INTERNATIONAL TRAINING PROGRAMME

ON

Seed Processing and Value Addition

(For Trainees from Afghanistan)

Funded by Ministry of Rural Rehabilitation and Development, MRRD, Afghanistan

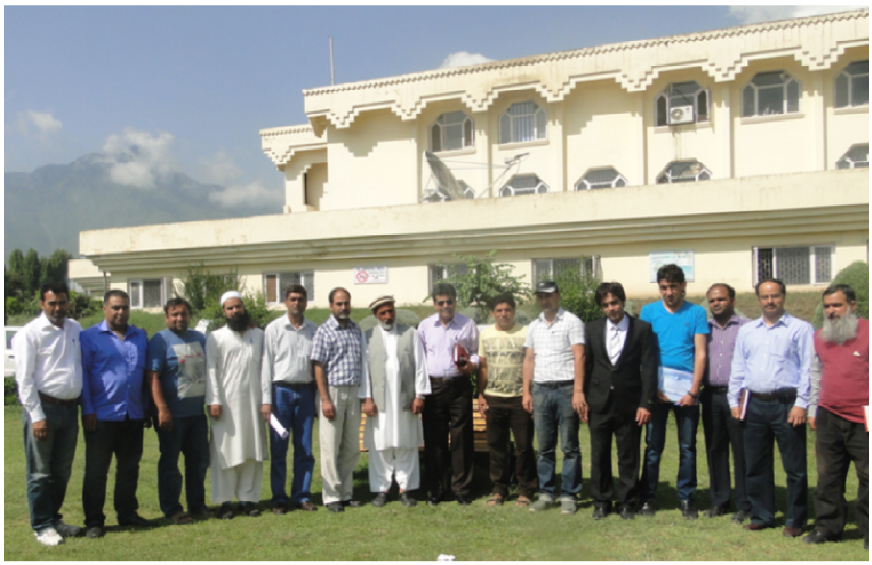
1st - 9th July, 2013

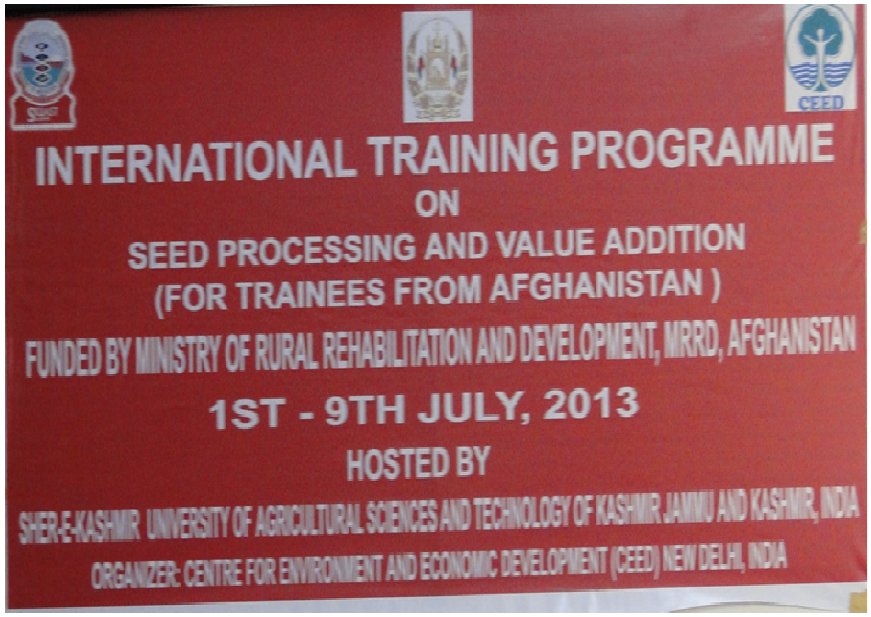
Hosted by

Sher-e-Kashmir

University of Agricultural Sciences and Technology of Kashmir Jammu and Kashmir, India

Organizer: Centre for Environment and Economic Development (CEED) New Delhi, India




CEED
INTERNATIONAL TRAINING PROGRAMME
ON
SEED PROCESSING AND VALUE ADDITION
(FOR TRAINEES FROM AFGHANISTAN)
FUNDED BY MINISTRY OF RURAL REHABILITATION AND DEVELOPMENT, MRRD, AFGHANISTAN
1ST - 9TH JULY, 2013
HOSTED BY
SHER-E-KASHMIR UNIVERSITY OF AGRICULTURAL SCIENCES AND TECHNOLOGY OF KASHMIR JAMMU AND KASHMIR, INDIA
ORGANIZER: CENTRE FOR ENVIRONMENT AND ECONOMIC DEVELOPMENT (CEED) NEW DELHI, INDIA

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1. INTRODUCTION

Seed can play a critical role in increasing agricultural productivity: it determines the upper limit of crop yields and the productivity of all other agricultural inputs to the farming system. Good and healthy Seeds always-prominent ingredients to nourish the plant and food production process. Quality Seed can be harvested from the better-managed crop yields. Seed harvesting, conservation and managements improve livelihoods for all sections of the rural community based upon economically viable activities – food production, off-farm employment and trade - social cohesion and sustainable use of natural resources. Quality seed is one of the most important input factors governing the yield potential of a crop. Use of unhealthy insect and disease attacked seed will just bring the disaster to farmers. Therefore, it is imperative to supply farmers quality seed of various crops. Freshly harvested and threshed seed is generally fit for growing a new crop. But it has to be stored for some period ranging from a few days to numerous years because of unfavourable climatic conditions or dormancy for germination or for national reserve. The raw seed though genetically pure, contains a lot of undesirable material like weed seeds, seeds of other crops or varieties or damaged seed. Therefore it has to be processed and upgraded for better and uniform crop stand in the next crop season. The main cause for damage of seed is the moisture content. N The deterioration in seed quality is initiated at moisture content above 15% due to mould growth, heating due to increased respiration and activities of micro-organisms. To avoid such losses in seed quality and to maintain it, the seed has to be artificially dried to 10-12% moisture content before storing. The seed has to be dried as soon as it is harvested.

