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# The measurement of farm size and the meaning of part-time farming: the AARES countries

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### Abstract

This paper examines what, precisely, is meant by a 'farm', the criteria for the inclusion of individual farms in a statistical register and the resulting enumerations and average sizes of farms in published statistics. Alternative measures of farm size are examined and a relatively novel measure of average farm size proposed to cope with the possibly uncertain population of farms. This is illustrated with reference to data relating to the AARES countries and to the UK. Finally the meaning of the expression 'part-time' as applied to farmers or farms is examined, with a call for great clarity in its use.

**Key words:** Farm; Agricultural holding; Farm size; Averages; Part-time farming

This paper originated from work undertaken while both of the authors were members of the Economics and Statistics Group of the UK Ministry of Agriculture, Fisheries and Food (MAFF). Philip Lund is now a part-time Consultant with Drew Associates and has also been a part-time Reader at Harper Adams University College. Roger Price is now a member of staff of the Department for Environment, Food and Rural Affairs (Defra).

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## 1. Defining a Farm

The term ‘farm’ is used, in common parlance, to refer to a unit engaged in agricultural production. However, this usage begs some important definitional issues – particularly those of a ‘unit’ and of ‘agricultural’ production. Of these, the definition of ‘agriculture’ is the simpler, this being defined within related systems of industrial classification: thus the United Nation’s ISIC is, for example, the basis for the EU level NACE and the UK level Standard Industrial Classification. The first two of these include industrial specifications to the 4-digit level while the national equivalents include the option of further detail (5<sup>th</sup> digit) in the specifications.

With regard to the ‘unit’, there is an important distinction to be drawn between the concepts which, in the context of broader national statistics, are referred to as the ‘enterprise’ and as the ‘establishment’. In the System of National Accounts (SNA) 1993<sup>1</sup>, the term ‘enterprise’ is used to describe an institutional unit in its capacity as a producer of goods and services, with an institutional unit having been defined as an economic entity that is capable, in its own right, of owning assets, incurring liabilities and engaging in transactions with other entities. An ‘establishment’, on the other hand, is defined as an enterprise or part of an enterprise that is situated in a single location and in which only a single (non-ancillary) productive activity is carried out or in which the principal productive activity accounts for most of the value added.

For the purpose of assembling data it is necessary to translate these conceptual definitions into operational specifications. For example, in the United Kingdom, the basic unit used for the annual Agricultural and Horticultural ‘Census’ and related surveys is the ‘holding’, the guideline definition of which (operated pragmatically and subject to agreement with the farmer) is that ‘it comprises land on which agricultural activities are carried out and which is, by and large, farmed as one unit having regard to such supplies as machinery, livestock, feedingstuffs and manpower’<sup>2</sup>. It is however recognized, on the Census forms, that several holdings may be run by the same holder (these being those ‘in the same occupancy/partnership’). It follows that the number of holdings will be greater than the number of farm businesses (i.e. enterprises in the terminology of the SNA) and that their average size will be smaller. This distinction between the concepts of a holding and of a farm business may be of considerable relevance to examinations, and comparisons, of the structure of agricultural industries.

Another issue, and one which is specific to agriculture (or at least to industries in which small-scale units run by self-employed persons are common) is that of defining the criteria for the inclusion, or otherwise, of a unit in the set of units which are deemed to constitute the ‘population’. The option of defining the population in terms of those units which sell at least part of their produce, or have some minimum level of commercial sales, is adopted in some countries but may not be universally acceptable because of the possible exclusion of large holdings linked to, and producing for, certain types of institutional units (schools, prisons etc.) and also, and particularly in developing countries, of holdings producing for the domestic consumption of large and possibly extended families. However, dismissing this option means that, in principle, any unit producing any form of agricultural produce (of which cut flowers and picked fruits are examples) could be considered to constitute an agricultural holding. In the absence of some specific criteria (which may differ between countries and through time), the classification of a productive unit as an agricultural holding is likely to be affected by the scale of its production, the extent of its land area and any administrative requirements which may affect the need for its recognition by public

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<sup>1</sup> See paragraphs 4.3, 5.17 and 5.21 of the System of National Accounts 1993, prepared under the auspices of the Inter-Secretariat Working Group on National Accounts 1993.

<sup>2</sup> MAFF (1998), page 2-1.

authorities. It thus follows that the cut-off point for the classification of an agricultural productive unit as a 'holding' may be imprecise and seems certain to vary between countries and probably through time.

Potentially this has a considerable influence on the comparability, both across countries and through time, of measures of average farm size. To some extent this problem may be reduced by focusing attention on, and producing statistics covering, only a subset of the separately identified holdings. For example, for many years, the practice in the United Kingdom countries was to distinguish between 'main' and 'minor' holdings on the basis of some specified criteria relating to the scale of their activities and their inputs. Such a distinction may lead to the identification of a fairly clearly defined set of 'main' holdings for any one country and point in time but comparisons through time and across space are still likely to be hindered by changes and differences in the criteria.

