

# Manual on the Basic Set of Environment Statistics of the FDES 2013



## Crops and Livestock Statistics

(Topics 2.5.3: Crops and 2.5.4: Livestock of the Basic Set of Environment Statistics of the FDES 2013)

*Elaborated by the Environment Statistics Section  
of the United Nations Statistics Division,  
in collaboration with the  
Expert Group on Environment Statistics*

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Methodology sheet of the Basic Set of Environment Statistics of the FDES

[https://unstats.un.org/unsd/envstats/fdes/manual\\_bses.cshmtl](https://unstats.un.org/unsd/envstats/fdes/manual_bses.cshmtl)

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# 1. Statistics in Topics 2.5.3 Crops and 2.5.4 Livestock

## Component 2: Environmental Resources and their Use

### Subcomponent 2.5: Biological Resources

Statistics and Related Information		Category of Measurement	Potential Aggregations and Scales	Methodological Guidance
(Bold Text - Core Set/Tier 1; Regular Text - Tier 2; <i>Italicized Text</i> - Tier 3)				
Topic 2.5.3: Crops				
a.	Main annual and perennial crops		<ul style="list-style-type: none"> <li>▪ By crop</li> <li>▪ By size</li> <li>▪ National</li> <li>▪ Sub-national</li> </ul>	<ul style="list-style-type: none"> <li>▪ FAO Indicative Crop Classification (for 2020 round of agricultural censuses, WCA 2020)</li> <li>▪ FAO/WHO Specifications for Pesticides (2010)</li> <li>▪ FAO Questionnaire on Fertilizers</li> <li>▪ ISIC Rev. 4, Section A, Division 1 (ISIC A 01)</li> <li>▪ FAOSTAT database</li> <li>▪ HS 2012, Section II</li> </ul>
	1. <b>Area planted</b>	Area		
	2. <b>Area harvested</b>	Area		
	3. <b>Amount produced</b>	Mass		
	4. <i>Amount of organic production</i>	Mass		
	5. <i>Amount of genetically modified crops produced</i>	Mass		
b.	Amount used of:		<ul style="list-style-type: none"> <li>▪ By type of fertilizer</li> <li>▪ By type of pesticide</li> <li>▪ By crop</li> <li>▪ National</li> <li>▪ Sub-national</li> </ul>	
	1. <b>Natural fertilizers</b> (e.g., manure, compost, lime) (also in 3.4.1.a)	Area, Mass, Volume		
	2. <b>Chemical fertilizers</b> (also in 3.4.1.a)	Area, Mass, Volume		
	3. <b>Pesticides</b> (also in 3.4.1.b)	Area, Mass, Volume	<ul style="list-style-type: none"> <li>▪ By crop</li> <li>▪ National</li> <li>▪ Sub-national</li> </ul>	
	4. Genetically modified seeds	Mass		
c.	Monoculture/resource-intensive farming systems		<ul style="list-style-type: none"> <li>▪ By crop</li> <li>▪ By size</li> <li>▪ National</li> <li>▪ Sub-national</li> </ul>	
	1. Area being used for production	Area		
	2. Amount produced	Mass		
	3. <i>Amount of genetically modified crops produced</i>	Mass		
d.	Imports of crops	Currency, Mass		
e.	Exports of crops	Currency, Mass		

## Topic 2.5.4: Livestock

a.	Livestock		<ul style="list-style-type: none"> <li>▪ By type of animal</li> <li>▪ National</li> <li>▪ Sub-national</li> </ul>	<ul style="list-style-type: none"> <li>▪ FAOSTAT database</li> <li>▪ ISIC Rev. 4, Section A, Division 01</li> <li>▪ HS 2012, Section I, Chapter 01</li> </ul>
	<b>1. Number of live animals</b>	Number		
	2. Number of animals slaughtered	Number		
b.	Amount used of:			
	1. <i>Antibiotics</i> (also in 3.4.1.f)	Mass		
	2. <i>Hormones</i> (also in 3.4.1.d)	Mass		
c.	Imports of livestock	Currency, Number		
d.	Exports of livestock	Currency, Number		

## 2. Introduction/Relevance

FAO defines agriculture as the cultivation of crops and animal husbandry as well as forestry, fisheries, and aquaculture. These dimensions of agriculture are brought together under the broader conceptual framework of agricultural statistics, which includes aspects of crop and livestock production and trade, fisheries, forestry and land and water use.<sup>1</sup> This methodology sheet covers statistics on crops and livestock. Statistics on crops and livestock are typically produced in countries by National Statistical Offices or Ministries of Agriculture, and those on fisheries and forestry by their respective line ministries.

Understanding the linkage between agriculture and the environment allows for analysis and planning of sustainable agricultural production and development. Promotion of sustainable agricultural development requires an increase in agricultural productivity while conserving the world's growing natural resources. It is important to ensure that growing agriculture and increased productivity should not only benefit the few and that the natural resource base can provide services (pollination, nutrient cycling in soils, quality water, etc.) that enhance sustainability.<sup>2</sup>

Sustainable food and agriculture increases agricultural productivity while enhancing the natural resource base through both improved efficiency of resource use and protection of natural resources. Examples relevant to crops and livestock include: better use of ecosystem services, balancing resources and inputs through a genetically diverse base of species; use of conservation agriculture practices such as reduced or zero tillage, cover crops and diversified cropping systems needed to maintain soil organic matter, soil structure and health, better use of both organic and inorganic fertilizers, improved soil moisture management; improved water productivity; improved pest management; and improved resource use efficiency in livestock production, through balanced animal feeding, nutrition and integrated animal health control.<sup>3</sup>

Agriculture interacts with the environment through several dimensions. Environmental conditions, such as weather, soil type, and hydrology provide the ecological foundation for agriculture, which uses as inputs environmental resources such as land, soil, water and energy. Environmental resources and the agricultural production process are affected by climate, its variability and change, including extreme events and disasters. Agricultural production processes in turn generate residuals, such as emissions to soils and water from inefficient use of fertilizers and pesticides, or emissions of greenhouse gases into the atmosphere. The production process and wastes generated, in turn change the environment and can transform ecosystems and physical conditions, with potential implications for areas such as ecosystems, land suitability, local and regional pollution, water stress, climate and biodiversity.<sup>4</sup> Understanding these relationships is a necessary step in ensuring that farming systems are productive and offer socio-economic benefits while protecting the environment.

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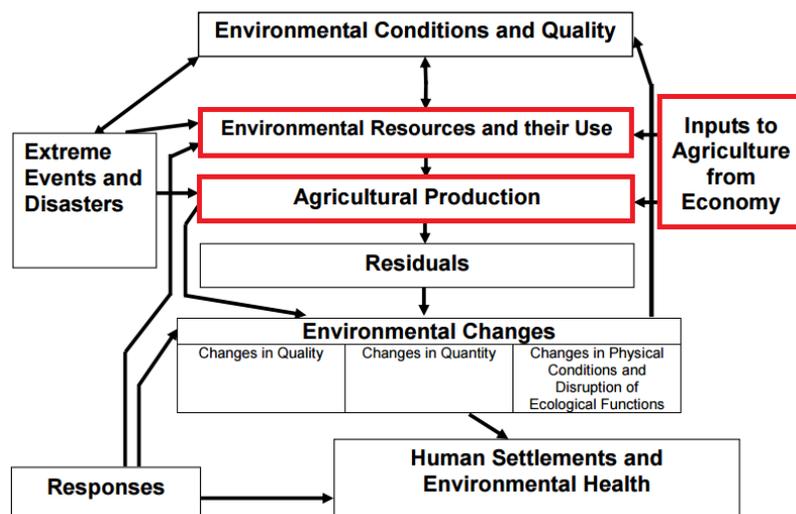
<sup>1</sup> World Bank, FAO, United Nations (2010) *Global Strategy to Improve Agricultural and Rural Statistics. Report No. 56719-GLB*, World Bank, Washington, D.C., <http://www.fao.org/docrep/015/am082e/am082e00.pdf> (accessed 20 October 2017)

<sup>2</sup> FAO (undated) The FAO Strategic Objectives, <http://www.fao.org/docrep/018/mi317e/mi317e.pdf> (accessed 20 October 2017)

<sup>3</sup> FAO (2014) *Building a common vision for sustainable food and agriculture: principles and approaches*, FAO: Rome, [www.fao.org/3/a-i3940e.pdf](http://www.fao.org/3/a-i3940e.pdf) (accessed 20 October 2017)

<sup>4</sup> United Nations Statistics Division (2017) *Framework for the Development of Environment Statistics (2013)*, <https://unstats.un.org/unsd/environment/fdes/FDES-2015-supporting-tools/FDES.pdf> (accessed 20 October 2017)

**Figure 1.1 The relationship between agriculture and the environment<sup>5</sup>**



Note: The methodology sheet on Crops and Livestock Statistics covers the components in red.

The FDES Chapter 5, section 5.4 Agriculture and the Environment examines the FDES statistics and indicators that relate to agriculture and the environment. It shows the relationship among the various components of agriculture and the environment: environmental conditions and quality, the basic ecological support for agriculture, the demand of inputs, residuals including agricultural waste, extreme events and disasters, responses of society aimed at protecting, managing, and restoring environmental resources, among others.

Understanding the impacts of agriculture on the natural resource base and the implementation of sustainable agriculture practices requires the development of core statistics across a wide range of areas. In addition to crop and livestock production, statistics are needed on agricultural inputs such as fertilizers, pesticides, land cover/land use, water availability, quality and use, soil erosion and degradation, alongside the quantification of greenhouse gas emissions and impacts on biodiversity.<sup>6</sup>

This methodology sheet does not cover all aspects of agriculture and its inputs, but only those pertinent to Topic 2.5.3: Crops and Topic 2.5.4: Livestock of the Basic Set of Environment Statistics. Other aspects of agriculture and its inputs, are covered under FDES Subcomponents 2.3 Land and 2.4 Soil Resources, Topic 2.5.1 Timber resources (not including tree crops), Topic 2.5.2 Aquatic resources and Subcomponent 2.6 Water Resources. Component 3 of the FDES covers residuals in the environment, including Topic 3.1.1 Emissions of greenhouse gases (including from agriculture).

<sup>5</sup> United Nations Statistics Division (2017) Framework for the Development of Environment Statistics (2013), <https://unstats.un.org/unsd/environment/fdes/FDES-2015-supporting-tools/FDES.pdf> (accessed 20 October 2017)

<sup>6</sup> United Nations Statistics Division (2017) Framework for the Development of Environment Statistics (2013), <https://unstats.un.org/unsd/environment/fdes/FDES-2015-supporting-tools/FDES.pdf> (accessed 20 October 2017)

# 3. Definitions and description of the statistics

The concepts and definitions in this section are provided by the standards and guidelines established by lead agencies in the field, such as FAO, etc., to ensure conformity with established international best practices. The references can be found with the respective definitions and classifications.

