ESRC RRL

Economic and Social Research Council

Regional Research Laboratory for Scotland

Land use and agricultural activity: an areal approach for harnessing the Agricultural Census of Scotland

J. McG. Hotson

Working paper No. 11
November 1988

Abstract

This paper describes the Agricultural Census and the extent to which it is available to the public for analysis and display. Particular focus is on the potential in the locational aspects of the information on agricultural activity. A technique designed to improve the areal definition of Census data is described with reference to the various sources of 'error' in the data.

Draft issue
November 1988

1. The Agricultural Census

The Agricultural Census is taken annually at the beginning of June each year. Forms are sent to occupiers of agricultural land who are obliged to answer questions about their holdings. A copy of the questionnaire form is given in Figure 1. A similar, but not exactly identical, set of questions is used in England and Wales. The purpose is mainly to produce national totals of agricultural production.

Information on hectares of crops reflects fairly accurately that kind of agricultural activity throughout the year; similar information on livestock does not. As data for estimating areal distribution, these data vary in their usefulness from item to item. Crops are (relatively) immobile and their existence at a particular point on a particular day is meaningful, information being recorded at the height of the growing season. Some livestock on the other hand are often highly mobile, being frequently produced in one part of the country and reared or fattened elsewhere. Where they all are on one day in the year is not necessarily a fair reflection of their distribution at other times of the year.

2. Access to Agricultural Census Information

The information provided by occupiers is confidential, an aspect which is guarded carefully by the Department in Scotland and the Ministry in England and Wales. It is made available to the public by summary with combined totals for local groups of occupiers, so that individual data returns cannot be distinguished. The smallest geographical unit, and hence the greatest amount of geographical detail made publically available, is the civil parish. The Parish Summary of the Agricultural Census is a set of aggregate 'small area' statistics based on information from groups of occupiers whose land most closely identifies with the land of each civil parish. The civil parish network in Scotland is shown in Figure 2.

The concept of the civil parish as the basic geographical unit of the Agricultural Census is fraught with difficulty. The land of the grouped occupiers does not coincide neatly with the land of the civil parishes. It may have been a reasonable fit in the historic past, but now it is a very indifferent fit, and from time to time, and place to place, very poor indeed. The main cause is the amalgamation of smaller holdings into larger holdings and the way in which an occupier is allowed to make one return for a number of associated separate holdings under his control, which return may be grouped within a particular civil parish even though some land is clearly elsewhere. This land may well be extensive and some distance away from the 'returning' parish. Regulations for answering livestock questions also make allowance for some livestock to be included in a parish return, though it is located on other land elsewhere.

However, many of the errors are relatively minor in terms of distance: in fact the 'flying' information relating to a civil parish is often not far away and the 'holes' within the parish are often small. Also, this is the most accurate locational detail that is publically available. What this adds up to in practice is that the Parish Summary of the Agricultural Census is a good locational data set in terms of national and regional distribution, but may be poor in some local detail, and that at the same time, individual items of information are variable in usefulness.

Civil parish groupings of occupiers that fall below a certain number (4 in practice) are combined with those from another parish, in order to preserve confidentiality. With farm amalgamations 'combined parishes' tend to increase in number over the years.

Civil parish boundaries change too, for a number of non-agricultural reasons, and an attempt is made to keep up to date, year by year, by regrouping occupiers. This is a drawback for comparisons over time as boundary changes are often not easily identifiable.

3. Areal Definition of the Agricultural Census

The areal definition of the Agricultural Census can, however, be improved without interfering with the confidentiality aspects and by accepting, as it is presented, the Parish Summary of the various civil parishes throughout the country. It may not be possible to say for certain that particular items of the Census are in particular geographical areas, but it is certainly possible to say that there are specific geographical areas which preclude agricultural activity. Urban areas, for instance, areas of inland water and extensive woodlands are examples of such geographical areas. Certain other areas preclude specific kinds of agricultural activity and therefore certain Census items. There are many examples of these areas in Scotland because of the abundance of what can be termed 'rough pasture', or 'moorland'.

Take, for example, one of the larger highland civil parishes, north of the Great Glen. Although sheep and some cattle may be found scattered throughout most of the parish, the greatest amount of agricultural activity is concentrated in one or two extremely restricted localities where suitable land exists in a sheltered site. It would not be unreasonable to restrict the location of much agricultural information from the Census to these geographical areas simply by excluding it from clearly unsuitable areas elsewhere.

4. Improved Areal Definition of the Agricultural Census

Civil parishes can be defined as groups of one kilometer squares of the National Grid. These squares are chosen to conform as closely as possible to the size and shape of the civil parish. Many parishes are awkwardly shaped for this exercise and do not lend themselves to being defined by the one kilometer grid lines of the National Grid. This is especially true when the parishes are small, but in all cases decisions were based on size rather than shape when adherence to both was impossible. This means that within the dataset of one kilometer squares the areas of the parishes are reasonably accurate, and the location by shape only fairly so. Information required for this exercise was taken from the latest published administrative maps showing the civil parishes, and subsequently modified to ensure that this conformed to the parishes listed in the Agricultural Census Parish Summary.

