

Building resilience, self-reliance and a reliable business model

The case of maize under the Agricultural Innovation Program for Pakistan.



Participants of the Annual Maize Working Group Meeting in Pakistan stand for a group photo holding new maize products and parental seeds. (Photo: Syed Kashif/CIMMYT)

Pakistan's heterogeneous agroecology is suitable for the production of tropical and sub-tropical maize. The country's 1.3 million hectares of maize are spread across a range of elevation — from 30 meters above sea level in the arid plains of Sindh province in the south to nearly 3,000 meters in the Karakoram mountain range of Gilgit Baltistan province, in the north.

In 2018-19, Pakistan's annual maize production reached an all-time high of 6.3 million metric tons. The production shows a 7% increase from the preceding year and maize was the only crop showing such level of positive surge during the same year. Pakistan's maize productivity which is at 4.8 metric tons per hectare is among the highest in South Asia and a number of sugarcane and cotton farmers have switched to maize during 2018-19 season for its productivity and output market attractions. With only 48% area increase, maize production increased almost by 320% and productivity by 182% in 2018-19 as compared to its [levels in 1995](#), setting an example of how improved genotypes and management practices can significantly boost on-farm productivity.

Although this tremendous growth is largely attributed to imported hybrid seeds and their wider adoption in the spring season, the local maize sector is not vibrant enough neither to offer smallholder and marginal farmers with affordable maize seeds and varieties nor to save millions of dollars that Pakistan spends on maize seed imports annually. In 2018-19 the import value of maize seed was almost [80 million dollars](#). Furthermore, a continued emergence of biotic and abiotic stresses mostly due to climate change is challenging maize production in Pakistan, which necessitates the use of more nutritious, diversified maize genotypes with tolerant traits to multiple stresses and climatic shocks that can fetch good markets.

To respond to these challenges, CIMMYT and the U.S. Agency for International Development (USAID) started the [Agricultural Innovation Program](#) (AIP) for Pakistan, which has been working with local partners for the past six years to promote climate resilient and biofortified maize, enhance local capacity

in developing and deploying maize varieties tolerant to biotic stresses, and engage private seed companies to strengthen maize R&D and product delivery. Since 2014, AIP has supported the evaluation and validation of more than 3,000 diversified maize products in various agro-ecologies of Pakistan with the participation of public and private stakeholders. The germplasm evaluation and validation network established under AIP was able to identify several well-adapted and superior varieties. In addition to testing, CIMMYT allocated 52 market ready maize products together with their parental seeds to 15 public and private partners. So far, 12 of these products have been officially released for commercial and large-scale production and many more varieties are in the pipeline for release in 2020 and beyond.



CIMMYT maize trial at Field Crop Research Station, Goner Farm, in Gigit Baltistan, North West Pakistan. (Photo: Salman Saleem)

Diversified maize products to boost farmers' resilience to shocks

In February 2020, AIP handed over 11 new maize products with their parental seeds to its partners, which included provitamin A enriched biofortified maize, drought-tolerant, low nitrogen, stress-tolerant and stem borer tolerant varieties. These new maize products are sourced from the International Institute of Tropical Agriculture (IITA) and successively tested for 2-3 years for their adaptation in Pakistan under the AIP germplasm evaluation and validation network. This process has saved partners at least 8-10 years and considerable amounts of money as compared to partners developing these products from an initial breeding process.

During the handover of the new maize products to partners at the annual AIP maize review meeting held in Islamabad on February 6-7, 2020, and attended by 60 participants, Jeff Goebel, Director of Economic Growth and Agriculture for USAID Pakistan, mentioned the collaboration of the USA and Pakistan in the last sixty years and recalled the contribution of Norman Borlaug to wheat self-sufficiency for Pakistan.

Goebel also mentioned the salient achievements of the AIP project in general and the maize interventions in particular. While presiding over the annual meeting, Muhammad Azeem Khan, Chairman of Pakistan Agricultural Research Council (PARC), the apex agricultural research body of Pakistan, said “today we are transferring the breeder seeds/parental lines of new hybrids and varieties that are high yielding, have traits to tolerate biotic and abiotic stresses and most importantly are nutritionally enriched or biofortified. We know how precious parental seeds are and the long time it will take to develop one. However, we are receiving them from CIMMYT under the Agricultural Innovation Program (AIP) in the shortest time possible and I urge all the stakeholders to utilize these new genetic materials for the benefit of our country. I want to reiterate the importance of collaboration among public and private stakeholders to produce the seeds at scale so that the varieties can make it to the farmers' fields as quickly as possible.”

