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Seed Summit Aims to Improve Delivery of High-Yielding Varieties to Farmers in Eastern India

Anuradha Dhar

Photo: Nabakishore Parida

Takashi Yamano, senior scientist and agricultural economist, International Rice Research Institute (IRRI), highlighting the scope and purpose of the event in the first session at the seed summit.

Strategies to make improved seed varieties more appealing and available to India's farmers were the focus of the Seed Summit for Enhancing the Seed Supply Chain in Eastern India, held 14-15 May in Patna, Bihar. The summit was organized by the Cereal Systems Initiative for South Asia (CSISA) and funded by the U.S. Agency for International Development Feed the Future initiative and the Bill & Melinda Gates Foundation.

More than 60 seed experts from the government, research institutions and the private sector identified the challenges in the seed value chain and discussed actionable solutions that will improve the delivery of improved wheat and rice varieties to farmers in eastern India.

Seed Scenario

Many varieties of the two key crops have been released in India in recent decades, which could significantly increase agricultural productivity and reduce rural poverty. However, most small-scale and poor farmers in eastern India do not have access to modern varieties that can tolerate flooding or are more resistant to pests and diseases while generating higher yields.

Seed replacement rates are extremely low in eastern India, for several reasons: farmers are not aware of the potential of new varieties; a lack of proper seed storage infrastructure to maintain good quality; poor linkages among government, private sector and farmers to provide seeds in a timely manner; and gaps in the policy environment.

The event focused on strengthening the financial capacity and marketing skills of rural seed dealers and input retailers, expanding the role of agricultural extension and advisory services, leveraging civil society – farmers' associations, community groups and nongovernmental organizations – to help promote new varieties and encouraging greater engagement from India's vibrant private sector in the region's seed markets.

David Spielman, senior research fellow at the International Food Policy Research Institute (IFPRI), said India is the fifth-largest seed market in the world, growing at 12 percent annually. "There is a need for better decision-making tools —better data, information and analysis at a strategic level to improve seed systems and markets in Asia. Greater investments in the research systems and improved market surveillance to identify and prosecute fraudulent seed production are also required," he said.

Vilas Tonapi, principal scientist at the Indian Agricultural Research Institute, promoted alternative seed system models – individual farmer as a seed bank, village-based seed banks and group-based small-scale seed enterprise – to provide local platforms where farmers can easily buy improved seeds.

Looking Forward

The last session established four critical priorities for an action plan in the Indian seed sector, especially in the eastern states: the extension system should be restructured and revived; effective seed subsidy programs should be designed that are based on evidence, are cost-effective and are better targeted to reach poor farmers; mechanization of the seed sector should be promoted with the introduction of mobile seed treatment units and seed weighing machines; and demonstration of new varieties and new farm technologies should be promoted through progressive farmers.

To view photos and press coverage of the summit, please visit www.csisa.org.

Mid-Career Scientists Get New Tools for Big Data Analysis

Raman Babu & BS Vivek

"It is the mark of a truly intelligent person to be moved by statistics," George Bernard Shaw once said, and the 56 maize researchers who attended a mid-career refresher course on statistical and genomic analysis likely would agree.

Five agriculture universities, seven national agriculture research systems, five seed companies from South and Southeast Asia, CIMMYT and ICRISAT were represented at the course, held 12-21 May at CIMMYT's Hyderabad office.

Big data is now a reality and the volume, variety and velocity of data coming into the breeding programs are reaching unprecedented levels. The ability to swiftly sift through multi-location phenotypes and high-density genotypes enables breeders to continuously drive innovation and make the best selection decisions. The course was intended to strengthen the statistical underpinnings of modern crop improvement approaches, particularly for mid-career scientists and students involved in maize research.

A significant percentage of the training was devoted to hands-on practical assignments using mostly open source data analysis platforms such as R and Genstat with real datasets obtained from CIMMYT breeding programs. A range of analyses such as generation of BLUPs for large and unbalanced data, factorial regressions, QTL mapping, genome-wide association analysis, genomic selection, fine mapping, and genotype imputation was demonstrated.

