

**Livestock-Environment  
Interactions  
in Industrial Livestock  
Production Systems**

# Characteristics of Industrial Production Systems

- land-detached (feed, waste), mostly urban or peri-urban
- capital intensive, commercialised, large-scale
- single purpose
- efficient in resource use

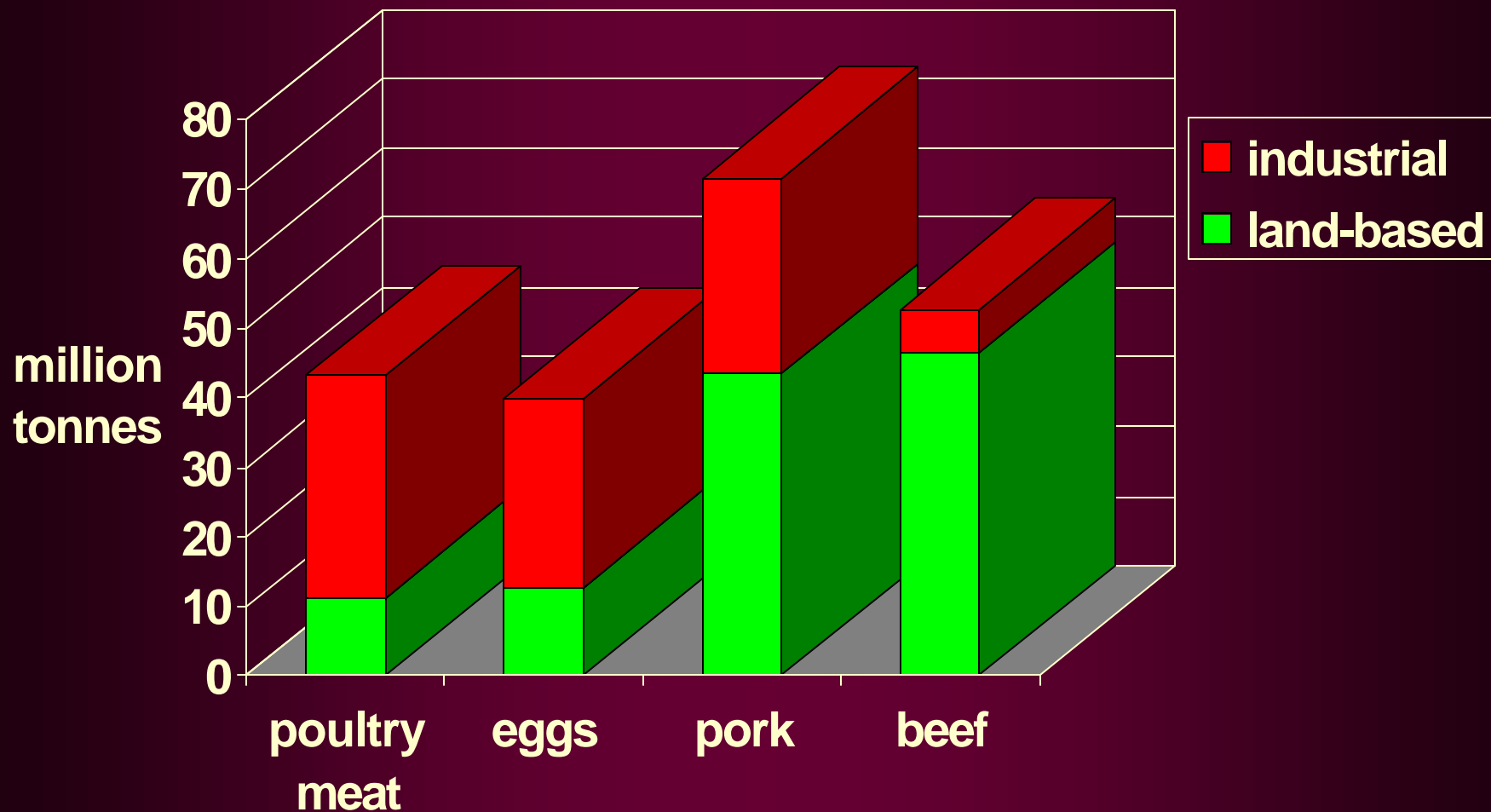
# Driving Forces

- Φ economic growth
- Φ increase in incomes (high income elasticity)
- Φ urbanization
- Φ policies

