

SNAP CODE:	100000
SOURCE ACTIVITY TITLE:	AGRICULTURE: INTRODUCTORY REMARKS
NOSE CODES:	Various
NFR CODES:	Various

1 OBJECTIVE

Section 10 of this Guidebook covers the core processes of arable and animal agriculture and structures them according to SNAP 97. This introduction aims at a compilation of the processes described, the gases or species emitted, and the methodology. It also indicates where processes, which are not described in this section, are dealt with in the Guidebook. Besides, it provides a definition that helps to differentiate agricultural and natural processes or sources. The structure of the section reflects the reporting procedures rather than the calculation procedures. Therefore, it flags those peculiarities where reporting and calculation fall apart or where the calculation procedure requires data from a process covered by another chapter.

2 COVERAGE

Agriculture is a branch of industry which cultivates land and keeps animals in order to produce food, fodder or raw materials used for industrial processes, and comprises arable agriculture, animal agriculture, horticulture, viticulture, etc., with a wide range of intensities. In principle, a sharp distinction between agriculture and natural systems is impossible, as even these systems are used intentionally for food, fodder or animal production and – at least in Europe – are almost everywhere subject to management measures. In order to avoid double counting or omission of sources, we therefore define in accordance with Winiwarter et al. (1999) and Simpson et al. (1999) that **agriculture does not include**:

- Forest foliar emissions (even if the forests are heavily managed);
- Forest fire emissions;
- Natural grassland and other low vegetation, including lands used for grazing only (such as mountain sheep walks);
- Soils;
- Wetlands;
- Waters;
- Wild animals;
- Humans;
- Lightning;
- Volcanoes;
- Gas seeps.

In principle, **CO₂ emissions** from agricultural processes are not covered by this Guidebook section, as agriculture itself is considered neither a net source or sink. By definition, only the non-energy processes and breeding are covered. CO₂ emitting processes that relate to agriculture such as fertiliser production are dealt with in other sections (see below).

Guidebook chapters in section 10 deal with emissions of gases (Tables 1 and 2) and particles (Table 3) from various categories, which themselves are further **structured** with regard to the activities governing them. These activities are listed as in the SNAP coding, though this coding is not always consistent. The tables indicate which type of methodology is available in the respective Guidebook edition: **S**: Simpler methodology available; **D**: detailed methodology available. If information is provided to feed in national data rather than default data, the methodology is called “improved”, and the information “**T**” is given in the table.

Table 1: Classification of activities according to EMEP/CORINAIR (2001) and attribution to SNAP (2001): *gases from arable agriculture*

Category	Activity	SNAP	NH ₃	N ₂ O	NO	CH ₄	nm VOC	PM	Re- marks
Cultures with Fertilisers (Fertilised Agricultural Land)	Emissions from fertiliser N applied	10 01 00	S, D	S					
	Crop residues	10 01 00	S						
	Organic soils	10 01 00		S					
	Indirect emission from deposition	10 01 00		S	S				
	Indirect emission from leached N Arable and grass-land soils	10 01 00				S			
Cultures without Fertilisers	Legumes	10 02 00	S						
	Unfertilised grass-land	10 02 00	S						
	Unfertilised agricultural soils	10 02 00		S	S				
Stubble Burning	On field burning of stubble, straw etc.	10 03 00	S					S	(1)
Pesticides and Limestone	Pesticides	10 06 00					S		
Natural Grasslands and other vegetation	Natural grasslands, crops	11 04 01					S		(2)

(1) The methodology allows calculation of NH₃-emissions with particles stemming from stubble burning only.

(2) These emissions have to be reported under 10 01!

Table 2: Classification of activities according to EMEP/CORINAIR (2001) and attribution to SNAP 97 (2001): *gases from animal agriculture*

Category	Activity	SNAP	NH ₃	N ₂ O	NO	CH ₄	nm VOC	PM	Re- marks
Methane emissions from animal husbandry (Enteric fermentation)	Dairy cows	10 04 01				S			(1)
	Other cattle	10 04 02				S			
	Sheep and goats	10 04 03							
	Fattening pigs	10 04 04							
	Horses	10 04 05							
	Sows	10 04 04							
	Sheep	10 04 05				S			
	Mules and asses	10 04 06				S			
	Goats	10 04 07							
	Laying hens	10 04 08							
	Broilers	10 04 09							
	Other poultry	10 04 10							
	Fur animals	10 04 11							
	Sows	10 04 12							
	Camels	10 04 13							
Buffalo	10 04 14								
Any other animals	10 04 15								
Manure management Regarding Organic Compounds	Dairy cows	10 05 01					S		(2)
	Other cattle	10 05 02					S		
	Fattening pigs	10 05 03					S		
	Sows	10 05 04					S		
	Sheep	10 05 05					S		
	Horses	10 05 06					S		
	Laying hens	10 05 07					S		
	Broilers	10 05 08					S		
	Other poultry	10 05 09					S		
	Fur animals	10 05 10					S		
	Goats	10 05 11							
	Mules and asses	10 05 12							
	Camels	10 05 13							
	Buffalo	10 05 14							
	Any other animals	10 05 11					S		
Manure management Regarding Nitrogen Compounds (3)	Dairy cows	10 09 01	S, D	S					
	Other cattle	10 09 02	S, D	S					
	Fattening pigs	10 09 03	S, D	S					
	Sows	10 09 04	S, D	S					
	Sheep	10 09 05	S, D	S					
	Horses	10 09 06	S, D	S					
	Laying hens	10 09 07	S	S					
	Broilers	10 09 08	S, D	S					
	Other poultry	10 09 09	S, D	S					
	Fur animals	10 09 10	S						
	Goats	10 09 11							
	Mules and asses	10 09 12							
	Camels	10 09 13	S						
	Buffalo	10 09 14	S						
	Any other animals	10 09 15							

