Energy crops and pesticide contamination – Lessons learned from the development of energy crop cultivation in Germany

Dr. Katja Bunzel, 24th November 2014

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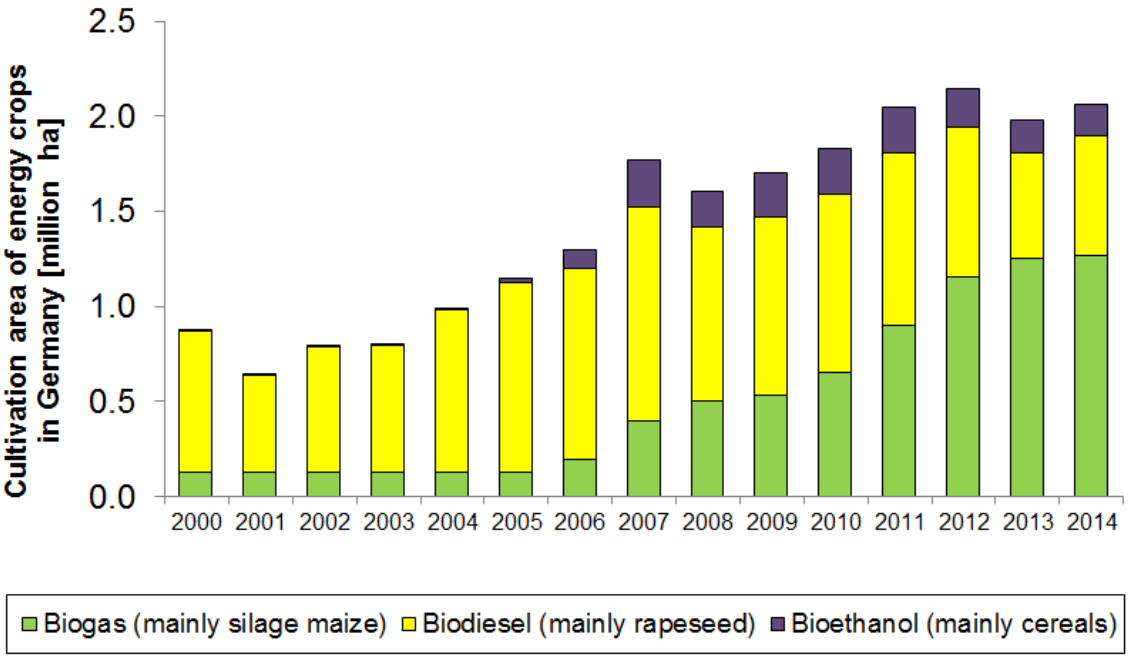
Development of energy crop cultivation in Germany

Source: based on FNR 2014



Increased pesticide contamination of agricultural ecosystems?

- Strong increase of annual energy crop cultivation (2014: 2.1 million ha, ~18% of Germany‘s arable land)
- Scenarios for 2020: 2.7 - 4 mn ha available

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Material and Methods

- Germany as case study
- Annual energy crops: Analysis of data on agriculture, pesticide application and energy crop cultivation
- Perennial energy crops: Literature review (short-rotation coppice and miscanthus)

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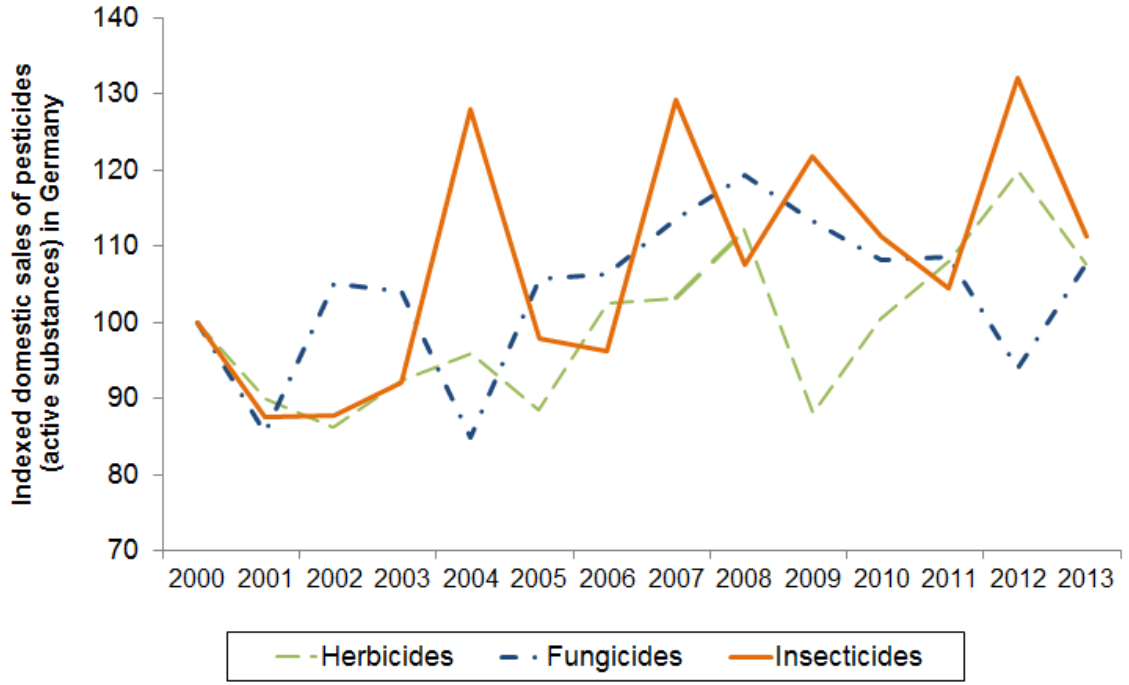
Results: Annual energy crops - Domestic sales of pesticides

