ICRISAT facility takes crop breeding to another level

Efforts to accelerate crop breeding took a giant leap with the unveiling of International Crop Research Institute for Semiarid Tropics’ (ICRISAT) new facility, which is projected to significantly lower the time and cost of crop varietal development.

The state-of-the-art facility, built on the ICRISAT premises, is a first for any public sector agricultural research institution. Called RapidGen, a moniker for Rapid Generation Advancement, the facility will accelerate plant lifecycle in light, temperature and humidity-controlled conditions.

Presently, breeding a new crop variety takes over a decade, with six-seven years spent on seasonal generational advancements to arrive at the elite lines that go for testing and release as varieties. RapidGen will shorten this window significantly. When used with the full suite of breeding acceleration techniques, the facility can reduce the breeding cycle by an estimated 40 per cent for most crops.

“Climate and exponential population growth has to be considered for the rapid development of improved food crops. But, we also need to look at what is achieved to sustain food and nutrition security,” Dr Peter Carberry, Director General, ICRISAT, said. “With facilities such as RapidGen, crop breeders can overcome the limitations of seasons and photoperiod to develop the elite generations in the fraction of the time and cost it would take if done in fields,” he said.

RapidGen comprises three installations – test-bed optimisation chambers, lighting-controlled greenhouse bays and a temperature-regulated light deprivation poly-house. Depending on the crop and requirements of breeding programmes, researchers can scale up their activities in either controlled greenhouse bays or in the poly-house facility after using the test-beds for protocol development.

The largest of the three installations, the poly-house can be used for over 30,000 crosses in one go. Each of the installations is equipped to finely regulate temperature, light and humidity. “Every crop is unique in the way it responds to a set of environmental parameters. We have to mimic the right set of conditions within these closed installations to convince a plant to grow faster at high density and to reproduce quickly. These set of conditions, which we call ‘recipes’, are crop specific-protocols that hasten the crop cycle while producing healthy, viable seeds,” Dr Pooja Bhatnagar-Mathur, theme leader at ICRISAT, said.

Dr Kiran K Sharma, deputy director general-research, ICRISAT, said protocols for chickpea, groundnut, pearl millet and sorghum were already in place. “Protocol development is the first step before a breeding programme can take advantage of facilities such as RapidGen. With their development, our partners and collaborators, both public and private, can integrate these modern techniques into their breeding programmes.”

ICRISAT is collaborating with several agricultural research institutes such as Indian Council of Agricultural Research (ICAR), State Agriculture Universities and industry partners to mainstream rapid cycling of the crops for which protocols were already standardised. “Through RapidGen, we attempt to herald a new era of breeding in agriculture research systems across the world. Moving forward, rapid cycling will be integrated with early generation testing, using advanced technologies to take further advantage of modern methods to increase genetic gains,” Dr Jan Debaene, Global Head-Breeding, ICRISAT, said.

“RapidGen is a case of many firsts, including a first for CGIAR, the group of research institutions which ICRISAT is part of. It is the world’s largest agriculture research system striving to ensure a resilient, food and nutrition-secure future,” he said. RapidGen’s infrastructure took almost a year to build and is supported by major donors through the CGIAR initiatives — Excellence in Breeding (EiB) Platform, Crops to End Hunger (CtEH), and Grain Legumes and Dryland cereals (GLDC) — and the Accelerated Varietal Improvement and Seed Delivery of Legumes and Cereals in Africa (AVISA). Industry partner Corteva Agriscience provided the technical and engineering support. Read More