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The First Heat Tolerant Maize Hybrids Are Licensed for Deployment in Bangladesh, India and Nepal

M.T. Vinayan, K. Seetharam and P.H. Zaidi

The Bangladesh Agricultural Research Institute (BARI), Bangladesh's ACI Seeds, India's Bihar Agricultural University, Sabor, and the University of Agricultural Sciences, Raichur, Ajeet Seeds, and Nepal's Hariyali Community Seeds and Sean Seeds are the first proud institutions/companies to receive a license for the deployment of heat tolerant maize hybrids. B.M. Prasanna, Director of CIMMYT's Global Maize Program, formally presented the product licensing certificates to the heads/representatives of these organizations during the Heat Tolerant Maize for Asia (HTMA) project's 3rd Annual Progress Review and Planning Meeting held from 10-12 August 2015 in Hyderabad, India. Other project partners, including national program and seed companies from Pakistan, Nepal and Bangladesh, have shared their choice of hybrids, and asked to submit them for formal licencing. The hybrids were developed under the HTMA project funded by United States Agency for International Development (USAID) under the Feed the Future (FTF) initiative, a public-private alliance that targets resource-poor people of South Asia who face weather extremes and climate-change effects.

At the event's inaugural session, Nora Lapitan, Senior Science Advisor, Bureau for Food Security, USAID, gave an update on the FTF initiative and highlighted its priorities, which include reducing poverty and malnutrition in children in target countries through accelerated inclusive agricultural growth and a high-quality diet. This was followed by an overview by B.M. Prasanna of the new CGIAR research program on Maize Agri-food system, its focus and priorities and the importance of stress-resilient maize in food security and livelihoods, especially in climate-change vulnerable regions, such as the Asian tropics.

▼ Women farmers at a HTMA hybrid demonstration at Dumarawana village, Bara District, Nepal.

Photo: NMRP, Rampur

The inaugural session was followed by technical sessions, during which Raman Babu, CIMMYT molecular maize breeder, M.T. Vinayan, CIMMYT maize stress specialist for South Asia, A.R. Sadananda, CIMMYT maize seed system specialist, and CIMMYT socioeconomist Christian Boeber presented their latest research results.

P.H. Zaidi, HTMA project leader and senior maize physiologist at CIMMYT, described the progress achieved at the end of the project's third year. Representatives from public and private sector partners presented the results of the HTMA trials conducted at their locations, and shared a list of top-ranking, best-bet heat-tolerant maize hybrids to take forward for large-scale testing and deployment. Collaborators from Pakistan's Maize and Millet Research Institute (MMRI) and Bhutan's Maize Program could not participate in the meeting but their progress reports were presented by K. Seetharam and Zaidi, respectively. It is quite impressive that within the first three years of the project, each partner has identified promising and unique maize hybrids suitable for their target markets/agro-ecologies.

Participants visited a demonstration of elite HTMA hybrids and their parents, where they observed the performance of their selected hybrids under Indian conditions. They were able to see the hybrids and their parents side by side, assess their performance and request seed of parental lines.

The project is also involved in capacity building, including providing support to a total of nine M.Sc./Ph.D. students, as well as workshops and in-country training courses in Nepal, Bangladesh and India, where over 100 researchers have been trained on developing stress resilient maize. In a special session dedicated to student research projects, four HTMA students, including Mahender Tripathi from Nepal, Ashraful Alam from Bangladesh and Akula Dinesh and C.N. Ranganath from India, presented their research projects.

The project's progress was critically reviewed by the project steering committee (PSC) headed by Prasanna, who expressed great satisfaction with its overall progress and acheivements. Speaking for USAID, Lapitan said they are highly impressed with the progress of the HTMA project and consider it a model project. Other PSC members also expressed their satisfaction and agreed that the HTMA team deserves special appreciation for remarkable achievements within a period of just three years.

The HTMA project meeting was attended by program leaders, scientists and representatives from collaborating institutions in South Asia, including BARI, Nepal's National Maize Research Program (NMRP) and two of India's state agriculture universities. Seed companies operating in the region, including Pioneer Hi-bred, Kaveri Seeds and Ajeet Seeds from India, and Sean Seeds and Hariyali Community Seeds from Nepal, and international institutions such as Purdue University, USAID and CIMMYT also participated in the event. ■

Photo: CIMMYT-India

▲ Mohammad Jalal Uddin, BARI Director of Research, receiving a licence for HTMA hybrid deployment from Prasanna.

Photo: CIMMYT-India

▲ The HTMA team at CIMMYT, Hyderabad, India.