§ No nationwide statistic on actual use of pesticides, only on domestic sales



Source: based on BVL 2014

[Slight upward trend, but considerable variation

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Results: Annual energy crops – Treatment index

- Indicator for crop-specific intensity of pesticide use
- However: allows no direct comparison of different crops or conclusions regarding environmental effects

	Potential use	Herbicide	Fungicide	Insecticide
Potato	Food			
Silage maize	Biogas			
Sugar beet	Biogas			
Triticale	Biogas/Bioethanol			
Winter barley	Biogas/Bioethanol			
Winter rye	Biogas/Bioethanol			
Winter wheat	Biogas/Bioethanol			
Winter rapeseed	Biodiesel			

Source: based on http://papa.jki.bund.de

- Only minor differences expected in pesticide use for crops used for energy production

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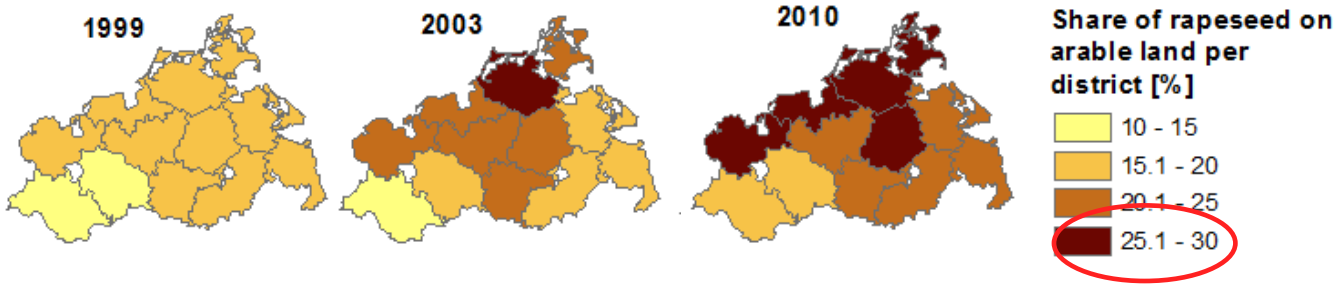
Results: Annual energy crops – regional intensification

§ Increase in the cultivation of certain energy crops not evenly distributed across Germany, but rather restricted to certain regions

Mecklenburg-West Pomerania



Source: based on data from StatA MV (2013)