## 3A. Crops (Topic 2.5.3)

The crop statistics in Topic 2.5.3 refer to statistics on production and therefore the applicable concept is the primary crop products and associated areas. Primary crops come directly from the land without having undergone any real processing, apart from cleaning. Primary crops are divided into temporary and permanent crops. Temporary crops (termed annual in FDES) are those that are both sown and harvested during the same agricultural year, sometimes more than once. Permanent crops (termed perennial in FDES) are sown or planted once and not replanted after each annual harvest.<sup>7</sup>

### Remarks:

- Crop products, which refer to the products(s) generated from a particular crop, and the actual plant crops grown are separate statistical concepts. In many cases, there is one product per crop, but for some there is more than one. The FDES refers to primary crop products.
- Some crops that remain in the field for more than one year may also be considered temporary crops. For example, strawberries, pineapples and bananas are considered to be annual crops in some areas. Such crops could be classified as temporary or permanent according to the custom in the country.<sup>8</sup>

International recommendations are that coverage of area, yield and production be as complete as possible.<sup>9</sup> However, due to the need for economies in data collection, many countries collect data on major crops with a limited number of minor crops. The crops that are important to the food strategy of the country or the ones that contribute to a significant part of its agricultural GDP, or contribute significantly to its food security, are usually included.

### 3A1. Main annual and perennial crops

#### Area planted (FDES 2.5.3.a.1)

**Area** refers to the area under cultivation. Area under cultivation means the area that corresponds to the total sown area, [but after the harvest it excludes ruined areas (e.g., due to natural disasters)]. If the same land parcel is used twice in the same year, the area of this parcel can be counted twice. For tree crops, some countries provide data in terms of number of trees instead of in area. This number is then converted to an area estimate using typical planting density conversions.<sup>10</sup>

<sup>7</sup> FAO (2011) *Crops statistics - concepts, definitions and classifications*, <http://www.fao.org/economic/the-statistics-division-ess/methodology/methodology-systems/crops-statistics-concepts-definitions-and-classifications/en/> (accessed 20 October 2017)

<sup>8</sup> FAO (2015) *World Programme for the Census of Agriculture 2020*. FAO Statistical Development Series 15, FAO: Rome (accessed 20 October 2017)

<sup>9</sup> FAO (2011) *Crops statistics - concepts, definitions and classifications*, <http://www.fao.org/economic/the-statistics-division-ess/methodology/methodology-systems/crops-statistics-concepts-definitions-and-classifications/en/> (accessed 20 October 2017)

<sup>10</sup> FAOSTAT metadata for crop area: <http://www.fao.org/faostat/en/#data/QC/metadata> (accessed 20 October 2017)

#### Remarks:

- Related terms are used when referring to the classification of agricultural land use under the agriculture census. The area of land under temporary crops refers to the physical areas of land on which temporary crops are grown (often referred to as **net cropped area**). The sum of the areas of all temporary crops grown (**gross cropped area**) may be greater than the net cropped area because of successive cropping (see paragraphs 8.4.10-8.4.11).<sup>11</sup> The area planted above would correspond to gross cropped area as any successive cropping is counted.
- This is not to be confused with the terms gross area and net area.<sup>12</sup>
- For successive crops (i.e., crops which are sown or planted more than once in the same field during the year), area planted/harvested is recorded only once in the case of successive gathering of the crop during the year from the same standing crops (i.e., crops which are not replanted) but is counted again each time the crop is planted.<sup>13</sup>
- For associated or mixed cropping (crops which are sown interplanted with other temporary or permanent crops), the area relating to each crop should be reported separately.<sup>14</sup> For permanent crops most countries report number of trees or plants in addition to or, instead of, the area planted, particularly for scattered trees. These are separated into bearing or non-bearing (usually young trees which are not yet productive) areas or trees.<sup>15</sup>

#### Area harvested (FDES 2.5.3.a.2)

Area harvested is the area from which a crop is gathered. Area harvested, therefore, excludes the area from which, although sown or planted, there was no harvest due to damage, failure, etc. It is usually net for temporary crops and gross for permanent crops (gross area includes uncultivated patches, footpaths, ditches, headlands, shoulders, shelterbelts, etc.).<sup>16</sup>

#### Remarks:

- The same remarks apply as for area planted.
- The area harvested is reported only once for the major crop, for example, for cotton the main commodity is seed cotton and the area harvested refers to it. The production then becomes an input for the two sub-products (cottonseed and cotton lint). Further detail on crops with multiple products can be found in FAO (2011).<sup>17</sup>

#### Amount produced (FDES 2.5.3.a.3)

Crop production data refer to the actual harvested production from the field orchard or garden, excluding harvesting and threshing losses and that part of crop not harvested for any reason.<sup>18</sup>

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<sup>11</sup> FAO (2015) *World Programme for the Census of Agriculture 2020, Volume I: Programme, concepts and definitions*, FAO: , Rome <http://www.fao.org/3/a-i4913e.pdf> (accessed 20 October 2017)

<sup>12</sup> FAO (2011) *Crops statistics – concepts, definitions and classifications*, <http://www.fao.org/economic/the-statistics-division-ess/methodology/methodology-systems/crops-statistics-concepts-definitions-and-classifications/en/> (accessed 20 October 2017)

<sup>13</sup> FAO (2017) *FAO Production Questionnaire 2017*, <http://www.fao.org/economic/ess/ess-home/questionnaires/en/> (accessed 20 October 2017)

<sup>14</sup> FAO (2011) *Crops statistics – concepts, definitions and classifications*, <http://www.fao.org/economic/the-statistics-division-ess/methodology/methodology-systems/crops-statistics-concepts-definitions-and-classifications/en/> (accessed 20 October 2017)

<sup>15</sup> FAO (2011) *Crops statistics – concepts, definitions and classifications*, <http://www.fao.org/economic/the-statistics-division-ess/methodology/methodology-systems/crops-statistics-concepts-definitions-and-classifications/en/> (accessed 20 October 2017)

<sup>16</sup> FAO (2017) *FAO Production Questionnaire 2017*, <http://www.fao.org/economic/ess/ess-home/questionnaires/en/> (accessed 20 October 2017)

<sup>17</sup> FAO (2011) *Crops statistics – concepts, definitions and classifications*, <http://www.fao.org/economic/the-statistics-division-ess/methodology/methodology-systems/crops-statistics-concepts-definitions-and-classifications/en/> (accessed 20 October 2017)

<sup>18</sup> FAO (2017) *FAO Production Questionnaire 2017*, <http://www.fao.org/economic/ess/ess-home/questionnaires/en/> (accessed 20 October 2017)

**Remark:**

- Production statistics can be derived either from direct collection of production figures, or from multiplying average yield per unit area by the corresponding crop area harvested.<sup>19</sup> Note that the area harvested is used rather than area sown. The latter would give the potential biological production rather than the actual, harvested production.

**Amount of organic production (FDES 2.5.3.a.4)**

Organic agriculture is a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. This is accomplished by using, where possible, agronomic, biological and mechanical methods, as opposed to using synthetic materials, to fulfil any specific function within the system.<sup>20</sup>

Data can be collected on amount of organic production or area of land under organic farming. FAO refers to land area managed for certified organic production as the land area exclusively dedicated to organic agriculture and managed by applying organic agriculture methods. It refers to the land area fully converted to organic agriculture. It is the portion of land area (including arable lands, pastures or wild areas) managed (cultivated) in accordance with specific organic standards or technical regulations and that has been inspected and approved by a certification body.<sup>21</sup>

The amount of organic production would be the production from areas of land under organic farming.

**Remarks:**

- However, statistics can also be collected on areas in-conversion to certified organic (which covers producers undergoing a conversion process to organic agricultural systems certified by third party certification bodies) or production from such areas.  
The producer must have registered with the certification body and initiated conversion in accordance with the requirements of the certification body.
- It is mentioned in the FAO World Programme for the Census of Agriculture that it is also possible to recognize non-certified (de facto) organic agriculture or products, which involve agricultural production systems that follow the principles of organic production but are not certified by a certification body or Participatory Guarantee Schemes. However, this may be difficult in practice.<sup>22</sup>

**Amount of genetically modified crops produced (FDES 2.5.3.a.5)**

Crop production from genetically modified organisms (such as genetically modified crops) which are organisms in which the genetic material has been changed through modern biotechnology in a way that does not occur naturally by multiplication and/or natural recombination.<sup>23</sup>

Data can also be collected on areas of land under genetically modified crops.

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<sup>19</sup> FAO (2011) *Crops statistics – concepts, definitions and classifications*, <http://www.fao.org/economic/the-statistics-division-ess/methodology/methodology-systems/crops-statistics-concepts-definitions-and-classifications/en/> (accessed 20 October 2017)

<sup>20</sup> FAO and WHO (1999) FAO/WHO Codex Alimentarius Commission, <http://www.fao.org/fao-who-codexalimentarius/en/> (accessed 20 October 2017)

<sup>21</sup> FAO (2016) *Land use and irrigation questionnaire 2016*, <http://www.fao.org/economic/ess/ess-home/questionnaires/en/> (accessed 20 October 2017)

<sup>22</sup> FAO (2015) *World Programme for the Census of Agriculture 2020*, FAO Statistical Development Series 15, FAO: Rome, <http://www.fao.org/3/a-i4913e.pdf> (accessed 20 October 2017)

<sup>23</sup> FAO (2009) *Glossary on Organic Agriculture*, [http://www.fao.org/fileadmin/templates/organicag/files/Glossary\\_on\\_Organic\\_Agriculture.pdf](http://www.fao.org/fileadmin/templates/organicag/files/Glossary_on_Organic_Agriculture.pdf) (accessed 20 October 2017)

### **Imports of crops (FDES 2.5.3.d)**

Import quantity represents the physical quantity of the products imported for domestic consumption or processing shipped into a country. It includes re-imports.<sup>24</sup>

#### *Remark:*

- As a general rule, trade quantity refers to net weight, excluding any sort of container. It includes also food aid quantities, where relevant.<sup>25</sup>

### **Exports of crops (FDES 2.5.3.e)**

Export quantity is the physical quantity of domestic origin shipped out of the country. It includes re-exports.<sup>26</sup>

#### *Remark:*

- As a general rule, trade quantity refers to net weight, excluding any sort of container. It includes also food aid quantities, where relevant.<sup>27</sup>

## **3A2. Fertilizers, pesticides and seeds**

### **[Amount used of] Natural fertilizers (FDES 2.5.3.b.1)**

International guidelines on agriculture refer to organic fertilizers (International Standard ISO 7851),<sup>28</sup> and the term organic fertilizers is commonly used. The term organic fertilizers can be used as an alternative to natural fertilizers. Organic fertilizers comprise residues of plants and animals, and human wastes. They include farmyard manure and animal droppings, crop wastes and residues, sewage sludge and other human wastes; and various industrial wastes.<sup>29</sup>

#### *Remarks:*

- Organic fertilizers exclude lime, which is an inorganic fertilizer.
- Organic fertilizers can be summed by type of product (e.g., farmyard manure, animal slurry and guano; vegetable material; stabilized sewage sludge) to produce total quantities of organic fertilizer or total quantity for each type of product. They can also be summed by nutrient, to give total quantities of each type of nutrient content. Different types of nutrients cannot be summed to produce a total.
- Quantity of fertilizers used should be analysed together with the area fertilized (if possible by type of crop) as rate of use and environmental impact is determined by area as well as quantity.