The next step was to identify within each parish any one kilometer squares that were of unsuitable land use in terms of attaching Agricultural Census information. Three basic kinds of land were identified. Land quite unsuitable for the location of any agricultural activity, land suitable for certain agricultural activity associated with 'rough pasture', and other land generally recognised as 'agricultural land'. This data set, when created, seemed as though it might be useful in a variety of other ways as background environmental information for other than Agricultural Census work. It was decided therefore to break down unsuitable agricultural squares into a variety of more clearly defined categories to ensure such an improved environmental data set.

In Scotland, the following list indicates the various categories identified:

1) Agricultural Land
   (ie land to which it is reasonable to attach Census items)

2) Moorland
   (ie land to which it is reasonable to attach certain Census items)

3) Woodland

4) Urban

5) Non-agricultural land - artificial
   (parks, golf courses, airfields, industrial sites, some MOD land, etc)

6) Non-agricultural land - natural
   (rock outcrops, sand dunes, mud flats, swamps, etc)

7) Inland water

Categories 3 to 7 constitute land quite unsuitable for the attachment of Census items.

When the same exercise was carried out for England and Wales, Agricultural land was further identified as being of Grades I and II, Grade III and Grade IV and according to the classification used by the Ministry of Agriculture. At the same time no attempt was made to split non-agricultural land into 'artificial' or 'natural' components. Land use information was provided by the Ministry of Agriculture in England and Wales for that exercise, but in the case of Scotland it was generated from the latest published information available, at EUCS Data Library, and has now become part of a Regional Research Laboratory project.

5. The Land Use Framework of 1 km Squares

As with the exercise in creating the land-use framework for England and Wales, that for Scotland was based on the general structure of the National Grid. As already noted, the basic unit was the one kilometer square, but major blocks of units were created relating to the 100 kilometer squares of the National Grid. This is designed to facilitate the creation of any regional grouping of data without being tied to areas delineated on a largely administrative basis, and therefore more subject to historical change. There is no direct connection with the layout of the civil parishes and subsequent joint manipulation of the two data sets is on a one kilometer grid basis. It should be strictly understood that the guiding principle in deciding the land use category of each one kilometer square of the National Grid was whether or not it was reasonable to attach agricultural information from the Census. An attempt was then made to attach a reasonable definition to the square on the basis of the land use categories. The coarseness in definition of the one kilometer square does not lend itself to accurate mapping of these land-use categories. The definition of urban areas does not give rise to too many problems, but woodland and inland water, which both frequently occur in lesser units than even half kilometer squares present greater difficulties. In areas of the country covered by frequent small occurences of such woodland or inland water, an attempt was made to compromise by declaring certain squares to be of woodland or inland water even though they were not even half covered by these land use features, but simply to present a more sensible picture of a larger area. Whereas this destroys the potential use of the data set for

many subsequent environmental exercises it does not invalidate the general picture of the environment thus created and, most important, it does not interfere unduly with the primary object which was the better geographical definition of agricultural activity.

Regrouping of one kilometer squares into 5 kilometer or 10 kilometer blocks presents, in many ways, a much more satisfactory dataset, provided that an attempt is not made to identify the larger square as a single land use unit, even though in some cases this might be possible. A 10 kilometer square, for instance, would include 100 different one kilometer squares and by adding up each land use category, would give a single percentage figure for each land use in that 10 kilometer square. Bearing in mind the techniques described above in dealing with woodland and inland water problems, the resultant percentage breakdown of a 10 kilometer square gives more sensible land use definition to that area. It is more realistic to infer that a particular 10 kilometer square has 15 percent woodland than that a particular one kilometer square is either all woodland or has no woodland. To be able to do this was in fact the motivation behind such application of the techniques in the first instance.

The illustration in Figure 3 is of a 100 kilometer square of the National Grid showing land use features. It presents a fair view of the value of the data set.

6. Agricultural Census Redistribution - The Land Use Framework in Action

In practice, consideration is given to the summary of grouped occupier information that has been attached to each particular civil parish. This civil parish is known to comprise a number of specific one kilometer squares of the National Grid. These same squares are also known to fall into the several land use categories already described in 4 above. The squares can now be considered to fall into one of the original three basic categories, ones to which no agricultural items should be attached ('non-agricultural' squares), ones to which some agricultural items may be attached ('moorland' squares), and the rest to which there appears no reason why agricultural items in general may not be attached ('agricultural' squares).

The items of the Census can then be treated one by one either for general distribution to both 'agricultural' squares and 'moorland' squares or only to 'agricultural' squares. If the item is one for general distribution (eg sheep) then the appropriate number of squares in the parish is calculated. Then the item total is evenly divided amongst such squares. If the item is one for more specific distribution to 'agricultural' squares only, then the item total is divided evenly among these squares.

Two points should be made here. First of all, care had to be taken to ensure that all parishes which were detailed as having Census information attached (the Parish Summary), did in fact have at least one appropriate land use square for redistribution. This was necessary because of the general crudeness of the exercise based as it was on separate applications of the one kilometer grid to both the civil parishes and the land use. Some readjustment of the land use framework achieved this alteration. Secondly, in the case of the England and Wales redistribution, it was possible with the data available to apply a more complicated algorithm involving certain Census items and differing grades of agricultural land. This has not been applied in practice, though.

The resultant data set was one of the redistributed Census items attached to certain chosen one kilometers of the National Grid, with the remaining one kilometer squares still identifiable by their land use definition. Consideration can now be given to the meaningfulness of this data.

