

CLIMATE
AND
AGRICULTURE

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1. Social problems occurring due to climate change

Agricultural production. Drinking water supplies. Seawater flooding. Problems between the generations.

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3. Climate change in Hungary

Impact assessment of ecological factors. Biodiversity. Change of climatic elements in Hungary in the context of global climate change. Impact areas.

5. Climate risks in agriculture

5.1. Hungary

Challenges of food security. Water use. Responses and Challenges. Environmental and social context of agricultural production. Food safety: possibilities. Adapting to climate change.

5.2. EU countries

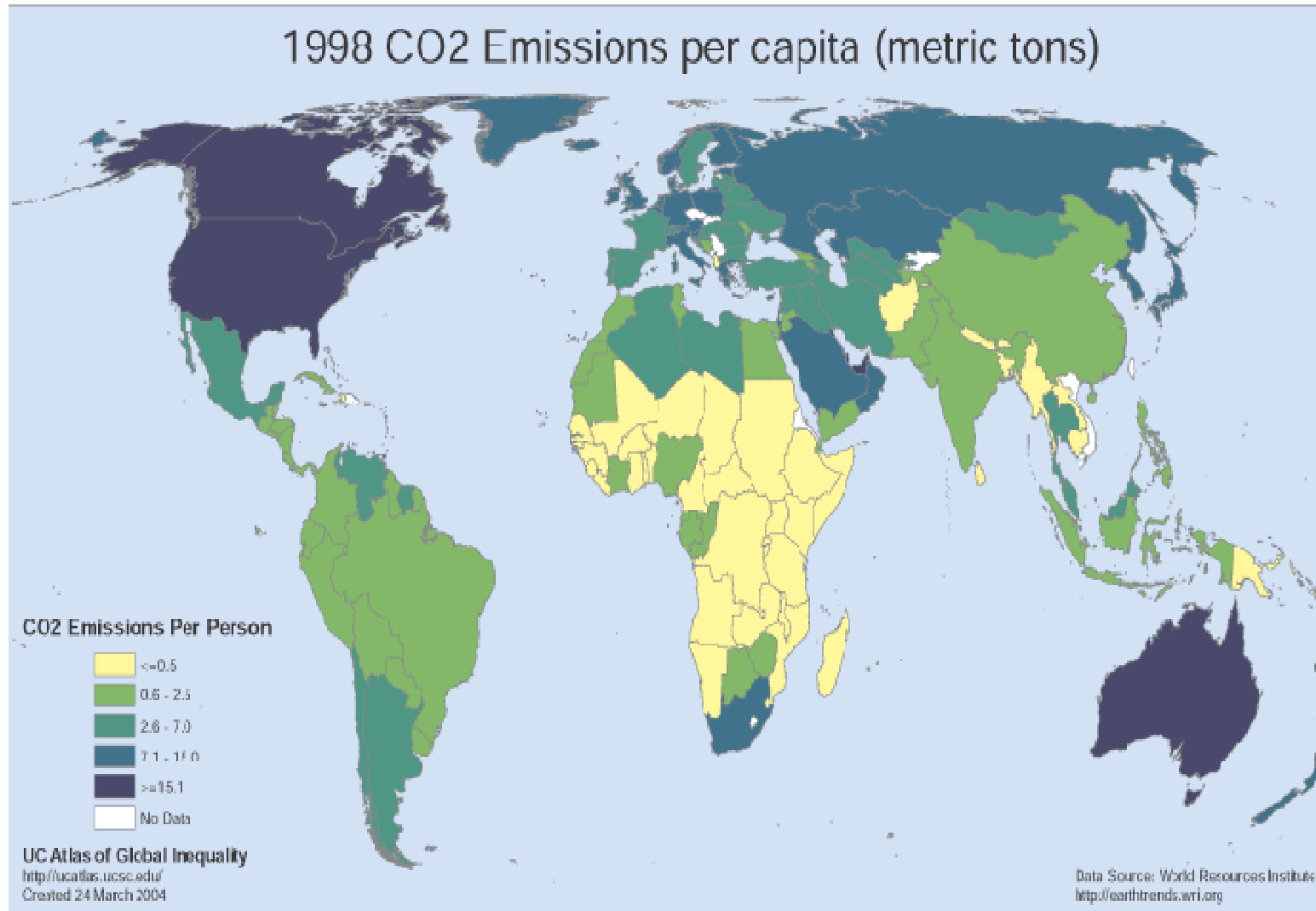
Interaction of agriculture and climate change. Agricultural aspects of climate change in the European Union.

6. Summary

Consequences of the climate change

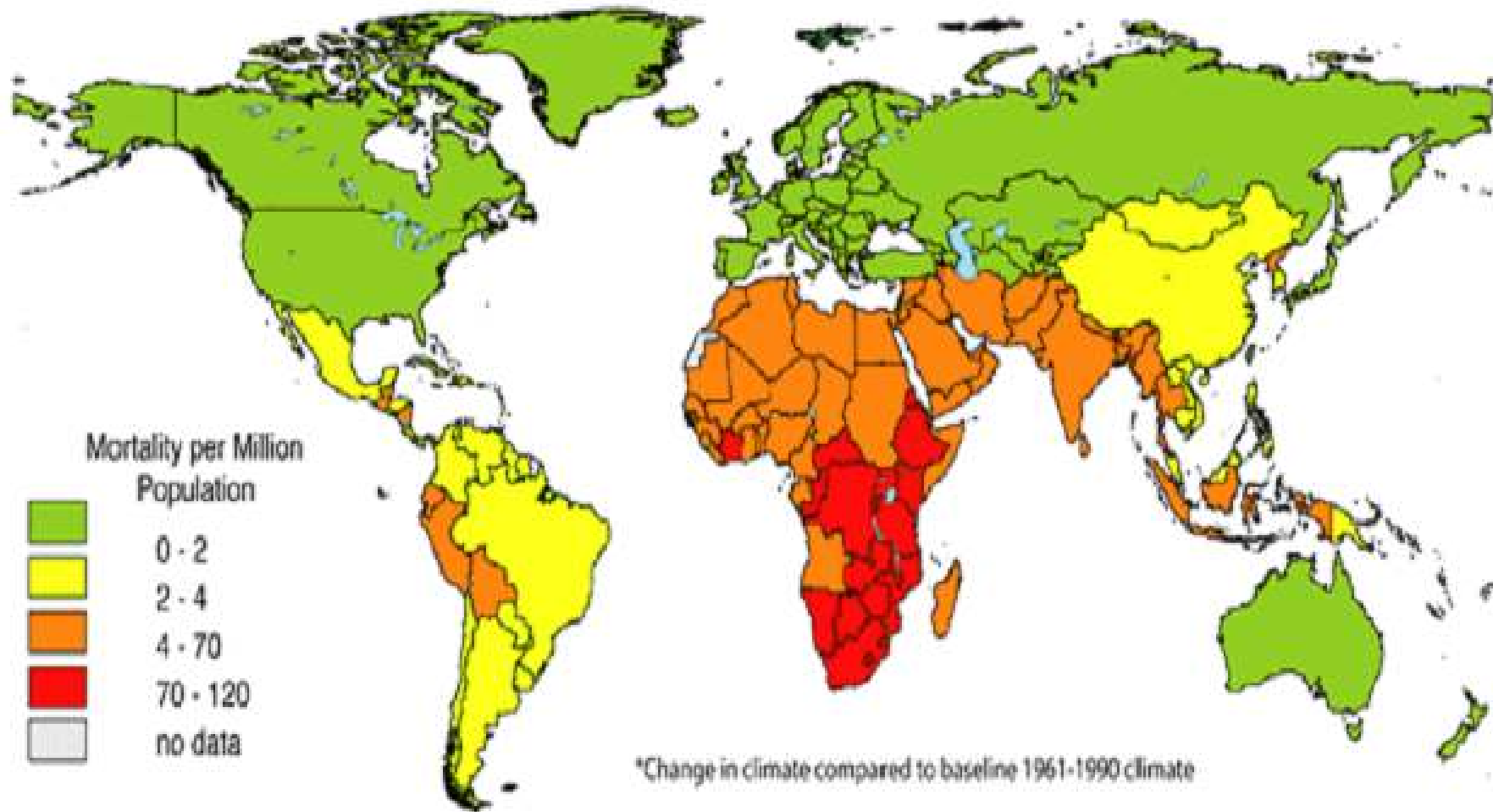
- The global sea level rises 1-2 mm per year
- Ice sheet of the rivers and lakes fell two weeks in the northern hemisphere
- The Arctic ice sheet thinned considerably, its extent decreased by 10-15%
- The extent of permafrost decreased both in the polar and subpolar region and in the mountainous areas
- The growing season extended by 1-4 days in the northern hemisphere
- A continental glaciers retreated each continent
- The zones of plants and animals move to higher latitudes
- The territory of snow cover decreased by 10%
- The flowering starts earlier
- Coral reefs turns white

Who has emitted the most carbon-dioxide up to the present?



Who bears most the consequences?

Estimated Deaths Attributed to Climate Change in the Year 2000, by Subregion*



The impact of climate change on agriculture

- The growing season is extended in the higher latitudes
- The minimum temperature is rising (this is favourable for the growth of crops, outbreak of pests and pathological changes of the species)
- The continent is becoming drier over the mid-latitudes (?)
- The date of the river floods is shifting in the middle and higher latitudes (water resources, etc.).
- The frequency and intensity of heat waves is changing; the number of frost days is also changing
- The extent of areas threatened by drought is changing

How climate change affects agriculture of the tropical and subtropical regions?

It is likely that the increasing concentration of CO₂ in the atmosphere causes significant changes in the distribution and intensity of rainfall in the tropics over the the next 50 years, including the following:

- Changes in the annual cycle of precipitation over the tropics:
 - Spatial and temporal structure of the monsoons will change significantly (for example, currently dry areas become wet, the cycle of monsoon will also change)
- Changes occur in ENSO, too
- Teleconnection systems of ENSO will also change
 - Spatial system, duration and intensity of droughts will change (worldwide).

Social problems caused by climate change

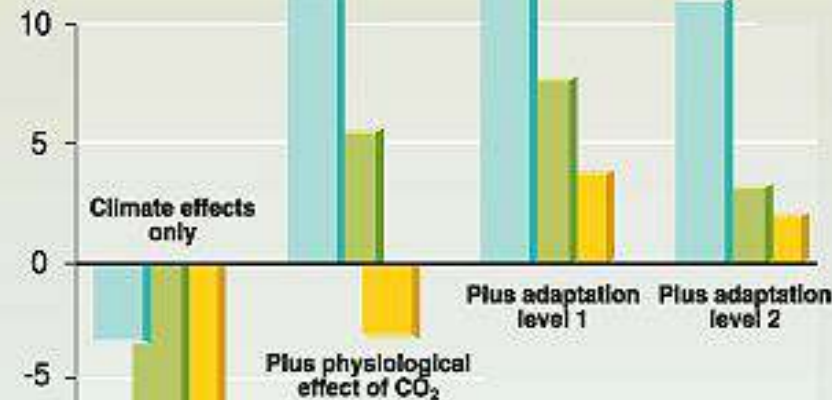
- Agricultural production
- Drinking water supplies
- Seawater flooding
- Problems between generations

Social problems caused by climate change

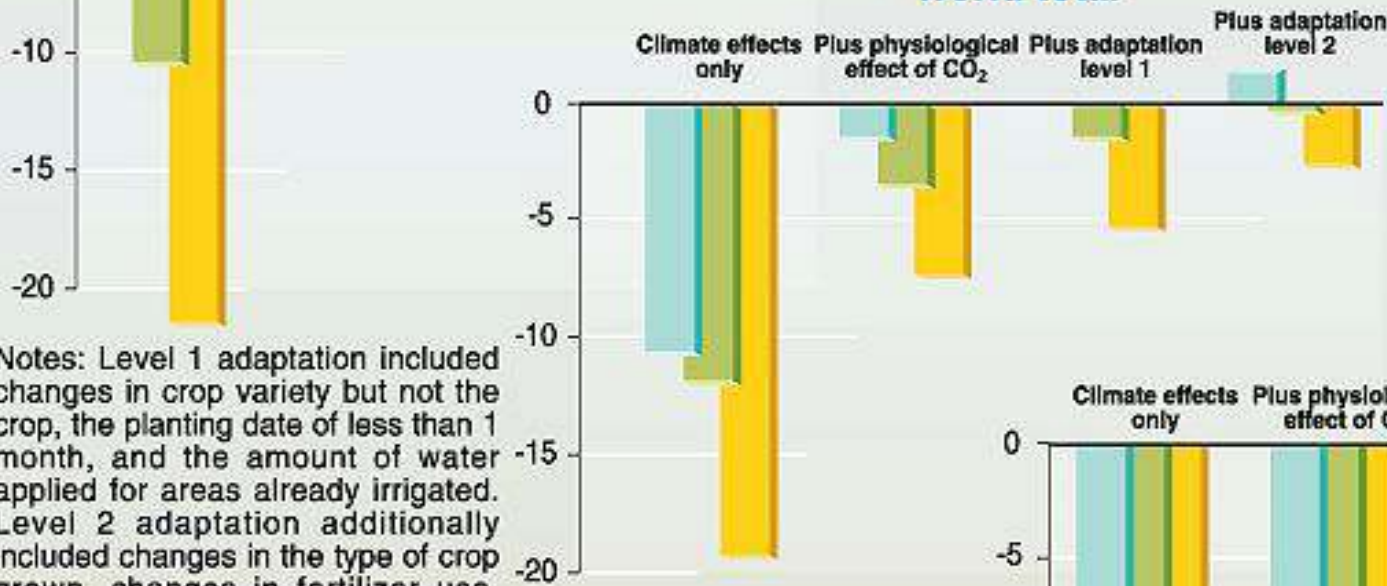
- **Agricultural production**
- Drinking water supplies
- Seawater flooding
- Problems between generations

Change in cereal production under three different GCM equilibrium scenarios in percent from base estimated in 2060

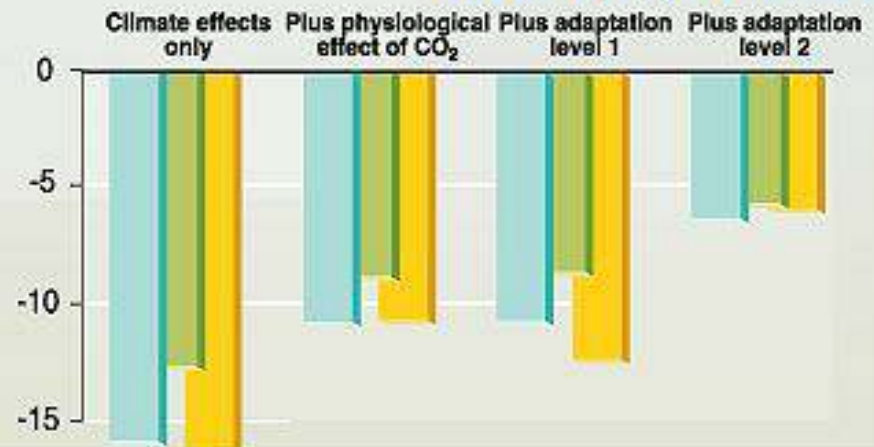
Developed countries



World total



Developing countries

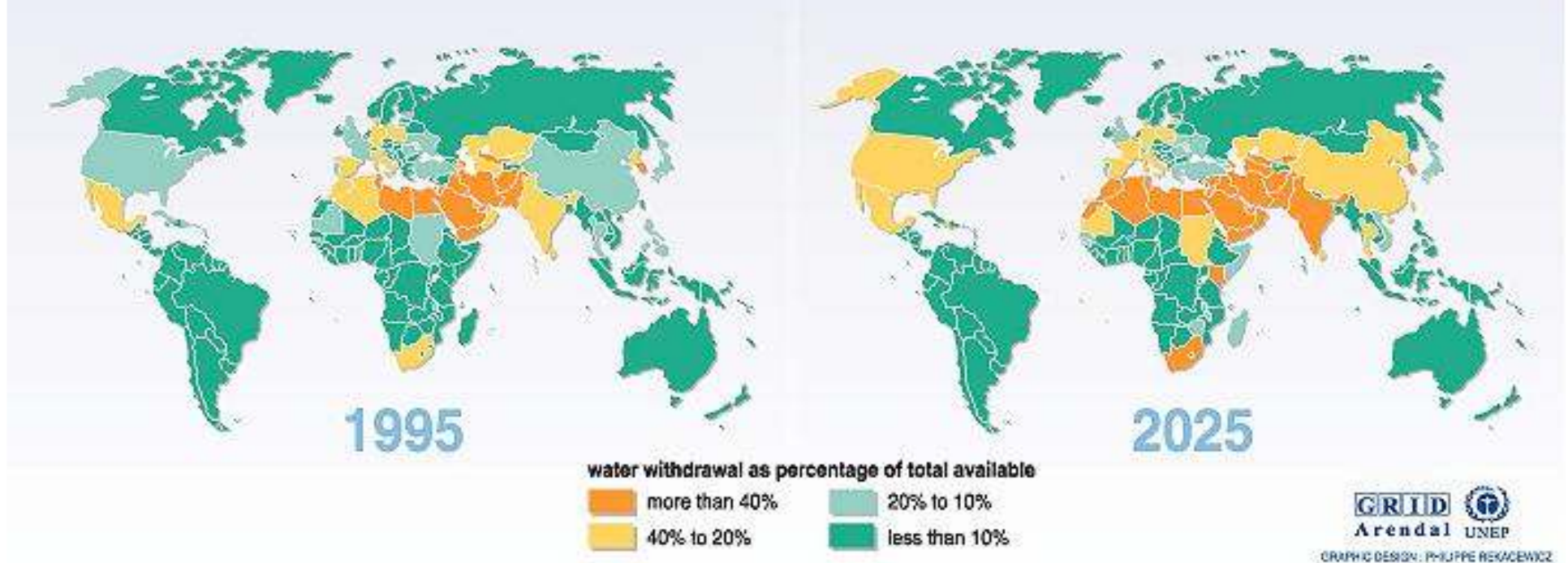


Notes: Level 1 adaptation included changes in crop variety but not the crop, the planting date of less than 1 month, and the amount of water applied for areas already irrigated. Level 2 adaptation additionally included changes in the type of crop grown, changes in fertilizer use, changes in the planting of more than 1 month, and extension of irrigation to previously unirrigated areas.

Social problems caused by climate change

- Agricultural production
- **Drinking water supplies**
- Seawater flooding
- Problems between generations

Freshwater stress

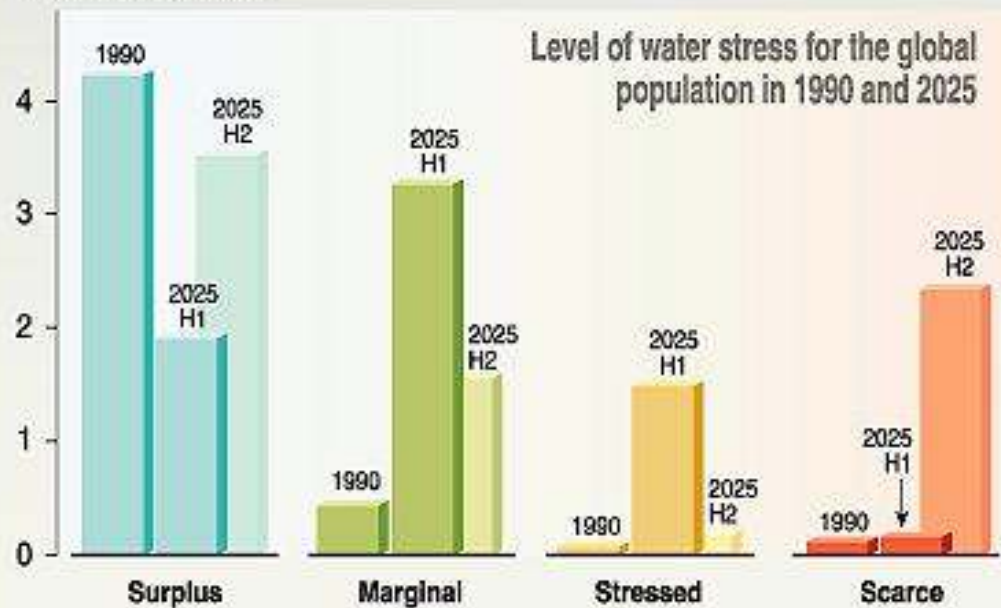


Source: Global environment outlook 2000 (GEO), UNEP, Earthscan, London, 1999.

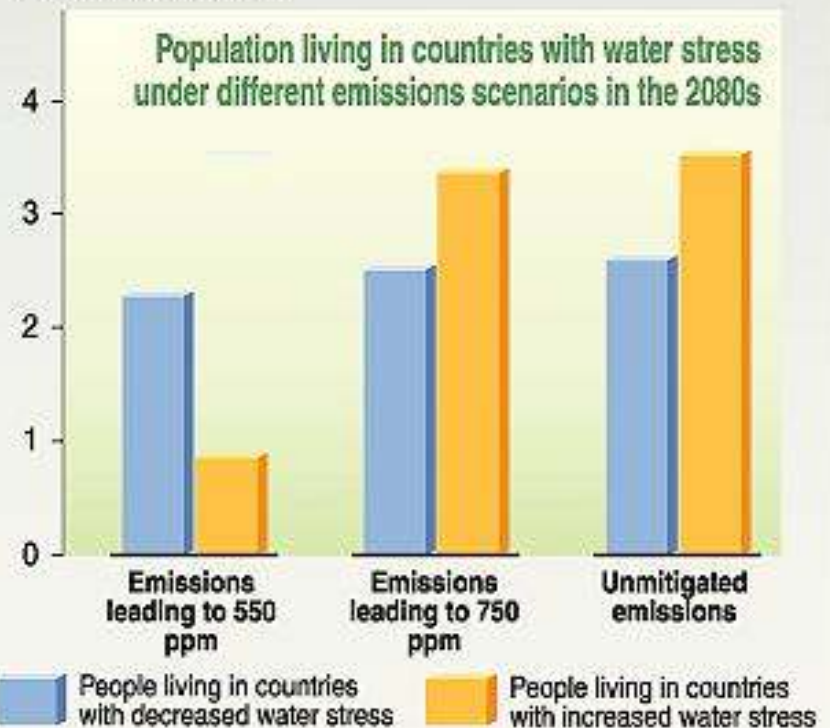
<http://www.grida.no/climate/vital/37.htm>

Freshwater stress: Current population at risk

Population (in billion)



Population (in billion)



H1 : Situation with no climate change
H2 : Situation in case of climate change

GRAPHIC DESIGN : PHILIPPE REKACEWICZ

Source: Climate change 1995, impacts, adaptations and mitigation of climate change: scientific-technical analyses, contribution of working group 2 to the second assessment report of the intergovernmental panel on climate change, UNEP and WMO, Cambridge press university, 1996; Climate change and its impacts, stabilisation of CO₂ in the atmosphere, Hadley centre for climate prediction and research, the meteorological office, London, 1999.

<http://www.grida.no/climate/vital/38.htm>

Social problems caused by climate change

- Agricultural production
- Drinking water supplies
- **Seawater flooding**
- Problems between generations

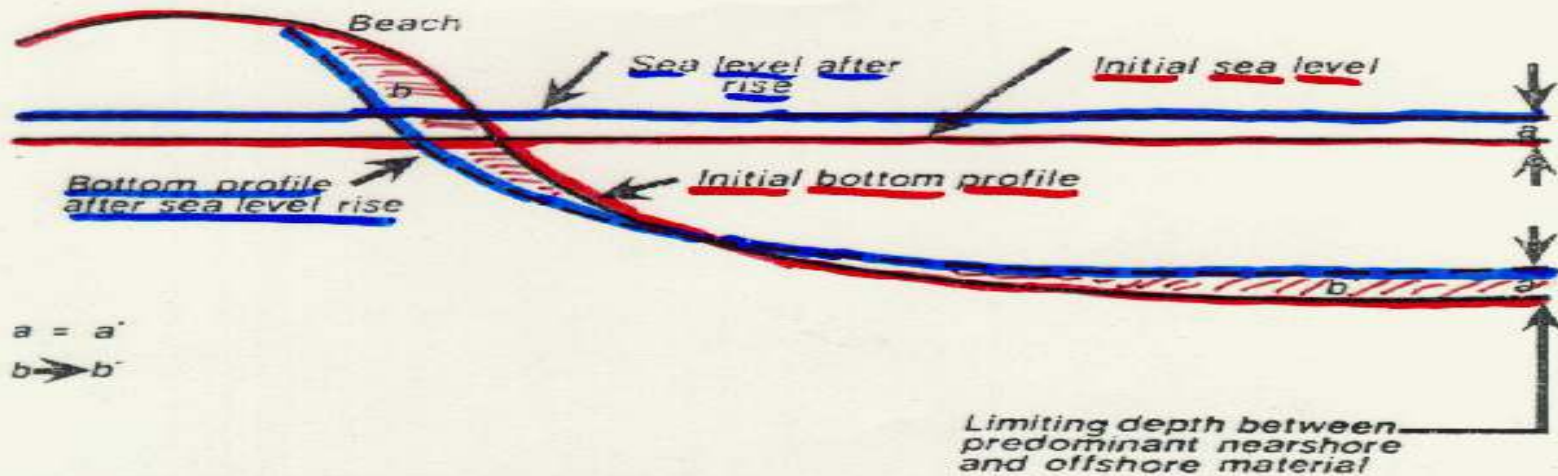
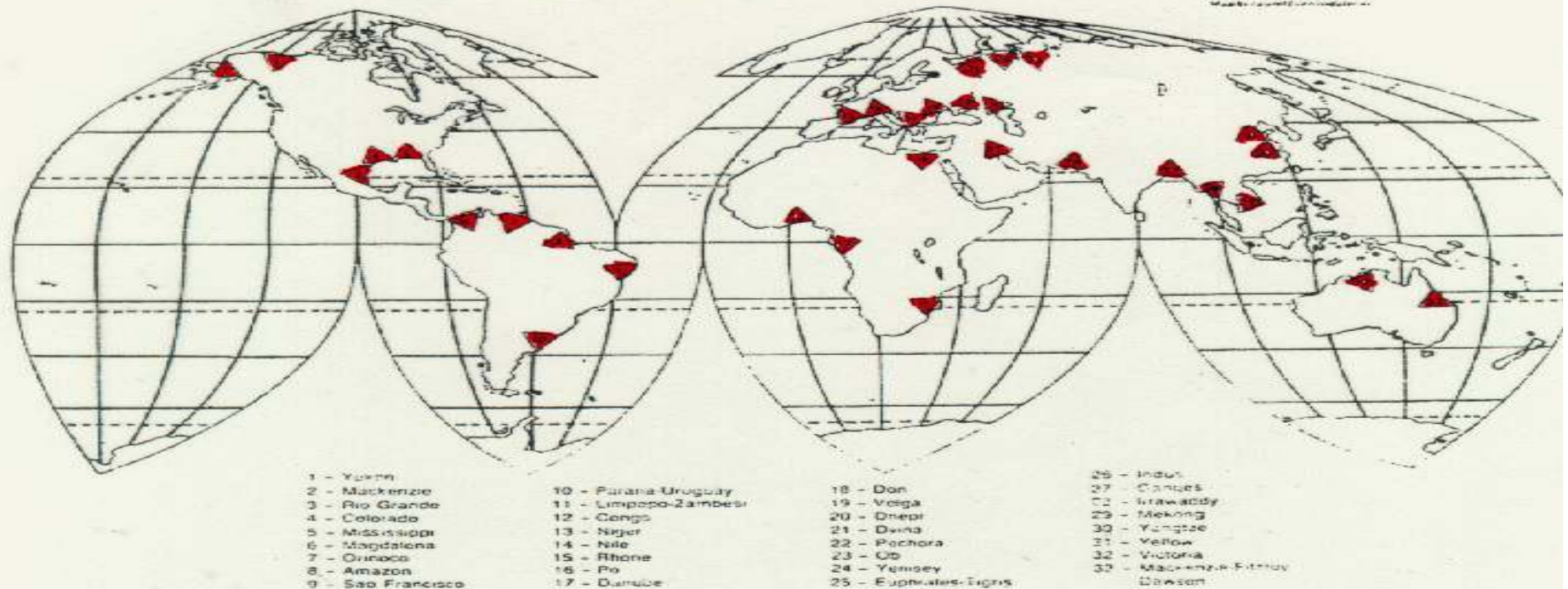


Fig. 3. The Bruun rule: a rise in sea level causes beach erosion. If the sea rises one foot, so will the offshore bottom. The sand necessary to raise the bottom (area b') can be supplied by artificial beach nourishment or by waves eroding the upper part of the beach (area b).
 Source: Titus *et al.*, 1987.

MAJOR DELTA AREAS VULNERABLE TO RISES IN SEA LEVEL





Seawater flooding Example: Maldives



- Area: 295 km²
- Population: 143.000 fő
- Highest elevation: 6,2 m above sea level



Social problems caused by climate change

- Agricultural production
- Drinking water supplies
- Seawater flooding
- **Problems between generations**

Problems between generations

- Sustainable development: "To live according to the present needs so as not to narrow the possibilities of future generations that they will live according to their own needs."
- Energy resources?
- Non-renewable Earth resources?
- Agricultural productivity?
- Sweet Water Resources?
- Heavy metal content of the soil and water?

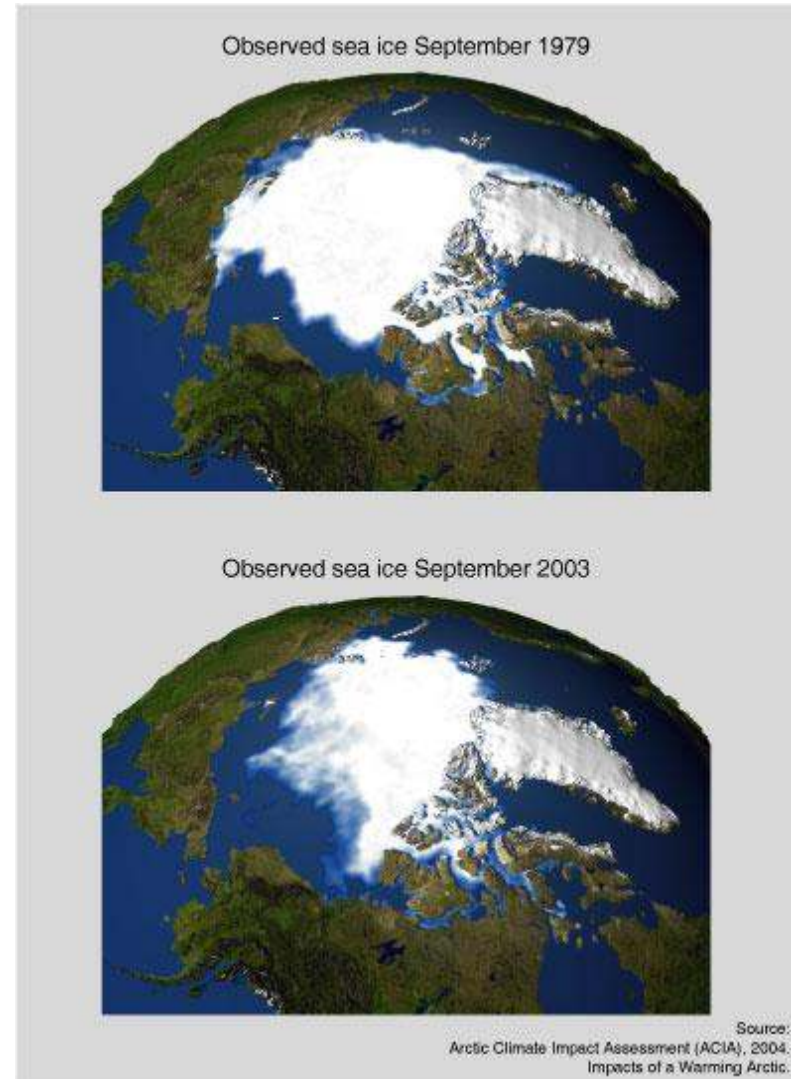
What are the consequences of climate change?

