



Department for Environment Food & Rural Affairs

August 2013

Summary quality report for Total Factor Productivity releases

1. Introduction

This report is an overview note that pulls together key qualitative information on the various dimensions of quality as well as providing a summary of methods used to compile the output. It relates to estimates of Total Factor Productivity in the UK agricultural industry and aim to provide users with information on usability and fitness for purpose of these estimates. Total Factor Productivity in the UK agricultural industry is derived from the economic accounts for agriculture. Methods and terminology used in the economic accounts for agriculture can be obtained from the following publications:

Manual on the Economic Accounts for Agriculture and Forestry EAA/EAF 97

http://epp.eurostat.ec.europa.eu/portal/page/portal/product_details/publication?p_product_code=KS-27-00-782

Agriculture in the United Kingdom

<https://www.gov.uk/government/organisations/department-for-environment-food-rural-affairs/series/agriculture-in-the-united-kingdom>

This report should be read in conjunction with the summary quality report for Total Income from Farming releases

<https://www.gov.uk/government/organisations/department-for-environment-food-rural-affairs/series/aggregate-agricultural-accounts>

2. Summary of quality

2.1 Relevance

The degree to which the product meets user needs for both coverage and content.

Economic accounts for agriculture provide the basis for analysing the economic performance of the agricultural industry and are used by government and the European Commission to make decisions on support for the agricultural industry. The accounts have a legal basis in the EU regulation (EC) No 138/2004 of the European Parliament and of the Council of 5 December 2003 on the economic accounts for agriculture in the Community (as subsequently amended). They are compiled in accordance with the European System

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of Accounts 1995 (ESA 95), adapted to the economic and structural developments in agriculture. Under EU law, ESA 95 is itself consistent with the standards set out in the United Nations System of National Accounts (SNA 93).

The EU regulation does not oblige any Member State to use the EAA methodology in compiling agricultural accounts for its own purposes. The UK, when compiling agricultural accounts follows the EAA methodology but differs in some respects, principally the inclusion of Gross Fixed Capital Formation of livestock in the value of total livestock production and the use of Fisher indices to compile volume indices.

Total Factor Productivity in the UK agricultural industry is derived from the economic accounts for agriculture. It is an indicator of the long-term performance of the agricultural industry in the United Kingdom and is used as an impact indicator by Defra to enable the public to judge whether Defra policies and reforms are having the effect they want.

Two estimates of Total Factor Productivity in the UK agricultural industry are published each year. A first estimate is published five months after the end of the reference year (during May) and a second estimate is published 12 months after the end of the reference year (during December). These estimates are again updated in the following May and may be revised later.

2.2 Accuracy

The closeness between an estimated result and the (unknown) true value.

There is no simple way of measuring the accuracy of Total Factor Productivity – that is, the extent to which the estimate measures the underlying ‘true’ value of Total Factor Productivity for a particular period – because it is compiled from multiple data sources.

One dimension of measuring accuracy is reliability, which is measured using evidence from analyses of revisions to assess the closeness of early estimates to subsequently estimated values. The following analysis use successive annual estimates to show the overall picture of revisions to Total Factor Productivity.

2.2.1 Revisions - general

There is a trade-off between accuracy and timeliness and the consequence is that statistics need to be revised. Revisions can only be avoided if either the first publication is delayed until after the final piece of information is received or if information which becomes available after the time of first publication is ignored, even if it suggests a different picture. Revisions are therefore treated as improvements in quality. They may be categorised as:

- Revisions to a source. These occur when data becomes available after statistics are compiled. This is particularly relevant to the first estimate of Total Factor Productivity, which may have elements based on incomplete data for the calendar year.
- More sources. For some parts of the accounts, e.g. for most elements of intermediate consumption, forecasts are made until the actual source becomes available.

- New methods. The methods used to compile the accounts are the subject of continuous improvement as new sources become available or new methods for making estimates are developed.
- New international standards. The economic accounts for agriculture are compiled in line with international frameworks, standards and definitions. Meeting new international standards will often lead to revisions.

2.2.2 Revision – Total Factor Productivity

Chart 1 show successive estimates of Total Factor Productivity with a reference year of 2000 made in annual estimates released from January 2001 to April 2013.

