CIMMYT
International Maize and Wheat Improvement Center

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Global Partnership Propels Wheat Productivity in China

Mike Listman

Benefits of three decades of international collaboration in wheat research have added as much as 10.7 million tons of grain – worth US $3.4 billion – to China's national wheat output, according to a study by the Center for Chinese Agricultural Policy (CCAP) of the Chinese Academy of Science.

Described in a report published on 30 March by the CGIAR Research Program on Wheat, the research examined China's partnership with CIMMYT and the free use of CIMMYT improved wheat lines and other genetic resources during 1982-2011. The conclusions are based on a comprehensive dataset that included planted area, pedigree, and agronomic traits by variety for 17 major wheat-growing provinces in China.

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>
> – Dr. Jikun Huang
> Director of CCAP

"Chinese wheat breeders acquired disease resistant, semi-dwarf wheat varieties from CIMMYT in the late 1960s and incorporated desirable traits from that germplasm into their own varieties," said Dr. Jikun Huang, Director of CCAP and first author of the new study. "As of the 1990s, it would be difficult to find anything other than improved semi-dwarf varieties in China. Due to this and to investments in irrigation, agricultural research and extension, farmers' wheat yields nearly doubled during 1980-95, rising from an average 1.9 to 3.5 tons per hectare."

The new study also documents increasing use of CIMMYT germplasm by wheat breeders in China. "CIMMYT contributions are present in more than 26 percent of ▸

Photo: Mike Listman/CIMMYT

all major wheat varieties in China after 2000," said Huang. "But our research clearly shows that, far from representing a bottleneck in diversity, genetic resources from CIMMYT's global wheat program have significantly enhanced China varieties' performance for critical traits like yield potential, grain processing quality, disease resistance and early maturity."

WILL CHINA WHEAT FARMING RISE TO RESOURCE AND CLIMATE CHALLENGES?

The world's number-one wheat producer, China harvests more than 120 million tons of wheat grain yearly, mainly for use in products like noodles and steamed bread. China is more or less self-sufficient in wheat production, but wheat farmers face serious challenges. For example, wheat area has decreased by more than one-fifth in the past three decades, due to competing land use.

"This trend is expected to continue," said Huang, "and climate change and the increasing scarcity of water will further challenge wheat production. Farmers urgently need varieties and cropping systems that offer resilience under drought, more effective use of water and fertilizer, and resistance to evolving crop diseases. Global research partnerships like that with CIMMYT will be vital to achieve this."

Dr. Qiaosheng Zhuang, Research Professor of Chinese Academy of Agricultural Science (CAAS) and a Fellow of Chinese Academy of Science, called the new report "… an excellent, detailed analysis and very useful for scientists and policy makers. CIMMYT germplasm and training have made a momentous contribution to Chinese wheat."

CIMMYT a Crucial Partner for China, Says Visiting Chinese Dignitary

Mike Listman

Photo: Jorge Humbeto Méndez/CIMMYT

▲ From left to right: Kevin Pixley, Program Director, Genetic Resources Program; Marianne Bänziger, Deputy Director Research and Partnerships; Dr. Liu Xu, Vice President, Chinese Academy of Engineering; and Zhonhu He, Wheat Breeder and Distinguished Scientist, Global Wheat Program.

Wheat disease resistance, especially to yellow rust and head scab, as well as heat and drought tolerance and enhanced water use efficiency, are key areas for future collaboration with CIMMYT, said Dr. Xu Liu, Vice President, Chinese Academy of Engineering, on his visit to the CIMMYT facilities at El Batán, Mexico, on 31 March. On this, his second visit to the Center, Xu came to discuss the possibility of establishing a joint wheat and maize innovation center with CIMMYT in China.

Breeding for drought-tolerant, water-use-efficient varieties is high on the list of shared research concerns. "China faces serious water shortages," said Xu, who is a senior scientist in the conservation and use of plant genetic resources. "Half of China's wheat area is in three provinces – Henan, Hubei and Shandong – that are characterized by severe overuse of water."