- Since the industrial revolution we influence our natural environment at an accelerating rate:
- extensive land conversion: extensive agriculture, urbanization, loss of forest cover and natural areas, 'fragmentation' of habitats;
- vast 'consumption' of biological resources natural resources, fossil fuels;
- environmental contamination, ground water pollution, ozone-depleting substances, greenhouse gases;

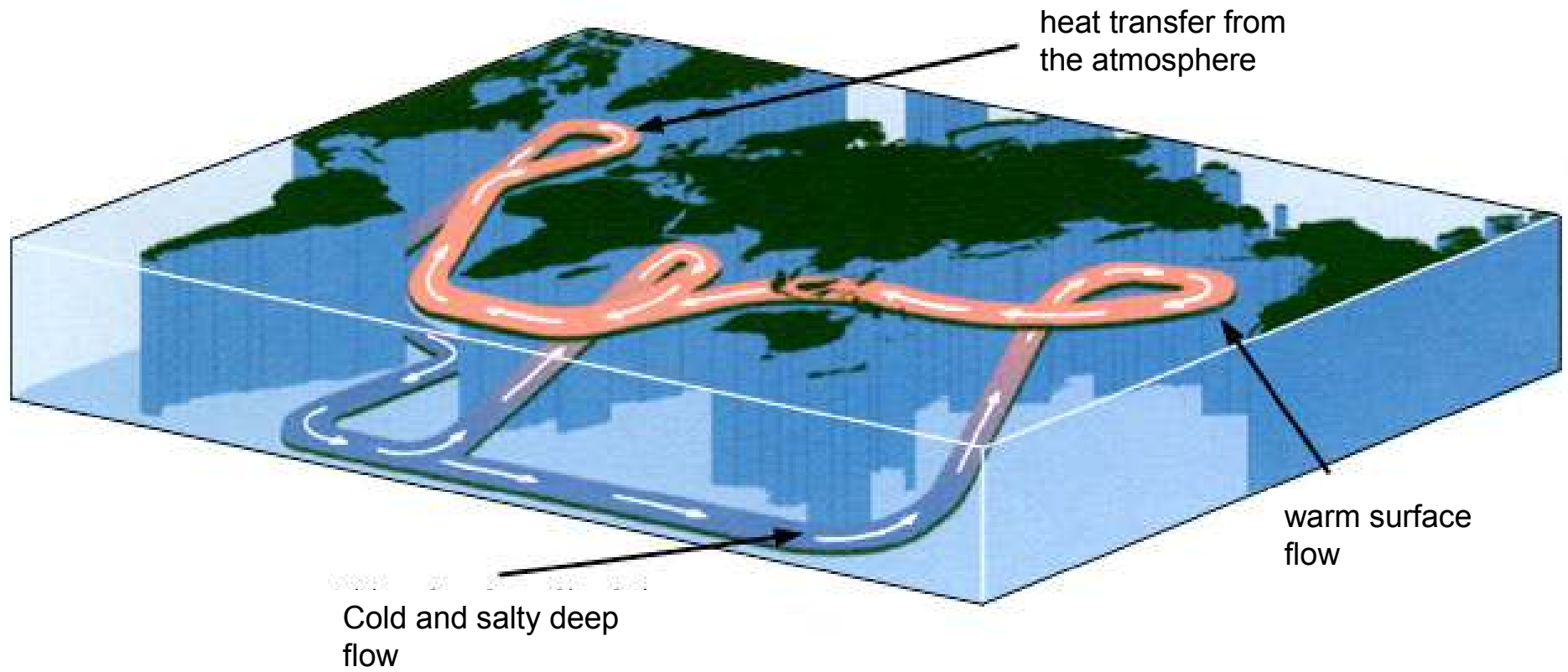
⇒ **TRANSFORMATION OF THE ENVIRONMENT**

Impact of climate change on Arctic ice cover, 1979 - 2005

- The ice cap is responsible for maintaining the climate balance;



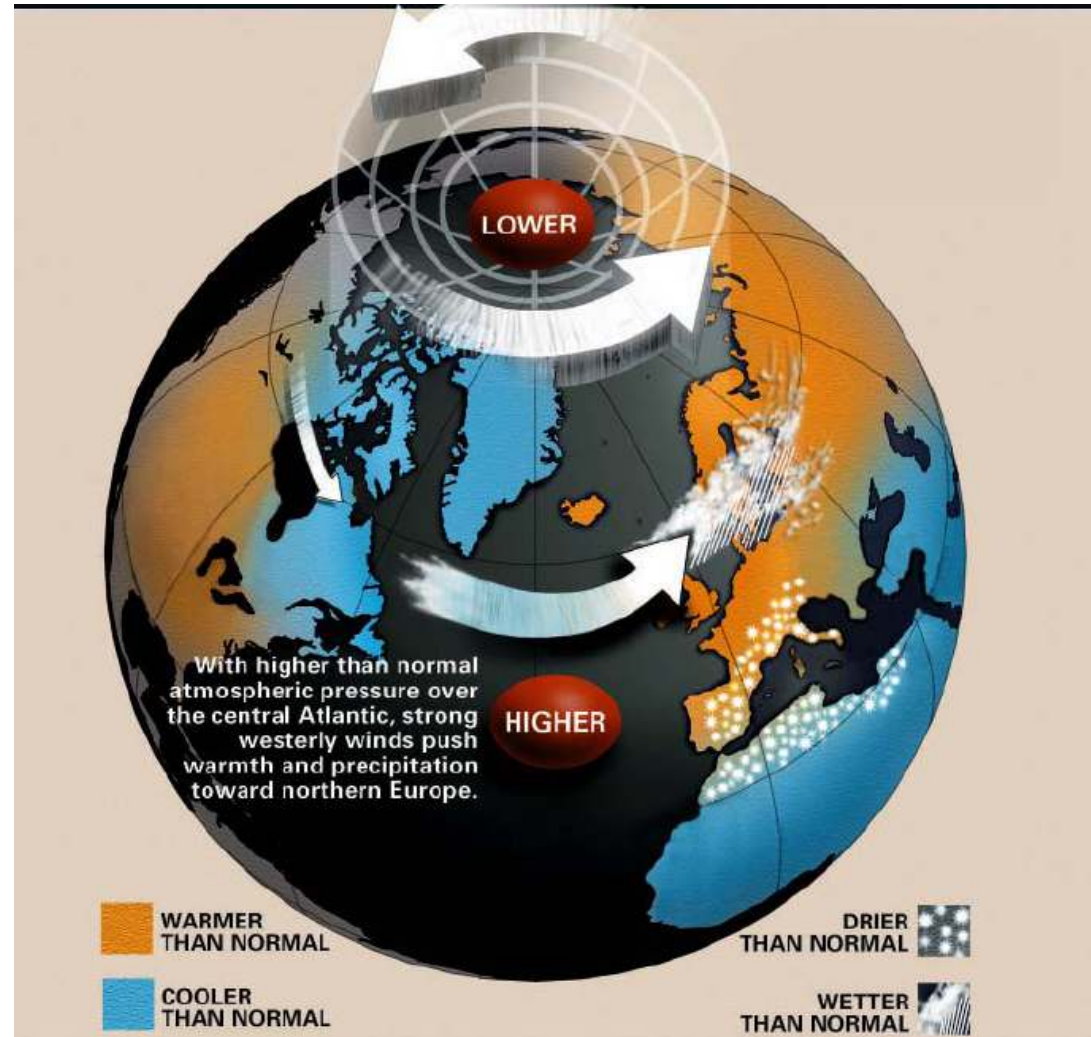
20% reduction in Arctic ice cover area in the period from 1979 to 2005.
Record: NASA, September 21, 2005



Broecker conveyor

Climate change

- The temperate westerly flow is strengthened \Rightarrow climate change



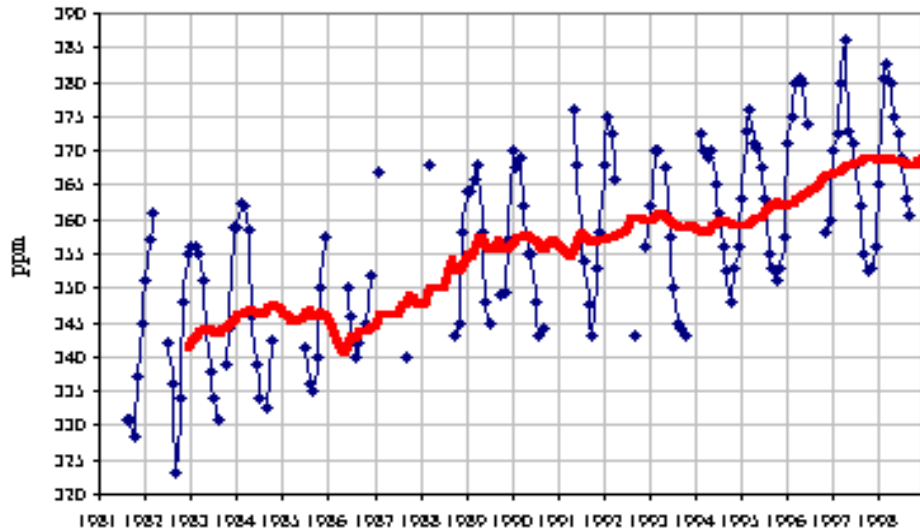
Why do we need to deal with climate change?

- Average temperature of the Earth could rise by up to 2-3°C, in the next 50 years;
- Until 2080 the Arctic ice sheet could melt even in the summer months \Rightarrow world sea levels will rise;
- Climate change may destroy one-third of the current flora and fauna until 2050;
- Global challenges need global response;
- Climate change is not only danger, but also opportunity;

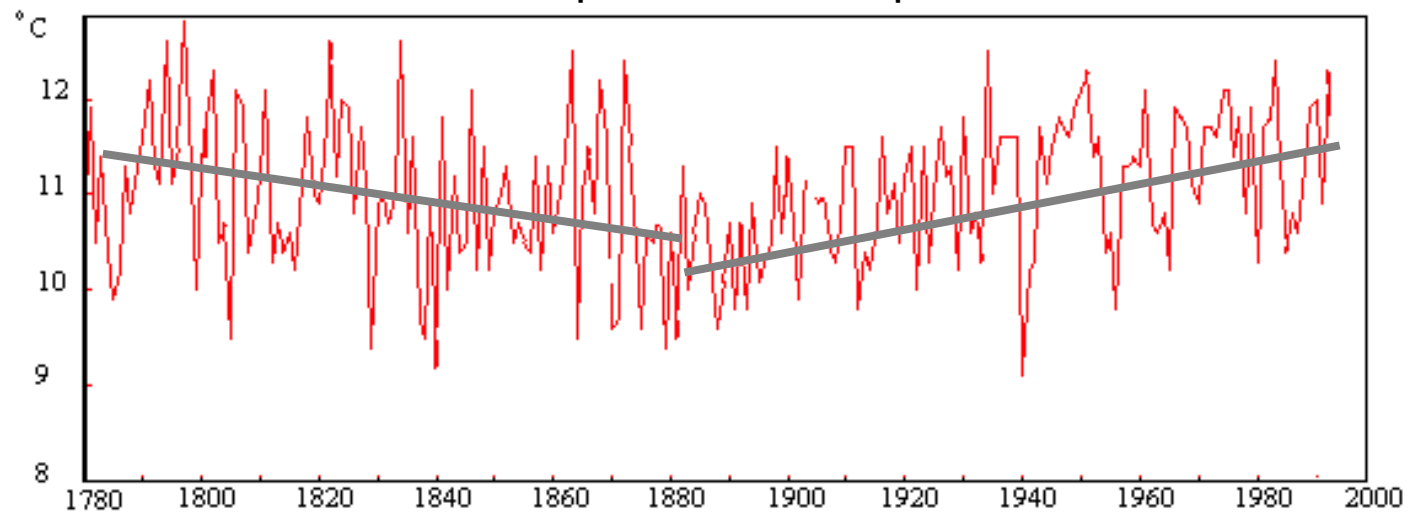


CLIMATE CHANGE: HUNGARY

Carbon-dioxide concentration, K-puszta, 1981-1998



Mean annual temperature, Budapest, 1780-1998



Hungary

- the average temperature increased by more than the global rate over the last century;
- The amount of precipitation decreased overall, in the last decades of heavy precipitations amount to increasing percentage of the annual rainfall, the trend varies by region;

Climate of Hungary is warming and drying

- **winters:** warmer + more rainy → risk of flooding;
- **summers:** warmer + rainfall is reducing → drought risk;
- +0,5°C (semi-spherical average) → frequency of draughty months increases by 60%;
- Soil water content and water supply are decreasing;
- Impact assessment: winter wheat and corn; period: 1961 – 1990;
 - 1) Climatic year types shift in an unfavorable direction (1901-1990);
 - 2) The risk of yield loss increases (Harnos, 2007);

Is there a link between summer tilage and climate risk?

Cultivation method	Surface tilth	Soil water loss	Climate risk at the end of summer sowing
deep plowing	yes	medium	Medium
	no	large	Strong
deep loosening	yes	medium	medium
	no	large	strong

Jolánkai (2008)

Impact assessment of ecological factors

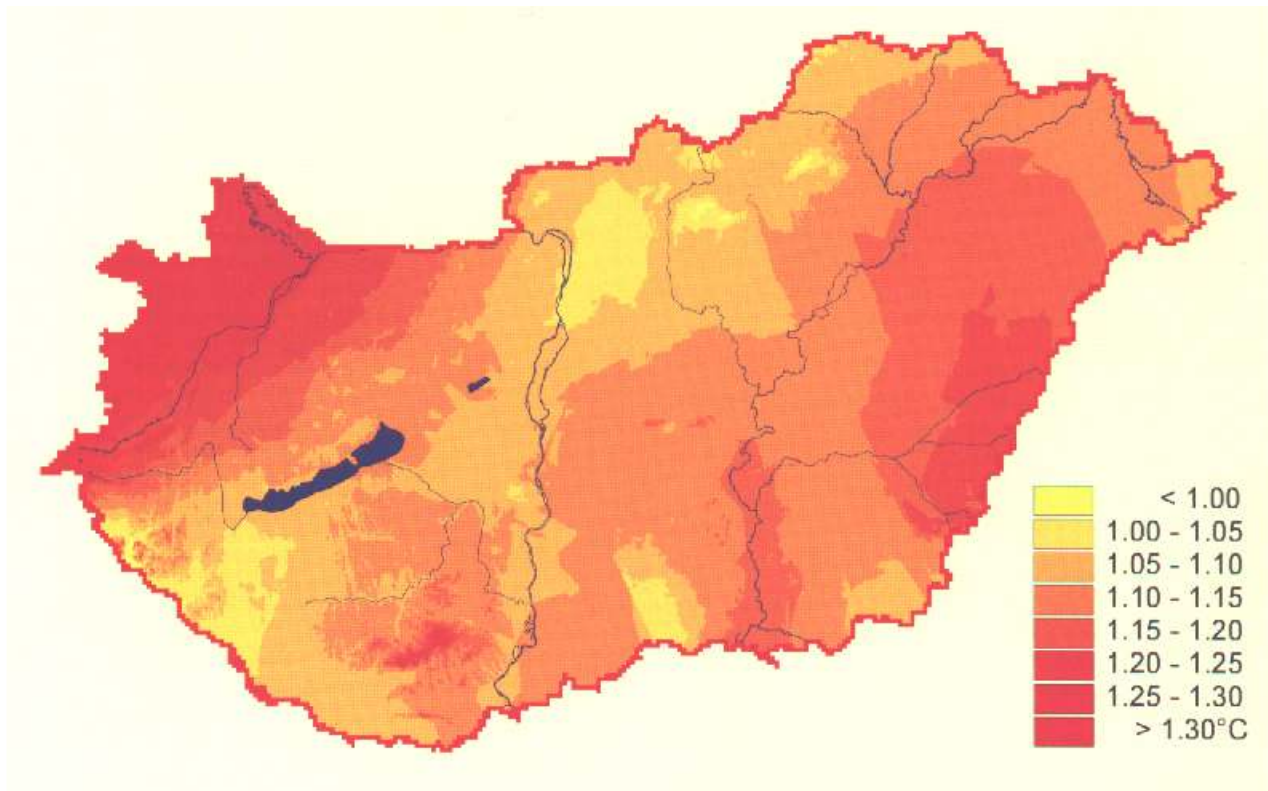
- Balanced water supply involves higher yields, but lower quality, and the very dry year results in lower yield, but good quality.
- If the average temperature increased by 2°C, plant development accelerated, and maturation occurred earlier, vegetation period was shortened and, as a result, yield loss was 20%. The CO₂ level is twice, by increasing the size of the grains could be compensate yield losses, however, high temperatures reduced the protein content of the grains (Veisz, 2008).

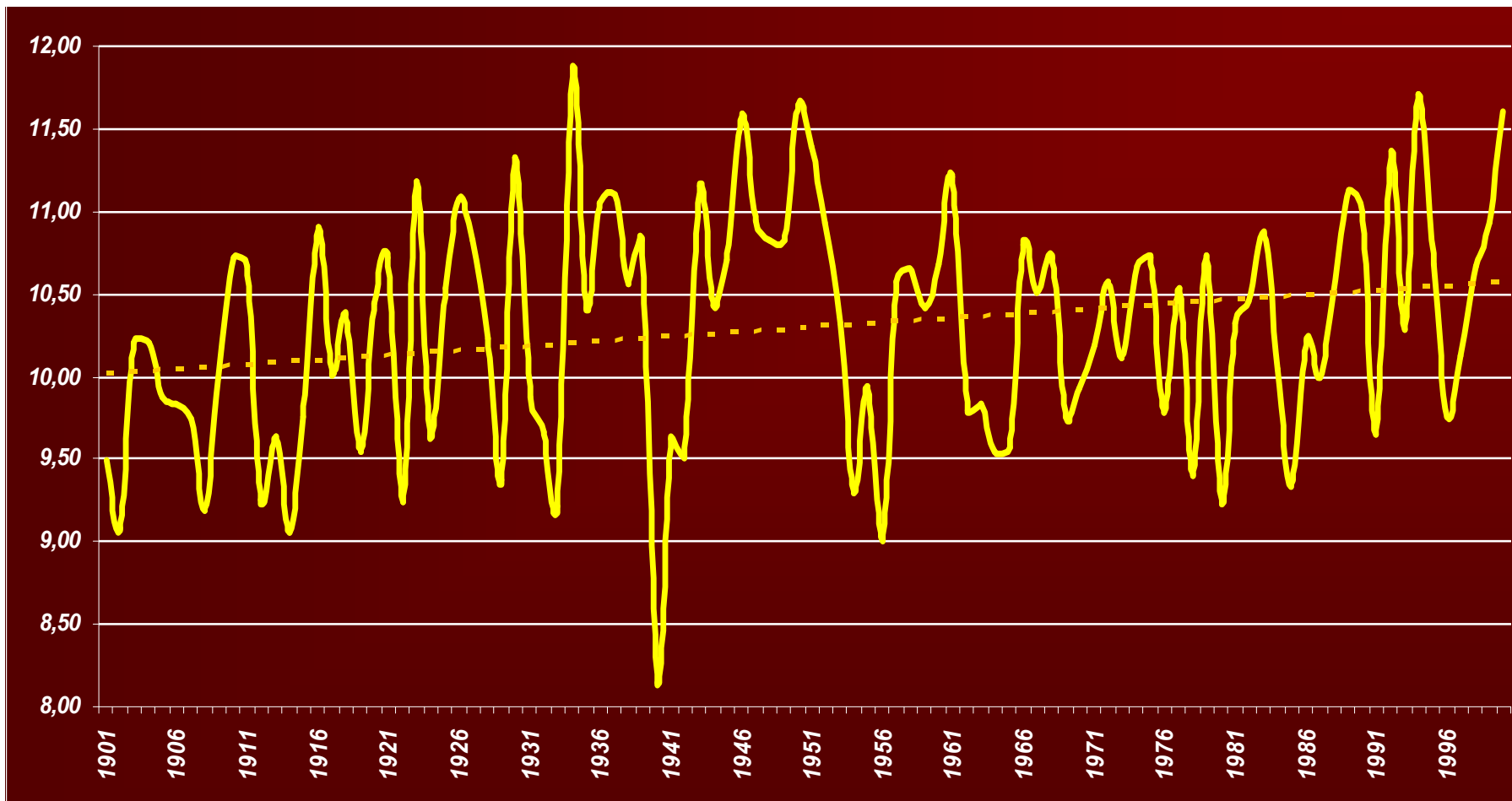
Biodiversity - ecology

- Grasslands play a role in absorbing CO₂, vast majority of which is manifested in the spring – early summer period.
- 4-15% of the annual average N deposition is returned to the atmosphere as a greenhouse gas.
- In case of elevated atmospheric CO₂ concentration the growing species-rich, nutrient-rich loess lawn leads to greater production. Impoverished in nutrient there is no significant increase compared to the control.
- Based on an analysis of moth species it is expected that the loss of northern-species is between 19-45%, but a 19-36% increase in new species may occur.
- Aquatic ecosystems are particularly vulnerable to the climate change.
- Pests of corn ecosystem get better environmental conditions ⇒ risk of potential damages caused by pests emergencies will increase in the future (Tuba, 2008).

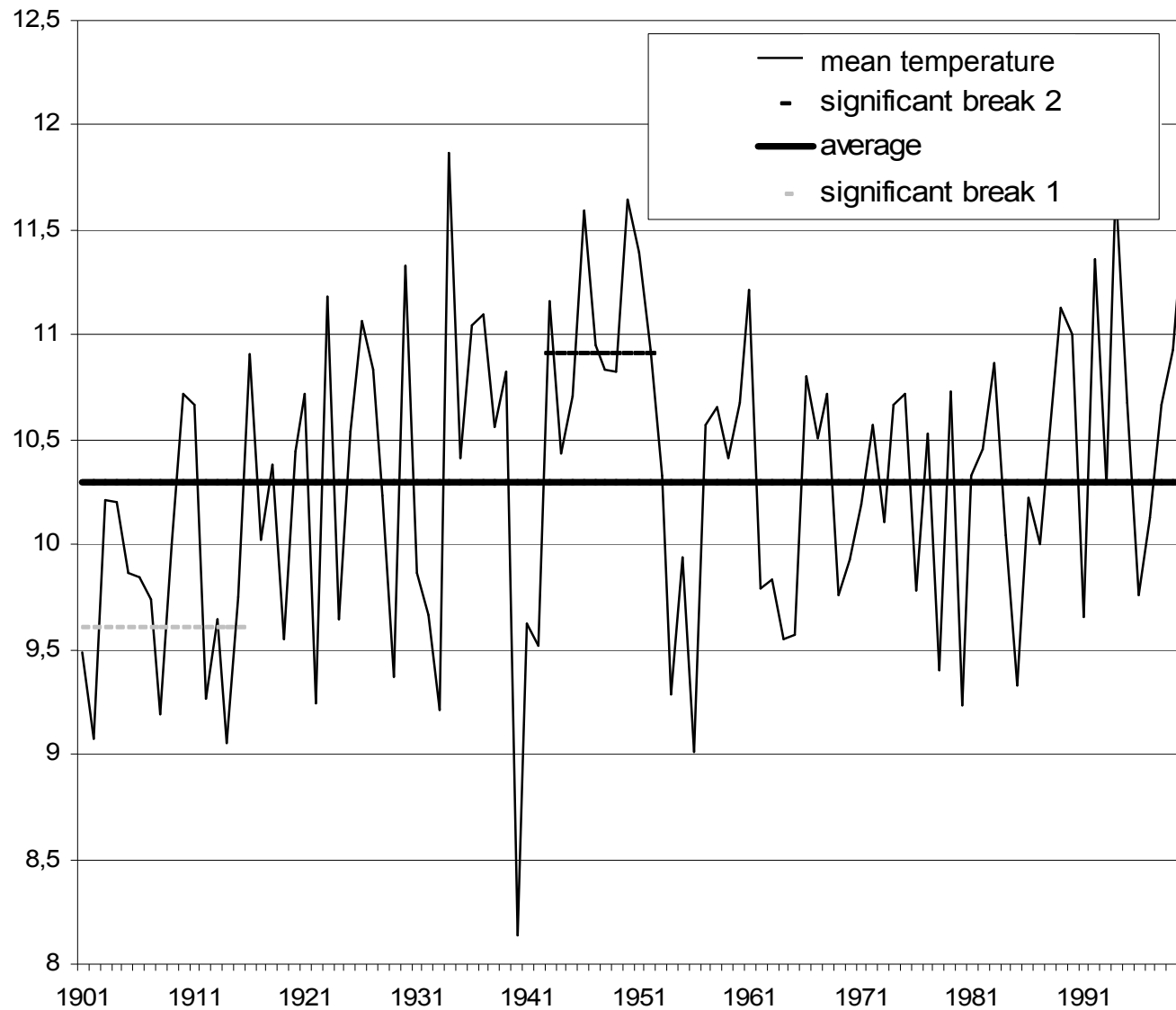
Change of mean annual temperature in Hungary, °C, 1901-2004

(Source: OMSZ)





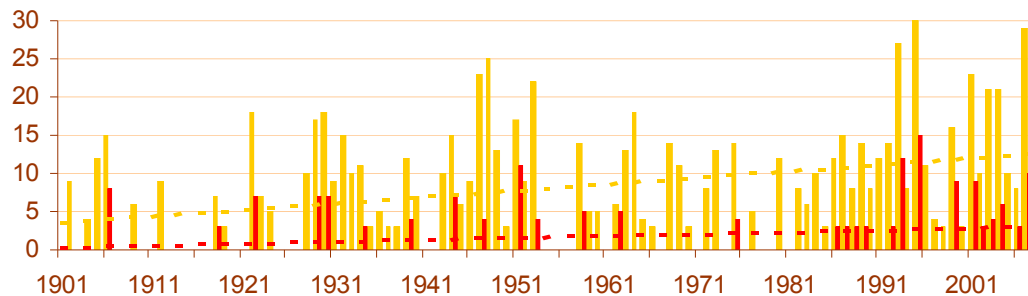
Mean annual temperatures, Szeged, 1901-2000



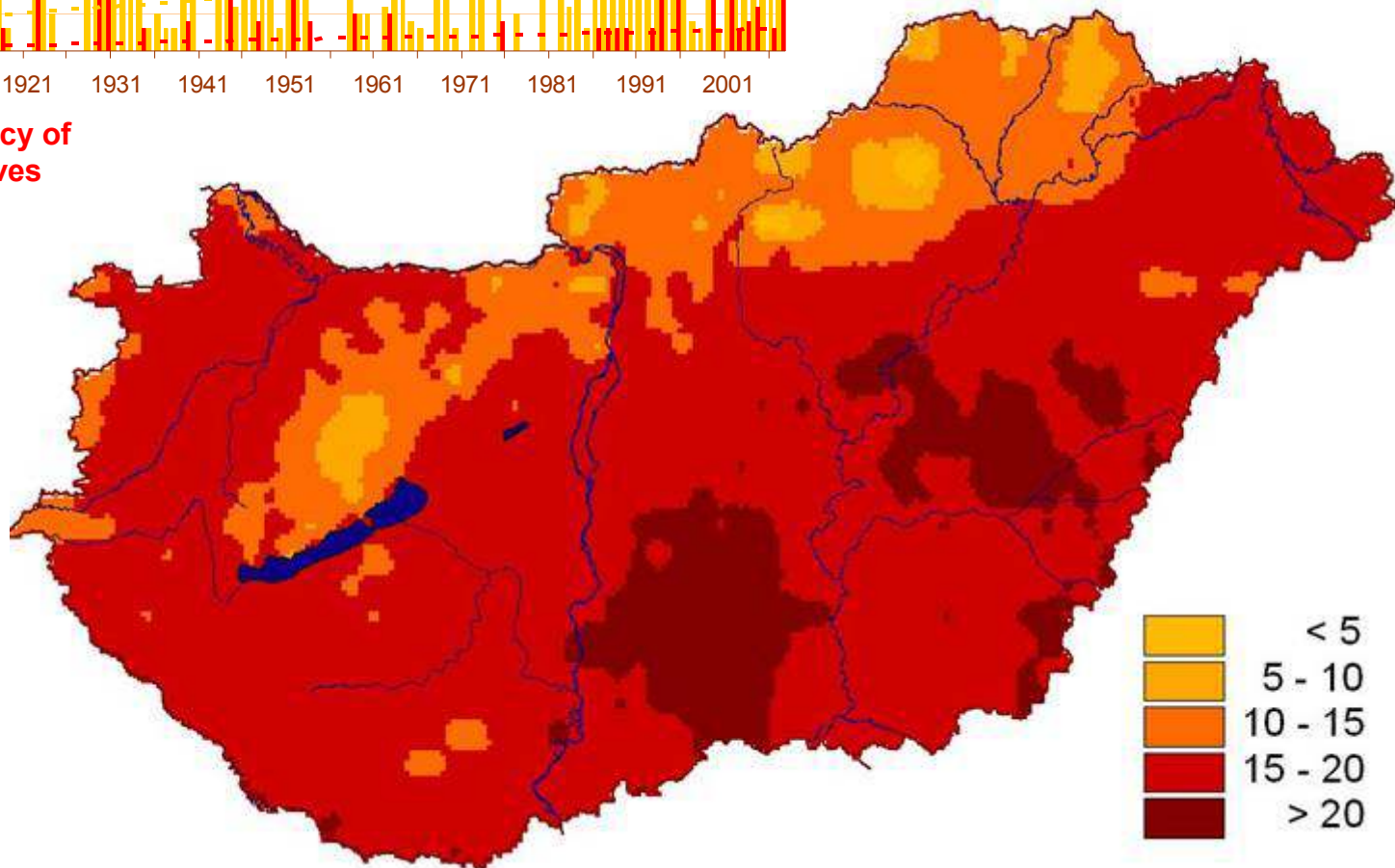
Significant breaks of mean annual temperatures, Szeged, 1901-2000,
Makra test, 1st-type 2D presentation (Makra, 2008)

