



**Proceedings of the XIV
RESEARCH ADVISORY COMMITTEE
MEETING**

25-26 July 2012

**National Bureau of Plant Genetic Resources
New Delhi-110 012**

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Proceedings of the XIV Meeting of the Research Advisory Committee for the NBPGR, held on 25-26 July 2012

Fourteenth meeting of the RAC, NBPGR was held in New Delhi on 25-26 July, 2012. The following members were present:

Dr. R.S. Rana:	Chairman
Dr. A.K. Tyagi:	Member
Dr. K.D. Srivastava:	Member
Dr. V. A. Parthasarthy:	Member
Dr. K. C. Bansal:	Member
Dr. J.S. Sandhu:	Member
Dr. Sai Kumar:	Member
Dr. Pritam Kalia:	Member
Dr. I.S. Bisht:	Member Secretary

Two members, Dr. P. N. Mathur and Dr. Ranjini Warriar, had sought leave of absence.

The meeting was also attended by all the Heads of Divisions/Units/Cells at the main campus and the Officers-in-Charge of the Regional Stations as special invitees and their names are listed in Annex-1. The Agenda and programme of the meeting are attached as Annex-2 and 3.

After welcoming the Chairman and other Members of RAC, Dr. K.C. Bansal, Director made a presentation on salient achievements of the Bureau during the year. The RAC team appreciated the outstanding work done by Bureau's scientists and particularly commended the Council's increased focus on consolidating gains already made in germplasm collecting, characterising, documenting, conserving and exchanging (with outstanding PQ screen) while also promoting their greater utilization by breeders by employing both conventional and molecular tools and techniques.

The Chairman, Dr. R. S. Rana, in his introductory remarks expressed his satisfaction over the Council's approval of all the 23 recommendations of the previous meeting, held in September 2011, and complimented the Director and all the staff members on their outstanding accomplishments since the previous meeting. He then elaborated the RAC's role pointing out how its mandate differed from that of the IRC as well as QRT and reiterated the RAC Team's resolve to provide stronger support to the Bureau in further strengthening and streamlining its research programmes, including its networking and outreach activities, and also developing better infrastructure and working facilities not only at the main campus but also at all the Regional Stations and National Active Germplasm Sites. He recalled that the previous meeting had focused on increasing efficiency and effectiveness of Bureau's research programmes, particularly supporting the core service activities, while promoting linkages, partnerships and synergies. He further added that identifying and overcoming the constraints that limit the pace of progress and capacity building at different levels would receive greater attention during the present meeting.

In their opening remarks, Dr. Tyagi urged speeding up of the research work on pre-breeding and functional analysis of genes while Dr. Srivastava emphasized giving

priority to documentation and Dr. Sai Kumar pleaded for undertaking more need-based joint explorations in collaboration with the maize breeders. Dr. Parthasarthy suggested more attention to plantation crops and spices, particularly the vegetatively propagated group, and Dr. Kalia recommended more attention to vegetable crops, particularly on the wild relatives.

Following approval of the minutes of the RAC XIII meeting, the Action Taken Report on the recommendations of the XIII RAC meeting was presented by Dr. I.S. Bisht, Member Secretary RAC as attached in Annex-4. The Chairman appreciated the point-wise response to the recommendations while taking note of some recommendations that were not fully implemented. He complimented Dr. Bisht for his painstaking effort and also thanked the Director for extending full support to the functioning of the RAC Team.

Brief but very informative presentations were then made by all the Heads of Divisions/ Units/Cells located at the main campus and also the OICs of all the ten Regional Stations on their mandated activities, notable achievements and proposed new initiatives while also mentioning some major constraints adversely affecting the progress of their research work. Salient points emerging from the draft minutes and recommendations of the last IRC meeting, held on 14-16 May this year, were presented by Dr. Celia Chelam and the RAC Team highly appreciated this useful input. Highlights of all the presentations are provided in Annex-5.

Major Issues Identified

The following issues, emerging from the presentations and follow up discussions, were further deliberated at length to formulate recommendations:

- More attention and vigorous follow up to some of the recommendations of the previous meeting that required longer time span for their effective completion.
- Considering that strength of the two platforms (among the 35 proposed by the Council during the XII Plan), focusing on agrobiodiversity and genomics, will depend on how well they are prepared, major attention is to be devoted to preparing a national atlas projecting the on-going, and also the proposed activities, in an integrated mode so as to present an All-India dimension across all the Bureaus, their regional stations and also the NAGS. The NBPGR is expected to play a lead and pro-active role in this entire exercise and the RAC may provide suitable inputs and guidance as required.
- Need to induct more scientific staff in key specializations like taxonomy/plant introduction, genetics & plant breeding and database management.
- Need to induct more technical staff in support of the Bureau's core service activities.
- Developing inter-disciplinary research projects linking Genomics Unit with Evaluation and Conservation Divisions.
- Need for another X-ray screening machine in the PQ Division.
- Urgent need to strengthen Germplasm Exchange Unit.

During the concluding session, Dr. Bansal projected the Bureau's vision and action plan for the next five years pointing out largely to the two platforms on agrobiodiversity and genomics and stressing that the recently launched programme on intensified characterizing and screening of germplasm collections of 10 prioritised

crops would be expanded to 15 crops. Dr. Tyagi added that Bureau's vision appeared to be in harmony with the emerging global scenario.

Dr. Rana summarized the points emerging from the preceding discussions and emphasized on increasing the scientific content in Bureau's programmes and the need for integrating more research-oriented activities into its projects, particularly for the emerging new conserving options and also for managing the PGR database. He also pointed to the unprecedented opportunity, offered by the COP-11 meeting of the 193 countries who are Parties to CBD and also the sixth meeting of the COP-MOP to the Cartagena Protocol on Biosafety taking place at Hyderabad in October this year, opening to the Council a new window for projecting its success stories in collecting, documenting, conserving, utilizing and exchanging agrobiodiversity for promoting food and livelihood security and serving thereby as a model for other biodiversity-rich developing countries.

Recommendations:

1. Speed-up action on the following recommendations made by the RAC-XIII meeting held in September, 2011.

All the 23 recommendations, made by the RAC-XIII meeting held in September, 2011 were accepted by the Council and marked to the Director for implementing. The following eleven recommendations were, however, not fully attended to owing primarily to the nature of the activities involved and, hence, the RAC reiterates its earlier recommendations and further recommends for speeding up action on those that were only partially implemented and to submit an action taken report for discussion in its next meeting.

S. No.	Recommendation made by the RAC-XIII meeting	Action Reported	Action Pending
1.	Gap analysis of germplasm collected and conserved in the National Gene Bank.	Soft copy of all the data with the NGB has been provided to the Head Pl. Exploration Division for gap analysis of germplasm collected by them and those conserved in the NGB.	The requested report has not yet been submitted to the RAC on actually conducting a gap analysis and its outcome. This item needs urgent attention of the Council/ Bureau.
2.	Greater attention to conservation of wild relatives of crop plants.	All data on wild species has been updated by the Conservation Division and a soft copy has been provided to the Plant Exploration Division for undertaking a gap analysis of germplasm collected and those conserved in the	RAC had recommended that a Committee comprising Heads of the Conservation and the Pl. Exploration Divisions and OICs of Shimla, Shillong and Thrissur may develop a Status Paper on the collection of wild relatives of crop plants and their availability in field gene banks and the NGB, along with suitable conservation action

		National Gene Bank with a view to planning further explorations and collecting.	plan and put up in the next RAC meeting. The requested Status Paper has not yet been prepared and put up for discussion in the RAC meeting.
3.	Special attention to be given to collecting and conserving diversity in horticultural crops.	Special drive has been undertaken in the NEH region and some other selected areas.	It was reported that NAB on Management of Genetic Resources had recommended that the responsibility of planning and coordinating specific explorations of all horticultural crops be delegated to IIHR, Bangalore. The matter was discussed by the RAC and it was recommended that NBPGR must remain associated with this effort and an action plan be prepared and made available to the RAC for further discussion.
4.	Improving the pace of flow from exploring & collecting to long term storage in the NGB.	It was recommended that a Committee (comprising HODs of Pl. Exploration, Germplasm Evaluation and Conservation, OIC of Regional Station at Akola and the ARIS Cell) may identify the bottlenecks and suggest what needed to be done to improve the pace of flow from the Exploration and Collection stage and a Report be made available to the RAC.	The requested report has not yet been made available to the RAC for further discussion on this topic, This task needs to be accorded high priority.
5.	Developing core sub-sets of the large base collections of 10 major crops.	Core sets in 4 crops have been developed and mini-core sets in 15 crops are under preparation.	A proper Status Report on the work already done, including validation of the core sets, needs to be made available to the RAC for further discussion.
6.	Validation of trait specific unique accessions for use by plant breeders.	Inventory of 9 crops has been compiled by the Conservation Division for further validation.	Work on validation of the desirable unique traits is yet to begin. The prepared inventory needs to be printed at the earliest and made available for further discussion.
7.	Mass characterizing & screening of germplasm	Extensive field work has already been undertaken in ten crops.	It was recommended that a Status Report be prepared and presented for discussion in the

	collections of prioritized 10 crops.		next RAC meeting. The Status Report is yet to be prepared and made available for further discussion.
8.	Accelerating the pace of developing National Permafrost Conservation Facility.	Several rounds of discussions have been held.	Not much headway appears to have been made. There is need for assigning high priority to this task.
9.	Strengthening partnership with NAGS	The proposal is under consideration of the Council.	It was recommended that a Report be submitted to the next RAC on the functioning of the already identified 57 NAGS and rationalization of adding more such sites. No specific report has yet been prepared submitted to the RAC for further discussion.
10.	Upgrading status of two Base Centres to Regional Stations.	Availability of staff and other resources are being ensured --- ---	There is no justification in not designating these two Base Centres as the Regional Stations when they are essentially discharging the same functions as the Regional Stations. The staff strength is not the consideration. The reality needs to be accepted and these Base Centres be designated as Regional Stations. In fact the Bureau has been naming them as Regional Stations in all its reports/ publications.
11.	Allocating core budget to Divisions and regional Stations.	Efforts are underway to allocate some core budget to different Divisions / Regional Stations of the Bureau.	Funds still remain to be allocated and released to the Divisions/ Regional Stations.

2. Preparing National Atlas projecting National Agrobiodiversity Strategy and Action Plan based on the on-going and proposed biodiversity conserving activities under the XII Plan Platforms.

Considering that strength of the two platforms (among the 22 proposed by the Council during the XII Plan), with a focus on agrobiodiversity and genomics, will depend on how well and precisely they are prepared, RAC recommends that major attention be devoted to preparing a national atlas projecting the on-going, and also the proposed activities, in an integrated mode so as to present an All-India dimension across all the Bureaus, their regional stations and also the NAGS.

The NBPGR is expected to play a lead and pro-active role in preparing the proposed atlas projecting National Agrobiodiversity Strategy and action Plan and the RAC may provide suitable inputs and guidance as required.

3. Inducting more scientific staff in key specialisations

NBPGR has at present 115 scientists in position against the sanctioned scientific staff of 152. Out of these, 85 are working at the main Campus and 30 at the Regional Stations. Their distribution is as shown below:

S. No.	Division/Unit/Cell	No. of Scientists	S. No.	Regional Station	No. of Scientists
1.	Director's Cell	1	1	Akola	2
2.	Pl. Exploration & Collection	6	2	Bhowali	3
3.	Germplasm Evaluation	20	3	Cuttack	2
4.	Plant Quarantine	11	4	Hyderabad	8
5.	Conservation	9	5	Jodhpur	2
6.	Germplasm Exchange	5	6	Ranchi	2
7.	TCCU	8	7	Shillong	3
8.	PPU	1	8	Shimla	1
9.	ARIS	2	9	Srinagar	1
10.	NRC (DNA FP)	21	10	Thrissur	6
11.	AICRN on UUC	1			
Total		85			30

Considering that there are 37 vacant positions of scientists and there is an urgent need to fill up these positions since the NBPGR is a service-oriented institution and its core service activities are under-performing because of the shortage of scientific staff, RAC recommends that these vacancies be filled by the Council on high priority. Also noting that there is acute shortage of scientific staff in some key disciplines, RAC further recommends that high priority be also accorded to adding more scientists with specialization in Economic Botany/Taxonomy and Genetics & Plant Breeding so as to strengthen the germplasm collecting and evaluation activities. Further, some positions including social science (like Agril. Economics, Sociology/Anthropology, Agril. Statistics), legal expert and computer science are also needed in view of the Bureau's emerging lead role.

