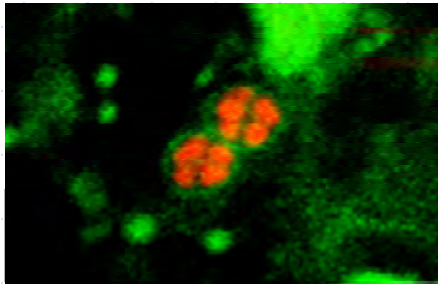


IEA Bioenergy Task 37,  
Istanbul, April 13 – 15, 2011

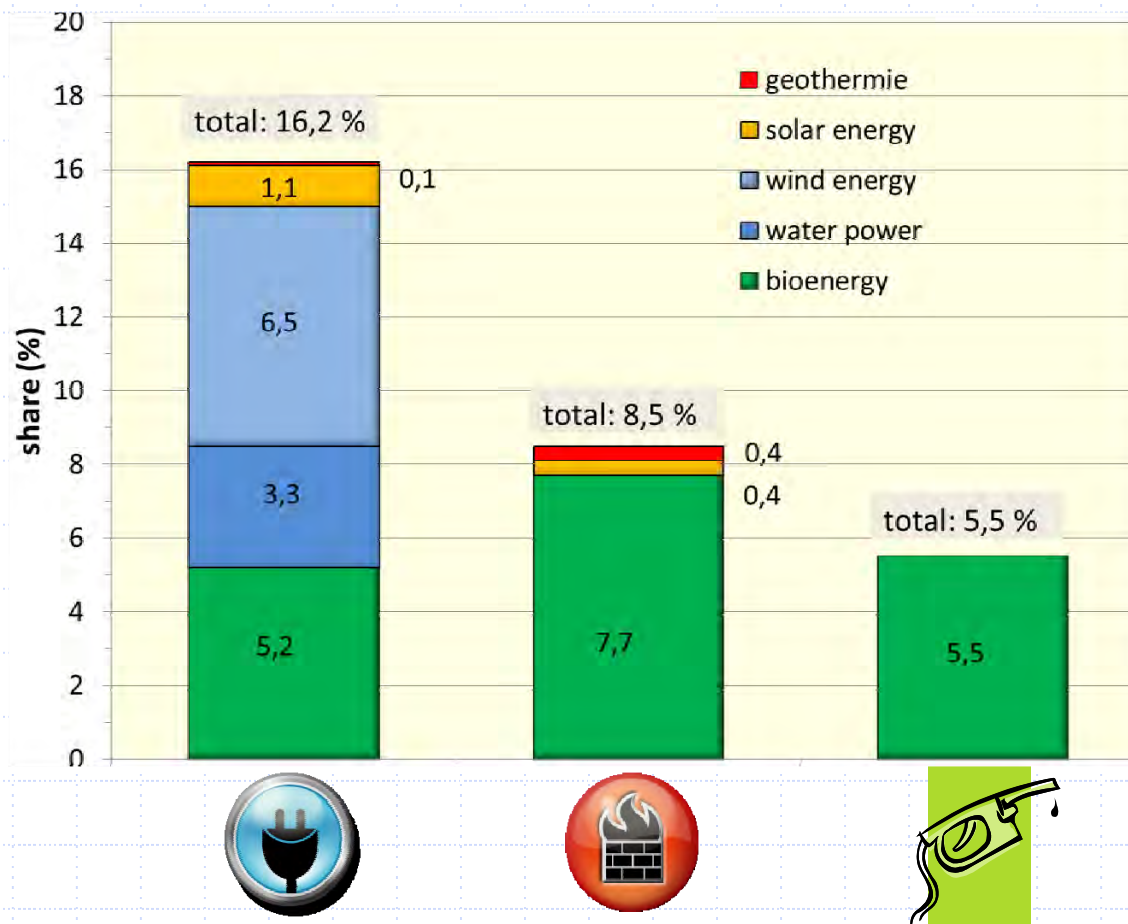


## Country Report Germany

Bernd Linke  
Leibniz-Institute for Agricultural Engineering

