Energy production from biogas in the Italian countryside: policies and organizational models

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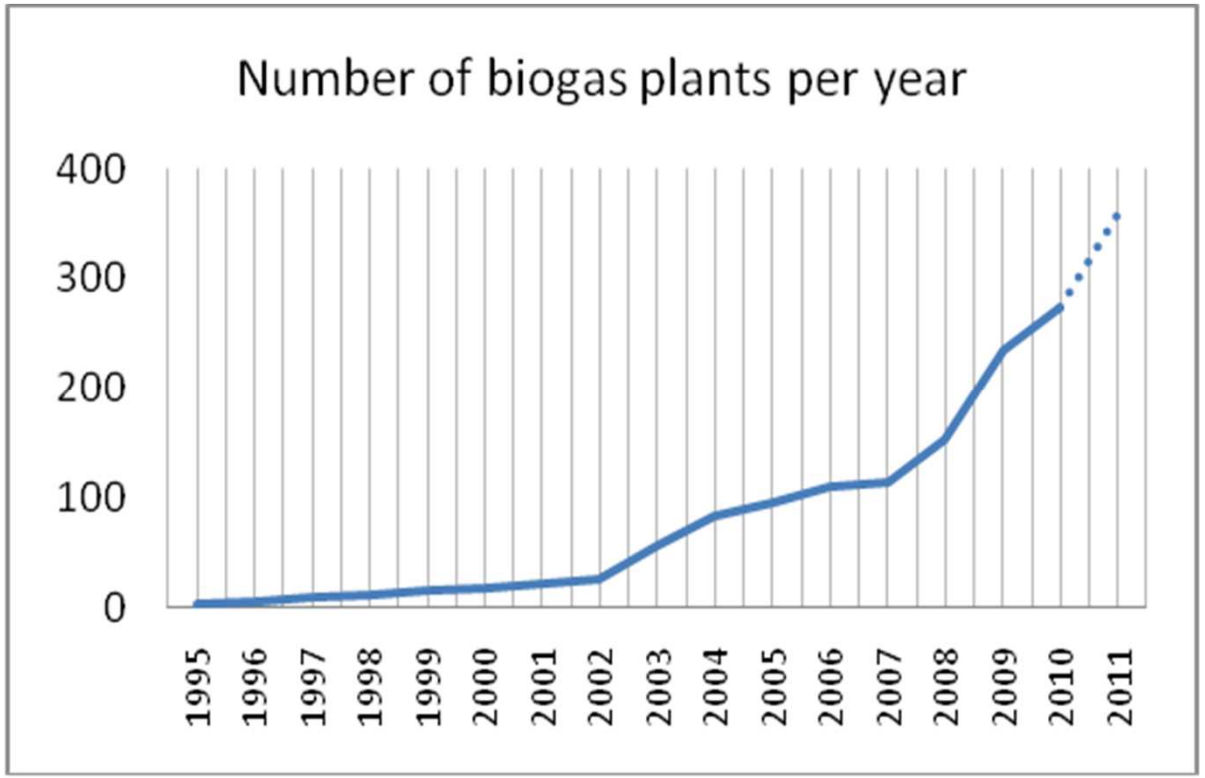
Objectives

- Description of the state of the field (size of the plants, localization, inputs, outputs, main policies)
- Describe the evolution of the field: integrating Farming Style Approach and Neo-Institutional Analysis
- Critical elements and reccomendations

