Brandenburg
University of Technology
Cottbus

Environment

Energy

Integration of Agroforestry in Agriculture and Landscape Reclamation

Dirk Freese and Christian Böhm
Brandenburg University of Technology,
Chair of Soil Protection and Recultivation

Who we are
Chair of Soil Protection & Recultivation

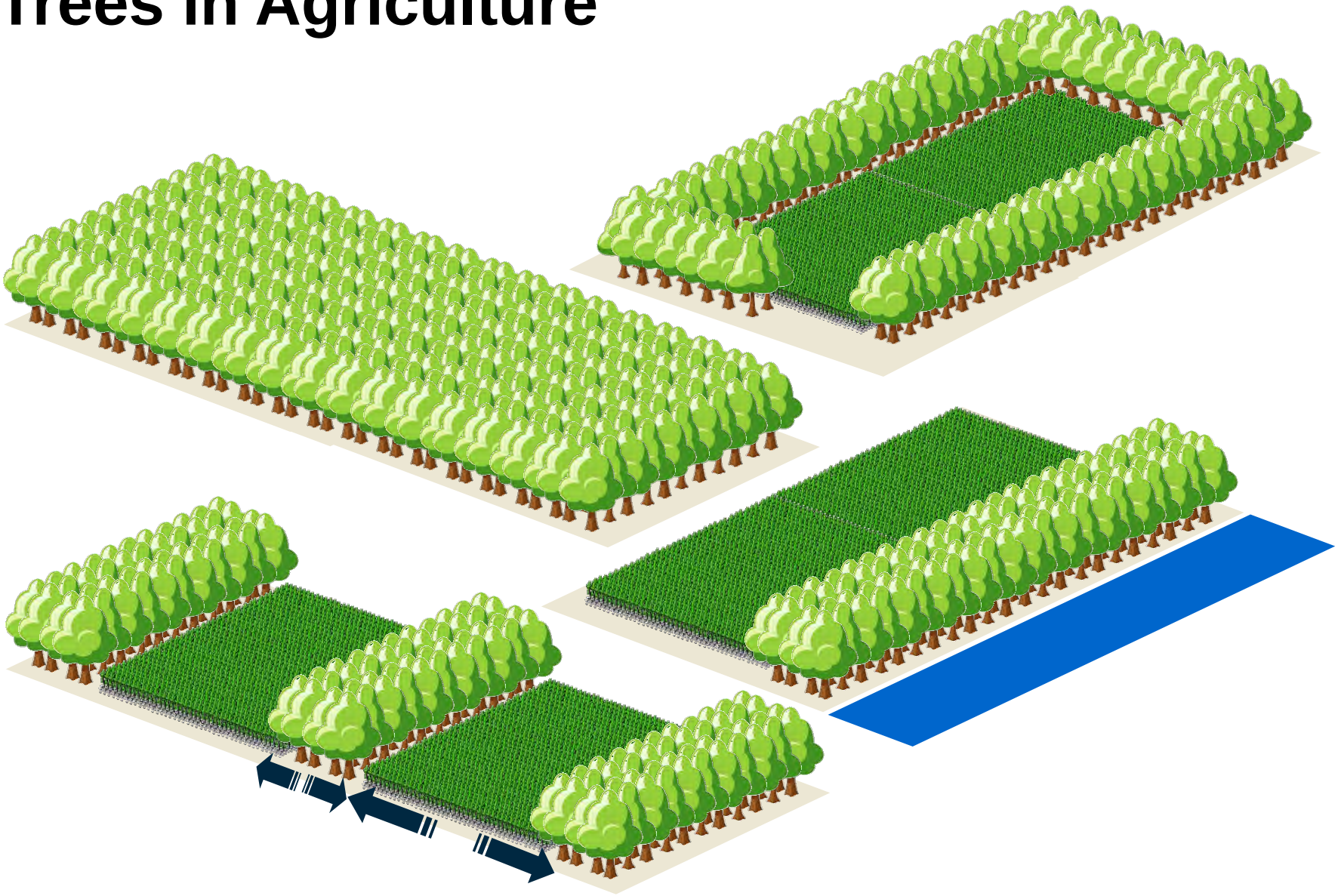
- Staff: 35 scientists and technicians specialized in soil sciences and related disciplines such as chemistry, biology, ecology, forestry and agricultural engineering

