H1:Economic impact of eradication and containment measures
09.2009 - 12.2012

The corn rootworm in Bavaria

- local relevance and economic impact on single farms -

International Conference
on the German Diabrotica Research Program

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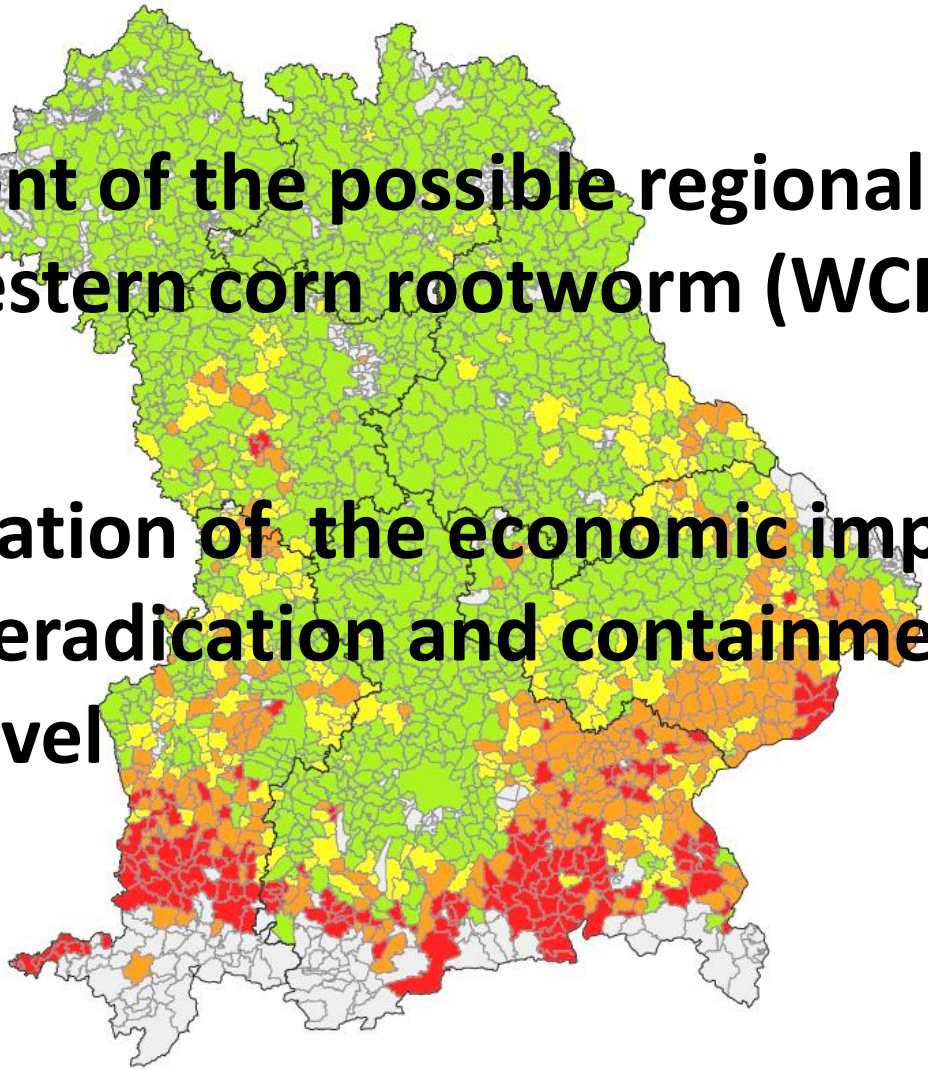
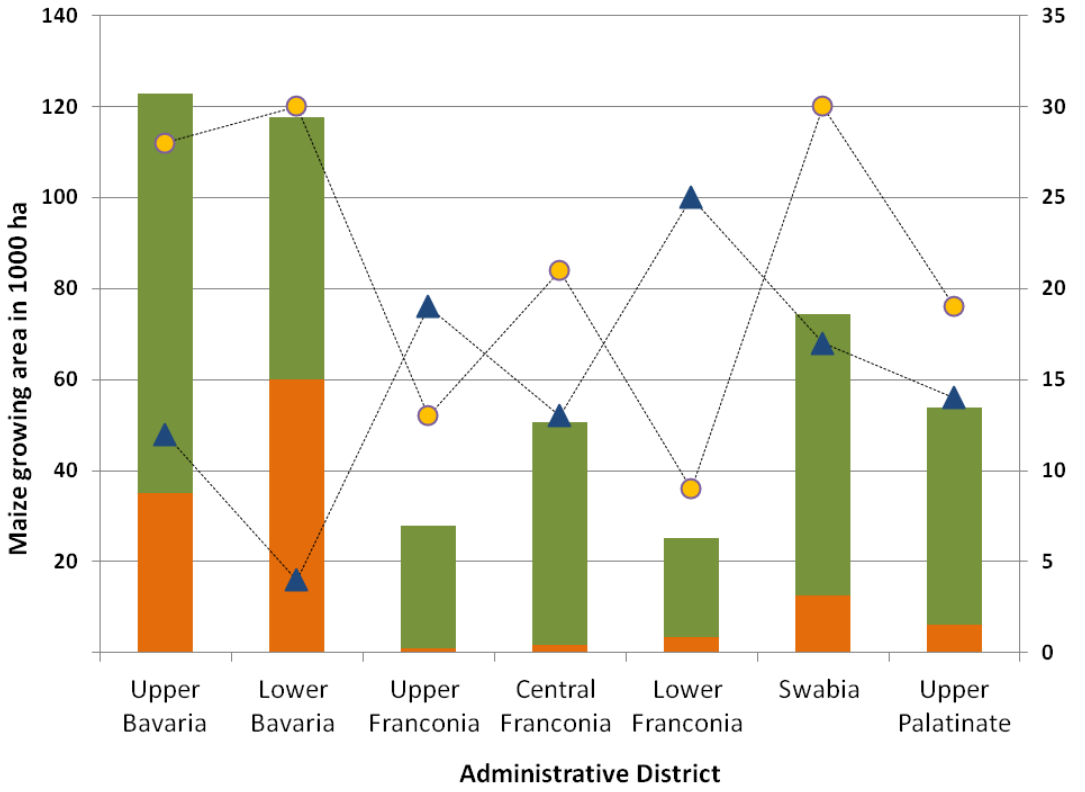
Institute for Rural Structural Development, Business Management and Agroinformatics