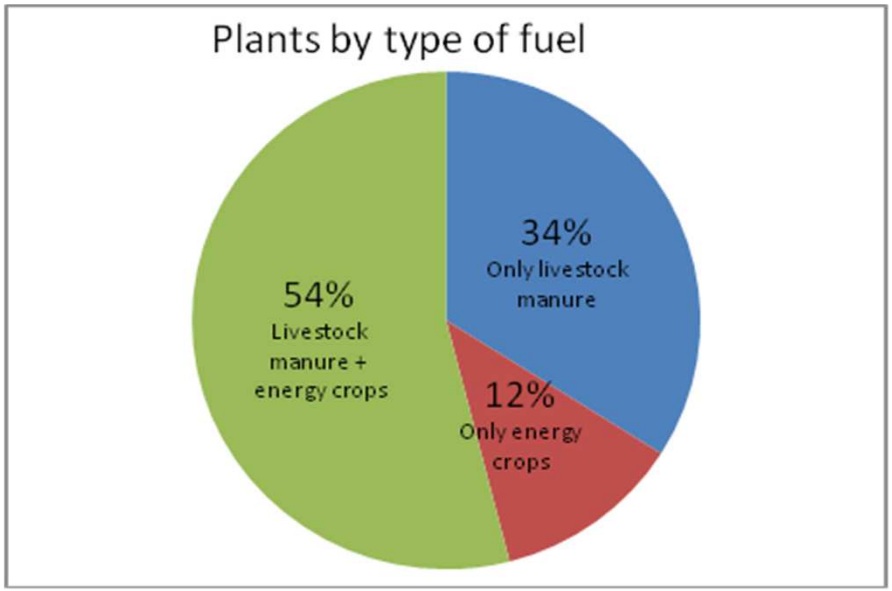
State of the field

From 2002 to 2010 plants increased by more than 200 units. It is estimated that by 2011 close to 100 more plants will be built, bringing the total to around 360.

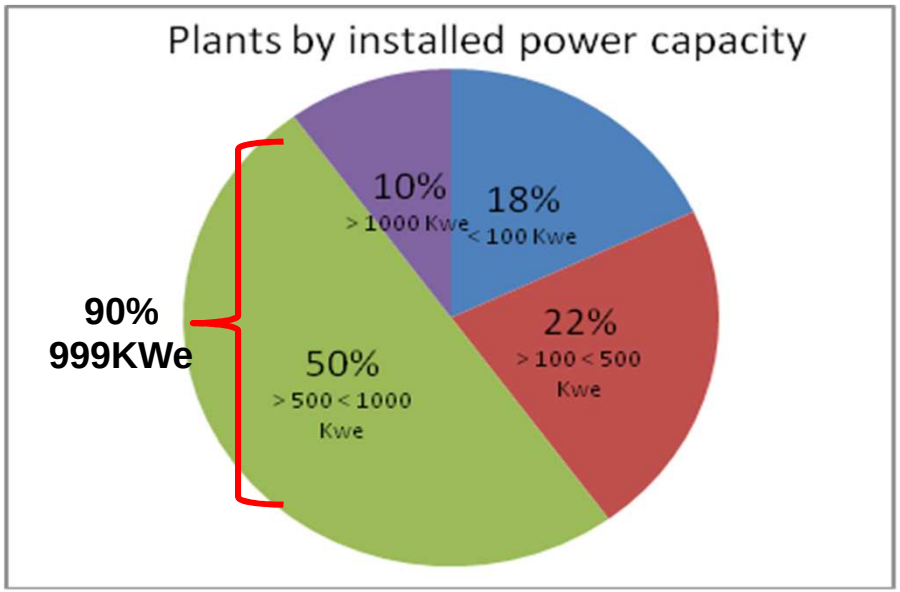
Among the 273 existing plants, 239 are located in the Northern regions.



Graph 1: Number of biogas plants per year in Italy from 1995 trhrough 2010, with projections for 2011
Source: CRPA (2011), Gse, Consorzio Italiano Biogas



Graph 2: Plants by type of fuel 2010
Source: Piccinini (2011), Gse, Consorzio Italiano Biogas



Graph 3: plants by installed power capacity 2010
Source: Piccinini (2011), Gse, Consorzio Italiano Biogas

Energy crops (mais) and livestock manure are the main fuels for biogas digesters.

34% of plants use only livestock manure, 11% use only energy crops, and 54% make use of both types of fuel.

The choice is dictated by the productive model of the farm, but also by the installed power capacity. During the fermentation process, livestock manure is less caloric then cereals.

In order to feed a digester with a capacity of 1 MWe, you need cereals or a mix of fuel.

50% had an installed power capacity between 500 KWe and 1000 KWe, 10% above 1000 KWe, 22% between 100 and 500 Kwe, and 18% less than 100 KWe.

Incentives and subsides:

-Green Certificates for a period of 15 years for plants > 1 MWe
-Feed-in-tariff 28€c/kWh for a period of 15 years < 1 MWe
-Investment subsides: regional funds given for the construction of biogas plants, often through agricultural policies intended to promote rural development or ecological modernization.

