



Netherlands Enterprise Agency

Energy Crops in the Netherlands and Ukraine

Ir. Kees W. Kwant



Contents

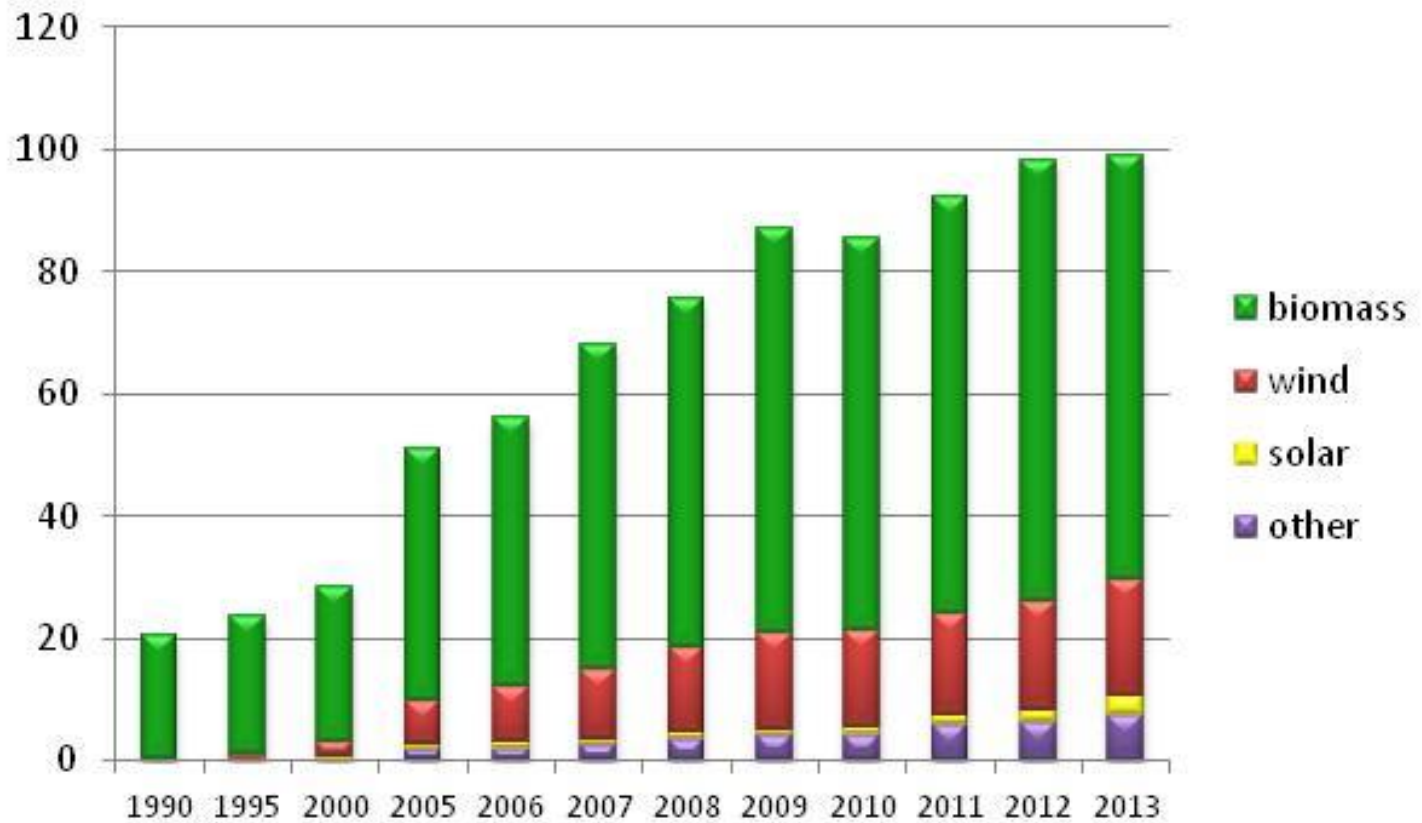
- Bio Energy supply in the Netherlands
- Biomass availability and Energy Crops in the Netherlands
- Willow Short Rotation Coppice
- Switchgrass in Ukraine
- Sugar Beet as a resource
- Conclusion