7. Use of the Kilometer Grid Data

Many users of the Parish Summary data frequently expressed dissatisfaction with the civil parish as an areal unit. The many different sizes and shapes of parishes, often related to regional characteristics, were felt to be unhelpful when distribution patterns of agricultural activity were being examined. The question "where are most cereals grown?" produced lists of large parishes rather than the answer required. Changing the question to ratios in areas produced a better result, but in the process lost the information on absolute numbers. A parish with a percentage value of 75 for cereals in relation to arable land may have achieved this relatively high figure because of a particularly small area of arable land and may not indicate a great amount of cereals.

Many users of Agricultural Census data were interested in the areal distributions of totals of crops and livestock. The National Radiological Protection Board and the Central Electricity Generating Board, for example, were both interested in how the patterns of various kinds of food production related to patterns of atmospheric radiation levels. Computer models were developed to overlay the two patterns to estimate the extent of association, on the basis of common unit areas. The National Grid provides a useful metric for this and can accommodate different levels of accuracy, from one metre squares or less to 100 kilometer squares or greater. Commercial and industrial concerns are interested in the location of totals, to help improve the deployment of sales staff. Others are interested in environmental pollution by application of fertilisers, insecticides, herbicides, etc to agricultural crops. If users are interested in computer modelling, and this is an increasing interest, then the Agricultural Census related to the National Grid is of immense value.

This brings us to the question of the validity of the data, and this is a most important factor. The coarseness of the one kilometer grid square does not permit the accurate redistribution of Census items from the Parish Summary to their correct location. Squares described as agricultural, urban, woodland and so on are frequently not wholly and completely so. The Census items are allocated to the least inappropriate squares rather than the most appropriate squares. Also, at the point of data collection, the Census items are not always accurately related to the original civil parish from which they were redistributed. Moreover, information on this inaccuracy is not readily available.

Nevertheless, the Parish total for any particular Census item, has been retained in the distribution process. For example, the total number of hectares of barley, adding together the various one kilometer square values, corresponds exactly to the total hectares of barley from the original Parish Summary. None has been lost or gained even though hundreds of thousands of hectares were involved, using double length arithmetic in the redistribution process.

The one kilometer data set then has the correct number of hectares of barley in total, but is most unlikely to have the correct value in each individual square. The squares to which they are attached are the most realistic ones in terms of general land use.

It is likely that the locational errors are not gross, although this may not be so with some livestock items. Two methods are used to deal with locational errors. One is to use a moving average technique, whereby the value of a Census item in a square is replaced by the mean of itself and the surrounding squares. An algorithm exists to do this, up to and including calculated means from a major grouping of 11 x 11 kilometer squares. This technique has been little used in practice, partly because

it is expensive in computer time and space, and partly because although it may correct some errors, it does compound others.

The more general approach is simply to produce data at higher levels of aggregation, adding up the various one kilometer squares into blocks of 5 x 5 or 10 x 10 kilometer squares. The 5 or 10 kilometer square data set has greater 'ground truth'. Clearly, these datasets are very much smaller and more easily managed. The appropriate level of such blocking depends on the demands of the user.

This grouping of squares need not be by blocking: any techniques used in modelling that produce grouped totals would improve the validity of the data set.

Bearing all this in mind, and recalling that certain Census items have dubious locational value on a one day in the year basis, care should always be taken in making use of the data whatever form it is in. Expert advice on Agricultural Census validity should always be sought by users who have doubts.

Census items attached to, say, a 5 kilometer square block do not have the same misleading implications of locational accuracy as the same Census items detailed within the intricate boundaries of a civil parish. Users of agricultural data are aware that it does not exist in such square units on the ground and are more likely to examine its validity in a grid data set than they might be in its civil parish guise.

Square grid data is fairly simple to map using a raster type program such as CAMAP. An interactive program especially designed to deal with the Agricultural Census in its grid form, called GRIDMAP, has been developed by EUCS Data Library, again as part of a Regional Research Laboratory project. Output from this program is to a laser printer which prints a variety of special symbols in addition to the normal set on a square grid. Examples of this output are shown in Figures 4 to 7. There are two kinds of output, one designed to provide reasonably detailed value information of the particular item of data in what has been called a 'study map'. The other is designed to highlight patterns of data distribution using shading symbolism and referred to as a 'display map'. Figures 4 and 5 are of study maps and 6 and 7 illustrate display maps of the same subject. Details of GRIDMAP are given in a separate publication.

8. The Future

To introduce a greater level of accuracy into the Agricultural Census data sets, whether Parish Summary or National Grid, it seems clear that in locational terms it is the collection system that is open to the most useful improvements. It seems most unlikely that confidentiality restrictions will ever be completely removed from the Agricultural Census, which means that any improvements must be with this in mind. Either the same civil parish system can be continued, with an increased level of accuracy in locational recording or a new system could be introduced, tied to the National Grid.

