



ABREN
ASSOCIAÇÃO BRASILEIRA DE RECUPERAÇÃO
ENERGÉTICA DE RESÍDUOS

MINISTÉRIO DE
MINAS E ENERGIA



**PÁTRIA AMADA
BRASIL**
GOVERNO FEDERAL

Workshop de Fontes Energéticas no Âmbito do Planejamento de Longo Prazo Recuperação Energética de Resíduos (Waste-To-Energy)

Italian biomethane and biogas scenario

Lorenzo Maggioni, R&D CIB

Brasilia, 17 October 2019



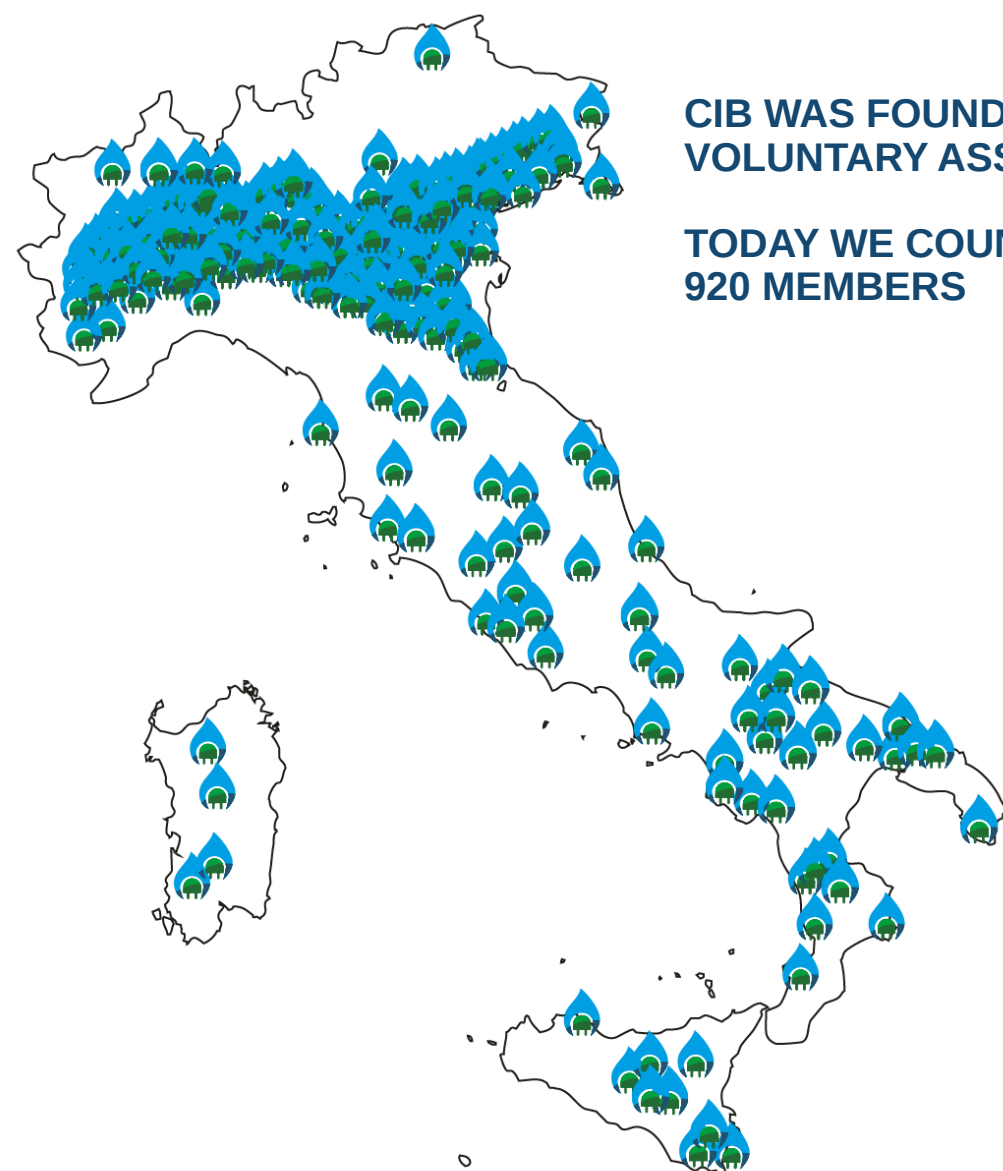
CIB –Consorzio Italiano Biogas

728 FARMERS

71 BIOGAS PLANT MAKER

CIB WAS FOUNDED IN 2006 AS A VOLUNTARY ASSOCIATION

TODAY WE COUNT MORE THAN 920 MEMBERS



7 RESEARCH CENTRES AND INSTITUTIONS



119 INDUSTRIAL AND SERVICE COMPANIES



Biogas: state of the art

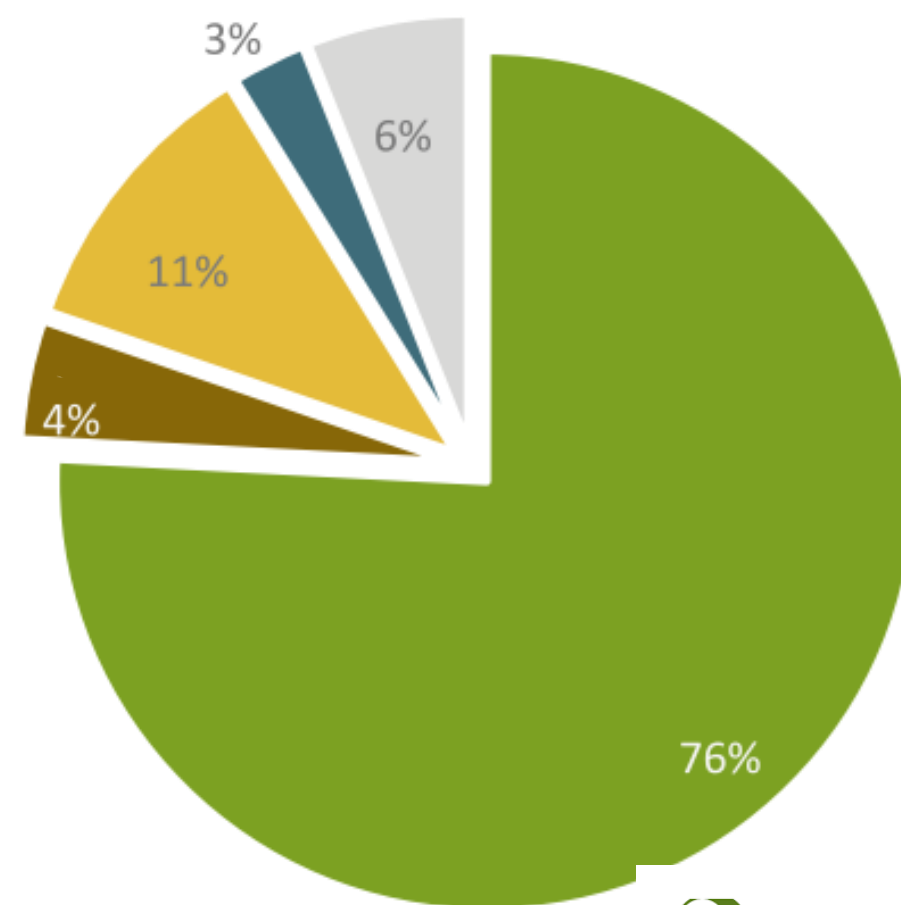
2,000 biogas plants -> 1,400 MW.
Of these 80% in agriculture

4 billion euros in investments

12,000 permanent jobs

10 TWh of renewable electricity ->
approx. 2.5 billion cubic meters of
biomethane

Quality thermal energy





“Renewable and low carbon gas can play an important role to meet the Paris Agreement target”

- Based on conservative assumptions it is possible to produce 122 billion cubic meters (bcm) of renewable gas in the EU by 2050. This gas consists of 98 bcm biomethane, that is sustainably produced while improving the farmer's incomes and boosting rural development
- Using this renewable gas, smartly combined with renewable electricity using the existing gas infrastructure can lead to 138 billion euro of annual cost savings by 2050 compared to an energy system in which no gas is used.

