

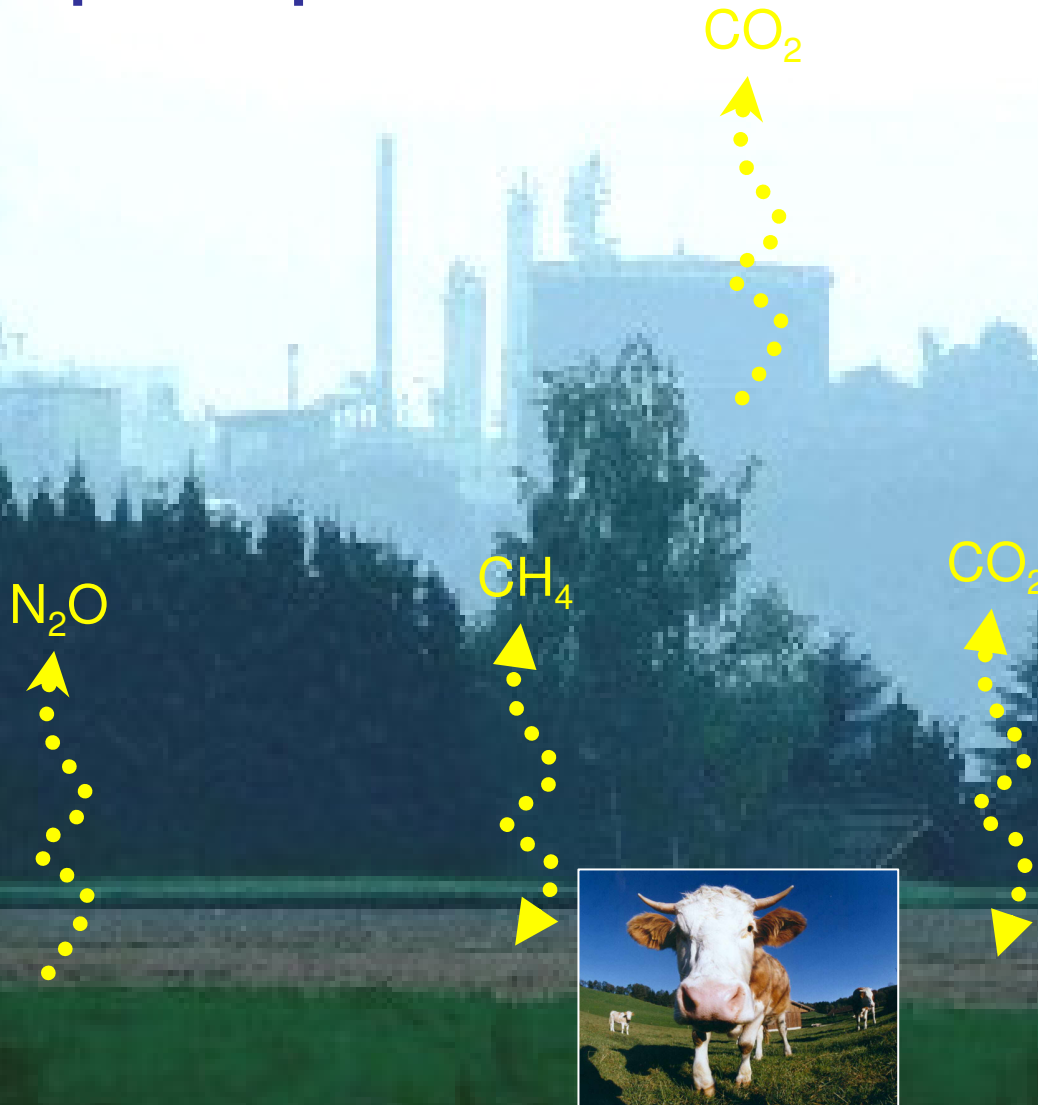
Thomas Schmidt and Bernhard Osterburg

## **Resource use and emissions of the agricultural production - a top-down approach**

**LCAfood2010**

7<sup>th</sup> International Conference on Life Cycle Assessment in the Agri-Food Sector  
Bari  
September 22–24, 2010

How can we estimate the negative externalities of agriculture at the national level, and attribute these to specific production activities and outputs?



