Experiences and sustainability aspects of the short rotation coppice development in Sweden

Nils-Erik Nordh and Jannis Dimitriou
Swedish University of Agricultural Sciences
Deparment of Crop Production Ecology

SLU
Swedish University of Agricultural Sciences

Salix SRC in Sweden

≈ 9 000 ha (jan. 2015)

8 t DM ha^{-1} $year^{-1}$, 3-year cutting cycle
≈ 4 m^3 oil or 40 MWh
Energy ratio 15-20 : 1

SLU
Swedish University of Agricultural Sciences

Poplars and hybrid aspen

≈ 2100 ha (Jan. 2015)

SLU
Swedish University of Agricultural Sciences

Driving forces behind SRC development in Sweden

- Wood deficiency
- Energy crisis
- Surplus agriculture land
- Environmental use

Low quality sites

Better sites

Swedish University of Agricultural Sciences

Research and commercialization

- Research and Development of SRC started in the early 1970's at the Swedish University of Agriculture Sciences
- Salix SRC was commercialized in Sweden in the beginning of 1990´s

Small scale

Large scale

Breeding

- Tordis
  - 3-year shoot
  - 6-year root
  - Irrigated and fertilised.

9.2 m height
75 mm diameter

SLU
Swedish University of Agricultural Sciences

Damage and pests

Insects

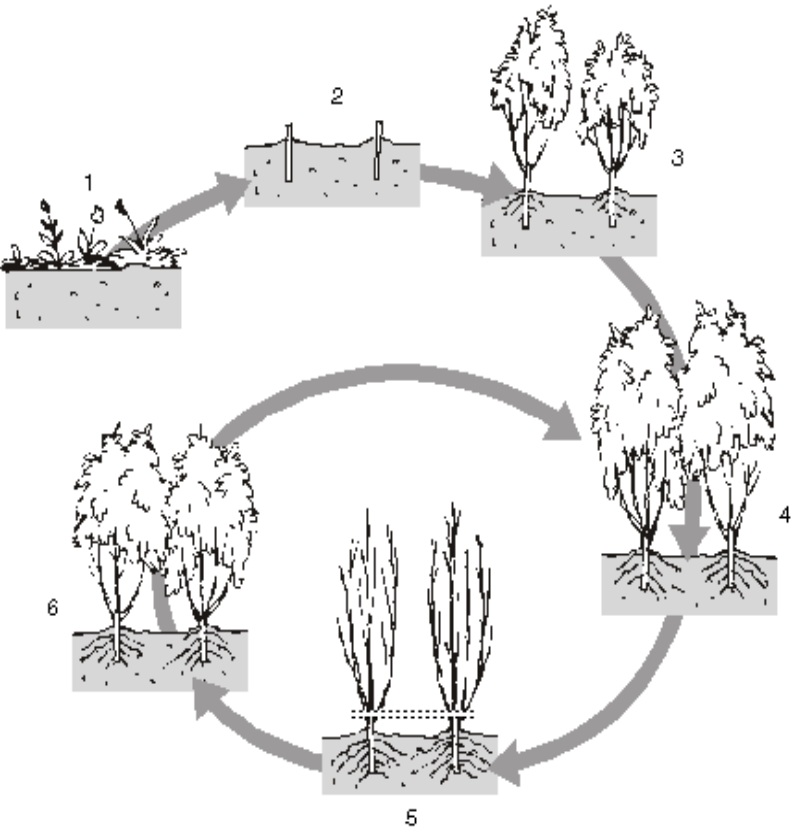
Leaf rust

Foto: Agrobränsle AB

Frost

Roedeer, moose

The salix production system



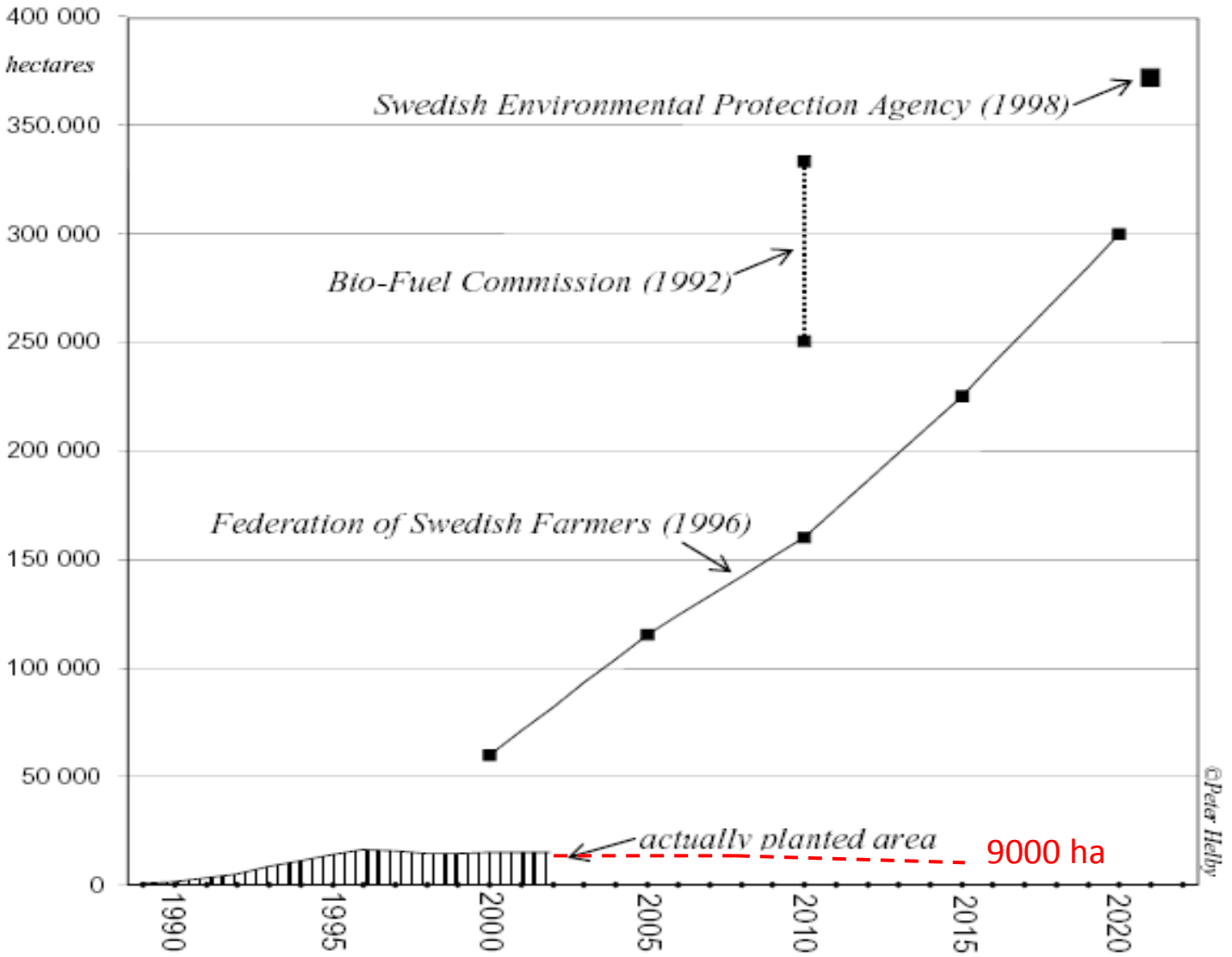
Cutting cycle for a salix plantation

Salix SRC in Sweden is a fully developed cropping system, from planting to harvest and there is a demand for wood chips

Should not the area planted with salix increase…?

