Agrobiotechnologies and plant biomass production for energetic

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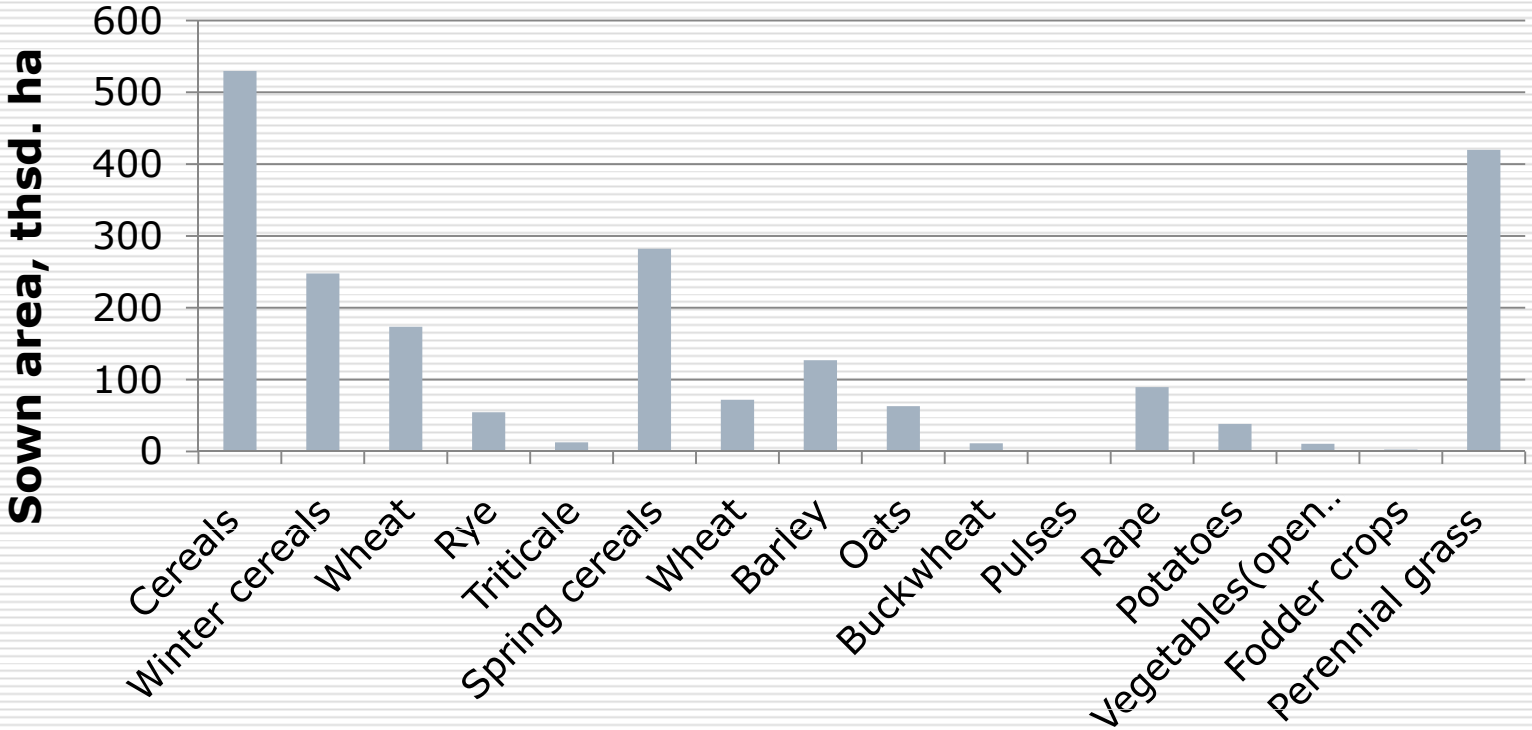
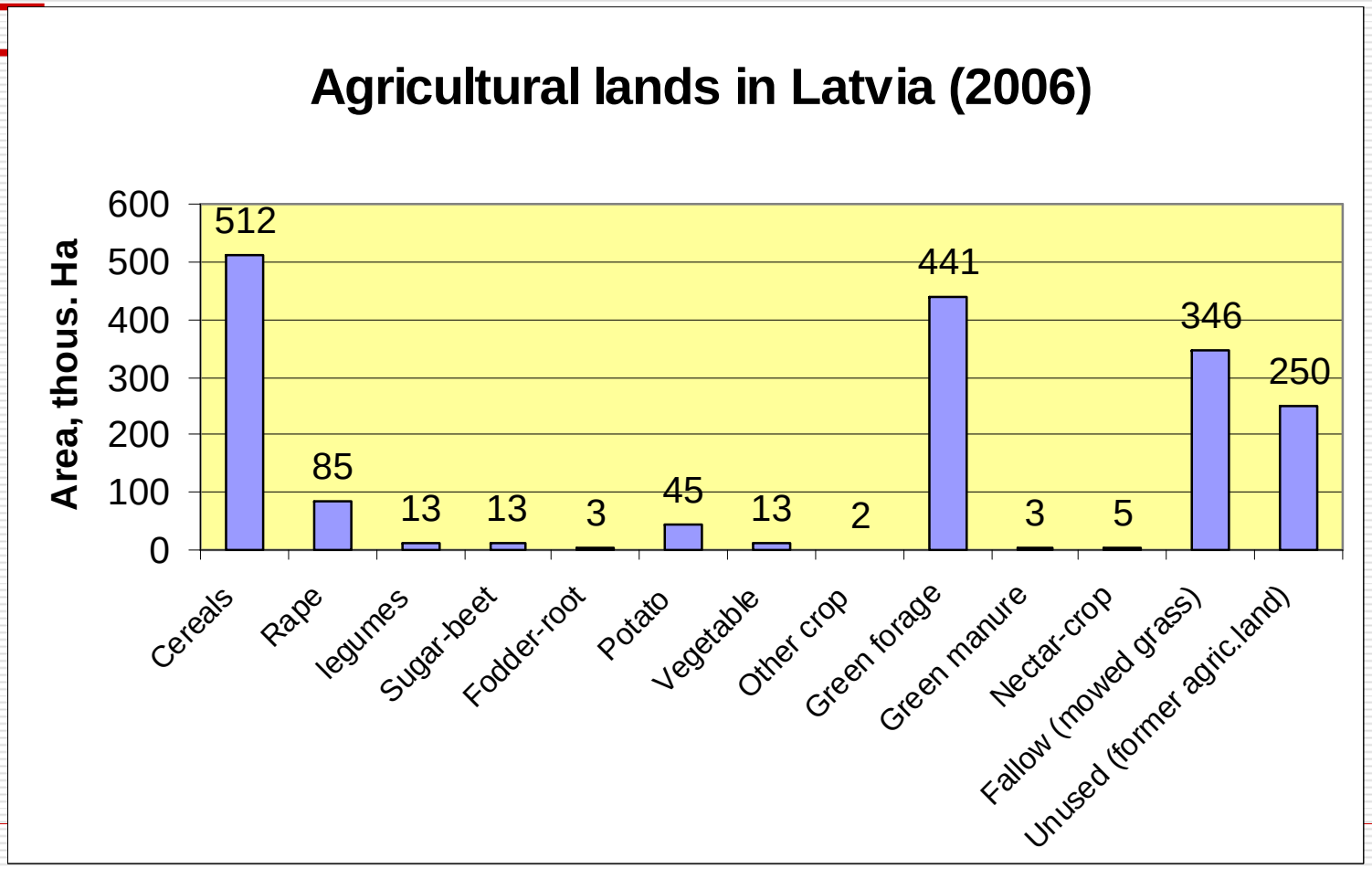
This presentation has been prepared within the framework of the ESF Project „Attraction of human resources to the research of the renewable energy sources", Contract Nr. 2009/0225/1DP/1.1.1.2.0/09/APIA/VIAA/129.