**APPROACHES:**

- ✓ bottom up
- ✓ top down
- ✓ hybrid

# Content

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- **Introduction**  
(International Standards)
- **Material and methods**  
(Data sources and modelling tools)
- **Results**  
(about GHG emissions, energy use, labour requirement and land use)
- **Conclusion**  
(system boundaries now and tomorrow)

# Introduction

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- top down approach integrates all inputs and outputs at regional level and split it in functional units
- understand the interrelation between resource uses and emissions at different points in the production
- material and energy flows are connected to the economics
- identifying causes of resource uses and emissions within the German agri-sector and the external suppliers such as the chemical sector and inputs imported from abroad
- International Standards (System of Environmental and Economic Accounting)

# System of Environmental and Economic Accounting (SEEA)

## UN Committee of Experts on Environmental - Economic Accounting:

Australia, Brazil, Canada, China, Colombia,  
Denmark, Dominican Republic, Germany,  
Finland, India, Indonesia, Italy,  
Netherlands, Norway, Philippines, South  
Africa, Russia, Sweden, United Kingdom,  
USA

UNITED NATIONS, European Environment  
Agency, Eurostat, Global Footprint,  
International Monetary Fund, OECD,  
UNEP, UNESCAP, The World Bank

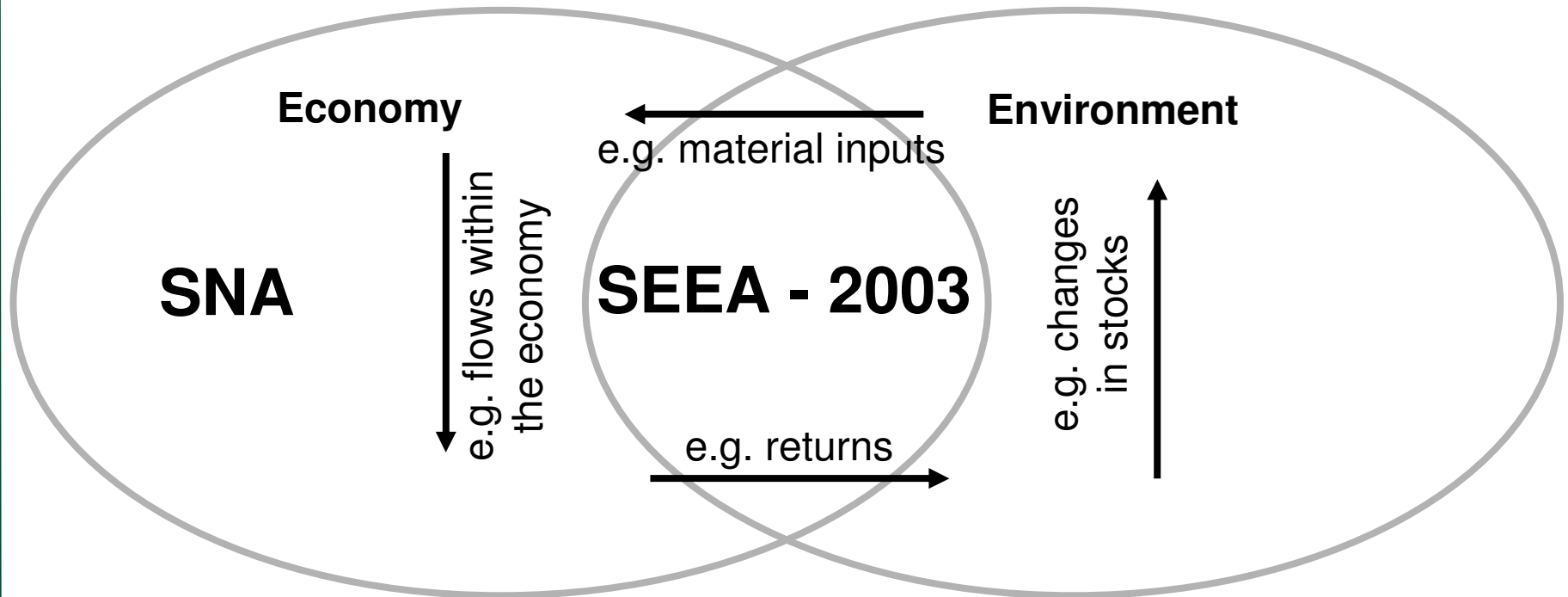


## Integrated Environmental and Economic Accounting 2003

*Final draft circulated for information prior to official editing*

United Nations  
European Commission  
International Monetary Fund  
Organisation for Economic Co-operation and Development  
World Bank