4. Increasing technical support to key service activities

Trained technicians, working under the guidance and supervision of scientists, form the backbone of key service activities of the Bureau. There are 119 sanctioned positions of technical staff for the NBPGR against which 94 are in position. RAC strongly recommends that the 25 vacant positions of the technical staff may be filled under a special drive and top priority to accelerate the pace and improve the output of Bureau's research effort and services to the users of PGR.

5. Developing inter-Divisional research projects

Convinced of the need of the Division of Germplasm Conservation and also of the Germplasm Evaluation Division for DNA profiling of some of their valuable seed

samples, RAC recommends that suitable inter-divisional research projects be developed linking these Divisions to the NRC on DNA Fingerprinting (Division of Genomic Resources) for getting their needs met through collaborative research work.

6. Providing one more X-ray machine for the PQ Division

Keeping in view that an X-ray machine is urgently needed by the PQ Division for ensuring that only pest-free seed samples enter the LTS modules, RAC recommends early procurement of another X-ray screening machine for dedicated use for sanitary checking of seed samples meant for long term storage in the National Gene Bank.

7. Restoring the status of the Germplasm Exchange Unit to the Germplasm Exchange Division.

Recalling that the Bureau arose originally from the Plant Introduction Division of the erstwhile Botany Division (now the Genetics Division) of the IARI and its major objective was introduction and exchange of plant genetic resources as reflected in its original name of the National Bureau of Plant Introduction and noting that the Division of Germplasm Exchange was established in recognition of its important role and also on learning that its status was later reduced to that of a Unit, RAC strongly recommends that its earlier status of the Division be restored to provide much needed support to its envisaged role and expanded activities. Also, noting that superannuation of the Principal Scientist in-charge of this Unit is due early next year, RAC further recommends that due advance action be initiated to fill up this position. Additionally, the Division of Cryobiology, as envisaged in XII Plan EFC of NBPGR, is also a welcome timely initiative.

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

Dr. I.S. Bisht
Member Secretary, RAC

Dr. R.S. Rana
Chairman, RAC, NBPGR

Annexure-1

List of Participants

RAC Members

1. **Dr. R.S. Rana** Chairman
Ex-Director, NBPGR; D-43, IndraPrastha Apartment, Sector-14,
Rohini, New Dehi-110085
2. **Dr. Akhilesh Kumar Tyagi** Member
Director, National Institute of Plant Genomic Research,
ArunaAsaf Ali Marg; P.O. Box No. 10531, New Delhi-110 067
3. **Dr. V.A. Parthasarthy** Member
Narmada Nilaya, Santhi Nagar, Chelavoor P.O., Calicut-673571
4. **Dr. K.D. Srivastava** Member
Ex-Professor, IASRI, House No. 23, Block No. 7, Sector 30-31,
Springfield Colony, Faridabad-1211003, Haryana
5. **Dr. J.S. Sandhu** Member
Assistant Director General (Seed), Indian Council of Agricultural
Research (ICAR), KrishiBhavan, New Delhi – 110114
6. **Dr. R. Sai Kumar** Member
Project Director, Directorate of Maize Research, Pusa Campus,
New Delhi-110 012
7. **Dr. PritamKalia** Member
Head, Division of Vegetable Sciences, IARI, New Delhi-110012
8. **Dr. K.C. Bansal** Member
Director, National Bureau of Plant Genetic Resources (NBPGR),
Pusa Campus, New Delhi-110012
9. **Dr. I.S. Bisht** Member Secretary
Principal Scientist & I/C Technical Cell, NBPGR, New Delhi-110
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Special invitees

1. Dr. D.C. Bhandari, Head, Plant Exploration & Collection Division
2. Dr. R. K. Tyagi, Head, Germplasm Conservation Division
3. Dr. P.C. Agarwal, Head, Plant Quarantine Division
4. Dr. M. Dutta, Head, Germplasm Evaluation Division
5. Dr. Arjun Lal, OIC, Germplasm Exchange Unit
6. Dr. Rekha Chaudhary, OIC, Tissue Culture and Cryopreservation Unit
7. Dr. K.V. Bhat, OIC, DNA Fingerprinting Unit
8. Dr. Pratibha Brahma, OIC, PGR Policy Unit
9. Dr. Sunil Archak, OIC, ARIS (AKMU) Lab.
10. Mr. A. Nizar, OIC, NBPGR RS, Akola
11. Dr. S.K. Verma, OIC, NBPGR RS, Bhowali
12. Dr. D. Pani, OIC, NBPGR Base Centre, Cuttack
13. Dr. S.K. Chakrabarty, OIC, NBPGR RS, Hyderabad
14. Dr. Om Vir, OIC, NBPGR RS, Jodhpur
15. Dr. J.B. Tomar, OIC, NBPGR Base Centre, Ranchi
16. Dr. A.K. Mishra, NBPGR RS, Shillong
17. Dr. J.C. Rana, OIC, NBPGR RS, Shimla
18. Dr. Sheikh M Sultan, OIC, NBPGR RS, Srinagar
19. Dr. N.K. Dwivedi, OIC, NBPGR RS, Thrissur

Annexure-2

AGENDA ITEMS

XIV Meeting of the RAC (NBPGR) NBPGR, New Delhi: 25-26 July 2012

1. Welcome and presentation on salient achievements since RAC-XIII meeting Director, NBPGR
2. Opening Remarks Chairman and Members of the RAC
3. Confirmation of the minutes of the XIII RAC meeting, held on 24-25 Sept. 2011, and Action Taken Report Member Secretary, RAC
4. Presentation on current status of on-going research work, Constraints and Emerging issues Divisions/ Units at NBPGR, New Delhi
5. Presentation on On-going research work, Constraints and Emerging issues Regional Stations of NBPGR
6. Presentation of IRC meeting's draft Minutes and Recommendations Member Secretary, IRC
7. Discussion and Recommendations All Divisions/ Units/ Cells, Regional Stations
8. Vision for the next 5 years Director, NBPGR
9. Discussion and Suggestions
10. Closing Remarks Director, NBPGR
Members and Chairman, RAC
11. Vote of thanks Member Secretary, RAC

Annexure-3

PROGRAMME

XIV Research Advisory Committee (RAC) Meeting of NBPGR

Venue: Dr. H. B. Singh Committee Room, NBPGR, New Delhi

Date: 25-26 July 2012

25 July 2012 (Wednesday)			
Opening Session			
10.00 - 10.20 hrs	:	Welcome and presentation on salient achievements since the XIII meeting	Director, NBPGR
10.20 - 11.00 hrs	:	Opening Remarks	Chairman, & Members of RAC
11.00 - 11.45 hrs	:	Confirmation of the minutes of the XIII RAC meeting	Member-Secretary, RAC
		Action Taken Report on recommendations of RAC-XIII Discussion	Member-Secretary, RAC
Presentation of Overview of on-going research work; Constraints and Emerging issues			
11.45 – 14:50 hrs: Divisions/Units at NBPGR, New Delhi			
11:45-12:00 hrs		Division of Plant Exploration and Collection	: Dr. D.C. Bhandari, Head of Division (HOD)
12:00-12:15 hrs		Germplasm Exchange Unit	: Dr. Arjun Lal, Officer-in-Charge (OIC)
12:15-12:30 hrs		Division of Plant Quarantine	: Dr. P.C. Agarwal, HOD
12:30-12:45 hrs		Division of Germplasm Evaluation	: Dr. M. Dutta, HOD
12:45-13:00 hrs		Germplasm Conservation Division	: Dr. R. K. Tyagi, HOD
13:00-13:10 hrs		Tissue Culture and Cryopreservation Unit	: Dr. Rekha Chaudhury, OIC
13:10-13:20 hrs		PGR Policy Planning Cell	: Dr. Pratibha Brahmi, OIC
13:20-13:30 hrs		NRC on DNA Fingerprinting	: Dr. K.V. Bhat, OIC
13:30 - 14:30: LUNCH			
14:30-14:40 hrs		ARIS Cell	: Dr. Sunil Archak, OIC
14:40-14:50 hrs		AICRN on Under-utilized Crops	: Dr. D.C. Bhandari, Nodal Officer
14:50 - 16:45 hrs: Regional Stations of NBPGR			
14:50-15:00 hrs		Akola	: Mr. A. Nizar
15:00-15:10 hrs		Bhowali	: Dr. S.K. Verma
15:10-15:20 hrs		Cuttack	: Dr. D. Pani
15:20-15:30 hrs		Hyderabad	: Dr. S.K. Chakrabarty
15:30-15:40 hrs		Jodhpur	: Dr. Omvir Singh
15:55-16:05 hrs		Ranchi	: Dr. J. B. Tomar
16:05-16:15 hrs		Shillong	: Dr. A.K. Mishra
16:15-16:25 hrs		Shimla	: Dr. J.C. Rana
16:25-16:35 hrs		Srinagar	: Dr. Sheikh M Sultan
16:35-16:45 hrs		Thrissur	: Dr. N.K. Dwivedi
16:45- 17:00 hrs: Presentation of IRC meeting's draft Minutes and Recommendations - Dr. V. Celia Chelam, Secretary, IRC			

26 July 2012 (Thursday)			
Discussion and Recommendations			
10.00 - 10.10 hrs	:	Exploration & Germplasm Collection	Dr. D.C. Bhandari*
10.10 - 10.20 hrs	:	Germplasm Evaluation	Dr. M. Dutta*
10.20 - 10.30 hrs	:	Plant Quarantine	Dr. P.C. Agarwal*
10.30 - 10.40 hrs	:	Germplasm Exchange	Dr. Arjun Lal*
10.40 - 10.55 hrs	:	Germplasm Conservation Seeds, In Vitro, Cryopreservation	Dr. R. K. Tyagi* Dr. Rekha Chaudhury*
10.55 - 11.05 hrs	:	NRC on DNA Fingerprinting	Dr. K.V. Bhat*
11.05 - 11.15 hrs	:	Under-utilized Crops	Dr. D.C. Bhandari*
11.15 - 11.25 hrs	:	PGR Policy Planning	Dr. Pratibha Brahma*
11.25 - 11.35 hrs	:	ARIS Cell	Dr. Sunil Archak*
11.35 - 11.45 hrs	:	Regional Station, Shimla	Dr. J.C. Rana*
11.45 - 11.55 hrs	:	Regional Station, Bhowali	Dr. S.K. Verma*
11.55 - 12.05 hrs	:	Regional Station, Shillong	Dr. A.K. Mishra*
12.05 - 12.15 hrs	:	Regional Station, Hyderabad	Dr. S.K. Chakrabarty*
12.15 - 12.25 hrs	:	Regional Station, Thrissur	Dr. N.K. Dwivedi*
12.25 - 12.35 hrs	:	Regional Station, Akola	Mr. A. Nizar*
12.35 - 12.45 hrs	:	Regional Station, Jodhpur	Dr. Omvir Singh*
12.45 - 12.55 hrs	:	Regional Station, Ranchi	Dr. J. B. Tomar*
12.55 - 13.05 hrs	:	Regional Station, Cuttack	Dr. D. Pani*
13.05 - 13.15 hrs	:	Regional Station, Srinagar	Dr. Sheikh M Sultan*
13.15 – 14.00 hrs. : LUNCH			
Concluding Session			
14.00 - 14.15 hrs	:	Vision for research: next 5 years	Director, NBPGR
14.15 - 15.00 hrs	:	Discussion and Suggestions	All Participants
15.00 - 15.55 hrs	:	Concluding Remarks	Director, NBPGR Members, RAC Chairman, RAC
15.55 - 16.00 hrs	:	Vote of thanks	Member-Secretary, RAC
16:00 hrs: TEA			

