Capacity Building Programs

National Agricultural Innovation Project
An employer once said, "What if I train my people and they leave?" and I answered, "What if you don't train them and they stay?"

Courtesy: Janice Strachan, Senior Examiner US-PVPO
Capacity building activities

* Foreign training at the centres of advanced research and studies in the frontier areas of agricultural sciences.
* Organizing National Training in the frontier areas of agricultural sciences.
* International trainings in consortia related subjects.
* Leadership training for research management position.
* International training for administrative and financial officials.
* International training for other officials.
* Training of administrative and financial staff in procurement in financial management of world bank aided projects.
* Farmers training.
* Training of Fishermen.
* Training of other stake holders.
Steps under-taken for Capacity Building Programs

To keep abreast the scientists of National agricultural research systems (NARS) with the advances being made in the frontier areas of agricultural sciences through international & national trainings of scientists, NAIP took the following steps:

* Initially (at formulation stage), a target was fixed to train/send for study visits/attend conferences etc. 420 Scientist in frontier areas of agricultural sciences.

* Priority areas for international trainings/visit were identified and number of scientists to be trained in different cutting edge areas were finalized, after several rounds of meetings and consultations with DDGs of different subject matter divisions (SMDs).

* After detailed and intensive discussions, the PMC in its 14th meeting held on 31st July 2008 allocated 456 slots to different areas and guidelines for the selection of scientist were also approved. 22 slots were allocated for training/study-visit/meeting of PIU-NAIP officials.
Steps under-taken for Capacity Building Programs

* On the proposal of NAIP through DARE, DEA, had approved training of 500 scientist vide DEA ID No. 8/11/2004- FB VII Dated 21.11.2008. Concurrence of World Bank was also taken.

* Along with the scientist it was proposed to train NAARM Scientist (26) and 50 NARS personnel (Including scientist, Admin staff, Financial staff etc.). At a later stage, these numbers were increased.

* After thorough discussion, PMC in it meeting held in October 2008, decided to train 984 scientists in frontier areas of Agriculture Sciences through 60 National Trainings. At a later stage, areas for training have been increased.
Summary of International and National Training sponsored by NAIP

<table>
<thead>
<tr>
<th>Training Type</th>
<th>Approved</th>
<th>Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open Trainings</td>
<td>478</td>
<td>471</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(98.53%)</td>
</tr>
<tr>
<td>Consortia Trainings</td>
<td>453</td>
<td>433</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(95.58%)</td>
</tr>
<tr>
<td>Total</td>
<td>931</td>
<td>904</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(97.09%)</td>
</tr>
<tr>
<td>National Trainings</td>
<td>95</td>
<td>92</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(96.84%)</td>
</tr>
</tbody>
</table>

Among the 904 participants, 487 scientists were trained in frontier area of Agricultural Sciences; 417 scientists and other officials went abroad for project based training, leadership training, study visit, attending conference /workshop/meeting etc.
### Component wise breakup of international trainings in various consortia

<table>
<thead>
<tr>
<th>Component</th>
<th>No. of Trainings Approved</th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>As approved at the initial stage</td>
<td>Revised</td>
<td>Completed</td>
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<tr>
<td><strong>Component I: ICAR as the Catalyzing Agent for Management of Change in the Indian NARS</strong></td>
<td>179</td>
<td>245</td>
<td>230</td>
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<tr>
<td><strong>Component II: Research on Production to Consumption Systems (PCS)</strong></td>
<td>75</td>
<td>61</td>
<td>61</td>
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<tr>
<td><strong>Component III: Research on Sustainable Rural Livelihood Security (SRLS)</strong></td>
<td>25</td>
<td>25</td>
<td>22</td>
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<tr>
<td><strong>Component VI: Basic &amp; Strategic Research in Frontier Areas of Agricultural Sciences (BSR)</strong></td>
<td>174</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>453</td>
<td>453</td>
<td>433</td>
</tr>
</tbody>
</table>
# International Trainings in Frontier Areas of Agricultural Sciences - completed

