Outcomes

The studies will focus on comparisons of wheat lines and populations which differ in their nitrogen use efficiency. These lines will be grown in field experiments in both countries and studied in detail using a range of biochemical and molecular genetic approaches. This will lead to the identification of genes and molecular markers that can be exploited by wheat breeders globally. New strategies for improving the precision of nitrogen application will also be developed and delivered to farmers via well-established mechanisms in both countries. In addition to supporting a closely integrated research programme in the UK and India, the Centre will also provide a legacy of trained scientists, shared facilities, technologies, genetic material and datasets.

The Funders

INEW is one of four virtual joint centres in agricultural nitrogen, delivered in Partnership the Biotechnology and Biological Sciences Research Council (BBSRC), the Natural Environment Research Council (NERC) and the Department of Biotechnology India (DBT) as part of the £10 million Newton-Bhabba fund.

BBSRC bioscience for the future

NERC SCIENCE OF THE ENVIRONMENT

Department of Biotechnology

Newton-Bhabha Fund

Further Information

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The Indo-UK Centre for the Improvement of Nitrogen Use Efficiency in Wheat

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Rothamsted Research

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Dr Karnam Venkatesh
Indian Institute of Wheat and Barley Research

The Background

Wheat is the most important crop grown in the UK, and one of two major crops in India. Nitrogen fertiliser is a key determinant of yield and the major cost of wheat production in both countries and excessive application can result in pollution of groundwater and increased production of greenhouse gases. Breeders and farmers in the UK and India have worked hard to reduce the nitrogen requirement for wheat, by improving the efficiency of use of applied nitrogen and the precision of fertilizer application in the field. However, further improvements are required to face the challenges of increasing crop production for an expanding global population with increasing uncertainty of climate. Both yield and quality attributes are dependent upon nitrogen inputs and need to be incorporated into economic and sustainable solutions.

To help meet this challenge INEW will support a co-ordinated programme research in the UK and India to understanding the genetic control of nitrogen use efficiency in wheat and apply this knowledge to develop improved varieties and agronomic practice to deliver sustainable increases in wheat production in both India and the UK. INEW will also look to the future, by providing training to students and early career scientists.

The Partners

INEW is led by Rothamsted Research and the Indian Institute of Wheat and Barley Research and brings bring together the major UK and Indian researchers with programmes on wheat improvement to determine the genetic control of nitrogen use efficiency in wheat. These comprise scientists from five Universities and Institutes in the UK and from six in New Delhi, Haryana and the Punjab, which is the major wheat-producing area of India.

Aims

A key aim of the joint centre is to advance our knowledge and understanding of nitrogen use efficiency in wheat through research and the development of applied tools for wheat breeders. INEW will therefore:

- Bring together the major UK and Indian research providers with programmes on nitrogen use in wheat, to provide a unique range of genetic material, skills and research facilities.
- Provide training to scientists in India and the UK.
- Exploit these resources to carry out an integrated study of the genetic, biochemical and molecular basis for improved nitrogen use efficiency in wheat grown in the UK and India, from mechanisms of nitrogen uptake to partitioning in the grain and effects on processing quality.
- Identify candidate genes that control key processes limiting nitrogen use efficiency in wheat grown in the UK and India.
- Develop molecular markers for key traits and transfer these to commercial and public sector wheat breeders in the UK and India.
- Develop improved nitrogen application strategies and deliver these to farmers as part of agronomic packages.
- Provide a “legacy” of joint facilities, datasets and technologies as a basis for longer term joint research programmes.

It also aims to help build capacity through the exchange and training of early career scientists and PhD students. As well as peer-to-peer exchanges four formal training courses are planned:

- Wheat genetics and marker development, held in Bristol and JIC
- Quantitative genetics, association genetics and whole genome selection, run by NIAB in Ludhiana
- High throughput phenotyping and transferrable skills, held at Rothamsted and Nottingham.
- Precision crop nutrition, run by BISA and PAU in Ludhiana