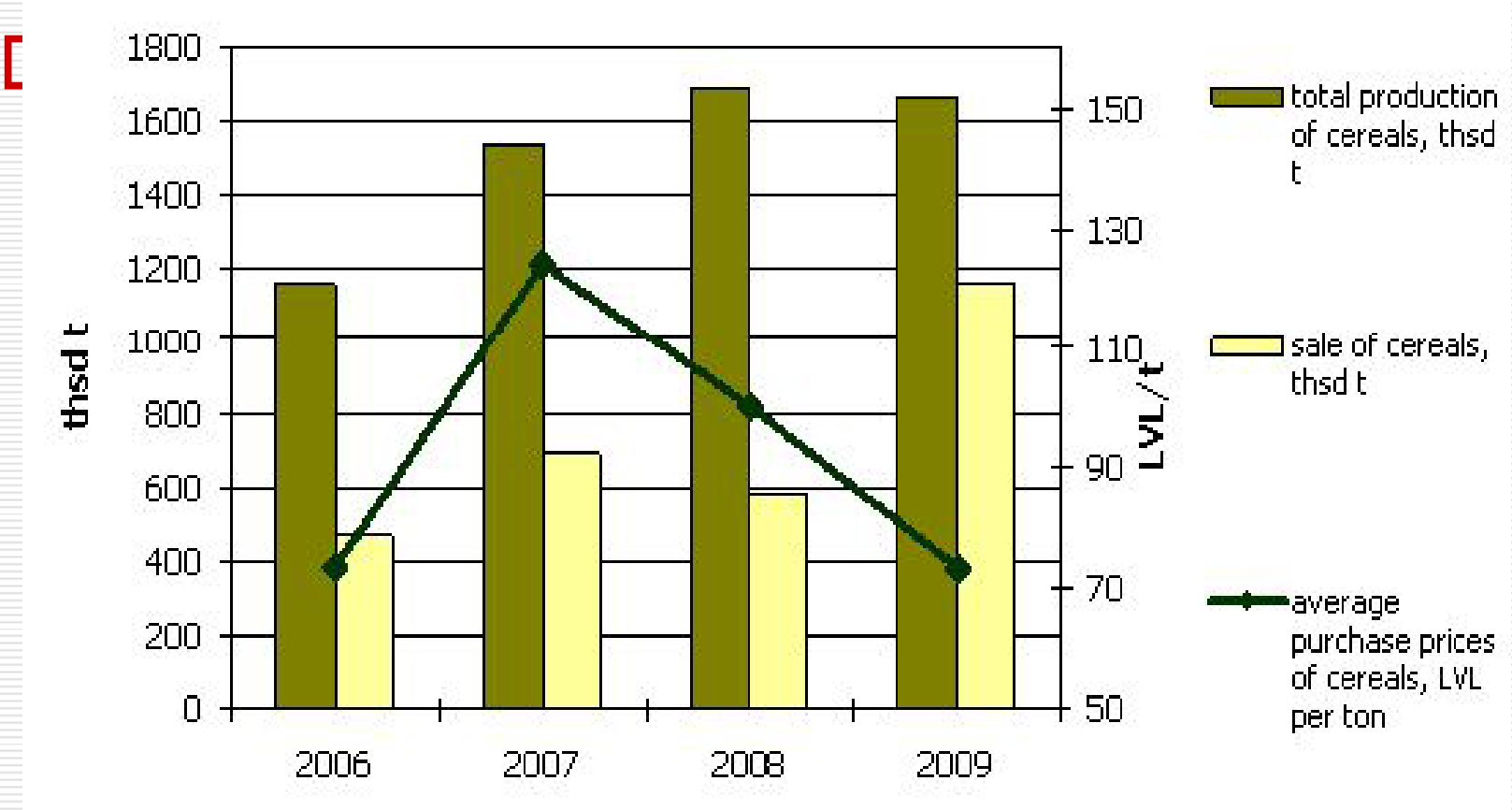
Average sown area by crops in Latvia (2006-2009)



