The tricky thing of measuring sustainability in food systems

Christel Cederberg

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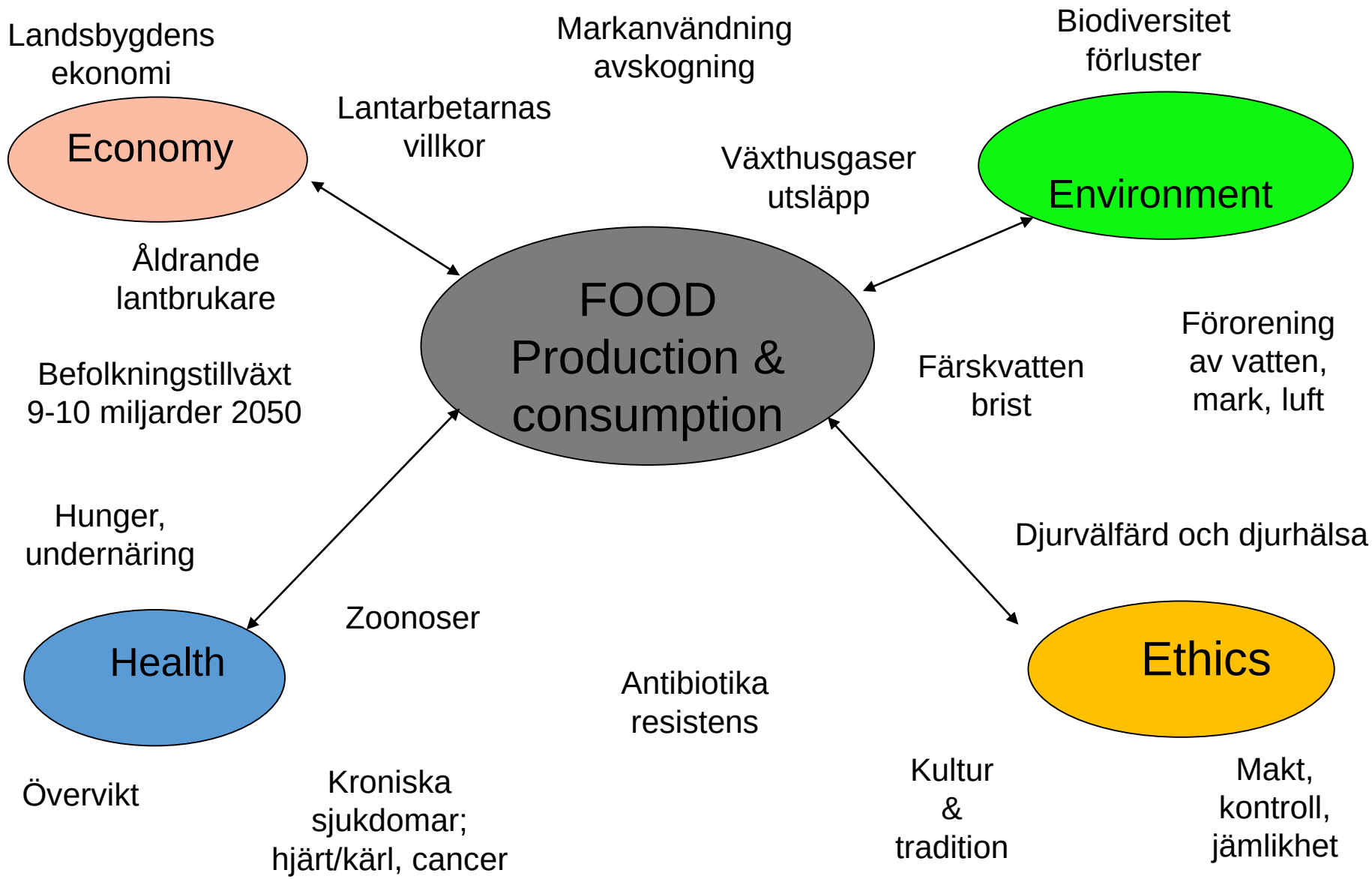
Sustainable Food Systems – the Complex Picture



Nature, December 2016

COMMENT

ZAKIR HOSSAIN CHOWDHURY/ANADOLU AGENCY/GETTY

Drying red chillis under the sun provides one of the few sources of employment for women in an area of Bangladesh.

Fix food metrics

For sustainable, equitable nutrition we must count the true global costs and benefits of food production, urge **Pavan Sukhdev**, **Peter May** and **Alexander Müller**.

Current patterns of crop and livestock production and of processing, transport and consumption, are not delivering healthy, nutritious food to society. They are generating large and unacceptable

Around 800 million people in developing countries consume less than the 2,100 kilocalories per day recommended by the World Food Programme[5] because of failures in access and distribution. At the same time,

million jobs[6], and major industries such as steel and car making employ only 6 million and 9 million people worldwide, respectively.