The program is being sponsored as part of Afghanistan Rural Enterprise Development Program (AREDP) under Ministry of Rural Rehabilitation and Development (MRRD) programme for practical exposure visit to Indian Universities and institutions, this programme is collaboration with CEED, ASIA. Under this exposure visit the Afghan participants could learn new technology, practical experience and gain applied knowledge to develop their own capacity and use local resources amicably to meet the present need and boost the rural economy of the Afghanistan. This training will bring together stakeholders including SMEs, technical officials, business groups, farmers, etc., to exchange views and ideas pertaining to variety choice, seed multiplication, exchange and marketing. The fairs attract a wide range of stakeholders including seed enterprises, farmers, NGOs, seed and agro-chemical dealers, research institutes, donors, senior MRRD /MAIL officials and many other stakeholders. It will further insight technical ideas starting from keeping records of the multiplication of varieties and inspection of the seed production field, seed processing, seed treatment, testing and finally packaging for marketing.

2. OBJECTIVE OF THE WORKSHOP

The objective of this training programme was to disseminate the knowledge and technological knowhow about quality of seed production, its processing and marketing strategies among the small and medium enterprises of Helmond provinces, Afghanistan.

The focal endeavors of this training workshop are to:

i) **Share and exchange scientific information technological know how and experiences on quality seed productions to small and medium seed enterprisers of Afghanistan.**

ii) **Train the participants on advanced technology to maintain the breeding and hybrid seeds.**

iii) **Hands-on training on scientific processing/ preservation, packaging and marketing to maintain quality and increase shelf life of the products.**

iv) **Pedagogue on value addition and quality control for better economic gain from the produces by the small and medium seed enterprisers.**

In order to achieve this objective, the topics were divided into four themes designed to address specific issues followed by applied activities. In short, the training deliberated in detail on how to address the following issues and problems faced by the farmers in their local conditions:

- ***Theme 1 – Quality Seed production, testing , release and notification of a variety***
- ***Theme 2 – Maintenance Breeding and Hybrid Seed Technology***
- ***Theme 3 – Seed Production , Testing and Marketing***
- ***Theme 4 – Seed processing, packaging and storage***
- **Visit to Mountain Research Centre for Field Crops, Khudwani**
- **Visit to Mountain Livestock Research Institute, Manasbal**
- **Visit to Seed Production Farm, Gulmarg**
- **Visit to Organic Farm Research Centre, Wadura**
- **Visit to Seed Processing Unit, Shalimar**

3. RECOMMENDATION

After deliberations and conclusions on a number of issues, the workshop made a number of recommendations for the MRRD and the DFID to consider implementing.

Recommendation 1

Organizing similar training workshop in abroad as well as in Afghanistan in order to sensitize farmers and entrepreneurs regarding the latest advances in quality seed production, storage and marketing in order to improve the productivity of the quality seed as well as increasing the net profit by effective marketing.

Recommendation 2

Production and maintenance of nucleus and breeder seed, hybrid seed production and establishment of seed testing laboratories in Afghanistan with the financial support of Afghanistan Government and other international organization with technical consultancy from India and other neighboring countries.

Recommendation 3

Production of foundation and certified seed and establishment of seed certification agency in Afghanistan to enhance the production of quality seed.

Recommendation 4

Establishment of seed processing units and value added seed enterprises which will increase the net profit of the farmers and boost their socio-economic status. In addition to this, it is also suggested to establish cold

storage units for effective storage and transportation of quality seed

Recommendation 5

4. WELCOME AND INTRODUCTORY SESSION

3.1 WELCOMING:

Dr. Rakesh Vaishnavi (Associate Professor) I/C NSP, Division of Plant Breeding and Genetics, SKUAST-K welcomed all the delegates to the training programme and suggested that the training programme should be more interactive and practical oriented apart from theoretical explanations.

3.2 INTRODUCTION TO THE TRAINING

Dr. Rakesh Vaishnavi also gave the introductory remarks regarding the training program. He further added that quality seed is one of the most important input factors governing the yield potential of a crop. Use of unhealthy insect and disease attacked seed will just bring the disaster to farmers. Therefore, it is imperative to supply farmers the quality seed of various crops. Freshly harvested and threshed seed is generally fit for growing a new crop. But it has to be stored for some period ranging from a few days to numerous years because of unfavourable climatic conditions or dormancy for germination or for national reserve. The raw seed though genetically pure, contains a lot of undesirable material like weed seeds, seeds of other crops or varieties or damaged seed. Therefore it has to be processed and upgraded for better and uniform crop stand in the next crop season. The main cause for damage of seed is the moisture content. The deterioration in seed quality is initiated at moisture content above 15% due to mould growth, heating due to increased respiration and activities of micro-organisms. To avoid such losses in seed quality and to maintain it, the seed has to be artificially dried to 10-12% moisture content before storing. The seed has to be dried as soon as it is harvested.

Seed lots usually contain inert material, weed seeds, deteriorated and damaged seeds, off-type seeds etc. Seed cleaning and upgrading to remove or reduce to the extent possible, the various undesirable material and to get a uniform size seed so as to upgrade its overall quality is a must. The cleaning process is done on the basis of differences in physical properties of desirable seed and undesirable matter i.e. seed size, density, shape, surface texture, colour etc. Most often, satisfactory processing requires that lots be processed in a specific sequence through several operations.

Seed is covered with some organic compounds to protect it from storage loss or loss to the germinating young seedlings by organisms like fungi, bacteria and viruses in the soil. The seed treatment is generally done with materials in the form of dust, wettable powders or liquids.

Packaging material must provide protection against high relative humidity. Under dry warehouses and storage conditions, the use of cotton, jute and paper bags is the most satisfactory method of seed packaging. While in high humidity locations, some moisture proof containers like aluminium-polythene laminated pouches, polythene bags of over 700 gauge thickness, sealed tins etc. are good for this purpose.

A reliable seed test, conducted by seed testing laboratories, will avoid the use of inferior seed and is mandatory. Seed testing is done for judging the physical purity, germination and moisture content as per the minimum seed standards. Seed of the new crop varieties, superior in some quantitative and qualitative characteristics to existing ones, should be made available in appreciable quantity to farmers in areas for which the varieties are most suitable. The farmers who purchase seed should be sure of buying good seed of specific varieties. To provide a reasonable guarantee of the genetic quality of seed prior to sowing, seed quality

control systems work in India with the aim of thorough supervision of the entire seed production system. This involves keeping records of the multiplication of varieties and inspection of the seed production field, seed processing, seed treatment, testing and finally packaging for marketing. Each bag, package or container is labelled to prove that it is a part of certified lot. Labelling the bags is the concrete act of certification and provides the tangible document of certification to each buyer.

