AGROFORESTRY WITH FAST GROWING TREES

FROM LANDSCAPING AND ARBORICULTURE TO AGROFORESTRY

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MODULE 9

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AIM OF THE MODULE

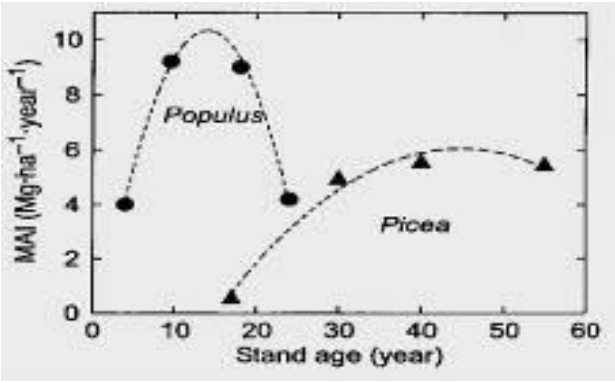
- Define fast growing trees
- Define main types of their stands (cultures)
- Define coppiced tree belts agroforesty (AFS-CTB)
- Explain main principles and agronomy
- Present economic aspects
- Briefly review situation of ASF – CTB in EU

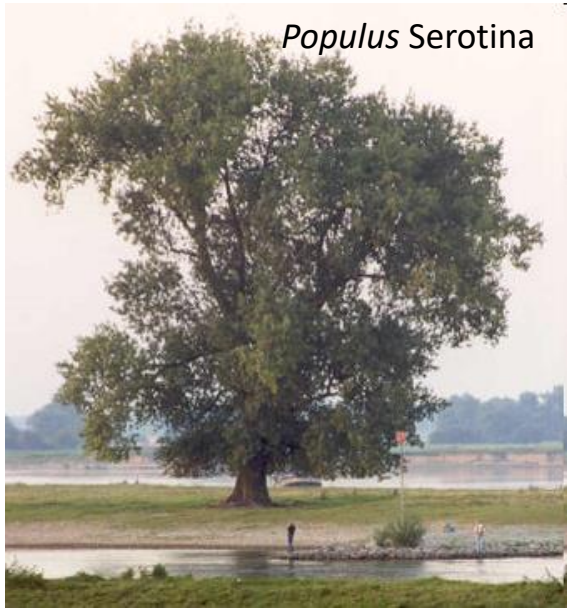
FAST GROWING TREES

- Fast growth of stems and roots in first 2 decades after planting
- High biomass production / yield (in first 2 decades after planting)

  > 10 m^3/ha/year = 4,5 t(dry)/ha/year (Forestry stands/Arboriculture; IUFRO)

  > 180 GJ/ha/year = 10,0 t(dry)/ha/year (bio-energy)
- Efficient ecosystem services (erosion protection, biodiversity)
- Buffering of extreme climate conditions (shading/cooling, water retention)
- Soil humus enrichment (leaves fall) and carbon sequstration (roots)
- Heavy metals uptake
- Selected and bred for 200 years for multipurpose use on forest and agricultural land including agroforestry and devastated sites
- **Used increasingly for biomass production for energy and material use on agricultural land**





POPLAR AND WILLOW – RICH NATURAL RESOURCE

- 35 species of poplar (people's tree by Romans)
- 350 species of willow (pictures in Bible, fences)
- Wide natural ranges and ecological amplitudes of some natural species (*Salix caprea, Salix* fragilis, *Populus nigra, P. deltoieds, Balsam poplars*)
- Easy natural hybridization and controlled breeding: hundreds of varieties which dominate landscapes (*P.* x *canadense, Salix x fragilis*),
- Interesting traits for breeding: horizontal resistance to rusts (*P. nigra*), wide ecological amplitude, metal uptake (*S.caprea)*
- Endangered species by antropogenic activities – destruction of natural habitats and breeding with introduced species (*Salix daphnoides, Populus nigra*)
- Reproduced mostly vegetatively – by cuttings, rods

ARBORICULTURES AND SILVICULTURES

Assortment: mainly *P. x canadensis, (black p.)*
Density: 620 pc / ha
Rotation: 8-25 years (optim.)
Product: paper, roundwood, matches

SHORT ROTATION COPPICE (SRC) with poplar and willow

> 35000 ha in EU
(willow in north, poplar in south)