In addition to talks with the CIMMYT management team, Xu's tour included overviews of conservation agriculture and visits to the biotechnology and grain quality labs and the germplasm bank, where he learned about Seeds of Discovery (SeeD), a CIMMYT-led project to better characterize and share useful diversity from the Center's vast seed collections of maize and wheat.

Xu sees maize and wheat as strategic crops for China. "We have rice, but you cannot have only rice," he said. "I believe that around 500 million people in our country depend on wheat, for example."

He described the China-CIMMYT partnership as essential. "Since 1978, Chinese scientists have collaborated closely with CIMMYT, and I can see that China's research to improve maize and wheat are strongly associated with the Center. CIMMYT is one of our most important partners."

Promoting Conservation Agriculture in Golestan, Iran

Mohammad Esmaeil Asadi

Presentations and field demonstrations about the latest conservation agriculture practices landed on fruitful ground in Golestan Province, northern Iran, as part of a workshop involving 150 farmers, farm machinery manufacturers, agricultural extension officers, researchers and other experts during 10-11 December 2014.

Organized by the Golestan Jihad-Agricultural Organization and the Golestan Agricultural Research Center, the workshop was led by Ken Sayre, senior consultant for CIMMYT's global conservation agriculture program, who worked through translators and responded to questions from highly-engaged farmers. The principles of conservation agriculture include reduced or zero tillage, retaining crop residues on the soil and targeted use of crop rotations.

"The many benefits of these practices include protecting the soil from erosion and saving farmers the fuel they would normally use for extensive tillage before sowing," Sayre explained.

Gaspardo planter adapted to local conditions.

Adjacent to the Caspian Sea, part of the fertile region of ancient Hyrcania, and whose capital Gorgan was a stop on the Silk Road, Golestan Province comprises more than 22,000 square kilometers and is home to nearly 1.8 million people, almost half of whom live in rural areas that contain commercial forests, pastures and 630,000 hectares of arable land.

"The topography is extremely diverse, ranging from 27 meters below sea level to 3,750 meters above sea level, presenting conditions from humid-temperate to semi-arid and apt for cereals, cotton, oilseeds, and rice," said M.E. Asadi, Water and Irrigation Scientist at the Golestan Agricultural Research Center and who helped organize the workshop. "Wheat and barley are grown on more than 300,000 hectares."

Rainfall ranges from 200 to 700 millimeters annually. Unplowed fields that carry crop residues are better at capturing and holding moisture and can thus raise yields for crops like cotton, maize and soybean, according to Asadi. "Farmers also have only a short time in the fall to sow barley, canola and wheat, to take advantage of the Mediterranean seasonal rains," he said. "If you reduce or eliminate tillage, farmers can plant sooner. And keeping crop residues on the soil protects it from erosion."

Asadi said that conservation agriculture practices had been introduced to Golestan about 15 years ago. "But we're now trying to promote them with the latest information and support from CIMMYT scientists like Sayre and M.L. Jat. Of particular interest right now are the potential fuel and energy savings from reduced tillage and the more effective use of water."

▼ Workshop participants included farmers, agricultural and extension experts, agricultural researchers, Golestan Province agricultural officers, Dr. Ken Sayre, Dr. Kamali (Principal scientist CIMMYT, Iran) and Dr. Asadi. Photos: Mr. Kamaraki/Organization of Agriculture Jihad.

Seed Improvement to Prevent Rust Disease Key to Boosting Wheat Productivity

Bekele Abeyo

A new project in Ethiopia aims to improve the livelihoods of wheat farmers by encouraging the development and multiplication of high-yielding, rust-resistant bread and durum wheat varieties.

High-quality seed is the key entry point for elevating farmer productivity in Ethiopia. As Norman Borlaug, the late Nobel Peace Prize laureate and wheat breeder who worked for many years with the International Center for Maize and Wheat Improvement (CIMMYT) wrote: "Rust never sleeps."

