

# Scottish Agriculture before the Improvers—an Exploration

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THE story of Scottish agriculture in the centuries between the break-up of the great monastic estates and the dawn of the improving movement is a neglected subject:<sup>1</sup> when historians have paid it any attention, their examination has always been cursory and often polemical, looking down the wrong end of the telescope in order to find examples of 'bad' seventeenth-century practice to contrast with 'good' eighteenth-century innovations.<sup>2</sup> The first intention of this paper is to plead for (rather than to carry out ourselves) a more intensive and sympathetic investigation of Scottish peasant farming in the social and economic *milieu* of its day: our second intention is to try to explore some of the uncharted country in search of the main trends of the period. No one would wish to deny that the structure of farming was basically unaltered between 1600 and 1700, that it was associated with run-rig and the open fields (usually on an infield-outfield pattern, though capable of wide variation) or that it was technically inferior to the best or even to the average English husbandry of the time. But the universality of an inefficient system does not mean that it was everywhere static—or in decay, as some have suggested—nor was its continued survival throughout the century determined only by ignorance of better things.

## I

The factor which has oppressed most commentators on Scottish farming in the seventeenth century is the incidence of severe dearth, the dreadful instance of the so-called "Seven Lean Years" in the 1690's being the example that springs first to everyone's mind.<sup>3</sup> There is no doubt that the country did experience sharp alternations of high corn price, accompanied by wide-

<sup>1</sup> We are indebted to Dr Roy Sturgess and Mrs R. Mitchison for several helpful criticisms of an earlier draft of this paper.

<sup>2</sup> This cannot be due so much to the scarcity of sources as to their scattered nature. See G. Donaldson 'Sources of Scottish Agrarian History before the Eighteenth Century', in *AHR*, VIII, 1960, pp. 82-90.

<sup>3</sup> In some districts the "famine" was four years in length, in some five years, and in a few six years: generally it affected the crops from 1695 to 1699. The term "Seven Lean Years" was a Biblical image that has frequently misled historians into taking the phrase at its face value.

spread mortality in town and country, and periods of very low price (which have been largely overlooked) when producers had difficulty in disposing of their surpluses. But such vacillations are normal in a society where a high proportion of the population still produces most of its own grain requirements—abundant harvests produce many sellers but few buyers, bad years many buyers but few sellers.<sup>1</sup> In seventeenth-century Scotland this pattern would certainly be confirmed by low yields and high fixed rents largely paid in grain—that is, in so many bolls of oats, bere, and sometimes wheat, in predetermined proportions. Generally 25 or 30 per cent of the average annual harvest was retained for seed, possibly another 30 per cent was handed over to the landowner and either consumed in his household or marketed, and the remainder was either eaten or sold by the tenant.<sup>2</sup> Thus in good seasons both lairds and peasants were competing in large numbers for a small market: in bad seasons the peasant's margin for sale vanished, and even the laird's might go if full rents could not be met except by the peasant dying of hunger. In really bad years the peasant was reduced to eating part of his seed-corn, and this invariably resulted in a double season of dearth as insufficient was left to put back into the land to give a full crop the following year. Without a complete alteration in the structure of farming and of the whole nature of Scottish society—and this certainly did not take place—some severe famines were only to be expected. Thus stagnation or decay in a system of peasant agriculture cannot be proved merely by a chronic tendency to years of high grain prices, though increasing incidence of high prices over a long period might prove the inability of grain output to keep pace with population. But were the years of high price becoming more frequent? The evidence does not suggest that this was the case. Lythe has shown how, in the sixteenth century, the leaps in price were enormous, especially after 1570. The position was certainly complicated by chronic debasements of the coinage, but the frequency of bad harvests is clear. He identifies from price series and literary sources about seventeen years between 1550 and 1600 in which the harvest failed over a wide area—"each food shortage drove the price of grain and grain products to a peak from which subsequent recession

<sup>1</sup> See J. D. Gould, 'Agricultural Fluctuations in the English Economy in the Eighteenth Century', *Jnl Econ. Hist.*, xxii, 1962.

<sup>2</sup> Mackintosh's statement in his *Essay on Ways and Means for Inclosing*, Edinburgh, 1729, pp. 59-60 that "the third corn in oats, and fourth in bear" was the average return is broadly supported by other eighteenth-century opinion. Rent was traditionally reckoned at the third corn, and that the two were approximately equal in size is illustrated by an incident in Angus in 1672, when the tenant petitioned to be excused his whole rent as thieves had stolen his seed oats—Scottish Record Office (henceforth S.R.O.), Dalhousie Muniments, 18:721.

was never more than partial."<sup>1</sup> The seventeenth century (see Appendix) began with a period from 1602 to 1630 when years of higher-than-average prices were relatively rare, interrupted by one or two seasons of dearth in the 1620's. Debasement had been stopped by the Union of the Crowns, but, due also to "a combination of better harvests and political stability" food prices were generally less liable to fluctuation.<sup>2</sup> From 1630 to 1660, natural harvest failure, exacerbated in the last decades by civil war and the presence of an English army of occupation, again produced many years of high price (with some very low ones in the 1650's). It is reasonable to suggest altogether fifteen or twenty seasons in which harvest failure was widespread between 1600 and 1660.

In the next half-century (down to the Union of 1707) bad harvests were rare: prices fell from the high levels of the Civil War and Interregnum, widespread dearth occurred in 1674-5, very severely from 1695 to 1700, and less sharply in 1690—in nine seasons in the east of Scotland at the most generous estimate, though our data do not show local scarcities in the west such as the dearths at Dumfries in 1681 and at Ayr in 1702. Contemporary complaints were almost all of glut, and inability to sell.

Finally, after the Union until 1760, most regions experienced remarkably stable prices, showing a tendency to lift until 1725, and again from 1745, but without more than four seasons of unusually high prices. If these figures mean anything, it is not to support the notion that agriculture was deteriorating. On the contrary, scarcities appear to occur less often and at longer intervals until on the eve of the Agricultural Revolution, which was to destroy the old farming system after 1750, they were a rare phenomenon indeed.

The evidence from imports and exports confirms the trend. It was to the Baltic that Western Europe normally looked to relieve her grain shortages for most of this period, and good statistics of Scottish-Baltic trade are available from the later sixteenth century onwards. The table on p. 76 sets out westward shipments of grain and flour carried in Scottish ships bound from the Sound.<sup>3</sup> This table blurs the relationship between years of scarcity and heavy imports, but the correlation was a close one and in cheap years nothing at all was imported. Even at an early date Scotland could clearly feed herself in times of reasonable plenty.

<sup>1</sup> S. G. E. Lythe, *The Economy of Scotland in its European Setting, 1550-1625*, 1960, pp. 15-23, 110-11.

