Borlaug Institute for South Asia
An International Agricultural Research Institute for Maize and Wheat Systems in South Asia
Taking Borlaug's Legacy Forward

Stress on food production systems has threatened lives and human potential throughout history. To address the challenges of human hunger, Dr Norman E Borlaug, an eminent agricultural scientist, developed successive generations of wheat varieties adapted to growing conditions across many degrees of latitude, and with high yield potential from 1944 to 1963. Joint agricultural research done with fellow scientists in Asia and Latin America led to viable technologies to blunt hunger and promote global food security, in what was called the Green Revolution. In 1969, Borlaug predicted that the Green Revolution boost in food production could not last, and was only a reprieve for humanity to develop more sustainable systems and policies to manage its population growth and use of natural resources.

Established in 2011 on the legacy of Borlaug, the father of the Green Revolution, the winner of Nobel Peace Prize (1970) and the recipient of the Government of India's Padma Vibhushan (2006), the Borlaug Institute for South Asia (BISA) is a non-profit international research institute dedicated to food, nutrition, livelihood and environmental security in South Asia.

BISA is a collaborative effort involving the International Maize and Wheat Improvement Centre (CIMMYT), the Indian Council of Agricultural Research (ICAR), and the governments of the Indian states of Punjab, Madhya Pradesh and Bihar. BISA has been able to mark its presence on the South Asian agricultural scenario with various kinds of support generously provided by both the central and state governments – financial grants, leased lands, facilities, approvals, etc.
Why BISA?

Climate change, ever-increasing population, persistent poverty, chronic malnutrition and declining annual crop yield gains are retarding human progress in South Asia, which is home to more than 300 million undernourished people or 35 percent of the world's total. Fortunately, South Asia is rich in scientific manpower, industry, communication and infrastructure to create appropriate solutions to the colossal challenges of food security facing the region and the world. BISA was created to enhance regional cooperation across geographies, disciplines, institutions and economic sectors to speed up the pace of innovation and increase opportunities. At present, BISA has three research centres located in three agro-ecological zones, namely, the semi-arid northwest Indo-Gangetic Plains of Ludhiana (Punjab), the semi-humid middle Gangetic Plains of Samastipur (Bihar) and the humid central plateau of Jabalpur (Madhya Pradesh). It has plans to establish more centres in South Asian region.

Existing, planned and under consideration locations of BISA in South Asia

1.6 & 2.4 billion people lived in South Asia in 2010 and are projected to live there in 2050.

101 & 124 million tons of wheat were consumed by South Asia in 2010 and are projected to be consumed in 2020.

25 & 30 million tons of maize were consumed by South Asia in 2010 and are projected to be consumed in 2020.

BISA builds on the Borlaug legacy aiming at:

- Improved germplasm of maize and wheat, and diversification for nutrition security
- Conservation agriculture for resilient production systems
- Improved soil health and environment quality
- Efficient extension system to reach the benefits of technology to the farmers
- Enhanced productivity and livelihoods
- Capacity building and regional cooperation
Strategy

- Strategize research aimed at doubling food production in South Asia while using less water, land and energy
- Build on CIMMYT's vast germplasm resources, and make research products and know-how developed by BISA freely available to stakeholders
- Strengthen cutting-edge research that validates and tests new technologies to significantly increase yield potential
- Ensure access to the latest in research and technologies that are currently not available in the region
- Develop technologies for higher productivity in maize and wheat based farming systems
- Design research outputs targeted to small and marginal farmers across the region, and beyond
- Create a new generation of scientists to work with novel technologies through training programs that will retain them in South Asia
- Enable researchers to pursue multiple strategies and research possibilities while simultaneously allowing for more meaningful collaboration with national institutions
- Build a forum with partners across the world from all sectors including research centres, governments, science community, businesses and farmers to transform farmers’ lives and improve food security in the region, and beyond
- Develop a policy environment that embraces new technologies and encourages investments in agricultural research
- Develop and utilize BISA as a regional platform that focuses on agricultural research in the whole of South Asia

Who will benefit from BISA and how?