Improving the civil parish system means trying as far as possible to ensure that the agricultural grouping of occupiers conforms as closely as possible to the area within the civil parish boundary. Occupiers should not be permitted to make blanket returns involving land outwith its parish unless it forms part of a holding, the bulk of which is within the parish and under their control. In a National Grid system, the choice of a basic unit could be made, say a 5 x 5 kilometer square. A summary could be made of occupiers returns, where the bulk of the land of the holdings was within a particular 5 x 5 kilometer square. If the critical level of number of

occupiers was not reached, and confidentiality of returns needed to be preserved, then the square size could be increased to 10 x 10 or even 10 x 5 could be used, comprising as it does two 5 x 5 squares. In all cases, holding information should be returned within the chosen size square which included the bulk of their areas. Special arrangements may be required for extra large holdings or estates.

Not much can be achieved with improvement to livestock information other than by asking additional questions or carrying out an additional Census, both of these suggestions being expensive.

Nevertheless, much can be done with little extra effort, and if the locational aspects of the Census are as important as many users seem to believe, then it would seem sensible that it should be done.

PAGE 1

Department of Agriculture and Fisheries for Scotland

Agricultural and Horticultural Census 2nd June, 1986
NOTICE REQUIRING INFORMATION BY 16th June, 1986

The Department of Agriculture and Fisheries for Scotland [illegible]

May, 1986

AGRICULTURE ACT 1947, SECTION 78 (AS AMENDED)

As the occupier of the land to which this form relates you must complete the form. The information you give should be as at 2nd June, 1986 except where otherwise stated. The completed form must be returned to the department as soon as possible after 2nd June 1986 and not later than 16th June, 1986. Please use the enclosed, pre-paid envelope.

The information you give on the return is strictly confidential and cannot be disclosed without your written consent except as specified in Section 80 of the above Act and Section 12 of the European Communities Act, 1972.

Anyone who fails to fill in and return the form or knowingly supplies false information may be prosecuted.

Secretary.

The area figures below are those previously received and include woods, roads, buildings, etc.

Total Area

Owned Area

OR PRESENT OCCUPIER

AGRICULTURAL AND HORTICULTURAL RETURN AS AT 2nd JUNE, 1986

PLEASE SEE THE ENCLOSED METRIC CONVERSION TABLES

FOR OFFICIAL USE					
C.O.	C.				
	A.				

CHANGE OF ADDRESS/POST CODE

If your postal address is different from that above please give the correct address here:

....

....

.............................Post Code.............

CHANGES IN AREA OF HOLDING

If the total area of your holding differs from that above the address, please give details. Exclude land rented for 364 days or less. Use a separate piece of paper if you need more space.

Land you have taken over

Name of land.............................Code No..........

Parish.............................Area Acquired..........Hect.

Name and Address of Previous Occupier ....

Land you have given up

Name of land.............................Code No..........

Parish.............................Area Given Up..........Hect.

Name and Address of Present Occupier ....

SEASONAL USE OF LAND

If so many months of grazing for so many head of stock are taken or let, rather than a set area, please estimate the area used to show that land is taken or let.

		Hectares (nearest 0.1)
Area of land on this form let seasonally (364 days or less), as at 2nd June, 1986 to another person for cropping or grazing. (This land should be included elsewhere on the form as crops, grass or rough grazing).	1	.
Area of land rented seasonally, as at 2nd June, 1986 from another person for cropping or grazing. (This land should NOT appear elsewhere on this form).	2	.

LAND RENTED AND/OR OWNED

Enter the total area of land to which this form relates (including woods, roads, yards and farm buildings), showing what area is rented by you on a full agricultural tenancy and what area is owned by you. [illegible]

		Hectares (nearest 0.1)
Rented by the occupier from an outside concern	7	.
Rented from a near relative or from a concern in which the occupier has an interest	10	.
Owned by the occupier	11	.
TOTAL AREA OF LAND	12	.

CROPS

Enter the area, including headlands and ditches, of each crop at 2nd June, 1986. Land being prepared for a crop should be returned as under that crop.

			Hectares (nearest 0.1)
Wheat		14	.
Barley	Winter	18	.
	Spring (including bere)	19	.
Oats		20	.
Mixed grain for threshing (only mixtures of wheat, barley, and oats or any two of these)		22	.
Rape for oilseed		23	.
Potatoes intended mainly for SEED		24	.
Potatoes intended mainly for WARE	Earlies intended for harvesting on or by 31st July	25	.
	Main crop intended for harvesting after 31st July	26	.
Peas for Combining		28	.
Turnips and swedes for stock feeding (Not for human consumption)		29	.
Kale and Cabbage for stock feeding (Not for human consumption)		30	.
Rape for Stockfeeding (Not oilseed rape)		31	.
Fodder Beet		32	.
Other Crops for Stock Feeding (Not grass)		34	.
Vegetables for Human Consumption grown in the open (must agree with item 68)		35	.
Orchard Fruit - apples, plums, etc., for sale or manufacture. Include land planted with maiden trees but exclude fruit stocks (see item 38).		36	.
Soft Fruit, (must agree with item 79)		37	.
Other Crops not included above (Not Grass) Include here Glasshouse Crops, item 81, and areas of unspecified crops, including mixed crops (other than vegetables or soft fruit at 67 and 79), which are too small to be shown separately. (see also foot of column).		38	.
Bare Fallow — land left uncropped for the season.		39	.
TOTAL CROPS AND FALLOW		40	.

Item 38 (Other Crops). If crops other than glasshouse crops, bulbs, flowers and nursery stock are included, please enter the total area in the box below.