Project aim:

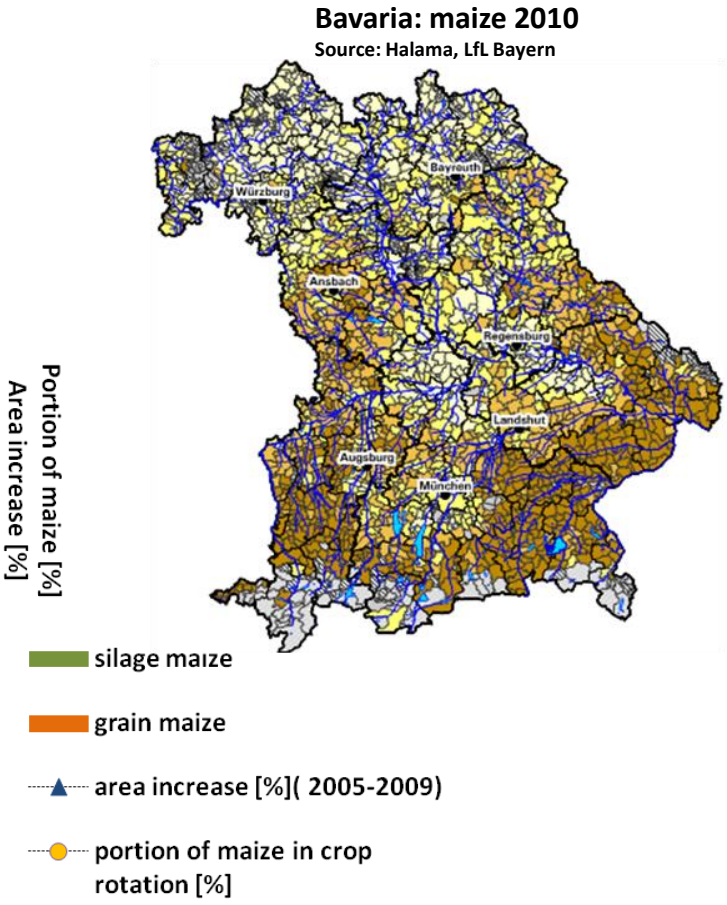


- **Assessment of the possible regional significance of the Western corn rootworm (WCR)**
- **Determination of the economic impact of different eradication and containment measures at farm level**