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<sup>24</sup> FAOSTAT metadata for crops and livestock products, statistical concepts and definitions, <http://www.fao.org/faostat/en/#data/TP/metadata> (accessed 20 October 2017)

<sup>25</sup> FAOSTAT metadata for crops and livestock products, statistical concepts and definitions, <http://www.fao.org/faostat/en/#data/TP/metadata> (accessed 20 October 2017)

<sup>26</sup> FAOSTAT metadata for crops and livestock products, statistical concepts and definitions, <http://www.fao.org/faostat/en/#data/TP/metadata> (accessed 20 October 2017)

<sup>27</sup> FAOSTAT metadata for crops and livestock products, statistical concepts and definitions, <http://www.fao.org/faostat/en/#data/TP/metadata> (accessed 20 October 2017)

<sup>28</sup> FAO (1991) *Manual on Fertilizer Statistics*, FAO: Rome, [http://www.fao.org/fileadmin/templates/ess/ess\\_test\\_folder/Publications/ManualFertilizers.pdf](http://www.fao.org/fileadmin/templates/ess/ess_test_folder/Publications/ManualFertilizers.pdf) (accessed 20 October 2017)

<sup>29</sup> FAO (2016) *FAO Questionnaire on Fertilizers 2016*, <http://www.fao.org/economic/ess/ess-home/questionnaires/en/> (accessed 20 October 2017)

### **[Amount used of] Chemical (or Mineral) fertilizers (FDES 2.5.3.b.2)**

International guidelines on agriculture commonly refer to chemical fertilizers. The term chemical fertilizers can be used as an alternative to mineral fertilizers. Inorganic (also termed mineral or chemical) fertilizers are defined in International Standard ISO 7851 as fertilizers in which the declared nutrients are as inorganic salts obtained by extraction and/or by industrial physical and/or chemical processes. Fertilizers can be classified into:<sup>30</sup>

- STRAIGHT FERTILIZERS: These fertilizers have a declarable content of only one of the three primary plant nutrients nitrogen (N), phosphorous (P<sub>2</sub>O<sub>5</sub>) or potassium (K<sub>2</sub>O).
- COMPOUND FERTILIZERS: These fertilizers have a declarable content of more than one of the three primary plant nutrients. They may be NP, NK, PK or NPK compounds, and include mixed fertilizers, produced by a physical process (e.g., blends, which comprise materials of matching granule size), and complex fertilizers, produced by a process of chemical reaction (all nutrients being present in the same granule).
- OTHER FERTILIZERS: Inorganic products that have fertilizer value in at least one of the fertilising elements nitrogen, phosphorous or potassium but are not included in any of the categories above.

#### *Remarks:*

Fertilizer statistics can be reported by quantity of product or by quantity of nutrient: N (nitrogen), P<sub>2</sub>O<sub>5</sub> (phosphorous) and K<sub>2</sub>O (potassium or potash).<sup>31</sup> When reporting by nutrient the chemical composition should be included.

- Note summations cannot be produced over different nutrient types - only if converted to nutrient equivalent amounts.
- However, totals can be given for quantities of product, e.g., tonnes of material of straight nitrogenous fertilizers, straight phosphatic fertilizers, straight potassic fertilizers, complex fertilizers or total tonnes of fertilizers.<sup>32</sup>
- Various methods exist for obtaining and reporting fertilizer use/consumption.<sup>33</sup> Where there are difficulties in reporting consumption, countries often report fertilizer use as 'apparent consumption', i.e., as a residual of production plus imports minus exports. Further information can be found in the FAO Questionnaire on Fertilizers.<sup>34</sup>
- Data may refer to fertilizer year, rather than calendar year, in which case the period should be referenced.

### **[Amount used of] Pesticides (FDES 2.5.3.b.3)**

The physical amount (mass) of pesticides products used in agricultural activities. This covers the use of major pesticide groups (Insecticides, Herbicides, Fungicides, Plant growth regulators and Rodenticides) and of relevant chemical families.<sup>35</sup>

#### *Remark:*

- Pesticides are generally reported based on the active ingredient of the pesticide with statistics for quantity of active ingredient and quantity of product. Where there are difficulties in reporting use, statistics are reported based on sales, used as a proxy. The different types of pesticides such as herbicides, insecticides and fungicides contain different pollution potential and impact ecosystems in different ways; it is not recommended that they

<sup>30</sup> FAO (2016) *FAO Questionnaire on Fertilizers 2016*, <http://www.fao.org/economic/ess/ess-home/questionnaires/en/> (accessed 20 October 2017)

<sup>31</sup> FAO (2016) *FAO Questionnaire on Fertilizers 2016*, <http://www.fao.org/economic/ess/ess-home/questionnaires/en/> (accessed 20 October 2017)

<sup>32</sup> FAO (1991) *Manual on Fertilizer Statistics*, FAO: Rome, [http://www.fao.org/fileadmin/templates/ess/ess\\_test\\_folder/Publications/ManualFertilizers.pdf](http://www.fao.org/fileadmin/templates/ess/ess_test_folder/Publications/ManualFertilizers.pdf) (accessed 20 October 2017)

<sup>33</sup> FAO (1991) *Manual on Fertilizer Statistics*, FAO: Rome, [http://www.fao.org/fileadmin/templates/ess/ess\\_test\\_folder/Publications/ManualFertilizers.pdf](http://www.fao.org/fileadmin/templates/ess/ess_test_folder/Publications/ManualFertilizers.pdf) (accessed 20 October 2017)

<sup>34</sup> FAO (2016) *FAO Questionnaire on Fertilizers 2016*, <http://www.fao.org/economic/ess/ess-home/questionnaires/en/> (accessed 20 October 2017)

<sup>35</sup> FAOSTAT metadata on pesticides, <http://www.fao.org/faostat/en/#data/RP/metadata> (accessed 20 October 2017)

be aggregated into one single mass unit, but should be kept separate when constructing time series, and shown in parallel when disseminated.<sup>36</sup>

#### **[Amount used of] Genetically modified seeds (FDES 2.5.3.b.4)**

Genetically modified organisms possess a combination of genetic material obtained through the use of modern biotechnology.<sup>37</sup> Genetically modified crops are grown from proprietary genetically modified seeds, but statistics are typically collected not on seeds but on areas (or percentage of areas) sown and harvested with genetically modified crops or quantity produced of genetically modified crops.

#### **Monoculture/resource-intensive crops (FDES 2.5.3.c.1, 2.5.3.c.2, 2.5.3.c.3)**

Intensive farming has traditionally had environmental consequences such as soil degradation and increases in crop specific pests and diseases. However, rather than identifying areas in monoculture, one approach is to identify sustainable agriculture practices.<sup>38</sup> One such example is the practice of conservation agriculture to sustainably increase agriculture production while enhancing biodiversity, minimizing soil disturbance, and optimizing external inputs. Conservation agriculture refers to the combination of use of crop rotations, zero or no tillage, and the presence of permanent soil cover. In a Conservation Agriculture system, all these components are combined and applied at the same time on the holding and to the same parcel.<sup>39</sup>

The statistics on area in and production from areas in conservation agriculture would apply.

### **3B. Livestock (Topic 2.5.4)**

The term livestock is used in a very broad sense, covering all domestic animals irrespective of their age and location or the purpose of their breeding. Also, non-domestic animals are excluded unless they are kept or raised in captivity, in or outside agricultural holdings, including holdings without land.<sup>40</sup>

Livestock can differ from one country to the other. The types that are important to the food strategy of the country or the types that represent a significant part of its agricultural GDP should be included. It is suggested where possible to break down the statistics by age, sex and purpose as indicated below as this detail is needed for livestock management and planning purposes.<sup>41</sup>

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<sup>36</sup> FAOSTAT metadata on pesticides, <http://www.fao.org/faostat/en/#data/RP/metadata> (accessed 20 October 2017)

<sup>37</sup> FAO (2015) *World Programme for the Census of Agriculture 2020*, Volume 1: Programme, concepts and definitions, FAO: Rome, <http://www.fao.org/3/a-i4913e.pdf> (accessed 20 October 2017)

<sup>38</sup> FAO (2014) *Building a common vision for sustainable food and agriculture*, FAO, Rome <http://www.fao.org/3/a-i3940e.pdf> (accessed 20 October 2017)

<sup>39</sup> FAO (2015) *World Programme for the Census of Agriculture 2020*, Volume I: Programme, concepts and definitions, FAO, Rome <http://www.fao.org/3/a-i4913e.pdf> (accessed 20 October 2017)

<sup>40</sup> FAO (2011) *Livestock statistics. Concepts, definitions and classifications*, <http://www.fao.org/economic/the-statistics-division-ess/methodology/methodology-systems/livestock-statistics-concepts-definitions-and-classifications/en/> (accessed 20 October 2017)

<sup>41</sup> FAO (2011) *Livestock statistics. Concepts, definitions and classifications*, <http://www.fao.org/economic/the-statistics-division-ess/methodology/methodology-systems/livestock-statistics-concepts-definitions-and-classifications/en/> (accessed 20 October 2017)

- CATTLE, total
  - A. Calves and young stock under 1 year of age
  - B. Young stock, 1 year of age and under 2 years
  - C. Cattle, 2 years of age and over
    - a) Females
      - i) cows - mainly for milk production
      - ii) heifers (including in calf)
    - b) Males - mainly for meat production (including spent)
- BUFFALOES, total
  - A. Buffaloes under 3 years of age
  - B. Buffaloes, 3 years of age and over Buffalo cows - mainly for milk production
- SHEEP, total
  - A. Lambs under 1 year of age
  - B. Sheep, 1 year of age and over Females - intended for breeding - intended for slaughter
- GOATS, total
  - A. Goats under 1 year of age
  - B. Goats, 1 year of age and over - Females
- PIGS, total
  - A. Young pigs, less than 50 kg
  - B. Pigs for breeding, 50 kg and over - Gilts - gilts in pig - Sows - sows in pig
  - C. Pigs for fattening, 50 kg and over
    - a) 50 kg and less than 80
    - b) 80 kg and over
- HORSES, total
  - A. Horses for agricultural production or use
  - B. Other horses
- MULES, total
- ASSES, total
- CHICKENS (domestic fowl), total
  - A. Chickens for breeding and egg production - Laying hens and pullets
  - B. Chickens for meat production (slaughter) - Broilers - Other (capons, etc.)
  - C. Other chickens (multi-purpose mixed stock) - Laying hens and pullets
- TURKEYS, total
- DUCKS, total
- GEESE, total
- GUINEA FOWL, total
- RABBITS, total
- BEEHIVES, total

### 3B1. Livestock

#### Number of live animals (FDES 2.5.4.a.1)<sup>42</sup>

Total livestock numbers.

