

'Lands' or Relict Strip Fields in South Australia

By C. R. TWIDALE

Introduction

THE Englishman travelling in Australia sees little to remind him of his homeland. Even in the better watered parts of the continent the whole look of the terrain is different, and arid and semi-arid Australia is metaphorically as well as literally half a world removed from green England with its long record of human history and settlement. Yet our hypothetical traveller would see in some semi-arid and arid regions of South Australia at least one relict of human activity to remind him of home. This is the long narrow field unit or *land*, known by various names in Britain, whose survival, making, and purpose have aroused a profound and long-standing interest.¹ *Lands*, which is the name by which they were and are widely known in South Australia,² and which is therefore retained here, remain imprinted on the landscape in several parts of the Flinders Ranges, and are widespread in the Mt Lofty Ranges.³ It must be emphasized that their occurrence here in no way implies the use of the open-field system, but merely results from a method of ploughing. Quite apart from the interest inherent in their occurrence, the South Australian lands derive some significance from the fact that all, of course, postdate the European settlement of the then Colony in 1836, and some few were ploughed as recently as 1949 with ploughs similar in every essential respect to those used a century ago. Thus it has been possible to discuss their making with the ploughmen responsible for them.

Distribution and Relation to Cereal Cultivation

The ridge and furrow microrelief features were first noted about 12 years ago in connection with soil erosion studies in the Mt Lofty Ranges (FIGURE I). The furrows, though shallow, are sufficiently pronounced to channel run-off and induce localized accelerated erosion in the form of gullying, even though the furrows are grassed over.⁴

¹ See C. S. and C. S. Orwin, *The Open Fields*, 3rd edn, 1967.

² Though the term 'bed' was also used occasionally. See, for example, W. Gray, Autobiography of the late Hugh McCullum, ed. Rev. W. Gray, *Proc. Royal Geogr. Soc. Australasia (S.A. Branch)*, 31, 1929-30, pp. 37-69.

³ See C. R. Twidale, G. J. Forrest, and Jennifer A. Shepherd, 'The Imprint of the plough: Lands in the Mt Lofty Ranges, South Australia', *Austr. Geogr.*, 11, 1971, pp. 492-503.

⁴ See C. R. Twidale, *Geomorphology, with special reference to Australia*, Nelson, Melbourne, 1968, pp. 342-6; C. R. Twidale, and M. R. Foale, *Landforms Illustrated*, Nelson, Melbourne, 1969, p. 106.

