

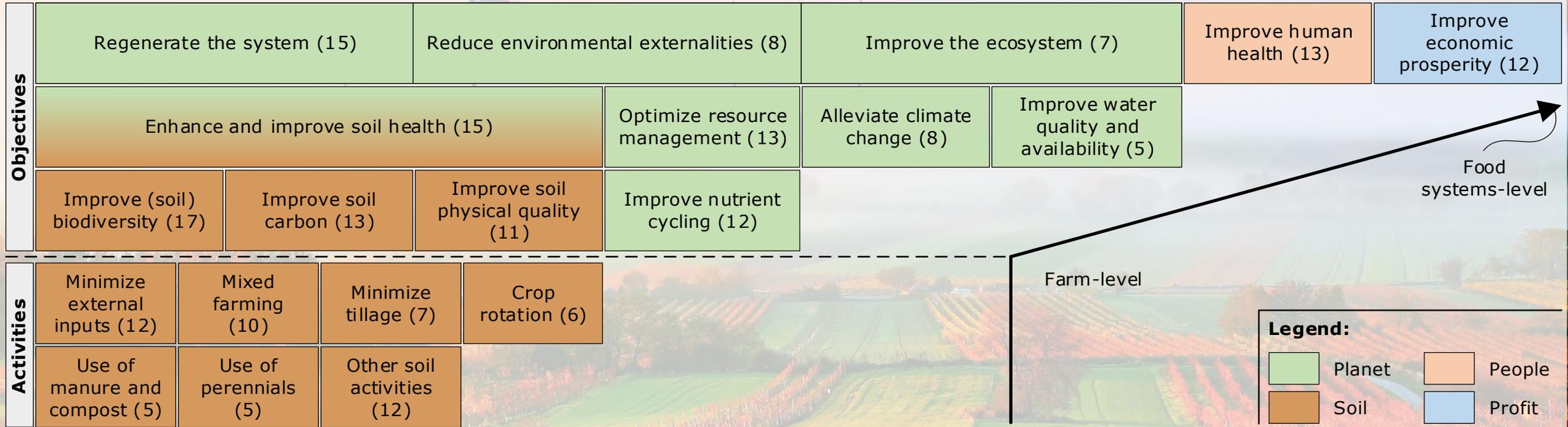


# Climate Neutrality Challenge for Dutch Agriculture

Carbon farming event, March 18 2021



# Regenerative agriculture - Definition



## We propose to define regenerative agriculture as:

an approach to farming that uses soil conservation as the entry point to regenerate and contribute to multiple ecosystem services, with the objective that this will enhance not only the environmental, but also the social and economic dimensions of sustainable food production ([Schreefel et al., 2020](#))

# Climate Neutrality is an essential required outcome of a regenerative agriculture system at (inter)national scale

## We propose the following vision for a regenerative agriculture system at landscape or higher levels:

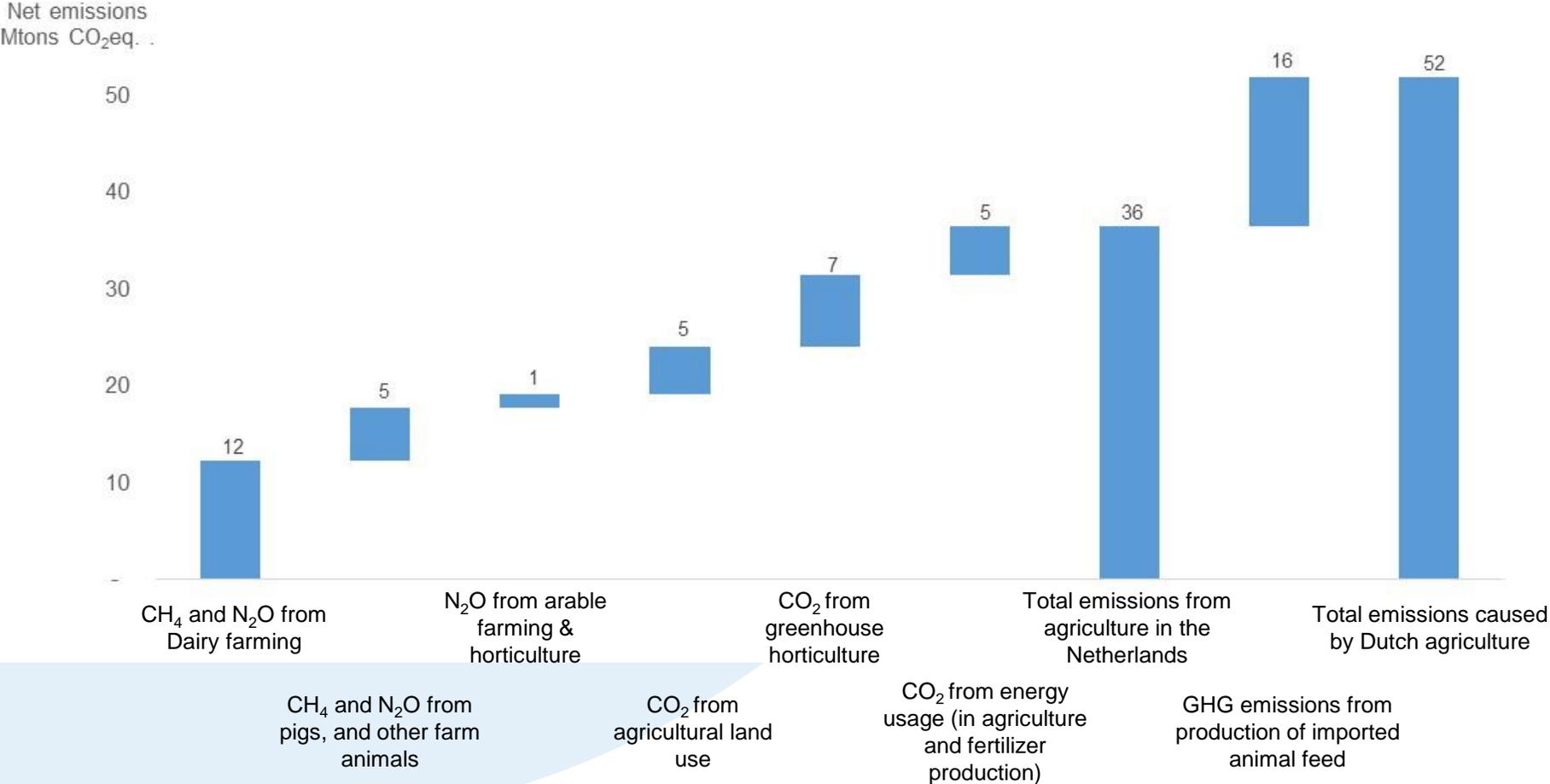
A regenerative agriculture system enables production of food & biomass and enables ecosystems to maintain a healthy state and evolve, while contributing to biological diversity, integrity of the biosphere, human well-being and economic prosperity of society.