"Getting to know an amazing variety of powerful statistical and molecular breeding tools will definitely help advance my breeding program," said Mahendra Tripathi, a maize breeder with the National Maize Research Program, Nepal, who is pursuing a Ph.D. with CIMMYT as part of the Heat Tolerant Maize for Asia project. Brad Thada, a student from Purdue University in the U.S. who researches heat tolerance, said he particularly liked the big picture of maize improvement that he could capture, while Ryan Gibson, also from Purdue, admired the fine mapping part of the course, which gave him an opportunity to understand the entire process of marker discovery and how to fine-tune it to breeder-ready applications. Willy Bayuardi from Indonesia's Bogor Agricultural University said he found the course intensely educational, especially the "Meta-R" suite of programs that summarize R Script-based statistical analyses in a user-friendly interface.

Photo: Dzung Do Van

Presenting certificates of completion to the participants.

Mateo Vargas and Gregorio Alvarado from the Biometrical and Statistical Unit of CIMMYT-Mexico facilitated the statistics part of the training as key resource persons. The molecular breeding team of CIMMYT-India (Raman Babu, Sudha Nair, Girish Krishna and S. Gajanan) along with Willy Bayuardi, Jefferson Paril (Institute of Plant Breeding, University of Philippines) and ICRISAT staff orchestrated the genomic analysis part. The course was coordinated by B.S. Vivek, Maize Breeder and Raman Babu, Molecular Breeder of CIMMYT-India, Hyderabad.

Participants of the international refresher course on Statistical and Genomic Analysis
Photo: CIMMYT

The Boom-Bust Cycle of Rust Resistance Genes Continues Unabated in Western China, but CIMMYT Lines Mostly Unaffected

Garry Rosewarne

The "boom-bust cycle" of resistance genes refers to the widespread use of a single resistance gene that protects multiple varieties of a grain from a disease (boom). When the disease overcomes this resistance gene many varieties simultaneously become susceptible (bust). The wheat cultivar Mianmai 37, released in 2004, has always had high levels of resistance to yellow rust. However, in the 2013-14 season in China's Chengdu basin, this cultivar has high levels of the disease, indicating a new rust pathotype has likely evolved. CIMMYT researchers are awaiting investigations by pathologists to confirm the presence of a new race.

Photos: Garry Rosewarne

Pi'Xian yield trials of Chinese-bred, CIMMYT-derived stem rust lines (above) and the National Yield Trials (below) in the 2013-14 season that was particularly bad for lodging.

Me Wu and Dr. Zhu Huazhong from the Sichuan Academy of Agricultural Sciences making final selections in Pi'Xian, Sichuan Province.

Mianmai 37 has been extremely popular in western China and has been used as the high-yielding check in the government-run provincial yield trials for several years. It is also used extensively in breeding programs throughout the region, but with the outbreak of this new pathotype, several breeders have reportedly lost between 60 percent and 80 percent of their breeding stocks. About 60 percent of entries in the government trials have also showed susceptibility this year, despite testing last year that showed they were all highly resistant. It is unknown which resistance gene has been overcome.

This new virulence comes on top of the V26 pathotype that first appeared in 2011-12. This pathotype took out the widely used gene *Yr24/26*, rendering many varieties susceptible. Of major concern was the apparent loss of resistance in the CIMMYT derived cultivar Chuanmai 42, the world's first commercially released variety with a synthetic background, which showed a 15 to 20 percent leap in yield potential compared with the best non-synthetic lines in the region. Fortunately, Chuanmai 42 was segregated for resistance to V26, and reselections were quickly made and seed was bulked up so that this high-yielding variety can still be grown.

The new yellow rust pathotypes have had virtually no effect on the CIMMYT nurseries in the region, where the vast majority of lines are maintaining their durability.

CIMMYT is collaborating with the Sichuan Academy of Agricultural Sciences (SAAS) and the Chinese Government State Affairs for Foreign Expert Administration, which partially funds Dr. Garry Rosewarne's work, on various projects to improve China's wheat yields. Over the past three years, in conjunction with Dr. Yang Ennian, a breeding program has been established that focuses solely on the use of adult plant resistances. This program is also virtually unaffected by the arrival of new pathotypes. This year, fixed lines were selected from the most advanced material, and these will be grown on small observation plots next year. Not only is the use of slow-rusting genes having an effect in this program, but the change from pedigree breeding to selected bulk generation advancement is resulting in much more efficient field operations. This, combined with extensive use of summer nurseries, will see an increase in efficiency of up to 50 percent in the breeding program.

Dr. Zhu Huazhong of SAAS is also using slow-rusting genes from CIMMYT, albeit for a different reason. Chinese material is generally completely susceptible to the wheat stem rust lineages of Ug99. Although stem rust is rare in China, Dr. He Zhonghu recognized that it would be prudent to employ a pre-emptive breeding strategy in preparation for a potential incursion of Ug99. To this end, Dr. Zhu has been making crosses between Sichuan material and several of the CIMMYT stem rust nurseries in China. Not only are these lines showing good yellow rust resistance in yield trials, there appears to be an increase in lodging tolerance.