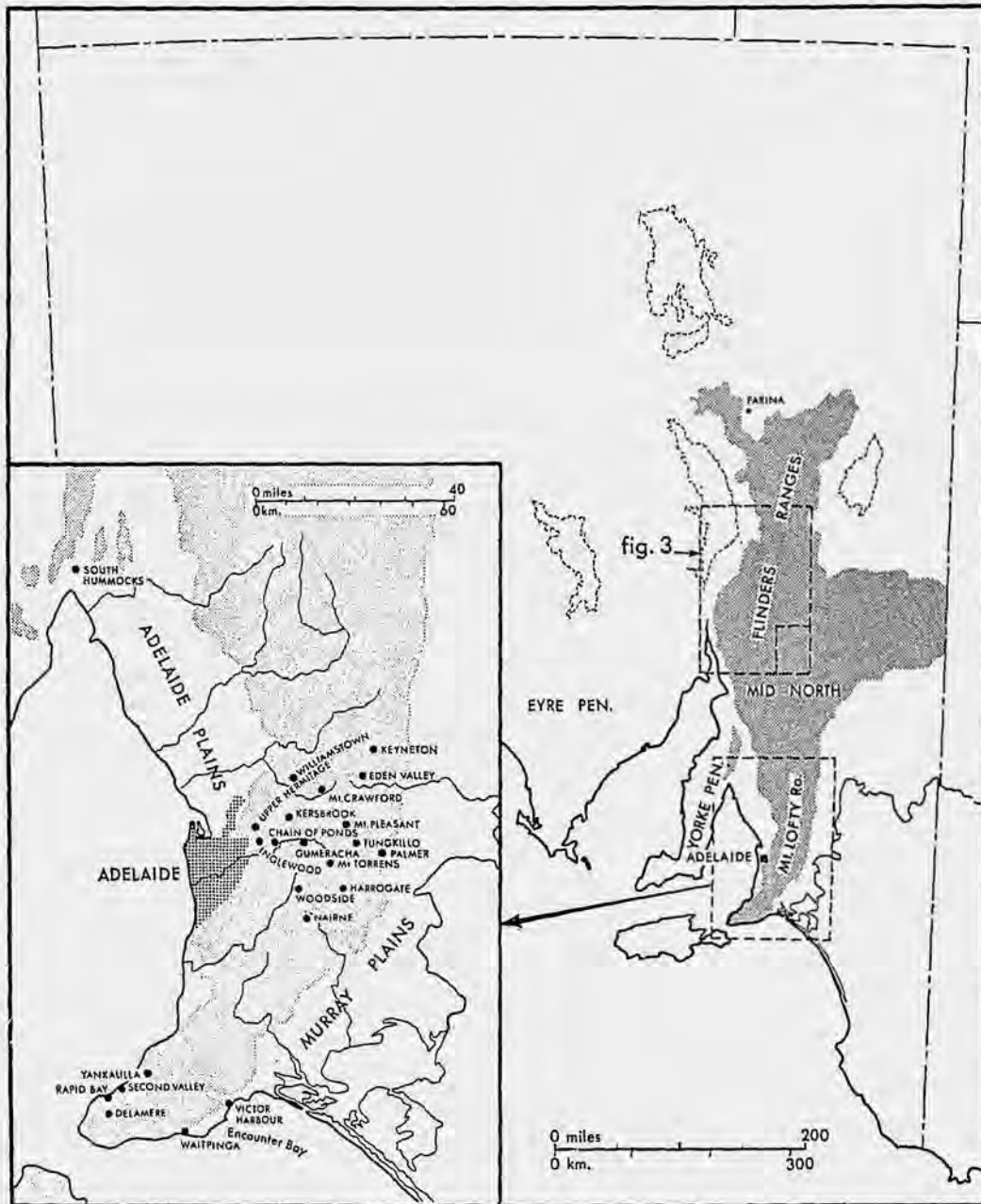


FIG. I

Mt Lofty Ranges, South Australia—Location map. Lands have been observed in each of the districts named in the hills.

Observations over the decade have shown that lands are preserved in many parts of the Mt Lofty Ranges (see FIGURE I and PLATES I, III). It is certain that they were formerly more widespread. None has survived modern cultivation methods, and several have been eliminated during the past decade by the ploughing of the fields in which they occurred, in preparation for pine planting or for potato cultivation. The evidence points to their being made when substantial areas of the Mt Lofty Ranges were ploughed for cereal cultivation—mostly wheat—from approximately 1850 onwards. This area, together with the adjacent Adelaide plains, then not only supplied South Australia but also sent large quantities of grain to Victoria and other parts of Australia. But, following the decline of the Victorian goldfields, new wheat areas were opened up in that state. The hilly and heavily wooded Mt Lofty Ranges were difficult and expensive to clear, and, with quite heavy winter rains, proved more suitable for other types of land use. Between 1860 and 1890, the more easily cleared, drier, and flatter areas of the Mid-North, and especially the mallee¹ lands of Yorke Peninsula and the Murray plains (FIGURE I) became South Australia's major wheat producers² (FIGURE II). The spread of wheat cultivation into the semi-arid regions of the State, to be joined in the 1920's and 1930's by Eyre Peninsula,³ brought about a decline in cereal production in the Ranges, and a return of many cultivated fields to pasture. This in turn ensured the preservation of the ridge and furrow microrelief.

There are fewer lands preserved in the Flinders than in the Mt Lofty Ranges. Lands survive mainly in scarp foot situations and between the channels of rivers debouching on to the plains or valley floors in the Mookra-Bruce-Hammond area, north of Quorn, and on the Lake Torrens plains west and south-west of Hawker. They are also in evidence in Wilpena Pound (FIGURE III). This last is a huge natural amphitheatre, or enclosed basin, in which wheat was cultivated up to 1914.⁴ In that year a flood (ending the drought—see below—in that area) washed away the only access road into the Pound and arable farming was abandoned. Today, a few sheep are run in the basin, but the old field and fence lines can still be seen and in one field lands are well preserved.

¹ Mallee—strictly speaking stunted eucalypts which branch profusely from ground level and have large tuberose roots, but commonly used of the semi-arid regions of the brown or pink pedocalcic soils, over which these woodlands extend.

² See C. Fenner, *South Australia: A Geographical Study*, Christchurch, 1931, pp. 93-153; E. Dunsdorfs, *The Australian Wheat-Growing Industry, 1788-1948*, Melb. Univ. Press, 1956, pp. 114-86, 531; W. S. Kelly, 1962, *Rural Development in South Australia*, Rigby, Adelaide, 1962; D. W. Meinig, *On the Margins of the Good Earth*, 1963.

³ C. R. Twidale and D. L. Smith, '“A perfect desert” transformed: the agricultural development of north-western Eyre Peninsula, South Australia', *Austr. Geogr.*, 11, 1971, pp. 437-54.

⁴ G. Hunt, Senior, Wilpena Homestead; personal communication. See also H. Mincham, *The Story of the Flinders Ranges*, Rigby, Adelaide, 1964.

In addition, lands ploughed before 1916 were visible near Blinman up to 1946,¹ though they are now discernible only on air photographs. That they have survived is remarkable. The paddocks were fenced and ploughed between 1870 and 1916,² when wheat cultivation was far more widespread and frequent

