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Feedstock potentials in Central and Eastern European countries

Regional Workshop on Promoting Sustainable Biofuels Production and Use in Central and Eastern Europe

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Veronika Dornburg, Andre Faaij, Marc de Wit, Jinke van Dam,
Utrecht University,
Copernicus Institute for Sustainable Development

Background

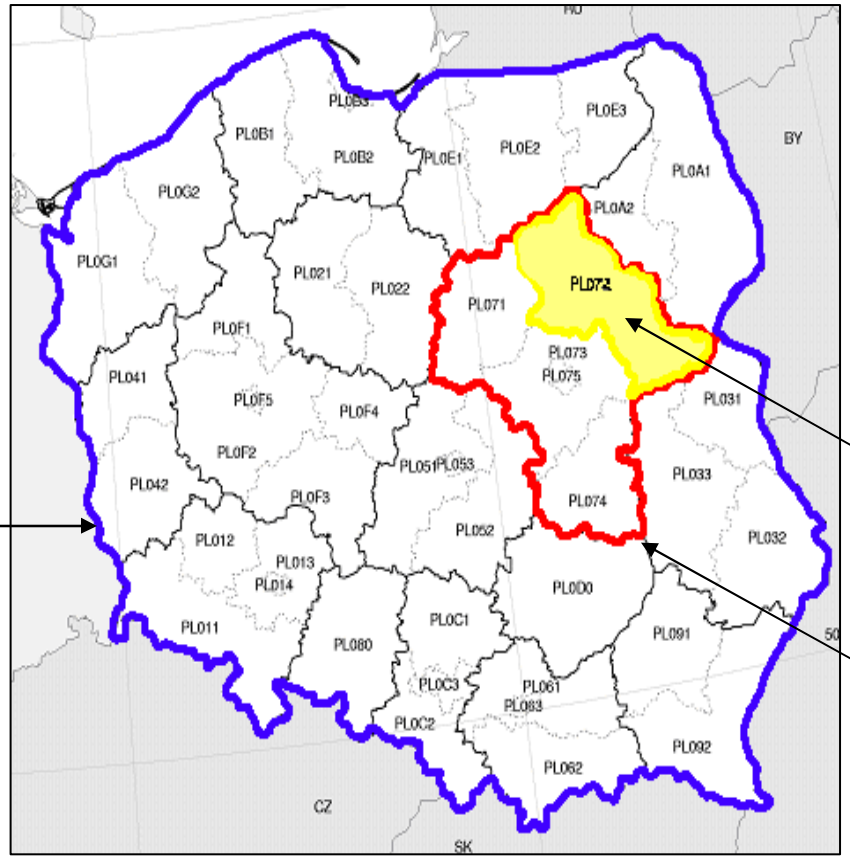
The Central and Eastern European Countries (CEEC) :
- large land resources and low land use and labor costs
- importance of agricultural sector
- competition with agricultural production in WEC

?Is the bio-energy potential in the CEEC large enough to supply biomass to the European market and under what conditions can such potentials be developed? What are the costs of biomass production in CEEC?

Methodology for biomass potential assessment in VIEWLS

Data input	Parameter	Output
Land use	Demand for food, feed and forest products	Land available for the production of energy crops
Land suitability	Productivity	
Yields: Actual and future	Allocation	Biomass potentials in CEEC
Production costs	↓	Cost-Supply-curves
	5 Scenarios	

Scale



Nuts =

Nomenclature of Territorial Units for Statistics

Nuts-3 level: regional or district level

Map of Poland showing NUTS-1, -2 and NUTS-3 regions. NUTS-3 regions are the level of detail for the biomass potential assessment in the CEEC

