

# ENRD Thematic Group on 'Bioeconomy and Climate Action in rural areas'

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## **Biogas development in Italy in the last 15 years**

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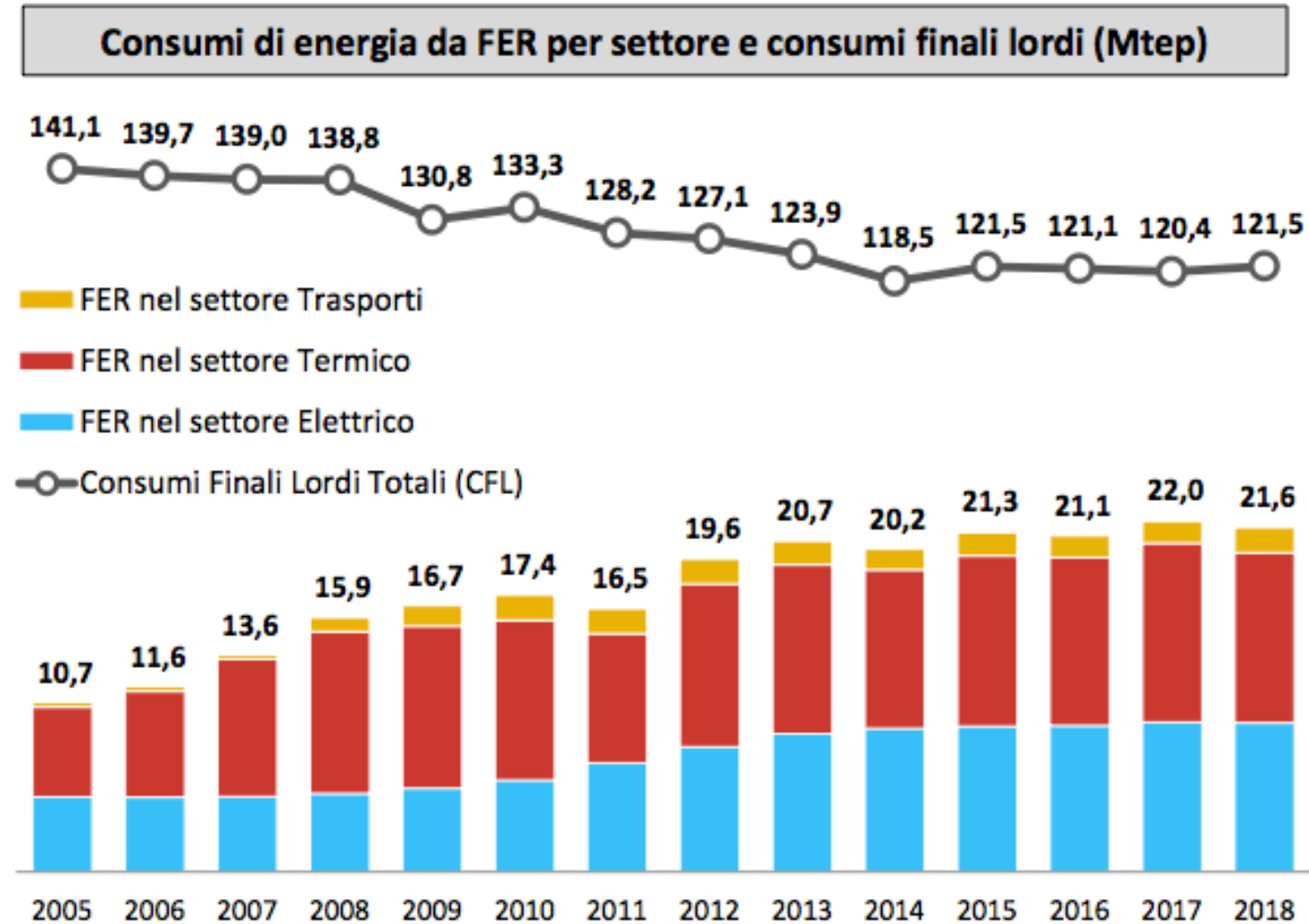
# Layout of the presentation

- A) Some biogas features
- B) Biogas in Italy – trends and numbers
- C) Sustainable biogas (GBEP indicators)
- D) Policy framework
- E) Further development

