

Flax-growing in Orkney from the Norse period to the 18th century

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ABSTRACT

Evidence for Norse flax-growing is becoming more apparent in the archaeological record of Orkney. This paper, stimulated by new material from the excavations at Pool, island of Sanday, Orkney, examines the botany, cultivation and processing of flax and considers its value in early subsistence economies. Flax is traditionally held to have been introduced into the Northern Isles in the 18th century, but the argument presented here suggests that cultivation may have taken place throughout the period from the Norse colonization to modern times.

INTRODUCTION

Current excavations at the multi-period coastal site of Pool in the island of Sanday, Orkney, have yielded considerable quantities of environmental material spanning the duration of a settlement from Neolithic to late Norse times. Among the carbonized plant remains flax/linseed (*Linum usitatissimum* L.) appeared regularly in the species lists, being present in 18 samples from the 1983 season and in 14 samples so far examined from 1984. Preliminary phasing places their occurrence in Norse contexts in association with radiocarbon-dated material (975 ± 50 bp, GU-1806; 1160 ± 50 bp, GU-2006; 1270 ± 50 bp, GU-1810). Published archaeological finds of flax are rare in Scotland and the authors felt that these new discoveries were sufficiently important to merit discussion in advance of the main report.

The earliest published record of flax in Scotland occurs from Fife, in the Bronze Age (Jessen & Helbaek 1944, 55), although recent work at Balbridie, Kincardine and Deeside has identified *Linum* within likely Neolithic contexts (A Fairweather, pers comm). With the exception of a single seed recorded from Crosskirk Broch, Caithness (Dickson & Dickson 1984, 152) and medieval material from Queen Street, Aberdeen (Murray 1982, 241–2) no other discoveries on mainland Scotland are known to the authors. Examples from Barvas Machair, Lewis (Dickson 1983), Saevar Howe, Orkney (Dickson 1983), and Kirkwall, Orkney (Hall 1982, 429) represent the archaeological material recorded from the Scottish islands. The Kirkwall examples belong to 15th/16th-century deposits, those from Barvas Machair and Saevar Howe to the Norse period. Comparable Norse seeds have also been identified at Carrigalla, Limerick, Ireland (Jessen & Helbaek 1944, 55).

Linum usitatissimum is an extremely versatile species which can be used to produce either linseed oil (from the seeds) or, by processing the stems, the flax fibres can be spun into linen. Both products can be obtained from the same form of plant, but not without some loss in oil production and

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a lessening of the fineness of the fibre (Bradbury 1925, 77). Although present-day linseed and flax plants are distinct cultivated forms of the same species, they remain distinct only because they are largely self-pollinated; crosses between the two are possible (Gill & Vear 1980, 197; Helbaek 1959, 107). Today these two main types of *Linum* are grown in response to the need to maximize each crop; 'linseed' (mainly grown in south Asia and India) is utilized for oil and has a larger seed, whilst 'flax' (traditionally grown in Europe and the Mediterranean) is a plant of more temperate climes, with a longer stem and a relatively low yield of smaller seeds (Gill & Vear 1980, 197). For ease of reading, the English name 'flax' is used below, but without the intention of presupposing the type of yield represented in the archaeological record.

In modern crops of *Linum*, plants grown for their oil are selected on size of seed and therefore a comparison with excavated seeds was undertaken (table 1). When allowance has been made for shrinkage on carbonization, the flax from the sites listed would still appear to be smaller than modern varieties grown specifically for oil. The Pool measurements compare well with those from Saevar Howe and Barvas Machair, while those from Crosskirk and Carrigalla were both larger. In this respect it is interesting to note that the carbonized seeds from Carrigalla were found pressed together in a 'clot' (Jessen & Helbaek 1944, 55) which Dickson (1983) interpreted as the possible result of linseed oil extraction.