#### Remarks:

- Livestock numbers are enumerated on a given day or in a few consecutive days of the year, where possible disaggregated as outlined in 3B. As the livestock population is subject to marked seasonal fluctuations, resulting in periods of maximum and minimum numbers within the course of the year the population should be enumerated more than once a year, particularly pigs and poultry. Where this is not possible at least one enumeration should be made towards the end of the year.<sup>43</sup>
- Livestock numbers are enumerated on a given day or in a few consecutive days of the year, where possible disaggregated as outlined in 3B. Live animals are expressed in units (heads); poultry, rabbits, pigeons and other birds are expressed in thousand units.
- Changes in national herds during the year are captured by statistics for each species according to the following equation: initial herd + animals born + imports of live animals - exports of live animals - natural losses - slaughter = closing herd.<sup>44</sup>
- For understanding resource productivity through herd balances and herd models, statistics would be required on livestock by age and sex, births, natural losses of various livestock categories, and by use (breeding, meat production, milk).<sup>45</sup>

#### Number of animals slaughtered (FDES 2.5.4.a.2)

The number of animals slaughtered includes all animals slaughtered during the year, of both indigenous and foreign origin, within the national boundaries.<sup>46</sup>

#### Imports of livestock (FDES 2.5.4.c)

Import quantity represents the physical quantity of the products imported for domestic consumption or processing shipped into a country. It includes re-imports.<sup>47</sup>

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<sup>42</sup> FAO (2011) *Livestock statistics. Concepts, definitions and classifications*, <http://www.fao.org/economic/the-statistics-division-ess/methodology/methodology-systems/livestock-statistics-concepts-definitions-and-classifications/en/> (accessed 20 October 2017)

<sup>43</sup> FAO (2011) *Livestock statistics. Concepts, definitions and classifications*, <http://www.fao.org/economic/the-statistics-division-ess/methodology/methodology-systems/livestock-statistics-concepts-definitions-and-classifications/en/> (accessed 20 October 2017)

<sup>44</sup> FAO (2011) *Livestock statistics. Concepts, definitions and classifications*, <http://www.fao.org/economic/the-statistics-division-ess/methodology/methodology-systems/livestock-statistics-concepts-definitions-and-classifications/en/> (accessed 20 October 2017)

<sup>45</sup> FAO (2011) *Livestock statistics. Concepts, definitions and classifications*, <http://www.fao.org/economic/the-statistics-division-ess/methodology/methodology-systems/livestock-statistics-concepts-definitions-and-classifications/en/> (accessed 20 October 2017)

<sup>46</sup> FAO (2011) *Livestock statistics. Concepts, definitions and classifications*, <http://www.fao.org/economic/the-statistics-division-ess/methodology/methodology-systems/livestock-statistics-concepts-definitions-and-classifications/en/> (accessed 20 October 2017)

<sup>47</sup> FAOStat Metadata Live Animals, *Statistical concepts and definitions*, <http://www.fao.org/faostat/en/#data/TA/metadata> (accessed 20 October 2017)

*Remark:*

- Imports for live animals are expressed in units (heads); poultry, rabbits, pigeons and other birds are expressed in thousand units. As a general rule, trade quantity refers to net weight, excluding any sort of container. It includes also food aid quantities, where relevant.<sup>48</sup>

**Exports of livestock (FDES 2.5.4.d)**

Export quantity is the physical quantity of domestic origin or manufactured products shipped out of the country. It includes re-exports.<sup>49</sup>

*Remark:*

- Exports for live animals are expressed in units (heads); poultry, rabbits, pigeons and other birds are expressed in thousand units. As a general rule, trade quantity refers to net weight, excluding any sort of container.

## **3B2. Livestock use of antibiotics and hormones**

**[Amount used of] Antibiotics (FDES 2.5.4.b.1)**

The quantity of antibiotics and other antimicrobial drugs used in animal production activities.<sup>50</sup>

*Remark:*

- This is a new area and few countries have data collections on use of antimicrobial agents in animals. As well as being used for treatment of disease, antimicrobials are used in animal feed and as such, quantity used may be difficult to obtain directly. Data may be more readily obtainable on numbers of animals treated. Data collections would therefore need to cover both types of feed used and veterinary treatments by purpose, as well as livestock numbers used for production, imports and exports, in order to generate estimates.

**[Amount used of] Hormones (FDES 2.5.4.b.2)**

The quantity of hormone substances used in animal production activities.

*Remark:*

- Hormones are applied as feed additives or using other methods of delivery such as implants or oil solutions, and therefore quantity used may be difficult to obtain directly. Data may be more readily obtainable on numbers of animals treated. Data collections would therefore need to cover types of feed used and other methods of delivery, as well as livestock numbers used for production, imports and exports, in order to generate estimates.

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<sup>48</sup> FAOStat Metadata Live Animals, Statistical concepts and definitions, <http://www.fao.org/faostat/en/#data/TA/metadata> (accessed 20 October 2017)

<sup>49</sup> FAOStat Metadata Live Animals, Statistical concepts and definitions, <http://www.fao.org/faostat/en/#data/TA/metadata> (accessed 20 October 2017)

<sup>50</sup> FAO (2017) Antimicrobial resistance in food and agriculture, <http://www.fao.org/3/a-i7138e.pdf> (accessed 20 October 2017)

# 4. International sources and recommendations

## 4A. Classifications and groupings

Primary crop products and livestock can be classified under the product classification below. Note that it is a crop product classification, not a crop plant classification.

### 4A1. The Central Product Classification (CPC) Version 2.1

The Central Product Classification Version 2.1 (CPC Ver.2.1)<sup>51</sup> was approved by the UN Statistical Commission in 2013. The proposal for CPC Ver. 2.1 expanded for agriculture was endorsed by the Expert Group on international statistical classifications in May 2011.<sup>52</sup> The full classification lists the individual products within each Division and Group.

**Figure 1: Relevant Central Product Classification Ver. 2.1  
Groups related to crops and livestock**

Group	Description
011	Cereals
012	Vegetables
013	Fruits and nuts
014	Oilseeds and oleaginous fruits
015	Edible roots and tubers with high starch or inulin content
016	Stimulant, spice and aromatic crops
017	Pulses (dried leguminous vegetables)
018	Sugar crops
019	Forage products; fibre crops; plants used in perfumery, pharmacy, or for insecticidal, fungicidal or similar purposes; beet, forage plant and flower seeds; natural rubber; living plants, cut flowers and flower buds; unmanufactured tobacco; other raw vegetable materials
021	Live animals

Note: Division 01: Products of agriculture, horticulture and market gardening and Division 02: Live animals and animal products (excluding meat)

<sup>51</sup> United Nations Statistics Division (2015) *Central Product Classification (CPC) Ver. 2.1*, <http://unstats.un.org/unsd/cr/registry/cpc-21.asp> (accessed 20 October 2017)

<sup>52</sup> FAO (unknown) *Central Product Classification (CPC) Ver. 2.1 expanded for agriculture*, <http://www.fao.org/economic/ess/ess-standards/en/#.WTWpRcspC70> (accessed 20 October 2017)

## 4A2. The FAO Commodity List (FCL)

The following groups of commodities are relevant for these FDES topics. Note that the commodity groups also list secondary derived products which are not applicable as the FDES topics relate only to primary products.<sup>53</sup> The full commodity list provides the commodities within each group. The FAOSTAT Commodity List products have been mapped to the CPC version 2.1, although the split factor for one to many or many to one mappings are not provided.<sup>54</sup>

**Figure 2: Relevant FAOSTAT Commodity List Groups for FDES Topics 2.5.3 and 2.5.4**

1. Cereals and cereal products
2. Roots and tubers and derived products
3. Sugar crops and sweeteners and derived products
4. Pulses and derived products
5. Nuts and derived products
6. Oil-bearing crops and derived products
7. Vegetables and derived products
8. Fruits and derived products
9. Fibres of vegetal and animal origin
10. Spices
11. Fodder crops and products
12. Stimulant crops and derived products
13. Tobacco and rubber and other crops
14. Vegetable and animal oils and fats
16. Live animals

## 4A3. The International Standard Industrial Classification of All Economic Activities (ISIC) Rev. 4

The International Standard Industrial Classification of All Economic Activities (ISIC) Rev. 4<sup>55</sup> defines the activities of the agriculture industry and is therefore a key classification which is complementary to the statistics in Topics 2.5.3 on crops and 2.5.4 on livestock.

The groups of Section A, Division 01 which are relevant to the FDES statistics on crops and livestock are shown below. Note that not all the groups related to agriculture are listed, only those relevant to the FDES statistics in Topics 2.5.3 and 2.5.4.

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<sup>53</sup> FAO (2011) *Crops statistics - concepts, definitions and classifications*, <http://www.fao.org/economic/the-statistics-division-ess/methodology/methodology-systems/crops-statistics-concepts-definitions-and-classifications/en/> and <http://www.fao.org/economic/ess/ess-home/questionnaires/en/> (accessed 20 October 2017)

<sup>54</sup> FAO (unknown) CPC ver.2.1 expanded for agriculture mapped to FAOSTAT Commodity List (FCL), <http://www.fao.org/economic/ess/ess-standards/commodity/cpc-item/en/> (accessed 20 October 2017)

<sup>55</sup> United Nations Statistics Division (2008) *International Standard Industrial Classification of All Economic Activities Revision 4. Series M No. 4/Rev.4*, <http://unstats.un.org/unsd/cr/registry/isic-4.asp> (accessed 20 October 2017)

**Figure 3: ISIC Rev. 4-Groups relevant to the FDES statistics on crops and livestock**

Group	Description
011	Growing of non-perennial crops
012	Growing of perennial crops
013	Plant propagation
014	Animal production
015	Mixed farming

#### 4A4. The Harmonized Commodity Description and Coding System (HS)

The World Customs Organization Harmonized Commodity Description and Coding System (HS) 2017<sup>56</sup> is the international product nomenclature used for statistics on import and exports of crops and animals. The relevant chapters fall under Section I: Live animals; animal Products and Section II: Vegetable products.