Cultivation of maize in Bavaria

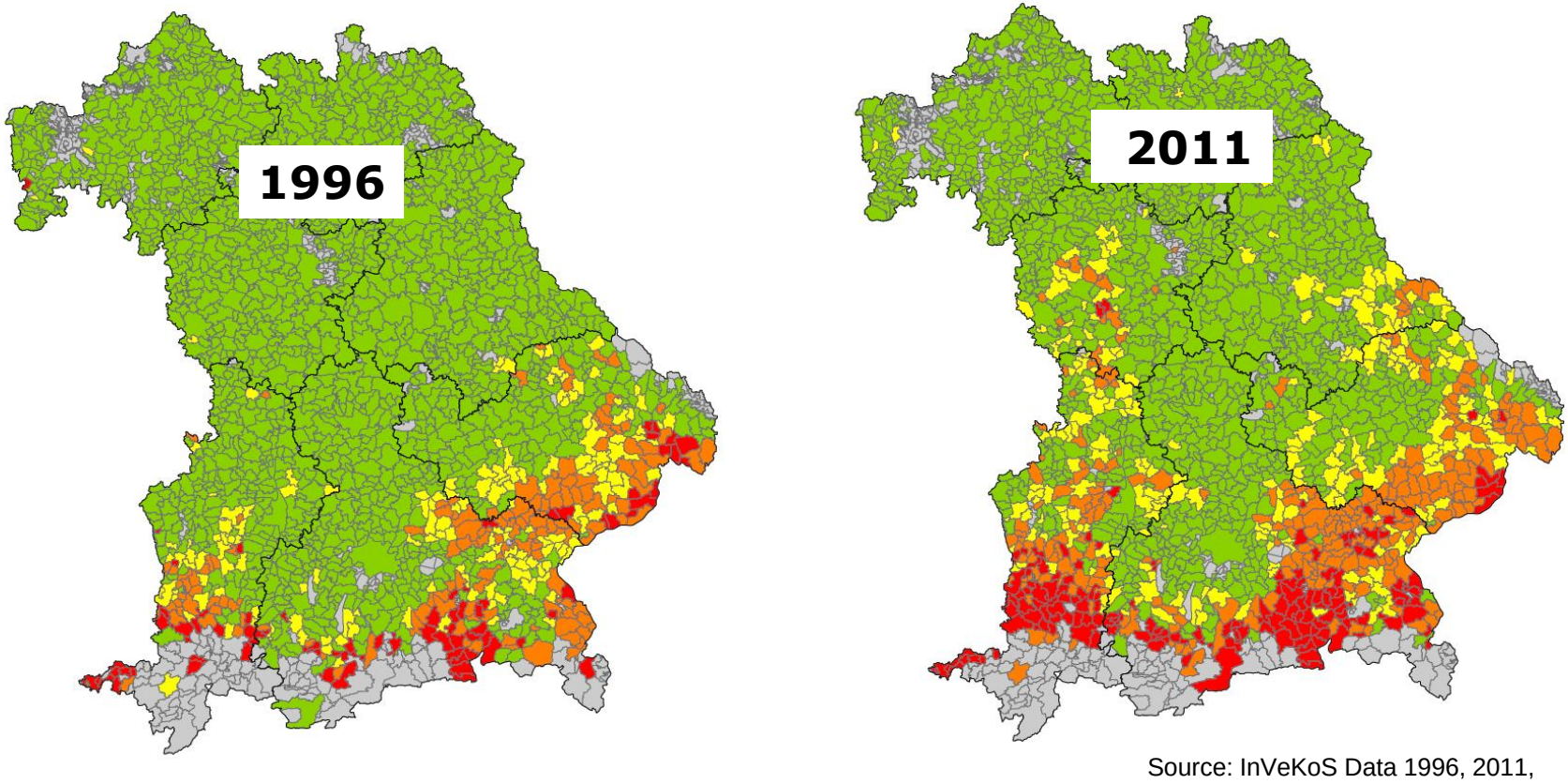


Source: InVeKoS- Data 2005-2009, own calculations



Bavaria:
Maize growing area: **464.688 ha**
Portion of maize in crop rotation: **22 %**
Area increase: **11 %**