Results: About 70% realised with Bioenergy

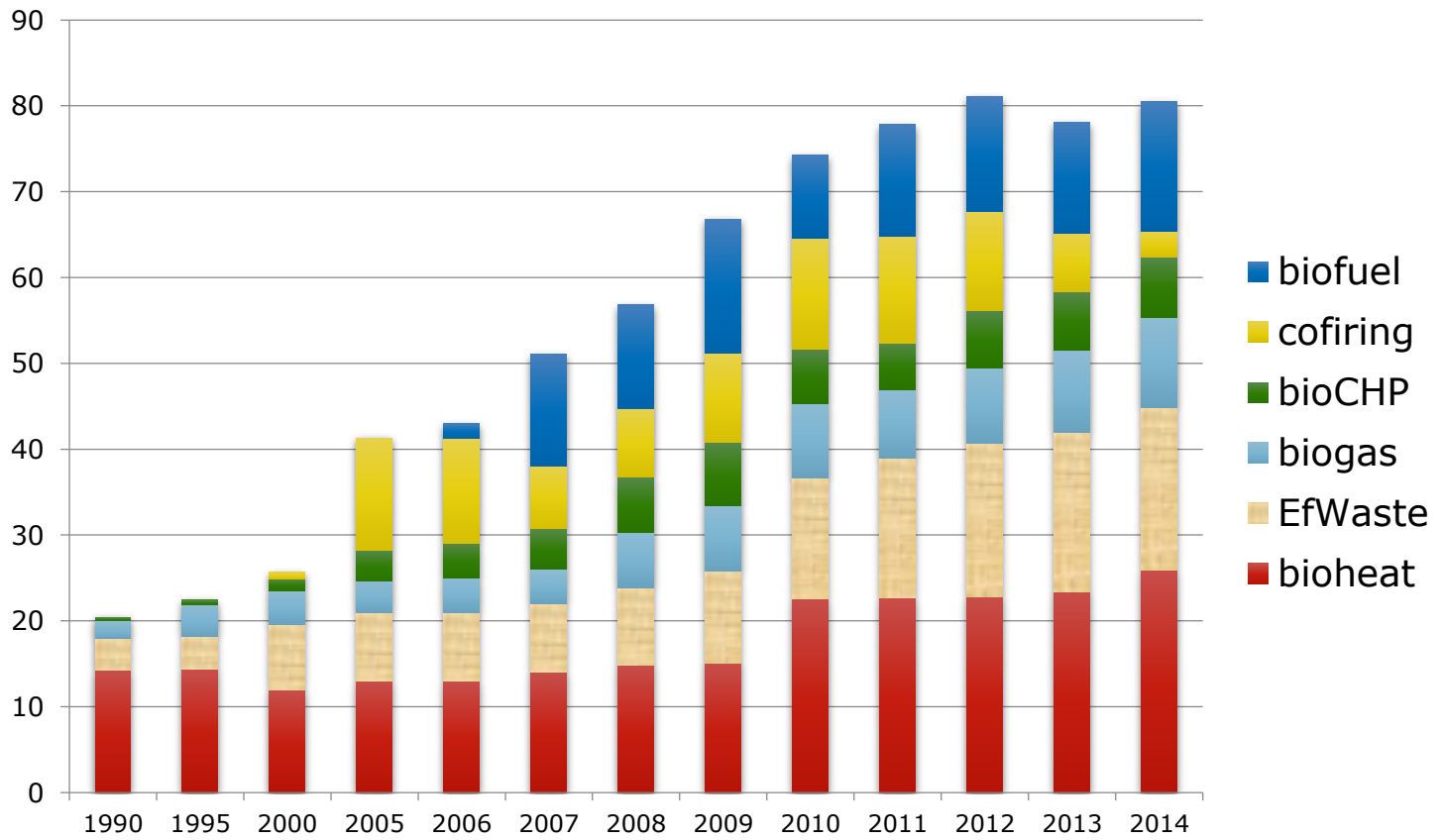
- PJ





Biomass for Bioenergy use in Netherlands

- PJ





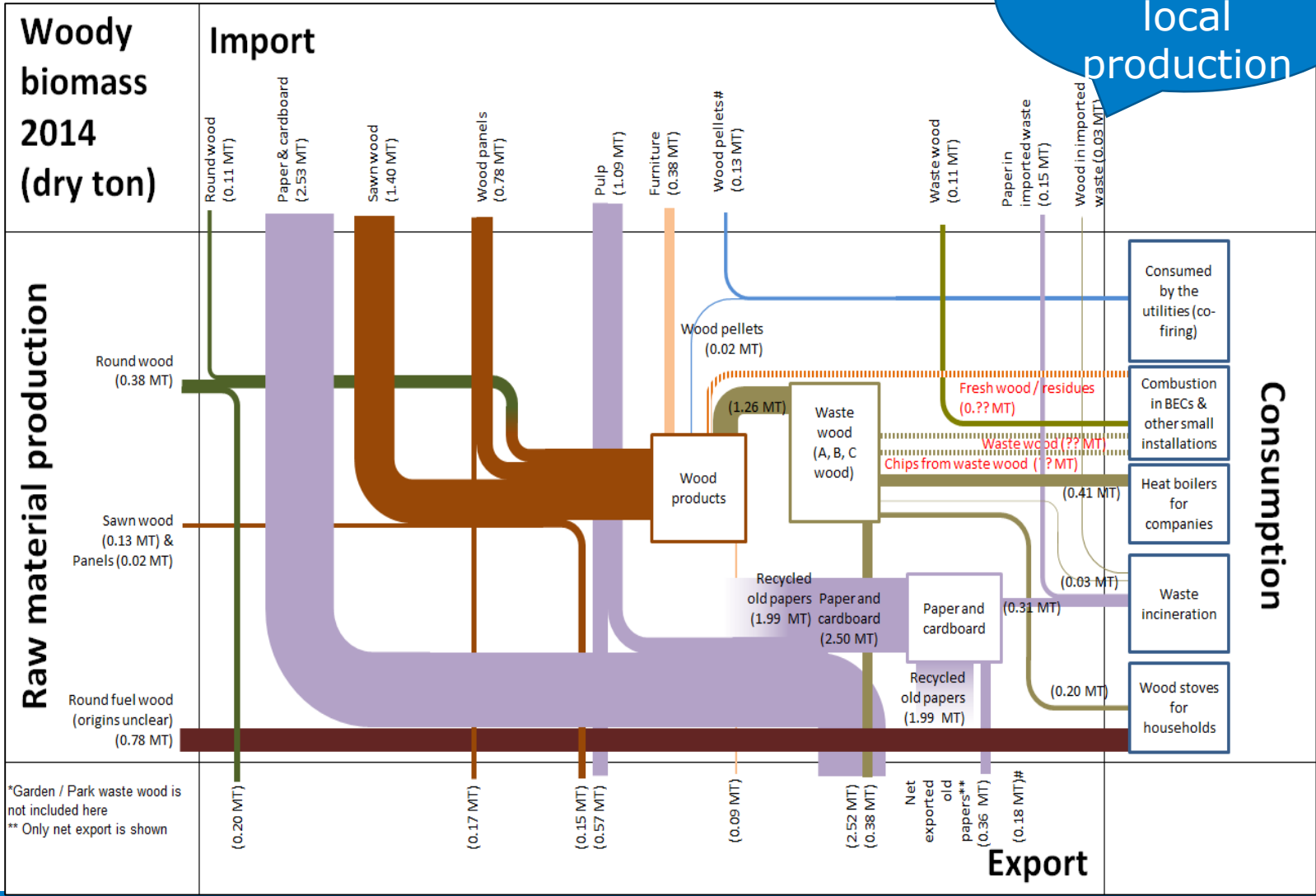
Netherlands Enterprise Agency

Biomass Supply





More import than local production





Biomass Potential

Type potential [PJ]	2010 BP [PJ]	2020 BP [PJ]
Biofuel 1 st generation crops	1.0	3.2
Woody/ligno cellulosic crops	0.0	9.7
Solid manure	17.2	17.4
Liquid manure	36.5	35.6
Straw/stubbles+ other residues agriculture	5.1	4.2
Pruning/cuttings fruit+shrubs agriculture	0.1	0.1
Waste	63.2	54.8
Used fats and oils	2.0	2.4
Road side verge grass	0.7	0.7
Stemwood (fuelwood)	2.6	2.6
Primary forestry residues	2.3	2.7
Secondary residues wood processing industries	2.7	2.8
Landscape care wood and wet biomass	4.8	4.8
Total	138.3	140.9



Certification

Type of biomass	Sustainability schemes	Market share (% of certified biomass per particular products group in the market)		
