Basic Wheat Improvement: A hands-on training course
CIMMYT, Mexico, February 23-May 26, 2017

The world's need for plant breeder's and agronomist's currently exceeds the capacity to train young scientists. Research and infrastructural support for public universities and CGIAR centers that train plant breeders has steadily declined in recent decades; furthermore, rapid advances in molecular genetics provide unprecedented opportunities to enhance breeding efficiency, but has created new challenges on a world scale in training breeders who are able to integrate the use of molecular breeding technologies with well-designed field experiments in order to improve world food production. Students in plant breeding need multidisciplinary training to be prepared to enter the workforce, including plant biology, transmission genetics, molecular genetics, population and quantitative genetics, pathology, entomology, and statistics as well as field-based research experience. Given that the majority of graduates will become breeders in the public sector in developing countries and more so in the private sector in developed countries; students and faculty need opportunities to interact with scientists in the public and private sectors to ensure that appropriate skills are obtained.

CIMMYT's experimental station (CENEB) at Cd. Obregon, Sonora, Mexico is an ideal platform to train young scientist in the modern technologies of wheat breeding. CIMMYT's scientists and lead scientists from public and private sectors (supported by Borlaug Training Foundation) will jointly run the training program at Obregon (annually: March-May, "2017 Time table").

Plant breeding is a science and art this course will provide the new generation of breeders with the opportunity to learn the science and develop an appropriation for the art from leading scientists.

Basic wheat improvement course content

1. Time Table February 23-May 25, 2017

Training Period	Training activity	Scientists
February 23-26	Arrivals, registration, travel by road Mexico City-Obregon, Sonora	
Feb.27-March 17	Introductions to CIMMYT's wheat research • Lectures[1] by CIMMYT Sr. Scientists • Group visits to research program	CIMMYT Scientists
March 20-31	Basic training Instructions • Lectures by BTF Guest speakers • Group research	BTF Guest lecturers:
April 1-30	Targeted training • Participants to work full time with selected research project (Monday-Thursday) • Workshops & visits (Fridays & week ends)	Project leaders
May 1-14	Training on Seed Quality	CIMMYT Scientists
May 15-20	Visit Mexican national research programs	
May 20-25	Laboratory research • Biotechnology, pathology, seed testing, statistics	CIMMYT scientists

Amor H. Yahyaoui: Wheat Training Officer/Consultant   Global Wheat Program

2. Training course content

2.1 Hybridization:
- Trainees will be instructed on parental choices for crossing.
- Get acquainted with CIMMYT crossing block
- Learn about parental characteristics for various objectives i.e biotic & abiotic stress tolerance/resistance
- Learn how to plan crossing schemes by objective
- Practice crossing and pollination methodologies
- Get acquainted with CIMMYT wheat pedigree system

2.2 Field pathology:
- Assessment of leaf & stem rust on specialized nurseries
- Determine the effectiveness of resistance genes under field conditions
- Practice selection for durable and APR rust resistance

2.3 Conventional and molecular breeding:
- Overview on breeding methodologies
- CIMMYT's breeding methodologies
  - Durable resistance (rust)
  - Drought and heat tolerance
  - Gene pyramiding
  - Application of marker assistant selection
- Breeding approaches Public vs. Private
- Hybrid wheat breeding

2.4 Physiology:
- Physiological breeding for target traits
- Physiology tools of application to breeding for drought and heat tolerance

2.5 Biometrics:
- Overview of commonly used statistic tools in wheat breeding
- Data management
- Biometric models used in trait breeding

2.6 Quality:
- Seed selection
- Rapid chemical analysis for durum wheat quality
- Acquaintances of traits for end use quality

3. Field research

3.1 Group training (March)
Course participants will be introduced by lead project managers to all wheat research projects (bread wheat, durum wheat, physiology, quality, genetics resources, pre-breeding etc..) for the first week of the course. Following 2-3 week trainees groups of 5 will learn how to:
- Assess wheat rusts under field conditions,
- Plan hybridization schemes
  - Parental selection
  - Crossing & pollinating

- Selection in segregating populations (bread and durum wheat nurseries)
  - Small groups will work with CIMMYT researcher on selection methods
  - Groups will interact daily (afternoon session) with guest lecturers and CIMMYT's scientists on the various themes outlined above
- Seed Quality
  - Trainees will join seed selection (bread and durum wheat)
  - Trainees will learn basic laboratory quality tests

3.2 Individual training (April)

Course participants will be assigned to work with on single project of their choice with selected CIMMYT mentor. Trainees will daily (Monday-Thursday) join research team selected and carry out all research activities of selected themes

4. Personal development

4.1 Technical writing

Course participants will be introduced to technical writing and power point presentations. Each participant will provide monthly reports as well a presentation on a topic of their choice.

4.2 Workshop and Seminars

- Course participants will attend seminars and meetings organized by global wheat program during the training period
- Weekly workshops will be organized (each Friday) on various research topics
- Trainees will establish contacts with local universities for cultural and social activities (Week ends)

4.3. Visits

Educational visits to the national research program (INIFAP), to seed growers (CAJEME), and to wheat farmers will be organized within the state of Sonora.