Northern Cereals

Northern Periphery and Arctic Programme 2014–2020

EUROPEAN UNION
Investing in your future
European Regional Development Fund

Northern Periphery and Arctic Programme

Northern Cereals – New Markets for a Changing Environment

DEVELOPING AN ORKNEY SUPPLY CHAIN FOR PRODUCING MALTING BARLEY FOR LOCAL WHISKY PRODUCTION

Case Study

Deliverable T4.2.4

Tartan malting barley being harvested for Highland Park Distillery at Weyland & Watersfield Farm, Orkney

By

Peter Martin and John Wishart

Agronomy Institute, Orkney College UHI

February 2018

AGRONOMY INSTITUTE

University of the Highlands and Islands Orkney College

HIGHLAND PARK
SINGLE MALT SCOTCH WHISKY

Northern Periphery and Arctic Programme
Northern Cereals – New Markets for a Changing Environment
CAV Diary Number 304-8673-2014

Developing An Orkney Supply Chain For Producing Malting Barley For Local Whisky Production – Case Study

Authors:

Peter Martin and John Wishart

With contributions from:

Highland Park Distillery, Orkney

Northern Cereals Partners:

Matis – Icelandic Food and Biotech R&D

Agricultural University of Iceland

Norwegian Institute of Bioeconomy Research

Agronomy Institute, Orkney College UHI

Agricultural Centre, Faroe Islands

Forestry and Agrifoods Agency; Newfoundland and Labrador, Canada

CONTENTS

1 Introduction 2

2 Rationale for the project 2

3 Preliminary research, 2009 3

4 Formation of a supply chain 3

5 Grower contracts 4

6 Supply chain operation 4

7 Supply chain performance 5

8 Supply chain challenges 8

9 Supply chain achievements 9

10 Acknowledgements 9

Photographs 10

1 Introduction

This case study describes a project which lasted from 2009 to 2016 to grow a modern variety of malting barley in Orkney for use by Highland Park (HP) Distillery for the production of an “all-Orkney” whisky. For the project, it was envisaged that the barley would be grown in Orkney and malted at HP; the malt would then be used for distillation at the distillery and the spirit would be matured on site and, eventually, possibly bottled in Orkney. A problem for most breweries or distilleries considering a similar project would be the lack of local facilities for producing relatively small quantities of malt. This was not an issue for Highland Park, however, as it is one of very few Scottish distilleries which still maintains its own floor malting facilities and therefore an “all-Orkney” whisky, in which every step in the process will be done in Orkney is a realistic option.

Although the project is probably larger than most micro-breweries or micro-distilleries in the Northern Periphery region would be able to support, the steps taken to deliver it provide a useful blueprint which could be replicated elsewhere on a different scale. The case study covers the following topics:

- The market forces which have driven the project (Chapter 2)
- Research which was carried out before the start of the project to assess its feasibility (Chapter 3)
- The composition of the supply chain and how it was managed (Chapter 4)
- The importance of the grower contract and what it included (Chapter 5)
- The annual cycle of supply chain activities (Chapter 6)
- The performance of the supply chain over the 7 years in terms of the quantity of grain produced and its quality for malting (Chapter 7)
- Some of the challenges faced by the supply chain (Chapter 8)
- The achievements of the supply chain (Chapter 9)

2 Rationale for the project

The main driver for the project was the expanding market for single malt whiskies, especially for those with a particularly unique character which can be sold as limited edition, high-value products. While geographical location has been important for marketing most Scottish whiskies for a long time, it is only recently that a wider range of provenance issues have started to be of interest to consumers. Several of these relate to the barley used by the distillery and include barley variety, husbandry (e.g. organic growing) and the location of the fields where the barley is grown. For island distilleries, there is a particular attraction in sourcing locally grown barley because islands are obviously geographically distinct entities which often have their own weather, soils, cultures and histories which are different from those of both mainland Scotland and other islands. Using local barley is therefore an

obvious way of reinforcing a whisky's island identity, particularly if the barley can also be malted by the distillery itself. There is controversy about the extent to which different types of barley or the location where it is grown contribute to the flavour of a whisky, but there is little doubt that use of local barley can make a valuable, genuine contribution to a marketing story and helps to reinforce the link between a distillery's location and its whisky.

