CREFF
Cost Reduction and Efficiency Improvement of Short Rotation Coppice (2008-2012)
What and why?

Present geopolitical and environmental world context:

- Rarefaction of fossil fuels
- Needs to reduce CO₂ emissions

➡ Promotion of renewable energy
➡ Biomass
➡ Short Rotation Coppice (SRC)
What and why?

Up to recently, slow development in Europe due to non-competitive profits as compared to non-energetic cultures

- Expensive plant material
- Plant breeding and optimization of species-site matching needed
- High harvest and transport costs

⇒ Necessity to reduce production and supply costs
What and why?

- At present, research results available for:
  - medium to good sites
  - for large field sizes

- Such conditions rarely found in many regions of Central Europe:

  - **Good sites** rare and expensive and used for demanding annual crops
    - SRC on less favorable sites in terms of soil quality and forms

  - Average **sizes of fields and farms** much smaller than in UK and south-Sweden
    - SRC in small field sizes, at scattered locations and on unfavorable sites
What and why?

- At present, research results available for:
  - medium to good sites
  - for large field sizes

- Such conditions rarely found in many regions of Central Europe:
  - **Good sites** rare and expensive and used for demanding annual crops
    - SRC on less favorable sites in terms of soil quality and forms
  - Average **sizes of fields and farms** much smaller than in UK and south-Sweden
    - SRC in small field sizes, at scattered locations and on unfavorable sites

  ➔ To promote the use of biomass from SRC, **optimized SRC value chains for unfavorable conditions have to be found**
What and why?

Short Rotation Coppice call 2008

1- Genetic improvement (BREDNet-SRC)
2- Value-chain optimization (CREFF)
3- Environmental issues (RATING-SRC)

- French-German project funded by ADEME and FNR

- 3 years (2008 – 2012)

- 5 scientific partners (INRA coordinator) + network of farmers and industrials
A complementary consortium:

WP1 Plantation management
WP2 Harvest & Transport
WP3 Conditioning of wood quality
WP4 Economic analyses of value chains
WP5 New business concepts

Farmers → WP1 → WP2 → WP3 → WP4 → WP5 → Industry

establish early and intensive cooperation between producers and consumers
Major achievements

- Correlations within soil, climate and plant categories
  ... but few correlation between yield and either soil or climate

Water use efficiency (WUE):
- Biomass produced / Water used
  ➔ Carbon isotope discrimination ($\Delta$, ‰), linearly and negatively related to WUE

Plantation management and plant characteristics are of primary importance for the first rotation
### Major achievements

**Woodchip production costs of different harvesting systems**

- **Motor-manual (17y) + chipper**
- **Motor-manual (2y) + chipper**
- **Feller-buncher/forwarder + chipper**
- **Stemster + chipper**
- **Self-propelled cutter-chipper**
- **Tractor-mounted JF Z 20**

- **WP2**

**FVA**

- **Only for 2-year old trees**

- **Cutter-chipper = most cost-efficient**
- **Still, can only be recommended on sites with good biomass productivity**

- **Without machine transport costs**
- **Without biomass transport costs**

**Semi-mechanized**

**Fully mechanized**

**WP5**

**Economic analyses of value chains**

**WP4**

**Conditioning of wood quality**

**WP3**

**Establish early and intensive cooperation between producers and consumers**

**WP1**

**Plantation management**

- **Without machine transport costs**
- **Without biomass transport costs**

**Farmers**

**Industry**

**Michael Nahm**

**Frank Brodbeck**
Major achievements

SRC material storage efficiency:

+ Whole shoot drying most efficient, followed by breathable covered chip heap storage
  - Uncovered chip heap storage is unfavourable
+ Water content reduction (9 to 28%)
  - Net calorific value increase (27 to 94%)

- Ash content rises, higher shares of fines
- Ash melting behaviour slightly negative

> Under a overall energy balance point of view, instant material use after harvest can be more efficient
> But storage can be necessary for many conversion techniques (e.g., small heating plants)
> Storage can give a higher added value
Major achievements

Elements of the standard process chain

WP4

Economic analyses of value chains

WP1: Plantation management

WP2: Harvest & Transport

WP3: Conditioning of wood quality

WP5: New business concepts

Total costs and revenues for the standard process chain

865 €/ha/y

Share of costs for the standard process chain
Major achievements

Two pilot co-operations initiated:

The low level of implementation of SRC production is caused by:

- Lack of knowledge amongst farmers
- Undeveloped markets and unclear quality criteria for the final products
- Lack of knowledge amongst industrial consumers
- Absence of regional business- and logistics co-operations between producers and consumers

Laura Van den Kerchove, Axel Weinreich
Lessons learnt

- SRC not competitive with traditional crops on medium/good sites
- SRC can be an opportunity to valorize unused unfavorable sites
- Some advices / recommendations to optimize the chances of success and profitability:
  - To establish producer – consumer co-operations
  - To define from the beginning the biomass end use
  - To adapt the plantation design to the requirements
  - To use plant material using efficiently resources or fixing atmospheric N
  - To use the plantation to valorize residual products, when possible
  - To plant mixture of species or varieties rather than monocultures
  - To plan harvest and logistic operation well in advance
  - To choose the conditioning method according to the planned end use

But financial support is needed to be profitable!
Guide technique
Taillis à courte et à très courte rotation

Proposition d’itinéraire technique
Parcelles Abac

General and specific guidelines and recommendations

Survey questionnaires (HFR, IER, UNIQUE)

www.creff.eu

Harvest calculation tool (FVA)
Web site and literature database
Thank you!

Plantation management: INRA Nancy – Nicolas Marron (marron@nancy.inra.fr)

Business concept: UNIQUE Freiburg – Axel Weinreich (Axel.Weinreich@unique-landuse.de)

Economic analysis: IER Stuttgart – Ludger Eltrop (ludger.eltrop@ier.uni-stuttgart.de)

Conditioning: HFR Rottenburg – Jan Focke (focke@hs-rottenburg.de) Thorsten Beimgraben (beimgraben@hs-rottenburg.de)

Harvest: FVA Freiburg – Michael Nahm (Michael.Nahm@forst.bwl.de) Frank Brodbeck (Frank.Brodbeck@forst.bwl.de)