- Third party projects in the fields of fundamental and applied research funded by EU, DFG, Ministries and Industry e.g.:

  - Eco System Development, DFG
  - Agroforestry and Climate Change, Ministry of Research
  - Agroforestry and Bioenergy, Ministry of Agriculture
  - Agroforestry and Compensation Measures, Ministry of Agriculture
  - Reclamation and Bioenergy Production, Vattenfall (New Energy)
  - Phytoremediation by Trees of Contaminated Sites, DB AG

- Supervision of PhD-Students/ projects in the frame of current research activities (10) and particularly in the frame of the International Graduate School (5)

Trees in Agriculture



Alley-Cropping aiming on food, feed and bioenergy

<u>Alleys</u>:

- integrated or organic farming

<u>Trees in multiple rows</u>:

- Management as SRC
  - Rotation 3-6 years
  - Harvest in winter
  - Expected lifetime > 25 years
  - Tree species (Populus, Willow, Robinia)
  - Plant density: 8000 -12.000 trees/ha

Benefits of alley cropping systems = our research topics

- Carbon sequestration
- Soil enrichment /soil chemistry
  - Nutrient use efficiency by crops and trees (N and P)
- Erosion control
- Improve microclimate
  - Reduce wind velocity
  - Water availability and quality
- Diversify income
- Biomass production
- Enhance biodiversity habitat
- Improve landscape

Education

- Integration of specific moduls „ Agroforestry“ in study courses for (under) graduates and PhD programs
- On–the–job training for farmers and stakeholders

Public relations

- Establishment of long-term demonstration sites adapted to practical issues
- Extension service
- Publications in periodicals of farmers
- Reports via regional broadcasting stations

Agroforestry Systems – a land use option adapted to climate change on the regional scale

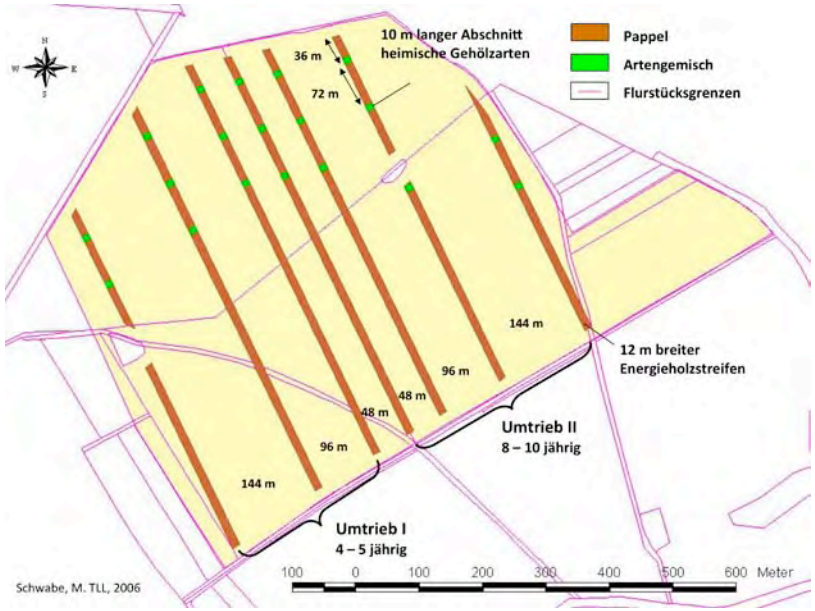
- **Development of new land use forms** (Alley-Cropping) as demonstration sites: relevant for practical farming keeping agricultural subsidies
- **Optimization of** Alley-Cropping in relation to adaptation to climate change
  (Interactions between trees and crops, water use efficiency, carbon sequestration, humus accumulation in soil ...)
- **Significant increase of woody biomass yield** by tree breeding

Project „AgroForstEnergie“ agroforestry and bioenergy

- **Demonstration site** in Thuringia (also in Brandenburg and Bavaria) with 50 ha

- high productive soils

- **non-structured landscape** with farmland



Alley cropping in Thuringia
(Project: AgroForstEnergie)

Issue:

Assessment of ecological and economical output

= **LER**

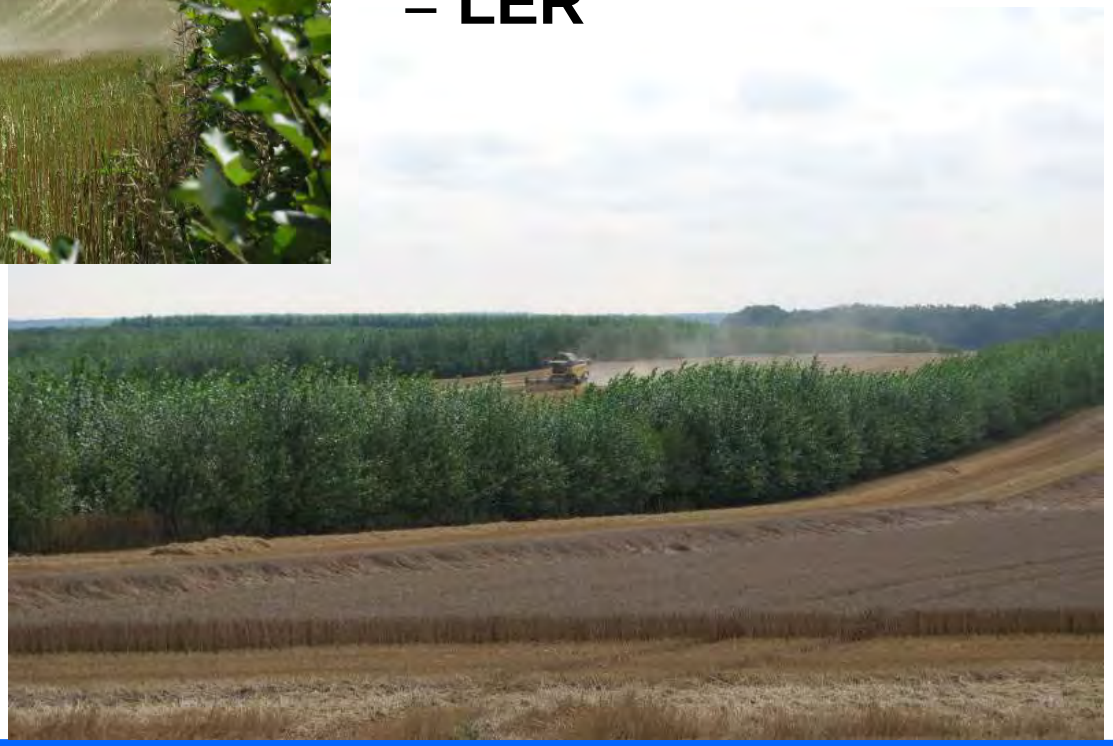


Foto: Baerwolff, 2011

Project Agroforestry and Compensation Measures

The National Nature Conservation Act in Germany (2002)
…any intervention causing impacts to nature has to be compensated.

The research project “ELKE” aims on the development of extensive land use options where agroforestry systems are addressed as reliable compensation measures on agricultural land.

Different demonstration sites distributed over Germany.

Surface mining and Soil Reclamation

Landscape restoration on the new way

Technology of Lignite Mining
Overburden Conveyor Bridge F60

100.000 ha mining area in Lusatia

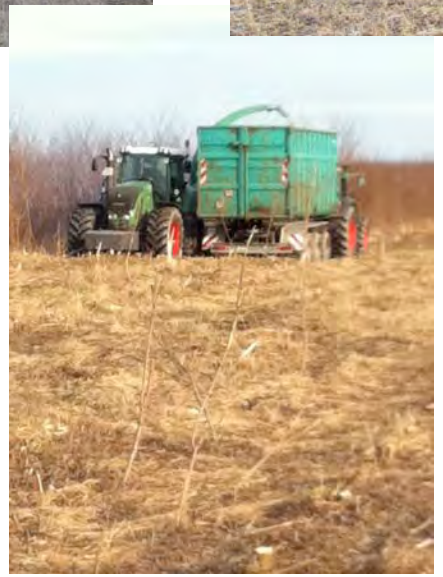
Impressions - Substrate Reclamation and Planting

- extrem soil heterogenity
- no soil structure
- initial pH < 3,0
- Corg < 0,005 %
- very low N and P

