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Livestock waste to biogas: the Italian BiogasDoneRight® model

GBEP – IEA Bioenergy Workshop
"Examples of Positive Bioenergy and Water Relationships"
Royal Swedish Academy of Agriculture and Science (KSLA)
Stockholm, 25-26 August 2015

Biogas Done Right®

Purpose

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

- **<u>Environmental sustainability</u>** (emissions reduction CO_2 and NH_3, soil and water use efficiency)
- **<u>New Agronomic practices</u>**
- **<u>Economic and social development</u>** (new green jobs, valorisation of agriculture products)
- **<u>Bioenergy without lowering food and feed</u>**

Multifunctional and Sustainable Agricolture

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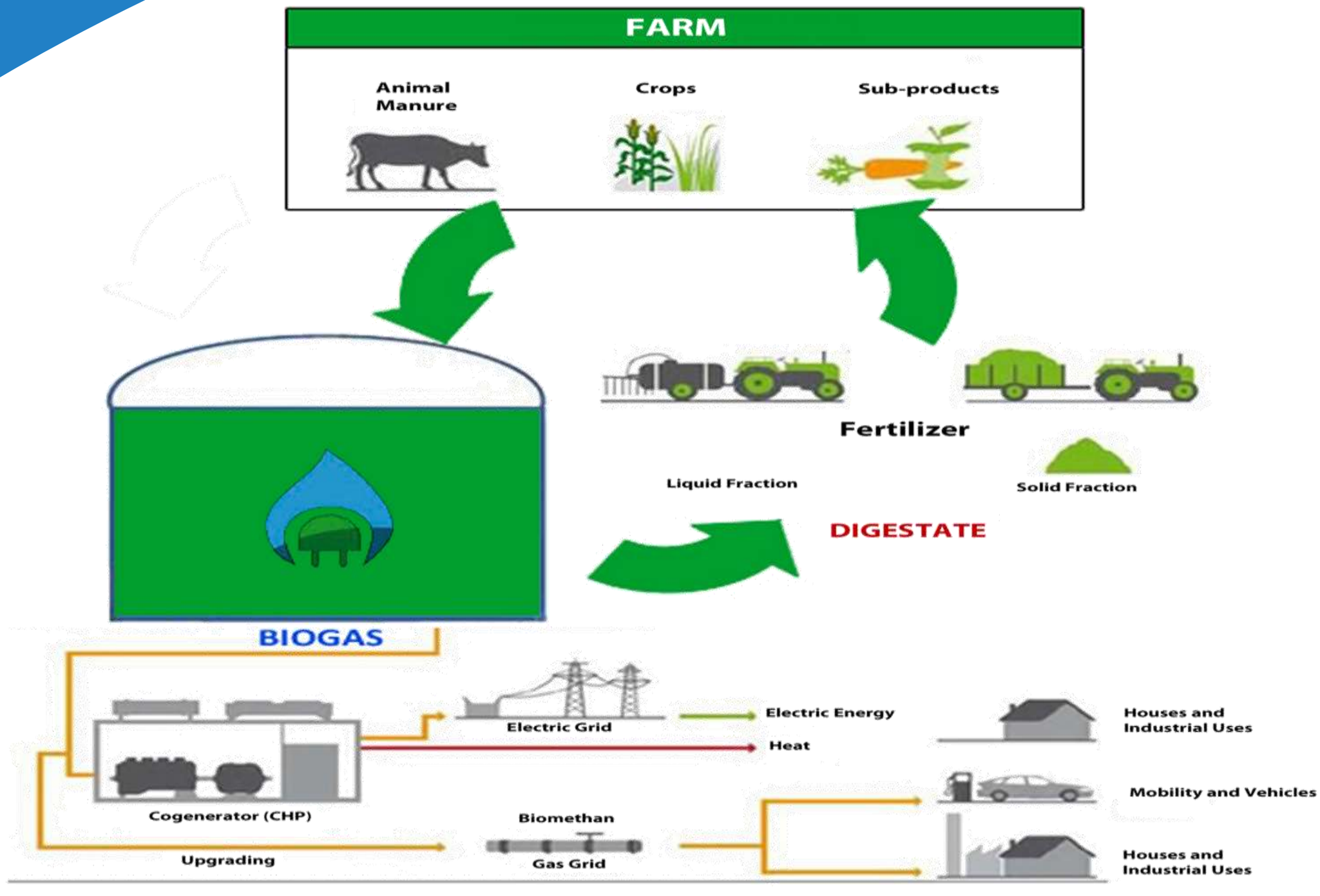
Circular Model and Rural synergies



