

# Climate Change Adaptation in Bavarian Agriculture

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CLIMATE CHANGE AND ITS IMPACT ON RURAL AND URBAN AREAS  
-PERSPECTIVES FROM BAVARIA AND ETHIOPIA

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# Bavarian State Research Center for Agriculture

## Legal status

- Authority under the Bavarian State Ministry of Food, Agriculture and Forestry

## Tasks

- Applied research from plant breeding, animal nutrition to agro-ecology, economics and digitalisation, biodiversity, climate change
- Transfer of knowledge to extension services and local administration
- Coordinates vocational education in >50 agricultural professions
- Authority work: controls the implementation of legal acts

## Capacities

- >1,000 people, 14 locations, 9 research institutes



# Overview: Bavarian agriculture

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- 1/3 grassland, 2/3 cropland
- 12.5% organic farming → 30% organic farming in 2030!
- One crop/year with intercrops for soil health. Mainly wheat, cereals, maize
- ~60% of cropland used for feed; ~10% for renewable energy and materials
- Animals: mainly cattle: dairy + beef (regional double-use breeds)
- Family farms, on average 35 ha of land – with animals enough to finance a family  
100 ha needed to finance a crop producing family





# Climate change impacts on Bavarian agriculture: temperature

## 1. Warmer winters, more/new pests



European corn borer  
(*Ostrinia nubilalis*)

## 2. Longer growing season



New successful crop: soybean

## 3. Heat stress for cattle



Cool animal houses,  
more grazing, shade trees

# Climate change impacts on Bavarian agriculture: precipitation

## 4. Longer dry spells in sensitive cropping phases



Plant breeding, soil health,  
organic farming  
soon: multi-risk insurances

## 5. More erosive rainfall, higher erosivity



No-till, low-till; organic farming  
Landscape management!

# Adaptation: organic farming

**Bavarian programme BioRegio 2030:** towards 30% organic farming in 2030

## Adaptation by

- Healthy crop rotation: grass-clover, legumes!
- Healthy soil and soil organic matter
- Diversification in production and along value chain
- High value products with stable yields (although lower than conventional)
- High nutrient use efficiency





# Adaptation: organic farming

**Bavarian programme BioRegio 2030:** towards 30% organic farming in 2030

## Measures

- Network of farms: farmer-to-farmer advise, school visits, ...
- „Eco-model regions“: bio-regional value chains including farms – processing (bakeries, butchers, ...) – consumption, e.g. in canteens, restaurants, ... Local host: village mayors
- „Eco-board“: sounding the market, organizing networks of willing cities
- Extended advise for farmers willing to move towards organic
- Extra subsidies for organic farms



# Adaptation: towards a soil carbon programme in croplands

**Maintain high soil organic matter;**

**Build up soil organic matter where possible**

## Measures

- Organic farming
- Combined approaches in crop rotations with
  - manure (leakage?)
  - Intercrops, undercrops
  - Carbon-positive crops (roots matter!)
- Model-based scheme in preparation

**CO<sub>2</sub>  
neutral**  
calculated according to GHG Protocol  
soilandmore.com





# Adaptation: erosion control by advice

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Erosion has doubled in last 30 years! Erosivity will again double in next 30 years.

## Measures

- Detailed erosion risk maps (USLE based)
- Mobile app for erosion risk and measures on field scale („ABAG interaktiv“ = „USLE interactive“)
- Increased erosion risk implemented in new factors  
→ much higher ambition level needed for farmers!
- Strengthened advise for erosion control and water protection (mud and phosphorus in streams endanger stream fishery!)



# Adaptation: erosion control by advice

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Erosion has doubled in last 30 years! Erosivity will again double in next 30 years.

## Measures

- The underestimated scale: Measures needed along the path of the water:
  1. Field (no bare soil)
  2. Field size (split, change crop; erosion control strips do not work well)
  3. Where water concentrates: grassed waterways → filter, slow down water
  4. Channels, ditches, water along streets: v-shape to slow down water

→ A planning issue!



# Climate change impacts on Bavarian agriculture and adaptation

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- Cattle: heat stress → adapted animal houses (green roof, natural venting, shaded courtyards; towards more grazing)
- Plant production:
  - Warmer winters, new pests and diseases against vanishing pesticides → adopt basic principles of organic farming
  - Warmer summers, longer growing season → new crops, e.g. soybean
  - Longer dry spells in critical cropping phases (spring, summer) → no-till, low-till, soil health, organic farming
  - More erosive rains, more of the rainfall as high-intensity rain, thunderstorm → same as for dry spells! Erosion control is a landscape issue
- Greenhouse gas mitigation:
  - N use efficiency, strict N fertilizer act, more legumes
  - Feed from grassland and residues, avoid food competition on croplands
  - Carbon farming (increase soil organic matter, wet use of peat soils, long-lived wood products)