



Work with projections for the agriculture sector in Norway

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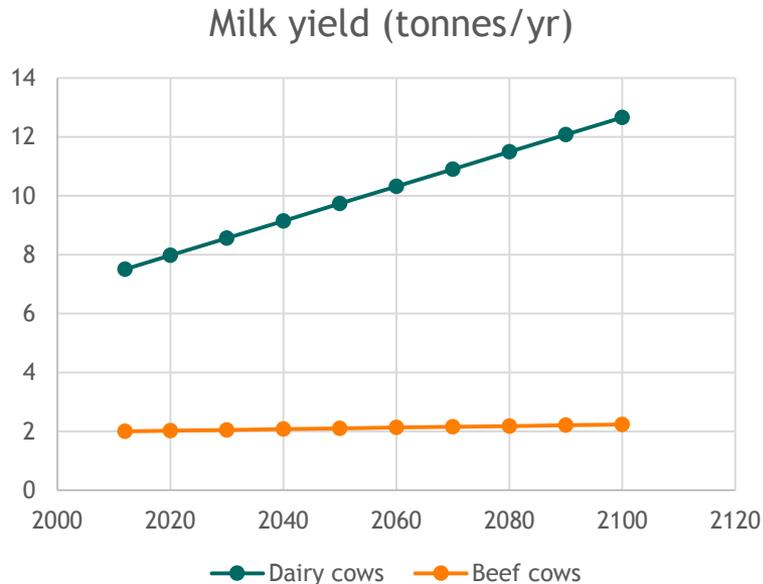
Projections – organization of work and methodology

- Ministry of Finance overall responsibility for emission projections, latest official projections presented in National Budget 2015, published 8. Oct 2014. Updated spring 2015 to reflect 2006 IPCC GL
- Ministry of Agriculture and Food responsible for agriculture projections, Norwegian Environment Agency (NEA) prepares the projections.
- Uses same estimation methodologies as for historical emissions. Calculations in Excel.
- 2012 basis year, projection estimations made for every tenth year 2020-2100.
- Side models and activity data for basis year 2012 from Statistics Norway
 - Enteric CH₄ from cattle and sheep, CH₄ and N₂O from manure management, NH₃ model

Projections – activity data

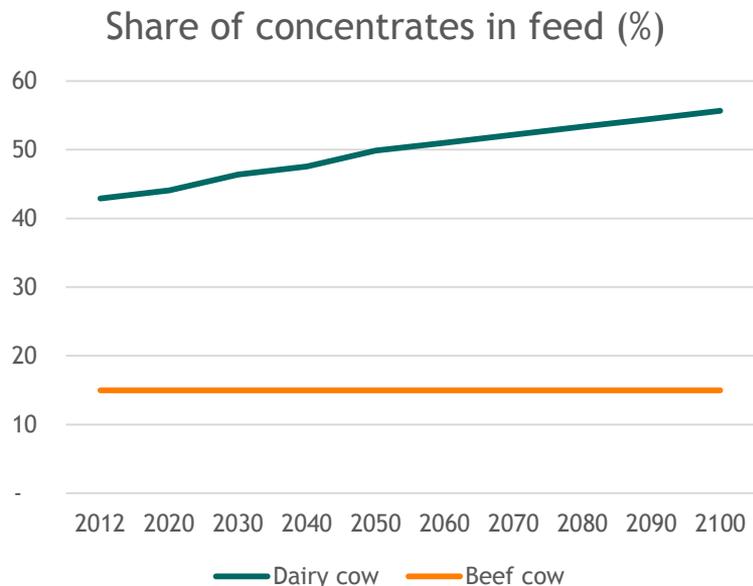
- Presumptions about expected development are given to NEA by the Ministry of Agriculture and Food
 - Animal population development (trend from Norwegian Agricultural Economics Research Institute)
 - Increase in animal manure substitutes synthetic fertiliser (1 kg manure-N:0.45 kg fertilizer-N)
- Expert estimates
 - Area cultivated organic soils, total area decreasing, development depending on cultivation of new areas, 2 km² per year (Norwegian Institute for Agricultural and Environmental Research)
 - Increased share of concentrates, increased milk yield (trend from Norwegian Agricultural Economics Research Institute)

