

Guidelines for the Preservation of Areas of Rig and Furrow in Scotland

Compiled by John Barber



Scottish Trust for Archaeological Research
2001

**GUIDELINES FOR THE PRESERVATION OF AREAS OF RIG AND
FURROW IN SCOTLAND**

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Acronyms used in this report

ALS	Afforestable land survey
AP	Aerial photograph(y)
ASSI	Archaeological Site of Special Interest
GIS	Geographical information system
GMS	Gross morphological survey
HLA	Historic landuse assessment
HS	Historic Scotland
MoLRS	Medieval or later rural settlement
NMRS	National Monuments Record of Scotland
NPPG5	National Planning Policy Guideline 5
OS	Ordnance Survey
PAN42	Planning Advice Note 42
RCAHMS	Royal Commission on the Ancient and Historic Monuments of Scotland

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PREAMBLE

INTRODUCTION

Agriculture was introduced into Scotland, ultimately from the Near East, probably in the fifth millennium BC. Successful populations altered the landscape to cultivate and to create pastures for their herds and flocks. Continuation of this process has so affected the British landscape that there is now no part of it that is truly wild.

Cultivation remains, especially areas of rigs and furrows, are the clearest presentation of this domestication of the landscape and, for some periods, are the only evidence we have for human activity in the landscape. Thus, though humble and ubiquitous, areas of rig and furrow constitute part of Scotland's heritage. However, their lowly status as a subject of study has meant that they rarely take centre stage in archaeological thinking while their ubiquity has resulted in the loss of many areas of rig and furrow, on the principle perhaps that many more such areas exist. Halliday (this volume) has shown that there are regional, and chronological differences in the form of surviving rig that reflect different geographies, the local histories of agricultural evolution and the nature and date of the final or current land-use.

It is accepted that *in situ* preservation of areas of rig and furrow threatened with destruction by development is not generally a reasonable option. Records prepared in advance of destruction, as advocated in NPPG 5 and PAN 42 are currently somewhat haphazardly compiled and many of the extant records are probably of limited value. Past work has not clearly demonstrated that the recording of areas of rig and furrow in isolation contributes significantly to knowledge of past agricultural practices and this has made it difficult to justify even minimum intervention in advance of destruction. However, detailed studies have been rare in the past and the work of the Royal Commission has already

shown that regional studies based on consistent records from individual sites will contribute significantly to our understanding of past agricultural practices in Scotland (see Dyson-Bruce and Halliday below). This work also highlights the need for more recording from a wide range of sites and contexts to obtain a fuller understanding of the date, character and form of rigging across Scotland (see Halliday; Appendix 1).

This guideline contains a set of recommended minimum standards for preservation *in situ*, or by recording in advance of destruction, of areas of rig and furrow cultivation. A body of competent experts, drawing on a wider pool of knowledge by consultation, has drafted this guideline as a recommendation to planners and other heritage managers. It has received the support of the Scottish Trust for Archaeological Research and of Historic Scotland.

This guideline focuses upon the requirement for a policy for the protection of certain important areas of rig and furrow in advance of development. It also describes standards of recording for areas of rig and furrow that cannot be preserved *in situ*. However, it is recognised that many such areas are not under direct threat and will survive to form a record for future generations. In heritage management terms, the main problem for these surviving areas of rig and furrow is likely to be the need to identify the situations in which they require management to ensure that they survive in good condition, visible and free of thick vegetation and trees. In other situations, the payment of grants for their management may not be justified.

Many of the issues raised in the guidelines relate to the relative value of different areas of rigging in the Scottish landscape. Therefore a number of issues raised in this guideline will be relevant to land management considerations, including the selection of particular areas of rigging for management under agri-environment schemes and other initiatives.

THE CULTURAL SIGNIFICANCE OF RIG AND FURROW

SUMMARY

Areas of rig and furrow, like all archaeological sites, contain information relating to aspects of the past that has value for present and future generations. This information can be considered under the general headings of social (including economic), historical, scientific and aesthetic information. Rig and furrow can yield this information at scales of investigation ranging from the molecular, through the macroscopic to entire landscapes and some of the information can only be retrieved at the appropriate scale. Our access to the cultural value of rig and furrow is circumscribed by current methodologies, ie by our ability to recover this information or to preserve it in forms that will facilitate future recovery.

SOCIAL AND ECONOMIC INFORMATION

Cultivated landscapes in general, and rig and furrow in particular, contain information about the practices of tillage, eg the physical preparation of the soil for cultivation, manuring, crops, use for grazing and pastures, etc. These, in turn, indicate particular social and economic practices and arrangements.

Within the landscape, superimposition of one set of rigs on another, whether of the same form or not, is evidence of repeated use of the landscape that may not be detectable from any other source.

Extensive, combined or juxtaposed areas of rig and furrow give evidence of larger units of landscape organisation and chart the agricultural fortunes of villages, towns, abbeys, etc.

The activities of many individuals and some groups fall below the awareness threshold of formal history, circumscribed as it is by written records. Rig and furrow may represent the only record of their activities. Small areas of rig and furrow may represent the activities of single households or indicate marginal cultivation.

Rig and furrow enriches the character of the modern landscape. Rural communities have perceptions of and beliefs about rig and furrow. People in many areas of Scotland have grown up and lived their lives within landscapes that contain evidence for former rigging and these are part of their sense of place (see Brisbane & Wood 1996, 25 for the values that people place on their own cultural landscapes). Cultural tourism also attributes value to rig and furrow in the desire of visitors to know and appreciate the landscapes of Scotland (see Hingley in press for a discussion of the potential value of rig and furrow in the context of the sense of place of local people and visitors).

HISTORICAL INFORMATION

The forms of rig and furrow emerging through time and varying in scale and regional distribution are the results of the interaction of social and technological change, on the one hand, and of natural change, eg of soil and climate, on the

other. As such, they hold the potential to become the fundamental subject matter of agrarian history.

Because successive episodes of cultivation can remove the surface evidence for earlier episodes, rig and furrow tends to survive best in marginal areas into which tillage was expanded at times of population pressure or economic expansion. Thus dated rig and furrow can be a proxy record of rural demography and/or of economic pressures.

As noted, the surviving surface features in most areas of rig and furrow are the results of the final episode of cultivation. Thus, their soils may contain a palimpsest of information covering many episodes of cultivation. Areas of rig and furrow created in single episodes of cultivation have the potential to preserve, in whole or part, a clear local history of soil use and land management at a point in time. In the aggregate, such areas can provide regional histories and can guide methodological improvements for unravelling the palimpsest of information contained in multiple-use areas of rig and furrow.

Earlier sites and monuments are often preserved under the cultivated soils of later ages. McCullagh has excavated the remains of a post-built house of Late Iron Age or Dark Age date beneath soils cultivated before the onset of peat around 1000 AD (McCullagh & Tipping 1998, 58–64). Where lynchets are formed as a result of cultivation, the anthropic materials preserved in the lynchet in roughly stratigraphic sequence are a proxy record of cultivation uphill from the site. Similarly, field banks, head dykes, etc all preserve beneath them ground surfaces of the periods preceding their building. Modern ploughing to remove rig and furrow in Warwickshire, England, has revealed buried prehistoric landscapes. Areas of rig and furrow are commonly delineated on early maps and make a contribution to our understanding of the historical geography of Scotland.

SCIENTIFIC INFORMATION

Rig and furrow provides evidence for the evolution, development and spread of agricultural technologies as represented in the hardware used to create the ridges and furrows. Spades and ploughs, traction by humans, horses or oxen, steam engines and tractors all played a role in the creation of rig and furrow and the latter has the potential to inform us on their use, through time.

The rig and furrow of the eighteenth and nineteenth centuries, in particular, reflect the written history of the evolution of agricultural theory but, unlike the written record, informs us about what actually happened on the ground. By extension we may deduce the agricultural theories of earlier peoples from their rig and furrow, albeit with varying degrees of confidence.

By scientific analyses, we may in some cases be able to extract information about the 'operational science' of rig and furrow cultivation. Additions to the soil, both mineral and organic, eg manures, may be detectable in some instances.

Crop yields, particularly for cultivation in earlier periods, may be deducible from the areas that were under cultivation, albeit that the volume of relevant modern experimental work underpinning such estimates is woefully small.

Areas of rig and furrow introduced into the midst of heathland and later abandoned are being reclaimed by

heathland vegetation and submerged in peat, in some instances. They represent reservoirs of biodiversity that may be locally significant and furnish evidence for rates and trajectories of ecological change that merit further study.

AESTHETIC VALUE

The perceptions of the landscape held by those who created the rig and furrow led to the avoidance or inclusion of landscape features and it may be possible to read some of this evidence to provide an understanding of these perceptions. In rural Ireland, for example, areas around 'fairy thorn trees' were left uncultivated and both there and in Scotland, grave yards or traditional burial grounds were similarly avoided. Ancient monuments, similarly, would not have survived in cultivated areas were they not deliberately excluded from cultivation. Here then is a native aesthetic geared to the preservation of antiquities, especially ritual sites and centres or objects of folk veneration. Halliday has noted the importance of regional variations in the forms of rig and furrow. While these must in part represent responses to local geology, topography soils and agricultural technology, they will also reflect some elements of regional aesthetic choice. To the extent that this is true, the regional patterns may, with study, reveal something of the social and aesthetic lives of their creators. Rig and furrow provides a link to the arts of earlier

times and add life and vigour to our perceptions of works as diverse as Gainsborough's *Mr and Mrs Andrews* and *Landscape with a woodcutter courting a milkmaid*, the tales of Piers the Ploughman and Grey's *Elegy in a Country Churchyard*. The system of runrig, with its periodic re-division of communally held lands supported a vernacular culture of great vitality and one that holds particular significance for the contemporary populations of the Highlands and Islands; perhaps for all Scots.

Similarly, rig and furrow produced latterly by ploughing, connects us to the traditions of the 'ploughman' or 'ploughboy', who is the hero or villain of many folk songs. Ploughing was hard work and often undertaken by teams of young men, drafted into an area for the season. The symbolism of ploughing as the act of male fertilisation of the earth was, no doubt, appreciated and given expression by the ploughboys and the young females of a locality and then celebrated or regretted in the songs and stories that make up a great part of the living vernacular arts of rural Scotland.

STATEMENT OF CULTURAL SIGNIFICANCE

Rig and Furrow has cultural value because it contains unique information about agricultural practice, a key relationship between people and place in Scotland.

GUIDELINES: TOWARDS A CONSERVATION POLICY

18. *The preservation in situ of important archaeological remains is always to be preferred, particularly in relation to nationally important sites. Where this is not possible, an archaeological excavation incorporating the recording and analysis of remains and publication of the findings, together with the deposition of the artefacts in an appropriate museum and the records in the National Monuments Record of Scot land, may be an acceptable alternative.*

(NPPG5)

INTRODUCTION

In responding to the threat of destruction to an area of rig and furrow, the curator or heritage manager will assess the site in question using some set of criteria. The Secretary of State's criteria for Scheduling ancient monuments under the Ancient Monuments and Archaeological Areas Act (1979) is well tested and at least provide a reasonable checklist for site assessment. These are listed in Historic Scotland's *List of Ancient Monuments in Scotland* 1997 (updated regularly) and, in amended form in PAN42, Section 47. These criteria provide a useful way of assessing rig and furrow and are therefore reiterated below, with appropriate comment and additions.

CRITERIA

Survival/ Condition The existence of well-preserved field characteristics can be of importance in itself. The survival of the monument's archaeological potential both above and below ground is a crucial consideration, and goes beyond survival of marked field characteristics.

Group Value: The value of a single monument (such as a field system) may be greatly enhanced by its association with related contemporary monuments (such as a settlement and cemetery) or with monuments of different periods. In some cases, it is preferable to protect the complete group of monuments, including associated and adjacent land, rather than to protect isolated monuments within the group.

Coherence/completeness Rig and furrow represents systems of agricultural practice that, in turn, may represent systems of rural social and economic organisation. The more coherent and complete the area/s of rig and furrow may be the greater is their potential to reveal something of the systems from which they arose.

Period: It is important to consider for preservation examples of all types of monument that characterise a period: monuments of different contemporary types complement each other in the evidence they present.

Rarity: There are some monument categories that in certain periods are so scarce that all surviving examples retaining some archaeological potential should be preserved. In general, however, a selection must be made which portrays the typical and commonplace as well as the rare. This process

should take account of all aspects of the distribution of a particular class of monument. Regionally rare types may have great cultural significance.

Situation: Types of monument abundant in one topographical or land use situation may be rare in others and special regard should be had to their heightened potential archaeological value. The regional rarity of types of rig and furrow should be considered a competent issue in their evaluation.