		2011	2012	2013
Sawn timber and wood based panels (Oldenburger et al., 2013)	<i>FSC</i>	23.7%	Unknown	To be updated
	<i>PEFC</i>	42.0%		
Paper and cardboard (Oldenburger et al., 2013)	<i>FSC</i>	23.9%	Unknown	To be updated
	<i>PEFC</i>	8.9%		
Wood pellets used by utilities (Self collection; Agentschap NL, 2013; RVO 2014)	<i>Green Gold Label</i>	51.8%	50.1%	69.0%
	<i>Laborelec Label</i>	33.5%	27.2%	-
	<i>FSC/PEFC/EUTR</i>	-	-	2.8%
	<i>NTA8080</i>	-	-	0.1%
	<i>Waste streams</i>	-	-	28.0%



Netherlands Enterprise Agency



Willow as an Energy Crop in the Netherlands

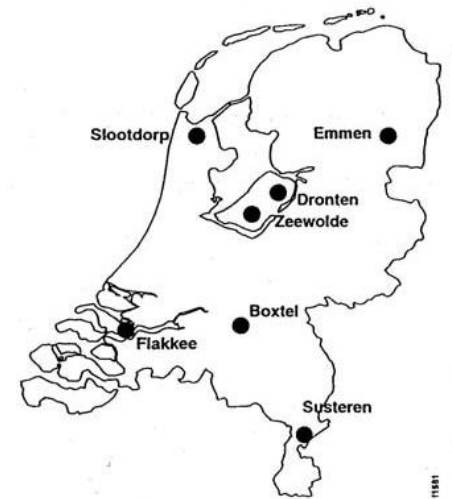


www.probos.nl



History Willow Short Rotation Coppice

- 70's : field trails with poplar spp.
- 1993-1999: SRC trials for energy
 - 20 ha **willow**, poplar and robinia spp.
 - Selection, site preparation, plant system etc.
- **1999 -> 45 ha willow**