On the continent, archaeological flax is more commonly found in waterlogged rather than carbonized states (eg in the Dutch *terpen*) and thus any continental distribution based solely on carbonized material is likely to be both sparse and biased (Van Zeist & Palfenier-Vegter 1979, 284). One interpretation for this scarcity of carbonized flax (Van Zeist 1970, 162) suggests that *Linum* grown for fibre, unlike cereal crops in temperate climes, at no point needs to be dried by direct heat and thus the chances of accidental carbonization are minimized. It might therefore be argued that the presence of carbonized flax on a site, as at Pool, is the result of the plant being used for its seed in domestic contexts.

TABLE 1
Comparative sizes of archaeological flax seeds

Site	Length (mm)	Breadth (mm)	Notes
Barvas Machair, Lewis (Norse)	Mean 3.2	Mean 1.6	19 seeds measured
Carrigalla II, Limerick (Norse)	Mean 3.77 (3.35-4.0)	—	8 seeds measured
Crosskirk, Caithness (Broch Period)	3.7	2.2	Single seed
Pool, Sanday, Orkney (Norse)	Mean 3.02 (2.3-3.5)	Mean 1.5 (1.1-1.8)	62 seeds measured
Saevar Howe, Orkney (Norse)	Mean 3.1 (2.8-3.4)	Mean 1.5 (1.3-1.9)	15 seeds measured
Westwood, Fife (MBA)	3.3	1.9	Single seed (impression)

On four of the sites listed flax can be ascribed to a Norse period of occupation and must be interpreted as the result of deliberate cultivation. Other crops such as cereals, notably hulled six-row barley and cultivated oats (*Avena strigosa*-type) are now well attested in the Norse archaeological record for north Scotland including Pool (eg Donaldson *et al* 1981) and can be used to demonstrate a necessary level of husbandry from which the cultivation of flax, traditionally a difficult crop, might have evolved.

Linen and oil are poor archaeological survivors and despite sporadic references to *lin* in saga sources, physical evidence for use is limited to a small group of implements that may have been used in its preparation (eg Muller-Wille 1976, 62). None of these has been identified at the sites listed. Flax cultivation also seems incongruous with the traditional view of a Norse subsistence economy; both animal fats and wool were direct competitors to oil and linen respectively, and were certainly

available in quantity at Pool within contemporary contexts. Considering the relative difficulty in cultivating and preparing flax, an obvious inference might be directed towards a 'luxury' value. However, although this would accord well with an implicit status attached to linen in Old Norse literature (eg *Lay of Volund*, 1), it cannot be fully supported (below).

GROWTH CONDITIONS

Writing from his experience of flax-growing in Ireland in the first quarter of this century, Bradbury (1925, 23) noted that flax grew well in a variety of soils 'provided that they are not too heavy or too light' and pointed out that some of the best Irish crops of flax (ie fibre) had been raised on light sandy soils. The importance of well-drained soils is emphasized by both Renfrew (1973, 124) and by Wild (1970, 14). Bradbury also describes the ideal growing climate (1925, 21) as being 'free from heavy rains and frost, interspersed with light winds, as when near the sea coast'. Pool, with its fertile, light sandy soils and its coastal position is exactly described by these remarks.

Flax does not compete well with weeds and today is rarely found as an escape in Orkney despite cultivation in the 18th and 19th centuries (Berry 1985, 253; Fenton 1978, ch 55). In Ireland flax was sown in rotation with potatoes or oats (Bradbury 1925, 29) both to resist soil exhaustion, a hazard of flax also noted by Pliny (*Nat Hist*, XVIII) and also to reduce the overall level of weeds in the field. Oats and barley occurred in every sample containing flax at Pool, and Dickson (1983) noted the same association in the Norse material from both Barvas Machair and Saevar Howe.

Bradbury's discussion is particularly useful as it pertains to an era prior to the advent of modern weedkillers and machinery when the circumstances of cultivation were arguably little different from those in the Norse period. His list of principal weeds in the Irish flax crops (1925, 53–62) includes dock, thistle, charlock, bindweed and redshank. The additional association of corn spurrey in the archaeological record was noted by Jessen and Helbaek (1944, 61) who suggested it might be specific to flax fields. However, corn spurrey (*Spergula arvensis*) was ubiquitous in the Pool samples and could equally have been a weed of the oat or barley fields, as in modern Orkney.