* Nodal persons to initiate discussion

Annexure-4

ATR on Recommendations of XII RAC Meeting held at NBPGR on 24-25 Sept. 2011

S. No.	Recommendation	Action Point
1.	<p>Identifying suitable sites for in-situ on-farm conservation of agro-bioresources</p> <p>Taking note of the progress made under the NAIP-Component 3 towards initiating in-situ on-farm conservation of agrobioresources in three states on an experimental basis, the RAC recommended that a committee under the chairmanship of Director, NBPGR and comprising HODs, Plant Exploration and Conservation; and OIC, Regional Station at Shimla may identify suitable sites for on-farm conservation interventions by the Bureau. Also considering that documentation of communities' agro-bioresources is essential to support <i>in situ</i> conservation on-farm activities, it further recommended that the Director may consider assigning the technical guidance role for developing the Community Agrobiodiversity Registers to the PGR Policy Planning Unit with a suitable follow-up report to the RAC.</p> <p style="text-align: center;">(Action: Director, NBPGR; HODs, Pl. Exploration and Conservation; OICs, PGR-PPU and Regional Station at Shimla)</p>	<p><i>In situ</i> (on-farm) conservation aspects of plant genetic resources are addressed in several projects/ programmes being executed/ coordinated by NBPGR.</p> <ul style="list-style-type: none"> • The NBPGR RS Shimla, has identified two sites, (i) Chidgaon Lower for 'Chauhatu red rice' and (ii) Dharchandna (Dhar, Tikkri and Sharrar) for 'finger millet' and 'grain amaranth' in Sirmour district. Baseline survey has been completed and 10 farmers in each cluster have been identified for taking up the activity further. Data on the inventory of genetic diversity will start from the kharif 2012. • A project entitled "Field level conservation of germplasm with community participation and establishing nurseries on shared basis with community to improve rural incomes: A project for Jharkhand" is in progress in collaboration with Gene Campaign. • For <i>in situ</i> on-farm conservation of agro-bioresources, a Concept Note was developed and submitted for the Seed Platform. The same has been further modified and resubmitted to Directorate of Seed Research, Mau, for inclusion in Mega Seed Project based on recent review on ICAR Platforms by DG, ICAR. (GCD). • The NAIP (GEF) sub-project on Biodiversity currently operative in three disadvantaged districts, Chamba, Udaipur and Adilabd primarily focuses on on-farm management of agro-biodiversity and linking the local bioresources to livelihood security of farming communities. Further, the CBRs/PBRs for villages under interventions are also being developed under the project. • Dr Pratibha Brahmi (as Director's nominee) attended the National Consultation-cum-workshop on People's Biodiversity Register organised by National Biodiversity Authority(NBA), MoEF, Karnataka Biodiversity Board with the support of UNDP and GEF, at Bangalore from 23-24 Dec., 2011. She participated in the workshop and contributed as member of the "Working group on Awareness raising on PBRs". The recommendations have been published in the Proceedings of the National Consultation brought out by the NBA. (PPU). • A few model case studies on <i>in situ</i>

		conservation on-farm are also envisaged in the proposed Agrobiodiversity Platform of ICAR to be coordinated by the NBPGR.
2.	<p>Adoption of an integrated approach to conservation of plant genetic resources</p> <p>Appreciating the need for adopting a holistic and comprehensive strategy for germplasm conservation, the RAC strongly recommended rationalizing and integrating all the following methods of germplasm conservation under one programme:</p> <ul style="list-style-type: none"> • In- situ on-farm conservation initiatives • Orthodox seeds stored in LTS modules • Non-orthodox (recalcitrant) seeds/ propagules conserved as tissue cultures • Gametes, embryos, buds and other propagules stored in cryo-preservation • Genomic resources • National Permafrost Conservation Facility • Field genebanks • National Active Germplasm Sites <p style="text-align: right;">(Action: Director's Cell)</p>	Conservation of PGR is practically considered as an integrated approach for management and reporting purposes in national context. However, for operational purposes, specific components are suitably addressed across various divisions/ units/ stakeholders wherever the desired expertise is available. Efforts are underway to develop effective networks with NAGS for maintenance and supply of active collections. As envisaged, a centralized database of PGR at NBPGR, will ensure easy access to genetic resources and associated information thereto to all stakeholders across the country.
3.	<p>Maintenance of LTS and MTS modules operating at different locations</p> <p>Considering that the 12 long term and 23 medium term seed storage modules were purchased under the Indo-US and Indo-UK PGR projects in 1990s and all the spare parts procured at that time had already been used, the RAC strongly recommended urgent procurement of adequate quantities of essential spare parts on a high priority basis to minimize the risk of possible breakdowns.</p> <p style="text-align: right;">(Attention: Director's Cell; HOD, Conservation Division)</p>	Requirement for upgradation and modernization, and maintenance of LTS and MTS facilities of the National Genebank has been discussed, document prepared and being submitted as XII Plan EFC, for consideration of the Council.
4.	<p>Gap analysis of germplasm collected and conserved in the National Genebank</p> <p>With a view to identifying areas for planning future explorations, the RAC recommended that inventories of all the germplasm accessions collected and also those currently available in National Genebank be prepared and a critical gap analysis be conducted to recognize the gaps in base collections as well as the areas which were not fully represented. It was further recommended that a document on locally adapted and commonly grown farmers' landraces, that were collected but were somehow missing in the National Genebank, be prepared and put up for discussion in the next RAC meeting.</p> <p style="text-align: right;">(Action: HODs, Plant Exploration and Conservation; OIC, ARIS Cell)</p>	<ul style="list-style-type: none"> • The soft copy of the database of National Genebank with physically verified and updated/authenticated data has been provided to Head, Plant Exploration Division for gap analysis of germplasm collected and conserved in the National Genebank. • The information on germplasm collected and conserved in NGB has been compiled, and future explorations are being planned based on the gap analysis. Further, the information on named landraces is being authenticated based on available passport data and collection of germplasm not available in genebank is in progress. However, this work will be further intensified as a specific activity under the proposed Agrobiodiversity Platform of the Council.

<p>5.</p>	<p>Greater attention to conservation of wild relatives of crop plants</p> <p>Taking note of the constraints for maintenance of germplasm of wild relatives of crop plants and their shy bearing nature and considering their inadequate representation in the National Genebank, the RAC recommended that a Committee (comprising HODs, Plant Exploration and Conservation and OICs, Regional Stations at Shimla, Shillong and Thrissur) may develop a status paper on the collection of wild relatives of crop plants and their availability in field genebanks and the NGB, along with a suitable conservation action plan, and put up for discussion in the next meeting of RAC.</p> <p style="text-align: center;">(Attention: HOD, Conservation)</p>	<ul style="list-style-type: none"> • The complete data on the wild relatives of different crop group were physically verified, updated and the soft copy has been provided to Head, Plant Exploration Div. for gap analysis of germplasm collected and conserved in the National Genebank so that an analysis of the collection of wild relatives of crop plants and their availability in field genebanks and the NGB can be ascertained for developing the status paper. • Emphasis has been given for germplasm collection of priority species of wild relatives (<i>Oryza</i>, <i>Abelmoschus</i>, <i>Cucumis</i>, <i>Luffa</i>, <i>Trichosanthes</i>, <i>Cajanus</i>, <i>Sesamum</i>, and <i>Vigna</i>) after gap analysis. For example, in wild rice, 424 acc. of <i>Oryza nivara</i> were collected of which 230 have been conserved in NGB from Odisha (101), UP (54) and WB (75). Based on this, more germplasm accessions of <i>O. nivara</i> (16) and <i>O. rufipogon</i> (17) were assembled from Chhattisgarh, Tripura and UP during 2011; more explorations to be carried out this year in NEH region. • A total of 1561 accessions in 146 taxa of wild relatives of crop plants belonging to 16 genera mostly collected from Western Ghats and Andaman and Nicobar Islands are being maintained in the MTS/FGB of NBPGR RS Thrissur. • Similar data from other regional stations are being compiled.
<p>6.</p>	<p>Special attention to conservation of diversity in horticultural plants</p> <p>Recognizing the importance of genetic resources of horticultural plants and taking note of their inadequate representation in the National Genebank, the RAC recommended a special drive be conducted for this purpose and a report presented during the next RAC meeting.</p> <p style="text-align: center;">(Attention: HODs, Plant Exploration, Conservation; OICs, Regional Stations)</p>	<ul style="list-style-type: none"> • Under a special drive to NEH region during 2011, 18 explorations were carried out in collaborative mode collecting 1378 acc. of which 639 acc. were of horticultural crops (vegetables -499; fruits- 68; spices- 4 and CWR- 68). • Four explorations were undertaken for collection of horticultural crops. In collaboration with Directorate of onion and garlic, Pune, two explorations were undertaken for onion and garlic and a total of 124 accessions were collected. One exploration was undertaken for palmyrah palm in collaboration with TNAU and 15 accessions were collected. An exploration was conducted for <i>Zehneria angulata</i> and <i>Momordica dioica</i> in which 78 accessions were collected. (NBPGR RS Hyderabad). • The National Advisory Board on Management of Genetic Resources (NABMGR) has recommended that the responsibility of planning and coordinating specific explorations, maintenance and evaluation of all horticultural crops be delegated to IIHR, Bangalore. Dr. S. Ganeshan, Pr. Sci. & Head, PGR Division has been identified as the nodal officer for the purpose.

<p>7.</p>	<p>Improving the pace of flow from germplasm collection to the genebank Taking note of the information made available by the HODs of Plant Exploration and Conservation and also OICs of Regional Stations regarding the pace of flow of the collected samples from the Plant Exploration Division to the National Genebank after due processing and checks, the RAC found that there was considerable scope for improvement in this context by streamlining the linkages among different nodes, the RAC recommended that a Committee (comprising HODs of Plant Exploration, Germplasm Evaluation and Conservation, OICs of Regional Station at Akola and the ARIS Cell) may critically analyse the situation, identify the bottlenecks and suggest improvements with a report submitted for discussion during the next RAC meeting . (Attention: HODs, Pant Exploration, Germplasm Evaluation, Conservation; OICs, Akola and ARIS Cell)</p>	<ul style="list-style-type: none"> • The pace of flow of material from germplasm collection (or further multiplication, till sufficient seed quantity is generated as per Genebank standards), its processing for pest free conservation and seed quality standards are monitored and coordinated between the Exploration, Conservation, Quarantine and ARIS Division/ Cell. It is suggested that only multiplied and characterized germplasm should be sent to genebank for conservation. An advance planning should be done for initial seed increase and characterization (nodal person, location, season), before collection of germplasm. (GCD) • To improve the flow of germplasm between two nodal points (collection and conservation) and keeping the NGB standards, a threshold level has been fixed for the collector i.e. 2000/ 4000 minimum seeds per acc. for self and cross-pollinated crops, respectively and for wild at least 500 seeds per acc. In problem spp. like endemic, narrow distribution/ of specialized habitats to be dealt on case by case basis to ensure conservation of collected germplasm. (PECD) • As germplasm multiplication/ regeneration is highly resource consuming and difficult job, it may be suggested that crops collected through exploration should be regenerated at appropriate agro-ecological locations and/or at crop based institutes by respective collectors and deposited in the NGB. Subsequently characterization and evaluation can be taken up by GED. (GED)
<p>8.</p>	<p>Developing core sets of large base collections in the genebank Taking note of some very large base collections in certain crops, the RAC recommended that core sets may be developed in some selected crops to accelerate their use by the breeders and other researchers with a suitable report to the RAC. (Attention: HOD, Germplasm Evaluation)</p>	<ul style="list-style-type: none"> • So far, core sets have been developed in four crops viz., sesame, green gram, okra and brinjal. Efforts are underway to develop core sets in wheat and chickpea by characterizing the entire NGB collection in these two crops. • Specific core set has been identified in kidney bean. Of the 4117 accessions, 176 and 196 accessions have been identified in bush and pole category, respectively. The data are being analysed and accessions have been planted at Shimla for validation and further seed increase for validation at more locations is underway. (NBPGR RS Shimla). • Development of core/monicore/ reference sets are envisaged in 15 prioritized crops proposed to be taken up for agronomic evaluation, and detailed trait specific multilocation evaluation of core/minicore sets under AICRPs.