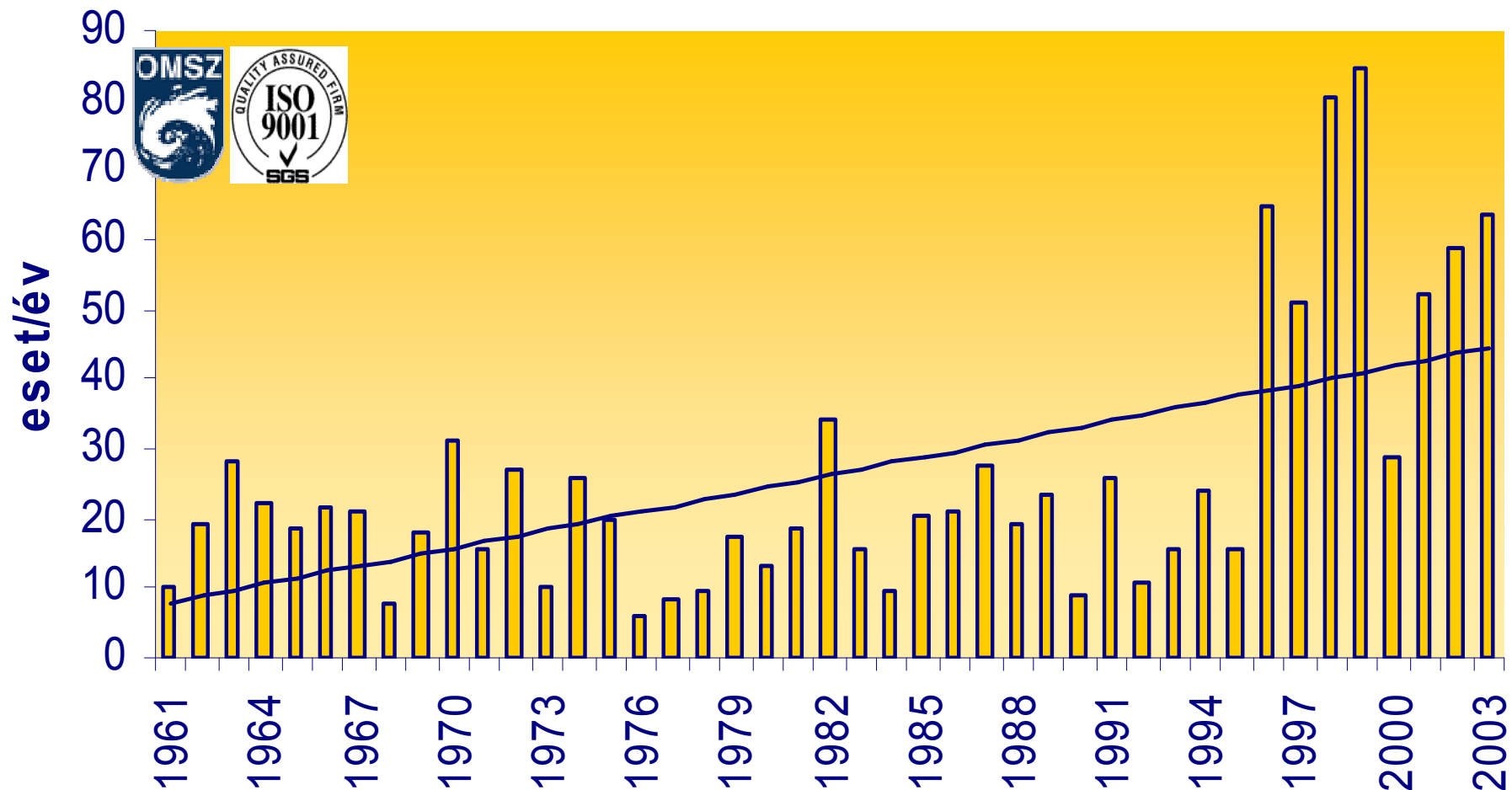


Number of summer days (daily maximum temperature > 25°C), 1976-2004

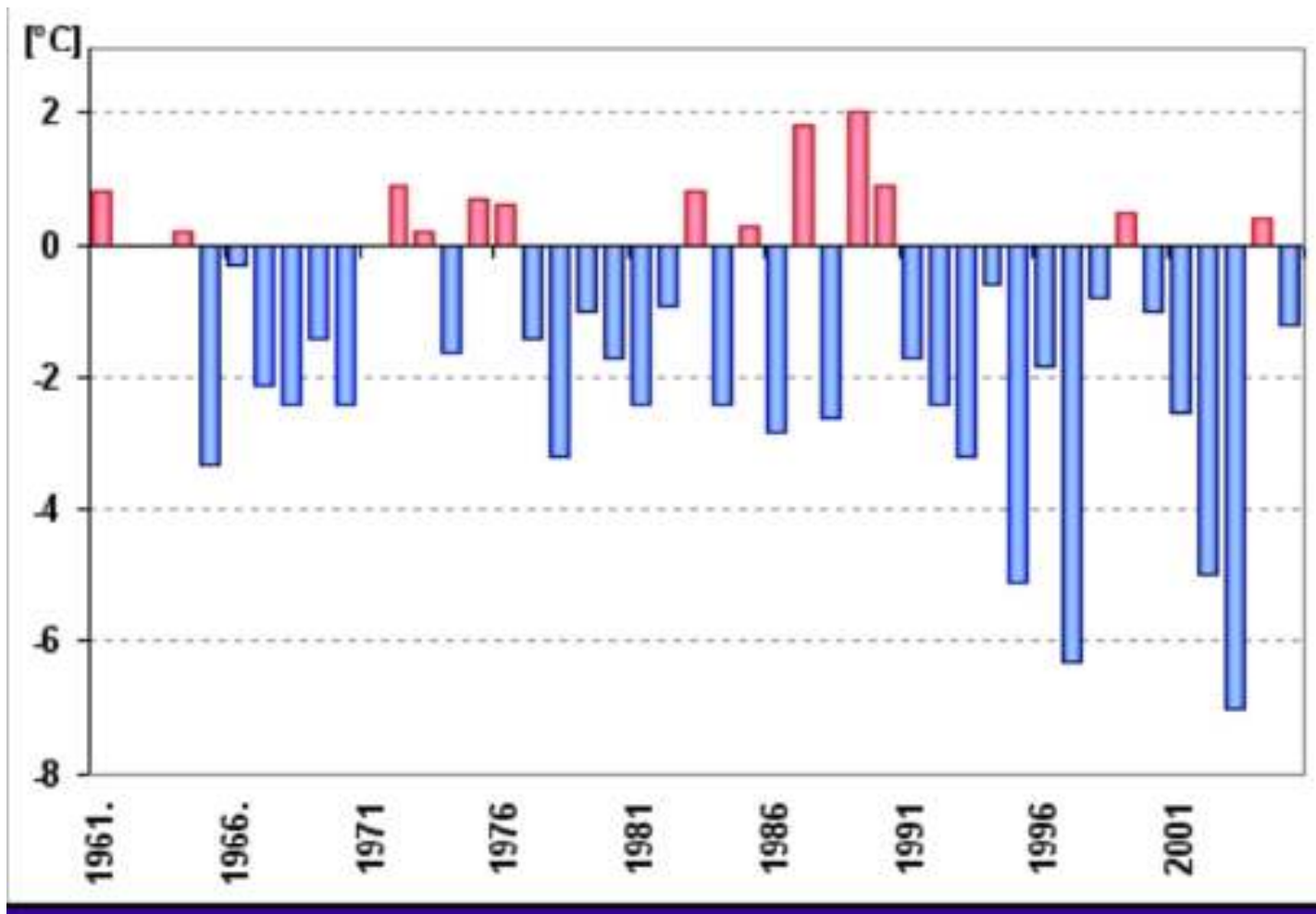


Frequency of
heat waves

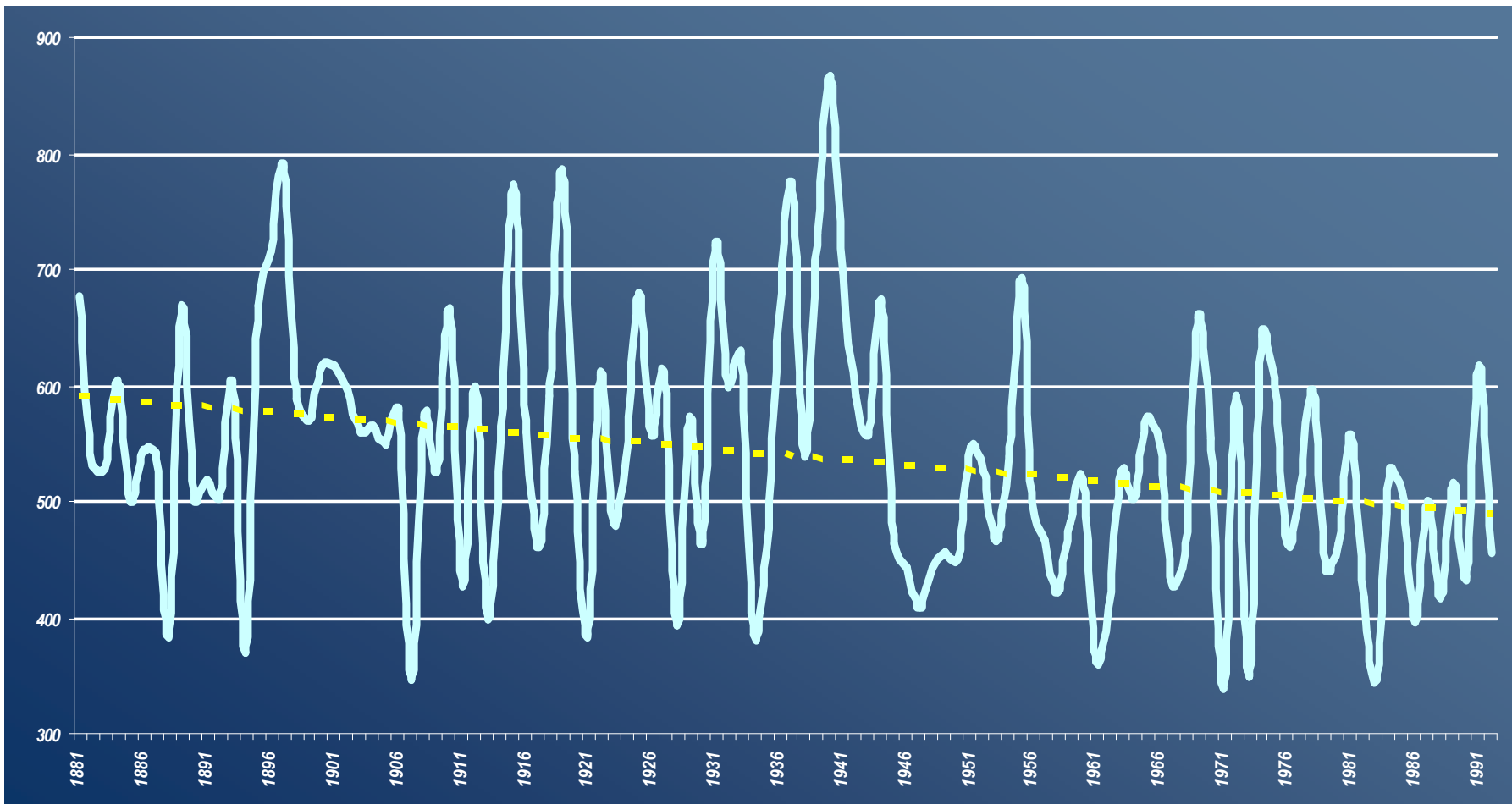




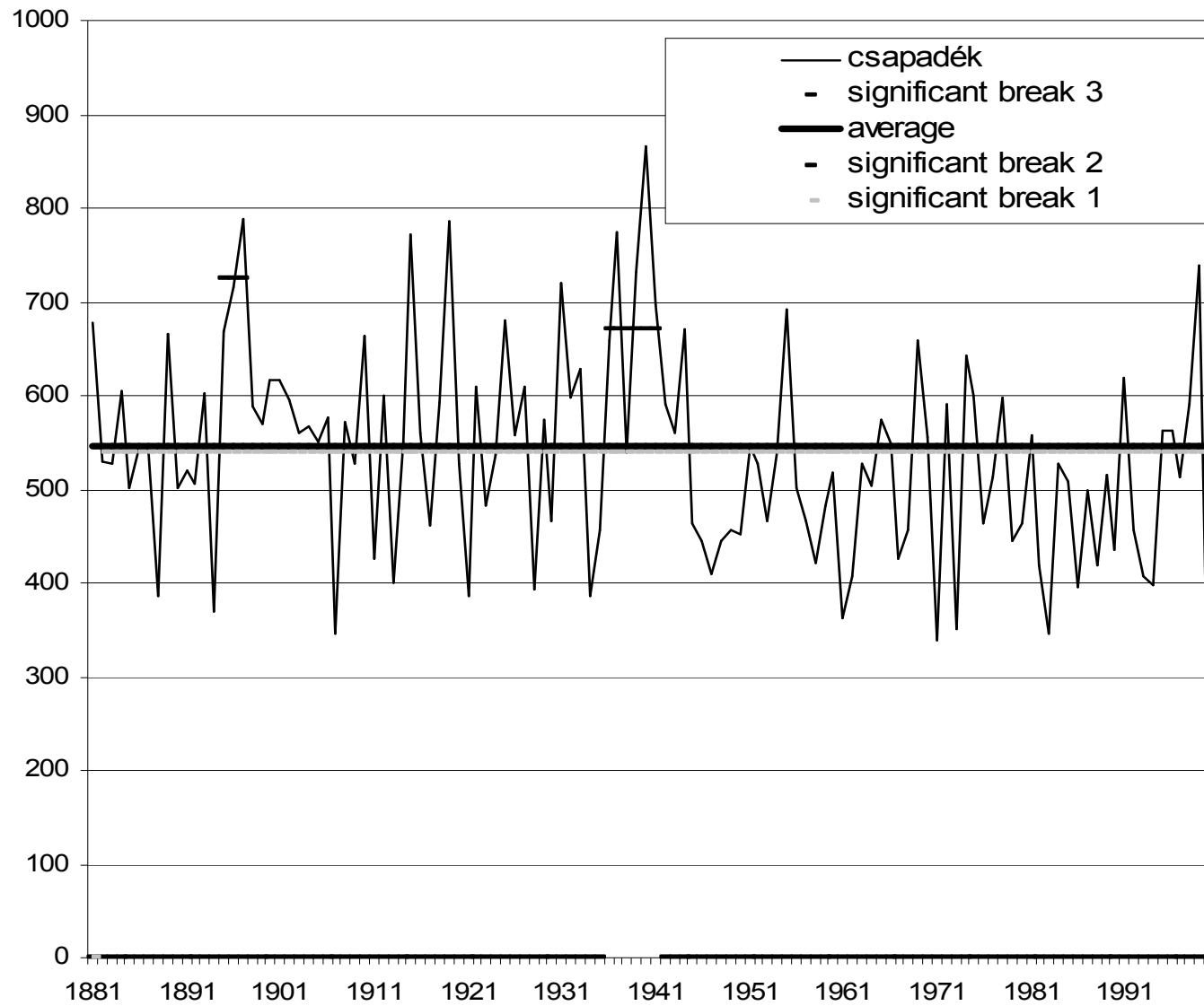
Trend of hot days in Hungary
 Daily mean temperature > 30°C,
 relative humidity > 60%,
 mean wind speed < 1 m·s⁻¹.



Absolute minimum temperatures, April, Szeged, 1961-2005

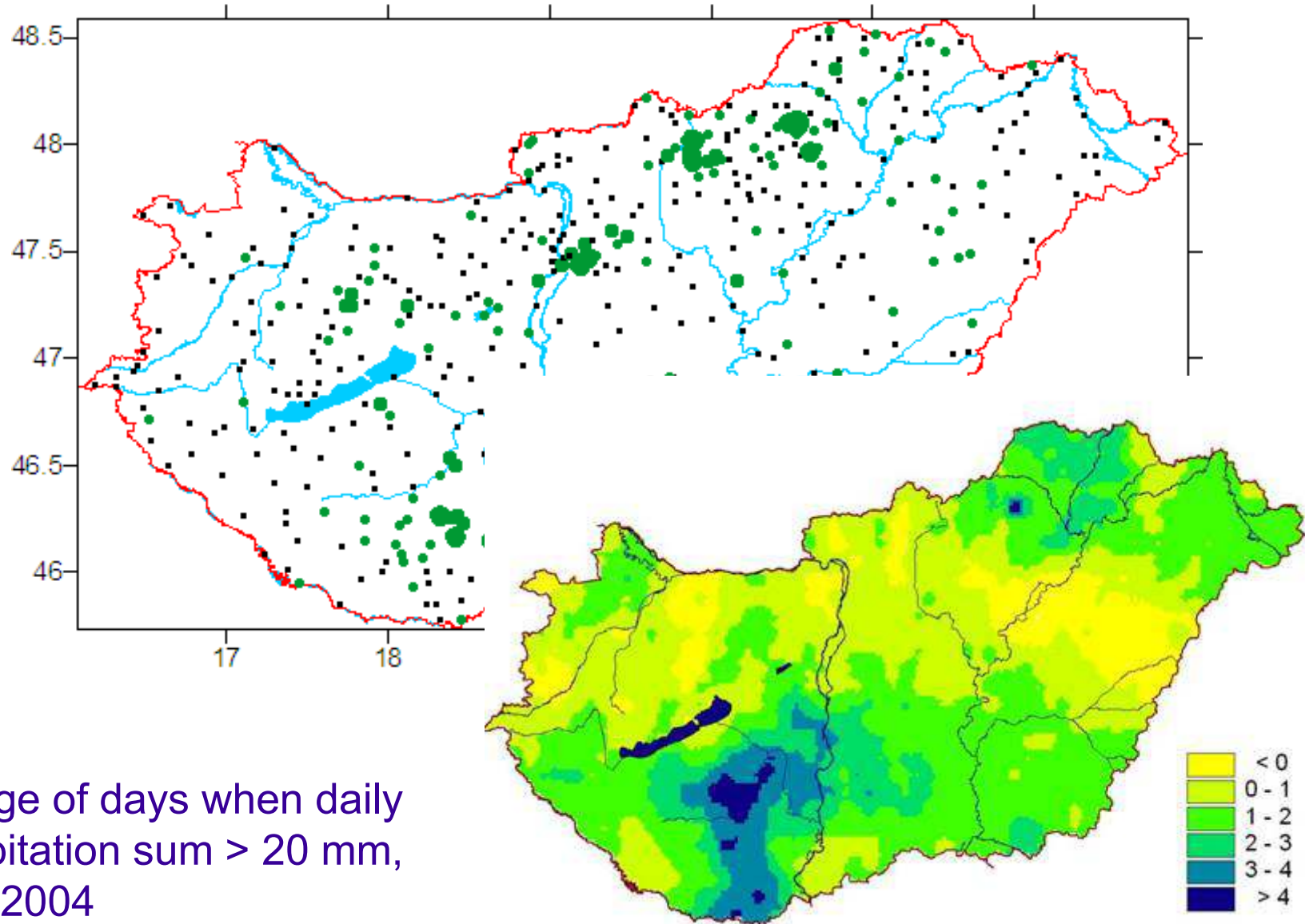


Annual precipitation sums, Szeged, 1881-2000



Significant breaks of annual precipitation sums, Szeged, 1881-2000,
Makra test, 1st-type 2D presentation (Makra, 2008)

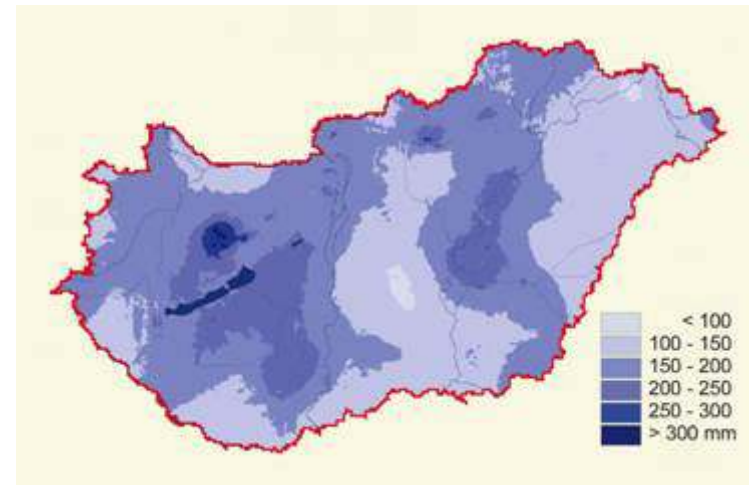
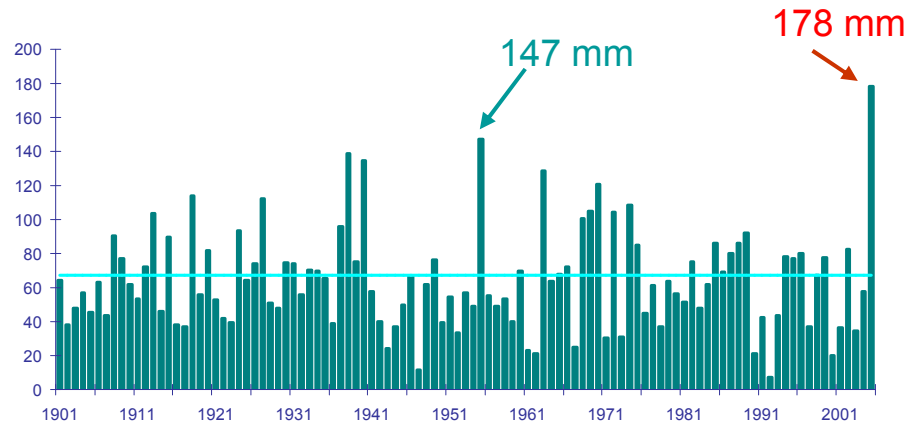
Number of days with daily precipitation sums > 50 mm, 2001 - 2006



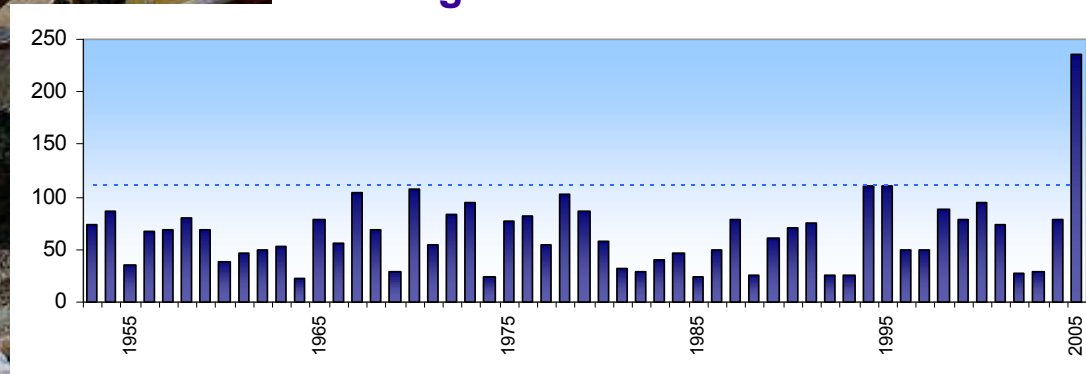
Change of days when daily precipitation sum > 20 mm, 1976-2004

August 2005: the most rainy month since 1901

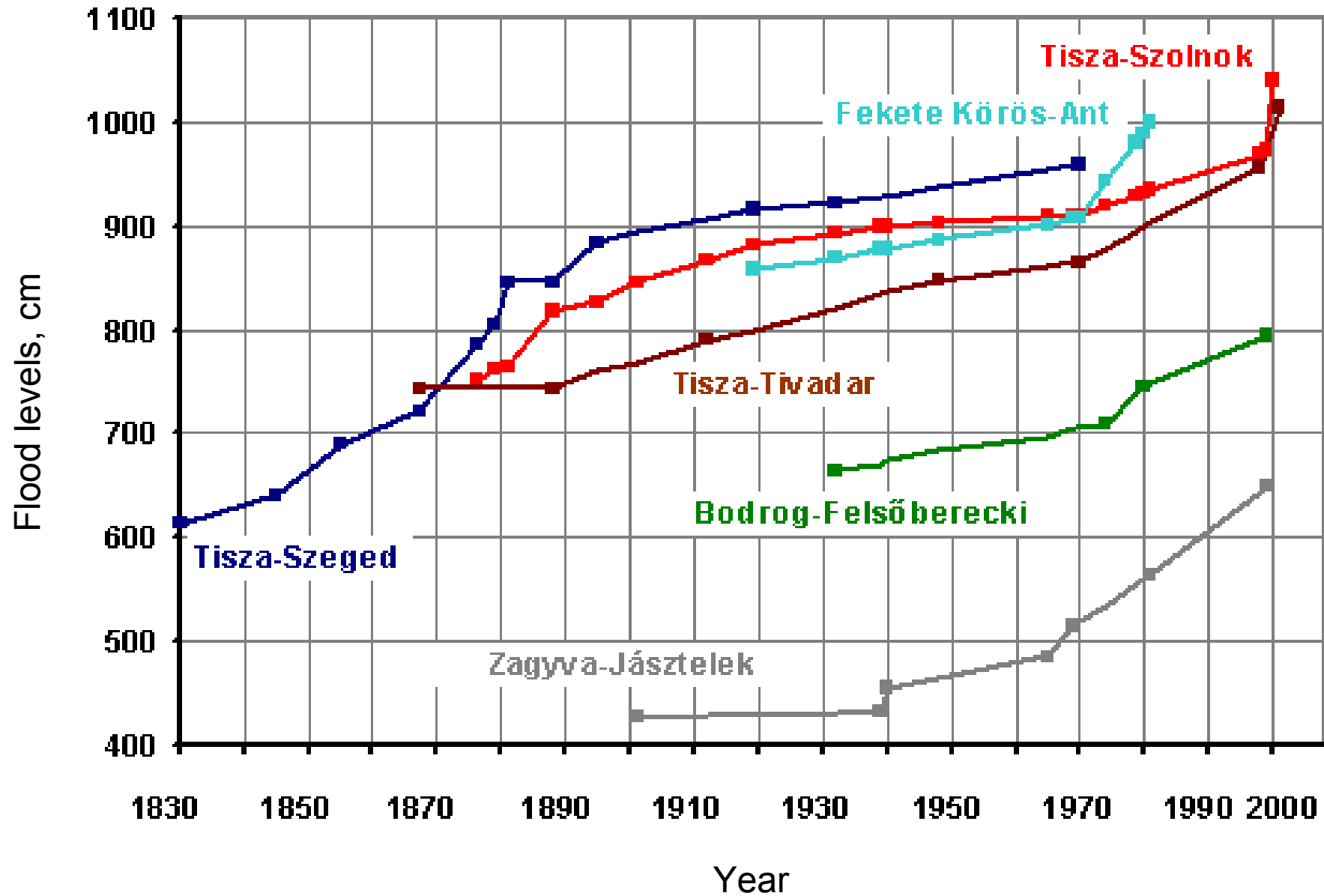
Such a high amount is expected in every ~ 660 years



Monthly rainfall amounts in April.
111 mm rainfall in Mátraszentlászló
during 2 hours



Rise in water levels on the River Tisza



Tisza River at Szolnok and Szeged

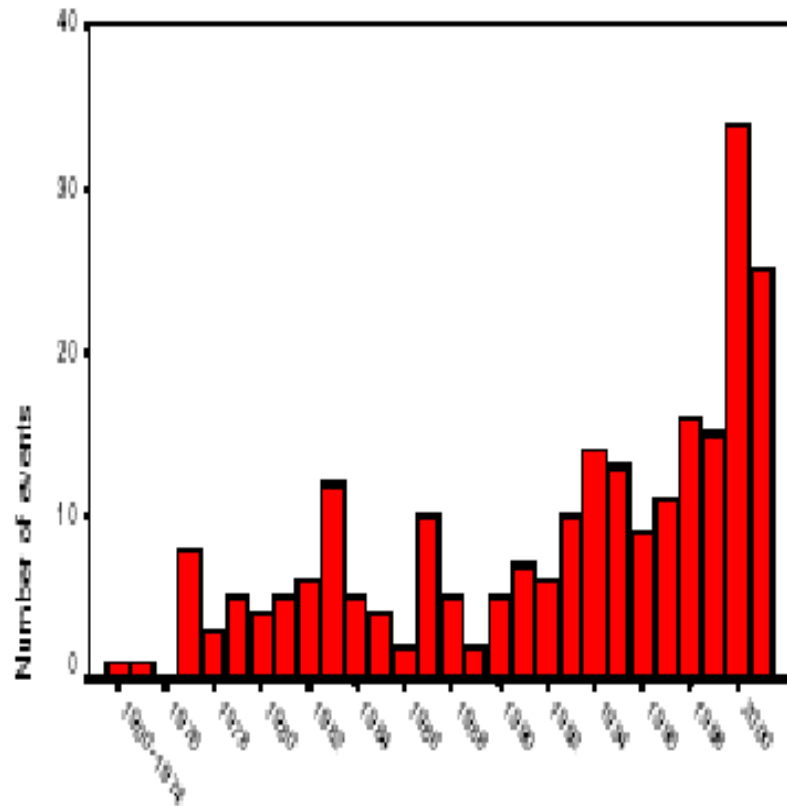


1970: 961 cm

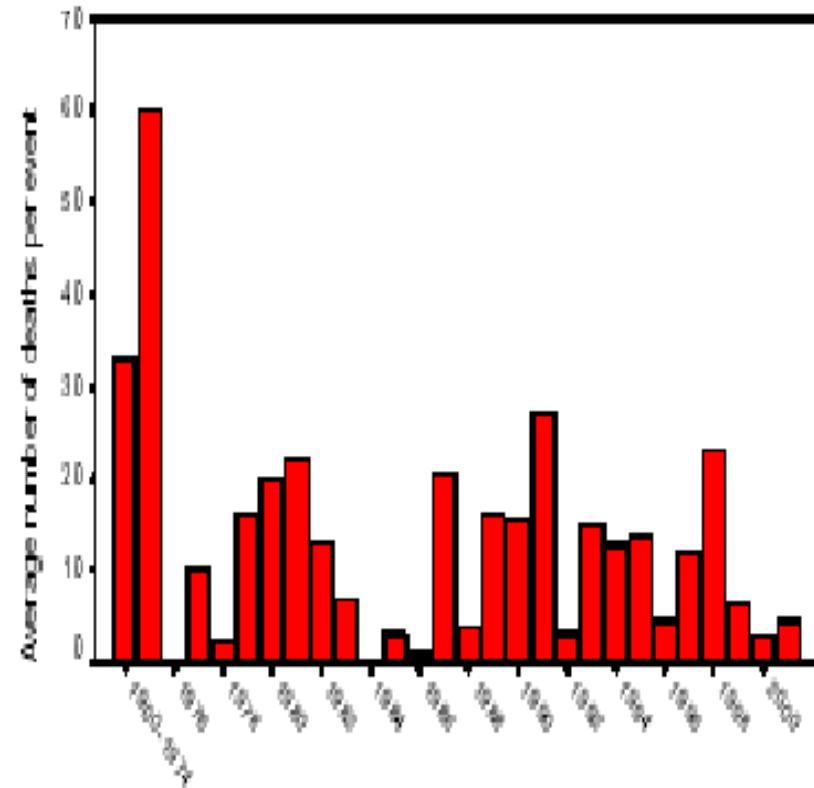
2002: 929 cm

2010: ?

Flood events



Registered flood events in Europe
between 1975-2001: 238



Human losses



Change in rainfall



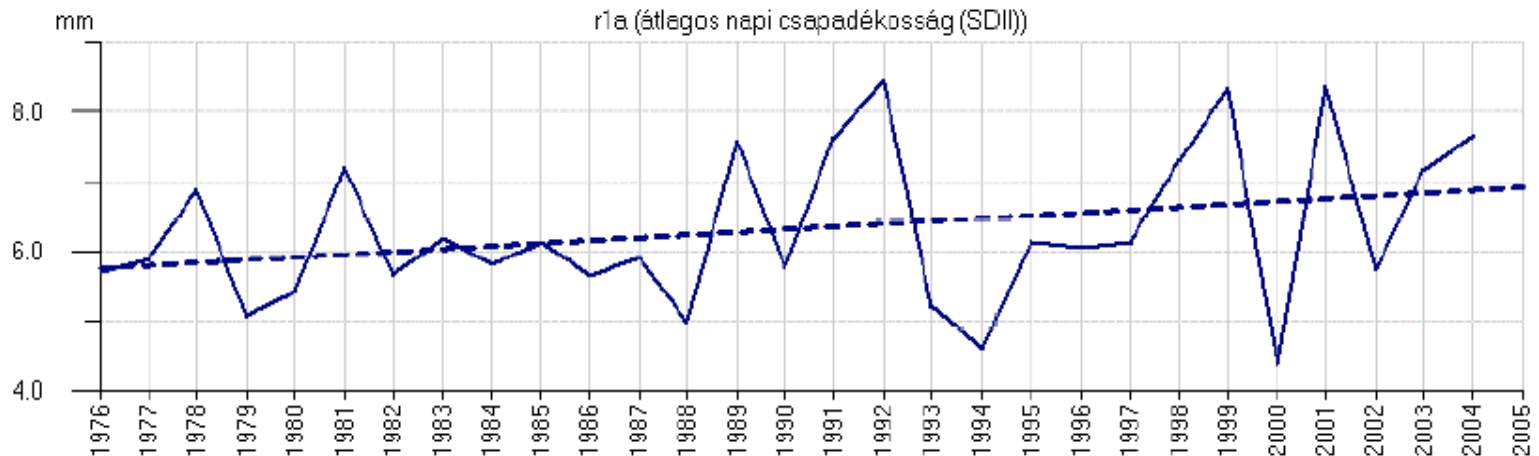
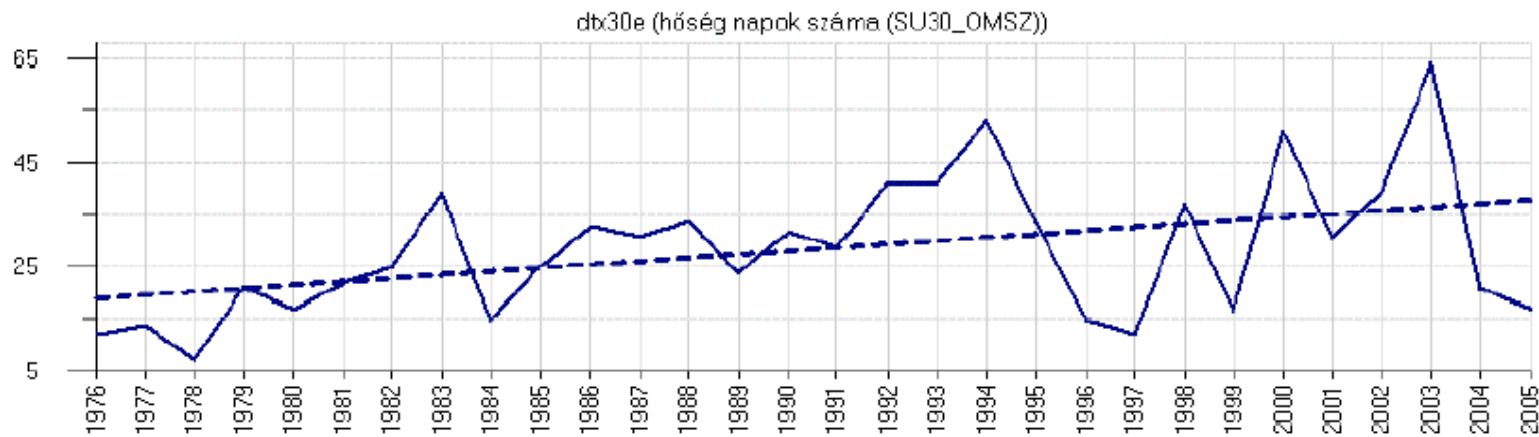
The annual rainfall amount reduces at most marginally and its temporal distribution develops multiply unfavorably by the end of the century:

- the occurrence of long periods of low precipitation increases,
- frequency of unique high incidence of rainfall increases,
- during the summer months rainfall decreases by 20-40% and reduction in runoff is 20-70%,
- In the winter both precipitation and runoff increase by 35% and 23-31%, respectively.