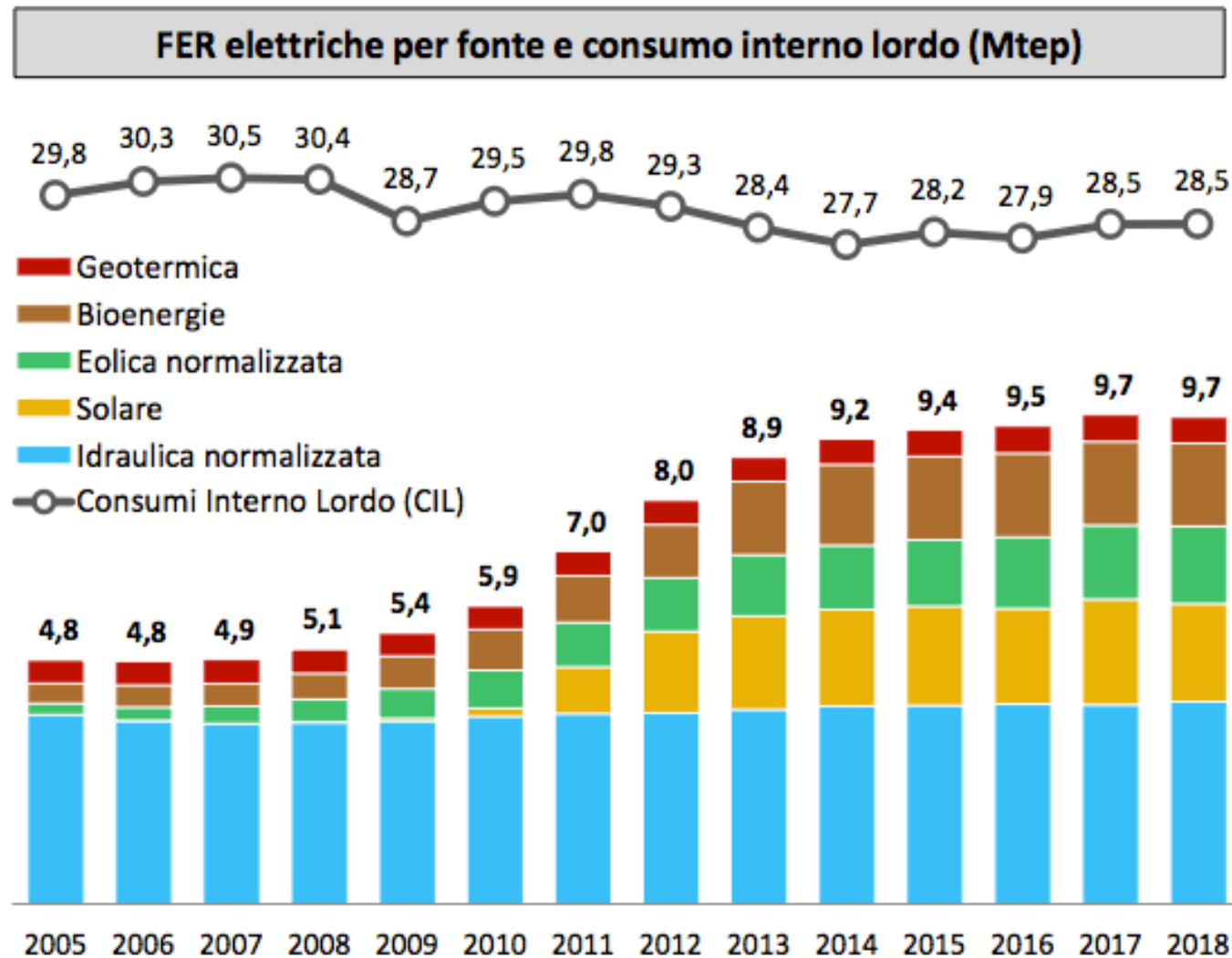
## A) Some biogas features

- Renewable energy source - programmable based on natural biological process (anaerobic digestion);
- Agricultural byproduct – energy crops – organic urban waste – sewage sludge – to produce biogas/biomethane and “digestate” (improving soil quality);
- Development strictly linked with livestock farms;
- Example of circular economy in agriculture (increasing farm competitiveness).