Flax is an annual crop but vulnerable to frost, and in Britain sowing is not recommended before mid-April under current climatic conditions (Gill & Vear 1980, 198). For fibre production, the crop is pulled after about 13 weeks, the sowing having taken place as early as possible to allow for drying and processing before autumn. For seed production, the growing time is slightly longer. In the 18th century the crops of Holme parish, Mainland Orkney were recorded as being sown on the first day of May and pulled in mid August (*Stat Acc*, 101). The growing period of flax is of relatively short duration, a significant advantage in Orkney where the optimum growing time is short, but where the summer hours of daylight are long.

BOTANY AND AGRICULTURE

The flax plant has a stem approximately 1 m tall at maturity, bearing round seed capsules, or bolls, on its branched head. Flax is classed as a *bast* fibre, ie the fibre is produced from the long vascular cells of the stem which must be separated from the woodier elements and from each other by a series of processes, including *retting*, the partial rotting down of the stem. The linseed contained within the seed-bolls contains 35–40% oil and approximately 20% protein (Gill & Vear 1980, 196).

Modern writers tend to overlook the fact that both fibre and oil can be produced from a single crop, but Bradbury, familiar with the relatively primitive conditions of early 20th-century Ireland, was clearly aware of the necessity for both fibre and seed within an unsophisticated subsistence economy. He observed that if both products were required, the yield of seed should vary from seven

to nine bags of clean seed for every bag sown (1925, 78). Given that the 18th-century seed:yield ratio in Orkney was only 1:3 or 1:4 for black oats, with bere yields only slightly better (*Stat Acc*, xiv), this Irish figure for a double crop cultivated on land without benefits of modern fertilizer or pest control, would seem to be more than satisfactory. By sacrificing the finest quality linen and the optimum seed yield, it was possible to obtain flax, linseed oil and seed for the following year from the same plant. The range of possible products would thus include:

- a *Linseed oil*, for food, preservative, domestic and medicinal use,
- b *Linseed cake*, for cattle fodder (by using remains of seeds pressed for oil),
- c *Linen* (coarse and fine), for clothes, sailcloth, ropes and sacking,
- d *Chaff/stems*, for cattle feed and (possibly) fuel.

Both a and b are products where carbonization of the plant material is most probable. This range of products would have presented an attractive proposition to a Norse subsistence farmer and thus the notion of flax being a specialized or 'luxury' crop in antiquity must be questioned.

HARVESTING AND PROCESSING

Flax was harvested soon after the petals had fallen, by pulling up the entire stem in order to retain the greatest possible length of fibre. It was subsequently stooked in the fields (Bradbury 1925, 80) or hung to dry (*Nat Hist*, XIX). The seed bolls were then removed, often by *rippling* – a process whereby the heads of the plants were drawn through a strong comb. The bolls were then separated from the broken straw using a coarse sieve and could be dried and stored until needed.

In order to produce fibre, a process of *retting* was undertaken whereby the substances that bind the fibres in the stem were decomposed. Bradbury (1925, 101–24) gives a comprehensive description of how this could be carried out either in ponds (stagnant water), rivers (sluggish water) or by spreading in the fields. Slightly acid water was preferred, hard water containing lime or mineral salts in solution being unsuitable. *Pond retting* was undertaken by positioning bundles of flax straw under the surface of the water, weighted with stones in such a way that the bundles neither floated nor sank, for a period of eight to 12 days. These ponds were called 'lint pots' or 'lint holes' in Scotland (Durie 1979, 2; Turner 1972, 134).

River retting followed a similar procedure but with the bundles enclosed in wooden crates and submerged for six to nine days between April and October, then dried and stacked until the following year. At that point they could be scutched (below) or, for best quality flax, retted again. The process therefore might entail an interval of two years between harvesting and use. By contrast, *dew retting* involved the spreading of the stems in the fields while the natural effects of climate worked on the fibres for a period of four to six weeks. This method required 1–1.5 times the area of land on which the flax was grown. The periods of March/April or September/mid-November were considered most suitable. There are no sizeable streams and very few ponds and lochs on the well-drained soils of Sanday, thus if fibre were ever produced in the vicinity of Pool, dew retting could have been a likely method.