Photo: CIMMYT

Stem, leaf and yellow rusts choke nutrients and devastate wheat crops without recognition of political boundaries, making it essential that global action is taken to control all virulent strains of these devastating diseases to ensure food security.

At a recent workshop hosted by the Ethiopian Institute of Agricultural Research (EIAR) in the capital, Addis Ababa, 150 participants from 24 organizations discussed the project, which builds upon the successes of a previous EIAR and International Center for Agricultural Research in the Dry Areas (ICARDA) program funded by the U.S. Agency for International Development (USAID).

The purpose of the March workshop titled "Seed Multiplication and Delivery of High-Yielding Rust-Resistant Bread and Durum Wheat Varieties to Ethiopian Farmers" was to launch the three-year seed project, which has a budget of $4.75 million, and strengthen the involvement of stakeholders and key partners.

Aims include enhancing rust disease surveillance, early warning and phenotyping; fast-track variety testing and pre-release seed multiplication; accelerating seed multiplication of durable rust-resistant wheat varieties; demonstrating and scaling up improved wheat varieties; and improving the linkages between small-scale durum wheat producers and agro-industries.

To achieve these goals EIAR, CIMMYT and the University of Minnesota will implement project activities in collaboration with other key Ethiopian stakeholders, including agricultural research centers, public and private seed enterprises, the Ethiopian Agricultural Transformation Agency, the Ethio-Italian Development Cooperation "Agricultural Value Chains Project in Oromia" and the Ethiopia Seed Producers Association.

Milestones will include direct access by at least 164,000 households to the new technology and more than 2 million households benefiting from indirect access to high-yielding rust resistant cultivars.

- The project covers 51 districts in four major wheat-growing regions of Ethiopia. Milestones include the following: reaching 164,000 households with direct access to the new technology and having more than 2 million households benefiting from indirect access to high-yielding rust resistant cultivars; wheat yield increases of 25 percent for farmers with access to rust-resistant seed varieties; training for about 5,000 agricultural experts, development agents, seed producers and model farmers; more than 50 percent of the wheat area being sown to cultivars with durable resistance to current rust threats; an increased number of seed growers and associations participating in accelerated seed multiplication; and the increased participation of women farmers to lead accelerated seed multiplication and scaling up.

All partners will be involved in close monitoring and working groups related to the project.

At the workshop, a key topic was emphasizing to farmers that they must avoid susceptible rust suckers as they are pumping more spores on cultivars under production, which is one reason for the recurrent epidemics of wheat rusts and break down of resistant genes.

Delegates also engaged in discussions on the importance of cropping systems and variety diversifications. Fruitful deliberations and interactions occurred and important feedback was captured for project implementation and to ensure successful results.

Photo: CIMMYT

Bekele Abeyo points out that high-quality seed is critical in Ethiopia.

A previous workshop on the surveillance, early warning and phenotyping component of the project was held at the Cereal Disease Laboratory in Minnesota.

Bekele Abeyo is a CIMMYT senior scientist based in Addis Ababa, Ethiopia. He will lead the seed improvement project.

DTMA Awards Leading Teams in Breeding and Technology Dissemination in Eastern Africa

Florence Sipalla

The Drought Tolerant Maize for Africa (DTMA) project recognized top country teams for their efforts in breeding and disseminating improved drought-tolerant maize varieties to benefit farmers in eastern Africa. The Ugandan team bagged top awards for both the breeding and dissemination categories, setting an excellent example for other country teams on successful collaborative research work. The dissemination team comprised breeders from Uganda's National Agricultural Research Organization (NARO), seed companies and one non-governmental organization. The Ugandan team was the winner of the breeding award for 2013 as well. Runners-up in breeding and dissemination were Ethiopia and Tanzania, respectively.

Photo: L. Machida/CIMMYT

CIMMYT scientists leading other collaborative research projects lauded DTMA for the awards, adding that they would emulate the project. "Recognition is a driver of progress," said Mulugetta Mekuria, SIMLESA project coordinator of and CIMMYT representative in Zimbabwe and the rest of Southern Africa. Stephen Mugo, CIMMYT–Kenya country representative and regional representative for Africa, added that the awards foster a spirit of healthy competition amongst the research team ensuring that farmers get the best product at the end of the research pipeline. For more information, click here.