**Figure 4: HS Headings relevant to FDES Topics 2.5.3 and 2.5.4**

Chapter	Title	HS Heading
1	Live animals.	01.01
6	Live trees and other plants; bulbs, roots and the like; cut flowers and ornamental foliage.	02.06
7	Edible vegetables and certain roots and tubers.	02.07
8	Edible fruit and nuts; peel of citrus fruit or melons.	02.08
9	Coffee, tea, maté and spices.	02.09
10	Cereals.	02.10
11	Products of the milling industry; malt; starches; inulin; wheat gluten.	02.11
12	Oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit; industrial or medicinal plants; straw and fodder.	02.12
13	Lac; gums, resins and other vegetable saps and extracts.	02.13
14	Vegetable plaiting materials; vegetable products not elsewhere specified or included.	02.14

#### 4A5. FAO classification of pesticides

**Figure 5: FAO classification of pesticides<sup>57</sup>**

Item FAO Code	Item Name
1309	<b>INSECTICIDES, TOTAL</b>
1310	Chlorinated hydrocarbons
1311	Organo-phosphates
1312	Carbamates-insecticides
1313	Pyrethroids

<sup>56</sup> World Customs Organization *Harmonized System Nomenclature 2017 edition* <http://www.wcoomd.org/en/topics/nomenclature/instrument-and-tools/hs-nomenclature-2017-edition/hs-nomenclature-2017-edition.aspx> (accessed 20 October 2017)

<sup>57</sup> FAO (2015) *FAO Questionnaire on Pesticides Use 2015*, <http://www.fao.org/economic/ess/ess-home/questionnaires/en/> (accessed 20 October 2017)

1314	Botanical products and biologicals
1315	Others (specify)
1316	<b>MINERAL OILS</b>
1320	<b>HERBICIDES, TOTAL</b> (including defoliants and desiccants)
1321	Phenoxy hormone products
1322	Triazines
1323	Amides
1324	Carbamates-herbicides
1325	Dinitroanilines
1326	Urea derivates
1328	Sulfonyl ureas
1329	Bipiridils
1330	Uracil
1327	Others (specify)
1331	<b>FUNGICIDES AND BACTERICIDES, TOTAL</b>
1332	Inorganics
1333	Dithiocarbamates
1334	Benzimidazoles
1335	Triazoles, diazoles
1336	Diazines, morpholines
1337	Others (specify)
1352	<b>FUNGICIDES - SEED TREATMENTS, TOTAL</b>
1317	Dithiocarbamates
1318	Benzimidazoles
1319	Triazoles, diazoles
1338	Botanical products and biologicals
1339	Others (specify)
1353	<b>INSECTICIDES - SEED TREATMENTS, TOTAL</b>
1340	Organo-phosphates
1342	Carbamates-insecticides
1343	Pyrethroids
1344	Others (specify)
1341	<b>PLANT GROWTH REGULATORS, TOTAL (specify)</b>
1345	<b>RODENTICIDES, TOTAL</b>
1346	Anti-coagulants
1348	Cyanide Generators
1349	Hypercalcaemics
1350	Narcotics
1347	Others (specify)
1351	<b>DISINFECTANTS</b>
1355	<b>OTHER PESTICIDES NES</b>

## 4A6. FAO list of fertilizers<sup>58</sup>

### 1. Chemical or Mineral Fertilizers

#### STRAIGHT NITROGENOUS FERTILIZERS

- Urea
- Ammonium sulphate
- Ammonium nitrate (AN)
- Calcium ammonium nitrate (CAN) and other mixtures with calcium carbonate
- Sodium nitrate
- Urea and ammonium nitrate solutions (UAN)
- Ammonia, anhydrous
- Other nitrogenous fertilizers and mixtures, n.e.c.

#### STRAIGHT PHOSPHATIC FERTILIZERS

- Phosphate rock
- Superphosphates above 35%
- Superphosphates, other
- Other phosphatic fertilizers, n.e.c.

#### STRAIGHT POTASSIC FERTILIZERS

- Potassium chloride (muriate of potash) (MOP)
- Potassium sulphate (sulphate of potash) (SOP)
- Other potassic fertilizers, n.e.c.

#### COMPOUND FERTILIZERS

- NPK fertilizers
- Diammonium phosphate (DAP)
- Monoammonium phosphate (MAP)
- Other NP compounds
- Potassium nitrate
- Other NK compounds
- PK compounds

#### OTHER FERTILIZERS

- Fertilizers, n.e.c.

### 2. Organic Fertilizers

- Animal or vegetable fertilizers (total)
  - Farmyard manure, animal slurry and guano
  - Vegetable material
  - Stabilised sewage sludge
- Other organic fertilizers, n.e.c.

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<sup>58</sup> FAO (2016) *FAO Questionnaire on Fertilizers 2016*, <http://www.fao.org/economic/ess/ess-home/questionnaires/en/> (accessed 20 October 2017)

## 4B. Reference to international statistical recommendations, frameworks and standards

Several international statistical recommendations, frameworks and standards for production of agriculture statistics have been produced by FAO. These focus both on agriculture census and survey data collection practices and guidelines for specific issues pertinent to crops and livestock statistics. In addition, under the Global Strategy to Improve Agricultural and Rural Statistics (GSARS) (a conceptual framework that relates the economic, social, and environmental dimensions of agriculture),<sup>59</sup> new cost-effective statistical methodologies, guidelines and training material for the production of agricultural surveys are being developed.<sup>60</sup>

Particularly relevant to the FDES topics on crops and livestock statistics are:

**FAO World Programme for the Census of Agriculture (WCA):**<sup>61</sup> The WCA provides guidance on standard international concepts, definitions and methodology for the agricultural census, which are one of the building blocks of the Agricultural Statistics System. Data from the agricultural census serves as a benchmark used to estimate or revise the time series of crop and livestock statistics; it provides baseline data on livestock numbers and serves as the basis for more frequent estimates of the livestock population.

Other useful guidelines/reports include:

- Improved Methods for Estimating Livestock Production and Productivity – Methodological Report<sup>62</sup>
- Guidelines for the Enumeration of Nomadic and Semi-Nomadic (Transhumant) Livestock<sup>63</sup>
- Methodology for Estimation of Crop Area and Crop Yield under Mixed and Continuous Cropping<sup>64</sup>
- Use of household surveys for collection of food and agricultural statistics<sup>65</sup>
- Estimation of crop areas and yields in agricultural statistics<sup>66</sup>
- Manual on fertilizer statistics<sup>67</sup>

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<sup>59</sup> World Bank, FAO, United Nations (2010) *Global Strategy to Improve Agricultural and Rural Statistics. Report No. 56719-GLB*, World Bank, Washington, D.C., <http://www.fao.org/docrep/015/am082e/am082e00.pdf> (accessed 20 October 2017)

<sup>60</sup> FAO, Website of the Global Strategy to Improve Agricultural and Rural Statistics, <http://www.gsars.org/category/publications/> (accessed 20 October 2017)

<sup>61</sup> FAO (2015) *World Programme for the Census of Agriculture 2020, Volume 1: Programme, concepts and definitions*, FAO: Rome, <http://www.fao.org/3/a-i4913e.pdf> (accessed 20 October 2017)

<sup>62</sup> Global Strategy (2017) *Improved Methods for estimating livestock production and productivity – methodological report*, <http://gsars.org/wp-content/uploads/2017/05/TR-04.05.2017-Improving-Methods-for-Estimating-Livestock-Production-and-Productivity.pdf> (accessed 20 October 2017)

<sup>63</sup> Global Strategy (2016) *Guidelines for the enumeration of nomadic and semi-nomadic (transhumant) livestock*, <http://gsars.org/wp-content/uploads/2016/08/Guidelines-for-the-Enumeration-of-Nomadic-and-Semi-Nomadic-Livestock-06.pdf> (accessed 20 October 2017)

<sup>64</sup> Global Strategy (2017) *Methodology for Estimation of Crop Area and Crop Yield under Mixed and Continuous Cropping*, <http://gsars.org/wp-content/uploads/2017/03/TR-15.03.2017-Methodology-for-Estimation-of-Crop-Area-and-Crop-Yield-under-Mixed-and-Continuous-Cropping.pdf> (accessed 20 October 2017)

<sup>65</sup> FAO (1983) *Use of household surveys for collection of food and agricultural statistics*, FAO: Rome, <http://www.fao.org/docrep/015/am080e/am080e.pdf> (accessed 20 October 2017)

<sup>66</sup> FAO (1983) *Estimation of crop areas and yields in agricultural statistics*, FAO Economic and Social Development Paper 22, FAO: Rome, [http://www.fao.org/fileadmin/templates/ess/ess\\_test\\_folder/World\\_Census\\_Agriculture/Publications/FAO\\_ESDP/ESDP\\_22\\_Engv2.pdf](http://www.fao.org/fileadmin/templates/ess/ess_test_folder/World_Census_Agriculture/Publications/FAO_ESDP/ESDP_22_Engv2.pdf) (accessed 20 October 2017)

<sup>67</sup> FAO (1991) *Manual on Fertilizer Statistics*, FAO Economic and Social Development Paper 102, Estimation of crop areas and yields in agricultural statistics, FAO: Rome, [http://www.fao.org/fileadmin/templates/ess/ess\\_test\\_folder/Publications/ManualFertilizers.pdf](http://www.fao.org/fileadmin/templates/ess/ess_test_folder/Publications/ManualFertilizers.pdf) (accessed 20 October 2017)

## 4C. Sources of global and regional environmental statistics and indicators series

### FAOSTAT

This is a complete global database on agricultural statistics, which is implemented and administered by the Statistics Division of FAO.<sup>68</sup> Environmental information found in FAOSTAT is presented in: <http://www.fao.org/faostat/en/>. Environment statistics of interest to the methodology sheet include crop and livestock production; and inputs (land, fertilizers and pesticides).

