The Processing of Cereal Grains in Scotland and Around

In recent years work on aspects of the drying and processing of cereal grains has been proceeding on a broad front in Scotland. Since the country shares with Ireland something of the quality of a cultural crossroads between Northern and Continental Europe, research in Scotland cannot be conducted in isolation from research in the countries around. Broadly speaking, for pre-industrial times we must look more to the north, and thereafter more to the south ; though perhaps what this means is that under pre-industrial, subsistence-orientated conditions, the comparisons to be looked for may lie more in the north.

When I came to review work done or work in progress over the last decade or so, I was pleasantly surprised both by the amount, and by the fact that it ranged chronologically over the entire period to be covered by this working party.

New archaeological techniques like sieving and flotation are throwing much light on the natural environment and on cereal crops. Until recent years we were dependent on grain impressions in pottery, carbonised grains and pollen grains to identify early crops. From the scanty evidence we could say that hulled and naked barley was the main Neolithic to Bronze Age cereal ; that emmer and wheat appeared in the Late Bronze Age ; and that oats first appeared in the Roman period, as did rye. We can now begin to fill in much more detail than was available to the Danes, Jessen and Helbaek, in 1949[1]. We now know, for example, that the Neolithic inhabitants of Skara Brae in Orkney grew barley, a fact not known to its first excavator, Gordon Childe.

1. JESSEN, K. and HELBAEK, H., 1949, *Cereals in Great Britain and Ireland in Prehistoric and Early Times*, (*Kongelige Danske Videnskabets Selskab. Biol. Skrift*, III). Note : In Iron Age Britain, the range of cereals currently identified covers four types of wheat (emmer, *Triticum dicoccum* ; spelt, *Tr. spelta* ; club, *Tr. compactum*, old bread wheat, *Tr. aestivum*), two kinds of barley (two row, *Hordeum distichum* ; six row, *H. hexastichum*, both naked and hulled). Rye and oats are possibles but not certainties.

The seeds of weeds associated with cultivated crops are also being identified, and even, for the later Bronze Age in Scotland, evidence for the fungus ergot on rye, *Secale cereale*. Ergot, if consumed in rye bread, for example, can have serious hallucogenic consequences and in its « gangrenous » form might also have leave its traces in the archaeological bone record[2].

A welcome change in the outlook of archaeologists is that they no longer concentrate simply on monuments, but are increasingly willing to look around and under them. As a result cultivation marks have been found widely, often under peat that has hidden them for long centuries. There is a growing impression that crops were being cultivated almost as far back as human settlement goes, and over wide areas that are now regarded as marginal, but which were then much more central to the everyday economy. One example may be given. Current excavations at Whithorn, the cradle of Christianity in South-West Scotland, have turned up furrow marks of 9th-10th century date, sealed under layers containing datable Anglo-Saxon coins. Scattered amongst them are wear pebbles like those from wooden plough-parts from Danish peat bogs[3]. These are the earliest known dated plough-pebbles, likely to parallel in time examples from Ireland recently studied by Niall Brady[4]. They mark sophisticated cultivating, and by inference, cropping techniques.

Allied with such evidence must be studies of shearing and processing equipment, including the numberless querns[5] that have turned up everywhere. There is also the question of storage of grain surpluses. François Sigaut's work on this topic is well-known, as is the experimental work of Dr Peter Reynolds at Butser Hill in Southern England. Reynolds tries not to be influenced by the fact that 'it has become increasingly fashionable to adopt ethnographic examples to illustrate the remote past', preferring to emphasise that in his experiments he is « measuring a sequence of variables against known constants »[6]. But when evidence is available, it should not be ignored, as in the case of the fine information on grain-storage pits from Hungary and around - though admittedly available only in Hungarian, except for a digest