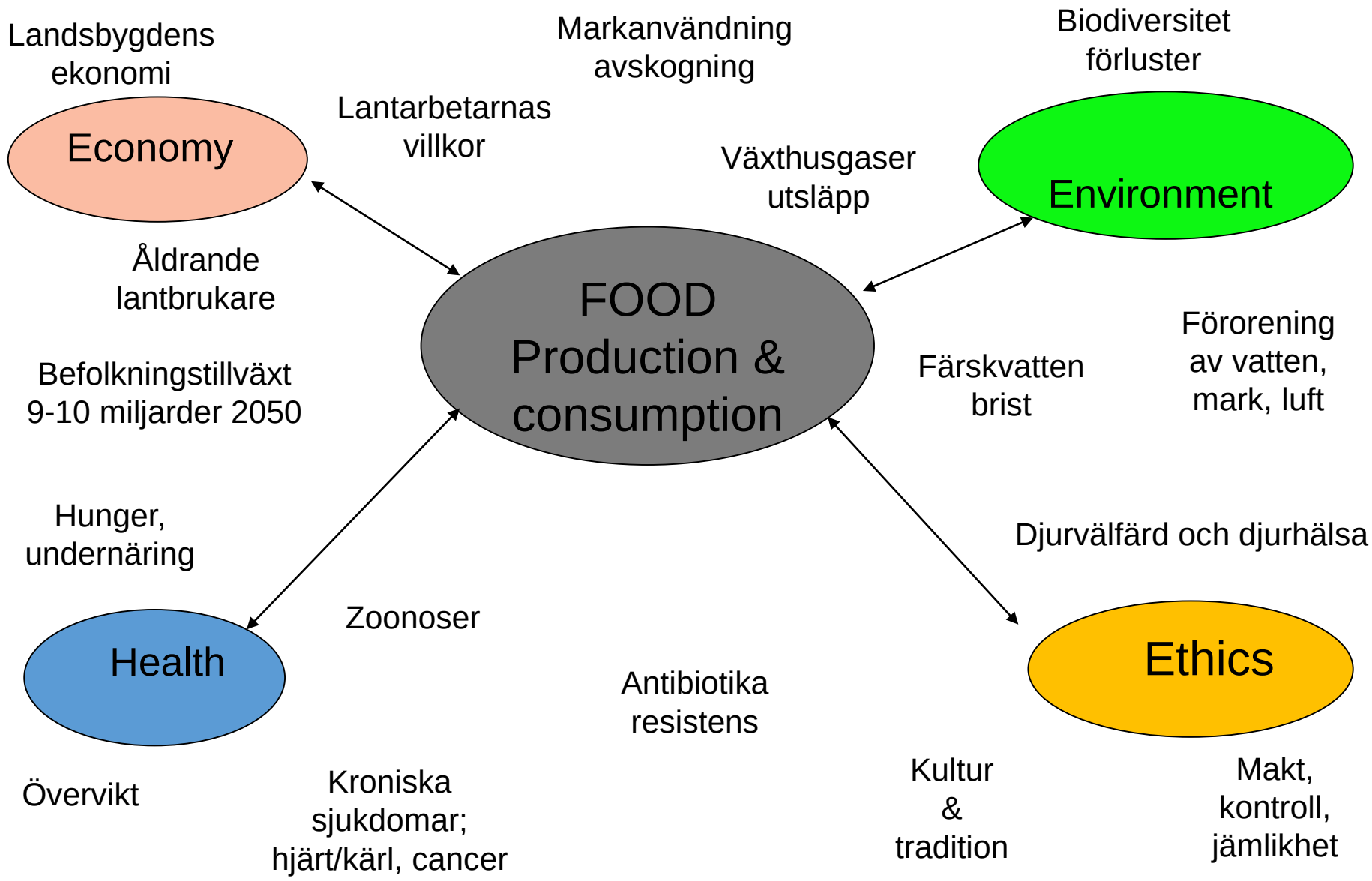
Small-scale agriculture provides subsist-

Citation:

"The emphasis on yields or profits per hectare is as reductive and distorting as is gross domestic product, with its disregard for social and natural capital.

Food metrics must be urgently overhauled or the United Nations' Sustainable Development Goals will never be achieved."

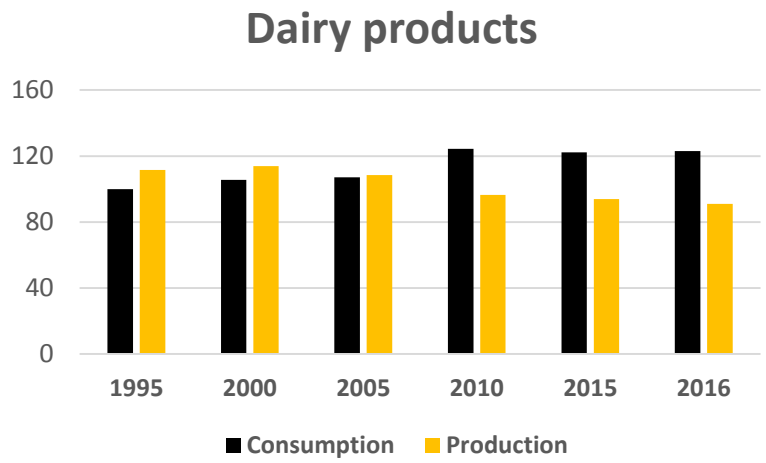
Sustainable Food Systems– the Complex Picture

