



**THE ARBIKIE DISTILLERY
SUSTAINABLE CREDENTIALS**



**OUR FARM. OUR FIELDS. OUR SOIL.
OUR SEEDS. OUR WATER. OUR STILL.
OUR SKILL. THAT'S OUR DIFFERENCE.**



CREDENTIALS HIGHLIGHTS

- Nàdar. The world's first climate positive spirits
- World's first Green Hydrogen distillery
- Regenerative farming practice
- Non-GMO crops
- Conservation barley cultivars
- Farm sustainable schemes
- Photovoltaic panels
- Fermentation CO₂ capture
- The net zero potato
- Field intercropping
- Supported by scientific papers
- An ethos to create a more sustainable environment



1. FROM THE FIELD

> REGENERATIVE FARMING PRACTICE

A CONSERVATION AND REHABILITATION APPROACH

A. SOIL REGENERATION AND INCREASED BIODIVERSITY

- i. Soil structure is analysed on a rotational basis. This provides maximum economic efficiency by minimising any artificial input whilst maximising the natural nutrient elements of the soil. By adding organic matter the quality of the soil structure is enriched, with improved drainage, water retention, and nutrition.
- ii. Carbon content of the soil is recorded and monitored to understand the impact of the farm activities and how this can be improved.
- iii. Rotational soil sampling analyses all nutrients and soil structure, ensuring the soil suffers no degradation, and supports our focus on sustainable agricultural practice.
- iv. Soil cultivation is minimised to help improve soil health, soil structure and water retention.
- v. Cover cropping improves soil health, water retention and reduces soil erosion. It also provides a natural means of controlling pests, diseases and weeds whilst increasing on-farm biodiversity.
- vi. All inputs are recorded to within 2cm in-field. This helps to analyse the results of our rotational soil sampling and ensure that we address any issues of degradation by specific and efficient compensation inputs.
- vii. A mixed crop 7-year rotation sees the crop change each season. This not only introduces a wider variety of plants being grown across the farm, but also reduces the presence of pests and diseases whilst helping maintain soil fertility.
- viii. Buffer strips of vegetation around field edges and waterways reduces field run-off, preventing soil, sediment and nutrient loss from fields.
- ix. Leaving stubble in the fields over winter provides both food and shelter for a range of birds and wildlife.
- x. Growing crops and hedgerows specifically benefits farmland birds and animals.



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B. NUTRIENT CYCLING

i. Legumes in rotation enrich the soil through capturing nitrogen from the air and depositing it in the soil. This results in an increase in natural soil nitrogen reducing the need for synthetic nitrogen fertiliser in the following season's crops.

ii. **Grazing and natural manure.**

C. WATER CONSERVATION

i. An annual water audit keeps track of usage and identifies areas where water can be conserved.

ii. Water conservation helps to enhance soil structure.

iii. We capture field and building water run off.

D. CIRCULAR ECONOMY

We supply straw, spent grains and other final food waste to our neighbouring farmer. He, in return, supplies manure that is used as natural fertiliser which improves soil structure and in turn reduces water, soil and nutrient loss.



> **NON-GMO CROPS** ALL OF ARBIKIE'S CROPS ARE NATURALLY OCCURRING

- **WE ARE GROWING CONSERVATION BARLEY CULTIVARS:**

these were grown historically on our farm and we believe are better suited to our ever more variable weather conditions. By moving away from modern high yielding varieties, we are also increasing the genetic diversity of the cereals grown.

- **WONKY VEG:** crops which are rejected for their imperfections by our produce buyers are used in the distilling process to minimise waste. They form the very foundations of our spirits with our first product, Tattie Bogle Vodka being made from 'wonky' potatoes.

- **PLANTING JUNIPER:** we have planted more than 5000 juniper plants to date. Juniper is a key woodland species in Scotland but the natural population is at risk of dying out due to over grazing, changing weather and disease.

- **RAW MATERIALS GROWN ON SITE:** or sourced as locally as possible.

This significantly reduces the CO₂ emissions associated with transportation.

- **RESEARCH & DEVELOPMENT PROJECTS:**

THE NET ZERO POTATO

This is a three year project looking at a variety of ways of reducing the carbon footprint of potato production in conjunction with Branston Potatoes, the main supplier to Tesco supermarkets.

INTERCROPPING

This project, in conjunction with the James Hutton Institute, is looking at undersowing Malting Barley with legumes, thus avoiding the need for nitrogen fertiliser.

FARM SUSTAINABLE SCHEMES

- LEAF - linking Environment and Farming
- **Red Tractor**
- **Scottish Quality Crops Assurance**

2. PRODUCTION



> MINIMAL DISTILLERY IMPACT LIMITING CO₂ THROUGHOUT THE DISTILLATION PROCESS

- **NÀDAR VODKA AND GIN:** each 700ml bottle avoids 1.53kg of CO₂e.
- **PHOTOVOLTAIC PANELS AND HYDROGEN POWER:** both sources of green energy reduce our reliance on fossil fuels allowing us to become more energy efficient in a sustainable manner.
- **FERMENTATION CO₂ CAPTURE:**
- **WATER MONITORING & RECYCLING:** this ensures there are no water shortages. In addition, water is re-used in the distilling process and liquid by-products are utilised in hydrogen production.
- **DISTILLING BY-PRODUCTS USED AS FERTILISER:** the pot ale from the 1st distillation is used as a natural fertiliser for our crops.
- **COMPOSTABLE CAPSULES ON BOTTLES:** these are more sustainable than plastic alternatives.
- **PAPER AND CARD SOURCED FROM FSC FORESTS:** this ensures that the process is regenerative and sustainable.
- **INKS ARE NATURAL AND VEGETABLE BASED:** printed inks used on our labels and packaging are as sustainable as possible.