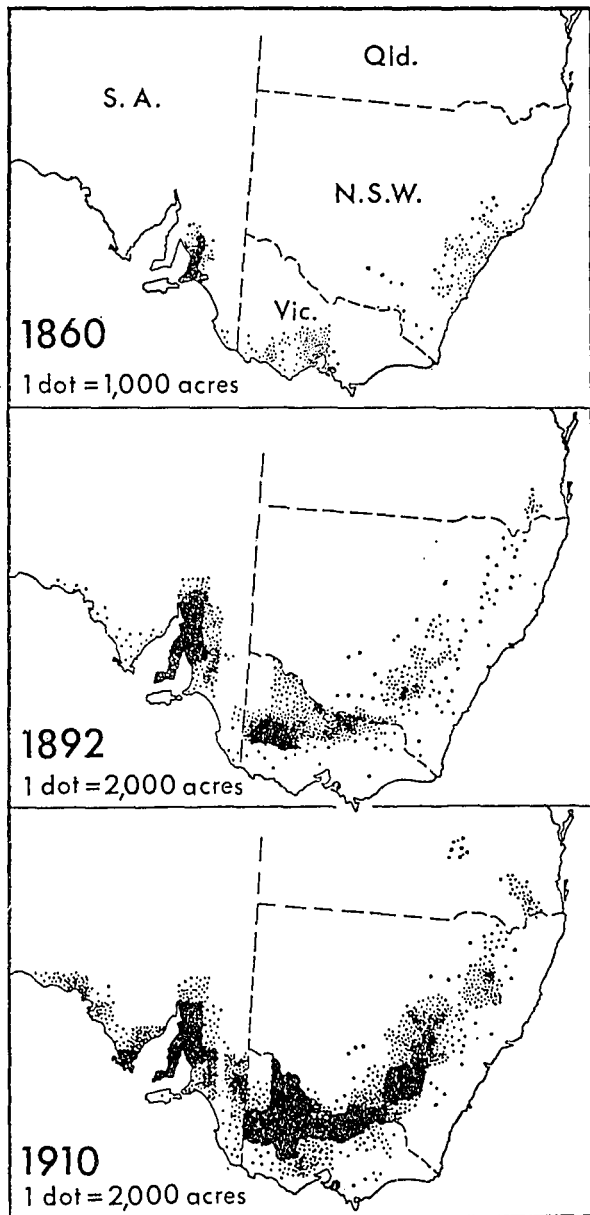


FIG. II

Wheat production in Australia in 1860, 1892, and 1910 (after Dunsdorfs). Note the heavy concentration in the Mt Lofty Ranges in 1860 and the subsequent decline of that region and the increased production first in the northern and mallee areas and second in other states.

¹ G. Hunt, personal communication; C. P. Edwards, Blinman South, personal communication; G. L. Parsons, personal communication to G. J. Forrest.

² See Meining., *op. cit.*, pp. 29-92.

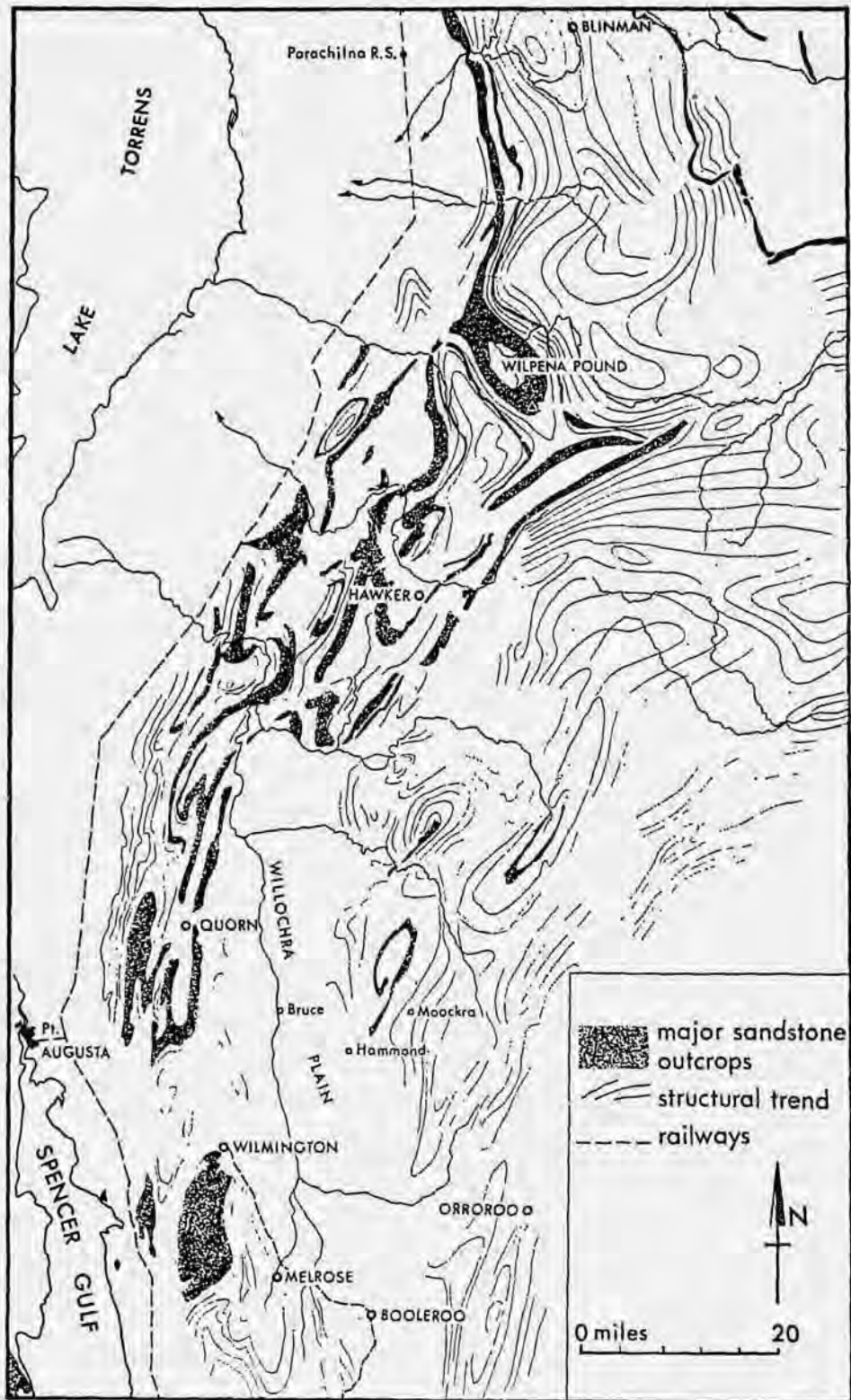


FIG. III

Flinders Ranges, South Australia, showing major sandstone features and locations mentioned in the text.