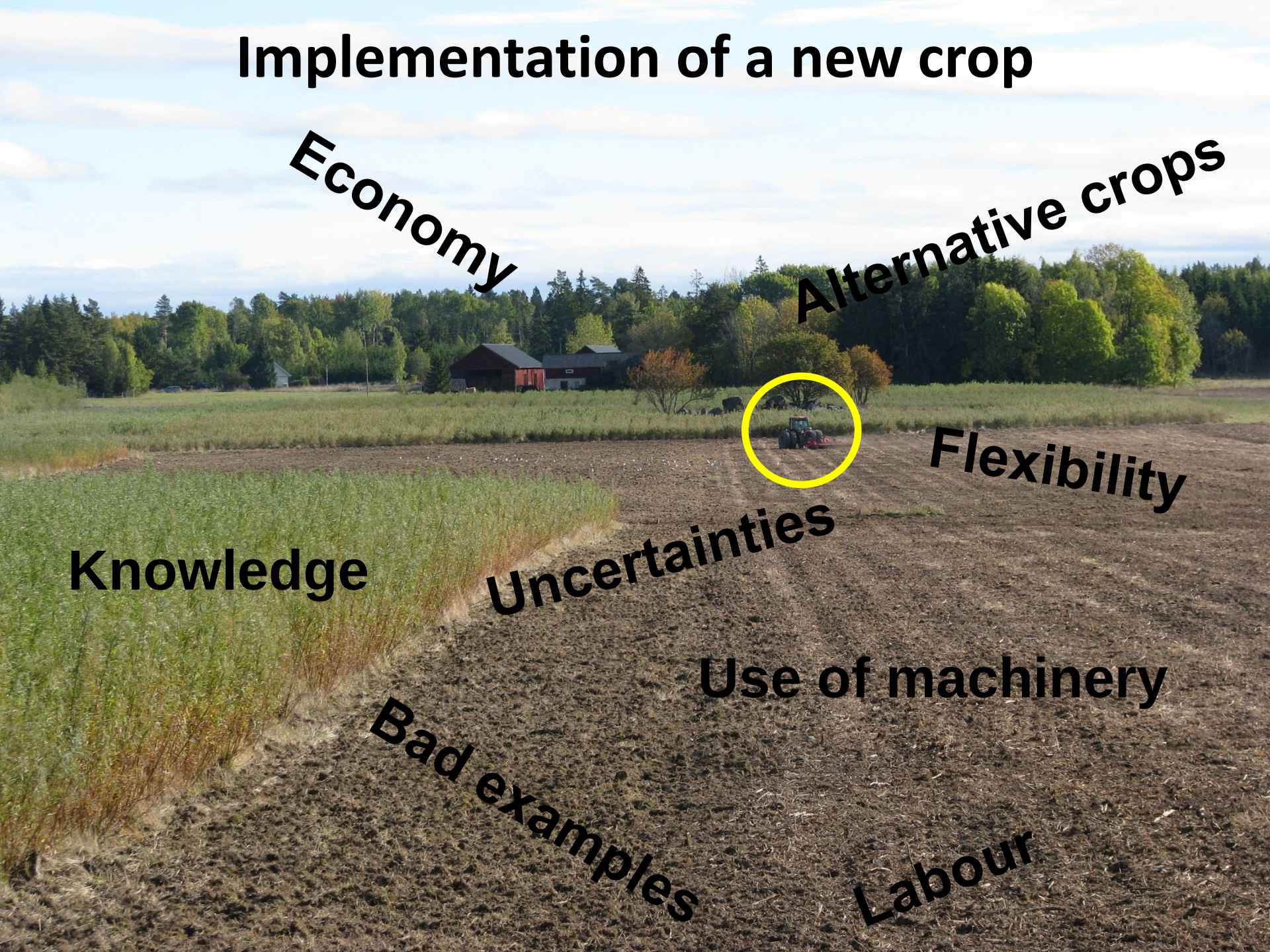
SLU
Swedish University of Agricultural Sciences

