Possibilities for sustainable agrarian feedstock production and utilisation

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OBJECTIVES:

- to determine site-adapted genotypes of commonly used energy crop
- to detect the optimum harvesting date
- to create sustainable crop rotation systems that allow the production of energy, food and feed.

MATERIAL & METHODS:

- Investigated crops:

Maize (16 varieties, FAO 250 – 500), Sorghum (7), Sunflower (4), Sugar beet (2), Cereals (9)

- Analysed parameters:

Biomass yield (at 3 to 6 maturity stages), Dry matter content, nutrient composition, Specific methane yield (according to VDI 4630)

- Data basis for the calculation of integrated crop rotation systems:

INVEKOS (proportion of crop cultures), AGES and AMA (crop yields), KTBL and Division of Agricultural Engineering (VS, specific methane yield)

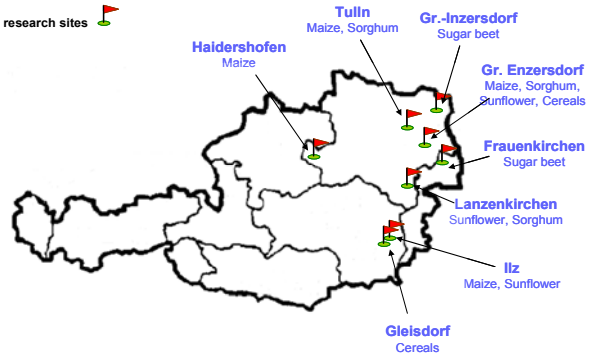

FIG. I: Research sites and investigated crops

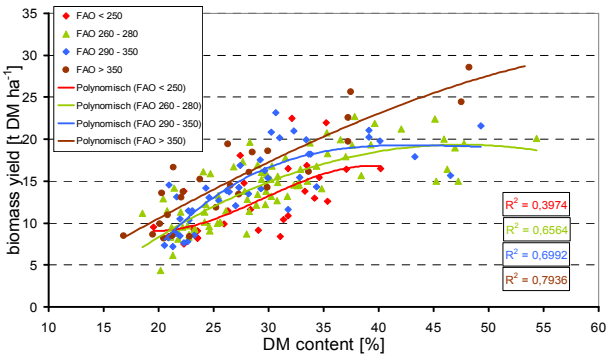

FIG. II: Biomass yield of different maize maturity types at Groß-Enzersdorf

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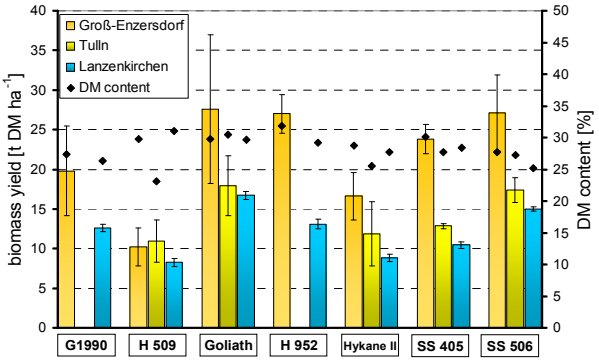

FIG. III: Biomass yield of 7 sorghum varieties under different site conditions

TAB. I: Methane yield per hectare of an integrated crop rotation system under conventional management at the region of Grieskirchen-Kremsmünster

Year	Crop	Biomass yield [t DM ha^{-1}]		Methane yield [m^3_N CH$_4$ ha^{-1}]	
		Main product	By-product	Single crop	Whole rotation
1	Winter wheat	5.6	5.6		
2	Vetch-rye	7.0		1,701	425
	Silo maize	18.5		5,535	1,384
3	Winter wheat	6.4	5.8		
4	Green rye	7.0		1,701	425
	Sunflower	16.0		3,853	963
Total methane yield per hectare and year					3,197

CONCLUSIONS:

- due to the selection of site-adapted and suitable energy crops and varieties, as well through their integration into balanced cropping systems, high methane yields per hectare can be achieved in a sustainable way
- for maize it has been shown that very-late maturing varieties can achieve higher biomass yields in contrast to early maturing varieties
- the preferable crop or variety for biogas production is highly dependent on the climatic and soil conditions of the production site
- sorghum bicolor is a good alternative to maize at sites with low rainfall patterns
- the concept of integrated crop rotation systems enables the production of food, feed and biomass for energy production without the competition for land
- a further improvement can be achieved by using additionally high ligno-cellulosic material from side-products or residues - therefore pre-treatment technologies need to be developed to digest such material