



SCAIL-Agriculture update

Table 2-A: Ranges of odour emission rates derived from literature

Livestock type	Housing emission rate (ou s ⁻¹ animal ⁻¹)	Housing reduction modifier	Manure storage emission rate (ou m ⁻² s ⁻¹)	Storage reduction modifier
Pigs	26 (average of FSF finishers in Table D-1)	25% for low emission area (Judgement of PSF finishers in Table D-1, conservative choice of 25% rather than 40% actual.)	20 (Average of Zhang <i>et al.</i> 2005 and Bicudo <i>et al.</i> 2001 values) Also average of values given in Hudson <i>et al.</i> (2007)	50% for low tech (e.g. straw cover) 50% for removal from yard 90% for high-tech system (English and Fleming, 2006)
Broilers	0.5 (Conservative worst case from data presented-except ADAS max value)	-	77 (Navaratnasamy and Feddes, 2004)	-
Layers	1.4 (highest value from Hayes <i>et al.</i> , 2006a)	25% for manure removal system (judgement comparing belt removal system to deep pit but a conservative estimate of 25% rather than 50%)	61 (Navaratnasamy and Feddes, 2004)	-
Turkeys	6.55 (From Hayes <i>et al.</i> 2006a)	-	20 (Navaratnasamy and Feddes, 2004)	-
Ducks	6 (Lubac <i>et al.</i> , 2005)	-	20 (assumed same as turkey)	-

2.1.3. PM₁₀

Emission factors for PM₁₀ were determined from a review of the available literature. Overall, the information from the EA Guidance note on Intensive Agriculture (Jan 2012) EA (2012) was found to be representative of a wide range of poultry types. A conversion factor of 1/3 was applied to convert dust emissions to PM₁₀ emissions in line with information in the EA guidance document. A summary of the relevant information is presented in Table 2-B. Emissions from pig production were taken from Takai *et al.* (1998), assuming that PM₁₀ was analogous to respirable dust and applying typical liveweights of 150 kg for sows, 60.3 kg for fatteners and 20 kg for weaners (Table 2-C).

It should be noted that emissions of PM₁₀ were not included for either stored manure or for slurry spreading.

A summary of emission factors for PM₁₀ are shown in Appendix C.

Appendix B. Emission Factors - Odour

Table B - 1: Emission factors for Odour in the SCAIL-Agriculture tool

Livestock	Housing System	Emission Factor	Units
Turkeys (male)	Litter	206560.8	k OU/animal place/year
Turkeys (female)	Litter	206560.8	k OU/animal place/year
Ducks	Litter	189216	k OU/animal place/year
Manure - belts		1923696	k OU/tonne fresh manure
Manure - deep pit		1923696	k OU/tonne fresh manure
Other litter		1923696	k OU/tonne fresh manure
Manure heap	No cover	2428272	k OU/tonne fresh manure
Slurry - circular store	No cover	630720	k OU/m ²
Slurry - circular store	Rigid cover	63072	k OU/m ²
Slurry - circular store	Floating	63072	k OU/m ²
Slurry - circular store	Low tech	315360	k OU/m ²
Slurry - lagoon	No cover	630720	k OU/m ²
Slurry - lagoon	Rigid cover	63072	k OU/m ²
Slurry - lagoon	Floating	63072	k OU/m ²
Slurry - lagoon	Low tech	315360	k OU/m ²
Broadcast	Laying hens	10404000	k OU/t
Broadcast & ploughed within 24hrs	Laying hens	4675000	k OU/t
Broadcast	Other poultry	15606000	k OU/t
Broadcast & ploughed within 24hrs	Other poultry	7021000	k OU/t
Broadcast (solid manure)		1717000	k OU/t
Broadcast (solid and ploughed within 24 hrs)		1122000	k OU/t
Broadcast (slurry)	<4% dry matter	935000	k OU/t
Broadcast (slurry)	4-8% dry matter	2295000	k OU/t
Bandsread (slurry)	<4% dry matter	697000	k OU/t
Bandsread (slurry)	4-8% dry matter	1717000	k OU/t
Trailing shoe (slurry)	<4% dry matter	459000	k OU/t
Trailing shoe (slurry)	4-8% dry matter	1139000	k OU/t
Injection (open slot)	<4% dry matter	272000	k OU/t
Injection (open slot)	4-8% dry matter	680000	k OU/t
Injection (closed slot)	<4% dry matter	85000	k OU/t
Injection (closed slot)	4-8% dry matter	221000	k OU/t
Layers	Enriched Cage	44150.4	k OU/animal place/year
Layers	Cage with deep pit	44150.4	k OU/animal place/year