## B) Biogas in Italy (trend and numbers)



# RES distribution



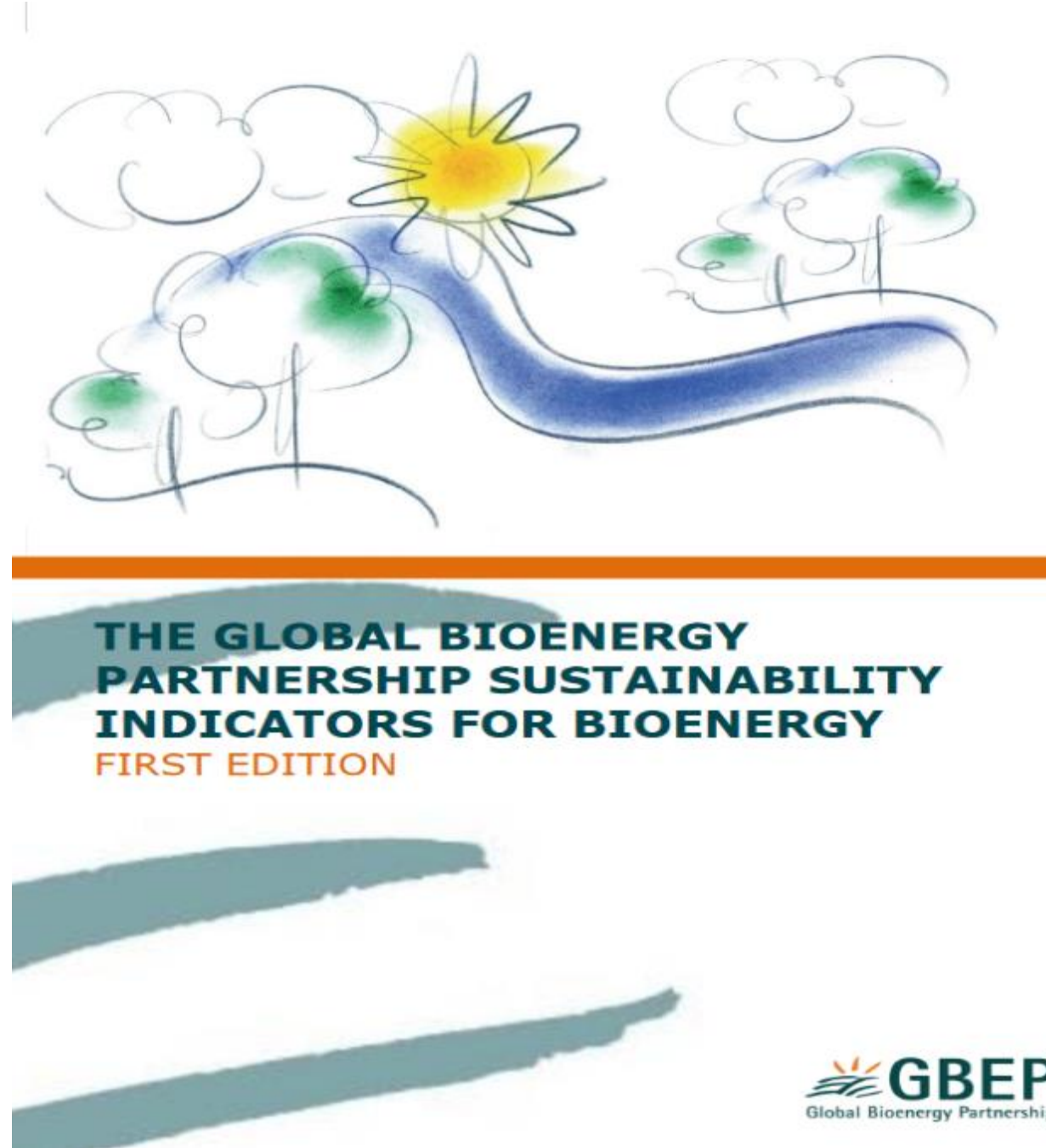
# Number of biogas plants and power

	2017		2018		2018 / 2017 Variazione assoluta		2018 / 2017 Variazione %	
	n°	kW	n°	kW	n°	kW	n°	kW
<b>Idraulica</b>	<b>4.268</b>	<b>18.862.925</b>	<b>4.331</b>	<b>18.935.507</b>	<b>63</b>	<b>72.582</b>	<b>1,5</b>	<b>0,4</b>
0_1	3.074	841.096	3.123	858.494	49	17.398	1,6	2,1
1_10 (MW)	886	2.640.760	900	2.676.100	14	35.340	1,6	1,3
> 10	308	15.381.069	308	15.400.913	0	19.844	0,0	0,1
<b>Eolica</b>	<b>5.579</b>	<b>9.765.856</b>	<b>5.642</b>	<b>10.264.690</b>	<b>63</b>	<b>498.834</b>	<b>1,1</b>	<b>5,1</b>
<b>Solare</b>	<b>774.014</b>	<b>19.682.293</b>	<b>822.301</b>	<b>20.107.589</b>	<b>48.287</b>	<b>425.296</b>	<b>6,2</b>	<b>2,2</b>
<b>Geotermica</b>	<b>34</b>	<b>813.090</b>	<b>34</b>	<b>813.090</b>	<b>0</b>	<b>0</b>	<b>0,0</b>	<b>0,0</b>
<b>Bioenergie</b>	<b>2.913</b>	<b>4.135.034</b>	<b>2.924</b>	<b>4.180.396</b>	<b>11</b>	<b>45.362</b>	<b>0,4</b>	<b>1,1</b>
Biomasse solide	468	1.667.340	475	1.725.415	7	58.075	1,5	3,5
– rifiuti urbani	65	935.816	65	938.831	0	3.015	0,0	0,3
– altre biomasse	403	731.524	410	786.584	7	55.060	1,7	7,5
