

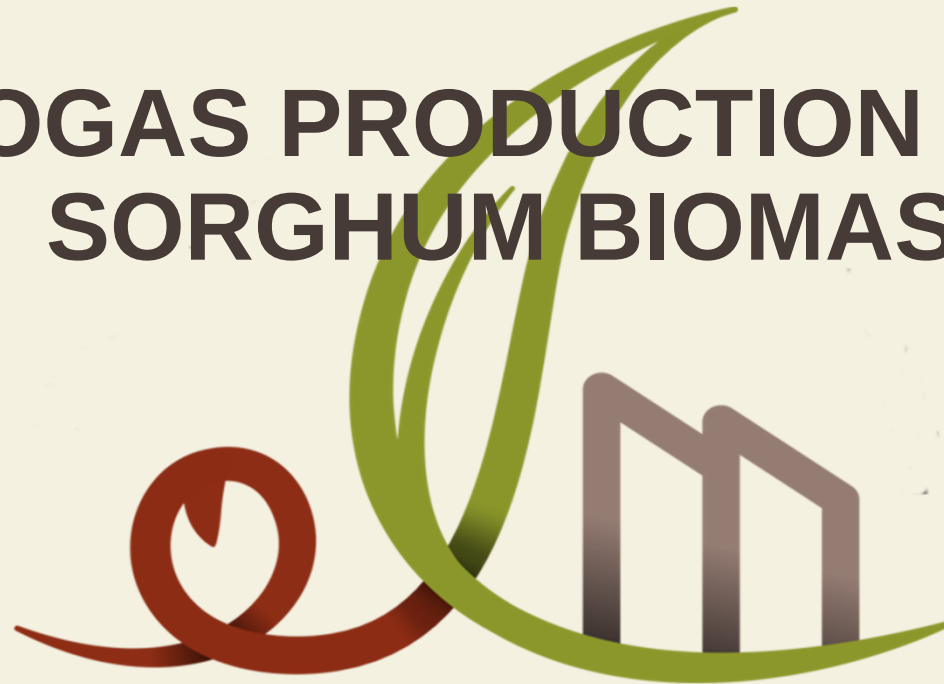


1ST EUROPEAN SORGHUM CONGRESS

WORKSHOP

FROM ENERGY PRODUCTION TO FOOD AND FEED

BIOGAS PRODUCTION WITH SORGHUM BIOMASS



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crops, TFZ institute GERMANY

BUCHAREST
3-4 NOVEMBER 2016

STRUCTURE

- **Why sorghum for biogas in Germany?**
- **Cultivar screening in Straubing, Bavaria**
- **Methane yield and influencing factors**
- **Sorghum as energy crop: key issues for breeding**





INSTITUTE DESCRIPTION

TECHNOLOGY AND SUPPORT CENTER (TFZ)

- Institution of the Bavarian Ministry of Food, Agriculture and Forestry
- Applied research:
 - Energy and raw material crops
 - Biofuels
 - Combustion
- Support of bioenergy projects, e.g. biomass heating stations
- Transfer of knowledge





WHY SORGHUM FOR BIOGAS?

SORGHUM IS MORE THAN FEED

- **High yield potential**
- **Requires only a short growing period**
→ Sorghum as catch crop in cropping systems with whole crop cereals
- **Lower input than maize**
- **Can be grown on light soils/under conditions, where maize has no stable yield**
- **Methane yield of sorghum is satisfying**
- **Sorghum is rarely used as fodder in Germany**
→ Hydrocyanic acid/prussic acid content



WHY SORGHUM FOR BIOGAS?