Information on revisions made to the economic accounts for agriculture may found be in the summary quality report for Total Income from Farming releases:

<https://www.gov.uk/government/organisations/department-for-environment-food-rural-affairs/series/aggregate-agricultural-accounts>

Chart 1: Revisions to Total Factor Productivity

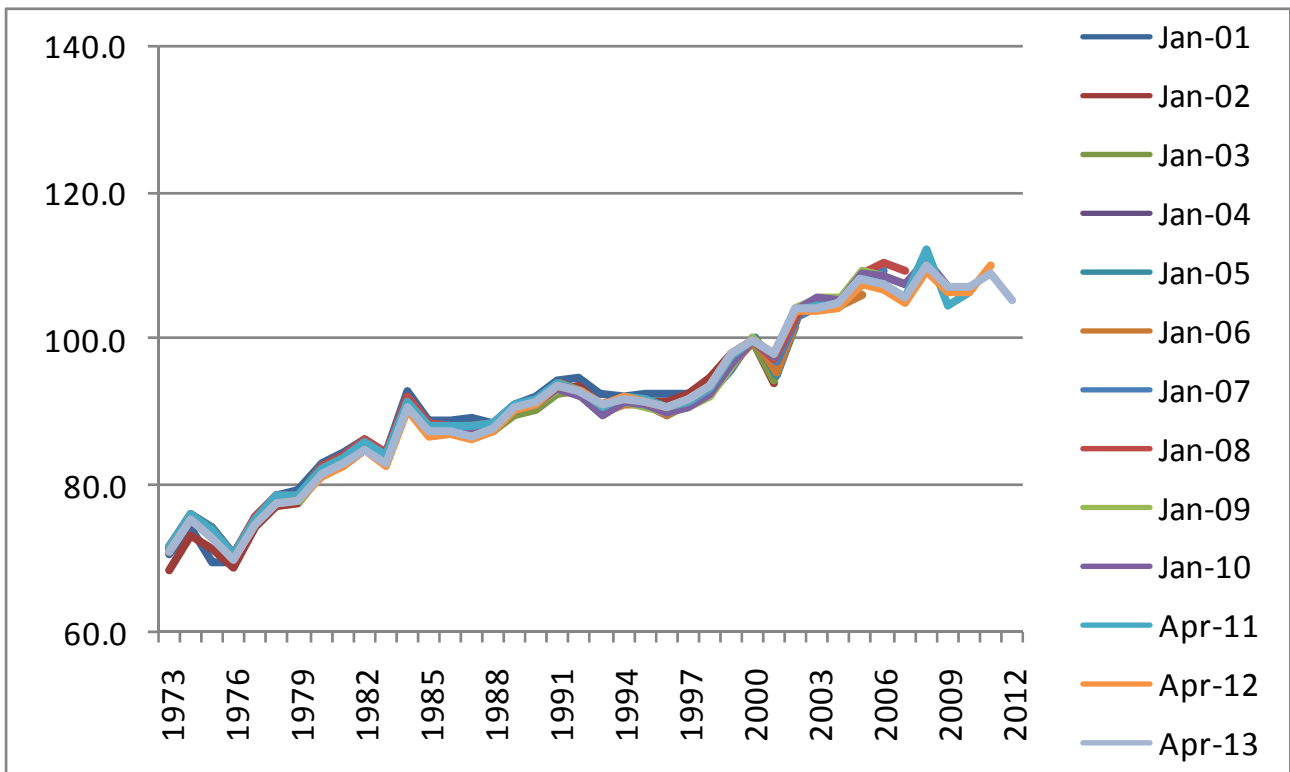
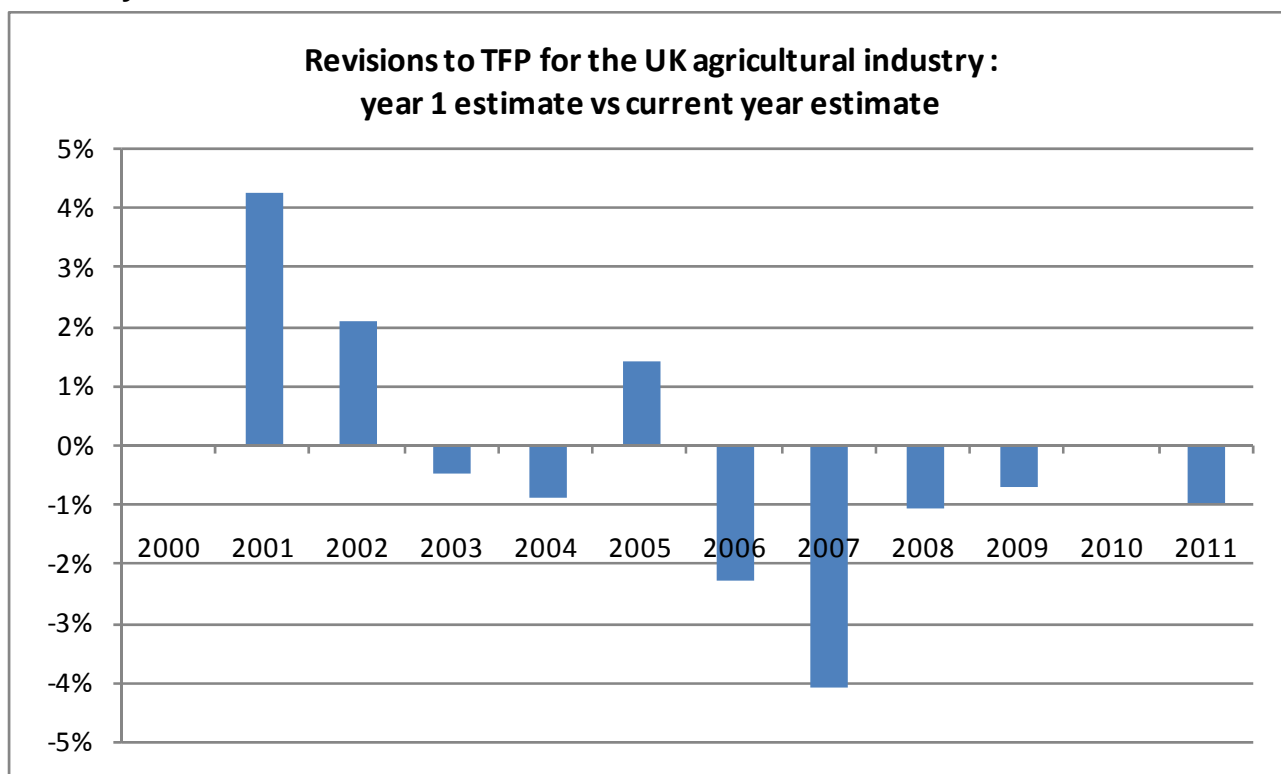