<b>Biogas</b>	<b>2.117</b>	<b>1.443.931</b>	<b>2.136</b>	<b>1.448.006</b>	<b>19</b>	<b>4.075</b>	<b>0,9</b>	<b>0,3</b>
– da rifiuti	410	411.204	403	405.370	-7	-5.834	-1,7	-1,4
– da fanghi	78	44.841	79	44.140	1	-701	1,3	-1,6
– da deiezioni animali	602	235.162	615	238.469	13	3.307	2,2	1,4
– da attività agricole e forestali	1.027	752.725	1.039	760.028	12	7.303	1,2	1,0
<b>Bioliquidi</b>	<b>500</b>	<b>1.023.763</b>	<b>497</b>	<b>1.006.974</b>	<b>-3</b>	<b>-16.788</b>	<b>-0,6</b>	<b>-1,6</b>
– oli vegetali grezzi	403	869.405	403	857.357	0	-12.048	0,0	-1,4
– altri bioliquidi	97	154.357	94	149.617	-3	-4.740	-3,1	-3,1
<b>Totale</b>	<b>786.808</b>	<b>53.259.198</b>	<b>835.232</b>	<b>54.301.272</b>	<b>48.424</b>	<b>1.042.074</b>	<b>6,2</b>	<b>2,0</b>

## Socio-economic dimension

Tecnologia	Investimenti (mln €)	Spese O&M (mln €)	Valore Aggiunto generato per l'intera economia (mln €)	Occupati temporanei diretti+indiretti (ULA)	Occupati permanenti diretti+indiretti (ULA)
Fotovoltaico	629	334	528	3.861	5.033
Eolico	814	303	660	6.023	3.516
Idroelettrico	46	893	703	417	10.160
Biogas	47	498	416	414	5.425
Biomasse solide	273	630	355	2.317	3.396
Bioliquidi	-	464	110	-	1.556
Geotermoelettrico	-	54	41	-	607
<b>Totale</b>	<b>1.809</b>	<b>3.176</b>	<b>2.813</b>	<b>13.033</b>	<b>29.693</b>