### Need to bend the curves; required outcomes:

- Climate: Carbon capture > GHG emissions — Focus today
- Land system change: Improve soil quality, enable nature restoration
- Freshwater use: Improve water quality and regulation
- Phosphorous and Nitrogen: Close nutrient cycles
- Increase biodiversity
- And: produce sufficient Food & Nutrition

# Dutch agriculture causes net emissions of ~ 52 Mtons CO<sub>2</sub>eq. per annum

Overview of GHG emissions from Dutch agriculture<sup>1</sup>

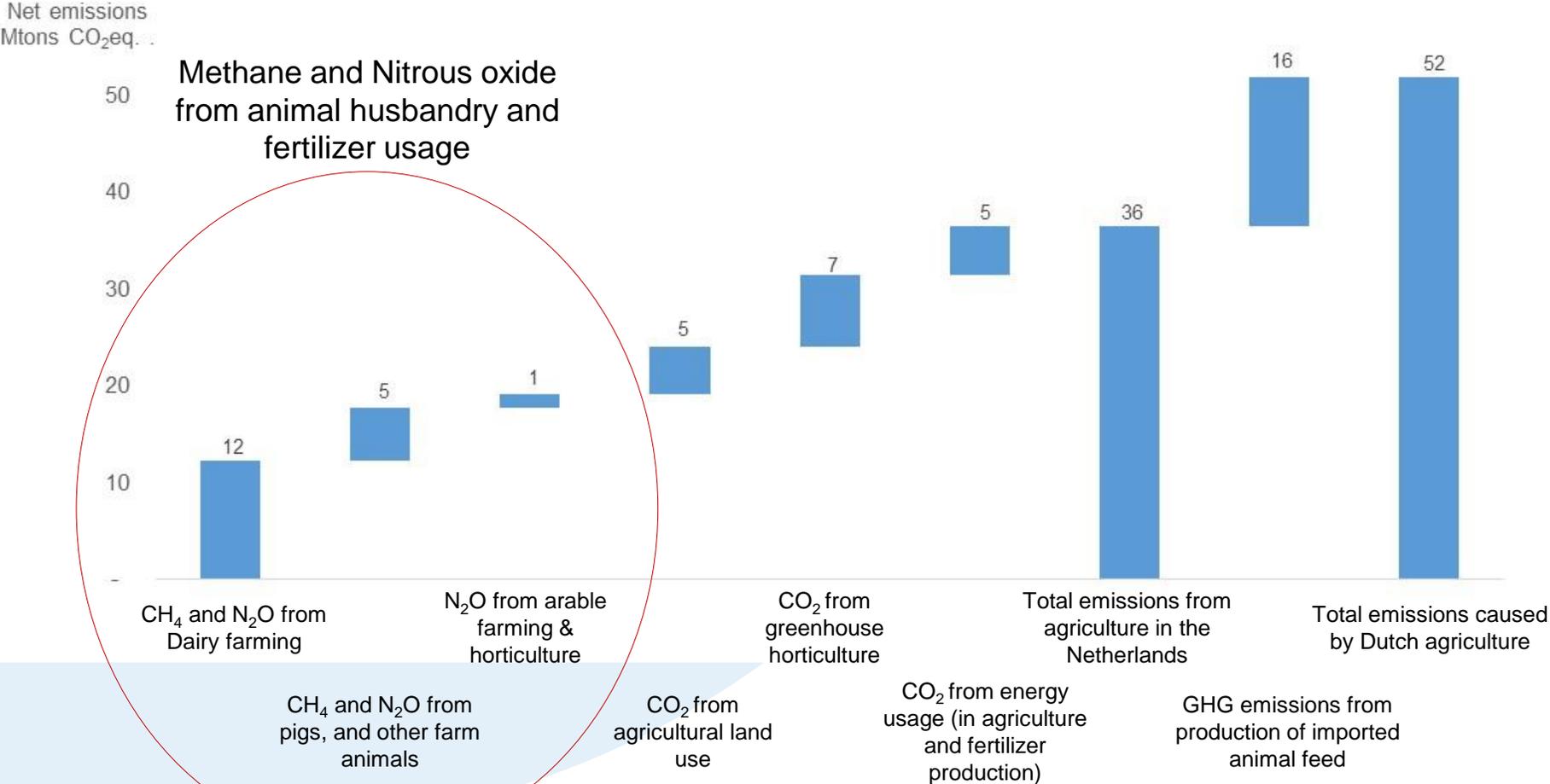


4 <sup>1</sup> Source: PBL, Balans van de Leefomgeving 2018; Vellinga, Reijs, Lesschen, van Kernebeek 2018



# Dutch agriculture causes net emissions of ~ 52 Mtons CO<sub>2</sub>eq. per annum

Overview of GHG emissions from Dutch agriculture<sup>1</sup>

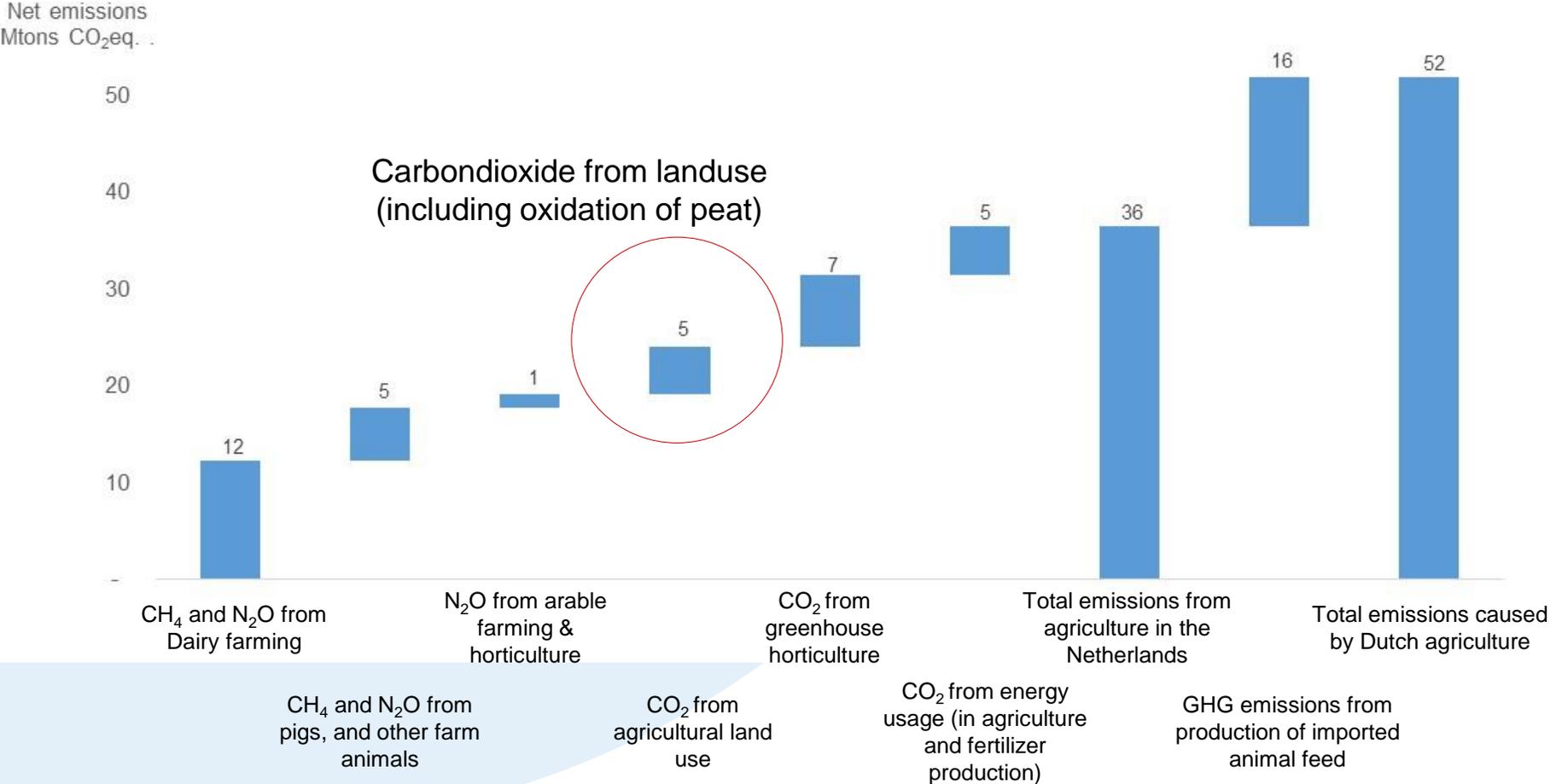


5 <sup>1</sup> Source: PBL, Balans van de Leefomgeving 2018; Vellinga, Reijs, Lesschen, van Kernebeek 2018