Chart 2 shows the size of revisions between the first estimate made and the current value between 2000 and 2011. The size of the average revision is 1.7%; the revisions range from +4.3% in 2001 to -4.1% in 2007.

Chart 2: Size of revisions to Total Factor Productivity, 1st estimate compared to current year value



Broader measures of examining accuracy include:

- analysis of the amount of data available at different stages of the production of aggregate agricultural accounts. Approximations of the amount of data available for each stage are presented in the table below:

Approx. amount of data available at different stages of the publication process for aggregate agricultural accounts as a % of value

	Stages of the publication process		
	April year n+1	November year+1	April year+2
Output	90%	98%	100%
Intermediate consumption	30%	80%	100%
Subsidies	100%	100%	100%
Other costs	55%	90%	100%

- describing how basic ‘raw’ data re transformed by a series of adjustment to give the statistical estimates that are used to compile the agricultural accounts and calculate Total Factor Productivity.

A summary of the calculation of Total Factor Productivity is given below:

Total Factor Productivity (TFP) index is calculated as:

$(\text{volume index of final output at market prices}) * 100 / (\text{volume index of all inputs})$.

When aggregating indices, the particular formula used is Fisher index, the geometric mean of the Laspeyres and Paasche indices.

For the Laspeyres index a volume relative is calculated for each output component as:

$(\text{volume in year } n) / (\text{volume in year } n-1)$.

The total output index is then calculated by taking a simple weighted average of all the volume relatives, where the weights are the values of the components in the year n-1.

For the Paasche index a volume relative is calculated for each output component as:

$(\text{volume in year } n-1) / (\text{volume in year } n)$.

The total output index is then calculated as the reciprocal of a simple weighted average of all the volume relatives, where the weights are the values of the components in the year n.

The Fisher index is calculated as the square root of the product of the Laspeyres and Paasche indices. The above method is repeated for the inputs and Total Factor Productivity calculated as:

$(\text{index of final output at market prices}) * 100 / (\text{index of all inputs})$.

2.3 Timeliness and punctuality

Timeliness refers to the lapse of time between publication and the period to which the data refer. Punctuality refers to the time lag between the actual and planned dates of publication.

A first estimate of Total Factor Productivity is published five months after the end of the reference period. A second estimate is published twelve months after the end of the accounting period. The first estimate for 2012 was published on 15 May 2013; the second will be published on 12 December 2013.

The release of Total Factor Productivity statistics is bound by an advance release calendar. Release dates up to one year in advance are recorded on the UK Statistics Authority's Publication Hub, which is the official calendar of releases published by Defra. <http://www.statistics.gov.uk/hub/release-calendar/index.html>

2.4 Accessibility and clarity

Accessibility is the ease with which users are able to access the data, also reflecting the format(s) in which the data are available and the availability of supporting information.

