



Report

“Capacity Building of Seed Science and Technology”

under

Academic Without Border (AWB) Program

March 17-25, 2023

by

Institute of Plant Breeding and Biotechnology

at

MNS University of Agriculture, Multan

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1. Background

Seed is the basic input of agricultural production. Success of crop production practices depends upon availability of quality seed. Pakistan is still struggling to bridge the gap between demand and supply of quality seed for various crops. More than 90% of seed of vegetables, oilseeds and fodder crops is imported to meet the seed requirement. There is a need of capacity building and developing skilled human resource having technical and practical knowledge of seed production, multiplication, testing and certification.

Likewise, sharing updated knowledge of handling seed during supply chain (Pre-sowing, production, harvesting, processing, storage and marketing) is very crucial. Recent economic crisis has severally affected the seed trade activities of Pakistan. Import sanctions are going to affect the availability of quality seeds in Pakistan especially for crops where all of the seed's demand is met primarily through import. This urged to look forward various aspects of seed systems in Pakistan.

This new academic and research avenue in Pakistan needs technical support from the world top seed scientists. Mr. Timothy Blank from California Crop Improvement Association visited the MNS University of Agriculture Multan from 17-25 March 2023, under the Academics Without Borders (AWB) Program of USA, with the objective to build capacity of academia, public and private sector seed industry and organizations, and students in seed sector including curriculum revision and development to meet the international standards and address various issues related to seed Technology, training the faculty, students and seed industry peoples about seed certification, seed sampling, seed testing and certified seed production standards, and guiding in functioning of seed testing lab at the University. This will help i) to improve the quality of education and research in the field of seed science and technology, ii) enhancing the capacity of seed industry persons regarding sampling and testing procedures as per international standards. Visit of this eminent scientist will further strengthen future collaborations between the California Crop Improvement Association and MNS University of Agriculture, Multan.

2. Executive Summary

Better seed ensures higher crop production, food security and better life. Seed sector in Pakistan is passing through a critical phase where lots of developments have been seen in recent past regarding seed regulations and institutional developments. In order to transform seed sector in Pakistan, there is a need of a) capacity building of public and private seed companies / organizations, academia, students, b) meetings and dialogue among all stakeholders including seed production companies, regulatory authorities, and c) knowledge sharing especially with the collaboration of seed scientist of developed world. The visit of Mr. Timothy John Blank, Executive Director, California Crop Improvement Association, USA was planned by Institute of Plant Breeding and Biotechnology, MNS University of Agriculture, Multan on March 17-25, 2023 through “Academics Without Border” Program of USA. His visit covered many activities including a seminar on “Certified Seed Production Program and OECD Schemes”, a hands-on-training workshop on “Seed Sampling and Seed Quality Testing”, meetings with representatives of seed companies, seed regulatory authorities, academia, researchers, and students, and visit of seed production farms of various public and private seed companies. In the seminar, Dr. Fawad Shah, President and CEO of Minnesota Crop Improvement Association, Mr. Timothy Blank, Executive Director of California Crop Improvement Association, Prof. Dr. Asif Ali, VC MNS University of Agriculture, Multan, and Mr. Asif Rasool, Deputy Director of Federal Seed Certification and Registration Department Pakistan, Punjab Seed Corporation talked on various aspects of seed production, certification, legislations, and international schemes. Mr. Saqib Ali Ateel, Secretary Agriculture, South Punjab was the chief guest. In the seminar, emphasis was focused on awareness of farmers regarding benefits of using certified seed, entrance of Pakistan in international seed schemes and opportunities for Pakistan for improving existing certification standards, recent development in seed regulations, and procedures and role of seed companies for ensuring provision of certified seed of crops to farmers. Representatives of multinational and local seed companies, researchers from research institutes, representatives of Federal Seed Certification and Registration Department, Punjab Seed Corporation, faculty and students of different universities participated in the event. This was followed by a meeting, chaired by Prof. Dr. Asif Ali, VC MNSUAM, and attended by representatives of seed companies, federal and provincial seed regulatory bodies, and academia with Mr. Timothy Blank for a broader discussion on practices of certified seed production, certification standards, issues of seed sector and their

possible solutions. The training on seed sampling and quality testing was attended by an encouraging number of representatives from private sector seed companies. This training was conducted by Mr. Timothy Blank, Dr. Irfan Afzal, and Dr. Amir Bakhtavar that was focused on the correct way of seed sampling, proper use of tools, and appropriate ways of conducting tests for quality assessment of seed lot. A seed dialogue at the University of Agriculture, Faisalabad, chaired by Prof. Dr. Iqrar Ahmad Khan, VC UAF, was also organized in which representatives of seed companies, regulatory bodies, Foundation Seed Cell of AARI, researchers, and faculty participated. This meeting was focused on seed production in the scenario of climate change, promotion of seed industry through public-private collaboration, and providing enabling regulatory framework and implementation for the seed sector. During the visit, Mr. Timothy Blank visited seed production farms of MNS University of Agriculture at Jalalpur Pirwala, Fatima Group and Farm Dynamics Pakistan at Khanewal, RCA at Pirowal, Punjab Seed Corporation at Pirowal, and ICI at Multan. During these visits, he observed the certified seed production practices and guided the respective persons to improving the efficiency of their farms following best practices of identification and removal of plants of other varieties, crops, weeds, and diseased plants etc. In the meetings and interaction with faculty and students, he trained them in field inspection rule, discussed the research projects of Seed Science students, and provided constructive criticism for improving the curriculum of Seed Science and Technology programs.

3. Recommendations

1. Pakistan must enter into the OECD seed scheme and be a member of Association of official Seed Certification Agencies (AOSCA) country list.
2. Regulations regarding seed production, import, and marketing needs to be enforced and implemented in true spirit in the country.
3. Public and private partnership needs to be encouraged for local seed production and supply chain.
4. Increased use of certified seed is imperative to get the best yield potential. Therefore, production of local certified seed of various crops should be increased.
5. Immediate postharvest drying, conditioning, storage practices should be adopted to maintain seed germination and vigour of crop seed.

6. Education and training of the human resource of seed companies should be a continuous activity at the University.
7. There is a need to establish Foundation Seed Program at universities for quick multiplication of early generation seed of varieties following the UC Davis system.
8. FSC&RD should focus on the standards for field inspection and certification of hybrid seeds.
9. Capacity building and strengthening of FSC&RD for strict implementation of seed act and laws to control ill practices in the seed industry. Moreover, FSC&RD should involve and train seed science graduates/students for field inspection and certification of crop seeds for supporting FSCRD staff.
10. Seed companies should take farmer's feedback and provide potential solutions of their problems in order to maintain trust in farming community.
11. Contract farming and corporate farming needs to be adopted in various crops especially in cotton for gaining exclusive benefits.
12. Fumigation of storage rooms, placement of seeds in the store rooms with proper aeration and temperature for maintaining viability of seed.
13. Dehumidification of cold storage rooms was suggested if seeds were stored in porous packaging or if dehumidification facility is not available then improved hermetic packaging should be used to avoid moisture gain by the seeds or quality losses.
14. DNA fingerprinting along with botanical descriptors was recommended for registration and approval of varieties
15. Proper procedural guidelines as set by ISTA must be ensured to take representative sample from the seed lot.
16. Getting plant variety protection through Plant Breeder Right Registry and go for exclusive licensing of the varieties developed by the university.
17. All the seed certification activities must be in strict observance of National Seed Standards notified from time to time by the National Seed Council and in consonance with rules and methods of seed testing maintained by the International Seed Testing Association. This will help to maintain the pedigree and quality of the seed.
18. Appropriate selection of triers/probes are essential for random or systematically collection of primary samples throughout the seed lot.

19. Seed germination, purity and disease testing, and also variety verification are important steps for certification process.
20. All cereal, herbage and oil, and maize and sorghum seed exported to European Union countries must be produced under OECD guidelines.
21. Development of new ISTA accredited laboratories in Pakistan to promote international sales.
22. Deep ploughing, green manuring and cultivation of chloride tolerant crops such as canola, wheat, barley, sorghum, rye grass, spinach and sugar beet as an effective management strategy to promote the agricultural production at Jalalpur Pirwala Farm.

