This article provides a fact sheet of the European Union (EU) agri-environmental indicator energy use. It consists of an overview of recent data, complemented by all information on definitions, measurement methods and context needed to interpret them correctly. The energy use article is part of a set of similar fact sheets providing a complete picture of the state of the agri-environmental indicators in the EU.

The indicator relates to the direct use of energy (solid fuels, petroleum products, gas, electricity, renewables, heat) by agriculture per hectare (ha) of utilised agricultural area (UAA). It assesses the trend of energy consumption, per ha and per fuel type and is measured by the following indicators:

Main indicator: Total direct energy use at farm level in KgOE per ha per year
Supporting indicator: Annual direct use of energy at farm level by fuel type (KgOE/ha)

Key messages

- Energy consumption by agriculture made up only 2.7% of final energy consumption in the EU-28 in 2016. The share of agriculture in final energy consumption was highest in the Netherlands (7.4%) and Poland (5.3%) (Table 1).

- Total energy consumption in the EU-28 was similar in 1996 and in 2016 (900 and 891 million tonnes of oil equivalent, respectively). In-between times, however, energy consumption increased and peaked in 2005 at 974 million tonnes of oil equivalent before falling back. Energy consumption by agriculture decreased by a little less than one fifth (18.6%) between 1996-2016 (Table 1).

1Data for Germany are not available for this publication.
Among the countries that joined the EU from 2004 onwards (Bulgaria, the Czech Republic, Estonia, Croatia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Romania, Slovenia and Slovakia) energy consumption by agriculture increased by 8.0% between 2009 and 2016, back to a level similar to that recorded in 2006 (Figure 1).

In the pre-2004 EU members (EU-15) energy consumption by agriculture decreased by 7.7% as a whole between 2006 and 2016, although it did increase in the United Kingdom, the Netherlands and Austria, and remained broadly unchanged in France and Luxembourg.

Oil contributed to 54% of total energy consumption by agriculture in the EU-28 in 2016 and was the main fuel type in most countries, the principal exceptions being the Netherlands (where gas is the dominant fuel type), Greece (electrical energy), and Sweden (renewables and electrical energy). In the EU-15 (data for Germany are not available for this publication), oil (53%), electricity (21%) and gas (17%) were the main fuel types used by agriculture, whereas in Member States joining EU in 2004 and after, oil (56%), solid fuels (16%) and renewables (13%) were the main fuel types in 2016. In the EU-15 the share of oil
decreased between 1996 and 2016, whereas the share of electricity and renewables increased. In Member States joining the EU in 2004 and after, the share of oil increased between 1996 and 2006 but fell slightly by 2016. The share of renewables increased from 6 to 13% during the 20 years time period (Figure 3).

Assessment

Total levels of energy consumption do not allow direct comparison between countries, as countries differ in size. To compare trends across countries a common denominator needs to be defined to assess the energy consumption per unit across countries. Ideally there should be a strong link between the indicator and the denominator.
A much used denominator to assess agri-environmental indicators across countries is the utilised agricultural area (UAA). Figure 4 shows the different levels of energy consumption per hectare of UAA in 2006 and 2016. The average energy consumption by agriculture in the EU-28 expressed per hectare of UAA in 2016 was 135 Kilogram of oil equivalent per hectare (KgOE/ha) compared to 158 KgOE/ha in 2006. Energy consumption per hectare declined most strongly in Greece and Sweden during this reference period but was notably higher in the Netherlands and Cyprus.

Figure 4: Energy consumption by agriculture, 2006 and 2016 (tonnes of oil equivalent per hectare of UAA)

Source: Eurostat (nrg_100a) and (apro_acs_a)

In some countries, however, the link between UAA and energy consumption requires further understanding. In particular, Figure 4 shows that energy use by agriculture per ha UAA was highest in the Netherlands. This was mainly due to intensive greenhouse farming. About 79 % of total energy consumption by agriculture in 2013 in the Netherlands was consumed by greenhouses, though the cultivation under glass according to the Farm Structure Survey covered only 0.5 % of the total UAA in the Netherlands in 2013.

Data sources

Indicator definition

The indicator relates to the direct use of energy (solid fuels, total petroleum products, gas, electricity, renewables, and heat) by agriculture per ha of utilised agricultural area (UAA). It assesses the trend of energy consumption, per ha and per fuel type.

Measurements

- Main indicator: Total direct energy use at farm level in KgOE per ha per year
- Supporting indicator: Annual direct use of energy at farm level by fuel type (KgOE/ha)

Links with other indicators

This indicator has links to a number of other AEI indicators that describe developments related to agriculture and the environment.

