directorate Unit has an entry under consideration for identification. The Committee may invite the concerned breeder or his representative for details /clarification. The Committee shall state in brief the specific reasons identification/re-testing or rejection of the proposal of a candidate variety.
- (iv) **Norms for identification:** The identification shall be on the basis of the following norms:
- a) Significant superiority for yield / produce of economic importance, over the best performing check (including qualifying checks) and acceptable level of other features.
- OR
- b) Yield/produce of economic importance comparable to the best performing check but combining specific favorable attributes such as tolerance to biotic and abiotic stresses relevant to the region/ agro-ecology along with other acceptable features *viz.* quality characters, suitability for specific cropping system of the region etc.
- OR
- c) Yield marginally lower to the best performing check but outstand in one or more crucial traits such as specific product quality-nutritional superiority, industrial processing property, export quality etc., which result in higher cash return per unit area to the cultivator / country.
- d) The candidate entry should be uniform for important characters like height, maturity and particularly in respect of distinguishing morphological characters in the region recommended for.
- e) In case the candidate variety qualified on the above characteristics is distinct enough from already released varieties on the basis of any of the morphological, or other diagnostic characteristics for which data available, it should be made identifiable on the basis of biochemical/ molecular markers before final release.
- f) The candidate variety must be stable for the key trait(s) (such as resistance to a specific disease/insect pest) for which it has been identified for the region.
- (v) **Relaxation in minimum years of testing for identification:** One year relaxation in respect of the period of testing under the coordinated system may be considered by the Variety Identification Committee under the following situations:

- a) A genotype representing a recognized/recognizable major breakthrough in yield potential/produce of main economic importance.
- b) A genotype capable of minimizing heavy yield losses by containing major epidemic of any disease or insect-pest against which the existing varieties are vulnerable
- c) A genotype capable of providing safety against a widely occurring disease/insect-pest of major importance and causing economic losses on large scale and for which resistance is not available in the already released varieties.
- d) A genotype possessing a special crucial feature not available in the existing varieties and has wide implication on agricultural exports/processing industries.

Name of Zone, Centres, and States it cover across the country for testing of test entries under AICRP-M

Zone	AICRP on Maize Centre	State
IA	i. Baderwah ii. Gangtok iii. K.D.Farm-Srinagar iv. Sagam	Jammu and Kashmir Sikkim Jammu and Kashmir
IB	i. Almora ii. Bajaura iii. Barapani iv. Kangra v. Poonch	Uttarakhand Himachal Pradesh Meghalaya Himachal Pradesh Jammu and Kashmir
II	i. Jammu/Udhampur ii. Ludhiana iii. Karnal iv. Delhi v. Kanpur vi. Pantnagar vii. Dhaulakuan (For Phathology)	Jammu and Kashmir Punjab Haryana Delhi Uttar Pradesh Uttarakhand Uttarakhand
III	i. Gossaigoan (Jorhat) ii. Dholi iii. Ranchi iv. Bhubaneswar v. Varanasi vi. Bahraich	Assam Bihar Jharkhand Orissa Uttar Pradesh Uttar Pradesh
IV	i. Arabhavi ii. Mandya iii. Karimnagar iv. Hyderabad v. Coimbatore vi. Vagarai vii. Kolhapur	Karnataka Karnataka Andhra Pradesh Andhra Pradesh Tamil Nadu Tamil Nadu Maharashtra
V	i. Udaipur ii. Banswara iii. Chindwara iv. Ambikapur v. Godhra vi. Jabhua	Rajasthan Rajasthan Madhya Pradesh Chhattisgarh Gujarat Madhya Pradesh

Annexure II

Criteria needs to be developed and fixed for nomination of entries (Near Isogenic Lines or Single Cross Hybrid developed using NILs) under Advanced Evaluation Trial to test under AICRIP-M.

With the advent of applications of molecular marker technologies in recent times there is need to develop AICRP-Maize guidelines for testing cultivars developed using latest molecular biology techniques and tools especially the Marker Assisted Selection products under AICRP-M. Similarly there is also need to develop guidelines for testing of the Genetically Modified Maize under AICRP-M. In this regard in the coming Annual Maize Workshop, which will be held on April 20-22, 2012 at CCSHAU, Hisar, there is need to constitute a committee comprising experts from different disciplines to develop criteria's for onward submission and get approval by the ICAR for implementation of guidelines for testing such products. Recently DRR has developed the guidelines to test Near Isogenic Lines (NILs) under AICRP on Rice. Such guidelines also need to be developed for maize as well. The brief details of Directorate of Rice Research (DRR) guidelines for testing NILs are given below.