Smart Mechanization Is a Continuous Improvement Process: The Case of a Conservation Agriculture Machinery Manufacturer

Luz Paola López Amezcua, Conservation Agriculture Program

Photo: Luz Paola López Amezcua/CIMMYT

▲ Martín Sánchez develops machines for conservation agriculture based on CIMMYT prototypes.

The building of local capacities is one of the objectives MasAgro pursues to achieve the adoption of conservation agriculture in Mexico. As part of this vision, MasAgro helps develop local machine manufacturers with the capacity to supply and service the implements farmers across the country need to implement conservation agriculture systems.

Martín Sánchez Gómez welcomed us to Sembradoras TIMS, the shop where he manufactures farm machinery, located in San Joaquín Coapango, Texcoco, State of Mexico. When we arrived, Sánchez and his family were in the middle of checking the details in preparation for an event to show the implements they have developed for conservation agriculture systems. They set up tents, chairs and a demonstration plot. This is the first demonstration Sánchez and his family have organized to show the machines they manufacture, and they invited several partners, such as CIMMYT, to attend.

Photo: Luz Paola López Amezcua/CIMMYT

▲ Multiuse-multicrop machine, the first model developed by Sembradoras TIMS.

Sembradoras TIMS is a family business that used to be a car repair shop before transitioning into the manufacture of farm implements five years ago, when the family started working with CIMMYT and learned about farm machine prototypes.

It all began when CIMMYT staff in charge of El Batán Experiment Station asked them to replace a harvester's four-cylinder engine with a six-cylinder one.

"I have always liked the idea of building things, but I didn't know how these machines work," says Sánchez.

The first seeder they developed was the multiuse-multicrop seeder. During the process, "we would go to CIMMYT, make changes in the shop, test the machines, make new changes and then tried to find ways of improving them. If we were told 'this doesn't work,' we would change it. Later, CIMMYT started to give technicians our contact information and we started to get calls from other states of Mexico," says Sánchez. Due to these requests, they had more work at the shop, so Sánchez asked the whole family to join in. That's when they decided to make a complete change and focus on manufacturing machinery.

After the "big" seeders, TIMS began manufacturing manual and animal-drawn machines.

"I can't say we've done everything ourselves, because we learned a lot from CIMMYT staff like Gabriel Martínez, Jesús López, Javier Vargas, Jelle Van Loon, and Dr. Bram Govaerts, who never lost faith in us, and that counts for a lot."

That's how the Sánchez-Gómez family started a business where innovation and continuous improvements have allowed them to market different types of seeders. Just recently they started manufacturing hermetic metal silos for post-harvest management. ■

Photo: Luz Paola López Amezcua

▲ Members of the Sánchez-Gómez family, Sembradoras TIMS.

Sustainable Intensification in China: Doing More with Less

Jack McHugh

As part of CIMMYT's ongoing collaboration with the Ningxia Academy of Agriculture and Forestry Sciences and the building of an innovation platform there, we have refurbished our site and undertaken a number of trials that reflect the concepts of sustainable intensification, which increases food production from existing farmland while minimizing pressure on the environment.

The site at Litong just outside the city of Wuzhong in Ningxia Province has been modified and now boasts a paved parking area, all-weather access roads and field paths, and an array of signage that explains CIMMYT's activities and the history of conservation agriculture undertaken by CIMMYT-China in this part of the country.

Zero-till rice transplanting

CIMMYT recently tested a zero-tillage (ZT) rice transplanting operation with a 9 row transplanter from Jiangsu province. The idea came from viewing a short video taken some years ago of a conventional transplanter being used under ZT conditions in Bangladesh. In Ningxia, recently harvested wheat fields were irrigated and rice seedlings were planted into standing wheat stubble without any further modification to the planter. In contrast, rice was conventionally transplanted in an adjacent field, which required two days of field preparation including inversion plowing, leveling and puddling at an extra cost of USD $375 per hectare.

Zero-till rice transplanting not only saves time, labor and fuel, but also minimizes soil disturbance, maximizes residue retention, and mitigates moisture and nutrient loss. Results from these trials will demonstrate the effectiveness of transplanting rice into ZT winter wheat standing stubble.

Photo: Yuan Hanmin

▲ Transplanting rice seedlings into ZT wheat stubble in Litong, China.

Relay and intercropping

Monocropping farming systems are predominant in Ningxia, with the same crop planted year after year. The region has very cold winters and short summers, but with the use of short season varieties and relay cropping, double-cropping and crop rotations can be realized in the region. Double-cropping is a form of sequential cropping in which two crops are grown in sequence within a year on a piece of land by seeding or transplanting one before or after harvesting the other.