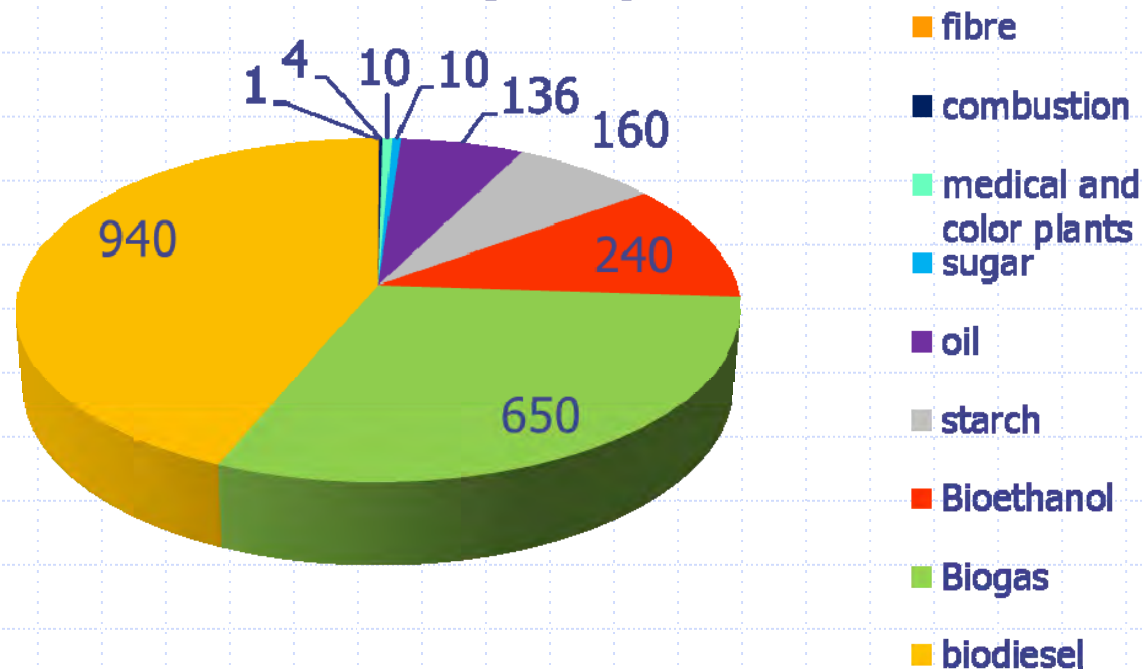


# Share of renewable energy in Germany 2010



## Area under cultivation for renewables (10<sup>3</sup> ha)

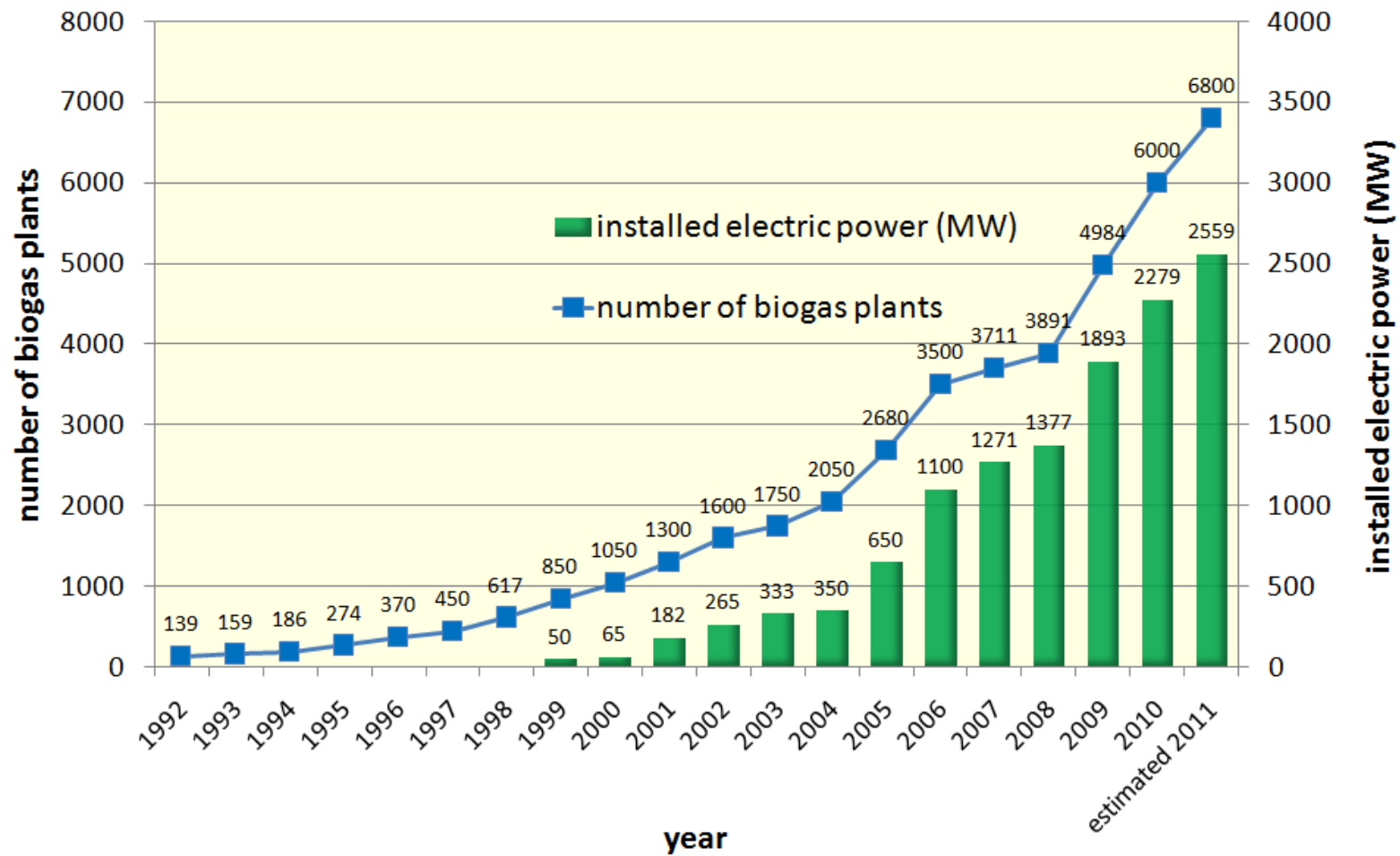
### Plants for material and energy supply (2150)



Agricultural crop land in Germany:  
12000\*10<sup>3</sup> ha

Source: FNR (Agency for Renewable Resources), 2011

# Biogas plants in Germany



Source: German Biogas Association

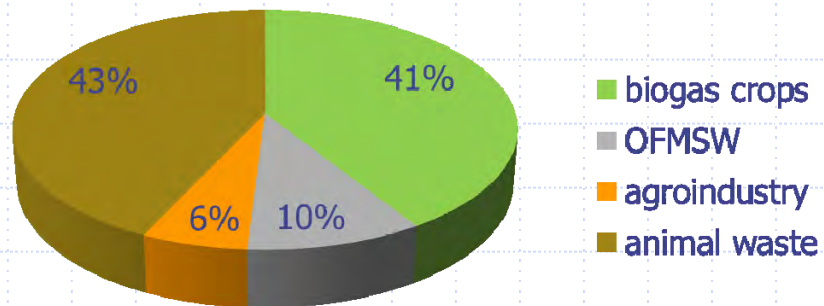
## Figures of agricultural biogas sector in Germany