RESTRICTIONS AND REGULATIONS

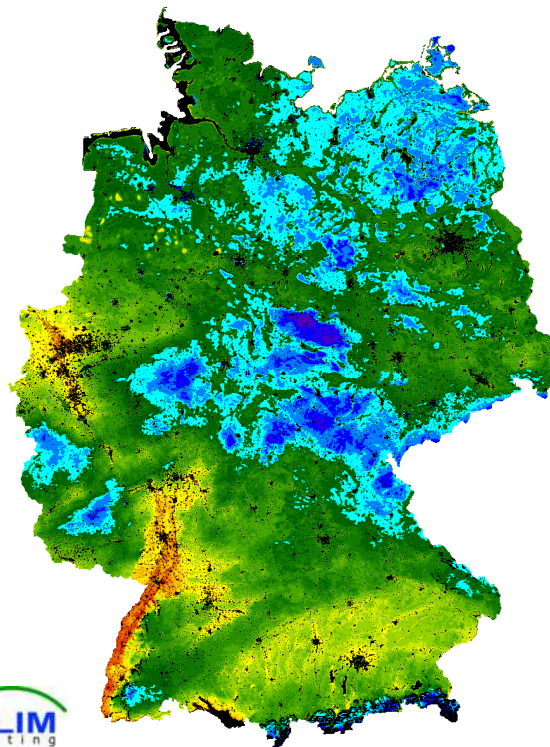
- Sorghum was alternative crop choice where Western corn rootworm (*Diabrotica virgifera virgifera*) occurred
 - Cropping system restriction allowed only in 2 out of 3 years maize
 - Since 2014, *Diabrotica* is no longer listed as quarantine pest → no cropping system restriction
- Maize as biogas substrate was limited to 60 % for biogas plants under Renewable Energy Law 2012 (EEG 2012)
 - Other crops such as sorghum, whole crop cereals, ley became more attractive for biogas plant owners
- No limitations for biogas plants in EEG 2004, 2009, 2014, 2017



CLIMATE CHANGE & SORGHUM

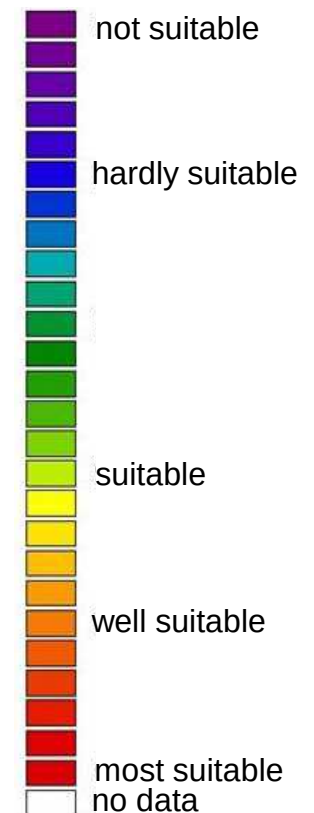
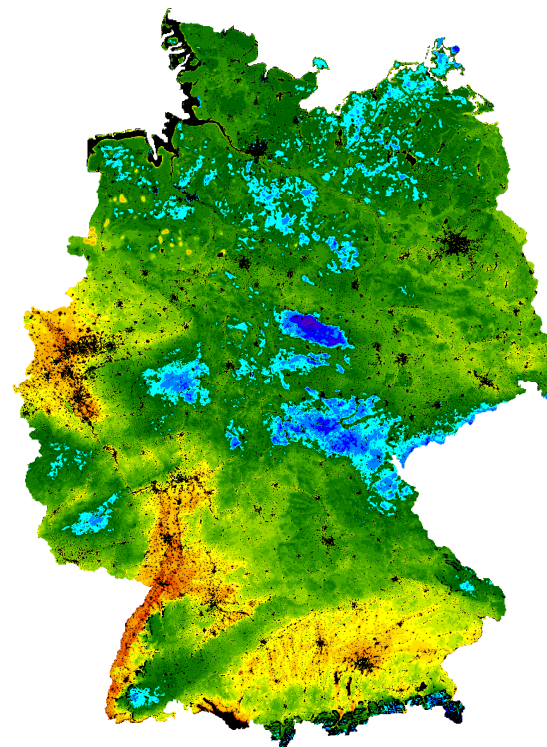
INCREASE OF POTENTIAL CROP AREA