4. Program Schedule

Date	Time	Activity
March 17, 2023	11:30 am	Meeting with Vice Chancellor and University Tour
March 18, 2023	10:00 am	i. Meeting with ACIAR Pulses Project Team ii. Visit of Jalalpur Pirwala Research Farm
March 20, 2023	10:00 am 02:30 pm	i. Seminar on Certified Seed Production Program and OECD Schemes ii. Meeting with seed companies
March 21, 2023	10:00 am 03:00 pm	i. Training on Seed Sampling and Seed Quality Testing ii. Meeting with IPBB Faculty
March 22, 2023	10:00 am 03:00 pm	i. Visit of University of Agriculture, Faisalabad to attend Seed Dialogue ii. Visit to Ayub Agricultural Research Institute, Faisalabad to attend meeting with Foundation Seed Cell, and visit of farm of Fodder Research Station
March 23, 2023		Visit to ICI Research and Development farms, Multan
March 24, 2023		Visit of Punjab Seed Corporation/ FSC&RD and farms of RCA/ FDP/ Fatima Fertilizer , Pirowal, Khanewal
March 25, 2023	09:30 am 11:00 am 1:30 pm	i. Meeting with IPBB faculty for Curriculum Review ii. Meeting with postgraduate students of Seed Science and Technology and their supervisors to discuss research plans iii. Training of students about field inspection

5. Event Details

Meeting with Vice Chancellor, HODs and University Tour

A formal meeting of Mr. Timothy Blank with Prof. Dr. Asif Ali, Vice Chancellor, MNS University of Agriculture, Multan was held on March 17, 2023. Dr. Imran Shah from University of California Davis, Deans/ Directors and Chairpersons of various departments also attended this meeting. The Vice Chancellor welcomed Mr. Timothy Blank and briefed about various academic, research, community service activities at the University



and achievements. He showed the various projects including hybrid wheat, ACIAR pulses project, pulses value chain project, ACIAR project on adapting to salinity, smart trap for fall army worm and Self-irrigating wheat project. He also explained the achievements in hybrid wheat project and system of inducing male sterility in wheat. The Worthy Vice Chancellor also told about the entrepreneurship initiative and brands developed by the university. Mr. Timothy Blank was requested to visit Multan and Jalalpur Pirwala research farms and give suggestions for initiation of foundation seed program at MNS University of Agriculture Multan. He was asked to review the Seed Science Program of MNS University of Agriculture Multan and give suggestions that how Seed Science department can become hub for the seed industry. He was suggested to have a meeting with ACIAR pulses project and pulses value chain project team. Mr. Timothy Blank appreciated the achievements of university. He shared his experiences of foundation seed program at UC Davis. He suggested to get plant variety protection through Plant Breeder Right Registry and go for exclusive licensing of the varieties developed by the university. He also suggested to work on variety development particularly minor crops and pulses.

Visit of Central Lab System

Mr. Timothy John Blank, Director Seed Certification Operations, California Crop Improvement Association, visited central Lab System of MNS University of Agriculture Multan on March 17, 2023. Following labs were visited:

1. Seed and Plant Testing Lab
2. Sample Storage Lab
3. Autoclaving Lab
4. Agro-climatology Lab
5. DNA Analysis Lab
6. NGS Lab
7. Analytical Lab
8. Spectroscopy Lab
9. Food Value Addition Lab
10. Nutrient Analytical Lab
11. Insect Ecology Lab
12. Tissue Culture/ Transformation Lab
13. Molecular Analysis Lab
14. Gene Cloning Lab
15. Postharvest Lab
16. Analytical Lab
17. Diagnostic Lab
18. Microbiology Lab



Students and faculty members briefed about the ongoing research activities in different labs. Mr. Timothy Blank appreciated the research activities and facilities available in the central lab system. He also visited the Business Incubation Centre (BIC) of the university.



Prof. Dr. Mubashir Mehdi briefed about the working and responsibilities of BIC. He told about the entrepreneurship initiative taken from the platform of BIC. He explained the system and stages being adopted for incubation of various business at the university. Mr. Timothy Blank visited the offices of incubation companies. He suggested to incubate companies for seed production particularly for the varieties developed by the universities.



Visit of Hydroponic Unit

Mr. Timothy Blank visited the Hydroponic unit at C-Block of MNS University of Agriculture, Multan. Dr. Abid Hussain elaborated on commercial production of cherry tomatoes and bell pepper in the hydroponic unit. He explained the media optimization, nursery raising, transplanting, and plant training procedures of soilless culture. The guest appreciated the efforts of team involved in management of hydroponic unit. He also asked about the varieties and source of cherry tomatoes and bell pepper being planted in the hydroponic units.



Visit of Hybrid Wheat Field

Dr. Muhammad Ali Sher, Lecturer, Institute of Plant Breeding and Biotechnology, MNS University of Agriculture, Multan briefed about the research work going on hybrid wheat. He explained that MNSUAM is running a project, funded by ACIAR, on the development of hybrid wheat. Mr. Timothy was informed that the BLA technology is being used in the production of hybrids. Mr. Timothy blank visited the female seed multiplication block where he appreciated the efforts of producing the pure seed of different female lines. Furthermore, he also visited the F₁ hybrid seed evaluation and production blocks. He discussed about the sowing methodology (especially the wheat sowing drills), roughing techniques, seed settings in the sterile lines, ratio of male and female lines in the F₁ hybrid seed production. He was also shown functioning of the color sorting machine for separation of sterile and maintainer seeds. Moreover, he visited the quarantine facility and quarantine lab at C-block. He was briefed about the precision planting drill for sowing

of head-to-row blocks of wheat. Mr. Timothy Blank was informed that this drill can be adjusted to set the wheat seed rate. He suggested to go for patent of the drill machine.

Mr. Timothy Blank visited the hybrid wheat field for evaluation of F1 hybrids. He observed the performance and disease resistance of different F1 hybrids. Mr. Timothy blank suggested using molecular markers developed by UC Davis for rust resistance in wheat, and using cluster of multiple genes for rust resistance in wheat crop.



Wheat Nursery Field Visit for Screening Against different Diseases

Mr. Timothy Blank visited wheat field containing nursery of 1431 different genotype for screening against yellow rust, leaf rust, stem rust and loose smut. Dr Muhammad Fayyaz, Senior Scientist, Crop Disease Research Institute, Islamabad was on the visit for field inspection who briefed the disease protection strategies in wheat crop. Mr. Timothy Blank recommended to target multiple genes for rust resistance in the wheat crop instead of single gene.



Visit of Glass House and Briefing on Hybrid Chili Breeding Program

Dr. M. Abu Baker Saddique briefed Mr. Timothy Blank about the breeding program for development of hybrids of chili. He demonstrated the nursery of different chili hybrids and their performance in the glass house. He also showed the exotic germplasm collected from various research institutes from all around the world. Mr. Timothy Blank appreciate the research work and suggested the public private partnership to speed up the breeding program and hybrid vegetable seed production in Pakistan.

Visit of Mango Small Tree System

Mr. Timothy Blank visited Mango Small Tree System established at B Block of MNS University of Agriculture Multan. Mr. Muhammad Usman, Lecturer, Department of Horticulture briefed about small tree system. He explained that 650 plants per acre have been planted at 3ft × 2ft planting geometry and number of plants can be increased up to 1300 by following planting geometry of 3ft × 1ft. While in conventional system 72-80 plants are grown per acre by following

planting geometry of 22ft × 27ft. The main objective of this system is to increase the exportable mango production per acre. This system needs heavy pruning every year that is mainly done through mechanical means limiting the height of the plants upto 7-8 feet for better handling of fruits.



Meeting with Team of Smart Trap Project

A meeting of Mr. Timothy Blank was held with Dr. Ayesha Hakim and Dr. Mirza Abdul Qayyum. Dr. Ayesha Hakim briefed about the working of smart trap and the related app developed by the project team. She informed that visit of various insects in the field can be monitored through cell-phone application. Mr. Timothy Blank appreciated the project and suggested to expand the project for identification and management of storage insect pests present in seed stores and warehouses.



Meeting with ACIAR Pulses Project Team

A meeting of Mr. Timothy Blank was arranged with the team, lead by Prof. Dr. Mubashir Mehdi, running the ACIAR funded project on pulses. Prof. Dr. M. Hammad Nadeem Tahir introduced Mr. Timothy Blank with the team. Prof. Dr. Mubashir Mehdi, Project Manager, elaborated the activities of the project. He described the importance and value chain system of pulses in Pakistan. He elaborated that lentil, chickpea, mung bean and mash bean crops are the principal crops and widely cultivated in Pakistan. He told that maize crop is grown in the country triple times more than wheat while the cultivation and production of pulses is stagnant. As a major source of protein, vitamins and nutrients, its use could be essential in our daily diet. He elaborated the import bill of pulses and further described that pulses are imported in Pakistan from different 13 countries. He said that Kabuli chickpea is mostly imported from foreign countries. Dr. Mubashir Mehdi informed that the overall objective of this project is to support development of socially inclusive and competitive value chain of chickpea, lentil and mung bean in Punjab, Sindh, and KPK provinces of Pakistan.