In the context of the above, and with its own malting facilities, HP's concept of an "all-Orkney" whisky was an attractive one to pursue.

3 Preliminary research, 2009

The project began in 2009 following discussions between HP and the University of the Highlands and Islands' Agronomy Institute (AI) into the feasibility of growing a modern variety of malting barley on Orkney for supply to the distillery. Since malting barley had not previously been grown on Orkney for distilling, it was decided to first investigate this through a replicated trial in 2009 using a selection of different varieties. Varieties were selected by HP based upon earliness, malting quality and disease resistance. The trial also included a fungicide treatment so that each variety could be assessed with and without this input. The trial was a very valuable prelude to the main project because:

- It provided an indication of likely grain yields. This allowed HP to identify a grain price which would give a competitive return to growers compared with other local farm enterprises
- It provided grain samples which were sent for micro-malting to give an indication of the likely quality of malt which would be obtained on Orkney and the resulting spirit yield
- The two above points allowed HP to estimate the main project costs and likely spirit production and to therefore make an informed decision on its economic viability
- It allowed a barley variety to be selected based upon both local field performance and malting quality. This variety was Tartan which the trial indicated was slightly earlier than other varieties but still had good malting quality

4 Formation of a supply chain

Once HP had decided to go ahead with the project, the next stage was to form a supply chain with local growers and to develop a system which would deliver a specific tonnage of good quality dried grain to the distillery each year. For this, the following was decided:

- The supply chain would be managed by the AI which would co-ordinate growing of the crop and carry out grain drying and grain processing for the whole supply chain each year
- The supply chain would consist of 5 growers (one of which was the AI), with each grower sowing between 2.0 and 2.5 ha of Tartan so that a total annual production of about 50 t of grain was expected
- Since growing malting barley was a new venture in Orkney, it was agreed that the AI would collect annual data on weather, field fertility, grower practices, grain yields and

quality. These would be analysed and reported on to HP and the whole supply chain each year to try to identify best growing practices and ensure high grain quality

With Tartan being a variety which was possibly likely to be phased out in the medium-term, a good relationship between HP, the supply chain and the seed supplier McCreath, Simpson & Prentice Ltd was very important and was also built into the supply chain from the start.

Based on their knowledge of local conditions and practices used elsewhere in Scotland, the AI and HP drew up guidelines for growing Tartan in Orkney and provided these to all growers.

5 Grower contracts

To avoid any possible misunderstandings and ensure that growers were aware of the quality of grain they were expected to supply, each grower was provided annually with a contract for growing a specific area of Tartan.

The contract specified the purchase price of the grain (defined at a specific moisture content) and any premiums or deductions which would be incurred based upon grain quality criteria. Price deductions were incurred for screenings above 10%, delivering grain for drying above 22% moisture content or for a grain nitrogen content above 1.65% dry weight. Premiums were paid for screenings below 10% and for grain nitrogen below 1.65% (dry weight). The contract also identified practices and grain quality criteria which would result in rejection of the grain.

6 Supply chain operation

The supply chain operated successfully for 7 years with the typical annual cycle being as follows:

- January. A meeting was held between the AI and HP to discuss the supply chain performance in the previous calendar year and whether any modifications were needed to grower guidelines or the grower contract. This was followed by a meeting at about the same time of the whole supply chain (growers, the AI and HP) to discuss supply chain performance and any changes that were being made to the grower contract or guidelines (Photo 8). A prize was also awarded to the grower who produced the best quality grain in the previous year. The annual supply chain meetings were important for building up a strong collaborative relationship between members and allowed a range of issues and experiences to be discussed
- February. Soil samples were collected by the AI and the results of soil analyses and a revised set of grower guidelines distributed to growers. Grower contracts were sent out by HP
- March. Seed of Tartan was provided to growers sufficient for the area each was contracted to grow
- April. In this month, growers were recommended to sow Tartan as early as ground conditions allowed
- June and August. All fields were visited by the AI and HP (August) to check on the state of each crop and look for possible problems (Photo 1)

