

Workshop on methods and models for the preparation of GHG emissions projections up to 2050

Models for agriculture: AGRI LIVESTOCK and AGRI SOILS

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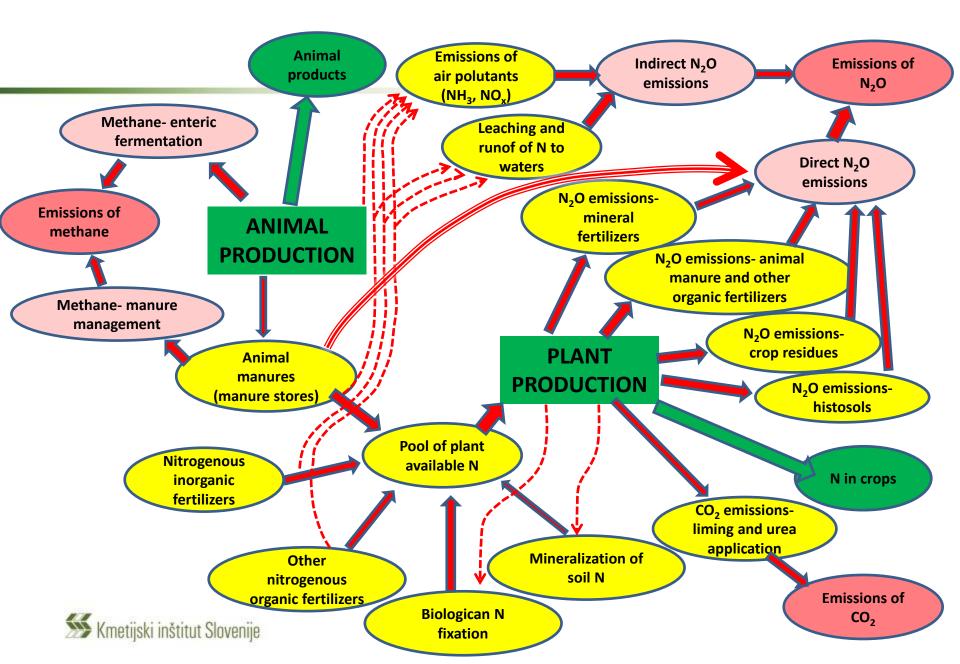
Model – simultaneous estimation of emissions of methane, nitrous oxide, ammonia, nitric oxide, and gross and net nitrogen balance

Intergovernmental Panel on Climate Change 2006 IPCC Guidelines for National Greenhouse Gas Inventories	EEA Report No 13/2019 EMEP/EEA air pollutant emission inventory guidebook 2019 Technical guidance to prepare national emission inventories	$\begin{bmatrix} \psi^{\phi,\phi} & \phi_{\phi} \\ \psi^{\phi,\phi} & \phi^{\phi} \\ \psi^{\phi,\phi} & \psi^{\phi} \\ \psi^{\phi,\phi} & \psi^{\phi} \end{bmatrix}$ EUROPEAN COMMISSION EUROSTAT Directorate E: Sectoral and regional statistics Unit E-1: Agriculture and fisheries
Volume 4 Agriculture, Forestry and Other Land Use Edited by Simon Eggleton, Leandro Burndia.	5511977.849	Methodology and Handbook Eurostat/OECD
Kyoko Miwa, Todd Ngara and Kiyoto Tanabe		Nutrient Budgets EU-27, Norway, Switzerland
		Date: 17/05/2013 Version: 1.02 Authors: Anne Miek Kremer Restised by: Approved by: Public: Reference Number:
IPCC National Greenhouse Gas Inventories Programme	emep 25 1924-2010	Commission europeenne, 2000 Luxembourg, LUXEVBOUNG - Tet. + 352 43011 Office BBCH - Tris. direct line + 452 403-43568 Mitglinge aurestate a curron a ai Annemies INTERVERGes europa eu

+ data on efficiency of mitigation measures from literature



AGRI LIVESTOCK and AGRI SOILS linked together



Examples of model use

N flow and related NH ₃ , N ₂ O and NO _x emissions	C flow and related CH ₄ emissions	Mitigation techniques
Livestock - N excretion	Livestock – enteric fermentation	N: low N diets, manipulation of protein degradability, CH ₄ : feed efficiency, forage quality, feed aditives, vaccination against methanogenes,
Animal housing	/	N: Low emission walking areas, design and area of slatted flors, biofilters,
Manure storage	Manure storage	N: fixed and floating manure covers, anaerobic digestion (biogas plants), slurry acidification, CH ₄ : anaerobic digestion (biogas plants), slurry cooling, decreased storage time, aeration,
Manure application	/	N: band spreading, injection, incorporation, weather conditions, dilution,
Agricultural soils	/	N: fertilization plans, precision farming, cover crops, nitrification inhibitors, urease inhibitost, denitrification inhibitors,



Model – improvements

- The AGRI LIVESTOCK and AGRI SOILS models were linked together. A module for estimating gross and net nitrogen balance has also been added. The renewal allows tracking of all forms of nitrogen in agriculture and modelling of nitrogen demand from mineral fertilizers due to reductions in emissions from animal housing, manure storage, manure application, and expected changes in nitrogen amount in agricultural crops.
- New emission sources (rabbits, composts, digestate) were added to the model.
- An updated methodology for estimating emissions of nitrous oxide, ammonia and nitric oxide (EMEP / EEA 2019) was implemented.
- Solutions were included in the model to assess the impact of some emission reduction measures (low protein diets, inhibitors of methanogenesis, nitrification inhibitors, efficiency of milk and meat production, ...).

Model – implications

The model was used for:

- projections of greenhouse gas emissions in agriculture (Integrated national energy and climate plan of the Republic of Slovenia, Resolution on the Slovenian climate long-term strategy 2050),
- projections of air pollutans in agriculture,
- evaluation of measures of Rural Development Plan 2014-2020.