The subsequent processing was concerned with the separation of the fibres from the stem and their preparation for spinning, an activity which may have been carried out indoors. The bark was first broken by use of a hand-brake, or by pounding on a flat stone with a wooden mallet in order to break the core and loosen the fibres. Some of the hammerstones found at Pool could possibly have been used for this, as well as for other purposes. The fibres were subsequently removed from the stem by *scutching*, often performed by bending the broken fibres over a narrow surface and beating with a flat wooden blade to remove the bark (Wild 1970, 28). Bradbury describes a slightly more sophisti-

cated version, using an upright wooden board with a notch (the stock) which held the straw while a broad, flat hardwood blade was used to break out the pith and bark. An early 16th-century *Book of Hours*, the *Heures de la Bienheureuse Vierge Marie* (Petit Palais, Paris: Dutuit, B 37, f 15r) illustrates a variation of the method. Presumably in an area such as Sanday where wood was scarce, whalebone could have acted as an adequate substitute.

The final stage of preparation was called *hackling* or *heckling*. In modern Italy the hackle used is a board set with rows of iron spikes across which the stalks are drawn to remove the remains of core and bark, leaving the fibres ready for spinning (Wild 1970, 28). An entry for Holme parish, Mainland Orkney in 1792 (*Stat Acc*, 106) records that there was no lint mill, and that the flax had to be processed with 'brakes, switches and coarse heckles'.

Flax fibre could be spun and woven in much the same manner as wool and could be bleached after spinning by steeping in a hot alkali bath made with wood or kelp ash, followed by treatment with a weak acid solution such as bran or buttermilk (Durie 1979, 5). Here the processes diverge; wool textiles might have had the nap raised and cropped, whereas coarse linen would have been *beetled* (beaten until soft) or fine linen could have been polished or *glazed* to present a smooth surface. The linen smoother, sometimes a flattened ball of glass, was rubbed across the fabric which was supported on a firm smooth surface. Objects interpreted as linen smoothers, formed as a single large droplet of glass, are known from Viking-age burials in Scandinavia and from a few contemporary sites in Britain (Oakley 1979). All examples appear to have been produced from a non-durable glass composition and are thus unlikely to belong to a period prior to the 10th century (Hunter 1985, 65). Other, unidentified materials were presumably utilized before that time.

LATER HISTORY IN ORKNEY

Flax growing in the Norse period now seems firmly established in the archaeological record of Orkney. Brief reference (above) has been made to the records of flax industry in Orkney in the 18th and 19th centuries, but little evidence survives for the intervening years. For example, the *Rentals of the County of Orkney* (Peterkin 1820) makes no reference to the crop unless 'oil' is interpreted as meaning linseed oil as opposed to the more commonly accepted fish or seal oil. Thomson, in his introduction to the *Statistical Account of Scotland* (*Stat Acc*, xxiv), favours the view that the industry was introduced in the first half of the 18th century and discounts as improbable the Minister of Holme's claim that 'this parish had been in the practice of sowing flax seed for one hundred years back' (written in 1792).

There is, however, one archaeological record of flax from Orkney which occurs within this 'blank' period: the series of small sites excavated in Kirkwall by McGavin (1982) which yielded flax seeds and capsule fragments in levels apparently dating to the 15th and 16th centuries. These occurred in harbour areas, and although imported fig seeds (*Ficus*) were also recorded (Hall 1982, 429), it is possible that the flax material represented local produce. In favour of this argument is the presence of capsule fragments. Imported seed might normally be expected to have been cleaned of flax straw and capsule fragments. Equally, if the seeds are assumed to have been imported for consumption or for oil, it would seem more logical to import ready-prepared oil rather than bulky seed susceptible to mould and germination. Hall's report of the Kirkwall seed also suggests that the material was waterlogged, not carbonized, an interesting echo of Van Zeist's observations on continental material.