3.3 KEYNOTE ADDRESS

Dr. Shafiq A Wani, Director Research, SKUAST-K Shalimar, Jammu and Kashmir, India welcomed the participants. After a brief introduction by the participants, he emphasized that seed is the basic and most critical input for sustainable agriculture. The response of all other inputs depends on quality of seeds to a large extent. It is estimated that the direct contribution of quality seed alone to the total production is about 15 – 20% depending upon the crop and it can be further raised up to 45% with efficient management of other inputs. The developments in the seed industry in India, particularly in the last 30 years, are very significant. A major re-structuring of the seed industry by Government of India through the National Seed Project Phase-I (1977-78), Phase-II (1978-79) and Phase-III (1990-1991), was carried out, which strengthened the seed infrastructure that was most needed and relevant around those times. This could be termed as a first turning point in shaping of an organized seed industry. Introduction of New Seed Development Policy (1988 – 1989) was yet another significant mile stone in the Indian Seed Industry, which transformed the very character of the seed industry. The policy gave access to Indian farmers of the best of seed and planting material available anywhere on the world. The policy stimulated appreciable investments by private individuals, Indian Corporate and MNCs in the Indian seed sector with strong R&D base for product development in each of the seed companies with more emphasis on high value hybrids of cereals and vegetables and hi-tech products such as Bt. Cotton. As a result, farmer has a wide product choice and seed industry today is set to work with a 'farmer centric' approach and is market driven. However, there is an urgent need for the State Seed Corporations also to transform themselves in tune with the industry in terms of infrastructure, technologies, approach and the management culture to be able to survive in the competitive market and to enhance their contribution in the national endeavour of increasing food production to attain food & nutritional security.

The Indian Seed Improvement Programme is backed up by a strong crop improvement programme in both the public and private sectors. At the moment, the industry is highly vibrant and energetic and is well recognized in the international seed arena. Several developing and neighbouring countries have benefited from quality seed imports from India. India's Seed Programme has a strong seed production base in terms of diverse and ideal agro-climates spread through out the country for producing high quality seeds of several tropical, temperate and sub-tropical plant varieties in enough quantities at competitive prices. Over the years, several seed crop zones have evolved with extreme levels of specialization.

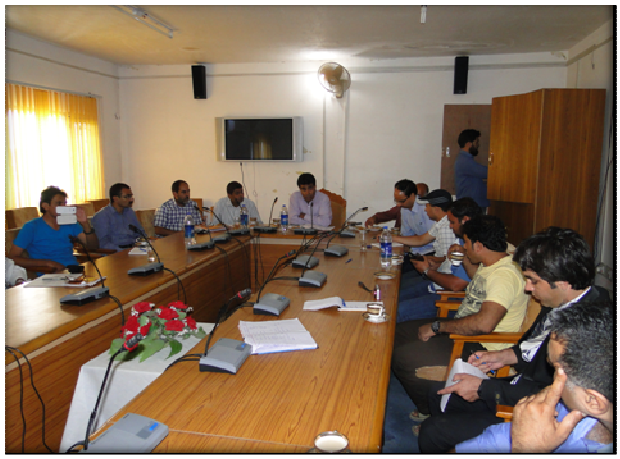
Similarly, for post harvest handing, the Indian seed processing/conditioning industry has perfected the techniques of quality up-gradation and maintenance to ensure high standards of physical condition and quality. By virtue of the diverse agro-climates several geographical zones in the country have emerged as ideal seed storage locations under ambient conditions. In terms of seed marketing and distribution, more than about 20000 seed dealers and distributors are in the business.

Over the years, seed quality specifications comparable to international standards have been evolved and are

adopted by the Indian Seed Programme in both the public and private sectors. The country has a strong rigorous mechanism for seed quality control through voluntary seed certificate and compulsory labelling monitored by provincial level Seed Law Enforcement Agencies. For seed technology research, India has a national level Directorate under the Indian Council of Agricultural Research as well as Status level research set up in the State Agricultural Universities. In seed education, 4-5 prominent State Agricultural Universities offer post graduation in Seed Technology leading to M.Sc./Ph.D Degree. The seed industry has three well reputed national level associations apart from several provincial level groups to take care of the interests of the industry.

Thus, the Indian Seed Programme is now occupying a pivotal place in Indian agriculture and is well poised for continued growth in the years to come. National Seeds Corporation, which is the largest single seed organization in the country with such a wide product range, pioneered the growth and development of a sound industry in India. NSC, SFCI, States Seeds Corporations and other seed producing agencies are continuously and gradually expanding all its activities especially in terms of its product range, volume and value of seed handled, level of seed distribution to the un-reached areas, etc. Over the past four decades, these seed producing agencies have built up a hard core of competent and experienced seed producers

and seed dealers in various parts of the country and have adequate level of specialization and competence in handling and managing various segments of seed improvement on scientifically sound and commercially viable terms.



5. QUALITY SEED PRODUCTION, TESTING RELEASE AND NOTIFICATION OF VARIETIES

4.1 Seed Quality : DR. Zahoor A. Dar

Dr. Zahoor emphasized the importance of Seed quality in agriculture. Seed quality results from genetic, physical, physiological and phytosanitary characteristics of the seeds. High quality seeds should have capacity to produce normal seedlings, expected field emergence and uniformity and potential storability. He further laid stress on the fact that Quality seed is critical in agricultural production: poor seed limits the potential yield and reduces the productivity of farmer's labour. When seed has good physical, physiological, health and genetic qualities farmers have greater prospects of producing a good crop. High quality seed is a major factor in obtaining a good crop stand and rapid plant development even under adverse conditions although other factors such as rainfall, agronomic practices, soil fertility and pest control are crucial

4.2 Testing, release and notification of varieties: DR. Dr. Gul Zaffar

The speaker discussed various stepdps involved in testing, release and notification of varieties under the following heads;

Evaluation: Consists of various trials and tests to determine its superiority over the best existing variety in yield, agronomic traits and its suitability for consumption

Identification: Outstanding cultures are identified for release as new varieties at the Annual workshops of the coordinated projects on the respective crops. Proposals for the identification of cultures may be prepared by the respective breeder in a prescribed format. Proposals should consist of information on the results of the various centres of AICRP for at least two years, pest and disease reactions and quality parameters. The proposals will be examined by an Identification committee. The criteria for identification as variety may vary form one crop the other. Culture after consideration called as Identified variety

Release and Notification: After identification, the variety is to be tested for at least one year for disease and quality tests. The breeder should submit a proposal for release as a new variety for approval by the Central Sub-Committee on Crop Standards, Notification and release of varieties. After a variety has been released for a zone by the Central Sub-Committee, the Director, HYV, Ministry of Agriculture and Irrigation, GOI notifies the concerned authorities of the states within that zone for seed multiplication and distribution of variety. This is known as notification of variety.