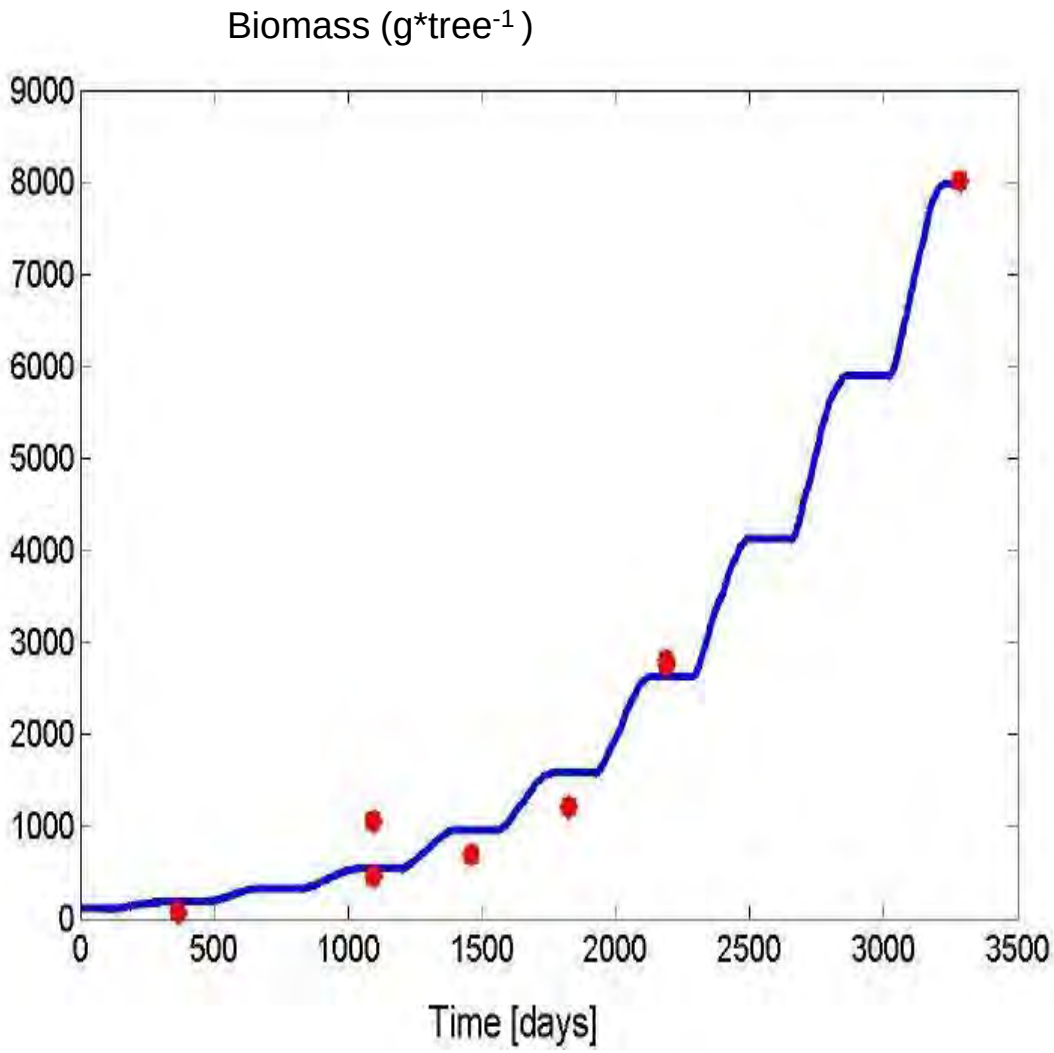
Impressions

Plant Growth

Impressions Harvest of short rotation trees in Welzow-South

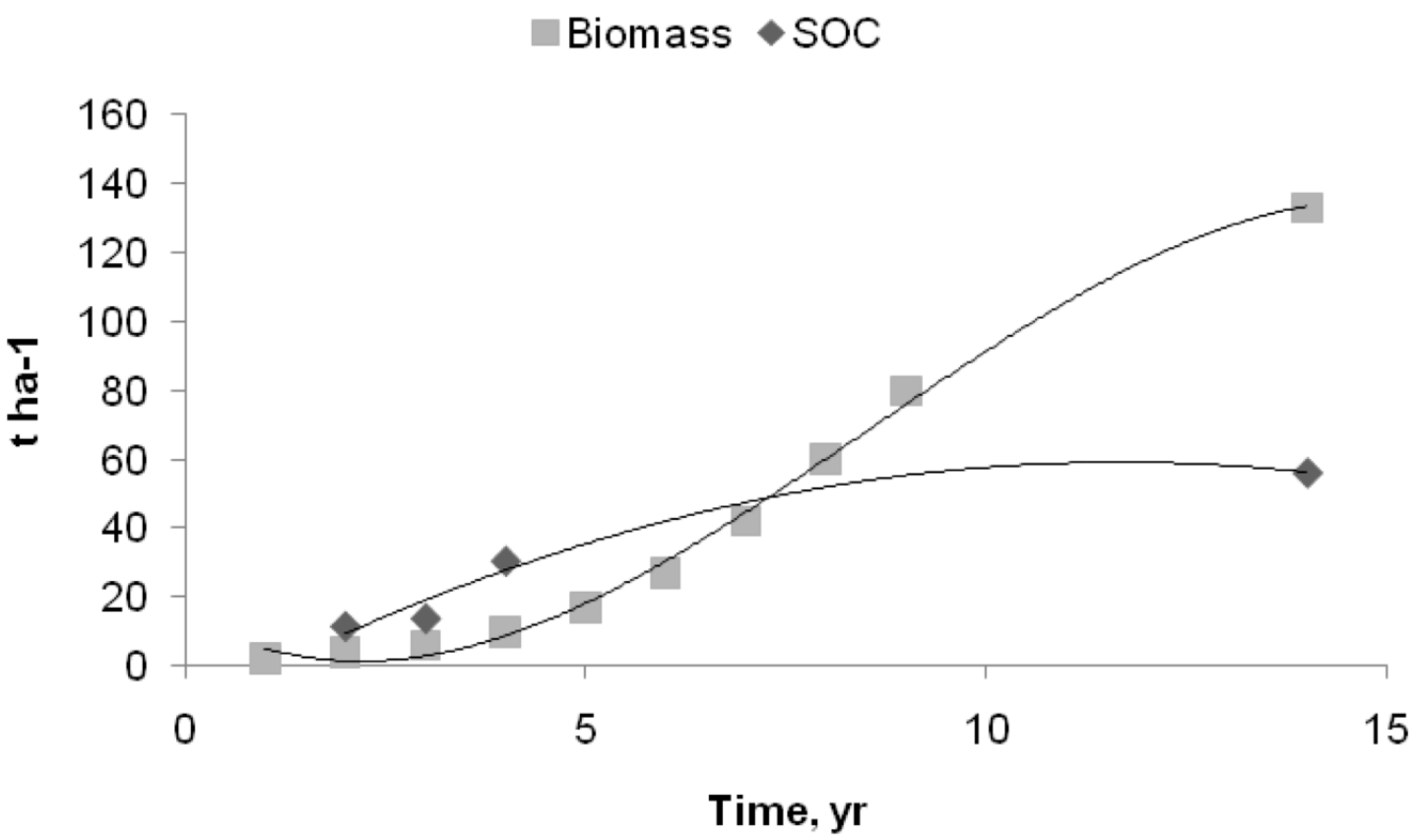


Prediction of yield of Robinia pseud. with the yieldsafe model up to 10 years



● measured data

Increase of biomass and humus in reclamation fields with *Robinia pseud.*



(Tsonkova et al., 2011)

Areal View
„Real Life Laboratory“ Welzow-South

2007

2010

Demonstration Site with 170 ha

Bioenergy production
Benefits

- Conversion of initially barren land to green landscapes supported by agroforestry
- Economic reuse use of mined area
- Enhancement of soil forming and soil conservation processes
- Sustainable energy production

Future Research

Spreewald Region

- 100 km south-east of Berlin
- Since 1991 biosphere reserve (UNESCO)

- Unique water channel system of 1,300 km length covering 484 km2
- Tradition: agroforestry systems (shelterbelts like) with organic farmland and grassland