2. CHILDE, V.G. and CLARKE, D.V., 1983, *Skara Brae* (HMSO), Edinburgh, p. 14-16 ; BARCLAY, G.J. and FAIRWEATHER, A.D., 1984, *Rye and Ergot in the Scottish Later Bronze Age*, in *Antiquity*, LVIII, 223, p. 126.
3. Personal communications from Peter Hill and Jean Comrie.
4. BRADY, N., PhD. thesis ; article forthcoming in *Tools and Tillage*.
5. P.R. Ritchie, Edinburgh, has done much work on Scottish querns from prehistoric contexts. Note also the interesting ongoing international investigation of geological sources of Roman millstones : e.g. WILLIAMS-THORPE, O. and THORPE, R.S., 1987, *Els orígens geologicos dels molins romans de Pedra del Nord-Est de Catalunya i l'ús de les laves de la regio volcanico d'Olot*, in *Vitrina*, 2, p. 49-58.
6. REYNOLDS, P.J., 1985, *Iron Age Agriculture Reviewed, (Wessex Lecture, 1, Council for British Archaeology Group*, 12), 1, p. 3.

I made of published articles, prior to the appearance of a doctorate by E. Füzes[7] in 1984.

Grain-storage pits of pre-Iron Age date are known in several parts of Britain, mainly east and south of a line drawn between the Humber and Severn estuaries, with some outliers in the East Riding of Yorkshire, and a few erratics in North East Scotland. In time they span a millennium and a half, c. 3000 to 1600 B.C., and therefore run through at least four cultures. The Scottish contribution is from Moray, a prime grain-growing area in the North East. The pits found there seem to range from the Neolithic to the Roman period, those of the latter period containing layers of burnt oats. The tradition is long. It must, therefore, be assumed that the lack of evidence for identified grain-storage pits elsewhere in Scotland is likely to be due to soil conditions and that above-ground grain stores were preferred, either in wood like the Roman ones so well discussed by Rickman[8], or in more ephemeral materials like straw, such as were known as recently as the twentieth century in Ireland and in Northern Scotland[9].

There is no doubt that the straw rope granaries of North Scotland were connected with the conversion of grain surpluses into hard cash. Can we assume that there were also trade motivations — and therefore pressures on production, including the use of manures — in prehistoric times ? Of course we do not have enough evidence to assume any such thing, but my old friend Professor Axel Steensberg in Copenhagen has just completed a book in which he deals with the fact that the early civilisations developed where hard grains, including rice and even maize, with their good keeping qualities, came to be treated almost as coinage, with an associated growth of counting and accountancy systems and alphabets and writing[10]. Stores of grain did more than guard against hunger ; they were also a means of exchange, a basis of power. Perhaps the way in which the storing of grain is built into the roots of our civilisations is a psychological factor that political and economic historians of the present should not ignore, even if only as a form of background awareness in considering the complicated aspects of international grain storage and pricing in relation to alimentation at the present day[11].

7. FENTON, A., *Grain Storage in Pits : Experience and Fact*, in O'CONNOR, A. and CLARKE, D.V., 1983 (eds.), *From the Stone Age to the « Forty Five »*, Edinburgh, p. 567-588 ; FÜZES, E., 1984, *A gabona tárolása a magyarparaszt-gazdaságokban*, Budapest.
8. RICKMAN, G.E., 1971, *Roman Granaries and Store Buildings*, Cambridge ; see also MANNING, W.H., 1975, *Roman Military Timber Granaries in Britain*, in *Saalburg Jahrbuch*, 32, p. 105-29.
9. FENTON, A., *op. cit.*, 1983, p. 569 ; LUCAS, A.T., 1956, *An Fhóir : a Straw-Rope Granary*, in *Gwerin*, 1, p. 2-20 and 2, 1958, p. 1-10.
10. STEENSBERG, A., *Hard-Grains and Their Role in the Development of Civilisations*, forthcoming.
11. Cf. SIGAUT, F., 1985, *Questions d'économie à propos des politiques céréalières et de stockage*, in *Les techniques de conservation des grains à long terme*, 3, fasc. 2, Paris, p. 597-606.