# Dutch agriculture causes net emissions of ~ 52 Mtons CO<sub>2</sub>eq. per annum

Overview of GHG emissions from Dutch agriculture<sup>1</sup>

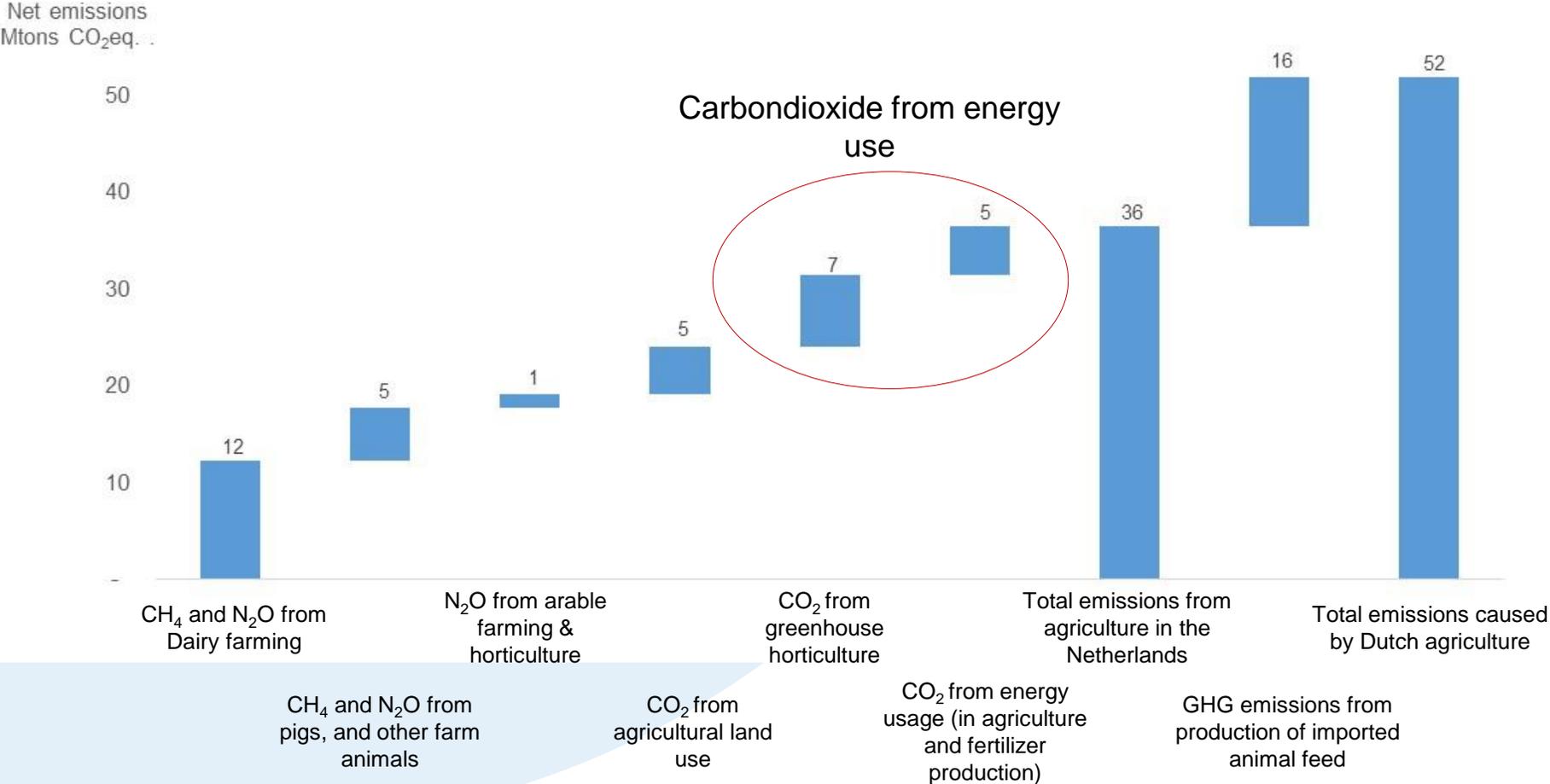


6 <sup>1</sup> Source: PBL, Balans van de Leefomgeving 2018; Vellinga, Reijs, Lesschen, van Kernebeek 2018