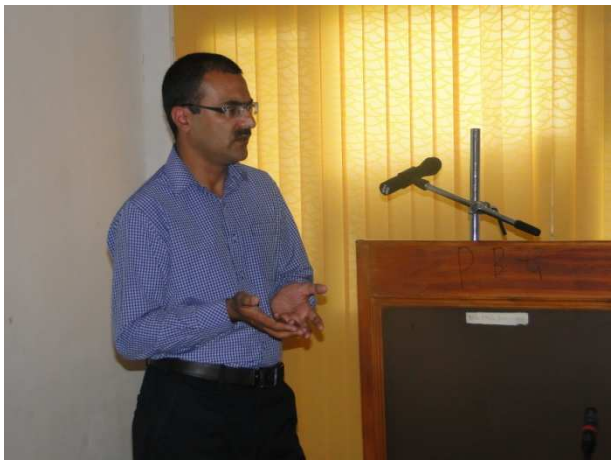
4.4 DISCUSSION OF THE ABOVE two presentations

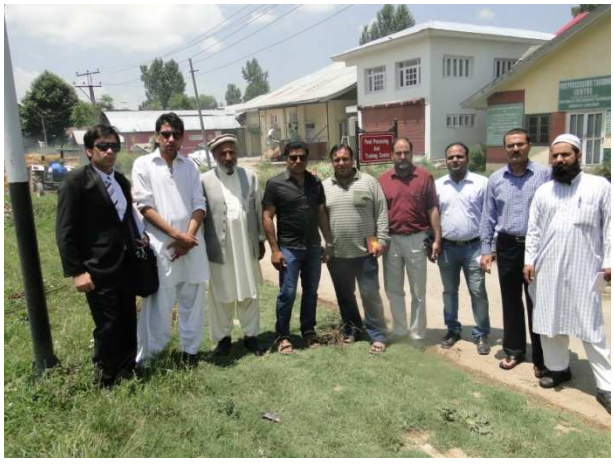
Following the presentations the following discussion points were raised by participants

- *How much time will it take to develop a new variety*
- *What are the parameters for selection of a variety*
- *How many seed companies are there in India*
- *In Afghanistan the farmers don't grow certified seed, what is the solution.*

Dr Zahoor replied that, to develop a new variety it will take 10 -12 years on an average. Further, he described that there are several parameters for selection of a variety which include yield, quality, and market quality. He also replied that there are about six hundred seed companies in India both public and private which are producing hybrid seed to fulfill the demand of farmers in India.

Dr Gul Zaffar replied, to grow certified seed, farmers need to be made aware by conducting awareness programmes regarding adoption of certified seed in collaboration with agricultural extension personnel. Certified seed results in production of quality seed.





5. Maintenance Breeding and Hybrid Seed Technology

5.1 Maintenance of nucleus and breeder seed production in self and cross pollinated crops: Dr. Najeeb A. Sofi

Dr Najeeb highlighted the different classes of Seed i.e., Nuclus seed: The initial hand full of seeds obtained from selected individual plants of a particular variety, for the purpose of purifying and maintaining that variety, by originating plant breeder. Breeder's seed: Progeny of Nucleus seeds, its production is directly controlled by the originating or the sponsoring breeder or institution, providing for the initial and recurring increase of foundation seed. Foundation seed: The Progeny of breeders or foundation seed handled to maintain specific genetic purity and identity. This seed is the source of all other certified seed classes. Certified seed: The progeny of foundation or certified seed that is handled so as to maintain satisfactorily genetic identity and purity and that has been approved and certified by the certifying agency. He further elaborated the maintenance breeding; it helps in purification and maintenance of a variety and consequent production of nucleus seed. The use of nucleus seed in turn enhances the amount the useful life of a variety. It will help in meeting the uniformity criteria in DUS testing, provided the maintenance breeding procedure is started at an early stage. Methods of maintaining nucleus seed/breeder's can be conveniently divided into the following two groups: Maintenance of newly released varieties Maintenance of established varieties

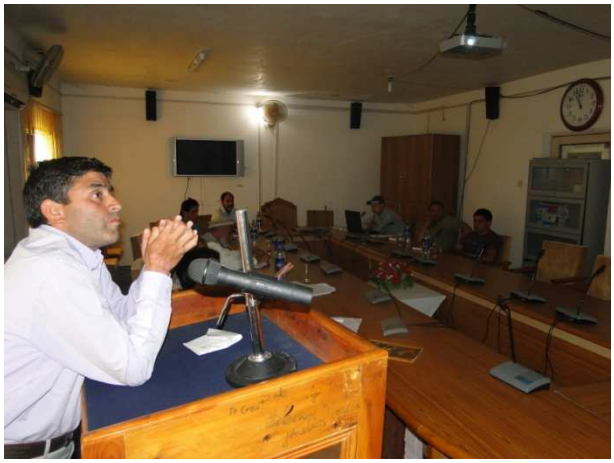
The following steps are involved in the maintenance of breeder's seed. Breeder's stock seed from the nucleus should be sown on the clean, fertile land, which did not grow a crop of the same kind in the previous year. The field should properly be isolated. The best farm procedures should be used in the sowing, raising and harvesting of breeder's stock. It should be produced at the experiment station in the area in which the new variety has been bred.