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Frontier Areas of Training</th>
<th>Trainings Approved</th>
<th>Slots from consortia</th>
<th>Total</th>
<th>Total Scientists Trained</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Allele mining</td>
<td>20</td>
<td>2</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>2.</td>
<td>Apomixis</td>
<td>7</td>
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<td>7</td>
<td>6</td>
</tr>
<tr>
<td>3.</td>
<td>Bioinformatics</td>
<td>21</td>
<td>1</td>
<td>22</td>
<td>22</td>
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<tr>
<td>4.</td>
<td>Biomolecules</td>
<td>19</td>
<td>2</td>
<td>21</td>
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<tr>
<td>5.</td>
<td>Bioremediation</td>
<td>12</td>
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<td>12</td>
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<tr>
<td>6.</td>
<td>Biosecurity</td>
<td>15</td>
<td>1</td>
<td>16</td>
<td>16</td>
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<tr>
<td>7.</td>
<td>Carbon trading/ carbon sequestration/climate change</td>
<td>25</td>
<td>4</td>
<td>29</td>
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<tr>
<td>8.</td>
<td>Fermentation technology</td>
<td>15</td>
<td>2</td>
<td>17</td>
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<tr>
<td>9.</td>
<td>Genome resource conservation</td>
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<td>Geoinformatics</td>
<td>8</td>
<td>2</td>
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<tr>
<td>11.</td>
<td>Image processing technology for characterization of agricultural produce</td>
<td>5</td>
<td>1</td>
<td>6</td>
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<tr>
<td>12.</td>
<td>Microbial molecular taxonomy</td>
<td>11</td>
<td>1</td>
<td>12</td>
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<tr>
<td>Sr. No</td>
<td>Frontier Areas of Training</td>
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<td>13.</td>
<td>Molecular diagnostics</td>
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<td>14.</td>
<td>Mitigation strategies for methane production from livestock</td>
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<td>Nutraceuticals</td>
<td>24</td>
<td>3</td>
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<tr>
<td>18.</td>
<td>Non-chemical/non-thermal processing and membrane technology</td>
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<td>19.</td>
<td>Sensor-based applications including bio-indicators</td>
<td>16</td>
<td>2</td>
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<td>20.</td>
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<td>Transgenic animals</td>
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<td>Gene knock down technology</td>
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<td>26.</td>
<td>Marker assisted selection</td>
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<td><strong>490</strong></td>
<td><strong>487</strong></td>
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<td>Number of Trainings</td>
<td>No. of Scientists Trained</td>
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<td>Bioinformatics</td>
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<td>Biomolecules</td>
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<td>Fermentation technology</td>
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<td>Microbial molecular taxonomy</td>
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<td>Nutraceuticals</td>
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<td>50</td>
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<td>2</td>
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<tr>
<td>21.</td>
<td>Smart packaging</td>
<td>1</td>
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<td>23.</td>
<td>Social sciences &amp; policy analysis</td>
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<td>3*</td>
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<td>24.</td>
<td>Forecasting modeling in crops</td>
<td>2</td>
<td>2</td>
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<tr>
<td>25.</td>
<td>Nutrient use efficiency</td>
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<td>2</td>
<td>31</td>
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<tr>
<td>26.</td>
<td>Water use efficiency</td>
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<td>1</td>
<td>15</td>
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<td>27.</td>
<td>Project formulation, risk assessment, scientific report writing &amp; presentation</td>
<td>17</td>
<td>16*</td>
<td>206</td>
<td></td>
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<tr>
<td>TOTAL</td>
<td></td>
<td>95</td>
<td>92</td>
<td>1425</td>
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</table>
INITIAL FINDINGS

Based on the institute’s visits and discussion with the scientists, the training had resulted in direct and indirect outputs in terms of scientific knowledge which are as follows:-

Direct Impacts

* Exposure to international Laboratories – The training provided them the opportunity to get the exposure to international laboratories.
* Knowledge gained - Increase in knowledge in the subject area trained through learning of new techniques, new experimental design systems, and new technologies.
* Connections and Collaborations Developed – Scientists were able to develop connections and collaborations with some of the experts in their subject fields. Some of the scientists were able to develop collaborative projects with their supervisors of the training.