<sup>2</sup> *Ibid.*, p. 16.

<sup>3</sup> *Tabeller over Skibsfart af Varetransport gennem Øresund*, edd. N. Bang and K. Korst, Copenhagen and Leipzig, 1909-45; S. G. E. Lythe, 'Scottish Trade with the Baltic, 1550-1650' in *Economic Essays in Commemoration of the Dundee School of Economics*, ed. J. K. Eastham, 1955.

## ANNUAL AVERAGE, IN BOLLS (to nearest 00)

1562-9	3,600	1630-9	5,400
1574-9	7,200	1640-9	4,400
1580-9	3,700	1661-9	200
1590-9	7,300	1670-9	1,300
1600-09	3,300	1680-9	2,000
1610-19	1,600	1690-9	300
1620-9	5,800	1700-9	100

The break in the volume of Baltic imports at mid-century is so unmistakable as almost to suggest these times of plenty had come to stay: in fact it can be partly explained by the partial replacement of the Baltic by English and Irish suppliers. The scattered customs sources of the early seventeenth century indicate that soon after 1600 some ships were returning from England with grain, and at Dundee England became the main source of relief from the famine of 1642, after those of 1622-3 and 1636-7 had been supplied from the Baltic.<sup>1</sup> After the Restoration, when port-books are more plentiful, little or no import is recorded except in one or two isolated years like 1674 when supplies were mainly English or Irish.<sup>2</sup> Undoubtedly, too, the famine of 1695-1700 was relieved mainly from British sources, bounty returns for 1699 indicating an import of about 26,000 bolls in six weeks, of which only 20 or 25 per cent can be reckoned as Baltic, the remainder being English or Irish.<sup>3</sup> In sum, the evidence of imports, while it does not suggest that needs were much smaller in times of famine at the end of the seventeenth century than they had been a century earlier, certainly backs our claim that dearth was occurring more infrequently after 1660. In the long run the need to import was declining significantly.

In a similar way, evidence on the export side points clearly to increasing sales abroad rather than to the diversion of corn from foreign markets to keep up with demand at home. In the second half of the sixteenth century there are few signs of export on any scale even to regions that later became important, but after 1600 grain is sent quite regularly to England and Scandinavia, London alone taking nearly 14,000 bolls in the good year 1625-6.<sup>4</sup> During the Restoration period little was sent to England due to customs' policy in the south, but Holland emerged for the first time as an important consumer of Moray and Lothian bere, and Scottish grain was even shipped *into* the Baltic, an average of 2,000 bolls a year entering between 1675 and 1685. By now, however, Norway and western Sweden had become the

<sup>1</sup> Lythe, *Scottish Economy*, pp. 219-20; Dundee City Archives: MS. shipping lists of the port of Dundee. We are indebted to the civic authorities for permission to examine these.

<sup>2</sup> S.R.O. Customs Books (Second Series) E.72.

<sup>3</sup> S.R.O. Customs Accounts, E. 73.126.

<sup>4</sup> Lythe, *op. cit.*, p. 220.

principal customers, and the grain trade provided the normal means of financing most of the wood trade, Gothenburg alone taking 10,000 bolls in 1667 and 22,000 in 1685.<sup>1</sup> The latter year was clearly most exceptional, plentiful supplies at home contrasting with famine in Scandinavia: the port-books show an export of 103,500 bolls from Scotland north of Fife—a remarkable figure compared to known imports to Scotland in time of dearth.<sup>2</sup> While the later 1690's saw a virtual cessation of this trade, it revived again after 1700 and especially after 1707. The table below states the export of grain from Scotland to beyond Britain from 1707 to 1752.<sup>3</sup>

## ANNUAL AVERAGE IN BOLLS (to nearest 00)

1707-12	55,900	1733-7	71,200
1713-17	95,300	1738-42	53,900
1718-22	115,000	1743-7	79,500
1723-7	59,200	1748-52	98,000
1728-32	40,300		

After 1707, this annual exported surplus was supplemented once again by considerable consignments to England, Chalmers holding that the perceptible rise in grain prices after the Union was entirely due to the admission of Scottish corn into the English market.<sup>4</sup> It is hard to escape the conclusion that in the century between 1650 and 1750 far more grain was sent out of Scotland in time of plenty than ever came in in time of dearth, and that this reflected a substantial improvement in domestic supplies.

In the later seventeenth century there was a striking change in government policy away from protecting the grain consumer and towards positive protection for the producer. This became obvious almost at once after the Restoration, and reached its culmination firstly in the prohibition of imports (except by express Privy Council permission in times of high price) in 1671, secondly in the Corn-export Bounty Act of 1695, and thirdly in the extension of the bounty system after the Union by an Act of the Westminster Parliament in 1707.<sup>5</sup> Now it might be argued that the shift from imports to exports was rather a consequence of this policy than of domestic changes in corn supply, but such a view would be hard to sustain. Traditionally, the Convention of Royal Burghs was the consumers' mouthpiece, since it was the

<sup>1</sup> I. Lind, *Göteborgs Handel och Sjöfart 1637-1920*, Gothenburg, 1923.

<sup>2</sup> S.R.O. Customs Books (Second Series) E. 72.

<sup>3</sup> G. Chalmers, *Caledonia* (Paisley edn, 1888), III, p. 33. The same source suggests that imports from all sources did not average more than 25 bolls a year until the dear years around 1740.

<sup>4</sup> *Ibid.*, p. 34.

<sup>5</sup> *Register of the Privy Council of Scotland*, Third Series, III, pp. 331-2; *Acts of the Parliaments of Scotland*, IX, p. 458; *Statutes*, 6 Anne 29, ch. 13.

urban communities that were most nearly divorced from production. Before 1650, the Convention had shown itself on many occasions to be in favour of free import and restricted export. Between 1660 and 1680, this body suffered a change of heart, and came to favour free export, even taking the lead in persuading Westminster to extend the bounty system after 1707.<sup>1</sup> Had consumers suffered under the new policy, not only would burghal prices have risen instead of falling after 1660, but the Convention would certainly have remained an advocate of free import. As it happened, their conversion, like the general conversion of official opinion, was a consequence and not a prime cause of more grain being offered for sale abroad.

The argument as we have developed it so far indicates not a *per capita* deterioration in home food supplies, but a situation in which in the long run dearth was tending to decrease, imports were declining, exports were increasing, and contemporary policy adjusting itself to new circumstances. Scotland, in other words, was becoming rather better fed from domestic supplies. The next question is, how far could this be attributed not so much to a real *per capita* increase in Scottish production as to an improvement in marketing?