Mr. Timothy Blank discussed about the quality analysis parameters of pulse crops. He suggested that it's a dire need of time to improve the capacity building and to strengthen system for quality seed production. In this system, grading the seed of pulse crops and freedom from weeds and diseased seeds could be effective to get more economic benefits. Mr. Timothy also suggested to produce the good quality seed of pulse crops through effective management of irrigation, weeds, insects and diseases, and by proper use of seed. Further, he suggested that there is a need to develop and improve the seed banks, storage facilities and seed production system for pulse crops. In this context, organic seed production of pulses could improve the demands in the country. He further discussed that promotion of cooperative farming system, development of input stores and common warehouse can increase the demands of pulses. The participants extended their gratitude to Mr. Timothy Blank for valuable suggestions to promote the pulses in the country.

After the meeting, Timothy Blank visited different field trials of chickpea, lentil and lupin crops. Dr. Amar Matloob, Assistant Professor Agronomy described the experiments on adaptability, planting density, and varietal comparison of chickpea, lentils and lupins.



Visit of Jalalpur Pirwala Research Farm

Mr. Mahmood Alam, Deputy Director Farms and his Team warmly welcomed Mr. Timothy Blank, Executive Director, California Crop Improvement Association at the Jalalpur Pirwala farm of the University. On behalf of Director Farms, he introduced the farm working team. He informed that our vision is to develop a self-sustainable and economically viable model agricultural farm for the training of the students and farming community. He further elaborated the overall objectives of activities at the farm:

- Knowledge generation and skill development
- Improving farm productivity of small and medium land holders
- Self-sufficiency in agricultural production

Mr. Mahmood Alam described the history of Jalalpur Pirwala Farm and said that the soil was degraded, saline, dune type and of poor



quality, and also the water was brackish that was totally unfit for agricultural production.

The soil and water analysis report generated by Soil Salinity Research Institute (SSRI), Pindi Bhattian was also presented. The SSRI reported that all water samples (Turbine, Tube well and Motor) at Jalalpur Pirwala Farm were unfit for irrigation due to high EC, TDS, SAR, calcium, sodium and chloride ions. Turbine water sample is saline-sodic while the Tube well water is highly saline. Similarly, EC and SAR of the soil was recorded up to 69 dS m^{-1} and 228 mmol L^{-1} , respectively. The soil is unfit for growing of crops due to high EC and SAR. Mr. Mahmood discussed that the Farm area was totally degraded and barren when handed-over to MNS University of Agriculture, Multan. In 2016, the efforts were made to develop the Farm and also described the current status of the Farm.



Mr. Timothy Blank suggested that gypsum may be used with irrigation to avoid the deleterious effects of saline sodic water. Further he proposed that deep ploughing should be preferred for sowing of crops. Green manuring and cultivation of chloride tolerant crops such as canola, wheat, barley, sorghum, rye grass, spinach and sugar beet could be an effective management strategy to promote the agricultural production at Jalalpur Pirwala Farm.

Mr. Mahmood Alam also discussed the initiatives taken at Jalalpur Pirwala Farm which are as under:

1. Collaboration with WWF for fruit tree plantation
2. Drip irrigation
3. Olive plantation
4. Short courses (Weed management, Composting, Tractor mechanic, Farm manager)
5. Organic farming, crop rotation & green manuring



Mr. Timothy Blank also visited the seed production blocks of different field crops. Firstly, he inspected different fields for wheat crop and described the accurate method to inspect the field. After walking to 20 feet, inspection should be done from one square feet, then walk 20 feet to right and sample should be inspected and then back to outside the field. He visited the seed production blocks of oats and quinoa and suggested to remove the weeds and off type plants properly from their fields. Dr. Shahid Iqbal briefed about the project of olive plantation which is funded by Pakistan Oilseed Department. Mr. Timothy Blank appreciated the efforts of olive production at Jalalpur Pirwala Farm.

Mr. Timothy Blank was also impressed from the facilities of fish ponds, construction of water channels and turbines for carrying water from distant place to Farm area. He also visited the seed storage facility and gave suggestions to further improve the storage of seeds. He briefly described about fumigation of storage rooms, placement of seeds in the store rooms, proper aeration and temperature of the store room. Mr. Timothy was greatly impressed from organic farming and rearing of goats at Jalalpur Pirwala Farm. Mr. Timothy Blank appreciated the efforts of the Vice Chancellor, Prof. Dr. Asif Ali and the whole Team for developing the Jalalpur Pirwala Farm.



International Seminar on Certified Seed Production Program and OECD Schemes

The seminar was held at Muhammad Nawaz Shareef University of Agriculture, Multan (MNSUAM) on March 20, 2023.

Participants:

Mr. Saqib Ali Ateel, Secretary Agriculture, South Punjab

Prof. Dr. Asif Ali Khan, Vice Chancellor, MNS University of Agriculture, Multan

Dr. Saghir Ahmad, Ex Director Cotton Research Institute, Multan

Dr. Haider Karrar, Deputy Secretary Agriculture, South Punjab

Ch. Muhammad Hanif, Four Brothers

Mr. Hassan Raza, Director Neelum Seeds

Syed Waqas ur Rehman, Maxim International

Dr. Haroon Maqsood, Deputy Director FSC & RD, Islamabad

Mr. Asif Rasool, Deputy Director, FSC & RD, Multan

Representatives from 35 private seed companies, faculty member, and students

Resource Persons

Dr. Fawad Shah, President & CEO Minnesota Crop Improvement Association, USA

Prof. Dr. Asif Ali Khan, Vice Chancellor, MNS University of Agriculture, Multan

Mr. Timothy Blank, Executive Director, California Crop Improvement Association, USA

Mr. Asif Rasool, Dy. Director FSC&RD, Multan Region, Pakistan

Inaugural session

The seminar was aimed to enhance the knowledge of the participants regarding certified seed production and the OECD seed schemes. The seminar started with the recitation of Holy Quran and Naat e Rasool e Maqbool.

Prof. Dr. Asif Ali, Vice Chancellor, in his welcome speech, appreciated the organizers for taking the initiative to hold seminar on such an important and much needed topic. He expressed his views that all the stakeholders are available to sit together and find a solution for seed sector



of Pakistan. He urged the importance of hybrids for maintaining the sovereignty of seed to be maintained and briefed the efforts of MNSUAM in creating wheat hybrids. Prof. Dr. Asif Ali presented a short video to highlight the key areas for collaboration with the seed industry. He emphasized the importance of seed in agriculture and considered it as life. He also stated that seed is the solution to the challenges associated with agriculture, and its supply chain needs to be thoroughly improved including its agronomy, pathology, breeding and marketing.

Dr. Fawad Shah (President & CEO, Minnesota Crop Improvement Association, Saint Paul, Minnesota USA)

Dr. Fawad Shah presented his talk on “Ensuring better crop yield through using certified seed”. He highlighted the importance of certified seed production and its impact on increasing crop yield. He discussed the benefits of using certified seed, such as higher yield, disease resistance and better quality. He emphasized the importance of seed treatments and necessitates collaboration, engagement and support by all stakeholders to maintain the integrity of seed. He recommended reduced dust emissions and development of industrial best practices for seed treatment. He provided the example of Crop Life Canada who created accredited seed treatment operations standards. He also told that Minnesota Crop Improvement Association is successfully running a foundation seed program. He gave his valuable suggestions for Pakistan including the development of foundation seed program, need to start seed production Programme in collaboration of industry, academia and research institutes for increasing local seed production. He offered help to provide guidelines for inclusion of Pakistan in AOSCA list. He emphasized the importance of improving harvest machinery and the storage conditions to be cooler and dry for improving seed quality. He considered plant breeder rights to be very important for improvement of seed sector.