Indirect Impacts

* Apart from the knowledge gained and skills learned, the indirect impacts from the training are:-
* Improved Confidence Level – The training had improved their confidence level in terms of the subject area trained.
* New Skills learned – Some scientists were able to learn new certain programming skills and improved their research methodological skills.
STRENGTHENING NARS THROUGH TRAINED MANPOWER

- 92 National Trainings utilizing the expertise of trained manpower have been organized.
- 79 National Trainings have been organized by these trained scientists as Course Directors.
- 100 trained scientists acted as Resource Person for National Trainings and Summer/Winter Schools.
- Over 100 students have registered for Doctoral and Masters Degree under the trained Scientist under the area of training of guide.
- In National Trainings, 85 Manuals & 13 CDs have been developed and distributed to trainees.
- A bulletin has been printed listing various National Training in Frontier Areas of Agricultural Sciences.
Invention

* Seed coating with electrospun nano-fibers for controlled release of pesticides
* Seed coating process in which pesticides incorporated in a biodegradable polymer coated on the surface of seeds using electrospinning/ electrospraying technology.
* Additional benefits like improved specificity, ease and safety in handling.

A Patent has been filed in USA in this area by Cornell University, USA which includes the name of trainee Dr. K. Rameash.

**Name of the Scientist**: Dr. K. Rameash, Sr. Scientist, NBPGRE, Regional Station, Hyderabad

**Place of Training**: Textile Nanotechnology laboratory, Cornell University, USA

**Resource Person**: Prof. Juan P. Hinestroza and Dr. K. V. Raman
Intervention:

* The First Genetic Map and positions of Major fruit trait loci of Bitter Melon (Momordica charantia). Construction of first genetics linkage map of bitter melon using a set of 146 F2 progenies derived from an inter-botanical variety cross between Taiwan white, Momordica charantia var. charantia and CBM12, M. charantia var. muricata was made.

* This map will be useful in marker assisted breeding of these fruit traits and future mapping of genes/QTLs controlling phytomedicines content exhibiting contrasting variation between the parents.

Name of the Scientists: Dr. Virendra K. Rao (GBPUAT)  
Dr. Anju Bajpai (CISH, Lucknow)  
Dr. S. Backyarani (NRC for Banana, Chennai)  
Dr. Jogendra Singh (ICAR Research Complex for NEH Region, Imphal)

Name of the Resource Person: Dr. Chitranjan Kole

Place of Training: Clemson University, Clemson

* Paper Published in the Journal of Plant Science and Molecular Breeding
1 Scientist could not go due to ill health.

2 Scientists had to reduce the training period due to mishap in family.

Delay in getting Visa
Factors which quickened the process of Training

- Approval by DEA for 500 slots in one go.

- Delegation of sanctioning power regarding international and national trainings to National Director, NAIP.

- Cooperation of all the concerned officials of NAIP, ICAR, DARE, DEA & World Bank.
Highlights – Budget and Scope

- **91.33 crores**
  - L&CB
- **487 Trainees**
- **23 Countries**
- **6 Core Themes**
- **38.26 crores (42%)**
  - International Training
- **7.86 Lacs per Trainee**
- **122 Institutions**
- **27 Sub-Themes**

**Distribution of Training Duration**
- **94%**
  - 12 weeks Training
- **6%**
  - 2-3 Weeks Training

**Core Themes**
- Basic Sciences
- Processing Technology
- Biosecurity
- Climate Change
- Informatics
- Social Science and Policy
 Participating Institutions

- **122 Total Institutes**
- **75% ICAR Inst.**
- **25% SAUs**

Trainees:
- **81%**
- **19%**

Trainees From IARI: **7%**

Top SAUs Participated:
- 3% UAS, Raichur
- 3% TN Vet and AS University, Chennai
- 2% PAU, Ludhiana
- 2% CSK, Palampur
Spread of Trainees by Subject Matter Divisions

- Social-Sc: 6%
- Engg: 8%
- NRM: 10%
- Fish: 14%
- Animal-Sc: 19%
- Crop-Sc: 20%
- Hort: 23%

SMD Horticulture Biggest Gainer followed by Crop Sciences
Distribution of Trainees (%) by Core Theme Areas

- Basic Sciences: 48%
- Processing Technology: 18%
- Biosecurity: 10%
- Climate Change: 8%
- Informatics: 8%
- Social Science and Policy: 8%
- Basic Sciences: 48%
Trainees Profile: Designation (%) and Age / Experience (years)

