



IPCC Inventory Software: Examples of Tier 2 for Livestock

IPCC TFI Side-event at UNFCCC COP-25 Chile

IPCC Pavilion

Madrid, Spain

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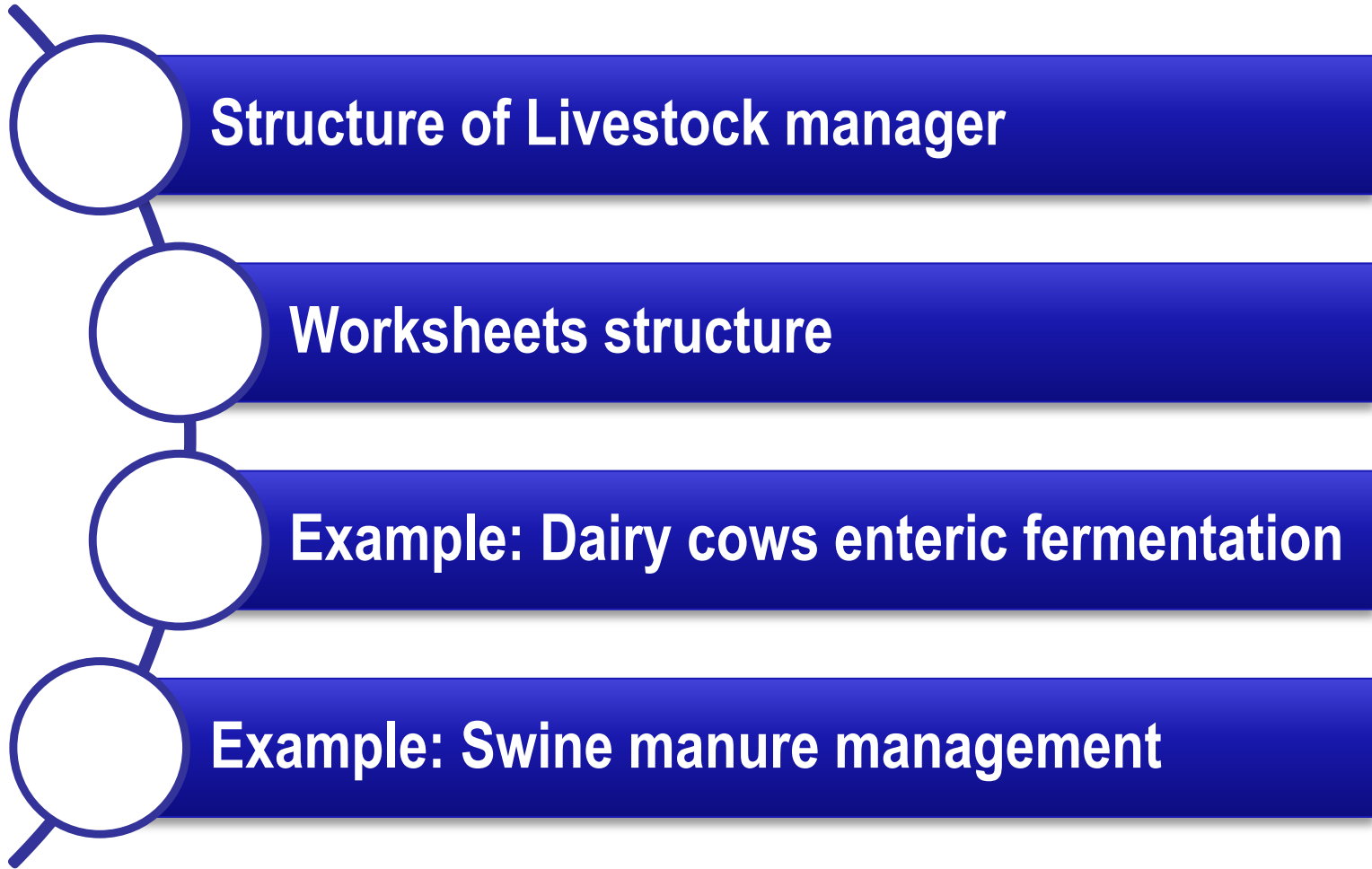
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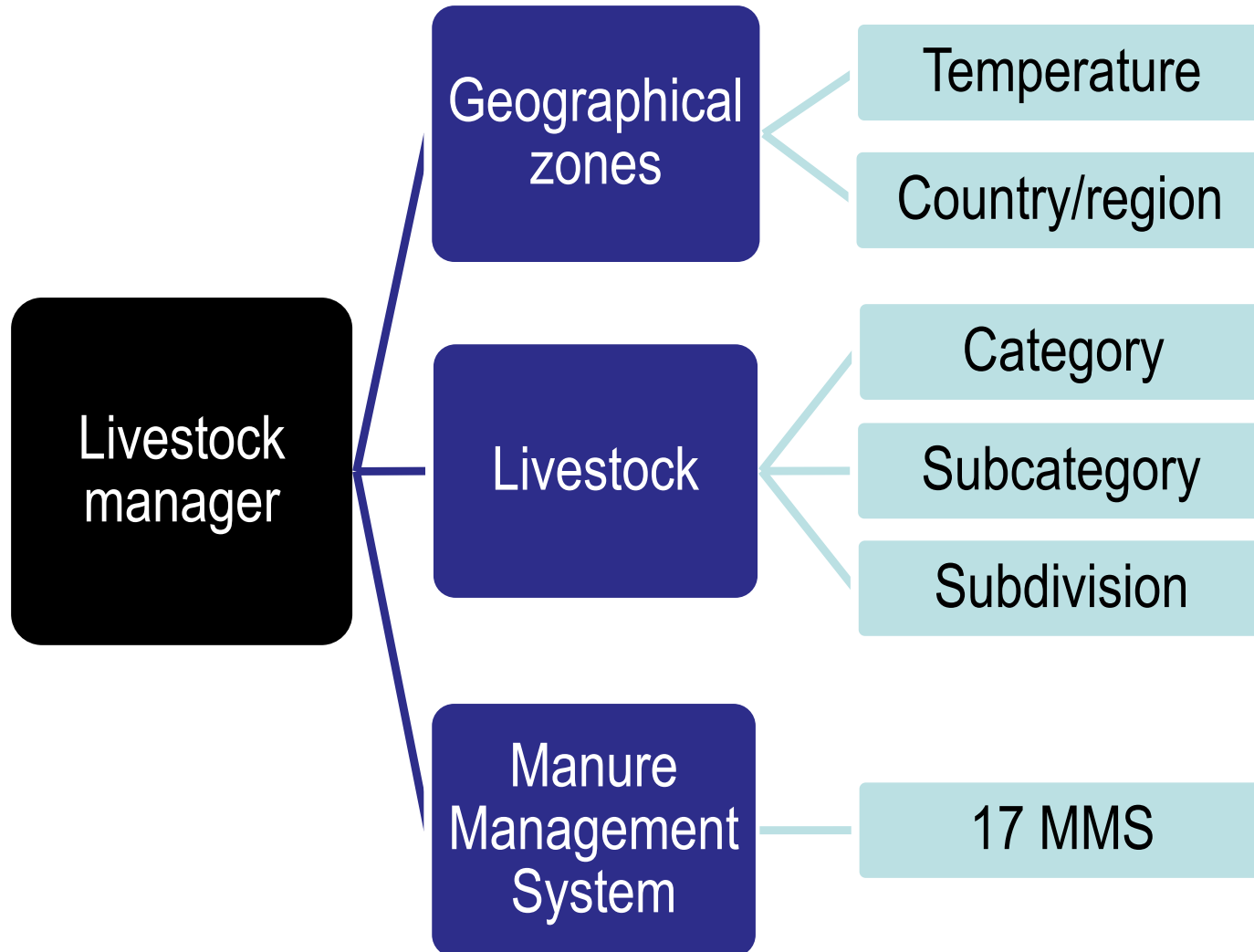
INTERGOVERNMENTAL PANEL ON climate change