A further problem in the identification of the set of holdings in a country may arise from the classification of let land. The normal practice is to include most rented land within the holding of the lessee but the position may not be so straightforward in the case of land let out for specified short periods. For example, in the United Kingdom, the practice until relatively recently had been to stipulate that land let for a period of less than a year should be returned, within the annual Census, by the lessor, such land thus possibly constituting a separate holding. However this practice has now been changed so that such land is to be recorded by, and attributed to, the lessee. The effect of this change was to reduce the number of holdings and to increase their average size. However other developments, notably the need to monitor animal movements, have resulted in the registration of a larger number of separate holdings, though many of these have very little land. These changes have affected the apparent number and average size of agricultural holdings, an issue to which attention is now turned.

## **2. Measures of Average Farm Size**

One important conceptual issue in specifying a measure of average farm size is that of selecting the measure of farm size to which the average (or any other presentation or summary of the frequency distribution) should relate. As stated by Lund (1983), 'there is ..no generally accepted measure of firm size in the economics literature to guide the choice in the specifically agricultural context. Various measures of output, sales or turnover; of inputs, both flow and stock based (e.g. number of employees or value of fixed capital); and of the incomes (accruing or capitalised) of a company's equity holders have been used in different contexts'<sup>3</sup>. Moreover the most obvious measure in the agricultural context, land area, may be a poor economic (as opposed to geographic) measure of farm size since land is so variable in its agricultural attributes and farms of different types can require vastly different areas of land for the same value of output. Other commonly used measures of farm size are ones based on the stocking of different types of animals and areas sown under different crops, these often being weighted together on the basis of the typical gross margins earned or the typical amount of manual labour involved. Such weighting approaches have, in the EU and UK, yielded the standard gross margin (SGM) and the standard man day (SMD) / standard labour requirements (SLR) measures respectively.

The final issue to be considered is that of choosing an appropriate measure of average with which to describe average farm size. It might of course be argued that, given the above problems and the width of the frequency distribution of farm size, it is better to present the whole frequency distribution rather than a single summary statistic. That is a valid point but there will inevitably be instances when a single measure is required. Unfortunately the more common measures of central

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<sup>3</sup> Lund (1983), page 188.

tendency (the arithmetic mean, and indeed other means, and the median) are sensitive to the total number of observations on the basis of which they are calculated and hence to the problems involved in defining the population of holdings.

It therefore seems desirable to calculate a measure of average farm size so that it is insensitive to the inclusion, or otherwise, of holdings (or potential holdings) at the bottom end of the size distribution. One way of doing this is by using the conventional measures of average size but focusing only on those holdings above a certain size threshold. However this approach is subject to problems due to possible inter-temporal and inter-spatial variations in the classification criteria.

An alternative approach is to adopt a measure of average farm size which is inherently insensitive to the inclusion or otherwise of 'holdings' at the bottom end of the frequency distribution. One such measure appears to have been first utilised in this context by Britton (1950). It is somewhat akin to the median in that it is based on a ranking of the separate units (e.g. holdings) by size. However instead of focusing on the size of that unit which lies in the middle of the distribution (or, more precisely, at which the cumulative percentage frequency distribution reaches 50%), it focuses on the size of the unit at which the cumulative sum of the variable under examination (e.g. area) reaches 50% of the total of the variable.

Describing this measure of central tendency in this way allows it to be appreciated intuitively but, to fully explore its various attributes, it has to be defined in formal mathematical terms. Just as the mean  $\mu(x,f)$  may be defined as

$$(1) \quad \mu = \int_{\min}^{\max} x.f(x).dx$$

where  $x$  is the measured variable,  $f(x)$  its probability distribution function and the integral is taken over the whole range of the distribution; and the median  $v(x,f)$  may be defined as the point  $v$  satisfying the equation

$$(2) \quad \int_{\min}^v f(x).dx = \int_v^{\max} f(x).dx = 0.5$$

where the integral is taken from the minimum of the distribution to the point  $v$ , the alternative measure  $\gamma(x,f)$  may be defined as the point  $\gamma$  satisfying the equations

$$(3) \quad \int_{\min}^{\gamma} x.f(x).dx = \int_{\gamma}^{\max} x.f(x).dx = \frac{1}{2} \int_{\min}^{\max} x.f(x).dx$$