A set of guidelines for nomination and testing of NILs have been framed by a committee constituted by Ministry of Agriculture in the year 2007 and approved by DDG (CS), ICAR. The meeting has been convened; a committee was constituted to mainly discuss issues related to operationalizing the guidelines for the above mentioned purpose during the 44th Annual Rice Research Group Meeting held at ANGRAU, Hyderabad during May 2009. The members of the committee discussed and finalized a criterion for nomination of entries under AVT1-NIL trial of AICRIP. The committee came out with the recommendations to facilitate the implementation of the guidelines in a practical manner. The details of the recommendations are with the Directorate of Maize Research. However the recommendations addressed several points *viz.*, choice of recurrent parent like it should be a notified variety/parental line of a hybrid which is widely cultivated and accepted by farmers ..., Conformity of the NILs to the recurrent parent as the breeder has to substantiate the proposed near isogenic lines (NILs) for its conformity to the parental variety with appropriate phenotypic data etc. and testing/evaluation of NILs under AICRIP as the NILs should be tested along with the recurrent parent as check for two years to verify the traits that are introgressed. The recommendations were also thrown light on monitoring NIL trials and the procedure to be followed for notification and release of NILs.



**PROFORMA FOR SUBMISSION OF PROPOSALS FOR IDENTIFICATION OF CROP VARIETIES/
HYBRIDS BY THE WORKSHOPS**

1 a) b)	Name of the Variety/Hybrid Species		
2	Parentage		
3	Breeding method used		
4	Developed by (Station and names of workers)		
5	Proposed by		
6	Zone for which to be identified		
7	Production condition for which to be identified		
8	In case of hybrid description of the parents		
9	List (at least two) important morphological features of the proposed variety/hybrid which distinguish it from other important commercial varieties under field condition. Also enclose separately a complete description of the variety”		
10	The new variety/hybrid provides an alternative/replacement for		
11	List main problems and special requirements (in order of importance of the concerned area of recommendation and how the proposed variety helps to resolve these.		
12	Year when first entered in Coordinated Varietal Trials.		
13	Quantity of breeder seed available (a) Variety (B) Parental lines in case of hybrids		
14	Summary/detailed data as per enclosures		
15	Problems and prospects in seed production of parental lines and hybrids and their maintenance. (wherever applicable)		



Summary of yield data of Coordinated Varietal Trials

Name of proposed variety / hybrid:	Adaptability Zone:				C. D.							
	Check Variety	Check Variety	Check Variety	Check Variety								
	1	2	3	4	1	2	3	4	Qualifying Variety	Qualifying Variety	Qualifying Variety	Qualifying Variety
Mean yield Zonal	1 st	2 nd	3 rd									
Mean												
Mean yield Across Zones (if applicable)	1 st	2 nd	3 rd									
Mean												
Percentage increase or decrease over the checks & qualifying varieties	1 st	2 nd	3 rd									
Frequency in the top group (pooled for three years)												

Note: Qualifying variety is one which has completed three years of testing in co-ordinated trials; Centre-wise and year-wise data must be appended otherwise proposal will not be considered.

Adaptability to Agronomic Variables

Name of proposed variety/hybrid:		Adaptability Zone:									
		Production conditions:									
Nature of experiment	Item	Level	No. of trials	Proposed variety	Check Variety 1	Check Variety 2	Check Variety 3	Qualifying Variety 1	Qualifying Variety 2	Qualifying Variety 3	Qualifying Variety 4
Sowing date experiments	Y (q/ha) under recommended sowing date										
	Percentage gain or loss when sown	Early									
		Normal									
Fertilizer Experiment	Y (q/ha) under recommended dose	Late									
	Percentage gain or loss under other doses										
		F0 F1 F2									
Irrigation experiment whenever applicable	Y (q/ha) under adequate irrigation										
	Percentage gain or loss + with irrigation level	Level 1									
		Level 2									
		Level 3									

Note: Specify each date of sowing, fertilizer level and number of irrigations at i, ii, iii, under column two



Reaction to Major Diseases

Name of proposed variety/hybrid:		Adaptability Zone:			Production conditions:				Qualifying Variety							
Disease	Item	Year of testing	No. of trials	Proposed variety	Check Variety	Check Variety	Check Variety	Check Variety	1	2	3	1	2	3	4	
MLB	Natural	1 st														
		2 nd														
		3 rd														
	Artificial	1 st														
		2 nd														
		3 rd														
TLB	Natural	1 st														
		2 nd														
		3 rd														
	Artificial	1 st														
		2 nd														
		3 rd														
BLSB	Natural	1 st														
		2 nd														
		3 rd														
	Artificial	1 st														
		2 nd														
		3 rd														