Parameter	2009	2010	Outlook 2011
Number of biogas plants	4984	6000	6800
Grid injection of that	30	50	80
Installed electric power (MW)	1893	2279	2559
Generation of electricity (MWh/a)	11, 6 Mio	15, 0 Mio	17,1 Mio
households provided with electricity	3.5 Mio	4.3 Mio	4.9 Mio
Share of electricity (%)	2,0	2,6	3,0
Volume of business	4,44 Mrd	4,70 Mrd	4,71 Mrd
Number of jobs	16.000	19.000	20.000
Share of export (%)	10	16	23

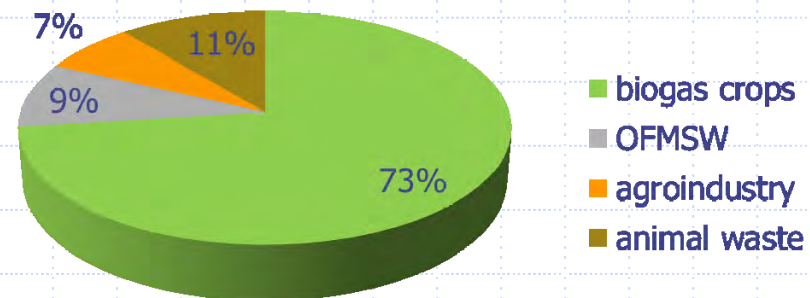
Source: German Biogas Association, 2011

## Main substrates for biogas production

**Mass proportion**

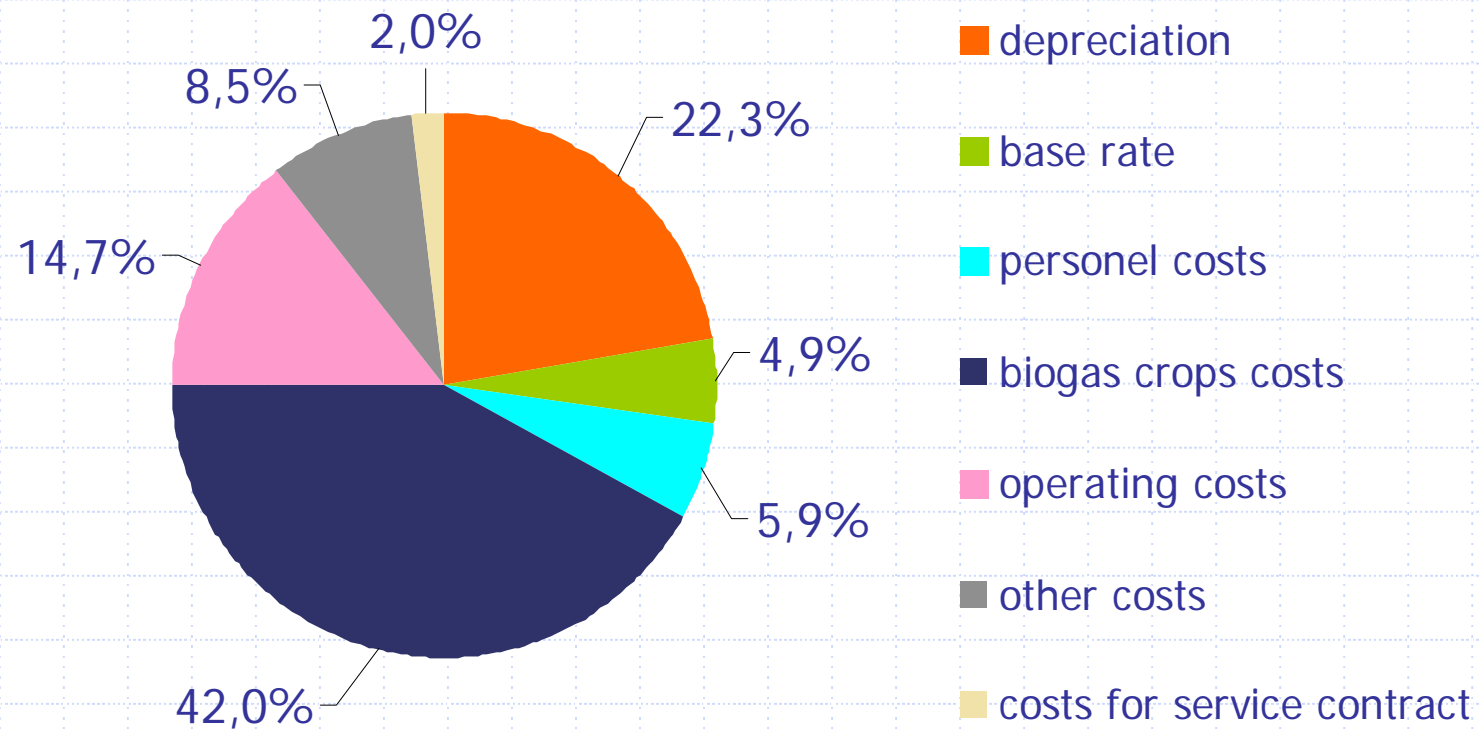


**Energy proportion**



Source: German Biomass Research Centre (DBFZ), Results from 420 German Biogas plants (2010)

## Distribution of costs



Source: Bundesmessprogramm, 2009, supported by  
Agency for Renewable Resources (FNR)