<p>9.</p>	<p>Validation of trait specific unique accessions for use of plant breeders Taking note that many accessions in the National Genebank have desirable unique traits of much interest to the breeders, the RAC recommended that these trait-specific attributes may be got validated and the resulting information may be extended to all potential users with a report to the RAC. (Attention: HODs, Conservation and Evaluation)</p>	<ul style="list-style-type: none"> • The inventory for trait-specific germplasm of pigeonpea, rapeseed-mustard, groundnut, safflower, soybean, tomato, amaranth, rice and wheat have been compiled and is ready for publication; which may be validated by NAGS/concerned breeders as proposed in Agrobiodiversity Platform. (GCD) • Majority of the accessions with unique traits have been introduced by private companies and/or plant breeders who generally validate these germplasm at their own level. However, under MLE using hot spot locations and artificial screening facilities available at crop based institutes limited number of germplasm in a few selected crops are being evaluated. (GED).
<p>10.</p>	<p>Mass screening of collections in suitable hot-spot locations Highly appreciating the mass screening of germplasm collections programme undertaken so successfully for ten crops during the X and XI Plans to identify promising genotypes, the RAC recommended that this programme may be further expanded during the XII Plan. It was further recommended that a status report on the accessions not yet been characterized be prepared and presented for discussion in the next RAC meeting. (Attention: HODs, Conservation and Evaluation)</p>	<ul style="list-style-type: none"> • Under X Plan (2002-07), a total of 15,525 accessions of four crops viz., rice (3489), wheat (4201), chickpea (4301) and pigeon pea (3534) were multiplied, characterized and evaluated for agro-morphological, biotic and abiotic stresses and quality parameters in collaboration with PD/PCs and SAUs. • Similarly, under XI plan a total of 17,081 accessions of ten crops viz., rice (2645), wheat (7273), maize (530), chickpea (2113), pigeon pea (1900), lentil (900), mustard (720), okra (500), brinjal (500) and giloe () were multiplied, characterized and evaluated. Promising accessions have also been identified for different traits. • Under XII plan 15 crops including (sorghum, soybean, pearl millet, finger millet, tomato, cucumber) have been added in EFC subject to approval of the Council. • A total of 20,660 accessions of wheat were sown at IARI, RS, Wellington (hot spot for rust and foliar diseases) to screen the germplasm against rust and foliar diseases. Data are being analyzed. • 15 agri-horticultural crops have been identified for multi-location detailed evaluation as an important component of proposed Agrobiodiversity Platform. • A total of 701 accessions of pea against powdery mildew and 252 accessions of paddy against blast were screened at hotspot locations by NBPGR Shimla.

<p>11.</p>	<p>Designating accessions in the National Genebank under the ITPGR treaty</p> <p>Taking note that the Government of India was a Contracting Party to the legally binding International Treaty on Plant Genetic Resources and national obligation under it required designating collections in the national Genebank that were available for exchange; the RAC recommended that this work may be taken up on priority and a report presented in the next RAC meeting.</p> <p>(Attention: Director's Cell; HOD, Conservation)</p>	<ul style="list-style-type: none"> The list of material available at NBPGR Genebank and also represented at IARCs has already been prepared and sent to ICAR/DARE along with the proposal for their designation for the MLS of the ITPGRFA. The matter discussed in 1st Meeting of the NABMGR is still under consideration of ICAR/DARE. A sub-committee was proposed by the Board to discuss the issue of designation of material for the MLS of the Treaty on 12.6.2012 and is scheduled to meet again on 27.7.2012. Matter is being pursued with ICAR/DARE.
<p>12.</p>	<p>Adopting user-friendly database software enabling on-line access</p> <p>Taking note of the announcement of a new Global GR Database Networking software system developed by the USDA and CGIAR, the RAC recommended that the Bureau may consider adoption of a suitable user-friendly on-line access to its designated database enabling the Regional Stations to make direct data entry. It also recommended further strengthening of the ARIS Cell on priority</p> <p>(Attention: OIC, ARIC Cell)</p>	<ul style="list-style-type: none"> Bureau considered adopting the already available software solutions (e.g. GRIN Global; ICIS). Meanwhile, in-house portal development was also initiated. Now PGR Portal of NBPGR is ready for online access. The access is given internally as well as to the regional stations for testing. However, direct data entry system is not yet implemented for operational issues. Further strengthening of the ARIS (AKMU) is being initiated with enhanced focus on PGR Databases and the Portal.
<p>13.</p>	<p>Assured continuity of DNA fingerprinting of crop varieties</p> <p>Appreciating the commendable work done by the Bureau on DNA finger printing of all the varieties released for commercial cultivation and also the registered elite genetic stocks, the RAC recommended further strengthening of this activity with a report to its next meeting.</p> <p>(Attention: Director's Cell; NRC-DNA Fingerprinting)</p>	<ul style="list-style-type: none"> The centre now receives on regular basis seed samples of pre-release and released varieties from breeders for DNA fingerprinting. DNA fingerprints of the varieties generated are being provided to the breeders. Four scientists are now addressing this task. Provision is being made in the 12th Plan EFC for providing essential staff such as Technical Officers, Technical Assistants, SRFs and other qualified contractual staff so that the routine service task is taken up on regular basis without delay. A National Genomics Platform is also being proposed under the new Plan to take care of the requirements of 'genomics' research. The centre received during the period of reporting a total of 1065 varieties for DNA fingerprinting. The group-wise break-up is as follows: Cereals (524: wheat, paddy, maize, sorghum, pearl millet, barley, millets), Pulses (152: blackgram, greengram, cowpea, mothbean, ricebean, lablab bean, pigeonpea, horsegram, pea, chickpea, frenchbean, lentil, guar), Oilseeds (278: sesame, groundnut, soybean, rapeseed & mustard, toria, safflower, castor), Fibres & forages (64: cotton, flax, Lucerne, oats), Vegetables (30: okra, gourds, spinach, turnip, radish, onion, garlic, coriander, spinach, tomato, capsicum, brinjal, dolichos bean, drumstick), Spices (2: turmeric, chilli), and Medicinal plants (15: kalmegh, sarpgandha, palmarosa, safed musli, asgandh, aster).

<p>14.</p>	<p>Strengthening quarantine check on commercial import of plant materials and developing domestic quarantine system</p> <p>Taking note of the application of new biotech diagnostic tools for early detection of plant pathogens and considering that commercial import of plant materials was on the increase, the RAC recommended strengthening of quarantine check including the developing of suitable domestic quarantine system in the country. It also recommended that a discussion meeting between the Director, NBPGR and Jt. Secretary (PP), Union Ministry of Agriculture may be organized at an early date in this context for developing an action plan.</p> <p style="text-align: center;">(Attention: Director's Cell)</p>	<ul style="list-style-type: none"> • A request in this regard was sent to Joint Secretary (PP) for a meeting at NBPGR with the relevant staff from DAC/ DPPQS to deliberate on this important issue. Accordingly a meeting with the relevant PQ staff including the PPA held on 20.7.2012 and recommendations for various action points finalized.
<p>15.</p>	<p>Need for computerisation of all data on pests intercepted by the PQ Division</p> <p>Recognizing the need for computerisation of all the available data on pests intercepted by the Bureau since its inception, the RAC recommended that the PQ Division may take up this activity with adequate budgetary provision made in the XII Plan proposals.</p> <p style="text-align: center;">(Attention: HOD, PQ and OIC, PPU)</p>	<ul style="list-style-type: none"> • The data entry for the last 30 years data on pests (fungi, insects, viruses) intercepted on introduced germplasm during quarantine processing has been completed. The data is presently being verified for its correctness. • Budgetary provision has been kept in the XII plan for the same.
<p>16.</p>	<p>Accelerating the pace of developing National Permafrost Conservation Facility</p> <p>The RAC welcomed the signing of MoU between the Council and the DRDO on establishing the National Permafrost Conservation Facility at Chang la and recommended that the pace of developing this Facility may be accelerated so as to begin the experimental work at the earliest.</p> <p style="text-align: center;">(Attention: HOD, Conservation)</p>	<p>Several rounds of discussions have been held between DRDO Scientists and Engineers for accelerating the pace of developing National Permafrost Repository. Simultaneously, studies have been initiated in collaboration with DRDO with 19 crops and 23 varieties to explore the feasibility of conservation of germplasm.</p>
<p>17.</p>	<p>Strengthening partnership with NAG Sites</p> <p>Taking note that the Bureau had already identified 57 NAGS and a Workshop had already been organized to further strengthen this partnership, the RAC felt that the listing of NAGS be planned in a more balanced manner and recommended that a report be put up in the next RAC meeting after having a re-look at the already identified locations and rationalization of adding more such sites. It was further recommended that a separate Cell may be assigned the responsibility to assist the Director for this purpose.</p> <p style="text-align: center;">(Attention: Director's Cell; OIC, PPU)</p>	<p>The proposed Agrobiodiversity Platform of ICAR to be operative in XII Plan has two components for PGR Management and Use. The Component I on National Network on PGR Management has 87 NAGS partners tentatively shortlisted for single/multi-crop. The proposal is yet to be approved by the Council. Once approved, the NAGS will shoulder the responsibility of maintenance of active collections and their supply to users under a National Network to be coordinated by the NBPGR.</p>
<p>18.</p>	<p>Signing MoU with NBA on Designated National Repository role of NBPGR</p> <p>Taking note that the Bureau has been notified as one of the 13 Designated National Repositories and</p>	<p>In the meeting of ICAR/DARE and NBA held on 2nd May 2012, the matter was brought to the notice of Chairman NBA. He informed that the NBA intends to have a meeting with all the repositories</p>

	<p>some samples for referral purpose had been received and held without any processing for their conservation, the RAC recommended that a suitable MoU may be developed with the NBA enabling the Bureau to add these samples eventually to the National Genebank and also making them available for research use.</p> <p>(Attention: HOD, Conservation; OIC, PPU)</p>	<p>notified by NBA where in such matters of mutual agreements would be discussed. The meeting is yet to be fixed.</p>
19.	<p>Developing norms for providing access to PGR for commercial use</p> <p>Taking note of the requests received by the Bureau from domestic users, and also some private seed companies and MNCs for research aimed at commercial benefits, the RAC recommended that a Committee comprising the Heads of Germplasm Exchange and Conservation Divisions and OIC, PPU may develop suitable norms and regulatory mechanism for this purpose for consideration and approval of the Council and report for discussion in its next meeting.</p> <p>(Attention: HODs, Germplasm Exchange, Conservation; OIC, PPU)</p>	<p>The matter of Exchange of material with the private sector was discussed as an Agenda in the First meeting of the National Advisory Board on Management of Genetic Resources held at NBPGR on 13th December 2011. The Board proposed to constitute a Sub-Committee to be Chaired by Dr. P.L. Gautam to examine all germplasm exchange issues including exchange with the private sector. The Sub-committee meeting was held on 12th June 2012 at NBPGR. A questionnaire developed by NBPGR to collect information on private sector's view on development of a suitable MTA was placed in the meeting. It was decided to get inputs from National Seed Association of India (NSAI) on the questionnaire. The same has been sent to NSAI and their response is awaited.</p>
20.	<p>Upgrading status of two Base Centres</p> <p>Taking note that the Bureau has two Base Centres located at Ranchi and Cuttack and they were engaged in PGR collection and management activities essentially similar to all the Regional Stations, the RAC recommended that these two Base Centres may also be designated as Regional Stations to bring administrative uniformity and remove disparity. It also recommended that networking may be developed among the Regional Stations following an agro-ecogeographic approach to avoid any overlapping in their activities and to promote operational synergies with a report for discussion in its next meeting.</p> <p>(Attention: Director's Cell; HODs; OICs, Regional Stations)</p>	<p>Availability of staff and other resources are being ensured before upgrading the status of Base Centres to Regional Stations. Moreover, the available resources are being mobilized and PGR management activities are being addressed in a holistic manner adopting agro-ecogeographic approach. For example, explorations are planned to be undertaken in the south-east coastal India (Andhra Pradesh and adjoining regions) and mandate crops have been identified for characterization and evaluation (blackgram, greengram, cowpea, horsegram linseed, brinjal, chillies, tomato). (NBPGR RS Hyderabad)</p>
21.	<p>Urgent attention to the needs of Regional Station at Srinagar</p> <p>The RAC took note of the operational constraints faced by the Regional Station at Srinagar and recommended that a Committee, led by the Director and comprising the Head, Plant Exploration Division and OIC, Regional Station at Shimla should visit the RSS to evolve workable solutions to the problems. If considered appropriate, a suitable MoU may be signed with the Director, CITH for sharing the agreed upon facilities.</p> <p>(Attention: Director's Cell)</p>	<p>A meeting has been convened with Director, CITH at Palampur during the ICAR Regional Committee Meeting. The status of collection is being complied and to be discussed in the next meeting proposed to be held in July, 2012 at Srinagar involving CITH, NBPGR and SKUAST (K).</p>