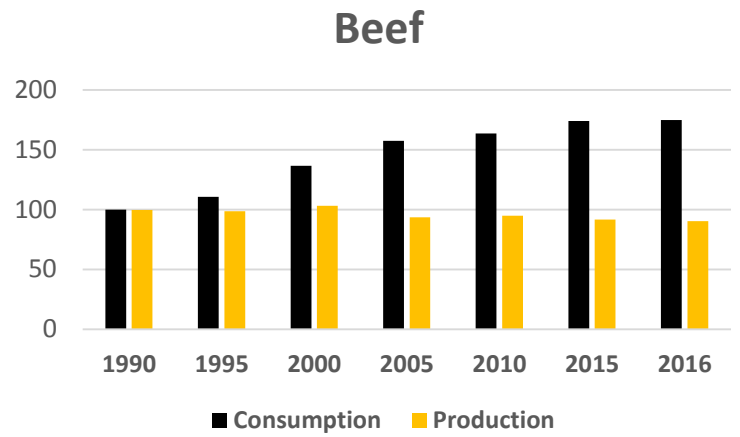


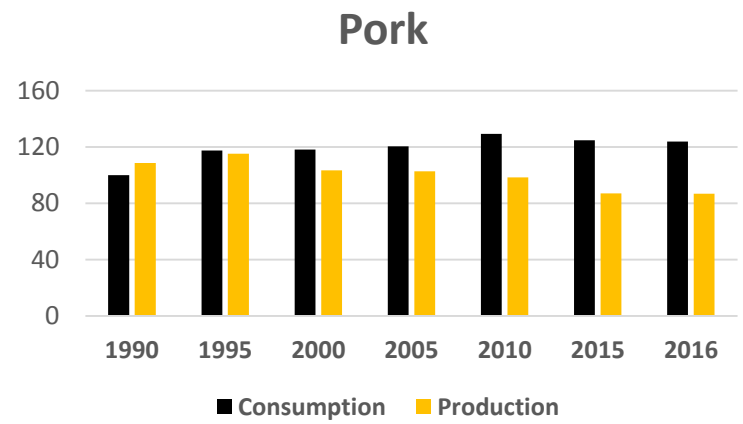
Outline

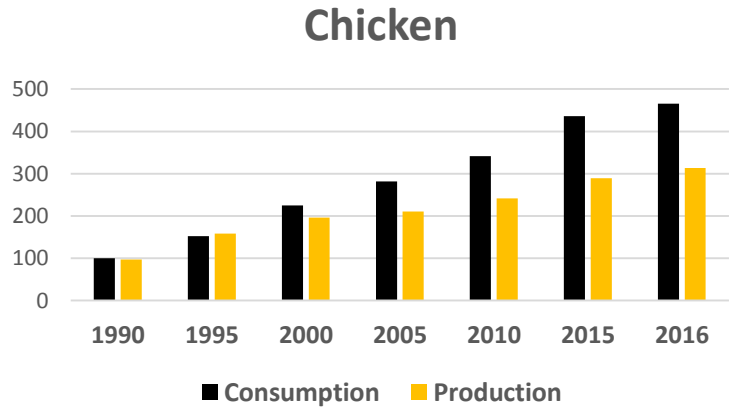
- Large deficit in Swedish food trade – some backdrops
- Short on Swedish environmental policy and motivation for the research project ”Prince”
- The challenge in ”Prince” of calculating Swedish food consumption´s pesticide footprint
- Results and discussions from the ”Prince” project

Changes in consumption and production of animal food in Sverige, 1990-2016. Consumption 1990=index 100



