Case study

‘GREEN Grain’

Collaborative supply chain research is powerful in achieving shared environmental benefits for the Scotch Whisky industry. The success of the five-year project ‘Genetic Reduction of Energy Use and Emission of Nitrogen through Cereal Production’ - GREEN Grain, completed in 2010, illustrates such benefits.

The Edinburgh-based Scotch Whisky Research Institute (SWRI) provides a centre of scientific excellence dedicated to the needs of the distilled beverage industry. SWRI led the distilling industry interest in the £2 million project. The GREEN Grain project was jointly funded with the UK Government under the auspices of the DEFRA Sustainable Arable LINK programme. GREEN Grain brought together an impressive partnership across the wheat supply chain, involving SWRI, Scottish Crop Research Institute, ADAS, FOSS, Wessex Grain, Syngenta, Green Spirit Fuels, Nottingham University, HGCA and Grampian Country Foods. This combination of genetic, agronomic, analytical and process knowledge led to significant scientific advances and commercial return with the introduction of a new wheat variety - Denman - whose potential was identified during experimental trials.

The new Denman wheat variety

Wheat is used in the production of grain spirit – a key constituent of Blended Scotch Whiskies. Good quality distilling wheat will have low nitrogen (N) levels as higher levels of starch will be converted into alcohol. The N level in the grain is determined by a combination of genetic and environmental factors, especially the amount of N fertiliser applied by the grower. While N fertilisers promote the crop yield, they are one of the most significant costs to the grower.

The project studied the genetics, physiology and agronomy of wheat to produce a new wheat type with a high energy grain suited to both distilling and livestock feeding, but with low N fertiliser requirements.

GREEN Grain’s central conclusions:

- It is possible to use currently available wheat varieties, with no toned for novel developments, to produce a variety needing 40% less N application.
- A reduction in fertiliser use limits the potential for run-off into water courses and high nitrate levels in groundwater. This would result in a reduction in greenhouse gas emissions of 33%. This represents the large amounts of energy required to make and transport N fertilisers which make a significant contribution to the carbon footprint of the wheat supply chain.
- The benefits would be financial as well as environmental, with improved alcohol yields and lower input costs.

The project also developed analytical tools to help early identification of promising wheat varieties in the plant breeding process to speed up their development to approval and commercialisation. Denman emerged from a range of new wheat varieties from the Syngenta breeding programme included in the GREEN Grain trials. SWRI found Denman to have a high alcohol yield potential, as well as strong agronomic performance. In late 2010, after further independent testing, Denman made it to the Home Grown Cereals Authority’s Recommended List as a fully approved variety.

The significance of Denman is not the commercial success of one variety, but whether it is the first from a range of varieties with improved GREEN Grain characteristics. The work demonstrates that it is possible to breed wheat varieties with reduced N requirements using traditional plant breeding techniques. There is now a need for further variety testing by plant breeders.

Follow-on work is underway with many of the original partners, including SWRI, to validate how varieties can be fairly compared in terms of savings in N application and to optimise the agronomy to produce them. This continuing research should help the distilling industry and the rest of the wheat supply chain achieve their sustainability goals.