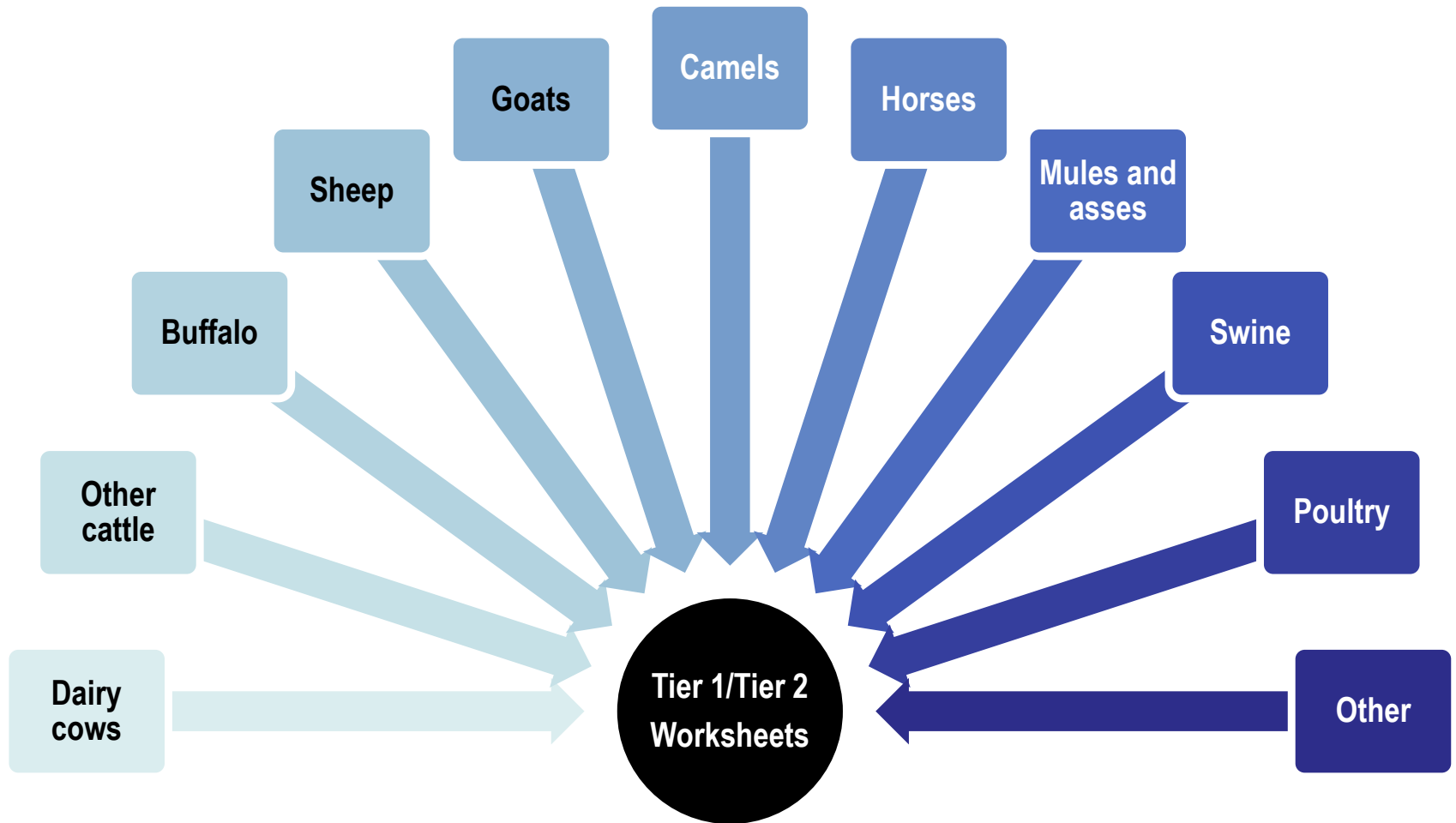
Outline



Structure of Livestock manager



Worksheets structure



Example: Dairy cows enteric fermentation (1)