Recommended limit: 25-33%

§ Regional expansion up to recommended maximum share in crop rotations

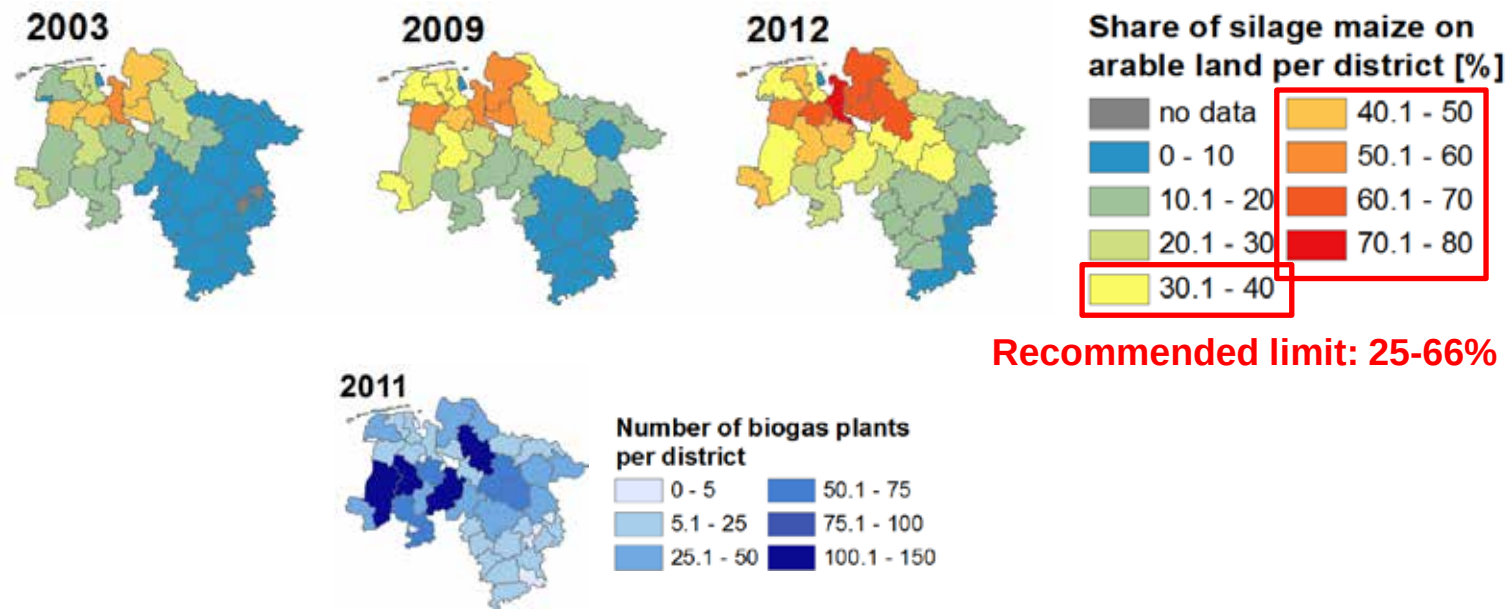
§ Continuous monoculture systems

Ø Built-up of pathogens and pests

Ø Increased need for plant protection measures

Results: Annual energy crops – „energy monocultures“

Lower Saxony



Recommended limit: 25-66%

Source: based on data from Lower Saxony Chamber of Agriculture and Lower Saxony Network for Renewable Resources (2013)

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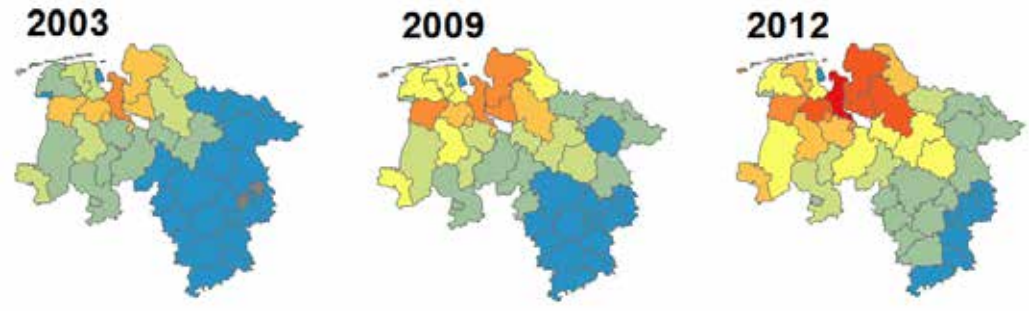
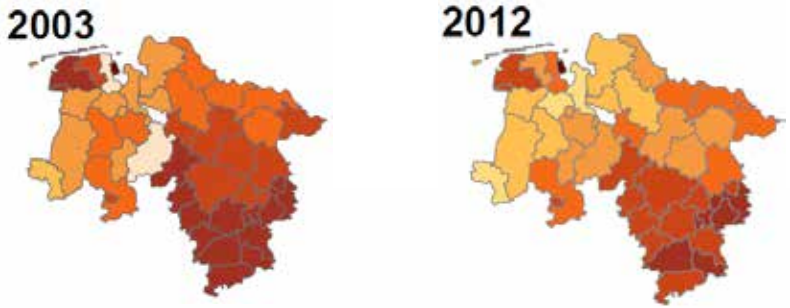
Results: Annual energy crops – „energy monocultures“