## II

Certainly one of the most striking changes in the seventeenth century appears to be an increase in the quantity of agricultural goods marketed rather than consumed on the spot—and this comment applies to livestock as well as to grain. The decline of the landowners' private followings of retainers who had been clothed and fed at baronial expense and used in feud and civil war throughout the Lowlands before the end of the sixteenth century may partially account for this. As Dr I. F. Grant puts it—"wealth was spent rather in a display of luxury and elegance than in maintaining a following . . . the modern dining room was at this time taking the place of the baronial hall."<sup>2</sup> The displaced may have emigrated or found a foothold on the land, but others went to swell the growing urban communities of Central Scotland. Edinburgh and Glasgow both appear to have doubled or even trebled in size between 1560 and 1700 and went on increasing to 1750 and beyond, while new small communities mushroomed along the Forth—places like Prestonpans, Bo'ness, Alloa, Wemyss, and Methil, all based on non-agricultural activities such as coal-mining, salt-panning, and shipping. Their rate of growth often startled contemporaries: "all the townes that were built in the last age are very much increased in buildings by what they were then,

<sup>1</sup> *Records of the Convention of Royal Burghs*, ed. J. D. Marwick, 1866-80, iv, pp. 23, 48, 72.

<sup>2</sup> *The Economic History of Scotland*, 1934, pp. 160-1.

but severalls are built wher ther were non in the last age: this is most remarkable upon our firths and rivers. Ther was a Gentleman died since the year 1660 who remembered that ther was but one house wher now there is the town of Borrostonesse, Grange Pans, Bridgeness, and Cruss-about-pans which make now two large parishes."<sup>1</sup> The need for food in an area like this must have exceeded the local ability to produce, and it is hard to see how this urban development could have taken place without a corresponding growth in imports, an increased incidence of dearth, or a consistently upward trend in prices, unless more food had been reaching these towns from inside Scotland.

At the same time, the lairds who had disbanded their retinues found themselves with a larger and more regular surplus for sale. One sign of this was in the greater diffusion of country trade outside the royal burghs and, to a very striking degree after 1660, outside the burghs of barony and regality as well. The following table, adapted from A. R. Ballard's article published as long ago as 1916, of Acts of Parliament authorizing markets and fairs shows this very clearly.<sup>2</sup>

	MARKETS AUTHORIZED IN		
	ROYAL BURGHS	UNFREE BURGHS	NON-BURGHAL SITES
1517-70	7	25	1
1571-1660	11	75	10
1660-1707	1	51	246

The astonishing increase in rural trading centres after the Restoration probably reflects the declining power of the royal burghs to obstruct a change that would otherwise have come about earlier and more gradually. Still, no one seeks the right to set up a market unless he has a surplus to sell, and the creation of markets on this scale must have done a great deal to facilitate the disposal of such surpluses in the second half of the century. Many of the new markets were for stock—Skene of Hallyards in 1663, for example, recommended Dunblane on Whit Monday as best for buying cattle for fattening, Carnwath on the 24th of June and Peebles on the 11th of June as best for lambs, Edinburgh on Trinity Monday as best for milk cows and Linlithgow on Magdalene Day for a variety of animals. A few were for victual, as at Minigaff in 1684 where the local mossmen bought meal and malt on Saturdays. The Kelso market was primarily for wool and served a large area. Many more were highly miscellaneous in character, like the two annual

<sup>1</sup> National Library of Scotland, MS. 33.5.16, Sir Robert Sibbald, "Discourse anent the Improvements may be made in Scotland. . ." (henceforth N.L.S. Sibbald's "Discourse"), f. 12.

<sup>2</sup> A. Ballard, 'The Theory of the Scottish Burgh', *Scottish Hist. Rev.*, XIII, pp. 16-29.

markets at Portree on Skye, selling horses, cows, sheep, goats, hides and skins, butter, cheese, fish, and wool, or the four annual Wigton Fairs selling horses, cattle, and cloth.<sup>1</sup>

There seems to be little indication here of wholesale trade in grain, yet it is first after 1660 that evidence grows for a much augmented coastal traffic in corn between the producing areas of the north and the consuming centres of the Forth. The merchants of Edinburgh, and also those of Dundee, Montrose, and Aberdeen, played a big part in this from Angus to Caithness; their method of contracting with landowners for their annual crops and grain-rents and shipping it south themselves perhaps by-passed local markets. In the wars against France after 1689 the victual ships were a lifeline that enemy privateers struck at immediately, and anxiety in the contemporary press is a measure of the reliance of the growing towns of the south on this source of supply.<sup>2</sup>

It may fairly be concluded from this that in certain regions best placed for the market there was in the seventeenth century an important increase in farming for external sales at the expense of subsistence farming for baronial consumption. This was obvious in the cattle trade, where the Union of the Crowns had permitted such a growth in droving for the London market that the value of black cattle sent to England sometimes accounted for more than half the total exports to that country, and in some years already touched the figure of 60,000 head.<sup>3</sup> Galloway was probably the area most closely affected, as it was here that Dunbar of Baldoon set up a ranch for 1,000 cattle and a group of landowners were agitating for fixed and defined drove roads in the 1680's.<sup>4</sup> It is perhaps also true of the wool trade, for there are signs that the pacification of the Borders after 1603 was followed in the eastern Border counties by clearances for sheep farming on the classic pattern. It is certainly true of the grain trade on coastal estates on the east side of the country, where examination of rentals and other papers shows that there was hardly a considerable family on such lands north of the Tay which was not shipping grain or meal either coastwise or abroad: the Earls of Glamis, Kincardine, Seafield, Buchan, Panmure, and Sutherland may be taken as typical of this group.<sup>5</sup> It also was obviously true of estates in the immediate region of the larger burghs, as at Tranent where the "great trafique of mercheandis" was

<sup>1</sup> Alexander Fenton, 'Skene of Hallyard's Manuscript of Husbandrie', AHR, XI, 1963, p. 68; A. Symson, *A Large Description of Galloway*, Edinburgh, 1823, pp. 30, 34-5; S.R.O., M.P. bundle 259:2, letter from Alexr. Baird and Robt. Turnbull, 21 April 1688; M. Martin, *A Description of the Western Isles of Scotland* (Glasgow edn, 1884), p. 205.

<sup>2</sup> T. C. Smout, *Scottish Trade on the Eve of Union*, Edinburgh, 1963, pp. 70, 143, 208.

<sup>3</sup> P.R.O. Customs, 3, 1:7.

<sup>4</sup> A. Symson, *op. cit.*, pp. 41, 81.

<sup>5</sup> S.R.O. Dalhousie Muniments 20: 4-46; Smout, *op. cit.*, pp. 74-5, 208, 211, 272.

put forward as the main stimulus to better farming in 1627.<sup>1</sup> Of course, it is not suggested that all Scottish farming before had been solely for local consumption—the presence of towns earlier and the obvious differences in natural endowment between upland and lowland areas always presuppose a good deal of trade: but the extension of this agrarian trade, both in quantity and horizons, must be considered a significant step towards the emergence of a modern agricultural economy in Scotland.