than it now is in the southern and central Flinders Ranges. Wheat is still grown extensively on the southern part of the Willochra plain (FIGURE III), south of a line extending east from Wilmington, and around Quorn, Hawker, and Moockra, particularly in narrow valleys or near the foot of sandstone escarpments¹ where moisture is especially abundant.² But at times, late in the last century and early in this, the whole of the Willochra plain and large areas of the central Flinders were considered good cereal country. The northern township of Farina (average rainfall just under 6 inches per annum) was named in the expectation that even there wheat could be grown and flour produced.

The fields were ploughed with single share implements,³ and the land was used as a ploughing unit at least during the early years of the twentieth century.⁴ As in the Mt Lofty Ranges, then, preservation is due to the land being allowed to revert to pasture when cereal cultivation was finally abandoned in these northern areas just before or during the First World War (see below). In those parts of the Flinders where cereals are still grown from time to time, no lands have survived modern cultivation methods. In many parts of the northern Willochra plain, the Lake Torrens plains adjacent to the Flinders Ranges, and in many plains and valleys within the upland, contour ploughing aimed at soil conservation, as well as occasional attempts to grow wheat in good seasons, have tended to destroy the ridge and furrow patterns.

In addition to these man-made hazards, the wind-drifting of soil (common during drought) and occasional floods are equally prone to eliminate the furrows discernible as topographic features. More important, however, is the fact that many of the clays deposited on the plains and valleys, and weathered from the underlying argillaceous bedrock, are of the 'cracking' variety—that is, they are hydrophylic and swell markedly on wetting, and shrink and crack on desiccation. Such swelling and contraction give rise to a churning of the soils sufficient to form the networks of microrelief forms known as gilgai,⁵ and to exert enough pressure to thrust fence posts from the ground. In the plains with-

¹ See C. R. Twidale, 'Chronology of Denudation in the southern Flinders Ranges; South Australia', *Trans. Royal Soc. S. Austr.*, 90, 1966, pp. 3–28.

² Cf. G. B. Cressey, Qanats, Karez, and Foggaras, *Geogr. Rev.* 48, 1958, pp. 27–44.

³ Two single-share ploughs were abandoned inside Wilpena Pound in 1914. Both are well preserved and both were made by Ransome and Sims.

⁴ One farmer who experienced these early years on the Willochra plain, but is now unfortunately deceased, was familiar with the term *land*, and his memory is indirectly confirmed by the accounts of several others who have passed on what their fathers told them of early ploughing procedures and who recognized the patterns of ridge and furrow for what they are on air photographs. All agree in general terms with the dating given here, though it has not proved possible to date particular lands. It must be remembered that most of the farmers who cultivated these properties abandoned their calling and left the district for good in 1914 or thereabouts.

⁵ See E. G. Hallsworth, G. K. Robertson, and F. R. Gibbons, 'Studies in pedogenesis in New South Wales. VII. The gilgai soils', *Journ. Soil Sci.*, 6, 1955, pp. 1–31; E. G. Hallsworth, 'The gilgai phenomenon, ch. 10, pp. 415–20, in H. C. T. Stace *et alii*, *A Handbook of Australian Soils*, Relim Tech. Publ., Adelaide, 1968.

in and marginal to the Flinders the majority of gilgai are of linear type and are elongated roughly along the contour. Such superficial disturbances of the soil have apparently been active enough effectively to mask or even to obliterate entirely the imprint of the plough. In some areas it seems that a combination of soil churning, wash, wind, and the feet of grazing animals has so disturbed the pattern of ridge and furrow that they are not distinguishable on the ground.

For example, in the area around Hammond (FIGURE III), furrows have been observed from a low-flying aircraft. Many sets of furrows, some faint, some remarkably clear, and some aligned at obtuse angles to each other because of cross-ploughing, are recorded on aerial photographs. Yet none can be distinguished in the fields, where bare soil patches, low mounds, and patches of stones attest to the presence of irregular gilgai. In this area, the fields were last ploughed in preparation for cereal growing before 1914, when the whole of the southern Flinders Ranges suffered a drought so disastrous that it is still known in the area as The Drought. Yet it is in a sense a misleading attribution, for the drought began in 1913 and in some areas, including Hammond, continued through 1915; but 1914 was evidently the year in which many farms were abandoned. Though these furrows near Hammond were ploughed over half a century ago, they have not yet been destroyed by gilgai development. Finally, lands have also been reported from the South Hummocks, in the Mid-North of South Australia,¹ though again they are no longer visible, having been destroyed by modern cultivation.

Lands may also have been ploughed late in the last century, and early in this, before the use of the tractor and the disc plough, in the newer wheat areas such as the Murray mallee, Yorke Peninsula, and Eyre Peninsula. If so, no traces of them remain in the landscape. The areas mentioned are still major producers of wheat, other cereals, and hay, and the fields are still under cultivation. This plus the common drifting of soil has evidently eliminated any signs of the old ridge and furrow.