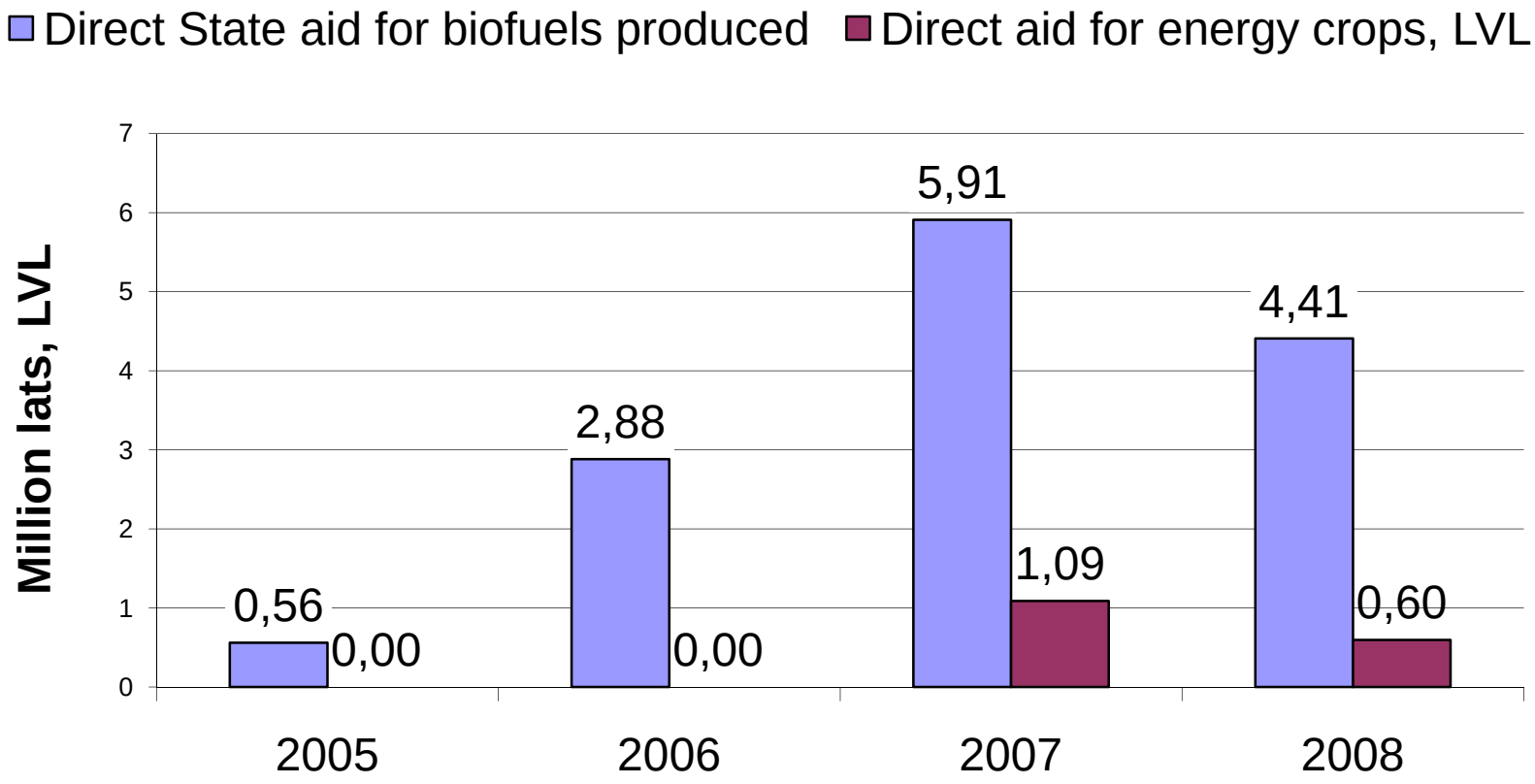
Agricultural areas in Latvia (2006)



Cereal production, sale to processing and procurement enterprises and average purchase prices in Latvia



Support for growing of energy crops and production of biofuels



Biomasas ranging in dependence on moisture

Wet plant biomass (W 65%-85%)

(fresh crop biomas harvested in before ripening)

Production: **green biomass;**

silage;

Preferred utilization in energetic:

Production of biogas

Biomass range in dependence on moisture

Relatively dry biomass (W 8-45%)

(straw, reed, hay, grain mill byproducts)

Production: **biomass pellets;**

briquettes

bales.