- (1) Methane emissions include both emissions from enteric fermentation and from manure management.
 (2) Organic compounds comprise all organic compounds except CH₄, i.e. nmVOC.
 (3) 10 09 SNAP has been reallocated in 2002, in line to changes to NFR. It now mirrors the 10 05 ordering.

Table 3: Classification of activities according to EMEP/CORINAIR (2001) and attribution to a preliminary SNAP code: *particulate matter (primary particles) from agriculture and their constituents*

Category	Activity	SNAP	PM (mass)	Const. 1	Const. 2	Re- marks
Particulate matter	Housed livestock	10 10 00							
	Free range livestock	10 10 10							
	Feed management on farm	10 10 20							
	Plant production	10 10 30							

3 DETAILS – AGRICULTURAL EMISSIONS TO BE REPORTED IN GROUP 10

3.1 Subgroups 10 01 (cultures with fertilisers) and 10 02 (cultures without fertilisers)

Subgroups 10.01 and 10.02 are to be assigned all emissions (except those of CO₂) originating from the agricultural plants themselves or from their supporting soils.

As far as emissions from NO_x, N₂O and NH₃ are concerned, the basic difference between subgroups 10.01 and 10.02 is that for the latter only unintentional fertilisation is taken into account whilst for subgroup 10.01 both intentional as well as unintentional fertilisation are considered, each of these two categories being specified as follows:

Intentional fertilisation comprises:

- synthetic (mineral) fertiliser;
- natural inorganic fertiliser;
- organic manure (farmyard manure);
- compost (either from municipal solid waste or sewage sludge).

Note that NH₃ emissions from the plant/soil system which take place during and after spreading, are covered by chapter 10 90.

Unintentional fertilisation means:

- biological nitrogen fixation;
- manure excreted by grazing animals;
- N input with atmospheric deposition resulting from NO_x and NH₃ emissions from agricultural plants and soil; and
- crop residue application (this last category is defined to be unintentional for ease of emission estimation).

Note that indirect N₂O emissions due to N leaching/run-off from (intentional) fertilisation are calculated and reported under unintentional emissions in 10 02.

CH₄ emission generating activities are associated only with rice fields and described under codes 10 01 03 and 10 02 03.

CH₄ consumption (oxidation by methanotrophic soil micro-organisms) is not considered yet.

nmVOC emissions occur both in fertilised and unfertilised systems. In this Guidebook the algorithms the estimate them are given in chapter 11 04 (other sources and sinks) together with emissions from natural vegetation. However, they have to be reported under Cultures with fertilisers (10 01).

3.2 Subgroup 10 03 (on field burning of stubble, straw,...)

As suggested above this subgroup is proposed to cover all emissions originated from burning of agricultural vegetation-wastes, excluding those of agricultural non-vegetation wastes and also of wood wastes.

The methodology proposed in the IPCC Guidelines gives guidance for estimation emissions of NO_x, CH₄, CO and N₂O (and of CO₂ from C burnt). Nevertheless, emissions estimates could additionally be obtained for SO₂, nmVOC, and NH₃ using the methodology described in chapter 11 03 (forest fires) as the emissions factors for the latter three gases are there related to the mass of C burnt, per unit of residue mass burnt. The implied assumption in this methodological extension is that burning of agricultural wastes could be treated similarly to forest fires, at least for CH₄, CO and N₂O.

3.3 Subgroups 10 04 (Enteric fermentation) and 10 05 (Manure management regarding organic compounds)

In contradiction to the title of the chapter, CH₄ emissions both from enteric fermentation and from manure management are dealt with in this chapter. At present, only simpler methodologies are applied.

3.4 Subgroup 10 06 (Use of pesticides and limestone)

At present, a simpler methodology is given for the assessment of emissions from the application of pesticides only.