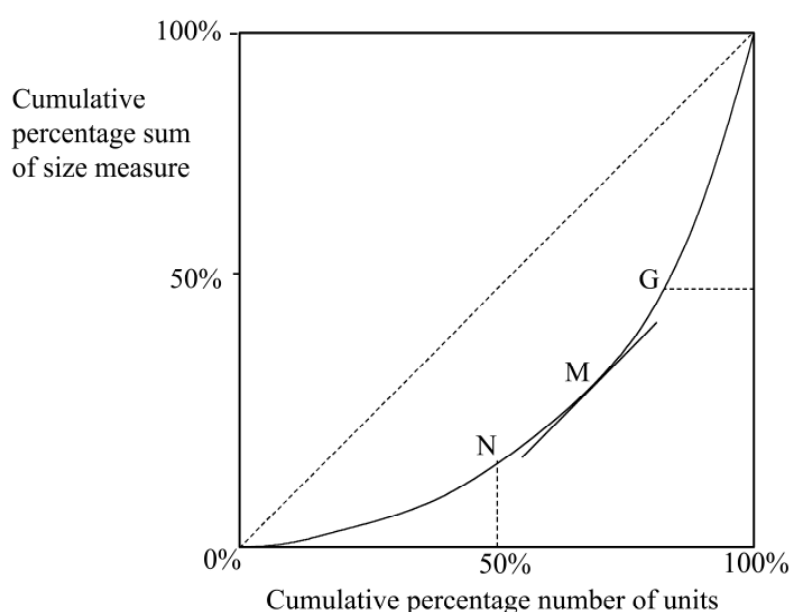
where  $0 \leq \min \leq x \leq \max$ . In practice this measure is likely to be evaluated from the second of these expressions since this specifies it in terms of the upper, and more readily observable, part of the distribution. These equations hold for discrete as well as continuous distributions but, in the special case of a finite population or sample of size  $n$ , it is more usual to adopt the notation:

$$(4) \quad \sum_{x_i \geq \gamma} x_i = \frac{1}{2} \sum_{i=1}^n x_i$$

The measure is thus the point in the distribution which divides the aggregate in half in the same way as the median divides the population of units in half when they are ranked according to size. For this reason, and lacking any other obvious name, it has been proposed (Lund and Price, 1998) that the measure be called the mid-aggregate point. It may be noted that Britton described the measure as the 'equatorial' size of holding and, in its application to data on areas, as the 'median of the frequency distribution of acreage by size of holding'.

There is a geometric interpretation of these definitions which, in addition, indicates the essential symmetry between the median and the mid-aggregate point. This makes use of the Lorenz curve more commonly associated with concentration measures such as the Gini coefficient. In the construction of the Lorenz curve the units are first ranked according to size and then the percentage (or proportionate) cumulative sum of the size measure is plotted on the vertical axis and the corresponding cumulative sum of units on the horizontal axis. As shown in Figure 1, the median is then the size of the unit corresponding to point N at which the vertical line from the 50% point on the horizontal axis meets the Lorenz curve, and the mid-aggregate point (G) is that at which the horizontal line from the 50% point on the vertical axis meets the curve. The mean is the size of the unit corresponding to the point M on the curve where its gradient is 45%. This is because, in the corresponding diagram with axes scaled in absolute units rather than as proportions, the gradient at any point on the curve is the actual size of the unit represented by that point. For the mean, this gradient will be parallel to the diagonal of the rectangle.

**Figure 1: The Measures of Average Size and the Lorenz Curve**



The characteristics of the newly proposed measure, and of other measures of central tendency, may be illustrated (see Table 1) using data on the size distribution of agricultural holdings in England obtained from the annual June Censuses of Agriculture and Horticulture, 1987-2000. The June Census for 2000 was the last one for which the data was split between that relating to ‘main’ and to ‘minor’ holdings, those above or below complex specified size thresholds. Part (a) of the Table relates to the total area of all holdings (main & minor) and Part (b) to the total area of main holdings only, the latter being the coverage of the averages (i.e. arithmetic means) published, through to 1999/2000, in the annual volumes of ‘Farm Incomes in the United Kingdom’ (DEFRA, annual). It will be seen that, comparing main holdings and all holdings, the mean and the median areas differ considerably, the differences in 2000 being 13.9% (mean) and 43.9% (median). By contrast, the difference in respect of the mid-aggregate point is only 1.0%, illustrating the lesser sensitivity of this measure to the truncation of the data set for the distributions of farm size observed in England<sup>4</sup>.

<sup>4</sup> It should however be acknowledged that the mid-aggregate point may be more sensitive to the inclusion or otherwise of small holdings when the distribution of holding sizes is bi- or multi- modal and such that approximately half of the total land area / agricultural area is on very large holdings and about half on very small holdings. Such a situation has prevailed in some eastern European countries.

Exact calculation of the mid-aggregate point, and of the median, requires access to the individual holding values whereas the mean can be calculated from summary statistics alone. However, and as illustrated in Table 1, the mid-aggregate point may be quite accurately estimated by interpolation from published frequency distribution tables. The resulting estimates are shown in the final column of Table 1 and are seen to be very close to those obtained from the direct method.

It will also be seen that the mid-aggregate points exceed the corresponding mean and median measures by considerable margins, particularly when the comparison relates to all holdings. This is not however considered to be a weakness of this measure; rather it reflects the extent to which the other measures are affected by the data on very many small holdings. In particular it is of note that, in year 2000, only 18% of the total land area on (all) holdings was on holdings with an area less than the mean area and only 4% was on those with an area less than the median area. The corresponding percentage for the mid-aggregate point is, by definition, 50%. It follows that the mid-aggregate point is likely to provide the better indication of the holding size from which the typical unit of agricultural production originates – at least for distributions of farm size observed in most countries.