Multiperiod/single period Multiperiod sites with well-preserved components are of special value since they can allow fine phasing. A single period site, on the other hand, will in general have more diversity of evidence for its functions in better preserved relationships. Examples of a type in both multiperiod and single period expressions should be preserved. Multi-periodicity may, in some cases, be determined from the 'horizontal stratification' of areas of rig and furrow that intercut or overlie each other or other monuments.

Fragility/Vulnerability: a single ploughing can destroy highly important archaeological evidence from some field monuments: there are structures of particular form or complexity whose value could be severely reduced by even slight mistreatment. Large areas of rig and furrow have particular value because of their potential to reveal the systems that created them (see coherence/completeness, above) and are therefore vulnerable to damage by fragmentation or piecemeal destruction. It is necessary therefore to consider the impact of a proposed development on the total area of surviving rig and furrow; not just on that part of it threatened with destruction.

Documentation: The significance of a monument may be enhanced by the existence of records of previous investigation or, in the case of more recent monuments, by the supporting evidence of contemporary written records.

Diversity: Some monuments may be selected for scheduling because they possess a combination of high quality features, others because of a single important attribute. Areas of rig and furrow in which numbers of relevant features can be discerned are of particular value. Among the relevant features the following may be noted: joints, headlands, balks, variations in ridge profiles and in the width of lands, clear ploughing curves, enclosures, boundaries, lynchets and settlement or other structures.

Potential: On occasion, the nature of the evidence cannot be specified precisely but it may still be possible to document reasons anticipating its existence and importance and so to demonstrate the justification for scheduling. This is usually confined to sites rather than upstanding monuments but is clearly a factor in the evaluation of rig and furrow also. Our ignorance of much that relates to agricultural remains in general and in particular to rig and furrow enhances the case for their protection; it does not diminish it.

Amenity/Visual impact: Ridged fields form landscapes that are of interest to the public and that have aesthetic appeal in their own right. The visual impact of proposed

developments, particularly on large areas of rig and furrow, should be evaluated and measures invoked to mitigate this impact.

PRESERVATION *IN SITU*

The emphasis in this document is on the preservation of rig and furrow in advance of development but, as stated above, much evidence for rig and furrow in the Scottish landscape will survive undeveloped or without management targeted directly at archaeological remains. In some cases enhanced management of this resource may be possible under the provisions of agri-environment and other management schemes. Some of the Guidance provided below relates to the significance of rig and furrow and is relevant for those producing farm plans and others who assess land for inclusion in the agri-environmental schemes.

Scheduled ancient monuments (SAM) are, by definition, of national importance and it is particularly important that they are preserved *in situ* and within an appropriate setting. However, as noted in NPPG5, not all nationally important monuments are scheduled and many that do not meet the formal criteria for scheduling are nonetheless of such great regional or local significance that their preservation *in situ* is also desirable, even if scheduling is not the appropriate mechanism. The use of Local Government designations and of specific management agreements may prove capable of protecting some of these sites and monuments. The designation of ASSIs (Archaeological Site of Special Interest) in Fife, for example, may be a more appropriate mechanism under which to consider the preservation of archaeological landscapes in general and rig and furrow in particular.

Northamptonshire County Council, in its publication *The Open Fields of Northamptonshire* categorises areas of rig and furrow under three headings: large areas (>40 ha), smaller areas (>10 ha) and fragmentary remains. In recommending the preservation *in situ* of all the remaining large areas they suggest that the most important criteria are size, completeness, diversity, visual impact, survival of associated settlement and documentation. These criteria are subsumed in those listed above and are equally relevant in identifying Scottish sites that should be considered for preservation in advance of development.

Historic Scotland have recently set out their approach to scheduling 'particularly coherent field systems' (HS n/d, Section 2.5) and indicate that in some particular situations, examples of field systems isolated from settlements may be considered for scheduling. This is a logical advance on the position originally set out by Hingley (1993) and indicative of the newly appreciated importance of medieval or later rural settlements (MoLRS). The recent increase in schedulings of MoLRS (171 sites scheduled prior to 1991, 228 since then) seems part of a pattern of appreciation of the significance of these sites. The inclusion of areas of rig and furrow within many of the scheduled areas is a welcome part of the trend, albeit that few substantial areas of rig and furrow have been scheduled and fewer still, or none, scheduled in the absence of apparently associated structures.

LARGE AREAS OF RIG AND FURROW

Given the nature of the Scottish landscape with its many relatively small glens, extensive areas of rig and furrow survive, for the most part in the Southern Uplands and on the eastern coastal plains. Within the glens of the north and west, the better lands on the valley floors and the lower slopes have probably been in continuous cultivation over the past several millennia. Thus, large areas of cultivation remains often survive only relatively high on the glen sides (or above the most recent head-dyke) and rig and furrow may have been obscured or removed on the lower ground. In such cases, preservation is merited not only where cultivation systems survive more or less intact but may also be merited where there is some survival of rig and furrow also on the floor of the glen, even if the system has been fragmented on the lower ground.

RECOMMENDATION R1

Extensive remains (ie areas of about 40 ha, or more) of contiguous or overlapping or of juxtaposed, non-contiguous areas of rig and furrow may be worthy of preservation *in situ* in Scotland especially where they form part of a landscape of historic importance or if found in apparent association with settlement monuments.

SMALLER AREAS OF RIG AND FURROW

There is a general acceptance that preservation *in situ* of areas of rig and furrow measuring 10 ha to 40 ha in extent will prove to be the exception rather than the rule. Preservation of smaller areas of rig and furrow might more generally be founded on the added value they bring to related monuments that merit preservation in their own right. Thus smaller areas of rig and furrow adjacent to deserted medieval villages, castles or abbeys might be worthy of preservation *in situ* because of their association with the monument in question or because they form an appropriate setting for it. On this principle, Historic Scotland has scheduled areas of rig and furrow adjacent to medieval or later settlements, eg Rosal, (Strathnaver, Sutherland) and Dunbeath (Caithness) because together with the settlement remains, they represent the remains of core agricultural activities (see Hingley 1993, 52-58).

RECOMMENDATION R2

Remains of contiguous or overlapping or of juxtaposed, non-contiguous areas of rig and furrow extending over 10 to 40 ha, may be worthy of preservation *in situ* where they form part of the setting of nationally-important monuments or are considered to be of regional importance, whether scheduled or not, or form field systems connected with such monuments.

FRAGMENTARY REMAINS

It is difficult to envisage preservation of any but the most exceptional sites in this category in advance of development. However, even fragments of regional variants found outwith their 'home' regions merit consideration for preservation. Where a group of fragments of a once much larger continuum survive, their preservation may be considered desirable because they represent the remains of a landscape. Conversely, small isolated areas may be significant because they represent single period cultivation of marginal lands resulting from social or economic pressures. Such exceptions apart, it is not envisaged that many fragmentary remains of rig and furrow will merit preservation *in situ*.

SURVEY, EXCAVATION, ANALYSIS AND PUBLICATION: 'RECORDING IN ADVANCE OF DESTRUCTION'

Where [preservation in situ] is not possible, an archaeological excavation incorporating the recording and analysis of remains and publication of the findings, together with the deposition of the artefacts in an appropriate museum and the records in the National Monuments Record of Scotland, may be an acceptable alternative.

(NPPG5)

Recording in advance of destruction is constrained by our ability to discover meaningful information with the methods currently at our disposal. Furthermore, as NPPG5 notes, excavation is destructive of major sources of evidence on any site and is clearly a second best option to physical preservation *in situ*. In the context of NPPG5 and PAN42, the term 'recording in advance of destruction' in respect of areas of rig and furrow, means that the developer will fund the survey and/or archaeological excavation of such areas, analysis and publication of the findings, together with submission of any recovered artefacts to the Finds Disposal Panel of the Q<R and deposition of the records in the National Monuments Record of Scotland (see Treasure Trove, 1999 and HS, 1996, for details of the Finds Disposal Process and Archiving, respectively).

LARGE AREAS OF RIG AND FURROW RECOMMENDATION R3

Any area of rig and furrow, greater than 40 ha, that cannot be preserved *in situ* should be considered for recording in advance of destruction. Where an area of this size would be fragmented or partly destroyed, the whole of the area should be surveyed even if excavation is largely restricted to the areas directly affected by development. In this respect, it should be noted that the whole of a set of parallel rigs and furrows is affected when any part of it is affected.

SMALLER AREAS OF RIG AND FURROW RECOMMENDATION R4

For smaller areas of rig and furrow, ie those between 10 and 40 ha in extent, that cannot be preserved *in situ*, recording in

advance of destruction should be considered in cases where they represent the final remains of more extensive systems or where they contain regionally significant features.

FRAGMENTARY REMAINS RECOMMENDATION R5

Consideration should be given to recording in advance of destruction of fragmentary remains of areas of rig and furrow where these are the surviving vestiges of significantly larger areas of rig and furrow, or where they are regionally or locally significant for their forms or other features or their associations. Isolated areas of rig and furrow may represent single-period cultivation exercises, particularly in marginal areas, and thus should be considered worthy of recording in advance of destruction.

ABANDONMENT OF AREAS OF RIG AND FURROW WITHOUT SPECIFIC RECORD RECOMMENDATION R6

Even where no specific work is undertaken, curators are encouraged to ensure that areas of rig and furrow threatened with destruction are recorded, for instance by aerial photography or rapid topographic survey (see page 10), into their Sites and Monuments Record (SMR), whence they will also become recorded in the National Monuments Record for Scotland (NMRS).

METHODOLOGIES

The decision to record in advance of destruction is constrained by the inadequacy of current field methods. In a NERC-studentship, sponsored by AOC (Scotland) Ltd and supported by Historic Scotland, aimed at exploring the relationships between form and function in Scottish field systems, Crystall (unpubl) found that an ostensibly medieval field system had considerable time-depth, ie it subsumed and overlay earlier fields. This factor considerably complicated the analyses undertaken and the palimpsest nature of the evidence contained in field systems will always prove problematic (see Carter & Simpson; Appendix 3, for further discussion).

There are clear indications that methodological improvements are not merely possible but are in fact in progress at this time (*ibid.*). In offering guidelines for preservation by record we recognise the need to avoid asking developers to fund the development of methodologies. Rather we propose that the developer fund the standardised recording of sites and the collection and partial processing of samples so that they may be stored for the longer term against the expectation that methods will improve. In all cases, the work indicated is the minimum consistent with good practice and where additional information could be gleaned, for example, in examining the chronology of the site or its relationships with associated structures etc, this additional work should be included. This approach is consistent with the policy of 'recording in advance of destruction', albeit that parts of that record cannot currently be read.

We propose further that appropriate grant-giving bodies should fund the analyses of the archive of preserved records, raw data and samples at regular intervals and we identify five year intervals as best suited to this purpose. The aim of these five yearly analyses is to provide heritage managers with effective management tools by improving the methodologies available to them.

RECORDING IN ADVANCE OF DESTRUCTION; MINIMUM STANDARDS

PAN 42 specifies that when 'preservation *in situ*' is not possible '...excavation, recording and analysis of the remains, and publication of the results...' should be carried out (PAN42, Section 26). This can be expensive and must be justifiable in relation to the proposed development. The need to record in advance of destruction even where parts of them may not be completely meaningful to us at present has been made clear above and the following guidelines are consistent with this principle.

Appropriate responses to the threat of destruction of areas of rig and furrow can be considered under three headings: i) survey, ii) field observation and excavation and iii) analyses and publication.

SURVEY

The work of Dyson-Bruce and Halliday (Appendices 2 and 1) has shown that patterns of rig and furrow:

- Inform us of the methods of their creation
- Reveal regional differences that may be indicative of social and/or chronological factors
- Indicate the scale and possibly the duration of land use in the area, with implications for patterns of land tenure, etc.

If, therefore, areas of rig and furrow are to be destroyed by development, a gross morphology survey (GMS) of the area/s affected should be undertaken. Large areas, for example areas proposed for afforestation, may initially be surveyed by aerial photographic (AP) transcription. Smaller areas should be ground-surveyed and transcribed AP surveys should be ground-checked.