# Dutch agriculture causes net emissions of ~ 52 Mtons CO<sub>2</sub>eq. per annum

Overview of GHG emissions from Dutch agriculture<sup>1</sup>

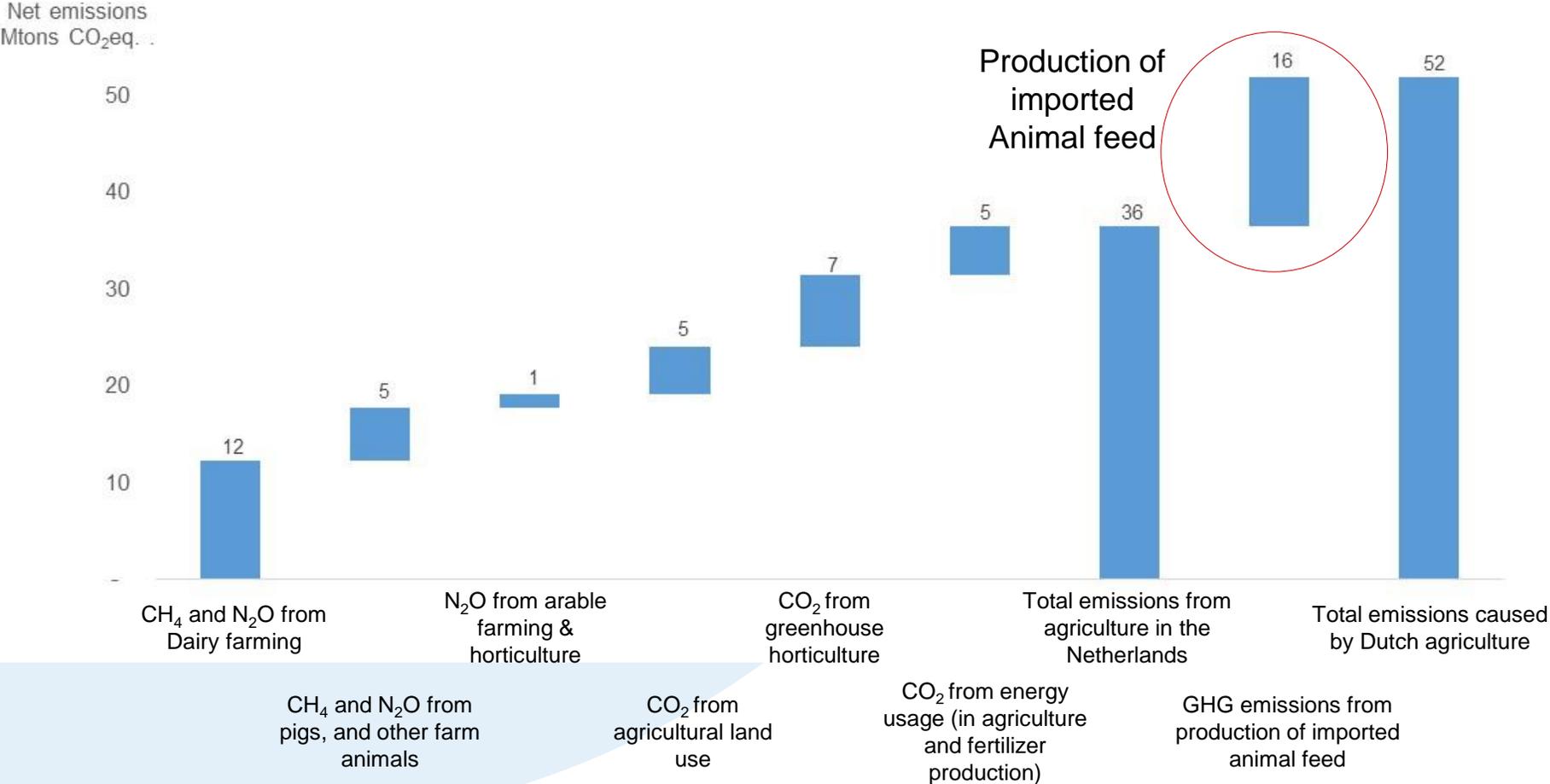


7 <sup>1</sup> Source: PBL, Balans van de Leefomgeving 2018; Vellinga, Reijs, Lesschen, van Kernebeek 2018