USAID Approves US $17.8 Million Grant for a New Project to Support Seed Scaling in Eastern and Southern Africa

Florence Sipalla

CIMMYT has received a grant of US $17.8 million from the United States Agency for International Development (USAID) to implement a new project dubbed Drought Tolerant Maize for Africa Seed Scaling (DTMASS). The three-year project officially started on 15 March 2015.

The project aims to produce and deploy affordable and improved drought-tolerant, stress-resilient and high-yielding maize varieties for 1.8 million smallholder farmers in Ethiopia, Kenya, Tanzania, Uganda, Mozambique and Zambia. Similarly, DTMASS will produce approximately 7,900 metric tons of maize varieties with a strategic goal of improving food security and income for the farmers.

"This is a great achievement for the project team, which worked tirelessly to develop the proposal that has just been approved for implementation", remarked Tsedeke Abate, DTMASS project leader. He added that the project will go a long way in supporting farmers to increase their returns from maize farming, while giving them good-quality maize for consumption. "This is a good day for maize in Africa," said Tsedeke.

DTMASS will be implemented in close collaboration with USAID's Feed the Future program, building on experience, successes and lessons from the Drought Tolerant Maize for Africa and other complementary CIMMYT maize projects in Africa like Improved Maize for African Soils and Water Efficient Maize for Africa, to strengthen production and delivery of maize seed to farmers in the seven target countries.

CIMMYT will also work with the respective countries' extension wings of the ministries of agriculture, public and private seed companies, national agricultural research organizations, community-based organizations and non-governmental organizations.

CIMMYT Joins Global Move to Adopt Climate-Smart Agriculture

Katelyn Roett

Climate-smart agriculture can be "an effective tool to address climate change and climate variability," according to Kai Sonder, head of CIMMYT's geographic information systems (GIS) unit, who was one of 754 participants from 75 countries, including 39 CIMMYT representatives, at the third annual Global Science Conference on Climate-Smart Agriculture, held in Montpellier, France, during 16-18 March.

"Challenges are different for developing and developed countries, but climate change is affecting all of us," said Sonder. Millions of smallholder farmers in developing countries have less than one hectare of land, earn less than USD $1 per day and are highly vulnerable to extreme climatic events. Many farmers in developed countries struggle to make a living, are dependent on subsidies and insurance payouts and are also highly vulnerable to extreme climatic events.

Modern agriculture, food production and distribution are major contributors of greenhouse gases, generating about one-quarter of global emissions. Climate-smart agriculture addresses the interlinked challenges of food security and climate change by sustainably increasing agricultural productivity, building resilience in food-production systems and reducing greenhouse gas emissions in agriculture.

Challenges and areas where climate-smart agriculture has yet to take hold were addressed at the conference. "California has not practiced it for 50 years and is now dealing with the consequences of poor groundwater management," said Sonder. "Likewise, Ciudad Obregón and Sinaloa in Mexico are fully-irrigated areas in the middle of a desert where climate-smart practices need to be implemented on a larger scale based on CIMMYT's activities with local partners."

Progress and exhibitions on climate-smart agriculture projects were also showcased. "This is becoming an integral part of CIMMYT work, as climate conditions increasingly disrupt growing seasons," Sonder said. "MasAgro is looking at water and nutrient efficiency in Mexico, and CIMMYT is developing maize and wheat varieties that are tolerant to stresses like heat and drought and their combinations," said Sonder. In collaboration with the CGIAR Research Program on Climate Change, Food Security and Agriculture (CCAFS), CIMMYT has also piloted 27 climate-smart villages in Haryana, India, which will disseminate key climate-smart agricultural interventions.