Cultivation of maize in Bavaria



Source: InVeKoS Data 1996, 2011,

Proportion of maize in crop rotation

- 0 %
- 0 < 33,33 %
- 33,33 < 40%
- 40 < 50%
- > 50%

Study Approach:

Steps:

1. Selection of specific regions
2. Selection of case study farms
3. Economic calculations
4. Qualitative survey

Conclusion

Method: Selection of case study farms

Selection of specific regions	Selection of typical single farms
➔ *Assuming that the economic importance of the beetle depends on the regional maize density* • Identification of regions in Bavaria with a high maize density • Analysis of the InVeKoS-Database - Regional portion of maize in crop rotation (> 50%) - Area related development of maize production (2005-09) • Expert interview	• Analysis of the InVeKoS-Database - Regional portion of maize in crop rotation (> 50%) - Portion of maize grown on single farm (> 66%) • Different farm types (diary cattle, cash crop production, bull fattening, swine production, etc.) • Expert interviews • Willingness of manager to participate

Method: single farm survey

1. Economic calculations	2. Qualitative survey
case study farms (n= 9)	case study farms (n= 50)
➔ **whole-farm simulation**	➔ **semi-structured interviews**
1. Data collection: - accountancy data - Interviews with farm manager	Purpose: - prove the results of the case study - obtain more information about the consequences on farm level - evaluate the proposed cultivation alternatives for maize
2. Calculating the gross margin of the main production processes (five-year average)	
3. Economic evaluation of the different single farm adjustment measures	

Results: Adjustment measures

grain maize/silage maize is replaced by:	
cash crop production	➔ winter wheat cultivation
swine production	➔ change of feed ration: Substitution of grain silage by wheat and barley, purchase of wet maize, winter wheat cultivation
dairy cattle	➔ change of feed ration: Substitution of maize silage by grass silage •diets with varying levels of grass silage (50 %, 70 %, 100 %) •purchase of feed wheat, reduction of soybean meal, increase of grass-clover cultivation
bull fattening:	➔ change of feed ration: Substitution of maize silage by grass silage •diets with a levels of 60 % grass silage •purchase of feed wheat, reduction of soybean meal, increase of grass-clover cultivation
biogas production	➔ purchase of substrate (silage maize), increase of grass-clover cultivation

Results: Adjustment costs

Adjustment costs: per 1 ha replaced maize area (at single farm level)		
Farm type	**Adjustment messure:**	**Costs [€/ha]**
cash crop production	winter wheat cultivation	**100- 200**
swine production	change of feed ration: Substitution of grain silage by wheat and barley, purchase of wet maize, winter wheat cultivation	**100**
dairy cattle	change of feed ration: Substitution of maize silage by grass-clover silage	**550 – 650 (extreme values: -500/ 1.200)**
bull fattening	change of feed ration: Substitution of maize silage by grass-clover silage	**100-350**
biogas production	purchase of substrate, grass-clover cultivation	**650 - 800**