Parts (c) and (d) of Table 1 present similar comparisons of the measures of central tendency for Standard Man Days (SMDs) and Standard Gross Margin (SGMs) respectively, though with these comparisons necessarily restricted to main holdings only. These comparisons show similar patterns to those presented in Parts (a) and (b) of the table: the values of the mid-aggregate points are higher than those of the mean and the median and also show the greater increase over the period.

**Table 1. Comparisons of Measures of Central Tendency: Agricultural Holdings in England.**

## Part (a) : Total Area of All holdings (main and minor)

Year	Number of holdings	Total area ('000 ha.)	Mean	Median	Mid-aggregate point (direct method)	Mid-aggregate point (by interpolation)
1987	192,885	9515.9	49.33	15.75	137.69	137.84
1990	188,132	9441.2	50.18	16.32	137.63	137.56
1993	190,242	9466.5	49.76	15.39	139.80	139.74
1996	179,220	9340.1	52.12	16.42	145.08	145.56
2000	167,855	9130.2	54.39	16.10	159.09	159.61

## Part (b) : Total Area of Main holdings (only)

1987	155,785	9424.5	60.50	27.24	139.60	139.69
1990	150,652	9351.0	62.07	28.58	139.35	139.39
1993	153,422	9371.2	61.08	26.73	141.69	141.70
1996	145,638	9250.5	63.52	27.70	147.10	146.96
2000	146,347	9069.5	61.97	23.17	160.65	160.26

## Part (c) : Standard Gross Margins (ESUs)

Year	Number of holdings	Total (million)	Mean	Median	Mid-aggregate point (direct method)	Mid-aggregate point (by interpolation)
1987	155,785	8106.7	52,038	20,097	129,235	129,534
1990	150,652	8033.5	53,325	19,733	134,274	134,250
1993	153,422	7772.5	50,661	16,592	133,894	134,796
1996	145,638	7734.3	53,106	16,578	142,754	142,543
2000	146,347	7424.7	50,734	11,491	155,284	155,154

## Part (d) : Standard Man Days

1987	155,785	88.320	567	243	1,320	1,323
1990	150,652	88.193	585	235	1,405	1,413
1993	153,422	87.719	572	225	1,373	1,375

### 3. Farms and average farm size – the AARES Countries

It has been argued above that comparisons of average farm size between countries may be much affected by what might appear to be detailed definitional issues and operational matters; in particular, ones relating to the classification, or otherwise, of agricultural productive units as ‘farms’, at least for statistical purposes. These problems are likely to exist when making comparisons between any pair or set of countries, and possibly also through time for the same country, and might be expected to be of greatest numerical importance when some of the countries concerned have extensive numbers of very small farms and perhaps ones not engaged in commercial transactions. These characteristics may be thought to be less predominant in the countries within the scope of the AARES than others.

However, it was expected that the statistical authorities of the AARES countries would be readily able to provide the necessary data to enable comparisons of the above quoted measures of average size. It was also expected that they would be in a good position to indicate the relevant details relating to the data they collect and publish - and so provide a clear indication of the comparability or otherwise of measures of average farm size for these countries. A document requesting these sets of information was thus sent to the apparently relevant officials in the AARES countries and in the UK. Specifically it was sent to: the Australian Bureau of Statistics; the New Zealand Ministry of Agriculture and Forestry; the United States National Agriculture Statistics Service; the Agriculture Division of Statistics Canada; and the Department for Environment, Food and Rural Affairs in the United Kingdom. Each of these requests for detailed information was sent under cover of letter explaining the reason for the request, mentioning this paper and referring to previous papers quoted herein. The substantive requests were summarized as follows:

‘The information....(being sought).. is of two forms. The first is statistical distributions showing the numbers of farms (and the amount of the relevant size measure which they account for) in each of a number of classes in some size distribution of farms (that / those which you normally use in your own presentations of farm size distributions). The second is information, relating to your country, on a number of features of these farm statistics as detailed in the attached note. For convenience this is written somewhat in the nature of a questionnaire and I would be grateful if you could supply such information as is readily available on each feature covered.’

A copy of the content of the letters is attached as Annex A while Annex B reproduces the requests for information.

The responses to this request (Table 2) indicated that the information was not as readily available as might have been expected. This observation applies to the availability of the sought frequency distributions, the specification of the precise coverages of these distributions and also, and rather surprisingly, to the availability of published measures of central tendency. Information proved to be less readily available for New Zealand than for the other countries approached.

Summarising the responses across countries, it appears that basic agricultural statistics normally relate to the concept of the establishment rather than to that of the business unit (or ‘enterprise’ in its general, as opposed to specifically agricultural, sense). However, in the United Kingdom, work is in progress to bring the register of agricultural units into line with that for the rest of the economic activity and thus to be on a business unit basis. The number of businesses will be below that of holdings (establishments) and thus, on the former basis, the number of agricultural units will be smaller and their average size larger. At the moment the apparent trend in the number of holdings in the UK is in the opposite direction. There has been a considerable (23%) increase in the registered number of holdings in five years; this is presumably to meet new and increased administrative requirements as this trend is contrary to anecdotal reports of a continuing reduction in the number of ‘farms’ and an increase in the average size of the remaining ones – something shown only by the mid-aggregate point measure.