inability of land-based systems to satisfy  
surging demand

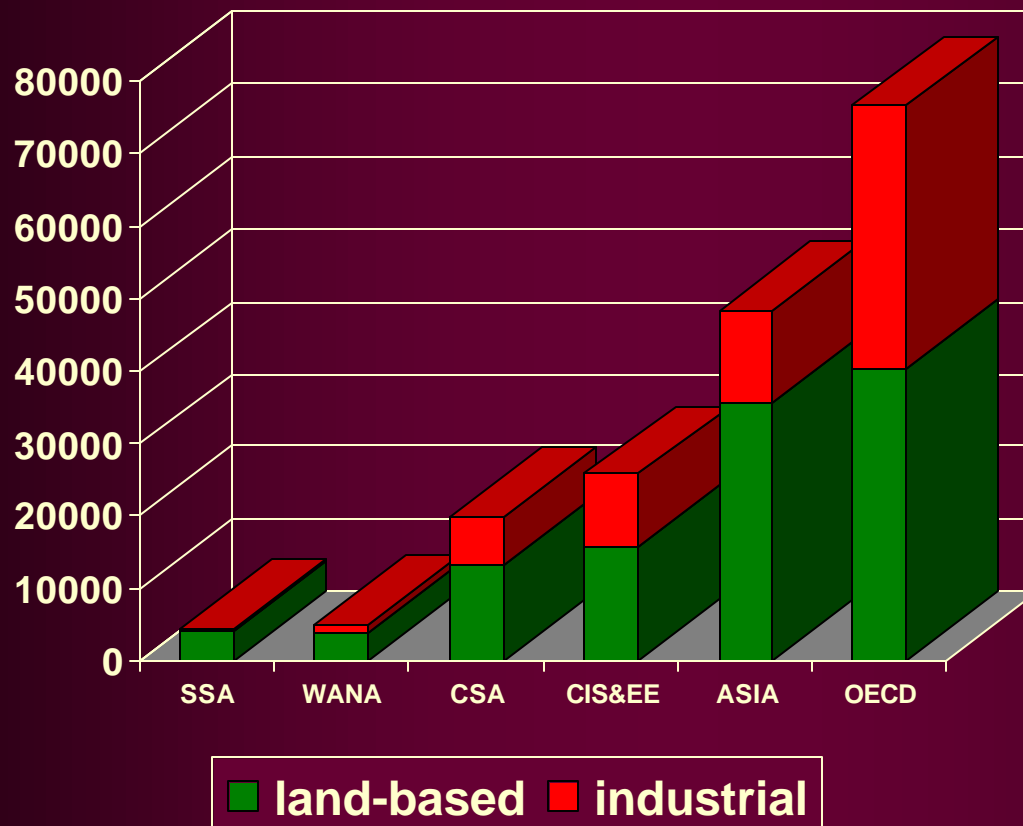
# Importance of industrial system

## Global production of animal products



# Importance of Industrial Systems by Region


Total meat production



## **Calculated Monogastric Density, by AEZ and Country, 1994**

Change in Monogastric Density  
by AEZ and Country 1962 to 1994

# Main Interactions

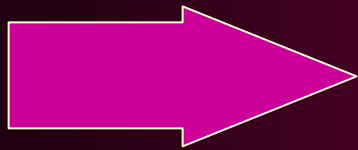
- Φ nutrient surplus (waste) feed-waste
- Φ impacts of concentrate  connection
- feed production