G.Bezzi, 2015

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Status

BIOGAS IN ITALY

- **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

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Status

BIOGAS FROM CONVENTIONAL AGRICOLTURE

monocropping	1st year												2nd year											
	bare soil					corn grain							bare soil					soy bean						
	nov	dec	jan	feb	mar	apr	may	Jun	Jul	Aug	Sept	oct	nov	dec	jan	feb	mar	apr	may	Jun	Jul	Aug	Sept	oct
	GHG emissions (CO2, N2O, etc.) soil C erosion												*GHG emissions (CO2, N2O, etc.) soil C erosion*										

- Biogas produced only by annual and energy crops and/or manure/sub-products
- Replacement of food&feed crops

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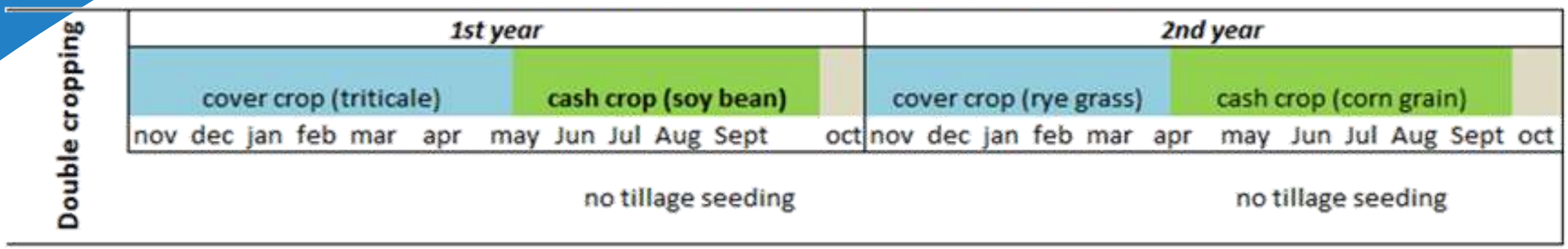
Status

BIOGASDONERIGHT®: AGRICOLTURAL ECOLOGICAL INTESIFICATION



cover crop for energy
cash crops food/feed market
bare soil

- 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

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is a positive bioenergy

What is its impact on water?

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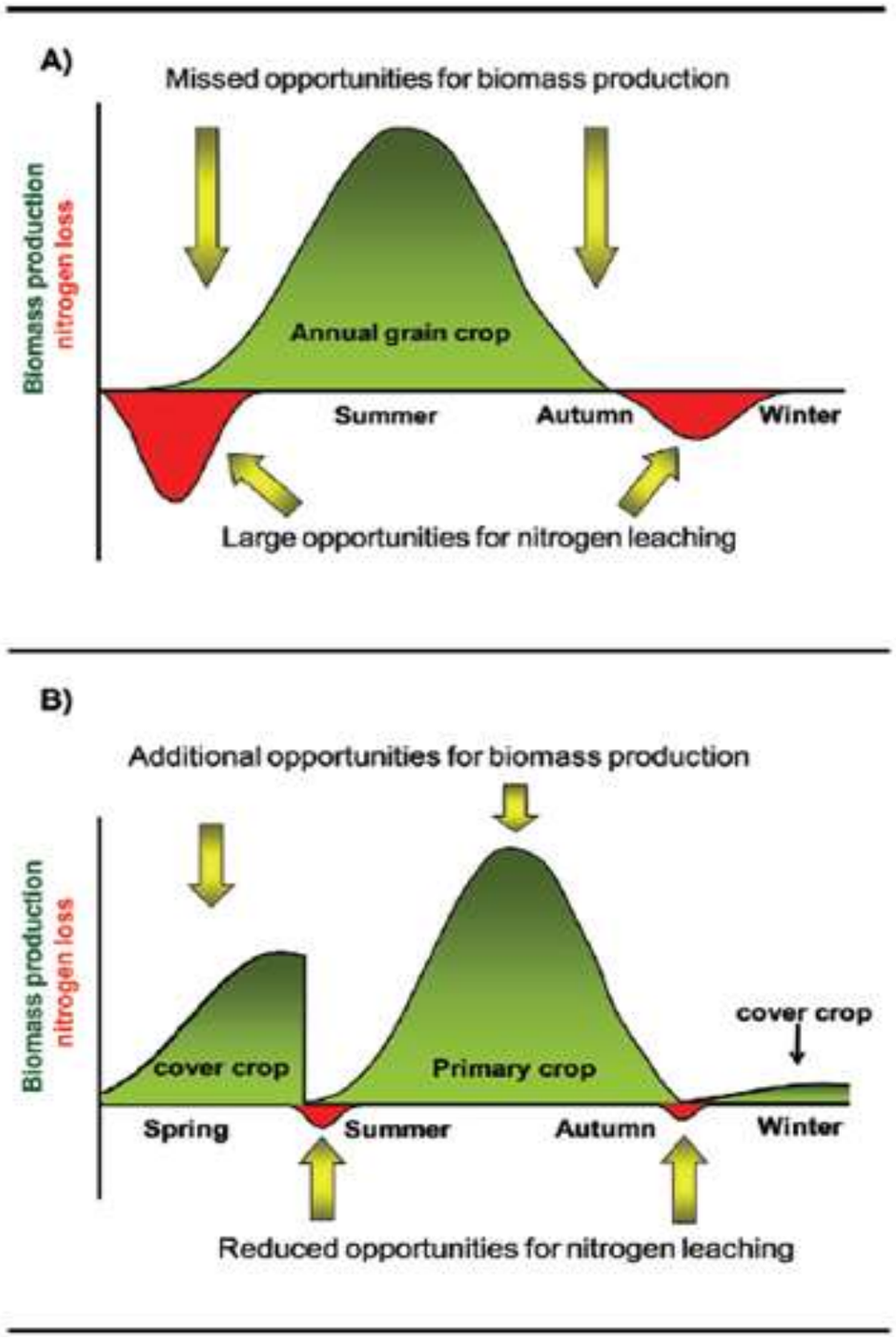
Positive impacts for water quality