		Hectares (nearest 0.1)
Unspecified Crops — total area	41	.

Please name any major unspecified crops, e.g., [illegible] 5 hectares, in the space below.

GRASSLAND

Land should be entered as "Grassland" where productive grasses, clovers, etc., are dominant. Land which cannot normally be cultivated or is dominated by poor quality grasses, heather, bracken, etc., should be returned as "Rough Grazings".

			Hectares (nearest 0.1)
FOR MOWING this season	Under 5 years old [illegible]	42	.
	5th year grass and older [illegible]	43	.
NOT FOR MOWING this season	Under 5 years old [illegible]	44	.
	5th year grass and older [illegible]	45	.

		Hectares (nearest 0.1)
TOTAL CROPS AND GRASS (total of item 40 and items 42 to 45)	46	.

		Hectares (nearest 0.1)
Rough Grazings — Mountain, Hill, Moor, Deer Forest situated within the farming unit, whether enclosed or not. Do not include woods, roads, etc., a share in common grazing or any land taken for you for the season.	47	.
Woodlands — (other than commercial orchards) — situated within the farming unit for shelter belts, fencing materials, other farm uses and for commercial or amenity purposes.	48	.
Other Land i.e. roads, yards, buildings (excluding glasshouses), ponds, derelict land, etc.	49	.

		Hectares (nearest 0.1)
TOTAL AREA OF ALL LAND to which this form relates (total of items 46 and 47 to 49) must also agree with item 12.	50	.

VEGETABLES FOR HUMAN CONSUMPTION GROWN IN THE OPEN

Do not give number of rows or plants. Include under the appropriate crop land prepared for it but not yet planted.

			Hectares (nearest 0.1)
Peas for canning, freezing or drying (Not green peas for market or peas for stock feed)		52	.
Beans for canning, freezing or drying (Not fresh beans for market or beans for stock feed)		53	.
Leeks (include land prepared for the crop)		55	.
Turnips and Swedes for human consumption		56	.
Cabbages and Savoys for human consumption (include land prepared for the crop)	Summer/Autumn	57	.
	All other	58	.
Brussels Sprouts (include land prepared for the crop)		59	.
Calabrese (Broccoli)		60	.
Cauliflower and Broccoli-Heading Varieties (include land prepared for the crop)		61	.
Carrots		62	.
Lettuce		64	.
Rhubarb		65	.
Other Vegetables grown in the open (Not tomatoes or other glasshouse crops)		66	.
Mixed Vegetables — areas which as individual crops are too small to be shown separately		67	.
TOTAL VEGETABLES (must agree with item 35)		68	.

Please see over →

Figure 1a

SOFT FRUIT

Exclude spawn beds, runner beds and young plants intended for sale. (These should be entered at item 60).

		Hectares (nearest 0.1)
Strawberries	70	.
Raspberries	71	.
Blackcurrants	72	.
Mixed and Other Kinds of soft fruit including the area of soft fruits mixed above which as individual crops are too small to be shown separately	75	.
TOTAL SOFT FRUIT (must agree with item 27)	76	.

BULBS, FLOWERS AND NURSERY STOCK GROWN IN THE OPEN

Do not give number of plants.

			Hectares (nearest 0.1)
Bulbs grown for the production of dry bulbs and/or cut flowers in the open		77	.
Other flowers for cutting in the open not from bulbs including land prepared for the crop		78	.
Hardy Nursery Stock	Fruit Stocks — assorted trees, runner beds and small beds and young plants intended for sale	80	.
	Roses and Rose Stocks	81	.
	Ornamental trees and shrubs (not forest trees)	82	.
	Other nursery stock (herbaceous plants, alpines, etc.)	83	.
	TOTAL (include also in item 28)	84	.

GLASSHOUSES AND TOMATOES

See metric conversion tables.

			sq. metres
GLASSHOUSES in use	"Walk-in" Plastic Structures	85	
	Glass clad structures	86	
Tomatoes		87	

Include total area of glasshouse crops in item 36.

HAY, STRAW AND SILAGE STOCKS

Include stocks left over from previous seasons and any which have been bought in.

		Tonnes (nearest tonne)
Hay, on holding at 2nd June, 1988 (Tonnes)	91	
Straw, on holding at 2nd June, 1988 (Tonnes)	92	
Silage, on holding at 2nd June, 1988 (Tonnes)	93	

LIVESTOCK

Enter livestock belonging or hired to you but on your workers or family, unless these persons have an agricultural return in their own right, whether on your farm or elsewhere. Include livestock you are keeping and managing on account for someone else. Enter livestock sent for sale on 2nd May or 2nd June.

Exclude any of your livestock kept on contract for you by another farmer or on hire to another farmer and any livestock owned by another farmer which are temporarily on your farm but which you are not managing on contract.