- September. This was usually the month of harvesting. This required close liaison between the AI and growers to ensure that the AI was warned in advance about the delivery of grain. Each grower produced about 10 t of grain which normally matched the capacity of the AI grain dryer (Photo 2). When growers produced more than one dryer load of grain, it was necessary to have mixed loads which combined the grain from different growers. Sometimes this meant that grain had to be kept for a few days before it could be dried, in which case it was spread out on the floor or kept in a trailer with air spears. The fresh weight of grain delivered by each grower was recorded and samples of both fresh and dried grain were provided to HP for accurate determination of moisture content, grain viability, nitrogen content and screenings (Photo 4). These criteria allowed the grain payments to be calculated
- September/October. The dried grain was screened (Photo 3) and delivered to HP for storage. To ensure good storage, the grain had to be below 13% moisture content at delivery

Tartan grain was normally stored in a silo at HP until about June of the following year when it was malted (Photo 5). Distillation (Photo 6) occurred in August and was the first to take place after the distillery's closure for summer holidays. In this way, it was easier for the distillery to ensure that the spirit from Tartan did not come into contact with spirit from any other type of malt, thus ensuring the purity of the future product. After distillation, the spirit was put into oak casks and stored (Photo 7) in the distillery's warehouses.

7 Supply chain performance

Over its 7 years of operation, the supply chain mostly delivered between 44 and 54 t of grain per year to HP which was close to the target of 50 t per year. There was, however, one year of low production (2012) when only 33 t was delivered. This was probably the result of low temperatures throughout the cropping season and reduced sunshine after heading.

Grower grain yields in each year are shown in Fig 1. The average annual yield for all growers ranged from 4.5 to 6.0 t/ha. High grain yields were often associated with the use of fields which had not been in arable cropping for many years while low yields were the result of husbandry issues, damage from wind, or years with low temperatures (2012 and 2015). Although high grain yields are considered desirable in many crops, in some years (2010, 2013, 2014 and 2015) there was a high positive correlation between grain yield and grain nitrogen content (Fig. 2) which meant that farmers with high yields often received price deductions for high grain nitrogen. Over the 7 years, there were 10 instances when grain nitrogen was above 1.65 %. One of the factors most highly correlated with grain nitrogen was the amount of available nitrogen in the soil before sowing. Monitoring of other fields which had recently been ploughed out of grass, showed that this decreased annually as the number of years of arable cropping increased. Consequently, one of the recommendations to growers for avoiding excessively high grain nitrogen was to use fields which had been about four years in arable cropping. The high available soil nitrogen in Orkney fields probably results from the widespread use of organic fertiliser from livestock which is high in nitrogen. Another method used to try to achieve appropriate levels of grain nitrogen was to use the same field for several years and for farmers to adjust the amount of nitrogen fertiliser applied according to both the amount of available soil nitrogen before planting and the level of grain nitrogen in the previous year's crop.