The answers to the question on how an individual unit is identified for inclusion in the register may appear to be more different than they really are, some focusing on how units appear on the register in the first place and others on recent register updating or checking exercises. It would appear that units are likely to be included initially as a result of some administrative process, or even just physical observation, and that attempts may be made periodically to validate and hence update the registers.

The responses from Australia and the United States indicated that their published statistics relating to agriculture (even if not their underlying registers) are limited to establishments above some minimum size threshold. This might mean that they are inherently relatively free of the type of problem which has recently afflicted the UK statistics but, on the other hand, the use of such thresholds may have some effect on comparisons through time or with other countries.

For Canada, the United States and the United Kingdom, size distributions are available for both land area and for some economic measure of size though the latter differs between the countries. However, there was a surprising lack of readily available information for Australia and New Zealand. First, distributions for New Zealand relating to whole establishments, as distinct from the numbers of sheep on them, were available for only one year (2002). Second as the distributions for both countries showed only the number of establishments in each area size category, and not the amount of land accounted for by each size group, it was not possible to apply the normal interpolation method to calculate the mid-aggregate point and so an alternative procedure had to be adopted.<sup>5</sup> It was also the case that fewer measures of ‘average’ establishment size are published than we might have expected: the measures that are published are arithmetic means.

The responses in respect of the topic of ‘part-time farming’, the meaning of which is considered in Section 4 of this paper, indicated that there are relatively few types of statistical analysis of it. Those available for the United States relate to the length of time spent by the farmer on off-farm work; those available for Canada relate, separately, to time spent on the farm and in other occupations; whereas those available for the UK relate to the hours worked on the farm by the farmer and to the size of the farm. Together these statistics thus cover the three main interpretations of the term ‘part-time farming’ which are examined in Section 4.

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<sup>5</sup> Where distributions of the measure were available, the cumulative of the measure was interpolated to obtain the 50% point. Where only distributions of farm numbers were available, two processes were necessary: (a) interpolation of cumulative farm numbers to obtain a series of interpolation equations to represent the integral of the probability distribution  $f(x)$  and (b) integration of  $x \cdot df(x)$  to obtain the cumulative of the measure.

**Table 2. Information received from each AARES country and England / UK**

<b>Information received from each country</b>				
<b>Australia</b>	<b>New Zealand</b>	<b>United States</b>	<b>Canada</b>	<b>England / UK</b>
<b>1. Coverage of farms within statistical register</b>				
<i>a) Does the register relate to establishments / holdings or to business units / enterprises?</i>				
Establishments classified to agriculture together with establishments self-identified as having agricultural activity	Businesses (enterprises) engaged in agricultural production, whether as primary or secondary activity	Place (i.e. establishment) normally producing agricultural products for sale	'Operations' (i.e. enterprises) producing agricultural products intended for sale	Agricultural holdings
<i>b) How is an individual unit identified for inclusion in the register?</i>				
(a) Register coverage survey was conducted in 2001/02 following introduction of new tax references (b) 5-year censuses	Businesses identified by Goods and Services Tax (GST) registration with the Inland Revenue Dept	The 2000 NASS register update used wide-ranging sources (including producer association and seed growers lists)	Information not provided	Administrative contacts with government
<i>c) Are the register / published statistics restricted to units above some size or criteria?</i>				
Estimated value of agricultural operations (EVAO) of \$5,000 or more (published statistics)	Coverage includes all businesses primarily classified to agriculture and other businesses where GST > \$200,000 (sales or purchases)	Establishments with agricultural sales and government payments normally of at least \$1,000 annually	No threshold applied	Holdings that have some agricultural or horticultural activity – including (just) claiming the EU Single Payment
<b>2. Size distributions of farms ('units' as referred to above)</b>				
<i>a) For what measures of size are size distributions available?</i>				
(a) Total area of holding (b) Estimated value of agricultural operations (EVAO)	Number of farms by land area size groups (2002 only)	From 2002 census of agriculture: (a) average size of farm in acres (b) by sales value and government payments (c) by sales value	(a) Total farm area (b) Total farm receipts (2001 census only)	(i) Total area on holdings and (ii) European size units (ESU) which measure the financial potential in terms of the margins expected from the holding's crops and stock
<i>b) Availability of size distributions showing both number of farms in each size group and amount of size measure accounted for by the size group</i>				
Only the number of farms; averages (per farm) are not published	Only number of farms; averages (per farm) are not published	In all cases, distributions of both farms and measures	Distributions of both farms and measures	Published annually, by country in the UK, in 'Agriculture in the United Kingdom'