Livestock Manager

Geographical zones Livestock Manure Management System

Geographical zone	Average annual temperature [°C]
▶ Cool	≤ 10
Temperate	15
*	

Livestock Manager

Geographical zones Livestock Manure Management System

Category
[-] Dairy Cows
[-] Mature Dairy Cow
[-] Agricultural enterprises
[-] Households
*

Example: Dairy cows enteric fermentation (2)

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Tier Tier 2
 Lives Tier 1
 Tier 2

Worksheet

Sector: Agriculture, Forestry and Other Land Use
 Category: Livestock
 Subcategory: 3.A.1.a.i - Dairy Cows
 Sheet: Livestock population - Tier 2

Data

Geographical zone (All) Livestock Subcategory (All)

				Per animal				
Geographical zone	Livestock Subcategory	Livestock Subdivision	Annual Average Population (head)	Live weight (kg)	Feeding situation	Mean daily temperature during winter season (°C)	Coefficient for calculating Net Energy for Maintenance (MJ/day/kg)	Coefficient for calculating Net Energy for Maintenance (in_cold) (MJ/day/kg)
Z	T	T	AAP	W	Ca	Tw	Cfi	$Cfi(in_cold)=Cfi+(0.0048*(20-Tw))$
Cool	Mature Dairy Cow	Agricultural enterpri...	446560	577	0.08	-10	0.375	0.519
		Households	1669600	577	0.13	-10	0.375	0.519
Temperate		Agricultural enterpri...	500000	600	0.17		0.375	
		Households	1000000	600	0.36		0.375	
Total			3616160					

Example: Dairy cows enteric fermentation (3)

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Tier Tier 2

Livestock population: Average Daily Feed Intake CH4 Emission Factor for Enteric Fermentation CH4 Emissions from Enteric fermentation

Worksheet

Sector: Agriculture, Forestry and Other Land Use

Category: Livestock/Enteric fermentation

Subcategory: 3.A.1.a.i - Dairy Cows

Sheet: CH4 Emission Factor for Enteric Fermentation - Tier 2

Data

Geographical zone (All) Livestock Subcategory (All)

			Per animal		
Geographical zone	Livestock Subcategory	Livestock Subdivision	Gross energy (MJ/day)	Methane conversion factor, percent of gross energy in feed converted to methane (%)	CH4 Emission Factor (kg CH4/head/yr)
Z	T	T	GE	Ym	EF
Cool	Mature Dairy Cow	Agricultural enterprises	262.18	6.5	120.3
		Households	214.93	6.5	91.63
Temperate		Agricultural enterprises	308.03	6	121.22
		Households	317.8	6	125.06

Geographical zone	Livestock Subcategory	Livestock Subdivision	Number of Animals (head)	Emission Factor (kg CH4/head yr)	CH4 Emissions (Gg CH4/yr)
Z	T	T	N(T)	EF(T)	CH4 = N(T) * EF(T) * 10 ⁻⁶
Cool	Mature Dairy Cow	Agricultural enterprises	446560	120.3	53.72
		Households	1663600	91.63	152.99
Temperate		Agricultural enterprises	500000	121.22	60.61
		Households	1000000	125.06	125.06
Total					392.38

Example: Swine manure management (1)