HORSES

		Number
Horses used for agricultural or horticultural purposes	96	
All other Horses and Ponies	98	

GOATS

Goats of all ages	99	

CATTLE

				Number
Cows and Heifers in milk	Dairy		600	
	Beef		601	
Cows in Calf but not in milk	Dairy		602	
	Beef		603	
Heifers in Calf for the first time	2 years old and over	Dairy	604	
		Beef	605	
	Under 2 years old	Dairy	606	
		Beef	607	
Bulls for Service	2 years old and over		608	
	1 year old and under 2		609	
All Other Cattle	2 years old and over	Male	610	
		Female — for Breeding — Dairy	611	
		Female — for Breeding — Beef	612	
		Female — Not for breeding	613	
	1 year old and under 2	Male	614	
		Female — for Breeding — Dairy	615	
		Female — for Breeding — Beef	616	
		Female — Not for breeding	617	
	6 months old and under 1 year	Male	618	
		Female	619	
	Under 6 months old	Male	620	
		Female	621	
TOTAL CATTLE			622	

CALVES SOLD AND BOUGHT DURING THE LAST YEAR

Enter the number of calves (i.e. under 1 year old) sold and bought during the last year.

		Number
Calves Sold Between 1st June 1987 and 2nd June 1988	Under 6 months including calves for immediate slaughter	132
	6 months old and under 1 year	134
Calves Bought between 1st June 1988 and 2nd June 1988	Under 6 months at time of purchase	135
	6 months old and under 1 year at time of purchase	136

IRISH CATTLE BOUGHT

		Number
Cattle you bought directly or indirectly from the Irish Republic or Northern Ireland during the year from 1st June, 1987 to 2nd June, 1988	for Breeding	137
	for Feeding	138

SHEEP

Do not enter your share in a Sheep Stock Club as the Club Secretary will return these sheep.

Enter at question 139 only those Ewes and Gimmers which have lambed since 2nd June and still belong to you.

		Number
Ewes used for breeding in 1987/88 season (Actual Number at 2nd June, 1988)	139	
Rams to be used for service in 1988	140	
Other Sheep 1 year old and over — for breeding	141	
Other Sheep 1 year old and over — Other	142	
Other Sheep under 1 year old (inc. Lambs)	144	
TOTAL SHEEP	145	

PIGS

Enter pigs being kept under contract on your farm.

		Number
Sows in Pig	146	
Gilts in Pig	147	
Other Sows for breeding	148	
Boars Sows for breeding	149	
Gilts 50Kg (110 lbs) and over not yet in pig, but expected to be used for breeding	150	
Boars being used for service	151	
All Other Pigs (not entered above) — 110Kg (240lbs) liveweight and over	152	
80Kg (175lbs) and under 110Kg (240lbs) liveweight	153	
50Kg (110lbs) and under 80Kg (175lbs) liveweight	154	
20Kg (45lbs) and under 50Kg (110lbs) liveweight	155	
under 20Kg (45lbs) liveweight	156	
TOTAL PIGS	157	

POULTRY

Exclude game birds.

Enter poultry being kept under contract on your farm.

			Number
Female fowls producing eggs for eating	Pullets and Hens in the Laying Flock	Pullets — fowls in first laying season	158
		Hens — other fowls including those in moult	159
	Growing pullets — day old to point of lay		161
Female fowls for breeding	Pullets and Hens in or of age kept (or being reared mainly for producing hatching eggs		162
	Stocks of all ages kept for being reared for breeding		163
Female fowls being reared for the table — broilers and other table birds including table cockerels			164
Other Poultry (ducks, geese, guinea fowl)			167
Turkeys of all ages — including breeding stock			169
TOTAL POULTRY			170

OTHER HOLDINGS IN THE SAME OCCUPANCY

Please give the Code No.'s under which you, your Company or Partnership make agricultural census returns for other holdings.	172
	173
	174
	175
	176
If Code Nos. not known enter addresses here:	

LABOUR
OCCUPIER AND WIFE OR HUSBAND

If you are doing farm work (including office work) enter yourself in this section, and your wife/husband if she/he is doing farm work.

Enter yourself as part time if you work less than about 40 hours per week on the farm, even if you have no other job. If you have more than one farm, do not enter yourself and your spouse on more than one return.

Where the farm is run by a partnership or company, enter only the principal or senior working partner or director as the occupier, enter also the spouse, if doing farm work.

Include other working partners or directors in the "All Other Labour" section.

		Number
Occupier — if doing farm work (one person only)	Full time	177
	Part time — More than ½ time	178
	Part time — Less than ½ time	179
Wife/Husband of occupier (if doing farm work)		181

ALL OTHER LABOUR EXCLUDING OCCUPIER, WIFE OR HUSBAND ENTERED ABOVE

This section relates only to persons working for you on 2nd June, including those that were sick or on holiday on that day.

Exclude anyone working under THE YOUTH TRAINING SCHEME.

Leave out school children, non-farm workers working on buildings, including plant or running out contract work, and gardeners or estate workers who do no farm work.

Enter wives only, and on only one return, all persons doing farm work including drainage, ditching, maintenance and minor work and transport of farm goods.

Part time workers are those who do farm work each week but for less than the full working week.

Casual and seasonal workers are those actually working on 2nd June doing work of a temporary or seasonal nature; include labour supplied by gangmasters.

			Number
FULL TIME REGULAR STAFF employed on 2nd June	Males — 20 years old and over	Hired	188
		Members of Occupier's family	189
	Males — under 20 years old	Hired	190
		Members of Occupier's family	191
	Women and Girls	Hired	192
		Members of Occupier's family	193
PART TIME REGULAR STAFF employed on 2nd June	Males	Hired	194
		Members of Occupier's family	195
	Women and Girls	Hired	196
		Members of Occupier's family	197
Casual and Seasonal Workers Employed on 2nd June	Males		198
	Women and Girls		199
TOTAL REGULAR AND CASUAL STAFF (excluding entries of occupier and spouse)			200

I declare the information I have given on this form to be correct to the best of my knowledge and belief.