Germany 1961–1990

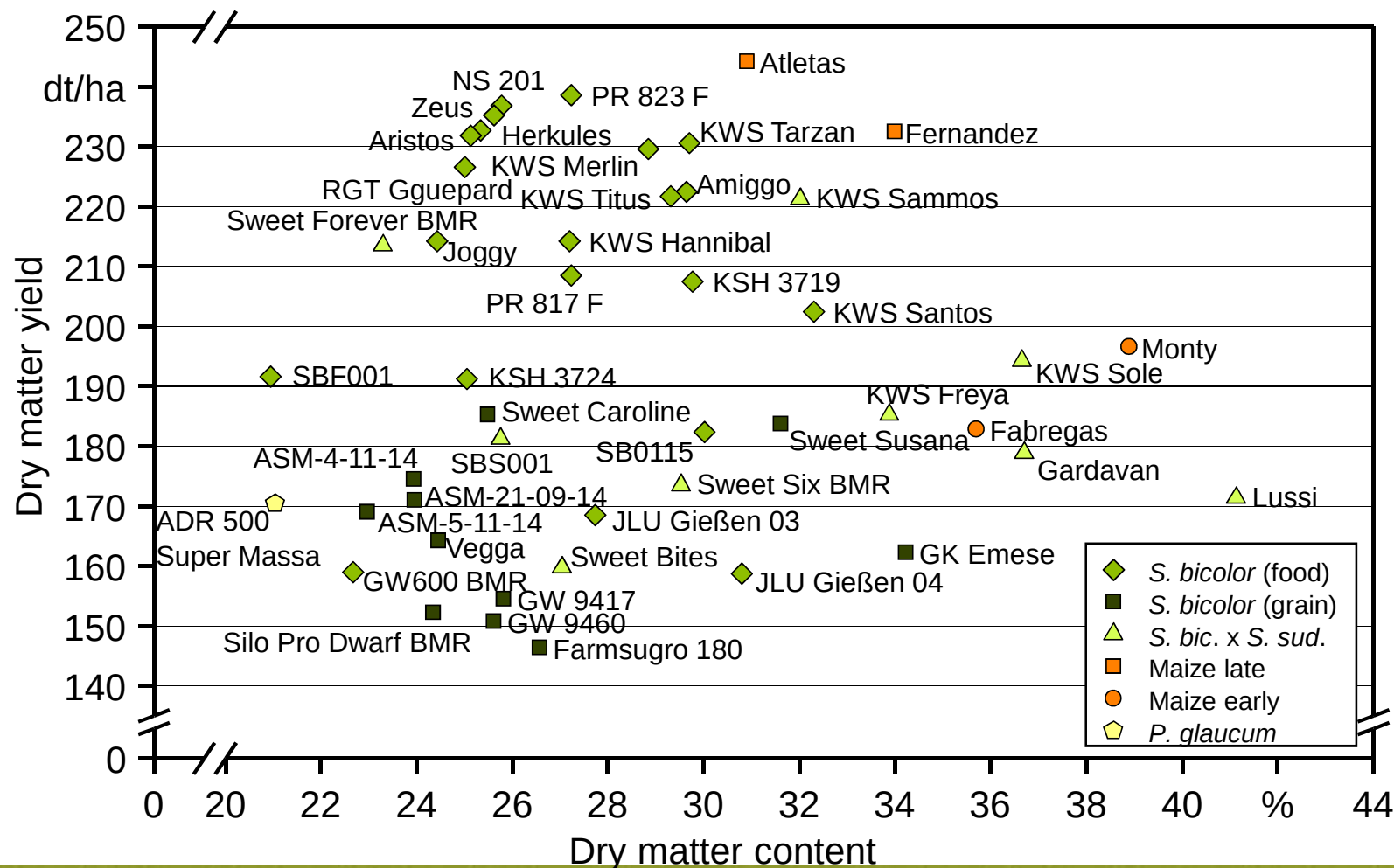


geoKLIM
consulting

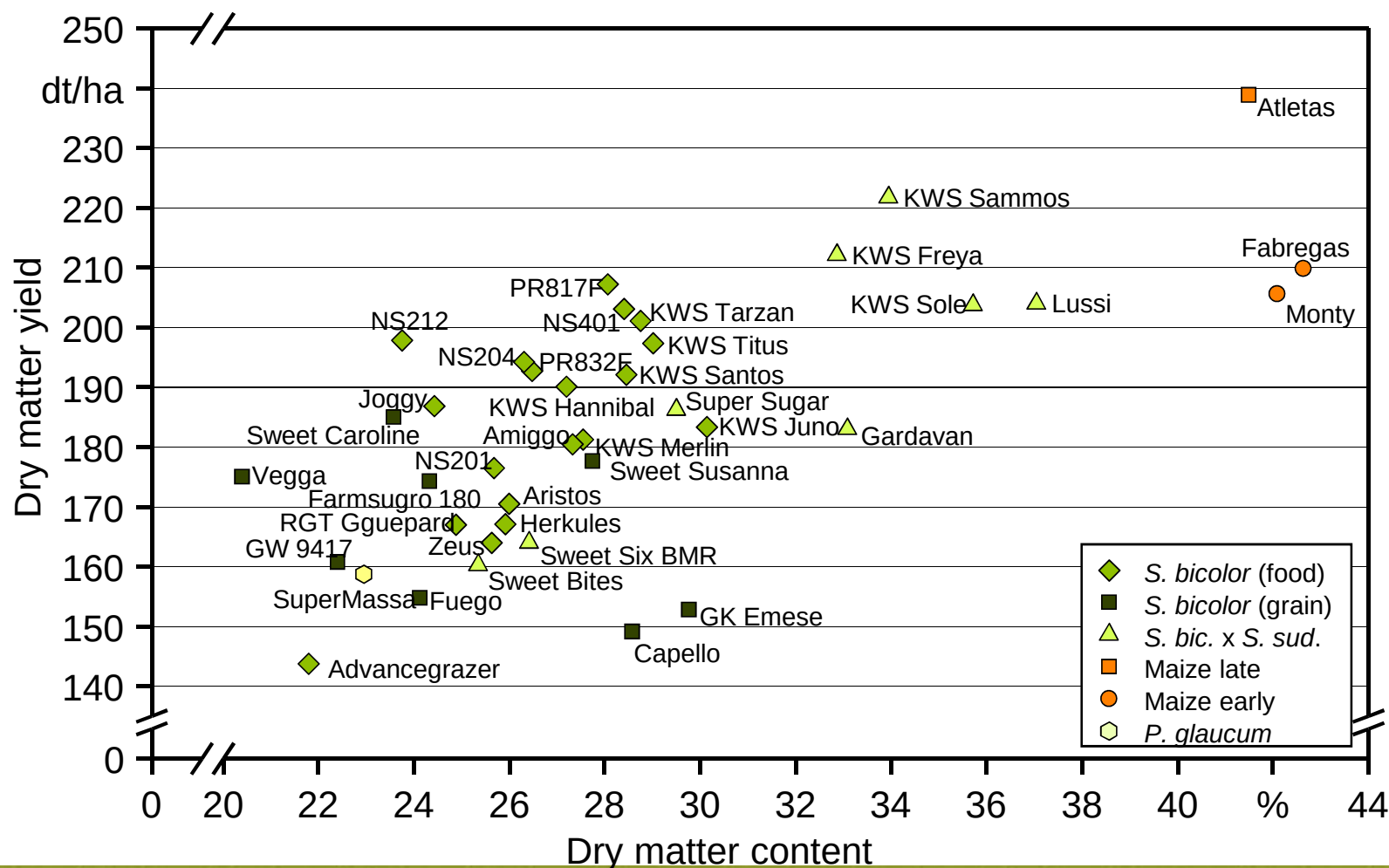
