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3. GREENHOUSE GAS EMISSIONS FROM AGRICULTURE

3.1 General

The atmosphere, which is a layer of gases surrounding the earth, contains, in part, water vapour, carbon dioxide, and other gases. Some of these gases, defined as greenhouse ones, enable solar radiation to pass through, but also absorb the incoming radiation from the earth, which converts to heat. This process, also called the “greenhouse effect”, preserves a temperature range that is conducive to the existence of life on earth. The industrial revolution and subsequent technological development led to accelerated usage of fossil fuels such as petroleum and coal, which contribute to an increase in greenhouse gas emissions and a substantial increase in their concentration in the atmosphere. An increase in the concentration of greenhouse gases intensifies the greenhouse effect, and leads to accelerated global warming and climate changes of unusual power and intensity.

Greenhouse gases are emitted mainly due to fuel combustion, but agriculture also contributes not insignificantly to the global emissions.

Worldwide recognition of the harm expected due to global warming led to a unification of forces on an international level in an effort to decrease greenhouse gas emissions and reduce the damages resulting from climate change.

3.2 Purpose and Implications of the Indicator

3.2.1 Purpose of the indicator

The indicator enables the presentation of the following aspects of Israel’s greenhouse gas emissions:

- The share of agriculture in total emissions, by type of gas.
- Trends and changes in emissions of greenhouse gases from agriculture.
- International comparisons.

3.2.2 Effects of greenhouse gas emissions on agriculture

The impact of greenhouse gas emissions is recognized globally and Israel’s share is very marginal. Despite this, global climate changes (for example, temperature and precipitation changes) has many consequences on agriculture in the world and in Israel.

3.2.3 The investigation period: 2003–2015.

3.3 Methodology

Emissions from agriculture were calculated based on the IPCC¹ guidelines, with adjustments to match Israeli agriculture. The calculations were based on data of agricultural activity multiplied by the appropriate emission coefficients .

¹ Intergovernmental Panel on Climate Change

As a result of agricultural activity, carbon dioxide, methane, and nitrous oxide are emitted:

1. Carbon dioxide is emitted from agricultural machinery due to fuel combustion.
2. Methane is emitted from livestock production in two ways:
 - Fermentation in the digestive system of grass consuming animals, mainly cattle and sheep.
 - Treatment of the manure excreted by animals in dairy farms, by grazing cattle, by fowl, etc.
3. Nitrous oxide is formed as a chemical reaction (nitrification and denitrification). The sources of emissions include the use of fertilizers, treatment and use of animal manure, crop remnants in the soil and the grazing of animals.

3.3.1 Method of the Indicator Calculation

Carbon dioxide (CO₂) is the main greenhouse gas, constituting 85% of these gases. Other greenhouse gases are methane (CH₄), nitrous oxide (N₂O), and the F-gases group (HFCs, PFCs, and SF₆).

The contribution of each gas to global warming is measured by its potential to maintain heat, its molecular weight, and the length of time it remains in the atmosphere relative to carbon dioxide. The unit of measurement of the potential warming is GWP (Global Warming Potential) in equivalents of carbon dioxide.

For example: Over 100 years, one ton of methane has a GWP equivalent to 21 tons of CO₂. Nitrous oxide has a GWP value of 310.² The F-gases group (HFCs, PFCs, and SF₆) is associated with very high GWPs, ranging between approximately 100 and 24,000.

The indicator was calculated using the following components:

- Agricultural quantities, inputs, and outputs
- Consumption of fuels and electricity in agriculture
- Number of animals, by type
- Emission coefficients, according to IPCC guidelines

² IPCC, 1995.

3.3.2 Reliability of the data

- Emissions of CO₂ from electricity production were calculated corresponding to the relative share of electricity consumption in the agricultural localities.
- Similar to other countries, the factors were based on estimates, adapted to Israel.

3.4 Indicator Data

Total Greenhouse Gas Emissions

Greenhouse gas emissions in Israel in 2015 totalled 80.716 million tons. Of these, 2.260 million tons (2.8%) were from agriculture.