- 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**

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Positive impacts for water availability

- Year-long soil coverage
- Rotation Crops instead of monocoltures
- 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**

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Reasons for implementing the model

CONVENTIONAL BIOGAS

Increasing energy demand

⬇

Electricity, Biofuels and Heat

Renewable raw material

⬇

Fertilizers and Biochemicals

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Growing global population

⬇

Increase of food&feed production

Safe environment

⬇

Carbon negative agriculture

Clean water and water saving

Soil fertility and hydrologic stability

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Reasons for implementing the model

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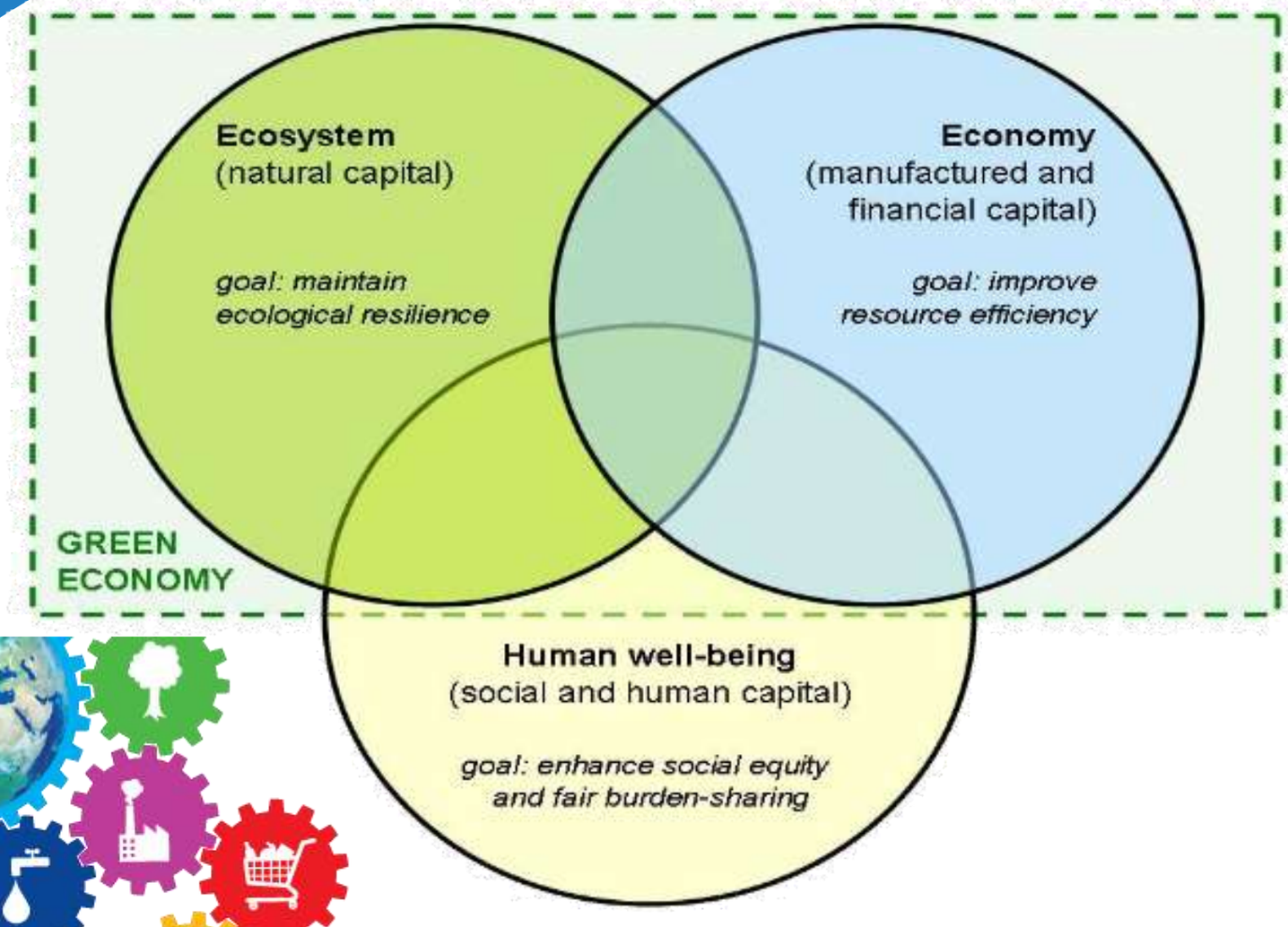
Key Enabling Factors



