Livestock waste to biogas: the Italian BiogasDoneRight® model
Biogas Done Right®

Purpose

Improve the traditional farming and livestock activity with agro-energy production

- **Environmental sustainability** (emissions reduction CO$_2$ and NH$_3$, soil and water use efficiency)
- **New Agronomic practices**
- **Economic and social development** (new green jobs, valorisation of agriculture products)
- **Bioenergy without lowering food and feed**

Multifunctional and Sustainable Agriculture
Biogas Done Right®
Circular Model and Rural synergies

G. Bezzi, 2015
Biogas Done Right®

Status

- 3° biogas in the world, behind China and Germany
- 2 Mrd Nmc of methane produced per year
- 4,5 Mrd € of realized investments
- More than 1,300 plants on farms today
- About 1000 MWe installed power and 8 GWhe/year produced
- 12,000 stable jobs from the sector

BIOGAS IN ITALY
Biogas produced only by annual and energy crops and/or manure/sub-products

Replacement of food&feed crops
**BIOGASDONERIGHT®: AGRICULTURAL ECOLOGICAL INTENSIFICATION**

<table>
<thead>
<tr>
<th>Double cropping</th>
<th>1st year</th>
<th>2nd year</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>cover crop</strong></td>
<td>cash crop (soy bean)</td>
<td>cash crop (corn grain)</td>
</tr>
<tr>
<td><strong>nov dec jan feb mar apr</strong></td>
<td><strong>may Jun Jul Aug Sept</strong></td>
<td><strong>nov dec jan feb mar apr</strong></td>
</tr>
</tbody>
</table>

- Biomass produced from Cover Crops (second harvest)
- Food&feed crops are preserved
- Integration with livestock effluents, sub-products and organic waste
- Perennial and nitrogen fixing plant in set-a-side or degraded lands
- Use of digestate and improve soil fertility
Biogas Done Right®
is a positive bioenergy

What is its impact on water?
Biogas Done Right®
Positive impacts for water quality

- Nitrogen leaching risk reduction
- Organic nitrogen stabilization
- Increased organic carbon in soils
- Reduction of chemical fertilizers

- Reduction of aquifer pollution
- Increased water soil capacity
- Increased hydrologic stability
• Year-long soil coverage
• Rotation Crops instead of monocultures
• No tillage, minimum tillage, strip tillage
• Digestate distribution techniques (storage, ombelical, Xerion, ecc.)
• Drip irrigation with renewable fertilizers or liquid fraction of digestate

• Reduction loss by evaporation
• Increased soil yields (10-15%)
• Conservation soil structure
• High water use efficiency
• Water saving (up to 10%) thanks to fertirrigation with liquid digestate
Biogas Done Right®
Reasons for implementing the model

**CONVENTIONAL BIOGAS**

- Increasing energy demand
  - Electricity, Biofuels and Heat
- Renewable raw material
  - Fertilizers and Biochemicals

**BIOGASDONERIGHT®**

- Growing global population
  - Increase of food&feed production
- Safe environment
  - Carbon negative agriculture
  - Clean water and water saving
  - Soil fertility and hydrologic stability
Natural resources optimization

More production per hectare and improve of land use efficiency in agriculture

Improve the competitiveness of agriculture and protection of environment

Return on investment opportunities as land improvement

Optimization of organic cycle

Valorisation of sub products and dedicated crops
Biogas Done Right®

Key Enabling Factors

- In line with EU Roadmap to a Resource Efficient Europe (COM(2011) 571)

- To value waste and byproducts and reduce raw material import

- To optimize agricultural costs (i.e.: cultivation costs drop of 290€/ha following reduction of chemical fertilizer use)

Source: European Environment Agency
Biogas Done Right®
Achieved Outcomes: Soil fertility

From Literature

To Our Results

Organic Matter

Nitrogen

G.Bezzi, 2014
Biogas Done Right®
Achieved Outcomes: Digestate Value

Average savings: - 291,00 €/ha
### Achieved Outcomes: Economic Value

#### Conventional Agriculture vs BIOGASDONERIGHT®

<table>
<thead>
<tr>
<th>Allevamento</th>
<th>Fase 1</th>
<th>Fase 2</th>
<th>Totale parziale</th>
<th>Fase 3</th>
<th>Fase 4</th>
<th>Fase 5</th>
<th>Gestione innovativa</th>
<th>Gestione integrata</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suino da carne</td>
<td>2,313</td>
<td>-7,418</td>
<td>-5,104</td>
<td>5,816</td>
<td>0,246</td>
<td>5,984</td>
<td>12,046</td>
<td>6,942</td>
</tr>
<tr>
<td>Bovino da carne</td>
<td>-12,620</td>
<td>-5,009</td>
<td>-17,629</td>
<td>5,816</td>
<td>0,104</td>
<td>5,984</td>
<td>11,905</td>
<td>-5,724</td>
</tr>
<tr>
<td>Bovino da latte</td>
<td>-4,600</td>
<td>-3,979</td>
<td>-8,580</td>
<td>5,816</td>
<td>0,034</td>
<td>5,984</td>
<td>11,834</td>
<td>3,254</td>
</tr>
</tbody>
</table>

G.Bezzi, A. Ragazzoni 2015
Biogas reduces 13.3% of nitrates in vulnerable areas

Quality of aquifer in Veneto is improved
Biogas Done Right®
Achieved Outcomes: Water Saving

- Liquid fraction of digestate is applied in fertirrigation up to 10% water solution

- Water solution is used with pivot or ranger systems

- Fertirrigation save water and increases yields up to 15%

- Lower concentration of digestate can used in drip fertirrigation

- Whole digestate drip fertirrigation is studied
Biogas Done Right®
Main challenges encountered

- Politics
- Laws
- Public Opinion
• BIOGASDONERIGHT® can fit properly with complex or simple technical solutions that are able to:

- Improve hygienical and environmental conditions
- Improve safety in food preparation
- Improve soil fertility also in sub-Saharan area
- Improve energy availability
- Improve instruction and work

• BIOGASDONERIGHT® is a universal solutions that sustain development.
INCREASE PRODUCTIVITY

Farmers are able to increase productivity with:
- technical improve of farm equipment
- improve soil fertility
- cultivation with reduced inputs
- application of sustainable agricultural intensification

With feeding the soil is possible to feeding the planet safely

NEW AGRICULTURE FOR FOOD & FUEL

Biogas can introduce a New Agriculture for Food & Fuel with Sustainable Agricultural Intensification.

The introduction of Cover Crops for energy, require a double cropping system.

In the same year is possible to produce food and fuel in the same soil.

Biogas is the destination of cover crops.

OPTIMAL USE OF NATURAL RESOURCES

Biogas can optimize the farm production cycle because:
- can valorize subproducts, reduce production costs and improve quality of productions.
- optimize use of fertilizers, water, soil fertility and soil use efficiency.

Today 2906/ha is the average safe cultivation cost in Italy with Biogas.

ENERGY AND DEVELOPMENT

Energy and Food production are at the beginning of development.

BIOGASDONERIGHT® is a sustainable solution to promote safe productions with safe environment.

BIOGASDONERIGHT® solution is simple, reliable and adaptable to promote safe development.

ENVIRONMENT AND SOIL FERTILITY

Digestate can close the carbon cycle with improve organic matter in soil.

The soil is good sink for atmospheric carbon in order to reduce global warming.

Biogas can introduce a Carbon Negative Agriculture and when the digestate is used properly can safe environment.
Thank you

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“Examples of Positive Bioenergy and Water Relationships”  
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