## III

We have, therefore, indications of better marketing facilities and of more produce being marketed. How far is there evidence for actual *per capita* increases in grain and cattle production, and what might have caused them?

On the grain side alone, one possibility is that the Scottish weather improved over a long period, and thus gave higher average annual harvest yields. Unfortunately there is little evidence in meteorological history that can be called decisive. Obvious famine struck when climatic conditions at seedtime or harvest were worst, but it cannot follow that fewer scarcities are a sign of better weather, because moderately bad conditions that would have caused dearth in the sixteenth century might have been more easily overcome in the seventeenth century by improved marketing or better farming. It is perhaps worth mentioning that the very bad winter of 1683–4 was not followed by serious dearth in Scotland in 1684–5, although it certainly was over a large area of the Continent, and again in the early 1690's Scotland remained substantially immune from the dearths that hit other countries. Long-term changes in the climate might very well have remarkable economic effects, but in the absence of very precise statistical data it seems fruitless to speculate.

Another possibility is that the population of Scotland, after important increases in the sixteenth century, actually fell during the seventeenth, and therefore that output of corn and cattle per head went up simply because there were fewer mouths to feed. Despite what we have said about the growth of urban communities in the Forth–Clyde valley, such an overall decline is feasible. Undoubtedly emigration from Scotland was astonishingly heavy at certain periods while at other times war and famine may also have contributed towards a serious loss of population. Mortality and emigration in the famine of the late 1690's were clearly very high; contemporaries spoke of parishes in which one-third or even one-half of the inhabitants had either died or fled, and even if the overall picture was nothing like as bad as that,

<sup>1</sup> *Reports on the State of Certain Parishes in Scotland . . . 1627*, Maitland Club, 1835 (henceforth *Reports of 1627*), p. 135.

it would be very surprising if population did not fall markedly over the decade 1690 to 1700.<sup>1</sup> Certainly some of the complaints of glut of the first years of the eighteenth century related superfluity of corn to a decline in the numbers of tenants to consume it, and the lengthening of leases on the Panmure estates—from an average of four years in the 1660's to one of 14 years in the 1700's—may have been related to the difficulty of attracting new tenants to fill the gaps left by the dead and departed.<sup>2</sup>

Nevertheless, the postulation of a long-term decline in population, like the one of a long-term improvement in the weather, remains in the realms of speculation, with no direct evidence to prove it and the word of at least one contemporary, Sir Robert Sibbald, to go against it. To this Fifer, writing in 1698, nothing was more obvious than “the great increase of people bejonde what was in the last century.”<sup>3</sup> We would also find it hard to accept that, except in the short run, it was depopulation that was accounting for the greater ability of Scotland to feed herself and to send more abroad.

There remains the possibility that improved farming or an increase in the area under cultivation was the prime cause of any *per capita* increases that did take place: we believe this was the case, and can produce evidence that in certain areas most in touch with the market agricultural practice was already changing in a way that must have led to increased efficiency and higher output. But we would stress that the movement appeared to be very limited both in its scope and in the geographical areas affected.

Perhaps the most important of the innovations sprang from the realization at the turn of the seventeenth century of the value of liming. It has generally been assumed that the application of lime to the acid soils of Scotland was an improvement first properly appreciated in the period after 1750: it would be nearer the mark to say that the later eighteenth century was the period when liming became universal and first penetrated those areas inaccessible to the market or to limestone quarries, or to both. In fact in certain places, the use of lime first produced spectacular results in the seventeenth century.

The most detailed evidence for this comes from the Lothians as early as 1627. In that year the Church carried out a survey of certain parishes in the Lowlands, and a large majority of the returns in Midlothian and East Lothian contained explicit reference to the new habit of liming and its beneficial consequences in increasing yields. Thus, for instance, in Borthwick parish, Midlothian, the rents of Wester Halkestoun had been raised from

<sup>1</sup> Smout, *op. cit.*, pp. 90-5, 244-9.

<sup>2</sup> S.R.O. Dalhousie Muniments, 18:387-97, 440-30. These tacks from as early as 1660 allow for compensation to tenants who have improved the land if the lease is not renewed.

<sup>3</sup> N.L.S. Sibbald's "Discourse," f. 11.

40 to 200 merks primarily as a result of liming, and at Neatone parish the farms could not continue to pay their victual rents "except they be gooded with lime." In East Lothian, money rents at Newhall, Yester, had risen in "twenty years or thereabout" from 200 to 1,040 merks: "if they wanted the liming they would hardly be worth the half:" at Longniddrie, Seton, and Tranent total grain rents rose from 28 to 40 chalders, from 21 to 32 chalders, and from 32 to 40 chalders respectively, in each case due to the application of lime. Not all results were as beneficial as that, for in the hands of the inexperienced it was possible to wreak havoc by overdoing it. Sir James Dundas of Arniston had used lime to great effect, but he warned the surveyors in 1627 that the practice "except the same be used with great discretion, may import no little harm and betime make the land to become altogether barren and yield no increase, whereof a great many in divers parts of this kingdom do already find the doleful experience, and the said Sir James as one through this occasion is forced to let a part that was wont to be his best fatland lie ly."<sup>1</sup>

Ayrshire was another region where liming was practised early and here brought benefits especially to the pastoral land. According to Timothy Pont in 1604, the county was "fertile in corn and store, being of a deep fat clay soil much enriched by the industrious inhabitants liming their grounds." His comment receives confirmation in a testament mentioning limed ground in Ayrshire in 1616.<sup>2</sup>

In the second half of the century liming is frequently mentioned by writers on agricultural improvement, all of them apparently writing in a Lothian or at least in a Forth context. Skene of Hallyards recommended liming before peas on the infield: Lord Belhaven in 1699 implied that liming of the outfield was common, and Sir Robert Sibbald in 1698 called it the "usual improvement" by which yields were increased, though he also warned against it "wasting the strength of the ground" and poisoning the fish in neighbouring streams. There seems to be no clear evidence of the use of lime north of the Forth, though it seems intrinsically unlikely that the enterprising lairds of the north-east would have ignored it if they had had the opportunity. Shortage of coal to manufacture lime was perhaps the obstacle, though peat was already being used in Galloway to make building lime from seashells.<sup>3</sup>

<sup>1</sup> *Reports of 1627*, esp. pp. 41, 92, 107, 135, 144.

<sup>2</sup> T. B. Franklin, *History of Scottish Farming*, 1952, p. 114; George Robertson, *Rural Recollections*, Irvine, 1829, p. 616.

<sup>3</sup> Fenton, *op. cit.*, p. 67; [Lord Belhaven], *The Country-Man's Rudiments*, Edinburgh, 1699, pp. 16-18; N.L.S. Sibbald's "Discourse," f. 13.