- Scientists / Asst. Prof.: 24
  - Age: 41
  - Exp.: 13
- Sr. Scientists / Assoc. Prof.: 63
  - Age: 36
  - Exp.: 8
- Principal Scientists / Prof.: 13
  - Age: 46
  - Exp.: 19

Senior Scientists a Major Lot
Gender of Trainees

ICAR
Male, 81%
Female, 19%

SAUs
Male, 78%
Female, 22%
Destination Mapping: Distribution of Trainees (%): Countries & Institutions

Top Destination Institutes:
- Michigan (9)
- Iowa (7)
- Cornell (6)

Distribution of Trainees (%):
- USA + Canada (70 + 3)
- UK + EU (8 + 9)
- SEA (4)
- AU + NZ (4)

EU – UK, Germany, France, Italy, Sweden, Denmark
SEA – Singapore, Malaysia, Thailand, Philippines
Others – Syria, Peru, Columbia, Mexico, Chile
Our Top Mentors /Facilitators

- Prof. K. V. Raman
  - Cornell University, USA

- Prof. James Reecy
  - Ohio State University, USA

- Prof. Karim M Maredia
  - Michigan State University, USA

- Prof. Muraleedharan G Nair
  - Michigan State University, USA

- Prof. Rattan Lal
  - Ohio State University, USA
Trainees’ perceptions about the training

- **Training review**
  - Training objectives were met (92%)
  - Training very comprehensive (82%)
  - Training content directly relevant to area of work (82%)

- **Impact on research, communication and networking**
  - Inspired new research ideas (94%)
  - Learnt, which is immediately applied to current work (80%)
  - Improved presentation/writing skills (65%)
  - Develop linkages at universities/ institutes visited (33%)

*(Figures in parentheses represent % of trainees responded)*
Trainees’ Perception, contd. …..

- **Impact on attitudinal change**
  - More motivated to do their job (83%)
  - More confident in their position (86%)
  - Increased expectations from trainee at work (85%)

- **Impact on trainees’ productivity, efficiency and effectiveness**
  - More efficient at work (86%)
  - Increase in productivity (86%)
  - Increase in effectiveness of trainees in their organisation (86%)
Indicators of benefits/outcomes of CBPs in terms of output index in pre and post training period

Note:- Technologies developed are defined application of techniques for improving productivity through developing new varieties/breed. Possible technologies are:- prototype, genetic/stock, variety/breed, product, vaccine, diagnostic kit, process, methodology/technique.
Gains with respect to journal articles, project proposals, technological innovations and patent submitted

- **Themes**
  - Biosecurity/conservation, Basic sciences, Processing Technology & Informatics have gained more respect to all outputs

- **Training location**
  - Trainees trained at USA have gained more with respect to all outputs

- **Divisions**
  - Horticulture, Crop Sciences and NRM have gained more with respect to all outputs
Gains, contd. …..

By Designations –
• Senior scientist/Associate Professor have gained more w.r.t. journal articles, followed by technologies developed, patent and project proposal submitted.
• Principal scientist/Professor have gained more with respect to patent and project proposals submitted.

By Duration - 12 weeks had shown more gains w.r.t all outputs.

By Age –
• Trainees with age of < 35 years and 35-40 years had gained with respect to journal articles accepted for publication and technologies developed.
• Those >40 years had gained more with respect to patents and project proposals submitted.
## Impact of training at institution level

<table>
<thead>
<tr>
<th>Impact at SAU</th>
<th>Impact at ICAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Immediate application of training skills in current work area</td>
<td>• More number of trainees submitting journal articles for publication</td>
</tr>
<tr>
<td>• High impact on presentation/writing skills</td>
<td>• Application of techniques learnt at training in developing new project proposals</td>
</tr>
<tr>
<td>• High impact on networking / linkage skills to enhance research</td>
<td>• More joint publications with supervisors</td>
</tr>
</tbody>
</table>
Connections leading to collaborations

- Connections resulting in collaborative projects (55%)
  - Trainees-level communication resulting in collaborative projects (47%)
  - Organisation-level communication resulting in collaborative projects (8%)