Source: European Environment Agency

- 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)

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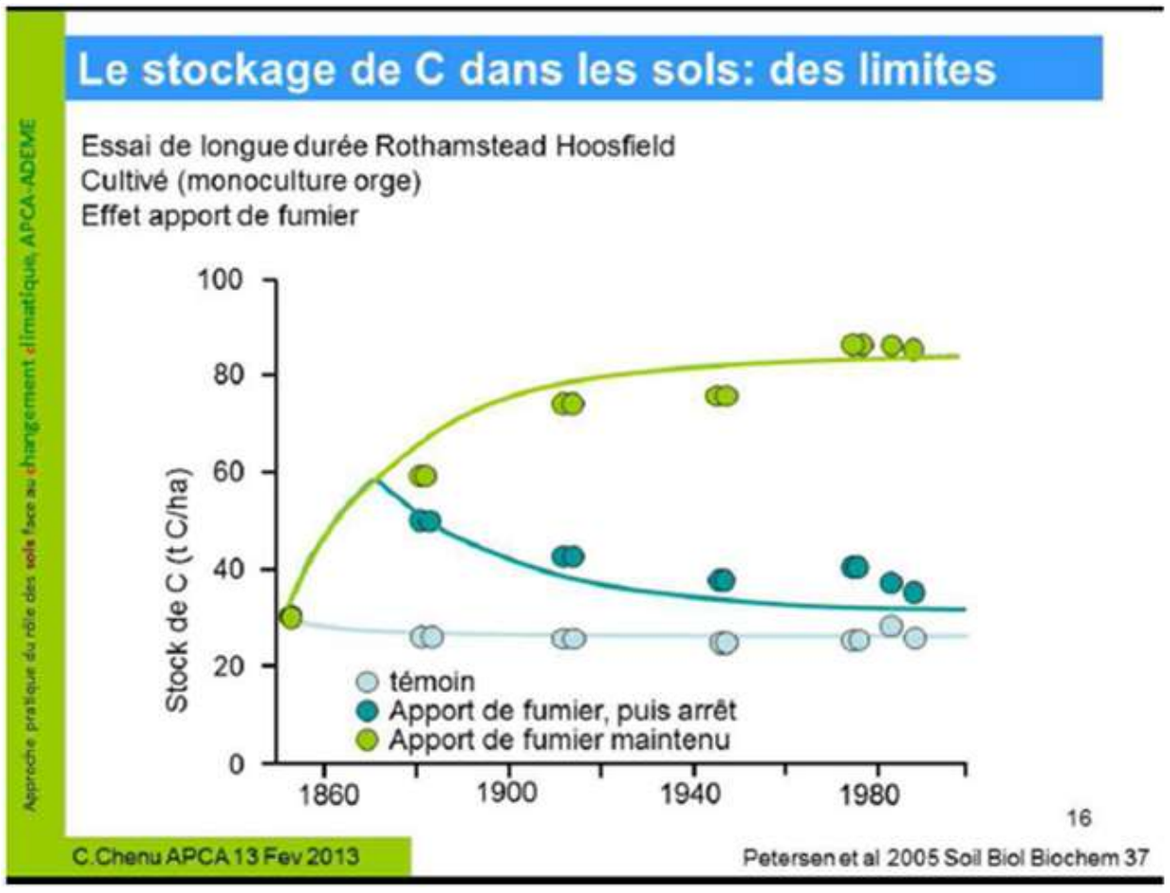
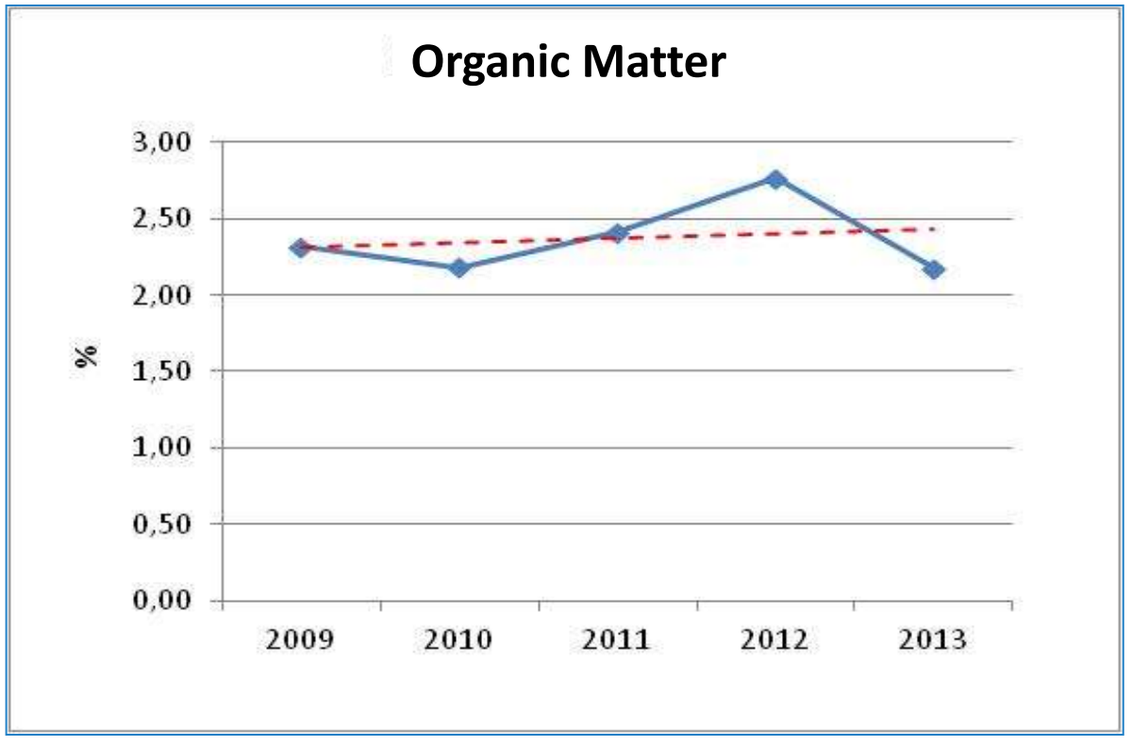
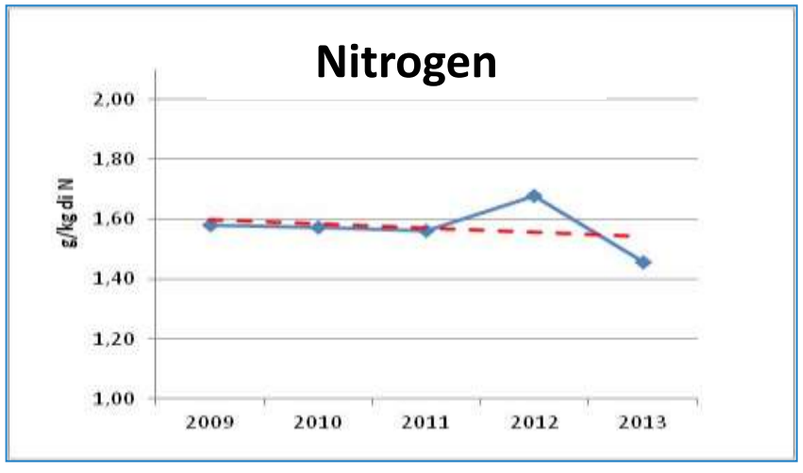
Achieved Outcomes: Soil fertility