# Introduction



SEEA = System of Environmental and Economic Accounting

SNA = System of National Accounts

Source: A. Alfieri, A. et al. 2010 (Fifth Meeting of the UN Committee of Experts on Environmental-Economic Accounting New York, 23-25 June 2010 )

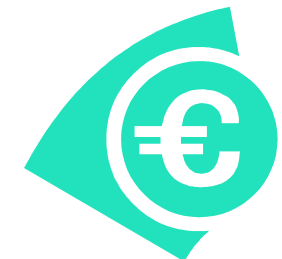
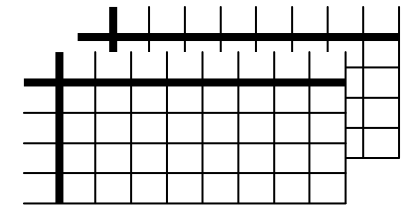
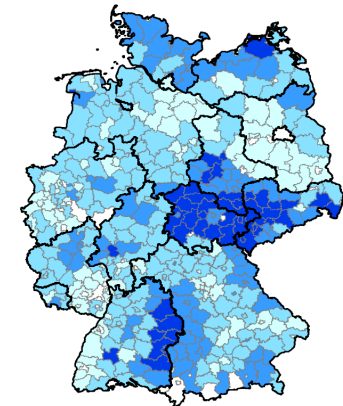
# Data sources

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- **Economic accounts for agriculture**
- **Agricultural statistics**
- **Imports – exports**
- **Parameters of farm activities**
- **Statistics about resource use**
- **Official quantitative reports**