## C) Sustainable biogas - GBEP indicators





N.	INDICATORE	DESCRIZIONE	STATO
1	Lifecycle GHG emissions	Lifecycle greenhouse gas emissions from bioenergy production and use, as per the methodology chosen nationally or at community level, and reported using the GBEP Common Methodological Framework for GHG Lifecycle Analysis of Bioenergy 'Version One'.	
2	Soil quality	Percentage of land for which soil quality, in particular in terms of soil organic carbon, is maintained or improved out of total land on which bioenergy feedstock is cultivated or harvested	
3	Harvest levels of wood resources (NOT APPLICABLE)	Annual harvest of wood resources by volume and as a percentage of net growth or sustained yield, and the percentage of the annual harvest used for bioenergy	N.A.
4	Emissions of non-GHG air pollutants, including air toxics	Emissions of non-GHG air pollutants, including air toxics, from bioenergy feedstock production, processing, transport of feedstocks, intermediate products and end products, and use; and in comparison with other energy sources	
5	Water use and efficiency	<ul style="list-style-type: none"> <li>- Water withdrawn from nationally determined watershed(s) for the production and processing of bioenergy feedstocks, expressed as the percentage of total actual renewable water resources (TARWR) and as the percentage of total annual water withdrawals (TAWW), disaggregated into renewable and non-renewable water sources;</li> <li>- Volume of water withdrawn from nationally determined watershed(s) used for the production and processing of bioenergy feedstocks per unit of bioenergy output, disaggregated into renewable and non-renewable water sources.</li> </ul>	
6	Water quality	<ul style="list-style-type: none"> <li>- Pollutant loadings to waterways and bodies of water attributable to fertilizer and pesticide application for bioenergy feedstock cultivation, and expressed as a percentage of pollutant loadings from total agricultural production in the watershed;</li> <li>- Pollutant loadings to waterways and bodies of water attributable to bioenergy processing effluents, and expressed as a percentage of pollutant loadings from total agricultural processing effluents in the watershed.</li> </ul>	
7	Biological diversity in the landscape	<ul style="list-style-type: none"> <li>- Area and percentage of nationally recognized areas of high biodiversity value or critical ecosystems converted to bioenergy production;</li> <li>- Area and percentage of the land used for bioenergy production where nationally recognized invasive species, by risk category, are cultivated;</li> <li>- Area and percentage of the land used for bioenergy production where nationally recognized conservation methods are used.</li> </ul>	
8	Land use and land-use change related to bioenergy feedstock production	<ul style="list-style-type: none"> <li>- Total area of land for bioenergy feedstock production, and as compared to total national surface and agricultural and managed forest land area</li> <li>- Percentages of bioenergy from yield increases, residues, wastes and degraded or contaminated land</li> <li>- Net annual rates of conversion between land-use types caused directly by bioenergy feedstock production, including the following (amongst others): <ul style="list-style-type: none"> <li>o arable land and permanent crops, permanent meadows and pastures, and managed forests;</li> <li>o natural forests and grasslands (including savannah, excluding natural permanent meadows and pastures), peatlands, and wetlands</li> </ul> </li> </ul>	

N.	INDICATORE	DESCRIZIONE	STATO
9	Allocation and tenure of land for new bioenergy production	Percentage of land – total and by land-use type – used for new bioenergy production where: - a legal instrument or domestic authority establishes title and procedures for change of title; and - the current domestic legal system and/or socially accepted practices provide due process and the established procedures are followed for determining legal title.	
10	Price and supply of a national food basket	Effects of bioenergy use and domestic production on the price and supply of a food basket, which is a nationally defined collection of representative foodstuffs, including main staple crops, measured at the national, regional, and/or household level, taking into consideration: - changes in demand for foodstuffs for food, feed and fibre; - changes in the import and export of foodstuffs; - changes in agricultural production due to weather conditions; - changes in agricultural costs from petroleum and other energy prices; and - the impact of price volatility and price inflation of foodstuffs on the national, regional, and/or household welfare level, as nationally determine	
11	<i>Change in income (PROBABLY NOT APPLICABLE)</i>	<i>Contribution of the following to change in income due to bioenergy production: - wages paid for employment in the bioenergy sector in relation to comparable sectors - net income from the sale, barter and/or own consumption of bioenergy products, including feedstocks, by self-employed households/individuals</i>	
12	Jobs in the bioenergy sector	<b>Net job creation as a result of bioenergy production and use, total and disaggregated (if possible) as follows: skilled/unskilled, temporary/indefinite.</b> - Total number of jobs in the bioenergy sector and percentage adhering to nationally recognized labour standards consistent with the principles enumerated in the ILO Declaration on Fundamental Principles and Rights at Work, in relation to comparable sectors	
13	<i>Change in unpaid time spent by women and children collecting biomass (NOT APPLICABLE)</i>	<i>Change in average unpaid time spent by women and children collecting biomass as a result of switching from traditional use of biomass to modern bioenergy services</i>	N.A.
14	<i>Bioenergy used to expand access to modern energy services (NOT APPLICABLE)</i>	- Total amount and percentage of increased access to modern energy services gained through modern bioenergy (disaggregated by bioenergy type), measured in terms of energy and numbers of households and businesses - Total number and percentage of households and businesses using bioenergy, disaggregated into modern bioenergy and traditional use of biomass	N.A.
15	<i>Change in mortality and burden of disease attributable to indoor smoke (NOT APPLICABLE)</i>	<i>Change in mortality and burden of disease attributable to indoor smoke from solid fuel use, and changes in these as a result of the increased deployment of modern bioenergy services, including improved biomass-based cook stoves.</i>	N.A.
16	Incidence of occupational injury, illness and fatalities	Incidences of occupational injury, illness and fatalities in the production of bioenergy in relation to comparable sectors.	