Prof. Dr. Asif Ali Khan, Vice Chancellor, MNS University of Agriculture, Multan

Vice Chancellor, MNS University of Agriculture, Multan, Prof. Dr. Asif Ali Khan, emphasized the utilization of innovation and technology for seed improvement. He highlighted the importance of innovation and technology in enhancing seed production, improving crop yield, and increasing food security. He considered CRISPR-Cas, marker assisted breeding, hybrid seed production system necessary for a gene revolution in agriculture seed sector. Furthermore, he considered plant breeder rights and seed stewardship principles to be very important for improving

agricultural seed supply chain. He described different activities and projects of hybrid crops including wheat and other crops being run at MNSUAM for production of better seed.

Mr. Timothy Blank, California Crop Improvement Association, UC Davis, California, USA

Mr. Timothy John Blank discussed “**Certified Seed Production Systems and OECD Schemes**”. He explained the importance of the OECD seed schemes in ensuring the quality and traceability of seed production. He told about the benefits of being a part of the OECD seed schemes, including access to new markets and increased consumer confidence. He elaborated the certified seed production systems and the processes in America. He urged Pakistan to get its lab accredited from International Seed Testing (ISTA) and participate in OECD seed schemes. Furthermore, he suggested that the certification of quality seed should be from third party for which FSC&RD, private seed sector companies, representatives from Seed Association of Pakistan and academia should sit together and work on it. In addition, he urged Pakistan private sector to come forward to produce certified seed and suggested not to rely on the government sector only for this purpose but all the stakeholders to play their role in certified seed production.

Finally, Mr. Timothy shed light on the opportunities to move forward in Pakistan for seed stewardship where only 25% of seed supply is certified. All the vegetables and oilseeds are imported. More number of seed production and multiplication agencies are required instead of relying only on Punjab and Sindh Seed Corporation as there are more than 20 reported in USA. He urged Pakistan to be a member country of OECD seed schemes or the Association of official Seed Certifying Agencies (AOSCA) and establishing more ISTA accredited laboratories for international sales. In addition, web-based communication could be used as an opportunity for outreach and knowledge sharing.

Mr. Asif Rasool, Deputy Director, FSC&RD, Multan.

Mr. Asif Rasool Ahmed presented the “Implementation of regulatory affairs in Pakistan for seed production and business”. He acknowledged the university efforts for inviting experts to discuss the issue of seed stewardship. He discussed the challenges associated with the seed industry in Pakistan and the steps taken by the government and private sector to improve seed production and distribution. He gave an overview about organizational structure, regional offices, the development of seed regulations before Seed Act, after Seed Act, 1976, the amendments in the Seed Act from

1976-2018. He explained the mandate of Seed Act and functions of National Seed Council as provision of quality seed to growers. He comprehensively elaborated the requirements, procedures of seed registration under Federal Seed Certification and Research Department. He explained the reasons behind amendments in Seed Act, 2015, and Seed (Business Regulation) Rules, 2016 and considered involvement of private seed companies as the main features of these amendments. He explained that Truth-in-Labeling Rules 1991 are regulating the seed imports/exports and to facilitate seed import and export. Furthermore, he explained the Plant Breeders Rights Act, 2016.



Concluding Remarks by Chief Guest Mr. Saqib Ali Ateel, Secretary Agriculture South Punjab

Mr. Saqib Ali Ateel while expressing his views urged upon the collaborative efforts of both public and private sector for the production of certified seed. He emphasized Agricultural Extension Department to guide and aware the farmers about the seed stewardship principles. He urged private seed sector to come forward for the production of certified seed for ultimate uplifting of the seed sector in Pakistan.

At the end, Dr. Asaf Khan, Associate Professor, IPBB extended his gratitude towards the foreign speakers and guests. He was hopeful that this seminar would result into concrete recommendations that will be helpful for the improvement of seed system in Pakistan.

The seminar was a great success, and the participants gained valuable insights into certified seed production and the OECD seed schemes. The seminar highlighted the importance of seed in agriculture and the need to improve seed production and distribution to ensure food security. The seminar concluded with a vote of thanks to the distinguished speakers and guests for their valuable contribution to the seminar and souvenirs and shields were distributed towards the distinguished guests at the end of the seminar.



Meeting with Private Seed Companies

An interactive discussion meeting was conducted in the Syndicate Hall in which representatives of 35 different private seed companies, officials of FSCRD, Punjab Seed Corporation, and faculty members, Vice Chancellor, Prof. Dr. Asif Ali, and Mr. Timothy Blank were present. The following points have been discussed.

1. Factors behind cotton failure in Pakistan have been discussed for which Mr. Timothy considered increase in temperature, increased levels of humidity and periods of drought to be important. Vice chancellor, Prof. Dr. Asif Ali Khan shared his experiences during his stay at UC, Davis, USA that the cotton production at UC Davis has also been decreased and shifted towards almonds and walnut planting due to shortage of water. All the cotton fields are being irrigated through drip irrigation in California in order to reduce wastage of water and 100% certified seed is mandatory to be sown there at California State, USA.
2. All participants agreed that agriculture is vital for the country's socioeconomic stability and seed is a vital factor to sustain Agriculture in Pakistan. For seed integrity and improvement of germination percentage, all the private sector seed companies need to produce a small amount of hybrid seed for different crops for which capacity building workshops and trainings from the University should be arranged. The Institute of Plant Breeding and Biotechnology was suggested to hold some seminar, workshop or training on seed sector

improvement on a monthly basis. The seed stewardship principles must be followed in true letter and spirit across the country for which awareness sessions can play a major role. All participants agreed that collaborative efforts of both public and private sector for certified seed production should be strengthened.

3. The importance of truth-in-labelling for breeder seed was emphasized cultivation of unapproved seed was considered to be the reason for loss of seed industry and it was suggested to follow the chain for seed production like pre-basic, basic and certified seed. Participants agreed to use proper channel for seed collection from different institutes to maintain the seed integrity which is vital for good germination, viability and growth of seed which is necessary for ultimate production of quality seed.
4. Importance of seed storage conditions for better seed germination was discussed and University was requested to hold seminars/workshops on seed storage for which Vice Chancellor Dr. Asif Ali agreed and suggested the categorization for cultivation of different crops based upon their use as a seed crop or for other general purposes and necessitated the post-harvest procedures to be carefully undertaken especially for seed crops.
5. Private seed companies requested the government agencies to review and revise rules and regulations for facilitating and encouraging the companies through providing a conducive environment to play their role in production and provision of certified seed.



6. The Vice Chancellor, Prof. Dr. Asif Ali Khan concluded the discussion with the remarks that contract farming and corporate farming should be adopted in various crops especially in cotton for gaining exclusive benefits from different crops across different regions in the country. Likewise, he recommended early planting of cotton with potato and other oilseed and pulse crops for Multan, Vehari, Khanewal, Sahiwal and Dera Ghazi Khan while considering Bahawalpur and Rahim Yar Khan suitable for normal planting of cotton in wheat cotton rotation.

At the end of discussion, Dr. Asif Ali Khan considered seed as a living entity and proposed early spot examinations for production of certified seed in various crops. He again emphasized the production of hybrid seeds in various crops to uplift the seed sector across the country and agreed to hold a seminar related to hybrid seed production for vegetable crops upon request of FSC &RD. At the same time, he consented to give a talk on hybrid seed production to Hybrid Seed Association of Pakistan upon their request.

Training on Seed Sampling and Seed Quality Testing Inaugural Session

A training session was held on 21st March 2023 at MNS University of Agriculture, Multan for seed sampling and quality testing.

Mr. Timothy John Blank, Executive Director, California Crop Improvement Association, UC, Davis, USA

The topic of his training was “Seed Sampling Methods and Seed Quality Testing”. He gave a detailed overview of ISTA sampling procedures along with different seed testing methods. He compared the different rules and regulations of the US Association of Official Seed Analysts (AOSA) being in practice for domestic sampling/testing in the US, and the International Seed Testing Association (ISTA) being in practice for foreign customers. He provided the procedural guidelines that ensure representative sampling according to the sampling goal. He told that a representative seed sample provides proper connection between the seed lot at the warehouse and the sample tested by a seed laboratory to provide accurate and reliable seed labeling information. He elaborately described the different sampling equipment, varying sampling intensity for seed lots of varying sized containers and the seed sampling techniques according to international standards. He showed the participants different types of ISTA seed certificates and labels used for categorization of different seed samples. He told that the acceptable seed purity percentage for various crops in America varies, however, it remains within the range of 80 to 90 percent.