# Dutch agriculture causes net emissions of ~ 52 Mtons CO<sub>2</sub>eq. per annum

Overview of GHG emissions from Dutch agriculture<sup>1</sup>



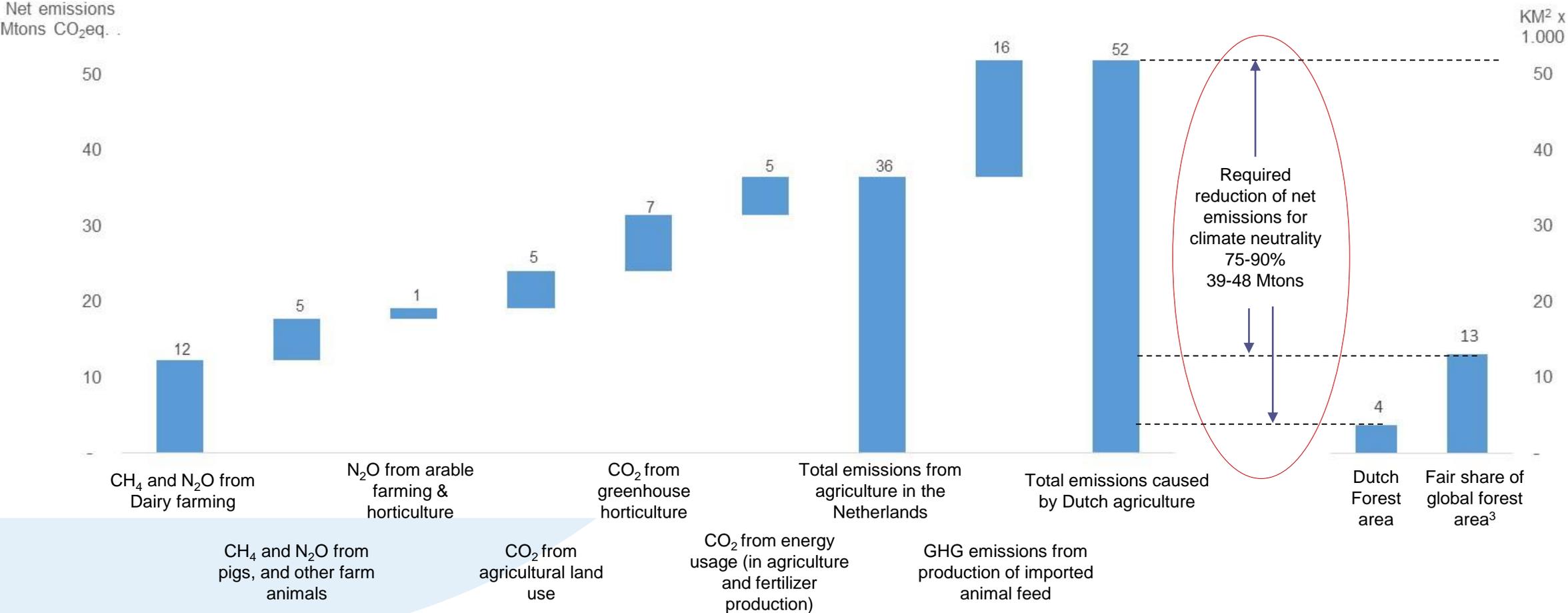
8 <sup>1</sup> Source: PBL, Balans van de Leefomgeving 2018; Vellinga, Reijs, Lesschen, van Kernebeek 2018



# Climate neutrality for Agriculture and Nature combined requires 75-90% reduction of net emissions caused by Dutch agriculture