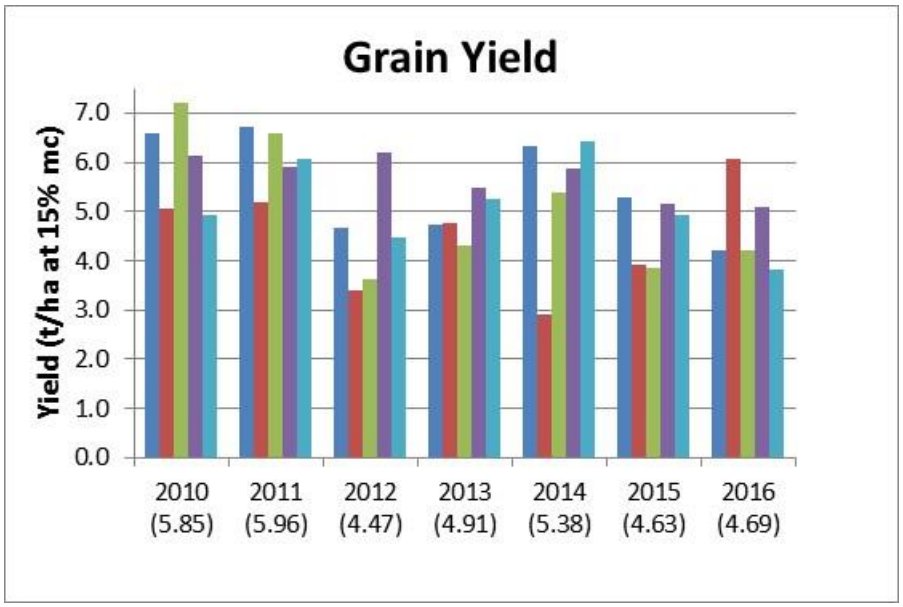

Fig. 1. *Tartan grain yields (at 15% moisture content) for 5 growers from 2010 to 2016. Figures in brackets are the average annual yields for all growers*

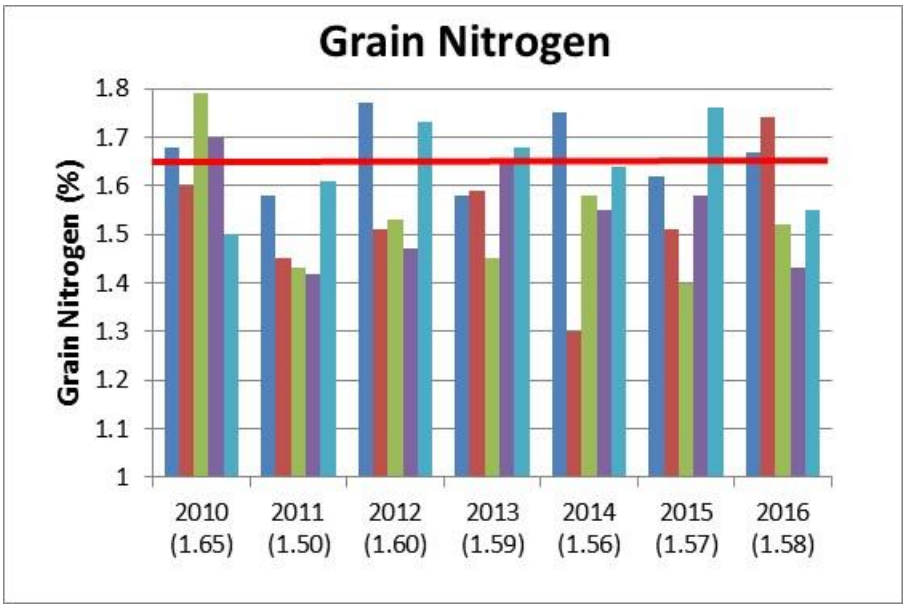

Fig. 2. *Tartan grain nitrogen content (% of dry matter) for 5 growers from 2010 to 2016. Figures in brackets are the average annual nitrogen contents for all growers. The horizontal red line is 1.65% which was the threshold level for price premiums and deductions*

Fig. 3 shows grain moisture % for each grower in each year of the project. There were 16 instances when growers were penalised for delivering grain above the 22% threshold. Growers were recommended to plant as early as possible to try to ensure an early harvest as it was thought this would increase the likelihood of harvesting at a reasonable grain moisture content before protracted periods of rain occurred. Inevitably, though, the success

of this strategy was very dependent on September rainfall – in 2010, for example, there were several dry periods throughout the month and grain moisture was low at harvest while in 2012 there were only 5 days without rain and grain moisture was much higher. With Tartan mostly not being ready for harvest until about mid-September, growers often considered it better to harvest at a moisture content higher than 22%, rather than to risk a much higher moisture content by delaying the harvest.