From Literature



To Our Results





Annual Content

5-year Trend

G.Bezzi, 2014

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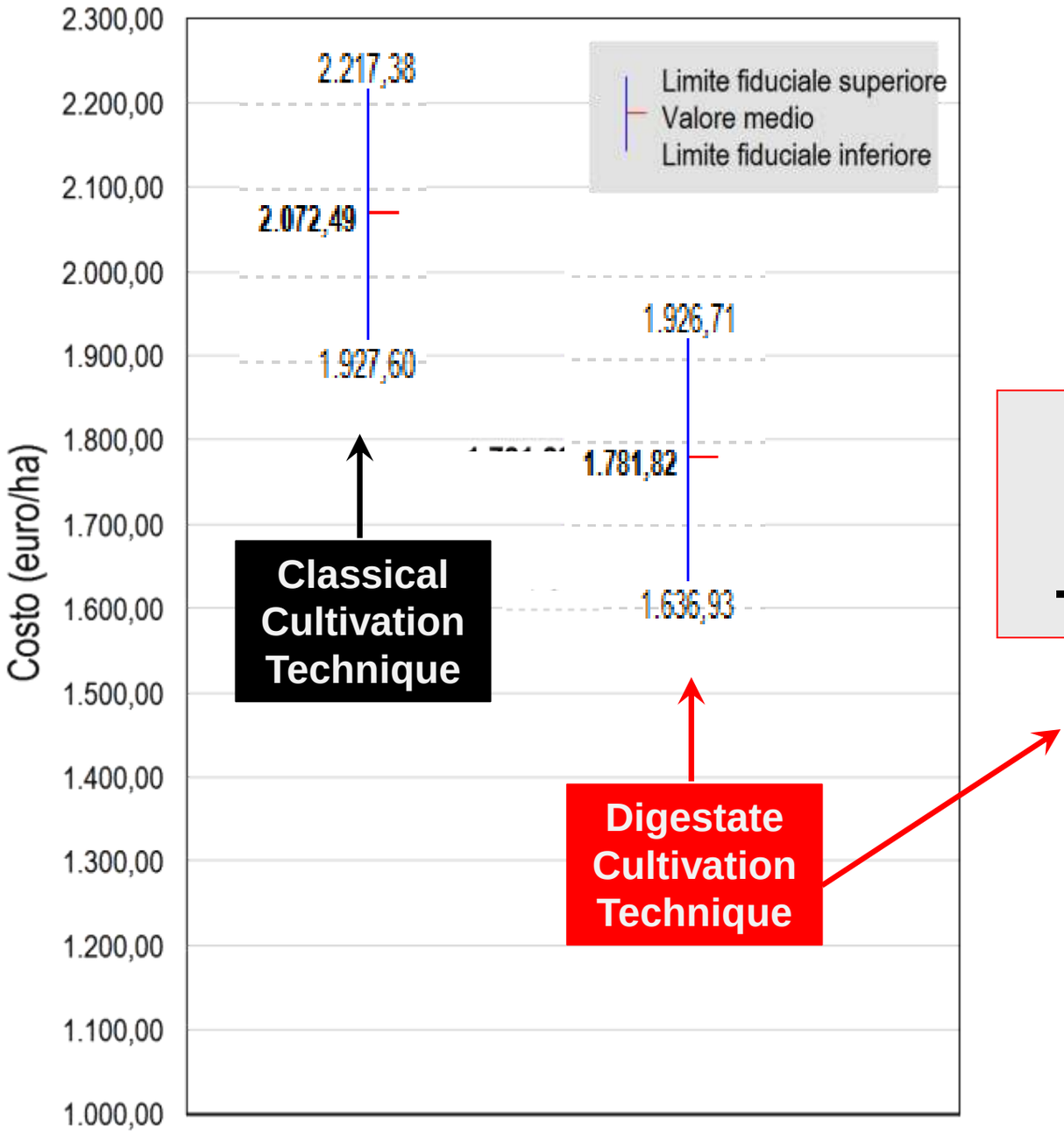
Achieved Outcomes: Digestate Value