Overview of GHG emissions from Dutch agriculture<sup>1</sup>

Potential forest area to compensate<sup>2</sup>

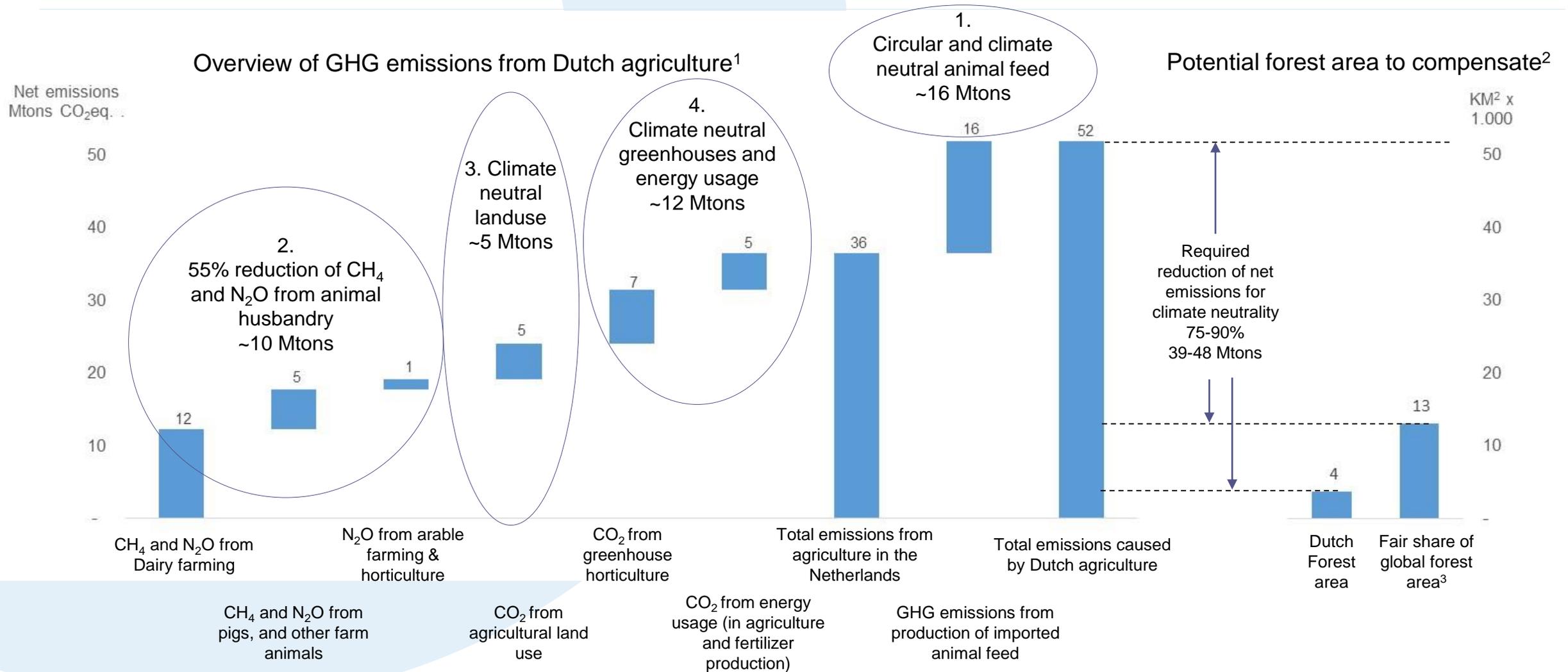


<sup>1</sup> Source: PBL, Balans van de Leefomgeving 2018; Vellinga, Reijs, Lesschen, van Kernebeek 2018

<sup>2</sup> Based on average of 10 tons CO<sub>2</sub> capture per hectare of forest per annum

<sup>3</sup> Based on global average ratio of 3,7 bln ha's forest divided by 5 bln ha's of agriculture area (crop land and permanent pastures)

# Four challenges to be tackled to achieve climate neutrality for Dutch agriculture



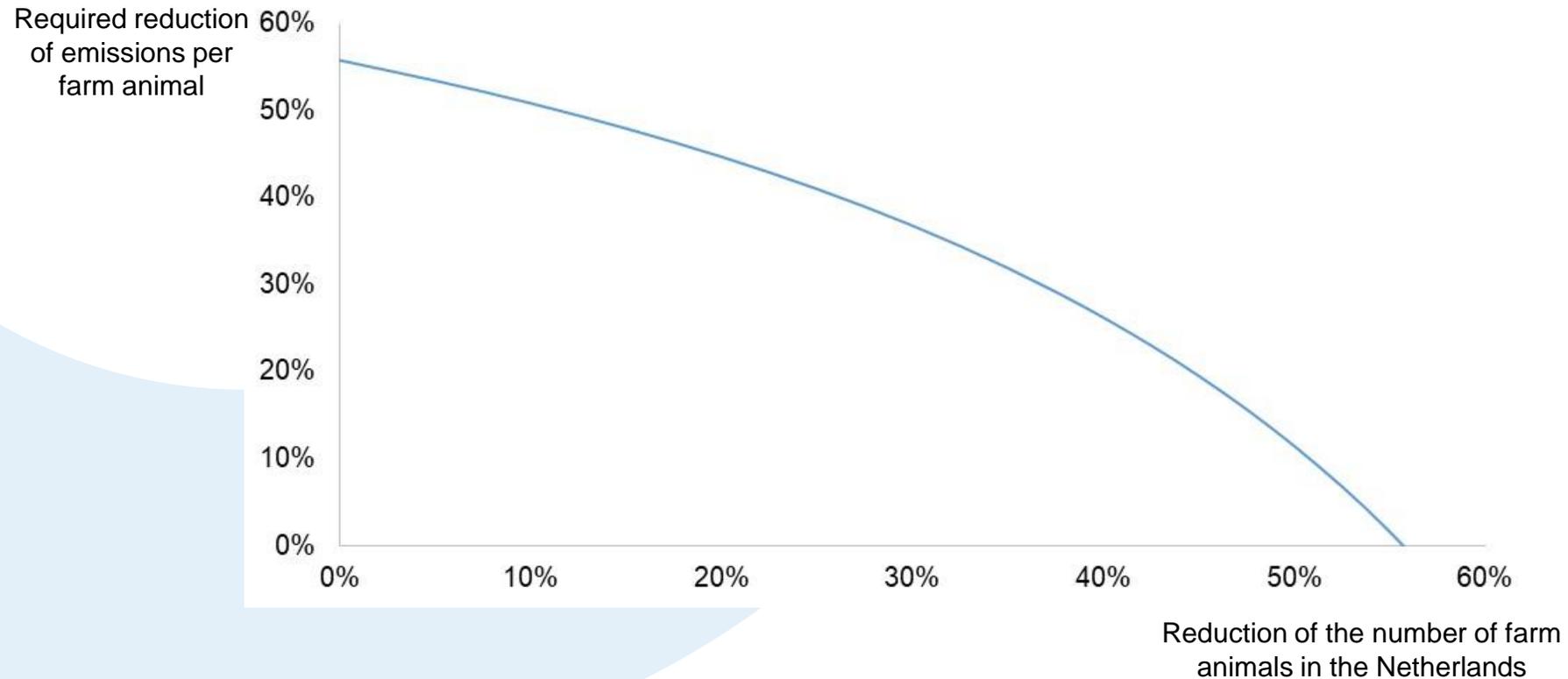
<sup>1</sup> Source: PBL, Balans van de Leefomgeving 2018; Vellinga, Reijs, Lesschen, van Kernebeek 2018

<sup>2</sup> Based on average of 10 tons CO<sub>2</sub> capture per hectare of forest per annum

<sup>3</sup> Based on global average ratio of 3,7 bln ha's forest divided by 5 bln ha's of agriculture area (crop land and permanent pastures)