---

2CBS Statline:Energieverbruik; land- en tuinbouw Data extracted at 13/12/2016 here
Data used and methodology

For a detailed description of the data source see the methodology.

Data for Germany on energy use in agriculture are not available since the energy consumption in this sector is not separately surveyed. Since Germany has a major share of the final energy consumption (FEC), Germany is therefore not included in the EU FEC since it would distort the data, i.e. data for Germany is not included in the calculations in this article.

Data are expressed in tonnes of oil equivalents. Tonne(s) of oil equivalent, abbreviated as toe, is a normalized unit of energy. By convention it is equivalent to the approximate amount of energy that can be extracted from one tonne of crude oil. It is a standardized unit, assigned a net calorific value of 41 868 kilojoules/kg and may be used to compare the energy from different sources.

The main data source for this indicator is the joint Eurostat/IEA/UNECE questionnaire. Energy indicators are compiled on the basis of the data collected under the standard collection cycles of the "Energy Statistics Unit". The relevant energy data collections are regulated since 2008 with the entry-into-force of the Regulation (EC) No 1099/2008 of the European Parliament and of the Council of 22 October 2008 on energy statistics. The energy statistics derived from the Joint Eurostat/OECD-IEA/UNECE questionnaires aim at presenting the full spectrum of the energy balances positions from supply through transformation to final energy consumption by sector and fuel type. Energy consumption by agriculture is of negligible importance to overall energy flows. Though the energy statistics are of high quality in general, the data on energy consumption by agriculture are of lower quality due to errors and incomplete data (e.g. no data on energy consumption by agriculture for Germany is available). No corrections have been made to the data as published in Eurobase. Energy consumption as presented here may therefore be underestimated due to missing data. Errors and missing data may also affect the trends in energy consumption over time and by fuel type.

In the Joint Questionnaires agriculture, forestry and fishing were combined in one category until 2004. From 2004 the questionnaires have distinguished fishing separately from agriculture/forestry. In 2014, 20 Member States and 5 other countries delivered separate data on fishing. For remaining countries it is possible that energy consumption by fishing is still included in the category agriculture/forestry. The share of fishing in the sum of energy consumption by agriculture, forestry and fishing is often not negligible. The share was in 2014 in Iceland 85 %, Norway 56 %, Portugal 21 %, Denmark 14 %, Croatia 12 %, Greece 9 %, France and Italy 7 %, Cyprus 6 %, and in Latvia, the Netherlands, Finland and Sweden 5 %. The share of fishing was below 5 % in Bulgaria, the Czech Republic, Estonia, Spain, Lithuania, Hungary, Malta, Poland, and Romania.

Energy consumption by agriculture may be overestimated in countries with significant forestry sector. From Denmark data have been received from the environmental accounts for energy use by agriculture, forestry and fishing separately and from Norway from the energy accounts. Data from these data sources show that the share of forestry in energy consumption by agriculture and forestry combined is around 1 % in Denmark (1990-2008) and the share of forestry in energy consumption by agriculture and forestry combined is of minor significance in Norway (ca 5 % in 2007). For other countries data on the use of energy by forestry is not available and an estimate for the share of energy consumption in energy consumption by agriculture and forestry cannot be provided. In most countries however the energy consumption by forestry is expected to be of minor significance.

For the indicator per ha, land use data from crop statistics are used. These data are annually available. Agriculture is highly heterogeneous in the EU; to target policies data would be needed by farm-type and region. This would also allow using different denominators for different farm types, for example for livestock farms a more appropriate denominator could be the number of animals.

Source data for tables and graphs

- Agri-environmental indicator - energy use: tables and figures

Context

Energy is consumed directly by agriculture with the use of machinery (e.g. cultivation of fields with tractors) and the heating of livestock stables and greenhouses. Agriculture also uses energy indirectly, for the production of agrochemicals, farm machinery and buildings. Considerable amounts of natural gas are used for...
the production of inorganic nitrogen fertilisers. The indicator currently only includes direct energy consumption.

**Policy relevance and context**

Energy Union and Climate is one of the 10 priorities for the European Commission under President Juncker. The Energy Union Strategy (COM(2015) 80 final) confirmed the energy efficiency target of 20% by 2020 first set out in Europe 2020 (COM (2007) 1 final). This is the basis for moving forward to a reduction of at least 27% by 2030 to be reviewed by 2020, having in mind a figure of 30%. In 2014, the Commission concluded in its Energy Efficiency Communication (COM(2014) 520 final) that the EU would achieve energy savings of around 18-19% in 2020. Since then Member States have made improved efforts to implement EU energy efficiency legislation and have set more ambitious energy efficiency targets.