Foto: Marcelo Ortiz/CIMMYT

The conference also allowed potential partners to meet and identify areas for future cooperation. Sonder mentioned interactions with Jacob van Etten, Senior Scientist at Bioversity International, who works on climate change and climate-smart agriculture in Costa Rica and uses iButton sensors to measure climate data in the field. "Such cheap and effective devices can allow us to reach more places, and I'd like to use them to monitor storage and humidity conditions in metal silos for CIMMYT's Effective Grain Storage Project in eastern and southern Africa, as well as in the postharvest activities of MasAgro in Mexico," said Sonder.

Water Fuels Maize and Wheat Production

Industrial Water Run-Off Can Sustainably Boost Crop Production

Julie Mollins

This irrigation reservoir at the Kulumsa Agricultural Research Center in Ethiopia's highlands captures water from a nearby beer distillery about 168 km (105 miles) southeast of the capital Addis Ababa. Before the irrigation project was constructed, the industrial runoff poured into the nearby river and affected the health of local residents. Now it nourishes crops growing in neighboring fields during the dry season or in periods of drought. It can store up to 38,195 m^3 of water.

"The irrigation project has been a key investment – it's very instrumental for accelerating seed multiplication of improved high-yielding rust resistant varieties for local wheat projects," said Bekele Abeyo, a senior scientist and wheat breeder working for CIMMYT.

"It allows us to advance wheat germplasm and seed multiplication of elite lines twice a year, which we couldn't do previously. This cuts the time by half from the currently required 8 to 10 years to 4 to 5 years for the development and release of new varieties through conventional breeding.

An additional pond with the capacity to capture 27,069 m^3 of natural water from the river, generates the capacity to irrigate more than 30 hectares of land during the off season. The project resulted from the joint investment of the East Africa Agricultural Productivity Program, the Durable Rust Resistance in Wheat Project and CIMMYT. The construction of the ponds began in April 2012. Sprinkler irrigation was completed in 2014 and management of the project was handed over to the Kulumsa Research Center.

Photo: Julie Mollins/CIMMYT

Center Pivot Crop Irrigation System Conserves Water

Julie Mollins

This picture by Alfonso Cortés shows a center pivot irrigation system in Ciudad Constitución, Baja California Sur, Mexico.

The Center Pivot System saves a significant amount of water while allowing the measured distribution of a precise amount to plants.

This maize crop has been cultivated using conservation agriculture techniques.

Through conservation agriculture, scientists aim to improve rural incomes and livelihoods through sustainable management of agro-ecosystem productivity and diversity, while minimizing unfavorable environmental impacts.

Mother-baby Trials Promote Conservation Agriculture in Manica, Mozambique

Christian Thierfelder

A testament to increased climate variability and risk for farming systems already operating on the razor's edge, the 2014-15 cropping season will be recognized as a sad write-off by most farmers in Central Mozambique. The rains started six weeks late and most of the rainfall fell in only two months (normally it's distributed over four), followed by a long drought and some few showers at the end.

But with funds from the CGIAR Research Program on Maize, partners from the Instituto de Investigação Agrária de *Moçambique* (IIAM) and CIMMYT are working with farmers in Manica Province, Mozambique, to test and promote conservation agriculture practices that better capture and retain precious precipitation, among other advantages.

As part of this, they have revived "mother-baby" trials, a participatory methodology pioneered over a decade ago by CIMMYT for testing drought tolerant maize in Africa and which was subsequently adapted for diverse agronomic practices and is used by researchers worldwide.

Comprising field experiments grown in farming communities, mother-baby trials feature a centrally-located mother trial that is set up with researchers' support. Baby trials, which contain subsets of the mother-trial treatments, are grown, managed and evaluated by interested farmers.

Moving from "business as usual" to innovation

In Machipanda, a small village in Manica on the border with Zimbabwe, IIAM maize breeder Dr. David Mariote established three mother trials, each with two conservation agriculture-based systems and a conventional control plot, combined with four maize varieties from the Drought Tolerant Maize for Africa (DTMA) project, which is funded by the Bill & Melinda Gates Foundation, and a traditional variety, in full rotation with cowpeas.