FIELD OBSERVATION

For each discrete area of roughly parallel rig and furrow, ie for each field, identified in the GMS, a topographic survey should be undertaken and the following should be recorded where possible:

- i) The boundaries of the field should be checked on the ground and specific boundary features noted and recorded
- ii) The areas of contact between adjacent field boundaries should be examined for evidence of sequence, surface

characteristics should be recorded and an explicit interpretation, testable by invasive fieldwork; devised;

- iii) The widths, heights and depths of rigs and furrows should be measured and the raw data preserved while ranges or means and standard deviations, where these are truly representative, should also be recorded.
- iv) It is not possible to provide a definitive list of additional, relevant field observations because areas of rig and furrow are so variable. However, the following should be observed and recorded where possible:
 - a) The size (ha) and shape of each 'field' or group of roughly parallel rigs and furrows
 - b) The relationship between the field and its topographical setting, eg
 - Observe and record the altitude, aspect and slope of the field
 - If rigs run along contours or at right angles to them or if at some other angle, then quote this as the smallest angle, in degrees, made between rigs and contours
 - c) Details of characteristic rig morphology in three dimensions should be observed and recorded. Are rigs:
 - Straight or curved?
 - If curved, are they reversed-S in plan?
 - Are rigs and/or furrows steep-sided or rounded?
 - d) Are there distinguishing regional or local characteristics? e.g.
 - Is there a slight trough along the spine of each rig?
 - Do the rigs in each field seem to radiate from some single point?
 - e) Relationships with other monuments should be observed and recorded
 - between fields and other monuments
 - between rigs and/or furrows and other monuments

EXCAVATION

Where excavation is required, it will be necessary to undertake some excavation in each field and to ensure that more than one rig and furrow is examined in every instance. The bulk of the observable evidence will be most easily seen in a section but small cuttings, eg 2 m by 2 m, may also reveal multi-periodicity by revealing ard-marks or the bottoms of plough furrows. Thus, a small cutting with a trench running along one side and projecting beyond it might prove ideal.

Sectioning: A machine cut section running through at least three rig and furrow pairs will provide access to the plough soil and to any relict features underlying it. An archaeologist and a trained soil scientist should record the sections and the soils they contain. Soil descriptions by persons other than soil

scientists will prove wholly inadequate in any subsequent analyses.

Sampling: Plough soil within the superficial rig should be sampled as should soil from earlier A-, or B-horizon features, like relict rigs, deepened plough soil beneath the superficial rigs and from the C-horizon. The emphasis should be placed on gathering contrasting samples that facilitate comparative studies.

ANALYSES

Carter and Simpson (Appendix 3) have shown that currently available analytical techniques yield little definitive information about the cultivation practices fossilised in rig and furrow. This is partly a reflection of the available methodologies and partly of inherent problems in resolving palimpsest deposits. For this reason, analyses should be restricted for now to simple tests, for example, of soil fertility or for the identification of introduced materials, and even these tests may not be justified in all instances.

Soil micromorphology: This is a relatively new technique, whose application to archaeological problems only over the past two decades is beginning to bear fruit (eg Acott 1993; Crystal 1998; Carter 1998). In a study sponsored by AOC (Scotland) Ltd and NERC, Guttman is currently using micromorphological and other analyses to compare the evidence from a field system on Papa Stour (Shetland) with the known historical and ethnographic evidence for its use, particularly for its manuring over the past two or more centuries. While micromorphology has problems of chronological resolution, caused by the palimpsest nature of the evidence, it has certain attractions for the heritage manager:

- sample collection in the field is cheap and easy
- impregnation of the samples is similarly cheap
- the impregnated samples have an indefinite shelf life

Thus many sites could be sampled, relatively cheaply, at the developers' expense, and the impregnated samples stored in an accessible archive. As noted above, the retained samples would then, at five yearly intervals, become the subject of a research driven project aimed at determining local, and regional variations and improvements in methodology.

The impregnated blocks, properly identified and documented, should be held at a central locus and cross-referenced with the site record sheets (below). This process would allow for recording in advance of destruction at the developers' expense while methodological improvements could be pursued, pro-actively, in research programmes. It is essential that the impregnated blocks and the prepared slides are accessible to all scholars. The National Museums of Scotland are willing to house both the blocks and the prepared slides and to furnish access to them for all interested scholars.

REPORTING

Reportage on cultivation remains tends to be heavily reliant on raw data and 'hard' science and unpopular with

traditional journals of 'cultural archaeology'. This will be particularly true with the reports from the survey and excavation exercises described above because these are mainly data collecting exercises from which larger studies should be made at five-year intervals. The latter are more likely to be appropriate for traditional archaeological journals.

The emphasis in reporting should therefore be placed on the creation of a high level of consistency in recording, using standard record formats, and these records should be compiled by archaeologists with soil science training or with the assistance of qualified soil scientists. A special archive of copies of the record should be maintained at one locus, in addition to the normal archiving with the NMRS. The archive of record sheets should be cross-referenced to the archive of impregnated soil blocks. This archive of site records should meet the standards set by RCAHMS (see HS 1996, 13–16, for details). If these recommendations are adopted, the reporting of each survey or excavation recording exercise could be restricted to a D&ES report cross-referenced to both archives.

The approach advocated here is that of creating an active archive with ensured review and revision at predetermined intervals. This bears some similarity to the Norwegian practice, for example, of archiving excavations for an indefinite future in the anticipation that scholars will one day find the time and funds to analyse and interpret them. However, this is not an advocacy of this process but merely an acknowledgement of the poverty of the methodologies currently available for the evaluation, management and study of areas of rig and furrow.

RECOMMENDATION R7

It is improbable that full records of all areas of rig and furrow could ever be entered into either local SMRs or the NMRS simply because such areas are so ubiquitous. Historic Landuse Assessment surveys offer the only practicable means now available of ensuring that rig and furrow is more comprehensively recorded. Clearly, without representation in the SMRs and NMRS it is probable that areas of rig and furrow will slip through the safety net of NPPG5 and PAN42. We therefore recommend the extension of HLA studies to other areas in Scotland and ideally to all of Scotland, mainland and islands. In so doing we are conscious that we recommend the inclusion of a 'landscape' category with the 'sites' and 'monuments' categories of SMRs in general. This approach is not inconsistent with the map-based approach adopted in the 1997 *Town and Country Planning (Scotland) Act*. We do not necessarily recommend this approach as a general precedent for the treatment of archaeologically- or historically-significant landscapes, but rather as a pragmatic approach to the curation of cultivation remains, especially of areas of rig and furrow. We further recommend that the results of the sampling exercises advocated above also be entered into the local and national sites and monuments records, subject to quality assurance from NMRS.

APPENDICES AND BIBLIOGRAPHY

APPENDIX 1. **RIG AND FURROW IN SCOTLAND** *S HALLIDAY*

APPENDIX 2. **HISTORIC LANDUSE ASSESSMENT** *LYNNE DYSON-BRUCE*

APPENDIX 3. **ANALYSIS OF CULTIVATED SOILS** *S P CARTER & I A SIMPSON*

APPENDIX I RIG AND FURROW IN SCOTLAND

S Halliday

INTRODUCTION

Agricultural remains form the most extensive component of the archaeological record to survive in the landscape today. And yet, this category of evidence, ranging from boundaries and enclosures to unenclosed cultivation remains, tends to be the least studied source of information about the past. Furthermore, it is probably amongst the most difficult evidence to deal with in any comprehensive manner. The various visible features can be mapped, a task made considerably easier with the advent of modern survey technology, and their overall pattern may be to some extent laid bare, but it is simply not practical to excavate such remains in their entirety. Thus the inclusive approach that may be taken in the excavation of a settlement is never adopted for agricultural remains. Settlements may be excavated, but their fields, if examined at all, are simply sampled.

This observation applies generally to all periods of agricultural remains, but it is particularly apposite with regard to medieval and later rig-and-furrow. While the exploration of prehistoric landscapes in Scotland has provided the focus for a series of concerted campaigns of excavation and sampling over the last twenty years (eg Barber 1997; Barber and Brown 1985), later ridged fields have been ignored largely, even where they impinged on the prehistoric remains. Essentially, the development of landscape sampling techniques has been motivated by prehistorians in fulfilment of their own objectives and interests. It has been left to historians and geographers to provide explanations and interpretations of the later landscape, and this has been done largely from historical sources. Despite the pioneering efforts of Horace Fairhurst in the 1960s (1969), it is only recently that any sampling programmes have been explicitly directed to the archaeological remains of the medieval landscape (eg Chrystall, unpubl: Chrystall & McCullagh forthcoming; Davidson & Simpson 1994). The Lairg Project (McCullagh & Tipping 1998) is probably amongst the first large scale sampling and excavation programmes in Scotland to attempt to deal with the totality of the landscape, placing the examination of the medieval and later remains on an equal footing with those of earlier periods.

RIG AND FURROW IN THE LANDSCAPE

The overriding lesson of excavation-based landscape projects, and indeed of the landscape mapping projects carried out by the Royal Commission for the Ancient and Historical Monuments of Scotland, is that archaeological remains only survive in the landscape in so far as later processes have allowed them to. These processes come in various guises, some of which are forms of natural erosion, but the main process involved is cultivation: this is what has shaped the modern landscape; this is what provides the horizontal stratigraphy from which the sequences of events in the landscape can be determined; this is what creates zones of differential preservation within the landscape; this is what creates zones in the landscape with different

potentials for the recovery of remains of different dates. Furthermore, these processes are operating not only in the widest sense of the landscape, but also in the shaping of the detail of archaeological sites within the landscape.

A typical archaeological site in a highland glen, for instance, is likely to contain evidence of successive phases of cultivation, each of which has modified, levelled or destroyed earlier evidence of settlement and land-use. This pattern of successive use creates differential patterns of preservation and destruction across each site, and in its wake each part of the site has a different potential to reveal information about the past. The case is eloquently demonstrated in Achany Glen, south of Lairg (McCullagh & Tipping 1998). There, early fields have provided the sites for hut-circles, but these have been superseded by other fields. The cultivation of these later fields has not only led to varying degrees of modification to the hut-circles, but, with the exception of the area underneath the hut-circle wall, has erased also all trace of the earlier fields in their immediate vicinity (even though other fragments may survive elsewhere). It is immediately apparent that this hillside can be zoned in terms of differential preservation and potential. The evidence of earlier cultivated soils can only be recovered where they lie beneath later structures, or outside areas of later cultivation.

These principals can be extended directly into the landscape. Visible remains can only be recovered on the surface of the ground where they are either substantial enough to have survived the impact of subsequent episodes of cultivation, or if they lie beyond its fringes. If the latest phase of cultivation has been both intensive and extensive, there may be no visible evidence of any earlier settlement and land-use. Based on these premises, it is possible to define a general threefold structure to Scotland's cultural landscape. The elements in this structure may be termed the Improved Landscape, the Ridged Landscape, and the Prehistoric Landscape, each with its own characteristics in terms of differential preservation and archaeological potential.

THE IMPROVED LANDSCAPE

The first element in this structure is usually made up of the walled fields, plantations and policies that came into existence with the agricultural Improvements some two hundred years ago. This is the most complete cultural landscape that survives, recorded in close detail on early editions of Ordnance Survey maps. Sadly this landscape has suffered grievously with the introduction of increasingly mechanised farming techniques, but it encloses vast swathes of the lowlands, and penetrates along the valley floors into the uplands. Invariably taking in the richest land of every region in Scotland, the Improved landscape contains the most intensively ploughed soils. This first zone, therefore, is one of maximum damage. Visible traces of earlier settlement and land-use are few and far between, and yet the soils in this zone have almost certainly been exploited for long periods during the last six millennia. Thus it is on the one hand a zone of differential preservation, in which all but the most substantial monuments have been levelled by ploughing, and on the other a zone of potential, where the application of appropriate techniques – aerial photography, geophysics, arable field-walking – may well reveal the sites of settlements

and other monuments dating from every period of history and prehistory. Even within this landscape some areas have a greater potential to preserve elements of earlier landscapes. Plantations, for instance, which would normally be regarded as areas of intense disruption to archaeological features, often provide havens within which fragments of the pre-Improved landscape are still visible. Recent work in the lowlands of Aberdeenshire has recorded in excess of 250 locations where fragments of rig-and-furrow systems have been preserved within areas that were planted with trees when the landscape was enclosed during the Improvements.

THE RIDGED LANDSCAPE

Rig-and-furrow generally forms the second recognisable zone in the landscape. Surviving in fragmentary form in the plantations, and often revealed by cropmarks in the adjacent fields across the more freely draining lowland soils, in many places rig-and-furrow can be found extending up onto the hills well beyond the edge of the enclosed fields of the Improved landscape. Leaving aside the complex sequences of cultivation and the range of different types of rig that may be distinguished, this is a zone that has both preserved visible elements of medieval and later settlement and land-use, but has also levelled, or at least modified, any evidence of earlier occupation that may have existed there. It is another zone of potential, but in this instance for archaeological evidence relating to pre-medieval periods. Here, however, the vegetation – heather, bracken, coarse grasses, improved pasture – does not allow the possibility of cropmarkings to reveal the sites of earlier structures, and the unbroken surface vegetation cover reduces the scope for identifying artefact scatters by fieldwalking to molehills, rabbit burrows, sheep scrapes and stream erosion. It should be noted, however, that different forms and profiles of visible rig-and-furrow probably indicate different intensities of cultivation, and almost certainly lower intensities than in the ploughed fields of the Improved landscape. Despite the problems of locating earlier features in this zone, some types of monument otherwise only known from cropmarks and chance discoveries in improved fields, such as souterrain settlements, may survive in significantly better condition in areas of rig-and-furrow.