Dr. Irfan Afzal, Associate Professor, University of Agriculture, Faisalabad

The second trainer was Dr Irfan Afzal, Associate Professor, University of Agriculture Faisalabad and the topic of his training was, “Seed Enhancement Techniques”. He said that it is a great opportunity for students and seed industry people to learn from Mr. Timothy about seed sampling free of cost as it heavily costs in America. He considered high quality seed to be crucial for farmers as it contributes about 30% to the total production. Then, he summarized the different problems associated with production and handling of quality seed



as seed quality is influenced by several factors during seed development, such as maturation, harvesting, drying, cleaning, grading, packing and storage. He offered different solutions for the said problems like production of more food on less land, increasing crop yield and yield potential, postharvest management to reduce food loss and waste, genetic improvement through traditional breeding & genetic engineering, farming techniques and practices, shotgun approaches such as seed priming, seed coating and pelleting. He described the new methods and technologies which are used for seed storage and maintain seed quality. He told about the different methods of seed priming and coating and their impact on improving seed quality. He also briefed about the efficacy of different priming and coating agents in different crops. He considered efficient seed germination and early seedling establishment very important for commercial agriculture. He concluded that different seed priming and coating technologies are now used to help sowing seeds and to improve or protect seedling establishment and growth under the changing environments and seedbed constraints. At the end, he emphasized the need of affordable seed enhancement technologies to be scaled-up at farmer and industrial levels.

Dr. Muhammad Amir Bakhtavar, Assistant Professor, Seed Science & Technology, MNS University of Agriculture, Multan

The third trainer was Dr. Muhammad Amir Bakhtavar and the topic of his training was “Seed Germination Testing”. He described the different requirements for proper seed germination of

different crops according to standards of International Seed Testing Association. He told about the various methods to improve seed germination percentage, the essential seedling structures. He elaborated the general principle involved in seedling evaluation in a seed standard germination test, details about germination test card and how to classify un-germinated seeds, normal and abnormal seedlings in monocots and dicots after seed evaluations and germination testing.



Later, the participants were taken to the seed store and seed testing lab for hand-on-training by the trainers where a healthy interactive practical session was held and the participants gained practical knowledge about the use of different sampling and quality testing tools and techniques.



Meeting with Faculty of IPBB

In the afternoon, dated March, 21st, 2023, a meeting of Mr. Timothy Blank was held with the faculty members of Institute of Plant Breeding and Biotechnology along with Director where all the faculty members introduced themselves and their research interests and shared areas of mutual collaboration with the foreign guest. After that, Prof. Dr. Hammad Nadeem Tahir, Director, IPBB introduced the vision and mission of institute, faculty strength, degree programs offered, completed and ongoing projects by different faculty members. He briefed about the eight different labs facilities, equipment available, experimental farms, weather station, greenhouse / glasshouse, containment and other research facilities. He also described the student strength both at undergraduate and post graduate level. He updated about the current field and lab activities along with research publications, book chapters authored by the faculty members, and various international conferences, workshops, seminars, webinars, and trainings organized by the Institute. An interactive healthy discussion was made between the foreign guest and the IPBB faculty where the foreign guest shared his experiences at UC, Davis about the different research domains of various crops. Mr. Timothy Blank offered faculty exchange to learn different technologies especially the hybrid seed production systems at UC, Davis, USA. At the end, Director IPBB concluded the meeting with a vote of thanks.

Visit of University of Agriculture, Faisalabad

Seed Dialogue at University of Agriculture, Faisalabad

A seed dialogue with theme “A way forward for Pakistan seed industry” was arranged at the USPCAS-AFS University of Agriculture, Faisalabad. Director General (Agri. Extension) Project Director Foundation Seed Cell AARI, Officials from FSC&RD, representatives of private seed companies, Crop Life, and Pakistan Hybrid Hitech Seed Association participated in this dialogue. The experts stated that, amid the situation when the country is under the grip of severe food insecurity owing to low per acre production and climate changes etc. it is prerequisite to hold joint efforts on the part of researchers, academia and industry to flourish local seed industry.

Chairing the session, Prof. Dr. Iqrar Ahmad Khan, Vice Chancellor, University of Agriculture, Faisalabad said that there was a need to create enabling and conducive environment for the regulations of seed laws. He said that we have to develop the seed keeping in view the farmer’s problems in view for agricultural development. He said that seed production is the most important



sector, which required coordinated efforts by seed experts and researchers. It was agreed that there is a need to introduce genes in seed production that increase resistance to changing climatic conditions. Former, Director General, FSC&RD, Dr. Shakeel Ahmad Khan said that the public private collaboration in the seed industry needs to be strengthened. He said that consultative process for the promotion of seed industry will come up with tangible solution. He also called for enabling environment for the implementation of seed laws.

Mr. Timothy Blank, Executive Director, California Crop Improvement Association informed the forum that in USA, the universities develop the seeds that are made public and given the industry on royalty. He said that Pakistan is already adopting the rules that are needed to be a member of OECD seed schemes. He urged the seed industry and FSC&RD to join hands and be a member of OECD seed schemes.



Director General Agriculture Extension Punjab Anjum Ali Buttar said that the all-out efforts were being made to disseminate the modern technologies among the farming community. He said that subsidy on nine crops were being provided in the province. Dr. Irfan Afzal, seed scientist at UAF also said that the universities are now running degree program in seed science. He urged the industry to provide the scholarships in the seed sciences program that will prove a milestone with trained manpower in seed industry. He said that focusing on the public private partnership will help to flourish the seed industry in Pakistan. After the meeting, Mr. Timothy Blank visited different labs of Centre of Advance Studies in Agriculture and Food Security.



Visit to Ayub Agricultural Research Institute (AARI), Faisalabad

Visit of Foundation Seed Cell at AARI

Mr. Timothy Blank visited Foundation Seed Cell of Ayub Agricultural Research Institute, Faisalabad on 22 March 2023. Director General Agriculture Research, Mr. Muhammad Nawaz Khan, Project Manager Foundation Seed Cell, Dr. Aziz-Ur-Rehman and Dr. Qamar Shakeel welcomed the guest. Dr. Aziz-Ur-Rehman briefed about the objective and achievements of Foundation Seed Cell. Under Foundation Seed Cell pre-basic seed of wheat, cotton, paddy, pulses, fodders, oilseeds and vegetable crops has been produced. Mr. Timothy Blank talked to the scientists involved in foundation seed cell. He briefed about the certified seed production programs and OECD Schemes. He explained the benefits of OECD seed schemes and opportunities for Pakistan seed industry.



Visit of Fodder Research Sub Station, Faisalabad

Mr. Timothy Blank visited Fodder Research Sub Station, Faisalabad on 22 March 2023. Dr. Qamar Shakeel briefed the guest about the on-going activities related to breeding and seed production of fodder crops. He told that Fodder Research Sub Station, Faisalabad is working on breeding and variety development of alfalfa, Egyptian clover, oats, maize, sorghum, rye grass, napier grass and rhodes grass. Mr. Timothy Blank also visited the seed multiplication unit of fodder crops. He talked about the control of noxious weeds such as dodder in alfalfa. Mr. Timothy suggested to introduce breeding material from University of California Davis alfalfa breeding program. He urged the needs to introduce honeybees and leaf cutter bees as pollinators for increasing seed production of alfalfa. He also planted tree at the Fodder Research Sub Station.



Visit to LCI Research and Development Farm, Pakistan

Mr. Timothy Blank along with Prof. Dr. M. Hammad Nadeem, Dr. Muhammad Ali Sher and Dr. Amir Bakhtavar visited LCI Research and Development Farm on 23 March 2023. Manager Research and Development, Mr. Muhammad Zulqarnain Hader briefed about the ongoing research activities at the farm. He told that LCI is in the process of getting rights of five wheat hybrids developed by the MNS University of Agriculture Multan. Later on, he showed F₁ hybrid performance testing field, and F₁ seed production blocks. He briefed about the hybrid wheat seed production research experiments. Problems of seed setting, planting time of male and female lines,

ratio of male and female lines, mixed sowing of male seed with female seed was discussed. Furthermore, he also brief that hybrid seed production through blending seed of male and female lines is more feasible for commercial scale seed production. Mr. Timothy discussed how the purity of the seed can be improved especially in the field through roughing. Few days ago, a heavy hailstorm was observed in the area but still hybrids were not showing lodging and some hybrids were showing high resistance for disease tolerance. It was observed that seed setting in the females was quite good. Mr. Zulqarnain also briefed about the maize, sunflower, sweet pepper hybrid evaluation program of LCI. Mr. Timothy Blank suggested to take FSC&RD in loop regarding the clarity in standards for seed production of hybrid wheat.