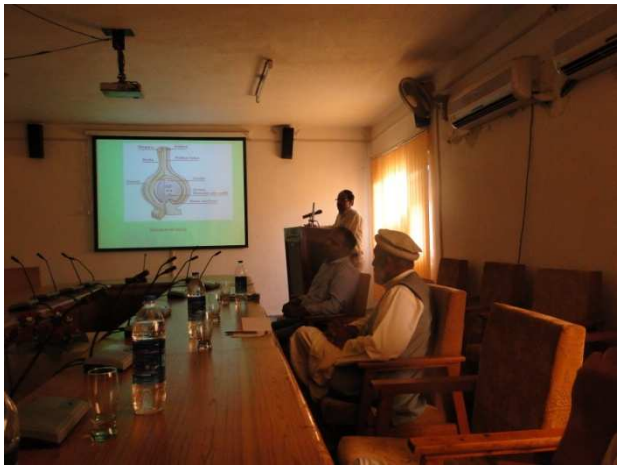
5.2 Hybrid Seed production: Dr. M. A. Bhat

Dr Bhat started his talk with the introduction about hybrid seed technology. In agriculture hybrid seed is seed produced by cross-pollinated plants. In hybrid seed production, the crosses are specific and controlled. The advantage of growing hybrid seed compared to inbred lines comes from heterosis. To produce hybrid seed, elite inbred varieties are crossed with well-documented and consistent phenotypes (such as yield) and the resulting hybrid seed is collected. Another factor that is important in hybrid seed production is the combining ability of the parent plants. Although two elite inbred parent plant varieties may produce the highest yields of their crop, it does not necessarily mean that crossing these inbreds will result in the highest yielding hybrid. Hybrids are bred to improve the characteristics of the resulting plants, such as better yield, greater uniformity, improved colour, disease resistance, and so forth. Today, hybrid seed production is predominant in agriculture and is one of the main contributing factors to the dramatic rise in agricultural output during the last half of the 20th century. All of the hybrid seeds planted by the farmer will be the same hybrid while the seeds from the hybrids planted will not consistently have the desired characteristics i.e. higher yield. This is why hybrid seed is constantly re-purchased by growers for each planting season. Development of hybrid seed has revolutionized production if different crops viz. Maize, rice, vegetables crops, barley, etc.

Male sterility in hybrid breeding :

Hybrid production requires a female plant in which no viable male gametes are borne. Emasculation is done to prevent a plant from producing pollen so that it serves only as a female parent. Another simple way to establish a female line for hybrid seed production is to identify or create a line that is unable to produce viable pollen. Male sterility (cytoplasmic) is used in hybrid seed production. In this case, the sterility is transmitted only through the female and all progeny will be sterile. These CMS lines must be maintained by repeated crossing to a sister line (known as the maintainer line) that is genetically identical except that it possesses normal cytoplasm and is, therefore, male-fertile. In cytoplasmic–genetic male sterility restoration of fertility is done using restorer lines (R lines) carrying nuclear restorer genes. The male-sterile line is maintained by crossing with a maintainer line carrying the same nuclear genome as the MS line but with normal fertile cytoplasm.





5.4 DISCUSSION OF ABOVE TWO PRESNTATIONS

Following the presentations the following discussion points were raised

- What is a Multilocational trial?
- Why is breeder seed produced in the same station where variety was released.

Dr. Najeeb elaborated the details of multilocational trial, that when a variety is tested for release, before its release it is tested in different locations for its adaptation in all the agro-climatic zones of the region.

Dr. Bhat elaborated about the breeder seed production of a new variety, that it should be produced in the same station where it was bred so that it remains in the strict supervision of the concerned breeder.

6 SEED PRODUCTION, TESTING AND MARKETING

6.1 Foundation and Certified Seed production, seed drying, cleaning and seed treatment: Mr. Noorul Saleem

Mr. Saleem gave introduction about Foundation and certified seed and further elaborated about the seed processing.

Foundation Seed: Foundation seed is the progeny of breeder seed and is required to be produced from breeder seed or from foundation seed which can be clearly traced to breeder seed. The responsibility for production of foundation seed has been entrusted to the NSC, SFCI, State Seeds Corporation, State Departments of Agriculture and private seed producers, who have the necessary infrastructure facilities. Foundation seed is required to meet the standards of seed certification prescribed in the Indian Minimum Seeds Certification Standards, both at the field and laboratory testing.

Certified Seed: Certified seed is the progeny of foundation seed and must meet the standards of seed certification prescribed in the Indian Minimum Seeds Certification Standards, 1988. In case of self pollinated crops, certified seeds can also be produced from certified seeds provided it does not go beyond three generations from foundation seed stage-I.

The production and distribution of quality/certified seeds is primarily the responsibility of the State Governments. Certified seed production is organized through State Seed Corporation, Departmental Agricultural Farms, Cooperatives etc.

Seed has been an important agricultural commodity since the first crop plant was domesticated by pre-historic man. For thousand of years, man cleaned seed of his process, but it is no longer adequate to supply the kind of seed needed by farmer.

Seed processing is a vital part of the seed production needed to move the improved genetic materials of the plant breeder into commercial channels for feeding the rapidly expanding world population. The farmer must get the quality seed that is free from all undesired materials because farmer's entire crop depends on it.

Seed can seldom be planted in the condition in which it comes from the growers. In fact, many seed lots contain weed or crop seed or inert material that make them unfit for sale without processing. Crop seed also frequently have stems, awns, clusters or other structures, which prevent from flowing through the drill freely.

Seed processing is that segment of the seed industry responsible for upgrading seed improving planting condition of seed, and applying chemical protectants to the seed.

6.2 Seed Dormancy, seed germination, viability, vigour, health and seed moisture:

Dr. Zeerak explained about many important aspects of seed science. A dormant seed is one that is unable to germinate in a specified period of time under a combination of environmental factors that are normally suitable for the germination of the non-dormant seed. Dormancy is a mechanism to prevent germination during unsuitable ecological conditions, when the probability of seedling survival is low. True dormancy or innate dormancy is caused by conditions within the seed that prevent germination under normally ideal conditions. Often seed dormancy is divided into two major categories based on what part of the seed produces dormancy: exogenous and endogenous. There are three types of

dormancy based on their mode of action: physical, physiological and morphological. Physical dormancy has been identified in the seeds of plants across 15 angiosperm families however it has not been found in Gymnosperms.

Exogenous dormancy is caused by conditions outside the embryo and is often broken down into three subgroups namely physical dormancy, chemical dormancy and mechanical dormancy. Endogenous dormancy is caused by conditions within the embryo itself, and it is also often broken down into three subgroups: physiological dormancy, morphological dormancy and combined dormancy.

