Synthesis of pilot biogas plant performances

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The objective of this study was to look of biogas energetic efficiency within 5 case studies (Italy (IT), France (FR), Netherlands (NL) and Switzerland (CH)

FARM CHARACTERISTICS

> Table 1: Farm characteristics

Country	IT	FR	NL	CH
Farm type	Commercial	Commercial	Experimental	Commercial
Animal productions	Dairy	Dairy	Dairy	Dairy
Number of animal	290 dairy cows	130 dairy cows	80 dairy cows	42 dairy cows
Agricultural area (ha)	150	200	55	38.9
Livestock density (dairy cows/ha)	1.9	0.65	1.6	1.1

- **Farms structure and management are related to local farming conditions and specific goals of the farmer(s).**

BIOGAS CHARACTERISTICS

> Table 2: Biogas characteristics of the 5 case studies

Country	IT	FR	NL	CH1	*CH2*
Interest characteristic	Drying of digestate	2 steps process (hydrolysis) and wood drying activity	Only manure as input	Single unit With a long experience	*A collective unit in project*
Inputs	Manure and crop residues	Manure, fodder waste, intercrops and wastes from dairy industry,	Liquid manure	Manure, vegetables, other co-substrates	*Manure, vegetables and industrial co-susbstrate*
Process	1 step 37°C / liquid	2 steps (hydrolysis) 37°C / liquid	1 step 37°C / liquid	1 step 37°C / liquid	*1 step 37°C/ liquid*
Size CHP unit (kWel)	250	250	36	45	*200*

ENERGY PERFORMANCES

- 2 steps process (FR) VS 1 step (IT) : no clear difference
- Electrical yield of CHP : age, brand and input quality have an effect
- Electricity consumption of biogas unit : a big variation between units
- Inputs diversity help to improve energy performances
- Heat valorization is not well known and could be improved in main cases

> Table 3: energy performances of the 5 case studies

Country	IT	FR	NL	CH1	*CH2*
Biogaz production (Nm^3)	1,095,000	723,894	90,000	93,000	*451,484*
% CH_4 in Biogas	52%	63%	63%	62%	*60%*
Methane production / t dry matter input (Nm^3/ t DM)	226	230	266	102	*262*
Electricity production (kWh/ tDM)	847	934	447	382	*913*
Real / Installed electrical power of CHP (kWel)	246 / 250	237 / 250	11 /36	26 / 45	*135 / 200*
CHP electrical yield (%)	39%	42%	17%	39%	*36%*
Electricity consumed by biogas plant (%)	10%	9%	78%	13%	*5%*
Total heat production (MWh)	NA	2,273	NA	296	*1,242*

CONCLUSION / DISCUSSION

- Case studies are an illustration of the diversity of biogas plant that can be seen through Europe
- Mixed farming system seems to be a very good opportunity to developed AD plants with diversified wastes interesting in terms of energy potential
- Main advantages: Create new activity on farm, employment, reduce mineral fertilizer use, decrease greenhouse gas emissions
- Main improvements: advice and farmers in biogas management, technical improvement needed within some processes, policy effort to help investments (very high costs)

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