Visit of Punjab Seed Corporation, FSC&RD, and farms of RCA, FDP, Fatima Group at Khanewal

Visit of Fatima Group Farm

Mr. Timothy Blank along with faculty of Seed Science and Technology arrived at Fatima Group farm at 09:30 am on March 24, 2023. Farm is located near Pirowal Khanewal. Mr. Syed Hassan Ahmed (Head of Agriculture Business marketing) welcomed the delegate.

Mr. Hassan briefed about Fatima Group business and explained that purpose of establishing this farm is to educate local farming community about 4 R nutrient management strategy. He further informed that Fatima Group is also collaborating with MNS-UAM to test and commercialize hybrid wheat and Durum wheat. Five potential hybrids provided by MNSU-UAM



were grown on seed production block for exploring yield potential. Mr. Timothy asked if these hybrids commercialized who will be beneficiary regarding royalty. Mr. Hassan responded that Fatima Group and MNS-UAM are working to address food security and no one will claim Royalty.



Mr. Imran Hameed showed the seed production blocks and further explained that male lines were sown 10 days later as compared to female lines. He added that wheat hybrids have potential of 15 to 20% more yield. Mr. Timothy asked about certification of these hybrids i.e., government policy, liaison with FSC&RD. Representatives of Fatima Group ensured that they will go for

certification through FSC&RD. Mr. Timothy Blank was also informed that triple gene cotton genotypes developed by CEMB are also under trials at the farm. On a query regarding any special requirements regarding seed storage of hybrid wheat seed, Mr. Timothy commented that normal storage arrangement adopted for common wheat seeds may work good but it is important to test viability and vigor of hybrid wheat seeds at different intervals. If needed storage practices can be modified accordingly.

Visit of Farm Dynamics Pakistan Farms at Pirowal, Khanewal

Mr. Ahsan Mustafa Bajwa, CEO Farm Dynamics Pakistan (FDP) welcomed Mr. Timothy Blank at Pirowal farms. He briefed that they have developed cooperative corporate within the family and now they are developing Corporate Farms for Fauji Foundation at Pirowal Khanewal. He added that FDP was established in 2010 and is a brainchild of second generation farmers who have been involved in managing family farms since 2000. FDP has always been proactive in introducing latest integrated crop management (ICM) technologies, advanced mechanization equipment and machineries, high efficiency irrigation systems, and quality inputs. He informed that they are importing farm equipment from Western companies John Deere, Lemken, Monesem, Pessler Instruments, Sentek and Spectrum etc. He added that our farms are equipped with weather stations and soil moisture monitoring systems. He added that they have been working with a main focus on farm mechanization and large farm development as business from last seven years. He said that a place where we are right now a farm of 2300 acres and FDP is working with Fauji Foundation as implementing partner to develop this farm on modern concept. i.e., with high efficiency irrigation systems, Hi-tech mechanization and layout as per large corporate farming systems and the same was explained as per the farm layout map displayed there. He added that the single plot length of farm comprises of 5 acres however the mechanization operations shall be over 10 acres length extending to the adjoining 5-acre plots to reduce machinery turnings to optimize mechanization efficiency. He informed that they are installing 6 central pivots over 450 ha and Rhodes grass will be planted there. Mr. Ahsan said that the cropping pattern shall be based on all major crops, however major focus will be on fodders and cereals.



Visit of Alfalfa field at Farm Dynamics

Mr. Timothy was taken for the farm visit to show the activities and the development done so far of an upcoming corporate farm. Mr. Timothy also visited alfalfa fields and liked the standing crop. Mr. Ahsan asked opinion of Mr. Timothy about seed production of various crops at the farms. Mr. Timothy was of the opinion that seed production is a long-term project however is very much possible at the Pirowal farms.

Visit of Punjab Seed Corporation

Dr. Muhammad Shafiq Ahmad and Mr. Muhammad Zeeshan Assistant Director Farms Punjab Seed Corporation (PSC) welcomed Mr. Timothy Blank. Mr. Muhammad Aasim Assistant Director processing briefed about PSC seed processing plant. Seed plant was installed in 1982-83 with total cost of 76.30 million PKR. Mr. Timothy visited different sections of plant i.e., pre cleaning, fine cleaning, seed treating and bagging. Mr. Aasim also showed grading system currently adopted for rice seed. He added that red rice seed can be separated through this system. Mr. Timothy also observed packaging of rice seeds (Basmati Kissan) and he suggested that separate tag other than seed category tags can also be attached with seed bags mentioning purity

and germination percentage. Mr. Timothy also visited certified seed production block of wheat variety Akbar grown on 50 acres and inspected according to FSC&RD standards and declared “Pass”. Mr. Zeeshan also briefed Mr. Timothy about on-going “DUS” and “NUYT” trials. Mr. Timothy asked about number of inspections carried out for seed certification and Mr. Asif Rasool informed that normally three inspection visits are carried out for pre-basic and basic seed and one for certified seed.



Visit of Precleaning and fine cleaning sections at PSC Seed Plant



Observing Rice Seed packing and discussion on Seed category tags



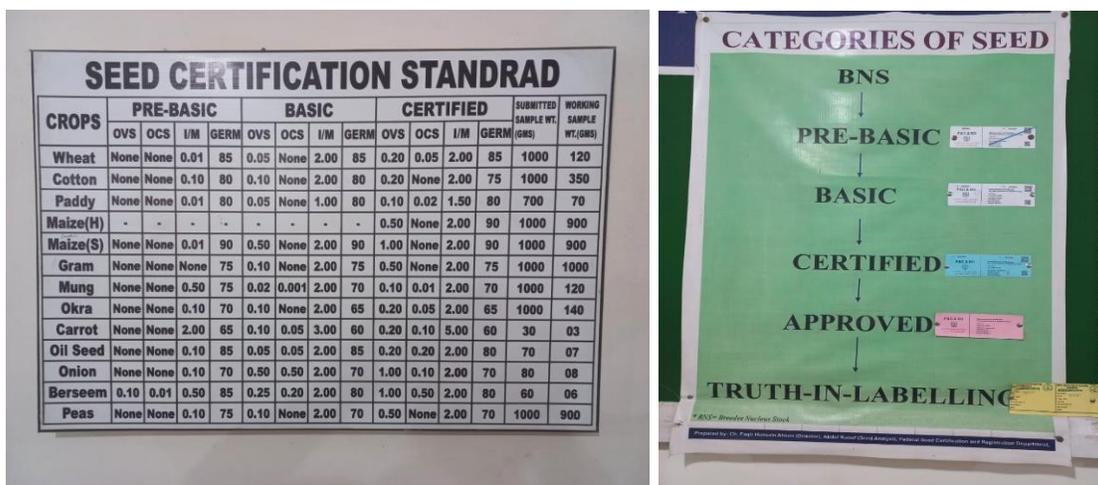
Conducting visit of Certified Seed Block of wheat varriety Akbar at PSC farm

Visit of FSC&RD Seed Lab

Mr. Asif Rasool Deputy Director FSC&RD Multan and Mr. Muhammad Azam Officer Incharge FSC&RD Seed Testing Lab Khanewal welcomed Mr. Timothy Blank and Faculty of MNS-University of Agriculture Multan at Seed lab of FSC&RD. Mr. Asif Rasool briefed about certification standards adopted for different crops. Mr. Timothy also observed functioning of different instruments of seed lab i.e., Seed germination chambers, seed blower, seed dividers, seed moisture meters. Furthermore, Seed analysts Muhammad Awais and Sajid Sharif also demonstrated physical purity testing of wheat seed samples.



Observing Seed Physical Purity Testing at FSC&RD Lab Khanewal



Seed Certification Standards and seed category tags adopted by FSC&RD

Visit of Roberts Cotton Associates Ltd. at Khanewal

Dr. Qaiser Rashid managing Director RCA seed welcomed the delegate and briefed them about RCA seeds. Sir William Roberts, the founder of the Company came to the Indian subcontinent in 1906 and joined the Indian Agriculture Service. He was appointed First Professor of the famous Punjab Agriculture College Lyallpur (now University of Agriculture, Faisalabad) in 1909. He became Principal of this College in 1916 and continued in this capacity till 1921. After the First World War, a vast area of Punjab became cultivable on completion of one of the largest canal irrigation systems in the world. Seeing the potential, he took over the assignment to introduce American Upland Cotton in place of “Desi” cotton varieties and entered in to a partnership with British Cotton Growing Association, Manchester (which pioneered cotton growing in Sudan) and took on lease 7221 acres of land near Khanewal. A separate Company BCGA Punjab (Pvt.) Ltd. was established to run the farms and Sir William Roberts became its Managing Director. With his knowledge and expertise, he succeeded in evolving a new American upland cotton variety and named it KT25. Thus, he became one of the pioneers of growing American upland cotton in the Indian subcontinent. As cotton became a principal agricultural produce in the Punjab and Sind, BCGA entered in to the cotton business as well by establishing a network of Cotton Purchase Agencies and Ginning Factories. BCGA continued Farming and Cotton Ginning business till partition of the Indian subcontinent in 1947. Thereafter farming and ginning businesses were bifurcated and BCGA exclusively became a Farming entity and Sir William Roberts formed his own company in 1949 and named it Roberts Cotton Associates Ltd to focus on Cotton Ginning.