<p>22.</p>	<p>Conservation of poly-embryonic mango germplasm</p> <p>The RAC appreciated the effort made by the OIC, Regional Station at Thrissur for conservation of poly-embryonic mango germplasm, adapted specifically to the West Coastal Region, with the cooperation extended by the CISH, Lucknow and recommended that such linkages be developed on a regular basis under MoU with the approval of the concerned authorities and a follow up report may be put up during the next RAC meeting.</p> <p style="text-align: center;">(Attention: HODs, Plant Exploration and Conservation)</p>	<ul style="list-style-type: none"> • NBPGR coordinated execution of one more exploration in A & N Islands for collection of poly-embryonic mango germplasm by CISH and IIHR during April 2012. • During 2011-12 also, 28 named landraces of poly-embryonic mangoes were supplied to CISH, Lucknow and 24 to IIHR, Bangalore as nuts and scions for further utilisation and establishment. Also facilitated preparation of grafted plants using existing facilities for subsequent supply to IIHR, Bangalore.
<p>23.</p>	<p>Allocating core budget to Divisions and Regional Stations</p> <p>Responding to some suggestions and with a view to encouraging better advance planning of activities at the Divisional and Regional Stations' level, the RAC recommended that the Director may consider allocation of some core annual budget to the Bureau's Divisions and Regional Stations.</p> <p style="text-align: center;">(Attention; Director's Cell; S.A.O; Sr. F&A.O)</p>	<p>Efforts are underway to allocate some core budget to different Divisions/ Regional Stations of the Bureau.</p>

Annexure-5

Mandate, activities, significant accomplishments and new initiatives of various Divisions/Units/Regional Stations

Mandate	Major Activities	Significant Accomplishments	New Initiatives
<p>• Plant Exploration and Germplasm Collection Division</p>			
<ul style="list-style-type: none"> To collect germplasm in different agricultural crops, wild relatives of crops and other economic plants from different phyto-geographical/ agro-ecological regions of diversity within and outside the country 	<ul style="list-style-type: none"> To plan, co-ordinate and conduct crop/ trait-specific explorations, To develop linkages with national/ international organizations for joint explorations, To strengthen the national herbarium of crop plants, wild economic plants and wild relatives, To carry out bio-systematic and crop evolutionary studies involving genepool of plant species, To carry out ethno-botanical studies, To collect, collate and disseminate information on agro-biodiversity status and future strategies, and 	<ul style="list-style-type: none"> A total of 47 explorations were undertaken across the country and 3,235 accessions of various agricultural crops, their wild relatives and other economic plants were collected. Of these, 582 accessions were collected by NBPGR Headquarters, New Delhi through ten explorations from parts of Arunachal Pradesh, Assam, Chhattisgarh, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Nagaland and Odisha. A total of 283 herbarium specimens, 26 seed samples and 19 economic products were processed and added to the National Herbarium of Cultivated Plants (NHCP). Major emphasis was given for collection of wild species including wild relatives of crops. Germplasm collected by NBPGR Regional stations during various explorations is summarized hereunder. 	<ul style="list-style-type: none"> A special drive to NEH region involving KVKs as facilitators in collecting germplasm from remote/ inaccessible/ disturbed areas in collaborative mode with ICAR institutes/SAUs. Trait-specific germplasm of rice (tolerant to drought, cold, salt and scented types) and its wild relatives; wheat (terminal heat tolerance) under NICRA Project. Gap analysis and mapping of collected diversity was completed in <i>Brassica</i>, vegetables and initiated in maize; to further strengthen this activity, advanced GIS software has been procured under NICRA project. In XII Plan, a five-year exploration programme is being finalized with focus on NEH region, Eastern Ghats and protected areas for the collection of left over diversity especially of known landraces, wild relatives and trait-specific germplasm..

<ul style="list-style-type: none"> • Germplasm Evaluation Division 			
<ul style="list-style-type: none"> • Characterization, evaluation, maintenance, regeneration and documentation of germplasm resources of various agri-horticultural crops. 	<ul style="list-style-type: none"> • Initial seed increase and regeneration of assembled germplasm • Characterization and preliminary evaluation of germplasm using standard descriptors • Organizing field days for the benefit of breeders and other users • Data documentation and cataloguing • Development of core collections of native crops for facilitating enhanced utilization of crop germplasm 	<ul style="list-style-type: none"> • During the year a total of 7,825 accessions of various agri-horticultural crops comprising cereals (2,097), millets (235), pulses (2,387), oilseeds (542), vegetables (1936), underutilized crops (493), and medicinal and aromatic plants (135) were grown for characterization, evaluation, regeneration, multiplication and species identification. In addition, 4503 accessions of international nurseries comprising of wheat, barley and <i>Triticale</i> were also evaluated under Post Entry Quarantine Nursery (PEQN). A total of 2,376 accessions of various crops namely, pearl millet (223), rapeseed-mustard (713), black gram (344), chickpea (90), lentil (30), okra (192), tomato (582), brinjal (200) were also screened for important biotic stresses (insects/pests and diseases). Under abiotic stresses, 224 accessions of wheat were evaluated for terminal heat tolerance. Under biochemical evaluation a total of 945 accessions of different crops were analyzed for oil content and fatty acid profile, protein, sugar, minerals etc. Under phytochemical evaluation 465 samples of different medicinal and aromatic plants were analyzed for their active compounds. Under multi-location evaluation (MLE), 1100 accessions of wheat, 900 accessions of rice, 200 accessions of maize, 240 accessions of mustard, 200 accessions of brinjal, 200 accessions of okra, 320 accessions of chickpea, 340 accessions of pigeonpea, 300 accessions of lentil and 14 accessions of <i>Tinospora</i> were multiplied and evaluated for agronomic traits, biotic and abiotic stresses and quality parameters in collaboration with NAGS, AICRPs and SAUs. 	<ul style="list-style-type: none"> • Mega programme on characterization and evaluation of wheat and chickpea germplasm of National Gene Bank (NGB) for development of core sets. • Evaluation of wheat germplasm of NGB for terminal heat tolerance. • Strengthening of multi-location evaluation of germplasm for ten prioritized crops. • Characterization and evaluation of wild species of chickpea and lentil. • Strengthening of pre breeding programme using offseason nursery. • Advanced screening of germplasm against biotic stresses. • Development of infrastructure facilities at IARI New Area Farm, NBPGR. • Strengthening of lab facilities for quality evaluation. • Renovation of medium term storage (MTS) facility.

<ul style="list-style-type: none"> • Germplasm Conservation Division 			
<ul style="list-style-type: none"> • To conserve crop genetic resources of various agri-horticulture crops • To develop information system for efficient utilization • To conduct research, undertake teaching and training in the area of PGR conservation • Operational management of National Germplasm Conservation Network (long-term storage and medium-term storage modules at NBPGR and NAGS). 	<ul style="list-style-type: none"> • Long term conservation of germplasm • Conservation of released varieties • Germplasm registration • Monitoring of accessions conserved over 10 years • Maintenance of reference specimen • Germplasm distribution • Physical verification of conserved germplasm • Supportive research and teaching 	<ul style="list-style-type: none"> • A total of 13,620 accessions of germplasm including varieties to be notified and released and trait-specific registered germplasm of various crops were received for long-term conservation in the National Genebank. These were processed following the genebank standards, adding another 5,131 accessions to the base collection raising the total germplasm holding to 3,88,985. Monitoring of seed germination and quantity in stored germplasm (5,044 accessions) and distribution (1,05,760) for evaluation/regeneration/research/restoration of active collections were the other priority activities. Dormancy breaking methods were standardized for <i>Andrographispaniculata</i>, (GA₃ 500 ppm for 48 and 72 h) <i>Capsicum</i> spp. (GA₃ 500 ppm co-applied at 15^oC) and <i>Morindacitrifolia</i> (clipping treatment +GA₃ 1000 ppm for 24 h). Assessment of longevity of ultra-dry seeds of safflower, sesame, chickpea, niger, and groundnut indicate significantly higher germination (64-96%) in seeds with low moisture content (mc) (1.7-3.0 %) than the germination (0-40%) recorded in seeds with next higher level of mc (3.8-5.0%) after 13-15 years of storage at ambient temperature. Agronomic and yield parameters during field evaluation of cotton seeds stored for 15 years at different moistures corroborate the benefit of ultra-low seed moisture ($\leq 3\%$) and low temperature storage. Studies on onset and loss of desiccation tolerance during wheat embryogenesis were initiated in <i>Triticumaestivum</i>, <i>T. durum</i> and <i>T. dicoccum</i>. A total of 88 accessions with unique traits were approved for registration and processed for long-term conservation. • Long-term storage (LTS) of seeds of various agricultural and horticultural crops in the National Genebank (-18^oC), and medium-term storage (MTS at +8^oC) of reference samples of introduced and collected accessions was carried out. In addition, the registration of potentially valuable germplasm and conservation of released varieties and genetic stocks identified under the National Agricultural Research System 	<ul style="list-style-type: none"> • Development of web-enabled database of (i) germplasm conserved in National Genebank to integrate the same with main database of NBPGR on plant genetic resources and (ii) registration of trait-specific germplasm. • Inventorization of trait-specific germplasm of tomato, pigeonpea, rapeseed-mustard, groundnut, safflower, soybean, wheat and amaranth available in the genebank. • Characterization of wheat germplasm (21,822) available in the genebank to identify the cores/minicores and screening against tolerance to terminal heat, rust and other foliar disease. • Studies have been initiated in collaboration with DRDO with 19 crops and 23 varieties to study the suitability of permafrost facility for conservation of germplasm.