<i>c) What measures of average size (mean, median etc) are published and provision of numerical figures</i>				
None	None	Arithmetic means	None	Arithmetic means
<b>3. Part-time farming</b>				
<i>Do you use the term in statistical presentations of data? If so, for which meaning, or meanings, of 'part-time'?</i>				
No information provided	Part-time employment not collected since 1996; before then 'Permanent part-time' was defined as working for less than 30 hours a week	No information found. However, statistics are available classified by number of days worked off-farm (in 5 classes)	Term not used. However census asks for time worked by operators in 3 time classes (with divisions at 20 and 40 hours/week) and total labour input. Census also asks for time spent by operator in other employment or self-employment (in same time classes)	A farmer, or worker, is classed as part-time if they work less than 39 hours per week in England and Wales, less than 38 hours per week in Scotland or less than 30 hours per week in Northern Ireland.  A size of 8 ESU is judged the minimum for full time holdings

The data which was received from the separate countries (essentially numbers of units in each of several size groups and the areas / economic activity accounted for them, and the same in total) and the measures of central tendency supplied with, or derived from this information, are shown in Tables 3 and 4. Table 3 relates to the land area of the agricultural units covered by the data while Table 4 relates to the various economic size measures available for the different countries. In principle an attempt was made to provide figures for two years, normally some 5-10 years apart, for each size measure and for each of the countries but it was not possible to do this for Canada and New Zealand.

Table 3 demonstrates the enormous differences in farm area size (all expressed in hectares) between the five countries covered. Irrespective of the measure of central tendency adopted it is clear that the average area of farms in the United Kingdom is very much less than it is in the AARES country even though it is greater than that in other European Union countries<sup>6</sup>. As already noted the figures for the UK are affected by recent changes affecting its holdings registers but this recent development can only explain a small part of the differences in average area size between the UK and the other countries. The more fundamental differences probably include the composition of farming by type, the nature of the terrain and the greater population density in the UK. By far the largest averages are for Australia, the mid-aggregate point measure of average for which corresponds to the size of the larger English counties.

<sup>6</sup> See Lund (2005).

**Table 3. Comparisons of Measures of Central Tendency: Land Area in AARES Countries & UK**

Country	Year	Number of farms	Total area ('000 ha)	Median (ha/farm)	Mean (ha/farm)	Mid-aggregate point (ha/farm)
Australia	2000	146,370	769,203	221.5	5,255	544,117
	2005	129,935	769,202	253.7	5,920	554,419
	<i>% change</i>	- 11.2 %	- 0.0 %	+14.5 %	+ 12.6 %	+ 1.9 %
Canada	1991	280,043	167,417	275.6	597.8	1,332
	2001	246,923	166,802	270.3	675.5	1,694
	<i>% change</i>	- 11.8 %	- 0.4 %	- 1.9 %	+13.0 %	+27.2 %
New Zealand	1994	Census year but area size distribution not readily available				
	2002	70,250	15,640	44.6	222.6	1,076
United Kingdom	2000	233,250	16,528	23.1	70.9	144
	2005	286,740	16,488	11.9	57.5	148
	<i>% change</i>	+22.9 %	- 0.2 %	- 48.8 %	- 18.9 %	+2.7 %
United States	1997	2,215,876	382,732	41.7	173.0	785
	2002	2,128,982	379,708	39.0	178.0	920
	<i>% change</i>	- 3.9 %	- 0.8 %	- 6.5 %	+3.3 %	+17.2 %

**Table 4. Comparisons of Measures of Central Tendency: Economic size in AARES Countries & UK<sup>7</sup>**

Country	Year	Number of farms	Total (\$m)	Median (\$/farm)	Mean (\$/farm)	Mid-aggregate point (\$/farm)
Australia	<b>Estimated value of operations (EVAO)</b>					
	2000	146,372	30,212	93,015	206,406	458,830
	2005	129,934	36,562	122,160	281,389	651,290
	<i>% change</i>	- 11.2 %	+21.0 %	+31.3 %	+36.3 %	+41.9 %
Canada	<b>Gross farm receipts</b>					
	1991	Census year but economic size distribution not readily available				
	2001	246,923	38,299	43,180	155,104	472,160
New Zealand	No data available by economic size					
United Kingdom	<b>European Size Units (€m and €/holding)</b>					
	2000	233,250	13,265	28,596	56,872	187,080
	2005	286,740	12,626	11,820	44,032	193,200
	<i>% change</i>	+22.9 %	- 4.8 %	- 58.7 %	- 22.6 %	+3.3 %
United States	<b>Value of sales</b>					
	1997	2,215,876	201,380	7,160	90,880	658,800
	2002	2,128,982	200,646	5,332	94,245	887,800
	<i>% change</i>	- 3.9 %	- 0.4 %	- 25.5 %	+3.7 %	+34.8 %

<sup>7</sup> In this table, the dollar symbol refers to the local currency of each country

#### 4. Part-time farming<sup>8</sup>

It is generally agreed that part-time farming is now common in agriculture and probably still of growing importance. However the term 'part-time' is rarely defined in discussions of its growth and importance, a fact of particular note since there are several definitions of the term in common use in the agricultural context.