Milk yield used in the side model for enteric CH₄ from cows



- *Milk yield in base year*: country specific 2012 values used in the Norwegian inventory.
 - Milk yield for dairy cow yearly from the Cow recording system by Tine, major Norwegian dairy product supplier.
 - Beef cow yield estimate from NMBU.
- *Trend in yield projections*: using trend from Norwegian Agricultural Economics Research Institute. Trend projection based on historical trend in milk consumption per capita and expected development

Share of concentrates in feed used in the side model for enteric CH₄ for cows



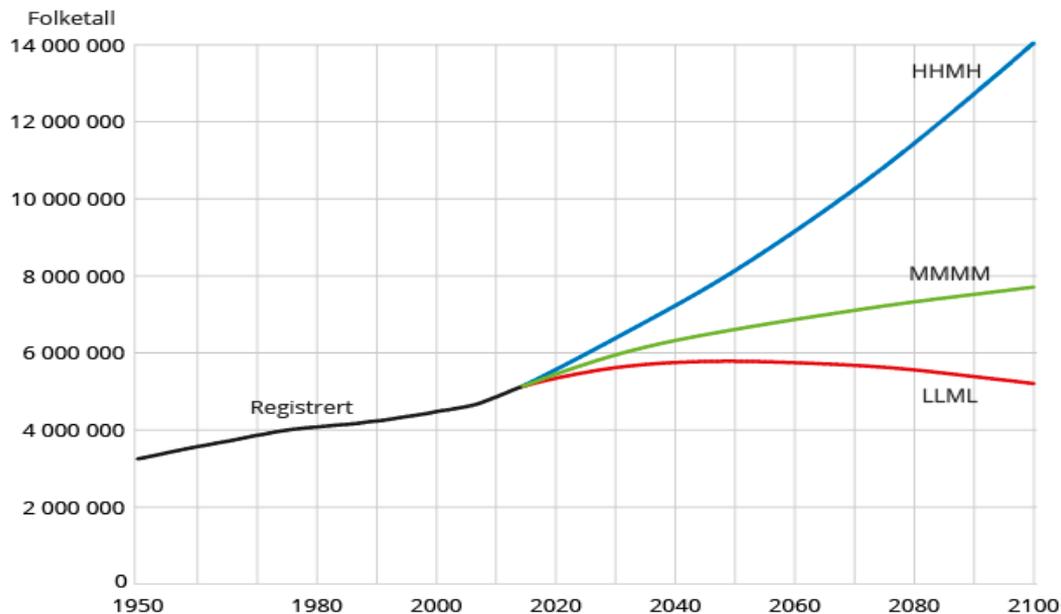
- *Share in base year*: country specific 2012 values used in the Norwegian inventory.
 - For dairy cow updated yearly from the Cow recording system by Tine, major Norwegian dairy product supplier.
 - For beef cow constant estimate from NMBU.
- *Trend in projections*: estimated using trend from Norwegian Agricultural Economics Research Institute.

Projections of animal numbers by the Norwegian Agricultural Economics Research Institute

- No official long-run projections available
- Rough projections based on
 - Production and consumption trends
 - Population growth
 - Consumption per capita
 - Efficiency and yield per producing animal