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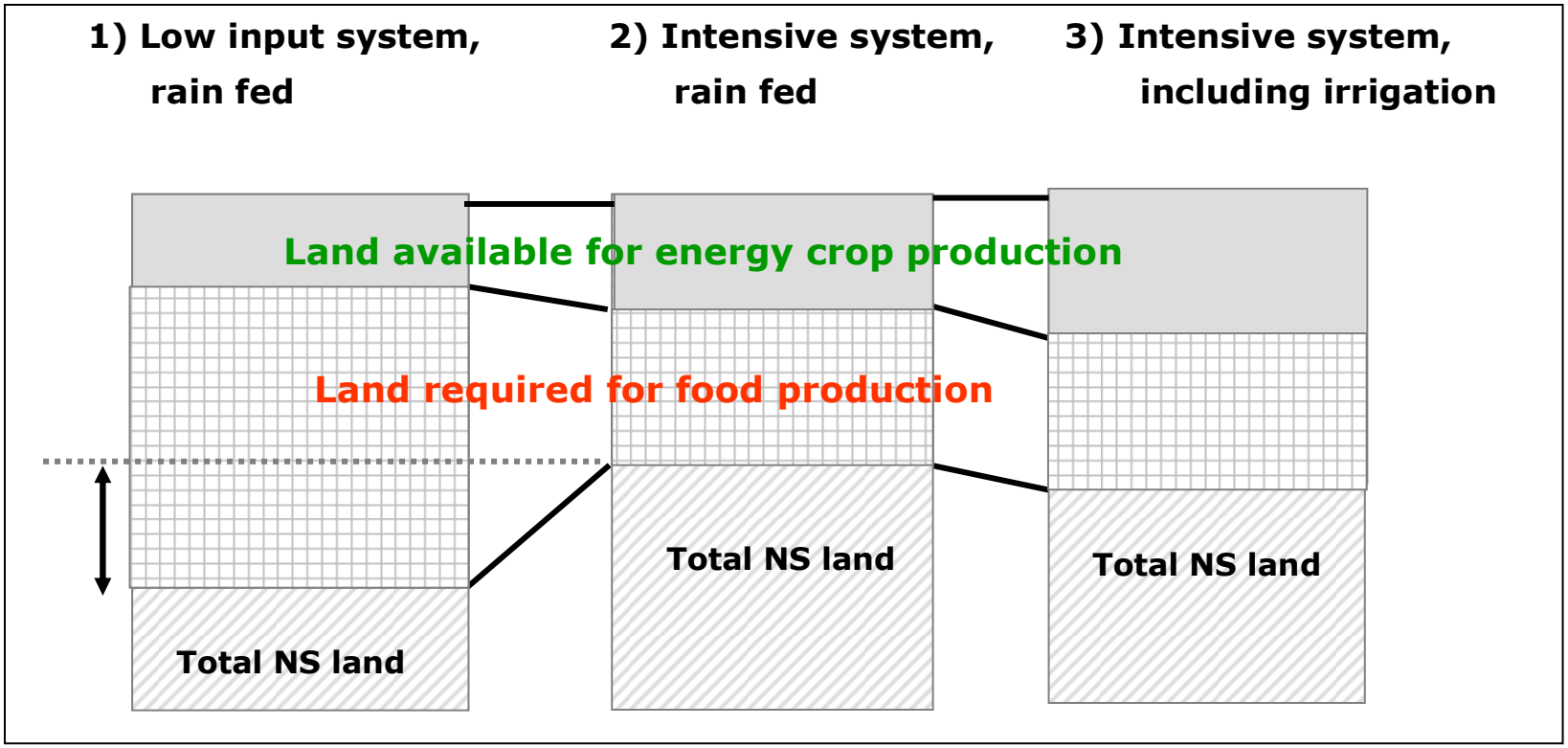
Main characteristics of scenarios

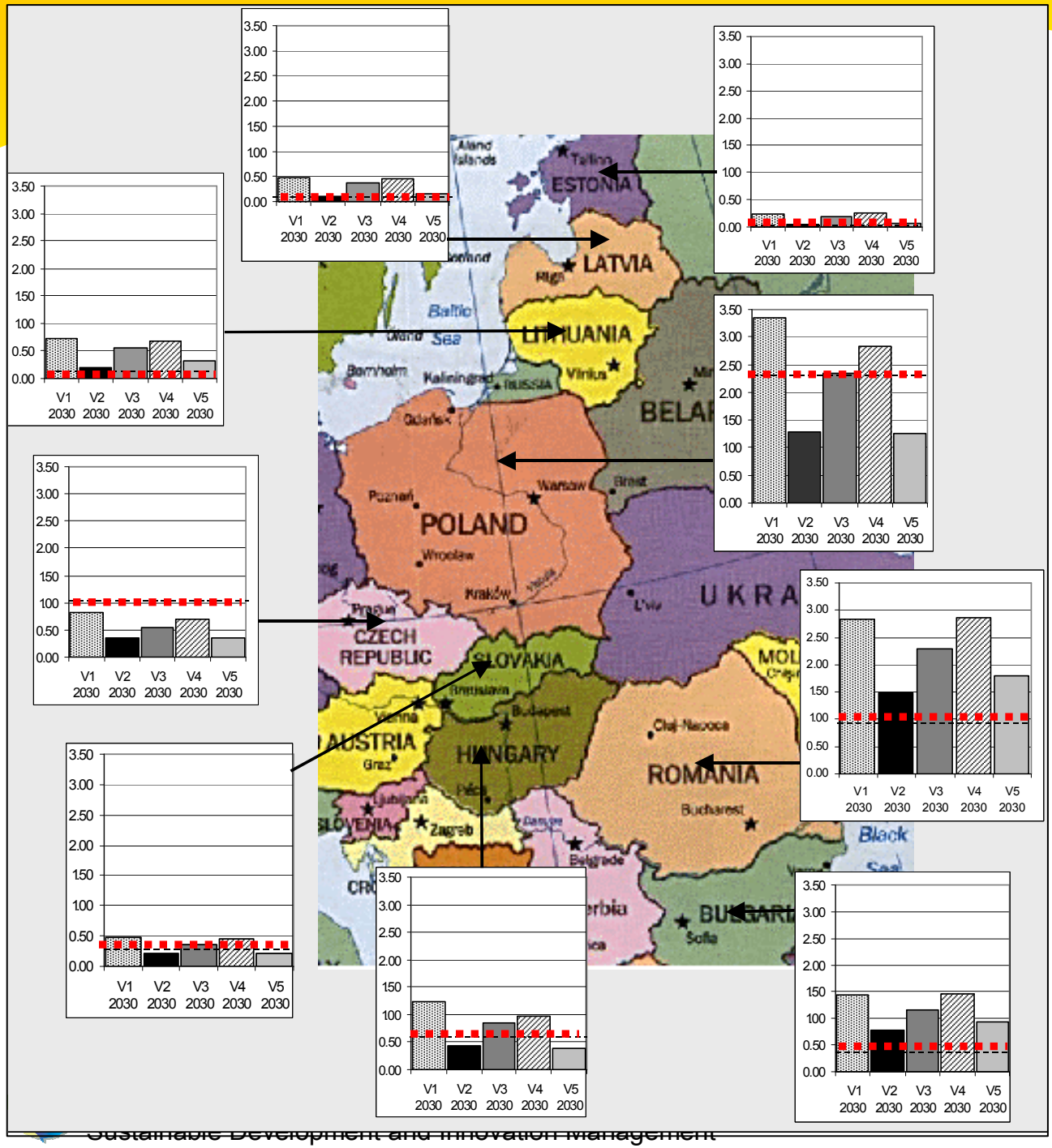
Scenario	V1	V2	V3	V4	V5
Name	**Full trade / High Tech**	**Current**	**CAP reforms**	**Protected Europe / High tech**	**Ecological**
Story line	Full international trade, free market	CEEC lacks behind WEC in agricultural and economic development	CAP reforms are implemented	Highly protected Europe (closed market)	Ecologically oriented Europe
Production system (FCE = feed conversion efficiency)	**High input advanced technology**, FCE based on WEC 2030	**Current** production system, FCE based on CEEC current situation	**High input**, FCE based on OECD 2030	**High input advanced technology**, FCE based on WEC 2030	**Ecological** (intermediate) input system, FCE based on current situation
Allocation	**CEEC**, division over countries	Country, division over Nuts-2	Country, division over Nuts-2	Country, division over **Nuts-3**	Country, division over Nuts-2