Description

Wherever they occur in South Australia, the lands display a similar range of size. At Tungkillo, many are approximately 20 by 200 yards, at Mt Crawford and Harrowgate 10 by 200, at Victor Harbour 7 by 100, and Rapid Bay 7 by 150. But in each area and indeed in many paddocks, there is a considerable range of size.

The lands vary in width between 5 and 60 feet, with a mode of between 15 and 30 feet. They are commonly 150–200 yards in length though some are as short as 20 yards and others as long as 300 yards. In all cases the furrows extend the length of slopes unless interrupted by outcrops or other obstructions; they

¹ K. L. Forrest, personal communication.

do not pass over the crests of hills, though some few carry over minor rises and undulations. Many furrows terminate a few yards short of the field boundary leaving a narrow headland or foraker at the field margin (see e.g. FIGURE IVa). The furrows display no regular curves near the field margins comparable to those described by Eyre¹ in England, though some furrows are sinuous, evidently in response to marked changes in slope. Most furrows run directly down the local slope of land, in the Flinders Ranges on rectilinear or gently concave slopes, and in the Mt Lofty Ranges on slopes which are sigmoidal (upper slope convex, lower concave) in section normal to the contour. In the Mt Lofty Ranges, the ridge and furrow can occur on valley flats (though they are rarely preserved in such situations) and on slopes up to 15°, though 7°–10° is more common. In the Flinders Ranges they are preserved in fields which are almost flat, as on the Willochra plain, or on slopes up to 4° in piedmont zones. Some lands are run diagonally across the slope, so as to maintain parallelism with others which are normal to the contour. In some fields, however, parallel sets sit at quite obtuse angles to each other, for instance near Victor Harbour and near Tunckillo (FIGURE IVb). On some concavo-convex slopes the furrows were curved or sigmoidal in plan, the trend of the furrows being changed in order to maintain proximity to the steepest slope. Only two instances of furrows running along contours have been observed, though near Victor Harbour, Hammond, and Blinman, on nearly flat fields, lands were evidently ploughed at right angles to each other—criss-cross ploughing—at different times. Some are now deepened by erosion, and others may have been slightly filled in by soil washed from the adjacent cambered ridges, but the original depth of furrow was apparently of the order of 5 inches. This is the depth of furrow mentioned in an account of ploughing with the early swing, or non-wheeled, ploughs,² and is also stipulated in the following excerpt from an advertisement laying down conditions for a ploughing match held near Victor Harbour (FIGURE I) in 1886: "All competitors to be subscribers to the funds of 10/6 each. The field to be ploughed with one ridge and one furrow each plough: depth 5 inches; width of furrow at the option of the ploughman; quality to the decision of the judges. Ridge to be formed in six fair furrows. No assistance in setting out except placing poles."³

Ploughing Procedure

All interviews, whether relating first, second, or third hand information, suggest that the ploughing procedure followed in South Australia in the making of lands was similar in broad outline to that used in Britain and described by

¹ S. R. Eyre, 'The Curving Plough Strip and its Historical Implications', *Agric. Hist. Rev.*, 3, 1955, pp. 80–94.

² Gray, *loc. cit.*

³ *Southern Argus*, 11 August 1886.

the Orwins.¹ Using a single share plough equipped with coulter and mould board, a deep double furrow was first prepared; a 'top' was opened. The ploughman then followed down this trench, first on one side and then the other, in such a direction that the mould board threw the soil toward the trench, which was of course filled in. The alternate traverses on either side of the original trench continued, thus creating a broad ridge. But the piling up of soil within the ridge did not go on indefinitely; when the ridge was perhaps about 20 feet across it was left, and another top was opened in what was to become the adjacent ridge or land.

In South Australia the whole procedure of ploughing soil toward the top in order to make a broad ridge was known as 'making a crown', and the furrows which survive in the present landscape mark the junctions of the lands. Some farmers did not open the first broad trench, but merely threw the soil up in a central ridge by ploughing two adjacent furrows traversing in opposite directions.² Temporarily there was (see below) at the crest of the land a narrow strip of unploughed land buried beneath a veneer of soil thrown over from adjacent furrows. Sometimes the coulter was dispensed with, and the soil was torn up, though still thrown by the mould board into furrows.³

During the latter part of the nineteenth century two- and four-share ploughs were available and were used on some farms. But the single share implement remained in use well into the present century. The lowest capital outlay required affords a partial explanation of the extended popularity of the smaller implement, but it must be borne in mind that the team of animals—whether horses, bullocks, or donkeys—required for it was smaller than for the larger machine. The lesser demands of such smaller teams on insecure water supplies assisted the retention of the single share plough until the advent and widespread use of machines powered by the internal combustion engine.⁴

Origin of the Lands

Previous Hypotheses. It has been suggested that lands need not have become permanent features of the landscape.⁵ Simply by treating the furrows formed in one year as the tops for the next year's ploughing, the microrelief features formed could, it is argued, have been neutralized, the implication being that

¹ Orwin and Orwin, *op. cit.* An excellent account of ploughing in the early days of settlement appears in Gray, *op. cit.*

² G. A. W. Depledge, Encounter Bay, personal communication.

³ The method of strip-field ploughing is similar to that described as *en adossant* (i.e. working outwards from a central furrow) described in A. G. Haudricourt and M. J. Bruhnes Delamarre, *L'homme et la charrue à travers le monde*, Gallimard, Paris, 1955, pp. 330–6. There is no suggestion of working inward toward the centre (*en refendant*) initially, though, as is mentioned below, this is what in fact happened in some cases where the lateral furrows of the previous year was taken as the central furrow the next.