Germany 2011–2040



BIOMASS YIELD & DRY MATTER CONTENT



BIOMASS YIELD & DRY MATTER CONTENT





SEVERE LODGING IN 2016

LODGING EVEN IN GRAIN SORGHUM





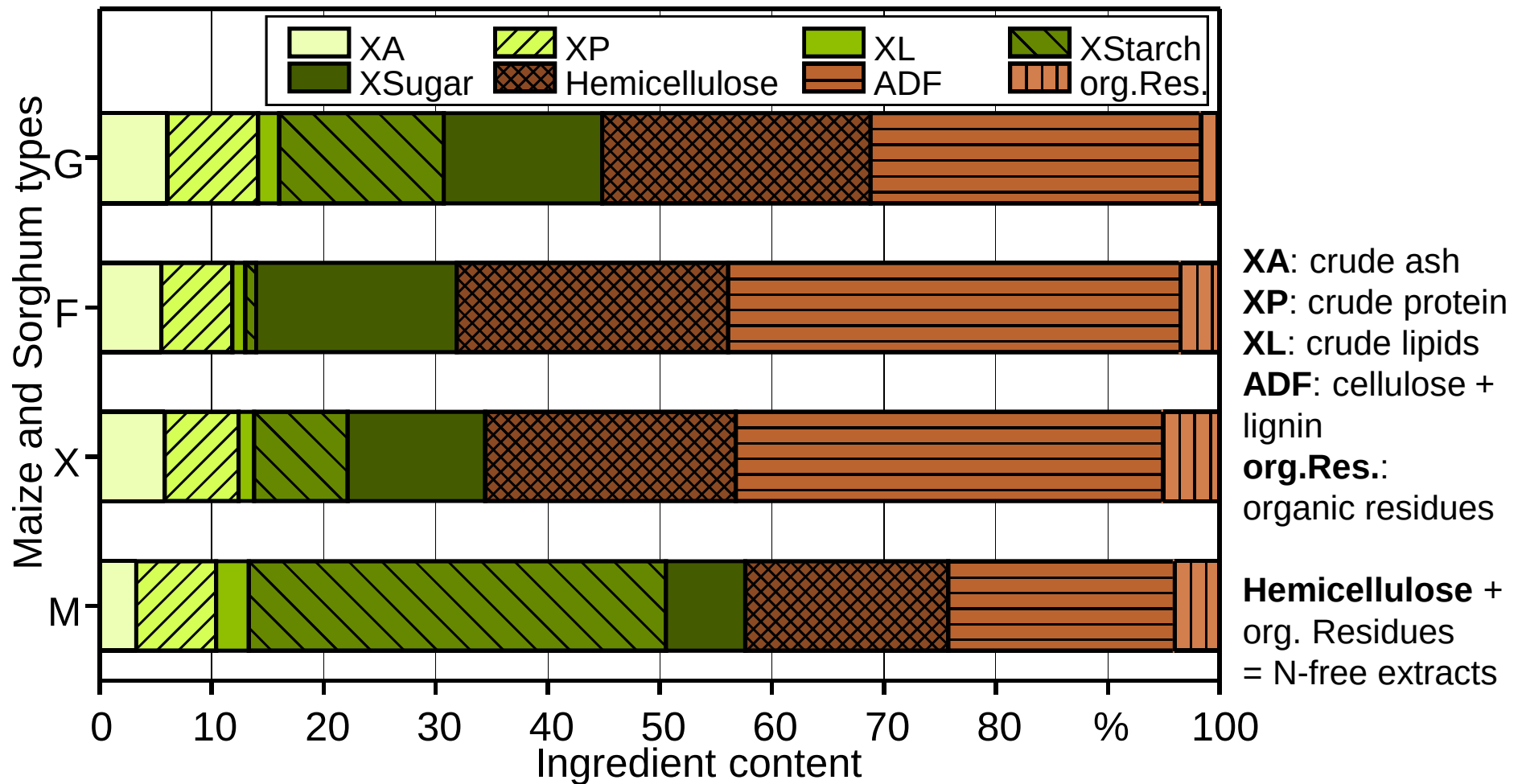
POSITIVE ASPECT

WILD BOARS PREFER MAIZE ...