## Others:

- Φ gaseous emissions (of local and global impact): methane, ammonia, nitrous oxides
- Φ animal genetic resources

# Feed-Waste Connection

**It is cheaper to transport concentrate feed over large distances than meat or milk**



**Concentration of animals and animal waste near to consumption**

# Feed-Waste Connection (2)

Main causes for **concentration of animals**:

Φ infrastructure weaknesses (cold chain, transport costs)

Φ low level of regulations

⌊ **Nutrient surplus**

# Animal Waste

## Main environmental problems

- Φ **pollution of soils** with nitrates, phosphates, heavy metals; **pollution of surface waters** (eutrophication)
- Φ **pollution of groundwater** (often long term)
- Φ **gaseous emissions** (ammonia, methane, nitrous oxides)
- Φ changes in, and loss of **habitats and biodiversity**

# Animal Waste: Dimension of the Problem

Country	Nitrogen surplus (kg/ha agric. Land)	Manure input (in percent of total)
Netherlands	305	58
Belgium	171	53
Japan	159	42

# Demand for Feed Grains

Can be met through:

⊇ expansion of crop area

⊄ intensification of land use

| losses in bio-diversity, soil, water

| fossil fuel, CO<sub>2</sub>

# World Cereal Production

cereals	1995	change 1980-1995
production	1,884 million tonnes	+19.7 %
area	686 million ha	-4.4 %
yield	2,747 kg/ha	+25.2 %

# Nutrient Deficits

Growing deficits in major grain/feed producing areas. Examples:

- one third of maize growing areas in the five top **US**-states have acute N-deficiencies
- one third of total cereal area in **Australia** is seriously deficient in nitrogen ( no gains in yields in 40 years)
- developing countries: **Thailand, Brazil, Mexico**

## Feed-Waste Connection (3)

**It is cheaper to transport concentrate feed over large distances than meat or milk**

**But:**

- Where waste has to be recycled it is cheaper to produce meat or milk where feed is produced.

# Slaughterhouse Waste

constitutes a major environmental and public health problem, particularly in developing countries

## Main causes:

- Φ concentration of animals
- Φ weak institutions and lack of regulations
- Φ lack of incentives for waste utilization
- Φ lack of know how

# Animal Genetic Resources

- Φ Industrial system uses uniform genetic stock favouring within-breed genetic erosion
- Φ The growth of industrial system causes both within-breed and within-species losses

## **BUT:**

- Φ uniformity fosters efficiency; helps to save (and spare) natural resources

# Policies

Objective: facilitate technology adoption which enhances efficiency; better geographical spread:

- Φ removal of subsidies and protection
- Φ astute pricing (for higher resource use efficiency)
- Φ zoning
- Φ infrastructure development
- Φ regulations (quantitative limits, prescription of methods)

# Technologies (I)

## **(1) Improve efficiency of feed conversion:**

- Φ feeds and feeding (multi-phase feeding, feed composition, enzymes)
- Φ genetic improvements
- Φ animal husbandry

## **(2) Improve efficiency of feed production**

# Technologies (II)

## **(3) Reduce emissions from waste**

- Φ storage (cover storage facilities)
- Φ manure application (timing, method of application)
- Φ filters (to reduce odour and ammonia emissions)