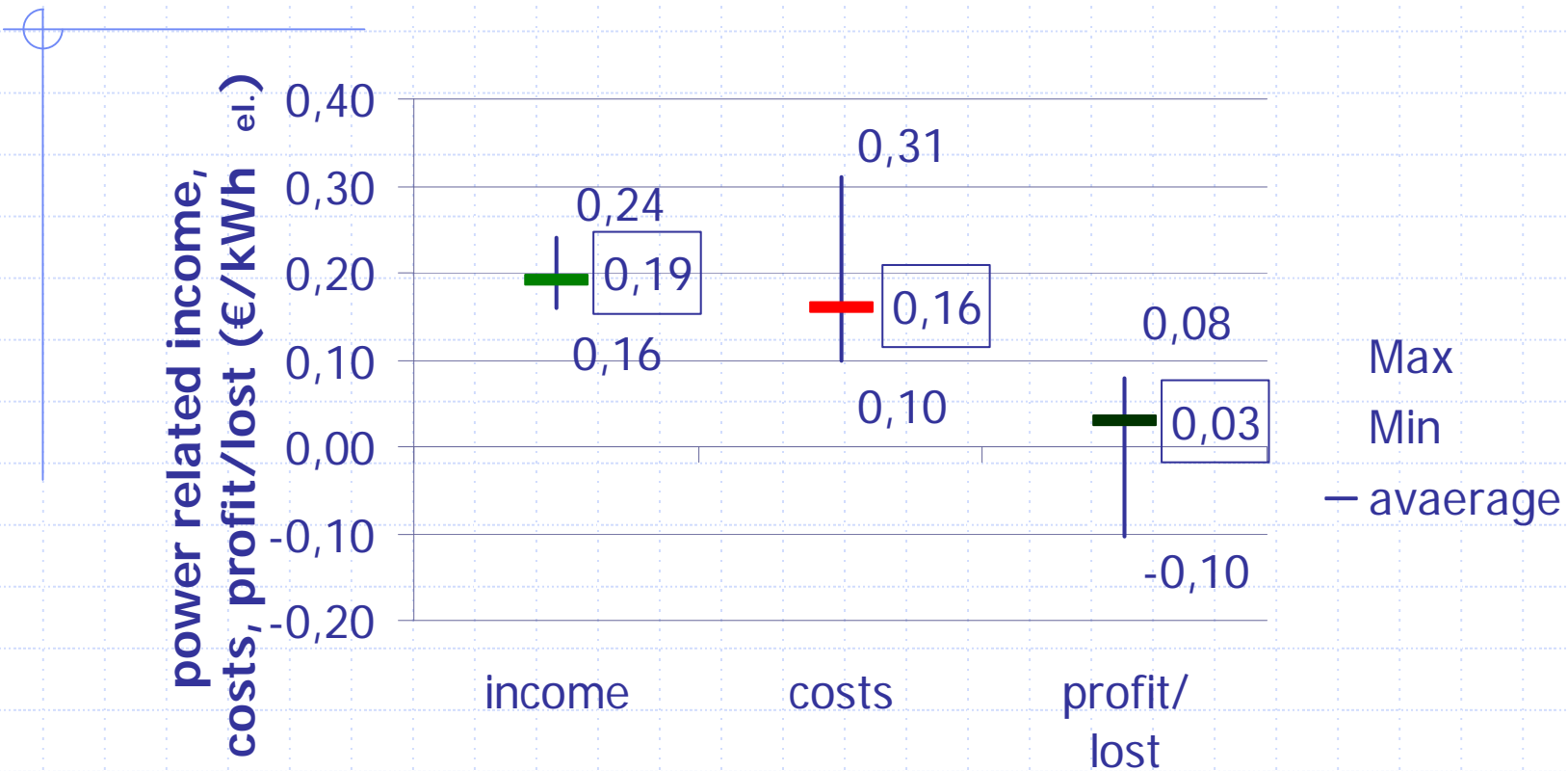
## Investment costs

		average	minimum	maximum
Investment costs	€	1.358.603	288.559	5.000.000
Specific investment cost - electric power	€/kWel.	3.087	1.529	6.140
Specific investment cost – reactor	€/m <sup>3</sup> AV	643	209	2.922
CHP	€/kWel.	610	251	868
Feeding system	€/kWel.	132	43	274

Source: Bundesmessprogramm, 2009, supported by Agency for Renewable Resources (FNR)