Variation in total available land (and NS land) for crop production between different production systems



Land available for the production of energy crops in all CEEC in 2030 in 1 000 000 ha

Scenario	V1	V2	V3	V4	V5
VS land	18.7	4.4	16.6	19.1	5.8
S land	17.2	16.0	17.7	17.3	16.4
MS land	6.7	8.6	7.0	7.1	9.9
mMS land	1.9	5.6	1.9	2.0	5.4
Sum	44.5	34.6	43.2	45.5	37.5



Biomass potential on country level (in EJ). Sum of residues, surplus forest and energy crops, energy crop is willow.

The lines in the graphs show the current final energy consumption on country level in EJ for the year 2000 from DG Tren (2003).

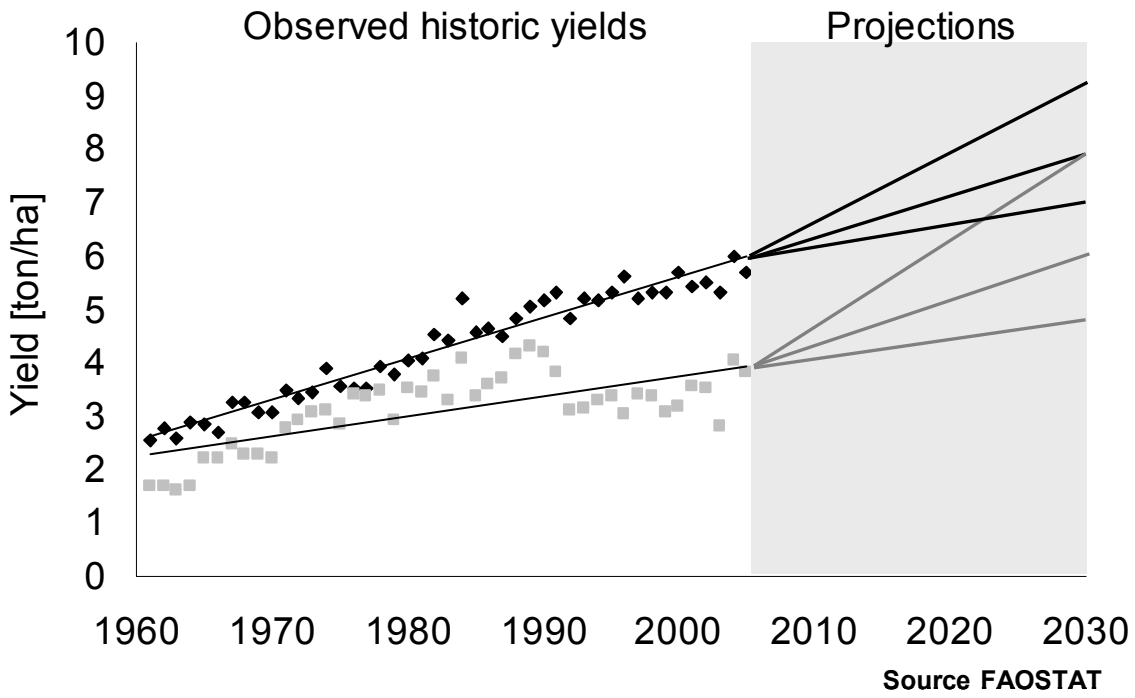
Biomass potential (in EJ) from energy crops, agricultural residues, forest residues and surplus forest for the sum of all CEEC