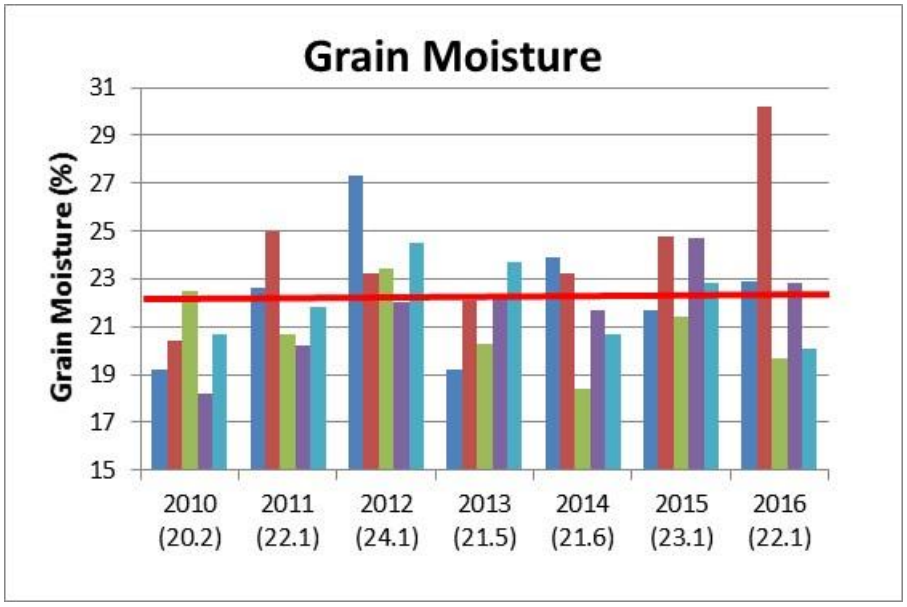

Fig. 3. *Tartan grain moisture (% of fresh weight) for 5 growers from 2010 to 2016. Figures in brackets are the average annual grain moistures for all growers. The horizontal red line is 22% which was the level above which growers incurred price penalties*

The % screenings (Fig 4) produced by the supply chain were generally well within the threshold set by HP and did not create a problem.

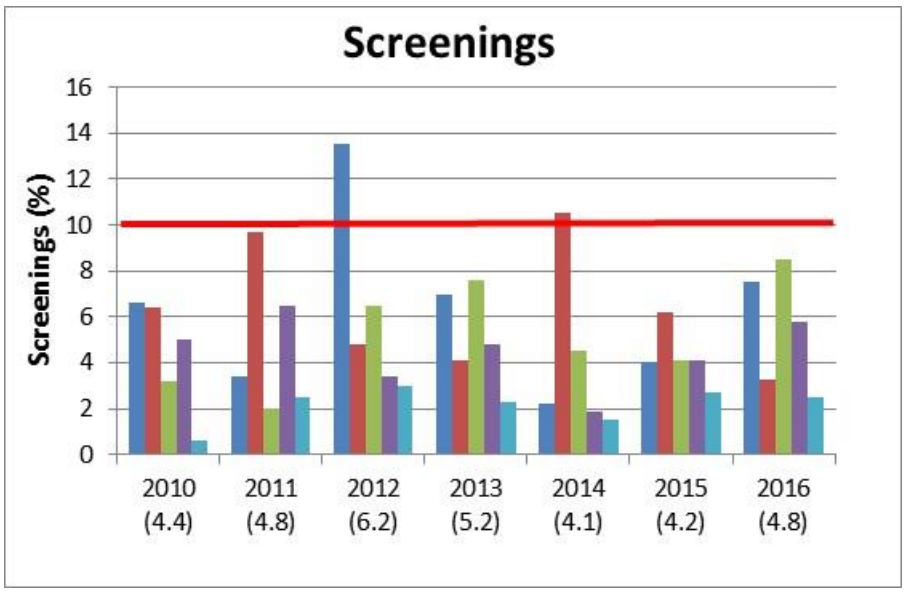

Fig. 4. *Tartan screenings (%) for 5 growers from 2010 to 2016. Figures in brackets are the average annual screenings for all growers. The horizontal red line is 10% was the level above which growers incurred price penalties*