The meaning which has perhaps been in most common use is that reported in CEAS (1977) as having been favoured by a workshop held at Wye College, University of London. This was: 'the practice of a farm-based household in which one or more members are gainfully engaged in work other than, or in addition to, farming the family's holding'. Logically this definition, and similar ones in Gasson (1988) and Kada (1980) could result in a farmer working for normal hours, or more, on a large farm being described as 'part-time' simply because some other member(s) of the household have some other form of gainful employment, possibly (but not necessarily) in addition to working on the farm. The adoption of such a definition would probably mean that the majority of farms, including many of the very largest, would be described as 'part-time' at some stage in the family life cycle.

It must, of course, be acknowledged that the definition quoted above can be considered as a rather extreme version of one in more common usage: that a farmer is part-time if they themselves have any other form of gainful employment. However even this definition differs from two others in common parlance outside the specifically agricultural context. The term is most commonly used to refer to the practice of working less than the standard time (i.e. hours per week) associated with a particular job or occupation. This use is clearest in the case of employees, though is followed for all people working on the holding (including the principal farmer) in the Agricultural Census form for England. The term 'part-time' is also used in common parlance to refer to the gainful activities of a person which are considered secondary (usually in terms of time) to their main occupation: thus a person might describe themselves as being a teacher but having some other 'part-time' job. In this usage it is the secondary job which is being described as 'part-time' and not the primary one.

In addition to these definitions, which clearly apply – at least in the first instance – to persons, part-time farming is sometimes defined with respect to the attributes and size of the holding rather than the persons running it. For example, in the UK, the sizes of holdings were measured, for many years, in terms of Standard Man Days and are now (from the 2004 Census) being measured in Standard Labour Requirements (SLRs), both of these measures being derived by summing the labour requirements estimated to be normally required on the basis of the holding's cropping areas and numbers of livestock. For the new measure, one SLR is defined as an annual labour requirement of 1900 hours. Holdings with a SLR above 1.0 are grouped into classes described as 'small', 'medium' and 'large'; however those with a SLR below 0.5 are described as 'very small spare-time' while those with a SLR between 0.5 and 1.0 are described as 'very small part-time'. Thus the term part-time is now being used in two different ways in UK agricultural statistics and with neither usage corresponding to that common, with respect to farming (but not other gainful activities), in the media and in farming circles. It is thus necessary for the intended meaning of the term 'part-time farming' to be clearly stated whenever it is used.

Fortunately it is possible to examine empirically the extent of correspondence between the different definitions of part-time farming. For example, on the basis of data from the Agricultural Census in England it has been possible to compare the split of the principal farmer(s) and spouse(s)

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<sup>8</sup> This section draws heavily on material first published in Lund (1991).

between whole-time and part-time and the size of the holding measured in SMDs. In England and Wales in 1989, there were nearly twelve times as many whole-time as part-time 'principal farmers and partners' on holdings requiring 250 or more SMDs per year. A similar comparison should be possible now, given the adoption of the SLR measure of holding size: moreover the comparison could be conducted on the basis of data for each holding rather than simply the overall aggregates. Information on the relationship between the different criteria for classifying farmers and farms as part-time is also provided by the Farm Business Surveys conducted in the United Kingdom (as part of the EU's FADN, Farm Accountancy Data Network).

More information on the relationship between the time-spent working on the holding and the size of the holding has been provided by the EU Farm Structure Surveys though, in this case, the size of the holding has been measured in ESUs rather than a required labour input measure. However these surveys have also provided a classification of holders, by size group of their holding, according to whether they had another gainful occupation and whether this other occupation was their major occupation or a subsidiary one. Both the existence of other gainful occupations and their importance (i.e. as the major occupation) have been found to be greatest for farmers on smaller holdings. There thus appears to be a substantial correspondence between the classifications of farmers and their holdings as 'part-time' on the basis of the different definitions of part-time. However this empirical observation does not remove the need for clarity with respect to the definition being adopted: the correspondences are not perfect and their extents can only be meaningfully examined on the basis of clear definitions relating to each of the uses of the term 'part-time'.

## **5. Conclusions**

There is no single conclusion to this paper. One of its main purposes has been to examine a set of data relating to the distributions of farm size in the AARES countries and in the United Kingdom. It has been first suggested, and then demonstrated, that understanding of the farm size distributions requires quite a lot of background information about the criteria for the inclusion of farms within the basic statistical registers and then within the presented frequency distributions. These may relate to any of a number of size measures but particular problems have been identified with the use of the more common measures of central tendency, the arithmetic mean and the median, in this agricultural context. The case for using an alternative indicator of average, the mid-aggregate point, has been made and demonstrated with respect to data relating to England. Measures of average farm size have been presented for the AARES countries and for the United Kingdom. These have demonstrated the enormous range which exists between these countries even though the United Kingdom has the largest average farm size amongst the European Union (EU 15) countries. The availability of data said to relate to 'part-time farming' has also been examined and the differences between the aspects covered by this data and detailed examination of this term both indicate the need for caution in its use.

