Proceedings of consultation meeting to prepare "Road Map for Seed Research in India"

Division of Seed Science & Technology
Indian Agricultural Research Institute
New Delhi - 110 012

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Proceedings of consultation meeting to prepare "Road Map for Seed Research in India"

Inaugural Session

Welcome and Introduction - **Dr. H. S. Gupta, Director, IARI**
Inaugural Address - **Dr. S. K. Dutta, DDG (CS), ICAR**
Address by guests of Honour - **Dr. R .R. Hanchinal, VC, UAS, Dharwad**
- **Dr. J. S. Sandhu, ADG (Seeds), ICAR**
Address by the Chairperson - **Dr. S. Ayyappan, Secretary, DARE & DG, ICAR**
DG's interactions with seed scientists
Vote of thanks - **Dr. Malavika Dadlani, JD(Research), IARI**

The Consultation Meeting on "**Preparing Road Map for Seed Research in India"** was organized on 1st August, 2011 under the Chairmanship of Dr. S. Ayyappan, Director General, ICAR in Plant Virology Auditorium, IARI, New Delhi. The inaugural session of Consultation Meeting resumed with welcome address by Dr. H.S. Gupta, Director, IARI, New Delhi. At the outset, he welcomed the dignitaries on the dais, Dr. S. Ayyappan, Director General, ICAR, Dr. S.K. Datta, DDG (CS), ICAR, Dr. R.R. Hanchinal, VC, UAS, Dharwad, Dr. J.S. Sandhu, ADG (Seeds), Dr. M. Dadlani, Joint Director (Res.), IARI, Dr. Vilas A. Tonapi, Head, Division of Seed Science and Technology and all the delegates representing both public and private sector who have come from all parts of the country. In his remarks, he emphasized on developing the world-class referral lab in India to address all issues related to seed quality. The issues related to seed policy, seed industry development were highlighted to bring in the harmonization in seed trade for a vibrant seed industry.

Dr. R.R. Hanchinal, VC, UAS Dharwad in his address opined that accesss to good quality seed will aid in enhancing commercial yield by 30% to usher in food security. Further it is required that the focus needs to be on supply of best quality high volume low value seed at the door step of the farmers at reasonable cost. The healthy competition between public and private seed sectors needs to bring in better Bt-cotton hybrid from public sector also. Since storage of seeds is a problem at the village level, the participatory and community based seed systems can help in solving this problem. He urged the scientists to work on issues related to climate change, seed viability and vigour to deliver better technologies to the stake holders.

Dr. J.S. Sandhu, ADG (Seeds), ICAR, stressed on the need to work on developing quick test for genetic purity and seed health management to ensure better seed quality assurance. He was of the opinion that there are still larger indents for very old varieties which need to be replaced with new and best varieties. There are 1200 varieties in seed

chain. It is important to maintain genetic purity to provide best quality seed. He also requested the scientists to explore the new areas for seed production.

Dr. S. Ayyappan, Director General, ICAR in his interaction with the seed scientists was of the opinion that seed is the basic input that creates considerable impact to usher in food security. The National Agricultural Research System including private sector and CG system needs to work on a common platform to deliver relevant innovations and seed production technologies. The new Seed Bill, which would help to streamline the supply of quality seed on new plane, is going to be the harbinger of seed quality assurance to the farmers and seed growers. He invited the views of the delegates relating to most important issues to be addressed in seed research during the next 10 years. The following issues were highlighted.

1. The newly bred hybrids/varieties are not seen the light of the day, hence suitable mechanism needs to be drawn to bring them in seed chain.
2. The seed production technology of unexploited crops including medicinal and aromatic plants needs to be worked out.
3. The vigour and viability of the seeds in relation to seed development and maturation is of prime importance.
4. Though we are talking about enhanced food productivity, the issue of enhancing the seed yield is an issue to be tackled.
5. The new areas of seed production vis-à-vis new provenances need to be explored in a network model. The documentation of entire seed research carried out across the NARS needs to be documented to integrate already carried work into new programme.
6. The effect of climate change on seed production needs to be taken up on war footing.
7. The issue of public-private partnership (PPP) needs to be on the common platform with joint working groups involving various stake holders.
8. The revalidation of new Indian Minimum Seed and Field Standards should be worked at the earliest to have our own seed certification standards.
9. The State of the art Referral Lab needs to be established to address all issues on seed quality.
10. Precision seed technology and innovative techniques, technologies and packaging to enhance shelf life of seed needs to be studied.
11. The work on seed physiology, seed priming and second generation seed treatment technologies relevant to the seed industry needs to be worked out.