To that end, five maize cultivars were relay-planted into winter wheat on 17 June, around two weeks before harvest; the plot was previously intercropped with 24 peanut varieties. The advanced winter wheat lines were harvested in late June and yielded quite well for the region. We expect to harvest the maize from late September to early October 2015. ▶

Photo: Jack McHugh/CIMMYT

▲ On the left, an irrigated ZT field; on the right, a conventionally prepared field (yet to be irrigated), 35 days after transplanting.

Zero-till and early maturing grain crops are key to double-cropping in the region; however, the current wheat variety – Ningdong 11 – is late in maturing. Next year, the earlier maturing Ningdong 10 will be used, with emphasis on residue retention and increased stubble height during harvest, before seeding maize directly and/or transplanting rice. However, the current Chinese-made Turbo Happy Seeders will need to be modified to cope with the rougher soil surfaces encountered under ZT to ensure better seeding depth control. ■

Photo: Jack McHugh/CIMMYT

▲ Winter wheat and peanut intercropping followed by relay-cropping maize into immature winter wheat.

The Government of Zimbabwe and CIMMYT to Establish Maize Lethal Necrosis Quarantine Facility at Mazowe

Johnson Siamachira

Photo: Johnson Siamachira/CIMMYT

▲ After the signing ceremony, B.M. Prasanna shakes hands with Ringson Chitsiko, while Mulugetta Mekuria looks on.

A modern quarantine facility will be established this year at Mazowe, just outside Harare in Zimbabwe, to make it possible to safely import maize breeding materials to southern Africa, and to enable local institutions to proactively breed for resistance to maize lethal necrosis (MLN). The announcement was made on 3 August 2015 at the signing of a memorandum of agreement (MoA) between CIMMYT and the Government of Zimbabwe. Ringson Chitsiko, Permanent Secretary of Agriculture, Mechanization and Irrigation Development, signed on behalf of the Government of Zimbabwe, while B.M. Prasanna, Director of the MAIZE CRP and CIMMYT's Global Maize Program, signed on behalf of CIMMYT. "Maize lethal necrosis is a reality that cannot be ignored. We have to work together to control its spread. We need to focus on finding practical solutions to this complex challenge, including strengthening MLN diagnostic and surveillance capacity, while we continue intensive inter-institutional efforts to develop and deploy improved maize varieties with MLN resistance. The commercial seed sector must also play a key role by producing and delivering healthy, MLN-free seed to farmers," said Prasanna during the MoA signing ceremony.

The MLN Quarantine Facility, the first of its kind in southern Africa, will be set up by CIMMYT before the end of this year at the Plant Quarantine Institute in Mazowe, Mashonaland Central Province; the institute is run by the Department of Research and Specialist Services (DR&SS). First detected in Kenya's Rift Valley region in September 2011, MLN has since been reported in Tanzania, Uganda, Democratic Republic of Congo, Rwanda and Ethiopia. It is caused by a double infection of maize plants by two viruses: maize chlorotic mottle virus and sugarcane mosaic virus. There is an urgent need to prevent the deadly disease from moving further south. Prior to signing of the MoA, Joseph Made, Zimbabwe's Minister

of Agriculture, discussed with Prasanna and CIMMYT-Southern Africa Regional Office (CIMMYT-SARO) senior staff how to strengthen maize research and development in Zimbabwe. "The Government of Zimbabwe is honored to be selected to host the new facility, which is important for stopping the spread and impact of MLN," said Made. To strengthen the phytosanitary work at the MLN Quarantine Facility, CIMMYT will also offer capacity building to DR&SS researchers through training, technical assistance and advisory services, according to Prasanna. "This MLN Quarantine Facility and the collaborative efforts between institutions of the Government of Zimbabwe, especially DR&SS and CIMMYT-SARO, are essential for preventing the spread of MLN in Africa," said Prasanna. Mulugetta Mekuria, CIMMYT-SARO Regional Representative, said that the new collaboration to set up the MLN Quarantine Facility in Zimbabwe would further enrich the long-standing and successful partnership between CIMMYT-SARO and DR&SS. After the signing ceremony, CIMMYT and DR&SS officials visited the site where the MLN Quarantine Facility will be established, and discussed implementation arrangements, including steps for strengthening the national phytosanitary capacity. ■

AAA Maize Hybrids Move towards Commercialization

B.S. Vivek

Four maize hybrids, representing combinations of Syngenta and CIMMYT germplasm, are currently at an advanced stage of hybrid testing at Syngenta, a partner of the Affordable, Accessible, Asian (AAA) Drought Tolerant Maize Project, at multiple locations. This process should lead to the pilot marketing of a limited quantity of hybrid seed in 2016 and a full market launch in 2017.