UPGRADING UNIT



CH_4 : 55-65%

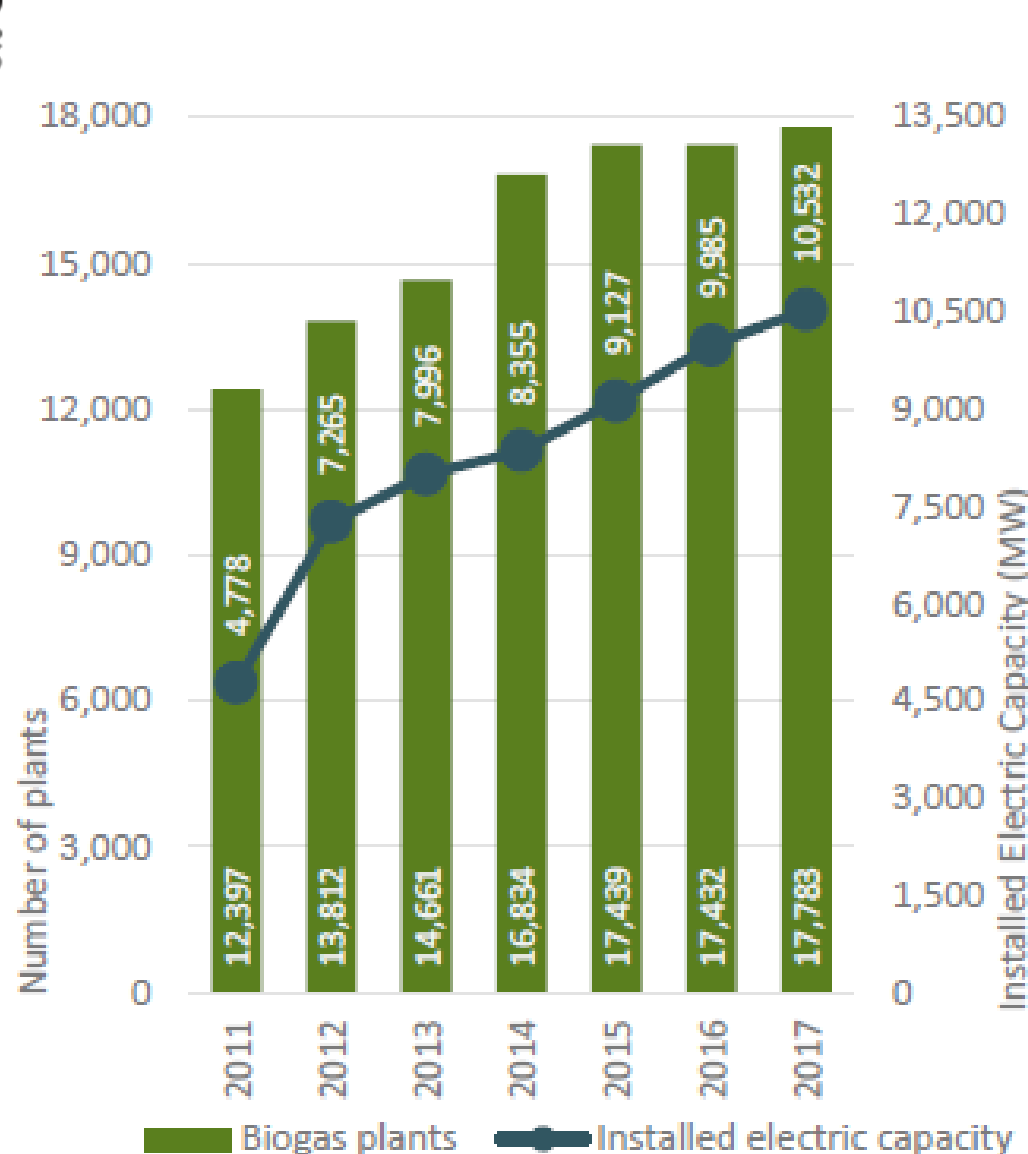


$\text{CH}_4 > 97\%$

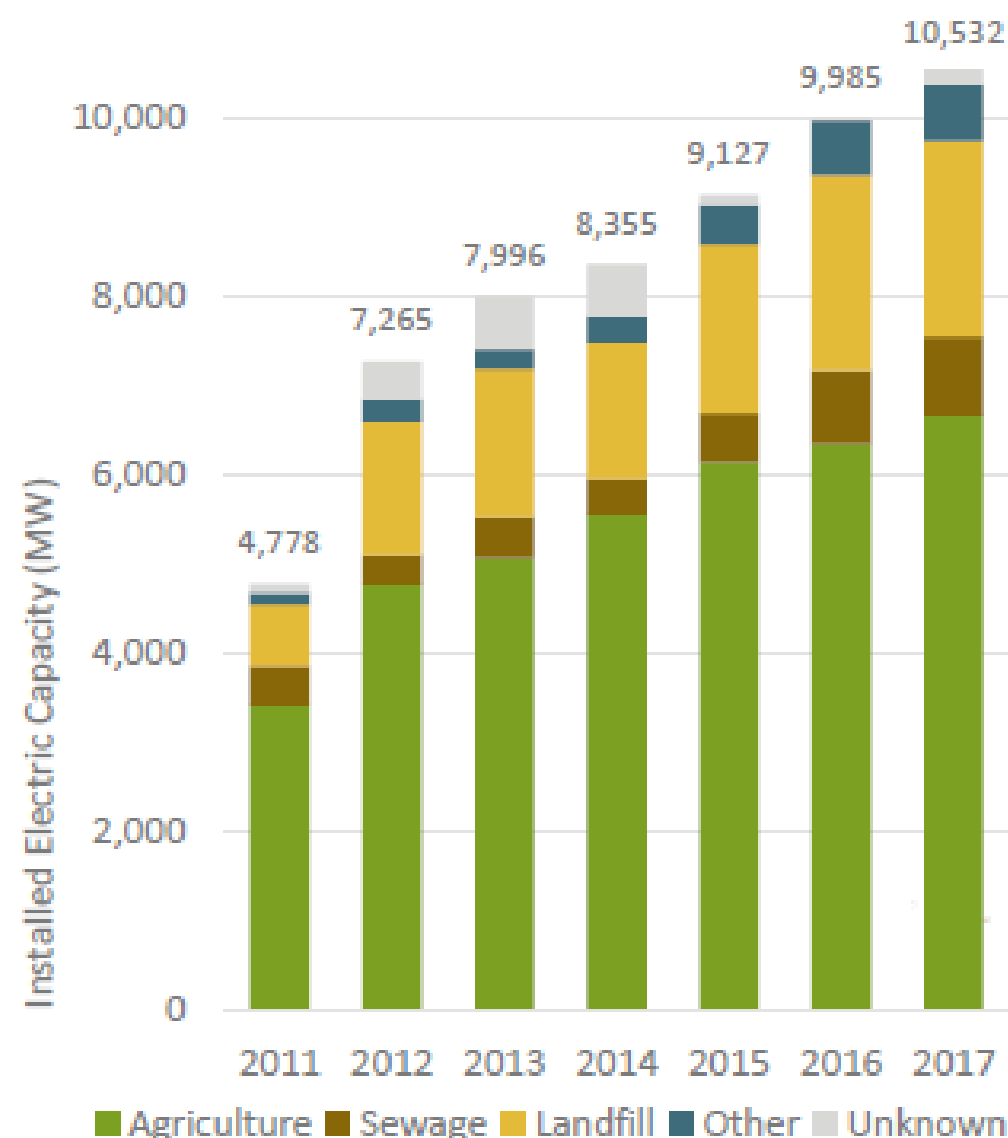
Italian D.Lgs 28/2011:

BIOMETHANE “...gas produced from renewable sources with the characteristics and usage conditions corresponding to those of natural gas and suitable for injection into the natural gas grid. $\text{CH}_4 > 97\%$ ”

Present situation in Europe: biogas plants



Development of the total biogas
Installed Electric Capacity in Europe set
against the total number of biogas
plants