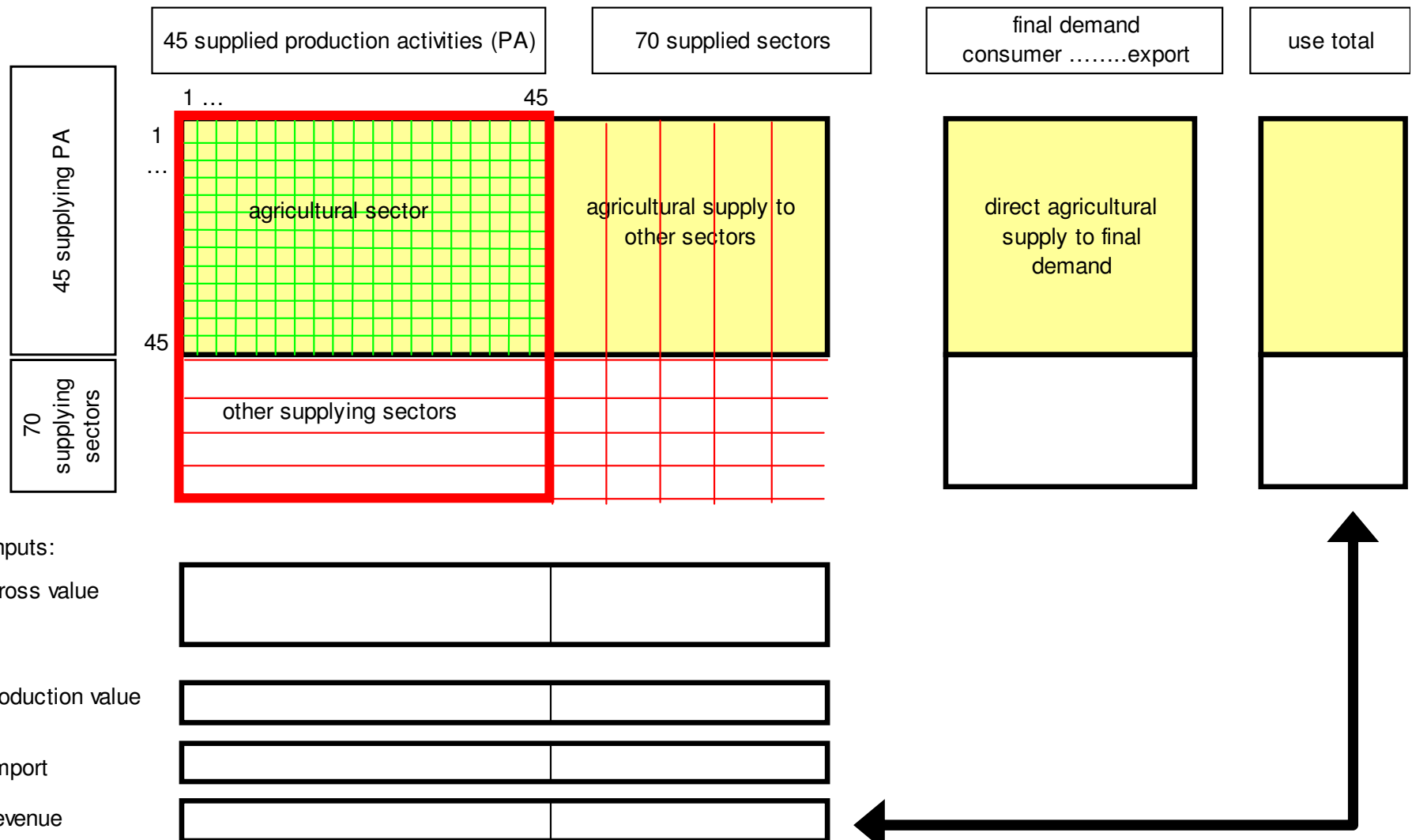
# Tools and allocation

- **Calculations are based on the German sector model RAUMIS**  
(regionalized agricultural and environmental information system)
- **input-output (I/O) analysis:**  
square matrix, which contains 45 production activities
- **Leontief-Inverse**  
(The columns of the Leontief inverse (input-output) table show the input requirements, both direct and indirect, on all other producers, generated by one unit of output)
- **Allocation procedures based on monetary I/O-relations for attributing resource use / emissions**