Agriculture's share in greenhouse gas emissions – 2003–2015

Greenhouse gas emissions from agriculture decreased by 3.3% and reached 2.263 million tons in 2015 .

Methane emissions increased from 833,000 to 847,000 tons (as CO₂ equivalent) in 2015, an increase of 1.6% .

Nitrous oxide emissions in Israel decreased from 1.379 to 1.282 million tons (CO₂ equivalent), a decrease of 7% .

Carbon dioxide emissions in Israel increased from 128,000 to 134,000 tons, an increase of 4.8% .

Diagram 14 shows that from 2013 to 2015, carbon dioxide, methane and nitrous oxide emissions were increasing.

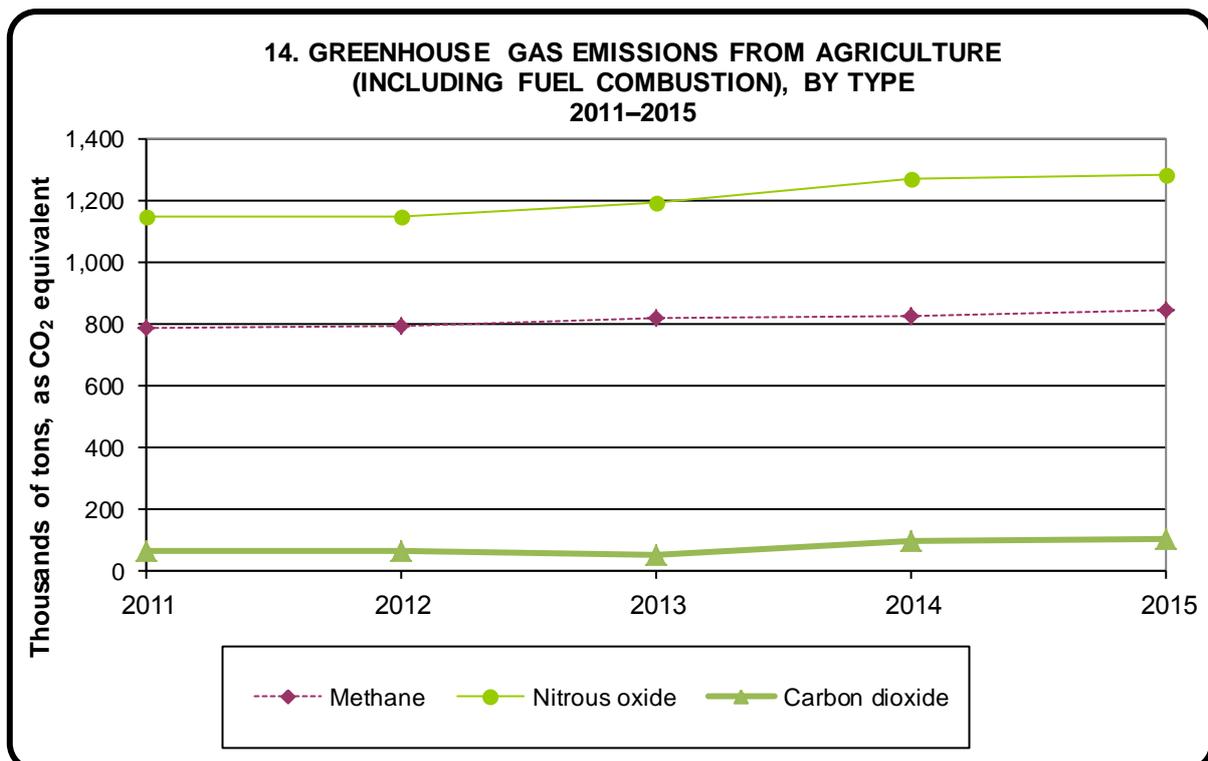
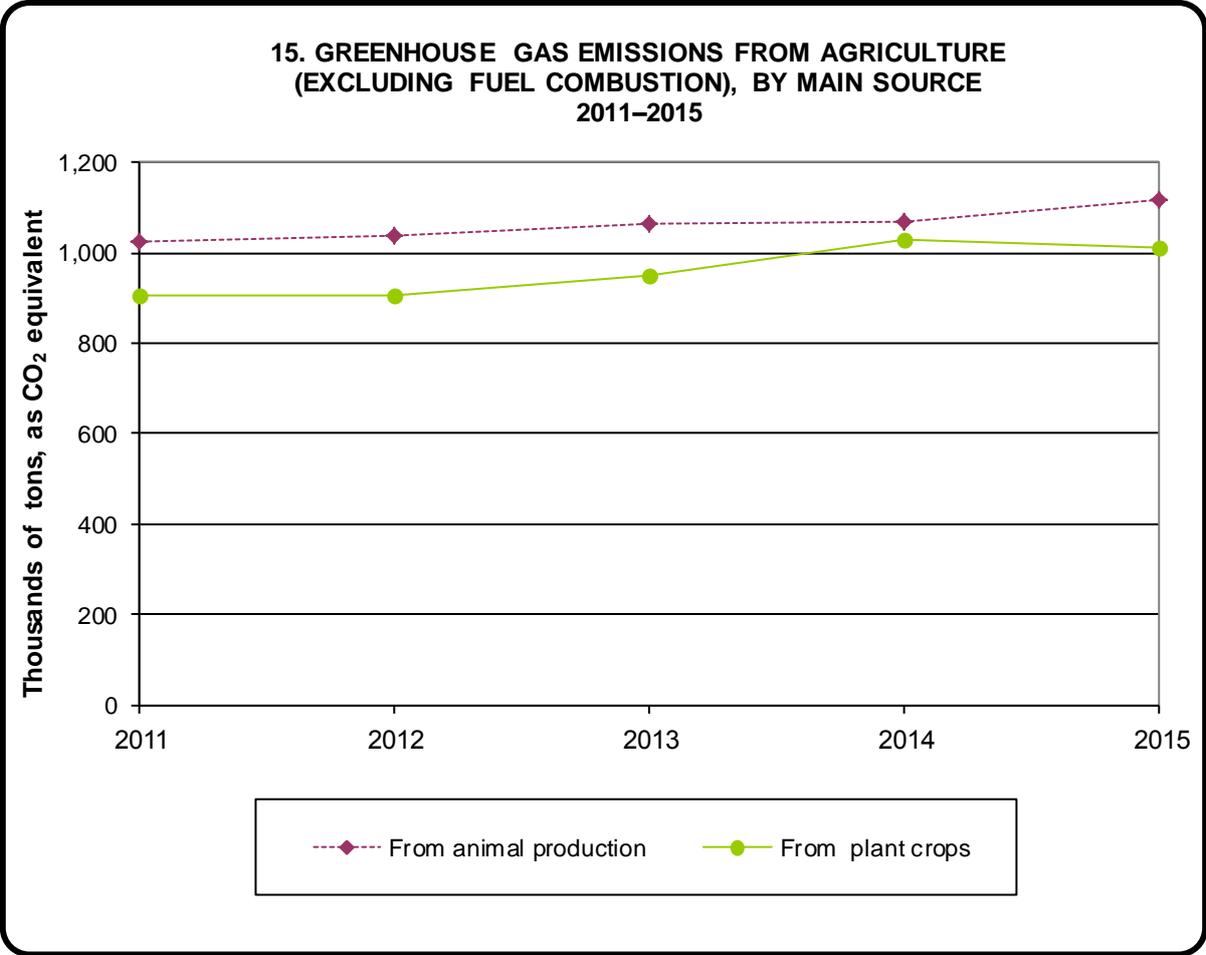
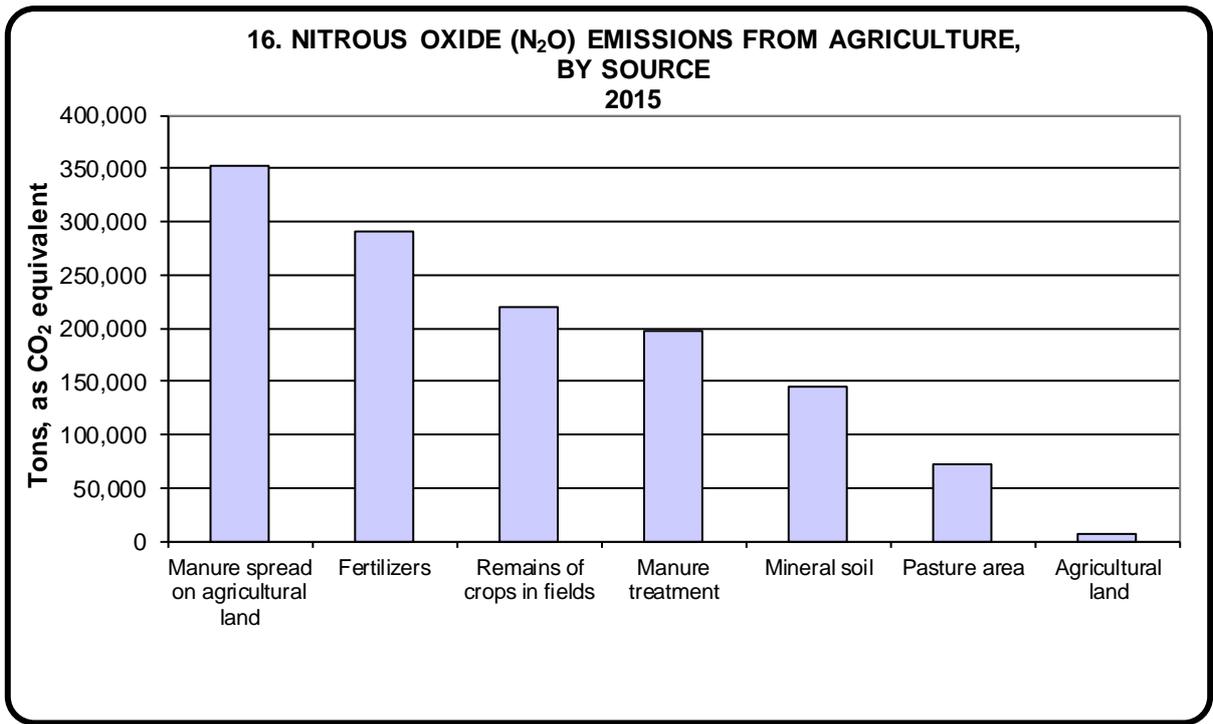