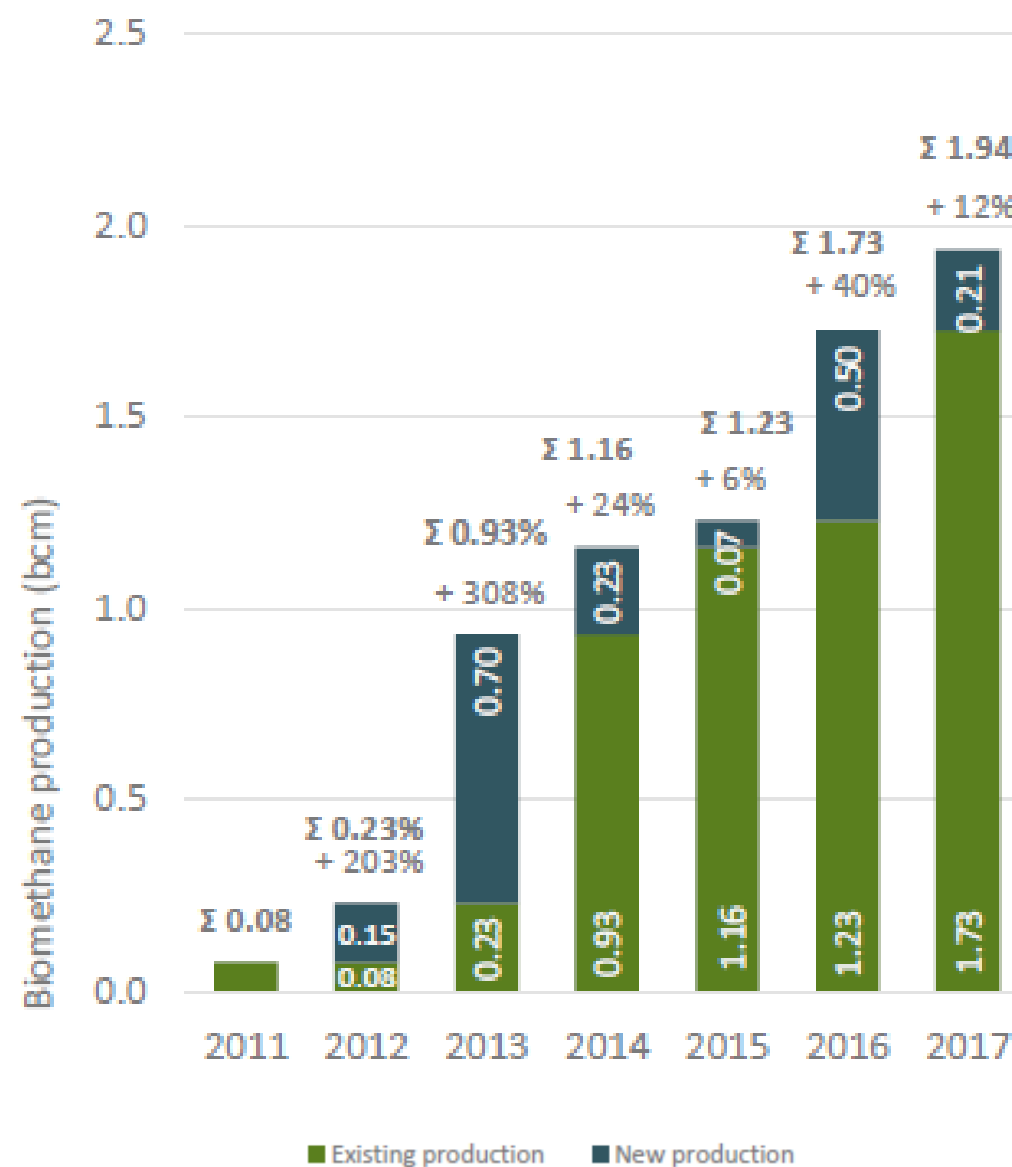
Development of the total biogas IEC
(MW) by feedstock

EBA 2018. "Statistical Report of the European Biogas Association 2018." Brussels, Belgium, December 2018

Present situation in Europe: biomethane plants



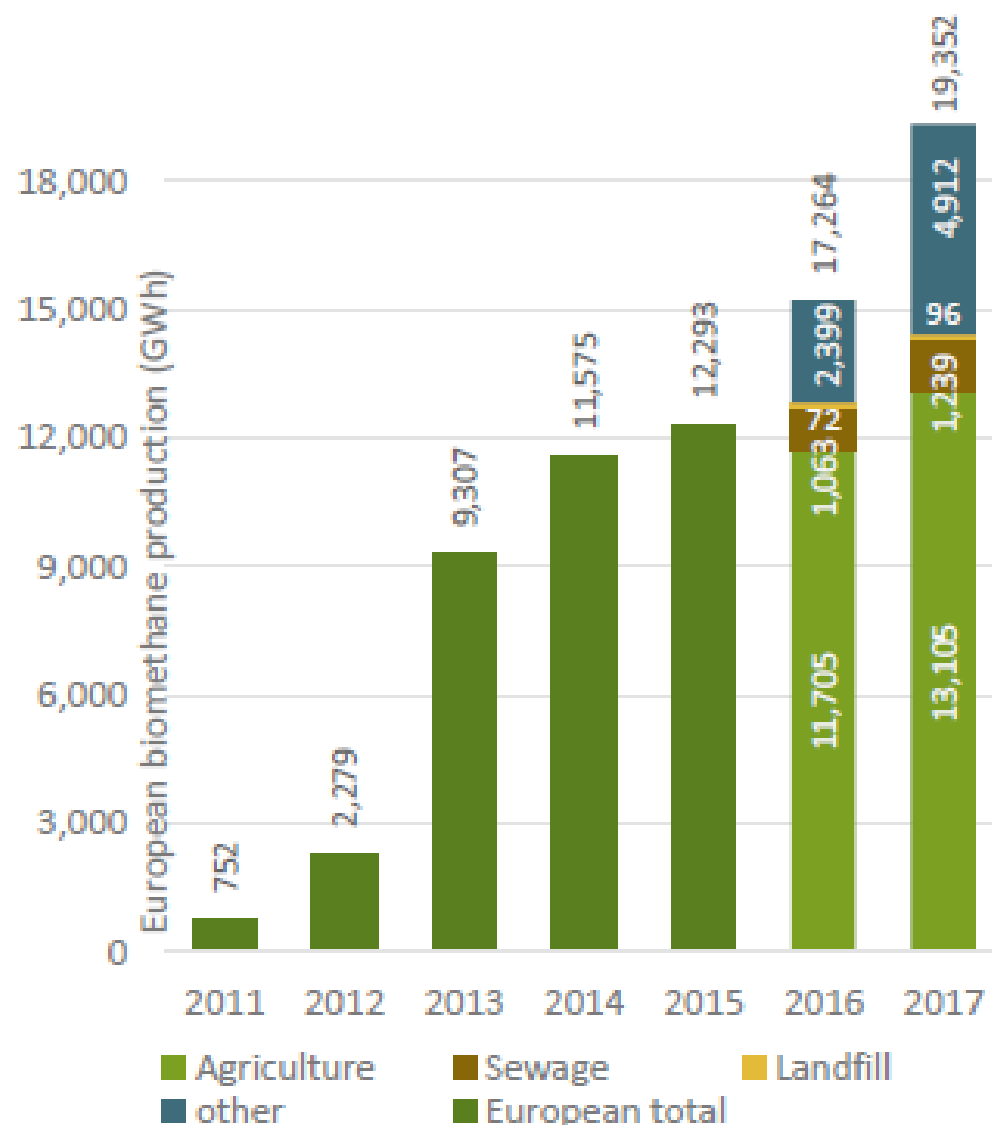
Development of the number of biomethane plants in Europe