		<p>has been the other important activity to facilitate their use in crop improvement programmes. Efforts were made to update and correct the information on conserved germplasm and port the data for incorporation in the national database. Supportive research directed towards understanding the storage behaviour of hitherto under-explored species, identification and manipulation of factors that prolong the storage life of seeds in a cost-effective manner and overcoming seed germination problems continued.</p>	
<p>• Plant Quarantine Division</p>			
<ul style="list-style-type: none"> • Quarantine Processing of PGR including Transgenics for Research • Pest-free Conservation of Indigenously Collected / Multiplied PGR • HRD and Inputs on Policy Issues 	<ul style="list-style-type: none"> • Quarantine Processing of PGR including Transgenics for Research • Detection and identification of pests intercepted • Post-entry quarantine growing and inspection • Salvaging of infected/infested material • Issue of Phytosanitary Certificate for material meant for export • Pest-free Conservation of Indigenously Collected / Multiplied PGR • HRD including teaching and training in quarantine, seed health testing, biosecurity and biosafety issues • Providing policy inputs on biosecurity related issues under national and international regulations of 	<ul style="list-style-type: none"> • A total of 1,16,980 samples of imported germplasm accessions as well as trial material entries of various crops and their wild relatives were processed for quarantine clearance. These samples included true seeds, rooted plants, cuttings, rhizomes, suckers, bulbs, nuts and tissue culture plantlets. The infested/infested samples (1,346)- comprised due to insects (487), nematodes (119), fungi/ bacteria (644), viruses (27), weeds (69) and several exotic pests. Of the 1,302 infested/infested/contaminated samples, 1,270 were salvaged through fumigation, hot water treatment (HWT), X-ray radiography, pesticidal dip, mechanical cleaning and growing-on test. Thirty two samples of <i>Oryzasativa</i> from China and USA were rejected due to infection by <i>Neovossiahorrida</i>, a quarantine pest for India. The remaining infested samples were salvaged through physico-chemical methods. A total of 2144 samples were processed for export of which 14 infested/infested samples were salvaged and 15 Phytosanitary Certificates were issued. Fifty six samples of exotic germplasm of different legume crops imported from different countries/ sources were grown in post-entry quarantine (PEQ) greenhouses and the harvest of the plants free from viral symptoms only was released to the indenters. Quarantine processing of 946 samples of imported transgenic planting material revealed, fungi and insect infestation in maize and rice; absence of terminator gene was ensured and all samples were salvaged prior to release. A total of 14759 samples were received from Germplasm Conservation 	<ul style="list-style-type: none"> • Developed digitised keys for identification of bruchids infesting seeds and a database on world bruchid genera and species. • Development of eco-friendly disinfestation technologies using infrared and UV technologies and oxygen scavengers. • Identification of weeds in germplasm under exchange. • Development of protocols for molecular detection of plant viruses viz., <i>Arabid mosaic virus</i> (ArMV), <i>Bean pod mottle virus</i> (BPMV), <i>Cherry leaf roll virus</i> (CLR), <i>Grapevine fan leaf virus</i> (GFLV) and <i>Tomato ringspot virus</i> (ToRSV). • Development of database on

	<p>IPPC, CBD, WTO etc.</p> <ul style="list-style-type: none"> • Providing policy inputs on biosecurity related issues under national and international regulations of IPPC, CBD, WTO etc. 	<p>Division for seed health testing of which 944 samples were subjected to X-ray radiography. A total of 1,060 samples were rejected as they could not be salvaged.</p>	<p>potential quarantine pests of edible oilseeds.</p>
<p>• TCCU Unit</p>			
<ul style="list-style-type: none"> • To store on short-, medium- and long-term basis <i>in vitro</i> cultures for which conventional methods are inadequate. • To develop appropriate cryopreservation protocols. • To develop cryopreservation protocols for difficult-to-store species using various explants. • To provide tissue culture-related services for germplasm exchange. • To monitor genetic stability of conserved germplasm. 	<ul style="list-style-type: none"> • Germplasm maintenance, augmentation, protocols development/ refinement for <i>in vitro</i> multiplication / conservation/ cryopreservation. • Pest-Free <i>in vitro</i> conservation, <i>in vitro</i> cryopreservation using techniques of vitrification, encapsulation-dehydration and droplet freezing • Augmentation of germplasm of prioritized seed species for cryobanking, characterization for germplasm diversity collected and conserved. • To cryopreserve seeds, pollen, embryo and embryonic axes in cryobank. • Genetic stability assessment using morphological, cytological and molecular markers. • Supply of conserved 	<ul style="list-style-type: none"> • During the year, a total of 2,075 accessions belonging to fruit crops, bulb and tuber crops, medicinal, aromatic and rare/endangered plants, spices, plantation and industrial crops, and others were conserved as <i>in vitro</i> cultures, under culture room conditions and/or at low temperature. The average subculture duration ranged from 4-24 months, depending on the species. In <i>Allium tuberosum</i> and <i>Picrorrhizascrophuliflora</i>, cultures were conserved for 21 and 8 months, respectively at low temperature in dark. In <i>Kaempferiagalanga</i>, encapsulated shoot bases were stored in cryovials without nutrient medium, up to 4 weeks. Cryopreservation experiments using droplet-vitrification, encapsulation-dehydration or vitrification techniques, led to varying degree of pre-and post-freezing success in <i>Allium</i> spp., Malus domestica and <i>Prunus armeniaca</i>. The genetic stability assessment was carried out in <i>in vitro</i>-conserved plantlets of <i>A. tuberosum</i> and <i>Colocasia esculenta</i> and, cryopreserved plantlets of <i>A. tuberosum</i> and <i>Morus</i> spp. using SSR markers. There were no significant differences between the <i>in vitro</i>-conserved regenerants and/or post-thaw regenerated plants, and their controls. • A total of 91 accessions comprising <i>Allium sativum</i> (3), <i>Dioscorea</i> spp. (3), <i>Malus domestica</i> (35) and <i>Musa</i> sp. (50) were cryostored as shoot tips or dormant buds. A total of 59 accessions comprising <i>Bacopa monnieri</i> (1), <i>Fragaria xananasa</i> (18), <i>Musa</i> spp. (34), <i>Picrorrhizascrophuliflora</i> (1) and <i>Vaccinium ovatum</i> (5) were supplied as <i>in vitro</i> cultures to various indentors. A total of 381 accessions were cryostored 	<ul style="list-style-type: none"> • To ensure multiplication of pest free cryostored germplasm, pest free status of accessions retrieved from cryogenebank after storage for various periods (9-24 years) was ascertained. • Micro-morphological and histological studies on dormant buds of almond and walnut have been undertaken.

	germplasm to users.	as seeds, embryonic axes and dormant buds during the year, totalling 9,869 accessions in the cryogenebank. Successful cryopreservation was achieved in seeds, embryos and embryonic axes of <i>Citrus karna</i> , <i>C. pseudolimon</i> , <i>C. megaloxycarpa</i> , <i>C. pati-jora</i> (citron), <i>C. jhambiri</i> , <i>C. sinensis</i> and <i>Manilkara hexandra</i> .	
• Germplasm Exchange Unit			
<ul style="list-style-type: none"> • Facilitate exchange of germplasm under provisions of MoUs/Workplans/ Collaborative research programmes 	<ul style="list-style-type: none"> • Import of plant genetic resources for research purposes under bilateral agreements/MoUs. • Procurement of elite/trait specific/ registered germplasm through survey of literature. • Facilitate exchange of germplasm for research under the provision of BSDA Act, 2002. • National supply of germplasm to breeders/other users. 	<ul style="list-style-type: none"> • Introduction of germplasm: During the period under report 1, 22,042 samples were imported which included 31,548 accessions (31,877 samples) of germplasm and 7,044 entries (90,165 samples) of CGIAR nurseries for trials. Promising trait specific germplasm introduced in wheat, paddy, barley, maize, sunflower, mungbean, chillies, tomato, taro, etc. for several desired traits. • Export of Germplasm: Requirements for germplasm from abroad were met by arranging material from different Indian sources and 1,303 samples of different crops were exported to ten countries under SMTA/ MTA after the approval of DARE. • National Supply: A total of 4,043 samples of different crops were supplied to national users for utilization in various crop improvement programmes in the country based on requests received from research workers under material transfer agreement (MTA). 	<ul style="list-style-type: none"> • Import of core collections from IARC Gene banks. • Import of germplasm from Gene banks of CG centres • Efforts to introduce pomegranate germplasm having resistance to bacterial disease. • Introduction of wild relatives of crop plants • Documentation of Exotic introduction through GEXQIS database • Formulation of Guidelines for Access to Genetic Resources for Food & Agriculture for Research purposes (after the notification of BDA, 2002 and Rules 2004

• PGR Policy Unit			
<ul style="list-style-type: none"> • To address various policy issues related to PGR management 	<ul style="list-style-type: none"> • Technical inputs on current international and related national regulations of relevance to plant genetic resource management. • Managing IPR Portfolio of the institute, filing patents, copyrights and formulating technology transfer agreements. • Facilitating protecting of plant varieties developed by National Agricultural Research Systems. 	<ul style="list-style-type: none"> • Processed 68 applications of extant varieties for registration (Protection) with the PPV&FR Authority. In a meeting of PPV&FRA Authority and DUS Centres, role of NBPGR in plant variety application process was presented. • Managed IPR and Technological Innovations of the Institute as Member Secretary of Institute Technology Management Committee (ITMC). • Provided Technical inputs on various PGR Policy issues provided to ICAR /DARE/MOEF/NBA etc. Inputs provided to Department of Agriculture and Cooperation, MoA for Plant Quarantine (Regulation for Import into India) Order 2003. • Provided inputs to Development Consortia for Invasive Species Compendium of CABI.. • Provided inputs to APAARI/ APCoAB, MoEF, MEA, on various PGR related policy issues. • Looked after the project Capacity Building and Enhanced Regional Collaboration for the Conservation and Sustainable Utilization of PGR. completed in December 2011. 	<ul style="list-style-type: none"> • Organization of trainings for protection of plant varieties especially the farmers' varieties. • Study and review of Biosafety regulations in the Asian region. • Organization of workshop on Implementation of Multilateral System of the ITPGRFA for policy makers and other stakeholders in India.
• ARIS/AKMU			
<ul style="list-style-type: none"> • To develop PGR information system for facilitating utilization 	<ul style="list-style-type: none"> • Development of PGR Databases • Maintenance of IT infrastructure • E-governance • Web Server management 	<ul style="list-style-type: none"> • All the three databases (Passport, Genebank and Characterization) have been integrated • Testing for technical feasibility completed • Testing for correctness of the contents pending; HoDs and OIC (RS) are given access to the portal and requested to verify the authenticity of the data and identify the gaps and discrepancies • Ready to be hosted for public access subject to clearance by competent authority on policy and regulatory requirements • Development of Germplasm Evaluation database initiated 	<ul style="list-style-type: none"> • On-line portal is ready for access of PGR databases • NBPGR webmail facility created and functioning
• NRC on DNA Finger Printing			
<ul style="list-style-type: none"> • To develop genomic resources and tools, to 	<ul style="list-style-type: none"> • Molecular characterization of germplasm and Marker 	<ul style="list-style-type: none"> • For genetic variability and characterization of germplasm in <i>Jatropha curcas</i>, 285 selected accessions were analyzed 	<ul style="list-style-type: none"> • Allele mining in crops for abiotic stress tolerance.