12. The off-season areas for seed production, mulching technology, SRI techniques in rice, mechanism of seed production to cut the cost of seed production needs special emphasis.
13. Steps to improve the quality of farmer's saved seeds need to be addressed urgently.
14. Strengthening community seed system needs special emphasis.
15. Better inventions, innovations, novel seed technologies and analytical tools need to emerge from the leads given by basic and strategic research.
16. ICAR Seed Project (Mega Seed Project) needs to be strengthened in the 12th Five Year Plan to work on diversified aspects related to seed production technology and access to quality seed.
17. String of quality seed testing labs with one nodal referral point needs to be established.

Drs. Sankaran, Swati-Sen Mandi, Sadananda, K.V. Prabhu, M. Bhaskaran, M. Dadlani, S.K. Yadav, S.K. Jain, K. Vishunawat, P.S. Nair, R.K. Chowdhury, N.C. Singhal, Randhawa, A.K. Singh, Janaki Ram, A.B. Mandal, P. Kalia, Manish Patel, Vilas A. Tonapi and others participated in the discussion. The inaugural session concluded with formal vote of thanks by Dr. (Mrs.) M. Dadlani, Joint Director (Research), IARI.

Dr. S Ayyappan, Secretary, DARE and DG, ICAR addressing the delegates and Dr. SK Dutta, DDG (Crop Science), ICAR delivering the inaugural address

Session I: Recommendations of the Technical Session on "Seed Production and Quality Assurance

Chairperson : Dr. R.R. Hanchinal, VC, UAS, Dharwad
Rapporteurs: - Dr. S.K. Chakrabarty, DSST, IARI
- Dr. S Natarajan, DSR, Mau

A. Seed Production Technology: Topic introduction
Lead Speakers: - Dr. V. Sankaran, Ex GM (Production), NSC
- Dr. L.V. Subba Rao, Principal Scientist, DRR

B. Validation of seed quality standards and standardization of testing protocols: Topic introduction
Lead Speakers: - Dr. S. Rajendraprasad, UAS, Bangalore
- Dr. V. Shenoy, Director (R), Barwale Foundation

Based on the above mentioned lead presentations that introduced the topics to identify the research gaps and future research needs, following recommendations as focal points of research have emerged:

1. Genetics of floral traits, floral biology and pollination dynamics and effects of maternal environment on seed quality.
2. Basic studies on pollen collection and storage leading to establishment of pollen banks.
3. Studies on physiological manipulations to enhance ovule to seed ratio.
4. Identification of suitable seed provenances to form 'National Seed Grid' including off-season seed production.
5. Seed production technologies for minor millets and other minor crops.
6. Studies on organic seed production and flower seed technology.
7. Seed production techniques under protected cultivation.
8. Effect of climate change on pollination dynamics and management of insect pollinators.
9. Bringing mechanization in seed production technology to optimize seed production economics.
10. Production technology for higher seed production in different crop varieties including vegetatively propagated crops and planting material.
11. Studies on pre-harvest sprouting in crops.
12. Seed processing studies for new crop varieties.
13. Validation of ITKs related to Seed Science and Technology.
14. Standardization of DNA finger printing/molecular tools to replace/supplement GOT.