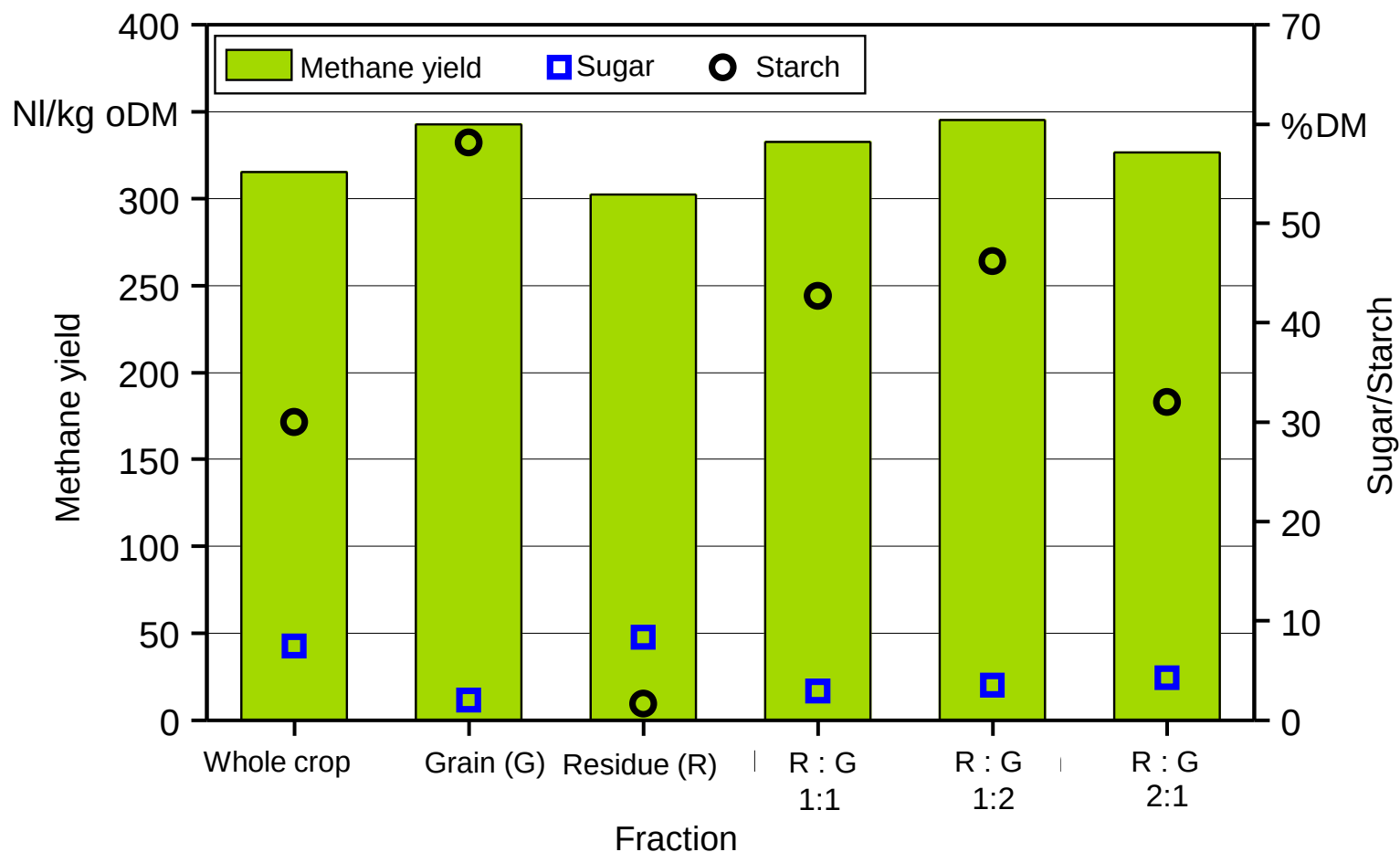
METHANE OUTPUT

INGREDIENTS MAIZE VS. SORGHUM



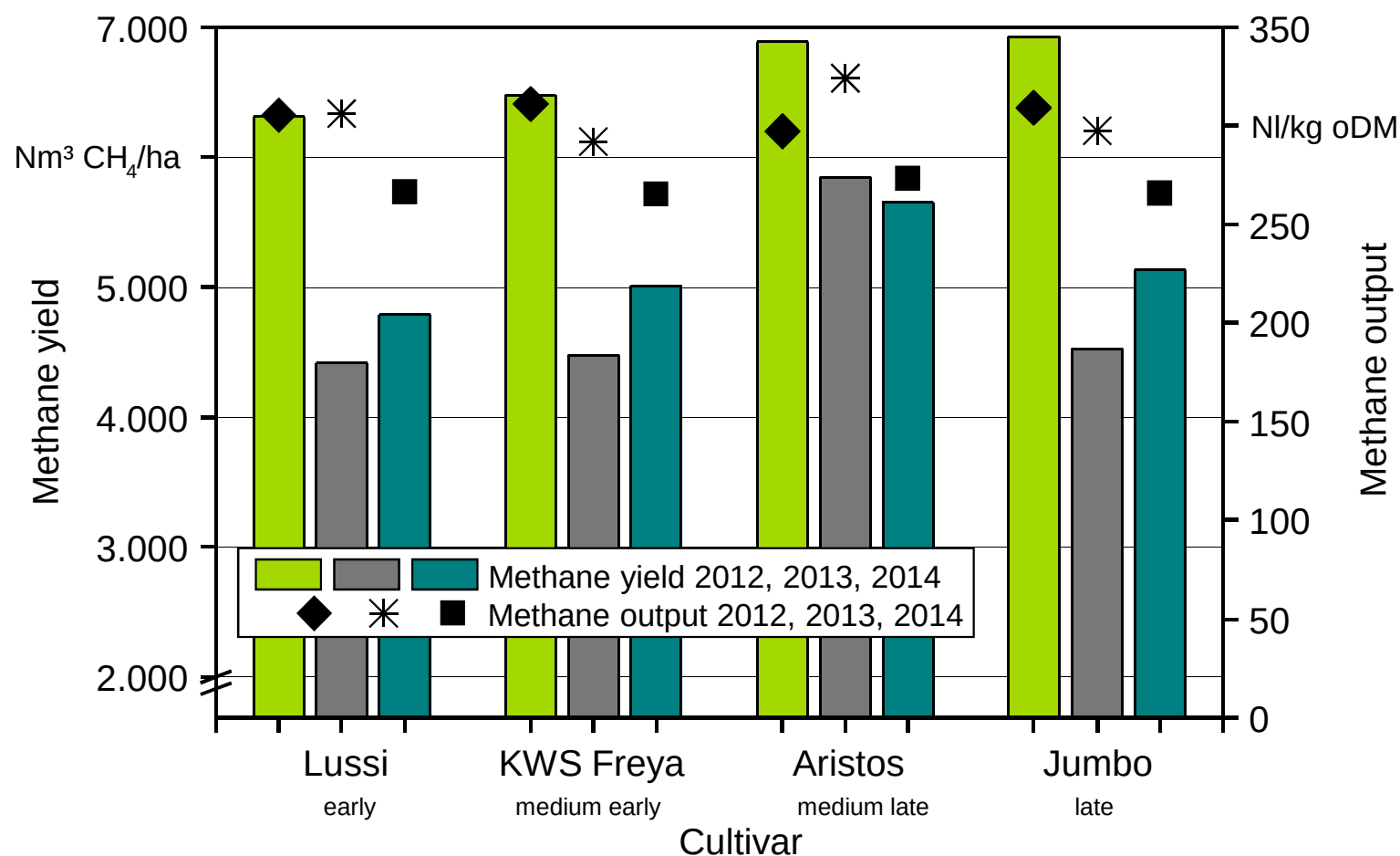
METHANE OUTPUT

CULTIVAR 'GK EMESE', 2013



METHANE YIELD 2012–2014

HIGH VARIABILITY BETWEEN YEARS





METHANE YIELD 2012–2014

BIOMASS YIELD DETERMINES METHANE YIELD

Crop	Number of data	Methane yield in $\text{NI CH}_4/\text{kg oDM}$	Methane yield in $\text{Nm}^3 \text{CH}_4/\text{ha}$
<i>S. bicolor</i> F	66	293,2	5143
<i>S. bicolor</i> G	37	315,4	4392
<i>S. bic.</i> x <i>S. sud.</i>	40	296,8	4892
Maize	6	347,2	7045

Maize

+ 15 %

+ 48 %



METHANE OUTPUT

WHAT IS REQUIRED FOR HIGH METHANE YIELD PER HECTARE?

- High biomass yield per hectare
- High methane yield per kg DM
 - High digestibility of the biomass
 - Low ash content
 - High content of N-free extracts
- Content of starch, sugar, etc. is less important



THANK YOU FOR YOUR ATTENTION