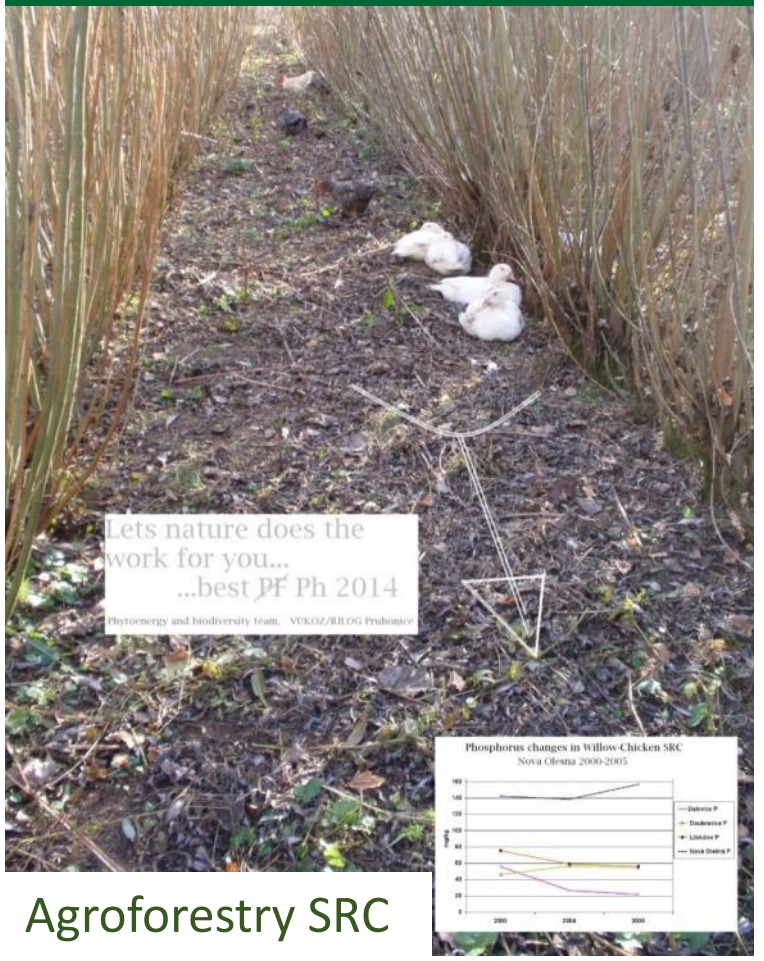
Assortment: ***Poplars and willows***
Density: 6000 - 15000 pc / ha
Rotation: 2-6 (8) years
Harvests: 3-7 x
Life time: 15-25 years
Product: woodchips, firewood

SRC - PRACTICAL „INNOVATIONS“

Poplar SRC for firewood self-suply

Assortment: ***Poplars and possibly willows***
Density: 2000 - 5000 pc / ha
Rotation: 5-8 years
Harvests: 3-4 x (?)
Life time: 15-20 years
Product: firewood, woodchips, kindligs

Design: Standard or firewood SRC
Product: wood and food
(e.g. Bio-eggs)



Agroforestry SRC

AGROFORESTRY SYSTEMS WITH COPPICED TREES BELTS

Agroforestry systems with coppiced trees belts (CTB) combine traditional alley cropping (rows of trees on agricultural land) with short rotation coppice (dense tree plantations repeatedly harvested every 3-9 years). CTBs:

- Environmental services: narrow tree stands with forest-like environment excellent for protecting soil, cooling landscape and beneficial for many organisms
- Economic products: renewable biomass (woodchips, firewood, wood assortments) and small fruits

Coppiced tree belts with poplar and robinia on arable land in Forst, Germany; Photo: D. Freese

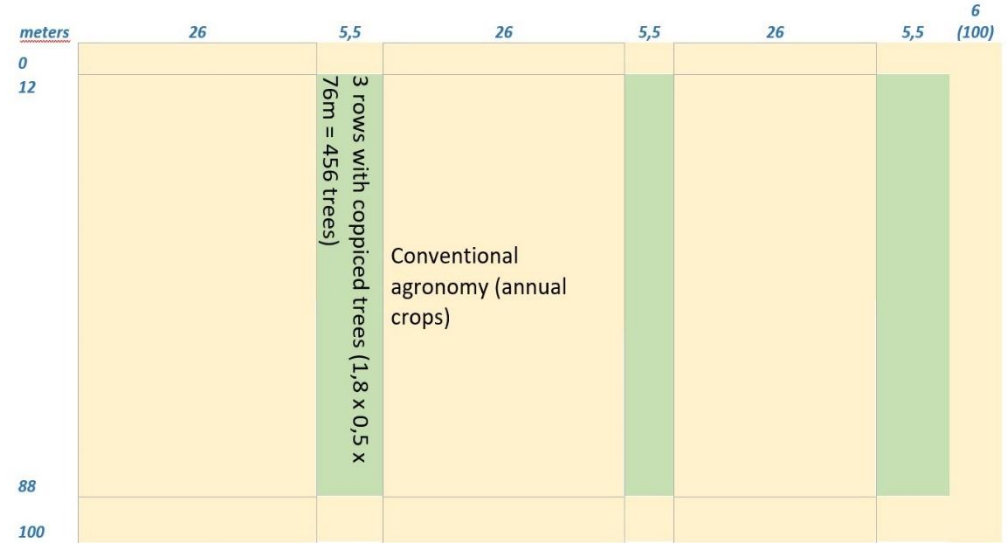
Harvested coppiced tree belts with poplar (Max-4) on grassland in Hrusice, CZ