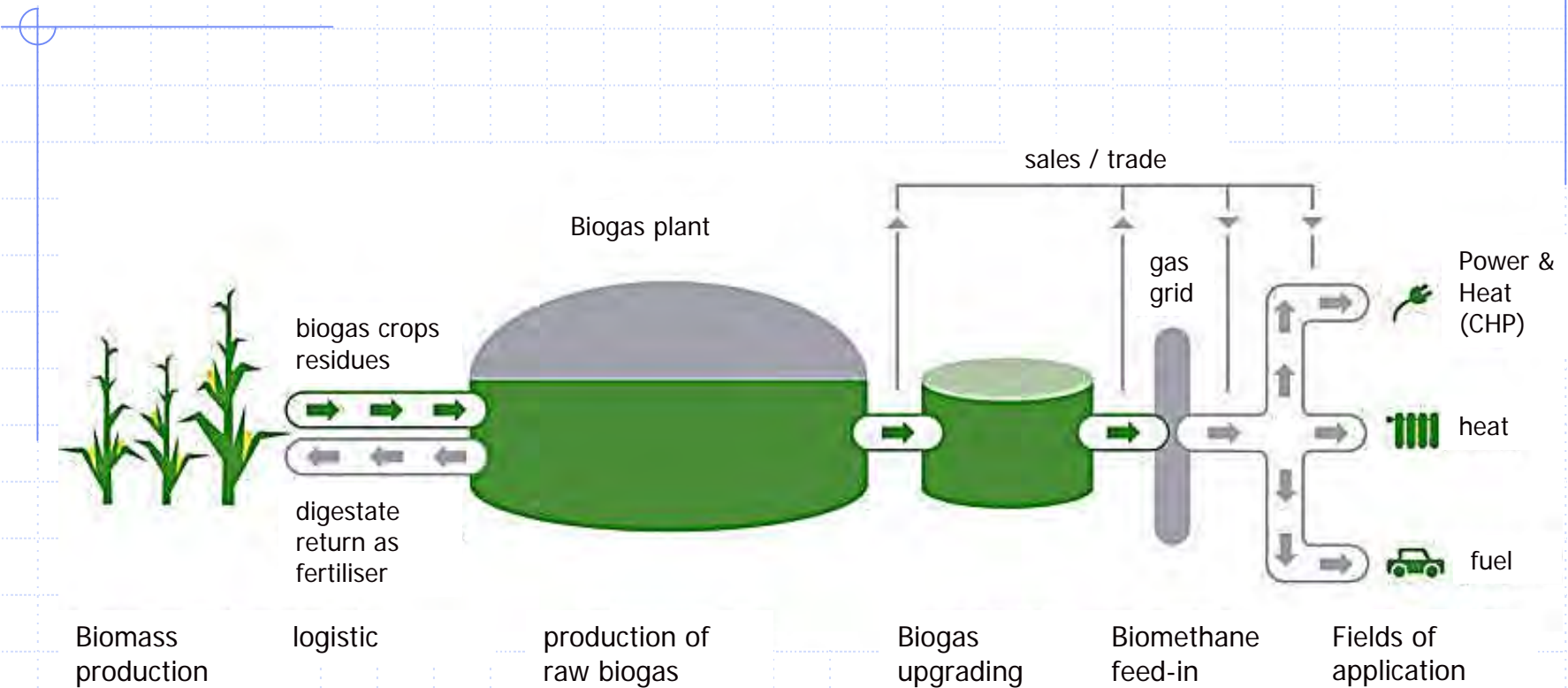


## Income, costs and profit/lost

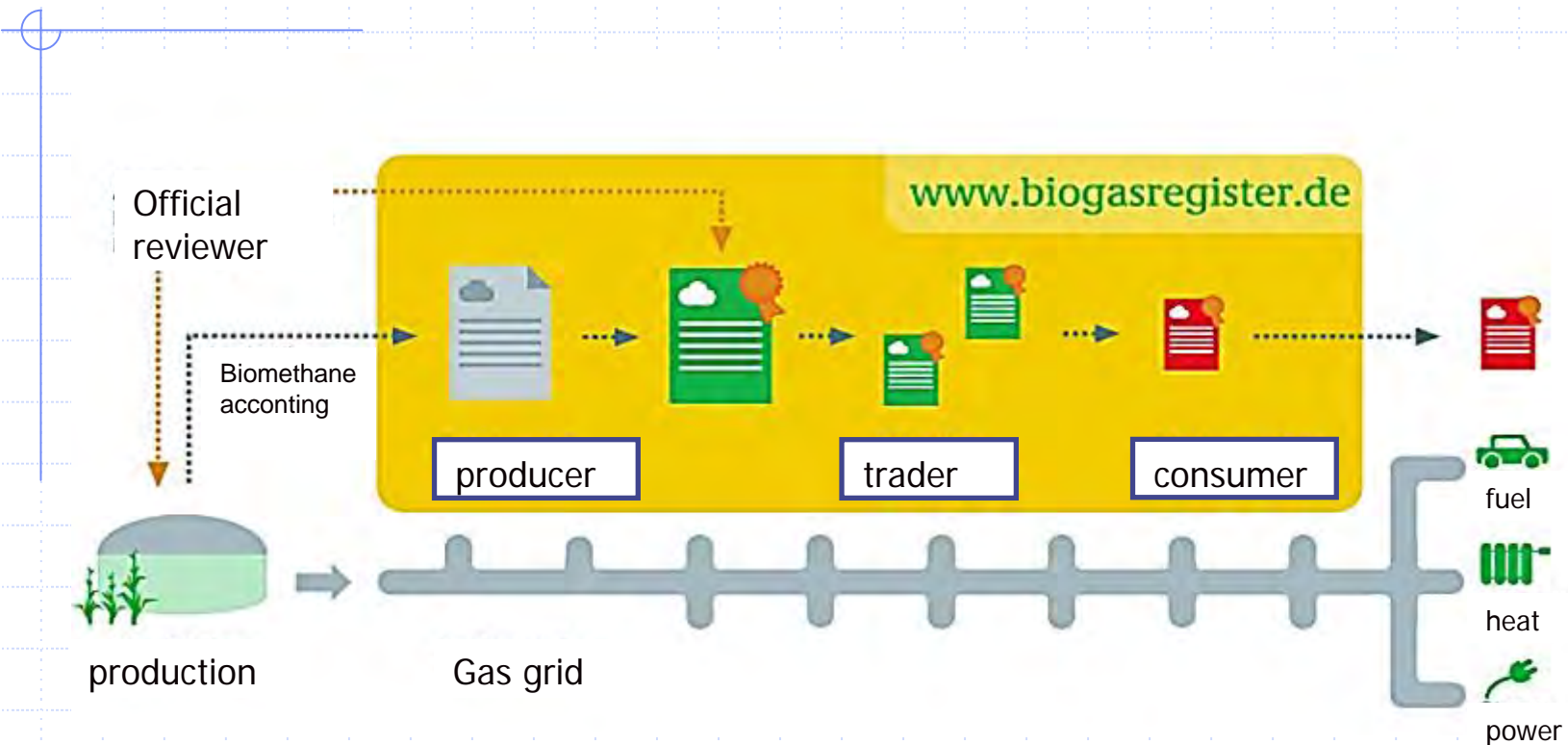


Source: Bundesmessprogramm, 2009, supported by  
Agency for Renewable Resources (FNR)

# Value chain of biomethane feed-in and distribution



## Operation mode of „biogasregister“



- Producer accounts biomethane in the biogasregister
- Official reviewer checks the production and confirms the feed in
- Producer and trader manage production chain and gas grid
- Consumer gets a record on the consumed biomethane

# Amendment of the Renewable Energy Sources Act (EEG) 2012 in Germany

## Position paper of the German Biogas Association, main topics

- Conservation of the status quo of existing biogas plants according EEG 2009
- Graduation of refund as a function of plant size have been proved