The uncertainty of forecasts of precipitation is far greater than that of temperature.

Results of past observations (Bartholy and Pongrácz, 2005):

- increasing trend in extreme temperature parameters.
- general increase in precipitation extremities.
- decrease in the number of days with large precipitation, but the growth of precipitation fell during this time in the annual precipitations.



OMSZ,
2006

In our country current rate of annual rainfall still remains,
The frequency of extreme rainfall incidences increase,
Rainfall decreases in the summer and increases in the winter,



decreasing infiltration, increased runoff

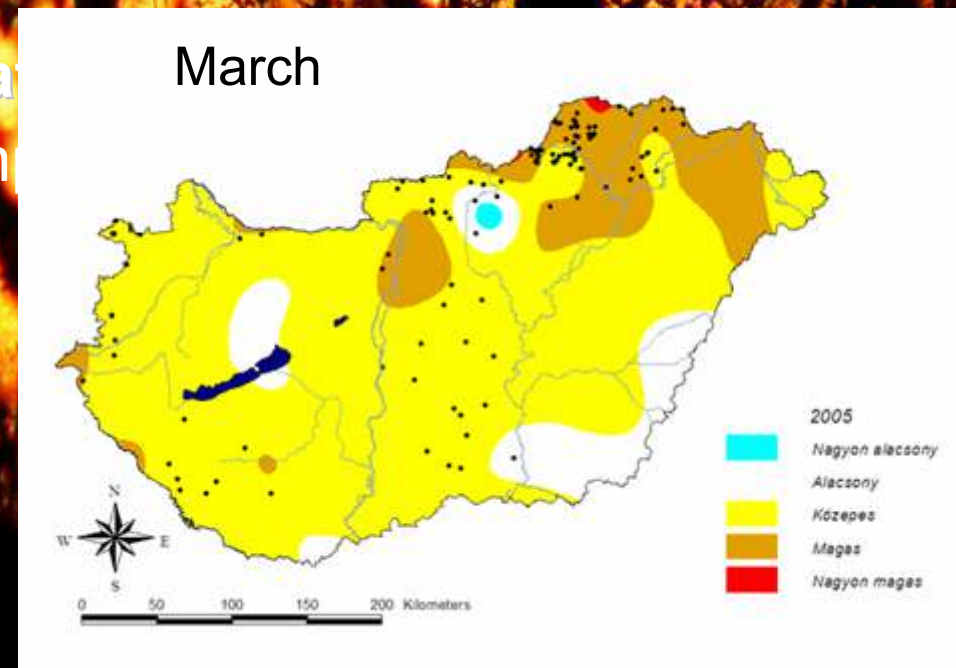
The consequences are even more extreme in inner areas.



Mátrakeresztes, April 2005

Forest fire risk factors

- Human factors
 - carelessness, negligence, irresponsibility, intentionality
(*violation of fire ban, dropping butts, forests decrepitude*)
- Natural factors
 - Geographical location
 - **meteorological, climate**
 - Vegetation status, composition
- Other factors
 - accessibility



SOLUTIONS

- **INTERNATIONAL ACTION TO REDUCE GAS GREENHOUSE EMISSIONS**
 - **KYOTO 1997: CLIMATE CONFERENCE**
 - **”Bubble policy” , ”emission trading”**
 - **EMISSION ALLOWANCES, 5.2% REDUCTION (2008-2012 /1990)**
 - **RATIFICATION (2005)**
 - **PROBLEM: the US has not signed (25% EMISSION), DEVELOPING COUNTRIES? 5.2% FOR WHAT IS ENOUGH?**
- **CHANGING ATTITUDES IN ENERGY CONSUMPTION**
 - **RENEWABLE ENERGY SOURCES (SOLAR, WIND-, HYDRO-, GEOTHERMAL-, BIOENERGY....)**
 - **REDUCTION OF CONSUMPTION („WASTE”) (ENERGY-SAVING EQUIPMENTS, LESS WASTE, HOCHANGING HABITS OF TRANSPORT**
- **ADAPTATIONS**
 - **SCENARIONS: IPCC (INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE) – 2007: 4TH REPORT**
 - **CHANGE OF AGRICULTURE – CROP PRODUCTION,**
 - **NEW DESIGN PRINCIPLES (E.E. PRECIPITATE FUNCTIONS)**

Impact areas

- **Agriculture**
- Hydrology
- Water management
- Forests
- Power engineering
- Health
- Air pollution

**Climate
risks in
agriculture**

Challenges of food security

- ❑ **Population grows – demand for food grows**
 - 1.2% growth: 70-80 million people per year
- ❑ **Income grows – feed consumption grows**
 - Economic growth of Asia: 5-6% per year
 - Consumption of animal products (meat, milk) grows
- ❑ **Production of biofuels grows – demand grows**
 - Competition for land (this will be a recurring problem after recession)
- ❑ **The production area is limited**
 - Expansion: Ukraine, Russia, South-America
 - Abroad land rental/purchase
- ❑ **Development of technology is dominant**
 - Another "green revolution" is needed?
 - This will be GMO?
 - Incentives / support is important.
- ❑ **Climate change**
- ❑ **Speculation**
 - It is important in terms of market liquidity
 - But it may increase the volatility of prices



Economic increase

Answer of Europe to GMO: unnatural... but we produce food not for nature!



E-mail on
GMO!



Evidence of climate change

18th century

1900 1950 1970 1980 1990

Global challenges from agricultural perspective

Food safety:
Population of the Earth grows + changes in diet

Until 2050

rising oil prices will be an important topic again

70% increase in energy demand by 2050

Demand for food increases

Low CO₂ emissions

Global food production is needed to increase by 70% in smaller area, using less water, energy, fertilizer and pesticides

Environmental security!

Limitation of indirect land use change:

In the EU, arable husbandry uses 66% of agricultural land: plow land + grasslands

Renewable Energy Directive!

Rather than input-intensive agriculture

- Food
- Forage
- Bio-based material (e.g. bio-fuel)

For producing 1 kg meat, 5-10 times more fodder is needed!

Energy-safety:
 In case of rising oil prices it will be an important topic again

Energy demand grows by 70% by 2050

Low CO₂ emissions

Increasing dependence

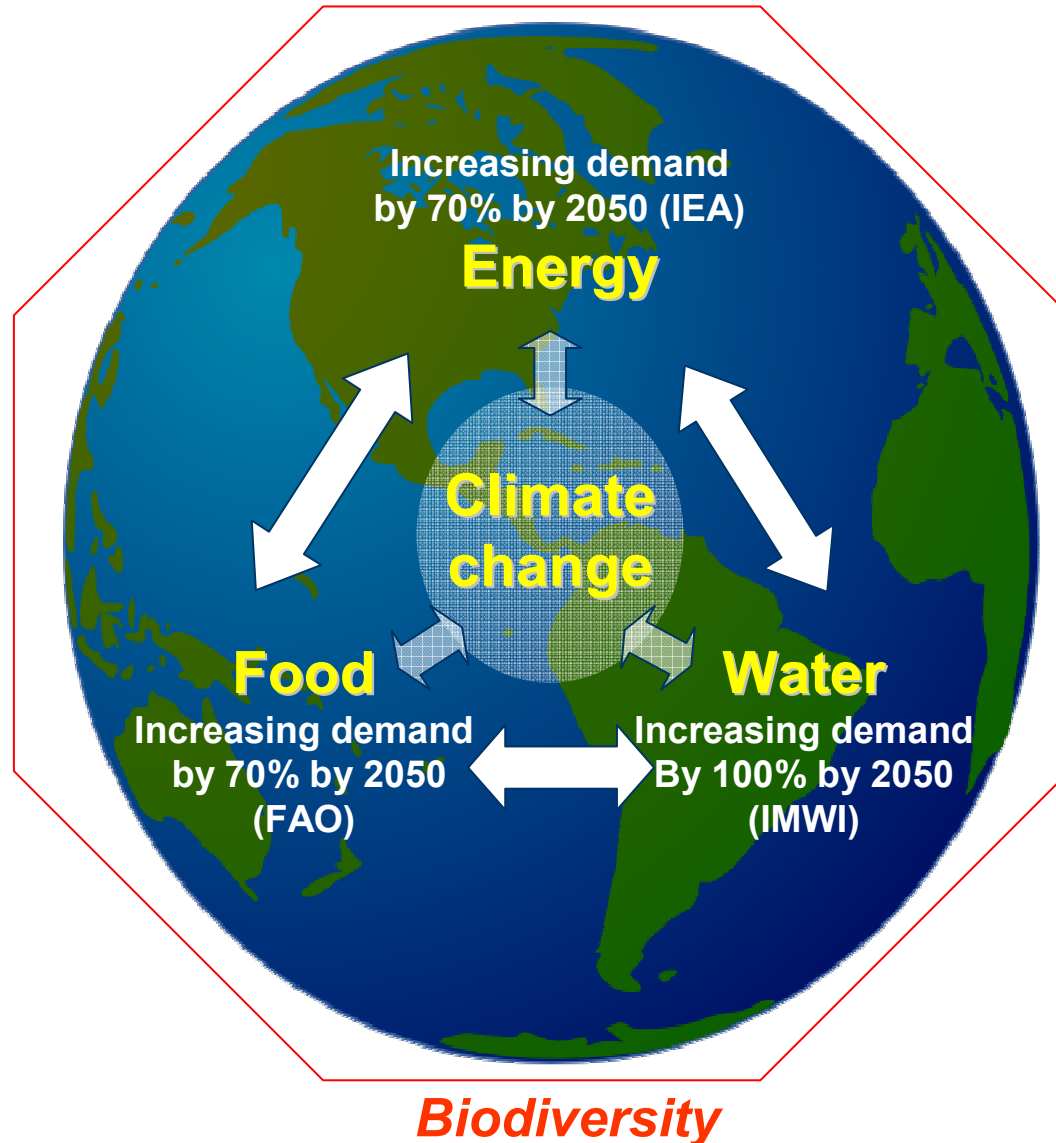
Environmental security!

Limitation of indirect land use change:

Renewable energy directive!

Knowledge-intensive agriculture rather than input-intensive agriculture!

Climate change: relationship of food-, energy- water security



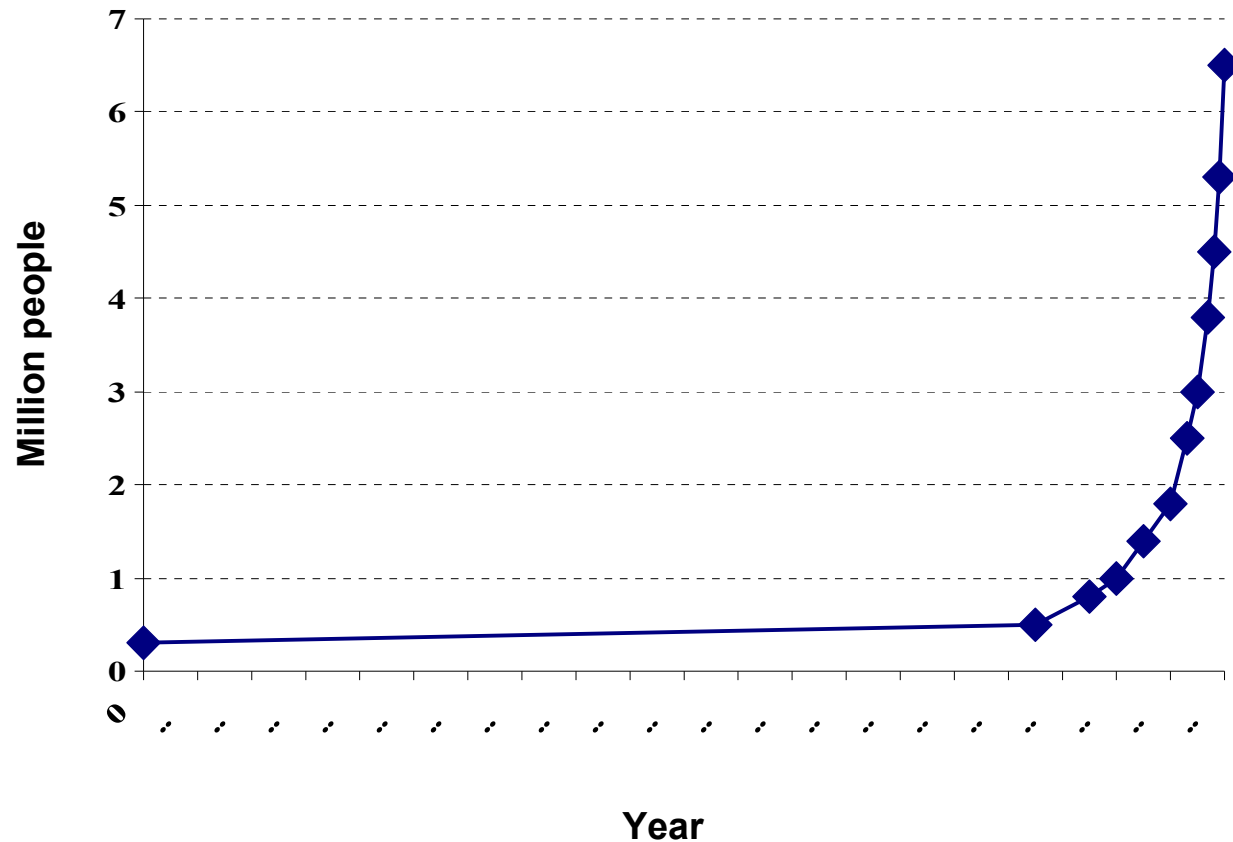
Major questions

1. Can we provide healthy and sustainable food supply of 9 billion people for changing diet?
2. Can we cope with the growing water demand?
3. Are we able to produce a sufficient amount of energy to the growing poor population?
4. Can we mitigate climate change and adapt to it?
5. Can we implement all of this into action so that to halt the loss of biodiversity and to preserve ecosystem?
6. Can we change the allocation of resources under the current social and economic system?

Increase of the Earth's population

- ❑ **7 billion people**
on October 31, 2011
- ❑ **70 billion people**
1.1% per year
- ❑ **200 thousand people**
daily increase
- ❑ **140 people**
per minute

Population bomb



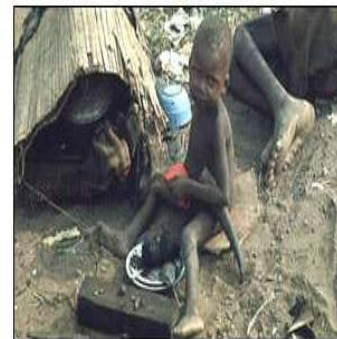
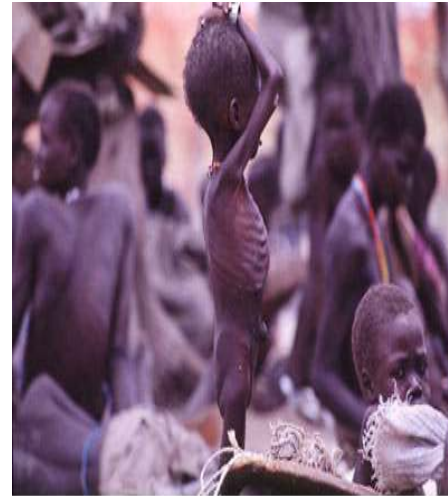
Real-time statistics on the **current population of the Earth**:
<http://www.worldometers.info/hu/>

Consumer socitey versus starvation

The amount of food produced is not a problem, but its global distribution: it is a function of income



The wealth increases (1 billion people suffer from it);
they buy more they need + a great proportion
of food waste

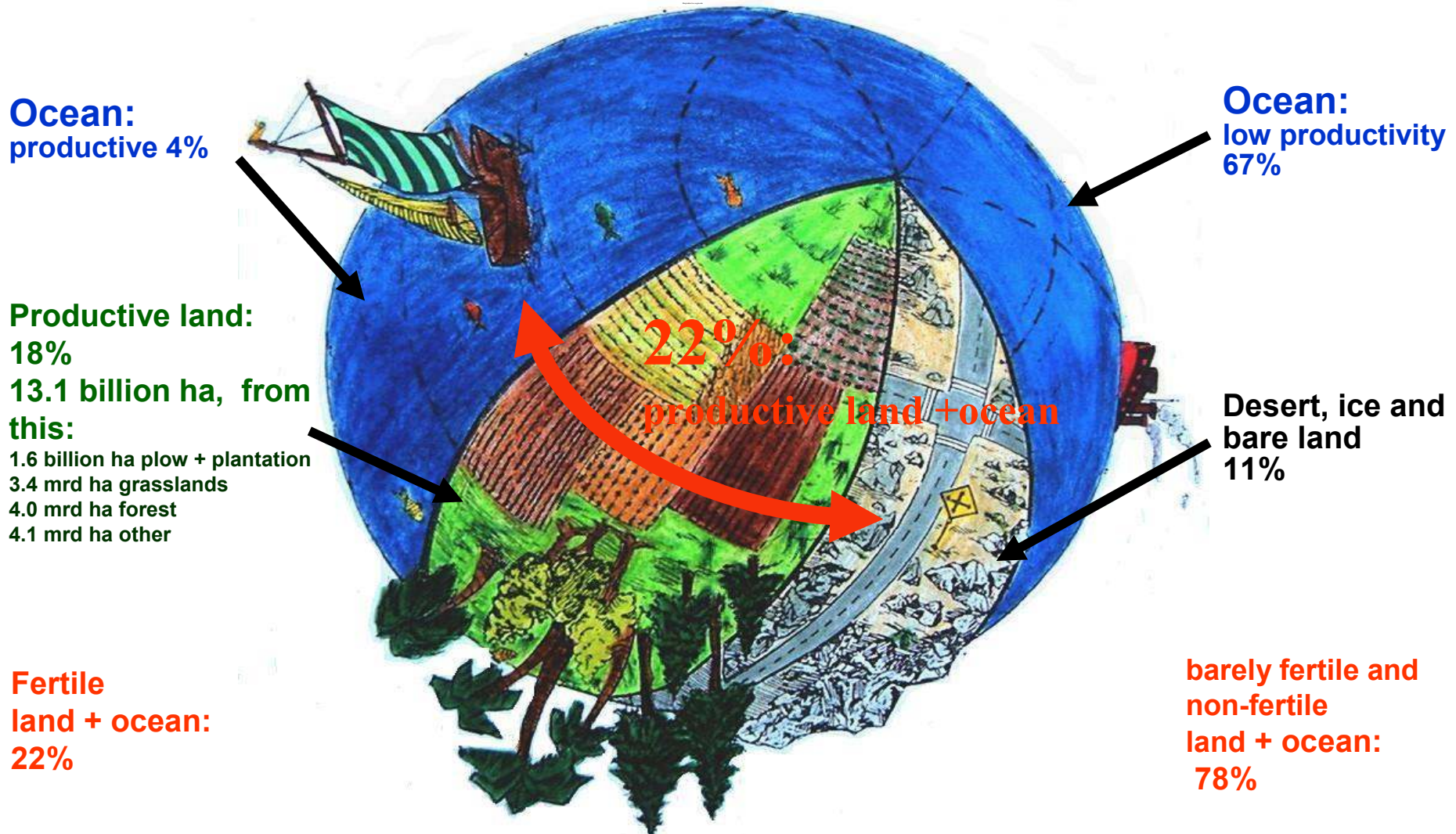


...but theirs not (one billion people suffer from it)!
They buy less they need but there is food

MIGRATION from south to north: COSTLY FOR THE EU!

Biocapacity of the Earth (potential)

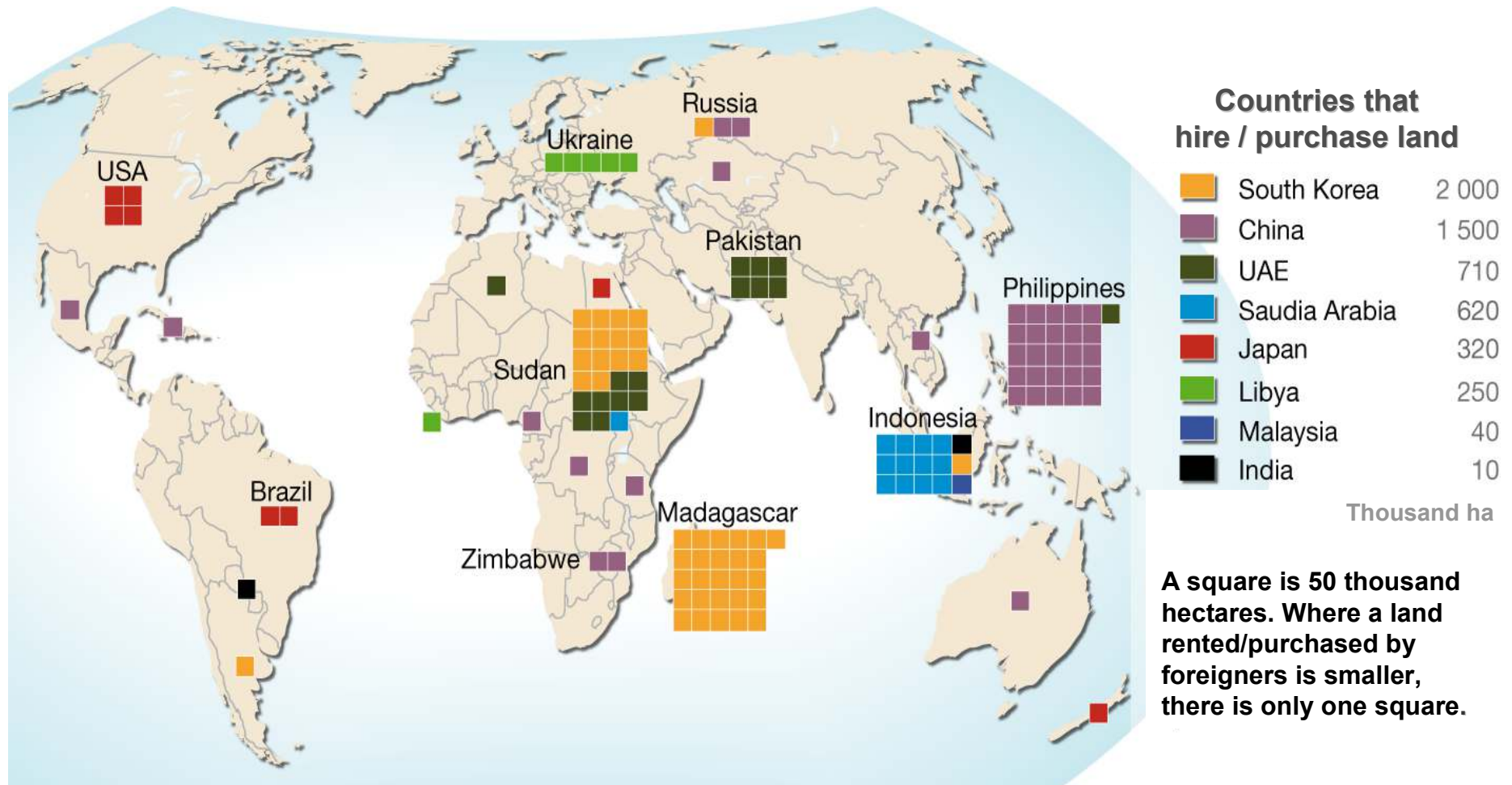
Only 22% of the Earth's surface is biologically productive



Where goes the world? \longleftrightarrow What economy and environment ensure a healthy future?

Countries that hire/purchase lands in other countries for reasons of food safety

<http://forum.index.hu/Article/showArticle?t=9033930>



Source: UNEP/GRID-ARENDAL

Increasing water use

- ❑ By 2050, 70% more food will be needed: growing food consumption and dietary changes
- ❑ Urbanization: domestic and industrial water use increases more than double
- ❑ Climate change: extreme weather
- ❑ Energy prices: hydroelectric power plant, bio-fuels, desalination, fertilizers and pesticides

Without improvements in water productivity, water needs of the crop will double by 2050!

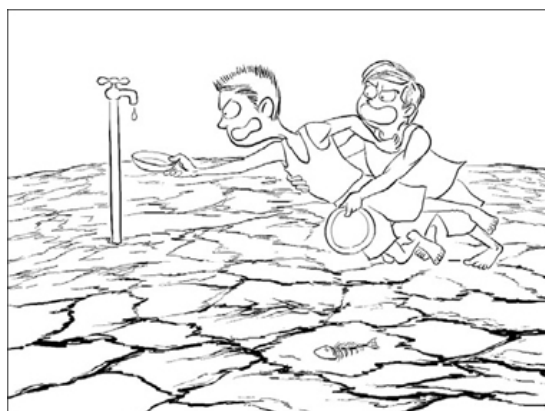
People and food



Water use

The „water bubble” is unsustainable and fragile: 7 billion people today share the same amount of water quantity as the global population of 300 million at the time of the Roman Empire.

Use	Liter
Drinking watre	2 - 5 liter/person/day
Household	20 - 500 liter/person/day
Wheat	500 - 4 000 liter/kg
Meat	5 000 - 15 000 liter/kg
Bio-fuels	1 000 - 3 500 liter/liter
Polo (cotton)	2 000-3 000 liter/polo
Agriculture	3 000 liter/person/day 1 liter/calorie



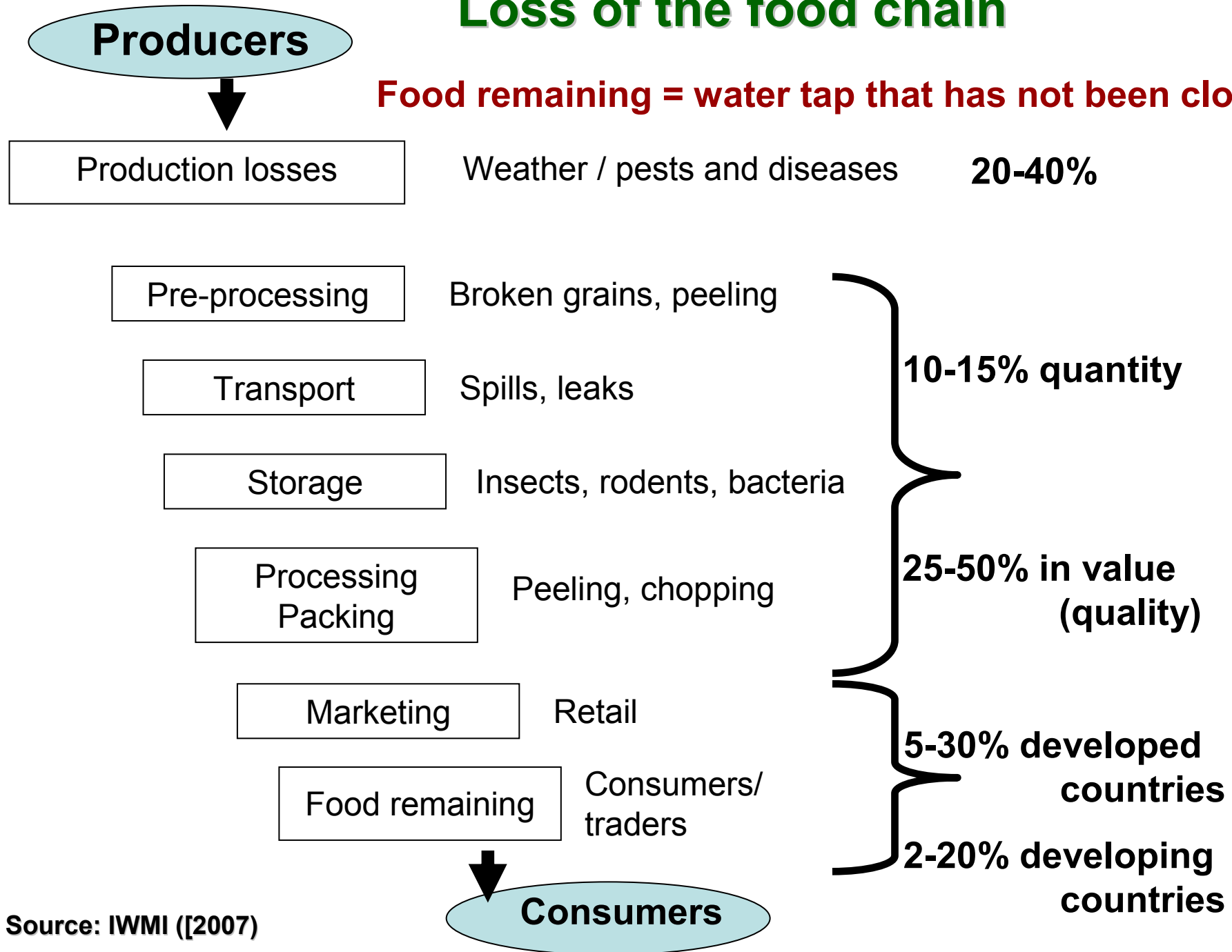
**Global evaporation of food plants: 7.100 km³/year:
7 100 000 000 000 000 liter/year**

- 78% of of water consumption of food production comes from rain water use
- An increasing share of water consumption is ensured by irrigation

Source: IWMI ([2007] In: *Water for Food, Water for Life: A Comprehensive Assessment of Water Management in Agriculture*, London: Earthscan, and Colombo: International Water Management Institute

Loss of the food chain

Food remaining = water tap that has not been closed



Source: IWMI (2007)

Élelmiszer-hulladék

 **recycle for Kent**

A third of the food we buy in the UK ends up being thrown away

Az UK-ban a megvásárolt élelmiszer 1/3-át kidobják!!!!