Various methods have been used by seed scientist and technologists to break the dormancy of seed. Simple and widely used methods are Scarification. Temperature Treatments, Light Treatments and treatment with growth regulators and other chemicals.

Germination is the resumption of growth of the embryo plant inside the seed. Its requirements include proper temperature, presence of adequate water and oxygen and correct photoperiod. Moisture content of seeds has tremendous effect on germination of seeds : 4 -8% moisture has little or no insect activity ; 10-12% has satisfactory to store most seeds in open storage and in cloth bags or moisture-resistant containers; 14-16% Moulds (fungi) may grow on and in seeds in open storage and on seeds in cloth bags or sealed containers; at 14-16% seed may heat because of seed respiration and microbial activity; at 18-20% seed declines rapidly in viability and vigour; at 24-60% seeds may rot and at 60% germination begins.

6.3 Seed marketing, marketing structure and organisation

Dr S A Wani started his talk with a brief introduction about agricultural scenario of India. Indian economy has grown steadily at 7 % in last ten years; 9 % in three years. There has been low and inconsistent growth in agricultural sector because it is dependent upon the monsoon. Agriculture contributes about 14 % to the GDP, but 60 % population lives off agriculture with mostly small and marginal farmers with low inputs. Yield levels are generally much lower than world averages. Agricultural production increased from 50 million tonnes to 227 million tonnes however growth turned over last ten years. New technologies must be deployed and most seed industry will continue to play a key role. Indian seed market estimated at US $1.1 billion, is the 6th largest in the world. It has grown @ 12% compared to 5% growth of global seed market Indian seed industry evolved from 1960s-1980s with minimal private sector participation, R&D was exclusively in public domain. There were restrictions on germplasm exchange, foreign ownership, etc. Under the post NSP (1998) seed industry boomed as a result of several Govt. initiatives. Foreign direct investment in this sector was also allowed and encouraged. Imports of improved varieties and breeding lines were liberalized under trade regulations. Its current status depicts private sector accounts for 80 % turnover in seed industry. Almost 1/3 companies have a global technology/ financial partner and private seed companies are spending 10-120% of their turnover in R&D. The budget of medium sized companies is growing @ 20% p.a. Private sector is not investing in self pollinated crops to develop and promote new varieties. Seed replacement ratio continues to be low and low hybrid adoption rates in most crops due to marginal growing conditions and /or subsistence farming. More than 40 seed companies have govt. recognition for their R&D units. Several Indian companies have introduced GM trait in their germplasm. Indian companies are investing in innovative biotechnology research. Indian seed industry needs policy support to research and infrastructure, minimal regulation and compliance, freedom to operate based on free marketing principles, streamlining of regulatory process to accelerate the development and introduction of new GM technology and robust PPP model are need to better serve the farmers by removing the various

productivity constraints through technological interventions

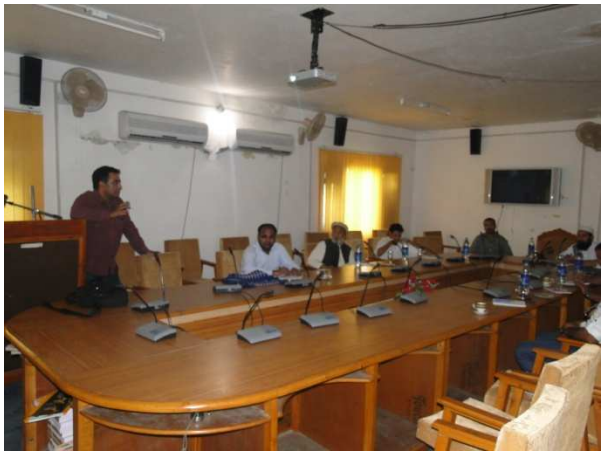
6.4 DISCUSSION OF ABOVE PRESNTATIONS

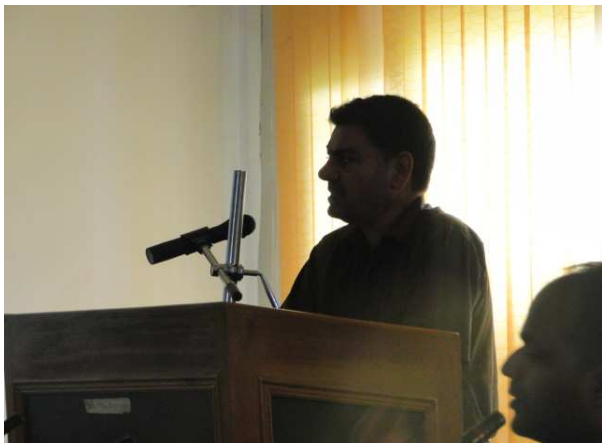
Following the presentations the following discussion points were raised

- What is truthfully labeled seed (TLS).
- What is the most common test for checking whether the seed is viable.

Mr Saleem answered the query related to TLS, It is a seed produced by farmers without certification.

Dr Zeerak replied that there are various tests for detection of seed viability, and among them seed germination test with the help of wet blotting paper is the most common.





7 SEED PROCESSING, PACKAGING AND STORAGE

7.1. Seed storage, categories of seed-orthodox and recalcitrant seeds-factors affecting, seed longevity in storage and conditions required for good storage-general principles of seed storage: Dr. Mehfuza

Dr Mehfuza started her talk with importance of seed viability. Seeds are uniquely equipped to survive, as viable regenerative organisms until the time and place are right for the beginning of a new generation. However, like other form of life, they cannot retain their viability indefinitely and eventually deteriorate and die. Depending on the longevity of seeds during storage, seeds can be divided into two categories---Orthodox seeds and recalcitrant seeds.

General principles of seed storage are :

1. Seed storage conditions should be dry and cool.
2. Effective control of storage pests.
3. Proper sanitation in seed stores
4. Before placing seeds into storage they should be dried to safe moisture limits, appropriate for storage system
5. Store only high quality seed i.e seeds which are well cleaned, treated, with high germination and vigour.
6. Determine seed storage needs in view of period or length of storage time and prevailing climate of the area during storage period.