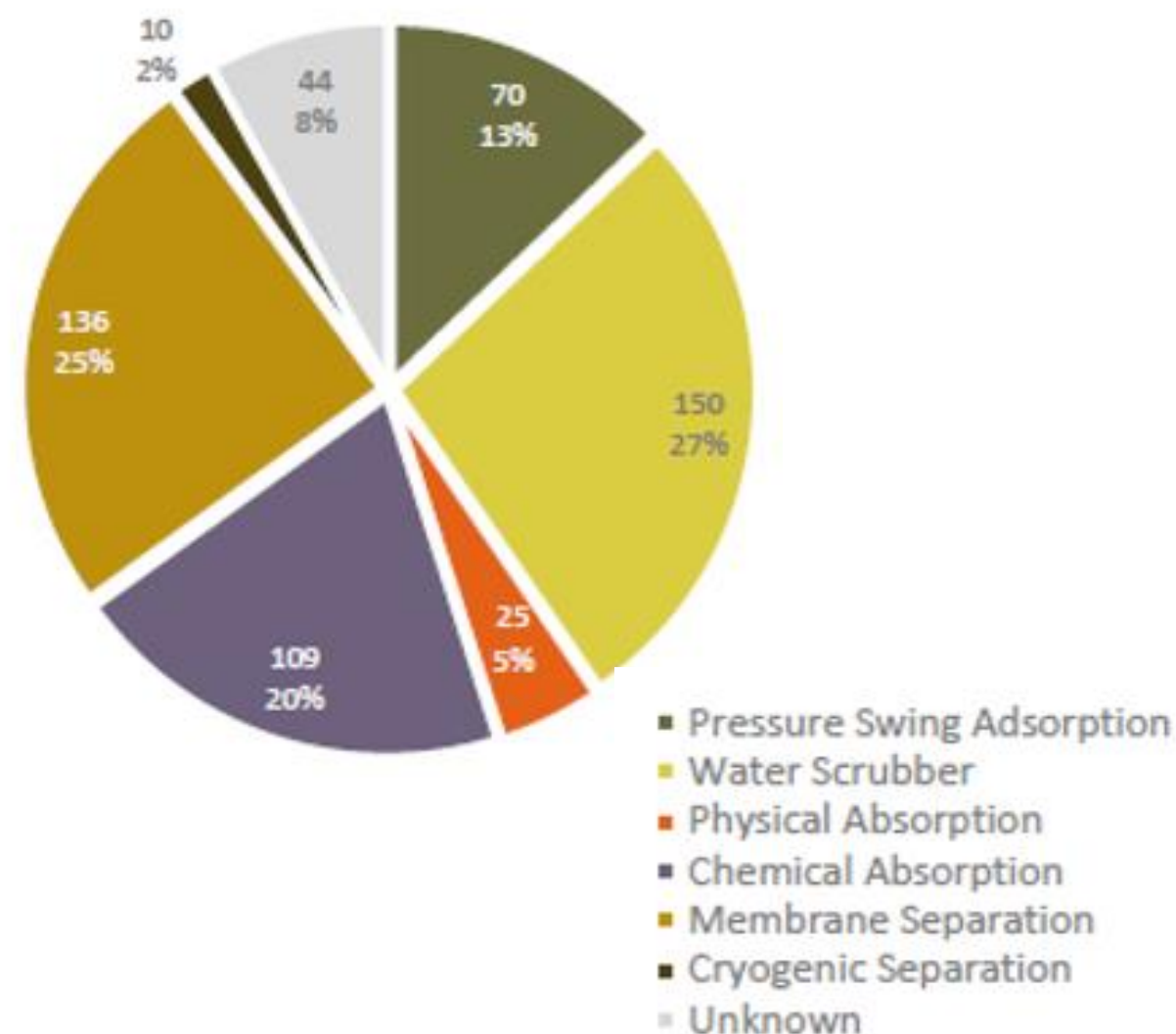
Development of European biomethane production in bcm

EBA 2018. "Statistical Report of the European Biogas Association 2018." Brussels, Belgium, December 2018

Present situation in Europe: biomethane plants



Development of European biomethane production by feedstock type in GWh



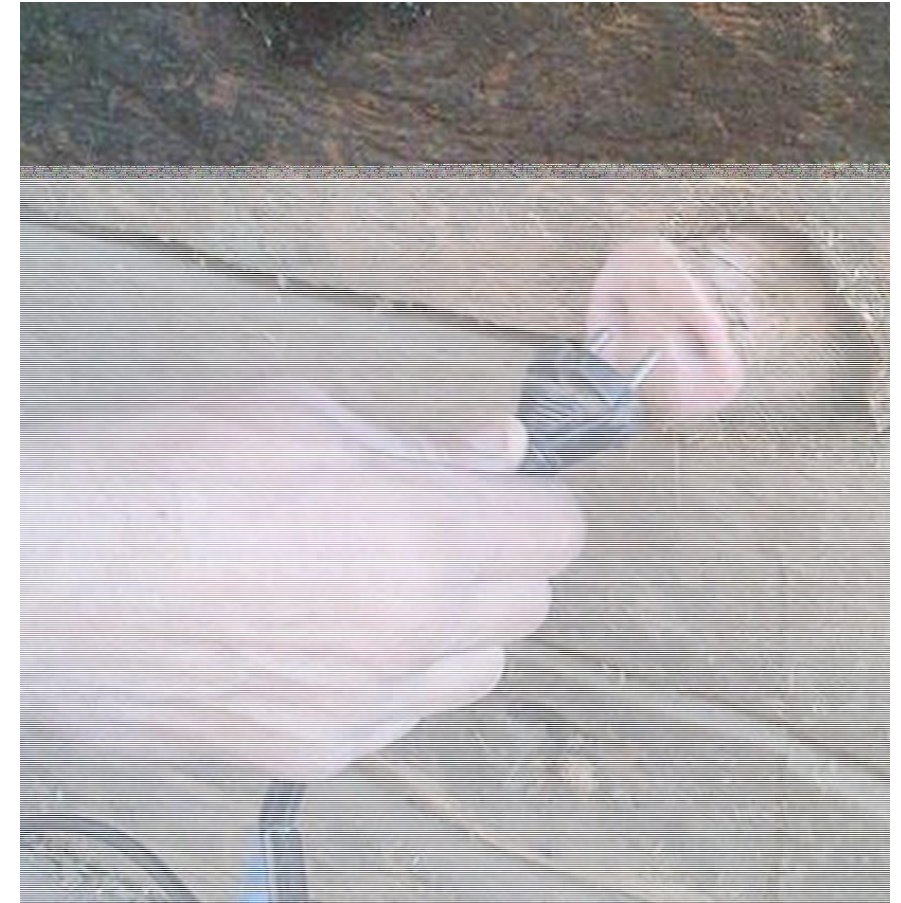
Relative use of different upgrading techniques, Europe-wide

EBA 2018. "Statistical Report of the European Biogas Association 2018." Brussels, Belgium, December 2018

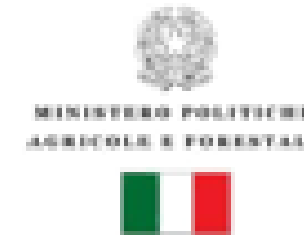
CURRENT SITUATION

Biogas in Italy

- **2nd European market after Germany**
- **> 4 Billion € invested in the last 6 years**
- **> 1.800 biogas plants built (*agriculture + sewage + waste + industrial*).**
- **> 1.300 MW_{el}** *(for the moment biogas used only for electricity production!)*
- **About 3 billion Nm³ Biomethane equivalent utilized per year**
- **12.000 qualified green jobs created thanks to biogas**