▲ IIAM researcher David Mariote (right) with farmers of Manica Province, Mozambique.

Photos: CIMMYT

▲ **Drought-stricken maize:** For most farmers around Machipanda village, Manica Province, Mozambique, the situation this season is bleak, auguring complete crop failure or a harvest of a few small maize cobs.

Farmers then put up the baby trials from a menu of practices that included direct seeding with no tillage, crop rotations, residue retention, herbicide applications, fertilizer use and improved varieties. Interest was high: 54 farmers grew baby trials and some even extended their plots beyond the designated areas, in the excitement of trying something new, according to Mariote.

"Conditions are changing fast; business as usual is no longer an option," Mariote said. "We have to offer improved technologies that farmers can use to mitigate negative effects from climate change and improve their lives."

Mariote witnessed first-hand the synergistic benefits of combining conservation agriculture and drought tolerant maize, as part of work in the Platform on Agriculture Research and Technology Innovation (PARTI), a project funded through the US Agency for International Development (USAID) via *Feed the Future* and implemented by CIMMYT in Central and northern Mozambique.

With training from CIMMYT's global maize program and technical backstopping from the CIMMYT global conservation agriculture program, Mariote sought new and stronger ways to spread these technologies. That's when he hit upon mother-baby trials, which had never been used before with drought tolerant maize and conservation agriculture in tandem.

Farmers who grew baby trials unanimously agreed that new ways of farming are needed and that the trials had been eye-openers. In a community meeting, some said: "We often do not have money to buy expensive fertilizers but we have seen that with good agronomic practices and good maize varieties we can already increase our maize yields."

More farmers in Machipanda have signed up for future baby trials and, as a clear indication of commitment and excitement about conservation agriculture and improved maize, they will use their own inputs to grow them.

Green Manures Help Zambian and Malawian Farmers Feed Crops and Livestock

The Food and Agriculture Organization of the United Nations (FAO) has tasked CIMMYT with a new project to introduce green manure cover crops to smallholder farmers in eastern Zambia and central and southern Malawi.

Green manures can improve fertility, protect soils and provide fodder and grain for farm animals and humans. They also help substitute for mineral fertilizers, which are costly for landlocked African nations to produce or import. Most smallholder farmers cannot afford them and apply less than 10 kg per hectare of fertilizer to their crops, according to a 2013 study on profitable and sustainable nutrient management systems for eastern and southern African smallholder farming systems.

"This is less than one-tenth of average fertilizer rates in prosperous countries and a key reason why maize yields in southern Africa are around only one ton per hectare," said Christian Thierfelder, CIMMYT conservation agriculture specialist based in southern Africa. "As a result, many farm families in the region remain food insecure and caught in a seemingly unbreakable cycle of poverty."

With full participation of farmers, the project will test green manures in rotation with maize and as intercrops or relay crops in different farming systems, according to Thierfelder.

"Improved, high-yielding maize can show its potential only under good agronomic practices, such as optimal plant spacing, timely planting, good weed and pest control and adequate fertilization," Thierfelder explained. "Farmers in Europe and the Americas have followed these basic principles for generations, and some of the ideas spread to Asia and Africa during the Green Revolution. But in Africa mineral fertilizers are most often used by rich farmers and for high-value crops."

"Improved maize that tolerates drought and other stresses, coupled with conservation agriculture practices –minimum soil disturbance, crop residue retention and diversification through rotations and intercropping systems – are farmers' best bet to escape the poverty trap," Thierfelder said.

Keeping crop residues on the soil is a critical component of conservation agriculture, but the residues are traditionally fed to livestock, which also underpin smallholder farmers' livelihoods. So the use of conservation agriculture hinges on the ability of a cropping system to produce enough biomass to feed farm animals while providing an adequate residue cover. This requires a source of fertilization to feed the cropping system.