7.2 Planning, layout and establishment of seed processing plant, seed packaging-operations in packaging-equipments used for packaging of seeds, types of bags and packaging sizes. Er. Faisasl

Er. Faisal gave a talk regarding seed processing machinery. Layout plan for construction of a seed processing plant should be carefully planned to ensure that the thorough seed cleaning, upgrading, seed treatment and other seed processing operations are carried out efficiently, without mixing and damaging seed lots, with a minimum of equipment, personnel, time and at minimum cost. The key to efficient plant layout is a thorough knowledge of what needs to be done, and sound planning. First, the general sequence of processes involved between the time seeds enter the processing plant and the time they are cleaned, packaged and ready for shipment, must be charted. The sequence of operations depends upon the kind of crop and the initial quality of seed lot, type of contaminants, moisture content of the seed lot, etc. The layout planner must have an intimate knowledge of the seed to be processed, its physical characteristics, the contaminants in it, and also of the selection of machines used to bring the seed to acceptable marketing standards. After processing and treating are completed, seeds are packaged into containers of specified net weight. Packaging or bagging is essentially the last operation in which seeds are handled in bulk flow. The packaging consists of the operations such as filling of seed bags to an exact weight, Placing leaflets in the seed bags regarding improved cultivation practices, Attaching labels, certification tags on the seed bags, and sewing of the bags, and Storage/shipment of seed bags.

7.4 DISCUSSION OF THE ABOVE TWO PRESENTATIONS

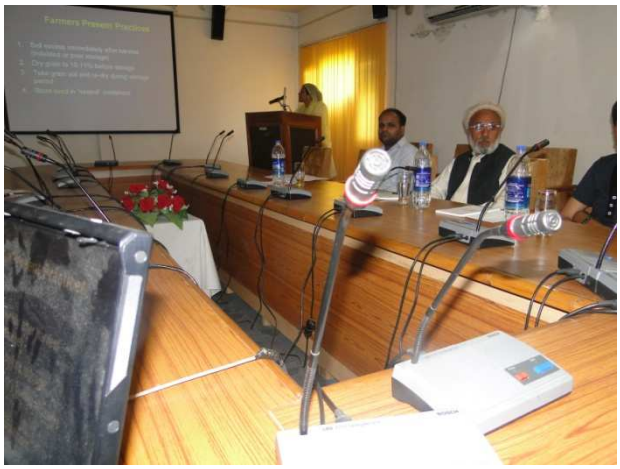
Following the presentations the following discussion points were raised

- How can we improve our seed storage.
- Do we have to use different processing plants for different crops

Dr. Mehfuza explained the need of proper storage facilities for seed storage. Scientific seed storage should

be introduced for effective storage; this will help in reducing the losses caused in seed storage.

Er. Faisal discussed about the processing plants, he further added that different crops have specific requirement of processing plants because variation in seed size and shape. All cereals can be processed in the same processing plant using sieves of different sizes. For vegetable seeds a different processing plant is required.



8. SWOT ANALYSIS

Strengths	Weakness	Opportunities	Threats
• Advanced machinery. • Quality seed • Production of Wheat, barley • Suitable climate for wheat and barley. • Availability of skilled labour • Availability of land. • Availability of irrigation. • Financial assistance from ministry to selected SMEs. • Management • Poilicy.	• Lack of high yielding varieties. • Lack of sufficient good quality seed. • Lack of financial assistance. • Electric supply storage. • Lack of transport infrastructure • Lack of good storage facilities • Lack of technical guidance from experts. • Lack of good market for seeds. • Lack of marketing knowledge. • Lack of technological knowhow • Lack of technical experts.	• Demand of quality seed • Lack of competition in market. • Production of wheat crop. • Human resource development. • More private banks/ financial institutions are available for providing loan. • Favourable agro-climatic conditions	• Lack of peace and security. • Cultivation of opium • Heavy import of seeds from foreign countries. • Disease and pest outbreaks .

9 FIELD TRIP FEEDBACK AND CONCLUSIONS

- **Visit to Mountain Research Centre for Field Crops, Khudwani**
- **Visit to Mountain Livestock Research Institute, Manasbal**
- **Visit to Seed Production Farm, Gulmarg**
- **Visit to Organic Farm Research Centre, Wadura**
- **Visit to Seed Processing Unit, Shalimar**

As a part of field visit, the participants visited 4 seed farms and seed processing unit for hands-on experience.

Visit to Mountain Research Centre For Field Crops, Khudwani (SKUAST-K)

During their first visit all the delegates received a warm welcome by Dr G A Parray, Associate Director Research of the station. After a brief introduction about the research centre, the delegates were given a brief about the activities of the centre. Further the delegates were provided with practical training on various steps for quality seed production in cereal crops. They were exposed to the various activities of the centre including the varieties being maintained and improved in the research farm. They were also shown the demonstration on nucleus and breeder seed production of rice. At the end there were fruitful discussions among the experts of the centre and the entrepreneurs from Afghanistan.

Visit to Organic Farm Research Centre, Wadura (SKUAST-K)

After reaching the research station at Wadura the delegates received a warm welcome from all the scientific staff present at the centre. The incharge of the centre gave a brief introduction about the centre. The delegates then visited the organic farming laboratory to have a practical demonstration on development of different biofertilizers. The entrepreneurs from Afghanistan were also provided with hands on training on production of vermicompost. Further, they were also introduced to the field gene bank of Rajmash at the centre.. A good number of improved genotypes were grown in the field to test their adaptability. Farmers were given demonstration on seed production of pulse crops including Rajmash. Lastly the delegates were taken to the horticultural crop nursery in which they were demonstrated with the quality planting material of apple and other fruit crops.

Visit to Mountain Livestock Research Institute, Manasbal (SKUAST-K)

During the visit to MLRI, Manasbal, the entrepreneurs were exposed to the fodder seed production being carried out in the farm.. They were also taken to the seed processing plant at the centre and were provided with practical demonstration on seed processing of oats. The delegates had a good discussion regarding seed processing unit.