Selected energy crop in scenario	Scenarios				
	V1	**V2**	**V3**	**V4**	**V5**
Perennial lignocellulosic crops					
Willow	11.65	4.86	8.65	10.67	5.47
Poplar	10.27	4.35	7.63	9.25	4.85
Miscanthus	10.93	5.71	9.08	10.03	6.28
Conventional crops					
Rapeseed (whole crop)	9.94	5.28	9.18	9.00	5.67
Sunflower (whole crop)	5.95	3.46	5.24	4.97	3.49
Sugar beet (beet)	8.32	3.55	6.42	7.27	3.59
Potato (beet)	6.06	2.03	4.65	4.94	2.06
Sweet Sorghum (whole crop)	7.20	2.56	5.81	6.64	2.94

Yield projections

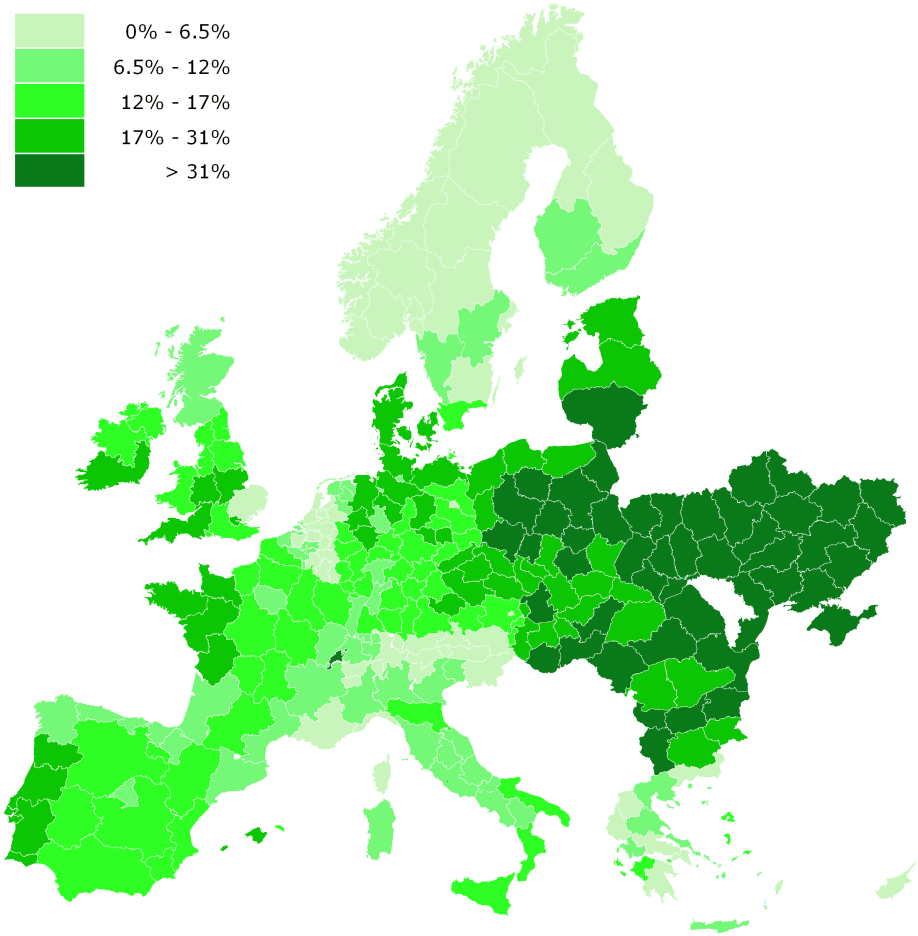
Observed yield for
- The CEEC and WEC

Future yields influence bio-energy potentials strongly

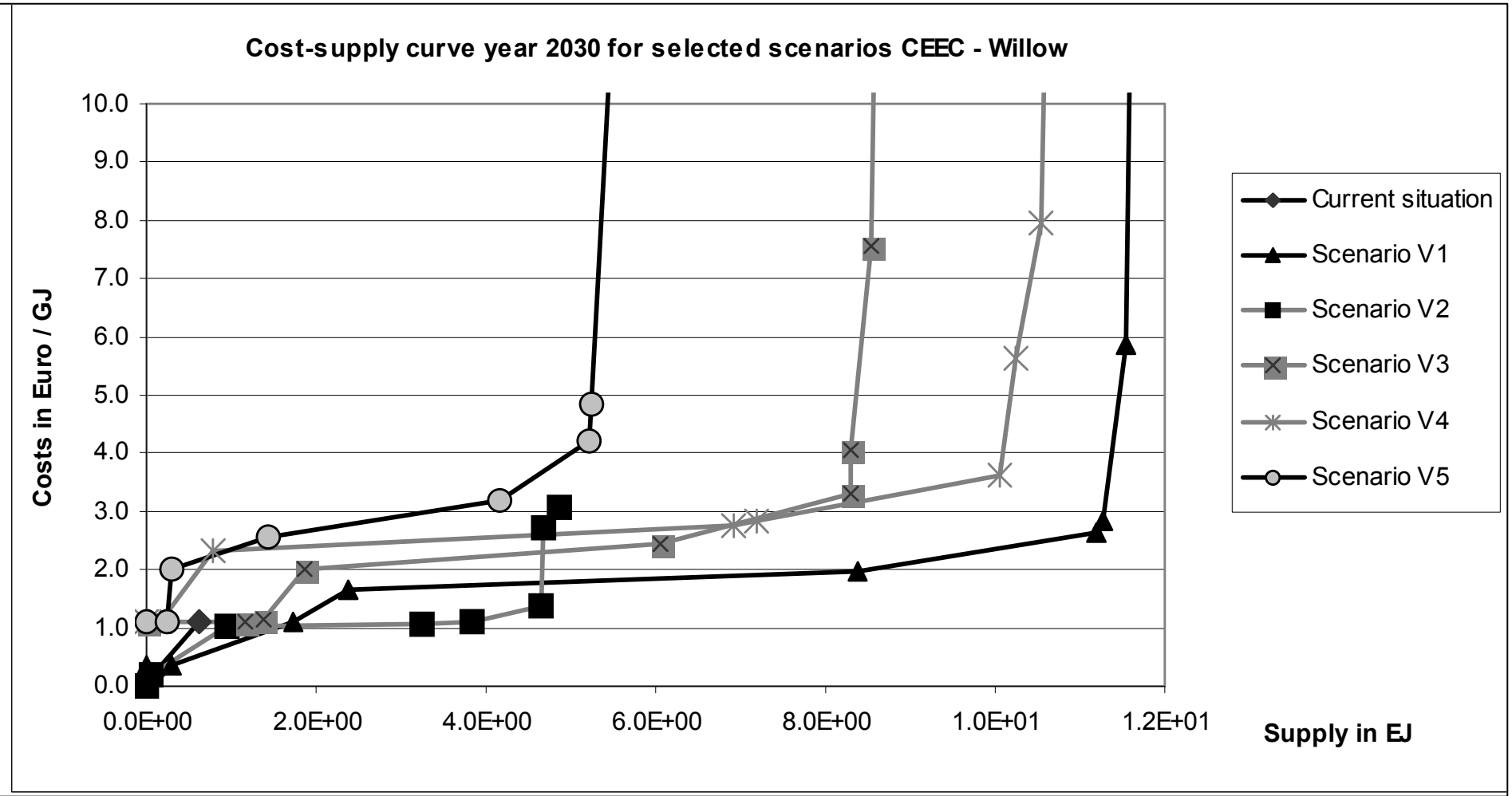


Preliminary results REFUEL - spatial production potential

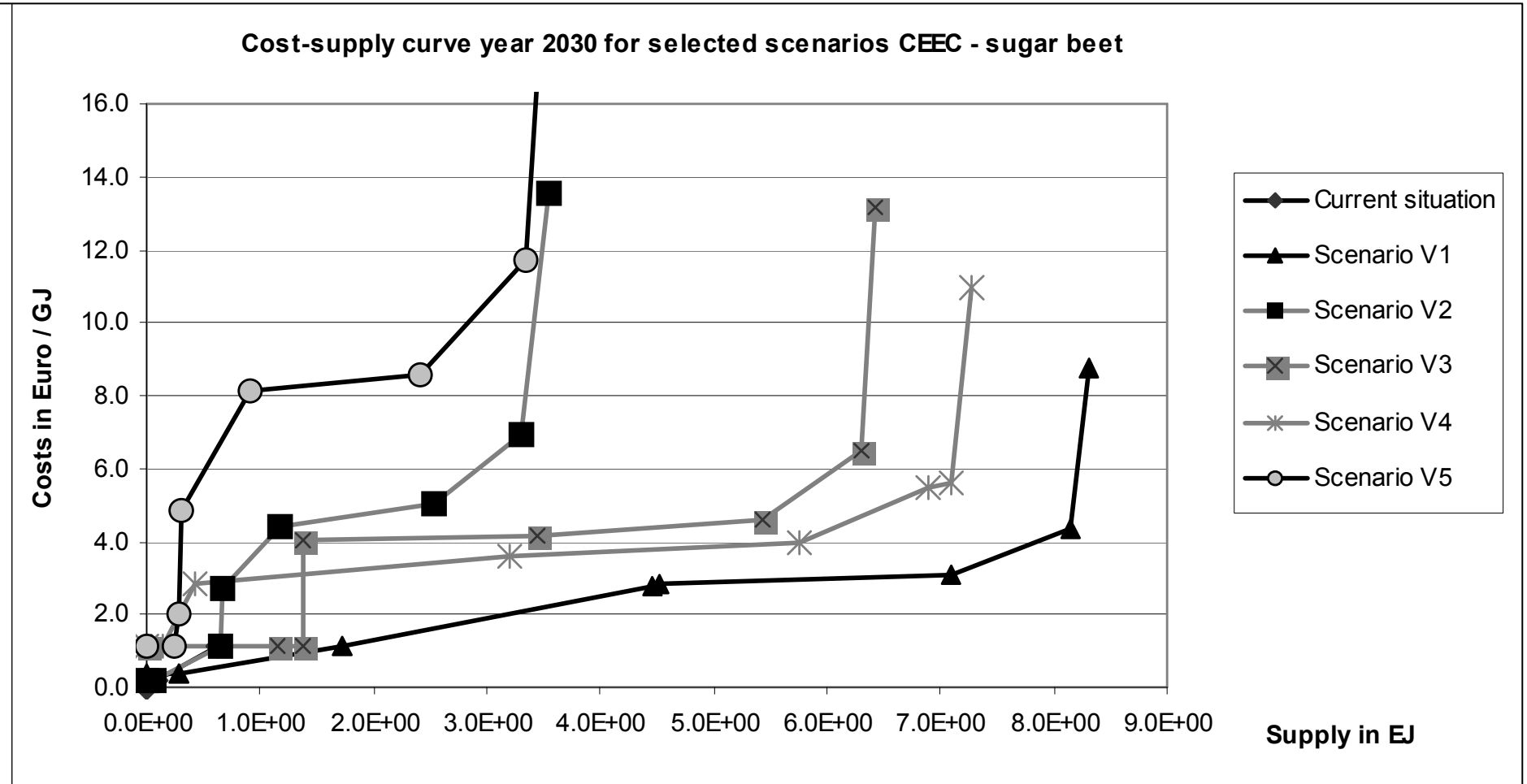
Potential		Countries
Low potential	< 6,5%	NL, BE, LU, AT, CH, NO, SE and FI
Moderate potential	6,5% - 17%	FR, ES, PT, GE, UK, DK, IE, IT and GR
High potential	> 17%	PL, LT, LV, HU, SL, SK, CZ, EST, RO, BU and UKR