⁴ See e.g. Twidale and Smith, *op. cit.*

⁵ Orwin and Orwin, *op. cit.*, p. 33.

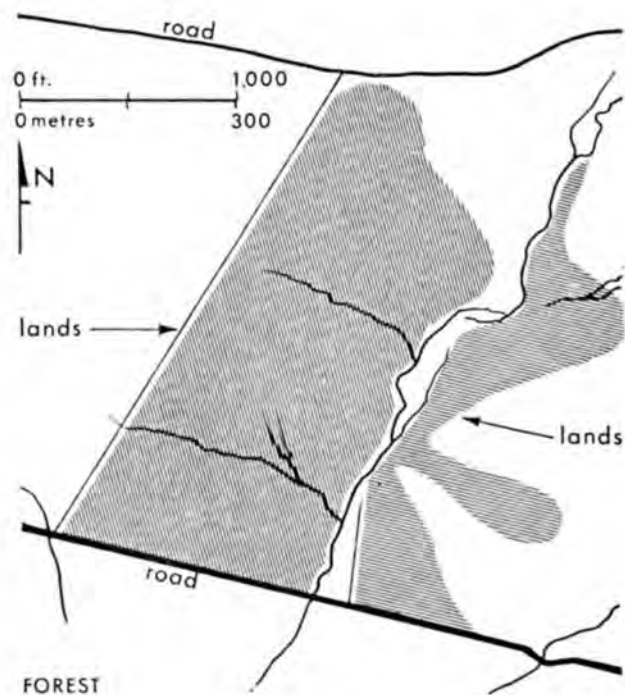


FIG. IVa

Map of a paddock near Mt Crawford, showing lands running downslope but diagonally to the field boundaries. Though of constant width they vary in length and hence in area. Note the foraker at the north-western edge of the paddock.

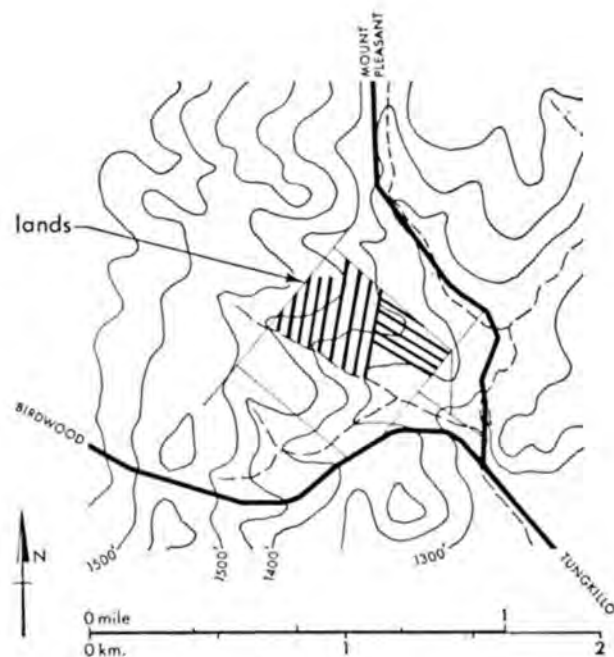


FIG. IVb

Plan of field, near Tungkillo, showing two sets of furrows disposed at an obtuse angle to each other so as to maintain a downslope orientation.

the features which survive in the landscape were imprinted over a number of years. It has been urged that the farmers of old did precisely perpetuate the location of ridge and furrow, and that they must therefore have had a positive reason for developing and retaining the pattern.¹ Local evidence does not support this contention. Interviews with farmers who have ploughed lands and who followed the procedures taught them by their fathers and grandfathers suggest that the South Australian lands were not permanently located, in the sense that the lands were not laid out for all time. Some farmers used the previous year's furrows as tops and ploughed into them, thus shifting the precise position of the depressions.²

The Orwins have suggested that some ridges and furrows were formed to improve land drainage.³ For this reason the lands were perpetuated, and for this reason the furrows were not only cut consistently across the contour but were so spaced that the slope from ridge crest to adjacent furrows was everywhere sufficient adequately to drain the soil. Margaret Clark has argued that if this were the correct explanation not only for the existence of the lands themselves but also for the observed variations in width of ridge, then there should be a correlation between the quality of drainage at a particular site (according to such factors as soils, bedrock, slope, and climate, though she was concerned principally with soil type) and the spacing of furrows ploughed there.⁴ She was not able to discover such a relationship. In South Australia also no such consistent correlation is evident. It has been noted that the lands preserved in valley floors are generally narrow (see e.g. PLATE II), but they are no different from those which occur on adjacent hillsides.

In South Australia, one farmer has stated specifically that ridge and furrow were ploughed to improve drainage.⁵ This farmer actually reverted to the ridge and furrow method of ploughing for the period 1911-46, in order to improve drainage and so increase cereal yields on a field near Victor Harbour. This is, however, a particular and rather atypical site. The field concerned is low-lying, virtually flat (slope $\frac{1}{2}^\circ$), and underlain by heavy, grey pedocalcic soils, the clays of which swell on wetting. Thus a number of factors at this site conspire to prevent good drainage (PLATE IV).