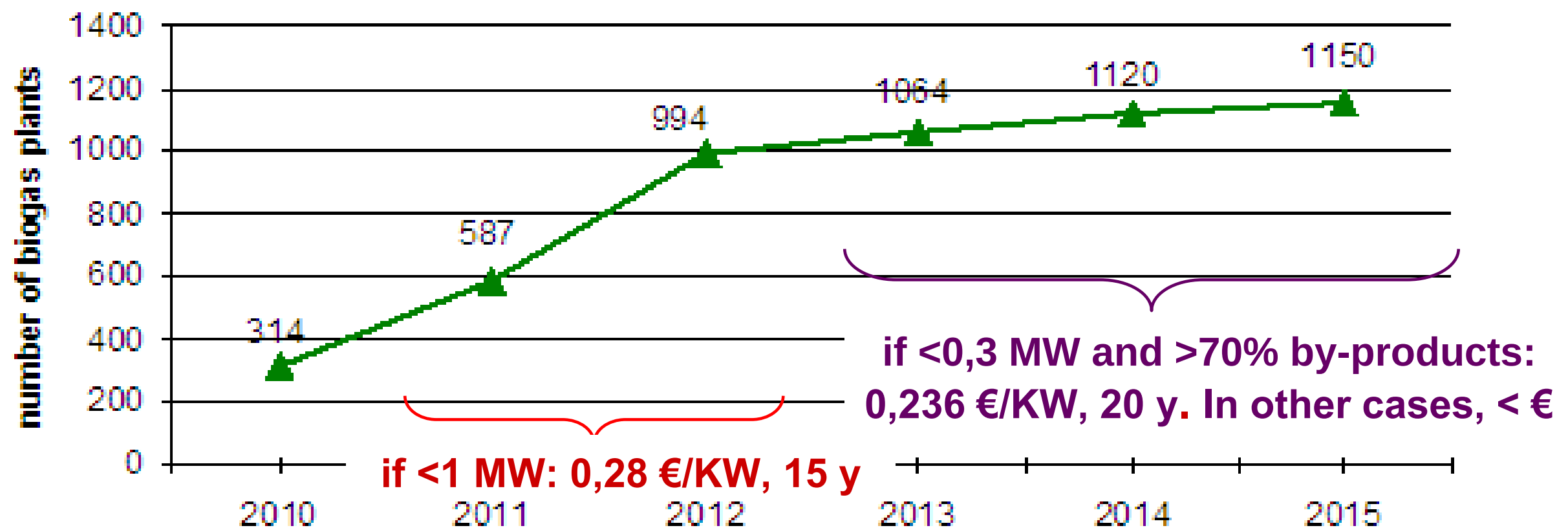


Biogas production in Italy from 2013 to June 2015



NEW INCENTIVES FOR GENERATING ELECTRICITY FROM BIOGAS IN 2013

D.M. 6 July 2012



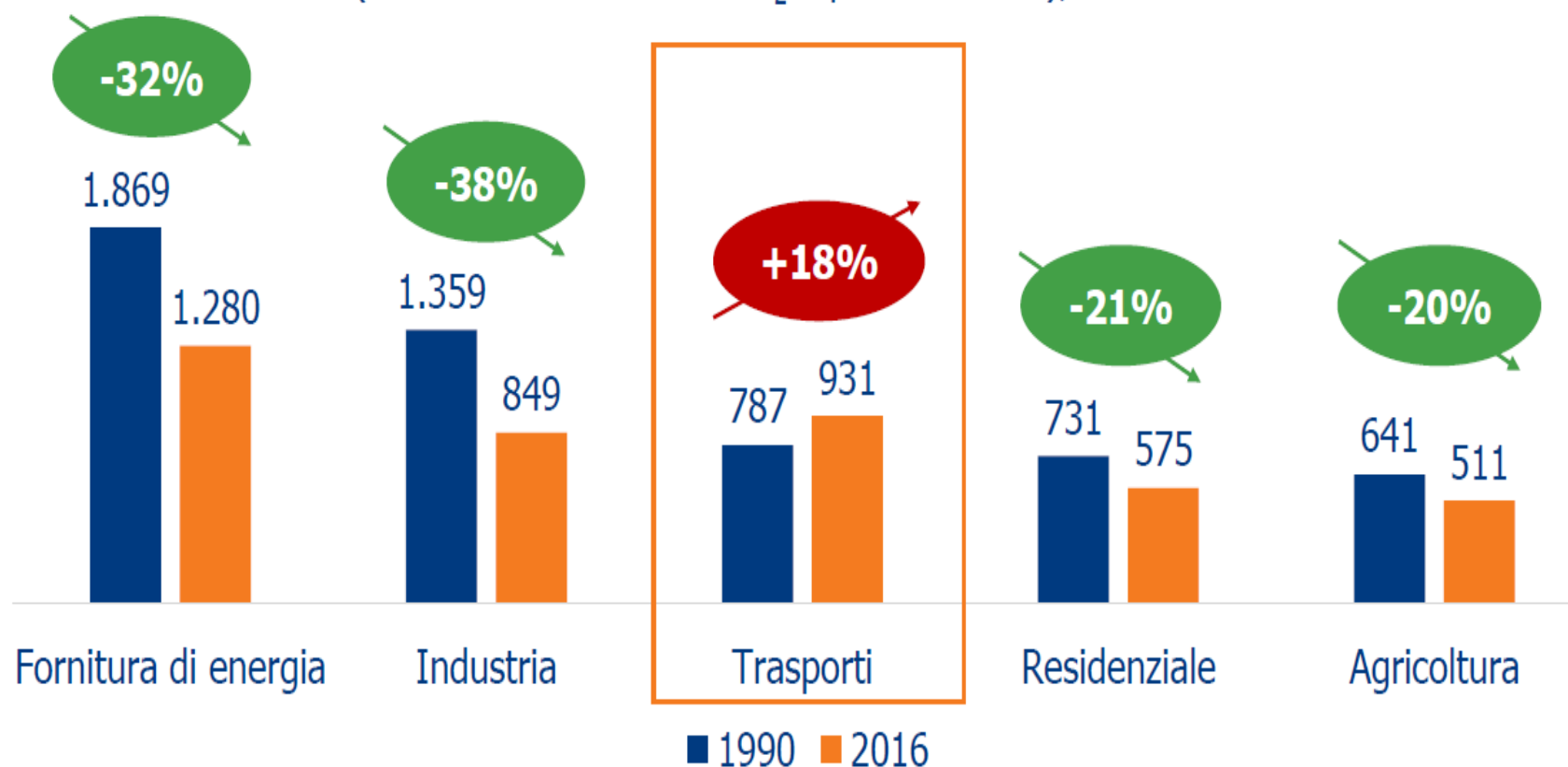
Only agricultural biogas plants. Year 2015: estimated data.

CURRENT SITUATION

Il punto di partenza: nonostante le emissioni totali in Europa siano diminuite negli ultimi 25 anni, nel settore dei trasporti è avvenuto il contrario

Emissioni di CO₂ e variazione percentuale per settore nei Paesi UE-28

(milioni di tonnellate di CO₂ equivalenti e %), 1990-2016



SERIE GENERALE

*Spediz. abb. post. - art. 1, comma 1
Legge 27-02-2004, n. 46 - Filiale di Roma*

Anno 159° - Numero 65

GAZZETTA UFFICIALE



DELLA REPUBBLICA ITALIANA

PARTE PRIMA

Roma - Lunedì, 19 marzo 2018

SI PUBBLICA TUTTI I
GIORNI NON FESTIVI

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AMMINISTRAZIONE PRESSO L'ISTITUTO POLIGRAFICO E ZECCA DELLO STATO - VIA SALARIA, 691 - 00138 ROMA - CENTRALINO 06-85081 - LIBRERIA DELLO STATO
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La Gazzetta Ufficiale, Parte Prima, oltre alla Serie Generale, pubblica cinque Serie speciali, ciascuna contraddistinta da autonoma numerazione:

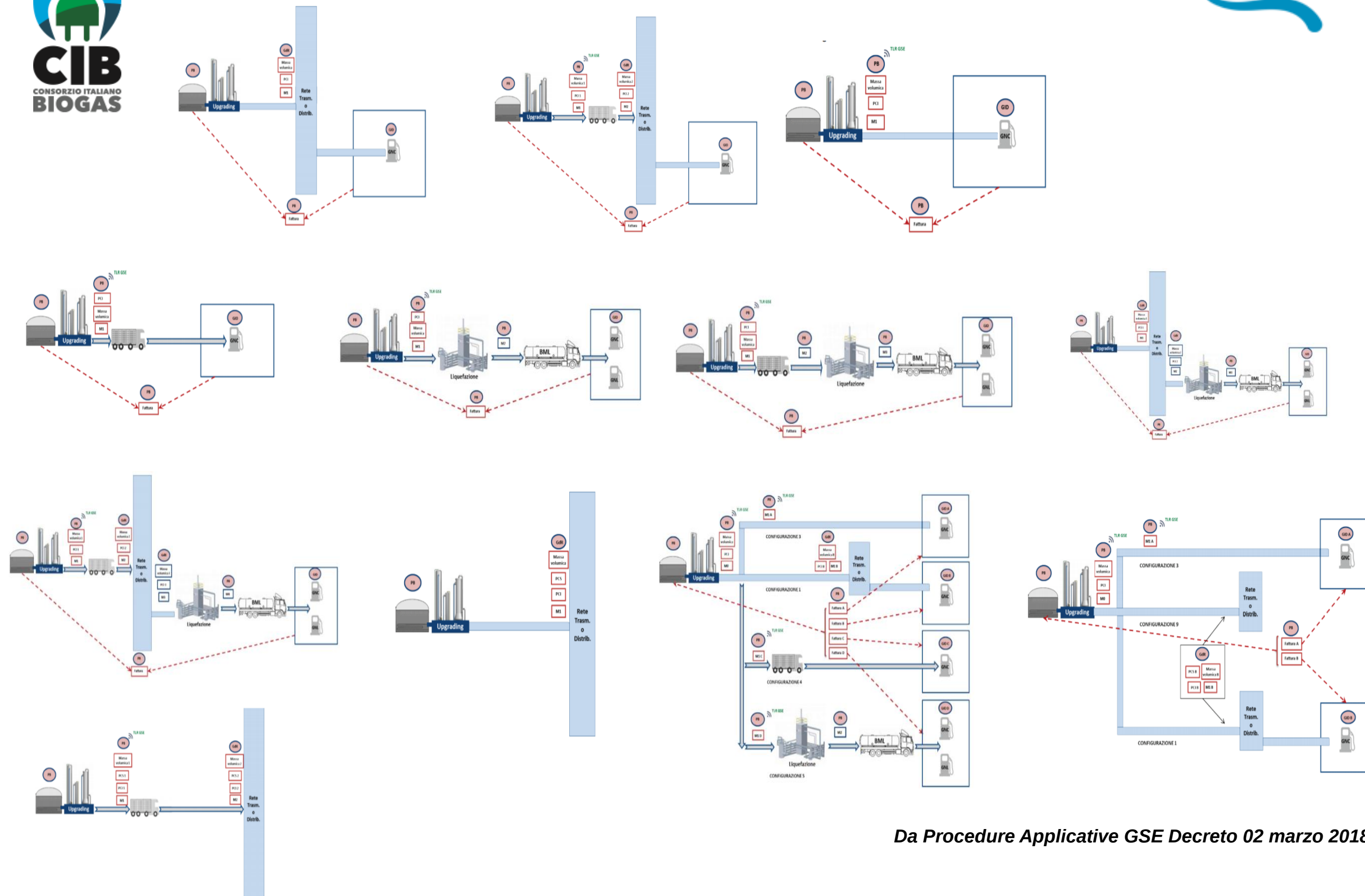
- 1ª Serie speciale: Corte costituzionale (pubblicata il mercoledì)*
- 2ª Serie speciale: Unione europea (pubblicata il lunedì e il giovedì)*
- 3ª Serie speciale: Regioni (pubblicata il sabato)*
- 4ª Serie speciale: Concorsi ed esami (pubblicata il martedì e il venerdì)*
- 5ª Serie speciale: Contratti pubblici (pubblicata il lunedì, il mercoledì e il venerdì)*