		Application of biogas			
		Only Power	**Co-generation (power+heat)**	**Only Heat**	**Injection to the gas grid**
Incentives	**Feed-in tariff**	Yes	Only for power	No	No
	Investment subsides	Yes	Yes	No	No
	Green certificates	Yes	Only for Power	No	No

Table 1: Incentive structure for biogas
Source: original material for this paper based on Italian legislation (2011)

Farming styles: methods of integrating biogas plants into existing farms

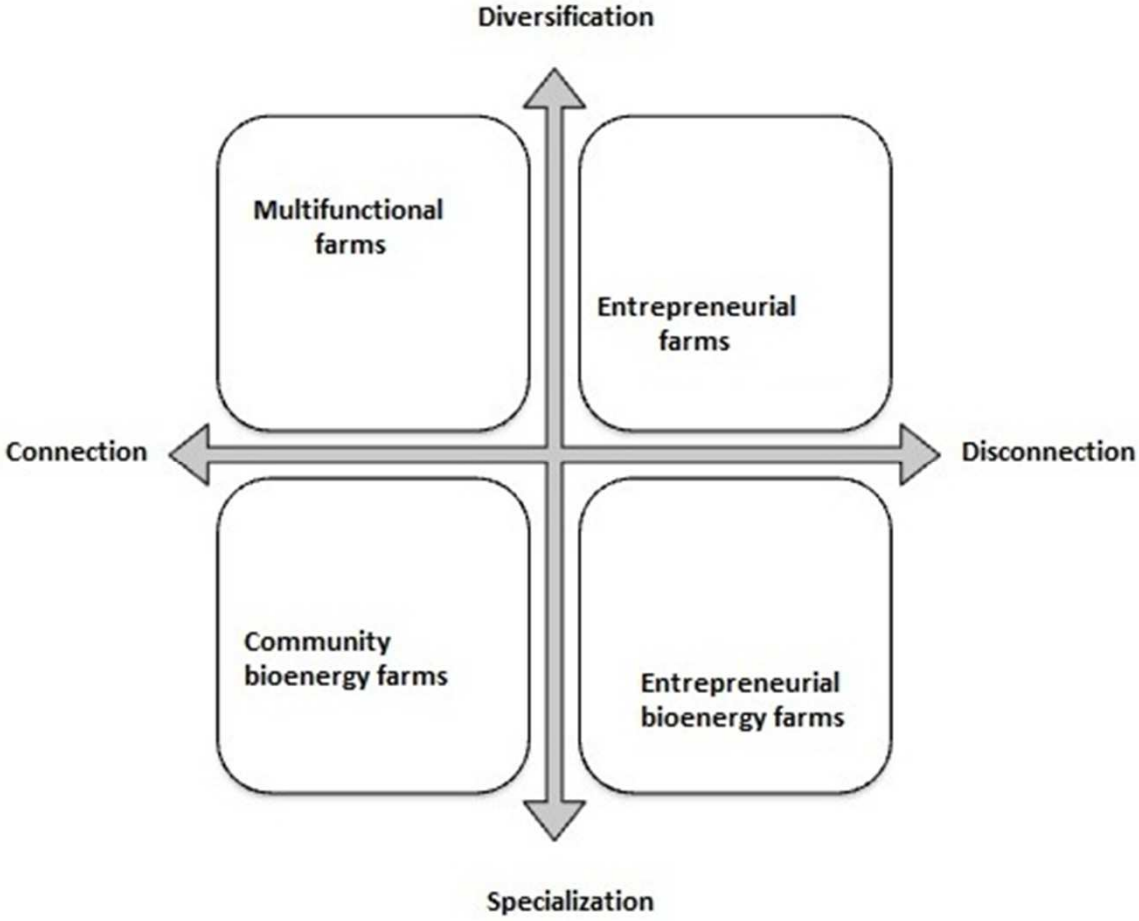


Figure 1: Ideal types of energy producing farms
Source: original material for this paper

The matrix chart (Fig. 1) shows four types of energy-producing farms.

-diversification versus specialization of the farming system as a consequence of the introduction of biogas;
- connection versus disconnection with the communities where the plants are located.

Connection and disconnection refer to the spatial dimension of market relations, both with regard to the supply of energy crops and the distribution of energy produced.

Diversification and specialization, on the other hand, refer to changes in production models of farms that have adopted biogas technology.

From the intersection of the identified characteristics, four types of farm are highlighted: multifunctional farms, entrepreneurial farms, community bioenergy farms and entrepreneurial bioenergy farms.

-Multifunctional Farms (Diversification and Connection):

Biogas is a way to close the productive cycle and increase autonomy from the market. Biogas technology is integrated taking into account the size of the company and internal supply of livestock manure. Often they take part to community projects for the supply of biomass, like local byproducts, and the use of heat. Their size is usually less then 100 KWe. They are small farmers.

-Entrepreneurial Farms (Diversification and Disconnection):

follow a continuous scale enlargement as the dominant trajectory of development. They need biogas production to increase profit margins, expand their farm and ecologically modernize their business. For anaerobic digestion they use a mix of fuels, 20% of manure and 80% of energy crops. They have no relations with local communities. Their size is usually 999 KWe. They are large livestock farmers with lands where they grow energy crops. Often they convert lands from feed production to energy crops.