Cost-supply curve for all CEEC – energy crop willow



Cost-supply curve for all CEEC – energy crop sugar beet



Preliminary results REFUEL - spatial cost distribution

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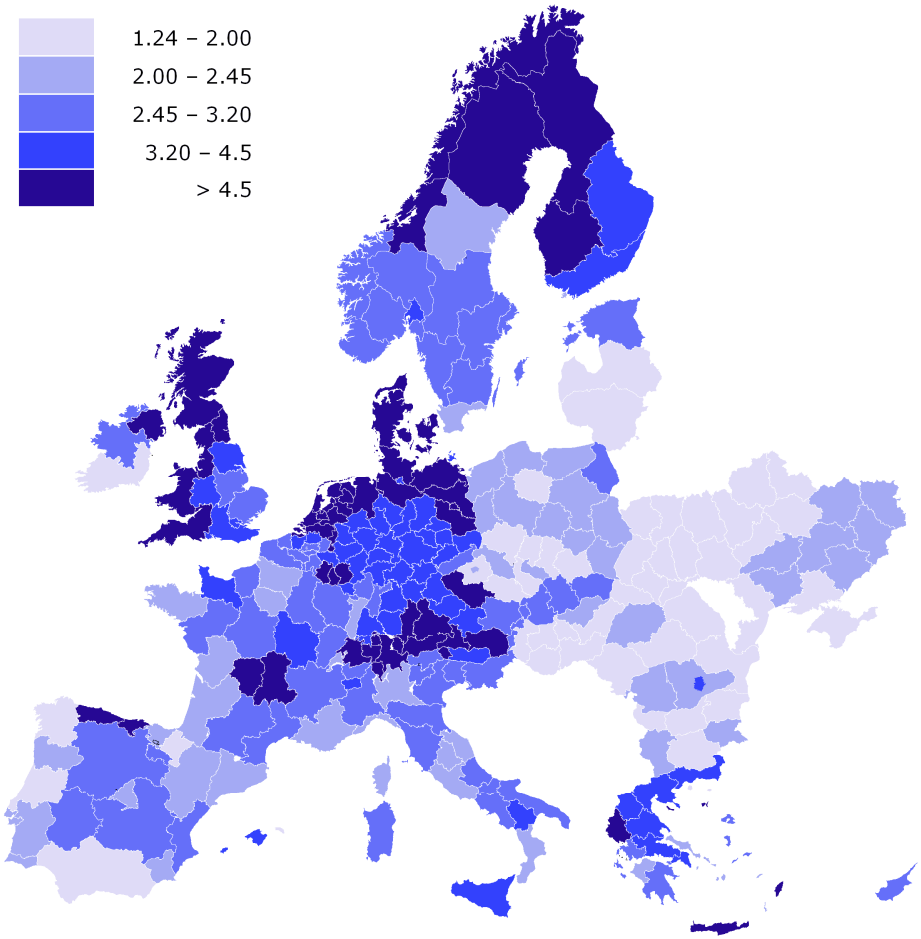
Potential		Countries
Low Cost	< 2,00	PL, PT, CZ, LT, LV, UK, RO, BU, HU, SL, SK, EST, UKR
Moderate Cost	2,00 – 3,20	FR, ES, GE, IT, SE, FI, NO, IE
High Cost	> 3,20	NL, BE, LU, UK, GR, DK, CH, AT



Areas of concern relevant for sustainability of the biomass production and trading chains