The FAO-CIMMYT project will address this by allocating green manure cover crops for different uses. "Over the last five years, CIMMYT's global conservation agriculture program has identified

Photo: Christian Thierfelder/CIMMYT

▲ Farmers admiring their maize-cowpea intercrop.

potential cover crop varieties that fit farmers' needs," Thierfelder said. "Velvet bean, lablab, cowpea, sunnhemp or jackbean can provide 10-50 tons per hectare of extra biomass for livestock. They can also leave 50-150 kilograms per hectare of nitrogen in the soil and do not need any additional fertilizer to grow. Finally, lablab and cowpea provide grain that humans can eat."

One approach Thierfelder promotes is for a farmer to dedicate part of her land to grow maize under conservation agriculture practices, and other areas to sow green manures, nutritional and cash crops that increase soil fertility and household income. "In this way, a farmer can diversify and gradually have money to purchase mineral fertilizer, boost productivity and move out of poverty."

Green manure cover crops are not new in Africa. Why should they work this time?
According to Thierfelder, there are examples of success in northern Mozambique with CIMMYT's partner organization CARE International, using lablab and improved germplasm in cassava-based CA systems can increase cassava tuber yields from 4 to 13 tons per hectare, without using additional mineral fertilizer.
"In Tanzania, lablab and other green manures are an important part of the cropping system," he said. "In Zimbabwe, successful experiments with maize and green manures under an ACIAR-funded ZimCLIFFS project also provide hope. The FAO-CIMMYT project will guide the way on integrating green manures cover crops into these farming systems."

Canadian Foodgrains Bank Highlights CIMMYT's Christian Thierfelder's Work in Conservation Agriculture

Jennifer Johnson

Photo: Laura Rance/Canadian Foodgrains Bank

Christian Thierfelder, CIMMYT senior agronomist stationed at Harare, Zimbabwe, was recently profiled by the Canadian Foodgrains Bank for his work promoting conservation agriculture techniques for smallholder farmers in Africa. Conservation agriculture systems are not only better for soils but help make agriculture more 'climate-smart', argues Thierfelder. "The conventional system can only make use of the water that is in the ridge and not further down in the soil," he said. "In conservation agriculture systems, there is access to deeper layers and a lot of water has infiltrated. The maize can actually access the water much better because of an improved root system."

In addition, the techniques can provide far-reaching food security benefits to smallholder farmers. As conservation agriculture diminishes the risk of crop failure, it also allows farmers to reduce the land devoted to maize and to diversify the crops they produce. "Then there is room for new crops, cash crops, rotational crops, nutritional crops that help them to improve their diets and reduce malnutrition," Thierfelder said. "That's a very good way to overcome all of these problems at once."

To read the full article, click here.

Innovation Key to Wheat Yield Potential Advances, Says Incoming CIMMYT DG

Julie Mollins

Martin Kropff, who will take the helm as director general of the International Maize and Wheat Improvement Center (CIMMYT) in June, joined scientists, and other members of the global wheat community at the CIMMYT experimental research station near the town of Ciudad Obregon in Mexico's northern state of Sonora for annual Visitors' Week.

Following a tour of a wide range of research projects underway in the wheat fields of the Yaqui Valley made famous around the world by the work of the late Nobel Peace Prize winner Norman Borlaug, who died in 2009 at age 95, Kropff shared his views.

Borlaug led efforts to develop high-yielding, disease-resistant, semi-dwarf wheat varieties in the mid-20th century that are estimated to have helped save more than 1 billion lives in Pakistan, India and other areas of the developing world.

"I'm very impressed by what I've seen in Obregon," said Kropff, who is currently rector magnificus and vice chairman of the executive board of Wageningen University and Research Center in the Netherlands.

"From the gene bank in El Batán, the breeding and pre-breeding and the work with farmers on a huge scale, it's extremely high quality and innovative," added Kropff, who with his wife Nynke Nammensma also visited CIMMYT headquarters near Mexico City earlier in the week.