But this is undoubtedly a local and particular situation. In the Mt Lofty Ranges, most lands are preserved on appreciable slopes, and many are ploughed in well-drained sandy soils. Likewise in the Flinders Ranges, the scarp foot situations which seem favoured for wheat growing and where lands are commonly preserved, are well drained. Only in local basins of interior drainage is

¹ Orwin and Orwin, *op. cit.*, pp. 33-5.

² G. A. W. Depledge, personal communication.

³ Orwin and Orwin, *op. cit.*, pp. 33-5.

⁴ H. M. Clark, 'Selion size and soil type', *Agric. Hist. Rev.*, 8, 1960, pp. 91-8.

⁵ Twidale, Forest, and Shepherd, *op. cit.*



PLATE I

Narrow lands on undulating hillside near Harrogate, South Australia (C. R. Twidale).



PLATE II

Narrow and short lands in a narrow alluvial valley floor, near Kersbrook, South Australia (C. R. Twidale).



PLATE III
Lands near Hermitage, Mt. Lofty Ranges.



PLATE IV
Furrows flooded after winter rains delineate old lands near Victor Harbour, South Australia
(R. P. Bourman).

there occasional flooding. In any case, water shortage rather than surplus is the problem in these arid and semi-arid climates.

In addition to her objection earlier referred to relating lands to drainage, Margaret Clark suggests that the drainage improvement hypothesis implies a knowledge of soil science unlikely to be found in farmers of old,¹ though farmers could have been, and surely were, guided in their methods and practices by the accumulated experience of generations of work on the land in a particular area.

As an alternative to the drainage hypothesis, it has been postulated that a land represents a day's labour for the ploughman.² This hypothesis is also held in some parts of South Australia;³ yet it is manifestly invalid, at any rate so far as South Australia is concerned. For if the suggestion were correct there should be a relationship between the site environment on the one hand and size of land on the other. Thus lands ploughed on light sandy soils and on flats or gentle slopes should be more extensive than those made on heavy clay soils and on steep gradients. In both the Flinders and Mt Lofty Ranges, there is no apparent correlation between site difficulty and size of land. The size of land varies between less than 200 and 4,000 square yards, with no apparent relationship between size and the factors mentioned. In any case, this is surely a range of variation greater than can be accounted for by the idiosyncracies of individual sites or ploughmen, or for that matter, and in the case of the lower limit, greater than would be tolerated by the economy of the property concerned. Furthermore, in order to maintain an orientation normal to the contour, the lands are, in many square and rectangular fields, run parallel with the diagonal. Their lengths differ greatly from one part of the field to another without there being any compensating variation in width of land; thus the area of lands even within the same paddock varies enormously—near Mt Crawford for instance by a factor of more than 3 (FIGURE IVa).

Finally, Gray records that in a ploughing match a man using a single share plough was expected to turn over half an acre in five hours.⁴ Now it is unlikely that self-employed farmers in the last century watched the clock any more than their modern counterparts. They most likely worked as long as possible while the job in hand remained to be done, in order to take advantage of favourable conditions such as rain. But even allowing only a 10-hour day, it is clear that about an acre could be ploughed with one share plough. Thus one of the larger lands could represent a day's work, but not the smaller ones of only 200 square yards. With the use of two- and four-share ploughs this daily rate increased, a point confirmed by interviews which put the daily capacity at between one and three acres, depending on conditions.

¹ Clark, *op. cit.*

² *Ibid.*

³ G. A. W. Depledge, personal communication.

⁴ Gray, *op. cit.*

Orientation of the Furrows in Relation to Slope. Most of the lands preserved in South Australia are on fairly steep slopes where drainage impedance is scarcely a problem. In valley floors where there is from time to time temporary waterlogging and where lands are also preserved, the width of the lands does not appear significantly different from that on nearby slopes. Though reference is made above to one instance where furrows were ploughed specifically to improve the drainage in a particular situation, drainage is not the reason for the ploughing of lands in South Australia, or for their common disposition normal to the contour.

Information obtained from interviews suggests that the furrows were ploughed across the contour for three reasons. The first is related to the operation of the one-share plough. The mould board was fitted to the plough so as to throw to one side the soil cut by coulter and share. Mould boards could be fitted to throw either to left or to right, but on an individual plough the throw was always in the one direction. Thus, ploughing along the contour and running say from north to south the plough may have thrown soil to the down-hill side; but running back from south to north, the soil would be thrown uphill, and on even moderate slopes this meant that the soil, which was in effect simply thrust upwards, came down on the board, which became choked. Thus, with the means of haulage available before the invention of the tractor, ploughing was very difficult running along the contour.

The second reason for ploughing across rather than along the contour is merely one of ease of working. It is less arduous, and safer, to plough up and down a slope rather than along it with both bullock or horse team and ploughman operating as it were with one leg longer than the other.¹

The third, relating to both the other two, is that when ploughing along the contour on even moderate slopes, the rear end of the plough, whether one-, two-, or four-share, whether swing or fixed,² tends to slip downslope as the plough is pulled along: the tendency known to early South Australian farmers

¹ Ploughs with two or more wheels were constructed in such a way that inequalities of level produced by ploughing were accommodated; the wheels which ran in the ploughed furrow were larger than those on the other side of the machine which ran on the as yet unploughed land.