THE PREHISTORIC LANDSCAPE

In the same way that the Improved Landscape contains niches where fragments of earlier landscapes are still visible (eg the old plantations), the Ridged Landscape rarely stretches unbroken across vast tracts, although in some parts of Berwickshire and Roxburghshire this is indeed the case. Pockets of earlier remains can often be found scattered in between the fields of rigs, and in some cases the rigs may have been woven in amongst earlier structures. This may blur the distinction that can be drawn between the Ridged Landscape and the third zone, the Prehistoric Landscape. This third zone was only exploited for pasture and shielings in the medieval and later periods. It has largely escaped any later cultivation, although small pockets of rig-and-furrow may be found within it. The greatest potential to recover surface remains of settlement and land-use dating from the

prehistoric period, and indeed the early medieval period, is found in this zone. The limiting factors are the topography of the landscape, the character of the soils, and the height above sea level. As with the Ridged Landscape, which may represent in excess of 600 years of cultivation, the Prehistoric Landscape is itself a very complex zone, and may contain numerous episodes of cultivation spread over a period of from four to five millennia. It may be possible to pick this apart through sampling and excavation in the detail of the archaeological site within the landscape, but it is not possible to do this at the scale of the wider landscape.

Not every area of Scotland contains each of the three elements that has been elaborated above. In some cases there may be no Improved Landscape, in others the Improved Landscape has subsumed all other evidence of its former presence. Equally the Ridged Landscape may have overrun any remains of the Prehistoric Landscape. Nevertheless, this broad structure is generally applicable, and it is mainly the Ridged Landscape with which this paper is concerned. Before going on to examine the various types of rig-and-furrow that form this zone, which can broadly be considered as medieval or later in date, it is worth briefly examining the evidence for prehistoric ridged cultivation.

PREHISTORIC RIG-AND-FURROW

As a result of the work that has been carried out on prehistoric agriculture, it has become clear that ridged cultivation surfaces have a very long history in Scotland (and indeed in Ireland). Traces of what are probably later prehistoric and Romano-British cultivation rigs have been found most extensively in the Southern Uplands and down into Northumberland along the Pennine range (Topping 1989; Halliday 1993, 70–8; RCAHMS 1998, 44–7). Termed *cord rig*, the individual rigs are between 1m and 1.5m in breadth, typically averaging 1.3m in breadth and occurring in small plots of between 0.02ha and 0.5ha. Despite the distinctive character of this form of cultivation, plots of cord rig cannot be dated unless they come into contact with other archaeological features. Fortunately, in one case in Northumberland, at Greenlea Lough, a Roman temporary camp has been shown by excavation to overlie the cord rig within a system of low banks (information from A T Welfare; RCHME 1995, 104–5). In other cases, ridged field surfaces of a similar gauge have been revealed by chance below Roman earthworks (eg Rudchester; Gillam, Harrison & Newman 1973). Although a pre-Roman context for the cord rig visible on hills in the Southern Uplands is clear, there is no reason why this form of cultivation should not have continued in use well beyond the collapse of the Roman province at the beginning of the 5th century AD. Similar field surfaces dating from the 11th century AD have been recorded in Denmark (Ramskou 1981; Lerche 1981).

The dense concentration of cord rig in the Southern Uplands is partly a facet of fieldwork patterns (eg RCAHMS 1998, 44–7), but it is also a reflection of topographical factors. The peats that blanket the gentler slopes across large areas of northern and western Scotland almost certainly hide numerous examples. Plots of rig were first discovered under these circumstances on Arran (DES 1979, 34), and an extensive area of ridged cultivation was revealed beneath about

0.4m of peat on Machrie North (Barber 1997, 107–9). Other examples have been uncovered since, along Achany Glen, south of Lairg in Sutherland (Carter 1995; McCullagh & Tipping 1998). In both cases it is considered that the cessation of cultivation was closely followed by the onset of peat growth. Thus, radiocarbon dates spanning the 1st millennium AD from the base of the peats on the cultivated slopes at least provide a chronology for the abandonment of these fields (Carter 1998, 157–8). Field survey and aerial reconnaissance is also playing its part, and is beginning to throw up a scatter of examples of cord rig in the highlands. In some cases it is apparently indicated by little more than vegetation marks recorded on oblique aerial photographs. Fieldwork in Perthshire recorded several patches of cord rig that were only detectable on the ground where the thin peaty soil filling the furrows had been consumed by an intense moorland fire (RCAHMS 1990, 73, no. 151.9 & 18). The discovery of further examples will largely depend upon the extent of aerial reconnaissance into the north and west and the conditions (lighting, vegetation growth and snow cover) under which it takes place.

The presence of cord rig beneath Roman earthworks clearly shows that this form of cultivation has considerable antiquity, but it has yet to be resolved at what date the technique was first introduced and how widely it was used. A ridged surface, with shallow furrows set some 2m apart, has been recorded on the old land surface beneath a large Early Bronze Age barrow at North Mains, Perthshire (Barclay 1990), and can thus be securely dated to the late 3rd millennium BC or earlier, and early plots of ridging have been excavated at Calanais, on the island of Lewis (Ashmore 1995, 30). Narrow rigs have been found beneath peat in Ireland and are thought to date from at least the 2nd millennium BC, if not earlier (Caulfield 1978, 137, 140–2). However, no field surface of equivalently early date in the Southern Uplands has produced evidence of ridging; the probable Bronze Age fields at Ellershie Hill, Lanarkshire, for instance, where house-platforms belonging to an unenclosed platform settlement are cut into one of the lynchets, are plainly smooth (RCAHMS 1978, 110–11, no. 246).

The antiquity of ridging in the Scottish landscape, or more particularly cord rig, is thus secure. Before moving on to discuss the Medieval and later types of rig found in the Ridged Landscape, however, it is worth noting the possibility that there may yet emerge evidence of prehistoric, or at least Early Medieval, ridging that is characterised by more broadly spaced furrows than the 1.3m so typical of cord rig. As we have seen, the rigs beneath the North Mains barrow were some 2m in breadth, and a few of the rigs on the fringes of the cord rig system on Scowther Knowe in the Cheviots are of this order too. Faint traces of relatively broad ridging are often detectable amongst the clearance heaps of prehistoric cultivation systems. Most of this probably reflects a relatively recent phase of cultivation, but the possibility of an earlier date should not be automatically discounted. The traces of plots of short, irregular rigs blocking together in one of the Pitcarmick field-systems in Perthshire (RCAHMS 1990, 72–3, no. 151.8), for instance, are evidently not the remains of cord rig, but equally defy confident dating to any later period.

CULTIVATION SEQUENCES IN THE RIDGED LANDSCAPE

Although the Ridged Landscape has been presented as a single zone, survey has shown that most extensive areas of rig-and-furrow contain evidence of successive periods of cultivation. In some cases, the evidence of succession apparently relates to rigs of the same morphological type, presumably simply indicating reorganisation within the field-system, but in others the morphology of the rig changes, and the succession may represent changes in agricultural practice. There are also regional patterns to the morphology of the surviving rig-systems, and to the observed successions. The areas containing the greatest variation in the morphology of rigs and the most complex sequences of cultivation remains are the eastern Borders and the Lothians. These are described first, in order to provide a general yardstick for the successions in other areas. Those in the east – Fife and Tayside, Grampian, and Sutherland and the north – which share common traits, are discussed next, followed by the contrasting successions and rig-systems of the Western Borders, Galloway, Argyll and the North-west. This regional structure roughly embraces the whole country, but it should be remembered that the assessments that are presented are based on a limited number of sites, reflecting the patterns of survey and aerial photography, and there are often vast swathes of country between the examples that are cited.

EASTERN BORDERS AND THE LOTHIANS

Rig-systems are found covering large areas around the fringes of the Improved Landscape throughout the Tweed Basin, and along the skirts of the Lammermuirs, the Moorfoots and the Pentlands. These are most strikingly preserved in the Cheviots and on the Lammermuirs, where entire hillsides are covered with broad, sinuous, high-backed rigs, but fragments of similar systems extend up into the narrow confines of the valleys of Peeblesshire and Selkirkshire. The Cheviots and the Peeblesshire hills in the upper Tweed also contain the bulk of the cultivation terraces that have been recorded in Scotland, and there is little doubt that many of the terrace-systems are derived from rigs swinging obliquely across the slopes. Particularly good examples can be seen at Braemoor Knowe and Chatto Craig in the valley of the Kale, Roxburghshire, where broad curvilinear rigs develop into well-defined terraces. Numerous other examples can be found, and there is a good case for suggesting that all the systems of narrow terraces are the result of rigs laid out across the slope, rather than up and down it. The most spectacular example of such a system is at Romanno Bridge, Peeblesshire, where subsequent cultivation has left the terraces isolated amongst the improved fields.

This type of rig-and-furrow, often with the classic reverse-S of medieval rig-and-furrow in England (see Hall 1982), probably survives more extensively in the hills of the Eastern Borders and the Lothians than anywhere else in Scotland, but little of it has escaped a subsequent period of cultivation. This later cultivation is characterised by curvilinear grooving, which turns up on virtually every system of curvilinear high-backed rigs that has been recorded on the hills. Where superimposed on an earlier rig-system, the grooving usually conforms roughly in its layout to the underlying high-backed rigs. In detail, however, the grooves are

often set asymmetrically to the earlier rigs, and occasionally extend beyond their ends. While the underlying rigs appear to invest this type of rig with considerable relief, this is probably misleading, and it should probably be equated with the rig-systems that comprise no more than curvilinear grooving. Rarely as broad as the high-backed rigs, these are found extensively in the Cheviots, where they also overlie numerous sets of cultivation terraces, and can also be identified westwards into Lanarkshire.

While it has been suggested above that there is a class of curvilinear rigs defined by little more than narrow grooves, there are also examples of systems of relatively narrow curvilinear rigs, where the individual rigs have a well-formed rounded profile. It is not known whether this form is the same as the groove type, but simply better developed as a result of a longer period of cultivation.

Most of the other forms of rig-and-furrow that overlie systems of broad high-backed rigs, and for that matter other forms of curvilinear rigs, are relatively straight, in some cases giving the appearance that they have been laid out with a ruler. Of particular note is a type found in the hills around Hawick, defined in geometrical blocks by little more than dead straight furrows. In other instances the furrows are little more than faint grooves, but occasionally the rigs have a well-formed rounded profile. The systems of very straight rigs all appear to be late in date and some are probably associated with the agricultural Improvements. Indeed, some areas of 19th-century Improvement are defined by shallow wide-spaced grooves aligned with the stone walls. Not all the systems of straight rigs need be contemporary with the Improvements, and relatively straight grooving is found enclosed in systems of turf field-banks.

Turf-banked field-systems are not as common in the Eastern Borders and the Lothians as they are in neighbouring parts of the Western Borders and Fife and Tayside, although isolated boundary dykes are found widely. Systems of banks appear occasionally in the Lammermuirs and the main Cheviot massif, most of the recorded example comprising single enclosures or small clusters adjoining fields. Extensive systems have been surveyed near Southdean, to the west of the A68 public road as it climbs towards the Border on Carter Bar. Here it has been argued that some of the dykes may be medieval boundaries, dating from when the area fell within the royal forest of Jedburgh, or after it had passed into the possession of the Douglasses in 1320 (RCAHMS 1994, 8, 13–17), although firm evidence of their date is almost impossible to establish without excavation. Some of the enclosures are obviously multi-period, in a fashion characteristic of field-systems in the western Borders. Another good example of such a multi-period field-system has been photographed in the valley of the Penchrise Burn, Teviotdale. Typically, successive fields have been constructed within or indiscriminately across the boundaries of their predecessors. Turf-banked field-systems seem to be of relatively late date, often overlying systems of broad curvilinear rig. In instances where the boundaries are laid out in geometrical shapes with straight sides, and the grooves delineating the rigs are equally straight, they may even be contemporary with the Improvements.

FIFE AND TAYSIDE

Rig-systems are found throughout the hill margins of Fife, mainly on the Cleish Hills and the Lomonds, but they also survive in areas that have been subsequently improved around their fringes. Northwards and westwards, extensive systems can be found on the Ochils and in many of the glens penetrating back into the highlands. The lowlands of Fife and Tayside are also noted for their cropmark-responsive soils, and rig-systems come through strongly in the aerial photographic record.

As in the Eastern Borders, systems of broad, sinuous, high-backed rigs form a substantial component of this material, not only making up the greater number of the cropmark examples, but also turning up on the lower unimproved hills in the lowlands and deep up glens in the highland glens. In some cases, such as at Spittal of Glenshee, Sheriffmuir and Tullymurdoch, all in north-eastern Perthshire (RCAHMS 1990, 136–8, no. 278.1; 160–2, no. 310.7; 169–70, no. 324.3), the systems include rigs that have developed into well-defined terraces. One of the most complete rig-systems of this sort to have been recorded to date is that at Sheriffmuir, which displays many of the features that have already been described in the Eastern Borders. Along the crests of the rigs there are traces of curvilinear grooves, broadly matching the pattern of the rigs beneath, but in places apparently relating to the banks that enclose parts of the system. While it is difficult to disentangle the embanked field-system from the broad rigs, the banks enclose areas that have no evidence of broad rigs, but where aerial photographs have revealed traces of grooving. Similarly, there are large areas of the broad rigs that are apparently unenclosed. This dislocation between the areas occupied by the different types of agricultural remains, coupled with the observed relationship between the grooving and the field-banks, suggests that the broad, high-backed, reverse-S rig-system is of relatively early date here, and was probably not enclosed when it was in use.