Average savings:
- 291,00 €/ha

G.Bezzi, A. Ragazzoni 2015

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Achieved Outcomes: Economic Value

	Conventional Agriculture			BIOGASDONERIGHT®				
Allevamento	Fase 1 Allevamento (euro/ton)	Fase 2 Rispetto Direttiva (euro/ton)	Totale parziale Fase 1 e 2 (euro/ton)	Fase 3 Biogas (euro/ton)	Fase 4 Separaz. digestato (euro/ton)	Fase 5 Tecnica colturale (euro/ton)	Gestione innovativa Fase 3 - 4 - 5 (euro/ton)	Gestione integrata Fasi totali (euro/ton)
Suino da carne	2,313	-7,418	-5,104	5,816	0,246	5,984	12,046	6,942
Bovino da carne	-12,620	-5,009	-17,629	5,816	0,104	5,984	11,905	-5,724
Bovino da latte	-4,600	-3,979	-8,580	5,816	0,034	5,984	11,834	3,254

G.Bezzi, A. Ragazzoni 2015

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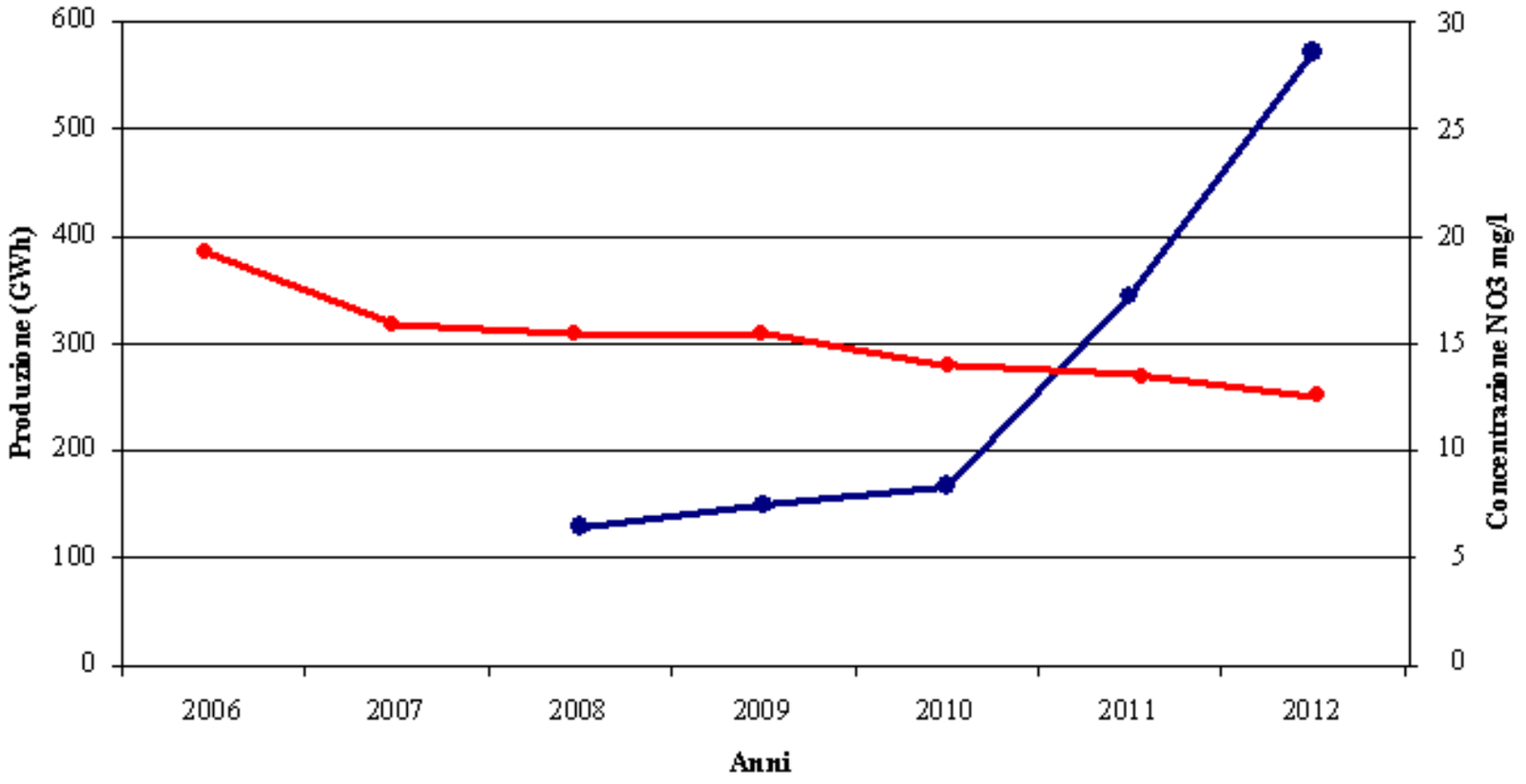
Nitrates Leaching