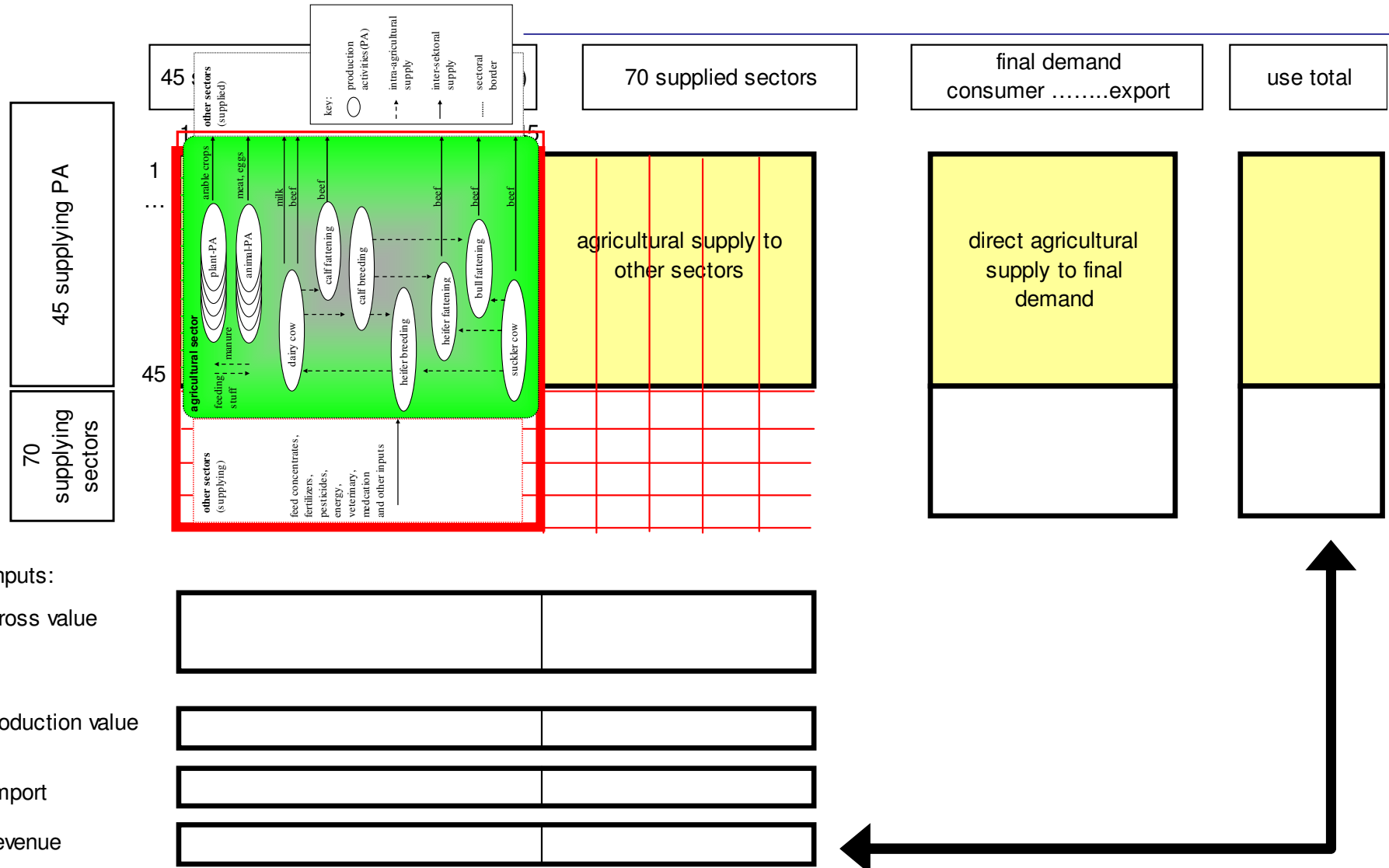




# Input-Output tables

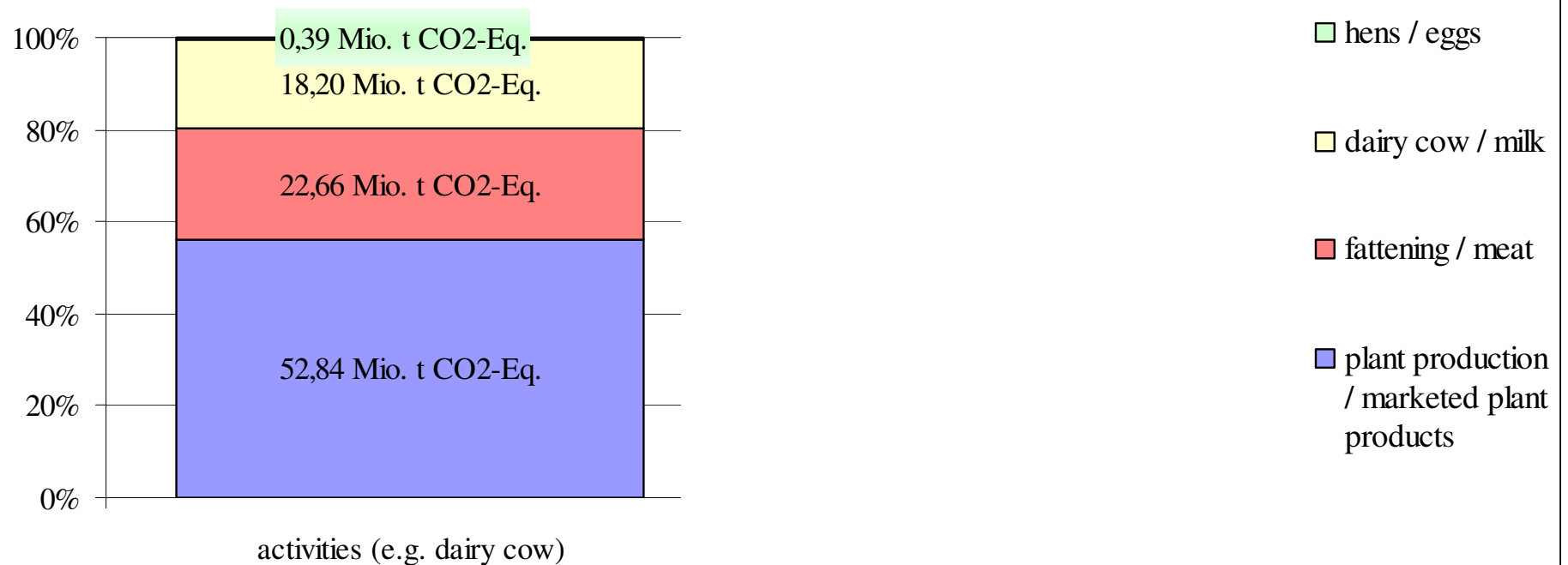


# Input-Output tables



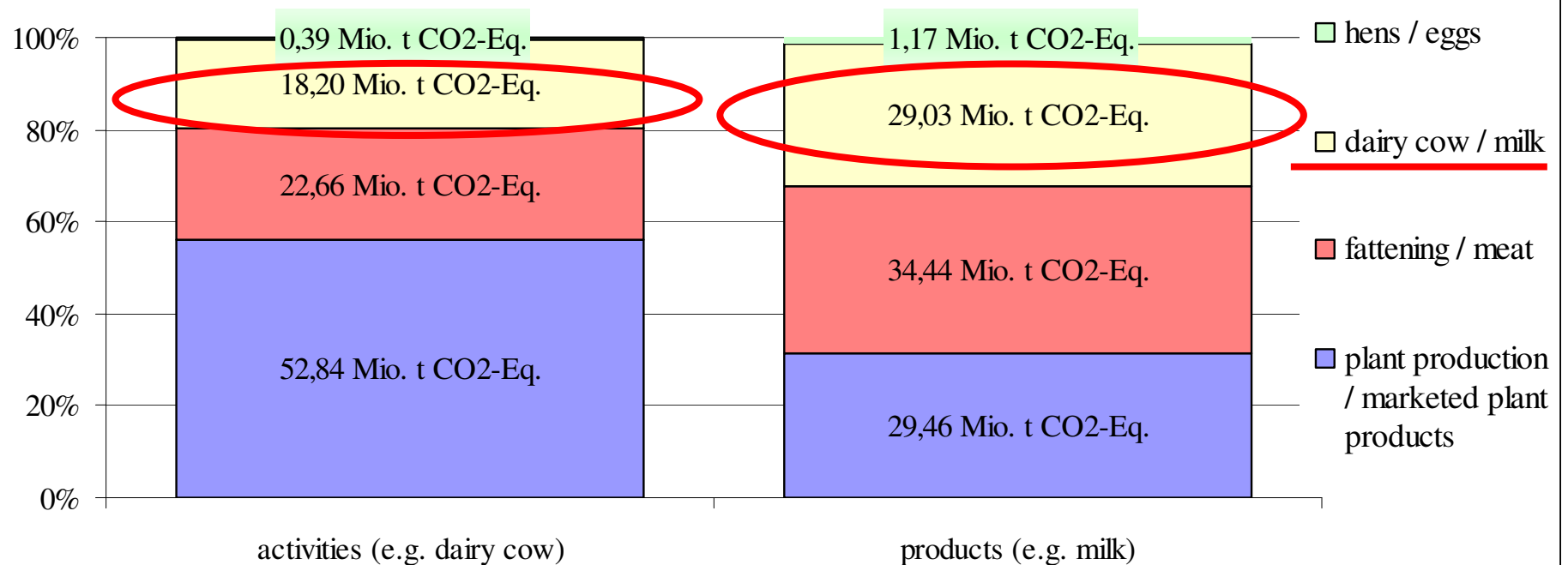


# CO<sub>2</sub>Eq. emissions of activities of the German agri-sector in 2007



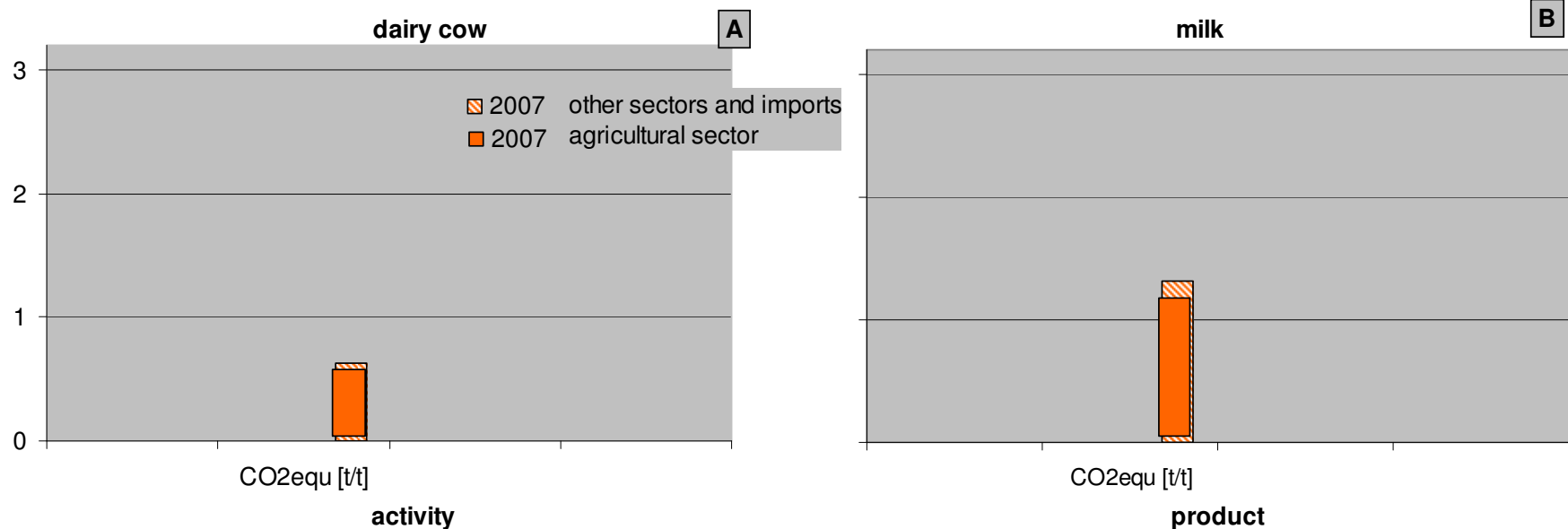