I have rambled away from the fields of Prehistory. It is an aspect of the topic under discussion that it is hard to periodise it, other than within broad limits, and even then perhaps mainly through methods of approach appropriate to the nature of the evidence. Under Scottish conditions this is especially true of the protohistoric to modern periods. The time warps of science fiction do exist in real history and we should not always be entirely dependent on the historians' strait-jacket of regnal years. In what follows, I shall maintain an awareness of historical chronology, though concentrating more on periods within themes with which Scottish researchers have been concerned.

One student at Edinburgh, now a university teacher, completed a thesis on the subject of *Changes in the Upper Limit of Cultivation in South-East Scotland, 1600-1900*, in 1973. In it he considered the evidence for, and effects of, long-term or secular climate change. On the analogy of data on minimum sown-to-ripe photo-thermal requirements for cereals in Finland, on the northern limits of cereal cropping in Scandinavia[12], he looked at physical traces of cultivation, primarily of oats, in the Lammermuir hills of South-East Scotland, plotted the retreat from the higher levels, and related the movement to historical records and to indicators of changing climate such as rainfall, temperature, summer wetness and potential water surplus, summer warmth and length of growing season, windspeed, and the like.

Aerial survey of the Hills examined showed 4890 ha. of land exhibiting cultivation ridges : all of this was abandoned for rough pasture before 1860, and 60 % of it before 1800. Yet the charters of abbeys show that these were traces of once regularly cropped fields. There were 29 associated settlements, of which 16 were abandoned before 1600. Without going into detail, these changes can be related to four phases - a « secondary climatic optimum » (1150-1250), the medieval climatic deterioration (1250-1550), a cold epoch (1550-1700) and a recent amelioration[13]. Here we can actually see the evidence on the ground, and obviously it can and should be related to wider European issues such as those brought together by Wilhelm Abel in his *Agricultural Fluctuations in Europe. From the Thirteenth to the Twentieth Centuries*[14]. This kind of exercise bears heavily on levels of alimentation amongst different levels of society at different times, and it plays a deservedly important role in our research.

12. NUTTONSON, M.Y., 1955, *Wheat-climate Relationships and the Use of Phenology in Ascertaining the Thermal and Photo-Thermal Requirements of Wheat.*
13. PARRY, M.L., 1978, *Secular Climate Change and Marginal Agriculture ; Climatic Change Agriculture and Settlement (Studies in Historical Geography)*, Dawson.
14. ABEL, W., 1980, *Agricultural Fluctuations in Europe. From the Thirteenth to the Twentieth Centuries*, London, (translation of *Agrarkrisen und Agrarkonjunkturen*, Hamburg and Berlin, 1966) ; GRIGG, D., 1982, *The Dynamics of Agricultural Change. The historical experience*, Hutchison.

What Parry did not do was to relate his data further to evidence for the processing of cereals, in terms, for example, of water-powered mills. A group of historians is currently preparing for publication a Medieval Atlas of Scotland. The maps will include data on the distribution of water-powered enterprises, including grain-mills, of which over 5000 have been recorded pre-1700. This does not mean they were all used at the same time, but it seems to be a large number for a small country. The map will provide a base also for comparison with later times : for example, in the agriculturally prosperous area of East Lothian about 80 mills were established pre-1700 ; by 1853 only 28 of these were working ; today there are none, though several mill buildings survive, including one maintained in working order by the National Trust for Scotland (see diagram)[15].

These mills covered two broad types, horizontal and vertical, the former commonly associated with subsistance or marginal farming areas. This, however, is a survival pattern. There is reason to believe that horizontal mills were more widespread before the days of the Agricultural Revolution which got into its stride effectively about the middle of the eighteenth century. The survival area lies in a crescent from Shetland and Orkney through Caithness, down the west coast and islands and on into the Isle of Man and Ireland[16]. There are indications in the form of paddles from mill wheels that have turned up in peat bogs, socket stones on which the iron shaft may have rested and turned, and some documentary evidence, that horizontal mills may also have been used in North East and Central Scotland and in the Scottish and English Borders[17]. The so-called « ladle » mill at Ednauchtie in Angus, described in detail in 1683, is likely to have been horizontal[18]. There may be place-name evidence from North-East Scotland. We have « Scottismyln »