For ways to reduce your food waste, visit lovefoodhatewaste.com

LOVE FOOD hate waste

1/3 OF WHAT YOU BUY GOES TO WASTE



Examples of food items and prices shown:

- Mushrooms: \$5.40
- Artichoke: \$5.77
- Tomato: \$7.19
- Bread: \$5.15
- Vegetables: \$1.84
- Produce: \$3.25
- Vegetables: \$4.29
- Vegetables: \$4.29
- Vegetables: \$3.92
- Vegetables: \$9.38
- Vegetables: \$1.88
- Vegetables: \$3.24
- Produce: \$10.95
- Vegetables: \$7.18
- Produce: \$1.85
- Produce: \$7.99
- Produce: \$2.34
- Produce: \$13.19
- Produce: \$24.29

WASTE NOT-WANT NOT



PREPARE FOR WINTER

Save Perishable Foods by Preserving Now



FOOD IS A WEAPON



DON'T WASTE IT!
BUY WISELY - COOK CAREFULLY - EAT IT ALL

FOLLOW THE NATIONAL WARTIME NUTRITION PROGRAM



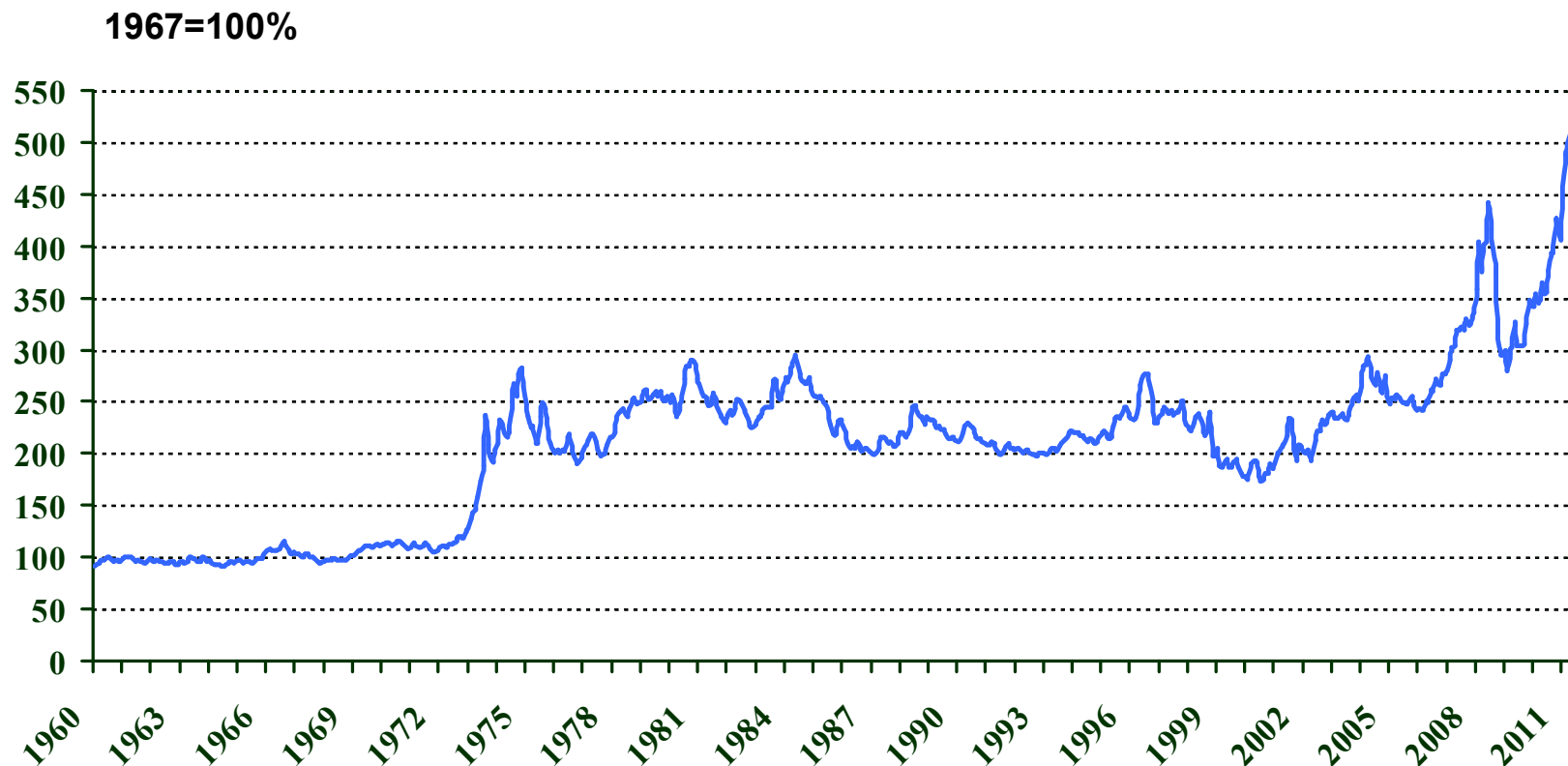
In the US against food waste

Zsófia Nagy [Origo, April 26, 2015]

- The **US government** is taking steps to reduce food wastage. They **declared the expiration date can not be taken seriously;**
 - **In the US, on average, more than 20% the food bought goes to trash** (US Department of Agriculture, USDA);
 - Most of the food is healthy and can be consumed even after expiry of the warranty period (eg, sugar or pasta);
 - **The USDA's call to citizens: Do not throw out all food** (for example, if the warranty a product expires on April 1, it might even be consumed for 1.0-1.5 years);
 - Foodkeeper application:
 - educational materials;
 - importance of recycling;
 - people donating food vs people being in need;
 - overwrite of the expiration date;
- ⇒ reducing food waste;**

CRB food-subindex (January 1960 – June 2011)

A direct association can be experienced between the increase of food prices and frequency of food riots



Wheat (Kansas City, Minneapolis), sugar, cattle, pig, cocoa, maize, soybean oil, butter and lard

Responses and challenges

❑ Increase of productivity

- **Physical water productivity** – more crop / drop of water
- **Economic water productivity** – more value / drop of water

❑ Stimulation of investments in order to increase productivity in the areas of natural rainfall and irrigation

❑ Improving water productivity

- Technically feasible, but farmers optimize rather regional productivity instead of water productivity especially where use of water is supported.
- Which incentives are needed?

❑ Facilitating food trade between water-rich, fertile areas and water-poor areas

❑ Reduction of losses in the food chain






South-China Plain, 1994;
Photos, László Makra

“Anyone who can solve the problems of water will be worthy of two Nobel Prizes – one for peace and one for science” (John F. Kennedy)

Due to the economic crisis not only demand but also business confidence have been shaken

□ Economic recession: 2007 - 2014

- *Decline in real incomes*
- *Fall in demand, change in its structure*
 - ✓ *Higher added-value products:* 
 - ✓ *Cheaper substitute products:* 
 - ✓ *Trade marks:* 

□ Devaluation of currencies, fluctuation of exchange rate

- *Rearrangement of market positions*

□ Lack of trusts between the main stakeholders and banks both in domestic and international markets

- *Narrowing of credit facilities*

Trade is the engine of the economy, oil of which is financial credit

□ Tightening of credit conditions

- **Size of business ownership structure**
- **Product offering, brand names of the company**
- **Markets and partners of the company**
- **Credit history and equity capital of the business**
- **Leading, financially strong, multinational companies in developed countries are strengthened, while small and medium-sized enterprises go bankrupt in large numbers**

□ Importers of risky countries do not have access to credit

- **Narrowing of business opportunities (all companies involved!)**
- **Decline in international trade**

The demand for agricultural products continues to grow after a temporary halt

□ The demand for basic foods and bio-fuels is inelastic

- Increase in quantity and quality demands
- The interest turned again to food industry, because it must be now grounded how it performs after a decade
- The capital has just been getting to the countries that make opportunity for land expansion and obtains resources

☞ The real value of funds turned to R&D has decreased in the OECD region

□ Today, the underdevelopment of infrastructure and logistics is the biggest problem, i.e. the products onto the market

Immunity to the crisis in agriculture is different from country to country...

- ❑ **General opinion: agriculture (especially plant production, except for organic farming) is less affected compared to other sectors;**
 - **Countries, whose agriculture is hardly affected in the crisis:**
Pl. United States, Canada, United Kingdom, etc.
 - **Countries, whose agriculture is severely affected in the crisis:**
Pl. Brazil, Argentina, New-Zealand, Denmark, Slovakia, etc.

- ❑ **The differences can be traced back to how the main stakeholders financed their operations and deliver what markets;**

HUNGARY

Operating structure in Hungary, 2007 vs 2004

Half of the arable land is private, the other half involves corporate farms!

- **Commodity economy: 90 000**
- **IIER data (2008): 188 000 economy were eligible for direct payments**
 - **Az IIER data does not reflect the actual land use („couch” ranchers)**
- **Slow process of concentration**
- **Limited land market**
 - **2% of the agricultural land is object of sale, while 1% is inherited per year**
- **The income-transfer efficiency is low: 38% of the funds „disappears”**
 - **31% get to the land owners, 5% to other actors of the food chain**

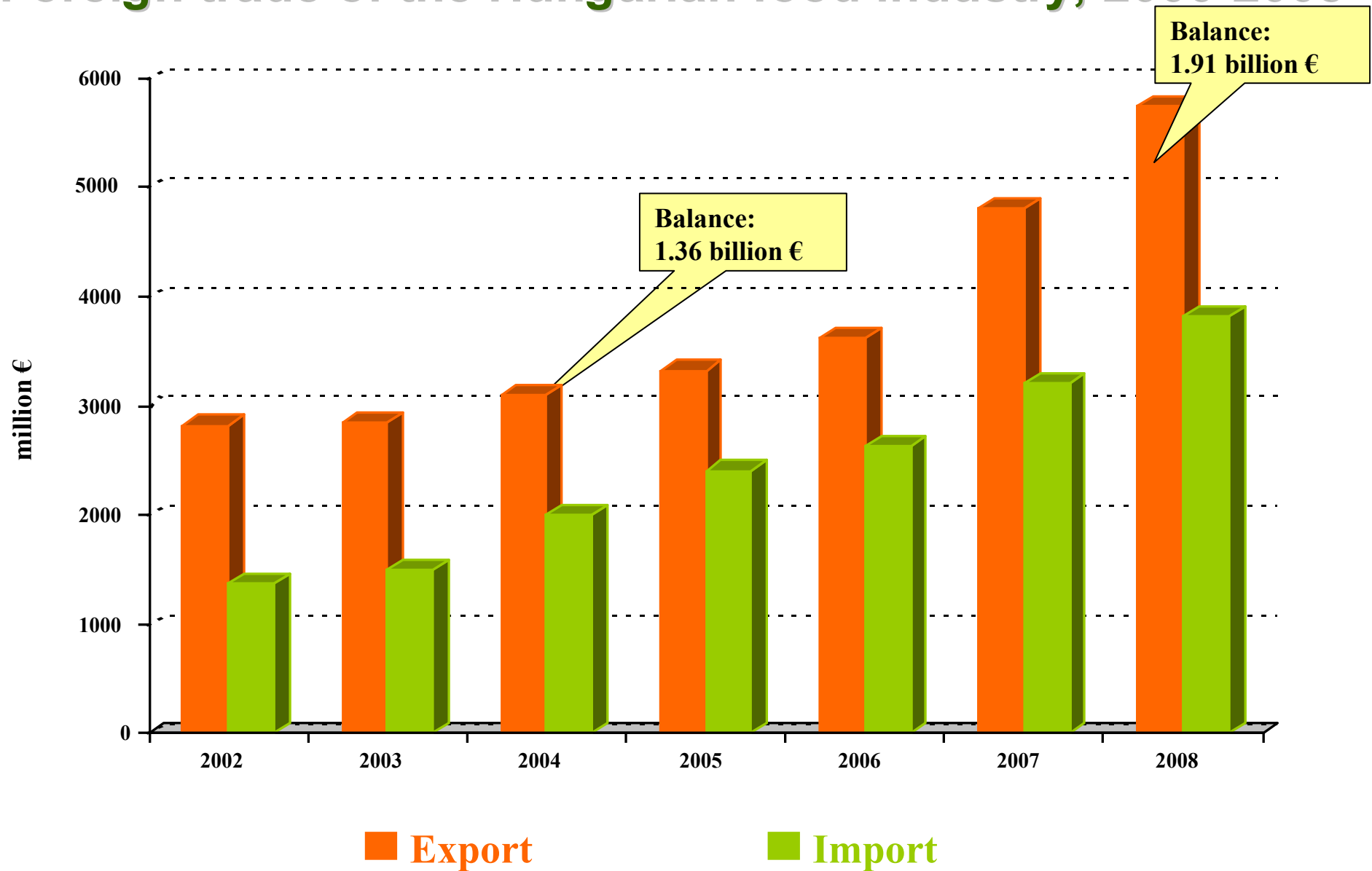
2004			
Farmméret	Gazdaság száma	Mg-i terület (ha)	Mg ter. (%)
<10 ha	147 949	533 068	10,7%
10-50 ha	45 961	950 687	19,0%
50-100 ha	6 952	486 168	9,7%
100-500 ha	6 460	1 272 183	25,4%
>500 ha	1 173	1 757 600	35,2%
Összes	208 495	4 999 706	100,0%

2007			
Farmmérete	Gazdaság száma	Mg-i ter (ha)	Mg ter. (%)
<10 ha	132 110	479 688	9,4%
10-50 ha	45 054	952 949	18,7%
50-100 ha	7 368	515 472	10,1%
100-500 ha	7 115	1 394 507	27,3%
>500 ha	1 232	1 759 518	34,5%
Összes	192 879	5 102 133	100,0%

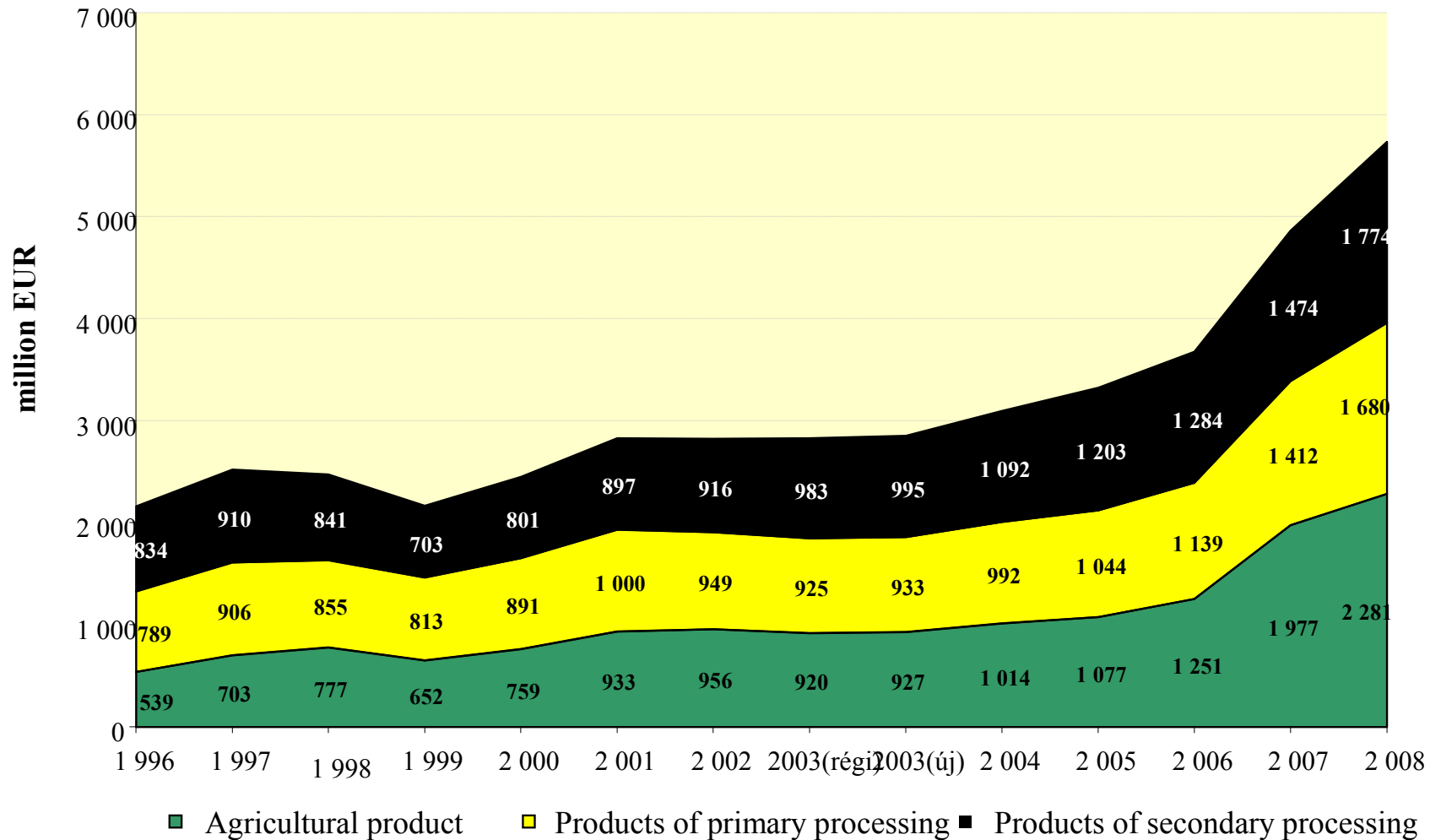
Source: Integrated Administration and Control System

Source: Leakage of direct subsidies, AKI (2008)

Foreign trade of the Hungarian food industry, 2000-2008

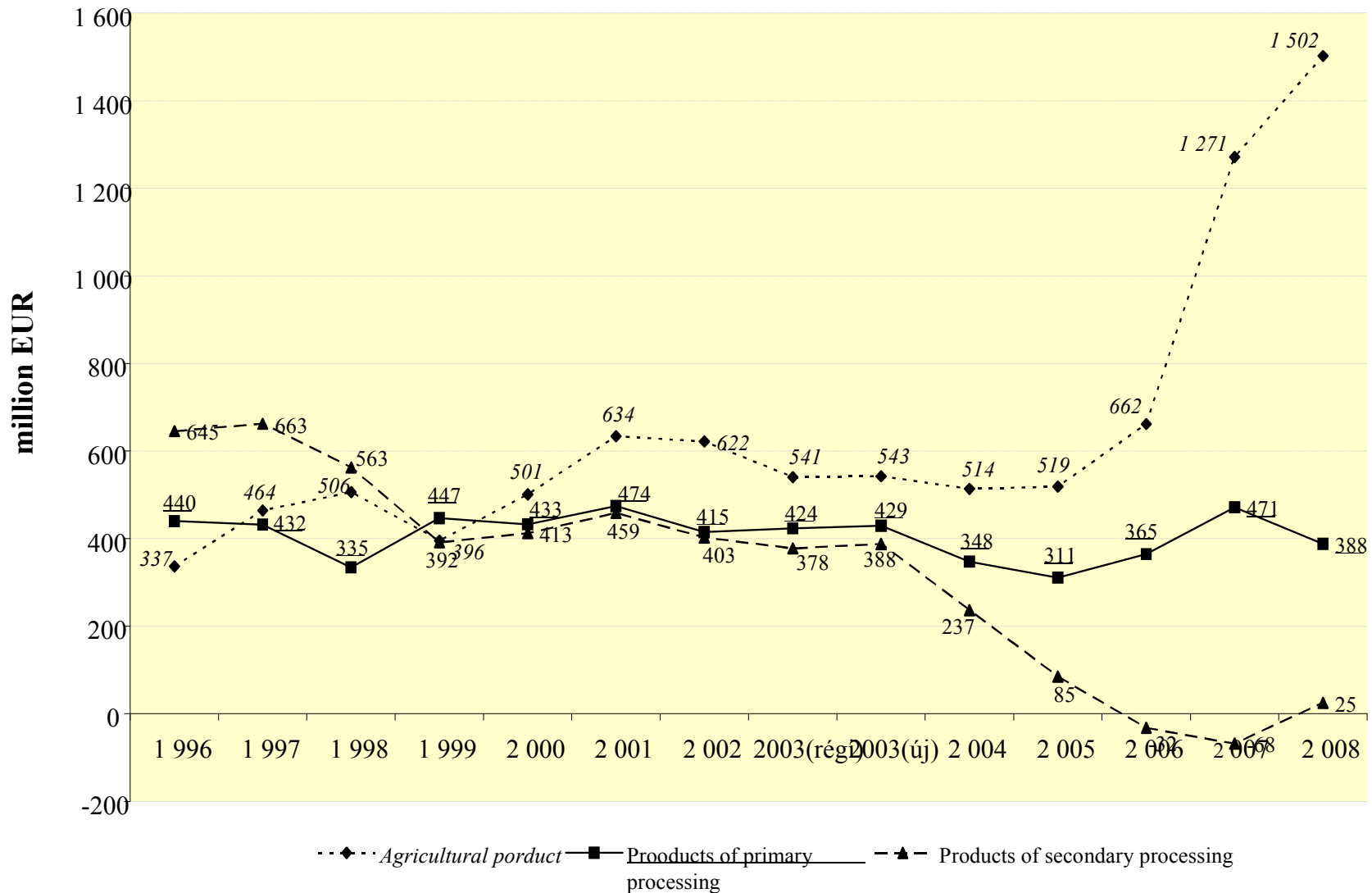


Agrobusiness export of Hungary in terms of processing, 2000-2008



Source: own calculation based on KSH data set

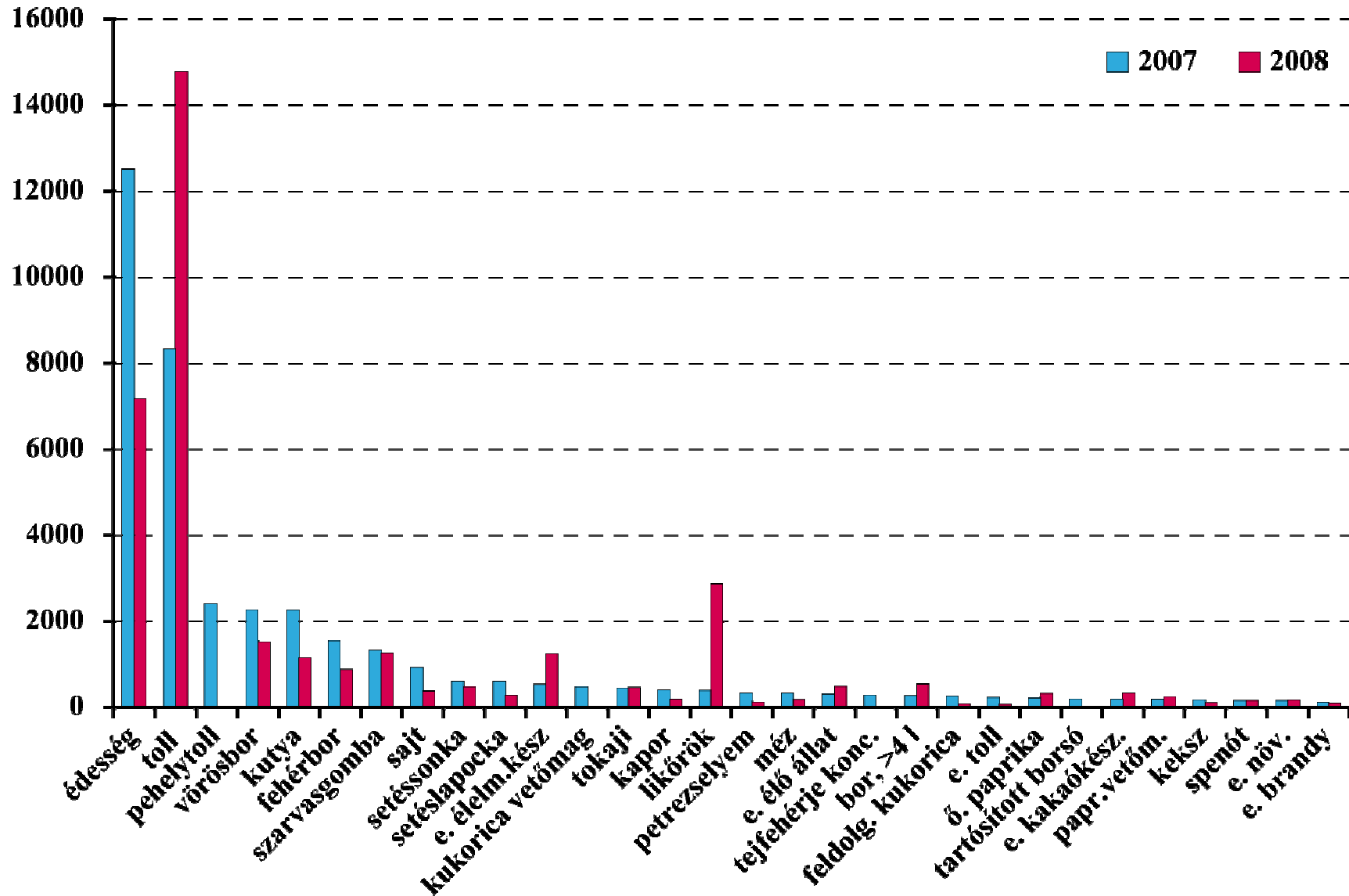
Balance of food economy of Hungary in terms of processing, 2000-2008



Source: own calculation based on KSH data set

Export structure of the Hungarian food economy, 2007-2008

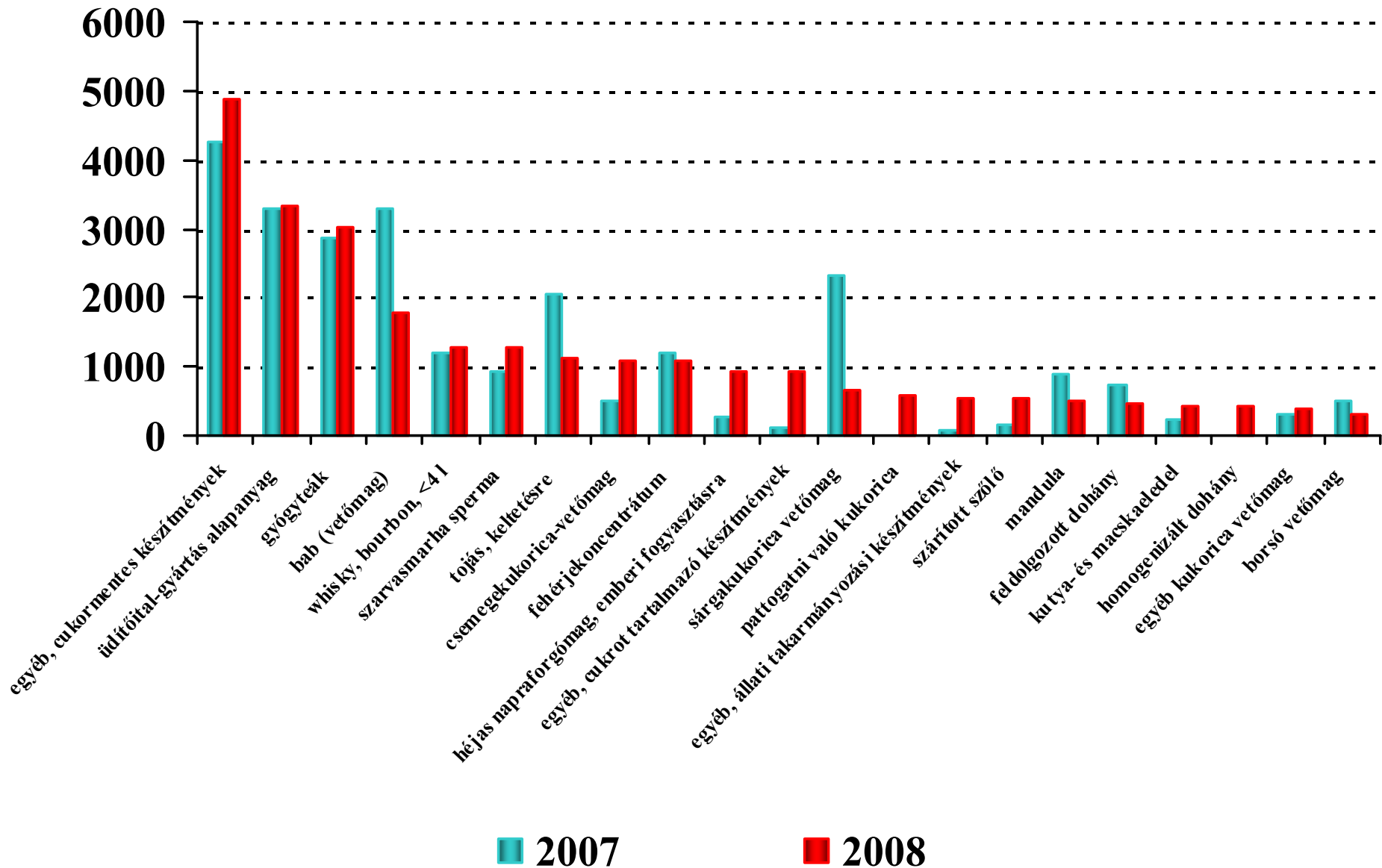
1000 USD



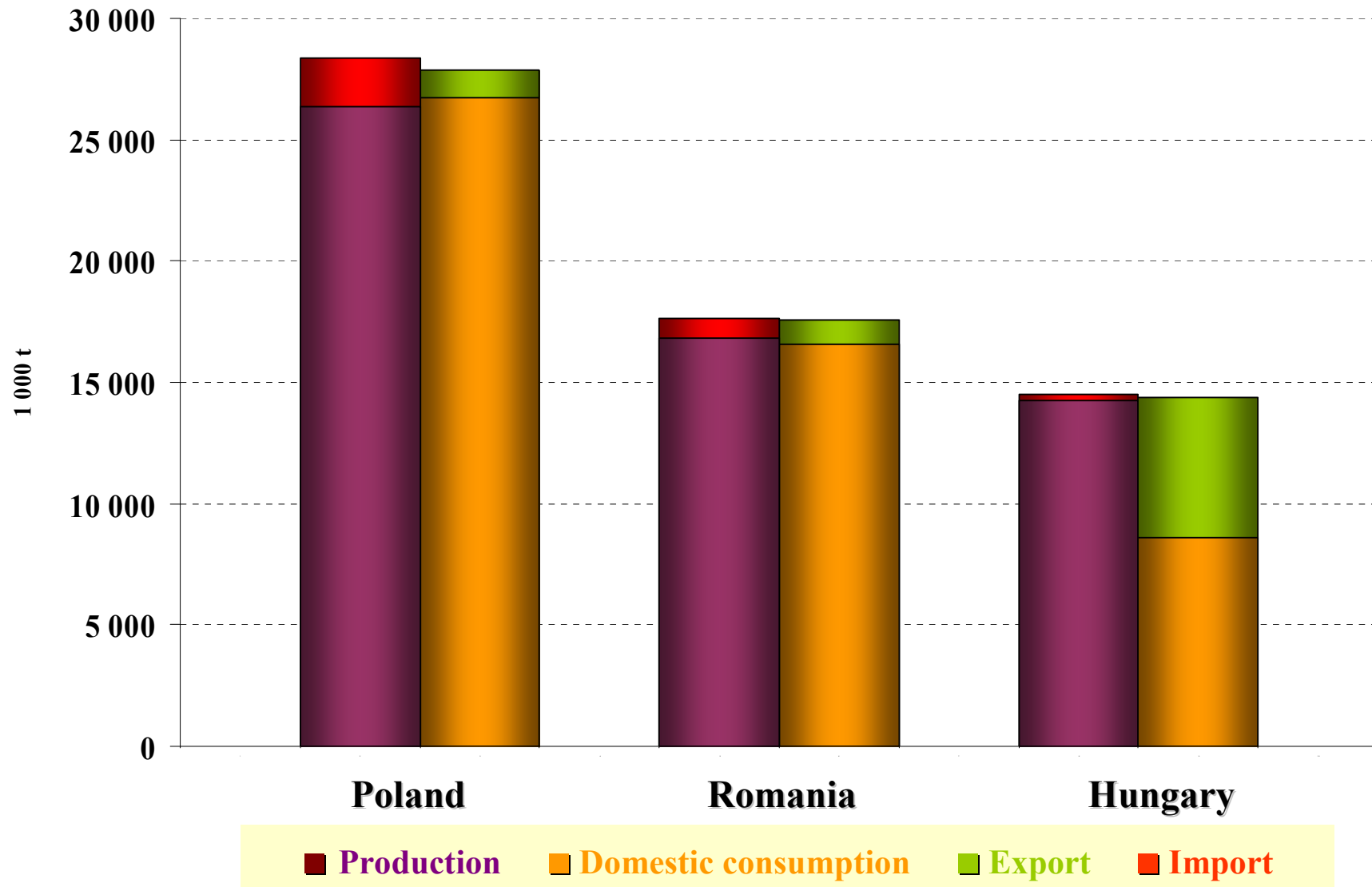
Forrás: U.S.Department of Commerce és U.S. International Trade Commission