**Plant production** emits more than 50 % of the CO<sub>2</sub>eq,

## CO<sub>2</sub>Eq. emissions of activities **and** products of the German agri-sector in 2007



**Plant production** emits more than 50 % of the CO<sub>2</sub>eq,  
whereas the **marketed plant products** emits one third of all emissions.  
Emissions of forage production are assigned to the **milk** and **meat products**.

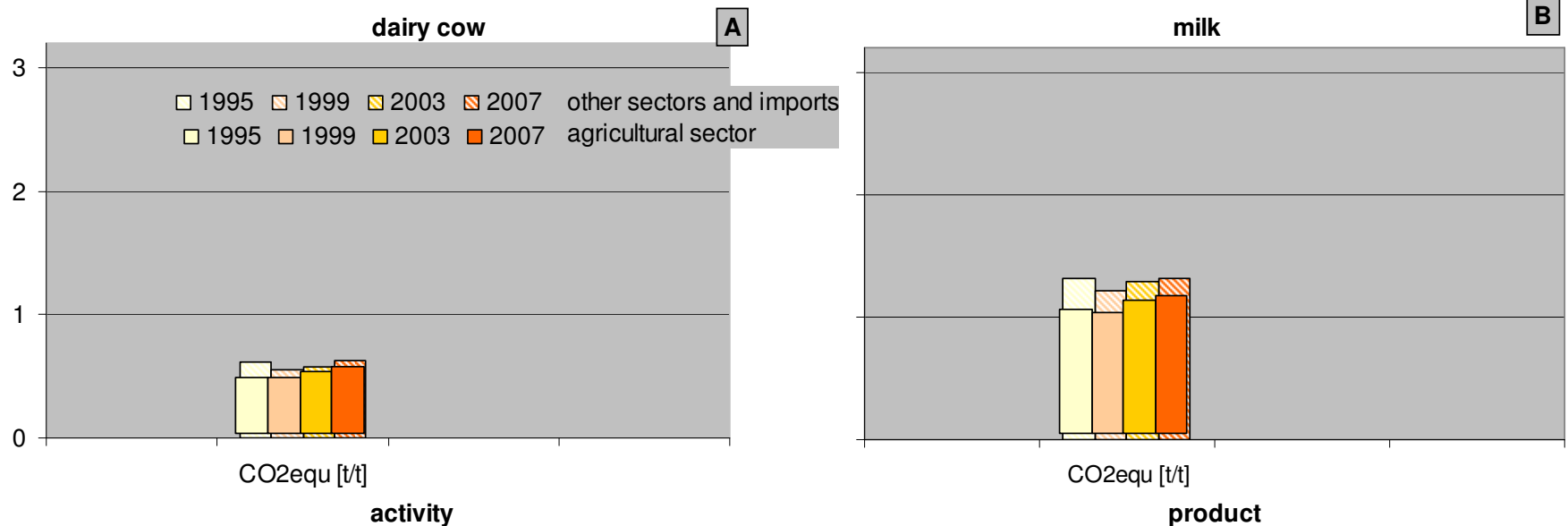
# Direct and indirect resource use and emissions of milk production in the German agricultural sector plus delivered products from other sectors and imports