La Gazzetta Ufficiale, Parte Seconda, "Foglio delle inserzioni", è pubblicata il martedì, il giovedì e il sabato

AVVISO ALLE AMMINISTRAZIONI

**Maximum biomethane
production with subsidies:
1,1 billion m³/year**

CURRENT REGULATION



Da Procedure Applicative GSE Decreto 02 marzo 2018



Atto Completo Avviso di rettifica Errata corrige Lavori Preparatori

MINISTERO DELLO SVILUPPO ECONOMICO

DECRETO 10 ottobre 2014

Aggiornamento delle condizioni, dei criteri e delle modalità di produzione dei biocarburanti (GU Serie Generale n.250 del 27-10-2014)



Art. 2

Definizioni

1. Ai fini del presente decreto si intende per:

a) benzina: quota parte minerale dei prodotti ottenuti da fonti primarie non rinnovabili, conformi alle specifiche EN 228 e immessi in consumo nel territorio nazionale come carburanti;

b) biocarburanti: carburanti liquidi o gassosi ricavati dalla biomassa utilizzati nei trasporti, indicati, con le relative specifiche convenzionali, nell'Allegato 1, compresi i biocarburanti avanzati di cui alla successiva lettera c);

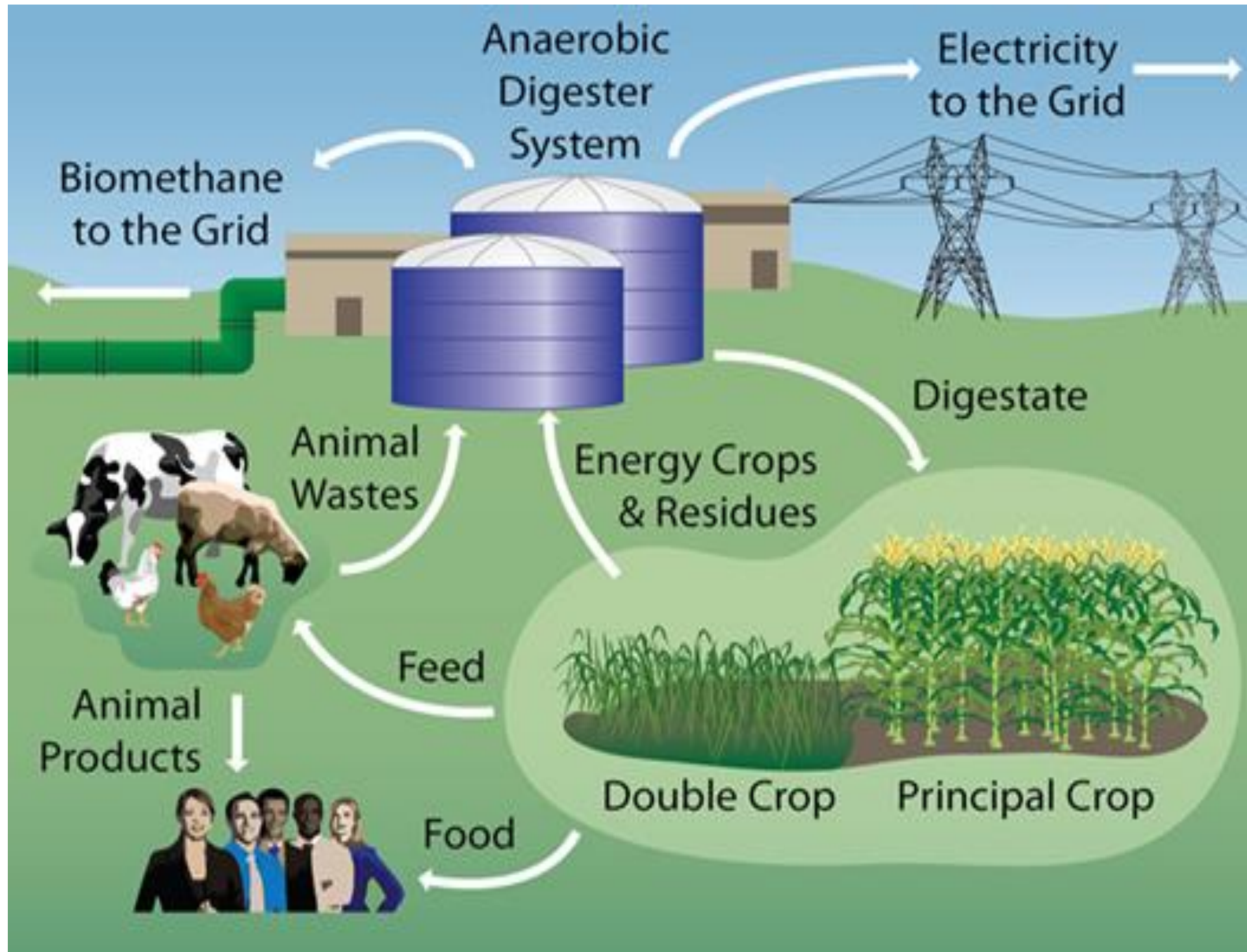
c) biocarburanti avanzati: biocarburanti e altri carburanti prodotti esclusivamente a partire dalle materie prime elencate nell'allegato 3 parte A ad esclusione delle materie prime elencate nell'allegato 3 parte B.

Advanced Biofuels
The definition is related to the use of a short list of feedstock

- **Algae if cultivated on land in ponds or photobioreactors**
- Biomass fraction of mixed municipal waste
- Bio-waste
- Biomass fraction of industrial waste not fit for use in the food or feed chain
- Straw
- Animal manure and sewage sludge
- Etc.

Vicia faba minor
Medicago sativa
Phacelia spp.
Lolium spp.
Brassica rapa
Brassica carinata
Sorghum spp.
Nicotiana tabacum
Trifolium spp.
Triticum secalotriticum
Hedysarum coronarium
Vicia sativa

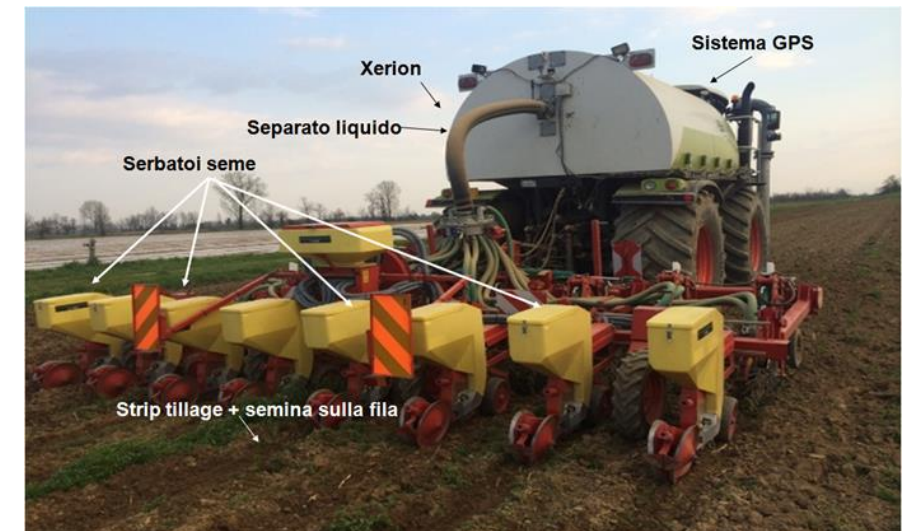
The Biogasdoneright® model: an holistic approach