Farmers from the Newly Merged Districts (NMD) of Pakistan are also able to get the fresh seeds of drought-tolerant and early maturing white maize varieties originally from CIMMYT and released in 2019 by one of the [project partners](#), the Maize and Millets Research Institute (MMRI)-Sahiwal. While appreciating the new seeds, Syed Khadem Jan, a farmer from Bajor district of the tribal areas of Pakistan, mentioned the importance of maize for his community and the limitations farmers have. “Our area is very fragmented and maize yields are less than two tons per hectare due to the lack of improved varieties and management practices. The new maize seeds with drought-tolerant characteristics are what farmers are looking for and they will help to secure more food and livelihoods in the area.” The new varieties have the potential to give up to 7 tons per hectare in good management and farmers can save and grow the seeds for consecutive seasons. Drought-tolerant seed varieties are strategies to mitigate and cope with climatic shocks and build resilience.

“Strengthening agriculture-to-nutrition pathways is the centerpiece of the AIP project to provide nutritious food to the needy. When we initiated the project seven years ago, we tried to unpack the challenges of malnutrition and envisioned how biofortified crops could help alleviate nutritional insecurity prevalent in Pakistan. The introduction and evaluation of quality protein, vitamin A and zinc enriched maize products for the first time in Pakistan through the project, is a significant contribution not only for the maize seed sector but also for the larger country-led agricultural transformation endeavors,” said Muhammed Imtiaz, CIMMYT’s Country Representative and AIP project leader. “Continued collaborations and support of all stakeholders are crucial to see specialty maize products reach the most vulnerable communities and foster the business model ushered in by the project.” Imtiaz also acknowledged USAID and the national government for the support of the project and the 22 public and private project partners who are working across the maize value chain in Pakistan.

Building a sustainable business model

Apart from allocating new products, AIP also facilitated the distribution of more than 150 elite CIMMYT maize lines to NARS and seed companies. In 2018, AIP facilitated the import and distribution of tropically adapted [haploid inducers](#) where two public institutions are currently in the course of developing double haploid maize lines that will help accelerate the cycle of new maize products development.

At the annual meeting earlier this year, participants mentioned the various contributions of the AIP project for bringing CIMMYT’s maize back in the agenda in Pakistan after it was suspended in the mid-1980s. After three decades of recess, CIMMYT/AIP was lauded for bringing innovations to the maize seed sector, building institutional capacity across the maize seed value chain, diversifying the country’s maize gene pools and training a number of Pakistani scientists locally and abroad. This all-around support, stakeholders’ mobilization, collaboration and integration has contributed significantly to increase

Pakistan's local capacity of developing and deploying maize seeds and varieties in the country. As an example, the volume of maize seed import shows a [decreasing trend](#) since 2016. Although the monetary import value is still high, the increased maize area and production is attributable to the local growing capacity of maize seed stakeholders in seed production and marketing.

"We are very grateful to CIMMYT for reviving and helping the crawling maize seed industry to walk. Now we need to learn how to run and that may take a few more years," says Aslam Yousuf, Managing Director of HiSell Seeds Private Ltd. Company. The company is among the dozens of AIP private partners that received market ready maize products and parental seeds as well as product advancement and business agility training from CIMMYT.

"The testing of diversified maize products and release of a number of new varieties are encouraging progress from the maize sector of Pakistan. A further thrust is required in quality seed production and seed business at scale so that farmers can benefit from these technologies," said AbduRahman Beshir, CIMMYT maize seed system specialist for South Asia. "The active involvement of the private sector and the model followed under AIP to build the competitiveness of the local seed sector and the strong business case for investment can be taken as an example for a sustainable intervention program."



Muhammad Azeem Khan (left), Chairman of PARC, addresses the Annual Maize Working Group Meeting on February 6, 2020, in Islamabad. (Photo: Syed Kashif/CIMMYT)

The Agricultural Innovation Program (AIP) for Pakistan has been working to sustainably increase agricultural productivity and incomes in the agricultural sector through the promotion and dissemination of modern technologies and practices in the horticulture, cereals and livestock sectors. Project management is vested in a unique consortium of CGIAR centers and the Pakistan Agricultural Research Council (PARC), led by CIMMYT and supported by USAID. The project aims to foster the emergence of a dynamic, responsive, and competitive system of science and innovation in Pakistan. AIP seeks to catalyze equitable growth in agricultural production, productivity and value.