

Dr Pete Iannetta of the James Hutton Institute in Dundee discusses a very practical result from the ongoing TRUE research project (Transition paths to sustainable legume based systems in Europe).



Pete Iannetta with Arlene Stuart of BBC's Landward



The project "Transition paths to sustainable legume based systems in Europe" is a balanced practice-research partnership of 24 institutions, which aims to identify the best routes, or "transition paths" to increase sustainable legume cultivation and consumption across Europe.

Why bean beer?

Beer can be a wholesome beverage, and the art of brewing beer has been intertwined with the development of civilised society for centuries. Today, the latest valuation of the economic value of beer (by accountants Ernst and Young in 2013), reported that Europe is the world's biggest producer of beer with over 4,500 breweries delivering around 390 million hectolitres annually – which in plain English is 68,632,200,000 pints (since 1 hectolitre is a small spillage less than 176 imperial pints). The industry employs over 2 million people, and around 125,000 of these are employed in breweries themselves. It should also be no surprise then that sales generated 53 billion Euro, which is almost doubled again by the value added from the supply chain. Also, the EU brewing sector had a trade surplus (i.e. exports were greater than imports) to the value of 3 billion Euro in 2012. Beer is serious business.

History, and even modern history, tells us that beer can be made using a wide range of crops. In northern Europe, oat grains were the traditional starch source for beer production in the Middle Ages. Nowadays, beers produced in areas such as sub-Saharan Africa tend to use grains of the cereal sorghum.

In Europe, barley is the main grain of choice, and modern brewers often mix barley grains up to a 1:1 ratio with grains from other cereal crops such as wheat, rice and maize. Such mixing is sometimes used to reduce production costs or to generate special flavours in beer - and often in combination with specific yeasts and types of hop.

Legume grains can also be used to produce beer, and the considerable potential of legumes to produce alcohol was recognised long ago, as witnessed by historical records (1708). In 1838, documents from the UK explained how a mixture of peas, beans and oats were commonly used to make beer.

Modern-day, legume-beer innovators include the Japanese Sapporo brewery (<http://sapporouse.com/>), who have marketed beers

based on a blend of grains from up to one dozen different pulses. Globally, the humble pea is the most widely used legume in brewing, and its inclusion can help contribute to a beer's 'body' (higher viscosity), flavour and head retention. Generally speaking, Europe has yet to reinvent the ancient art of brewing legume-cereal beers.

Faba bean remained an elusive ingredient for legume-brewers until recently, since faba beans were notoriously difficult to work with: assumedly because of their potential to limit the biochemical activity which converts starches into fermentable sugars. However, pioneering efforts with Barney's Beer (Summerhall, Edinburgh) have featured a series of products using faba bean since about 2012.

First, there was 'Fi Fi Fo', which was brewed using a 1:5 mixture of air-fractionated faba bean starch concentrate and barley. Then, there was 'Tundra', produced in partnership with Limagrain (who bred the winter bean variety of the same name), made using a 1:4 mixture of whole beans and barley. 'Tundra' was heavily hopped to deliver an American IPA hit. In 2017, 'Jack IPA' was launched and while this tested as gluten free it was not marketed as such. Now, in 2018, there is the 40% faba bean kernel-based ale, which is simply entitled 'Faba Bean IPA'.

The latest production run of 'Faba bean IPA' was filmed by the BBC's Landward team and will be presented on national television by Arlene Stuart (before this article is published, so interested readers will need to use the *BBC iPlayer* to catch up with past series).

News of 'bean beer' is now attracting serious attention from brewers and, perhaps more importantly, from a public that is becoming increasingly aware of the need to consume more sustainably. Thus, their interest is not simply one of exploring new beers, but one of trying to encourage natural nutrient- (that is, nitrogen-) cycling from legume-supported agri-food systems.

Legumes, such as faba beans, can fix their own nitrogen and, therefore, require less synthetic nitrogen fertiliser and support natural nitrogen cycling. The infrequent inclusion of legumes in UK cropping systems - only 1% of the cropped area is legumes on average - is reflected in the low level of home-grown legume use within the supply chain. Furthermore, brewed legume by-products from the brewing process have high amounts of protein and can be used in animal feeds. Currently, barley-based 'brewers grains' are a highly valued feed for dairy farmers.



Good beer is best enjoyed slowly and in good company, and good research equally so. Our research on brewing with beans is in its sixth year, and emerged from small beginnings within the *www.beans4feeds.net* and *www.legumefutures.eu* projects.

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The interest is now an international effort. There is a dedicated part-time PhD student (Kirsty Black, who is also Manager of Arbikie Distillery) supervised by Abertay University (yeast specialist Prof Graeme Walker) and The James Hutton Institute (including plant-nutritionist Prof. Philip White). Kirsty's work has included blind taste-testing, which has shown that consumers cannot tell bean-based beer from its barley-only counterpart.

The bean-brewing process is the focus of a 'Life Cycle Analysis', where the relative environmental impacts of barley-only and bean-based beers are being compared by colleagues at Trinity College Dublin, Bangor University and Scottish Rural Colleges (SRUC) within the EU-funded project *www.true.project.eu*. This is coordinated by Pete Iannetta, and is a 24 partner industry-academia effort with participants from as far afield as Kenya. A number of scientific articles reporting on bean beer are in preparation - the 'how to brew bean beer' guide (available from *www.true-project.eu*) has been circulated on request to craft breweries throughout the UK.

The hope is that one day bean-based beers will not be viewed as an oddity but rather a truly traditional source of beer and high protein coproducts that encourage greater uptake and more profitable use of locally grown faba beans.

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