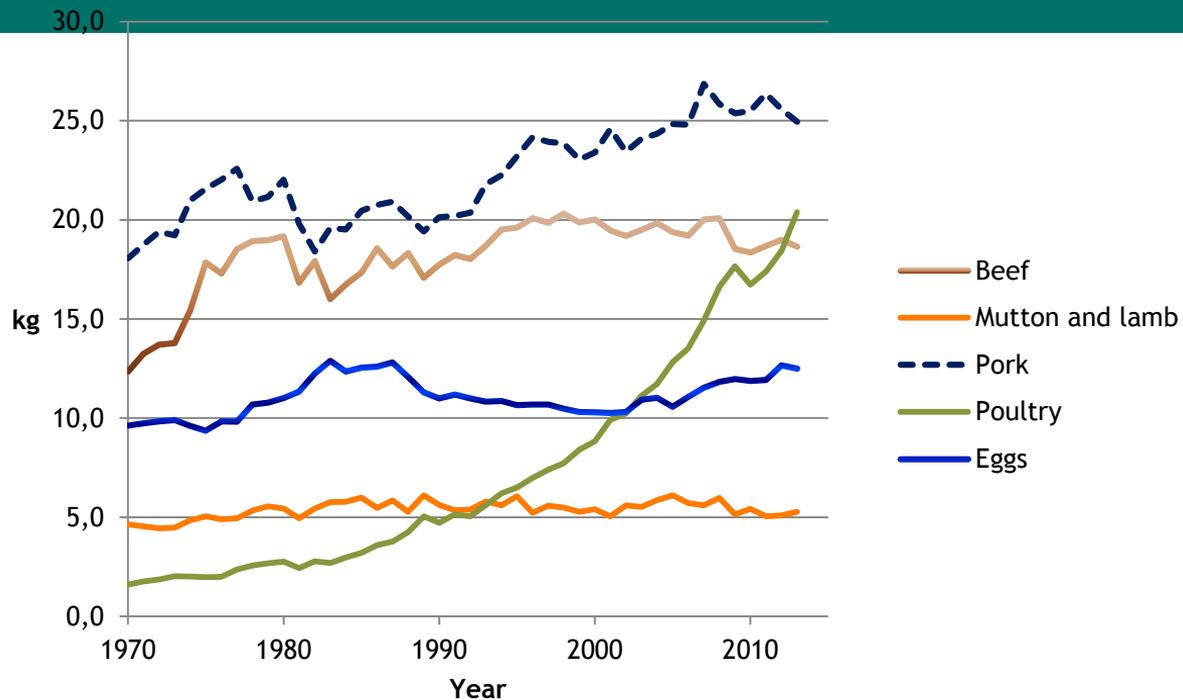
Background for projections of animal numbers: Basic assumptions – population of Norwegian inhabitants

Figur 1. Folketall per 1. januar. Registrert og framskrevet i tre alternativer



Kilde: Statistisk sentralbyrå.

Background for projections of animal numbers: Meat and egg consumption per person 1970-2013



Background for projections of animal numbers: Expected consumption trends

- **Milk**
 - Constant milk production until 2030
 - Thereafter an increase relative to 25% of the population growth
- **Beef**
 - Constant consumption per capita per year (19 kg)
- **Mutton and lamb**
 - Constant consumption per capita per year (5.5 kg)

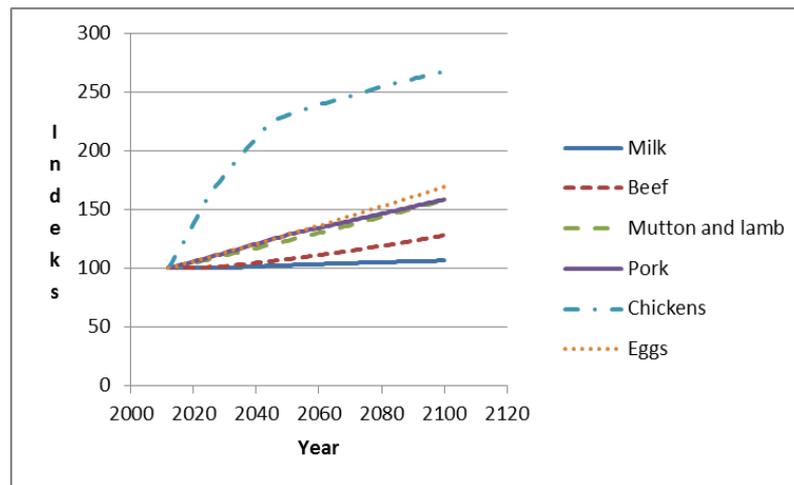
Background for projections of animal numbers: Expected consumption trends

- Pork
 - Increase by 0.05 kg per capita until 2050, constant per capita from 2050 to 2100
- Poultry
 - Increase by 0.5 kg per capita until 2025;
 - by 0.25 kg per capita from 2025 to 2045;
 - 27.5 kg per capita from 2045 to 2100
- Eggs
 - Increase by 0.02 kg per capital per year