8 Supply chain challenges

The main challenge faced by the supply chain was when seed of Tartan was no longer commercially available, from 2013. Fortunately, it was known that this would happen and so from 2012 the AI held back sufficient grain from each grower's annual crop to provide seed for the following year. Seed was sent down to McCreath, Simpson & Prentice Ltd (MSP) for safe storage and dressing with a fungicide before being returned to Orkney for sowing. A reserve stock of each farmer's seed was also held by MSP as an insurance against crop failure. This process had to be followed each year because UK regulations only allow farm-saved seed to be used by the farmer who grew the crop; the supply chain therefore needed to hold five separate batches of farm-saved seed. As a result of the requirement for seed, it was necessary from 2013 to slightly increase the area of Tartan which was grown.

With each grower's crop of Tartan being used for both malting and seed, control of volunteer barley plants became very important and each field was rogued at least once, after heading. One problem that affected some growers who grew Tartan next to fields of the Scottish 6-row barley landrace Bere, was the appearance of hybrids within the Tartan crop. Fortunately, these plants were considerably taller than Tartan and were easily identified at roguing, but it was necessary to stop growing the two crops in adjacent fields. This also raised the possibility that some of the growers' lines of Tartan might gradually be losing purity through hybridisation with adjacent short-strawed 2–row barley varieties. Such hybridisation would be very difficult to detect without detailed examination and it was not practical to ask growers to stop growing Tartan next to all other barley. This issue highlights the need to maintain the purity of varieties or landraces where these are being grown for specific markets and maintained by farm-saved seed.

9 Supply chain achievements

In spite of the major challenges of growing barley for malting in Orkney's northern maritime location, the supply chain is considered to have been very successful and its achievements are summarised below:

- Over the duration of the project, it delivered 335 t of Tartan to HP for malting
- While yields in some years were low, no farmer failed to harvest his crop in any year
- Growing Tartan for HP was sufficiently successful and attractive to growers that all the original farmers continued within the supply chain throughout the project
- Although some farmer's crops had a higher nitrogen content than desirable, the overall quality of the grain was very suitable for malting and no consignment had to be rejected. Grain viability was always high even though high rainfall at harvest meant there was often a risk of pre-germination
- The supply chain managed to maintain its own seed supply of Tartan, even after commercial seed was no longer available
- During the project, the Tartan delivered to HP was the most northerly grown modern barley supplied for malting in the UK
- As a result of the project, HP now has a considerable quantity of spirit maturing in its warehouses which will be released in future as an "all-Orkney" whisky. This will probably be the first HP whisky for about 100 years made entirely from Orkney-grown barley

10 Acknowledgements

The authors would like to thank staff at Highland Park Distillery and the Edrington Group for their support in producing this case study. They are also very grateful to contractors, growers, other staff members of the AI and all at Highland Park, the Edrington Group and McCreath, Simpson & Prentice Ltd who contributed to the success of the "all-Orkney" whisky project over several years.

Photographs

Photo 1 (top). Staff of Highland Park, the Edrington Group and McCreath, Simspon & Prentice Ltd visiting a field of Tartan in 2011.

Photo 2. (bottom). The Agronomy Institute's batch grain dryer used for drying Tartan

Photo 3 (top). Removing small grains (screenings) from Tartan before delivering it to Highland Park distillery

Photo 4 (bottom). Assessing Tartan grains for viability at Highland Park distillery

Photo 5 (top). Grains of Tartan germinating during malting at Highland Park distillery

Photo 6 (bottom). New-make spirit made from distilling Orkney-grown Tartan at Highland Park distillery

Photo 7 (top). Casks containing Tartan spirit being stored in Highland Park's warehouse

Photo 8 (bottom). The 2017 meeting at Highland Park of staff from the distillery, Agronomy Institute and growers