MAIN PRINCIPLES OF CTB

Agroforestry systems with coppiced trees belts can be established and cultivated in a number of variants - according to the conditions of the location and needs of the farmer. To optimize environmental and economic benefits, the following parameters of CTB are recommended for large fields (over 20 ha):

- two to four rows of trees planted in scheme 1.8-2.2m) x (0.25 - 0.5m)
- plant 2 to 4 belts per 1 ha at a distance of 24-40 meters
- leave passages for mechanization (6 - 12 m) on the edge or suitable place
- use trees species and varieties with good coppicing ability, both native and introduced, e.g**. poplar, willow, alder, ash, oak, linden, hazelnuts** etc.

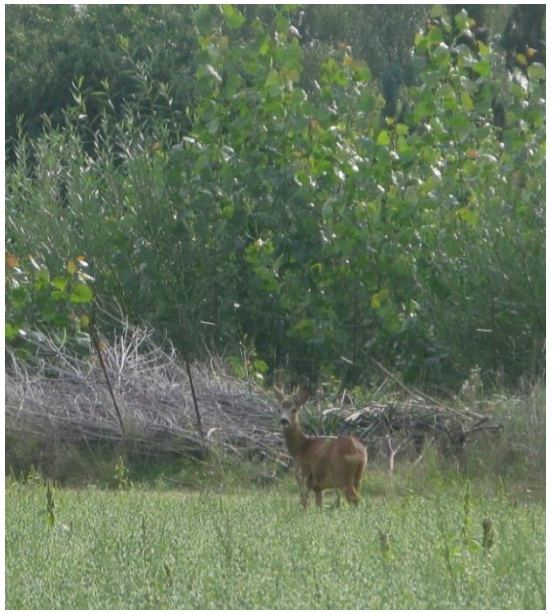
Possible scheme of CTB: a three-row belt of trees per 1 ha of arable land



MAIN PRINCIPLES OF CTB: AGRONOMY

- Plant cuttings (plants) in early spring (III-V) or late autumn (XI) on ploughed and weed-free soil
- Weed (mechanically or chemically) for first six months
- Harvest periods (rotation) of the CTB can vary between 2 to 10 years depending on tree species, their growth, final product and market situation
- Harvest with standard forest or farming mechanization (corn forage harvester with standard of special cutting head, chain saw, wood chipper)

PRODUCTS AND SERVICES



ECONOMIC VIEW ON CTB

Good yields of CTB would be between 15-20 tons/ha of CTB/year of fresh biomass (woodchips) on average of whole production time. Such yields can be expected on good sites for coppiced trees, e.g., well and moderately moist soils. The establishment cost for a CTB (considering the above-described scheme of 3 belts) could be around 2000 €/ha of AFS in the current conditions in the CEE countries.

When adhering to the principles of good farming and proper site and tree selection, the economic productivity of CTBs over the 20-year period of the productive life of the trees is comparable to that of annual crops. The return on invested funds is shorter and establishment costs are lower than in many other alley cropping systems.

CURRENT SITUATION OF AGROFORESTRY WITH COPPICED TREES IN EUROPE

The CTB as such has not yet been introduced in the EU as a CAP / CAP measure, although it appears in some countries under different types and schemes. In Saxony, Wales and in the Czech Republic you can find different types of multifunctional or research CTBs plantations that document environmental and economic parameters of this AFS.

By including CTBs in the portfolio of supported and accepted agroforestry systems, farmers will gain a multifunctional and potentially economically viable agronomic procedure that can be flexibly set up to address specific land and site situations and needs. CTBs would also be an effective adaptation and mitigation measure against the impacts of climate change.

SUMMARY OF THE MODULE

LESSON LEARNED

- **AFS-CTB produce** demanded **renewable biomass** (woodchips, firewood, assortments) for local **bioenergy** and **bioeconomy**
- **Faster cash –flow** (economic turnout) that clasical **alley croping** (income every 3-6 years)
- CTBs create **“hedgerows or narrow forests”** with a **small-forest environment**, which is beneficial for many organisms (biodiversity) and effective for buffering climatic extremes (erosion, heat). It **sequestrates carbon** (wood, leaves) in **deaper layers of soil** as well as in surface (old roots resp. leaves mull)
- Risk of damage to **new cuttings** or small plants from conventional agriculture