## **(4) Re-use waste**

- Φ as feed, fuel (biogas) or fertilizer

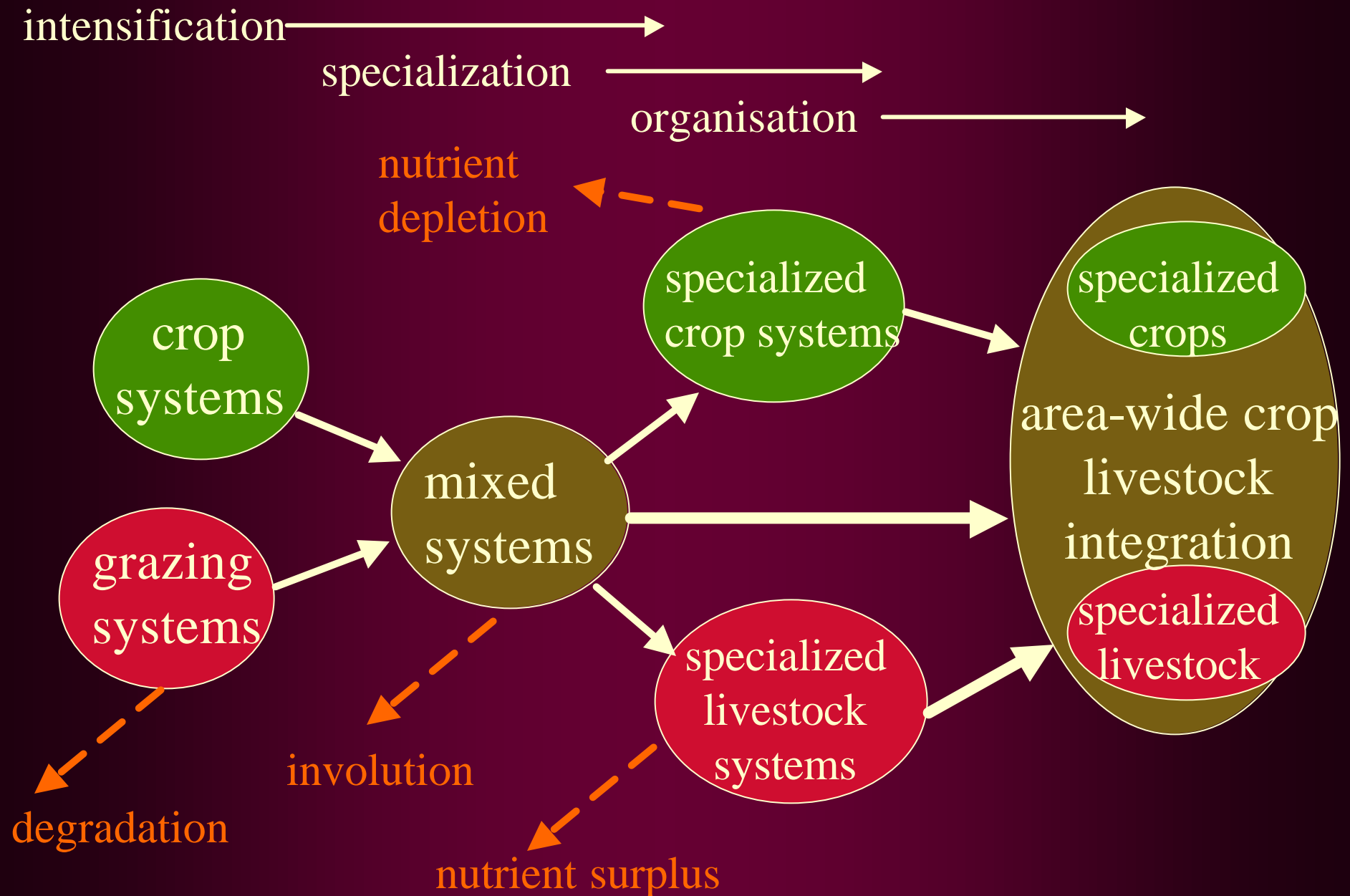
# Main conclusions

Problem: geographic concentration of production - not the technology used

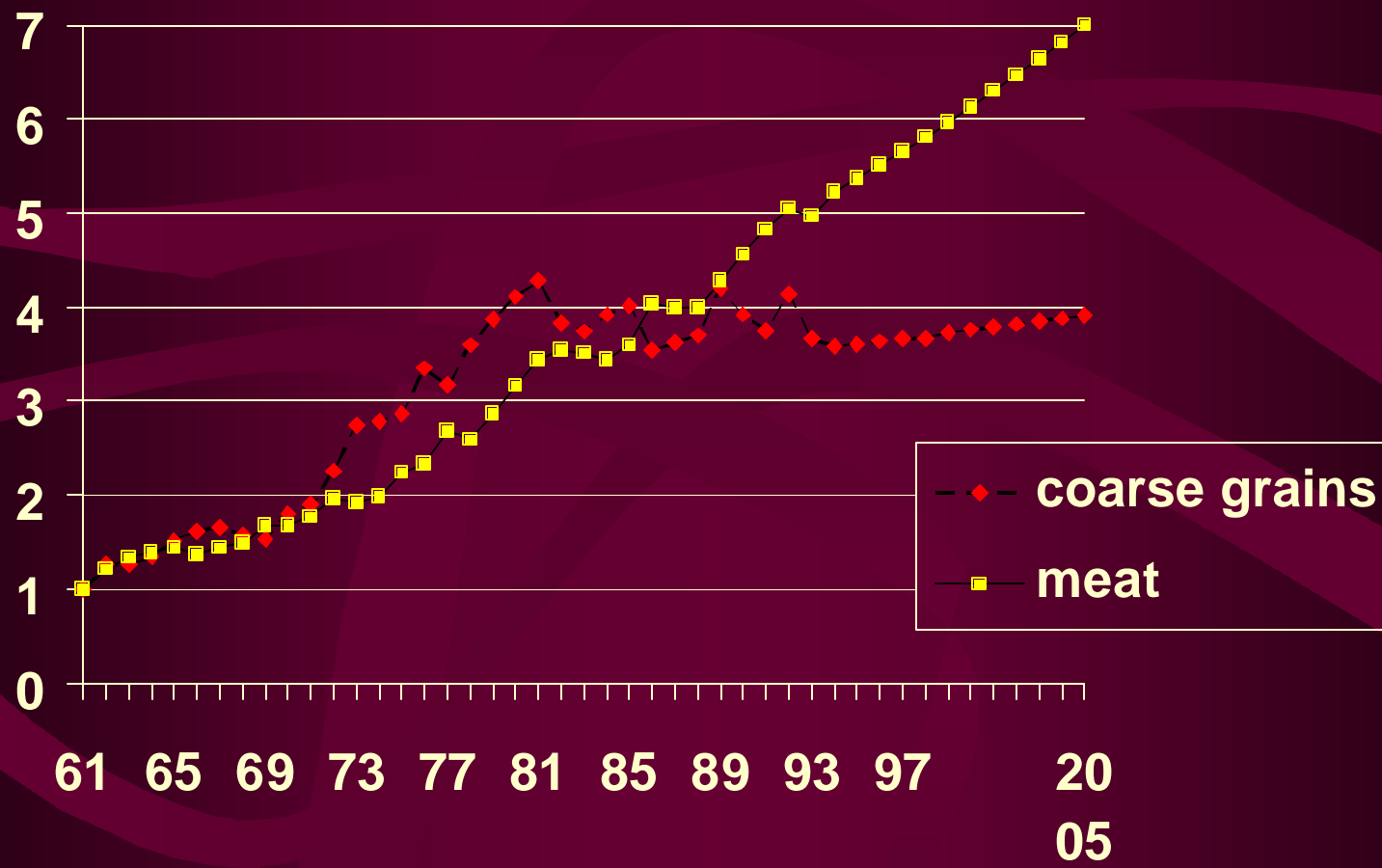
Two **imperatives**:

- Φ improve **efficiencies** in order to reduce land requirements for livestock production;
- Φ **area-wide integration** of specialized crop and livestock enterprises to blend resource use efficiencies with assimilative and productive capacities of land.

# Livestock Systems Development Pathways



# International Trade in Meat and in Coarse Grains (Indices)



## Main Conclusions (2)

**Area-wide integration** of specialized crop and livestock activities:

- most rational form of resource use (economic and environmental benefits)
- rural based livestock production (social benefits - employment, income)
- will be mainstream agriculture in the next century globally