

GHG emissions from farm machinery

Direct emissions from

- combusting diesel fuel in engines

Indirect emissions from

- manufacturing
- repair & maintenance
- discarding/recycling



IPCC emission factors

http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html

National Greenhou	use Gas Inventor	ies	INTERGOVERNMENTAL PANEL ON CLIMATE CHARGE
	Publications		
Home IPCC	2006 IPCC Guidelines for	National Gr	eenhouse Gas Inventories
IPCC-TFI Home			
Organization	_		
Technical Support Units	• 2006 IPCC Guidelines Top		2006 IDCC Cuidalizes for
Publications	Vol.1 GGR	7 <u>-</u> 100000 - 10	2000 IPCC Guidelines for
2006 IPCC Guidelines	 Vol.2 Energy Vol.3 IPPU 	Nati	onal Greenhouse Gas Inventories
GPG-LULUCF	Vol.4 AFOLU		Volume 2
Degradation of Forest	 Vol.5 Waste 		Energy
GPG2000	l		
Revised 1996 IPCC Guidelines			
Presentations	(Chapter	Chapter Name
Meetings	l.	- Cu	over Page of Volume 2 🌆
Support to Inventory Compilers		1 Ini	troduction 📴
FAQs		2 St	tationary Combustion 🔤 🕈
Links		3 M	obile Combustion
Emission Factor Database (EFDB)			utitive Emissions
Electronic Discussion Group (EDG)		4 F.	ugarro cinissionis carat 🛔
100 Page 1	l i i i i i i i i i i i i i i i i i i i	5 C.	aroon Dioxide Transport, Injection and Geological Storage L
Contraction Towned	1	6 R.	eterence Approach Line
E Nord E		Annex 1 W	Vorksheets Linda
		+ · · · ·	d chanter(c) as of 4 mil 2007
The second second		T . Correcte	d chapter(s) as of November 2002
	1	**: Correcte	•d chapten(s) as of June 2010.
3 The Nobel Foundation	1	. 0011601	
IPCC honoured with the 2007 Nobel Peace Prize		In addition th	ie worksheets are provided here in MS Excel spreadsheet
		format as su simply the w additional for	upporting material to assist users of the guidelines. They are vorksheets above translated into spreadsheets without any rmulae.
ICE		All Workshe	ets in Vol.2
IGES	1	All Worksho	ets of 2006GLs (all in one file rinned 1821/B)

ENPOS Workshop 14.-15.3.2011, Helsinki



Three tiers for direct emissions from engines

- Tier 1
 - Average emission factors are used.
- Tier 2
 - Country-specific emission factors are used.
- Tier 3
 - Detailed emission models or measurements and data at individual plant level are used where appropriate.