This paper has focused on countries which are generally recognized as being highly developed and having sophisticated agricultural industries and statistical systems. Nevertheless the paper has indicated the need for caution in drawing conclusions from comparisons of their agricultural structures and statistics. If caution is needed in this context it would appear to be even more necessary when making comparisons of agricultural industries across the globe.

## Annex A

### Letters to Government Statisticians / Statistical Offices in the AARES Countries and the UK

#### **The measurement of farm size and the meaning of part-time farming: the AARES countries**

I am writing to ask for your assistance in the supply of some data, and related explanatory information, in conjunction with the preparation of a paper of above title which is to be given to the 2007 AARES (Australian Agricultural and Resource Economics Society) Conference which is to be held in New Zealand in mid-February. I understand that AARES covers Australia, New Zealand, the USA and Canada and I am writing similarly to all these countries and also to colleagues responsible for comparable data for England and the United Kingdom.

The coverage of the paper will be as described below in its Abstract:

‘This paper examines what, precisely, is meant by a ‘farm’, the criteria for the inclusion of individual farms in a statistical register and the resulting enumerations and average sizes of farms in published statistics. Alternative measures of farm size are examined and a relatively novel measure of average farm size proposed to cope with the possibly uncertain population of farms. This is illustrated with reference to data relating to the AARES countries and to the UK. Finally the meaning of the expression ‘part-time’ as applied to farmers or farms is examined, with a call for great clarity in its use.’

The information which I am seeking from you is of two forms. The first is statistical distributions showing the numbers of farms (and the amount of the relevant size measure which they account for) in each of a number of classes in some size distribution of farms (that / those which you normally use in your own presentations of farm size distributions). The second is information, relating to your country, on a number of features of these farm statistics as detailed in the attached note. For convenience this is written somewhat in the nature of a questionnaire and I would be grateful if you could supply such information as is readily available on each feature covered.

If you have any queries about the information being sought please do not hesitate to contact either me or my co-author. Our email addresses are:

[roger.price@defra.gsi.gov.uk](mailto:roger.price@defra.gsi.gov.uk) and [philip.lund@orange.net](mailto:philip.lund@orange.net)

I would in any case appreciate an acknowledgment of receipt of this request and an indication of who will be dealing with it. I would ideally like a full response as soon as possible, and certainly by Christmas (as we need to finalise the paper within a month from then).

Finally you may be interested to know that, within the paper, we will be advocating the use of a particular type of ‘average’ – the ‘mid-aggregate point’ – which we consider to have particular advantages in making comparisons of average farm size between countries and also through time within the same country. This measure has been described in some previous papers, for example:

Lund, P J and Price, R D S, “The Measurement of Average Farm Size”, Journal of Agricultural Economics, January 1998.

I regret any inconvenience this request may cause you but trust that the resulting information will assist the making of meaningful comparisons between countries, particularly those covered by AARES.

## **Annex B**

### **Information being sought from each AARES country and England /United Kingdom**

1. Coverage of farms within your statistical register (that for which you provide statistics on the number of units and their size distribution)

- (a) does the register, and do the resulting statistics, relate to individual ‘establishments’ / agricultural holdings or to business units or ‘enterprises’ (in general statistical terminology)?
- (b) what is the means by which an individual unit is identified for inclusion on the register and thus within the count and size distribution of units? Is it, for example, as a result of visual observation, administrative contacts with government or inclusion in other listings of units?
- (c) are either the register, or the published statistics derived from surveys of the units, restricted to units above some specified (lower) size limit or meeting some other criteria (e.g. those making commercial sales)?

2. Size distributions of farms (meaning here the ‘units’ described above)

- (a) for what measures of size are size distributions of ‘farms’ available in your country? Examples might be land area (some particular definition of area?), value of output, employment (covering which persons on the farm?), asset value or some hybrid measure of size reflecting the crop areas / livestock numbers on the farm (for example, in terms of the financial ‘margins’ they might be expected to produce or their normal labour requirements)
- (b) please provide size distributions, as described above and for the most recent year available, showing both the number of farms in each size group and the amount of the size measure accounted for by the farms in each size group. Both of these are required in order to calculate an estimate of the mid-aggregate point (i.e. one based on classified size distributions as opposed to the set of data on each individual farm)
- (c) what measures of ‘average’ are published for the size distributions described above – please specify in terms of mean or median etc and also provide the numerical measure(s) as published (such presumably being based on the data for each farm as opposed to the classified size distributions).

3. Part-time farming

Do you use the term ‘part-time’ in your statistical presentations of data and, if so, do you use it to mean:

- (i) working for less than normal weekly hours on the farm
- (ii) having some other gainful occupation
- (iii) occupying a farm / holding which, on the basis of its size, would normally require less than the full-time work input of one person
- (iv) meeting some other criteria (please describe).

Note that the term ‘part-time’ may be used in more than one of these different ways – please indicate the way or ways in which it is used and the precise criteria by which a person or farm is specified as being part-time (for each usage of the expression).



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