This pattern is repeated across Fife and Tayside. Curvilinear grooving, broadly conforming to the layout of the underlying high-backed rigs occurs widely, and in places clearly exists as a form of independent rig-system. Good examples have been recorded in the Ochils, notably in Menstrie Glen (RCAHMS forthcoming), where documentary evidence has allowed the identification of rig-systems of this type and fields enclosed by turf banks that were in use in the first half of the 18th century. The stratigraphical relationships between the systems of broad high-backed rigs, the grooving, and the embanked field-systems, however, is as difficult to establish by survey elsewhere as it is at Sheriffmuir, as can be seen around Harperlees Reservoir in the Lomond Hills, and behind Murrayhill Plantation and on Knock Hill in the Cleish Hills. It appears that areas of earlier broad ridging were deliberately enclosed at a later date, and it is only the occasional bank inserted as a sub-division into a field, thus cutting across a block of the broad rigs, that hints at the probable overall stratigraphical sequence.

Amongst the cropmarks, particularly good examples of reverse-S rig have been photographed at Glendelvine and Bargarvie in south-eastern Perthshire, and at Shiells Avenue in Fife. The example at Glendelvine is notable for the blocks of rig set at right angles to each other to form a continuous patchwork across the modern fields. Other

features come through at Shiells Avenue, where there is also evidence of a multi-period system of enclosure ditches, perhaps a lowland equivalent to some of the systems of turf-banked fields recorded on the hills. In one of the blocks of rig, the furrows are noticeably far apart, and not strictly parallel, raising the question as to whether these particular features are really the remains of rig-and-furrow. Immediately adjacent, however, there are more regular blocks of sinuous furrows, some of them displaying traces of fainter and narrower intermediate furrows. Traces of similar intermediate furrows can be seen nearby at Myres Castle too. Presumably such features have come about from the splitting of broad rigs into pairs of narrower rigs.

In addition to the broad, sinuous, high-backed rig-systems and the curvilinear groove type of rig, there is what might be described as an intermediate type amongst the upstanding remains. This form of rig evidently has a more rounded profile than the groove-defined rigs, and indeed may be no more than a more developed form of that type, but the individual rigs are not anywhere near the breadth of the broad sinuous type. Typically, these systems turn up around what appear to be late 18th or early 19th-century abandonments, forming swirling blocks of curvilinear rigs. Examples can be seen at both Lurg and Craigentaggart Hill in Perthshire, and at the latter, there are also blocks of straight rigs. In these instances, the individual blocks of rigs have not been enclosed, but there are evidently turf banks in the vicinity, and the rig-system may well belong within a wider enclosed landscape.

Turf-banked field-systems are a striking feature of Fife and Tayside, often enclosing rigs defined by grooving. Systems of this sort can be seen on Outh Hill, on the Cleish Hills, Fife, with both globular and rectilinear enclosures. This system displays also the pattern of multi-period construction that has been referred to already in the Eastern Borders, with successive enclosures laid out across their predecessors. The best example of this that has been recorded is probably at Over Fingask in the Sidlaw Hills, south-eastern Perthshire, although the fields here are strikingly rectilinear. A more curvilinear system survives at Baadhead, on the northern flank of the Ochils, southern Perthshire, but what appear to be the latest elements here are rectilinear. Other systems appear to have evolved rather differently, tending to form a series of conjoined, if irregular, enclosures. Evidence that they are multiperiod can be seen at some of the junctions of the enclosing banks, but the overall impression is of a coherent system. Examples recorded in Glen Devon, in the Ochils, include an extensive system at Frandy. Here some of the fields contain grooving, which also occurs outside the system, but others are apparently uncultivated. Such a conclusion must be treated with caution, however, and in some instances the plots of cultivation may not have been defined by even the slightest of rigs or furrows. One of the rectilinear enclosures at Baadhead, for instance, contains no evidence of furrows, and yet its interior contains shadowy traces of earlier banks and trackways that have been all but levelled by cultivation. Unridged field surfaces that had been ploughed with a mouldboard plough were recorded by Pollock at Corbie, at the mouth of the Lunan Valley in Angus (1987, 389–93). At earliest, these may be of Early Medieval date, but they serve as a warning not to assume that all medieval and later cultivation is necessarily defined by ridging.

GRAMPIAN AND THE NORTH-EAST

The occurrence of sinuous, high-backed, broad rig-and-furrow extends northwards from Tayside into Kincardine and Aberdeenshire. In Kincardine, good examples are found within the area enclosed by the pale of the medieval deer park on the hills to the west of Fettercairn. As further south, grooving can often be seen extending along the crests of the rigs. Some of this rig, as on the Clermont Parks, overlooking the Cairn O Mount road, is evidently unenclosed, but a little deeper into the hills there is a system on Longside Hill that is enclosed by field-banks. The stratigraphic relationships are as difficult to unravel here as elsewhere, but they give the impression of a similar sequence to those described from further south. Not all the rig on Longside Hill is broad and sinuous. At least one of the enclosures contains relatively straight rigs of a narrower gauge and a low profile, while shadowy traces of grooving can also be detected outside the field-banks.

North of the Mounth, in Aberdeenshire, the pattern of survival becomes fragmentary, and it is more difficult to determine to what extent these sequences are present. So much of the rig has been reduced to small islands surviving in old plantations in the Improved Landscape (eg Ardlair, Kennethmont; Shepherd and Greig 1996, 18, no. 21), that all that can be said with certainty is that vast swathes of Aberdeenshire were once under cultivation in systems of sinuous, high-backed, broad rig. Two slightly curious features of the Aberdeenshire rig can be noted. The first is the sharp crest lines that are often revealed when the rigs are photographed under oblique lighting, suggesting a profile that is more triangular than rounded. The second feature is of well-defined ridges separated by broad flat-bottomed furrows. Whether either of these features reflects the original profiles of the rigs, or is perhaps the result of modification under a more recent episode of cultivation is not known. Good examples of both types have been published recently, the former represented by Aboyne Golf Course, Deeside, the latter by the Wardhouse, Kennethmont (Shepherd and Greig 1996, 8–9, no. 1; 24–5, no. 27).

To the north-west of Rhynie, in the shadow of Tap o' Noth, estate maps dating from the mid-18th century and vertical aerial photographs have revealed a pattern of enclosed fields that appears more familiar in the context of the turf-banked field-systems further to the south (Corser, work in hand). Unfortunately the whole area has succumbed to forestry, but there is little sign on the aerial photographs that the fields have developed on extensive remains of broad high-backed rigs. Indeed, the estate maps suggest that they represent multi-period agglomerations of cultivated enclosures around farmsteads that are known to have been occupied since at least 1600; the aerial photographs show that the systems continued to evolve after 1760. Elements of one of the farmsteads and enclosures have been recorded already beneath the trees, but little trace of its associated rig was visible. In itself, this suggests that the rig was not of the breadth and profile of the sinuous high-backed type known from the adjacent lowlands.

SUTHERLAND AND THE NORTH

Rig-systems are found extensively around the abandoned townships in Sutherland, most of them probably relating to the final stages of cultivation immediately prior to the eviction of the tenants at the beginning of the 19th century. They were first studied by Fairhurst in the course of his work at Rosal in Strath Naver (Fairhurst 1969). There the rigs are up to 6m in breadth and up to 0.4m high, in places forming low terraces where they run along the slopes. The individual blocks of rigs are not enclosed but the whole of the cultivated area around the township is enclosed by a near complete ring-dyke. Head-dykes of this sort, enclosing all the cultivated ground, are a distinctive feature of these northern townships and are found more widely than simply Sutherland.

The most recent detailed survey of a rig-system around a township, at Learable in the Strath of Kildonan (RCAHMS 1993b, 19–20), has revealed a very similar pattern, with evidence of both broad ridging and terraces. The sequence, however, is slightly more complex than at first appears, and it is evident that on some of the terraced plots there are not only traces of broad rigs, but also narrower forms, largely defined by grooves. It is equally clear that the head-dyke is not necessarily an original feature of the field-system around the township, since at one point it overlies a large rectangular building with a sunken floor. The central question that emerges from these observations relates to the form of the broad ridging. While much of it is curvilinear and sinuous, this appears to be the result largely of topographical considerations, and there is little of the reverse-S shape recorded widely, but not universally, amongst the rig-systems of Eastern Scotland south of the Moray Firth. In this sense these northern rig-systems compare more closely with those found around the farmsteads at Lurg and Craigentaggart Hill in the uplands of western Perthshire, than the swathes of broad ridging on, for instance, the Lammermuirs. Amongst the cropmarks in the vicinity of Inverness, however, there are traces of reverse-S rigs, notably at Ellenslea on the Black Isle.

WESTERN BORDERS

This area has seen extensive survey recently, taking in the whole of the eastern half of Dumfriesshire (RCAHMS 1998), and most of the west side of Liddesdale, in the south-western most portion of Roxburghshire immediately adjacent to Dumfriesshire. In contrast to the Eastern Borders, there is relatively little evidence of sinuous, high-backed, broad rig in this area, although no attempt was made to explore all the lowland plantations in the Improved Landscape in Annandale and on the Solway Plain. Much of this area was held in forest, and the expansion of agriculture here in the medieval period would have been through licensed enclosures, known as assarts. No certain remains of such enclosures can be identified, although both on the Dumfriesshire hills and in Liddesdale the process of intake and expansion, albeit undated, can be identified. Examples at Cowburn, Carterton and Lyneholm in Dumfriesshire reveal a sequence in which large areas, in the case of Cow Burn some 60ha, were taken in by an enclosing bank and ditch. Within the enclosure there are extensive traces of rig-and-furrow, the earliest of it in both unenclosed and enclosed curvilinear blocks on the better drained slopes

(RCAHMS 1998, 36–39). These fields are succeeded by straight rigs, some of which fall within rectilinear fields defined by turf dykes. In Liddesdale, the progressive intakes eventually enclosed most of the east side of the valley.

At Bailiehill, in Eskdale, what appears to be one such intake overlies rigs that have given rise to cultivation terraces on the western flank of the hill (RCAHMS 1998, 89–93). The extensive swathes of similar slight terracing found across parts of Eskdale and in Ewesdale may well form the earliest medieval cultivation remains to survive in this area. Essentially it appears to be unenclosed, aerial photographs giving the impression of a regular grain extending along many of the hillsides. On Bailiehill, the intake is succeeded by a complex multiperiod system of largely rectilinear turf-banked fields. These fields contain straight rigs defined by sharply cut furrows.

As we have seen in the Eastern Borders, systems of turf-banked fields become progressively more common towards the west, exhibiting many of the same characteristics as the numerous examples in the Western Borders. In the latter area they fall broadly into two categories, one being agglomerations of interconnected enclosures enclosing both curvilinear and straight rigs, the other multiperiod enclosures laid one across another. The multi-period systems of Liddesdale form particularly spectacular earthworks. Whether this division confers any more than relatively continuous use in the former, and episodic use in the latter, is not known, but in at least one case there are grounds for identifying turf-banked field-systems as the remains of outsets dating from perhaps the 16th or 17th centuries (RCAHMS 1998, 39).

GALLOWAY AND SOUTHERN AYRSHIRE

Moving westwards into Galloway from the Western Borders, the character of the surviving rig-systems changes, and a distinctive form of rig is found on the hills from the Stewartry across to Wigtownshire and up into southern Ayrshire. Typically, the rigs are curvilinear and relatively narrow, reaching no more than 4.5m at broadest, and often pinching to considerably narrower gauges towards the ends of the plots. Indeed, many of the plots give the impression that the rigs are emanating from a single point. In many of the cases that have been recorded, both by survey and aerial photography, these rig-systems form isolated pockets on the better drained hillocks and ridges in what is otherwise a very poorly-drained and boggy landscape. In some cases, these systems are composed of interlocking blocks of swirling rigs, and they appear to have been enclosed by a ring-dyke, one example of which has been surveyed around the farmstead of Fauldinchie, and another photographed from the air at Kilhern, both near New Luce, Wigtownshire. In other cases, where the ground is more broken, the plots of rig form individual fields, each occupying its own small hillock and separated from the next field by a boggy saddle or gully, as at Pularyan in Wigtownshire, and perhaps Balsalloch Hill in Ayrshire. In yet other cases, a pattern of infilling between isolated fields is apparent, these later fields often bearing more regular patterns of straight rigs. Typically, the curvilinear rigs within a field have been partly obliterated by a plot of straight rigs, or the infilling fields contain straight rigs.