Four million hectares in India and Indonesia are the project's potential target area, which translates into a market potential of about 80,000 metric tons of seed to address the needs of over five million households. In Indonesia, the target area primarily covers the island of Sulawesi and eastern Java Province. In India, it includes the west central zone with drought prone and tribal areas, a high risk environment where farmers require improved low-cost seed.

According to Syngenta, the region is often overlooked by the private seed sector due to its climate and other dynamics that make seed marketing risky, unpredictable and unattractive —exactly the kind of under-served area CIMMYT is mandated to target.The AAA project held its annual meeting at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) campus in Hyderabad, India, on 22-23 July 2015. Members of the AAA team highlighted achievements over the past five years, ranging from identifying hybrid combinations, fast-tracking their deployment, developing new inbred lines, identifying molecular marker leads for root traits and grain yield under drought, generating information on genomic selection and genome-wide associations, and building human, infrastructural, informatics and networking capacity. All this was done through an exploratory partnership model that included NARS partners (from Vietnam and Indonesia) in addition to Syngenta.

CIMMYT and the AAA team would like to thank the Syngenta Foundation for Sustainable Agriculture (SFSA), especially Mike Robinson, Chief Science Advisor, and the mastermind behind this approach, for the support provided and for enabling the collaboration. ■

Participants in the AAA Drought Tolerant Maize Project Meeting, ICRISAT, Hyderabad, India.

Photo: P.S. Rao/ICRISAT

Wheat Scientists Urge Funding Boost after UK-U.S. Food Security Report

Julie Mollins

Food shortages will escalate due to climate change-related production shocks and the international community must prepare to respond to price increases and social unrest, particularly in less developed countries, cautioned a joint British-U.S. task force in a new report. CIMMYT and its sister CGIAR centers, which conduct research on agriculture and food security, have been building a vital infrastructure to reduce the risk of famine at a global level. Read the full article here to learn more about the task force report, which shows that food security concerns are widely recognized, but that concerted political will to support research is still lacking. ■

Coming up:

- 10 September: Deadline for applying for the wheat stem rust course in Nairobi, Kenya
- 17-20 September: BGRI Technical Workshop in Sydney, Australia. #bgri2015
- 20-25 September: 9th International Wheat Conference in Sydney, Australia

Recent Publications by CIMMYT Staff

Knowledge Center

Climate change adaptation, greenhouse gas mitigation and economic profitability of conservation agriculture: some examples from cereal systems of Indo-Gangetic plains. 2015. Sapkota, T.B.; Jat, M.L; Aryal, J.P; Jat, R.K; Khatri-Chhetri, A. Journal of Integrative Agriculture. Online First.

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Genetic dissection of grain size and grain number trade-offs in CIMMYT Wheat Germplasm. 2015. Griffiths, S.; Wingen, L.U.; Pietragalla, J.; Garcia, G.; Hasan, A.; Miralles, D.; Calderini, D.F.; Jignaben Bipinchandra Ankleshwaria; Leverington Waite, M.; Simmonds, J.; Snape, J.; Reynolds, M.P. PLoS One. Online First.

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Moving from Resource Development to Resource Management : problems, prospects and policy recommendations for Sustainable Groundwater Management in Bangladesh. 2015. Qureshi, A.S.; Zia-ud-din Ahmad; Krupnik, T.J. Water Resources Management. Online First.

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GCAP to become Sustainable Intensification Program (SIP)

Conservation agriculture has been a major focus of CIMMYT research, positioning the Center as a world scientific leader in the area. Following a recent internal consultation and discussions with Program Director Bruno Gerard, CIMMYT has decided to change the name of the Global Conservation Agriculture Program (GCAP) to "Sustainable Intensification Program (SIP)."

This change reflects the broader research-for-development agenda that CIMMYT and the Program have progressively embraced in maize and wheat farming systems over recent years, which includes social, economic, and environmental issues beyond the strict principles of conservation agriculture. We also feel that the name should represent the Program's objectives, rather than the means by which it works to reach them. Finally, the new name will align perfectly with those of the corresponding Flagship Projects on sustainable intensification of the CGIAR Research Programs MAIZE and WHEAT, which CIMMYT leads. Change will be effective on 1 October 2015. ■

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