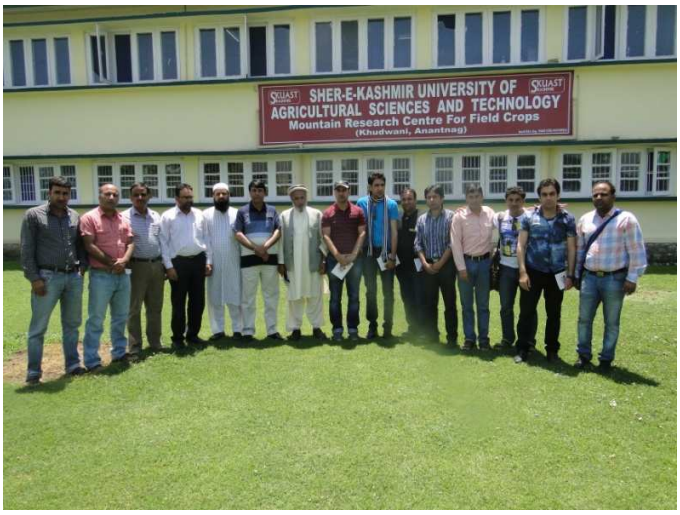
Visit to Potato Seed Production Farm at Gulmarg

During the visit to Potato seed production farm at Gulmarg, the entrepreneurs from Afghanistan got in interaction with the experts and were demonstrated the quality seed production technology of potato.

Visit to Seed processing unit , Shalimar

Apart from other farms, the delegates were also provided with practical hands on training at the seed processing unit of SKUAST-K at Shalimar where the delegates were given demonstration and training on the different operations of the seed processing unit starting from drying of the harvested seed and ending up with packaging and labeling of the seed. They were also given practical training on the use of moisture meter to check the moisture content of seed at field level. They were also trained in handling the instruments for measuring the different parameters of seed quality like oil content, protein content etc.

The delegates from Afghanistan were keen enough in learning things regarding seed production and its processing. They were impressed with the development of seed industry in India and were eager to see the developments in seed sector in their country.


SHER-E-KASHMIR UNIVERSITY OF
AGRICULTURAL SCIENCES AND TECHNOLOGY
Mountain Research Centre For Field Crops
(Khudwani, Anantnag)

13 APPENDIX

Details of the participants from Afghanistan recommended by Ministry of Rural Rehabilitation and Development, Afghanistan for Training Programme on "Seed Processing and Value Addition" scheduled from 1st – 9th July, 2013 at SKUAST-K, Shalimar, Kashmir, India:

List of Improved Seed SMEs' owners and their Passport details								
No	SME/BDSO Name	Members Name	F/ Name	Date of issue	Date of Expiry	Date of Birth	Passport No	Valid for
1	BDS Officer	Shafiullah	Amanullah	27-06-13	26-09-13	06-11-1988	OA1060564	20 days only
3	Helmand Musamir Imroved Seeds Company	Noor Ahmed	Karam Khan	27-06-13	26-09-13	03-01-1982	OR842316	20 days only
		Aqel Shah	Akhtar Moh	27-06-13	26-09-13	20/7/1981	OA1162742	20 days only
4	Bost Improved Seeds Company	Wahidullah	Haji Abdul Shukoor	27-06-13	26-09-13	03-03-1986	OR860000	20 days only
		Abdul Rahman "TARIQ"	Ata Mohammad	27-06-13	26-09-13	04-10-1960	OA333026	20 days only
5		Manoranjan Mishra	Harihar Mishra	23-06-2009	22-06-2019	05-09-1979	H4823365	

Training Programme Schedule

TIME	EVENT	SPEAKER
Date 01/07/2013 Inaugural session		
10.30-11.00	Registration of delegates	
11.00-11.05	Welcome address	**Dr Rakesh Vaishnavi**
11.05-11.30	Tea	
11.30-13.00	Seed quality	**Dr. Zahoor A. Dar, Associate Professor**
13.00-14.30	Lunch	
14.30-15.30	Testing , release and notification of varieties	**Dr. Gul Zaffar (Professor)**
Date: 02-07-2013		
11.00-11.30	Tea	
11.30-13.00	Maintenance of nucleus and breeder seed in self and cross pollinated crops.	**Dr. Najeeb Sofi (Assistant Professor)**
13.00-14.30	Lunch	
14.30-15.30	Hybrid seed production, male sterility.	**Dr. M.A. Bhat (Associate Professor)**
Date: 03-07-2013		
10.00 onwards	Visit to MFCRC, Khudwani	**Dr. Z. A. Dar /Mr. Noorul Saleem and Mr. Reshi Ab. Majid**
Date04-07-2013		
11.00-11.30	Tea	
11.30-12.00	Foundation and certified seed production, seed drying, seed cleaning and seed treatment.	**Mr. Noorul Saleem (Assistant Prof.)**
12.00-13.00	Seed dormancy-seed germination-seed viability-seed vigour-seed health and seed moisture.	**Dr. N.A Zeerak (Professor)**
13.00 – 14.30	Lunch	
14.30-15.30	Seed marketing-marketing structure and organization.	**Dr. Shabir (Professor & Head) Agriculture Economics**

Date: 05-07-2013		
11.00-11.30	Tea	
11.30-13.00	Seed storage, categories of seed-orthodox and recalcitrant seeds-factors affecting, seed longevity in storage and conditions required for good storage-general principles of seed storage.	**Dr. Mehfuza Habib (Assistant Prof.)**
13.00-14.30	Lunch	
14.30-15.30	Planning, layout and establishment of seed processing plant, seed packaging-operations in packaging-equipments used for packaging of seeds, types of bags and packaging sizes.	**Er. Faisal**
Date:06-07-2013		
10.00 onwards	Visit to OFRC, Wadura	**Dr. Z. A. Dar /Mr. Noorul Saleem & Mr. Reshi Ab. Majid**
Date:07-07-2013		
10.00 onwards	Visit to MLRI, Mansbal	**Dr. Z. A. Dar /Mr. Noorul Saleem & Mr. Reshi Ab. Majid**
Date:08-07-2013		
10.00 onwards	Visit to Seed Production farm, Gulmarg	**Dr. Z. A. Dar /Mr. Noorul Saleem & Mr. Reshi Ab. Majid**
Date:09-07-2013	**Valedictory function**	
11.00-13.00	Tea and visit to Seed Processing Unit, Shalimar Seed testing-objectives of seed testing-International Seed Testing Association (ISTA) and Association of Official Seed Certifying Agencies (AOSCA) - establishment of seed	**Dr. R. Vaishnavi & Mr. Reshi Ab. Majid, Dr Aflaq and Dr Shabir**
13.00-14.30	Lunch	
14.30-15.00	Importance of Seed Production	**Prof. Shafiq A. Wani, Director Research.**
15.00-15.15	Remarks by Dr. Mishra / Remarks by delegates	
15.15-15.30	Remarks by Director Research	
15.30-15.35	**Vote of thanks**	**Dr Rakesh Vaishnavi**