General criteria

•e.g. Traceability

•Avoidance of leakage effects

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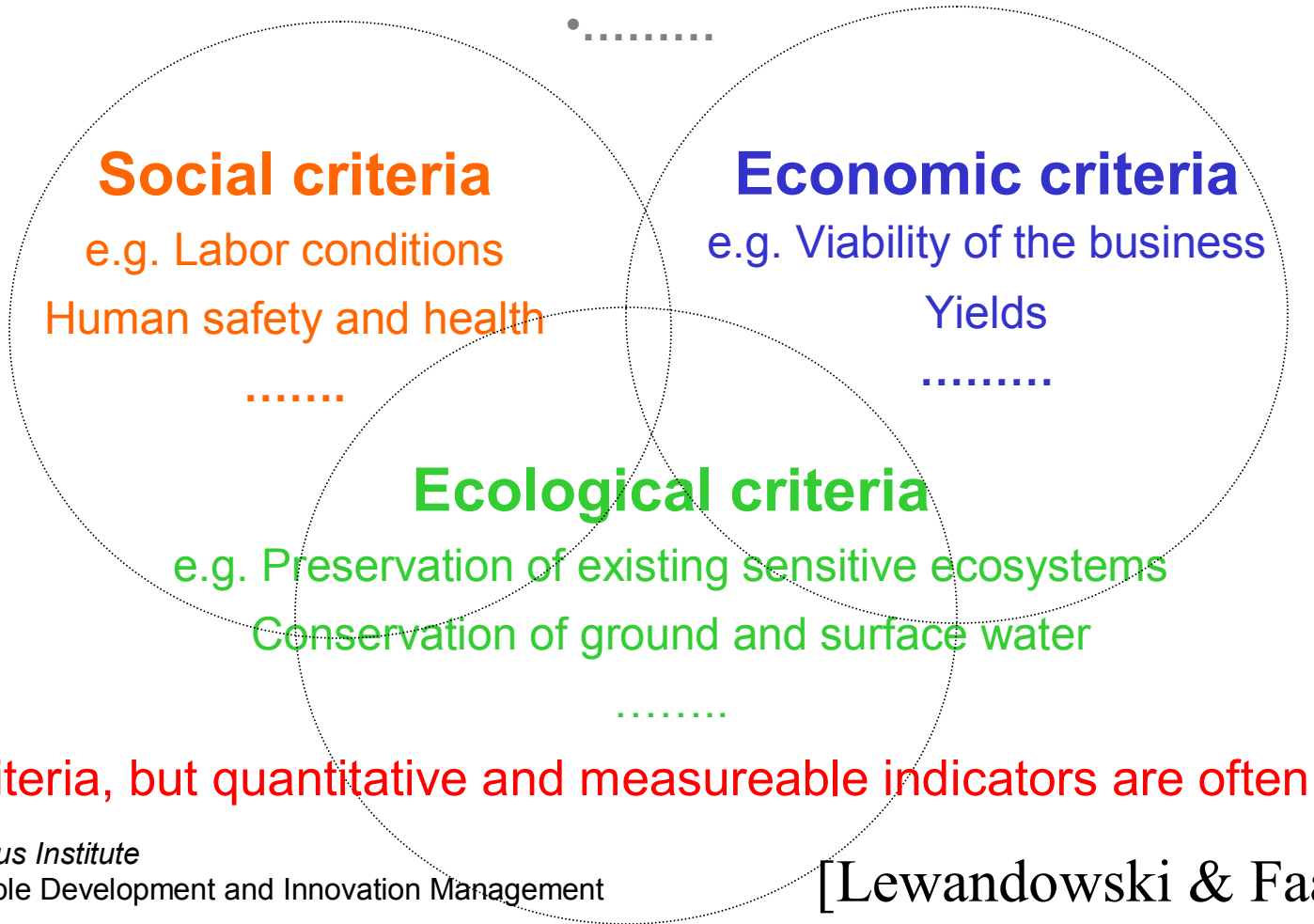