15. The relevant maps are being prepared by Dr John Shaw, National Museums of Scotland, author of *Water Power in Scotland 1550-1870*, Edinburgh, 1984, which contains chapters on grain mills, flour and pot barley mills and urban grain mills as well as on brewing and distilling.
16. Cf. FENTON, A., 1978, *The Northern Isles : Orkney and Shetland*, Edinburgh, p. 396-410 ; CHEAPE, H., 1984, *Kirtomy Mill and Kiln* (Sutherland) (*Scottish Vernacular Buildings Working Group*) ; FAHY, E.M., 1956, *Horizontal Mill at Mashanaglass, Co. Cork*, in *Journal of the Cork Historical and Archaeological Society*, LXI, p. 15-57 ; MEGAW, B.R.S., 1940, *Mwyllin Beg*, in *Journal of the Manx Museum*, IV, p. 199-202 and Plate 182 ; More about the little watermills, in *Ibid.*, V, 1944, p. 147-8 ; QUALTROUGH, J.K., 1969, *An Introduction to Manx Watermills*, in *Isle of Man Natural History and Antiquarian Society Proceedings*, (N.S.), VII/2, p. 248-263 ; HAY, G.D. and STELL, G.P., 1986, *Monuments of Industry, an Illustrated Historical Record* (*Royal Commission on the Ancient and Historical Monuments of Scotland*), HMSO, 1986, p. 8-9.
17. See, e.g., MAXWELL, S., 1954-6, *Paddles from Horizontal Mills*, in *Proceedings of the Society of Antiquaries of Scotland*, LXXXVIII), p. 231-232 ; MAXWELL, S., 1956, *A Horizontal Water Mill Paddle from Dalswinton*, in *Transactions of the Dumfries and Galloway Natural History and Antiquarian Society*, XXXIII, p. 185-186 ; SHAW, J., 1984, *op. cit.*, p. 2.
18. Two documents in the Scottish Record Office ; GD 205/23/126/12, dated 1683, refer to this mill : a « bedston » lay on a « stoole ». It had a « litle Iron Spindle fastened in a piece timber which piece timber is girded with thrie Iron girds wherein the awes or laidles ar fastened ». The « stoole » consisted of 8 pieces of timber. The « haper » was made of « riven pieces of dailes ». There was also a kerbing or « curble », and a shoe, through which the grain from the hopper entered the eye of the millstone. I am indebted to John Shaw for drawing my attention to these papers.

(1494), « Scottis Myln » (1495), « Scotsmilne » (1679), and Latin descriptive phrases, « scoticum molendinum » (1226) « ad locum antiqui molendini scoticani » (1253). But we also have, on the other side of the same river, « English Mill », recorded in 1592 : « molendinum de Inverugie lie Inglis-mylne vocatum »[19]. Does this mark a contrast between horizontal and vertical mills ? or simply between Gaelic speaking Scots and an English (or Lowland Scots) speaker introduced by a laird ? I raise the question merely ; a question raised may eventually find an answer.

What we must avoid, of course, is to call horizontal mills « Norse », since we have pre-Viking evidence for them, particularly in Ireland, and antiquarian speculation on Scandinavian origins of such mills in Scotland is now out of date[20]. Nevertheless the speculation marks an important point. In Orkney and Shetland, parts of horizontal mills have names, a number of which are paralleled in the Scandinavian languages[21]. But there are also parallels with Lowland Scots dialects, and this is true in even greater measure of the terminology of corn-drying kilns in these Northern Isles[22]. The Central Scottish ladle mill has its vocabulary, as have mills in Gaelic areas in the North and West, and in Ireland there are detailed vocabularies from the seventh century AD and later[23]. It would be very revealing for patterns and chronologies of diffusion if we were to try, with due linguistic caution, not only to list terms in Scotland and in other countries of Europe, but also to plot them out, using cartographic techniques. Indeed, why stop at Europe ? — for the horizontal mill is widespread in the world and an exercise in relating its vocabulary and diffusion to those of vertical mills could hardly fail to produce insights into technological and economic developments, or lack of these, and into questions of alimentation, over a wide canvas. The principles of the European Ethnological Atlas might well be applied to such a thematic task, which has already to some degree begun, for there is a substantial literature on the subject, extending over more than a century[24].