SIGNATURE OF OCCUPIER .....

Date ..... Telephone No. .....

If signature is not one of the above names, please say who, e.g., "Manager", "Farm Bailiff", "Secretary-Director" etc.

FOR OFFICIAL USE			
C.	C.	C+	D.

Figure 1b

Figure 2

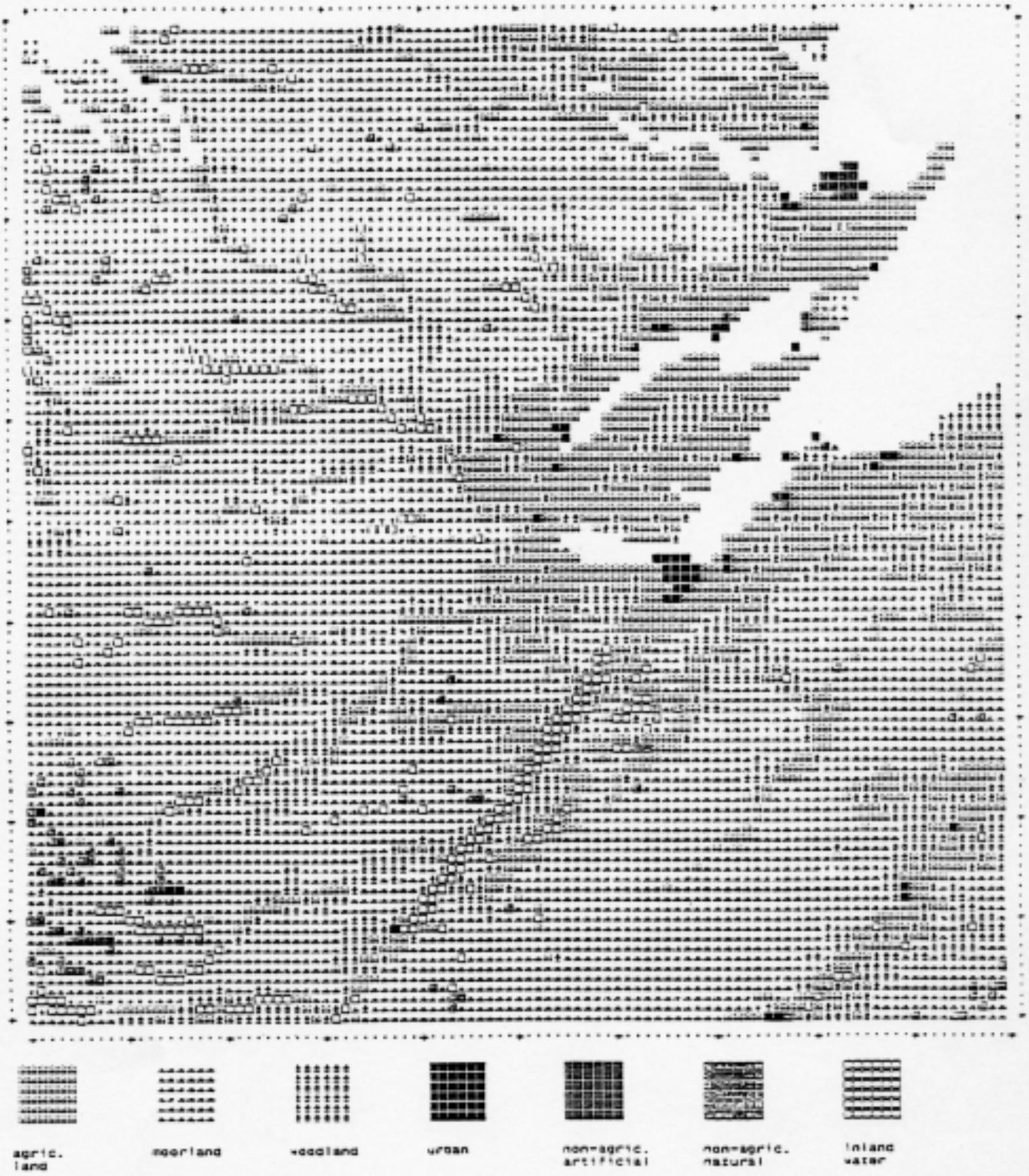

agric. land
moorland
woodland
urban
non-agric. artificial
non-agric. natural
inland water

Figure 3

Winter Barley in Grampian Region
Hectares in 100s by 10km squares
from the Agricultural Census for Scotland, 1986


```
resolution      =    10.00 km
scaling factor  =      100 hectares
##              >=   10000 hectares
+               <      100 hectares

space           =        0

-               =        no data

location of map: 02800700 to 04300880
```