N.	INDICATORE	DESCRIZIONE	STATO
17	Productivity	Productivity of bioenergy feedstocks by feedstock or by farm/plantation: <ul style="list-style-type: none"> <li>- Processing efficiencies by technology and feedstock</li> <li>- Amount of bioenergy end product by mass, volume or energy content per hectare per year</li> <li>- Production cost per unit of bioenergy</li> </ul>	
18	Net energy balance	Energy ratio of the bioenergy value chain with comparison with other energy sources, including energy ratios of feedstock production, processing of feedstock into bioenergy, bioenergy use; and/or lifecycle analysis	
19	Gross value added	<b>Gross value added per unit of bioenergy produced and as a percentage of gross domestic product</b>	
20	Change in consumption of fossil fuels and traditional use of biomass	<ul style="list-style-type: none"> <li>- Substitution of fossil fuels with domestic bioenergy measured by energy content and in annual savings of convertible currency from reduced purchases of fossil fuels</li> <li>- Substitution of traditional use of biomass with modern domestic bioenergy measured by energy content</li> </ul>	
21	Training and re-qualification of the workforce (PROBABLY NOT APPLICABLE)	<i>Percentage of trained workers in the bioenergy sector out of total bioenergy workforce, and percentage of re-qualified workers out of the total number of jobs lost in the bioenergy sector</i>	
22	Energy diversity	<b>Change in diversity of total primary energy supply due to bioenergy</b>	
23	Infrastructure and logistics for distribution of bioenergy (NOT APPLICABLE)	<i>Number and capacity of routes for critical distribution systems, along with an assessment of the proportion of the bioenergy associated with each</i>	N.A.
24	Capacity and flexibility of use of bioenergy	<ul style="list-style-type: none"> <li>- Ratio of capacity for using bioenergy compared with actual use for each significant utilization route</li> <li>- Ratio of flexible capacity which can use either bioenergy or other fuel sources to total capacity</li> </ul>	

## D) Policy framework

- National body in charge of managing renewables (GSE)
- Collect data and information on plants, register, admin info, type, source, dimension, production, compliance,  
....and pay incentives
- TO, Conto Energia (FV), CV, TEE, etc.
- Huge amount of financial resources (public), payed by consumers in their energy bills (30%)  
.....14 billion Euro/year
- Biogas plant 1 Mega (TO 0,28 Euro/kWh)  
productivity 7.800 KWh/kWp  
Investiments costs = 4.000 Euro/kWp  
2.2 MEuro/year  
management costs... payback time 10 years



## E) Further development

- 15 years are close to the end.... (Starting form 2008)
- Upgrading biogas plant for **Biomethane** production.
  - From electricity to **transport**(advanced biofuels)
- New national Decree (CIC – Certificate for Immission in Consumption) 1 CIC = 5 Gcal (625 smc) = 375 Euro/CIC (GSE)
- Depending on type of biomass (byproducts)  
(double counting)

# Conclusions

- Biogas in Italy had a huge development for the opportunity recognized by agricultural sector (livestock); ...different from FV
  - Diversification of activity and income, competitiveness, contribution to CC, ..
- It became an industrial sector, involving farms, companies, services represented by CIB (Italian Biogas Consortium); ...national value chain
  - 700 farms, services provider, 50% agricultural biogas plants,
- It is sustainable (GBEP environmental, social and economic dimension);
  - Renewable energy prod, new jobs, Added Value, Soil quality,..
- It's been able to adapt and to change according to external (climate and policy conditions)
  - Circular economy, digestate, reducing GHG emissions, "positive" lobby (from electricity to transport..).



...THANK YOU FOR YOUR ATTENTION!

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