15. Identification of regions and studies on seed production technologies for off-season multiplication for summer ground nut varieties.
16. Seed storage studies in high volume crops viz. groundnut, soybean and other poor storers.
17. Optimization of micro-nutrients and growth regulators in relation to reproductive behavior to increase the seed yield.
18. All the crop improvement programmes needs to have standardized seed production and protection technology before a new hybrid or variety is released.
19. Developing policy document to enable contact seed farming.
20. Use of second generation tools for seed quality assessment.
21. Developing weed seed herbarium and weed seed identification handbook.
22. The blue book has been published long back the amendment has not been put to the book of Indian minimum seed certification standards which was published in 1988. Hand book of seed testing has to be revised since it was published in 1993. Hence revalidation seed and field standards need to be taken up on priority.
23. Standardizing quality measures for primed and colored seeds.
24. Harmonization of morphological traits in GOT and DUS testing.
25. Enhancing quality seed availability through farmers' participatory seed production, and developing new models for strengthening community seed systems
26. Standardizing seed production technology and standards for genetically modified seed crops.
27. Pest risk analysis and Identification of (pest) disease free zones for quality seed production to harmonize with the OECD standards, and identification of pest and disease free zones and disease and pest risk analysis

Dr. HS Gupta, Director, IARI and Dr. RR Hanchinal, Vice-chancellor, UAS, Dharwad addressing the delegates

PROPOSED ROAD MAP

Three network projects are proposed to work on following priority areas:

A. Seed production

1. Network project on identification of alternative areas for hybrid seed production in rice, maize and vegetables (main/off-season, staggered sowing, protected cultivation etc.) and off-season ground nut.

2. Network project on validation/upgradation of field and seed standards/protocols
   - isolation distance
   - sample size
   - physical purity and ODV
   - designated disease
   - seed health
3. Identification of major seed-borne diseases and developing seed standards for the same.

B. Seed Quality Assurance

1. Establishment of referral laboratory for seed quality evaluation.

2. Referral laboratory for DNA finger printing of varieties for establishing identity and genetic purity.

C. Human Resource Development

1. Gap analysis of wave-length of academic curricula and upcoming seed-industrial requirements (as put forth by the industry) to synchronize the academic and industrial expectations synergistically

2. Development of effective R&D linkages between NSP centres, seed technology units at ICAR institutes, SAUs and private seed companies.

3. Exposure visits and advanced training of the scientists in reputed labs (both national & international).

Session II: Basic research and seed quality enhancement

Chairperson : Dr. J.S. Sandhu, ADG (Seeds)
Co-chairperson : Dr. M. Dadlani, JD(R), IARI
Rapporteurs : Dr. M. Bhaskaran, Head, DSST, TNAU
Dr. Sherry R. Jacob, NBPGR

A. Basic studies on seed germination, vigour and longevity: Topic introduction

- Dr. Swati Sen-Mandi, Prof., Bose Institute, Kolkata
- Dr. V. Krishnasamy, Prof., Biotechnology, TNAU

B. Second generation seed quality enhancement technologies: Topic introduction

- Dr. Dr. V.A. Tonapi, Head, DSST, IARI
- Dr. Manish Patel, Incotech India Pvt. Ltd.

Based on the above lead presentations, the following research gaps and researchable areas have emerged to prepare the roadmap for seed research in this area:

1. Species, varietal and seed lot specific studies on molecular basis of seed germination, vigour and longevity, along with basic studies on the role of LPOs, ACCs and flavonoids in seed vigour and longevity. For a comprehensive analysis of seed germination, both pre- and post-maturation stages should be analyzed.

2. Genetic and molecular basis of seed dormancy is another major area to be addressed.

3. Optimization of harvesting time based on physiological maturity indices to ensure maximum seed quality, needs to be studied.

4. Mechanism of desiccation tolerance, enhancing storage life of primed seeds, synthetic seed technology, and basic seed anatomy studies.

5. Advanced biotechnological and OMIC tools should be utilized, for staying in tune with international research.

6. Linking of all the basic studies with practical field situation is very important. For this basic and applied research should go hand in hand.

7. The basic research needs to translate into useful analytical tools and novel technologies.

8. Absence of commercial protocols for even routinely followed techniques like seed priming and dormancy breaking is a matter of serious concern and has to be looked into.

9. The novel analytical tools currently emerging in the Seed Industry viz., cold plasma coating, single seed analyzer, chlorophyll fluorescence analysis, Q_2 technology, electron treatment needs to be adopted to enhance seed quality.

10. Packaging materials, packaging environment vis-a-vis seed viability and longevity, including vacuum packing for seed storage.