Import structure of the Hungarian food economy, 2007-2008

1000 USD

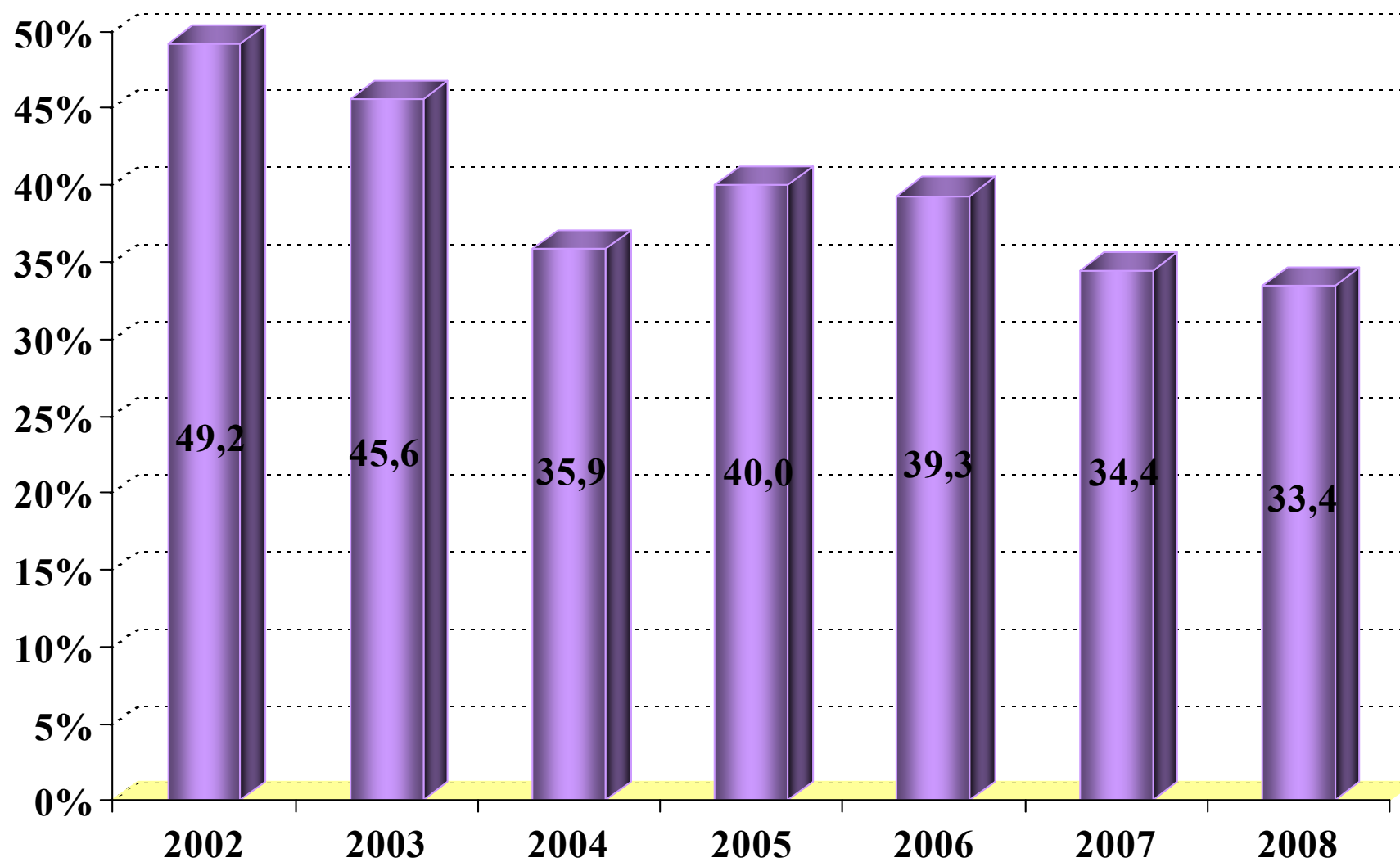


Supply and demand for cereals in some new EU member states, average of years 2004/05-2007/08



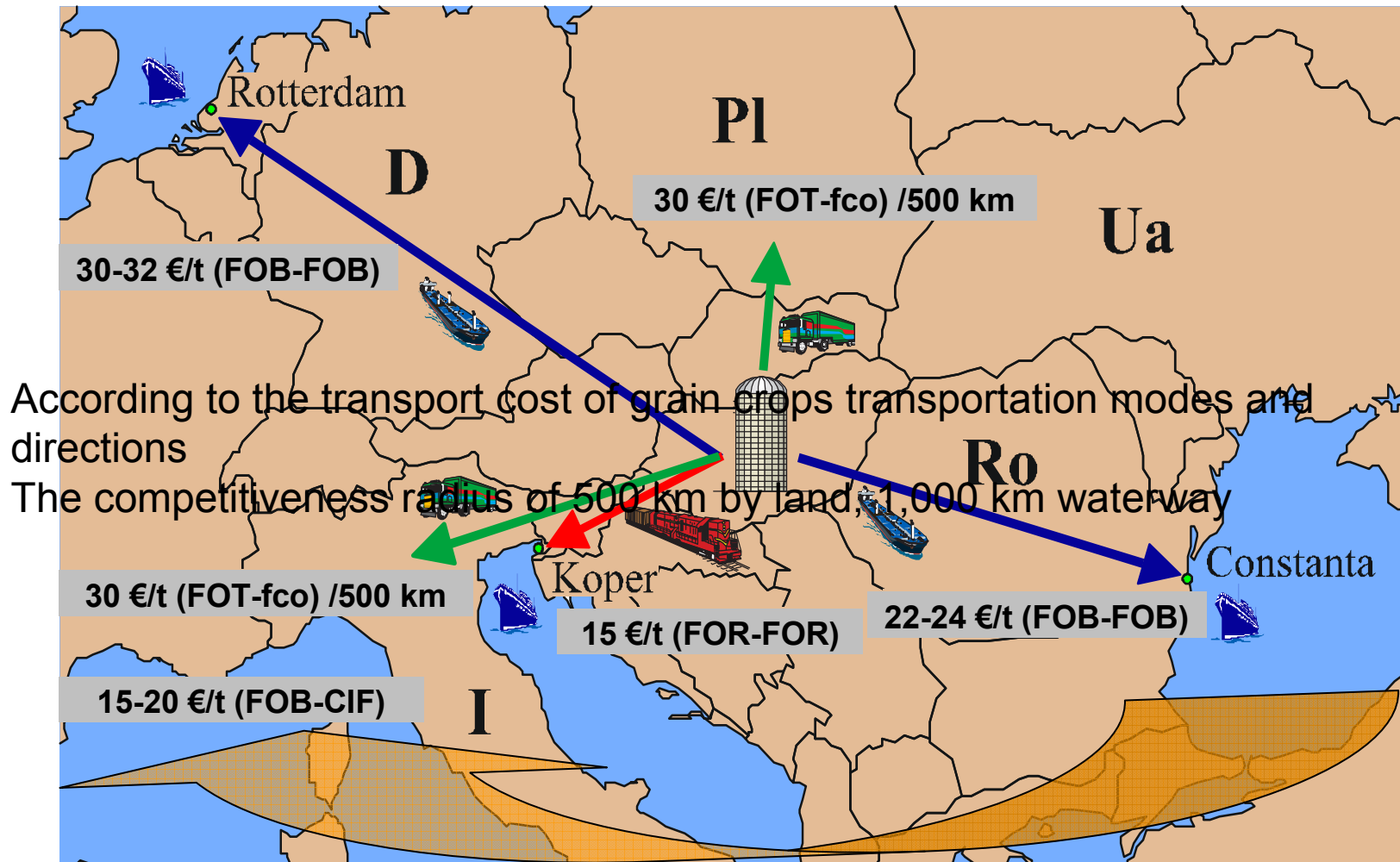
Source: Eurostat

Share of livestock production from the gross output of the sector



Source: KSH

Transport cost of grain crops according to transportation modes and directions



Competitiveness radius: 500 km, land; 1000 km, waterway!

Problems of domestic crop production

- Strong dependence on rainfall amount and its distribution in time**
- Drought: a lot of talk, little action: territory of areas irrigable with water rights permit was 165 000 ha in 2008, however, of which 59 000 ha was actually irrigated**
- Fragmented land structure, land law restrictions**
- Steady decline in the use of certified seed**
- Periodic cuts of other inputs**
- Too much wheat variety selection (135), the lack of large and homogeneous export items**
- Steady decline in livestock (feed consumption decreases)**
- Fusarium infection in cereals (place to place and time to time)**
- Uncertainty of investors in biofuel production**
- Poor competitiveness of rail transport**
- Uncertainties in inland waterways due to the water level fluctuations**
- Domestic and export sales without account (huge amount of VAT fraud)**
- The lack of contract discipline and long-term contractual relations**
- Strong price volatility, lack of risk management**
- GMO regulations**

Alternatives of eliminating surplus grain

(Bio)ethanol-production

- The European (and North American) ethanol price crucially dependent on the Brazilian export tariff price
- Domestic capacities are not utilized (50%)
- Realization of the planned / announced projects in Hungary are complicated:
 - There is no willingness on the long-term, stable contracts and joint risk
 - Logistics conditions are not adequate
 - The domestic market is saturated, foreign market sales force, Hungary and the EU are net exporter of petrol, and net importer of diesel
 - In the fuel consumption, the proportion of diesel continues to increase (now 63%)

Alternatives of decreasing surpluses of oil-crops

Biodiesel-production

- The price of biodiesel is determined in Germany
- Leading representatives of biodiesel production in Europe are Cargill, ADM and Bunge
 - These companies integrate production: who has the raw material, he dominates the market ...
- The interest of a few big oil companies is to obtain standard quality biodiesel, MOL / has own biodiesel production (purchases vegetable oil)

Drawbacks in the domestic meat industry (general)

- ❑ On average, genetics is moving ten years before the domestic breeding technology
 - Compliance with environmental regulations - especially during a recession - caused a huge competitive disadvantage
- ❑ Difficulty of borrowing: interest of borrowed capital is very high (14-16%)
- ❑ Black economy handicaps concentration
 - Price competition of illegal meat trade complicates the legal status of processors
 - Raising VAT is an additional incentive for the black economy
- ❑ Bodyguard requires rising costs for (it may rise up to 0.5% of sales revenue)
- ❑ Official fees are high (veterinarians, meat inspection, etc.)
- ❑ The manufacturing structure is fragmented, technology is outdated, capacity utilization is low (40-70%)
- ❑ Low labor efficiency
- ❑ Concurrent professional advocacy system
 - Product Councils, associations, etc.
- ❑ We have become net importers from pork and dairy products

Drawbacks in the domestic meat industry (specific)

Poultry

- ❑ Small manufacturing capacity, the presence of foreign capital is insignificant
- ❑ Competitiveness of chicken declines, export of waterfowl remains important
- ❑ **Goose liver???**

Pig

- ❑ Disorganized product chain (gilts are often produced by the breeders)
- ❑ Heterogeneous genetic basis, few breeders, small stock, small selection base
- ❑ Pig keeping needs own / leased land (manure, fodder production)
- ❑ Domestic producer prices are aligned to prices in Germany and the Netherlands
 - HUF / EUR exchange rate affects export and import, e.g. shipping costs from the Netherlands 2009: 45 € /kg (live weight) → import slow down effect (2008: 25 € /kg live weight!)

Cattle

- ❑ Slaughter cattle breeding (dairy 50%) has been shrinking, beef cattle are sold on foreign markets
- ❑ In terms of price stability domestic demand is of crucial importance in the (the market price today depends on the export market)
- ❑ Condition of beef cattle breeding is own grassland (grazing and mowing) and conscientious "portfolio management"

Drawbacks in the domestic dairy industry

- ❑ The average protein and fat content is relatively low compared to other Member States
- ❑ Lack of intensive grassland management, lack of low-cost grazing, expensive intensive livestock farming
- ❑ The milk production needs (own / leased) land (manure, fodder cultivation)
- ❑ The elderly leaders of large dairy farms, gradually divest holdings
- ❑ Bodyguard needs considerable additional cost, the official toll is high (veterinarian, ATEV, etc.).
- ❑ Outdated manufacturing technology, low capacity utilization
- ❑ Smaller processors (mass product manufacturers) are becoming weaker position
- ❑ No pursuit among processors for rational division of labor
- ❑ Regional processors could provide some margin against the trade

Reducing negative effects of climate change and promoting adaptation and changes in Hungary

Sustainable agriculture

Measures to reduce intensive production, taking into account environmental concerns and promote the use of renewable energy.

Rural development funds for sustainability

Investment and development grants

Modernisation of agricultural holdings
Spreading renewable energy

Normative subsidies

Agri-environmental managements:
Support for energy crops
Support for less favoured areas
Support for afforestation

2010 Single Payment Scheme (SPS)

Cross-compliance: Cross-compliance (cross-compliance): Only those farmers can obtain total subsidy who respect legal requirements in the field of environment and nature protection, food safety, animal health and animal welfare.

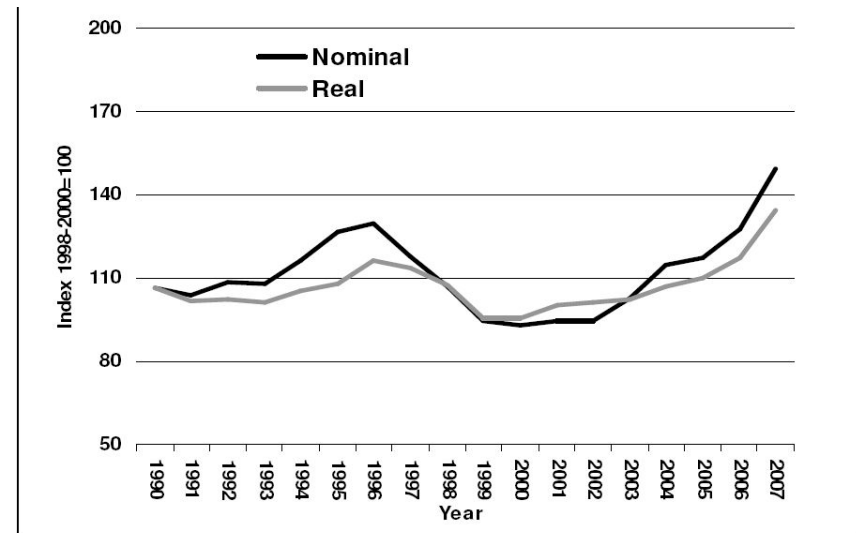
Decoupling from production: (almost) total separation of direct payments from production eliminates production not justified by market conditions.

Modulation: In case of direct payments exceeding EUR 5000 withdrawal of a given the percentage of the support for environmental and rural development measures.



Increasing food prices

- Why are food prices rising?
- What is the role of increased demand for bio-fuels in economic growth?
- What is the effect of "emerging economies" on the global food markets?
- What is the role of climate change in forming these phenomena?
- Is it expected to further rise in prices?
- What is the impact of worldwide high food prices on different social groups - who wins (producers) and who loses (consumers)?
- What steps are being taken by political leaders to deal with negative consequences of these developments?



FAO, annual price index 1998-2000 = 100

Reasons – for the supply side

- **Weather-related production losses.** (floods caused by climate change, drought and severe winters, cyclones, hurricanes and earthquakes);
- **Gradual decline in stocks.** (Cereal stocks are at the lowest level since 1980, they fell by 3.4% annually → mainly cereal stocks);
- **Increasing fuel prices.** (A higher costs not only increase the cost of agricultural production, but also the transportation costs);
- **Lack of investments in the agricultural sector** (in the early 1980s, from the level of more than USD 9 billion a year, agricultural investments fell back below US \$ 5 billion by the end of 1990)

Reasons – for the demand side

- **Population of the Earth grows.**

- **The demand structure transforms.**

(Economic development and revenue growth in some emerging countries gradually changes the structure of demand for food. Economic development and revenue growth in some emerging countries gradually changes the structure of demand for food. As a result of migration and urbanization food market structures and consumption patterns are changing.)

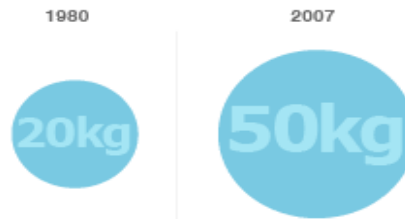
- **New demand for bio-fuels.**

(Those crops that are decisively produced in food production purposes, now are sold as a raw material for the production of bio-fuel.)

Increase of the Earth's population

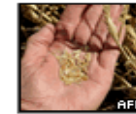


Changes in food consumption
Per capita consumption of meat in China



use of resources

1000-2000 l of water are needed to produce 1 kg of wheat



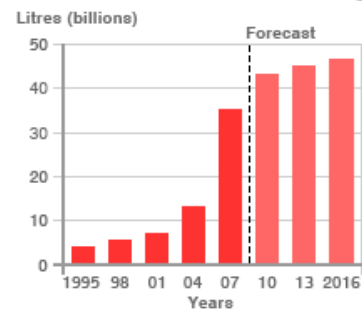
10000-13000 l water are needed to produce 1 kg of beef



SOURCE: UN

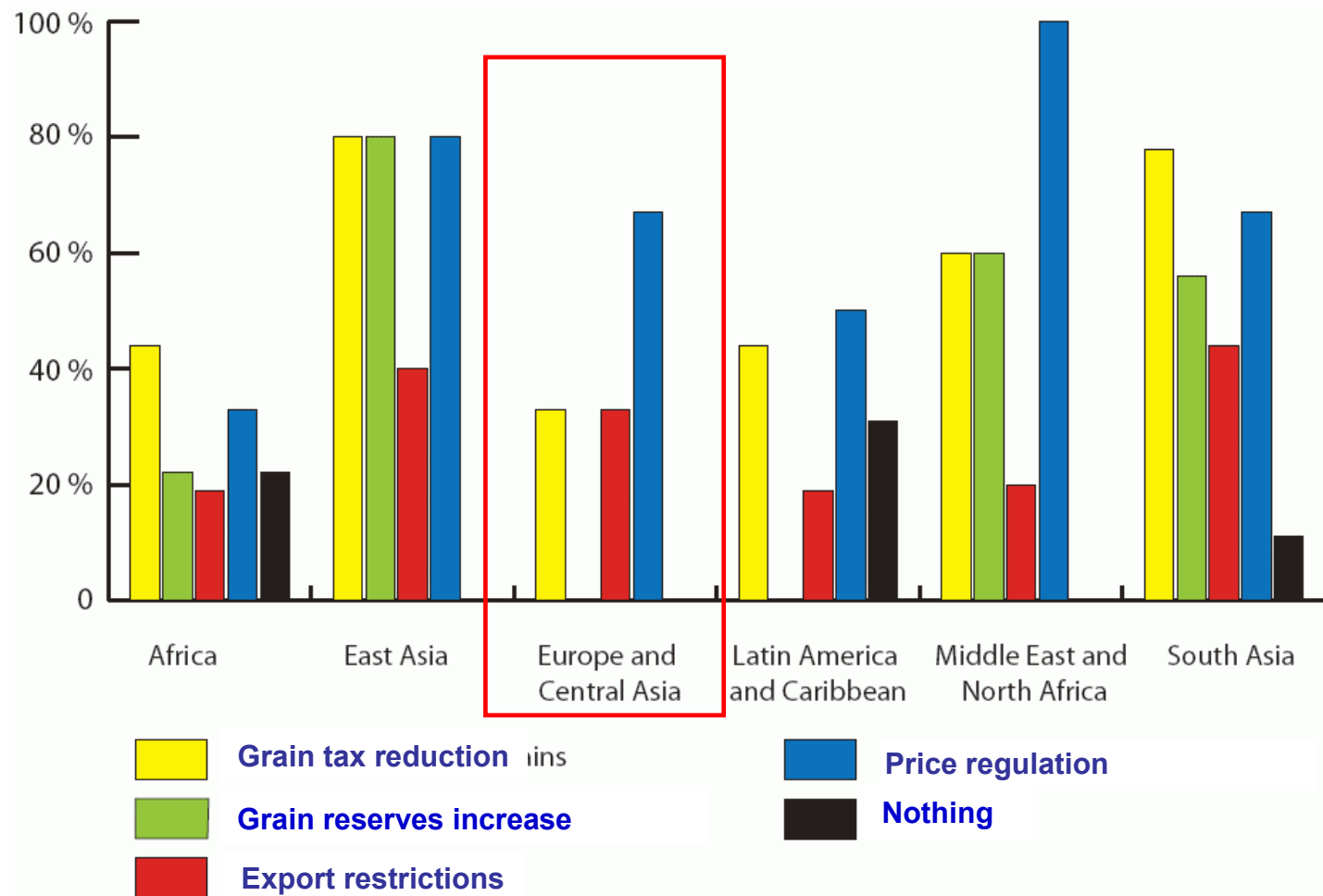
SOURCE: FAO

Ethanol production of US



SOURCE: ERS/FAO

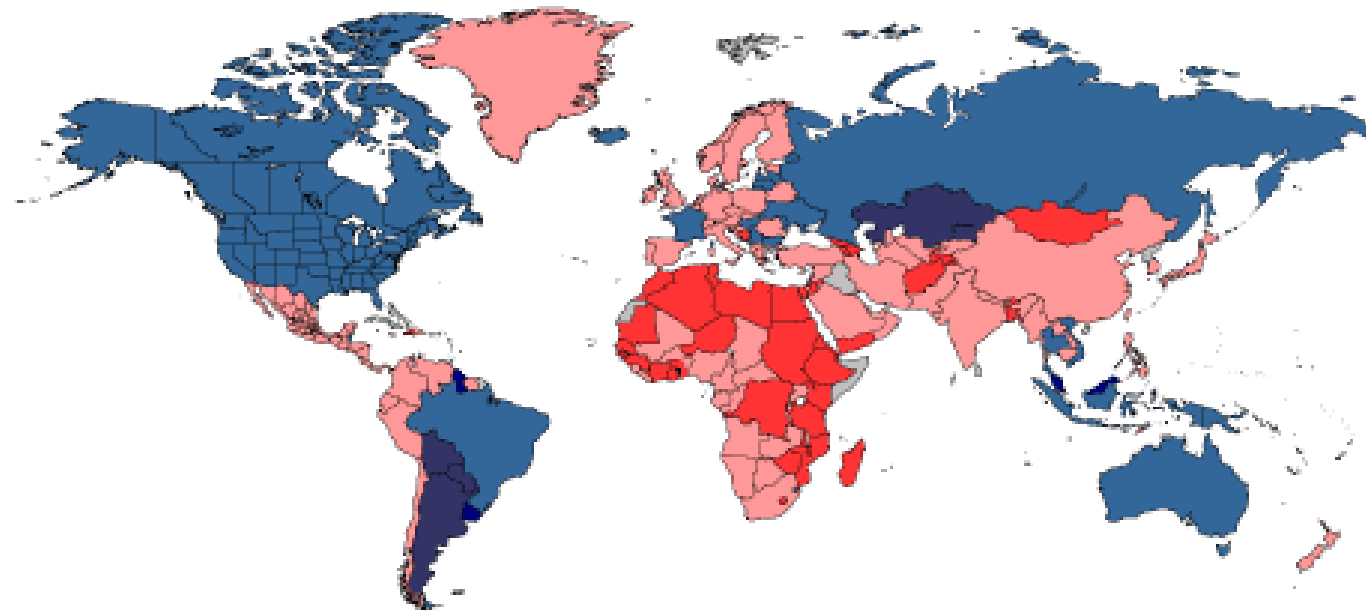
Response of the market to high food prices by regions, 2007-2008



Source: FAO (2008) *Soaring food prices: facts, perspectives, impacts and actions required*. HLC/08/INF/1

Impact of rising food prices on trade balance

2007 - 2008 IMPACT OF PROJECTED FOOD PRICE INCREASES ON TRADE BALANCES



- Large losers (trade balance worsening > 1% 2005 GDP)
- Moderate losers (trade balance worsening < 1% 2005 GDP)
- Moderate gainers (trade balance improving < 1% 2005 GDP)
- Large gainers (trade balance improving > 1% 2005 GDP)
- No data

SOURCE: The World Bank

FOOD SECURITY: OPTIONS

- **Increasing production:**
 - Tools: Investments, research and development programs, education and training services, rural infrastructure.
 - Result: sustainable food security.
- **Short-term measures:** → to meet the long-term investment needs
 - eg. linking food aid to education (school lunch),
 - infrastructure development (construction of rural roads and irrigation systems);
 - Ensuring access to land, strengthen the rights of poor people to agricultural tools and resources (land, water),
- **Medium-term measures:** → strengthening of institutions and organizations involving small-holder farmers.



Unused agricultural potential in Eastern Europe

EBRD and FAO → significant untapped agricultural production potential is present in Eastern Europe, especially in Kazakhstan, Russia and Ukraine.

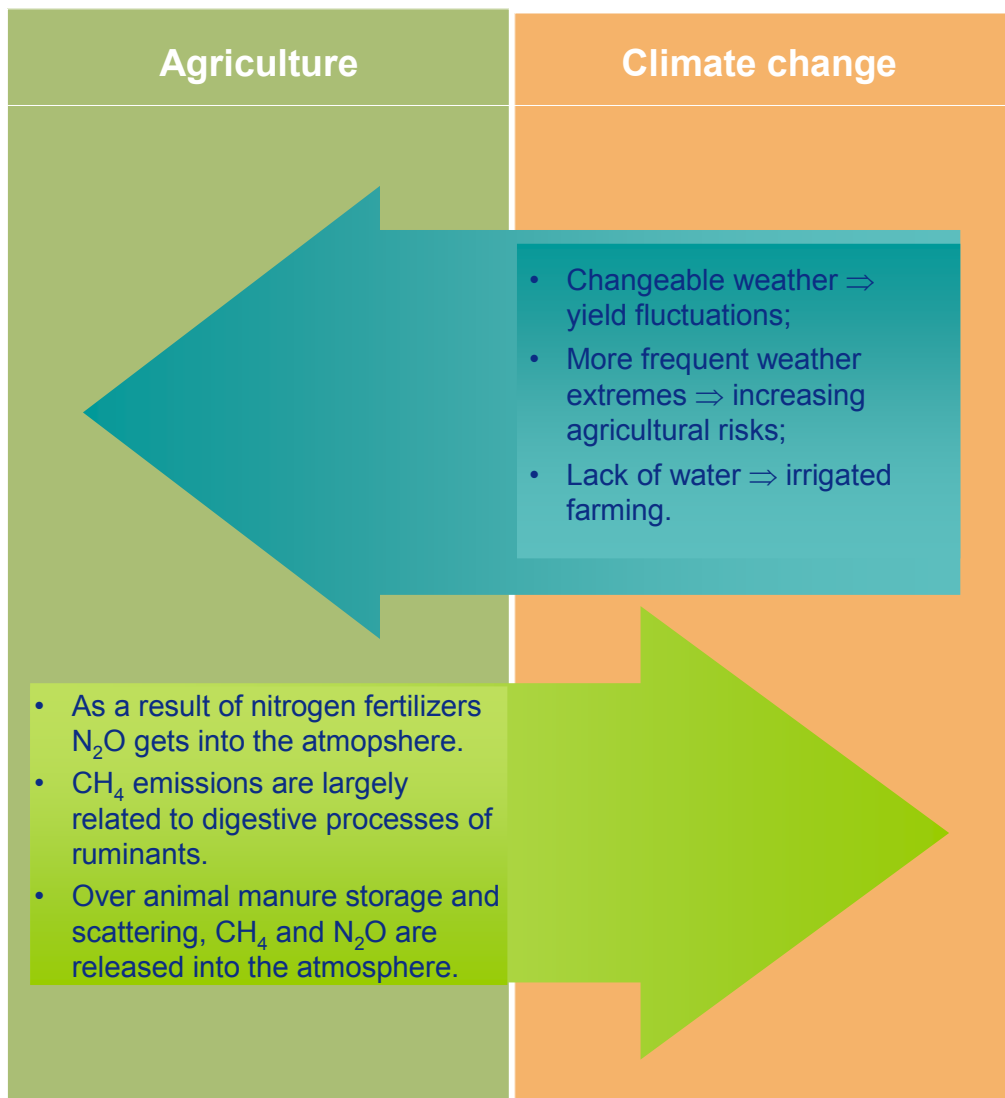
In these countries, approx. 23 million hectares of arable land were withdrawn from production in recent years. At least 13 million hectares could be put back into production without major environmental burden.

Current forecasts of Eastern Europe's cereal production promise a 7% increase between 2007 and 2016, reaching 159 million tonnes.

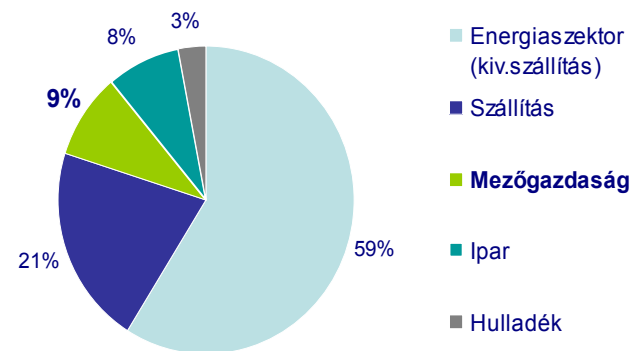


EU member states

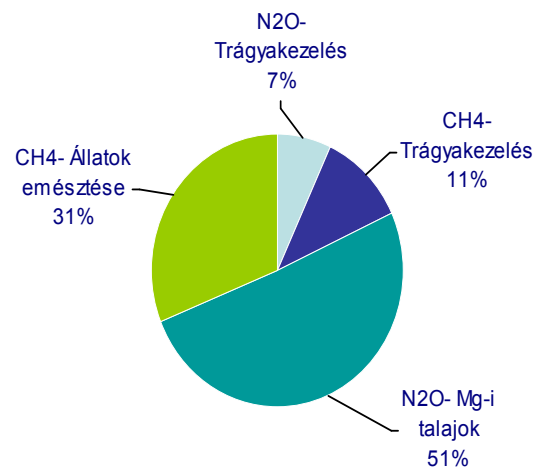
Interaction of agriculture and climate change



Share of agriculture from the total GHG emissions of EU-27



Composition of GHG emissions coming from agricultural activities



Source: EC: Agriculture of EU – answer to the challenges of climate change

Treatment of climate change at the EU level

Climate change program of the EU

Goals, 2000 → 2020

- Reducing greenhouse gas emissions by at least 20% compared to 1990 levels
- Ensuring 20% of final energy consumption from **renewable energy**
- Increasing **energy efficiency** by 20%

The EU's climate change program launched in 2005 aims at:

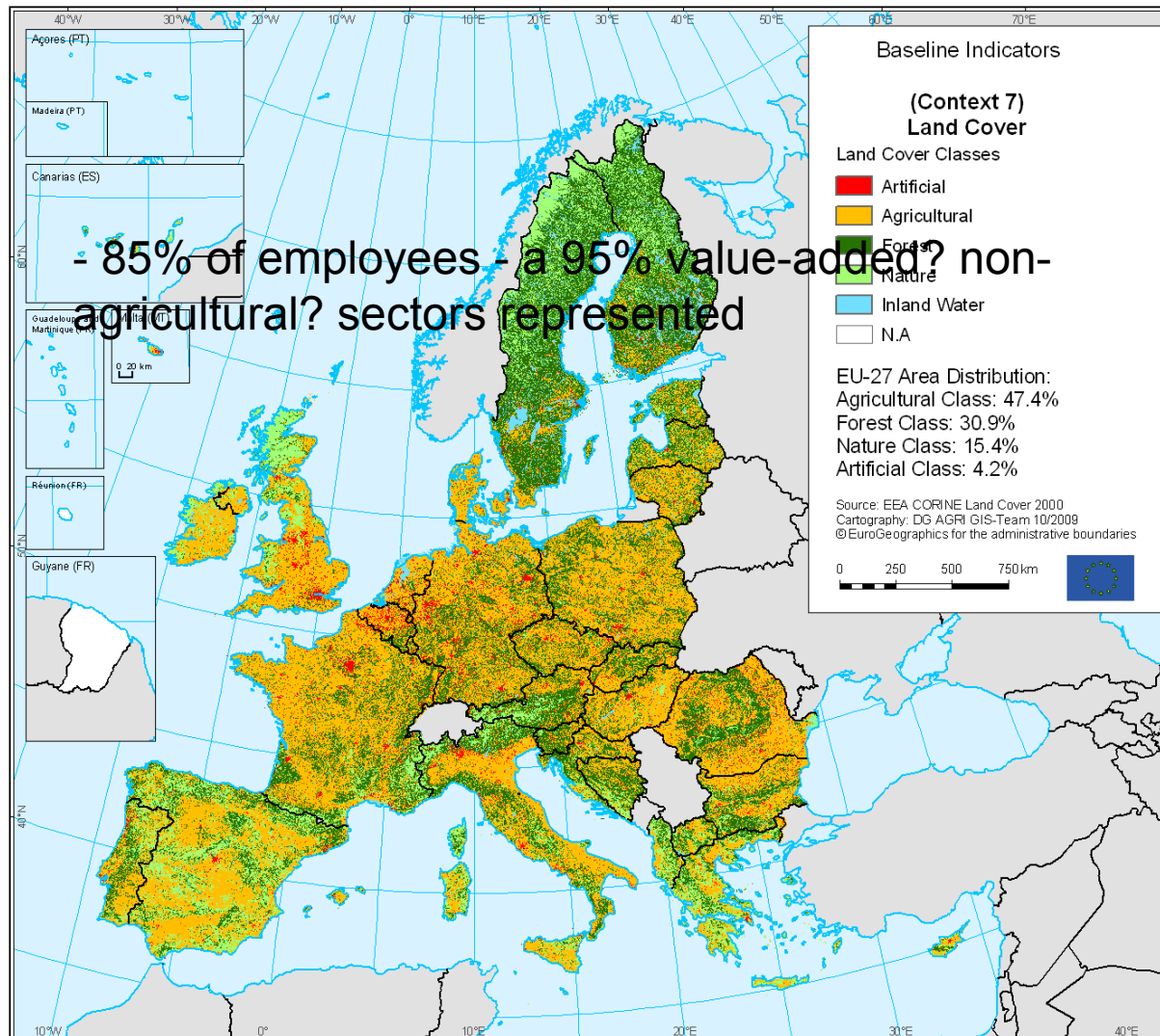
Exploring those cost-effective options that help reduce emissions of greenhouse gases, while consistent with the objectives of the Lisbon Strategy (economic growth, job creation).