Where liming was carried on, it was generally to allow the cultivation of more outfield more frequently. Sir James Dundas in 1627 said that by this "the whole bounds of the said lands that can be made arable are riven out, manured, and sown, and without the benefit of [limestone and coal] the half of these lands as are now gooded, laboured, and sown would of force lie by as in former times, as other rooms do, that has not the same or some other benefit of the like nature." Other observers commented on a general increase of land coming under the plough. In 1704 the Earl of Cromartie claimed that "one fourth of the Pasture land has within these fifty years turned to Tillage," and an anonymous writer of the same year said "there was less tillage [around 1670] than now there is." Sir Robert Sibbald spoke almost in terms of a cultivation explosion around the villages: there was "a vast deal of ground now tilled and laboured that before was pasture," and whereas formerly rural settlements had "only a small parcell of ground laboured, and that was fenced in with a ditch and dyke that the beasts might not come at it," now "for a good distance from towns and villages there is little to be seen but laboured land."<sup>1</sup>

Liming was not the only means by which an extension of the farmed area came about. Already we hear of occasional reclamation schemes to take in the waste. At Loth in Sutherland an arterial drain was cut to free a large area of land for cropping; at Irvine in 1691 a minister who had suffered exile in the Netherlands drained another substantial tract of marshy land; and Inchaffray Pow in Perthshire had an Act of Parliament facilitating drainage all to itself in the seventeenth century. Sibbald told of a "gentleman who in my time within a few miles of [Edinburgh] made of his share of a common twenty chalders of victual and have meadowland, corn fields, and grass where his predecessor made not (as he told me) above fifty merks Scots of profit."<sup>2</sup>

It is also around the end of the seventeenth century that we first hear of "enclosures" to keep stock in rather than to keep them out. On the traditional old Scots Farm the arable area was surrounded by an earthen dyke, as described by Sibbald in the passage quoted above, and the animals roamed about on the rough grazing or common outside this "head dyke" until the end of summer, when they were allowed in to graze on the stubbles: enclosures in any other form were non-existent. Now, however, we begin to

<sup>1</sup> *Report of 1627*, p. 44; Anon., *A Speech in Parliament concerning the Exportation of Wool*, Edinburgh, 1704, p. 4; Anon., *A Speech without doors concerning the Exportation of Wool*, Edinburgh, 1704, p. 4; N.L.S. Sibbald's "Discourse," f. 13.

<sup>2</sup> J. A. Symon, *Scottish Farming Past and Present*, 1959, p. 101; George Robertson, *Topographical Description of Ayrshire*, Irvine, 1820, p. 180; *Acts of the Parliaments of Scotland*, x, p. 67; N.L.S. Sibbald's "Discourse," f. 25.

hear of a different practice. Thomas Kirk, in his abusive *Modern Account of Scotland* of 1679, said that Scotland was "freed from the charge and incumbrance of enclosures" but admitted that "in many places you may see half a rood of land divided by an earthen bank into many different apartments according to the quality of the beasts that are to possess them." What he saw in the Lothians was perhaps more accurately described by Taylor in 1705 who also described the arable land as open and the meadowland near Edinburgh as "very inconsiderable, its generally enclos'd with a mud or stone wall and goes by the name of a park, but is rather a pasture for cattle . . . those we saw containing but few acres of ground." In the works of Donaldson (1697) and Belhaven (1699) both writers evidently thought of enclosures solely in terms of stock: the latter recommending no more than a small paddock on the outfield in which to keep horses.<sup>1</sup>

In Galloway and the south-west, where the market influence of the English cattle trade was likely to be most stimulating, we hear of a really large "park" for cattle set up by Sir David Dunbar of Baldoon before 1684: it enclosed three square miles of good grass, grazed 1,000 beasts winter and summer, and was said to be the first of its kind in the area. Already at that date his example had been followed by the Earl of Galloway, Sir William Maxwell, Sir Godfrey McCulloch, Sir James Dalrymple, the Laird of Logan, and others. Forty years later the spread of this type of enclosure throughout the south-west was to lead to the famous riots of the 'Levellers', but evidently the movement was not yet generalized enough to arouse widespread agrarian resentment of this nature.<sup>2</sup>

It needs to be stressed again that all these improvements were very limited both in the areas they affected and in the repercussions they had on the structure of farming. It is easy to find estates even in fertile areas in close touch with the market where grain yields were not improved throughout the century—at least if the stagnation of rents in kind is any guide. Thus at the Mains of Panmure in Angus rents were unvaried from 1612 to 1700, and on the Barony of Belhelvie in Aberdeenshire unchanged from 1662 to 1704.<sup>3</sup> Similarly the enclosures were very scattered, usually very small, and never seem to have comprehended enclosure of the arable or subdivision of the open fields.

<sup>1</sup> *Early Travellers in Scotland*, ed. P. Hume Brown, Edinburgh, 1891, p. 254; J. Taylor, *Journey to Edenborough*, Edinburgh, 1903, p. 99; James Donaldson, *Husbandry Anatomized*, Edinburgh, 1697, pp. 68-9; Lord Belhaven, *op. cit.*, pp. 23-5.

<sup>2</sup> A. Symson, *op. cit.*, pp. 41, 81; R. Chambers, *Domestic Annals of Scotland*, Edinburgh, 1859, II, p. 367; III, pp. 152-3; Henry Hamilton, *An Economic History of Scotland in the Eighteenth Century*, Oxford, 1963, pp. 81-2.

<sup>3</sup> S.R.O. Dalhousie Muniments.

## IV

The question now arises as to why, given these trends towards increased farming for profit, improved marketing, and limited gains in agricultural efficiency, improvement did not go further. Why did it not result in still greater technical efficiency, and in that subdivision of the open fields by dykes and enclosures that was to be the hall-mark of the agricultural revolution in late eighteenth-century Scotland? Why did virtually every English traveller before the Union and for several decades afterwards still have cause to think Scottish farming practice backward compared to that of his own country?

The backwardness of Scottish farming must ultimately be attributed to the conservatism of the lairds, on whom the investment decisions regarding the improvement of the lands rested. To a high degree this conservatism is no doubt explicable in terms of the ignorance and self-satisfaction of the landowners, who saw no reason to disturb the timeless traditions of tenure and cultivation, were content with their income from the land, and unable to think in terms of dynamic expansion or dramatic innovation. At the same time this conservatism was reinforced and partly justified by the continuing military basis of land tenure in some parts of the country and, after 1660, by low prices for agricultural produce which made the prospects for heavy capital investment poor.