11. To obtain maximum benefit from second generation seed treatment technologies and analytical tools, which are highly accurate and reproducible, we need to have an integrated approach involving Seed Industry, Physical Science, Plant Science and Computer Science.

12. Creating facilities for on farm seed priming through community seed systems need to be explored to benefit rainfed seed ecology.

13. Designing workable drying technologies in relation to wet treatment of crops needs special emphasis.

14. Developing designer seeds with switch-on and switch-off mechanism of germination to avoid staggered planting and to aid perfect synchrony.

PROPOSED ROAD MAP

Three network projects are proposed to work on following priority areas:

1. Network project on physiological, biochemical and molecular basis of seed germination, dormancy, vigour and longevity.
2. Network project on seed quality enhancement using second generation technologies.
3. Network project on second generation drying technologies, packaging materials, packaging environment *vis-a-vis* seed viability.

Technical Session III: Variety Maintenance, Protection and Seed Testing

Chairperson : Dr. K.V. Prabhu
Co-chairperson : Dr. S. Rajendraprasad
Rapporteurs : Dr. SK Lal, IARI, New delhi
Dr. K. Keshavulu, Head, DSST, ANGRAU

A. Molecular tools for variety maintenance and purity testing: Topic introduction

- Dr. K.V. Prabhu, Head, Genetics, IARI
- Dr. K.V. Bhatt, Principal Scientist, NBPGR

B. Establishing norms for protection of EDVs: Topic introduction

- Dr. A.K. Singh, Senior Scientist, IARI
- Dr. Aravind Kapur, CEO, Hyveg Rasi Seeds

There were three presentations in this session by Dr.K.V. Prabhu, Dr. KV Bhat, Dr. A.K. Singh and Dr. Arvind Kapur. The following issues have emerged to prepare roadmap for seed research in these areas:

1. Developing genotype-wise, marker-system-wise protocol for maintenance with signature marker or trait marker of a variety as a tool for identifying a progeny family for bulking in nucleus seed product.

2. Developing crop wise protocol for quick on-site sampling immediately before packaging from each production location/site.

3. Molecular markers enabled genetic purity testing of the commercial seed lots products and management of nucleus seed and its further maintenance.

4. To prescribe the minimum sample size for molecular marker based genetic purity testing.

5. To establish threshold level for EDV's (crop-wise).

6. Association between threshold levels based on morphological evaluation and molecular polymorphism for optimizing the genome coverage and marker systems.

7. Determine through statistical robustness, the distribution of markers over chromosomes and genome similarity percentage.

8. Standardization of format for reporting DNA fingerprinting results.

9. Establishment of cropwise Advisory body/Referral lab for implementation of quality control system.

PROPOSED ROAD MAP

Three network projects are proposed to work on following priority areas:

1. Network project on development of genotype-wise marker system for varietal identification and genetic purity maintenance.
2. Network on developing national data base of DNA profiles.
3. Network project to develop thresholds for EDVs based on morphological and molecular characters.

Dr. Malavika Dadlani, Joint Director (Research), IARI presenting the Roadmap for Seed Research in India

Plenary session

Chairperson : Dr. S.K. Dutta, DDG (CS), ICAR
Rapporteur : Dr. Mohan S. Bhale, JNKVV, Jabalpur

In the plenary session, Dr. SK Dutta, DDG (Crop Science), ICAR, opined that all the seed scientists need to develop proactive thinking to address the most important basic, strategic, applied and anticipatory research problems to deliver the required innovations, technologies and practical solutions to the seed grower, seed industry and other stake holders.

Dr. Malavika Dadlani, Joint Director (Research), presented the recommendations that have emerged from the deliberations in the preceding three technical sessions and the emerging areas for developing network projects.

It was suggested by the chairman that a core group representing researchers, industry, DAC, administrators and the policy makers should meet in next few weeks and develop the network projects to address the most important key issues in XII Plan. The meeting concluded with formal vote of thanks by Dr. Vilas A. Tonapi, Head, Division of Seed science and Technology, IARI.