- 1999-2006: Flevo- wood energy (SHELL)
 - 45 ha plantation (willow, poplar, robinia)
 - 5 sites in the province of Flevoland
 - Operational testing
- 2007 – .. Ready for extension





Basics SRC Willow plantations

- 15.000/ ha, Mechanized ('Swedish' grid)
- Harvest 2 – 4 /years
- Yield: 10 tons/Ha./yr. (dry matter)
- Market value: € 20 – 25/ ton (fresh), on-site
- Investment in plantation: € 4000/ Ha.
- Pay-back period: >10 years
- Markets; traditional use and local energy; warming of stables, houses, workshops etc.
- Reinforcement biodiversity (compared tot meadow)
- Fits in historical landscape



Biodiversity monitoring

Monitoring in SRC willow in Flevoland (2006-2008)

- Surprisingly rich biodiversity:
Vascular plants (101)*, fungi (62-96), birds (18-22),
amphibians (4), mice (6), butterflies (13), beetles (54),
mosses and lichens (12)
- Especially species of shrub vegetation.
- Advantages of dynamic environments!



Broad-leaved Helleborine (*Epipactis helleborine*) , Willow Warbler (*Phylloscopus trochilus*) and *Conocybe vestita* (Pictures: Fred van Daalen, Martin Parss & Yves Deneyer)



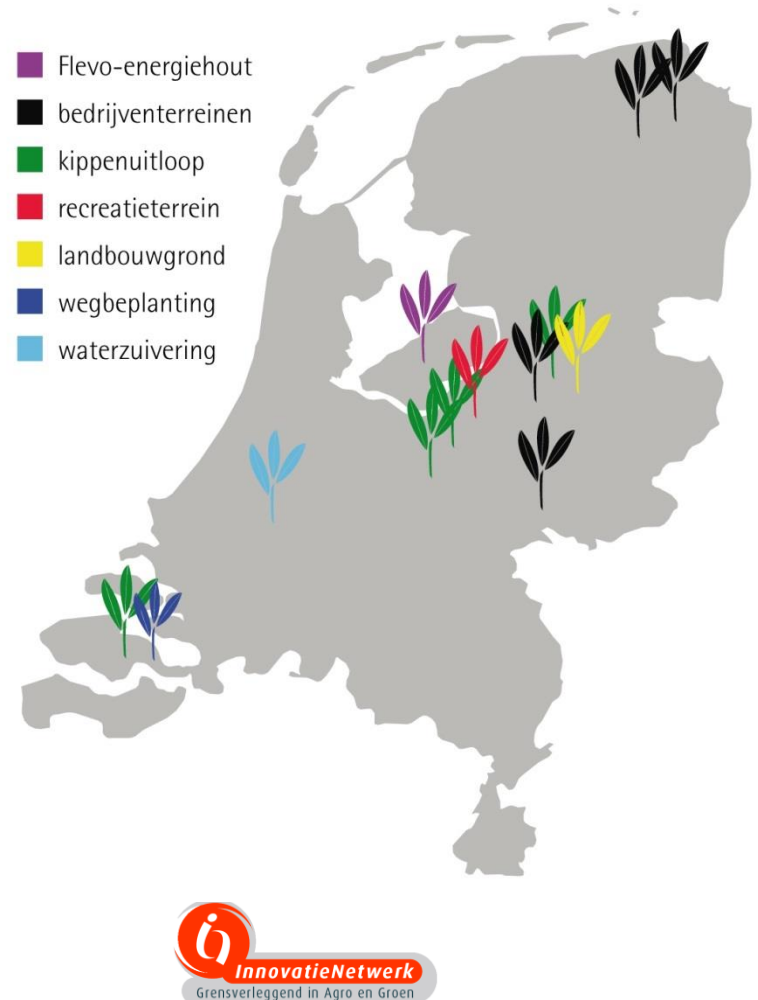
2016: Short Rotation Coppice

- Total of 30 Ha. (20 locations)
- Private investments
- Cost reduction not profit!
- Not an alternative for agriculture
- As added value!
- Pilots: focus on multifunctional land use and use of redundant area!
- Bottom-up approach



Examples of pilots

- Fallow areas industry
- Biological poultry farming
- Recreational areas
- Redundant area
- Road sites
- Water purification sites (helophytes)





Free range poultry

- Demo project 2013-2015 (www.kiplekkeronderdewilgen.nl)
- 4 sites
- In total 2,75 ha