- Post training Professional Recognitions:
  - Awards received (27%)
  - Institutional award (17%)
  - National award (7%)
  - State-level award (3%)
<table>
<thead>
<tr>
<th>Theme</th>
<th>Product</th>
<th>Average B-C Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marker Assisted Selection (123)</td>
<td>HY Cattle</td>
<td>11.35</td>
</tr>
<tr>
<td></td>
<td>Disease Resistant PB</td>
<td>9.32</td>
</tr>
<tr>
<td></td>
<td>Salt Tolerant PB</td>
<td>9.31</td>
</tr>
<tr>
<td>Nanotechnology (19)</td>
<td>Nano-biochar</td>
<td>1.95</td>
</tr>
<tr>
<td></td>
<td>Biobased polymeric films</td>
<td>1.13</td>
</tr>
<tr>
<td></td>
<td>Cellulose nanofibre</td>
<td>1.25</td>
</tr>
<tr>
<td>Fermentation technology (15)</td>
<td>Nisin (biological preservative)</td>
<td>1.40</td>
</tr>
<tr>
<td></td>
<td>Cellulosic ethanol</td>
<td>1.15</td>
</tr>
<tr>
<td>Carbon Trading / Sequestration (19)</td>
<td>Carbon Credits</td>
<td>1.85</td>
</tr>
<tr>
<td></td>
<td>GHG reduction factors</td>
<td>2.52</td>
</tr>
<tr>
<td>Genome Resource Conservation (13)</td>
<td>All economic traits</td>
<td>3.88</td>
</tr>
<tr>
<td>Genome Resource Conservation</td>
<td>Hybrid</td>
<td>1.009</td>
</tr>
<tr>
<td>Nutraceutical (20)</td>
<td>Nutraceuticals Fish</td>
<td>1.17</td>
</tr>
<tr>
<td>Allele Mining (14)</td>
<td>Identification of special Genes</td>
<td>25 times cost efficient</td>
</tr>
</tbody>
</table>
Leadership Management Program – Outputs and Outcomes

**Skills developed/improved**
- Decision making skills
- Management skills
- Communication skills

**OUTPUTS**

**OUTCOMES**
- Useful in problem solving
- Better understanding of leadership process
- Developing a leadership plan for long-term perspective with effective utilization of institute resources

**Follow-up Actions**
- Skills to be used for better research management process
- Training modules developed for grassroots level workers and stakeholders
- Efficiency improved in managing programs
- Collaborations developed
Response from Directors/Heads of the ICAR institutes & VCs of SAUs.

OUTCOMES

Research/Technical skills improved
- Analytical skills improved
- Improvement in formulating better project proposals
- Technical capacity improved (through new techniques learned)

Soft skills development
- Peer interaction improved
- Motivation improved
- Communication skills improved
- Confidence to conduct quality research
- Special skills to do demand driven research

Linkages developed
- International contacts developed
- Interactions with global knowledge resource

IMPACT

New Projects Initiated
Help in current projects
Publishing reports
Long-run projects planned to maintain relations with global institutions

International Trainings
Way Forward
1. Designing course and training placement

- Identify mentors, resource persons, labs
- Collaborating committee of institutions
- *ICAR-SA U-US Universities-CG centres*
- Develop mutually acceptable priority areas
- *Research, Teaching and Extension*
2. Selection of candidates

- < 40 years
- 40-50 years
- > 55 years

But more flexibility

3. Pre training orientation

- Retreat
- Briefing at SMDs
- Do’s and Don’ts
- Correspondence with mentor
4. Duration of training

- **Dovetail training with duration**
  - Short: 3-4 weeks → Skill Development
  - Medium: 15 weeks → Update Expertise
  - Long: 60 weeks → Frontier areas
  - Skill development of technical staff
  - Leadership training for V.C., Directors, Dean, Head of Division etc.
  - Foreign training of administrative and financial officials etc.
5. Encourage long term partnership

- Association in on-going projects
- Exchange of interns/researchers
- Exchange of PhD students
- MOUs

6. Seed grants for short term collaborations

7. Inventory of discipline-wise resource persons and their expertise

Develop a pool of trained resource future programs in India to emerge as a “Training Hub”
THANK YOU!