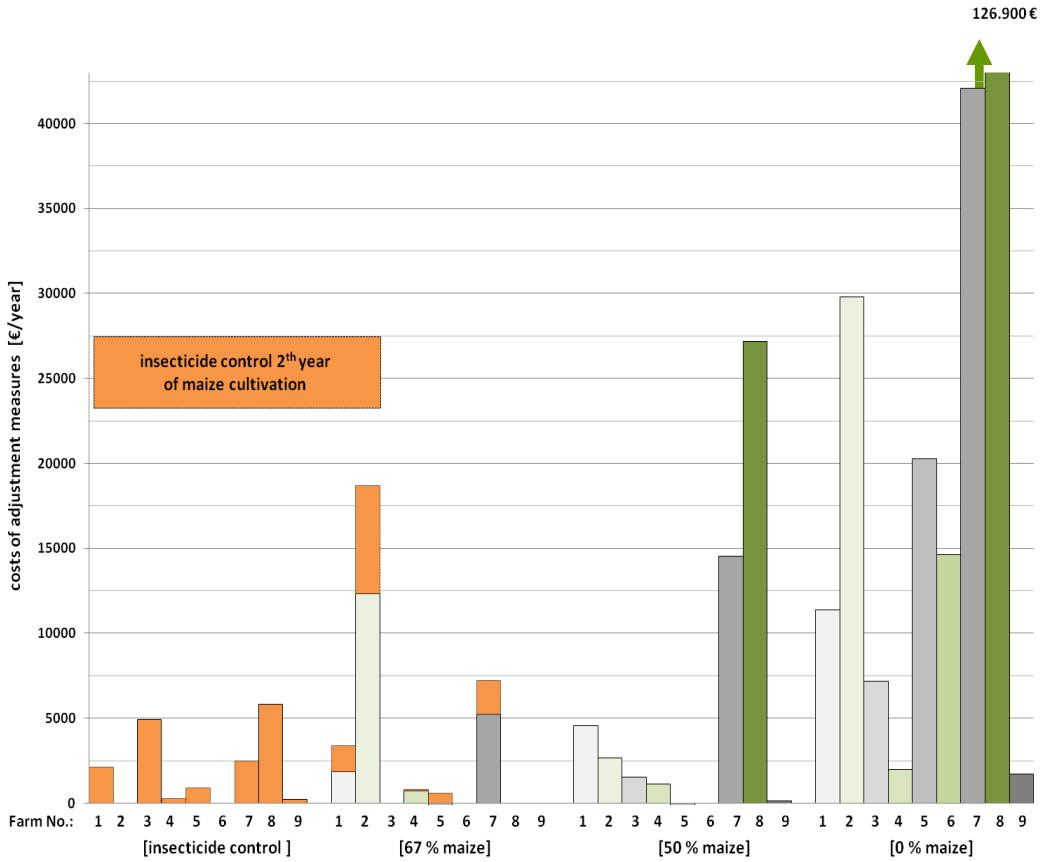
Source: own calculations reference : Ø harvest year 2005 - 2009

Adjustment costs depend on:

- Cash crop production: high gross margin of alternative crops
- Purchase cost of silage maize
- Land availability for enhanced forage production
- Necessity of farmland lease

Results: Economic impact per year

➔ great differences of the economic impact



Source: own calculations, reference : Ø harvest year 2005 - 2009

Economic impact depends on:

- size of the affected area

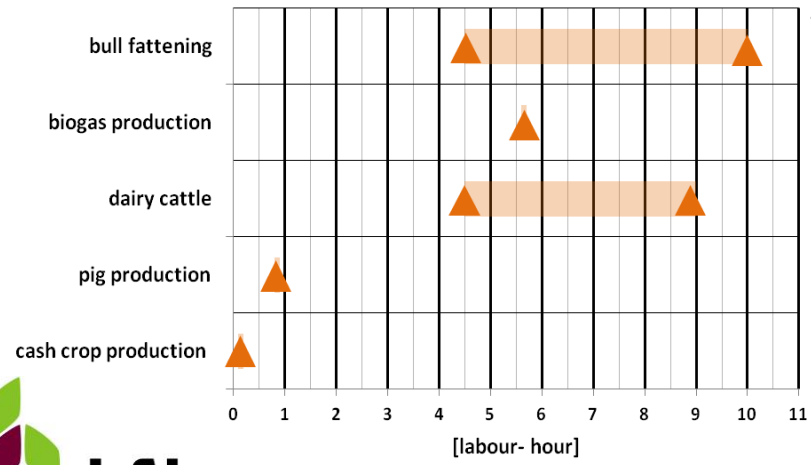
- level of maize restriction (67% , 50 %, 0%)

- level of farm-specific costs

Results: Additional Work

Additional work: per 1 ha replaced maize area (at single farm level)		
Farm type	**Adjustment measure:**	**Labour hour [LH/ha]**
cash crop production	winter wheat cultivation	**0**
swine production	purchase of wet maize, winter wheat cultivation	**1**
dairy cattle	change of feed ration: Substitution of maize silage by grass-clover silage	**4,5 - 10**
bull fattening	change of feed ration: Substitution of maize silage by grass-clover silage	**4,5 - 10**
biogas production	purchase of substrate, grass-clover cultivation,	**4,5 - 10**