In collaboration
with Bruce Dale,
Michigan State
University

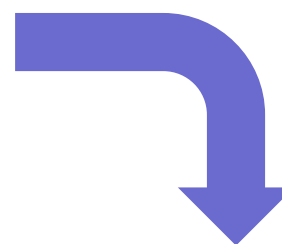
- **Biogasdoneright agronomic practices are built around some cornerstones:**

- Keeping the soil covered the whole year with double crop to mitigate soil GHGs emissions and to improve carbon in the soil
- Utilization of livestock effluents in AD to avoid their emissions
- Increased biodiversity and crop rotation via double cropping and nitrogen fixing crops
- Adopting conservative and precision farming techniques to:
 - *reduce soil tillage*
 - *distribute digestate without compacting the soil when the fertilizer demand is highest and putting the digestate straight below ground, speeding up the second crop seeding*
 - *saving water through drip irrigation and no labour practices*
 - *increasing Soil Organic Matter and therefore water field capacity*



Machinery for sequential cropping

Forage crop harvesting

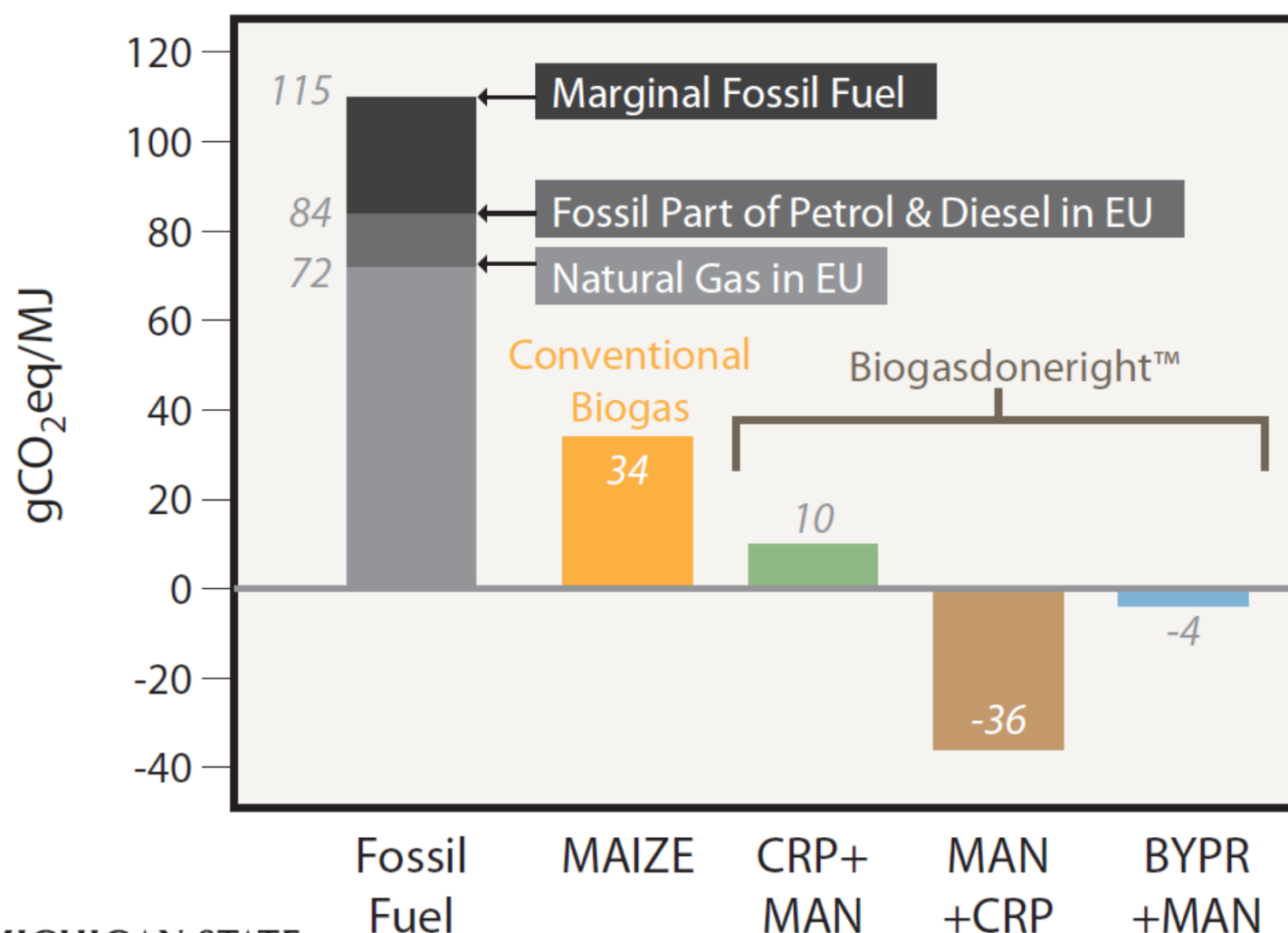


Immediate digestate application
with a multifunction machinery



The Biogasdoneright® model

Three BIOGASDONERIGHT Case Studies from Real Farms: GHG Emissions Comparison with Conventional Biogas



MICHIGAN STATE
UNIVERSITY

Source: Valli et al. (2017). Greenhouse gas emissions of electricity and biomethane produced using the Biogasdoneright™ system: four case studies from Italy. Biofuels, Bioprod. Bioref. (2017); DOI: 10.1002/bbb

CURRENT SITUATION

CNG and LNG in Italy

- > 1 Bm³ natural gas / year used in the transport sector
- 1.350 CNG filling station
- 50 LNG filling station (> in the North of Italy)
- 15 new LNG or LCNG station in the process of authorization
- > 2.000 LNG trucks
- > 1.000.000 NGV



L-CNG



LNG filling station
Gera Lario



Fleet of 40 LNG trucks



LNG filling station –
Piacenza

(70 trucks/d 10 t/d)

CURRENT SITUATION

LNG and LBM in Italy

Supply	Diesel	LNG
Model	Veicolo a Gasolio	Iveco Stralis 400 NP
Medium consumption	3,2 km/L	3,5 km/L
Fuel cost	0,9 €/L	0,75 €/L
Purchase cost	€ 100,000	€ 130,000
Maintenance in 5 years	€ 19,200	€ 21,000
Auto tax li 5 years	€ 4,100	free
Urea	€ 5,850	free
National incentive		– € 20,000
Cost in 5 years 500.000 Km	€ 269,775	€ 245,286
Savings Using LNG	€ 24,489	

Economic data of LNG Valtellina
Logistica Sostenibile Project

CURRENT SITUATION

LNG and LBM in Italy

Vehicle fleet in 2016	12 Iveco Stralis 330 LNG
Vehicle fleet in 2017	27 Iveco Stralis 400 N.P.
Vehicle fleet in 2018	3 Iveco Stralis 460 N.P.
School Bus Gera Lario nel 2017	1 Iveco CNG (28 posti)
Kilometers routes	3,007,000 km
LNG used	859,000 kg
average consumption	3.5 km/kg
Saved GHG towards diesel vehicle (€ 6 LimitS)	CO ₂ : – 373,000 Kg (– 15 %)* NO _x : – 3,800 Kg (– 70 %)* PM: – 1,700 Kg (– 99 %)* Noise: – 6 decibel (for each vehicle)*
Refueling station LNG MANGANETTI of Gera Lariano	In operation from 13 September 2016
LNG provided by the refueling station	1,100,000 Kg