19. ALEXANDER, W.M., 1952, *The Place-Names of Aberdeenshire* (Third Spalding Club), Aberdeen, p. 113, 368.
20. Cf. GOUDIE, G., 1886, *On the Horizontal Water-Mills of Shetland*, in *Proceedings of the Society of Antiquaries of Scotland*, XX, p. 257-297 ; LUCAS, A.T., 1953, *The Horizontal Mill in Ireland*, in *Journal of the Royal Society of Antiquaries of Ireland*, LXXXIII, p. 1-36 ; LUCAS, A.T., 1955, *Horizontal Mill at Ballykilleen*, Co. Offaly, in *Ibid.*, LXXXV, p. 104-112.
21. GOUDIE, G., *op. cit.*, 1886, p. 279 ; FENTON, A., *op. cit.*, 1978, p. 400-408.
22. FENTON, A., 1974, *Lexicography and Historical Interpretation*, in BARROW, G.W.S. (ed.), *The Scottish Tradition*, Edinburgh, p. 247-257.
23. Cf. LUCAS, A.T., *op. cit.*, 1953 ; MACEOIN, G., 1981, *The Early Irish Vocabulary of Mills and Milling*, in SCOTT, B.G. (ed.), *Studies of Early Ireland. Essays in Honour of M.V. Duignan*, Belfast, p. 13-19.
24. Some examples are : MACADAM, R., 1856, *Ancient Water-Mills*, in *Ulster Journal of Archaeology*, 4, Belfast, p. 6-15 ; CURWEN, E.C., 1944, *The Problem of Early Water-Mills*, in *Antiquity*, XVIII, p. 130-146 ; CURWEN, E.C., 1945, *A Vertical Water-Mill near Salonika*, in *Ibid.*, XIX, p. 211-2, pl. III-IV ; FORBES, R.J., *Power*, in SINGER, Ch. *et al.*, 1967, *History of Technology*,

In Scotland, as in England and in Ulster, vertical water mills and windmills have been studied from the point of view of technology, sources of stones, etc.[25] and it is needless to go into detail that is readily available in print. Two points may be highlighted for further study, however.

The first is the way in which vertical mills reflected an essentially feudal estate organisation that was gradually replaced by more commercial forms of organisation. Their spread into horizontal mill areas goes with the days of agricultural improvement ; the period and effect of this spread has to be examined, and the consequences assessed not only insofar as it affected local community organisation, but also in terms of alimentation. It is not without interest, for example, that on Lowland Scottish farms, oatmeal became the great staple of the rural diet in the late eighteenth, nineteenth and early twentieth centuries, whilst bere meal continued to have a greater emphasis in the more marginal areas[26].

II, Oxford, p. 589-594 ; FORBES, R.J., 1955, *Studies in Ancient Technology*, II, Leiden, p. 78-104 ; STEENSBERG, A., 1959, *Skvatmolle i Ljørring*, in *Kuml*, p. 130-146 ; STEENSBERG, A., 1978, *The Horizontal Water-Mill. A Contribution to Its Early History*, in *Prace i Materialy Museum Archeologicznego i Etnograficznego w Łodzi (Seria Archeologiczna*, 25), p. 345-356 ; FERNANDEZ, X.L., 1959, *Muiños de maré*, in *Trabalhos de Antropologia e Etnologia*, XVII, p. 249-255 (describes a horizontal tide-mill) ; DIAS, J., *Moulins portugais*, p. 7-38 ; WILLIAMSON, K., 1946, *Horizontal Water-Mills in the Faeroe Islands*, in *Antiquity*, XX, p. 83-89 ; AVITSUR, S., 1969, *Water Power in Eretz Israel and Abroad*, Tel-Aviv ; RETI, L., *On the Efficiency of Early Horizontal Waterwheels*, p. 388-394 (T. & C.) ; MUENDAL, J., *The Horizontal Mills of Medieval Pistoia*, p. 194-225 (T. & C.) ; GADE, D.W., *Grist Milling with the Horizontal Waterwheel*, in *The Central Andes*, p. 43-51 (T. & C.) ; STRAUSS, F.F., 1967, *« Mills without Wheels » in the 16th century Alps*, in *Technology and Culture*, 8, p. 23-42.