<p>discover and validate the function of genes of importance to agriculture and to develop bioinformatics tools for enhanced utilization of genomic resources.</p>	<p>development</p> <ul style="list-style-type: none"> • Marker development for characterization and tagging of traits • Allele mining • Marker development for transgene detection • Gene identification and characterizations • Genomics • Species relationships and phylogeny • Development of data base and bioinformatics • Transfer of Technology and DNA fingerprinting services 	<p>using AFLP and SSR markers. In addition 18 RAPD and 24 SRAP primers were used to analyze 37 <i>Pongamia</i> accessions. SSR genotyping information was generated in <i>Cucumis</i>, mothbean and <i>Lathyrus</i>. Eleven polymorphic functional markers (EST-SSRs) were used for genetic diversity analysis in 12 germplasm lines of finger millet of Indian and African origin for genetic variability studies. Genetic characterization of <i>Morindatomentosa</i> accessions were analyzed using 21 ISSR primers. Seventy ISSR markers used for characterization of collected accessions of <i>Luffa</i> species. Molecular diversity among 24 released varieties and germplasm lines of wheat have been demonstrated with 32 identified SSR markers having high PIC value. A total of 391 cotton samples were fingerprinted using 25 genome-wide microsatellite loci. In 94 accessions of <i>Linum</i> microsatellite fingerprinting was carried out.</p> <ul style="list-style-type: none"> • For molecular mapping and QTL analysis in sesame germplasm, large-scale DNA sequence information was generated using next generation sequencing approach. In wheat, a 237 promising germplasm lines showed near immunity for leaf rust resistance in nine different locations across the climatic zones in India. A new program was initiated to develop mapping populations for heat and drought tolerance in wheat during 2010 summer at IARIRS, Wellington, Tamil Nadu and NBPGR, New Delhi. • Over 200 candidate gene sequences were screened in the contrasting accessions of <i>Cucumis</i>, <i>Lathyrus</i> and mothbean for development of SNP markers. Novel promoter region targeted marker CBDP (CAAT box derived polymorphism) and Start Codon Targeted (SCoT) polymorphism markers were developed and demonstrated their utilization in cultivars of <i>Corchoruscapsularis</i> and <i>Corchorusolitorius</i>. Genomic SSR markers have been developed in finger millet. Ten Resistance gene analogue polymorphism (RGAP) markers were demonstrated in finger millet to produce polymorphic profiles in finger millet. Sixty SSR markers have been demonstrated for transferability from 	<ul style="list-style-type: none"> • Generation of SSR and SNP markers in unexplored indigenous crops. • Identification and validation of core collection in prioritized crops. • Establishment of National Genomic Resource Repository.
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		<p>cucumber to characterize 40 bottle gourd germplasm lines. Eight SSR enriched library has been developed each for Giloe and Andrographis using different combination of biotin labeled repeat sequences. Ninety eight microsatellite primers in jute were custom synthesized and screened for amplification in a representative panel of eight genotypes. Twenty nine new microsatellite loci have been identified through genomic library enrichment and sequencing for identification of microsatellite markers in bittergourd.</p> <ul style="list-style-type: none"> • Under the genomic resources development from plant genetic resources activities Transcriptome profiling in <i>Cucumis</i>, <i>Lathyrus</i> and mothbean has been carried out and stress response genes has been classified. Cloning of a novel cold tolerance gene <i>COR14</i> from white clover (<i>Trifolium repens</i>) has been carried out. A carotenoid pathway gene, phytoene synthase 1, was amplified (750bp amplicons) and sequenced from red pulp black seeded watermelon line DRB-669 using degenerate primers from conserved region of <i>psy1</i> gene. Sixteen Resistance gene candidates (RGCs) has been isolated and characterized from ToLCND Virus tolerant sponge gourd genotype and submitted to GeneBank. A Carbonic anhydrase gene has been amplified and characterized from the young leaves of cowpea cv. PUSA Kamal. Allelic variations of the CA gene have been demonstrated in cowpea genotypes. In mothbean SSH library has been developed for moisture stress. • For biosystematics and species evolution survey of different eco-geographical regions has been conducted for occurrence of <i>Vigna</i>, <i>Cucumis</i> and <i>Abelmoschus</i>. Molecular taxonomic studies have been carried out for species delineation and differentiation of <i>Cucumis</i> and <i>Abelmoschus</i> species based on cpDNA, mtDNA and rDNA sequences. Separately species relationship studies have been conducted in <i>Luffa</i> spp. • Multiplex-PCR based diagnostic tools have been developed for GM-maize events. Event-specific Real-time PCR protocols have also been developed in BtBrinjal and Bt 	
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		<p>cabbage. A real time PCR-based diagnostics of GM event in imported transgenic planting materials has been conducted. DNA fingerprinting services has been provided to agencies and resources were generated through the service. A sponsored training programme on “Forest Biotechnology” for senior scientists of Indian Council of Forestry Research and Education, Dehradun was organized.</p>	
<p>• AICRN on Underutilized Crops</p>			
<ul style="list-style-type: none"> • To find out new plant resources for food, fodder and industrial uses. • To build up germplasm collection for characterization, conservation and genetic enhancement. • To identify/develop high yielding varieties for different farming systems. • To develop appropriate package of agronomic practices for their economic cultivation. • To disseminate knowledge about potential species for their popularization/commercialization. 	<ul style="list-style-type: none"> • The project envisages to build up genetic resources of selected underutilized plants of economic value for food, feed, fodder and industrial use from indigenous and exotic sources; evaluation for various agro-morphological and quality traits for potential future use; multi-locational testing of germplasm and elite breeding lines, identification of superior genotypes, development of high yielding varieties and agro-techniques for their economic cultivation in suitable agro-ecological areas of the country. 	<ul style="list-style-type: none"> • A total of 161 experiments were allotted during 2011 which included germplasm evaluation (59), breeding (55), agronomic (24) and quality aspects (23). These were allotted at twenty three locations in different agro-climatic zones of the country. Out of these, 140 trials were carried out. • Based on the three years data, the best genotype VRB-3 for high yield in Rice bean was identified for its cultivation in North-west and North-east hill regions of the country. • Different varieties/ genotypes of some underutilized crops, buckwheat, amaranths and rice bean were selected for standardization of recipes in underutilized crops to exploit their nutritive value. 	<ul style="list-style-type: none"> • Strengthening screening of germplasm for adaptability and quality parameters; augmentation for desired traits. • Promoting cultivation/ consumption of UUC through add-value interventions for nutritional tarits. • Research on anti-nutritional aspect and proper processing and storage facilities • As source of novel genes for improvement of nutritional quality in other crops, biotic/ abiotic traits and other properties.
<p>• NBPGR RS Akola</p>			
<ul style="list-style-type: none"> • Augmentation, characterization, evaluation, maintenance, regeneration, 	<ul style="list-style-type: none"> • Plant Exploration and Germplasm Collection • Germplasm Evaluation 	<ul style="list-style-type: none"> • Undertook two exploration and collection missions under NEH programme during the reporting period. A total of 101 accessions of germplasm comprising <i>Oryzanivara</i>(17), <i>O. rufipogon</i>(16) and <i>O. sativa</i> (68) were collected during two 	<ul style="list-style-type: none"> • As agreed upon by the Director, NBPGR in consultation with the Project Co-ordinator, AICRP (Chickpea), 17,084

<p>conservation, documentation and distribution of Genetic Resources in the Central Indian Plains.</p> <ul style="list-style-type: none"> The mandated crops include: minor millets; chick pea, pigeon pea, horse gram, grass pea, mung bean; winged bean, amaranth; sesame, castor, linseed, niger, safflower, soybean and their wild relatives; okra and its wild relatives 	<ul style="list-style-type: none"> Germplasm Conservation National supply of PGR 	<p>explorations in Chattisgarh and adjoining Uttar Pradesh under NICRA and Western and Southern Tripura district in Tripura.</p> <ul style="list-style-type: none"> A total of 2,465 accessions were characterized, out of which a total of 1,361 accessions of germplasm comprising of grain amaranth (1,170), of vegetable amaranth (85), linseed (52) and safflower (55) accessions were characterized during <i>Rabi</i> 2010- 2011 and 1,104 accessions of germplasm comprising finger millet (273), niger (443), castor (288) and winged bean (100) were characterized during <i>Kharif</i> 2011. Sesame (1,662), pigeon pea (793), green gram (641) and <i>Abelmoschus</i> spp. (237) during the <i>Kharif</i> 2011 were regenerated and multiplied. In all 330 accessions of germplasm comprising sesame (307) and grain amaranth (23) accessions were multiplied and sent for conservation in the National Genebank.. 	<p>accessions of chickpea germplasm conserved in the National Genebank were sown at MPKV Pulses Research Unit Farm, Rahuri, Ahmednagar District, Maharashtra and characterized for identifying a core set in collaboration with MPKV, Rahuri. In addition, another set of 1,710 accessions with limited seed quantity were also sown for multiplication for long term conservation. Monitoring of the characterization and multiplication activities were done by the Regional Station, Akola.</p> <ul style="list-style-type: none"> Incorporated the original passport data of 777 accessions of soybean germplasm to the National germplasm Database, of which no information was hitherto available.
<p>• NBPGR RS Bhowali</p>			
<ul style="list-style-type: none"> Coordinate, execute and monitor various PGR activities of Central Himalayan region. 	<ul style="list-style-type: none"> Augmentation, characterization, evaluation, maintenance, regeneration, conservation and documentation of genetic resources of field crops with emphasis on ethno botanical aspects Augmentation, characterization, evaluation, maintenance, regeneration, 	<ul style="list-style-type: none"> Two crop-specific explorations and one survey cum identification (26 acc. tagged) tour were undertaken and 58 accessions were collected which include landraces and primitive cultivars of cereals (32) and fruits (26) from remote areas of Uttarakhand hills under National Exploration Programme. A total of 942 accessions were received from for regeneration, characterization and maintenance. Some of the elite seed samples and live rooted plant material <i>viz.</i> M. & AP and WEUPS (Wild Economically Useful Plant Species): <i>Hedychiumspicatum</i> (300 nos.), <i>Pelargonium</i> 	<ul style="list-style-type: none"> Establishment of mother blocks for bud wood production of citrus and kiwi fruit. Popularization of geranium, lavender and rosemary among local farming communities of Uttarakhand.

	conservation and documentation of genetic resources of temperate horticultural crops	<i>graveolens</i> (4576 nos.), <i>Origanumvulgare</i> (335 nos.), <i>Rosmarinusofficinalis</i> (49156 nos.), <i>Valerianajatamansi</i> (300 nos.), Horticultural Plants: Kiwi (1174 nos.), Kiwi seedlings (200 nos.), Kiwi fruits: 265 kg. (Grade – A: 136 kg. + Grade – B: 126 kg. + Grade – C: 03 kg.), Strawberry (5.250 Kg + 540 nos.), Kagazinimbu (788 nos. + 06 kg.); Agricultural Crops: Green pod peas (56 kg), Horsegram (17 kg.), Paddy mix (70 Kg), Rice bean mix (17 Kg), Soybean (38 kg.) were supplied to different farmers / indentors.	
• NBPGR Base Centre, Cuttack			
<ul style="list-style-type: none"> • To explore and collect the indigenous plant genetic resources of rice, other agri-horticultural crops, their wild relatives, wild economic plants, M&AP of Odisha and adjoining region. • To characterize evaluate and rejuvenate the plant genetic resources suited to this region. 	<ul style="list-style-type: none"> • Exploration & Germplasm Collection, Germplasm Characterization and Evaluation • Seed multiplication and conservation Germplasm Exchange • Germplasm Maintenance in FGB • Documentation & Publication on PGR Training/ Field days / workshop / symposia 	<ul style="list-style-type: none"> • During the reporting period, five explorations were undertaken and a total of 261 accessions comprising cultivated rice (drought tolerant-59; cold tolerant-43; salt tolerant-63), cotton (29), <i>Crotalaria</i> (10) M&AP (49), Chilli (01), Sesame (01) and wild relatives of crop plants (06) were collected from 193 collection sites covering Odisha, Mizoram, Arunachal Pradesh and West Bengal (Sundarban). Wide range of variability was observed for various morphological and agronomical traits among cultivated rice and other collected germplasm. • A total of 1927 acc comprising cultivated rice (1500), green gram (57), black gram (41), <i>Ocimum</i> species (30), <i>Mucunapruriens</i> (12), wild <i>Oryza</i> species (254) and other wild relatives of crops (33) were characterized for various agro-morphological traits. A set of 1149 accessions of cultivated rice was evaluated and screened against bacterial leaf blight in collaboration with CRRI, Cuttack out of which, 18 accessions have been identified as tolerant against BLB. In addition, 254 acc of wild rice germplasm and 33 acc of wild relatives of vegetable crops were grown for characterization and a total 2516 acc comprising cultivated rice, sesame, <i>Trichosanthes</i>, tubers, <i>Ocimum</i> spp., <i>Andrographispaniculata</i>, <i>Mucunapruriens</i> and other 	<ul style="list-style-type: none"> • Evaluation of cultivated rice germplasm for submergence, drought and salinity tolerance. • Screening of cultivated rice germplasm collected from Odisha against leaf blast caused by <i>Pyriculariagriseain</i> collaboration with CRRI, Cuttack. • Initiative has been taken to enrich the herbarium of wild relatives of crop plants, medicinal, rare & economic species of the state with a total repository of about 550 specimens belonging to 165 species and 49 families. . • Validation of ethno-botanical uses of M&AP through phyto-chemical screening.