- Agriculture has the most potential for increase in biogas capacity, therefore  
Extension of biogas crops culture and utilisation of animal wastes
- Organic waste biogas plants have switched to NawaRos plants, therefore  
Separation of boni for biogas crops (NawaRos) and animal waste
- Biogas plants for organic wastes utilisation should get the animal waste boni
- Implementation of a renewable biomethane feed in law (EGE)
- Priority of biogas plants in comparison with fossil or nuclear plants

## Research projects, sponsored by the Agency for Renewable Resources, FNR, examples

Project Short title	Institution	Project expery
Micro wave analytic for process control	IBA Heiligenstadt	5/2011
upscaling for high performance microorganisms	Schmack Biogas	10/2011
Data collection of energy crops	KTBL, Darmstadt	7/2012
Methanogenic Archaea Culture Collection, MACC	ATB	8/2012
membrane technology for higher biogas yields	FH Nordhausen	2/2013
Sugar beet breeding for high methane yield	KWS	3/2013
sun flower breeding for high methane yield	KWS, Univ. Hohenheim	10/2013
biofilms in CSTR and two phase digesters	ATB	08/2013
Application of enzymes in lab scale and practice	ATB, DBFZ, industry	9/2013
Climate impact of Biomethane economy	DBFZ	2/2014

# Research on two phase biogas fermenters at ATB

- Fermentation in solid and liquid (2 phase), batch [A] and continuously feeding, [B] [C]
- Fractional separation of hydrolysis and methanogenesis
- Reduction of energy demand for mixing
- Integration of high performance anaerobic filter for VFA degradation
- Removal of ammonia from process liquor to prevent ammonia inhibition