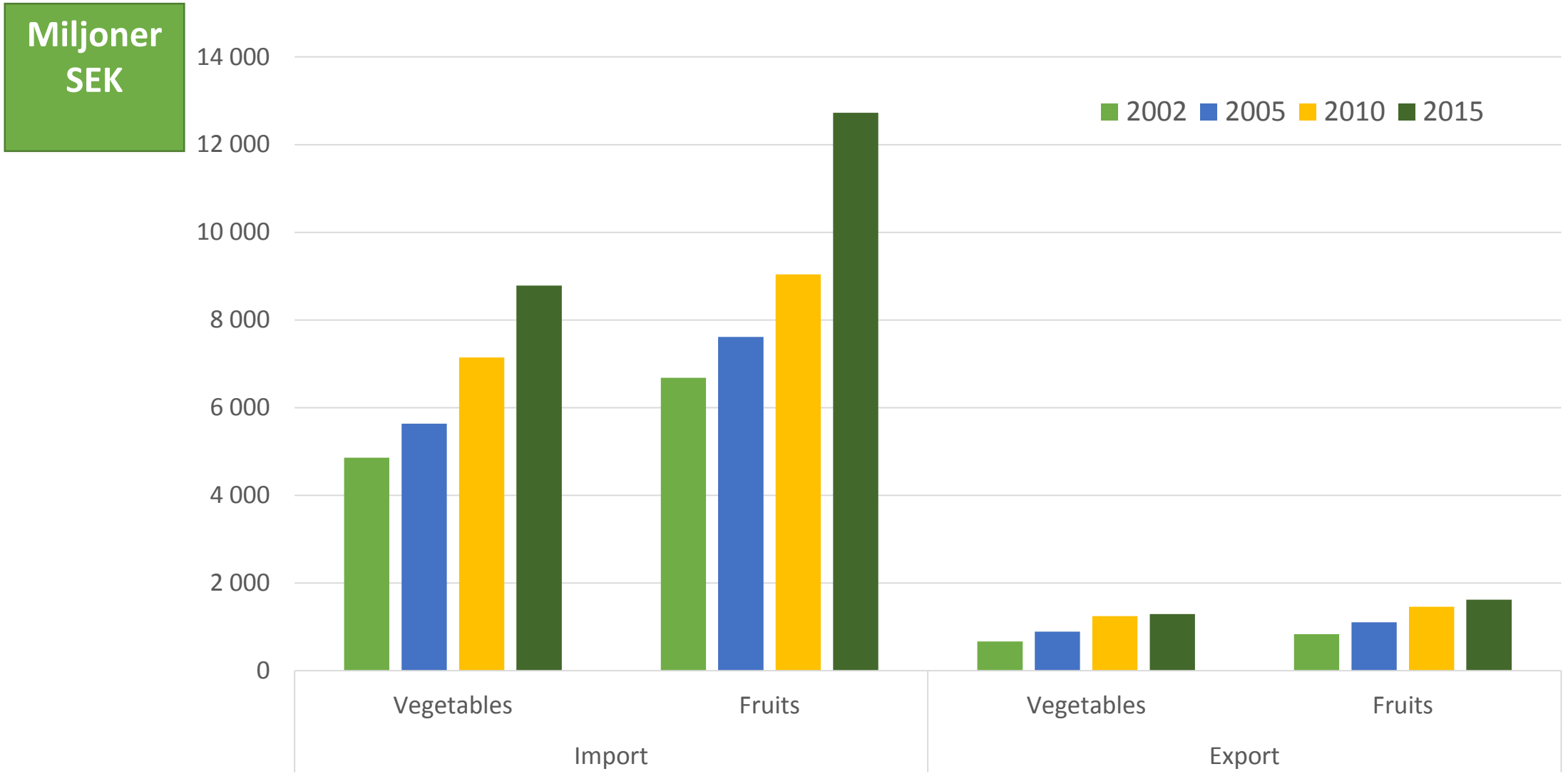






Källa: Jordbruksverkets marknadsbalanser, mjölk, nötkött, gris, matfågel

Sweden´s import and export of vegetables & fruits miljoner SEK, 2002 - 2015



Short on Swedish environmental policy and the motivation for the research project ”Prince”

SWEDEN'S ENVIRONMENTAL OBJECTIVES

Reduced Climate Impact

Non-toxic Environment

Zero Eutrophication

A Varied Agricultural Landscape

- The Swedish Parliament has set 16 environmental objectives to promote sustainable development
- These goals guide environmental efforts in Sweden. They point the way to a sustainable society

The Generational Goal

"The overarching goal of environmental policy is to leave for the next generation a society where the biggest environmental problems are solved, *without causing increased environmental and health problems outside Sweden's borders*"

PRINCE (Policy-Relevant Indicators for National Consumption and Environment)

- Aim is to develop a new framework for monitoring the environmental impacts linked to Swedish consumption – both inside and outside Sweden's borders – using the latest modelling and statistical techniques.

