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

Models for agriculture: AGRI LIVESTOCK and AGRI SOILS

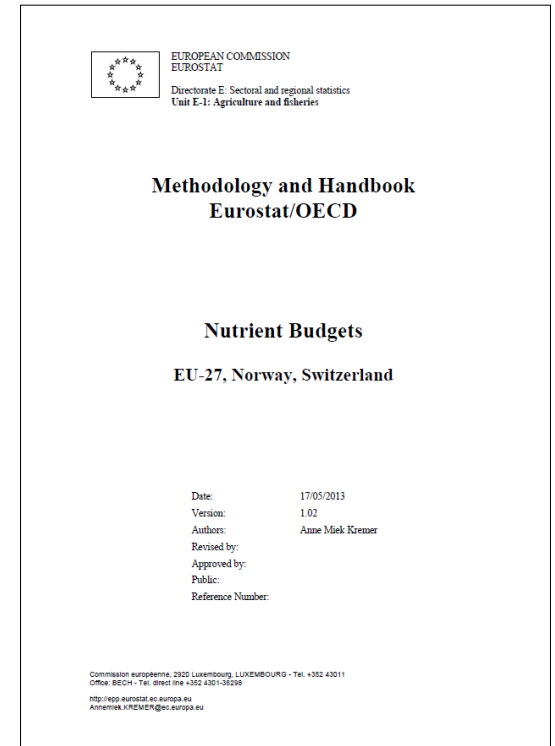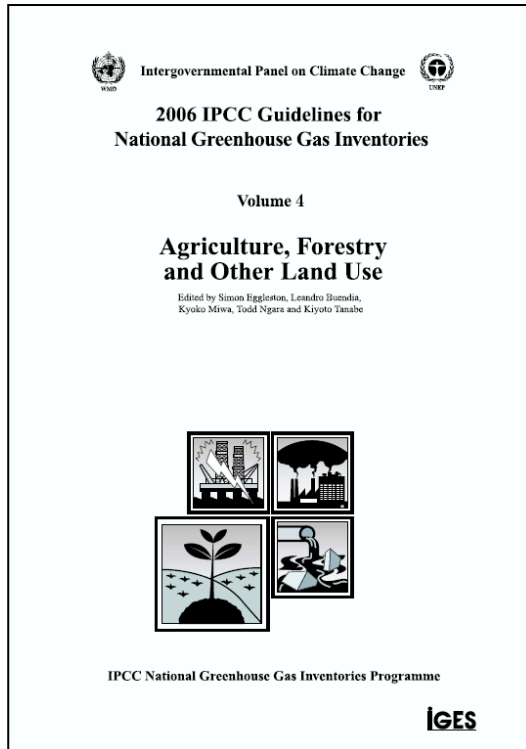**Jože Verbič, Agricultural Institute of Slovenia Ljubljana, 15th September 2021**
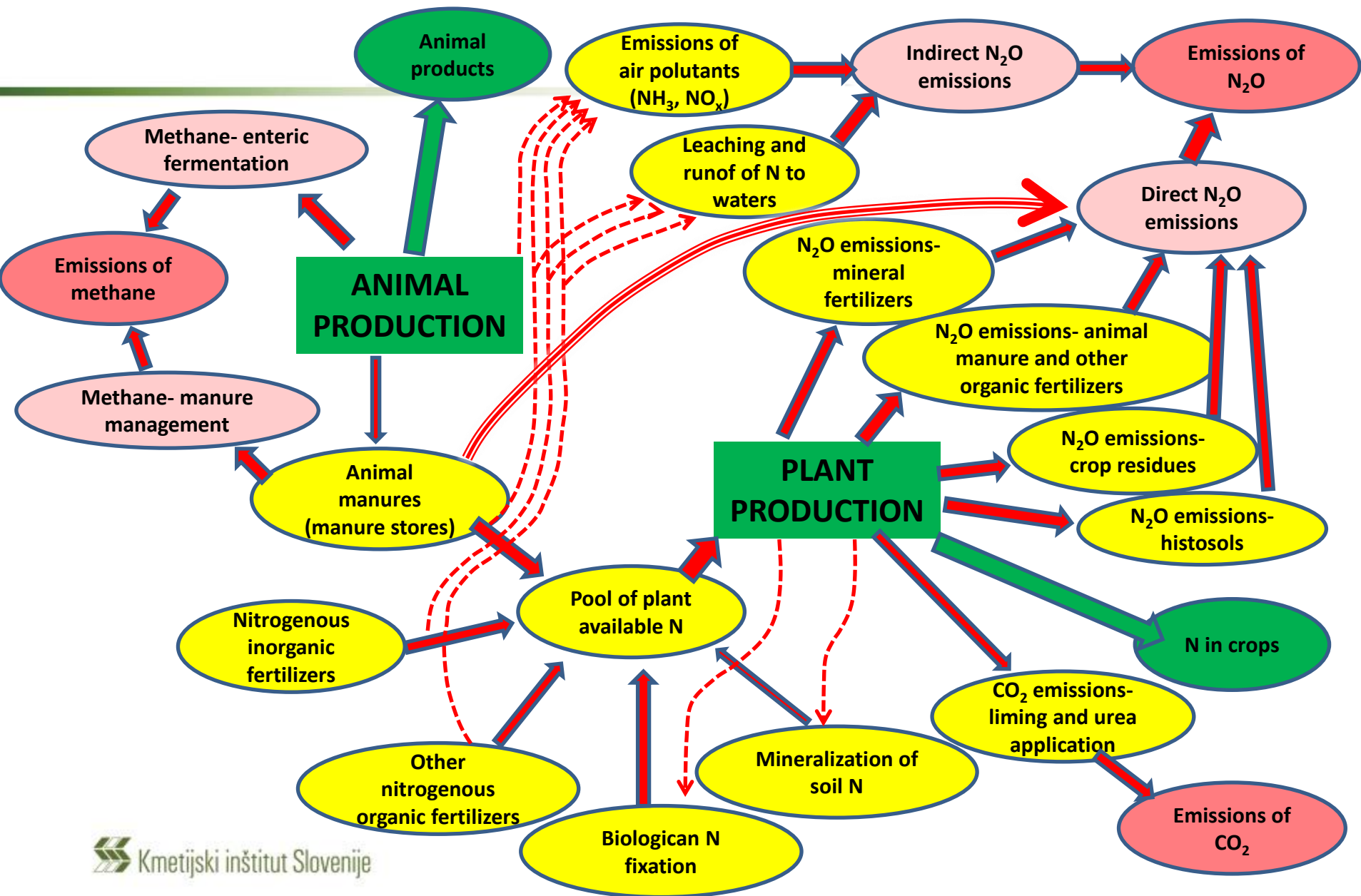
Model – simultaneous estimation of emissions of methane, nitrous oxide, ammonia, nitric oxide, and gross and net nitrogen balance

+ data on efficiency of mitigation measures from literature

AGRI LIVESTOCK and AGRI SOILS linked together

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Examples of model use

N flow and related NH_3, N_2O 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, …

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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, …).

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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.