



New partnerships support nitrogen research and network building



NIAB is involved in three recently funded Virtual Joint Centres (VJCs) for Agricultural Nitrogen investigating ways to sustain or improve crop production with reduced energy and environmental impacts.

There are eight VJCs in total, part of the £12.4 million Newton-Bhabha Fund working with researchers in India, China and Brazil and delivered in the UK in partnership between the Biotechnology and Biological Sciences Research Council (BBSRC) and the Natural Environment Research Council (NERC). NIAB is involved in two of the UK-India VJCs (co-funded in India by the Department of Biotechnology (DBT)) and a UK-China partnership (co-supported by partner institutes in China).

The Cambridge-India Network for Translational Research in Nitrogen (CINTRIN) is led by NIAB CEO Dr Tina Barsby and Dr Rajeev Gupta, who leads the Genomics and Trait Discovery programme at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT). It includes partners from the University of Cambridge (Plant Sciences, Sainsbury Laboratory), ADAS,

Punjab Agricultural University, the National Institute of Plant Genome Research (NIPGR, Delhi) and the technology SME KisanHub.

CINTRIN aims to be a truly translational centre, taking fundamental discoveries about how plants use nitrogen as part of their developmental processes and scaling this to generate new knowledge in the key cereals wheat, sorghum and millet. The first component of the programme involves high-throughput phenotypic screens of large panels of diverse wheat, sorghum and millet pre-breeding germplasm, and genetic transformation of wheat, to enable study of the function of key genetic regions.

The second component will use glasshouse and field-screening data to identify key lines for further testing in large-scale variable nitrogen trials, using the ADAS 'Opti-Plot' trialling system already developed for wheat in the UK. This will allow the investigation of performance at a

gradient of nitrogen levels in a single trial. The system will be established and extended in India for wheat, sorghum and millet experiments during the project.

The third component involves the creation of a data/informatics platform based on KisanHub technology. This aims to create a cloud-based app which can be used to make region- or variety-specific, nitrogen recommendations to farmers in the UK and India. CINTRIN also aims to build a network to enable and support future work in this area.

The Indo-UK Centre for Improvement of Nitrogen Use Efficiency in Wheat (INEW) is led by Professor Peter Shewry, at Rothamsted Research, and Dr Karman Venkatesh, at the Indian Institute of Wheat and Barley Research (IIWBR). It brings UK and Indian researchers together on wheat improvement to determine the genetic control of nitrogen use efficiency. This includes scientists from five



The 26 participants at the NIAB Quantitative Methods in Plant Breeding course hosted by Punjab Agriculture University, India with NIAB tutors Ian Mackay and Alison Bentley and local organisers

New partnerships support nitrogen research and network building *continued*

universities and institutes in the UK (including NIAB) and six in India (New Delhi, Haryana and the Punjab, the major wheat-producing area of India). A key VJC aim is to advance knowledge and understanding of nitrogen use efficiency in wheat through research and the development of applied tools for wheat breeders. It will also help build capacity through the exchange and training.

N-CIRCLE (Closed-Loop Cycling of Nitrogen in Chinese Agriculture) is a UK-China partnership led by Professor Pete Smith at the University of Aberdeen, with the University of Cambridge, Scotland's Rural College (SRUC), ADAS, the University of East Anglia and NIAB alongside nine partner institutes in China. The emphasis is on recycling nitrogen resources and 'closing' the nitrogen cycle. The programme is multi-faceted: looking to tackle nitrogen inputs into agriculture as well as studying transfer and losses within cropping systems. This will be achieved through combined innovations ranging from soil microbiology, novel manipulation of crop protein storage, through to livestock nutrition. These challenges are particularly relevant in China which is the largest user of nitrogenous fertilisers in the world. Within N-CIRCLE NIAB will use wheat transformation expertise to attempt to manipulate grain protein storage as a function of nitrogen uptake.

All of these VJCs will conduct innovative research to improve the

sustainable use of nitrogen within cropping systems in India and China, delivering new knowledge of direct relevance to breeding and agriculture. The VJCs will also build new collaborative capacity between researchers in the UK and partner countries, including an extensive range of training and exchange activities which will particularly target early career scientists. To this end, NIAB ran its Quantitative Methods in Plant Breeding (QMPB) course at Punjab Agricultural University's (PAU) College of Agriculture in India in early September this year. The workshop, delivered by Dr Ian Mackay and Dr Alison Bentley, was a joint initiative of the INEW and CINTRIN projects which have both committed to extensive training activities as well as promoting network and capacity building.

The 26 course participants were selected from 81 applications and represented all the Indian INEW and CINTRIN partner institutes as well as two UK INEW partners. Additional participants working in areas complementary to the research programmes in the VJCs were also selected to attend the training. The course was officially opened by the Head of the Plant Breeding and Genetics Department Dr Karanjit Singh Thind with an introductory welcome given by renowned PAU quantitative geneticist Dr GS Chahal.

The course content was delivered through lectures and practical sessions

adapted from the annual two-week NIAB QMPB course to cover basic statistics and quantitative genetics, trial design and analysis, population genetics, genetic mapping and genomic selection. The computer-based practical sessions, including the use of specific software packages, allowed the participants to gain valuable hands-on experience. The course included a field trip to visit INEW partners at the Borlaug Institute for South Asia (BISA), world leaders in the testing and application of precision farming methods, with demonstrations of conservation agriculture in wheat, rice and maize systems and precision agriculture equipment. The course was a resounding success and was highly praised by the participants, project partners and given strong support by the Vice-Chancellor of PAU Dr Baldev Singh Dillon. NIAB hopes to run the course again in India over the next two years of the VJCs and is currently seeking additional financial support for this initiative.

For more information on these projects please see:

CINTRIN

www.niab.com/cintrin

INEW

www.cerealsdb.uk.net/cerealgenomics/INEW

N-CIRCLE

<https://twitter.com/ResearchNCircle>

www.abdn.ac.uk/ncircle