Name of proposed variety/hybrid:		Adaptability Zone:											
Disease	Item	Year of testing	No. of trials	Proposed variety	Check Variety	Check Variety 1	Check Variety 2	Check Variety 3	Qualifying Variety 1	Qualifying Variety 2	Qualifying Variety 3	Name Variety 4	
PR	Natural	1 st											
		2 nd											
		3 rd											
	Artificial	1 st											
		2 nd											
		3 rd											
	PFSR	Natural	1 st										
			2 nd										
			3 rd										
Artificial		1 st											
		2 nd											
		3 rd											
SDM		Natural	1 st										
			2 nd										
			3 rd										
	Artificial	1 st											
		2 nd											
		3 rd											
	RDM	Natural	1 st										
			2 nd										
			3 rd										
Artificial		1 st											
		2 nd											
		3 rd											

Data on Quality Parameters

Name of proposed variety / hybrid:		Adaptability Zone:							
Insect Name	Item	No. of trials	Proposed variety	Check Variety	Production conditions:				Name Variety
					Check Variety	Check Variety	Check Variety	Qualifying Variety	
Parameter 1				1	2	1	2	3	4
Parameter 2									
Parameter 3									
Parameter 4									
Parameter 5									

Note: specify the parameters at 1 to 4 under first column

PROFORMA FOR SUBMISSION OF PROPOSALS OF CROP-VARIETY TO CENTRAL SUB-COMMITTEE ON CROP STANDARDS, NOTIFICATION AND RELEASE OF VARIETIES

1	Name of the Crop and Species		
2 a)	Name of the Variety under which tested.		
3	Sponsored by		
4 a)	Institution or agency responsible for development variety (with address).		
b)	Name of persons who helped in the development of variety.		
5 a)	Parentage with details of its pedigree.		
b)	Source of material in case of introduction.		
c)	Breeding method		
d)	Breeding objective		
6	State the varieties which most closely resemble the proposed variety in general characteristics.		
7 a)	Whether recommended by Seminar /Conference/ Workshop/State Seed Sub-Committee.		
b)	If so, its recommendations with specific justification for the release of proposed variety.		
c)	Specific areas of its adaptation.		
8	Recommended production ecology		
9	Description of Variety / hybrid.		
a)	Plant height		
b)	Distinguishing morphological characters.		
c)	Maturity (range in number of days) Seeding/ Transplanting to flowering, seed to seed.		
d)	Maturity group (Early, Medium, Extra Early, Late)		
e)	Reaction to major diseases under field and controlled conditions (reaction to physiological strains/races/bio-types to be indicated wherever possible)		
f)	Reaction to major pests (under field and controlled conditions including storage pests)		
g)	Agronomic features (e.g. resistance to lodging, fertilizer responsiveness, suitability for early or late sown conditions, seed arte etc.,		
h)	Quality of produce of grain, forage, fibre including nutritive value		
i)	Reaction to stresses		

10.	Description of parents of hybrid		
a)	Plant height		
b)	Distinguishing morphological characters.		
c)	Days to 50% flowering		
d)	Maturity (Range in number of days-seed to seed)		
e)	Is there any problem of synchronization? If yes, method to overcome it.		
f)	Reaction to major pests (under field and controlled conditions. Reaction to physiological strains/ indicated whenever possible)		
g)	Reaction to major pests (under field and controlled conditions including store pests)		
h)	Agronomic features (e.g. resistance to lodging and other fertilizer responsiveness; seed rate)		
i)	Reaction to stresses		
11 a)	Yield data in regional inter-regional I district trials year wise (levels of fertiliser application, density of plant population and superiority over local control I standard variety to be indicated).		
b)	Yield data from national demonstration I large-seals demonstration.		
c)	Average yield under normal conditions (yield in kgs hectare).		
12 a)	Agency responsible for maintaining breeder seed.		
b)	Quantity of breeder seed in stock in kgs.		
13	Information on the acceptability of the variety by farmersl consumers I industry.		
14	Specific recommendations, if any for seed production.		
15	Any other pertinent information		
16	Vivid presentation with the help of photographs of the variety is to be submitted by the Breeder.		



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