"The MasAgro program is very impressive because it takes the step of integrating scientific knowledge with farmers' knowledge – it's a novel way to aid farmers by getting new technology working on farms at a large scale. It is a co-innovation approach," Kropff said.

Photo: Alfredo Sáenz/CIMMYT

"This is a historic site of great significance. Norman Borlaug was the only Nobel Peace Prize winner in our sector. He's the hero of the agronomists, agro-ecologists and wheat breeders. Just to be here is already special, but also to have the opportunity to see what is happening here with regard to the work that is being done at CIMMYT is extremely impressive."

– Martin Kropff
Incoming CIMMYT Director General

The Sustainable Modernization of Traditional Agriculture, led by country's Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA) and known locally as MasAgro, helps farmers understand how minimal soil disturbance, permanent soil cover and crop rotation can simultaneously boost yields and sustainably increase profits.

"The program is an example of how farmers, scientists and other stakeholders can think about and create innovations through appropriate fertilizer applications, seed technologies and also through such instruments as the post-harvesting machines," Kropff said.

"This is fantastic. That's what the CGIAR is all about."

"The HarvestPlus program, which adds more zinc and iron into the crop through breeding, also plays a key role in CIMMYT's research portfolio," Kropff said.

Zinc deficiency is attributed to 800,000 deaths each year and affects about one-third of the world's population, according to the World Health Organization. Enhancing the micronutrient content in wheat through biofortification is seen as an important tool to help improve the diets of the most vulnerable sectors of society.

The climate change adaptation work he observed, which is focused on drought and heat stress resilience is of paramount importance, Kropff said.

Findings in a report released last year by the Intergovernmental Panel on Climate Change state it is very likely that heat waves will occur more often and last longer throughout the 21st Century and that rainfall will be more unpredictable.

Mean surface temperatures could potentially rise by between 2 to 5 degrees Celsius or more, the report said.

"To safeguard food security for the 9 billion people we're expecting will populate the planet by 2050, we need innovations based on breeding, and solid agronomy based on precision farming," Kropff said.

"There's no other organization in the world that is so well designed as the CGIAR to do this type of work. CIMMYT is the crown jewel of the CGIAR together with the gene banks. No other organization can do this."

"We've done a lot of work in getting higher yields, but not much through increased yield potential, and that's what we have to work on now," he added.

"If you raise the yield through agronomy, you still need to enhance yield potential and there's very good fundamental work going on here."

"The partnerships here are excellent – scientists that are here from universities are as proud as CIMMYT itself about all the work that is being done. I'm really honored that from 1 June, I have the opportunity to be the director general of this institution. I cannot wait to get started working with the team at CIMMYT and I'm extremely grateful for the warm welcome I've received – a smooth transition is already underway."

Follow Martin Kropff on Twitter @ KropffMartin

"It's important that we have such excellent scientists and scientists that can lead the way to impact. Among the CGIAR centers, this is the flagship institute. I am impressed by the passion of the people, the high quality and the partnerships. You can't get impact from research if you don't have good partnerships."

– Martin Kropff
Incoming CIMMYT Director General

▲ Left to right: Tom Lumpkin, John Snape and Martin Kropff.

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Call for Abstracts for the 9th International Wheat Conference (IWC) Now Open

29 May 2015: deadline for submitting abstracts to participate in the 2015 IWC (20–25 September, Sydney, Australia)

Submissions invited for presentations which address one or more of the following topics:

- Global Wheat Research and Production
- Increasing Wheat Yield – Breeding and Management
- Hybrid Wheat – Systems and Developments
- Harvesting Wheat Genetic Resources
- Achieving Yield Potential – Abiotic Stresses
- Achieving Yield Potential – Biotic Stresses
- Wheat Improvement by Biotechnology and Genomics
- Wheat Genetics and Breeding for Processing Quality
- Wheat for Human Nutrition and Health
- Global Wheat Research Initiatives and Cooperation

For more information or to submit an abstract please click here.

Wheat-friendly bug caught an intruder. Photos by Muhammad Sajjad, CIMMYT-Pakistan office driver.

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