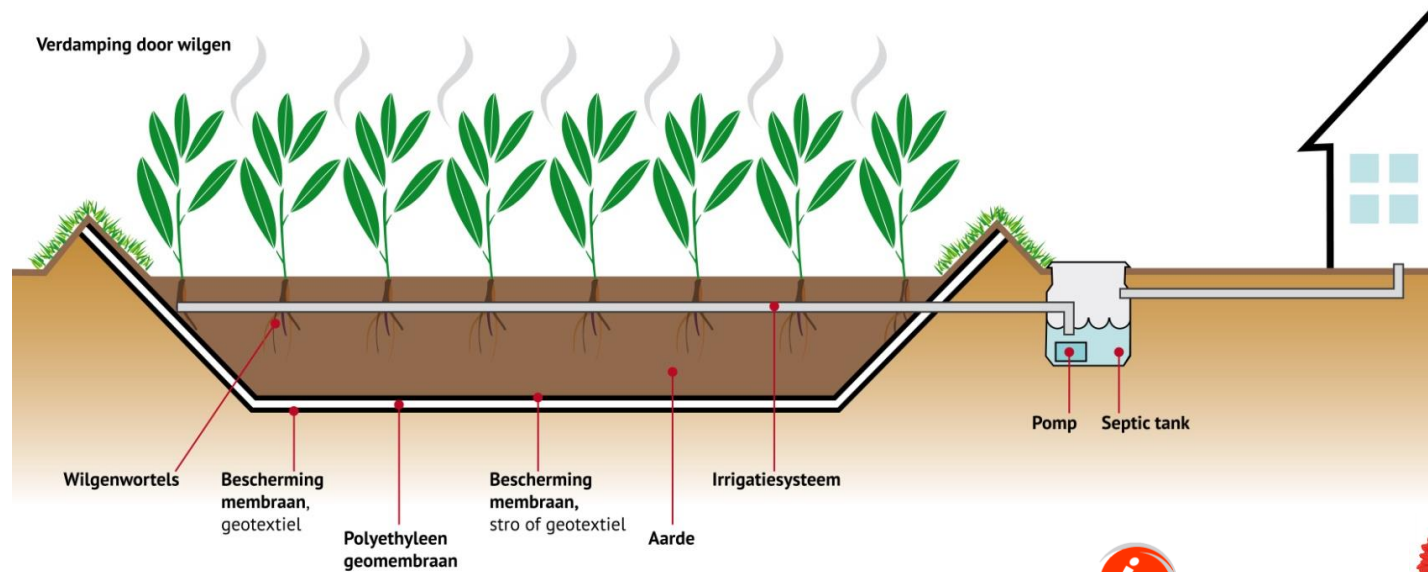
Free range poultry





Water purification

June 2015: first in NL: Biesboschmuseum Eiland





Greening of infrastructure

- Infrastructure
- Recreation areas

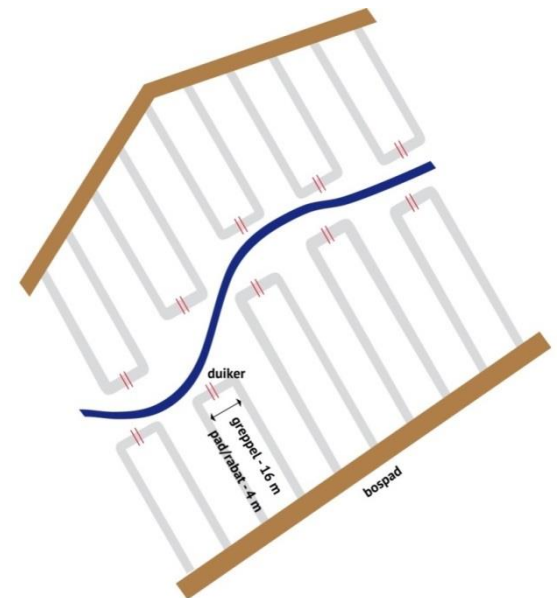


H+N+
S+ +



Water retention

- climate adaptation measures such as water retention, reinforcement dams and dykes “building with nature”,
- Pilot SRC Alder





Conclusions

- Finally the knowledge can be used!
- Fun but difficult (ad-hoc finance)
- Added value by function combination!
- Entrepreneurs start to pick it up!
- Lack of specialized harvest equipment
- Area approach needed; many small make big
- We like to join international networks to exchange knowledge and experience!



Netherlands Enterprise Agency

Switchgrass

as an

Energy Crop

Pellets4Power (2010 – 2014)

Wageningen University

Wolter Elbersen

With Poltava Researchers

wolter.elbersen@wur.nl



Wageningen UR (University & Research centre)

- Two pillars:
 - Wageningen University
 - DLO – Specialized Research Institutes
- Annual budget about 650 Mm euros
- About 6500 employees
- 9500 BSc/MSc; 1900 PhD (>100 countries)
- Extensive international network.