Diagram 15 shows that the source of most of the greenhouse gas emissions from agriculture was animal production.

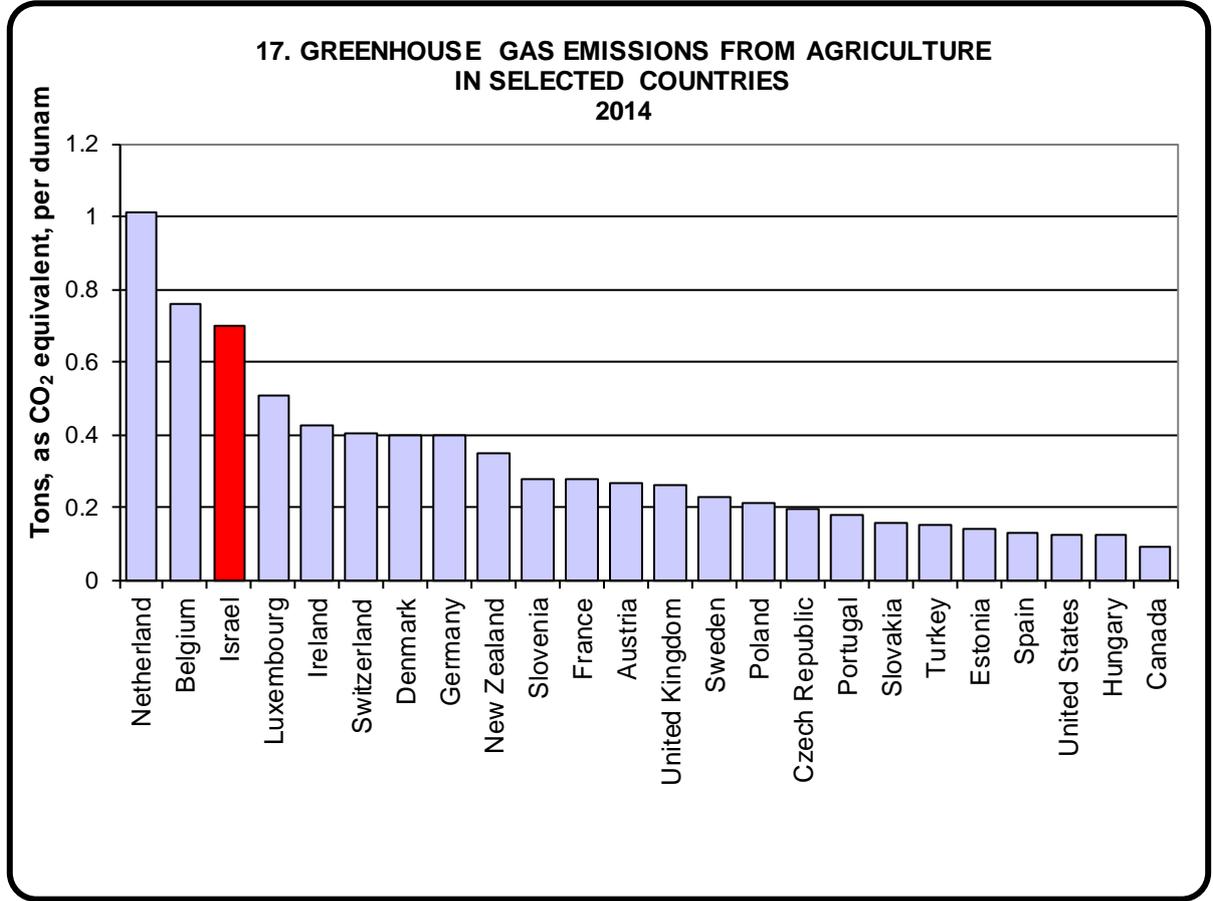
From 2011 to 2014, an increasing trend in greenhouse gas emissions from animal production was apparent, which became higher in 2015. Emissions from plant crops increased until 2014, and in 2015 a slight decline was noticeable.



As can be seen in Diagram 16, the sources of nitrous oxide emissions (N₂O) are many and varied. Among the most prevalent are: Manure spread in fields (352,000 tons), fertilizers (290,000 tons), and remains of crops in fields (220,000 tons).



Israel is one of the OECD countries in which the amount of greenhouse gas emissions from agriculture is relatively high (Diagram 17).



3.5 Terms, Definitions, and Explanations

- Greenhouse gas – A gas occurring naturally or resulting from human activity, and contributing to the greenhouse effect and global warming.
- Ozone – A greenhouse gas produced by photochemical reactions between hydrocarbons and nitrous oxides.
- Methane – A colourless, non-poisonous, and flammable hydrocarbon greenhouse gas created by anaerobic decomposition of organic compounds.
- Nitrous oxide – A greenhouse gas produced from fuel combustion and microbial processes in soil and on water, which are caused by the use of fertilizers that contain nitrogen.
- IPCC – Intergovernmental Panel on Climate Change
- GWP – Global warming potential

3.6 Sources of the Data

- Emissions data were calculated at the Agriculture, Environment, and Energy Sector of the ICBS
- International comparison data were from OECD and UNFCCC publications:

http://stats.oecd.org/OECDStat_Metadata/ShowMetadata.ashx?Dataset=AEI_OTHE&ShowOnWeb=true&Lang=en

http://di.unfccc.int/comparison_by_category