Of relevance to this chapter, is the FAOSTAT dataset on Inputs (Fertilizers, Pesticides, Land Use) and the related agri-environmental indicators for monitoring the environmental performance of agriculture, to track trends in environmental impacts, and to provide information to assess the effects of the integration of agri-environmental concerns into policy measures. It includes 24 indicators under the domains:<sup>69</sup>

- Air and climate change
- Energy (use in agriculture and bio-energy production)
- Fertilizers
- Land Use (area, use-change, irrigation, conservation, cropping patterns, organic, protection)
- Land Cover
- Livestock Density
- Pesticides
- Soil (erosion, degradation and carbon)
- Water
- Emissions by sector
- Emission Intensities

The FAO CountrySTAT<sup>70</sup> system provides data managed by countries at the national and subnational levels.

### EUROSTAT

Eurostat<sup>71</sup> provides data on agriculture, forestry and fisheries, including data on crop and livestock statistics. Particularly relevant to this chapter are the agri-environmental indicators on pesticides, gross nitrogen balance, intensification-extensification, irrigation, mineral fertiliser consumption, pesticide risk, pollution risks of agriculture and environment, organic farming statistics and pesticide sales statistics.

Also available are the Eurostat agri-environmental indicators which track the integration of environmental concerns into the Common Agricultural Policy (CAP).<sup>72</sup>

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<sup>68</sup> FAO, FAOSTAT database, <http://faostat3.fao.org/home/E> (accessed 20 October 2017)

<sup>69</sup> FAO, FAOSTAT agri-environmental indicators dataset, [http://faostat3.fao.org/browse/E/\\*E](http://faostat3.fao.org/browse/E/*E) (accessed 20 October 2017)

<sup>70</sup> FAO, CountrySTAT portal, <https://www.countrystat.org/> (accessed 20 October 2017)

<sup>71</sup> Eurostat, Eurostat statistics on agriculture, [http://ec.europa.eu/eurostat/statistics-explained/index.php/Agriculture,\\_forestry\\_and\\_fishery\\_statistics](http://ec.europa.eu/eurostat/statistics-explained/index.php/Agriculture,_forestry_and_fishery_statistics) (accessed 20 October 2017)

<sup>72</sup> Eurostat agri-environmental indicators, <http://ec.europa.eu/eurostat/web/agri-environmental-indicators> (accessed 20 October 2017)

### **The Organisation for Economic Co-operation and Development (OECD)**

OECD agri-environmental indicators,<sup>73</sup> developed in co-operation with Eurostat and FAO, provides information on the state and trends in agri-environmental conditions. It includes the index of agricultural production, agricultural land area, organic farming, transgenic crops and data on nutrients, as well as other agricultural variables.

### **UN Comtrade Database<sup>74</sup>**

The UN Comtrade Database is the primary source for data on imports and exports of agricultural commodities.

### **The World Bank (WB)<sup>75</sup>**

The World Bank provides indicators on agriculture and rural development, including cereal yield, crop production index, food production index, fertilizer consumption, livestock production index, obtained from a variety of sources.

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<sup>73</sup> OECD agri-environmental Indicators database, <http://www.oecd.org/tad/sustainable-agriculture/agri-environmentalindicators.htm> (accessed 20 October 2017)

<sup>74</sup> United Nations Statistics Division, Comtrade Database, <https://comtrade.un.org/data> (accessed 20 October 2017)

<sup>75</sup> World Bank, FAO, United Nations (2010) *Global Strategy to Improve Agricultural and Rural Statistics. Report No. 56719-GLB*, World Bank: Washington, D.C., <http://www.fao.org/docrep/015/am082e/am082e00.pdf> (accessed 20 October 2017)

# 5. Data collection and sources of data

The environment statistician will receive statistics on crops and livestock, from the responsible producers, in most cases from statisticians in the Ministry of Agriculture, and in some countries the National Statistical Office. Ideally, the statistics in Topics 2.5.3 and 2.5.4 are produced yearly, although this may vary due to resource and other constraints. The producer will estimate the statistics from dedicated agriculture surveys, although in many countries other methods are used such as inclusion of questions in household surveys; administrative records, such as organic farm registers, or livestock registration systems; reported data from local authority extension officers; expert judgement based on reports from local officers combined with other relevant information; trade data or data from producers, trade associations, importers/exporters; or estimates using data from the census as a basis, for example, livestock production estimates using census livestock data combined with technical factors. The details of agriculture statistics' data collections are not covered in this methodology sheet as these are the responsibility of the agriculture statistician.

## Scope of the statistics

The scope (for this methodology sheet) are all crops, livestock, and areas under crops, including crops produced, crops and livestock traded, and related inputs. Note this methodology sheet does not attempt to identify the scope of agriculture statistics.

## Statistical unit

It includes all the agricultural holdings of a country – this includes both holdings which are managed by juridical persons such as corporations, cooperatives or government agencies, or managed by clans or tribes, and “own account” agricultural producers, i.e., households which farm on their own account. The holding is defined as an economic unit of agricultural production under single management comprising all livestock kept and all land used wholly or partly for agricultural production purposes, without regard to title, legal form, or size.<sup>76</sup>

Within the holding data may also be collected on the parcel, which is any piece of land of one land tenure type, entirely surrounded by other land, water, road, forest or other features not forming part of the holding or forming part of the holding under a different land tenure type; or the plot which is part or whole of a field on which a specific crop or crop mixture is cultivated. Note the field is a piece of land in a parcel separated from the rest of the parcel by easily recognizable demarcation lines, such as paths, cadastral boundaries, fences, waterways or hedges.

For a certain type of agriculture survey called an “area frame survey”, the unit is the area of agricultural land, such as parcels of land for the area of interest.<sup>77</sup> The concept used in agricultural statistics may not be consistent with that used in cadastral work.

For livestock, various units may be used including the holding, holder or the herd.

## Measurement units

Area planted and harvested is measured in hectares (ha). Agricultural products are usually measured by weight (tonnes) or volume (cubic metres). Productivity measures, such as the amount of output per unit of a particular input or yield

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<sup>76</sup> FAO (2010), *World Census of Agriculture, A system of integrated agricultural censuses and surveys Volume 1* - Revised reprint, <http://www.fao.org/docrep/009/a0135e/A0135E04.htm#ch3> (accessed 20 October 2017)

<sup>77</sup> World Bank, FAO, United Nations (2010) *Global Strategy to Improve Agricultural and Rural Statistics. Report No. 56719-GLB*, World Bank, Washington, D.C., <http://www.fao.org/docrep/015/am082e/am082e00.pdf> (accessed 20 October 2017)

(output per unit of land) is given by tonnes/hectare. Yield is commonly used to assess the success of new production practices or technology. Live animals are reported in number of heads (units) except for poultry, rabbits and other rodents that are reported in thousand units. Imports or exports of agricultural products are usually reported in both physical mass units (tonnes) and in monetary value (currency units).

### **Aggregation**

For environment statisticians, it may be of interest to display crop and livestock data by agricultural practices, by holding size or by tenure, and inputs by crop and livestock type, e.g., pesticide use for cereals, fruits etc.

### Temporal aspects

Crop production statistics are published for a reference period that is related to the agricultural year which may not match the calendar year. The agricultural year is based on the crop calendar in each country and is the period before sowing or planting to after harvest. The agriculture statistician generally produces crop production data for each cropping season (in some countries there may be more than one harvest), which are often aggregated to provide a figure for the year.

The livestock population is subject to marked seasonal fluctuations, resulting in periods of maximum and minimum numbers within the course of the year. These periods differ by species of livestock and also differ from country to country. Livestock numbers are therefore best estimated more than once a year, particularly pigs and poultry.<sup>78</sup> However, due to resource constraints this may be only once a year.

The reference period for livestock numbers is usually on one day, such as the day of enumeration or a given reference day. Statistics on livestock inventories are published with reference to this date. Statistics on animals slaughtered can be referenced over longer periods, e.g., weekly, monthly or yearly summaries, although the yearly summaries, while often for a calendar year, may also cover other reference years.

Where data on crops and livestock are analysed together with other environmental data, the temporal periods should be aligned, for example, weather-related events with crop and livestock production.

### Spatial aspects

Countries often require information at highly disaggregated geographical levels; however, statistics on agricultural variables are often only available at national levels and sometimes for the larger sub-national areas, such as region/province or agro-ecological zones.

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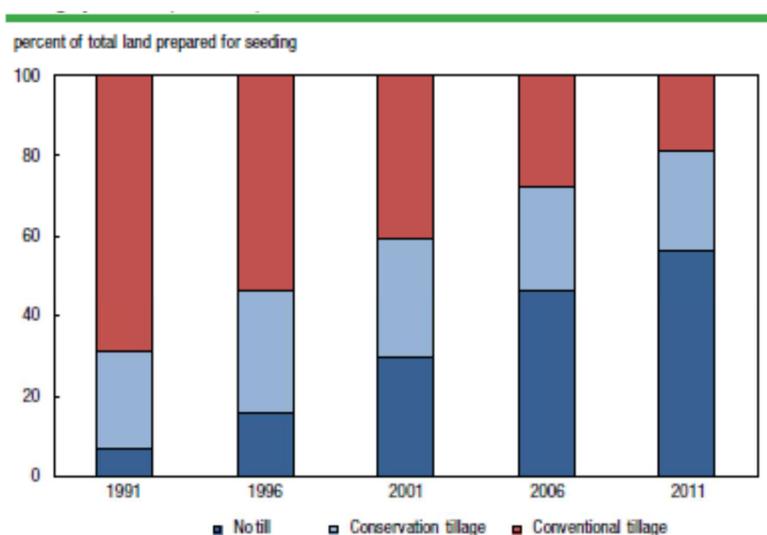
<sup>78</sup> FAO, *Livestock statistics concepts, definitions and classifications*, <http://www.fao.org/economic/the-statistics-division-ess/methodology/methodology-systems/livestock-statistics-concepts-definitions-and-classifications/en/> (accessed 20 October 2017)

## 6. Uses and dissemination

### 6A. Potential presentation/dissemination formats

The following images illustrate some of the potential dissemination formats for these statistics.

Figure 6.1 Tillage practices, Canada, 1991 to 2011



Source: Statistics Canada, Census of Agriculture, 1991 to 2011.

Source: STATCAN (2015) Agriculture and wildlife: a two-way relationship, <http://www.statcan.gc.ca/pub/16-002-x/2015002/article/14133-eng.pdf> (accessed 20 October 2017)

Shows percent of land under conservation agriculture tillage practices.