		medicinal plants were multiplied for conservation in LTS.	
• NBPGR RS Hyderabad			
<ul style="list-style-type: none"> • Quarantine processing of PGR under exchange meant for South India for detection of pests and salvaging of infested/ infested samples. • To plan, conduct, organize, coordinate explorations in South East Coastal Zone (Andhra Pradesh & adjoining regions of Maharashtra, Chattisgarh, Orissa, Tamil Nadu, Puducherry and Karnataka) for collection of Agri-biodiversity. • To characterize, evaluate, multiply, conserve and distribute germplasm of collected and mandate crops. • Documentation of passport, evaluation and quarantine information on PGR. • To organize training and awareness programmes, and workshops on diverse aspects of PGR and Plant Quarantine 	<ul style="list-style-type: none"> • Import processing for South India and export of germplasm especially for ICRISAT mandate crops. • Post entry quarantine inspection of introduced germplasm for ICRISAT, Public sector institutions and Private seed industry • Seed health certification for private seed industry • Focused trait specific germplasm collection based on the gap analysis • Collection of Crop wild relatives and underutilized species • Characterization/ Evaluation/ Multiplication/ Identification of sources of resistance of various mandated crops. • Medium-Term conservation in MTS and seed supply for LTS. Germplasm supply against indents from the NARS for the mandate crops 	<ul style="list-style-type: none"> • A total of 43,232 samples consisting of 14, 901 import samples and 28, 331 export samples were processed for quarantine clearance and a total of 106 phytosanitary certificates were issued. Several pathogens of quarantine importance were intercepted, of these, downy mildew (<i>Peronosporamanshurica</i>) of soybean and bacterial speck of tomato (<i>Pseudomonas syringaepvtomato</i>) are quarantine pests for India. The import samples (2625) that were found infested/infected with pests/pathogens could be salvaged and released to the consignees except thirteen detained/rejected samples (sunflower-1; tomato-2 & soybean-10). In exports, 103 samples were rejected due to the association of quarantine pests/pathogens. Quarantine service was extended to 46 organizations in South India. Post-entry quarantine inspection was conducted on 2,103 samples of different crops meant for ICRISAT (1002), and private industry (1101), which include transgenics also. • A total of 14 explorations (including 8 explorations in Adilabad district under the NAIP) were undertaken and 1461 collections made in various crops; 1231 accessions of different crops were characterized/ evaluated and multiplied in Rabi 2010-11 and 1715 accessions in Kharif 2011 and Rabi 2011-12. A total of 329 accessions of different crops were supplied to researchers in India under MTA; a promising accession of Dolichos lablab having resistance to anthracnose and aphids was registered (INGR 110311) 	<ul style="list-style-type: none"> • Strengthening development of eco-friendly salvaging treatments using microwaves, thermal treatments and botanicals • Identification and characterization of elite genotypes using physiological attributes (greengram, blackgram, cowpea chillies and horsegram)

<ul style="list-style-type: none"> • NBPGR RS Jodhpur 			
<ul style="list-style-type: none"> • Executing, coordinating and monitoring plant genetic resources management activities of arid region 	<ul style="list-style-type: none"> • Augmentation, characterization, evaluation, maintenance, regeneration, conservation, documentation and distribution of genetic resources of (a) cereals, pearl millet, minor millets and horticultural crops; (b) legumes and oilseeds, and (c) fodder, fuel, medicinal and aromatic and other economic plants. 	<ul style="list-style-type: none"> • An exploration trip was undertaken for the collection of landraces of major crops, minor fruits, M&AP and economic potential species from Rana Chowki, Jhakhm Dam, Balmikhi Ashram, Dhulia Khem and Sari Pipli collection sites at Sitamata forest area Sanctuary (Pratapgarh, Chittaurgarh Districts of Rajasthan). A total of 90 accessions, including rare and endangered species, were collected • Also, 81 germplasm collections of different crops, maize landraces (68) [Malan (28) and Sathi (40)], Urd (04), Sorghum (08) and Horse gram (01) were raised in <i>khariif</i> 2011 under NAIP (Harmonizing Biodiversity) project. In all 4,596 germplasm accessions were grown for characterization, evaluation and multiplication. A total of 33,856 germplasm accessions were conserved in the MTS facility. A total of 751 germplasm accessions of different taxa are maintained in the field gene bank. Seed samples of 6,134 accessions were received from different sources and 386 germplasm accessions were supplied to various inventors. 	<ul style="list-style-type: none"> • Introduced first time in the history of NBPGR and CAZRI summer cultivation of guar. • Conducted summer experiments of guar, cowpea, moongbean and mothbean.
<ul style="list-style-type: none"> • Base Centre, Ranchi 			
<ul style="list-style-type: none"> • Executing, coordinating and monitoring plant genetic resources management activities of Chhota Nagpur Plateau and parts of eastern India 	<ul style="list-style-type: none"> • Augmentation, characterization, evaluation, maintenance, regeneration, conservation and documentation of genetic resources of agri-horticultural crops of the region. The mandated crops include: jackfruit, bael, jamun, tamarind, tropical minor fruits; perennial medicinal and plants of economic importance; Medicinal and 	<ul style="list-style-type: none"> • Three explorations were undertaken in the areas of Dumka, Jamtara, Pakur and Deoghar districts of Jharkhand during 2011 and 113 samples of different plant species were collected. • A total of 411 accessions comprising kulthi (362), <i>Mucuna</i> (39) and <i>Cajanuscajan</i> (10) were multiplied and evaluated. A total of 669 accessions of mandate crops, namely, jack fruit tamarind, jamun, bael, barhal, aonla, mango, <i>Lawsoniaindica</i>, moringa and several medicinal and aromatic plant species were maintained in the Field Gene Bank. Accessions of <i>Jatropha</i> spp. were maintained in National <i>Jatropha</i> Germplasm Garden. 	<ul style="list-style-type: none"> • To augment trait-specific unique diversity in different agri-horticultural crops.

	aromatic plants; Horsegram; wild relatives of crop plants.		
• NBPGR RS, Shillong			
<ul style="list-style-type: none"> Augmentation, characterization, evaluation, maintenance, regeneration, conservation, documentation and distribution of plant genetic resources in north-eastern India. 	<ul style="list-style-type: none"> Augmentation, characterization, evaluation, maintenance, regeneration, conservation and documentation of genetic resources of agricultural field crops (paddy- low land/upland, maize and mustard) and their wild relatives; horticultural crops (chilli, ginger, turmeric, yams, taros, <i>Citrus</i>, banana and passion fruit) and their wild relatives, and UU & UEP crops (buck wheat, <i>Coix</i> , <i>Perilla</i> and rice bean) and their wild relatives. 	<ul style="list-style-type: none"> Three explorations were conducted in Manipur, Mizoram and Sikkim during 2011. A total of 41 aromatic rice (chakhao rice) germplasm were collected from Manipur. Collection of multi-crop germplasm comprising vegetables (14), rhizomatous crops (6), fruits (4), cereals (4) and 10 other crops were made from Mamit, Aizawl and Champhai districts of Mizoram. From the exploration trip in the Eastern, Western and Southern districts of Sikkim, maize (46), rice (17), buckwheat (22), <i>Vigna</i> spp. (37) were collected. The station was also collaborated in two other explorations to Arunachal Pradesh under NEH exploration plan. A total of 1082 accessions of different agri-horticultural crops comprising maize (151), upland paddy (273), lowland paddy (229), rice bean (155), <i>Coix</i> (54), <i>Perilla</i>(40), buckwheat (85) and chilli (95) were characterized for agro-morphological traits. Lowland paddy germplasm were evaluated for leaf blast incidence and considerable variation was observed for percent disease incidence (4.4-77.8%). In field gene bank, 610 accessions of various horticultural crops and M&APs were maintained. 	<ul style="list-style-type: none"> Molecular characterization of scented rice and ricebean diversity of NEH region was initiated in collaboration with ICAR RC for NEHR, Umiam, Meghalaya. A work on association mapping of photosynthetic efficiency and grain yield in rice germplasm of NE India is to be initiated under DBT funding.
• NBPGR RS, Shimla			
<ul style="list-style-type: none"> Acquisition and management of indigenous and exotic plant genetic resources (PGR) for food and agriculture, and to carry out related research and human resource development for sustainable growth of agriculture in North- 	<ul style="list-style-type: none"> Augmentation, characterization, evaluation, maintenance, regeneration, conservation, documentation, and distribution of genetic resources of Amaranth, Buckwheat, Chenopod, Kidney bean, pea, adzuki bean, rice bean, small millets, apple, pear, peach, 	<ul style="list-style-type: none"> Three explorations were conducted and diversity collected represent maize (51), kidney bean (27), rice (14), wheat (17), buckwheat (25), barley (11), mustard (15), amaranth (32) and others (26). Significant collections include landraces of red rice, traditional maize, kidney bean and grain amaranth. A total of 2,013 germplasm accessions were grown for characterization, evaluation and multiplication. Genetic variability for seed and pod colour, shape and size was recorded in pea germplasm and also for other traits in different crops. Sixty-four accessions of field pea were 	<ul style="list-style-type: none"> Digitalized geo-referenced maps of PGRs of HP Development of traits specific sets of germplasm for diseases resistance and quality traits for enhanced use and core sets in amaranth and kidney bean On farm conservation of landraces of rice, maize, kidney bean, grain amaranth,

Western Indian Himalayan Region	plum, apricot, walnut, pecan nut, kiwi, minor fruits and other economic plants of temperate WH region	screened against 4 isolates, viz., <i>Rangway</i> , <i>Trilokinath</i> , <i>Stingri</i> , <i>Kangraof</i> powdery mildew (<i>Erysiphepisi</i>). Among fruits, 202 accessions of apple (41), pear (24), plum (41), apricot (22), peach (33), and walnut (41) were characterized and evaluated. Wide range of variability was recorded for traits like fruit colour, shape and size. In peach EC038736, EC312408, EC552643, EC552644 and EC387511 were found superior for multiple traits while ‘Silver King’ of nectarinewas found promising for fruit size and colour.	buckwheat and finger millet (at 12 different sites) • Impact of climate change on genetic diversity & species compositions and shift in cropping patterns • Genetic diversity analysis at molecular level for buckwheat, kidney bean, and chenopod in collaboration with CSK HPKV, Palampur and NBPGR Hqs.
• NBPGR RS, Srinagar			
• Augmentation, characterization, evaluation, maintenance, regeneration, conservation, documentation and distribution of plant genetic resources of J&K region	• Germplasm exploration and collection • Germplasm characterization, evaluation and maintenance • Germplasm supply to users	• The 478 accessions of wheat (240), barley (114) and mustard (124) were evaluated for their morphological characters during <i>Rabi</i> 2010-11 under rainfed conditions. The 723 accessions of wheat (335), barley (280) and sarson (108) were sown in <i>Rabi</i> 2011-12 for characterization and evaluation under rainfed condition of Himalayan. The 39 accessions comprising <i>Dioscoreadeltoidea</i> (23)strawberry (5), pran (onion) (5), mint (3) and <i>Iris spp.</i> were maintained as a live plants in the field.	• To augment trait-specific unique diversity of different agri-horticultural crops of the region.
• NBPGR RS, Thrissur			
• Augmentation, characterization, evaluation, maintenance, regeneration, conservation, documentation and distribution of plant genetic resources in southern Western Ghats region of India including A&N and Lakshwadeep Islands.	• Germplasm Collection • Germplasm Characterization and Evaluation • Germplasm Registration • Germplasm conservation • Germplasm supply • Transfer of horticultural crop germplasm to crop based institutes • Field Day organized • Biodiversity day	• Four exploration/ collection missions were conducted in 2 districts of Goa, 4 districts of Mizoram, 3 districts of Tripura and 6 districts of Assam and a total of 365samples of germplasm were collected from Goa (54), Mizoram (150), Tripura (96) and Assam (65). Out of the collected germplasm, 2 samples of unique chillies landraces and 61 of landraces of deep-water rice from Assam were sent for long-term storage at Germplasm Conservation Division, NBPGR, New Delhi. • During <i>Rabi</i> 2010-11, 170 accessions of rice (<i>Oryzasativa</i>), 3 of wild bittergourd (<i>Momordicacharantia</i> var. <i>muricata</i>),	• Study on effect of climate change on crops.. • Conservation of released crop varieties from ICAR Institutes and SAUs in the region. • Transfer of germplasm to NAGS.

		<p>22 of pumpkin (<i>Cucurbitamoschata</i>), 5 of cushaw (<i>C. argyrosperma</i>), 5 of <i>Solanuminsanum</i>, 17 of <i>Kaempferiagalanga</i> and 380 of horsegram (<i>Macrotylomauniflorum</i>) were evaluated. During <i>Kharif</i> 2011, 34 accessions of upland landraces and 85 of lowland rice, 43 of <i>Sesamum</i> species and 36 of Malabar tamarind (<i>Garciniacambogia</i>) were characterised/ evaluated. Seeds of 67 accessions mostly of forage crops and pumpkin were multiplied and sent for long-term storage.</p>	
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