SNAP CODE: **100301**
100302
100303
100304
100305

SOURCE SUB-SECTOR TITLE: **STUBBLE BURNING**
Cereals
Pulses
Tuber & Root
Sugar cane
Other

NOSE CODE: **110.03.01**
110.03.02
110.03.03
110.03.04
110.03.05

NFR CODE: **4 F 1**
4 F 2
4 F 3
4 F 4
4 F 5

1 ACTIVITIES INCLUDED

This chapter relates to the emissions of ammonia from stubble burning. This activity is understood to include the burning of crop residues and wastes from crops in situ. Emissions of other pollutants will be provided in subsequent edition of the Guidebook

2 CONTRIBUTION TO TOTAL EMISSIONS

The contribution of agricultural crop waste burning to ammonia emissions on a European scale is currently unknown, but is probably a relatively minor source in comparison to animal wastes. Lee and Atkins (1994) have estimated a contribution of 135 ktonnes NH_3 per year from Western Europe.

This sub-sector is minor source of several pollutants.

Table 1: Contribution to total emissions of the CORINAIR90 inventory (*28 countries*)

Source-activity	**SNAP-code**	**Contribution to total emission [1%]**							
		SO_2	NO_X	NMVOC	CH_4	CO	CO_2	N_2O	NH_3
Stubble Burning	100300	-	0.1	0.2	0.1	0.8	0.1	-	-

0 = emissions are reported, but the exact value is below the rounding limit (0.1 per cent)
- = no emissions are reported

3 GENERAL

Very little information exists on the nature and strength of this source of ammonia emissions. The principal source of the ammonia is from plant nitrogen although some ammonia is likely to originate from the soil underlying the crop wastes combusted. Most of the N from NH_x is released as NH_3 although some is also directly released as NH_4 particulate. Control of this source is effectively be cessation of the activity, the alternative adopted in many countries being that crop wastes and residues are ploughed in.

4 SIMPLER METHODOLOGY

The simple methodology for calculation emission is that outlined by Lee and Atkins (1994), where an emission factor is combined with an activity statistic, i.e. the amount of residue burnt. It is assumed in this methodology that a dry weight of straw from cereal crops is 5 tonnes per ha.

5 DETAILED METHODOLOGY

An improvement on the above can only be achieved by a prior knowledge of the dry weight per ha yielded from a specific crop. Some crop residue statistics are provided by the Greenhouse Gas Inventory Reference Manual, pages 4.69 - 4.73 (IPCC, 1995). The following ratios for residue/crop product are given: wheat 1.3, barley 1.2, maize 1, oats 1.3 and rye 1.6.

6 RELEVANT ACTIVITY STATISTICS

The activity statistics is the amount (dry weight) of waste/residue combusted.

7 POINT SOURCE CRITERIA

8 EMISSION FACTORS, QUALITY AND REFERENCES

The emission factor given by Lee and Atkins (1994) is 2.4 mg NH_3 per gram straw (consisting of 80% NH_3 and 20% NH_4).

9 SPECIES PROFILES

This chapter covers emissions of NH_3 and particulate NH_4 only from this source.

10 CURRENT UNCERTAINTY ESTIMATES

11 WEAKEST ASPECT/PRIORITY AREAS FOR IMPROVEMENT IN CURRENT METHODOLOGY

The weakest area in this source is the lack of data on emission factors.

12 SPATIAL DISAGGREGATION CRITERIA FOR AREA SOURCES

Spatial disaggregation relies upon a knowledge of the location of crop waste/residue burning. This may be crudely estimated from local country statistics on land-use.

13 TEMPORAL DISAGGREGATION CRITERIA

This relies upon prior knowledge of current agricultural practices, although it is likely that the activity will take place shortly after crop harvesting.

14 ADDITIONAL COMMENTS

Stubble burning of crop residues will also release other gases like NH_4, CO, N_2O and NO_x. IPCC recommends the following procedure. Starting with an estimation of the total amount of biomass burned, total amounts of released carbon and nitrogen are calculated. The emissions of $CH_4$and CO are related to the total mass of carbon released and the emissions of N_2O and NO_x to the total mass of nitrogen released. Details and default values are given in the Greenhouse Gas Inventory Workbook, pages 4.22 - 4.26 (IPCC, 1995).

15 SUPPLEMENTARY DOCUMENTS

16 VERIFICATION PROCEDURES

17 REFERENCES

IPCC, 1995. Guidelines for national greenhouse gas inventories. Volume 1 (Reporting Instructions), Volume 2 (Workbook) and Volume 3 (Reference Manual). OECD, Paris.

Lee, D.S. and Atkins, D.H.F., 1994. Atmospheric ammonia emission from agricultural waste combustion. Geophysical Research Letters 21, 281-284.

18 BIBLIOGRAPHY

19 RELEASE VERSION, DATE AND SOURCE

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20 POINT OF ENQUIRY

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