To assess energy efficiency, data on energy consumption would need to be linked to outputs produced. The FP7 research project "State of the Art on Energy Efficiency in Agriculture" produced country data on energy consumption in different agro-production sectors in European countries. Scenario building showed that the specific energy input (direct and indirect energy) in crop production differed between countries for the same crop. For example, specific energy input in wheat production was twice as high in Portugal as in the Netherlands.

The structure of direct and indirect energy use may reflect the potential for energy savings. The figures presented for agriculture in this fact sheet relate only to direct energy use and are therefore underestimations of the total energy use. Agriculture uses also energy indirectly through the use of fertilisers, pesticides, animal feed and agricultural machinery (which are produced using large amounts of energy). Data on indirect use of energy by agriculture are not available at EU-level. The "State of the Art on Energy Efficiency in Agriculture" project showed for example that indirect energy use was higher than the direct energy use in most countries for wheat production, while the direct energy use was over 90% for sunflower production in Portugal and for cotton production in Greece. With this kind of information it is possible to better target energy savings. The structure of direct and indirect energy use may reflect the potential for energy savings.

**Agri-environmental context**

The use of machinery and mineral fertilisers has made it possible to increase agricultural productivity and food supply. However, agriculture, as an energy user, contributes to the depletion of non-renewable energy sources and to global warming through energy-related emissions (like CO2 emissions from fossil fuel combustion). To facilitate influencing energy consumption levels through policy measures, the factors which influence energy levels should be understood. The indicator could be improved if data would be available by farm-type and region.

Agriculture is also an energy producer through renewable resources such as biogas, biomass, wind and solar energy. Under the Rural Development Programmes 2014-2020 almost EUR 3 billion (public and private funding) will be invested in improving energy efficiency in agriculture and food processing. Another EUR 3 billion will be invested in renewable energy production on farms and in rural areas.

**Other articles**

- Agri-environmental indicators (online publication)
- Renewable energy statistics
- Sustainable development in the European Union

**Publications**

- Agriculture, forestry and fishery statistics (Statistical book) — 2017 edition
- Shedding light on energy in the EU — A guided tour of energy statistics (digital publication) — 2018 edition
- **Energy, transport and environment indicators** - 2017 edition
- **Agriculture, forestry and fishery statistics** - 2016 edition
- **Agriculture, forestry and fishery statistics** - 2015 edition

**Database**

- **Energy**, see

Energy Statistics - quantities, annual data (nrg_quant)
  - Energy Statistics - supply, transformation, consumption (nrg_10)
  - Simplified energy balances - annual data (nrg_100a)
  - Complete energy balances - annual data (nrg_110a)
  - Supply, transformation and consumption of solid fuels - annual data (nrg_101a)
  - Supply, transformation and consumption of oil - annual data (nrg_102a)
  - Supply, transformation and consumption of gas - annual data (nrg_103a)
  - Supply and transformation of nuclear energy - annual data (nrg_104a)
  - Supply, transformation and consumption of electricity - annual data (nrg_105a)
  - Supply, transformation and consumption of heat - annual data (nrg_106a)
  - Supply, transformation and consumption of renewable energies - annual data (nrg_107a)
  - Supply, transformation and consumption of wastes (non-renewable) - annual data (nrg_108a)
  - Primary production - all products - annual data (nrg_109a)
  - Sankey diagram dataset - annual data (nrg_sankey)

- **Agriculture**, see

Agricultural production (apro)
  - Crops products (apro_cp)
    - Crops statistics (areas, productions and yield) (apro_acs)
    - Crops statistics (from 2000 onwards) (apro_acs_a)

**Dedicated section**

- **Agri-Environmental Indicators**
- **Energy**
- **Environmental Accounts**

**Methodology**

- Energy Statistics (nrg_10_esms)
- Crop products (apro_acs_esms)

**Legislation**

- Commission Communication COM(2006) 508 final - Development of agri-environmental indicators for monitoring the integration of environmental concerns into the common agricultural policy
- Commission Staff working document accompanying COM(2006)508 final

**External links**

- European Commission - Energy - Renewable energy
- European Commission - Europe 2020

**Notes**

Agri-environmental indicator - energy use