CIMMYT's Sichuan office also is testing machine harvesting of yield trials using a Chinese-built small plot harvester that costs about US $6,000, with hopes of implementing multi-location yield trials so lines can be more rigorously tested for yield stability.

Collaborative breeding and research activities throughout China are also being driven by the Sichuan office, where slow-rusting germplasm is being distributed to selected key breeding programs to use in their hybridizations. Genetic populations have also been distributed for multiple environment testing against yellow rust, leaf rust, powdery mildew and fusarium head blight. Other research is focusing on quantifying the value of slow-rusting genes under epidemic conditions, using molecular markers to pyramid slow-rusting genes behind major seedling resistances and identifying novel resistance genes to yellow rust.

Varietal uptake by farmers is particularly difficult in China, where new seed can cost up to US$ 1,000 per ton. In a novel venture for this region, a seed company is being paid by the provincial government to grow another CIMMYT synthetically derived cultivar, Chuanmai 104, and the seed will be given directly to farmers in an effort to improve yields in the region.

Photo: Garry Rosewarne

A Chinese-produced small-scale combine harvester is being tested on yield plots at Guanghan, Sichuan Province.

CIMMYT Promotes the Role of Women in Agriculture at Pakistan Maize Conference

AbduRahman Beshir and Imtiaz Muhammad

Photo: AbduRahman Beshir

Dr. AbduRahman Beshir, right, accepting an honor shield on behalf of CIMMYT staff.

Dr. Imtiaz Muhammad, CIMMYT country representative for Pakistan, urged academics to encourage women to pursue agricultural careers during his keynote speech at a maize conference 3 May at the University of Agriculture Faisalabad-Pakistan.

"Why are women not competing for jobs in the field of agriculture, despite the relatively good numbers of women in the university?" he asked. He mentioned a recent example from the CIMMYT-Pakistan office, which advertised local vacancies for maize, wheat and agronomy positions but was unable to find qualified women candidates with relevant experience. He emphasized the role of women in Pakistan's agricultural sector and said failing them is tantamount to failing half the country's population.

The conference, organized by the university's Department of Plant Breeding and Genetics, drew 150 participants from public and private maize research and development institutions, including multinational companies and academia, for an update on recent trends in maize production.

Dr. AbduRahman Beshir, a maize improvement and seed systems specialist at CIMMYT-Pakistan, spoke about CIMMYT's activities to enhance productivity and promote maize excellence in Pakistan. He encouraged public and private institutions to test and use CIMMYT maize germplasm in order to fast-track the deployment of improved maize varieties.

Participants expressed appreciation for CIMMYT's recent efforts to bring maize excellence back to Pakistan and enthusiasm for partnering with the organization. CIMMYT staff received an honor shield during the closing ceremony.

CIMMYT Maize Projects Creating Synergies for Enhanced Impacts in South Asia

AbduRahman Beshir and P.H. Zaidi

Photos: AbduRahman Beshir

Dr. P.H. Zaidi explaining about phenotypic traits.

South Asia is particularly vulnerable to climate fluctuations, and extreme weather conditions can cause abiotic stress in rain-fed crops such as maize. Recognizing these challenges to crop production, CIMMYT has partnered with national programs in South Asia to develop and deploy climate-smart agricultural technologies through two projects supported by USAID's Feed the Future initiative - Agricultural Innovation Program (AIP) for Pakistan and Heat Tolerant Maize for Asia (HTMA).

HTMA is an alliance between private and public research and development institutes in Bangladesh, India, Nepal and Pakistan whose goal is to develop new generations of maize hybrids that can withstand heat stress. AIP for Pakistan is a multi-stakeholder and multi-disciplinary project partly focused on deploying the most promising

technologies, including stress-resilient maize cultivars, suitable for the country's environment. Recognizing an opportunity for the two initiatives to collaborate, the Maize and Millets Research Institute (MMRI) and CIMMYT organized a workshop for 35 AIP and HTMA project partners 29-31 May at Sahiwal, Pakistan.