Livestock Manager



Geographical zones Livestock **Manure Management System**

Save Undo Close

	System	Definition	
<input type="checkbox"/>	Pasture/Range/Paddock	The manure from pasture and range grazing animals is allowed to lie as deposited, and is not managed.	
<input type="checkbox"/>	Daily spread	Manure is routinely removed from a confinement facility and is applied to cropland or pasture within 24 hours of excretion.	
<input checked="" type="checkbox"/>	Solid storage	The storage of manure, typically for a period of several months, in unconfined piles or stacks. Manure is able to be stacked due to the presence of a sufficient amount of bedding material or loss of moisture by evaporation.	
<input type="checkbox"/>	Dry lot	A paved or unpaved open confinement area without any significant vegetative cover where accumulating manure may be removed periodically.	
<input checked="" type="checkbox"/>	Liquid/Slurry	Manure is stored as excreted or with some minimal addition of water in either tanks or earthen ponds outside the animal housing, usually for periods less than one year.	
<input checked="" type="checkbox"/>	Uncovered anaerobic lagoon	A type of liquid storage system designed and operated to combine waste stabilization and storage. Lagoon supernatant is usually used to remove manure from the associated confinement facilities to the lagoon. Anaerobic lagoons are designed with varying lengths of storage (up to a year or greater), depending on the climate region, the volatile solids loading rate, and other operational factors. The water from the lagoon may be recycled as flush water or used to irrigate and fertilise fields.	
<input type="checkbox"/>	Pit storage below animal confinements	Collection and storage of manure usually with little or no added water typically below a slatted floor in an enclosed animal confinement facility, usually for periods less than one year.	

Example: Swine manure management (2)

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Tier Tier 2

Livestock population Average Daily Feed Intake Volatile solid excretion per day MMS Usage and Methane Conversion Factor CH4 Emission Factor for Manure Management CH4 Emissions from Manure Management N Excretion rate MMS - EF for direct N2O-N emissions Direct N2O

Worksheet

Sector: Agriculture, Forestry and Other Land Use

Category: Livestock/Manure management

Subcategory: 3.A.2.h - Swine

Sheet: Volatile solid excretion per day - Tier 2

Data

Geographical zone (All) Livestock Subcategory (All)

			Per animal							
Geographical zone	Livestock Subcategory	Livestock Subdivision	Gross energy (MJ/day)	Feed digestibility (%)	Urinary Energy fraction	Urinary energy expressed as fraction of GE	Ash content of manure calculated as a fraction of dry matter feed intake	Volatile solid excretion per day on a dry-organic matter basis (kg VS/day)		
Z	T	T	GE	DE	UE	UE*GE	ASH	VS = Eq. 10.24		
Cool	Breeding boars	Agricultural enterprises	100	60	0.04	4	0.16	Calculated	1.2	
		Households						Calculated	1.3	
	Farrowed checking sows							Specified	0.75	
	Fattening swine	Agricultural enterprises							Specified	0.62
		Households							Specified	0.81
	Gilts from 4 months	Agricultural enterprises							Specified	0.62
		Households							Specified	0.81
	Main sows	Agricultural enterprises							Specified	0.93
		Households							Specified	1.21
	Piglets from 2 to 4 months	Agricultural enterprises							Specified	0.21
		Households							Specified	0.28
	Piglets up to 2 month	Agricultural enterprises							Specified	0.06
		Households							Specified	0.08

Example: Swine manure management (3)

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Tier **Tier 2**

Livestock population Average Daily Feed Intake Volatile solid excretion per day **MMS Usage and Methane Conversion Factor** CH4 Emission Factor for Manure Management CH4 Emissions from Manure Management N Excretion rate MMS - EF for direct N2O-N emissions

Worksheet

Sector: Agriculture, Forestry and Other Land Use

Category: Livestock/Manure management

Subcategory: 3.A.2h - Swine

Sheet: Fraction of livestock category's manure handled using MMS and Methane conversion factor-Tier 2

Data

Geographical zone (A) Livestock Subcategory (A)