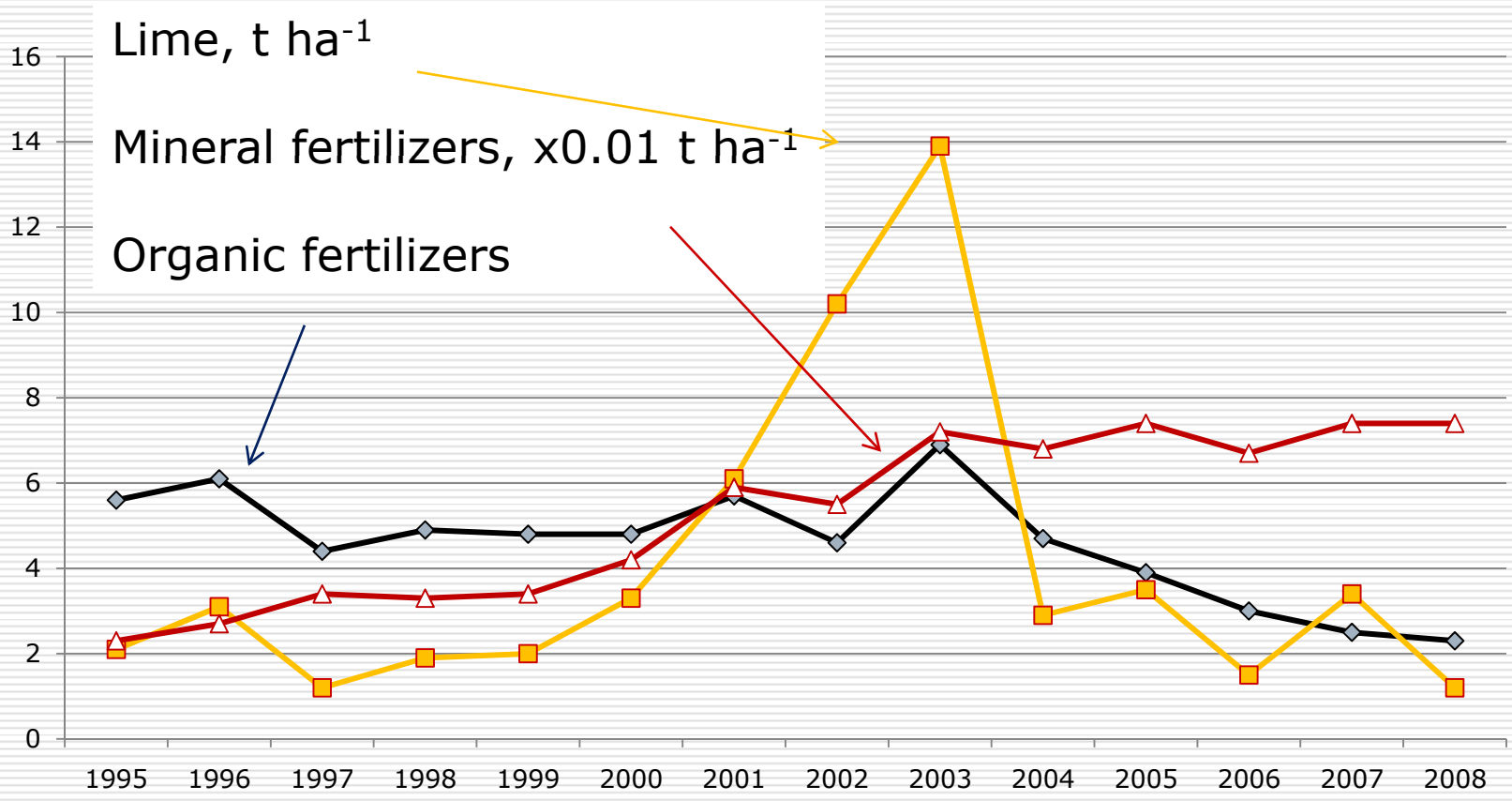
Preferred utilization in energetic:

Production of heat and electricity

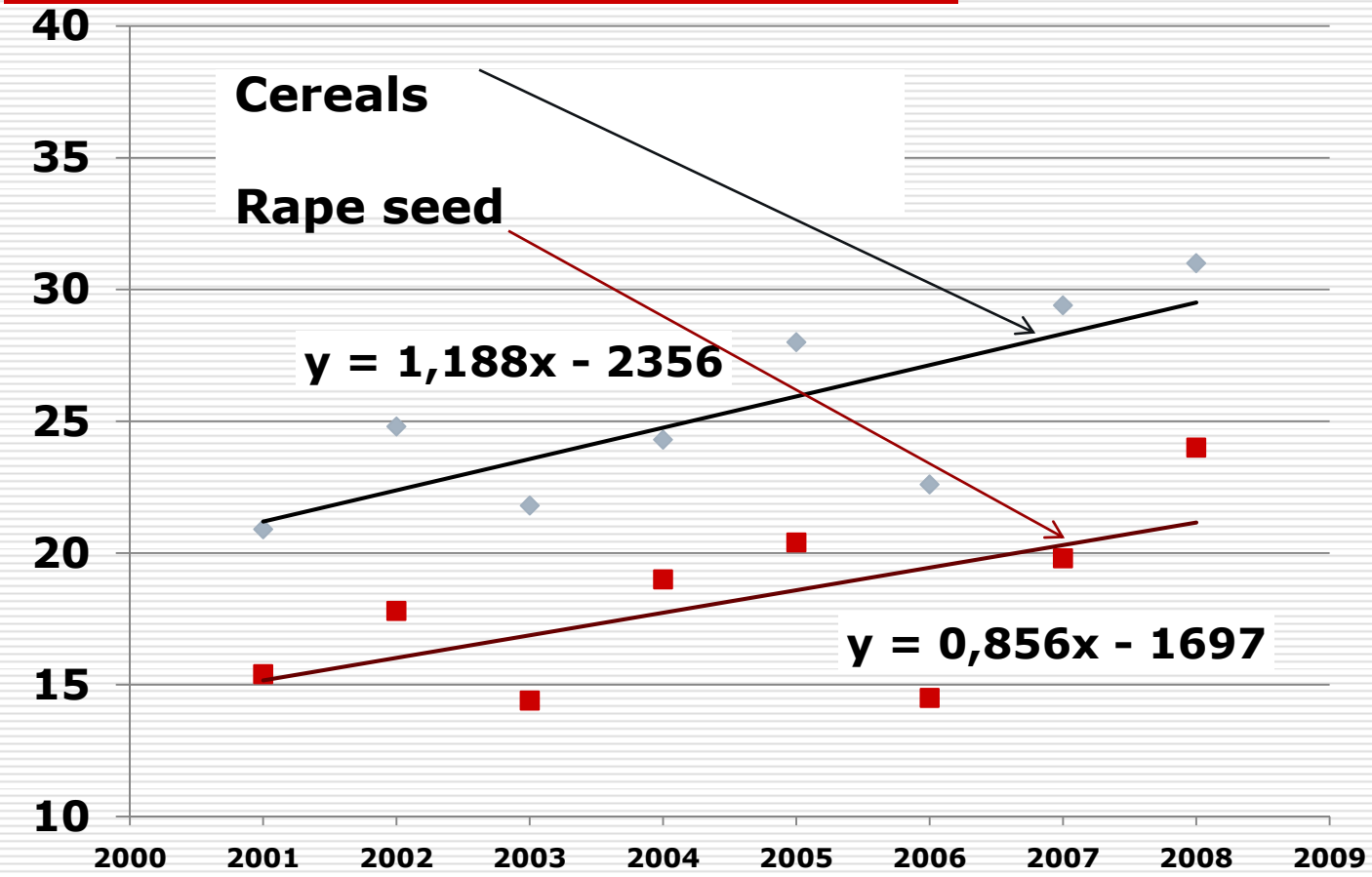
Cereals, rape straw and grass outcome in 2002-2005