Clarity refers to the quality and sufficiency of the metadata, illustrations and accompanying advice.

Total Factor Productivity statistics are disseminated in the form of a .PDF document and as an .XLS dataset. These may be downloaded from the GOV.UK website free of charge at 9.30am on the day of release. Different formats may be requested.

Contact details for general enquiries about the Total Factor Productivity series are published on releases and the landing page on GOV.UK.

<https://www.gov.uk/government/publications/total-factor-productivity-of-the-agricultural-industry>

2.5 Comparability

The degree to which data can be compared over time and domain.

Every effort is made to ensure that the series is comparable over time. A comparable time series is available back to 1973. Where possible, changes to methodology are applied to the whole series to ensure this comparability is maintained.

Since international standards such as SNA 93 and ESA 95 are used in the production of the agricultural accounts and methods are defined in EU legislation, economic accounts for agriculture should be directly comparable with the accounts of other countries and Member States. The revision policy of other countries may differ however and caution should be exercised when comparing historic data.

2.6 Coherence

The degree to which data from different sources or methods, but which refer to the same phenomenon, are similar.

Productivity may be measured as unit of output per worker, per job or per hour worked, as well as per unit of input.

Defra produces a measure of labour productivity (net value added at market prices per annual work unit of all labour), which is published in the *Productivity* chapter of the compendium *Agriculture in the United Kingdom*, alongside Total Factor Productivity.

3. Summary of methods

Defra produces a comprehensive set of annual production and income accounts twice yearly. Indicators of economic activity such as output, intermediate consumption, gross value added, net value added and Total Income from Farming, are all integrated within the accounts, as is the indicator of productivity, Total Factor Productivity.

The key principle that drives production of aggregate agricultural accounts is that the purpose is to analyse the production process and primary income generated by the agricultural industry thus the accounts are based on the industry concept rather than institutional sectors or sub-sectors.

The accounts are estimates of an underlying reality using an output or production approach based on statistical surveys, administration data, forecasts and model-based estimates, and are not compiled through 'accounting' in the common sense of the word.

For the first estimate of Total Factor Productivity published in May, forecasts and models are used to estimate components, such as intermediate consumption, for which survey results or other data are not yet available. Later estimates are based on more complete information.

Methodological improvements may also be made and, where possible, applied to the whole series to ensure comparability of the time series is maintained.

3.1 Production stages

The main stages of the production process are outlined here.

3.1.1 First estimate. The first estimate of Total Factor Productivity is published five months after the end of the reference year.

It is based on 65 per cent 'actual' data by value from survey results and administration data, and on model-based estimates largely for output or production data, with most intermediate consumption and other costs being derived from price data, estimates of volume changes based on professional advice, and a variety of modelling techniques.

Revisions to previous years, incorporating further data so that estimates for those years are based on 100% 'actual' data by value, are also included. A full dataset is published.

Total Factor Productivity and other analyses, such as of labour productivity and volume indices, are published in the following month in the *Productivity* chapter of the statistical compendium, '*Agriculture in the United Kingdom*'.

3.1.2 Second estimate. This estimate is published twelve months after the end of the reference year.

The estimate is improved by basing most estimates of intermediate consumption and other costs on the results of the Farm Business Survey for England that are published in October. At this point, Total Factor Productivity is based on 90 per cent of actual data by value. A revised dataset is published.

4. Sources of data and methods of calculation for compiling economic accounts for agriculture

One of the main characteristics of economic accounts for agriculture is the adoption of the 'quantity x price' formula when measuring the output of the large majority of products.

The valuation of crop output is normally based on resources, i.e. the estimate of quantities produced (harvested) based on estimates of areas under crops and yields, or on uses, i.e. on estimates of purchases by the user branches of agricultural products, exports net of imports, to which should be added certain quantities used for intermediate consumption by

the agricultural industry, changes in producer stocks and use for own account (much of which is own final consumption). The latter approach can be highly appropriate in cases where the buyers of these agricultural products are readily identifiable and the four other components of uses are limited (for example, products requiring preliminary processing before they can be used, such as sugar beet).

Statistics on slaughtering, exports/imports of live animals and the size of herds are the main sources of data for measuring the output of animals. The output of animal products (mainly milk) is generally estimated using sales to user branches (dairies, packers) because of the specific uses to which they are put.

Most intermediate goods (seeds and planting stock, fertilisers, pesticides, etc.) are largely based on representative samples of farm business accounts with averages being raised by information from farm structure surveys. Volume estimates are derived by using a 'value / quantity' formula.