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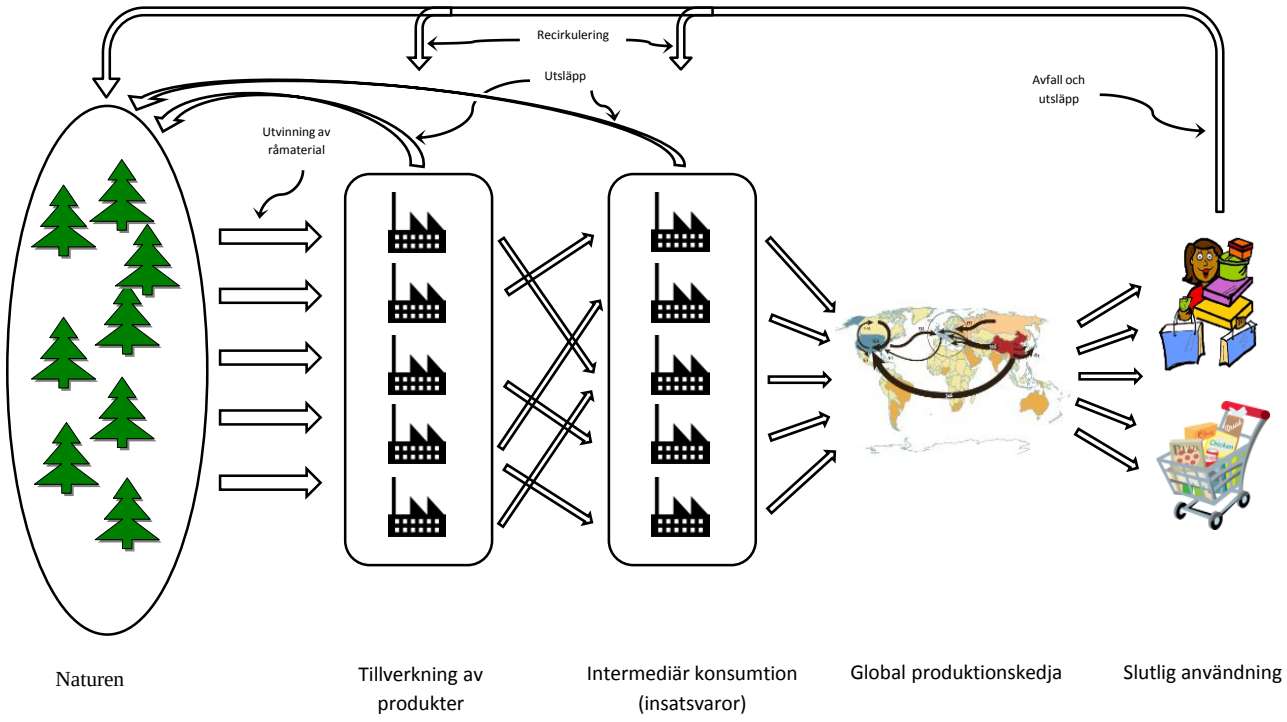
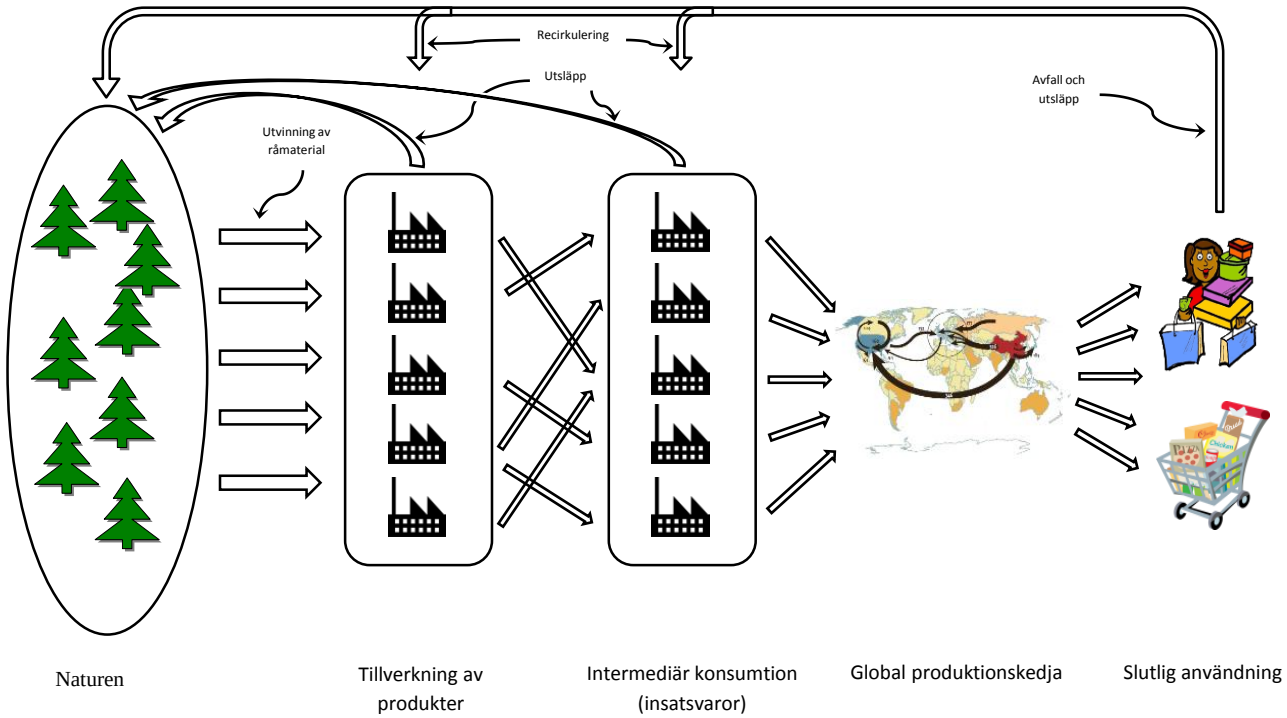
Environmentally Extended Multi-Regional Input/Output Analysis, EE MRIO

- Input-output analysis method for describing countries´ (regions´) economy
- Describes how different sectors in society trade with each other
- ”If we consume a product in Sweden, what production is required in different sectors”?
- Input/Output analysis used in economic accounts in many countries.



Environmentally Extentended Multi-Regional Input/Output Analysis (EE-MRIO)

- In Environmental Expanded Input-Output analysis environmental data are included for different sector, e.g. emission of pollutants.
- Multi-Regional Analysis shows how different countries (regions) trade with each other
- EE-MRIO makes is possible to study how consumption of a production in Sweden leads to emisssion in different sectors in different countries.



EXIOBASE3 EE-MIRO modell developed in the EU (Stadtler et al. 2018)

- 44 countries + 5 Rest-of-the-World-regions
- Agriculture: 8 crop-sectors, 6 animal-sectors, 1 fish
- Food: 11 sectors including beverages

- Environmental data for e.g. GHG-emissions and water-, energy & resource use
- In Prince-project we added environmental data on agro chemicals

The challenge in ”Prince” of calculating Swedish food consumption´s pesticide footprint

In the Prince project we wanted to investigate the pesticide footprint caused by Swedish food consumption

Use of Pesticides

Emissions…..

Many different situations ??

Impact Indicators (Metrics)?

Pesticide Footprint

Our question : What problems for environment and health from pesticide use due to Swedish food consumption?

Use of Pesticides

Emissions…..

Many different situations ??

Impact Indicators (Metrics)?

Pesticide Footprint

Compare Carbon Footprint calculation

Use of Fertilisers → Emissions of greenhouse gas, e.g. N2O → Metrics: GWP GTP → CO2-eqivalents

The indicator ”use of pesticides” is very early in the chain and gives limited information on impacts and effects of pesticides

USE of Pesticides

Emissions…..

Many different situations ??

Data?

Impact Indicators (Metrics)?