Key steps in the relationship between agriculture and climate change in the context of the ECCP II:

- In the 2007-2013 Programming period, climate change was integrated into the rural development policy → the EU Member States should use at least 25% of their EMVA resources along with **environmental and rural development priority**.
- Reducing soil nitrate content of the soil (91/676 / EEC) in order to prevent water contamination. The nitrate - which is a greenhouse gas – is largely emitted by **agricultural wastes and fertilizers**.

The importance of agriculture in the EU

2010: export 91 billion €, import 84 billion € (balanced)



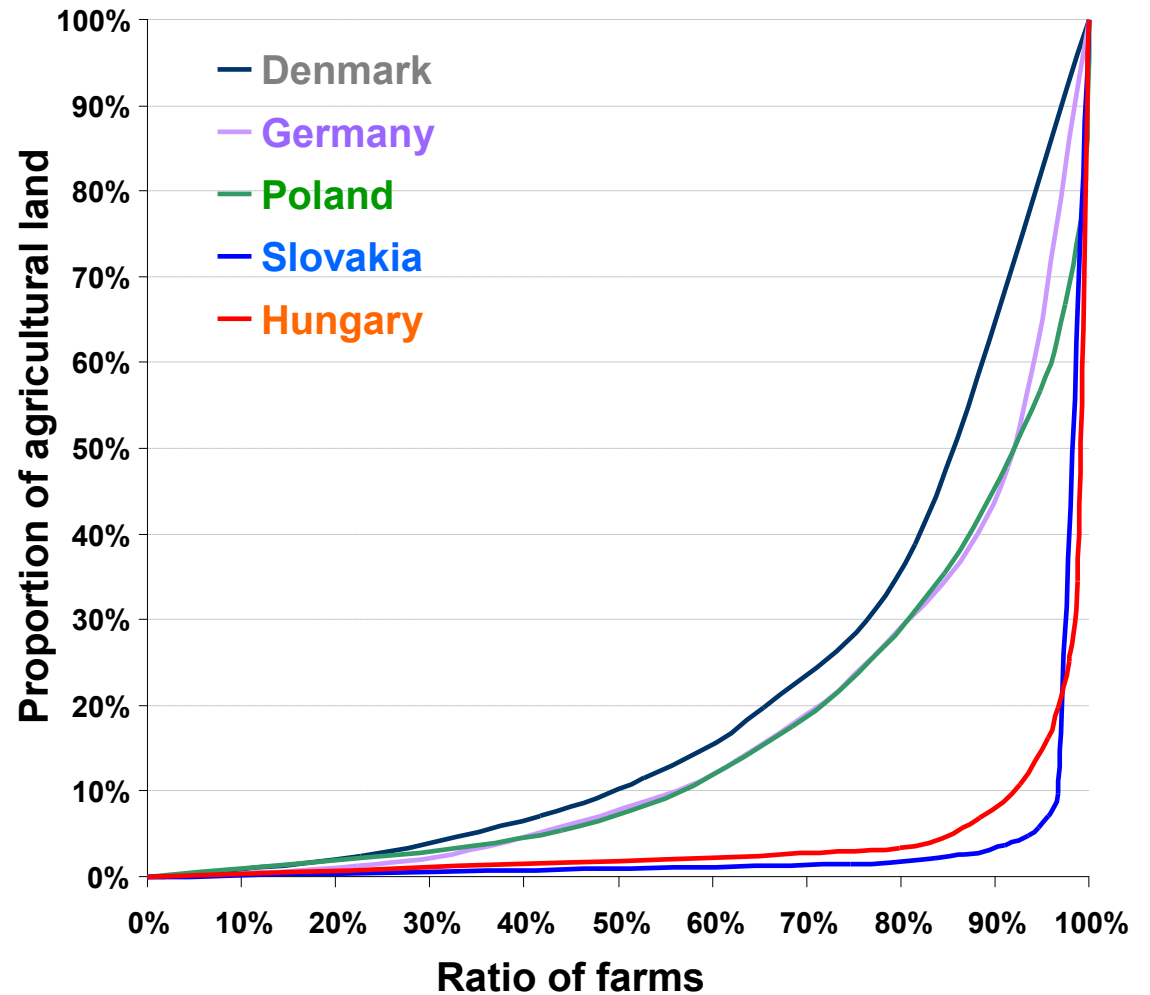
- ❑ 1,6% of GDP
5,4% employees
- ❑ agricultural + forest area: 84% of the total
- ❑ 13,7 million farms based on the national census (2007)
(70% > 5 ha; 11% < 20 ha:
77% of the agricultural land is cultivated)
- ❑ Food industry employs
17,5 million people
(7,7% of all employees)
- ❑ In the economy of the primary rural areas also the service sector is the engine of the economy:
85% of employees,
95% of added value
→ non-agricultural sectors

Source: European Committee (2010)

Operational structure in some EU member states

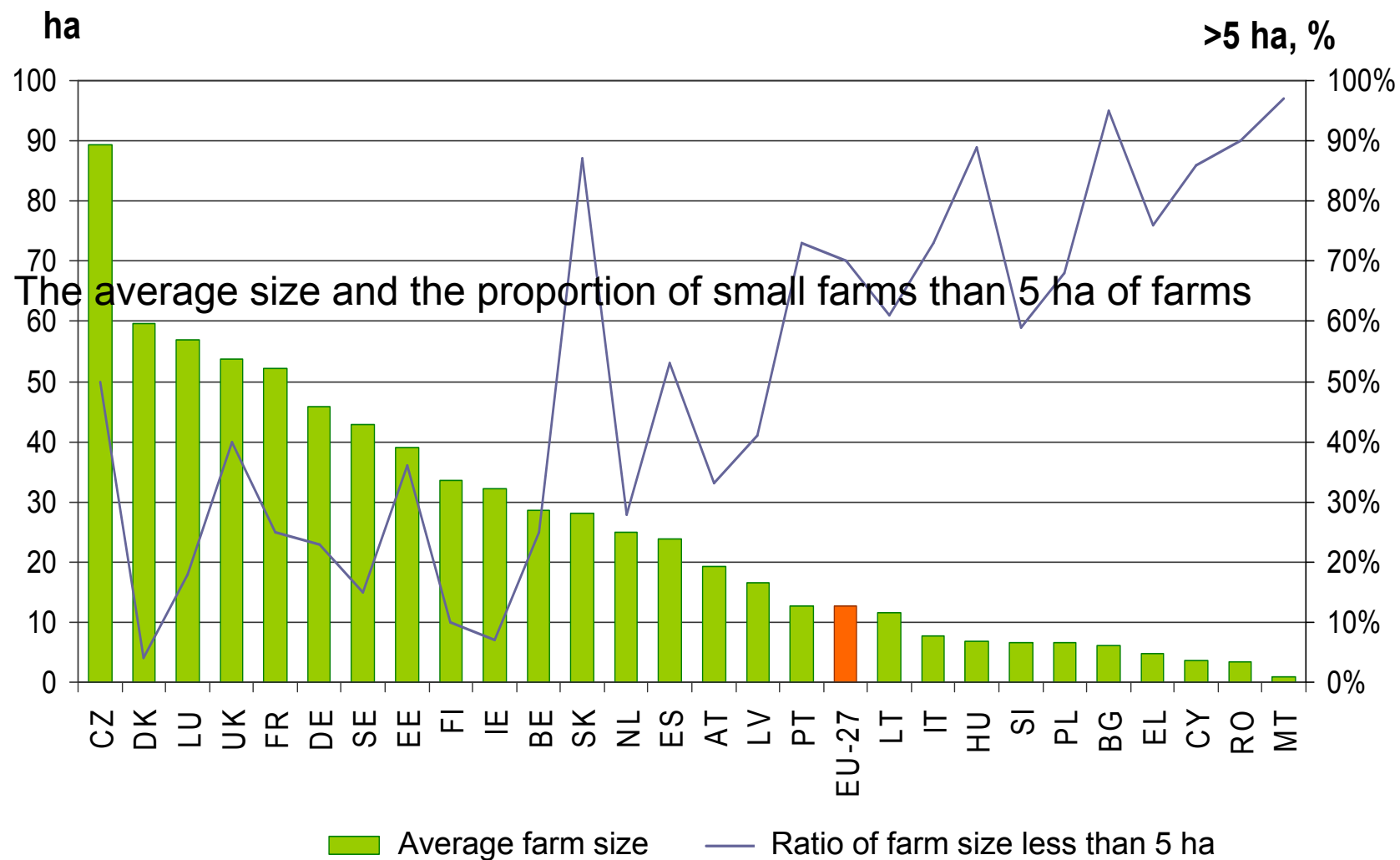
- **GSzÖ (2007):**
 - 619 000 individual farms
 - 7 400 economic organizations
 - Private economy (also support)*
 - 1 pig or 400 m² vegetables/fruit
 - Self-supporting farm*

	Average size of farms (ha)
Denmark	57,6
Germany	48,3
Poland	7,0
Slovakia	45,5
Hungary	8,7



Source: KSH: Industry structure census: GSzÖ (2007), Eurostat (2007)

Average size of farms and ratio of farm size less than 5 ha



Limits of farm structure survey in some EU member states

- ❑ **Danmark: 5 ha of agricultural area**
- ❑ **Germany: 2 ha of agricultural area, 0,3 ha of plantation, 8 cattles, pigs, 20 ship**
- ❑ **Sweden: 2 ha of plow, 50 cows, 250 cattles, 50 sows or 50 pigs, 50 ewes, 100 poultry**
- ❑ **Austria: 1 ha of agricultural area, 0,25 ha of plantation, 3 cattles, 5 pigs, 10 ships/goats, 100 poultry**
- ❑ **France: 1 ha of agricultural area, 0,2 ha of plantation, 1 breeding animal, 2 cattles, 6 ewes, 5 pigs**
- ❑ **Hungary: 0,15 ha of agricultural area, 0,05 ha of plantation, 1 cattle, pig, ship, goat, ló, 50 poultry**
- ❑ **Cyprus: 0,1 ha of agricultural area, 0,05 ha of greenhouse, 1 cow, 2 bulls/horses, 5 pigs/ship/gouts, 50 chicken**
- ❑ **Poland: 0,1 ha of agricultural area, > 0,1 ha + 1 cattle/hourse/sow, 5 pigs, 3 ship/gouts, 30 poultry**
- ❑ **Greece: 0,1 ha of agricultural area, 0,05 ha of greenhouse, 1 cow, 2 bull/horse, 5 pigs/ship/goats, 50 poultry**
- ❑ **Ireland: no limit**
- ❑ **Malta: no limit**
- ❑ **Romania: no limit**

Number of farms in the EU member states

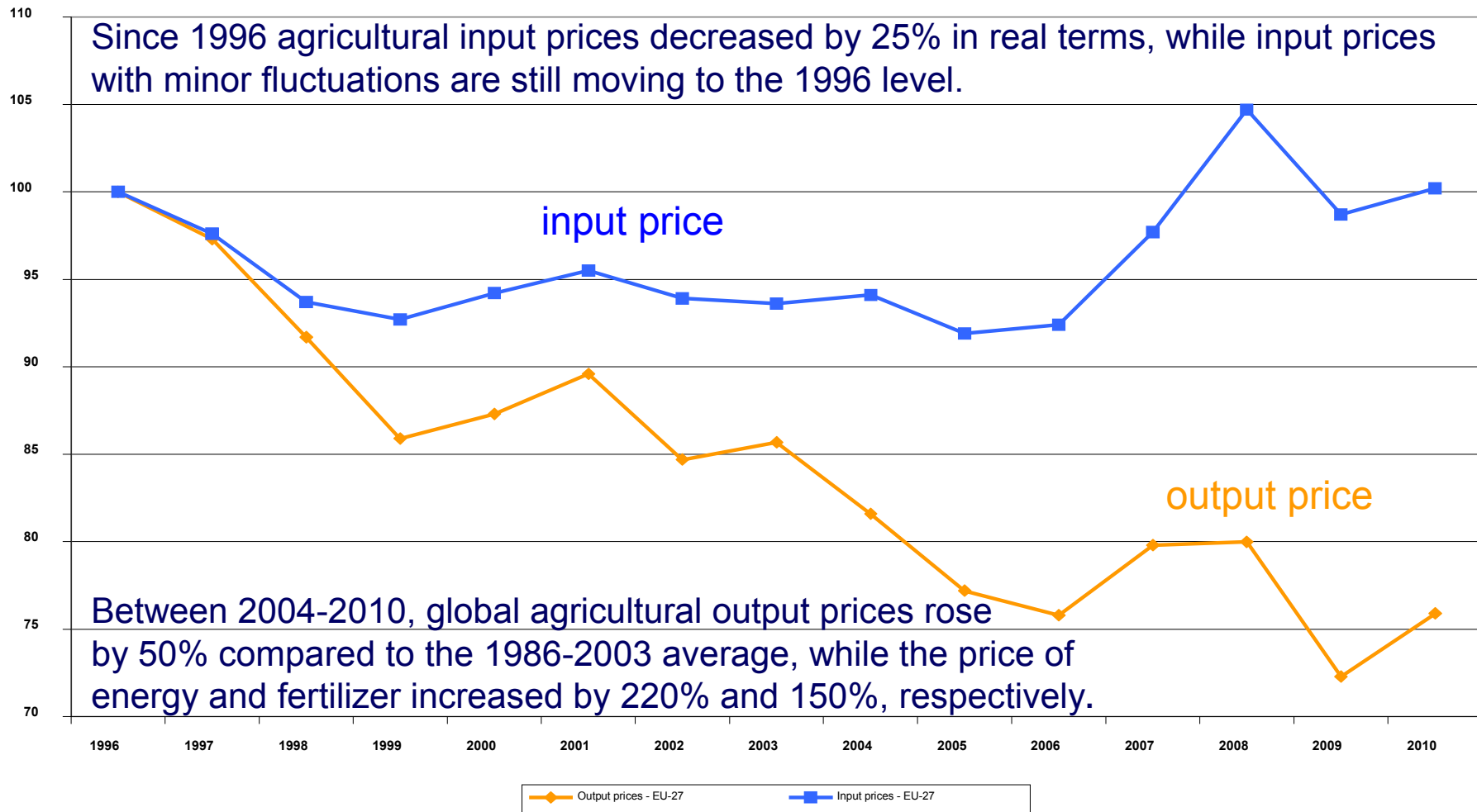
	Number of farms, 2007	Unit labour (1000), 2009
Belgium	48 010	63,7
Bulgaria	493 130	399,7
Czech Republic	39 400	134,0
Danmark	44 620	55,8
Germany	370 480	536,0
Estonia	23 340	29,1
Ireland	128 240	146,5
Greece	860 150	570,6
Spain	1 043 910	909,1
France	527 350	857,3
Italy	1 679 440	1 163,5
Cyprus	40 120	25,9
Latvia	107 750	91,9
Lithuania	23 0270	147,3
Luxemburg	2 300	3,6
Hungary	626 320	440,7
Malta	11 020	4,2
The Netherlands	76 740	181,7
Austria	165 420	153,8
Poland	2 390 960	2 213,8
Portugal	275 080	344,0
Romania	3 931 350	2 148,0
Slovenia	75 340	81,9
Slovakia	68 990	82,2
Finland	68 230	86,9
Sweden	72 610	63,2
United Kingdom	299 830	289,3
EU-27	13 700 400	11 223,1

Limits of the direct subsidy in EU member states

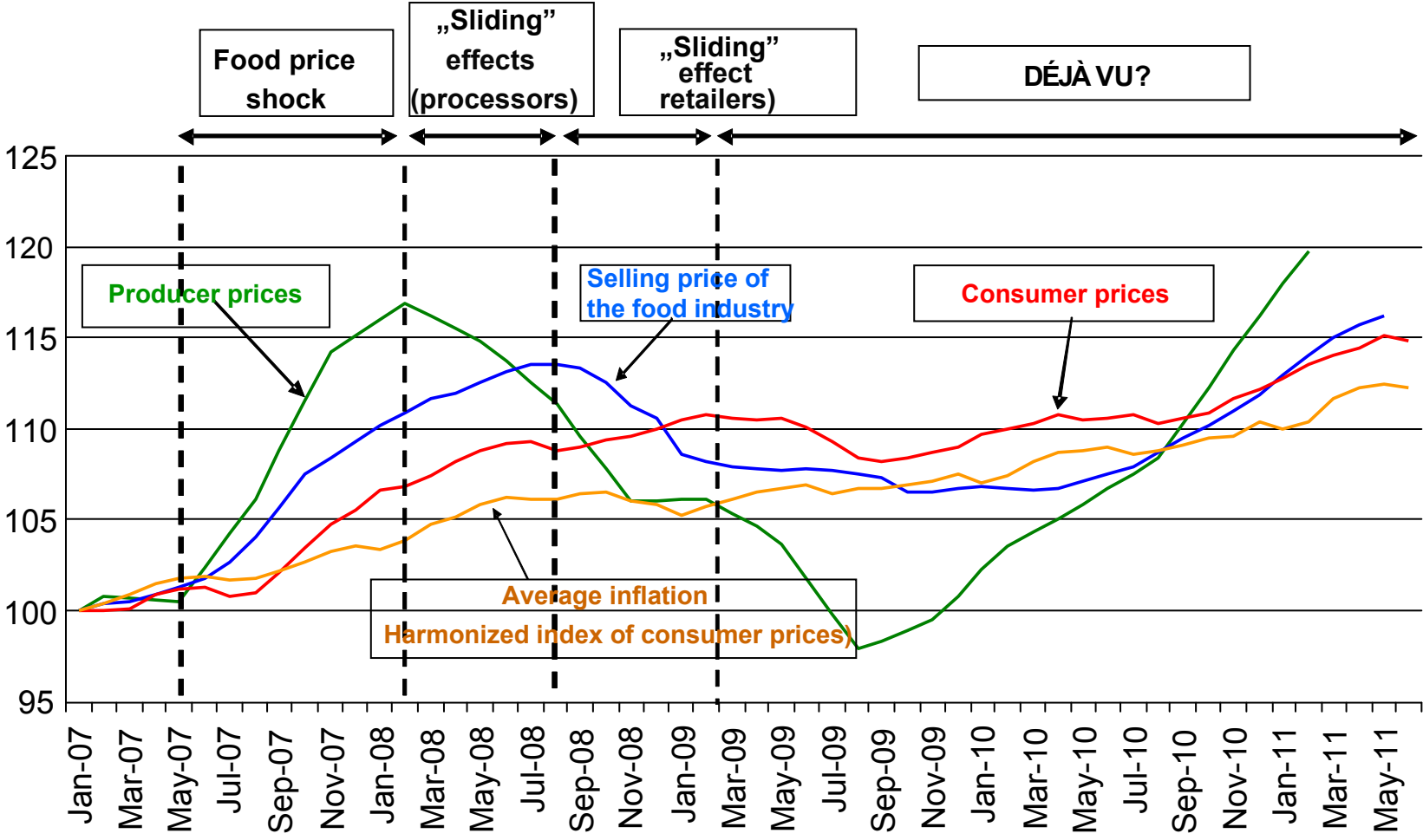
	Euro	Hectare
Belgium	400	2
Bulgaria	200	0,5
Czech Republic	200	5
Danmark	300	5
Germany	300	4
Estonia	100	3
Ireland	200	3
Greece	400	0,4
Spain	300	2
France	300	4
Italy	400	0,5
Cyprus	300	0,3
Latvia	100	1
Lithuania	100	1
Luxemburg	300	4
Hungary	200	0,3
Malta	500	0,1
The Netherlands	500	2
Austria	200	2
Poland	200	0,5
Portugal	200	0,3
Romania	200	0,3
Slovenia	300	0,3
Slovakia	200	2
Finland	200	3
Sweden	200	4
United Kingdom	200	5
EU-27	100-500	0,3-5,0

Agricultural input and output prices in EU-27

1996=100%



Slow, limited and asymmetric price transmission along the food supply chain

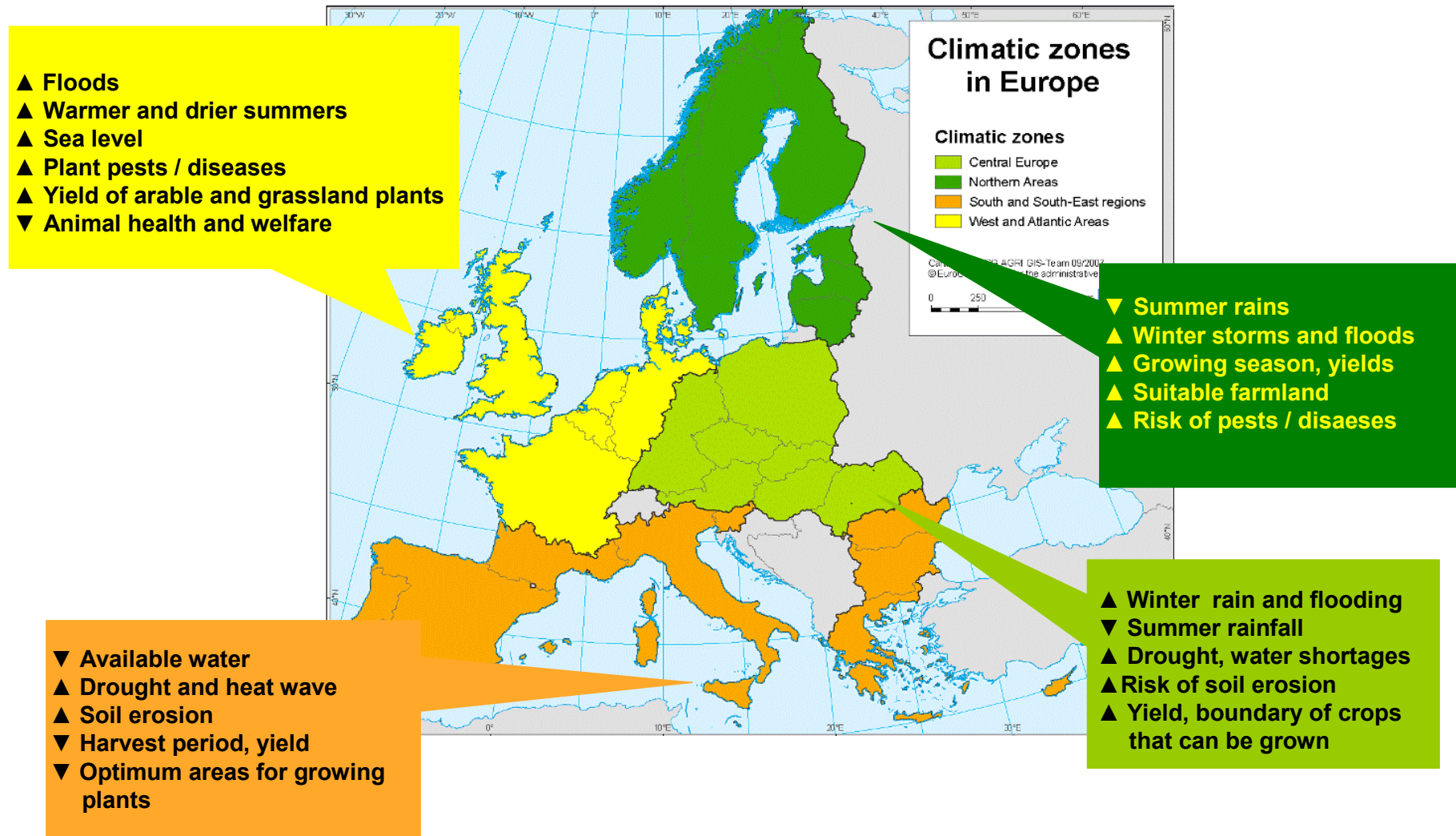


The share of agriculture in the food supply chain declined from 29% to 24% between 2000-2005, while the share of food industry, wholesale and retail equally increased.

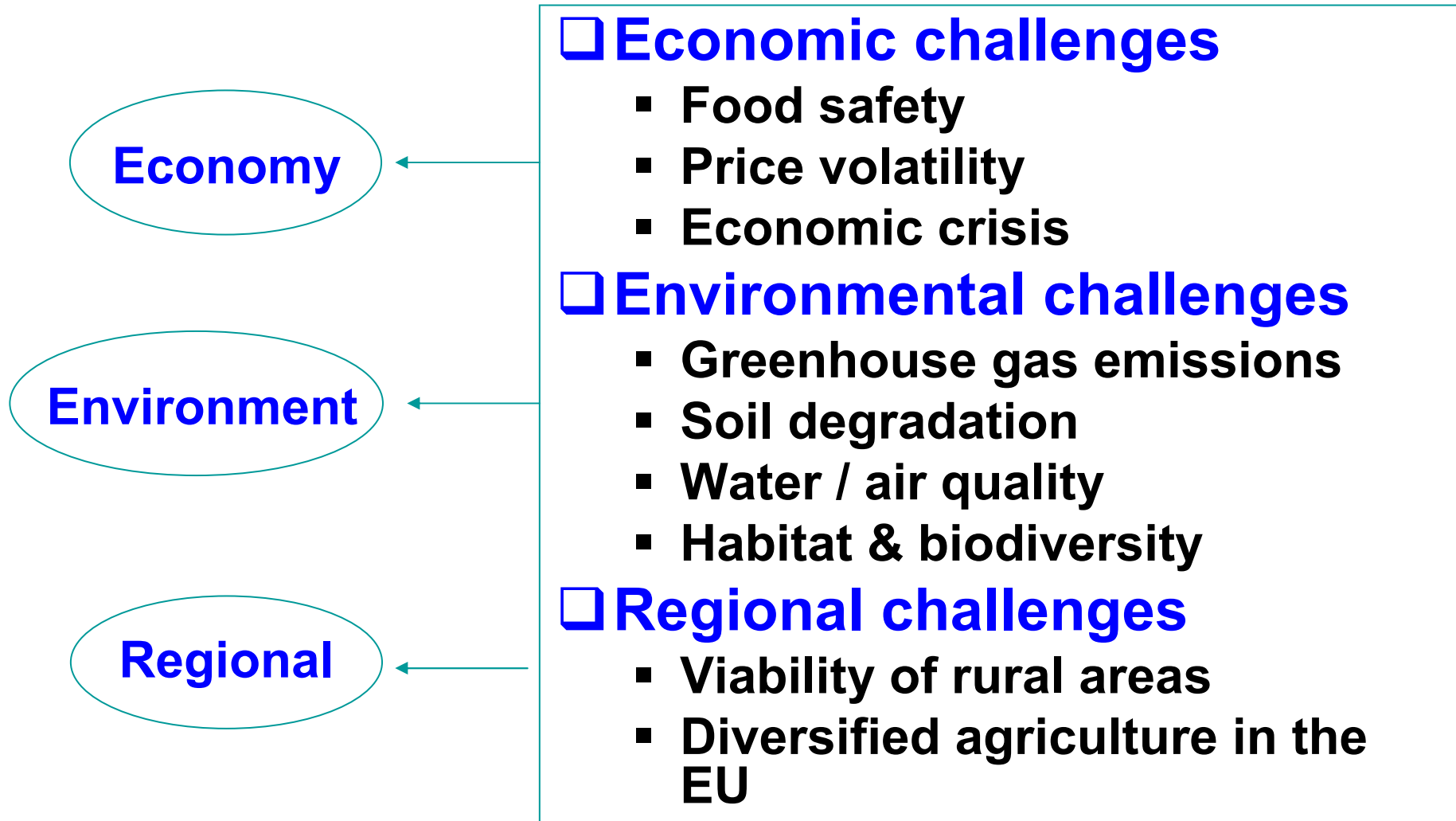
Source: European Committee (2011)

Climate change: possible effects on EU agriculture

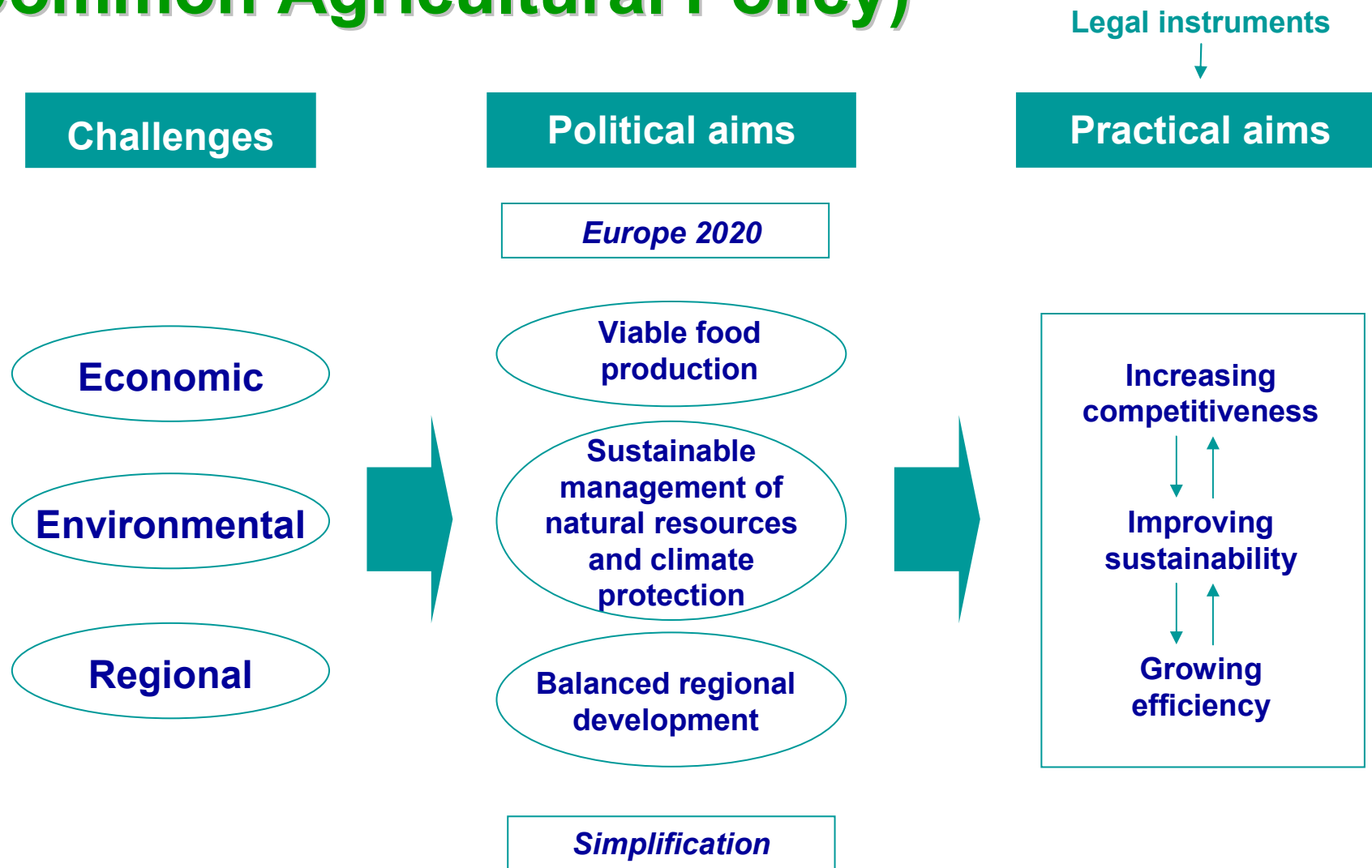
Agriculture is responsible for 10.3% of all greenhouse gas emissions, which in 2010 reported a 22% decrease compared to 1990 (total greenhouse emissions fell by 17.4%).



