The International Wheat Yield Partnership:
A unique global public-private partnership for delivering wheat for the future.
UKRI-BBSRC and major funding agencies in other countries, including Australia, Canada and USA are addressing the crucial need to increase global wheat yields through investment in the International Wheat Yield Partnership (IWYP). IWYP is a public-private partnership programme with an ambitious goal – to increase the genetic yield potential of wheat by 50% by 2035.

Wheat is the most widely grown crop worldwide by area (over 230m hectares), providing 20% of the daily calories and 20% of daily protein for mankind. At the same time, there is a demand for increased food production that uses sustainable agricultural methods and less land while the world population is growing rapidly and the climate is changing. This makes the need for increasing wheat yield even more urgent.

The annual rate of gain in wheat yields is well below what’s needed to serve future food production needs and to sustain the environment. ‘Business as usual’ is unlikely to meet the demand, and new discoveries are needed to meet the wheat production needs of the future.

To address this global challenge, for the first time IWYP public funders across different countries and private industry joined together with a specific agricultural research goal, leveraging each other’s investments and scientific discoveries in many institutions around the world.
Achieving IWYP’s mission:

IWYP maximises the value of research investments to benefit local and global agriculture communities, in developed and developing countries. This is achieved through research coordination that enables international collaboration across the IWYP partners and beyond. IWYP ‘aligns’ with research projects not funded within IWYP when they have related goals, allowing IWYP to widen its scientific network and the chances of success. To date, the IWYP community involves over 200 scientists, working in 30 research projects amounting US $50M across 58 research institutions in 14 countries.

To increase genetic yield potential, new discoveries and combination of different genetic traits that affect wheat grain yield are required. IWYP’s focus and route to success is the combination of IWYP discoveries with other promising breakthroughs and testing them in cultivars in the field. This is rarely done by individual researchers, resulting in loss of potential impact in public sector research.

An IWYP Hub based in CIMMYT, Mexico – the world’s leading institution for spring wheat improvement – is combining, integrating and testing novel genetic discoveries in wheat cultivars. Two new, private sector-led IWYP Hubs in UK and USA will lead yield improvements in winter wheat (usually grown in northern countries). In this way, IWYP delivers benefits relevant to both the north and the south, developed and developing countries alike.

Benefits from IWYP:

- $2.59\text{ billion} \text{ leveraged by other funders for every}\$1\text{ invested by BBSRC to support }\text{collaborative IWYP research.}
- 40\text{ countries}\text{ UK-based scientists have joined a }\text{network of over 200 researchers.}
- 19\text{ network}\text{ UK early career researchers (Pre-Docs, PhDs & Post-Docs) received training through the IWYP network.}
- 10\%\text{ gain in yield from wheat lines developed through IWYP compared to local varieties in more than 30 locations.}
- 150\text{ new potential high yielding lines now being tested in the field.}
One of the IWYP projects, led by Cristobal Uauy in the John Innes Centre in collaboration with researchers in the USA and Mexico, focuses on identifying key developmental genes that control the weight and size of wheat grains. The researchers have characterised several altered forms of genes that result in wheat plants with larger and heavier grains.

The researchers worked on TaGW2, a gene comparable to the rice gene OSGW2, which has been shown to influence grain size. Using gene editing techniques and mutagenesis, the researchers showed that by altering the function of TaGW2 in the wheat genome, grain weight, width and length were significantly increased. They tested different versions of this gene in both bread and pasta wheat lines, which contain multiple copies of the gene. The effects on grain size became more prominent as more copies of TaGW2 were edited. By editing each copy of the gene in the bread wheat genome the researchers showed that grain width and length changed in an additive way.

Wheat lines carrying the different mutant allele of TaGW2 are available to wheat breeders (through the JIC Germplasm Resources Unit and the US National Small Grains collection), while further evaluation of the alleles continues through combination of these edited lines with other emerging IWYP crosses into CIMMYT elite lines. The lines created have also been shared with private breeding companies to evaluate their effect on yield in field conditions.
Funding and research organization Partners:

- Biotechnology and Biological Sciences Research Council
- GRDC (Grains Research & Development Corporation)
- USAID (US Agency for International Development)
- Department of Biotechnology, Government of India
- Agriculture and Agri-Food Canada
- SAGARPA (Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación)
- syngenta foundation for sustainable agriculture
- CGIAR
- CIMMYT

Private Member Partners:

- DuPont
- Pioneer
- syngenta
- Limagrain
- KWS
- LongReach
- mahyco
- SEED•CO
- BASF
- RAGT