Dr. Qaiser emphasized for strict implementation of seed certification standards and informed that there is lot of need of seed technologist in local seed industry. Dr. Qaiser added that they are working on cotton, wheat, hybrid rice, okra and pearl millet seeds. Mr. Imran Rashid General Manager also showed seed lab and seed storage facility of RCA to the delegate and Mr. Timothy suggested bags should be properly placed on pallets and passage should be left in order to get better sampling. Mr. Imran also asked about seed sampling triers' availability and Mr. Timothy suggested to purchase from "Seedburo"



Dr. Qaiser Rashid managing Director briefing about RCA



Visit of RCA Seed Lab and Seed Storage facility

Meeting with Faculty and Students of Seed Science and Technology

Meeting of Mr. Timothy Blank was held with Vice Chancellor, faculty and postgraduate students of IPBB to discuss scheme of studies (SOS) of Seed Science and Technology and research plans. Mr. Timothy appreciated that SOS is linked with SDGs and CLOs are provided in the scheme and it contains desired contents. However, he suggested few changes need to be incorporated in the SOS. Furthermore, he informed that some content of a course “Seed Business 101” offered by Department of Plant Sciences, UC Davis can be incorporated in course SST-710 Seed and Agricultural Marketing. Furthermore, OECD standard can also be incorporated in this course. Mr. Timothy suggested that students should have strong link with seed industry. The Director IPBB informed that internship at public or private seed farms is a mandatory requirement for 8th semester students of BSc (Hons) Seed Science and Technology Program. Students work with seed industry to get practical knowledge and skills of the subject. Vice Chancellor Prof. Dr. Asif Ali suggested that a new course may be designed and offered in collaboration with the Business Incubation Center with the objective to teach students “How to Start Seed Business”. The Vice Chancellor also appreciated the conducting of invited lectures by representative of seed industry in different courses and emphasized to make it regular activity by inviting resource person from seed industry, FSCRD, and Punjab Seed Corporation. The Vice Chancellor also suggested to conduct two dialogues at the end of each semester about seed stewardship. He also suggested that case studies i.e., declining of SNIFA and Punjab seed corporation can also be conducted in courses related to seed Business. Furthermore, BCGA a successful model can also be part of case studies. Vice Chancellor desired and direct Director IPBB to make a committee to conduct case studies about these organizations. The Vice Chancellor also suggested that PhD students of IPBB should visit Seed Centre of UC Davis for 6 months under auspices of IRSIP program of HEC.



Meeting of Mr. Timothy Blank with IPBB faculty

After detailed discussion on SOS, postgraduate students of Seed Science and Technology presented their research plans. Mr. Timothy appreciated the efforts of students and suggested general possibilities i.e., clear depiction of problem statement/rationale of study in the research plan. He also suggested to conduct research for an increased viability and vigor of cotton seeds.



Postgraduate Student presenting his research plan

Training of Seed Science students about field inspection

Mr. Timothy Blank conducted an on-farm training of students of Seed Science and Technology about methods of inspection in seed production block. Mr. Timothy Blank used standards of FSC&RD for inspection of seed production block of wheat crop. He identified and showed objectionable plant species in the wheat field i.e., barley and wild oat. Students also identified other variety spikes as guided by Mr. Timothy. Mr. Timothy also asked student to read seed certification standards available CCIA website (<https://ccia.ucdavis.edu/>).



6. List of Industry Participants

Industry Participants on Seminar on Certified Seed Production and OECD Schemes-IPBB, MNS-UAM

Sr. No	Name	Designation	Organization
1	Rao Zulfiqar Ali	Manager R & D Regulatory	AGC-Allahdin Group
2	M. Afnan Khalil	Director	Agrium Enterprises
3	M. Touseef Iqbal		Agrium Enterprises
4	Dr. Muhammad Shahid	Research Officer	Ali Akbar Seeds
5	Yasir Jan Khan	Chief Executive	Capital Seed Corp
6	Ali Farzand	Executive Technical Seed	Certus Seeds
7	Imdadullah	Managing Director	Cropsman Seeds & Services
8	Abid Hussain	Production Manager	Everest Pakistan
9	Ali Haider-e-Karar	Assistant Manager	Everest Pakistan
10	Faheem Iqbal	CEO	Everest Pakistan
11	Muhammad Asif	Manager Processing	Everest Pakistan
12	Malik Abdul Karim	Manager Seeds	F.M. Seeds
13	M. Isfandyar Javed	Technical Manager	Fatima Fertilizer
14	Ch. M. Hanif	GM Seeds	Four Brothers Group
15	Dr. Rana Haroon Maqsood	SCO	FSC & RD BWP.
16	M. Azam	SCO , FSC & RD	FSC & RD Khanewal
17	Asif Rasool Kulachi	Deputy Director	FSC & RD Multan
18	M. Shahbaz Asghar	Seed Inspector	FSC & RD Multan
19	Dr. Aslam Yousaf	Consultant Executive	Hi-Cell Seeds
20	Abdul Razaq Soomro	Senior breeder	ICI (LCI)
21	M. Hamza Gul	Plant Breeder	ICI (LCI)
22	Qaiser Mahmood	Product Manager	ICI (LCI)
23	Waqas Ahmad	Plant Breeder	ICI (LCI)
24	Asif Idrees	Production Office	ICI Seeds
25	Haroon Tahir	AL	Kanzo Ag.
26	Fasial Hayat	CEO	Khaksar Crop Sciences
27	Hassan Mujtaba	District Coordinator	Lodhran Pilot Project (LPP)
28	Muhammad Bin Mushtaq	QL officer	Lotus Seeds
29	Rao Imran	CEO	Marx Seeds
30	M. Babar Raza	ZSM	Maxim Agri
31	Fozia Nawaz	Assistant Manager	Maxim Agri
32	Hafiz M. Farrukh	ZSM	Maxim Agri
33	Muhammad Ilyas	QA Manager	Maxim Agri
34	Syed Waqas	Business Unit Head	Maxim Agri
35	Syed Amir Hussain	Procurement Officer	Miankhel Seeds
36	Abdul Razzaq	ASM	Neelum Seeds

37	Ehsanullah	AM	Neelum seeds
38	Waqar Abdul Sammad	ASM	Neelum Seeds
39	M. Imran	Manager Seeds	Patron seeds
40	Waseem shahzad	Maize R&D Officer	Patron Seeds
41	Ibrar Nawaz	Seed Sourcing Officer	Premium Seeds
42	Feehan Hassan	Assistant Director	Punjab Seed Corporation
43	Nadeem Ul Haq Awan	Director Farms	Punjab Seed Corporation
44	Dr. Babar Ijaz	Business Manager	Rainbow Agri.
45	Dr. Muhammad Salman	CEO	Rathore Seeds
46	Dr. Daniyal	Lab assistant	RCA Seeds
47	Khalil Malik	Manager Seeds	RCA Seeds
48	Noman Asghar	Lab assistant	RCA Seeds
49	Salman Amjad Shah	CFO	RCA Seeds
50	Imran Haider	GM	Richword Seeds
51	Rana Muhammad Tahir	CEO	Richword Seeds
52	Munawar Hussain	Chief Executive	Rohi seeds
53	Akhlaq Ahmad	QA Manager	Sayyam Seeds
54	Ghulam Abbas Khan	CEO	Sayyam Seeds
55	Arshad Ali		Seed 2nd
56	M. Moazzam	Trade Manager	Sheikh Arshad & Co.
57	Dr. Haider Karar	Deputy Secretary Agri.	South Punjab Secrteriat
58	Dr. Dilbaugh Muhammad	Senior Director Seeds and R&D	Suncrop Group
59	Ameer Hamza	R&D Assistant Manager	Tara Group
60	Dr. Saghir Ahmad	Chief Scientists	Tara Group
61	Dr. Sagheer Ahmad	Director	Unicorn Seeds
62	Zeshan Ali	APS to Director	Unicorn Seeds
63	Dr. Rahmat Ullah Shah	Manager Seed Business	Wellwisher Seeds Pvt Ltd.
64	Rizwan Haider	SO	Zamanon Ag
65	Syed M. Tayyab Gardezi	CEO	Zamanon Ag
66	Zaighum Abbas	BM	Zamanon Ag