-Local Bioenergy Farms (Specialization and Connection):

Local cooperatives creating local networks for the supply of livestock manure, energy crops and byproducts as well as integration with local communities for heat distribution. Size is variable.

-Entrepreneurial Bioenergy Farms (Specialization and Disconnection):

Intensive farmers changing their mission. Food and feed production is abandoned and replaced with energy crops. Unusual, but there are some cases. Their size is usually over 1 MWe. They don’t use heat.

The isomorphic trend

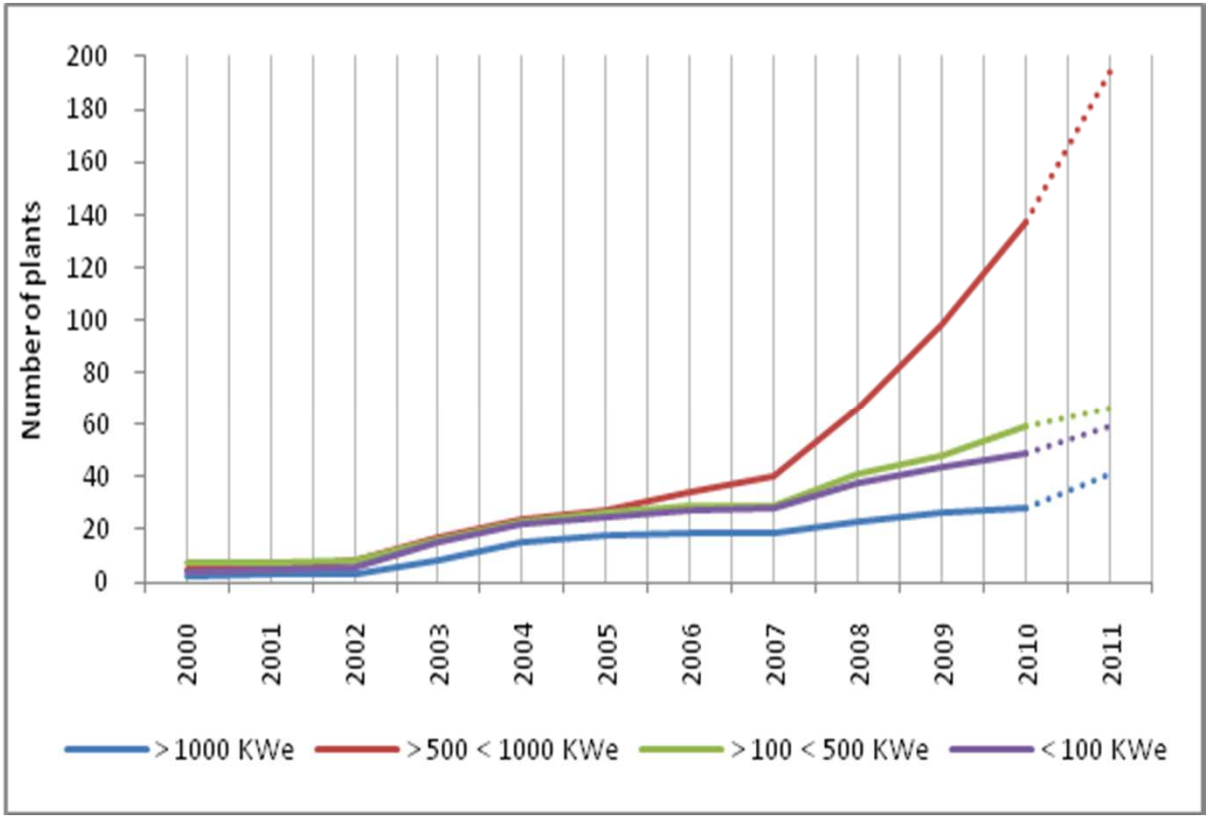


Figura 2 Number of plant per year distinguishing the installed power capacity from 2000 through 2010, and projection for 2011 Source: Piccinini (2011), Gse, Consorzio Italiano Biogas

As we can see from Graph 4, plants with a capacity between 500 and 1000 KWe have become dominant. In 2004 they only made up 29% of the plants. By 2007 they represented 35% and by 2010 they made up 50% of all biogas plants. It is further estimated that by the end of 2011 they will make up 55% of all biogas plants in Italy.

Almost all of these plants, about 90% have an installed capacity of 999 KWe. They use a mix of fuels, they don't have connection with local communities and do not make use of heat.