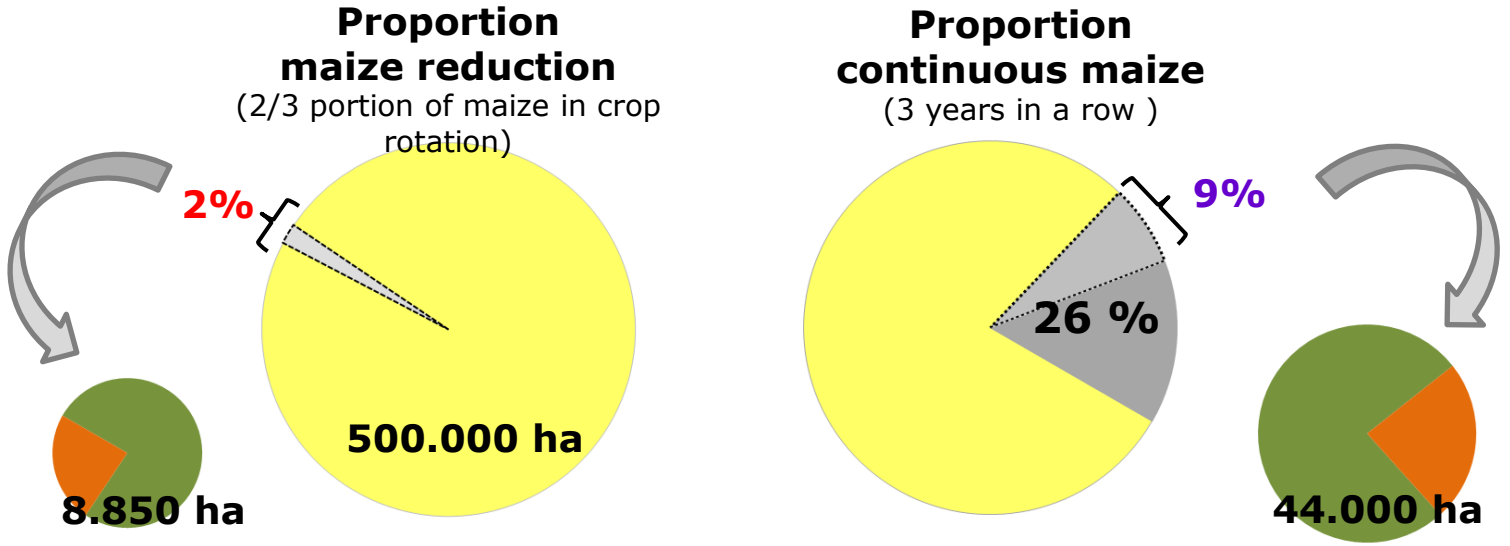
Source: LfL, own calculations



Additional work depends on:

- Cash crop production: no significant difference between the crops
- Forage production: relatively high increase in labour
  - Silage maize causes less work than clover growing
  - Change of feed ration:
    1 ha maize = 2 ha grass-clover

Results: Adjustment costs vs. yield loss (Bavaria)



	economic damage yield loss 5%	economic damage yield loss 10%	Adjustment costs (min*) (2/3 maize reduction)	Adjustment costs (max*) (2/3 maize reduction)
affected area [ha]	132.150	132.150	8.850	44.000
silage maize [ha]	100.430	100.430	6.730	33.440
grain maize [ha]	31.720	31.720	2.120	10.560
silage maize [€/ha]	105	210	600	600
grain maize [€/ha]	70	130	150	150
costs [€]	**12.800.000**	**25.000.000**	**4.400.000**	**21.700.000**