25. Cf. SHAW, J., *op. cit.*, 1984, chapters 2, 10, 11, 12 ; SHAW, J., 1982, *An Introduction to the Technology of Meal Milling in Scotland*, in *Scottish Industrial History*, 5.1, p. 8-24 ; HAY and STELL, *op. cit.*, 1986, p. 1-8 ; JESPERSEN, A., 1963-64, *Watermills on the River Eden*, in *Proceedings of the Society of Antiquaries of Scotland*, XCVII, 1963-64 (a digest of an unpublished 4-volume study) ; BENNETT, R. and ELTON, J., 1898-99, *The History of Corn Milling*, 2 vols., Liverpool and 4 vols., New York, n.d. ; Sir FAIRBAIRN, W., 1864, *Treatise on Mills and Millwork*, 2 vols., London ; TINDALL, F., 1970, *East Lothian Water Mills (East Lothian County Planning Department)*, Haddington ; GRAY, A., 1806, *The Experienced Millwright*, London ; REYNOLDS, J., 1970, *Windmills and Water Mills*, Newton Abbot ; WAILES, R., 1956-1957, *Tide Mills* (Society for the Preservation of Ancient Buildings) Pt. 1 (1956), Pt. 2 (1957) ; WILSON, P.N., 1956, *Water Mills : an Introduction*, (SPAB) ; DONNACHIE, I.L. and STEWART, N.K., 1967, *Scottish Windmills. An Outline and Inventory*, in *Proceedings of the Society of Antiquaries of Scotland*, XCVIII, p. 176-299 ; MCCUTCHEON, W.A., 1970, *The Corn Mill in Ulster*, in *Ulster Folk Life*, 15/16, p. 72-98 ; DOUGLAS, G., OGLETHORPE, M. and HUME, J.R., 1984, *Scottish Windmills. A Survey (Scottish Industrial Archaeology Survey)* ; GAULDIE, E., 1981, *The Scottish Country Miller 1700-1900. A History of Water-Powered Meal Milling in Scotland*, Edinburgh ; DAVIES-SHIEL, M., 1978, *Water Mills of Cumbria*, Dalesman Books.

26. FENTON, A., 1971, *Hafer und Gerstenmehl als Hauptgegenstand der schottischen Nahrungsforschung*, in *Ethnologia Scandinavica*, p. 149-157 ; FENTON, A., 1971, *The Place of Oatmeal in the Diet of Farm Servants in the Eighteenth and Nineteenth Centuries*, in SZABADFÁLVY, J. and ÚJVÁRY, Z. (eds.), *Studia Ethnographica et Folkloristica in Honorem Béla Gunda*, Debrecen, p. 87-101 ; FENTON, A., 1987, *Country Life in Scotland*, Edinburgh, p. 171-180 ; FENTON, A., 1974, *Sowens*, in *Folk Life*, 12, p. 41-47.

The second is to establish in greater detail the story of the urban grain mills, kilns and malt kilns, because these symbolise the more commercial development of trade in cereal-based products, drink as well as bread, with widespread collecting areas for the raw materials and areas of sale far beyond their own locality. One writer has opened up the subject[27], but there is scope for much more work including the roles of baxters, brewers and other associated food and drink related trades and guilds, and the question also of household storage of flour, meal and the like.