² The swing plough had no wheels. The fixed plough, with one, two, or four wheels was introduced in South Australia from about 1857 onwards, according to Gray (*op. cit.*). The single-wheel plough had the advantage that the wheel regulated the depth of furrow; the two- and four-wheel ploughs, which were introduced later, were more easily controlled. Some of the early ploughs used in South Australia were imported from Britain (Gray records the names 'Avery' and 'Ransome & Hornsby' on some of the old ploughs) but from an early date ploughs were manufactured locally. For example, Hugh McCullum, an early resident of the Woodside-Mt Torrens district, was given a plough by his father who bought it from a blacksmith, Daniel Ferguson of Glenunga, now a suburb of Adelaide (Gray, *op. cit.*). The multi-shared ploughs used until the early 1950's in the Harrogate and Victor Harbour districts were made early in this century in Adelaide (G. A. W. Depledge, personal communication, and H. L. Smith, Harrogate, personal communication).

as 'crabbing'.¹ To keep a plough on line, whilst at the same time controlling the team and keeping both it and oneself in a straight line on a considerable slope, was a difficult task. The downslope swing of the plough caused a widening of the furrow ploughing in one direction along the slope and its narrowing on the return journey. Crabbing may also have led to departures from the straight furrow and the involuntary development of curved lands and lands of variable widths on slopes (though see earlier, p. 53).

Ploughing in Strips. The system of ploughing responsible for the making of lands was undoubtedly brought to South Australia by the early immigrants and settlers, who, having cleared the land for cereal cultivation, applied their traditional methods in their new environment. It may be that tradition prevailed until such time as new machinery and means of motivation became available through technological advances, and that until these advances were practised, there was no change on the farm. The force of tradition is illustrated by the case of one farmer near Harrogate (South Australia) who ploughed ridge and furrow until 1949, despite the availability of disc ploughs.² Certainly, the only positive reasons advanced for making lands are those referred to above concerned with drainage improvement and a day's work, both of them already considered in relation to British lands, and both hypotheses therefore possibly exported along with the ploughing procedure itself.

But even before the problem of lands is broached it is necessary to ask why the field was ploughed in long parallel furrows rather than, as is so often done today, particularly in large flat Australian paddocks, in circuits, which is of course, less wasteful of time and effort. One possible reason is that such circuits embrace a range of slopes some of which, as mentioned earlier, were difficult to negotiate. Second, far from being a disadvantage, the necessity or the opportunity to rest at regular intervals at the end of a given unit of work—the land—may have been beneficial before the days of machines for both man and beast probably worked longer and better for periodic rests.

Variable Width of Lands. Neither of the two competing hypotheses proposed in explanation of the variable width of lands—those relating to drainage and to a day's work—appears consistent with the field evidence in South Australia. Of course, dimensions soundly based in experience in parts of Britain may merely have been passed down from generation to generation. It may be that in setting out the lands, the farmers merely paced say 20 yards or 10 yards or a chain—or any well-known or round figure of units, rather than say 19 or 12 or 9 or any other odd or unusual, though logically just as defensible, number of yards. There may be no rationale behind the width of lands. But two possible explanations, one indeed mentioned by the Orwins,³ emerge from a consideration of

¹ G. A. W. Depledge, personal communication.

² Twidale, Forrest, and Shepherd, *op. cit.*

³ Orwin and Orwin, *op. cit.*, p. 34.

ploughing procedure, and the general circumstances of farming in the early days of settlement in South Australia.

First, as noted earlier, in South Australia, as indeed in Britain, a headland was left at each end of the several lands which occupied each field. This was where the team and plough were turned around in preparation for the return trip on the other side of the top. Thus, as he passed from one side of the land to the other, the farmer had a certain amount of dead running, and the wider the land the greater the amount of wasted time and effort for both the team and the ploughman. Hence the width of a land may represent a compromise between the desire not to waste time and energy in the manner outlined above, and the effort required to open the top of each land (where this was the practice). Second, consider the resources available to the early immigrant farmer, and the environment in which he found himself in South Australia. The early farmer, usually holding a 40-acre or 80-acre lot, was essentially dependent on his own resources—his wife, his sons and daughters, but above all, himself. In South Australia with its uncertain rains, it is imperative to take advantage of the opening rains, and to plough and seed immediately after the rains, at the beginning of the season. This is particularly true of the more arid areas, including the Flinders Ranges. Today, with modern quick-moving equipment, a whole field is ploughed in one continuous operation, though the urgency attached to catching the rains is indicated by the common practice of working through the night with the aid of lights. But if the early farmer working with horses and a one-share plough had adopted this plan, the opportunity for ploughing and seeding might have been lost: the team of horses and the one-share plough could not cover the ground quickly enough. What he may have been forced to do was to plough a relatively narrow strip—a land—and then either proceed to the next while his family sowed the first ploughed strip or sow his first land himself before going on to plough the next. Thus, he may have ensured that some at least of his field was sown and stood some chance of yielding a crop.

These may have been powerful enough reasons for the land system to have been retained in South Australia. As has been mentioned, the system had the disadvantage of encouraging gully erosion, but it was not really abandoned until the development of the trailing disc plough and the tractor. With such power and machinery, the farmer can make every yard he travels another yard ploughed and, armed with this equipment, he can plough at such a rate that he can take much larger units of land—whole fields—and still plough and sow in time to take advantage of the rains. These technological advantages were not available to the early settlers and agriculturalists who had perforce to evolve procedures which would be least wasteful of time and effort, and ensure that some parts of their fields, at any rate, were sown and stood to yield the precious crop, if only seed for the next season.