3. POST PRODUCTION



> **BY-PRODUCTS ARE NEVER BYPASSED** AN END TO END COMMITMENT TO SUSTAINABILITY

- **ALCOHOL FROM THE DISTILLING PROCESS:** any excess alcohol that cannot be redistilled is burnt in the visitor centre's fireplace providing supplementary heat to our air source heat pump system.
- **COMPOSTING:**
- **DRAFF USED TO FEED THE CATTLE:** this prevents waste and reduces our cattle feed purchases.
- **BARRELS IN THE CAR PARK:** instead of paint, to avoid wasting the barrels we use them as vehicle spacers.
- **SECOND-HAND FURNITURE:** the visitor centre uses up-cycled second-hand furniture from antique shops to follow our sustainable ethos.
- **CARDBOARD:** excess cardboard is shredded and re-purposed as protective packaging for online orders.
- **COLLABORATION WITH ECO-SPIRITS:**
- **STAFF CAR-SHARE:** the majority of our staff live locally and many also cycle to work.
- **MINIMIZING SINGLE-USE PLASTIC:** we use paper straws and veg-ware in our visitor centre. We have almost no single-use plastic anywhere on-site.

SCIENTIFIC PAPERS

- 1.** Black, K., Walker, G., White, P., Karley, A., Ramsay, G., James, E., Squire, G. and Iannetta, P. (2016) 'Main-streaming pulses: exploring local solutions to supply chain limitations', Legumes for a sustainable world: Second International Legume Society Conference. Tróia Resort, Portugal, 11-14 October. Universidade Nova de Lisboa, pp. 51.
- 2.** Black, K., Walker, G., White, P., Squire, G. and Iannetta, P. (2017) 'Intercropped barley for brewing and distilling', Local roots, global reach: Delivering distilling expertise to the world: Sixth worldwide distilled spirits conference. Hilton Hotel, Glasgow, 29 May-1 June. Packington: Context Products Ltd, pp. 45-48.
- 3.** Black, K., Barnett, A., Tziboula-Clarke, A., White, P.J., Iannetta, P.P.M. and Walker, G. (2019) 'Faba bean as a novel brewing adjunct: Consumer evaluation', *Journal of the Institute of Brewing*, 125(3), pp. 310-314. doi:10.1002/jib.568.
- 4.** Black, K., Tziboula-Clarke, A., White, P.J., Iannetta, P.P.M. and Walker, G. (2020) 'Optimised processing of faba bean (*Vicia faba* L.) kernels as a brewing adjunct', *Journal of the Institute of Brewing*, 127(1), pp. 13-20. doi:10.1002/jib.632
- 5.** Black, K., Daute, M., Tziboula-Clarke, A., White, P.J., Iannetta, P.P.M. and Walker, G. (2020) 'Utilization of low nitrogen barley for the production of distilling quality malt', *Journal of the American Society of Brewing Chemists*, 79(1), pp. 26-32. doi:10.1080/03610470.2020.1796090.
- 6.** Houdijk, J.G.M., Black, K., Barnett, A., Walker, G. and Iannetta, P.P.M. (2022) 'Standardised ileal digestibility of amino acids from barley-bean spent for broilers'. To be published in *British Poultry Abstracts*, 18 [Preprint].
- 7.** Lienhardt, T., Black, K., Saget, S., Porto-Costa, M., Chadwick, D., Rees, R.M., Williams, M., Spillane, C., Iannetta, P.M., Walker, G. and Styles, D. (2019) 'Just the tonic! Legume biorefining for alcohol has the potential to reduce Europe's protein deficit and mitigate climate change', *Environmental International*, 130, 104870. doi:10.1016/j.envint.2019.05.064.
- 8.** Lienhardt, T., Black, K., Saget, S., Porto-Costa, M., Chadwick, D., Rees, R.M., Williams, M., Spillane, C., Iannetta, P.M., Walker, G. and Styles, D. (2019) 'Data for life cycle assessment of legume biorefining for alcohol', *Data in Brief*, 25, 104242. doi:10.1016/j.dib.2019.104242.
- 9.** Saget, S., Porto Costa, M., Black, K., Iannetta, P.P.M., Reckling, M., Styles, D., Williams, M. (2021) 'Environmental impacts of Scottish faba bean-based beer in an integrated beer and animal feed value chain', *Sustainable Production and Consumption*, 34, pp. 330-341. doi: 10.1016/j.spc.2022.09.019.
- 10.** Schestak, I., Styles, D., Black, K. and Williams, A.P. (2022) 'Circular use of feed by-products from alcohol production mitigates water scarcity', *Sustainable Production and Consumption*, 30, pp.158-170. doi:10.1016/j.spc.2021.11.034.
- 11.** Schestak, I., Spriet, J., Black, K., Styles, D., Faragò, M., Rygaard, M. and Williams, A.P. (2023) 'Heat recovery and water reuse in micro-distilleries improves eco-efficiency of alcohol production', *Journal of Environmental Management*, 325 A, 116468. doi: 10.1016/j.jenvman.2022.116468.
- 12.** Duffy, C., Styles, D., Schestak, I., Macgregor, K., Jack, F., Henn, D., Black, K. and Iannetta, P.P.M. (2023) 'Optimising sustainability: Circular pathways for Scotch Whisky distillery co-products', *Journal of Cleaner Production*, 395, 136436. doi: 10.1016/j.jclepro.2023.136436.
- 13.** Black, K. and Walker, G. (2023) 'Yeast Fermentation for Productino of Neutral Distilled Spirits'. *Applied Sciences*, 13(8):4927. doi: 10.3390/app13084927