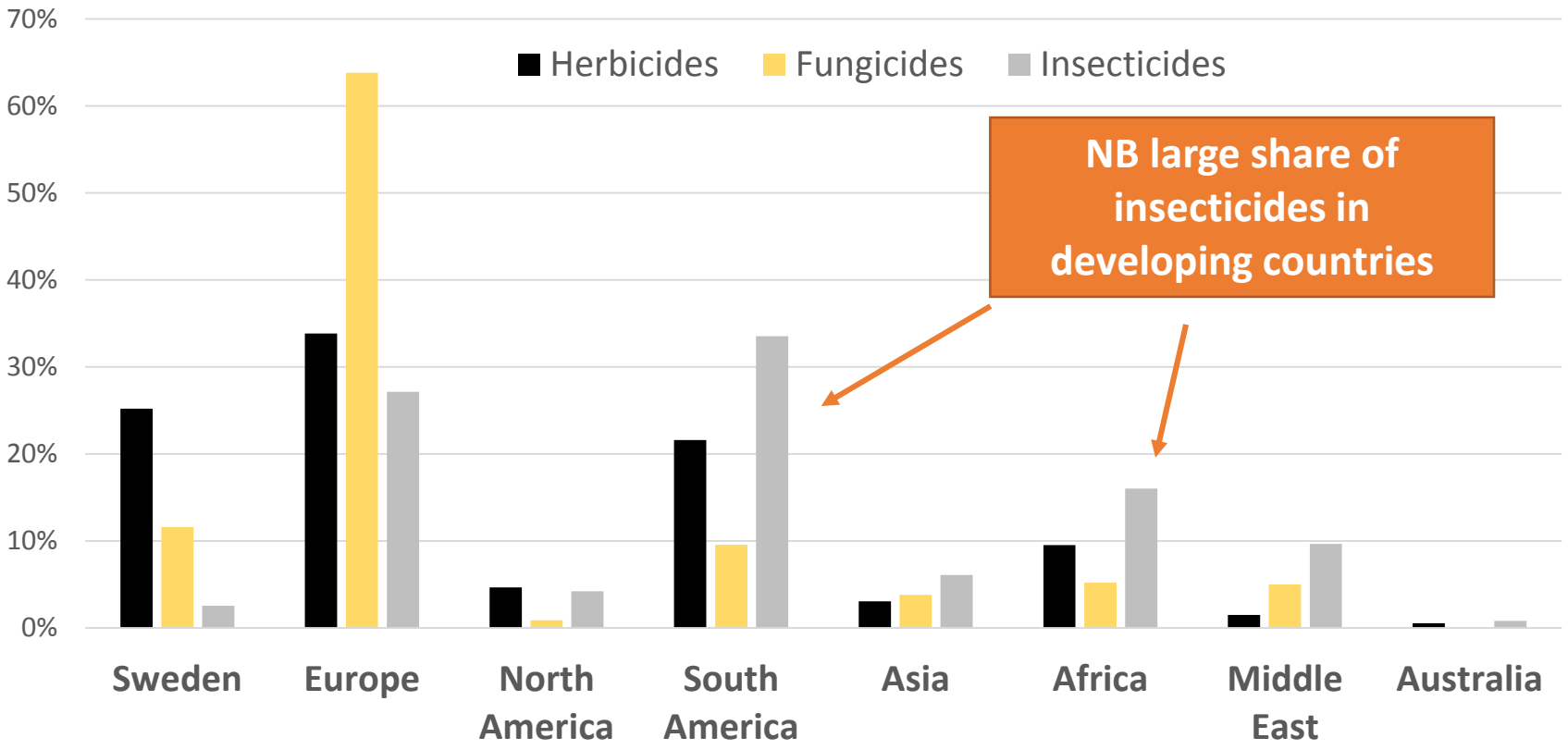
Data? Knowledge?