Cereals and rape	Area, thous. ha (aver. 2002-06)	Grain yield (aver. 2002-06), t/ha	Grain:straw ratio	Straw, grass, thous. tons	Straw, grass, available for energy
Wheat	215	3,1	~ 1:0,9	600	
Barley	136	2,1	~ 1:1	285	
Rye	43	2,3	~ 1:1,2	118	
Oat	53	1,7	~ 1:1,1	105	
Rape	51	1,7	~ 1:1,3	114	
Sum, straw	545			1216	174
Fallow grass	346	1,9	~ 50% of grass area	649	325

Usage of organic, mineral fertilizers and lime in Latvia



Average yields of cereals and rape seed in Latvia, cnt/ha (2001-2008)



Straw available energy from biomass residues in Latvia

- Cereals and rape straw available for energy S_e calculates:

$$S_e = Y_g - S_m \times A_s - L - I =$$
$$= 1216 - 545 \times 1{,}6 - 160 - 10 = 174 \text{ [thsd.t]}$$

where,

S_e – straw available for energy, thous. t;

Y_g – straw yield, thsd. t;

A - area of cereals and rape, ha;

S_m–straw not removed from field to keep organic matter content at the same level at Latvia conditions, thous. t, (S_m=1.6 t/ha);

L – straw for litter, t,

I – straw for chemical industry, t

Boiler for burning of straw in Saulaine, Latvia

Plant for heat energy production from straw in Saulaine, Latvia

- Power of plant for burning of– 1,36 MW
- Utilised biomass - wheat straw, 1300 tons/year
- Area for straw production ≈ 500 ha
- Average transport distance ≈ 6 km
- Density of square bales – 0,11...0,12 t/m^3
- Weight of bale ≈ 500 kg
- Straw price (transport costs included) – 23,7 €/t
- Heat energy produced – 20 TJ/year

Problems, if straw burning process is used for energy production

- Straw contains chlorines (Cl ≈ 0,17…0,6%), that can cause forming of dioxines (at temperatures 600…700°C).
- Straw contain nitrogen (N ≈0,5….1,2%), that can cause forming of NOx gases (at temperatures above 750°C.
- Straw contains potassium (K ≈ 0,35…0,8%), that can cause melting of ashes (at temperatures below 800°C).

Problems, if straw burning process is used for energy production

- Straw burning process require more running costs, due to need for more frequent cleaning of burners
- Ashes, that is produced by straw burning, can contain heavy metals, for example, cadmium, that can be rectrictive factor to use ashes as fertilizer in soil.
- There no ready available technologies for ashes incorporation/spreading in the soil, due to specific physical properties of straw asches.

Recomendations, if straw burning process is used for energy production

- Burning process should be provided within temperatures 700-750 °C.
- Biomass retention time should be minimiozed at temperatures 600-700°C, to avoid forming of excess dioxines, therefore small biomass particles, e.g. pellets, is preferred to supply in burner by contionuos flow.
- The combined usage of straw with other biomass, e.g. Wood, is preferable, due to increased melting temperature of ashes.
- Most environmental technology is usage of straw, after prtreatmen, for biogas production together with nitrogen-rich biomass.

Recomendations regarding green biomass usage for energetic

- Grasses from abandoned lands should be used widely for energy production.
- Energy crops with less need for mineral fertilizers should be preferred for bioenergy production.
- Cropping systems having less number of tillage operations should be preferred for energy production

Hemp in trial field growing for bioenergetics

Thanks for attention