Air View of the Spreeewald landscape with Shelterbelts

- Future need:

sensitive restoration of the old tree hedgerows

- Important issues:

management of organic soils, water regime and biodiversity

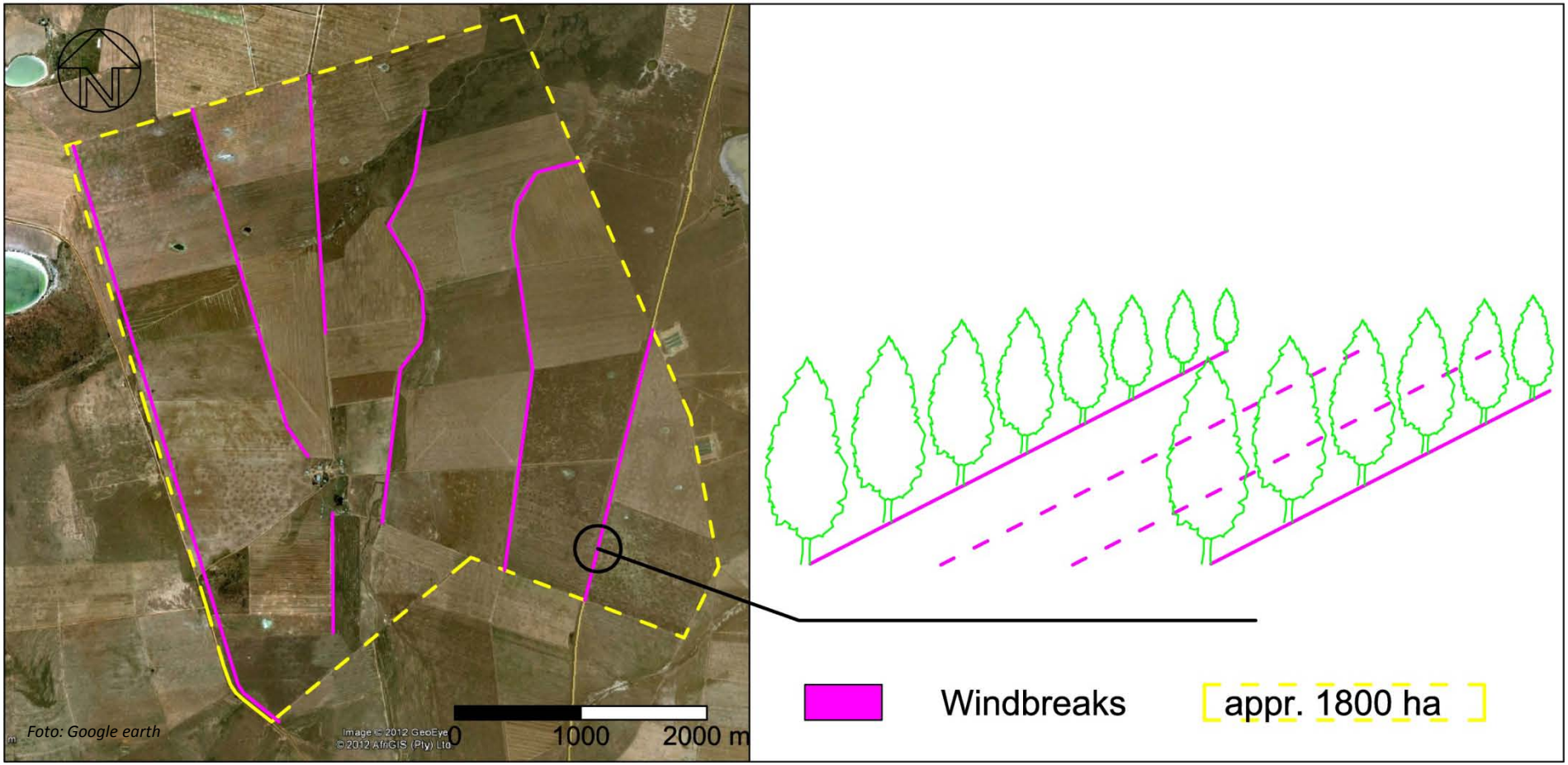
Windbreaks in Northern Brandenburg

- Windbreaks planted 50 years ago
- main tree species populus
- Issues:
    - recall of the erosion function
    - stepwise re-planting of trees
    - selection of different tree species / shrubs / perennial crops
    - integration into daily farm management = farmer are user
    - recognition in CAP 2013 ?