References to the introduction of the 'manufacture of linen yarn' or the 'importation of seed' in works such as the *Statistical Account of Scotland* are normally taken to imply the introduction of flax-growing to Orkney. However, these references could equally denote the introduction of linen yarn

manufacture as an industry, and the importation of foreign linseed; developments directly related to attempts to boost the linen industry as a whole in Scotland in the contexts of the agricultural and industrial changes of the 18th century. With this in mind, the discrepancy between the Minister of Holme's claim that flax had been grown since late 17th century (*Stat Acc*, 101) and the entry for Kirkwall and St Ola recording that 'the manufacture of linen yarn was introduced in 1747' (*ibid*, 121) ceases to exist. The latter date fits well with the publication of a government directive concerning premiums allowable for flax growing (CTS 1747). This appears to have been part of a drive, in Scotland as a whole, to raise the quantity and quality of flax (Durie 1979; Fussell 1950, 33). Fussell's research into 18th-century farming books also points out that text-books on individual crops were uncommon (1950, 124), yet his records include details of at least five pamphlets, books or treatises on flax, all produced in Scotland in the second half of the 18th century.

The impetus was clearly directed towards increasing the level of flax output but the question remains as to what extent flax was cultivated locally prior to any imposed encouragement. The *Account* of the island of Shapinsay (1790) records that 'formerly flax of a tolerable quality was raised' (*Stat Acc*, 277) and represents one of the few records indicating actual cultivation. The potential for flax-growing in Orkney would have been considerably improved by the removal of the ancient runrig system in the mid 18th century, which Clouston recognized as being a major factor in elevating linen and kelp manufacture in the Orcadian economy (1932, 364). The runrig system would undoubtedly have inhibited flax cultivation on any scale and its removal would have had the effect of making the crop potentially important.

Most of the 'manufacture' appears to have been of spindles of yarn, made by the women of the household and traded in Kirkwall or shipped south to Glasgow, Edinburgh and Newcastle. Often this was not flax which had been grown in Orkney but imported dressed lint, principally from Russia and Holland, and from other parts of Britain, amounting to an annual total of about 40 tons (Barry 1805, 371). There were, however, quantities of coarse linen produced in Orkney for both export and home consumption, eg in Sandwick and Stromness (*Stat Acc*, 238) and this might be seen as representing the continuity of local flax-growing and processing traditions. The same explanation might be applied to the *Account* for the island of Sanday itself (Cross, Burness and North Ronaldsay; *ibid*, 64) which records in 1791 that:

'there is no manufacture carried on in these islands unless kelp may be reckoned one. They manufacture linen and coarse cloths for their own use only'.

It seems unlikely that an isolated island should have taken up a 'new' crop and processing methods in order to produce a small quantity of linen for local purposes. The record is perhaps better interpreted as indicative of a continuing tradition, similar perhaps to the situation recorded in the Hebrides,

'where each plot of land carried a little lint and a few sheep and from these the wife of a married labourer made all his clothing' (Turner 1972, 135)

CONCLUSION

The above evidence would seem to indicate that flax was cultivated in Orkney, certainly in Norse times. It arguably continued in cultivation until re-emerging as a major crop plant in the industrial intensification of the 18th century. In the intervening centuries, as in the poorer parishes of the 1790s, flax was probably grown by the small farmers to fill their own needs for linen and coarse cloth, and thus, as a small part of the Orcadian economy, found no place in the historical records. It remains to be seen whether flax was introduced to Orkney prior to the Norse period; there are surprisingly few published environmental records from archaeological sites in the Northern Isles. The excavations at Pool, Sanday are still in progress but at the time of writing flax has not been recorded

from either Neolithic or later Iron-Age samples, nor has it been identified from an equally intensive sampling strategy undertaken from Bronze-Age levels at Tofts Ness, Sanday (S Dockrill, pers comm). The introduction of a major new crop such as flax suggests a change in farming practice, whether for oils or fibre: interestingly, this development occurs in the 'Pictish'/Norse interface phase of occupation at Pool and coincides with cultural changes interpreted from both structural and artefactual remains.

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