*...to explore the potential of nature
to improve the quality of life...*





Switchgrass

- Model perennial biomass grass from North America. Tested in Europe and introduced to Ukraine by project partners.
- Switchgrass is seeded and can cover large areas at a low cost
- Low inputs
- Harvest in winter → lower nutrient removal and better quality
- Switchgrass introduced and tested at 4 sites



Switchgrass plot in Yaltushka





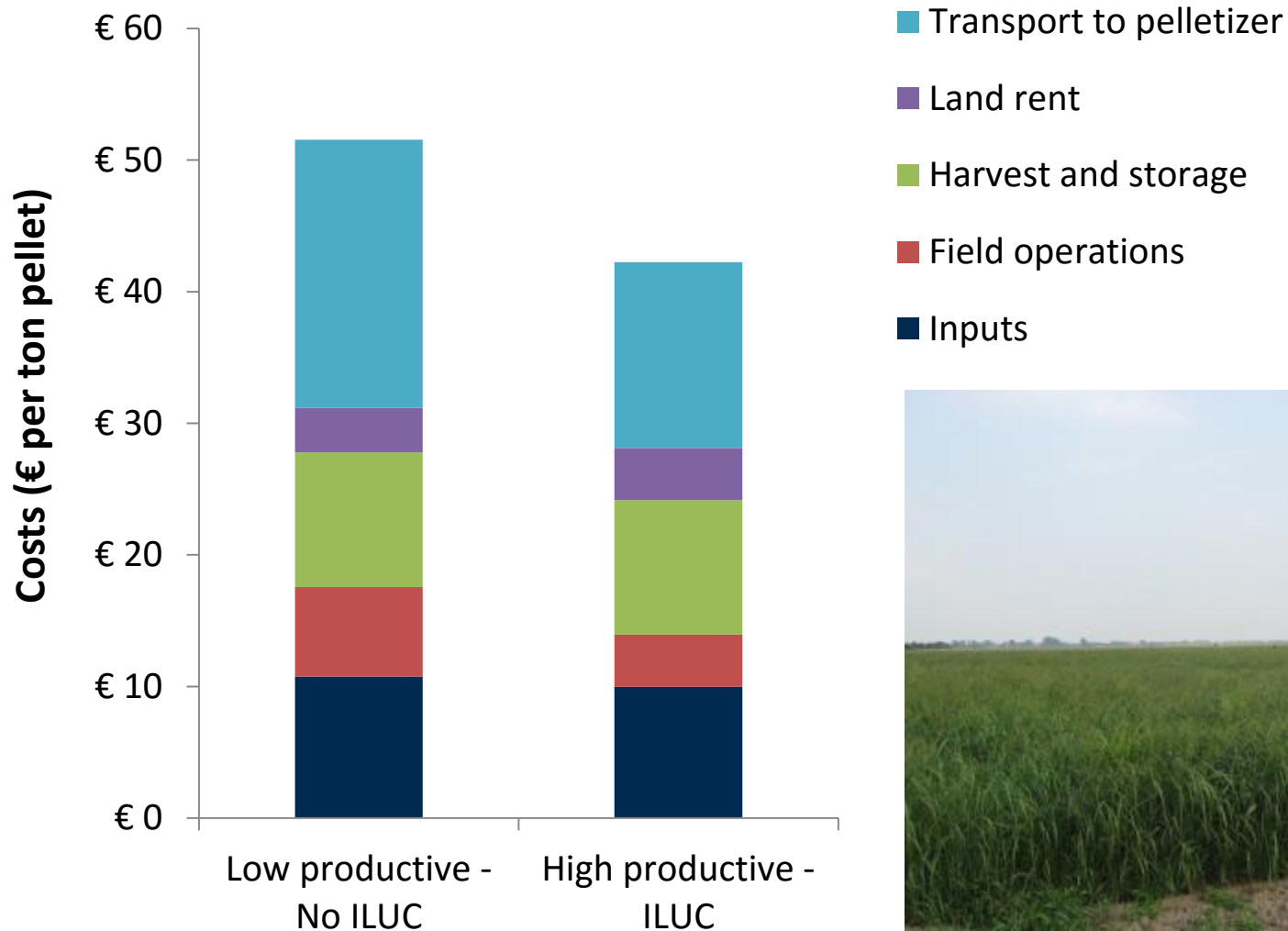
Switchgrass results

- Best varieties known
- Establishment methods known
- Management known
- Expertise is now available
- Yields positive → longer period needed for results
- iLUC assessed
- 4 sites – up to 7 years experience



Location	Fresh matter MT/ha	Moisture content, %	Dry matter MT/ha
Yaltushka	20,0	36,8	12,6
Veselyi Podil	27,5	22,2	21,4

Growing switchgrass on marginal land 22% more expensive (Ukraine case)





Miscanthus – switchgrass – switchgrass- Miscanthus





Woody crops vs herbaceous crop/grass

	Wood	Grass
Moisture:	high	low
Bulk	high	very high
Cl	low	high
K	low	high
Ash	low	high
Cost	low	maybe lower





Where do we stand?

- Switchgrass proven in Ukraine
- More info needed for optimisation
- Attractive on low quality inexpensive soils
- Large scale field results → Stand maintenance + yields maintenance
- Where to grow this crops?
- Training experts → maintain expertise!
- Locally adapted varieties needed
- There is a market!
- Let's roll it out!!