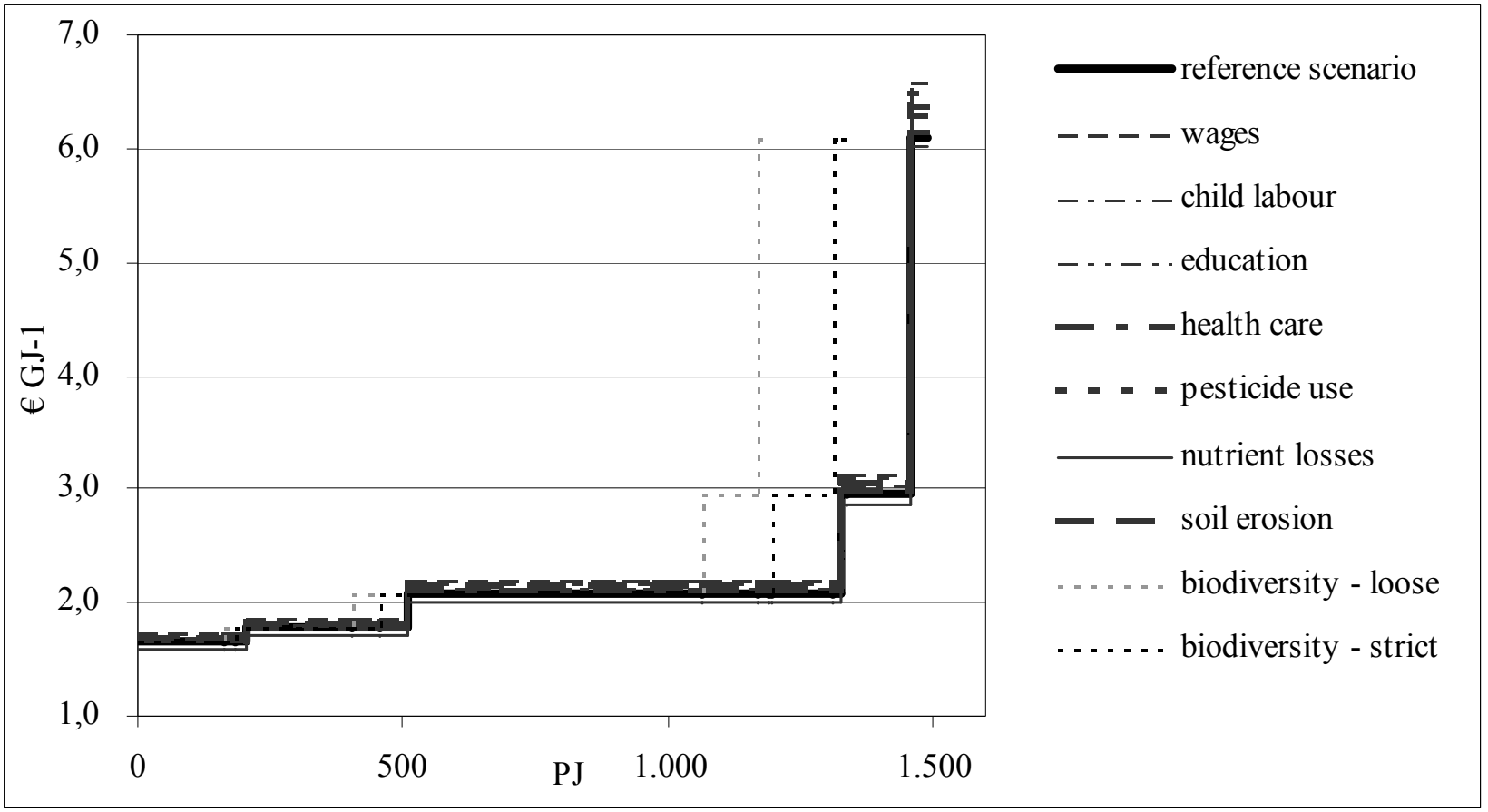
⇒Many criteria, but quantitative and measureable indicators are often missing

[Lewandowski & Faaij, 2004]

NL proposal: minimum safeguard-> stabilisation-> improvement…

1. **GHG balance** -> Chain performance (30-80%+..)
2. **Land-use/competition with food**: reporting
3. **Biodiversity** -> reporting/FSC/RSPO
4. **Wellfare** -> Reporting EPI
5. **Well being** -> ILO, Social accountability standards, etc.
6. **Environment**
   - Waste; law, GPG's
   - Agrochemicals; law, GPG's
   - Soil quality; reporting/monitoring
   - Water quality & quantity; law, reporting/monitoring

Cost supply curve Ukraine with sustainability demands



[Smeets et al., 2005]

Key Findings

- Current (2005) production cost level low in the CEEC
- The CEEC present a large supply potential to relatively low cost important potential supply region
- Large difference between 1st and 2nd generation feedstock potential

  produced on the same land

Conclusions (I)

- Bulk of the biomass potential (83 – 94%) in the CEEC comes from energy crops
- Availability of land for the production of energy crops increases with productivity of the agricultural management systems
- Poland (1.25 –3.4) and Romania (1.5 – 2.8 EJ) have the highest biomass potentials of all CEEC because of large land resources.

Conclusions (II)

- Regions with high biomass potentials are characterised by:
  - Large areas of arable land
  - Good quality land
  - Or presently extensive agricultural production

- Up to 78% of the current agricultural area could become available for the production of energy crops (V1 scenario) => major socio-economic implications for the CEEC with positive effects on employment options and the development of the agricultural sector and rural areas.

- Lignocellulosic crops, willow in particular, best combine high biomass potentials, low cost levels and environmental benign biomass production.

- Sugar beet and rape seed show best potential among conventional annual crops, however, good quality land and high inputs (fertilizer, pesticides) are needed.

Conclusions (III)

- The potential analysis showed that, under a scenario with intensive, advanced agricultural production methods and optimal land allocation within CEEC, nearly 12 EJ could be produced from biomass in the CEEC.
- In most CEEC, the production potentials are larger than the current energy use in the more favourable scenario's (such as V1).
- Bulk of the biomass in CEEC could be produced at costs lower than 2 Euro/GJ and therefore become available at lower costs than fossil oil.
- High potentials combined with the low cost levels, this gives CEEC major export opportunities for the European and perhaps global market.