Pesticide Footprint

Environmental data for pesticides in PRINCE project

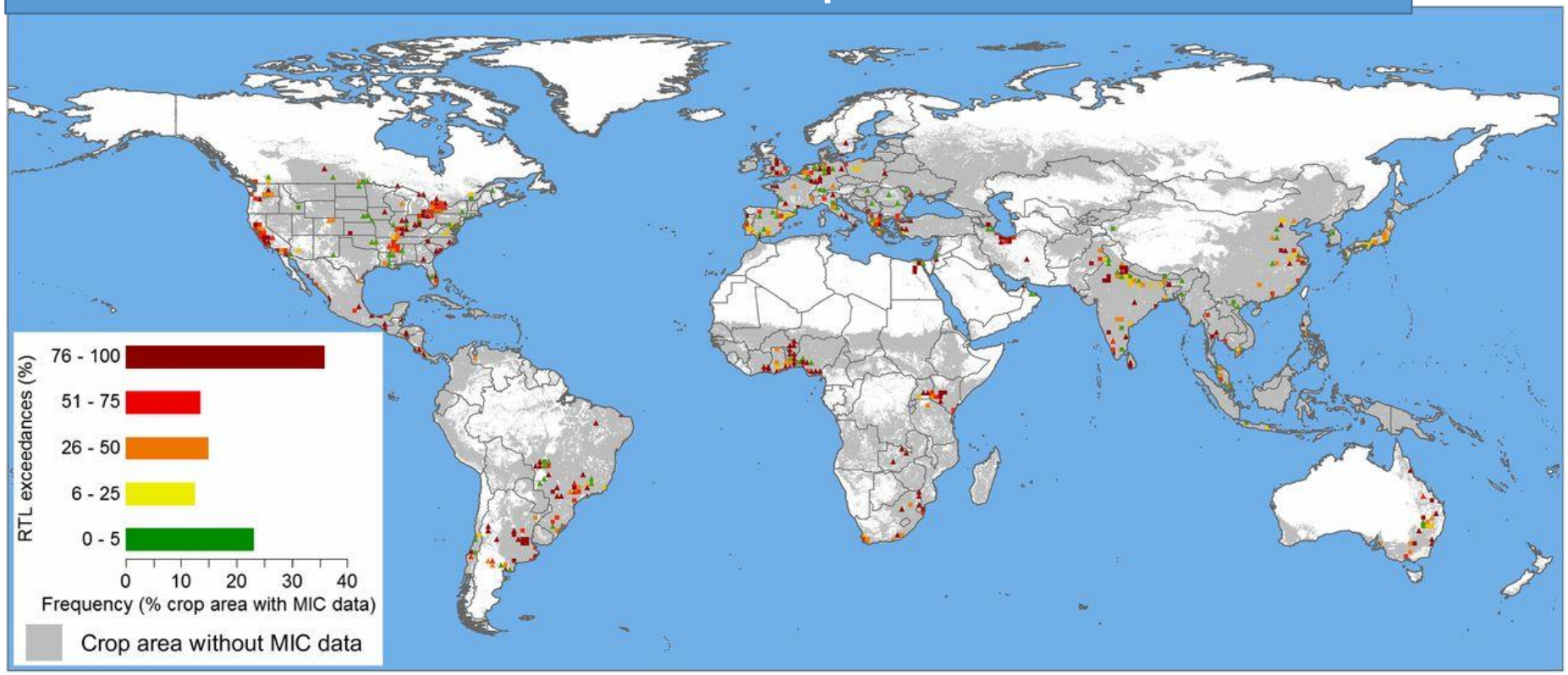
- Data from FAOSTAT on use of pesticides
- Only total use-data for countries, lacking data on individual substances and how substances were allocated to different crops.
- Moreover, lack of data on use of pesticides in FAOSTAT in surprisingly high for many countries

Regional distribution of pesticides used for Swedish food consumption



Global crop area and the distribution of regulatory threshold level (RTL) exceedance rates for reported measured insecticide concentrations (MICs, n = 10,659) aggregated in 1° grid cells.

Data on freshwater exposure for insectides residuals only for roughly 10 % of world cropland



Regulatory Threshold Level (RTL) exceedance rates

Sebastian Stehle, and Ralf Schulz PNAS 2015;112:18:5750-5755

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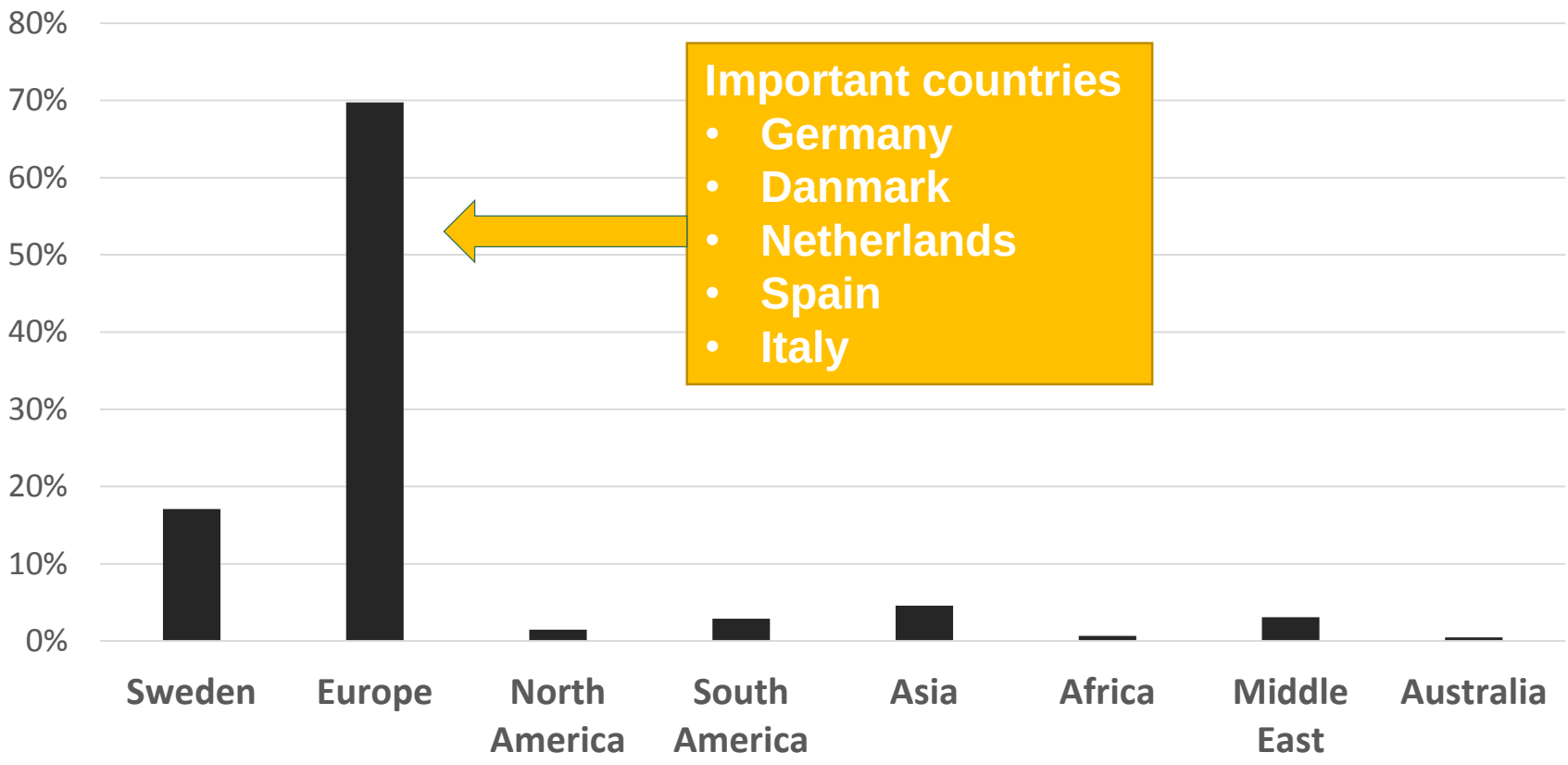
Results and discussions from the ”Prince” project