Industry Participants in Meeting

Sr. No	Name	Designation	Organization
1	M.Yousaf	Director sales	Aag seed multan
2	M.Nadeem	Director Registration	Aggrio pakistan
3	Dr. M. Shahid	Research Officer	Ali Akbar Seeds
4	Sherzaman	Director	Azan Seeds
5	M. Umar Hassan	Seed Development Manager	Bounty Seeds
6	Yasir Jan Khan	Chief Executive	Capital Seed Group
7	Imdadullah	Managing Director	Cropsman Seeds & Services
8	M. Mujahid Malik	CEO	Early Wood Seeds
9	Muhammad Asif	Processing Manager	Everest Pakistan
10	Abid Hussain	Production Manager	Everest Pakistan
11	Shujad Ullah Malik	Production Manager	Four Brothers
12	Asif Rasool kulachi	Deputy Director	FSC & RD
13	Dr.Rana Haroon Maqsood	SCA/STA	FSC & RD
14	M. Azam	SCO	FSC & RD
15	M. Shahbaz Asghar	SI	FSC & RD
16	Burhan Khalid	CEO	Gems Seeds
17	Hafiz M. Rafeeq	Managing Director	Hanzala Seeds
18	Ahmad Azan	Assiatant Manager	Harral Seed Corporation
19	Asif Idrees	Production Office	ICI Seeds
20	Dr. Amir Bakhtavar	Assistant Professor	IPBB-MNSUAM
21	Dr. Shahid Iqbal	Assistant Professor	IPBB-MNSUAM
22	Dr. Asif Shahzad	Assistant Professor	IPBB-MNSUAM
23	Mahmood Alam Khan	Assistant Professor	IPBB-MNSUAM
36	Dr.M.Faisal	Assistant Professor	IPBB-MNSUAM
37	Dr.Akash Fatima	Assistant Professor	IPBB-MNSUAM
35	Dr.M.Asif khan	Associate Professor	IPBB-MNSUAM
34	Dr.sehrish Ijaz	Lecturer	IPBB-MNSUAM
38	MS.Plosha khanum	Lecturer	IPBB-MNSUAM
24	Shahid Yaqoob	Procurement Manager	Kanzo Quality seed
25	Fasial Hayat	CEO	Khaksar Crop science
26	CH.M.Riaz	Director	khalique seeds
27	M. Javed	CEO	Khyber Seeds
28	Shameer Ijaz	Director Registration	Lake share seeds
29	Fozia Nawaz	AFM	Maxim agri
30	Syed Waqas	Sector Head Agri	Maxim Agri
31	M.Babar Raza	ZSM	Maxim agri
32	Hafiz M.Farrukh	ZSM	Maxim agri
33	Syed Aamir Hussain	Procurement officer	Mian khd seed
39	M. Abubakar	Director	Monal Seed Corporation

40	Imran Ali	Production Manager	Mukabla Seed Corporation
41	Waqar Abdul Sammad	Manager R&D	Neelum seed
42	Abdul Razzaq	Procurement Officer	Neelum seed
43	Ehsanullah	Assistant Manager	Neelum Seeds
44	M.Imran	Manager Seed Business	Patron seed
45	M. Majid	CEO	Qpur Seeds
46	Shakeel Anwar	Director	Raxi seeds
47	CH. Asif Ali	Chairman SAP	SAP
48	Ghulam Abbas Khan	CEO	Sayyam seeds
49	Hafiz Younas Rehman	CEO	Stallion Seeds
50	Muhammad Sajid	Production Manager	Stone Seeds
51	Hamza Ahmad Qureshi	Cotton breeder	Suncrop Group
52	Dr. Dilbagh Muhammad	Sr. Manager Seeds	Suncrop Group
53	Jahangir Nawaz	Farm Manager	Suncrop Seeds
54	M. Shoaib	CEO	Warad Seeds
55	Dr. Rahmatullah Shah	Manager Seed Business	Wellwisher Seed
56	Naeem Anwar	CEO	Zarai seeds

Industry Participants in Training on Seed Sampling and Seed Quality Testing

SR. #	Name	Designation	Organization
1	Dr. M. Amin	AO(Ext)Mumtazabad	Agri. Extension & AR
2	Muhammad Wajid	AB(Tech) Kot Addu	Agri. Extension & AR
3	Ahmed Sardar	Executive QC	Certus Seed
4	Anees-ur-Rehman	Lab Technologist	Certus Seed
5	Amna Bibi	Scientific officer	CRI,Multan
6	Nadia Hussain	Scientific officer	CRI,Multan
7	Sadia Kanwal	Scientific officer CRI,Multan	CRI,Multan
8	Zaib-un-Nisa	Senior Scientist	CRI,Multan
9	Saif Ali	AO(Ext)	Dept Of Agri(Ext)
10	M. Zia-ul-islam	Development Manager	Enza Zaden
11	Ali Haider-e-karar	Assistant Manager	Everest Pakistan
12	Dr. M. Iqbal Khan	Dy. Director Agriculture	Ext Khanewal
13	Abdul Kareem	Manager Seed	F.M Seed
14	Dr. M. Hammad Raza	Lecturer	Ghazi University
15	Dr. M. Sohail Saddiq	Assistant Professor	Ghazi University
16	Dr. M. Asad Sadique	Operation Manager	Haji Sons
17	Sajid Ali Tabssum	Agri-Engineer	Haji Sons
18	M. Ajmal Akhtar	Corporate Mgr Registration	Hexon
19	M. Hamza Bhutta	Plant Breeder	ICI (LCI)
20	M. Hussnain	TSO	ICI (LCI)
21	M. Tahir	Quality Officer	ICI (LCI)
22	M. Aqib Riaz	Farm Executive	Kenzo(Certus Seeds)
23	Fasial Hayat	CEO	Khaksar Crop Sciences
24	M. Shahbaz	Product Agri.	Leepa Seed
25	Malik Noor Akbar	Product Manager	Leepa Seed
26	Muhammad Bin Mushtaq	QC officer	Lotus Seeds
27	Hassan Mujtaba	District Coordinator	LPP
28	Rao Imran	CEO	Marx Seeds
29	Fozia Nawaz	AFM	Maxim Agri
30	Hafiz.M.Farrukh	ZM	Maxim Agri
31	M. Ilyas	QA Manager	Maxim Agri
32	M.Babar Raza	ZSM	Maxim Agri
33	Syed Waqas	Sector Head Agri	Maxim Agri
34	Waseem Shahzad	Maize RD officer	Patron
35	M.Nadeem Khan	Asst Director (PP)	Pest Warning and Quality Control
36	Ibrar Nawaz	Seed Sourcing officer	Premium Seed
37	Dr.Muhammad Shafiq Ahmad	Assistant Director Farm	Punjab Seed Corporation

38	Muhammad Zeeshan	Assistant Director Farm	Punjab Seed Corporation
39	M.Ayaz Irshad	QA Officer	RCA KWL
40	M.Daniyal Junaid	R&D RCA	RCA KWL
41	Noman Asghar	Lab Asst	RCA KWL
42	Imran Rashid	GM RCA Seeds	RCA Seed
43	Khalil Malik	Manager Seed Procurement	RCA Seeds
44	Rana Muhammad Tahir	CEO	Richword Seeds
45	Dr. Haider Karar	Deputy Secretary Agriculture	South Punjab Agri Sectarite Multan
46	Abdul Mannan	Product Specialist	Syngenta
47	Asif Javaid	QAM-Seeds	Syngenta
48	Naveed Asghar	Manager Supply Planing	Syngenta
49	Nasir Ali	Seed Quality Officer	Tara Group Pakistan
50	Waheed Akhtar	Sr.Manager SC&QC	Tara Group Pakistan
51	Dr. Irfan Afzal	Associate Professor	UAF
52	Zaighum Abbas	BM	Zamanon Ag

7. Media Coverage