Challenges of the EU



... and the response of CAP (Common Agricultural Policy)



The draft of CAP between 2014-2020

The two-pillar structure remains, but

- ❑ More targeted and more equitable distribution of direct payments:
 - Mandatory "green" component in Pillar 1 (support of sustainable ecosystem): 30% of the first pillar envelope
 - Convergence of direct payments between Member States
 - targeted support for active farmers
 - Simplified support for small farms
 - Limitation of support for the biggest farms

- ❑ Market support and crisis management:
 - Conversion of existing instruments
 - New crisis management instruments (non-MFF instruments)
 - Intervention powers of the European Globalisation Fund has been extended to farmers

- ❑ Rural development policy:
 - Focus on results
 - Coordination with other EU funds under the Common Strategic Plan

- ❑ Special emphasis on research, innovation and knowledge transfer

The CAP will support the 2013 level (nominal value)

Billion € (at current prices)

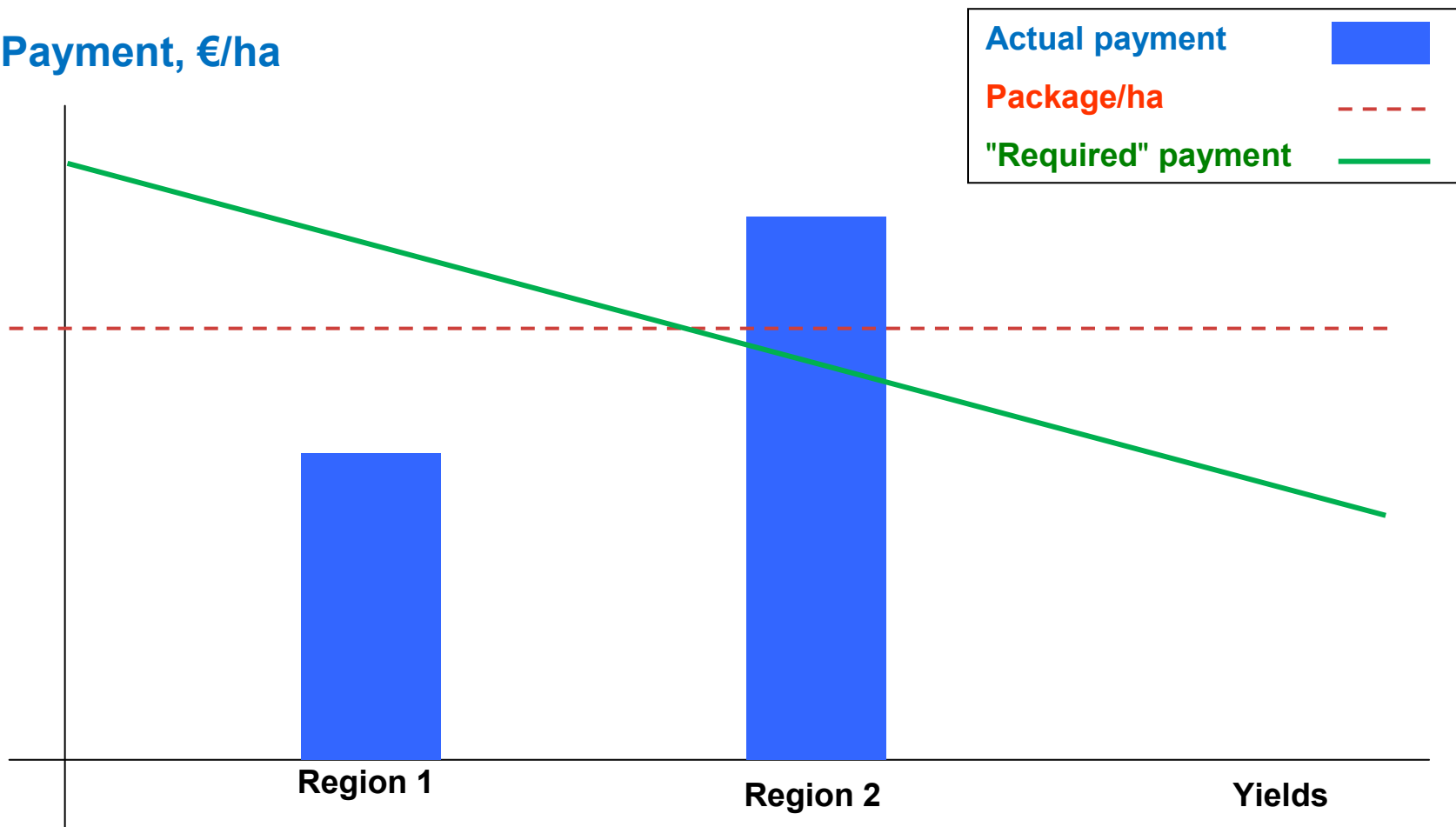
- Pillar 1 – direct payments and market support	317,2 €
- Pillar 2 – Rural Development	101,2 €
Pillar 1 and Pillar 2 in total	418,4 €
Food security	
- Food security and sustainability in R & D	5,1 €
- Strengthening of food safety	2,5 €
- Food aid to the most needy	2,8 €
- Training of Emergency Reserve for market intervention	3,9 €
- European Globalisation Fund	2,8 €
All additional funding	17,1 €
All budgets from 2014-2020	435,5 €

Direct payments

Challenges: history of direct payment

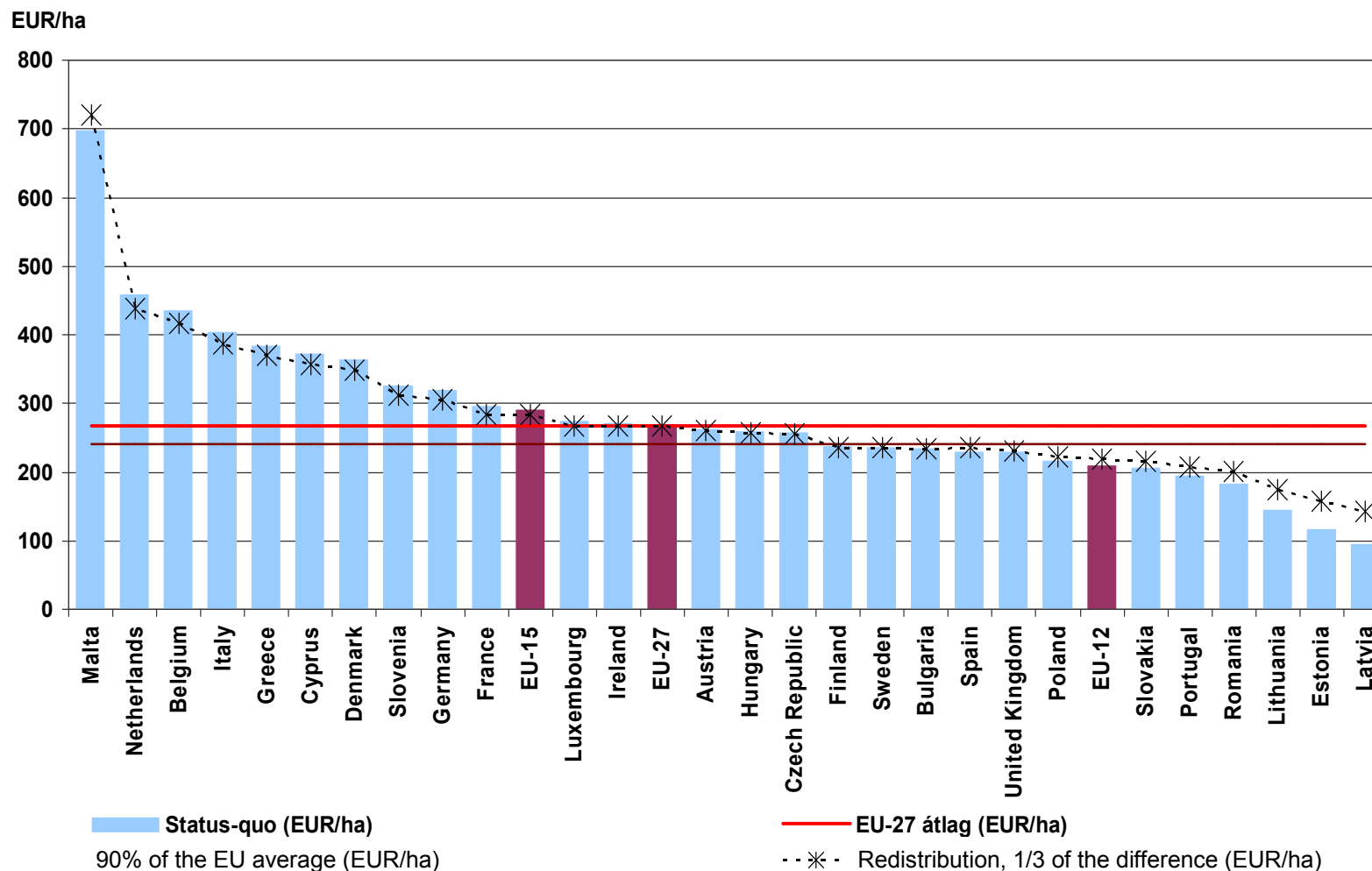
Payments based on historical (institutional) price loss: a legitimacy problem

Payment, €/ha



Comment: some Member States have a number of regions; the number of regions, at least as much aid per hectare; within the region also different aid per hectare as a function of the historical structure of production (crop and livestock)

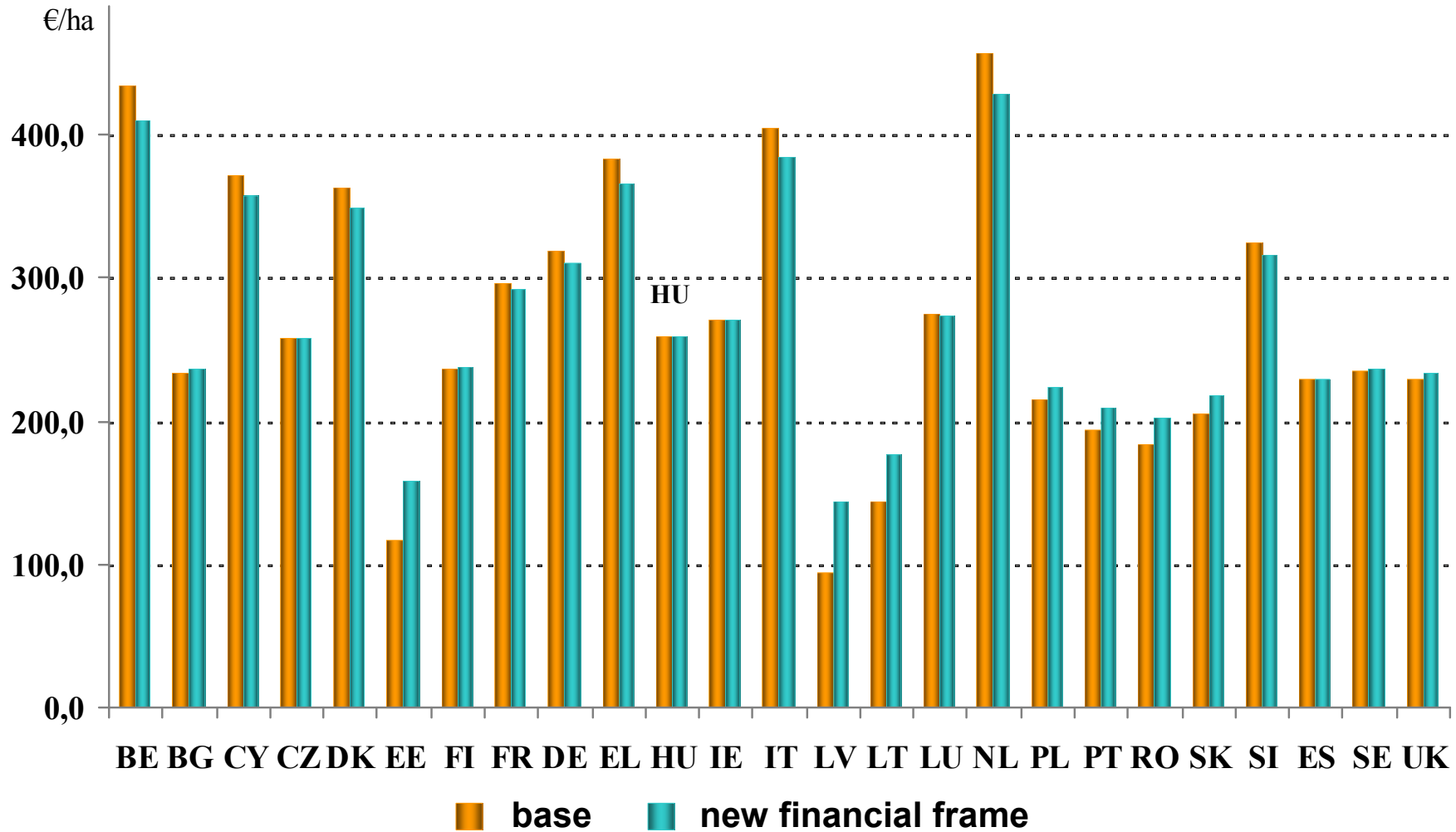
Direct payment per hectare



Support for a given Member State increases by 1/3 of the difference between average of the 90% of the EU-27 level of support and self-support level, if direct payment per hectare is below the EU-27 average of 90%. They are funded by member states receiving payment per hectare, exceeding the average of EU-27.

Direct payment per hectare

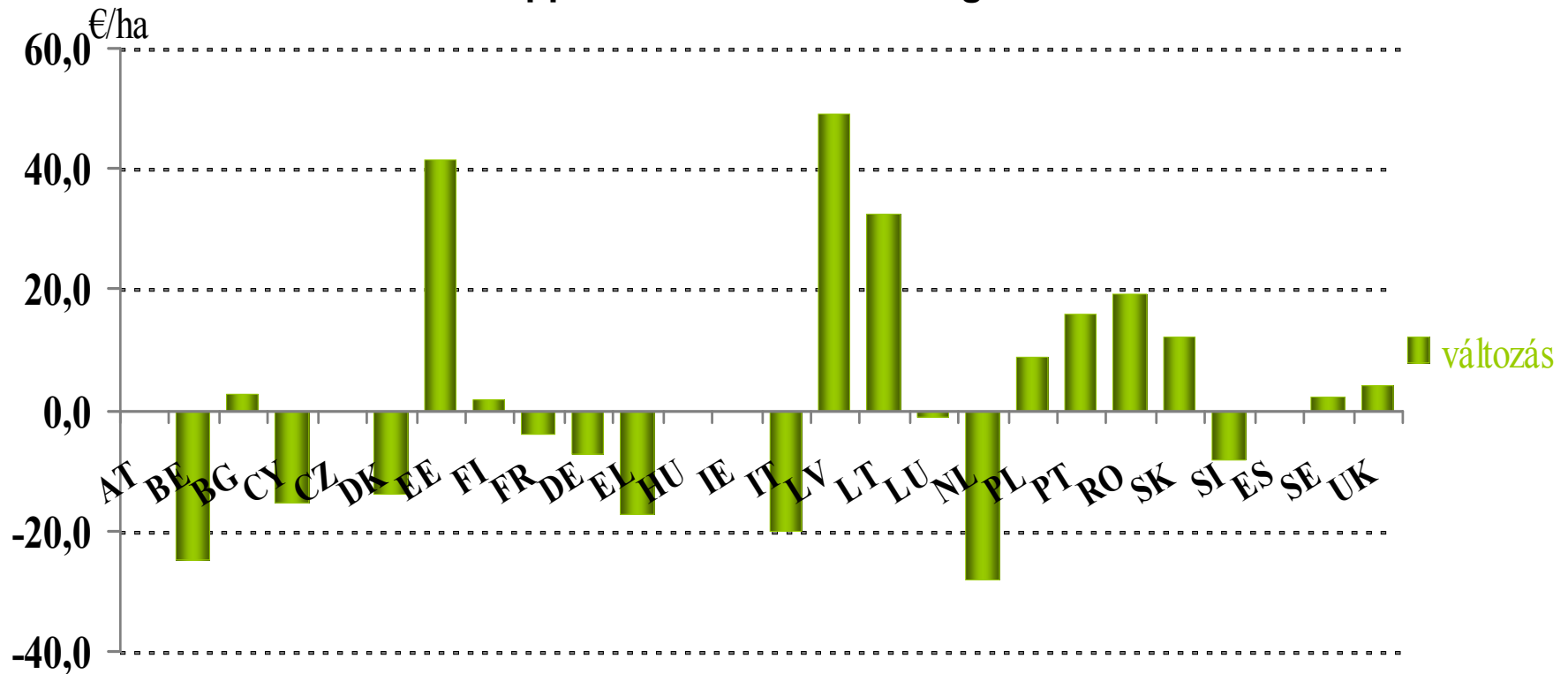
The introduction of flat-rate subsidy would mean redistribution of nearly 16% of the total direct support (€ 7 billion), but only € 665 million will be allocated again (payment over the average level changed little)



Source: Calculations of Agrarian Policy Department for Research, AKI

Change in direct payment per hectare

Reallocation of funds will take place in several stages between 2014-2018!
Reallocation of funds means some % decline in member countries supported above the average.



Member states can transfer 10% support from Pillar 1 to Pillar 2.

12 member states, having less subsidy than 90% of the EU-27 average subsidy, can transfer 5% support from Pillar 2 to Pillar 1

Direct payments (1)

□ In 2014, EU farmers will be eligible for:

Mandatory programs (all countries):

- Fund Scheme
- Sustainable Ecosystem programme
"green" component
- Young farmer program

(+)

Voluntary programs (member state decision):

- Less Favoured Area (LFA)
- Production-related payment

Condition of payment: matching cross compliance

Every farmer is entitled to make use of the farm advisory system

and

Simplified support of small farms (mandatory for the member state, voluntary for the farmers)

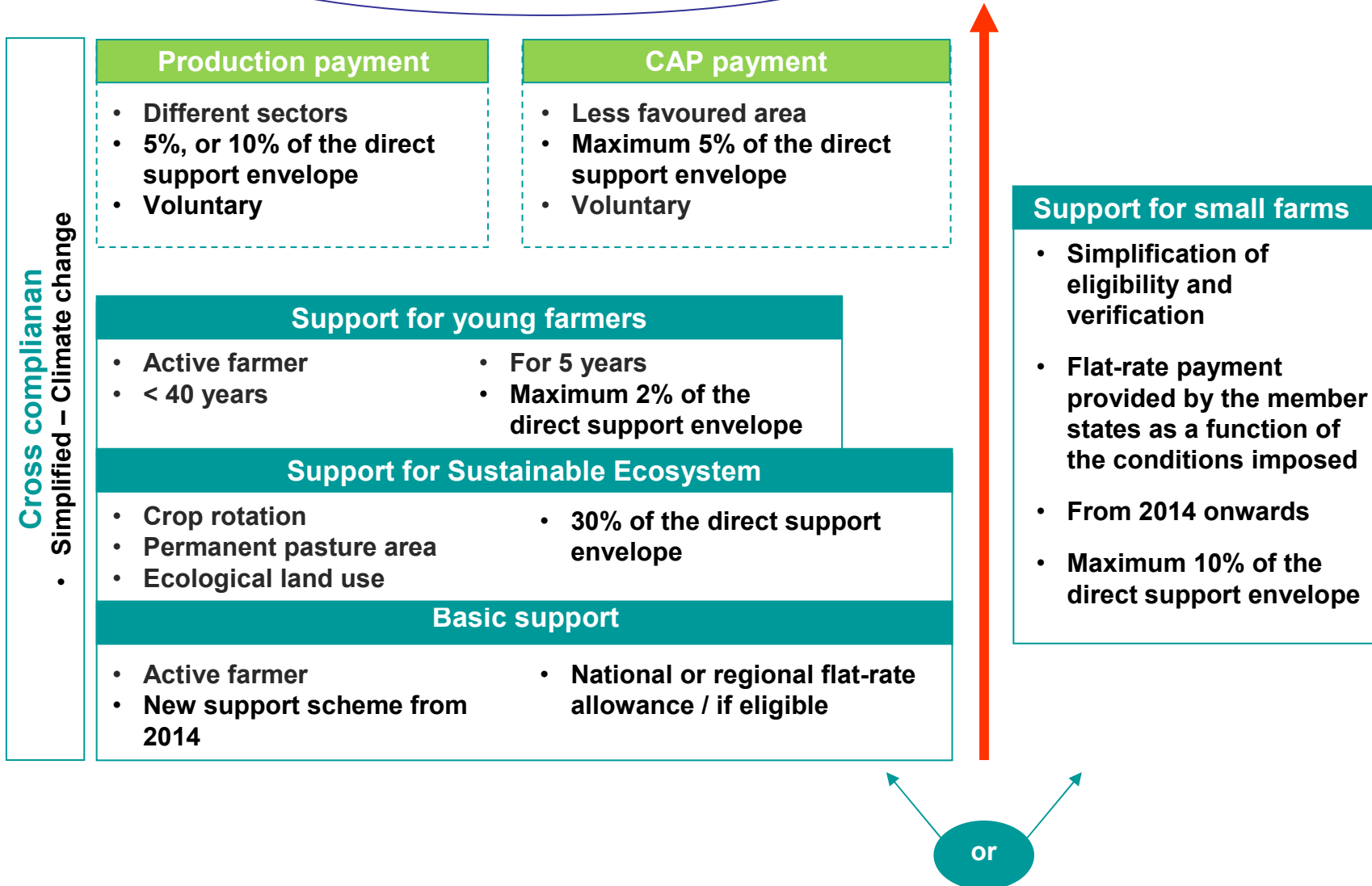
A farmer may receive payment entitlement if

In 2011, activated at least one payment entitlement or produced only vegetables, fruits and / or grapes in the consolidated area payment scheme (SPS);

In 2011, applied for area-based support in the single payment scheme (SAPS), or if not required, only had a land that on 30 June 2003 did not constitute state kept the cultural area.

Direct payments (2)

Degressivity and capping
(all itmes except for the green component)



Rural development

Rural development

Political aim of CAP/EU

Europe 2020

**Viable food
production**

**Sustainable management
of natural resources and
climate protection**

**Balanced regional
development**

Simplification

Unified EU development funds

- Common strategic framework
- Partnership agreements
- Income approach

Regulation of the rural development

- Six rural development priority
- Some 20 measures (without axes)
- Programming
- Finance
- Monitoring and evaluation
- European Innovation Partnership
„Agricultural Productivity and
Sustainability”

Regulation of rural development (RD)

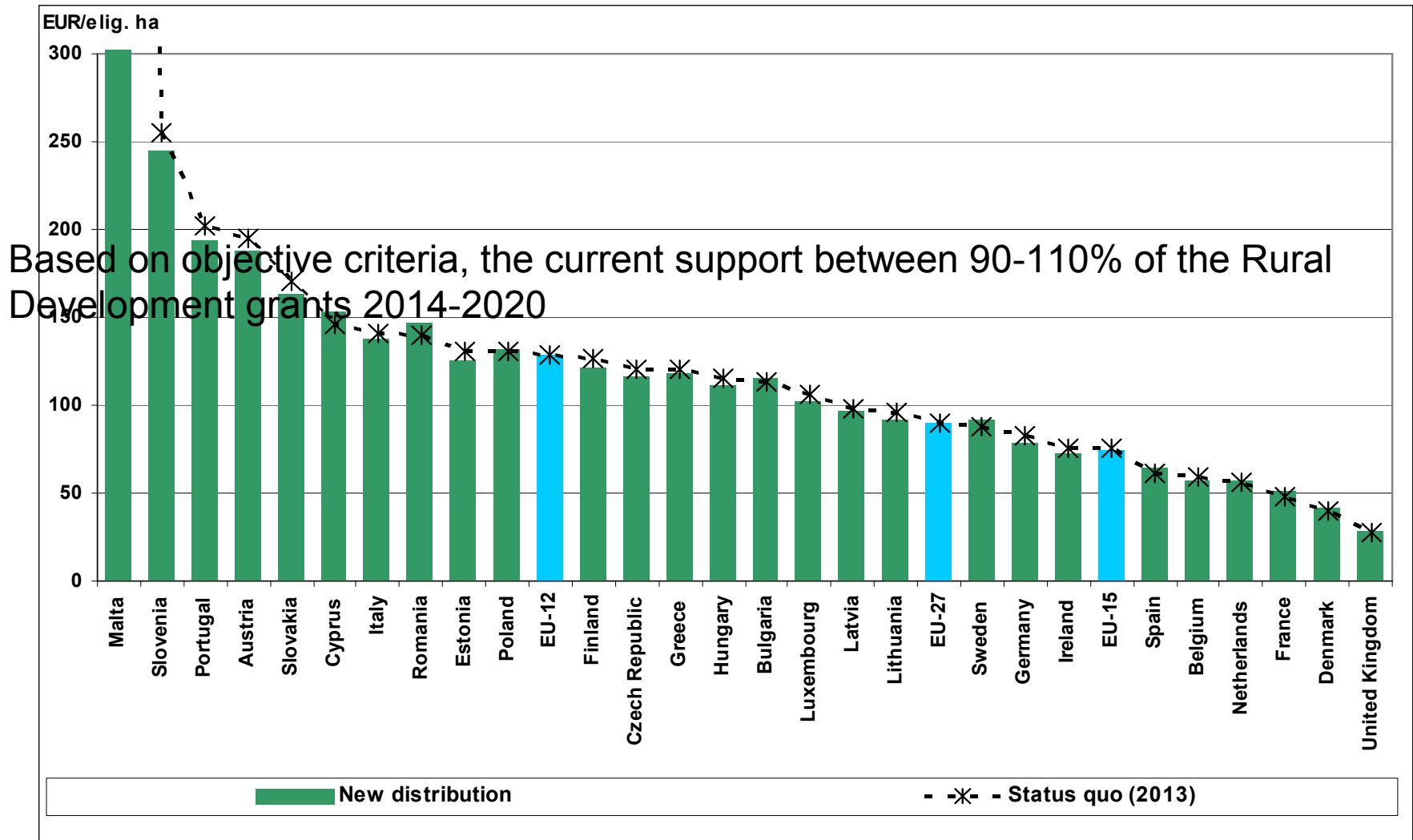
Europe 2020: Six priority topics

1. Knowledge transfer and innovation in the promotion of agriculture and forestry
2. Strengthening of the competitiveness of farms and the viability of agriculture
3. Promote food chain organizations and risk management in agriculture
4. A The maintenance and enhancement of ecosystems dependent on agriculture and forestry
5. Promoting efficient use of resources, reducing consumption and carbon emissions of food and forestry economy
6. Reduction poverty and economic development in rural areas

Regualtion of RD:

Art. 5

Rural development grants between 2014-2020: based on objective criteria, between 90-110% of the current support



Source: European Committee (2011)

*Common organization of the
markets in agricultural products*

Market-regulating devices

Greater support for research and innovation
A better functioning food supply chain

Sustainable consumption – school fruit and school milk

- Greater support
- Private co-financing opportunities



Customer relationship

Encourage of common action – improving the position in the food chain

- **Faster recognition:** agricultural producer organizations (APO)*, APO associations, Inter-branch organizations
- **Transparent competition rules**
- **Support for rural development (support for start-ups and cooperation)**



Joint answer for economic and environmental challenges

Market orientation

- Terminal of certain subsidies (skim milk, hops and silkworms)
- Elimination of production restrictions (sugar, wine)



Competitiveness of farmers

Stronger safety net

- Exceptional instruments – greater flexibility and authority
- Public intervention / private storage – a simplified and more effective response during crisis
- Support during crisis

APO: agricultural producer organization

Unified common organization of markets

Market intervention

☐ State intervention

- The durum wheat and sorghum falls (left wheat, barley, maize, rice)
- Option intervention extended for beef and veal (see barley, maize and rice)
- Automatic tendering for butter and skimmed milk powder (see wheat)

☐ Support for private storage

- Extending for flax and skimmed milk powder (maintained for sugar, as well)
- Private storage of butter will be an optional opportunity

☐ Agricultural regime of sugar

- Quota is terminated (September 30, 2015)
- The private storage is maintained
- The mandatory written contract remains between producers and processors
- Authorized for market regulation in case of market disruption

CMO regulation:

Art. 10

Art. 12(1)(c)

Art. 20(b)

Art. 16

Ex Art. 55-64

Art. 16

Art. 101

Art. 155

Proportion of Hungarian agriculture and agricultural subsidies in the EU

Weight of the Hungarian agriculture in the EU in terms of production value

2006 - 1,83%
2007 - 1,86%
2008 - 2,07%
2009 - 1,76%

Contribution level of the Hungarian agriculture compared to the EU's total agricultural contribution

Pillars I. and II. total

2009 - 2,43%
2010 - 2,62%
2011 - 2,83%
2012 - 3,00%
2013 - 3,18%

Direct payments (Pillar I.)

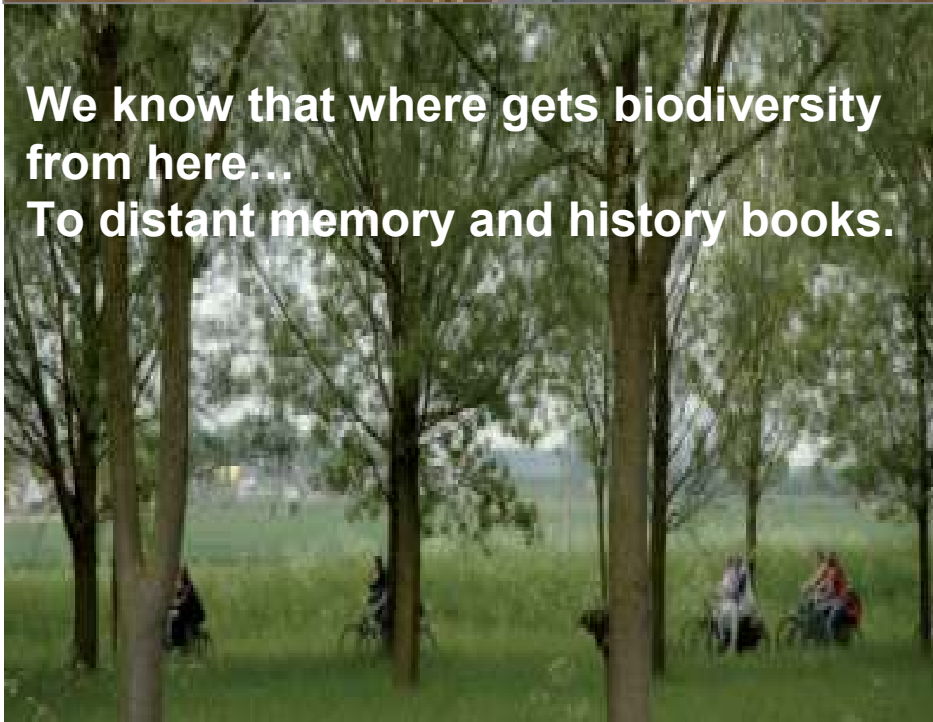
2009 - 1,97%
2010 - 2,26%
2011 - 2,51%
2012 - 2,71%
2013 - 2,93%

Rural development funds (Pillar II.)

2009 - 3,77%
2010 - 3,69%
2011 - 3,80%
2012 - 3,86%
2013 - 3,95%



We know that where gets biodiversity
from here...
To distant memory and history books.




- Adaptation or mitigation?
- Large uncertainties
- High economic impacts
- Serious risk (high inertia)
- Facts are largely supported by the assumptions

Where goes the world? \longleftrightarrow What economy and environment ensures a healthy future?



Always look on the bright side
of things!

We finished for today, goodbye!



ямарваа нэг зүйлийн гэгээлэг
талыг нь үргэлж олж харцгаая
өнөөдөртөө ингээд дуусгацгаая, баяртай

让我们总是从光明的一面来看待事物吧！

今天的课程到此结束，谢谢！

دعونا ننظر دائما إلى الجانب المشرق من
الأشياء!

انتهينا لهذا اليوم، وداعا!