So far I have only touched on the question of corn drying kilns. A good deal of investigation has been carried out into kilns built into the sides of slopes, and freestanding kilns combined with barns. Built structures for drying can be traced back to at least the twelfth century[28]. The data is available and can be studied. The topic I want to turn to in conclusion, however, is the question of how grain can be dried without the use of any built kiln. This subject appeals to me not only because it lends itself to the Wörter und Sachen approach, but also because it gets right at the roots of how ordinary folk lived with the help of their own accumulated knowledge and skills. Consequently, data on such a topic, if used with due care, may be a sound means of interpreting the living procedures of the past where archaeological sources are lacking.

Three drying methods are in question : net-drying, pot-drying and graddaning. In West Scotland, as in the Faeroe Islands, grain was dried in nets over an open fire in the eighteenth century and later. The technique was especially suitable for ears of bere or barley, which did not shake as easily as those of oats or rye. Technique and crop matched. Pot-drying was suitable for oats or barley. An actual pot was used latterly, but earlier on a flat stone with a rim of clay served the purpose. An « oven » of this form, with clay sides on a slaty stone, turned up at the Neolithic settlement at Rinyo in the island of Rousay in Orkney, alongside a stone-lined hearth. It is reminiscent, in its positioning, of Norwegian forms of drying oven. It is possible that the pot-drying technique is very old, and it certainly is common to Scotland and to several districts of Norway. Even containers of straw could be used : the grain was put in, and then heated stones were dropped into it. The Norwegians did the same, using wooden troughs.

27. Shaw, J., *op. cit.*, 1984, p. 139-148.

28. Fenton, A., *op. cit.*, 1974 ; Gailey, A., 1970, *Irish Corn-Drying Kilns*, in *Ulster Folklife*, 15/16 ; Gregor, W., 1892-5, *Kilns, Mills, Millers, Meal and Bread*, in *Transactions of the Buchan Field Club*, III, p. 125-159 ; Marshall, J.N., 1935, *Old Kiln at Kilwhinleck*, in *Transactions of the Buteshire Natural History Society*, XI, p. 84-87 ; Marshall, W.J., 1887-90, *Old Corn Kilns at Barclosh*, in *Transactions of the Dumfries and Galloway Antiquarian Society*, 6, p. 58-59 ; Milligan, I.D., 1963, *Corn Kilns in Bute*, in *Transactions of the Buteshire Natural History Society*, XV, p. 53-59 ; Whitaker, I., 1957, *Two Hebridean Corn-Kilns*, in *Gwerin*, I/4, p. 161-170 ; Hay and Stell, *op. cit.*, 1986, p. 14-15 ; Fenton, A., *op. cit.*, 1978, p. 375-387.

The third technique, called *graddaning*, is recorded from the early 1600s. The job was done by women. They held handfuls of corn in one hand, set fire to the ear end, then beat off the grain with a stick just as the husk burned through. The grain was then dried and partly parched, ready for grinding (following winnowing) in the hand-mill. Graddaning was done in Lowland parts of Scotland as well as in the Highland areas ; and laws were made against it in seventeenth century Ireland, because it was said to waste straw. There is a hint of it in Iceland, too[29].

Net-drying relates to a specific cereal, and the two other techniques are more general. They are, of course, for small-scale use. They permit freshly cut grain to be turned into edible food in a very short time. They say something about levels of subsistence that lie outside the forms of community or estate organisation that are marked by built structures like kilns and mills, and we must take all of these into account equally in considering the preparation of cereals for alimentary purposes.

This paper has ranged widely in time, and across social levels. It has pinpointed areas where work is in progress, and where more work has to be done. It relates primarily to Scotland and North-West Europe, but in the full consciousness that in Scotland only part of the story can be told. I should like to think that following this working meeting, the Scottish and North West European ingredients can be mixed into a much bigger international cake, and that our considerations here can lead to systematic study and publication of all aspects of the subject, as it were from the field to the stomach, as a major contribution to something that concerns all mankind.

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29. FENTON, A., 1982, *Net-Drying, Pot-Drying and Graddaning : Small-Scale Grain Drying and Processing Techniques*, in *Saga och Sed, (Kungl. Gustav Adolf Akademiens Årsbok)*, Uppsala, p. 85-105.