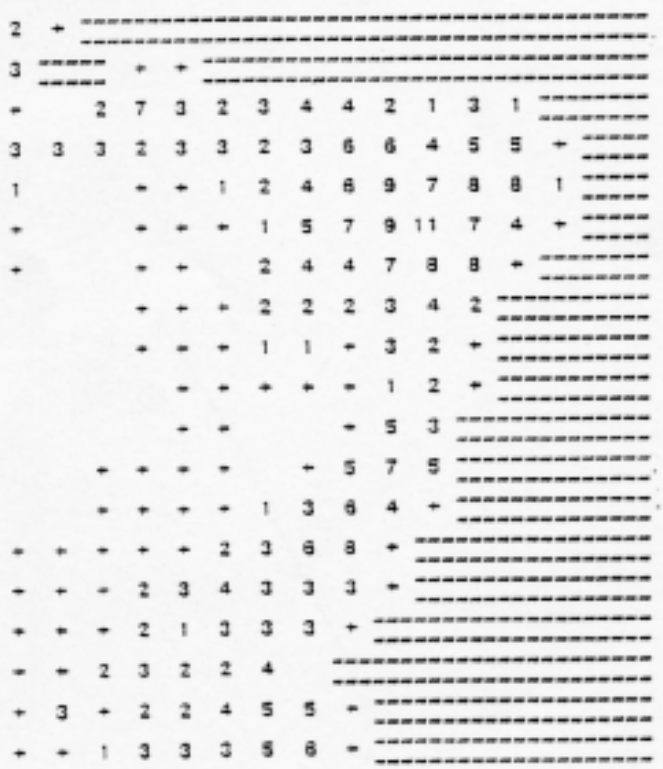


Figure 4

Numbers in 1000s by 10km squares
from the Agricultural Census for Scotland, 1986


```
resolution      =   10.00 km
scaling factor =    1000 numbers
##              >=  100000 numbers
+               <    1000 numbers

space           =       0

-               =       no data

location of map: 01000740 to 03400980
```

																						+	+	2
																				+	+	3	3	11	7	-
					+	1						+	1	3	2	3	1	2	3	6	17	27	29	10	
			1	5	3							+	1	3	3	4	4	5	5	7	9	12	19	9	
	+	4	5	3	+							+	1	2	3	4	4	5	4	7	8	9	13	8	
4	4	6	4	2	-					+	1	1	2	4	5	4	3	4	7	8	6	4	+	
5	6	5	5	1	+					1	2	2	5	4	4	5	3	4	5	7	3				
6	6	5	5	1					+	2	2	3	6	5	3	7	5	4	6	2					
4	6	5	3						+	2	3	3	4	5	4	7	8	4	1						
5	5	1		+			+	1	+	2	3	3	4	4	3	7	9	1							
3	+					2	2	3	3	3	3	4	4	6	9	9	8	3							
+			1	7		1	2	2	3	3	2	3	4	3	6	8	17		+	+					
	3	5	17	2	+	1	2	2	3	2	2	2	3	7	5	3	1	+	-	4	2	2	3		
	3	5	7	12	2	2	2	1	2	2	2	2	2	2	8	8	3	4	3	4	5	5	5	9	
	5	9	10	10	4	+	2	2	3	3	2	3	2	2	4	6	6	6	3	6	3	4	12	16	
	+	2	9	10	6	+	1	2	3	2	2	2	2	4	6	8	5	7	6	6	8	12	12	13	
		6	7	3	2	2	2	1	1	2	2	4	4	7	7	5	4	3	4	8	14	10	12		
		+	3	2	5	2	3	2	2	4	5	4	3	6	6	4	3	3	5	4	7	9	11		
	+	1	+	3	3	2	2	3	3	3	4	4	5	5	5	3	2	3	4	4	4	4	9		
		3	+	+	+	2	2	4	4	4	3	5	4	3	3	4	3	2	2	2	2	2	3		
		+	1		+	2	2	3	4	3	4	4	2	3	4	4	4	3	3	2	3	4	5		
		+	+	+	1	2	3	3	3	3	3	4	4	3	5	5	5	5	9	11	10	9	8		
	3		3	4	4	3	4	3	3	5	4	5	6	6	6	4	4	8	10	14	13	12	11		
5	4	2	5	2	3	4	3	3	5	6	8	8	5	4	5	9	15	11	15	14	17	14	7		
8		4	8	4	2	4	3	5	5	4	6	6	8	7	10	10	14	9	11	16	13	11	4		

Figure 5

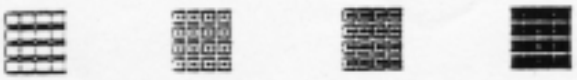
Hectares by 5km squares
from the Agricultural Census for Scotland, 1986
Edinburgh University and Crown Copyright reserved, 1988

greater than:	0.0	75.0	150.0
less than or equal to:	75.0	150.0	357.0
number of occurrences:	2245	1273	160	136

resolution of map = 5.00km units: hectares
location of map: 00500530 to 04651215

Figure 6

Sheep in Scotland
by 10km squares
from the Agricultural Census for Scotland, 1986
Edinburgh University and Crown Copyright reserved, 1988



greater than:			
0.0	1000.0	10000.0	20000.0
less than or equal to:			
1000.0	10000.0	20000.0	45073.3
number of occurrences:			
113	655	197	103

resolution of map = 10.00km units: numbers
location of map: 00500530 to 04601210

Figure 7

The following diagram illustrates some of the problems inherent in the Agricultural Census data.

Figure 2.1