Lower Saxony



Recommended limit: 25-66%

§ <u>However:</u> Energy crops could diversify crop rotation in regions with e.g. high shares of cereals



Source: based on data from Lower Saxony Chamber of Agriculture (2013)

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Results: Annual energy crops – innovative cropping systems

For example: Mixed cropping systems

- Mixed cultivation of crops for biogas substrates
- Lower disease and pest infection rates, better weed suppression
- However: difficult to mechanise and optimise management
  [lower biomass yields
- More research for conclusive assessment needed


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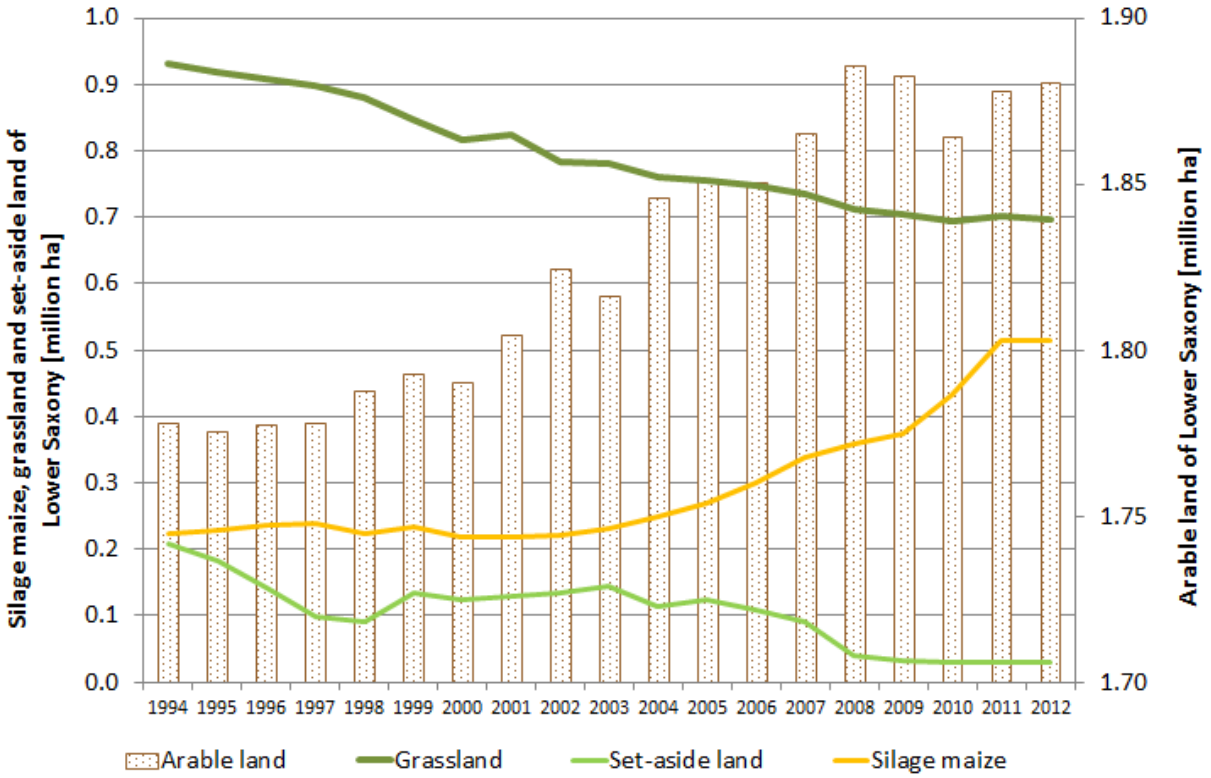
Results: Annual energy crops - set-aside land and grassland



Source: based on data from Lower Saxony Chamber of Agriculture (2013)

Increased conversion of grassland to arable land

[Loss of ecological functions (e.g., carbon storage, soil protection, provision of habitat)

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Results: Perennial energy crops

- § (so far) of minor importance
- § Only herbicides in establishment phase
- § Occationally: fungal infestitations or insect pests

  Ø Breeding of resistant varieties

- § <u>However:</u> mainly small-scale projects

  What happens on commercial scale?

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Conclusions

- Integration of energy crops in existing food production systems
- Promotion of perennial energy crops and innovative cropping systems with lower pesticide demand
- Protection of permanent grassland

Thank you for your attention!

More details:

Bunzel, K.; Kattwinkel, M.; Schauf, M.; Thrän, D. (2014): Energy crops and pesticides contamination - Lessons learned from the development of energy crop cultivation in Germany. Biomass & Bioenergy 70, 416-428

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