

Evaluation of Winter Faba Bean (*Vicia faba* L.) for Biogas Production

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Summary

In Germany the most frequently cultivated energy crop is maize. In order to increase dry matter (DM) and methane yield per hectare and year preceding crops before energy maize are cultivated. To produce higher biomass in crop rotation with maize winter faba bean as sole crop or mixture is possibly an alternative to other preceding crops. The current project aims at optimizing a cropping system with winter faba bean to produce biomass.

Field Trials 2006-2009

Location: Reinshof near Goettingen, Germany

Preceding Crops

- Sole crops: winter faba bean, winter pea, winter rye
- Mixtures: winter faba bean + winter pea, winter faba bean + winter rye
- Sowing dates: September 26th and October 18th, 2006
- Harvesting dates: May 7th and 31st, June 19th and July 6th, 2007
- Sowing densities: winter faba bean: 35 and 70 seeds/m², winter pea: 70 seeds/m², winter rye: 300 seeds/m², mixtures: 75% of the sole crop densities

Table 1: Fresh Matter Yield (FM), Dry Matter (DM) Yield, Growth Rates and Dry Matter Contents of Winter Faba Beans at four Harvesting Dates in 2007.

	Harvesting Date			
	7-May	31-May	19-Jun	6-Jul
FM Yield [g/m ²]	3877.88	6731.35	6920.29	6588.42
Difference [g/m ²]		2853.47***	188.94	-331.86
FM Growth Rate [g/(m ² ,d)]		118.90	9.94	-19.52
DM Yield [g/m ²]	436.27	916.23	1012.75	1060.75
Difference [g/m ²]		479.95***	96.53	48.00
DM Growth Rate [g/(m ² ,d)]		19.10	5.08	2.82
DM [%]	11.25	13.61	14.63	16.10

*** significant difference at p = 0.001

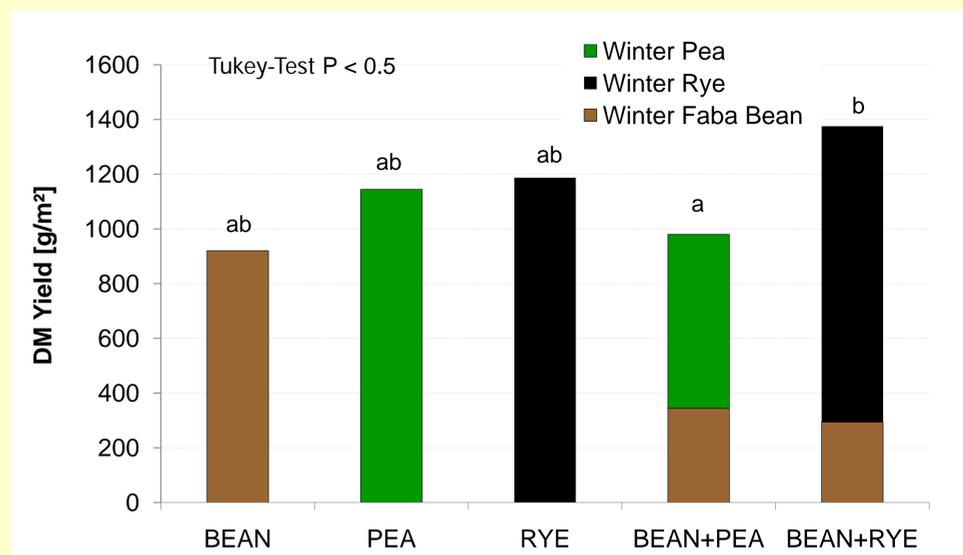


Figure 1: DM Yield of Winter Faba Bean, Winter Pea and Winter Rye as Sole Crop or Mixtures. Sowing Date: October 8th, 2006, Harvesting Date: May 31st, 2007.

Main Crop

- Sole crop: maize
- Sowing dates: equal to harvesting dates of preceding crops
- Harvesting dates: depending on dry matter content of maize (30% DM)
- Sowing density: 12 seeds/m²



May 31st 2007: Preceding Crop Winter Faba Bean for Biomass Production next to Main Crop Maize sown at May 7th, Goettingen, Germany

Results: Yields of Preceding Crops

- Sowing faba bean at September led to significantly higher DM (1111 g/m²) than sowing at October.
- In May measured FM and DM crop growth rates were the highest. They decreased from May to July from 19.1 to 2.8 g/(m²,d) DM and from 118.9 to -19.5 g/(m²,d) FM (Tab. 1).
- Till June FM of faba bean increased. Later it decreased. DM increases till July (Tab 1).
- From May until July DM content of faba bean increased from 11.25 to 16.1% (Tab. 1).
- FM and DM of faba bean harvested at May 7th was significantly lower than FM and DM at later harvesting dates (Tab. 1).
- DM of faba bean harvested at May 31st showed no significances to the mixtures with pea or rye or sole crops of pea or rye (Fig. 1).
- Maximum of DM harvested at May 31st (1375.5 g/m²) was achieved with the mixture of faba bean plus rye (Fig. 1).

For a comprehensive evaluation of the productivity of the whole cropping system further investigations are under way. A yield response of preceding crops and main crop to varied sowing and harvesting dates must be expected. In addition, the effect of symbiotic nitrogen fixation of winter faba bean and pertinent nitrogen transfer to the maize will be studied.