Veterinary antibiotics footprints

- Indicator: use ”ton active substans”
- Data from EMA (ESVAQ) for EU-countries
- Countries outside Europe, assumed use as European average

Regional distribution of veterinary antibiotics footprint from Swedish food consumption



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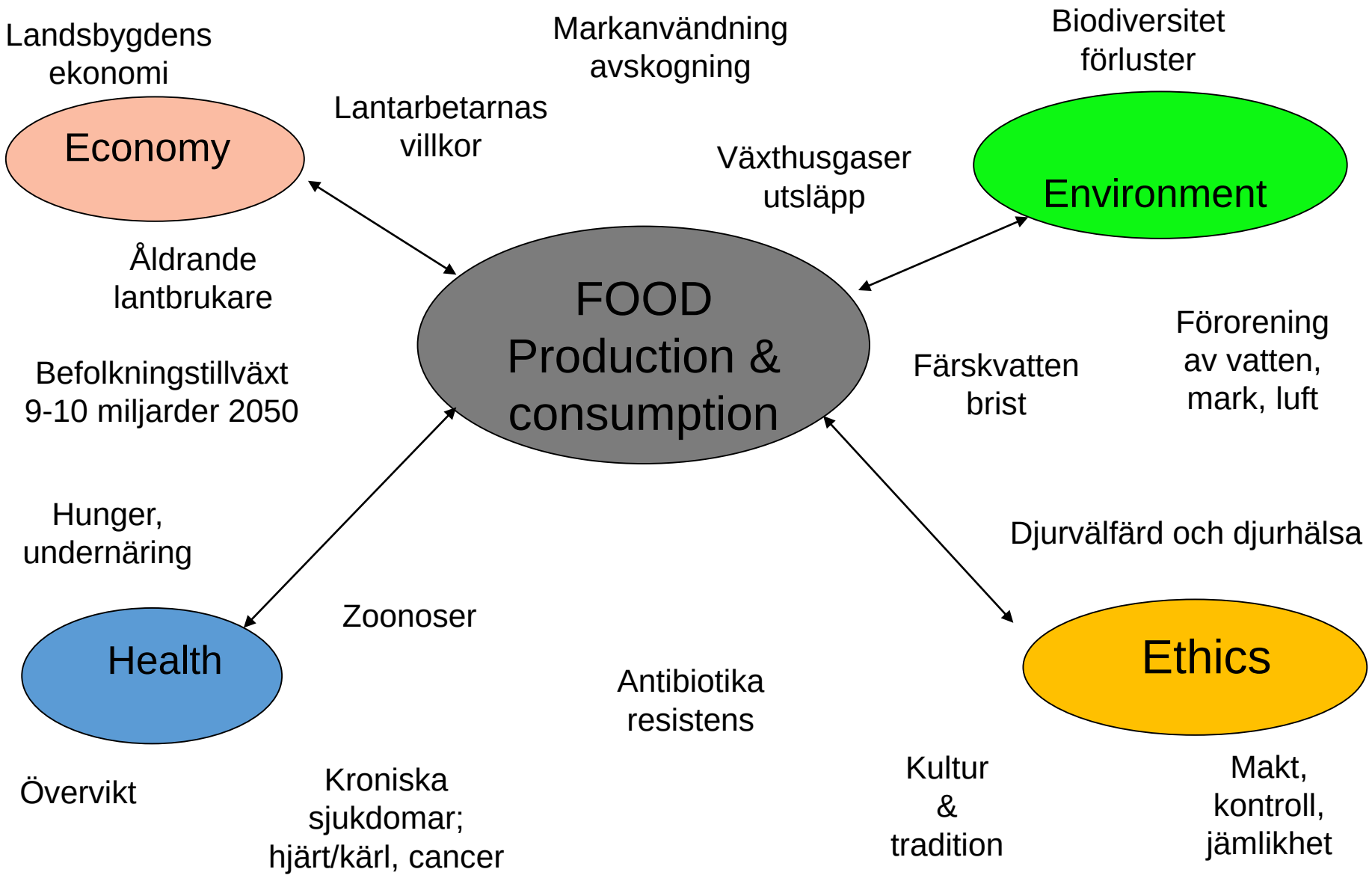

Thank you for your attention!

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