Tier 1 factors for stationary and mobile combustion of diesel oil

IPCC Tier 1 emission kg/TJ/Stationary combustion					IPCC Tier 1 emission kg/TJ/Mobile combustion - Road						
CH_4	N_2O					CO ₂ CH ₄	N	₂ 0			
74100	3	0,6			kg/TJ	74100	3,9	3,9			
1	25	298 Tot	al		$\rm CO_2 conversion factor$	1	25	298 Tot	al		
74100	75	179	74354 <mark>74</mark>	kg/TJ <mark>g/MJ</mark>	CO ₂ -eq.	74100	98	1162	75360 <mark>75</mark>	kg/TJ <mark>g/MJ</mark>	
g/TJ/Mob	ile com	bustio	า - Off-ro	oad/Ag	riculture	National f	acto	ors from	NVTT:		
74100	4,15	28,6				- Stationar	y a	89 g/M.	J		
1	25	298 T	otal			- Mobile	Ĵ (98 a/MJ			
74100	104	8523	82727	kg/1	-J			- <u></u> .			
http://ww http://ww	/w.ipcc-n /w.ipcc.c	ggip.ige h/pdf/as	83 <u>s.or.jp/pu</u> ssessmen	g/iv blic/200 t-report	u Dégl/vol2.html /ar4/wg1/ar4-wg1-ch	apter2.pdf					
	g/TJ/Stati CH ₄ 74100 1 74100 g/TJ/Mob g/TJ/Mob 2 74100 1 74100 1 74100 <u>http://ww</u>	g/TJ/Stationary c CH ₄ N ₂ O 74100 3 1 25 74100 75 g/TJ/Mobile com CH ₄ N ₂ C 74100 4,15 1 25 74100 4,15 1 25 74100 104 http://www.ipcc.c	g/TJ/Stationary combus CH ₄ N ₂ O 74100 3 0,6 1 25 298 Tot 74100 75 179 g/TJ/Mobile combustion CH ₄ N ₂ O 74100 4,15 28,6 1 25 298 T 74100 104 8523 http://www.ipcc.nggip.ige http://www.ipcc.ch/pdf/as	g/TJ/Stationary combustion $CH_4 N_2O$ 74100 3 0,6 1 25 298 Total 74100 75 179 74354 74 g/TJ/Mobile combustion - Off-ro 2 $CH_4 N_2O$ 74100 4,15 28,6 1 25 298 Total 74100 104 8523 82727 83 http://www.ipcc-nggip.iges.or.jp/pu	g/TJ/Stationary combustion CH ₄ N ₂ O 74100 3 0,6 1 25 298 Total 74100 75 179 74354 kg/TJ 74 g/MJ g/TJ/Mobile combustion - Off-road/Ag 2 CH ₄ N ₂ O 74100 4,15 28,6 1 25 298 Total 74100 104 8523 82727 kg/T 83 g/N http://www.ipcc-nggip.iges.or.jp/public/200 http://www.ipcc.ch/pdf/assessment-report	g/TJ/Stationary combustion IPCC Tier 1 emissi CH_4 N_2O 74100 3 0,6 kg/TJ 1 25 298 Total CO_2 conversion factor 74100 75 179 74354 kg/TJ CO_2 -eq. 74100 75 179 74354 kg/TJ CO_2 -eq. 74 g/MJ 74 g/MJ g/TJ/Mobile combustion - Off-road/Agriculture 2 CH_4 N_2O 74100 4,15 28,6 74100 4,15 28,6 74100 104 8523 82727 kg/TJ 83 g/MJ 83 g/MJ http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html 4 http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-ch	g/TJ/Stationary combustion IPCC Tier 1 emission kg/TJ/Mok CH4 N20 CO2 CH4 74100 3 0,6 kg/TJ 74100 1 25 298 Total CO2-conversion factor 1 74100 75 179 74354 kg/TJ CO2-eq. 74100 74 g/MJ 74 g/MJ CO2-eq. 74100 74100 g/TJ/Mobile combustion - Off-road/Agriculture National f National f 2 CH4 N20 - Stationar 74100 4,15 28,6 - Stationar 1 25 298 Total - Mobile 74100 104 8523 82727 kg/TJ 83 g/MJ - Mobile - Mobile http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html - Mobile - Mobile	g/TJ/Stationary combustion IPCC Tier 1 emission kg/TJ/Mobile composition CH4 N2O CO2 CH4 N 74100 3 0,6 kg/TJ 74100 3,9 1 25 298 Total CO2 conversion factor 1 25 74100 75 179 74354 kg/TJ CO2 eq. 74100 98 g/TJ/Mobile combustion - Off-road/Agriculture National factor 1 25 298 Total - Stationary 6 CH4 N2O - Stationary - - 74100 4,15 28,6 - Stationary - 1 25 298 Total - Mobile - 74100 104 8523 82727 kg/TJ - Mobile - 83 g/MJ 83 g/MJ - Mobile - http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html - - Mobile -	g/TJ/Stationary combustion IPCC Tier 1 emission kg/TJ/Mobile combustion CH ₄ N ₂ O 74100 3 0,6 kg/TJ 74100 3,9 3,9 1 25 298 Total CO ₂ cO ₄ N ₂ O 74100 75 179 74354 kg/TJ CO ₂ -ceq. 74100 98 1162 74100 74 g/MJ 74 G/MJ Stational factors from g/TJ/Mobile combustion - Off-road/Agriculture National factors from - Stationary 89 g/MJ 1 25 298 Total - Mobile 98 g/MJ 1 25 298 Total - Mobile 98 g/MJ 74100 104 8523 82727 kg/TJ 83 g/MJ http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html 83 g/MJ - Mobile 98 g/MJ http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-chapter2.pdf 83 g/MJ - Stationary 84	g/TJ/Stationary combustion IPCC Tier 1 emission kg/TJ/Mobile combustion - Road CH4 N20 CO2 CH4 N20 74100 3 0,6 kg/TJ 74100 3,9 3,9 1 25 298 Total CO2conversion factor 1 25 298 Total 74100 75 179 74354 kg/TJ CO2-eq. 74100 98 1162 75360 74 g/MJ 74 g/MJ 75 75 75 75 g/TJ/Mobile combustion - Off-road/Agriculture National factors from VTT: - Stationary 89 g/MJ 1 25 298 Total - Stationary 89 g/MJ 1 25 298 Total - Mobile 98 g/MJ - Mobile 98 g/MJ 1 25 298 Total - Mobile 98 g/MJ - Mobile 98 g/MJ 1 25 298 Total - Mobile 98 g/MJ - Mobile 98 g/MJ 1 25 298 Total - Mobile 98 g/MJ - Mobile 98 g/MJ 1 25 298 Total - Mobile 98 g/MJ	

ENPOS Workshop 14.-15.3.2011, Helsinki

🕑 Eesti Maaülikool Indirect GHG emissions from agricultural machinery

Energy Positive Farm

European Regional Development Fund

• A detailed analysis for every machine is impossible due to the workload and missing data.

CENTRAL BALTIC INTERREG IV A PROGRAMME 2007-2013

CMTT

- The only practical way is to estimate GHG emissions on the basis of energy consumption in manufacturing.
- For example: 86.7 MJ is needed to produce 1 kg machinery \rightarrow Emission is: 74 g/MJ x 86.7 MJ/kg = 6.416 kg CO2/1 kg machine.



Questions to be answered:

- Which emissions factors do we apply for direct CO₂ emissions from stationary and mobile use of diesel oil?
- Do we include indirect emissions from manufacturing, R&M of farm machinery into ENPOS project?
 - If the answer was YES, how do we do it?



This material has been produced in ENPOS project. ENPOS is acronym for *Energy Positive Farm*.

The project partners are

- University of Helsinki, department of Agricultural Sciences Agrotechnology
- MTT Agrifood Research Finland Agricultural Engineering
- Estonian University of Life Sciences

Project home page is at <u>http://enpos.weebly.com/</u>

The project is financed by the EU Central Baltic IV A Programme 2007-2013

This publication reflects the authors views and the Managing Authority cannot be held liable for the information published by the project partners.