Success in one segment of beneficiaries will facilitate success in another

Farmers & Greater Regional Society
Agribusiness & the Private Sector
R & D Scientific Community

Who will benefit from BISA and how?
BISA – An International Platform for AR4D in South Asia

BISA provides an international platform for agricultural research for development (AR4D) to the students and researchers around the world to work for South Asian countries. Since 2011, it has been undertaking extensive strategic research on phenotyping for heat stress tolerance in wheat and maize; sustainable intensification for enhancing system productivity and profitability; conservation agriculture in wheat based cropping systems of Indo-Gangetic plains; water-wise technologies; and development of farm machinery.

Phenotyping for heat stress tolerance in wheat and maize

BISA centres have been identified as suitable phenotyping sites with excellent discriminative ability for heat tolerance and heat susceptibility among genotypes. Across the site data analysis of phenotyping done at BISA showed significant genotypic variability in the panel for heat stress tolerance.

- Five heat tolerant lines of wheat with high yield and stable performance were identified for large scale testing and scale-out by alliance partners, including seed companies.
- Three wheat genotypes which out-yielded the best national/local check were identified and made available to NARS of India.
- Five heat tolerant maize hybrids with high yield and stable performance were identified for large scale testing.

Sustainable intensification for enhancing system productivity and profitability

Agricultural intensification can be accomplished by:

- Increasing yields per hectare through timely sowing and with increased inputs of water and fertilizers and improving nutrient and water efficiency
- Increasing cropping intensity per unit of land. This includes: use of short duration crop cultivars, relay cropping of mung bean in standing wheat and planting of wheat in standing cotton
- Changing land use from low value crops to crops that receive higher market prices and/or that serve as a continuous source of income

Mung bean relay planted in standing wheat by using a high clearance tractor and a relay seeder (as seen after wheat harvest)
Conservation agriculture in wheat based cropping systems of Indo-Gangetic plains

In order to address the issues related to natural resource fatigue and make agriculture climate resilient, conservation agriculture (CA) based crop management practices have been advocated by BISA for both irrigated and non-irrigated systems.

- Conservation agriculture, practiced in the presence of residue for 2-3 seasons continuously, results in improved soil health and crop yields.
- Conservation agriculture improves water and nutrient use efficiencies.

Water-wise technologies

Rice consumes about 50% of total irrigation water in Asia and accounts for about 24-30% of the withdrawal of the world's total fresh water. The higher water application in rice is due to water requirements for puddling and losses through seepage and deep percolation to ground water.

- Compared to conventional practice (flooded, plodded transplanted rice), drip irrigation system saves almost 57% of water.
- Direct seeded rice (DSR) crop subsequently managed like a flood irrigated crop can still save 20 cm of precious irrigation water.
- The presence of crop residue enables additional water saving.
- Drip irrigation system also improves partial factor productivity of nitrogen.

Spring maize (February–June) is expanding rapidly in northwest India. However, evaporative demand during the growing period as well as knowledge gap on irrigation water management leads to application of water in much higher quantities than required for physiological purposes.

- Physiological yield and irrigation water use are significantly and positively affected by mulch and irrigation.
- Mulching results in significant increase in yield.
- Drip irrigation saves up to 66% water compared to that in farmers' practice.
- Mulching with skip furrows and drip irrigation are effective tools for improving water productivity.
Development of farm machinery

BISA has developed machines and implements suitable for conservation agriculture. Notable among them are:

- High Clearance Tractor
- Modified Combine Harvester
- Knife Roller
- Mini Happy Seeder
- Self-propelled Relay Seeder

Looking Ahead

BISA is on the threshold of becoming an agent of change in the South Asian agricultural scenario with novel technologies being developed at its three centres. With its focus on holistic, interdisciplinary and collaborative approach to AR4D, BISA's facilities and formal institutional partnerships can create a world-class research infrastructure and lead to strategic collaborations among regional and international scientists as well as public and private stakeholders across the region's agriculture and its value chains.

Ms Carolyn Lowry, a graduate student with a Borlaug Fellowship from USAID, successfully completed her research program at the research centre of BISA at Pusa, Bihar in April, 2015.

BISA is attracting global attention for its cutting edge research at local level with immense possibilities for researchers, entrepreneurs and other stakeholders. BISA is augmenting its training facilities to attract talents and bridge the gap between innovation and adoption at farm level so as to accelerate the global efforts directed towards achieving food and nutritional security in South Asia.

Researchers from all over the world are welcome.

Disclaimer

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