Development of biogas and management of the nitrates in Veneto

P.Belcaro, F.Schenato, 2015

- Biogas reduces 13,3% of nitrates in vulnerable areas
- Quality of aquifer in Veneto is improved

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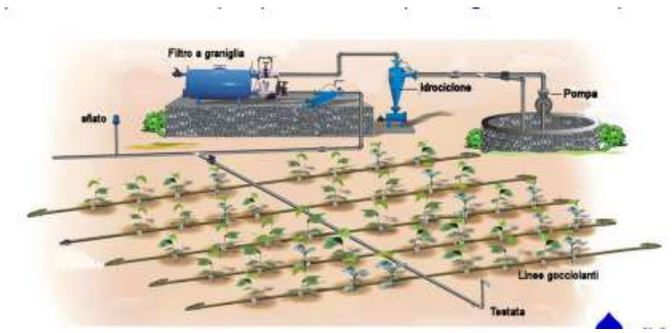
Achieved Outcomes: Water Saving



- 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

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Main challenges encountered

Politics

Laws

Public Opinion

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Potential Scaling-up and replicability

• BIOGASDONERIGHT® can fit properly with complex or simple techinical solutions that are able to:

- Improve igienical and environmental conditions

-Improve safety in food preparation

-Improve soil fertility also in sub-saharian area

- Improve energy availability

-Improve instruction and work

• BIOGASDONERIGHT® is a universal solutions that sustain development.

BIOGASDONERIGHT® CONCEPT

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

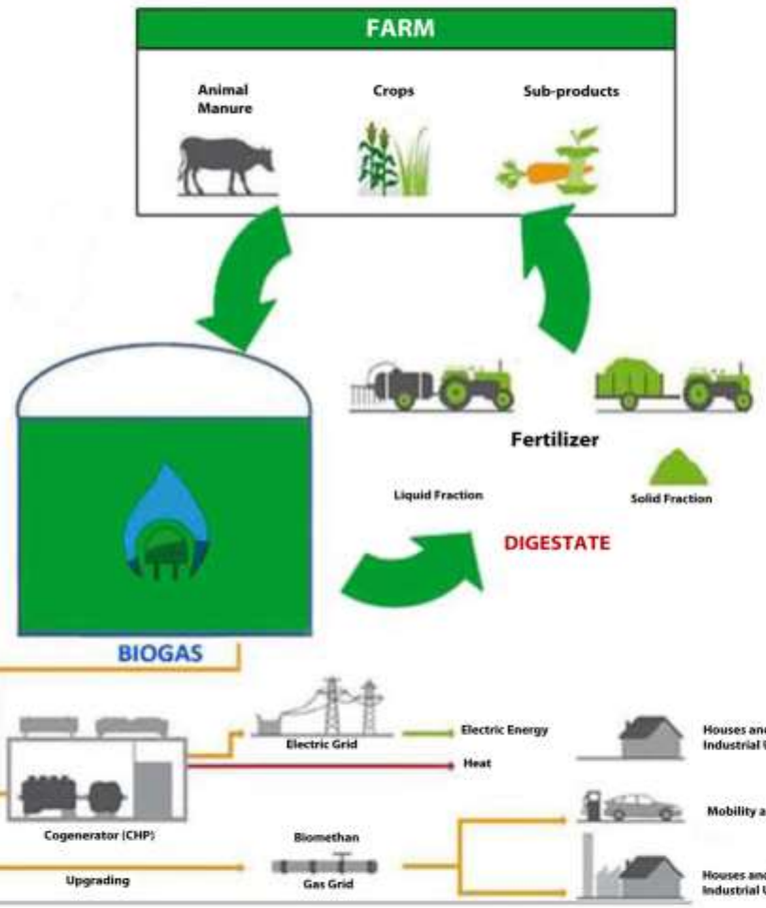
NEW AGRICOLTURE FOR FOOD&FUEL

Biogas can introduce a New Agricolture for Food & Fuel with Sustainabile 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 290€/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 atmosferic carbon in order to reduce global warming.

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

Thank you

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