Salix SRC in Sweden: Scenarios versus reality

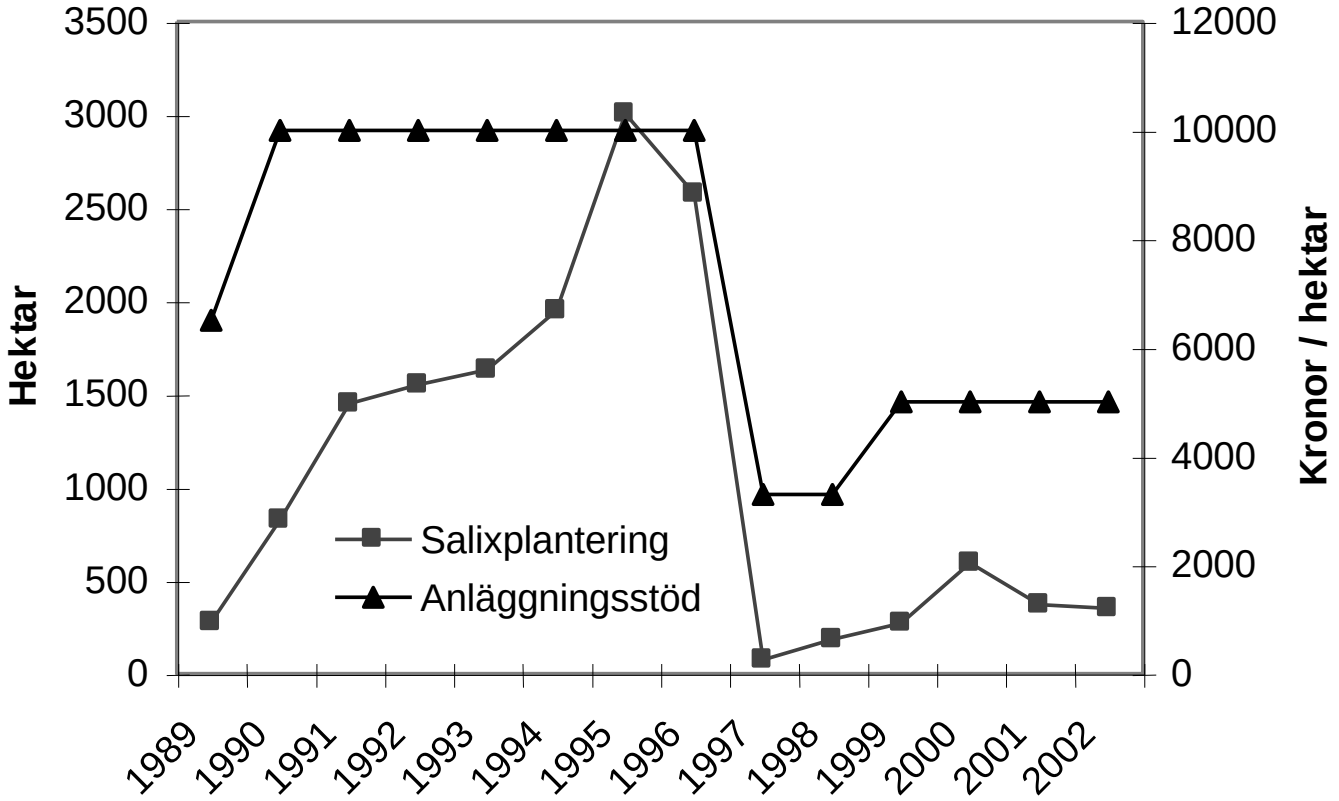


(Helby et al, 2006)

SLU
Swedish University of Agricultural Sciences


Implementation of a new crop
Economy
Alternative crops
Flexibility
Uncertainties
Knowledge
Use of machinery
Bad examples
Labour

Annual Willow Planting 1989-2002 in relation to planting support..



Källa: Energiskogsutredningen 2003.

Salix SRC is a bioenergy crop that changes agricultural practise a lot:

- it is perennial, life span ≈ 25 years
- harvest takes place every 3rd to 4th year,
- it is woody,
- little use of excisting farm machinery after establishment,
- few working hours for the farmer
- changes the landscape