Livestock	Housing System	Emission Factor	Units
Layers	Ventilated deep pit	44150.4	k OU/animal place/year
Layers	Manure removal twice a week by manure belt	33112.8	k OU/animal place/year
Layers	Vertical tiered cages, forced air drying, weekly removal	33112.8	k OU/animal place/year
Layers	Vertical tiered cages, whisk forced air drying, weekly removal	33112.8	k OU/animal place/year
Layers	Vertical tiered cages, manure belt, drying tunnel, 24-36 hr removal	33112.8	k OU/animal place/year
Barn and free range	Perchery with deep litter	44150.4	k OU/animal place/year
Barn and free range	Litter system with forced air drying	33112.8	k OU/animal place/year
Barn and free range	Litter system with perforated floor and forced air drying	33112.8	k OU/animal place/year
Barn and free range	Aviary system	44150.4	k OU/animal place/year
Broilers	Naturally ventilated, fully littered floor, non-leaking drinkers	15768	k OU/animal place/year
Broilers	Fan ventilated, fully littered floor, non leaking drinkers	15768	k OU/animal place/year
Pullets	Naturally ventilated, fully littered floor, non-leaking drinkers	15768	k OU/animal place/year
Pullets	Fan ventilated, fully littered floor, non leaking drinkers	15768	k OU/animal place/year
Sows	Fully Slatted Floor (FSF)	819936	k OU/animal place/year
Sows	Solid Floor - straw system	819936	k OU/animal place/year
Sows	Part-Slatted Floor (PSF) with reduced manure pit	614952	k OU/animal place/year
Sows	FSF with vacuum system for frequent slurry removal	614952	k OU/animal place/year
Farrowers	Fully Slatted Floor (FSF)	819936	k OU/animal place/year
Farrowers	Solid Floor - straw system	819936	k OU/animal place/year
Farrowers	FSF/PSF with combination of water & manure channel	614952	k OU/animal place/year
Farrowers	FSF/PSF with flushing system with manure gutters	614952	k OU/animal place/year
Farrowers	FSF/PSF with manure pan underneath	614952	k OU/animal place/year
Weaners	Fully Slatted Floor (FSF)	126144	k OU/animal place/year

Livestock	Housing System	Emission Factor	Units
Weaners	Sold Floor - straw system	126144	k OU/animal place/year
Weaners	Pen/flatdeck, FSF/PSF, vacuum system for frequent slurry removal	94608	k OU/animal place/year
Weaners	Pen/flatdeck, FSF beneath with sloped floor to separate faeces or urine	94608	k OU/animal place/year
Weaners	Pen with PSF (2-climate system)	94608	k OU/animal place/year
Weaners	Pen with PSF and sloped or convex solid floor	94608	k OU/animal place/year
Weaners	Pen with PSF, triangular slats & manure channel, sloped side-walls	94608	k OU/animal place/year
Growers	Fully Slatted Floor (FSF)	315360	k OU/animal place/year
Growers	Solid Floor - straw system	315360	k OU/animal place/year
Growers	FSF with vacuum system for frequent slurry removal	236520	k OU/animal place/year
Growers	PSF with reduced manure pit including slanted walls & vacuum system	236520	k OU/animal place/year
Growers	PSF with convex solid floor & manure gutters, slanted sidewalls, sloped manure pit	236520	k OU/animal place/year
Finishers	Fully Slatted Floor (FSF)	819936	k OU/animal place/year
Finishers	Solid Floor - straw system	819936	k OU/animal place/year
Finishers	FSF with vacuum system for frequent slurry removal	614952	k OU/animal place/year
Finishers	PSF with reduced manure pit including slanted walls & vacuum system	614952	k OU/animal place/year
Finishers	PSF with convex solid floor, manure gutters, slanted sidewalls, sloped manure pit	614952	k OU/animal place/year