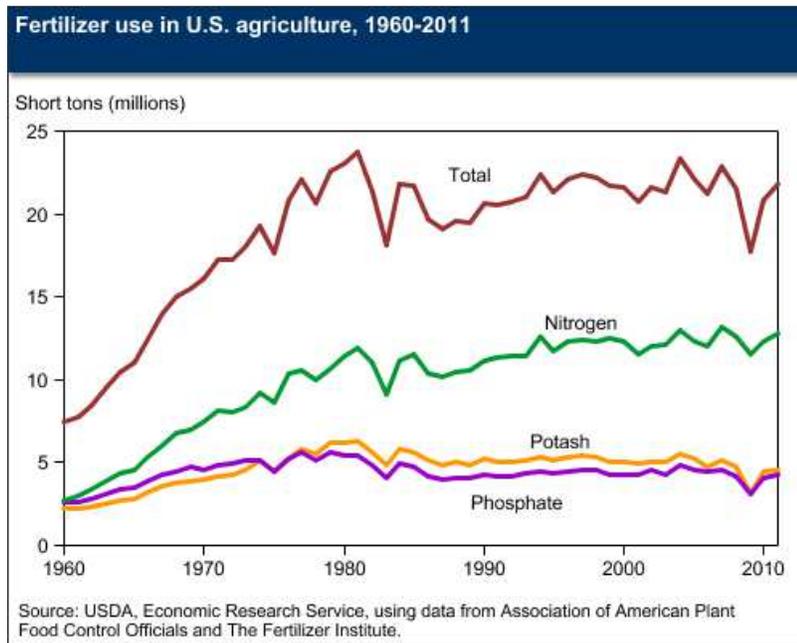
Figure 6.2 Livestock numbers by region and sex of owner, Republic of Niger

Régions	Bovins / sexe propriétaire				Ovins / sexe propriétaire				Caprins / sexe propriétaire			
	Hommes		Femmes		Hommes		Femmes		Hommes		Femmes	
	Effectif	%	Effectif	%	Effectif	%	Effectif	%	Effectif	%	Effectif	%
Agadez	1124	74,4	386	25,6	52261	73,1	19199	26,9	50153	44,8	61865	55,2
Diffa	457736	83,7	89436	16,3	372917	76,0	117513	24,0	575371	72,3	220233	27,7
Dosso	385896	84,1	73131	15,9	219342	60,9	140946	39,1	240722	35,3	441271	64,7
Maradi	565463	76,7	171642	23,3	494641	49,8	498915	50,2	430988	25,3	1271671	74,7
Tahoua	404617	65,1	217237	34,9	665933	62,5	399636	37,5	668372	51,1	638753	48,9
Tillabery	985218	80,6	236878	19,4	704910	62,2	429029	37,8	762293	58,8	535171	41,2
Zinder	864593	77,1	256849	22,9	858952	57,9	624854	42,1	1086981	43,3	1423611	56,7
Niamey	25571	69,9	11006	30,1	88974	64,1	49788	35,9	43993	58,4	31307	41,6
<b>Ensemble de Niger</b>	<b>3690218</b>	<b>77,7</b>	<b>1056565</b>	<b>22,3</b>	<b>3457930</b>	<b>60,3</b>	<b>2279880</b>	<b>39,7</b>	<b>3858874</b>	<b>45,5</b>	<b>4623882</b>	<b>54,5</b>

Source: République du Niger (2008) Recensement General de l'Agriculture et du Cheptel Vol. VIII-A Résultats Définitifs, Dimension Genre Elevage Sédentaire, [http://www.elevage.gouv.ne/IMG/pdf/recensement\\_general\\_niger\\_2005-07\\_vol8a-2.pdf](http://www.elevage.gouv.ne/IMG/pdf/recensement_general_niger_2005-07_vol8a-2.pdf) (accessed 20 October 2017)

Shows heads (effectif) and percentage owned by males (hommes) and females (femmes), of cattle (bovine), sheep (ovin) and goats (caprin) for each region (région) and the total (ensemble).

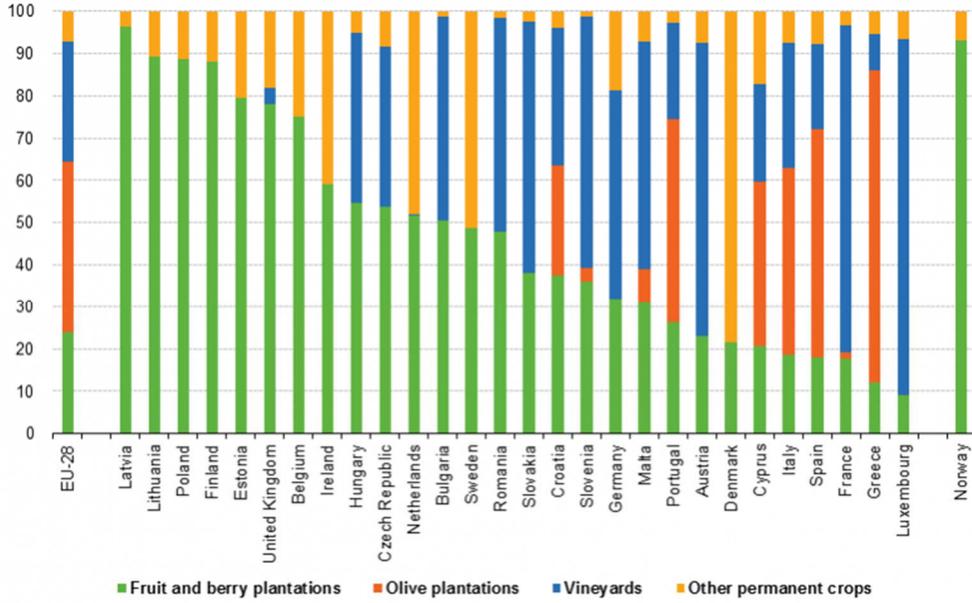
**Figure 6.3 Annual fertilizer consumption by type of fertilizer**



Source: United States Department of Agriculture Webpage: Fertilizer use and markets, <http://www.ers.usda.gov/topics/farm-practices-management/chemical-inputs/fertilizer-use-markets.aspx> (accessed 20 October 2017)

Annual fertilizer consumption by type of fertilizer in the US from 1960 to 2010. Note that displayed is the amount of material for each type of fertilizer, not the nutrient. International recommendations do not recommend summation of different types of nutrients to produce a total, only if converted to nutrient equivalent amounts.

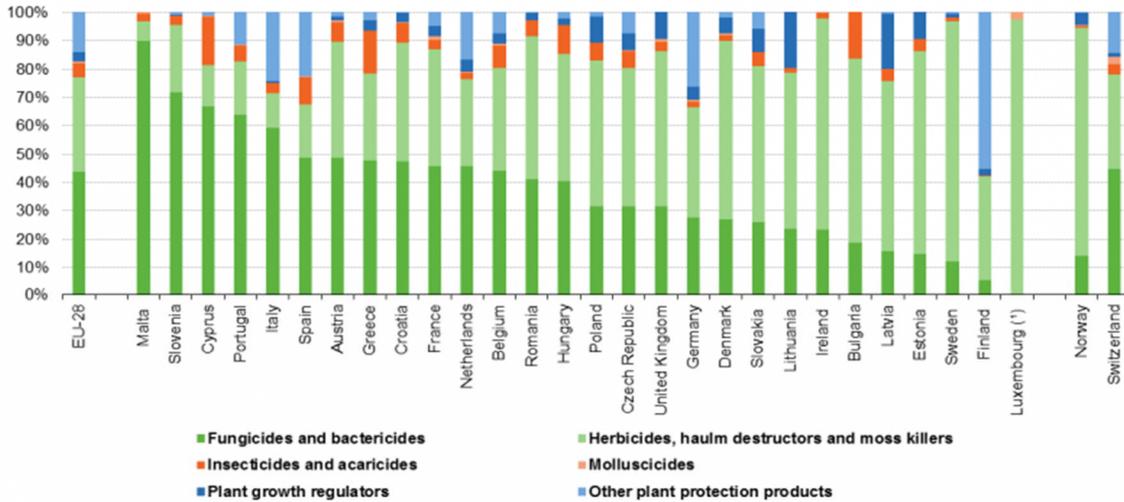
**Figure 6.4 Share of different crops in permanent crops, EU-28 and Norway, 2013**



Source: Eurostat statistics, [http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Share of different crops in permanent crops, EU-28 and Norway, 2013.png](http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Share_of_different_crops_in_permanent_crops,_EU-28_and_Norway,_2013.png) (accessed 20 October 2017)

Share of fruit and berry plantations, olive plantations, vineyards and other permanent crops out of these crops for the EU-28 countries and Norway.

**Figure 6.5 Share of different types of pesticides in total sales of pesticides, EU-28 and Norway, 2014**

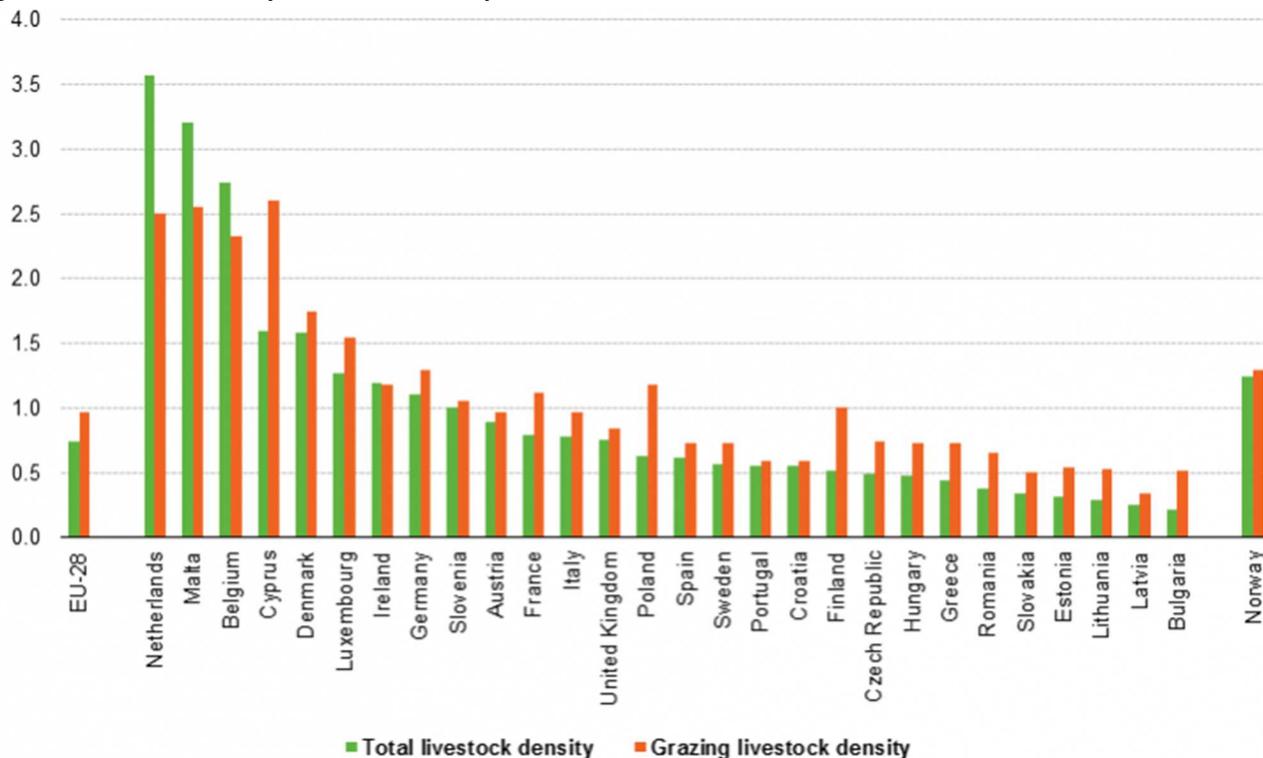


(\*) 2013 data.