Rosenqvist 2007

SLU
Swedish University of Agricultural Sciences

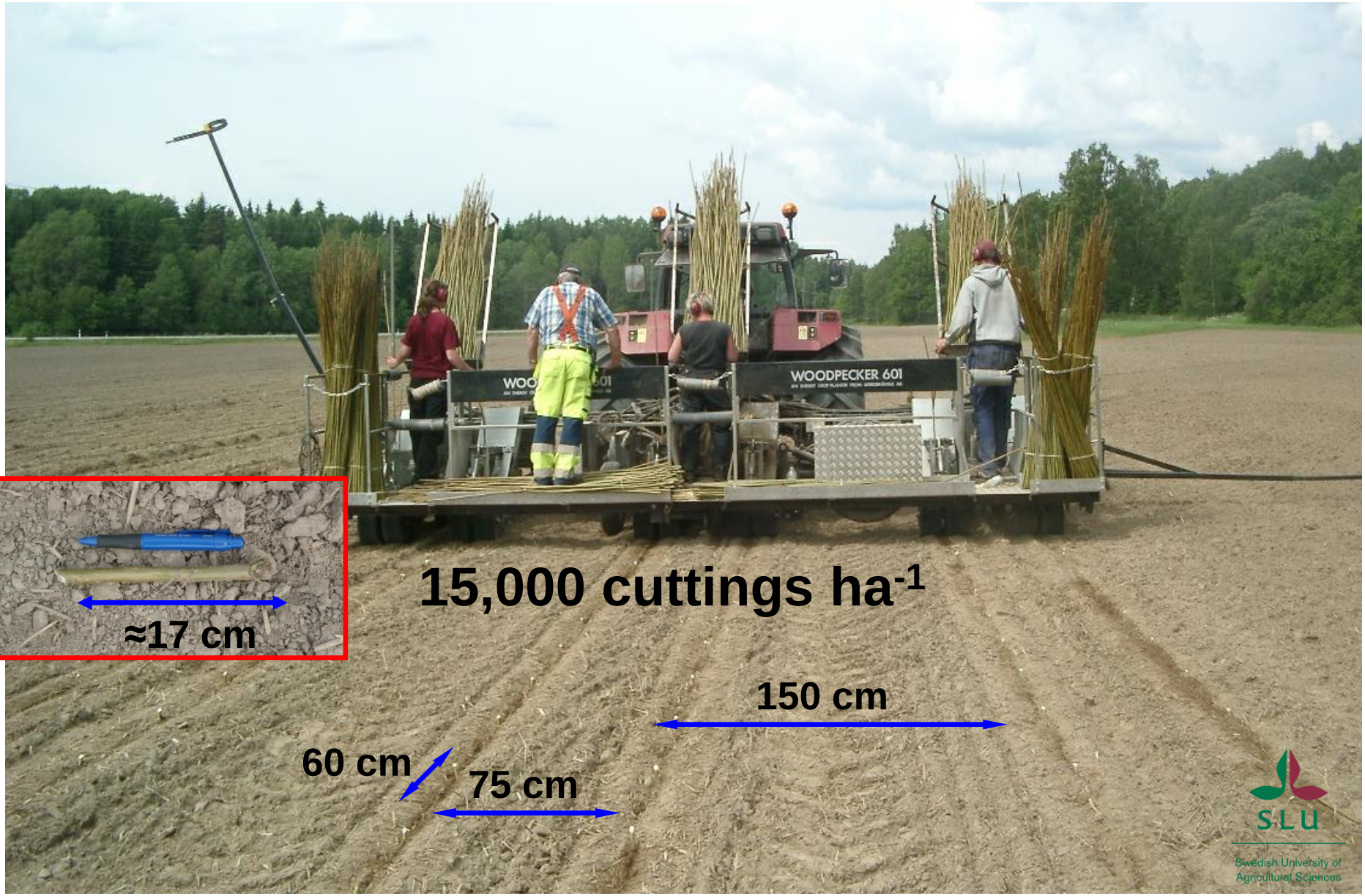
Agricultural crop – must be managed

Before planting:

- **Choice of site**
- **Weeding**
- **Ploughing**
- **Harrowing**

SLU
Swedish University of Agricultural Sciences

Planting in spring…



The young plants are poor competitors

Harvest methods

”Direct chipping”

Harvest methods

”Bio-baler”

SLU

Swedish University of Agricultural Sciences

Harvest methods

”Whole shoot harvest”