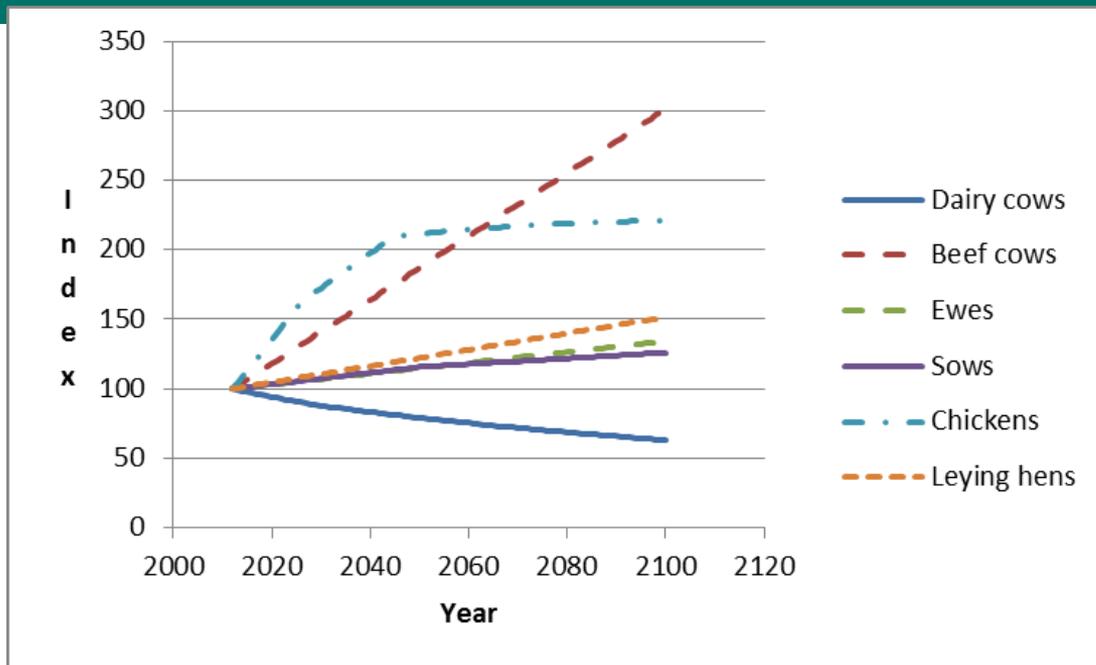
Background for projections of animal numbers: Efficiency and yield

- Milk yield
 - + 50 kg per cow per year
- Beef, kg per cow
 - Increase from 268 kg in 2012 to 300 kg in 2100
- Sheep and lamb
 - +0.05 kg per ewes per year
- Pork
 - +4 kg per sow per year
- Poultry
 - Slaughter weight from 1.26 kg to 1.53 kg
- Eggs
 - + 0.02 kg per laying hen per year