Dr. Abid Mehmood, director general of agricultural research of Punjab Province, Pakistan, told the Pakistani maize scientists that "maize is one of the important crops for the food security of Pakistan" and said the workshop was "an excellent platform to learn and work together and share knowledge among scientists." Mian Muhammad Shafique, director of MMRI, gave an overview on maize research and development at MMRI and its importance for Pakistan, and for Punjab in particular.

Drs. P.H. Zaidi, B.S. Vivek and Raman Babu from CIMMYT-India and AbduRahman Beshir from CIMMYT-Pakistan shared current developments associated with conventional and molecular breeding for abiotic stress tolerance to help the scientists understand various principles, tools and techniques involved in developing climate-smart maize hybrids, with enhanced tolerance to major stresses such as drought and heat. The training also addressed the basic principles of quality maize seed production.

The workshop was followed by a field visit at the MMRI experimental farm, where participants got practical experience in identifying important phenotypic traits for climate-resilient maize and evaluated the performance of AIP, HTMA and MMRI maize trials at the institute. Zaidi commended the MMRI team for the way it managed the field trials, saying, "The longtime research work from MMRI and other centers is a primary reference for people working on developing heat stress-tolerant maize, and this effort has to continue at an accelerated pace."

The participants also appreciated the performance of some of the germplasms in Sahiwal, where the maximum temperature often exceeds 45ºC during May and June. Dr. Beshir explained how the scientists can access CIMMYT's germplasm and encouraged public and private institutions to further engage in the development and deployment of CIMMYT maize materials.

In the closing session, Dr. Sartaj Khan, national coordinator for cereal systems at the Pakistan Agricultural Research Council (PARC), thanked CIMMYT for organizing the course and urged participants to use the knowledge gained in their day-to-day activities. He also requested more training sessions with participants from diverse disciplines.

Sahiwal training field visit at MMRI

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Management Course Offers Staffers Opportunities to Develop Leadership Skills

Guillermo Flores

The First Level Leadership Program took place in Cali, Colombia, from 6-9 May with participants from three CGIAR centers – CIMMYT, the International Center for Tropical Agriculture (CIAT) and the International Potato Center (CIP).

This intensive four-day course sought to build leadership and management competencies, with 360-degree feedback to facilitate professional development.

The program was facilitated by Sharon Crabtree of the Hay Group and Nellooli Rajasekharan, CIMMYT'S director of international human resources.

According to Hay, "First level leaders form the backbone to power an organization's vision. While they have high levels of functional expertise, systematic support to build their leadership and managerial competencies has not been provided in the past."

Participants offered positive feedback, saying they had a fruitful learning experience and enjoyed

Photos courtesy of CIAT.

the opportunity to interact with and know more about colleagues from other CGIAR centers:

"Now I have better understanding of my strengths, weaknesses, leadership style and work environment." – Awais Khan, geneticist, CIP

"I can't believe it's been four days already! The course felt as if I was thrown into the deep end of a pool. I was forced to find undiscovered areas of myself. It was greatly balanced between theories, practice and personal insights. I feel committed to transmit the best sides of myself to others!" – Guillermo Flores, HR recruitment specialist, CIMMYT

"Now I'm more aware of my strengths and my weaknesses. I understand that I don't have to be a different person but that I can use tools to be a much better leader than the one I am right now. I appreciated the organizational climate survey. This will help me with my team." – Anonymous Participant

For more information about FLDP, please contact Pooja Sharma or Guillermo Flores.

CIMMYT Scientist in the Spotlight

Dr. Ravi Singh, a CIMMYT wheat breeder and distinguished scientist, was quoted extensively this month in *The Scientist* about his work with wheat, Ug99 and transgenic approaches to stopping the spread of the disease. Dr. Singh spoke to us about the importance of connecting with the media.

"We do our scientific papers, but the much broader community doesn't read it," Singh said, stressing the importance of quotes and interviews even around difficult topics. "Most people should do it and do it in a positive sense. I think we made a lot of headway, and that's the positive aspect." Dr. Singh noted the experience of publishing online means interacting with the public, joking "there are some wild comments, it makes you laugh."

Media attention also benefits CIMMYT as a whole, Dr. Singh said, pointing out that articles like this "help us later on in generating financial resources" through general awareness and attention from donor communities, and that many donors also use media mentions to demonstrate the value of their own work. As a result of outreach to the media from Dr. Singh and other scientists, Ug99 has been recognized as a topmost food security issue.

Dr. Singh also appeared recently in a YouTube video, "Modern wheat isn't causing your gluten allergy," from the Borlaug Global Rust Initiative. In 2011, he gave a *New York Times* writer a tour of the Ciudad Obregón experimental station.