It might be argued that the impression of uniformity amongst the Galloway field-systems is in part a manifestation of the overall structure of the cultural landscape – a single short, and relatively late, period of activity that pushed out into what were otherwise peat-covered wastes – but it is remarkable how little evidence of any other ridging has been recorded in the adjacent lowlands. While evidence of broad, sinuous, high-backed rig may yet emerge from low-lying plantations in Galloway, it is notably absent from any of the relatively rich cropmark record in Wigtownshire. It is also evident from the remains of the enclosures and lynchets around many of these rig-systems that they represent a considerable depth of antiquity. This is particularly so in the valley of the Water of Luce, where there are several instances of field-systems of this sort in the vicinity of farms that were monastic holdings for much of the medieval period. At Markdhu, for instance, in the peatlands, the only areas that could have been cultivated, since the area was engulfed by peat, are represented by such remains. Examination of the lower sides of individual fields of the rigs often reveals that a considerable lynchet has formed, and it is often the case that the low walls that appear to enclose the rigs are either built along the crests of the lynchets or overlie the scarp. At Stroan, in the Stewartry, some of the walls can be seen to overlie rigs, while in other places lynchets have apparently built up against walls (Dixon 1994, 46).

This distinctive type of rig-system is not the only type of rig found in the uplands of Wigtownshire. At places like Kilhern, in addition to the curvilinear plots of rigs, there are also smaller plots and blocks that have been fitted around the outcrops and the features of an earlier prehistoric landscape. In particular there are two rigs fitted into the interior of a hut-circle. These smaller blocks are evidently lazy-beds that have been cultivated with hand-tools, and it is possible that even the tapering rigs in the larger curvilinear plots are essentially lazy-beds too. In its most typical and distinctive form, at High Eldrig and Pularyan, for instance, traces of a medial groove can be seen running the length of some of the rigs, a telltale sign that they have probably been formed with relatively compact turf cheeks and a loose soil infill. It would not be wise to be dogmatic about the ways in which the systems with this distinctive layout were cultivated. Where the rigs are of some length, they may well be formed by ploughing, and it is quite possible that the distinctive plan is the result of ploughing without a formal headland around the field. In a similar manner the outer rigs on both sides of a turf-banked fields at Belhamie, Ayrshire, turn along what would have been the headland of the rigs between. Nevertheless, it is likely that a range of tools were being used on these fields, perhaps depending on the wealth of the tenant. Some of the systems are more overtly lazy-beds, with short plots and considerable variation in breadth, such as on the slopes immediately around the farmstead of Braid, overlooking Loch Ryan, but even here there are plots of longer curving rigs nearby.

Although it has been suggested that this distinctive type of Galloway rig-system extends up into southern Ayrshire, it is equally evident that other types of ridged field-system also make their appearance in the hills to the east of Ballantrae and Girvan, although it is again apparent that in some instances these have been cultivated with hand tools rather than ploughs. In part, the variation in the outward appearances of the field-systems may be no more than a reflection

of a change in the topography. The systems are not constrained by the peatlands and outcrops in quite the same way, and the surviving evidence of an arable landscape is far more extensive. Whole hillsides are covered with rigs, one of the best examples being around a farmstead at Auchensoul, not far from Barr, although even here it is evident that the rigs have been cultivated with hand-tools rather than ploughs. In this area, however, there are also extensive systems of fields defined by turf and earthen banks, in some cases forming substantial earthworks. Some, such as at Belhamie, where the top of a system survives beyond the improved ground, define individual blocks of rigs, but in many instances these banks appear to be designed to fulfill a much wider role in the division of the arable ground, and in the separation of the arable from rough pasture. Again, considerable chronological depth is apparent in these systems, with banks both overlying and overlain by curvilinear blocks of rigs.

Throughout Galloway and southern Ayrshire there is little doubt that the curvilinear rig-systems and the lazy-bed systems are succeeded by straight rigs. This can be seen in small pockets in the accretions of curvilinear plots and fields, but it can also be seen on a wider scale at places like the Gables, above Loch Ryan, where the earlier rigs falling within a pattern of later geometric enclosures have been obliterated by straight rigs. On Cairn Pat, enclosed geometric fields of straight rigs around a farmstead, probably representing an attempt to break in an area of moorland during the 19th century, provides a good example of what is to all intents and purposes a small early Improvement rig-system. In Southern Ayrshire, on Kirkland Hill, there is a rather different system of rigs dating from the Improvements, carving in straight lines across smaller plots of both curvilinear and straight rigs, and the banks that enclosed them.

ARGYLL AND THE INNER HEBRIDES

This area is relatively poorly represented in the collection of oblique aerial photographs held in the National Monuments Record, and the work for the Royal Commission County Inventory was focused on individual monuments rather than the landscapes within which they lay. Nevertheless, by a combination of the available oblique photographs and the collection of vertical photographs held by the NMRS, it is possible to make a broad assessment of the rig-systems in this area. In the first place, however, the photographs show that the topography of even the lowest ground along the west coast, broken by rocky ridges and knolls, has had a profound effect upon the layout of the rig-systems found around the abandoned townships and farmsteads. Rigs have been formed wherever there is sufficient soil to grow a crop, and are thus woven amongst the rock outcrops in patterns that defy categorisation. The broadest of impressions of this material suggests a familiar pattern, in which systems of curvilinear rigs, none of them particularly broad, are succeeded by straighter rigs, and it is also possible to detect straight rigs that are almost certainly the result of the Improvements. There are also small plots of what are evidently hand-dug lazy-beds exploiting pockets of soil on rocky outcrops between more extensive rigs in the intervening gullies.

The rig-systems that can be found throughout Argyll include examples that would be at home in southern Ayrshire or Galloway. On Bute, for example, at Bicker's Houses, there is a farmstead surrounded by blocks of both curvilinear and straight rig, the latter, at least, within geometrically defined enclosures formed by turf banks. This system compares well with the southern Ayrshire evidence, although elsewhere on the island, at Kelspoke Castle, there is a much more varied array of rigs. Even here, however, where there are some relatively broad rigs overlain by plots of short straight rigs, there is at least one plot of rigs that appears to be pinched in towards one end in the manner of the classic Galloway type. Indeed, northwards throughout Argyll this type of tapering plot can be found, examples being identified in the collection of vertical aerial photographs on Kintyre near Saddell, on the Craignish peninsular, and around Kilmichael Glassery. On the island of Lismore too, rigs with this distinctive feature at one end of a plot have been photographed at Achadun. It may also penetrate into the central highlands, an example having been recorded at Garth Beg, on the shores of Loch Garth. While this feature can be found amongst the rig-systems, it must be stressed that the majority of the blocks of rigs are not of this form, merely curving around the topographical features and often meeting neighbouring blocks at right-angles. Many of these blocks on the mainland are of considerable length and it is likely that they represent ploughing.

Enclosure has also played its part in the development of the rig-systems in Argyll, and both isolated enclosures, presumably small intakes in areas of pasture, and extensive systems have been recorded, although only one has been surveyed to date. This is around Loch Finlaggan, on Islay, where turf and stone-faced dykes enclose a wide area for both cultivation and pasture; the antiquity of this system is quite unknown, although the island site at the north-east end of the loch was a major centre of the Lordship of the Isles, its occupation certainly extending well back into the medieval period. In the rockier parts of the west coast these enclosures are not so obvious, but fragments of banks can often be found extending along the edges of the outcrops. Where their lines cut across cultivable ground sections have often been removed to make way for a subsequent phase of cultivation, as often as not represented by straight rigs that are likely to belong to the Improvements.

While the curvilinear rig-systems are found extensively around abandoned townships throughout the mainland and the larger islands of the Inner Hebrides, it is equally clear that a significant proportion of the surviving cultivation remains are lazy-beds. This is particularly the case on the smaller islands, where intricate patterns of short and long beds have been formed in amongst the outcrops. Good examples can be seen on Iona, around Dun Cul Bhuirg, and on Staffa. As in Galloway and southern Ayrshire, however, there is often no clear definition between areas of lazy-beds and blocks of plough rigs. Even in the systems that appear to be largely formed by ploughing, there is little doubt that hand tools were being used extensively to build lazy-beds on awkward pockets of ground. At one extreme, the entire arable area of a township may have been cultivated with hand-tools, and there may be little overall pattern to the lazy-beds. At the other, the entire system may be composed of what appear to be blocks of relatively long plough rigs.

Between these extremes there is a mixture of larger blocks of long rigs and small pockets of shorter ones.

THE NORTH-WEST AND THE OUTER HEBRIDES

As in Argyll, relatively little aerial photography has taken place in the north-west of Scotland, but survey of the Waternish peninsular on Skye (RCAHMS 1993a), Achiltibuie (RCAHMS 1997), and the island of Canna (RCAHMS 1999), has revealed something of the character of these landscapes and their cultivation remains. Particularly striking are the swathes of hand-dug lazy-beds that are found covering every scrap of land. In some cases, in an effort to gather up sufficient soil and peat for a crop to grow, the natural rock has been laid bare for a distance of from 2m to 5m between individual beds. In contrast to the more rounded profiles of the hand-cultivated rigs further south in Argyll and Galloway, the lazy-beds of the north-west have evidently been built. They retain a sharply angular profile with steeply sloping sides, and also include plots where the rigs have markedly asymmetric profiles. In some cases a shallow groove can be seen extending down the centre of the bed, a feature already identified in relationship to the rig-systems of Galloway and almost certainly reflecting the compact curves that were used to form cheeks along the sides, and the looser soil that formed the body of the bed between them. This feature can be seen in similar landscapes in Ireland.

Unfortunately, the pattern of lazy-bedding often represents a relatively late period of land-use, when the population was at its peak shortly before the tenants were evicted or emigrated. Thus, the visible lazy-beds tend to override all the other features in these landscapes, from the remains of buildings and other structures to the systems of banks and walls that are also found. On Waternish there were extensive systems of dykes practically the entire length of the western side of the peninsula (see RCAHMS 1993a). Some apparently served to separate the arable ground from the rough pasture, but others formed enclosures within the area that was subsequently engulfed in lazy-beds. With the late dating of the lazy-beds, it is difficult to be certain as to the antiquity of the underlying dykes and enclosures. Tacks of the mid-18th century required tenants to enclose and sub-divide the farms for both arable and pasture, and also to maintain a boundary around their farms. Thus it is fairly certain that some of the dykes here date from that period, and it may be that the pattern of enclosure is a manifestation of the pressure that the land was coming under as the population grew during the 18th century. Examination of the overall plan of some of these systems suggests that they evolved organically from either single oval enclosures or clusters of enclosures, but it is impossible to be certain whether these were originally for arable or pasture. Infilling between the enclosures appears to have taken place to create the pattern of dykes that survives today. The latest of the dykes are set in straight lines and probably relate to the alienation of the MacLeod estate in the first half of the 19th century. As to other forms of the rig that may have existed, little can be said. Apart from the lazy-beds, the only other rigs to survive are patches of straight Improved rigs, largely defined by grooves and probably ploughed. These represent the last period of cultivation in some of the enclosed fields. The broad picture that emerges

from Canna, where the entire island was mapped in detail, is much the same (RCAHMS 1999).

TYPES OF RIG IN THE RIDGED LANDSCAPE

The descriptions of the local sequences of cultivation remains above have avoided any strict classification of the cultivation remains. Deliberately impressionistic, it has barely introduced any measurements that might be employed in isolation in the definition of types, to distinguish, for instance, between broad rig and narrow rig. To do so would have risked introducing a precision that is hardly justified by the remains themselves. In virtually every area there is a myriad of different gauges, profiles and plans, as often as not reflecting the character of the topography into which the rig-systems have been fitted. Nevertheless, from these sequences several basic types can be identified, recurring from area to area. Essentially these are as follows: –

BROAD, HIGH-BACKED, CURVILINEAR RIG

This category includes the sinuous reverse-S ridging, with its connotation of the English medieval field-system, although a wide range of curvilinear forms is found. It is presumed that this type of rig is the result of cultivation with a mouldboard plough. There is no evidence that the reverse-S systems are any earlier than those with other curvilinear forms. It should also be noted that the massive headlands that characterise reverse-S rig-systems in the midlands of England have not been recorded in Scotland. The overall distribution of this type extends along the eastern seaboard from the Eastern Borders as far north as the shores of the Moray Firth around Inverness, and possibly still further north into Sutherland. In the south it also penetrates into Clydesdale and across the central belt.