The weak rule of the central government is probably as important as any other factor. From the purely economic point of view, the most obvious moment at which to have begun an agricultural transformation would have been in the second half of the sixteenth century. In this period of rapidly rising grain prices, and therefore of larger profits and higher rents, capital accumulation ought to have been easy except on estates where rents were fixed. The redistribution of monastic lands would also have made an opening for a break with old traditions, and, assuming a shortage of food, the stimulus to maximize efficiency in areas close to the market should have been considerable.

The landowner's viewpoint, however, was not a purely economic one. He was primarily interested in the maintenance of his personal power, and as the Lowlands and Southern Uplands were still in the grip of periodic anarchy and endemic feud until after 1600, personal power might be maintained more effectively by a land system aimed at keeping the maximum number of dependents on the estate, supporting themselves and producing a small surplus for the retainers in the castle, than by a system aimed at maximizing efficiency at the expense of personal dependence.<sup>1</sup> It might even be easier to get

<sup>1</sup> Even after 1600 the tradition of feud was slow to end. Cattle raiding in the Southern

rich by robbing your neighbour by force of arms than by patiently building up an improved estate, and in any case it was no use having economic power unless it was backed by the requisite spending on defence. This political instability also strengthened the laird's other natural inclination to spend rather than to save. The gains from conspicuous consumption were immediate but enjoyable, and they were a demonstration of power that would in itself tend to add to that power, whereas the gains from investment in enclosure were long-term and probably illusory if your neighbour was in a stronger military position than yourself.

During the seventeenth century, stronger government in the Lowlands and Uplands finally did away with the military justification of the land tenure system though in the Highlands it was to persist until after 1745. This, of course, did not happen quickly or uniformly: the tradition of armed retainers took time to die, and a resurgence of anarchy accompanied the warring factions of the Civil Wars. Nevertheless, especially after 1660, when raid and feud were becoming things of the past over most of the country, the need for the landowner to base the land system on anything other than economic expediency evaporated. Why then did no thorough reorganization come about in the best-placed regions? After the Restoration the Scots showed themselves less conservative and more interested in escaping from agricultural stagnation. Acts of Parliament to encourage better husbandry were numerous after 1660, culminating in the two well-known Acts of 1695 which made it easier for landowners to divide commons and to sort out land lying runrig for the purpose of enclosure without recourse to the private Acts that were necessary in England when enclosure involved any measure of disagreement between interested parties.<sup>1</sup> At the same time in the 1690's, the first published Scottish tracts on how to improve farming methods appeared. Yet the fundamental agricultural change that might have taken advantage of this permissive legislation and technical advice was delayed for many years.

A glance at the price statistics may suggest one reason why wider reorganization of agriculture was not attempted. From 1650 to 1670, victual prices fell sharply, and recovery from the new low levels was slight before the great famine. Contemporary complaints were all of glut. Thus in 1681 it was complained before Privy Council that "this victual, which before gave

Uplands was still common in the first quarter of the century, and the Civil Wars saw the resurgence of the private bands: it was only after 1660 that landowners everywhere abandoned the tower-house and felt safe to inhabit undefended houses.

<sup>1</sup> *Acts of the Parliaments of Scotland*, VII, pp. 263, 575-6; VIII, pp. 295, 488, 494; IX, pp. 452, 462.

a good rate *comunibus annis*, and so noblemen and gentlemen, who had victual rent, were able to leave and keep their credit, is now become almost a very drug."<sup>1</sup> In 1701, on the morrow of the great famine, William Patterson observed that "for several years before the last five, corn was extreme cheap and low, even so as to discourage both the raiser and the heretor," and in 1706 David Black said the abundance and plenty of grain made it so cheap that heretors and labourers may be the first losers, yet the nation in general are gainers." That was an urban consumer's viewpoint. A more heartfelt *cri du cœur* came from one of the northern landowners who produced the surplus: "we are yearly improveing our landes to produce more and more grain (but) . . . unless we alter our methodes or fall on some nieu wayes of export, our cornes will become such a drug on our handes that we shall never be able to pay our publick dues."<sup>2</sup>

Price series for the products of animal husbandry (beef, wool, tallow, and hides) are lacking, but from the general complaints of writers in the last decade before Union it would not appear that they offered much incentive to swing agricultural production from grain to stock, or to encourage fundamental changes in districts already given over to pastoral husbandry. The depth to which wool prices had sunk was put forward as the main justification for allowing the export of wool in 1704, and even the cattle trade to England appeared to be seriously affected by low prices, high dues, and restrictions on autumn marketing.<sup>3</sup>

In this environment, the failure to undertake more basic agricultural change becomes easier to understand. In an economy where a high percentage of the population were producers, even a small glut engendered by better marketing facilities and limited improvements in efficiency could produce a large fall in price: this did not necessarily prevent all further attempts to increase output, but it was likely to discourage them because capital accumulation became harder and returns smaller—and capital was already desperately scarce in seventeenth-century Scotland. A more economically minded or technically alert landed society might have achieved the necessary saving by cutting the costs of production, but it was hard to see how this could be done without displacing the tenantry, and a numerous tenantry was still in itself regarded as one of the main assets of the estate. Alternatively, it

<sup>1</sup> *Register of the Privy Council of Scotland*, Third Series, VII, p. 670.

<sup>2</sup> [William Patterson], *Proposals and Reasons for Constituting a Council of Trade*, Edinburgh, 1701, p. 60; [David Black], *Essay upon Industry and Trade*, Edinburgh, 1706, p. 18; *Seafield Correspondence*, Scottish Hist. Soc., 1912, p. 415.

<sup>3</sup> Smout, *op. cit.*, p. 213; Anon., *A Speech in Parliament concerning the Exportation of Wool*, Edinburgh, 1704; Anon., *A Speech without doors concerning the Exportation of Wool*, Edinburgh, 1704.

might have financed change by cutting down on personal expenditure: such a thrifty reaction was highly improbable in a society in which prestige depended on a high level of conspicuous consumption, particularly when low prices meant that obvious or immediate gain was unlikely. All improvements before the Union were limited to those that neither demanded much capital nor upset the social structure of the farm. Long-term projects involving subdivision of the open fields and expensive levelling and straightening of ridges, drainage, and displacement were generally eschewed as much from economic and social considerations as because of the conservatism of the lairds.

