- 1 **Title: Land use change in Europe: interpreting regional scenarios from global storylines: land-use change as a basis to discuss and interpret gc-scenarios on a regional level**
- ▼2 Basics
  - 2.1 What do we want to do: develop land use change scenarios for Europe, at a spatial resolution of 10 minutes
  - 2.2 Concept of the ATEAM project: using the SRES-Scenarios including models for ecosystem processes to come up with VA
  - 2.3 The Basic Problem: how to go from global to regional scale whilst maintaining plausibility and internal consistency
  - 2.4 Basic interpretation methodology: develop a comprehensive framework on a regional scale and on the basis of the global scenario
  - 2.5 Identify Drivers (qualitative): how fit generic european drivers into the global scenarios?
- ▼3 Example: which drivers are important for urban land use change? — how can we use the information from the SRES-Scenarios to derive spatially-explicit scenarios?
  - 3.1 quantity — population, gdp (affluence affects household size and industry)
  - 3.2 spatial location — planning policy, accessability
  - 3.3 simple model: assessment of demand for housing on the NUTS2 level and allocation of the demand to the ATEAM cells > creating maps (e.g. urban land use per ATEAM cell on a temporal horizon) — simple models advantage: very transparent
  - ▼ 3.4 which drivers affect land use quantities and which the spatial allocation? — brainstorming with the audience: *consumer preferences, changing markets, policy, technology development, non domestic demand, climate change, resource competition, biofuel, eu-integration,*
    - 3.4.1 policy — market intervention, rural development, environmental policy
    - 3.4.2 macro-socioeconomic demand — population, consumer preferences, market liberisation
    - 3.4.3 macro-socioeconomic supply
  - 3.5 spatial drivers: resource competition, rural and environmental policy and cc
  - 3.6 non-spatial (quantity) drivers: all the rest
  - ▼ 3.7 as a function of the drivers: a simple demand and supply function >> Lt/Lt0 = Dt/Dt0 * Pt0/Pt * Or,t/Or,t0 — L=Agricultural land use, t=Time, D=demand for production, P=Productivity, O=Overproduction
    - 3.7.1 quasi-validation with historic trends (1960–2000) and real observed data (e.g. demand change=1,5 or technology change (average for Europe)=2,4 or setaside requirement (10% of cereal areas))
    - ▼ 3.7.2 scenario parameter values
      - a estimated future demand (Dt) — (it's related to global markets: using IMAGE because it includes macroeconomic factors)
      - b productivity changes: estimating climate effects on basis of ENC classes to wheat yields (Eurostat,ENC) > example map shown — breaking down productivity into the factors atmhospheric CO2, climate, temperature: again a formula (relatively simple)
      - ▼ c technology effect
        - ho to quantify future changes in crop yield arising from technology and management change? — in the past there was a strong increase in crop yield (based on real data): trend appears more or less to be linear? so how to project into the future? >> depending on scenario!
        - wheat yield differences between countries!! — do we need to disaggregate europe for consistent scenarios?
        - also to mention: relative change in yield is less in time then the absolute change: so the relative changes were used
        - tended towards conservatism in those scenarios — differences between different land use types
        - how to interpret technology changes per scenario? — A1 is assumed to be more innovative but what about protected markets...?
      - d oversupply factors (baseline=1,0)
  - 3.8 estimated land use demand (quantitative): european change quantities >> 50% decline in agricultural production areas by 2080
  - ▼ 3.9 allocate land use demand in space (rule-based) — where will a certain land use change occure?
    - 3.9.1 but what about the spatial allocation?? >> scenario spatial allocation rules fit into the SRES-scenario space (A1, A2, B1, B2)
    - 3.9.2 less favored areas: a map of non-optimal locations — mountain areas, areas with specific handicaps, less favored areas
    - 3.9.3 arable land in 2080 with HadCM3: Maps for the different SRES Scenarios (percentage of arable land per ATEAM grid cell)
    - 3.9.4 the same for grasslands....

- 3.10 so what happens to all the spare land? can we substitute food production for energy production on agricultural land: potential biofuel locations (distinguished between woody, liquid and non-woody biofuel), but biofuels still don't count up to the surplus of land: maybe more forests..
- 3.11 but what happens to whats left?? even more trees? abandonment? special areas for nature conservation and/or recreation? and, who pays?

▼4 Conclusions:

- 4.1 The scenarios suggest large declines in the surface areas of agricultural land use (especially grassland) for the A (economic scenarios)
- 4.2 The principal cause of these reductions lays in the assumptions about the role of technological development
- 4.3 The reduction seems to be only partly compensated by increasing biofuel production and forest land use
- 4.4 it is unclear what might happen to the large areas of surplus land
- 4.5 declines in agricultural areas are less for B (more green) scenarios than for the A scenarios
- 4.6 this assumes that pressures toward declining agricultural areas are counterbalanced by policy mechanisms that seek to limit crop productivity
- 4.7 includes measures to promote extensification or organic production, or
- 4.8 the substitution of food production by energy production and the planting of trees, or
- 4.9 an acceptance of overproduction (as with the current CAP)

▼5 Finally....

- 5.1 scenarios are themselves models of the real world...(uncertainty of inputs!!) – descriptive/qualitative, – conceptual, – quantitative
- 5.2 sc can be interpreted from storylines in many different ways – there is no correct answer, and many possibilities
- 5.3 sc allow us to explore our understanding and preconceptions of how the world works – so came up new that technology is potentially so important for agricultural land use
- 5.4 sc allow us to confont (policy) questions about the future

▼6 Some discussion questions (for your study region)

- 6.1 How do the presented scenarios of land use change compare with your responses to the questionnaire (of Tim Carter)?
- 6.2 If there are differences, what are they and why?
- 6.3 are there additional drivers of importance for land use change?
- 6.4 what are the possible solutions to the surplus land issue
- 6.5 what are the consequences of the presented changes to goods and services