A view of interaction sessions, and Dr. JS Sandhu, ADG (Seeds) addressing the delegates

Programme

Consultation meeting on "Road map for Seed Research in India"
Date : August 1, 2011: Venue : Plant Virology Auditorium, IARI

Inaugural Session

08:00 AM Registration
08.27 AM Assembly and Invocation: ICAR Theme song
08:30 AM Welcome and Introduction - Dr. H.S. Gupta, Director, IARI
08:45 AM Inaugural Address - Dr. S.K. Dutta, DDG (CS), ICAR
Address by guests of Honour : - Dr. RR Hanchinal, VC, UAS, Dharwad
- Dr. JS Sandhu, ADG (Seeds), ICAR
09:00 AM Address by the Chairperson - Dr. S. Ayyappan, DG, ICAR
09:15 AM DG's interactions with seed scientists
09:45 AM Vote of thanks - Dr. Malavika Dadlani, JD(R), IARI

09.55 AM **Tea Break**

10:30 AM **Technical Session I: Seed production and quality assurance**
Chairperson : Dr. R R Hanchinal, VC, UAS, Dharwad
Rapporteur : Dr. S.K. Chakraborty, DSST, IARI
Dr. S Natarajan, DSR, Mau

A. Seed Production Technology: Topic introduction
- Dr. V. Sankaran, Ex GM (Production), NSC
- Dr. L.V. Subba Rao, Principal Scientist, DRR

10:45 AM **Open Discussion**
11:15 AM **Chairperson's remarks**

11:30 AM **B. Validation of seed quality standards and standardization of testing protocols: Topic introduction**
- Dr. S. Rajendraprasad, UAS, Bangalore
- Dr. V. Shenoy, Director (R), Barwale Foundation

11:45 PM **Open Discussion**
12:15 PM **Chairperson's remarks**

12:30 PM **Technical session II: Basic research and Seed quality enhancement**
Chairperson : Dr. JS Sandhu, ADG (SEED), ICAR
Co-Chairperson : Dr. Malavika Dadlani, JD(R), IARI
Rapporteur : Dr. M. Bhaskaran, Head, DSST, TNAU
Dr. Sherry R. Jacob, NBPGR

C. Basic studies on seed germination, vigour and longevity: Topic introduction
- Dr. Swati Sen-Mandi, Prof., Bose Institute
- Dr. V. Krishnasamy, Prof., Biotechnology, TNAU

12:45 PM **Open Discussion**
01:15 PM **Chairperson's remarks**

01:30 PM **Lunch Break**

02:15 PM **Continuation of Technical session II**

D. Second generation seed quality enhancement technologies: Topic introduction

- Dr. Dr. V.A. Tonapi, Head, DSST, IARI
- Dr. Manish Patel, Incotech India Pvt. Ltd.

02:30 PM **Open Discussion**

03:00 PM **Chairpersons remarks**

03:15 PM **Technical session III: Variety maintenance, protection and seed testing**

Chairperson : Dr. KV Prabhu, Head, Div. of genetics, IARI
Co-Chairperson : Dr. S. Rajendraprasad, UAS, Bangalore
Rapporteur : Dr. K. Keshavulu, Head, DSST, ANGRAU
Dr. Sandeep Lal, IARI, New Delhi

B. Molecular tools for variety maintenance and purity testing: Topic introduction

- Dr. K.V. Prabhu, Head, Genetics, IARI
- Dr. K.V. Bhatt, Principal Scientist, NBPGR

03:30 PM **Open Discussion**

04:00 PM **Chairpersons remarks**

04:15 PM **Tea break**

04:30 PM **B. Establishing norms for protection of EDVs: Topic introduction**

- Dr. A.K. Singh, Senior Scientist, IARI
- Dr. Aravind Kapur, CEO, Hyveg Rasi Seeds

04:45 PM **Open Discussion**

05:15 PM **Chairpersons remarks**

05:30 PM **Plenary Session**

Chairperson : Dr. S.K. Dutta, DDG (CS), ICAR
Rapporteur : Dr. Mohan S. Bhale, JNKVV, Jabalpur

Research Priorities - Dr. Malavika Dadlani, JD(R), IARI

06:00 PM Chairperson's remarks

06:30 PM Vote of thanks - Dr. Vilas A. Tonapi, Head, DSST, IARI

06:35 PM **Tea: Meeting concludes**

List of Participants

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