Netherlands Enterprise Agency

Sugar Beet as an Energy Crop





Common Agricultural Policy

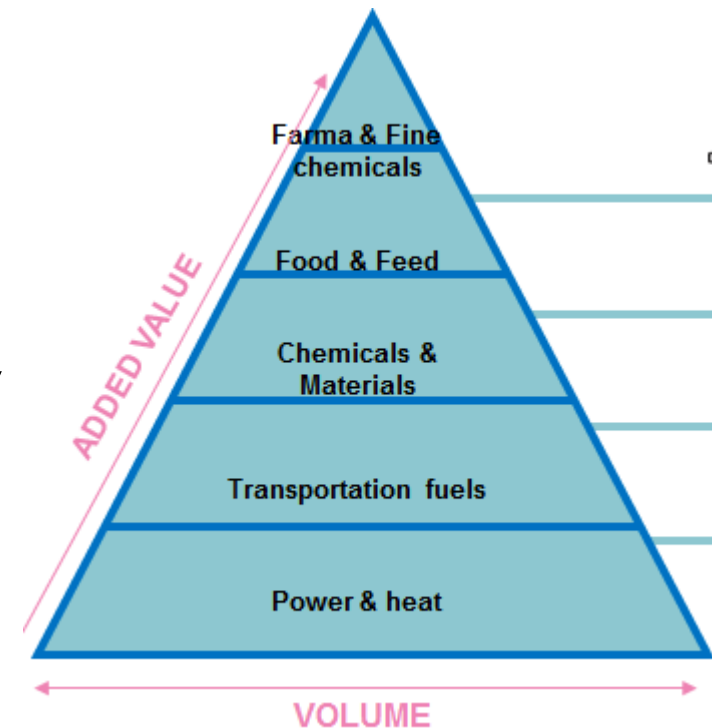
- Stop of Production quota
 - Sugar
 - Milk
- Open Borders
- Opportunities for
 - increased production
 - competition