Removal of 25 year old salix SRC
Replacing with winter wheat and new salix

Salix SRC add dynamics to the agricultural landscape

SLU
Swedish University of Agricultural Sciences

Localization of SRC in the landscape

SLU
Swedish University of Agricultural Sciences

Biodiversity

SLU

Swedish University of Agricultural Sciences

Biodiversity

Biodiversity
Unplanted border zones

SLU
Swedish University of Agricultural Sciences

Biodiversity

SLU

Swedish University of Agricultural Sciences

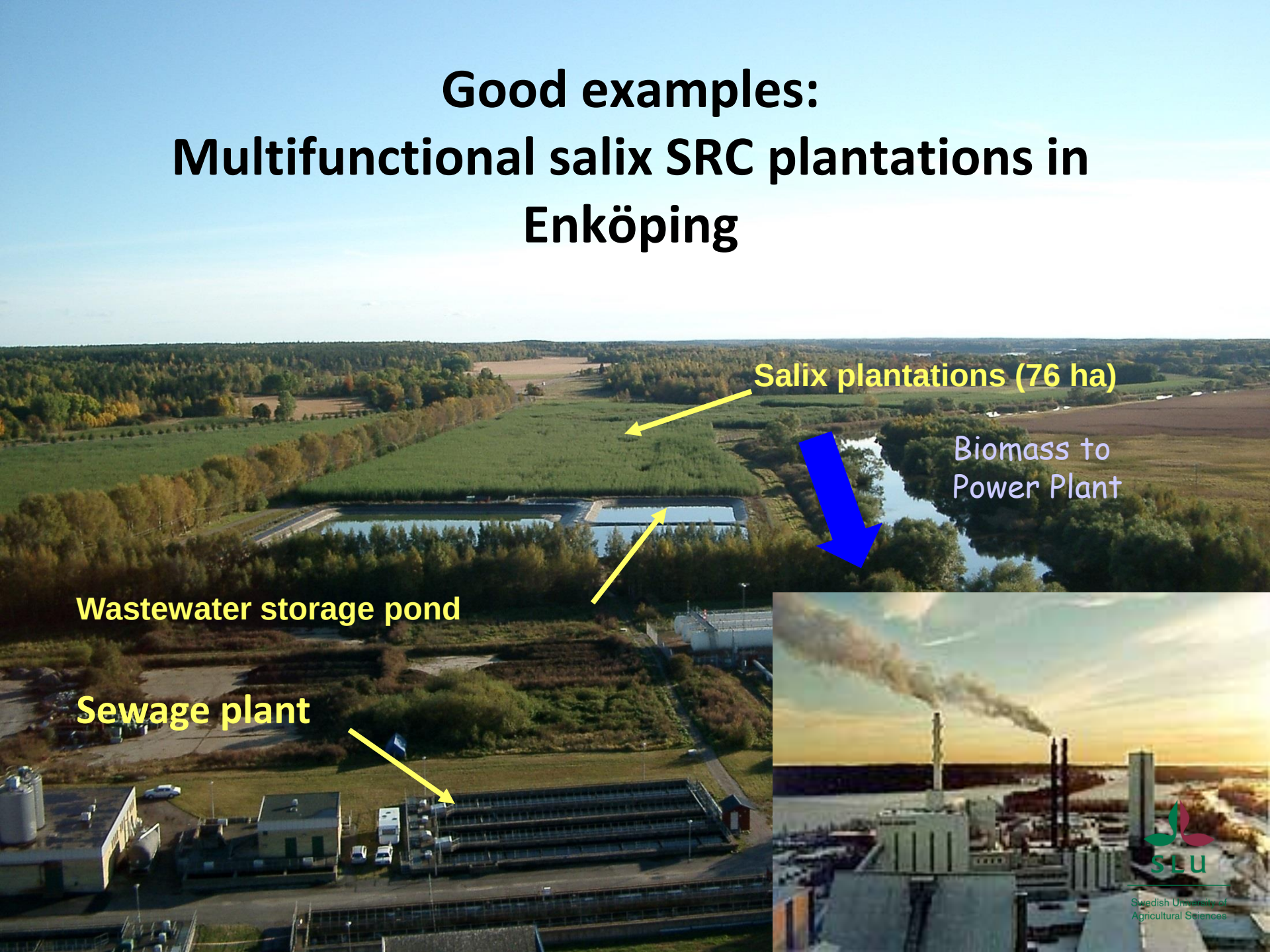
Phytoremediation

Cadmium in agriculture soil

Nutrients in wastewater/sludge/ash

Prevent leakage from city dumps

Good examples: Multifunctional salix SRC plantations in Enköping



The waste water is stored in ponds….

SLU
Swedish University of Agricultural Sciences

…and is spread in the plantation through drip irrigation tubes

Photo: Pär Aronsson, SLU

SLU
Swedish University of Agricultural Sciences

Good examples: a farmer owned boiler

SLU
Swedish University of Agricultural Sciences

Lessons learned (1)

- Drivers for developing and implementing a new biomass crop change through time
- Need for breeding programs that continue to provide the market with new material
- Plantations has to be designed so they can be efficiently managed
- Site choice, preparation and successful establishment is crucial for later production

Lessons learned (2)

- Large-scale implementation needs to be well prepared in advance
- Extension work needed to support farmers
- Grant scemes should be targeted towards production, not towards planting……
- Planting SRC implies a long-lasting commitment for farmers and thereby for all actors in the chain

Lessons learned (3)

- Design your multi-purpose systems to adress a variety of markets
- During large scale implementation, commercial fields need to become the main research and development objects
- SRC is an international discipline that needs to be developed further by means of international co-operation