*Shaded: imports from other sectors and from abroad*

**Resource uses and emissions** decreased over the last decade.  
2007: Higher burdens because of yield depression.

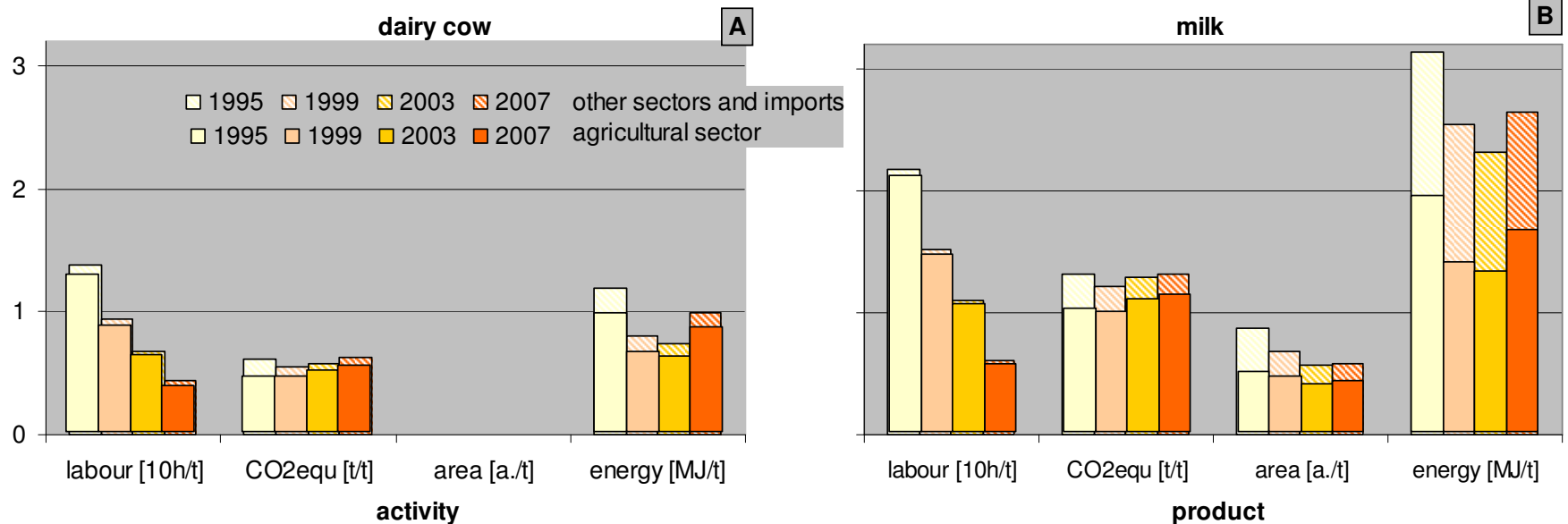
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# Conclusion

## Main outcomes:

- most important processes in an I/O square matrix
- monetary allocation (pay attention to price volatility!)
- consistent calculation of all relevant data
- delivers national average values for agricultural commodities: resource use and emissions of agricultural products at the farm gate

## Future tasks:

- expand the system boundaries towards the food and retail industry
- integration of private households and the waste management industry
- scaling-down of agricultural national accounts into regions and farm types
- connect production activities to specific types of land use and land use change
- Connecting other national SEEA calculations from exporting countries



**Thank you for listening.**

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