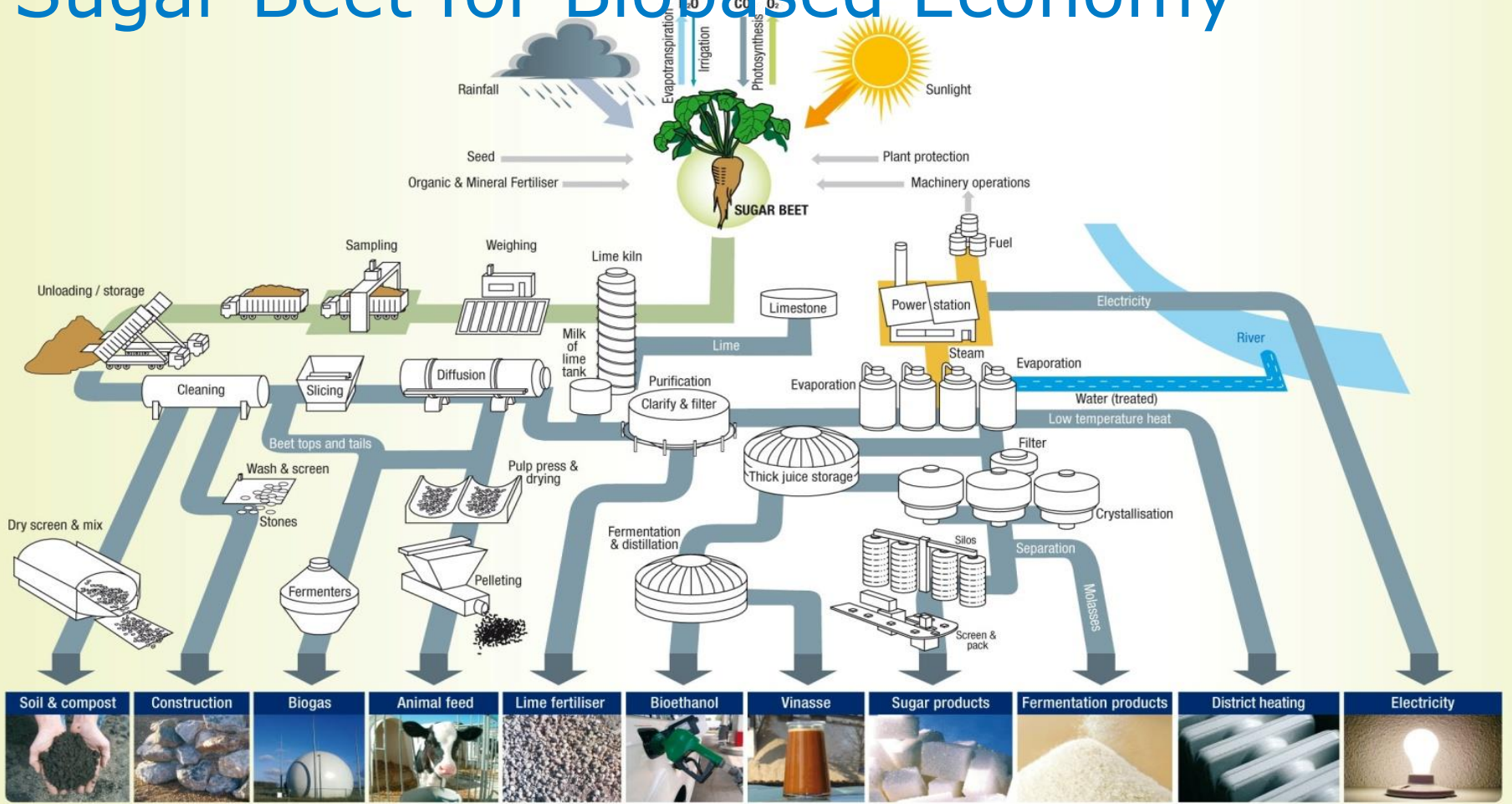
Biorefinery

- Splitting up biomass into several fractions;
- In EU: energy price often too low for good bio-energy business case;
- Bioenergy needs subsidy;
- Cascading of biomass
 - Co-production;
 - High value components not wasted;
 - More value created;
 - More profit;
 - Cheaper energy.





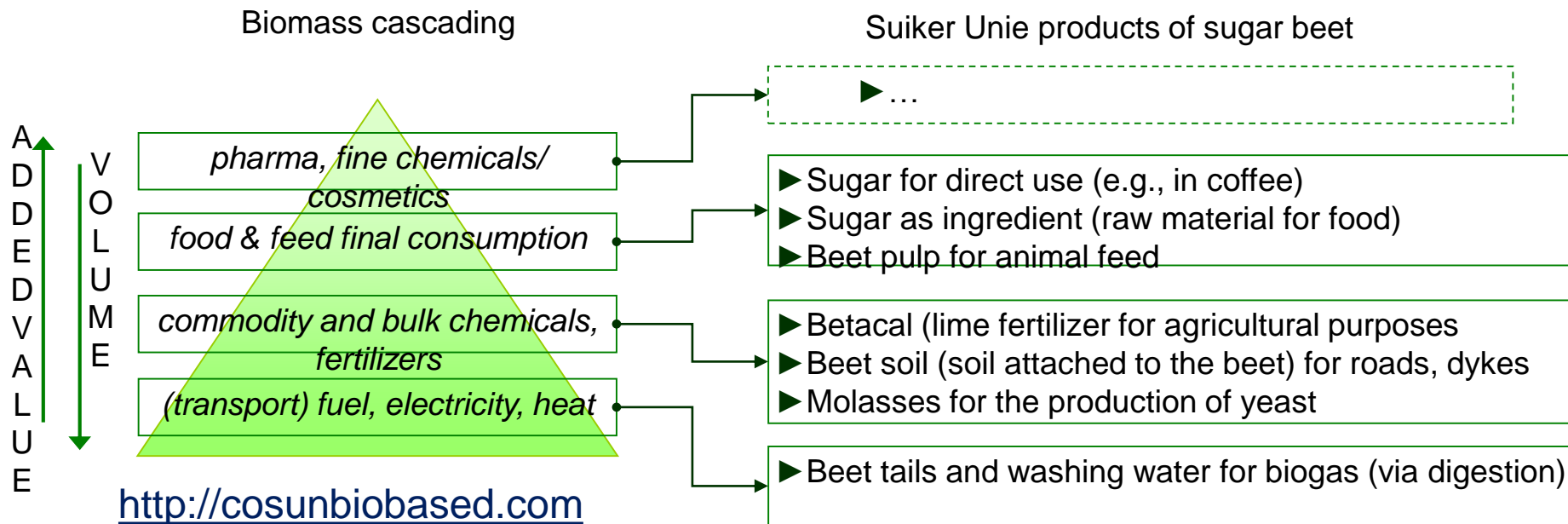
Sugar Beet for Biobased Economy



Source: CIBE and CEFS (after British Sugar)



Biomass Cascading and Valorisation



- Total concept, including a 50% increase in sugar beet yield per hectare, a 50% reduction in fertilizer use, and a 50% efficiency improvement in the sugar plant (all in about 20 years).
- Further optimization includes export of waste heat, and site utilization for renewable energy production (solar and wind).



Netherlands Enterprise Agency

Conclusion





Conclusion:

1. Netherlands has extensive experience with energy crops
2. Limited area available, and land costly
3. Netherlands requests high value crops for biorefinery
4. Opportunities exist in combination of functions, creating synergy
5. Good opportunities for collaboration with Ukraine



Biobased Energy Ukraine

<http://biobased-ukraine.nl/>



Rijksdienst voor Ondernemend
Nederland





Netherlands Enterprise Agency

***Thank you for
your attention***

Questions?

Kees.Kwant@rvo.nl