# How to achieve 55% reduction of CH<sub>4</sub> and N<sub>2</sub>O emissions from animal husbandry?

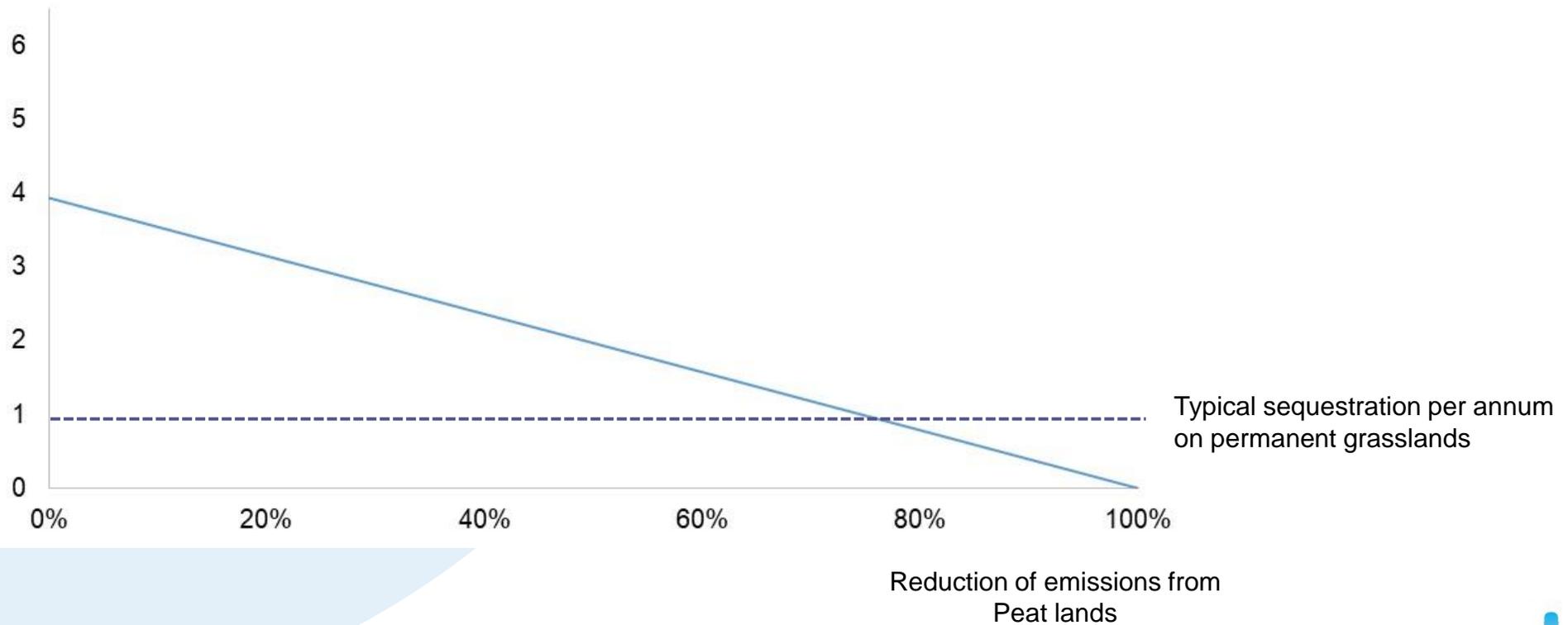
Balancing the reduction of emissions per farm animal versus the total number of farm animals in the Netherlands



# How to achieve 'Net zero' agricultural land use?

Balancing carbon sequestration/ha on mineral soils versus emission reductions on peat land

Required carbon sequestration on mineral soils; tons CO<sub>2</sub> per hectare per annum



# System challenges translated to challenges at farm level

Incentives needed that enable farmers to meet these challenges

## Animal husbandry

1. All animals fed with grass and/or climate neutral by-products
2. Emissions of CH<sub>4</sub> and N<sub>2</sub>O of less than 4 tons CO<sub>2</sub> eq. per annum per hectare of land where manure of the farm is applied
3. Climate neutral land use:
  - On Peatland: CO<sub>2</sub> and N<sub>2</sub>O emissions less than 7 tons CO<sub>2</sub> eq. per annum per hectare
  - On grasslands on mineral soils: sequester 1 ton CO<sub>2</sub> eq. per hectare per annum
4. Climate neutral energy usage

## Arable farming

2. Apply fertilizer/manure that has caused less emissions than 4 tons CO<sub>2</sub> eq. per annum per hectare
3. Sequester carbon until soil organic matter > 4%
4. Climate neutral energy usage

## Agroforestry and permacultures

3. Sequester > 5 tons CO<sub>2</sub> per annum per hectare
4. Climate neutral energy usage

## Greenhouse horticulture

2. Apply fertilizer/manure that has caused less emissions than 4 tons CO<sub>2</sub> eq. per annum per hectare
4. Climate neutral greenhouses

## Recap: three key messages

1. Climate Neutrality is an essential required outcome of a regenerative agriculture system at scale.
2. Climate Neutrality cannot be achieved through sequestration alone.
3. Need material incentives for farmers to enable them to tackle the climate neutrality challenges and provide for other ecosystem services at farm level