BROAD, CURVILINEAR GROOVING

This form of rig has a similar distribution to the first category, very often overlying high-backed ridging, but also occurring independently. It is, therefore, not only a relatively late form of ridging, but also one that belongs to a phase of even more extensive arable agriculture than the broad high-backed ridging. It is assumed here that this type represents plough agriculture and, given how quickly experimental work has shown that raised rig will form (Lerche 1986), that the flat profile was deliberate. However, it might be argued also that the flat profile suggests a very limited period of use, perhaps as no more than occasional outfield. If the latter proves to be the case, then the antiquity of this form may be considerably greater than the various relationships described above might suggest. In effect, some of the independent grooving would be embryonic high-backed ridges. The association of many examples of this form of rig with enclosed fields should also be noted.

GALLOWAY-TYPE CURVILINEAR RIG

The classic blocks of rig of this type, pinching in like a section through the layers of an onion are at first sight restricted to Galloway and southern Ayrshire, but this feature has a much wider distribution in Argyll and the central highlands. It is arguably present in a more limited fashion in some of the systems in the highlands of western Perthshire. It is not certain how this type of ridging was formed, but in several places in Galloway there are hints of a groove running down the crest of a rig, probably a telltale sign that hand-tools have been used in these instances. However, this form might equally have come about through the use of a plough, and may relate to a technique of ploughing without the necessity of a headland extending the breadth of the plot.

NARROW CURVILINEAR RIG

In addition to the distinctive Galloway-type rig, many rig-systems along the west coast, in the central highlands, and across into western Perthshire, do not display this feature. In essence these curvilinear rigs do not have the form, breadth and height of the high-backed broad rig-systems, but nor do they have the flat profiles of the curvilinear grooving. The formation of the curvilinear grooving has already been discussed, and it might be no more than a question of the length of time under which the groove systems were under cultivation. Nevertheless, it would appear that by the end of the 18th century the plough rigs forming the arable in the immediate vicinity of many highland townships and farmsteads were relatively long and narrow and had well-defined rounded profiles.

STRAIGHT RIG AND GROOVING

Universally across Scotland the latest phases of arable agriculture in the recorded sequences involve relatively straight and narrow ridges or grooving. Some of the grooves are so straight and sharply defined as to give the impression that they have been drawn with a ruler and chiselled indiscriminately across any earlier fields or structures that lay in their way. This form is almost certainly a manifestation of Improvement. Not all the Improved rig is as starkly defined as this, but it stands out from the earlier cultivation remains by virtue of its regularity. The relatively straight grooving that turns up in geometric turf-banked fields in southern Scotland may date from before the Improvements, but this is again invariably at the end of a sequence of sequences of cultivation remains.

LAZY-BEDS

The type-fossils for this form of ridging, which by its very name assumes construction with hand tools rather than gradual formation by ploughing, mainly lie in the north-west of Scotland. Typically little more than 1m or 2m in breadth with sharply defined sides, they are an obvious feature of the north-western landscape, the patches of beds dug across peat and rock in a futile attempt to sustain a population that had

grown beyond the capacity of the land. However, as we have seen, there are hints that the Galloway-type rig-systems are also lazy-beds, and the intricate patterns of other plots of short rigs that can be found extensively in Wigtownshire, southern Ayrshire and Bute in the south, and throughout Argyll and the Inner Hebrides in the west, reveal, if a little less overtly, a unity in the cultivation remains extending the length of the west coast of Scotland. Considerable variation emerges in the breadths of the lazy-beds, some of which, but for their short length, are so broad as to suggest that they might have been formed by ploughing. Elsewhere, in the east of Scotland, lazy-beds appear to be limited to small garden enclosures attached to farmsteads and dwellings.

WATER MEADOWS

This is the final category of ridged fields that should be briefly mentioned, if only to register their presence in Scotland. The creation of these irrigated meadows, which were designed to provide an early flush of grass after the winter, is a feature of Improved agriculture. Usually found on highlands, the surface of the meadow was formed into broad ridges, and water was led from the burn or river via a series of sluices and leats into channels extending along the crests of the ridges. Thus the flooding of the meadows could be controlled. A recent survey by Iain Fraser (forthcoming) has noted well in excess of 150 documented examples, generally scattered up and down eastern Scotland and across into Lanarkshire and Galloway. Too often these fields have fallen victim to more recent ploughing, and very few now survive in anything approaching their original form or extent. Indeed, if steps are not taken to conserve the few that are left, it is likely that even this handful will be removed.

CONCLUSIONS

This survey of rig-and-furrow in Scotland has largely avoided documentary evidence for ridging, its historical context, and its place in agricultural practice (but see Dixon 1994), focusing instead on its archaeological context within the landscape. It will be evident that this landscape context is complex, and that in every area we are dealing with sequence. As far as can be seen there is no universal sequence for Scotland, but it must be remembered that the landscape context of the surviving rig-systems changes from area to area. The sequences and their final stages relate directly to when the parent settlements were abandoned, and arable land-use withdrew from more marginal areas in the uplands. Thus, if settlement withdrew from an area before the late medieval period, there is a possibility that the pattern of cultivation remains may be frozen at that relatively early point. Even with a brief episode of resettlement at a later date, the earlier fields may survive substantially intact. This sort of pattern may well be witnessed by parts of the Borders.

By way of contrast, in areas of the north-west, where the population reached its peak during the 19th century, the extent of arable agriculture probably reached its zenith at the same time. The intensity of this desperate scramble to sustain a population that was rapidly outstripping the capacity of the land to produce food has irrevocably skewed our perception

of any sequence of cultivation remains that may have existed here. Most of the evidence of sequence comes from the dyke-systems, and the lazy-beds have obscured any trace of earlier forms of ridging that may once have existed. Our view in the highlands is further obscured by the Improvement of the majority of the best agricultural land. While it would be convenient if the patterns of surviving ridging that have been recovered, invariably from the poorer soils, are representative of highland agriculture *in toto*, this is not necessarily the case. The better land may well have been held by the most prosperous and wealthy tenants, and may have been treated entirely differently. In the north-west, for instance, despite the wealth of evidence for the cultivation of lazy-beds with hand-tools, some of the ground may have been under plough, producing entirely different patterns of rig, which have since been erased by improvement. In short, had the high-backed, sinuous, broad rig that is found ubiquitously in the eastern half of the country ever been present in the west, should we expect any trace of it to survive?

Despite this caveat, there does seem to be a basic division in the country between east and west. Even with the variation in the local sequences that have been recorded, there are equally unifying threads running through the sequences that have been recorded from the Moray Firth down to Berwick on the one hand, and from Cape Wrath down to Galloway on the other. It appears that the systems of broad, high-backed, reverse-S rig that underpin the recorded sequences in the east are entirely lacking in the west. The absence of broad reverse-S rig from Galloway, despite the presence of cropmark-responsive soils, is compelling. It is notable that Galloway only reluctantly took on the mantle of Anglo-Norman lordship, and was not finally subdued until the late 13th century (Barrow 1980, 30–1). Even then Galloway maintained a reputation for its independence. The introduction of this type of rig into England is believed to be AD 700–800 in date (Hall 1994, 99), but there are no grounds to attribute such an early date to any Scottish examples, even in the south-east of Scotland. More likely it represents an Anglo-Norman introduction into Scotland, but one that found favour only in the areas subdued and most densely settled with incomers in the 12th century.

Such an interpretation is particularly attractive, for it creates a context by which prehistoric cord rig may be ancestral to the forms of rig that are found in Galloway, and ultimately the lazy-bed systems in the north-west. It is certainly difficult to envisage an evolutionary path leading from the plots of cord rig into reverse-S rig. In the south-east of Scotland the cord rig has largely been confined by later ridging to relatively high altitudes, thus creating its relatively early landscape context in that area. In the north, however, the mosaic of broken topography and bog has created niches in the landscape where it survives at a much lower altitude, in amongst other pockets of later cultivation. From this context come examples of what appears to have been cord rig cultivated well on into the medieval period, perhaps as late as AD 1400 (Carter 1995).

The resolution of the problems of dating rig-and-furrow in Scotland has yet to be systematically tackled. Nevertheless, the relative sequences that have been demonstrated above offer several opportunities where judicious excavation may allow a *terminus post quem ante quem* to be established for some of the rig-systems. These opportunities must be

pursued if we are to understand the full complexity of the archaeology in the landscape and the history of its use. It is only from these sources that we will be able to demonstrate

how the different types of surviving rig were formed and how they were used.

APPENDIX 2 HISTORIC LANDUSE ASSESSMENT

L Dyson-Bruce

This is a joint pilot project between HS and RCAHMS (Dyson Bruce *et al* 1999). The project was conceived to identify, assess and map relict archaeological landscapes within the current landscape, the resultant information to be then plotted on tracing paper overlays at a scale of 1:25000 and finally be digitised within a GIS. The maps are then within a wider GIS which enables overlaying and comparison with other data sets within GIS (currently *circa* 85 layers, eg Macaulay Landcover, NMRS, Contours, OS Basic Scale etc).

The project has been developed from the initial work carried out in Cornwall, where Relict Landscapes were identified and mapped on paper maps in various stages (Types, Zones and Areas). This important step towards dealing with archaeological landscapes has generated further development and work including an MSc Thesis on Historic Landuse Assessment (HLA) based on Mar Lodge Estate, which has led, in conjunction with the work at HS and RCAHMS, to the development of the HLA methodology.

The methodology is relatively simple, the OS Basic Scale maps, 1988 AP (all of Scotland) coverage and other map data are assessed and the resultant data synthesised and plotted on 1:25000 OS sheets. This scale was chosen as it was neither too broad nor too small a scale, to allow efficient and effective coverage of relatively large areas without too great a loss of detail. Maps at 1:25000 still retain field boundaries, and are compatible with the all-Scotland AP coverage at 1:24000. The areas are initially coded as to their current landuse and then relict areas are identified and plotted within.

The pilot project areas have been selected to reflect different landscape within Scotland all exhibiting different characteristics. These areas have included:

- a) Skye – Waternish (subject to an Afforestation Land Survey), and Trotternish (having had no formal survey) – to compare with the adjacent area
- b) Fife – St Andrews – an intensively agricultural area with extraction and forestry,

Cleish – with forestry, pasture and widescale extractive industrial activity and recent development
- c) Orkney – to assist in the assessment of World Heritage Status
- d) Liddesdale – an area subjected to an ALS, with issues including forestry and land drainage
- e) Antonine Wall (East) – to place this monument within its wider landscape context.
- f) Cairngorms – (areas within Speyside and the Mar Lodge Estate have been subject to an ALS), to assess part of the Cairngorm Partnership Area.

Each area surveyed with this new methodology has yielded surprising results, not only in the variety of archaeological landscapes identified but the range of current landuse types within which one sees these relict landscapes. As far as rig and furrow groups are concerned HLA is an excellent mechanism for identifying and mapping relevant landscape units, succinctly in a pragmatic and cost-effective manner. Rig and furrow can be readily identified and assessed using HLA, and the results used to direct further studies to the most potentially productive and interesting areas.