3.5 Subgroup 10 09 (Manure management regarding nitrogen compounds)

The subgroup deals with emissions of all gaseous nitrogen species (NH₃, N₂O, NO) from animal husbandry as a whole.

For NH₃, the calculation procedures given in this chapter include emissions from grazing animals, which have to be reported under 10 01 (Cultures with fertiliser). Note that grazing of "hill sheep" would have to be reported under 10 02 (Cultures without fertiliser), but (at present) the emission factor is zero. NH₃ emissions from manure and slurry applied to soil and plant canopies are to be reported under 10 09, whereas emissions of N₂O and NO from the same (physical) sources have to be reported under 10 01 (Cultures with fertilisers).

3.6 Subgroup 10 10 (Emissions of primary particles PM₁₀)¹

Agricultural sources may emit particles directly. Both their size (particle diameter and shape) and the composition (element and species composition, active biological material such as bacteria) are interesting properties. In a first step, the chapter under preparation will deal with

¹ The proposed SNAP 10 10 is new, created in 2001/02 in order to accommodate the need for reporting (under NFR) PM emissions from agricultural activities not yet covered by the existing SNAP definitions.

physical properties and classify particles accordingly (total suspended matter, TSP; particulate matter with an aerodynamic diameter < 10 µm, PM₁₀; particulate matter with an aerodynamic diameter < 2.5 µm, PM_{2.5}).

4 AGRICULTURAL ACTIVITIES NOT TO BE REPORTED IN GROUP 10

Sector specific emissions from agriculture or related to agriculture include sources which are not listed under chapter 10. These are covered in the Guidebook sections 02, 08 and 09.

4.1 Non-industrial combustion plants

A subgroup is reserved for all stationary combustion sources in the agriculture, forestry and aquaculture:

02 03	Plants in agriculture, forestry and aquaculture
02 03 01	Combustion plants >= 50 MW (boilers)
02 03 02	Combustion plants < 50 MW (boilers)
02 03 03	Stationary gas turbines
02 03 04	Stationary engines
02 03 05	Other stationary equipment

4.2 Non-industrial combustion plants

The internal combustion engines used in agriculture will be dealt with in a special subgroup.

08 06	Agriculture
08 06 01	2-wheel tractors
08 06 02	Agricultural tractors
08 06 03	Harvesters / combines
08 06 04	Others (sprayer, manure distributors, agricultural mowers, balers, tillers, swathers)

At present, methods are given in chapter 08 10 00.

4.3 Non-industrial combustion plants

Though the title of section 09 is misleading, open burning of (organic) agricultural wastes with the exception of those items covered by 10 03 is dealt with in subgroup 09 07. A (very) simple methodology is given, which includes:

- Crop residues (cereals, crops, peas, beans, soy, sugar beet, oil seed rape etc.);
- Wood;
- Leaves;
- Animal carcasses (unless they are incinerated under controlled conditions, see Chapter 09 09 02);
- Plastics;
- Poultry and animal excreta (unless they are burnt under controlled conditions);
- Vegetation wastes except stubble, straw (covered within subgroup 10.03).

4.4 Other sources or sinks – agriculture under natural or semi-natural conditions

As mentioned above, extensive agriculture may make use of natural or semi-natural grassland or low vegetation, and is then to defined non-agricultural (see above).

11 04	Natural grasslands and other vegetation
11 04 01	Grassland
11 04 02	Tundra
11 04 03	Other Low vegetation
11 04 04	Other vegetation (Mediterranean scrub,...)

It is advisable that for the purpose of reporting definitions are made and justified in order to guarantee comparability of results.

5 NFR AND NOSE CODES

References are made to other codes used within the UNECE reporting system at the beginning of each chapter (at least when they are next updated). Besides, correspondence tables relating SNAP to IPCC and (at the same time) NFR coding are provided in Part B (Background), Chapter BSVI, of the Guidebook.

6 REFERENCES

Simpson D, Winiwarter W, Börjesson G, Cinderby S, Ferreiro A, Guenther A, Hewitt CN, Janson R, Khalil MAK, Owen S, Pierce TE, Puxbaum H, Shearer M, Skiba U, Steinbrecher R, Tarrasón L, Öquist MG (1999) Inventorying emissions from nature in Europe. *J. Geophys. Res.* 104, 8113-8152.

Winiwarter W, Haberl H, Simpson D (1999) On the boundary between man-made and natural emissions: Problems in defining European Ecosystems. *J. Geophys. Res.* 104, 8153-8159.

7 RELEASE VERSION, DATE AND SOURCE

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Authors: Antonio Ferreiro Chao
Análisis Estadístico de Datos (AED)
Madrid
Spain
Ulrich Dämmgen
Federal Agricultural Research Centre (FAL)
Institute of Agroecology
Bundesallee 50
38116 Braunschweig
Germany