The seventeenth-century situation, then, was one in which agricultural change was limited by a number of factors, and not least by the restricted market it was able to serve both on the local and national level. The agricultural revolution could come about in the eighteenth century only after new markets had been discovered and developed. In 1776 Adam Smith was to describe the rise in the price of cattle as the most beneficial consequence of the Union of Parliaments, which had finally opened the English market to the Scots on the same terms as their English competitors.<sup>1</sup> Such a rise, most notable after 1745 when the Highlands had finally been pacified and when rising population and incomes in England were making their mark, led to the introduction of turnip rotations, subdivision of fields, convertible husbandry, and all the paraphernalia of the new farming. There was also a small but perceptible rise in Scottish grain prices in the first generation after 1707 which some observers also attributed to the opening of markets in England. The gain was perhaps too small, however, to provide real encouragement until the upward trend was resumed more steeply in the second half of the century, under the combined pressure of population increase and extended urbanization within Scotland. This new facility to make profits more easily from both stock and grain, combined with changes in the entail law in 1770 to assist borrowing for enclosure, created an environment highly favourable to reorganization, and in the fifty years spanning 1800 the old Scottish way of farming completely disappeared in the Lowlands.

The early experiences of some of the first post-Union improvers confirm how little headway could be made in a country where demand was slack. Cockburn of Ormiston, who injected capital from his private income and was wild with contagious enthusiasm for enclosures, turnips, and new rotations, failed to make a profit himself and certainly failed to convert his neighbourhood. Many such men—even Grant of Monymusk is not immune from the stigma in his early days—were rich men playing at farming, and

<sup>1</sup> *Wealth of Nations* (Everyman edition), I, pp. 201-5.

their experiments had little relevance to the ordinary farmer.<sup>1</sup> Not until a generally expanding market put money into the pockets of the farmer and the landowner for the first time since the late sixteenth century could there be a basic change in the structure of farming. Not until Scottish farming was found so inadequate that imports revived on a scale never before known was its structure transformed. Not until then did the general farming community (as opposed to a few enthusiasts) become really contemptuous about old ways. The peasant agriculture of the open fields remained for so long because there was no practical alternative. Would it be wrong to suggest that it served the community in its own day and in its own social and economic environment as well as any form of farming has ever served Scotland?

<sup>1</sup> *The Letters of John Cockburn of Ormiston to his Gardener, 1727-1744*, ed. J. Colville, Scottish Hist. Soc., 1904; *Monymusk Papers*, ed. H. Hamilton, Scottish Hist. Soc., 1946.

APPENDIX: EAST SCOTTISH BREAD AND GRAIN PRICES, 1600-1750<sup>2</sup>

	<i>Edinburgh wheat bread</i>	<i>Stirling oats</i>	<i>Fife oats</i>	<i>Haddington oats</i>	<i>Aberdeen oats</i>	<i>Fife bere</i>
1600	16	0. 2.0				
1	16	0. 2.0				
2	12	0. 2.6				
3	16	0. 2.0			3. 0.0	
4	16	0. 2.6				
5		0. 3.0				
6	16					
7		0. 2.8				
8		0. 3.0				
9		0. 2.6				
1610	18	0. 2.6				
11		0. 2.6				
12	13					
13	14	0. 3.4				
14		0. 2.6				
15		0. 3.4				
16		0. 3.0				
17	14	0. 3.4				

<sup>2</sup> Column 1. Wheat bread in Edinburgh: weight of town bread in ounces for one shilling Scots. Fixed by burgh authorities. Source: *Extracts from the Records of the Burgh of Edinburgh*, ed. M. Wood, H. Armet *et al.*, 1868-1954; column 2. Oats in Stirling: price in lib Scots of Dryfield oats per peck. Fixed by burgh authorities. Source: *Extracts from the Records of the Burgh of Stirling*, Scottish Burgh Record Society, 1888-9; column 3. Oats in Fife: price in lib Scots per boll. County fiars. Source: Pamphlet kindly made available by Professor Jacob Viner; column 4. Oats in Haddington: price in lib Scots per boll. County fiars. Source: *Transactions of the Society of the Antiquaries of Scotland*, 1; column 5. Oats in Aberdeenshire: price in lib Scots per boll of great oats without the fodder. County fiars. Source: *Miscellany of the New Spalding Club*, 11; column 6. Bere in Fife: price in lib Scots. County fiars. Source: as column 3

	<i>Edinburgh wheat bread</i>	<i>Stirling oats</i>	<i>Fife oats</i>	<i>Haddington oats</i>	<i>Aberdeen oats</i>	<i>Fife bere</i>
1618	14	0. 3.4			3. 6.8	
19	16	0. 2.0			2.13.4	5. 6.8
1620	20	0. 2.0				5. 6.8
1	13	0. 2.8				9. 0.0
2	11	0. 3.0	6.13.4			10. 0.0
3	9	0. 3.4	7. 0.0			10. 0.0
4	13	0. 2.6	4.13.4			5. 6.8
5	13½	0. 2.6	4. 6.8			5. 6.8
6	16	0. 2.0	4. 6.8			5. 0.0
7	16		4. 6.8			5. 6.8
8	15	0. 2.0	8. 0.0		6. 6.8	10. 0.0
9	14	0. 2.6	7. 0.0		5. 0.0	8. 0.0
1630	10	0. 3.0	8. 0.0		3.13.4	9. 6.8
1	12½	0. 2.8	4. 6.8		3. 0.0	5. 6.8
2	11	0. 2.8	4. 0.0		4.10.0	5. 6.8
3	12	0. 2.8	6.13.4			8. 0.0
4	13	0. 3.4	7. 0.0			7.13.4
5			8. 6.8	6. 0.0		9. 6.8
6	9	0. 2.8	5. 6.8	5. 6.0		6. 0.0
7	12	0. 4.0	9. 0.0			10. 0.0
8	14	0. 3.4	4. 6.8			5. 6.8
9	14	0. 2.8	3.13.4			4. 6.8
1640	14	0. 2.8	5.13.4	8. 0.0		6.13.4
1	11	0. 3.4	7. 6.8	7. 0.0		8. 0.0
2	11	0. 3.4	7.13.4	6. 0.0		9. 0.0
3	13	0. 3.4	5. 0.0	5. 0.0		6. 0.0
4		0. 3.4	5. 0.0	6. 0.0		6. 0.0
5	14		4. 0.0	3. 0.0		5. 0.0
6			4. 6.8	3.10.0		5. 6.8
7	10	0. 4.0	4. 0.0	6. 6.8		5. 0.0
8	8		5. 0.0	8. 0.0		6. 0.0
9	8	0. 6.8	9.13.4	8. 0.0	7. 0.0	10. 0.0
1650			10.13.4	11. 0.0	6. 6.8	10.13.4
1			9. 6.8	10.13.4	6. 0.0	11.10.0
2	10		8. 0.0	8.10.0	6.13.4	11. 0.0
3	12½	0. 6.8	3.13.4	4. 6.8		4.10.0
4	15		4. 0.0	2.13.4		4.13.4
5	14		3. 6.8	3.13.4	4. 3.4	5. 0.0
6	13		4. 0.0	4.13.4	3.13.4	4. 6.8
7	14		3.13.4	4.13.4		4. 3.4
8	9		5. 6.8	6.13.4		6. 0.0
9	8		5. 6.8	6.16.0		6. 0.0
1660	9½		5. 6.8	6. 0.0		6. 0.0
1	9		5. 0.0	5.13.8		6. 0.0
2			3.13.4	4.15.0		5.13.4