Corporate Services Survey Results

Dear colleagues,

Thank you to everyone who took time to respond to the Corporate Services survey that was distributed in December. Over the past few months, each department has developed an action plan based on your feedback. Some of the recommendations have already been implemented, while others are underway or will be implemented later in the year.

Over the next few weeks, Informa and InSide CIMMYT will spotlight a different department's action plan each week, to show how your ideas are being put to work. The plans also will be posted in the Documents section of each department's page on InSide CIMMYT and on the Survey Results page.

We hope these changes will improve your work environment and your interactions with Corporate Services. If you have additional comments or concerns, please feel free to contact the department leaders listed on the Survey Results page.

Regards,
Tom Short

Survey Action Plan: Guest Services Adds Menu Options, Drivers, Training

Guest Services has already adopted many of your suggestions, with more to come in the next few months.

Accomplished:

- The El Batán dining facilities have added dozens of new menu items, including vegetarian and vegan options. Staff members have offered positive feedback on the quality and variety of the new selections. (You can view the expanded weekly menu at InSide CIMMYT.)
- Two additional drivers have been hired to meet guests' and employees' transportation needs.
- A new driver reservation system will confirm the name of the driver who will be in charge of the service and provide a contact number in case of emergency or delay.
- English lessons and customer service training are being provided to all drivers and food services staff.

In Progress:

- To minimize wait times, the dining facility will adopt a cashless point-of-sale system that will allow employees to use a prepaid card to purchase food and drinks.
- The dining facility will operate on a full schedule, including weekends, during the "high" season of visitors.
- The department is working with Human Resources to evaluate the ridership on CIMMYT bus routes to and from Mexico City, in orders to determine if the routes should be changed to serve more people. The cost of either modernizing the current buses or renting replacements until funds are available to buy new ones is being evaluated.
- Drivers will get new signs to help people identify them at the airport.
- Additional dining space for the Comedor will be explored.

To read the full report of the survey results for Guest Services, visit InSide CIMMYT.

Recent Publications by CIMMYT Staff

Lucía Segura

Combining ability of maize (Zea mays) inbred lines resistant to Striga hermonthica (Del.) Benth evaluated under artificial Striga infestation. 2014. Karaya, H.; Njoroge, K.; Mugo, S.; Ariga, E.S.; Kanampiu, F.; Nderitu, J. *African Journal of Agricultural Research* 9(16):1287-1295.

Dry soil planting of sorghum for vertisols of Ethiopia. 2014. Merga, F.; Kindie Tesfaye Fantaye; Wortmann, C.S. *Agronomy Journal* 106(2):469-474.

Improved wheat performance with seed treatments under dry sowing on permanent raised beds. 2014. Mulvaney, M.J.; Verhulst, N.; Herrera, J.M.; Mezzalama, M.; Govaerts, B. *Field Crops Research*. Online first.

Traveling? Staying in a Hotel?

The El Batán office donates leftover toiletry supplies to a program that feeds homeless and low-income people in Texcoco.

Soaps, shampoo, conditioner, toothbrushes, toothpaste, lotion, etc., including partially empty bottles, are very welcome.

Please drop off your leftover supplies to Kate Dreher, Office B35 in the basement of the Borlaug building. If you have any questions, you can contact Kate at k.dreher@cgiar.org.

International Fair at El Batán

To celebrate the start of the 2014 FIFA World Cup, the new El Batán Social Committee invites all employees to a free International Fair on Friday, 13 June. We'll have music, dancing, food and booths that show the diversity of the countries represented on campus.

The fair will start at 1 p.m. in the area between the IT building and the new Library, following the Mexico vs. Cameroon match. The afternoon matches will be shown on a big TV screen during the fair.

Weekly photo contest ▶

Informa is published by CIMMYT Communications Department. We welcome your input, preferably in both English and Spanish. The deadline for submissions is 3:00 p.m. on the Wednesday before publication. We reserve the right to edit all contributions. Please send proposed material to CIMMYT-International-Communications-Department@cgiar.org

Pure seed production crop of the CIMMYT synthetic derived variety Chuanmai 104 intercropped with maize.

Weekly Photo Contest Winner

Rural village near Renshou, Sichuan Province, China

Pictures submitted by Garry Rosewarne

Don't forget to send us your entries for the next competition. Look out for the winners on CIMMYT's flickr, where they are shared under a Creative Commons license.