Source: Eurostat Agri-Environment Indicators, [http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Share of different types of pesticides in total sales of pesticides, 2014 \(%25\) F1.png](http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Share_of_different_types_of_pesticides_in_total_sales_of_pesticides,_2014_(%25)_F1.png) (accessed 20 October 2017)

Share of types of pesticides for all pesticide sales for EU 28 countries and Norway.

**Figure 6.6 Livestock density, EU 28 and Norway, 2013**



Source: Eurostat agri-environmental indicators, [http://ec.europa.eu/eurostat/statistics-explained/index.php/Agri-environmental indicator - livestock patterns](http://ec.europa.eu/eurostat/statistics-explained/index.php/Agri-environmental_indicator_-_livestock_patterns) (accessed 20 October 2017)

Livestock density for EU 28 countries and Norway.

## 6B. SEEA accounts/tables that use these statistics

The System of Environmental-Economic Accounting for Agriculture, Forestry and Fisheries (SEEA-AFF)<sup>79</sup> developed by FAO, in collaboration with UNSD and other international organizations, is a satellite account of the SEEA.

The statistics covered by this methodology are used in the following accounts:

### Physical flow account for crops

The physical flow account shows the quantity of food and non-food crop products for variables on:

- Total supply of the raw product from the agriculture industry and the rest of the world
- Total use of the raw product
- Total supply of the processed product
- Total use of the processed product, including household consumption

<sup>79</sup> United Nations and FAO (2017) *System of Environmental-Economic Accounting for Agriculture, Forestry and Fisheries SEEA Agriculture*, Consultation Draft, [https://unstats.un.org/unsd/envaccounting/aff/2GC\\_Draft.pdf](https://unstats.un.org/unsd/envaccounting/aff/2GC_Draft.pdf) (accessed 20 October 2017)

Of the data required for the physical flow accounts, the FDES statistics contributes to data for raw crops (2.5.3), imports (2.5.3.d) and exports (2.5.3.e) of crops. The FDES statistics on production correspond to SEEA-Agri net output, while the accounts also cover gross output and harvest losses. To complete the account additional data are needed on processed products from crops, harvest losses, various uses and changes in inventories.

#### **Physical flow account for livestock products**

The account covers the rearing of livestock and the supply of all livestock products. The FDES statistics include the number of live animals (2.5.4.a.1), imports (2.5.4.c) and exports (2.5.4.d) of livestock. However, these should be distinguished by use (e.g., dairy, meat) as the account identifies as gross fixed capital formation animals used to produce outputs over an extended period of time such as dairy cattle as opposed to livestock raised for meat. Other statistics required to complete the account are production, imports and exports of livestock products and uses.

#### **Asset account for livestock**

The account shows the total number of livestock, by type of animal, and changes in the number of livestock over an accounting period. All animals are included regardless of age, sex or use. The statistics required to complete the account are opening livestock numbers, births, imports, and decreases from slaughter, natural deaths and exports. The FDES statistics include the number of live animals (2.5.4.a.1), number of animals slaughtered (2.5.a.2), imports (2.5.4.c) and exports (2.5.4.d) of livestock. However, these should be identified by type of livestock and aligned to the accounting period.

Further extensions would disaggregate the statistics by purpose, e.g., meat, milk and for breeding, and by age distribution.

#### **Asset account for plantations**

The account shows the total area of plantations, by type, and changes over an accounting period from additional planting, removal of plants or catastrophic losses. Generally, the account could be compiled using number of plants rather than area. FDES statistic 2.5.3.a.1 area planted contributes and can provide opening and closing stocks, provided that the statistics align to the start and end of the accounting period and disaggregate by permanent crops in plantations and those in scattered plantings.

#### **Physical flow account for fertilizers, nutrient flows and pesticides**

The account records the flows of fertilizers and pesticides and allows comparison with production and consumption of agriculture. Data on inorganic fertilizers are measured in terms of active nutrients and for pesticides in terms of active ingredients. The FDES statistics can contribute to the supply accounts for inorganic fertilizers and pesticides (2.5.3.b.2, 2.5.3.b.3). The account requires further disaggregation into exports and imports. For organic fertilizers FDES statistics (2.5.3.b.1) contribute to the total but these need to be classified to show not only type but source: either application 'in situ', or collected and manufactured as a by-product of other sources. Other data required for the account are quantity of fertilizers and pesticides by crop type, forestry, fisheries, other uses, households and change in inventories.

#### **Asset account for land use and land cover**

The asset account for land use requires disaggregation according to the SEEA Land Use classification and would require collection of data for all applicable land uses. Area harvested by crop type and its change over time would supplement the account.

## 6C. Commonly used indicators that incorporate these statistics

Useful indicators linking agriculture and the environment:<sup>80</sup>

- **Agricultural production volume indices** of agricultural production show the relative level of the aggregate volume of agricultural production for each year in comparison with the base period 1999-2001. They are based on the sum of price-weighted quantities of different agricultural commodities produced after deductions of quantities used as seed and feed weighted in a similar manner. The resulting aggregate represents, therefore, disposable production for any use except as seed and feed.

All the indices at the country, regional and world levels are calculated by the Laspeyres formula.

- **Livestock density**<sup>81</sup>

Livestock density is the number of livestock units per hectare of utilised agricultural area. It facilitates aggregation of livestock from various species and ages. The utilised agricultural area (UAA) is the total area taken up by arable land (including temporary grassland and fallow land), permanent grassland, permanent crops and kitchen gardens. Livestock numbers are converted into livestock units using specific coefficients. The term does not include unused agricultural land, woodland and land occupied by buildings, farmyards, tracks, ponds, etc.

*Livestock density = livestock units (heads) (2.5.4.a.1) / (area of arable land + permanent grassland + permanent crops + kitchen gardens ha)*

- **Tonnes of pesticide used per 1000 ha**

Measures the use of pesticides per area of arable land (land under temporary crops, land under temporary meadows and pastures and land temporarily fallow) and land under permanent crops.

*Tonnes of pesticide used per 1000 ha = Amount used of pesticides (2.5.3.b.3) / (arable land and land under permanent crops)*

- **Fertilizer consumption**

Use of nitrogen nutrient (N tonnes per 1000/hectares per arable and permanent crop area). Arable land is land under temporary crops, land under temporary meadows and pastures, and land temporarily fallow. Note that nitrogen nutrient consumption is measured. The indicator can also be calculated for other nutrients, P<sub>2</sub>O<sub>5</sub> (phosphorous) and K<sub>2</sub>O (potassium or potash).

*Tonnes of nitrogen nutrient used per 1000 ha = Amount used of fertilizer (2.5.3.b.2) / arable land*

- **Conservation agriculture (1)**

Conservation agriculture area as a percentage of agricultural area. Agricultural land is defined as land under temporary crops, land under temporary meadows and pastures, land temporarily fallow, land under permanent crops and land under permanent meadows and pastures.

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<sup>80</sup> FAO agri-environmental indicators <http://www.fao.org/economic/ess/agri-environment/en/> (accessed 20 October 2017); OECD indicators database <http://www.oecd.org/tad/sustainable-agriculture/agri-environmentalindicators.htm>; EUROSTAT agri-environmental indicators [http://ec.europa.eu/eurostat/statistics-explained/index.php/Agri-environmental\\_indicators](http://ec.europa.eu/eurostat/statistics-explained/index.php/Agri-environmental_indicators) (accessed 20 October 2017)

<sup>81</sup> Eurostat, Livestock density index, [http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Livestock\\_density\\_index](http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Livestock_density_index) (accessed 20 October 2017)

*Conservation agriculture = (conservation agriculture area (2.5.3.c.1) / agricultural land area) x 100*

- **Conservation agriculture (2)**

Share of arable areas under conservation and zero tillage. The indicator differs from the one above in that land temporarily fallow and land under permanent crops or permanent meadows and pastures is not included. Arable land is defined as land under temporary crops, land under temporary meadows and pastures, and land temporarily fallow. However, arable land not sown/cultivated corresponds to land temporarily fallow.

*Tillage practices =  $\sum$  (conventional tillage + conservation tillage + zero tillage) / (area of arable land – arable land not sown/cultivated during the reference year)*

- **Organic farming**

Share of crop production from certified organic farming. In some cases, the agricultural area under organic farming is calculated. Agricultural area is land under temporary crops, land under temporary meadows and pastures, land temporarily fallow, land under permanent crops and land under permanent meadows and pastures.

*Percentage of crop production from organic farming = amount of organic production (2.5.3.a.4) / amount produced from temporary and permanent crops (2.5.3.a.3) x 100*

- **GHG Emissions**

Data on livestock numbers and crop production are required for generation of GHG emissions from agriculture. This is discussed further in the Methodology Sheet on GHG Emissions.

## 6D. SDG indicators that incorporate these statistics

### **Indicator 2.1.1: Prevalence of undernourishment indicator**

This measures the probability that a randomly selected individual from the reference population is found to consume less than his/her calorie requirement for an active and healthy life. Dietary energy consumption is based on data on production, trade and utilization of food commodities. FDES covers some of the data, such as primary crop production (2.5.3.a.3), and import and exports of crops (2.5.3.d, 2.5.3.e).

Further detail can be found at: <http://www.fao.org/economic/ess/ess-fs/fs-methods/fs-methods1/en/>; <http://www.fao.org/3/a-i4646e.pdf>; <https://unstats.un.org/sdgs/metadata/files/Metadata-02-01-01.pdf>.

### **Indicator 2.4.1 Proportion of agricultural area under productive and sustainable agriculture**

Related to the target 2.4: by 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality. The indicator is currently Tier III (October 2017) and the methodology is under development by FAO.





**F D E S**

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