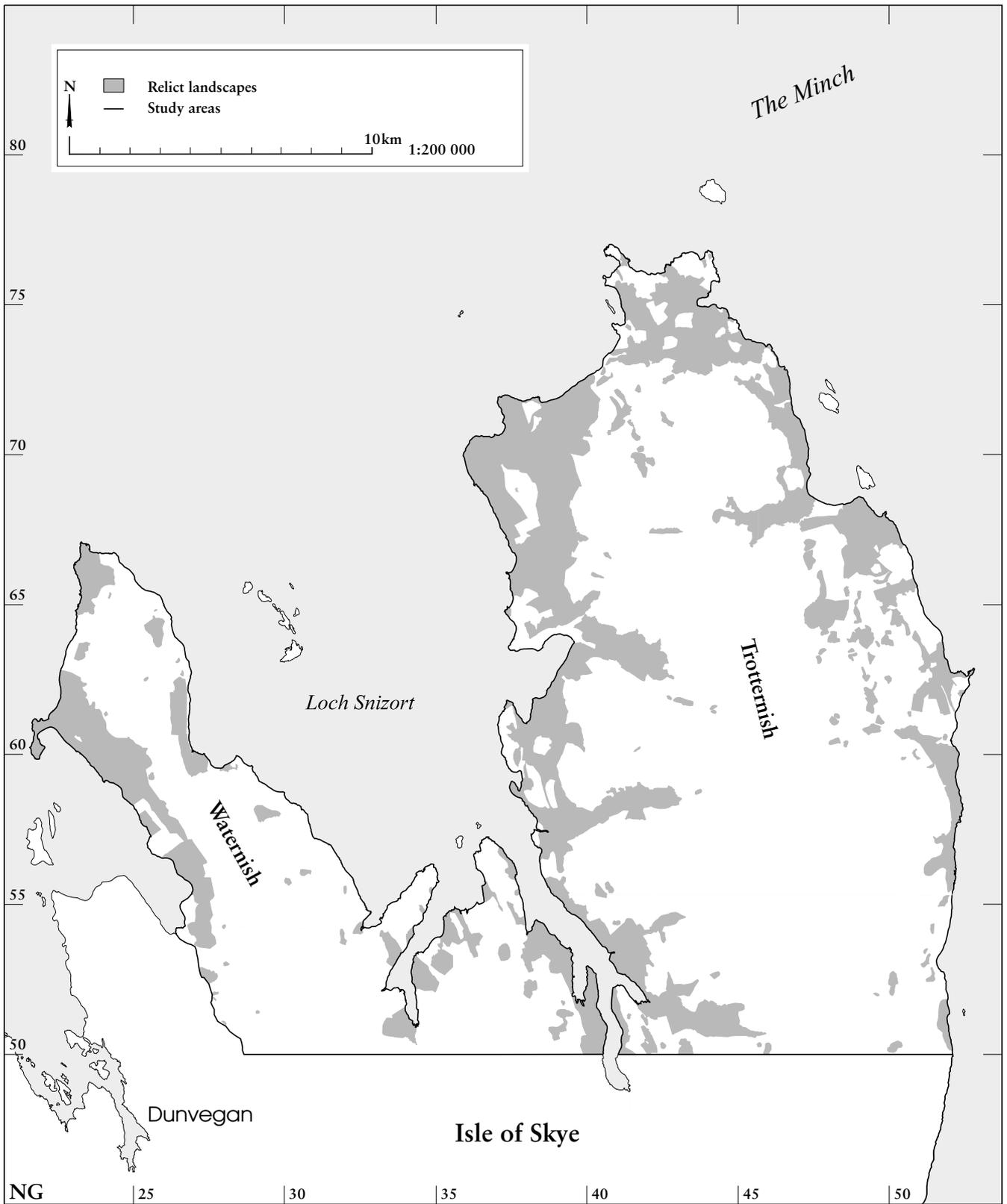


Illustration 1. Survey of the Waternish peninsular on Skye

APPENDIX 3 ANALYSIS OF CULTIVATED SOILS IN FOSSILISED RIG AND FURROW

S P Carter & I A Simpson

INTRODUCTION

The purpose of this appendix is to provide a brief overview of the analytical techniques currently available for the study of ancient cultivated soils and specifically those relevant to soils in ridged fields. The value of any one analytical technique, or combination of techniques, to the analysis of a particular site will be dependent on site conditions and the particular research questions being asked of that site. This overview attempts to show what is possible but it must be remembered that this will not always match what is either desirable or feasible at specific sites.

Soils can potentially provide evidence for three aspects of agricultural practice:

- Tillage: how was the soil prepared prior to planting?
- Manuring: what materials were added to fertilise the soil?
- Cropping: which crop plants were grown?

In each case, the evidence is provided either by modifications to the organisation of the existing soil or by the addition and loss of soil components. Various analytical techniques are available to detect, characterise and quantify these modifications and these are summarised below. The value of this evidence for agricultural practice is constrained by three principal factors, which are also discussed further below:

- Persistence of evidence;
- Availability of control soil samples;
- Evidence for age and duration of activities.

AGRICULTURAL PRACTICES

Tillage

Tillage involves the re-distribution of soil on scales ranging from whole fields to microscopic disruptions and the appropriate technique to record these effects varies with the scale. Evidence can survive that indicates the types of tools and methods of traction used, and also the deliberate or accidental impacts of that tillage regime on the soil. The largest re-distributions include the deliberate creation of ridges, raised beds and terraces as well as accidental by-products of cultivation such as lynchets. The sheer size of these features makes them highly persistent in the landscape and, because of their size, it also follows that they are best studied in the field. Tool marks, although much smaller in scale, should also be analysed in the field with records of their size, shape, orientation and inter-relationships which provide evidence for the types of tools and how they were used. Tool marks generally only survive to be recorded at the base of a cultivated soil horizon and are susceptible to destruction by continued cultivation and soil processes.

Moving further down in scale, tillage frequently results in the mixing of pre-existing soil horizons. This may be

apparent in the field, by comparison with uncultivated soil profiles, but more definite information can be obtained from soil thin sections, particularly in cases where subsequent pedogenesis has masked the field evidence. Thin sections can also provide evidence for soil microstructural and other microscopic changes induced by cultivation but these are highly susceptible to destruction unless the soil experiences rapid and deep burial.

Manuring

It is clear from archaeological evidence that manuring has been practised for several millennia and a wide variety of organic and inorganic substances have been applied in the past to enhance soil conditions for crop growth. The general heading of manuring includes the creation of wholly artificial soils (plaggen soils) through the collection and application of bulky inorganic materials to fields. Manures applied to arable soils potentially comprise a wide range of materials. In traditional agricultural systems in Scotland, organic matter sources may include turf with different types of vegetation cover; excreta from a range of different domestic livestock as well as from humans; food wastes and, in coastal areas, different types of seaweed. Mineral materials are also applied, including turves, ash from hearths and calcareous shell sand. All these materials may have a range of different routes from source to the arable field and are modified as the pathway progresses; further modification of the original material arises with decomposition processes in the soil; these materials rarely survive in identifiable fragments. This complexity of sources, pathways and decomposition demands precise analytical techniques if the details of early soil manuring practices are to be recognised. Recent investigations using experimental approaches have indicated that molecular biomarkers can provide the means of elucidating manuring processes.

The possibility that molecular biomarkers might prove a useful tool in tracing the occurrence and type of manuring episodes in early arable soils has recently been advanced. Lipids are known to be recalcitrant compounds in organic cycling and recent analyses have suggested that manure identification may be possible through the excreted sterol and bile acid products of mammalian gut flora. These analyses have indicated that the major stanol present in the faeces of herbivorous mammals is 5-stigmastanol, a product of reduction in the rumen of the plant lipid sitosterol, while coprostanol has been identified as the most abundant 5-stanol in the faeces of omnivorous animals such as humans and pigs. Distinguishing between omnivorous manure origins may also be achieved through comparative analyses of individual secondary bile acid compounds. Comparison of bile acid fractions in the faeces of human, pig and cow has demonstrated that hyodeoxycholic acid is a biomarker of pig faeces, with deoxycholic acid absent. In an archaeological context, lipid biomarkers have been used to successfully trace cattle manure application in arable soils managed over thirteen years as part of the experimental Butser Ancient Farm site in Hampshire, while lipids of manure origin have been identified in Bronze age arable soils in Orkney, indicating that such compounds can be retained in archaeological soils over long periods of time.

As yet there is only limited evidence to suggest that molecular biomarkers may indicate seaweed application to arable soils. Preliminary analyses from relict and fossil cultivated soils in Scotland has indicated a number of possible molecular biomarkers including fucosterol and its possible diagenetic products, gas chromatography – combustion – isotope ratio mass spectrometry (GC-C-IRMS) analyses to establish ^{13}C values of individual fatty acids, compound specific ^{15}N analyses of individual amino acids and polyphenolic constituents. Compound specific ^{15}N analyses of hydrophobic amino acids have also provided empirical evidence to distinguish between cereal and grass cover in early managed soils in Orkney.

Inorganic components of manures are much more stable and therefore are highly likely to persist in cultivated soils. They can include fragments of artefacts and exotic materials such as shell sand but much may be undiagnostic soil-derived mineral grains of little interpretative value. They may well have a detectable impact on the inorganic chemistry of the soil but they can also be recovered and studied as macroscopic fragments from bulk sediment samples and studied as microscopic fragments in thin sections.

Cropping

Independent evidence for crops grown on cultivation ridges is only likely to be obtained from the detection of pollen from crop-plants remaining in the soil. Limited dispersal of pollen from crop-plants makes local growth simple to substantiate but this advantage is countered by the limitations of pollen identification at species level and poor survival of pollen in surface soils.

CONSTRAINTS TO INTERPRETATION OF RIG AND FURROW

Persistence of evidence

The question of the survival of evidence has been mentioned in the preceding sections and it is clear that it is highly variable. In most circumstances, abandoned rig remains at the ground surface and therefore continues to develop as a soil. Soil biological activity will rapidly re-work the near-surface soil horizons and destroy any small-scale structural or morphological features; it will also degrade any residual organic components. Biological processes will interact with chemical processes and promote the development of new soil horizons with distinct chemical and morphological properties. The key variable in these processes is time; the longer the time interval the greater the loss of original, cultivation-derived, soil properties. Most of the surviving rig and furrow was apparently last cultivated between 150 and 300 years ago and the precise date of abandonment and any one site will exert a strong control over the survival of archaeologically useful information.

Availability of control samples

Much of the analysis discussed in this report relies on the use of control samples in order to identify and interpret cultivation-induced changes to soil properties. Confidence in interpretations of cultivated soil properties will be greatly enhanced if parallel analyses have been undertaken on suitable uncultivated control samples. The collection of control samples presents genuine problems, both practical and methodological. From a practical point-of-view it may prove difficult within the confines of a developer-funded project to justify expenditure on, and gain access to, uncultivated land adjacent to the study area. Clearly, the need for control samples should be stressed in any brief provided for the work. From a methodological point of view it may not be possible to identify a suitable uncultivated control. The site may be surrounded by a large area of cultivated soils or, even if there is a local limit to cultivation, this may follow a natural soil boundary and therefore cannot offer a control either. Frequently, isolated areas of cultivation occupy entire well-drained knolls and are surrounded by uncultivated bog which does not match the state of soils on the knoll prior to cultivation. It is inevitable that control samples will not be available in some situations and this must be taken into account when planning analyses and interpreting results.

Evidence for age and duration of activities

Areas of rig and furrow are likely to possess long and complex histories of changing agricultural practices as only in exceptional cases will an area of rig have been created, used and abandoned within a few years without modifications to tillage and manuring or change of crop. Change through time is likely to include both elements of short-term cycles: fallowing and crop rotations, and longer-term change induced by economic, demographic and tenurial factors. It is easy to arrive at unrealistically simplistic conclusions about the past agricultural history of an area simply through an absence of evidence. For example, an abandoned rig may yield pollen of barley, indicating that this crop was probably grown on the rig, but this is all that the information can tell us. It provides no evidence of when barley was grown and for how many years. It cannot exclude the possibility that other crops were also grown on the rig, maybe for longer than the barley, or before it. In other words care must be taken not to argue simply from negative evidence.

In many cases it may prove impossible to identify either the date or duration of a particular activity. However, any study should attempt to provide maximum chronological control for its site. This may come from documentary evidence, field stratigraphic control or dateable stratified artefacts. In all cases, the degree of chronological control should be clearly understood and brought into any discussion of the evidence for agricultural land-use.

Summary of current prospects

Table 1 provides a summary of the preceding discussion, listing the various types of evidence for agricultural practice, their relative persistence, and the analytical techniques

Evidence for agricultural practice	Persistence of evidence	Analytical techniques					
		Field recording	Bulk sample processing	Chemical analysis (inorganic)	Chemical analysis (organic)	Thin section analysis	Pollen analysis
TILLAGE							
Deliberate bulk soil movement: eg ridging	***	***					
Accidental bulk soil movement: eg lynchets	***	***					
Tool marks	*	***					
Soil horizon mixing	**	**				***	
Change in microstructure	*					***	
MANURING							
Organic manures	**		**	*	***	**	**
Inorganic manures	***		**	**		***	
CROPPING							
Pollen from crop plants	*						***

*Table 1. Summary of types of evidence and relevant techniques for analysis of cultivated soils in fossilised rig and furrow. (Persistence: * = low, ** = medium, *** = high)
(Value of analytical techniques: * = low, ** = relevant, *** = highly relevant)*

currently available for their study. This table highlights the current prospects for analysis of rig and furrow soils.

The analysis of tillage can be divided broadly into persistent large-scale features that can be studied in the field and less persistent small-scale features that require the microscopic approach of thin section analysis. There are good prospects for the future if greater emphasis is placed on field recording; the role of thin sections is likely to be limited by problems of persistence of micro-features.

The study of manuring practice from soils evidence is still relatively undeveloped and offers considerable prospects. Recent research into the application of thin section, inorganic and organic chemistry techniques have all yielded positive results and more progress is possible. The decomposition of organic manures remains a problem but development of more sophisticated analyses of the organic residues that do survive may allow more detailed reconstruction of the original nature of organic manures in the future.

Techniques for the identification of crop plants from soils evidence are currently limited to pollen analysis. It seems unlikely that the taxonomy of pollen will improve in the near

future so the restrictions caused by the inability to identify specific crop plants will remain.

The overriding problems caused by the lack of chronological control, absence of surviving evidence, and a lack of suitable control samples remain. Whilst it is not possible to totally overcome these problems, greater efforts should be made to minimise their impacts through best use of any available chronological/stratigraphic information, careful planning of sampling programmes and the use of appropriate analytical techniques.

FURTHER READING

*Some 8 publications have been identified thus ** in the bibliography as examples of recent work in Scotland that illustrate the application of analytical techniques to the study of abandoned cultivation soils. They reflect the current position (1998) and show what can be achieved at present; it is anticipated that on-going research will make significant progress in the near future.*

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