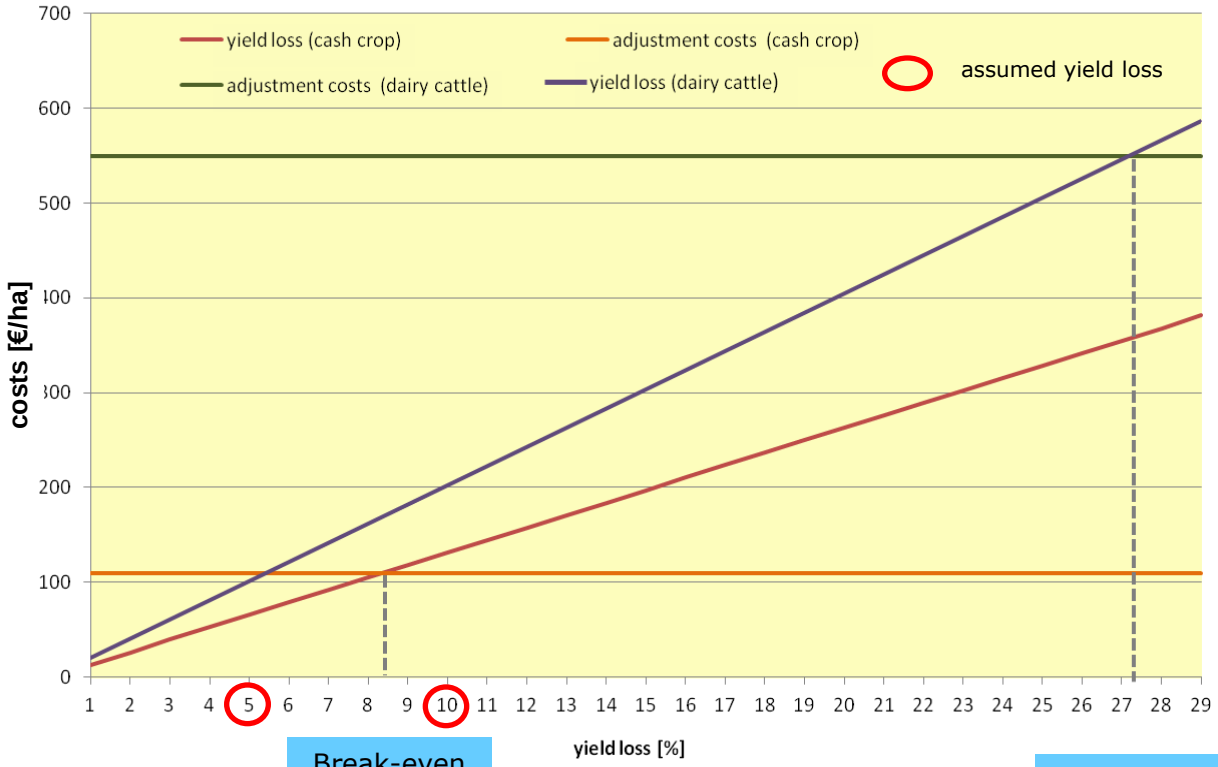
max*= based on continuous maize

min*= based on single farms > 67% maize in crop rotation

Source: InVeKoS 2010-2012, own calculations

Results: Break-Even anlaysis

yield loss ⟷ adjustment costs



Time to act?

Cash crop:

- Low adjustment costs
- Low tolerance for yield loss
- *Relatively quick response required*

Dairy cattle:

- Relatively high adjustment costs
- High tolerance for yield loss
- *Quick response not required*

Source: own calculations

Conclusion of calculation and survey

❖**Assessment of the possible regional significance of the Western corn rootworm (WCR)**
❖**Determination of the economic impact of different eradication and containment measures at farm level**

- Small- scaled, regional Problem
- The calculations and surveys show that necessary adjustments upon the occurrence of the WCR only in **individual farms** or very **limited regions** are a major problem.
  - even in most high-risk regions crop farms with high proportions of maize are relatively rare
  - comparatively low consequences for cash crop production
  - swine production: unexpectedly low impacts
- „special status“ region of Rottal-Inn ➔ substantial compliance costs

Conclusion of calculation and survey

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- Grassland farms (forage production) comparatively strong impacts
  - Silage purchased almost impossible
  - Feed substitutes expensive
  - Solution: change of feed ration – avoid silage maize
- Most frequently mentioned consequences:
  - additional work
  - higher costs
  - higher demand of arable land
- Most farmers assessed the adaptation measure that maize can be at most 2/3 of crop rotation to be of a minor problem

Conclusion of calculation and survey

❖**Assessment of the possible regional significance of the Western corn rootworm (WCR)**
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- Break- even analysis :
  - Cash crop production low tolerance for yield loss, because of comparatively low adjustment cost.
  - Single farms with high adjustment costs have a relative high tolerance for yield losses

- Analysis of Bavaria : Adjustment costs vs. Yield loss
  - continuous maize 26 %
  - Proportion of maize reduction 2 – 9 % (whole Bavaria)
    - **gap of 7 %** - seems that many single farms have continuous maize, although the portion of maize grown is much lower than 66 %
      = large potential for crop rotation – to reduce proportion of continuous maize
  - ➔ Adjustment costs between € 4 million – € 22 million
  - ➔ Economic damage yield loss (5%, 10%) between € 13 million - € 25 million

Economic no clear basis for decision-making

Thank you for your attention