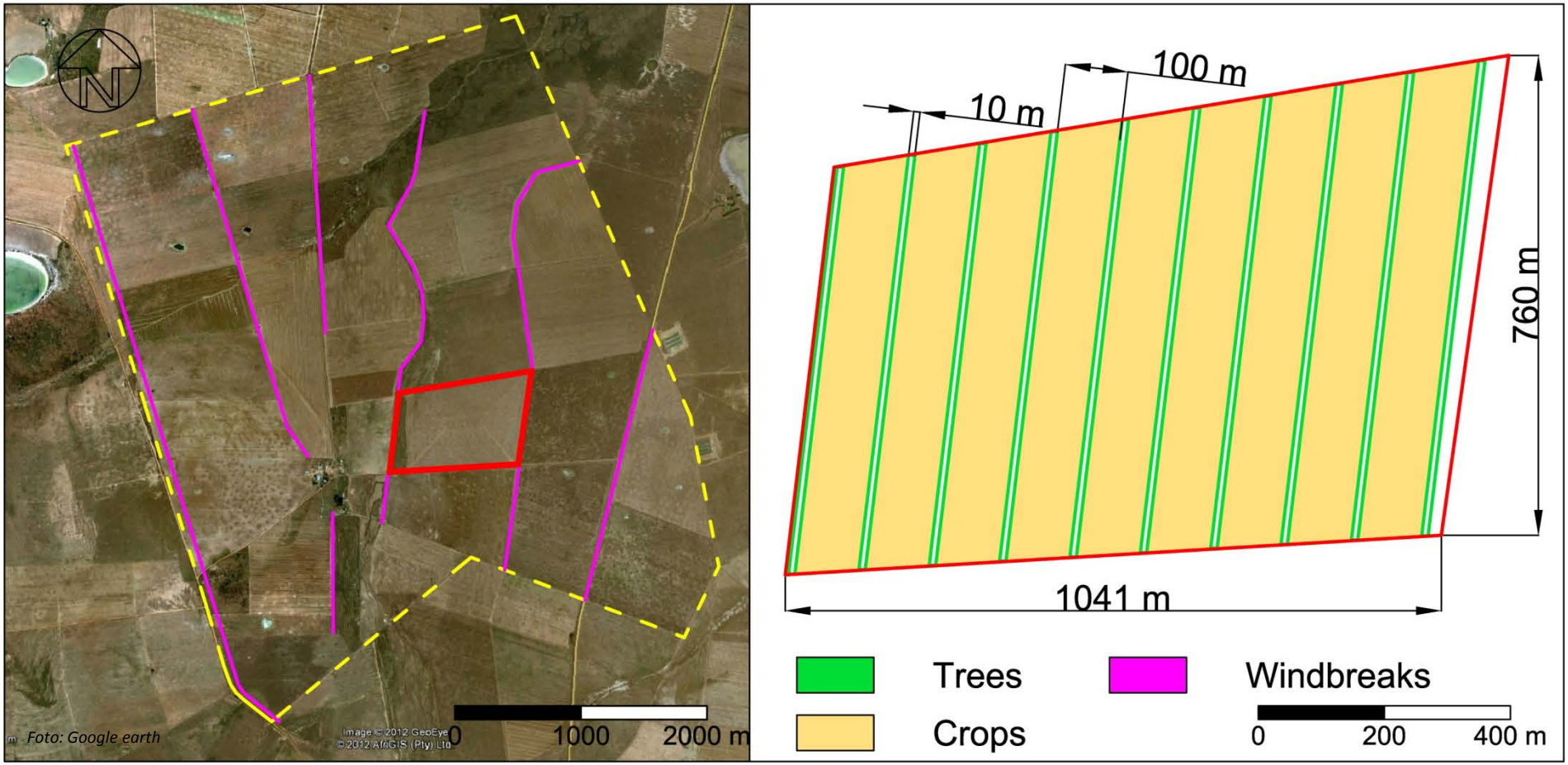
Slangkop-Project Western Cape
Bioenergy production and soil protection

Landscape Western Cape

Slangkop-Project:
Bioenergy production and soil protection



Slangkop-Project:
Bioenergy production and agroforestry



Slangkop-Project
Targets - Partners

- Soil protection in sensitive areas susceptible to wind erosion

- Agroforestry to promote adapted and sustainable agricultural production systems

- Bioenergy production to meet local energy demands and to boost the availability of energy

UNIVERSITEIT STELLENBOSCH UNIVERSITY

Faculty of AgriSciences

Farmers, companies and government of Western Cape

Agroforestry the present option and future solution

Thank You !

Source: images.google.com