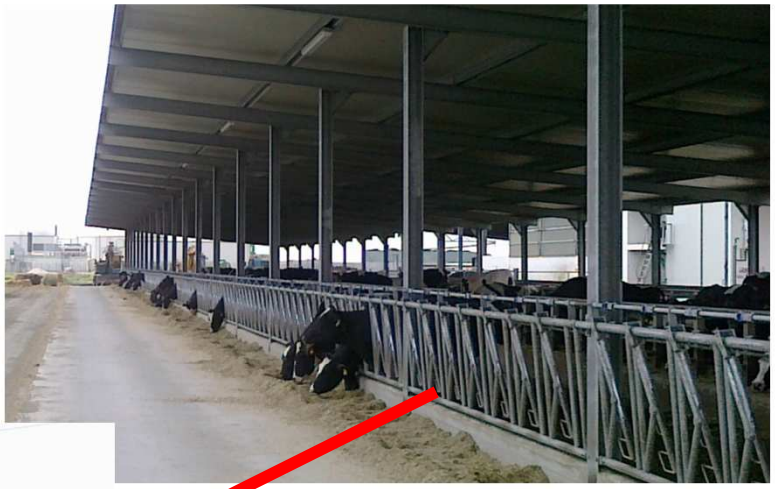
Organizations belonging to an organizational field become similar because of three types of pressure: coercive, normative and mimetic (DiMaggio and Powell, 1991).

COERCIVE: a common legal environment affecting many aspects of an organization's behavior and structure.
-National application of the Nitrate Directive gave the first impetus for adoption of biogas (90s). Later, the evolution of the system of incentives accelerated the adoption process and exerted pressure for the homogenization. The dominance of plants with a power capacity of 999 KWe is justify by the desire of farmers to access to the feed-in-tariff and not to been subject to the legislation on Environment Impact Assessment.

NORMATIVE: arising of a professionalization process. Planners, consultant, bank officials, ecc. impose standardized technology packages, forcing farms to adapt. Often they are inflexible in adapting technologies. Bank officials have an important role: for grant funding they require sppedy return and substantial documentation of the operation of the plants. The best way to ensure meeting the requirements is to replicate an existing plant.

MIMETIC: uncertainty encourage imitation. Farmers imitate existing biogas plants in order to be certain of the result.

Energy crops 80%

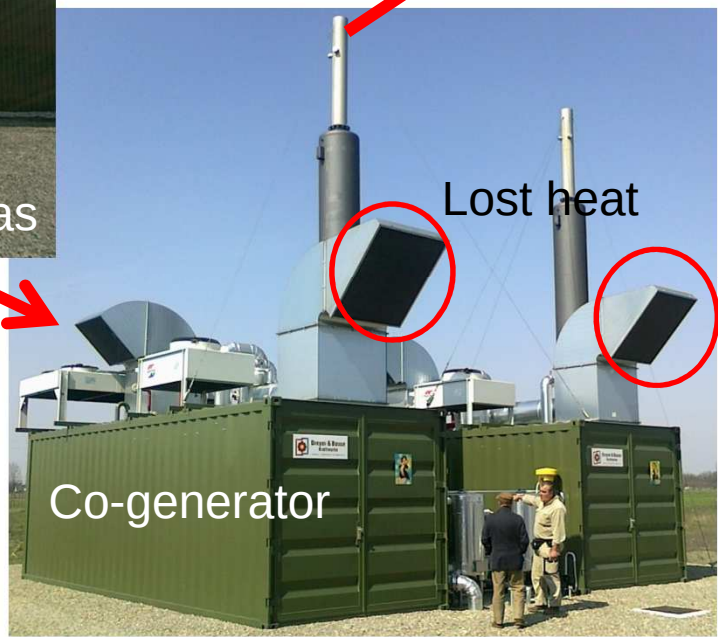


Manure 20%

electricity

Deydrated digested manure

Liquid digested manure



Critical elements and recommendations

-Mode of integrating biogas (and the size of digestors) is determined by external pressures: legislation, subsides, experts…
-The isomorphic process often leads to an inefficient use of resources: different uses of biogas could be more efficient and sustainable.
-Biogas is developing disorderly, there is not an institutional coordination: plants are too close and too big for the surrounding localities
-They are contested by local communities: rising prices of land and food-energy competition
-Energy and rural policies are poorly integrated

-A reorganization of incentives is needed, promoting socio-territorial integration and diversification in the use of biogas
-The need that technology is adapted to local conditions, and not vice-versa.
-The need of a new institutional framework