	<i>Edinburgh wheat bread</i>	<i>Stirling oats</i>	<i>Fife oats</i>	<i>Haddington oats</i>	<i>Aberdeen oats</i>	<i>Fife bere</i>
1663	10	0. 1.10	4. 0.0	4. 6.8		5. 6.8
4	12½	0. 1.10	2.10.0	3. 0.0		3.13.4
5			2.13.4	3.13.4	3.13.4	3. 0.0
6	12½			4. 0.0	4. 0.0	
7	14	0. 2.6		3. 8.0	5. 0.0	
8	15	0. 2.1	3. 0.0	3. 0.0	3. 6.8	3.13.4
9			3. 0.0	3.13.4	3.13.4	4. 6.8
1670	14½	0. 2.0		4. 6.8	4. 6.8	
1				5.14.0		
2	14½	0. 2.6	3.13.4	4. 0.0		4. 6.8
3	14	0. 2.6	3. 6.8	4. 8.0		4. 0.0
4	8		6.13.4	8.12.0		7. 0.0
5			7. 0.0	7.13.4		10.0.0
6	14	0. 2.6	3. 3.4	3. 6.0	3.13.4	4. 6.8
7		0. 2.2	2.18.0	3.10.0	3.10.0	4. 0.0
8	14	0. 1.2	2. 8.0	3. 0.0	3. 0.0	3. 3.4
9			2.10.0	3.13.4	3. 6.8	3.16.8
1680			3. 0.0	4. 0.0	3. 0.0	3.16.8
1	11	0. 5.0	4.13.4	5. 0.0	3.13.4	3.16.8
2		0. 4.2	4. 3.4	5.16.0	4. 0.0	6.13.4
3			3. 3.4	3.16.4		3.16.8
4			4. 0.0	4. 6.8		4. 0.0
5			3. 0.0	3.13.4		3.16.8
6			3. 0.0	3.13.4		5. 0.0
7			3. 0.0	3.14.0		4. 0.0
8			4. 0.0	4.10.0		4. 0.0
9			4.13.4	5. 6.8		4.13.4
1690			6. 0.0	6. 4.0	6. 0.0	6.13.4
1			3. 3.4	3.16.0	4. 0.0	4. 3.4
2			3. 0.0	4. 0.0	4. 0.0	4. 0.0
3			3. 3.4	4.10.0	4. 0.0	4. 3.4
4			3.10.0	4.16.0	4. 6.8	4. 3.4
5			6.10.0	7. 0.0	6. 0.0	6.13.4
6			7. 0.0	9. 0.0	8. 0.0	8.13.4
7			5. 3.4	6. 6.0	7. 0.0	7. 6.8
8			7.13.4	10.10.0	10. 0.0	9. 6.8
9			7.13.4	9.10.0	8. 0.0	9.13.4
1700			4.13.4	6. 0.0	6.10.0	7.10.0
1			3.10.0	4. 6.8	5. 0.0	4. 6.8
2			4.10.0	4.13.4	4. 6.8	4.10.0
3			4. 6.8	5. 0.0	4. 0.0	4.10.0
4			3.10.0	5. 0.0	4.13.4	4.10.0
5			3. 3.4	4.10.0	4. 3.4	4. 6.8
6			2. 6.8	2.16.0	4. 0.0	3. 6.8
7			2. 6.8	4. 0.0	4. 6.8	3. 3.4

	<i>Edinburgh wheat bread</i>	<i>Stirling oats</i>	<i>Fife oats</i>	<i>Haddington oats</i>	<i>Aberdeen oats</i>	<i>Fife bere</i>
1708			4.16.8	5. 8.0	5. 6.8	5. 3.4
9			5.10.0	7. 6.8	5. 6.8	
1710				6. 0.0	5. 6.8	6.10.0
11			4. 0.0	5. 0.0	4. 6.8	4.13.4
12			3.10.0	4.13.4	3.13.4	4. 0.0
13			3.10.0	5. 0.0	5. 0.0	4.13.4
14			4.16.8	5. 6.0	5. 0.0	6.13.4
15			4. 5.0	5. 6.8	4.13.4	4. 3.4
16			3.10.0	4.13.8	4. 6.8	4. 3.4
17			3.16.8	5. 6.8	5. 0.0	4. 0.0
18			4.10.0	5. 2.0	4.13.4	4.13.4
19			4.16.8	6. 2.0	5. 0.0	5. 0.0
1720			4. 0.0	5.10.0	4. 0.0	4.13.4
1			4. 3.4	4.18.0	4. 6.8	4.10.0
2			5.10.0	5.13.0	5. 6.8	5.13.4
3			5.16.8	6. 5.0	6. 0.0	7. 6.8
4			4. 0.0	5. 0.2	4. 3.4	4.10.0
5			4. 0.0	5.16.0	4. 0.0	4.16.8
6			4.10.0	5. 8.0	4. 6.8	4.13.4
7			4.13.4	5.13.4	4.13.4	5. 6.8
8			5. 6.8	7. 4.0	5.13.4	6. 6.8
9			5. 0.0	6.10.0	5. 0.0	5. 0.0
1730			4.10.0	4.16.0	4. 6.8	3.16.8
1			4.10.0	4.13.8	5. 0.0	3. 3.4
2			4. 0.0	4. 3.8	4.13.4	3.15.0
3			4. 0.0	5. 2.0	4.13.4	4. 3.4
4			4. 3.4	5. 0.0	5. 0.0	4. 6.8
5			4.13.4	6. 0.0	5. 3.4	4. 6.8
6			5. 0.0	5.16.0	5. 0.0	5.10.0
7			4. 8.0	5. 0.0	4.13.4	5. 6.8
8			3. 6.8	4. 0.0	4. 0.0	4. 6.8
9			4.13.4	5.18.0	5. 6.8	5.12.0
1740			7.13.4	9. 0.0	7. 0.0	8.10.0
1				6. 0.0	6. 0.0	
2			4. 0.0	4.12.0	5. 0.0	5. 0.0
3			3.12.0	4. 0.0	3.12.0	4. 3.4
4			4.12.0	6. 8.0	6.13.4	4.12.0
5			5.10.0	6.16.0	6. 0.0	5. 5.0
6			5. 3.4	5. 6.8	5. 6.8	5.10.0
7			4.12.0	4.16.0	4.13.4	4.10.0
8			4.13.4	5. 6.0	5. 0.0	5. 0.0
9			4.12.0	5.10.0	4.10.0	4.10.0
1750			4.18.0	5.10.0	5. 0.0	4.16.8