Geographical zone	Livestock Subcategory	Livestock Subdivision	Manure Management System	Methane conversion factor for MMS in Geographical Zone (%)	Fraction of livestock category's manure handled using MMS in geographical zone		
Z	T	T	MMS	MCF(T,S)	MS(T,S)		
Temperate	Breeding boars	Agricultural enterprises	Solid storage				
			Liquid/Slurry				
			Uncovered anaerobic lagoon	MMS	Average annual temperature	MCF (%)	Source
		Households	Solid storage				
			Liquid/Slurry	Solid storage	15	4	Judgement of IPCC Expert Group in combination which shows emissions of approximately 2% in (warm climate is based on judgement of IPCC Ex (1998).
			Uncovered anaerobic lagoon				
	Farrowed checking sows			Solid storage			
Cool	Breeding boars	Agricultural enterprises	Solid storage				
			Liquid/Slurry				
			Uncovered anaerobic lagoon	MMS	Average annual temperature	MCF (%)	Source
		Households	Solid storage				
			Liquid/Slurry	Solid storage	10	2	Judgement of IPCC Expert Group in combination which shows emissions of approximately 2% in (warm climate is based on judgement of IPCC Ex (1998).
			Uncovered anaerobic lagoon				
	Farrowed checking sows			Solid storage			

Example: Swine manure management (4)

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Tier Tier 2

Livestock population Average Daily Feed Intake Volatile solid excretion per day MMS Usage and Methane Conversion Factor CH4 Emission Factor for Manure Management CH4 Emissions from Manure Management N Excretion rate MMS - EF for direct N2O-N emissions Dir

Worksheet

Sector: Agriculture, Forestry and Other Land Use

Category: Livestock/Manure management

Subcategory: 3.A.2h - Swine

Sheet: N Excretion rate - Tier 2

Data

Geographical zone (All) Livestock Subcategory (All)

Geographical zone	Livestock Subcategory	Livestock Subdivision	Per animal		
			Daily N consumed per animal (kg N/animal/day)	Fraction of annual N that is retained by animal	Annual N excretion rate (kg N/animal/yr)
Z	T	T	Nintake	Nretention(frac)	$Nex=Nintake*(1-Nretention(frac))/365$
Cool	Breeding boars	Agricultural enterprises	0.1	0.3	Calculated 25.55
		Households			Calculated 33.5
	Farrowed checking sows			Specified 19.27	
	Fattening swine	Agricultural enterprises			Specified 16.01
		Households			Specified 20.82
	Gilts from 4 months	Agricultural enterprises			Specified 16.01
		Households			Specified 20.82
	Main sows	Agricultural enterprises			Specified 24
		Households			Specified 31.27
	Piglets from 2 to 4 months	Agricultural enterprises			Specified 5.48
		Households			Specified 7.12
	Piglets up to 2 month	Agricultural enterprises			Specified 1.51
		Households			Specified 1.96

Example: Swine manure management (5)

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Tier **Tier 2**

Livestock population Average Daily Feed Intake Volatile solid excretion per day MMS Usage and Methane Conversion Factor CH4 Emission Factor for Manure Management CH4 Emissions from Manure Management N Excretion rate MMS - EF for direct

Worksheet

Sector: Agriculture, Forestry and Other Land Use
 Category: Livestock/Manure management
 Subcategory: 3.A.2h - Swine
 Sheet: Emission factor for direct N2O-N emissions from MMS - Tier 2

Data

Geographical zone **(All)**

Geographical zone	Manure Management System	Emission factor for direct N2O-N emissions from MMS (kg N2O-N/(kg N in MMS))
Z	MMS	EF3(S)
Cool	Solid storage	0.005
	Liquid/Slurry	0.005
	Uncovered anaerobic lagoon	0
Temperate	Solid storage	0.005
	Liquid/Slurry	0.005
	Uncovered anaerobic lagoon	0.005

Definition	Default Value	Uncertainty	Source
The storage of manure, typically for a period of several months, in unconfined piles or stacks. Manure is able to be stacked due to the presence of a sufficient amount of bedding material or loss of moisture by evaporation. -	0.005	Factor of 2	Judgement of IPCC Expert Group in combination with Amon et al. (2001), which shows emissions ranging from 0.0027 to 0.01 kg N2O-N (kg N)-1.



Thank you!

<https://www.ipcc-nggip.iges.or.jp/index.html>

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