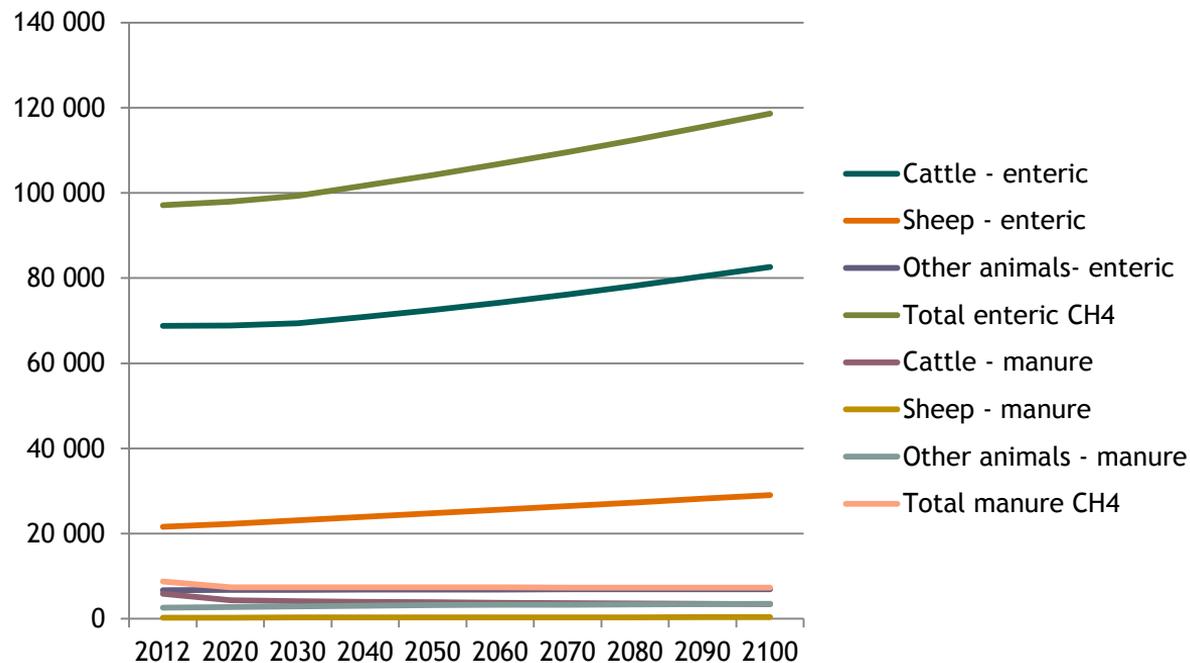
Production - relative numbers



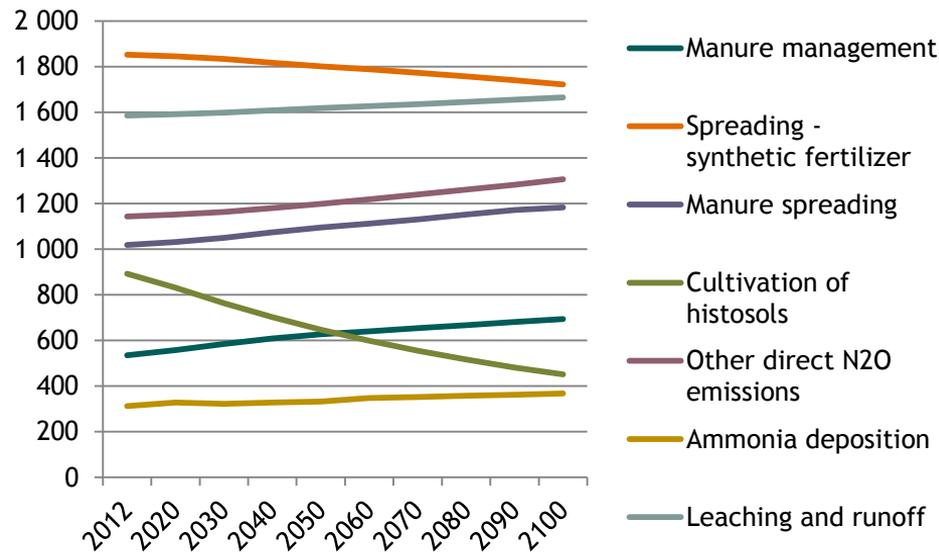
Relative number of producing animals



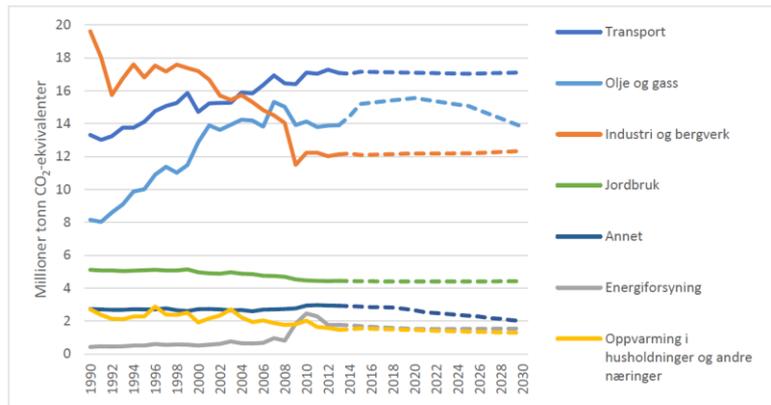
Projections for emissions of CH₄ from domestic animals (enteric fermentation) and from animal manure 2012-2100. Tonnes CH₄



Projections for emissions of N₂O in the agriculture sector 2012-2100. Tonnes N₂O



Projections updated after implementation of 2006 IPCC Guidelines



Figur 2-6 Historiske utslippstall og justerte framskrivninger for 2014-2030. Kilde: SSB, Finansdepartementet og Miljødirektoratet

- For N₂O from agriculture the methodological changes has reduced the emissions in 2012 with 500-600 000 tonnes CO₂-eq, while CH₄ has increased with about 100 000 tonnes CO₂-eq.
- Projections have been correspondingly adjusted. N₂O and CH₄ emissions have been scaled at the same source aggregation level that was used in the projection calculations.
- Used in the NEA-report *Climate mitigation measures and emission trajectories up to 2030*