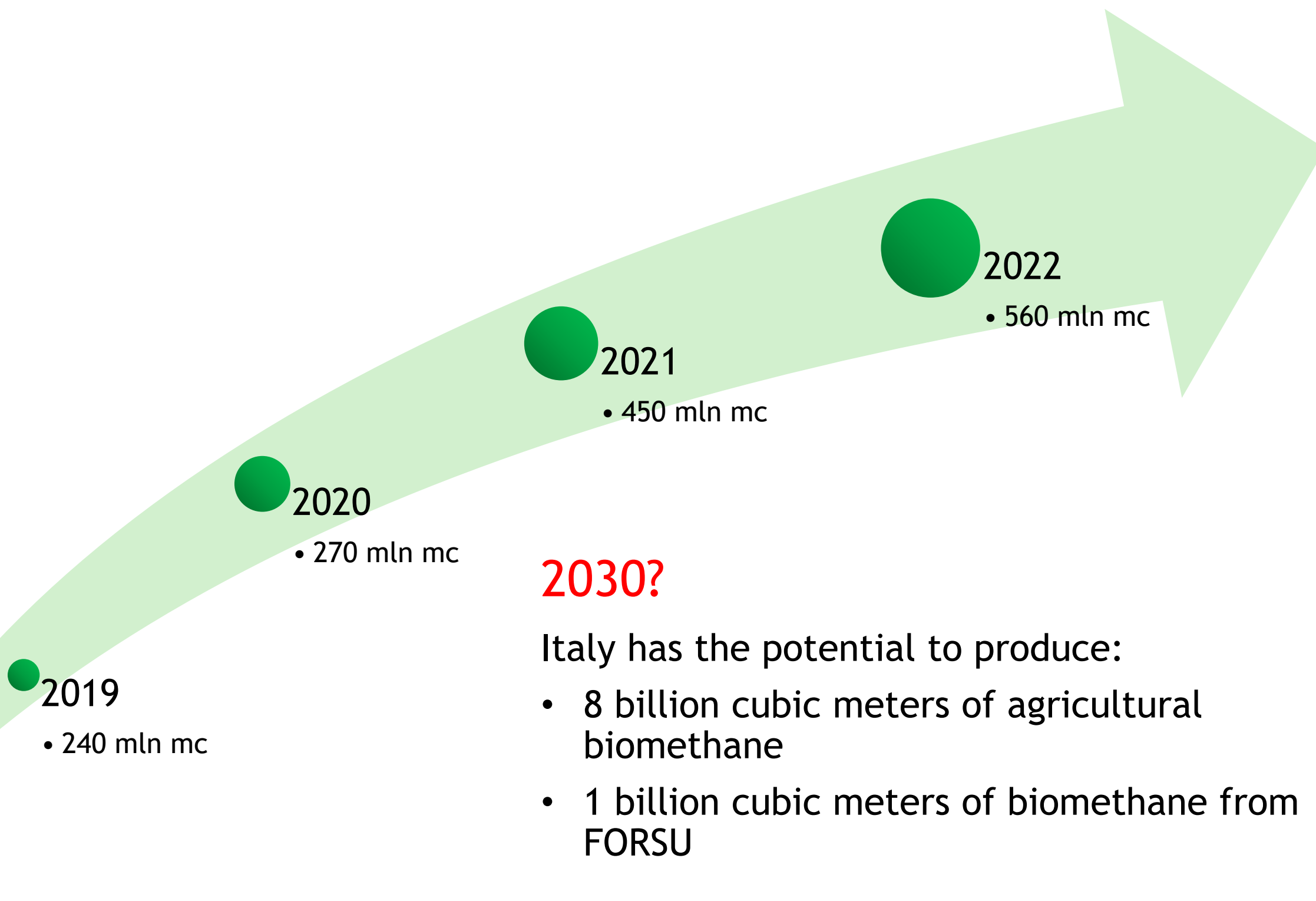
General project statistics and environmental savings at 1 March 2018

Figures calculated for Iveco Stralis 400 NP (Source Iveco – CO₂ emissions reduction of – 15 % compared to diesel equivalent, – 70 % NO_x, – 99 % PM, – 90 % NMHC, – 6 db vs E6 limits)



POTENTIAL DEVELOPMENT

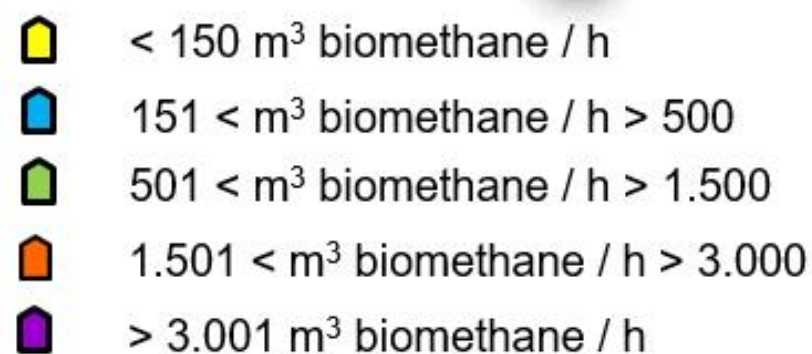
The advanced biomethane market at 2022

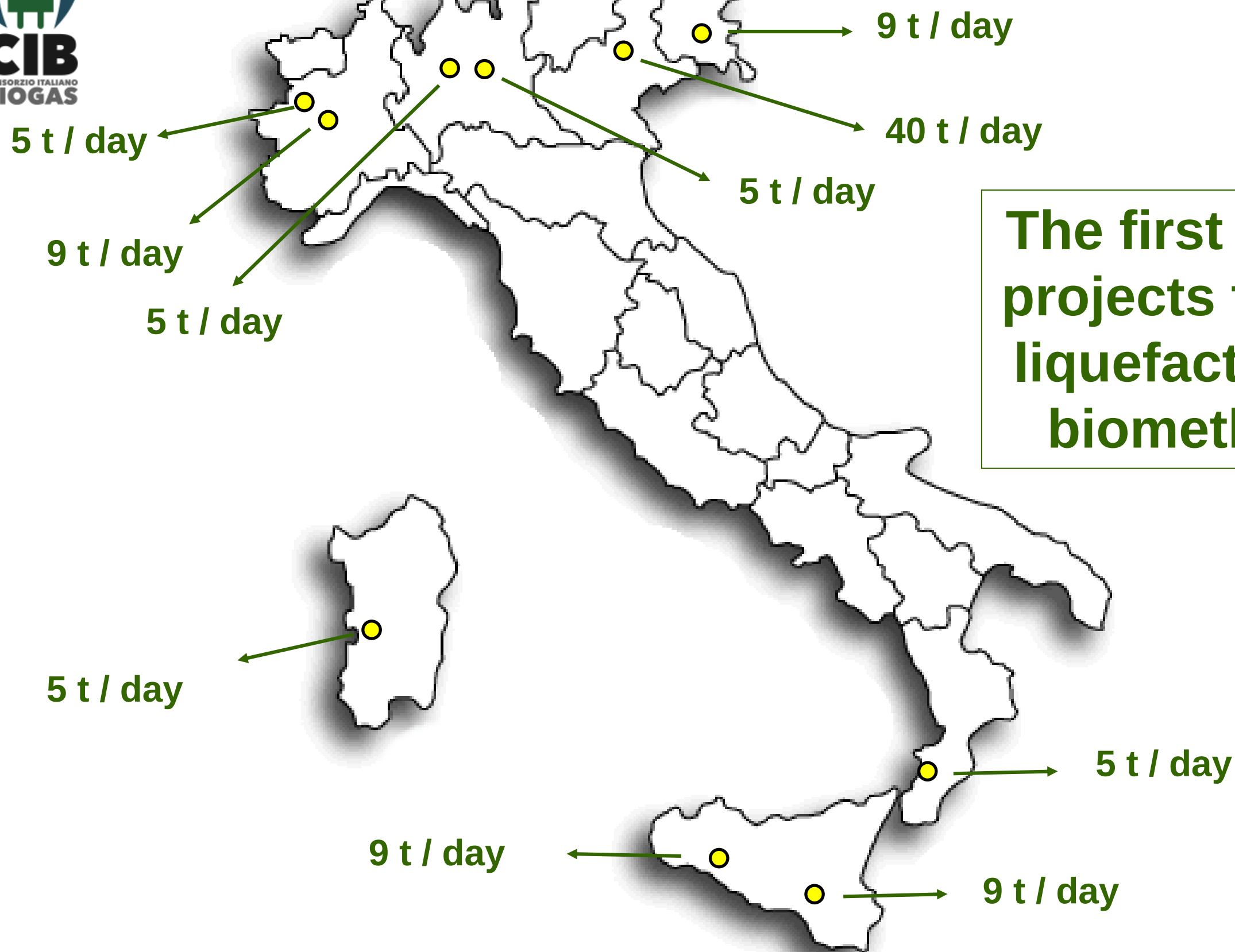


Biomethane projects

(26 working or already authorized)

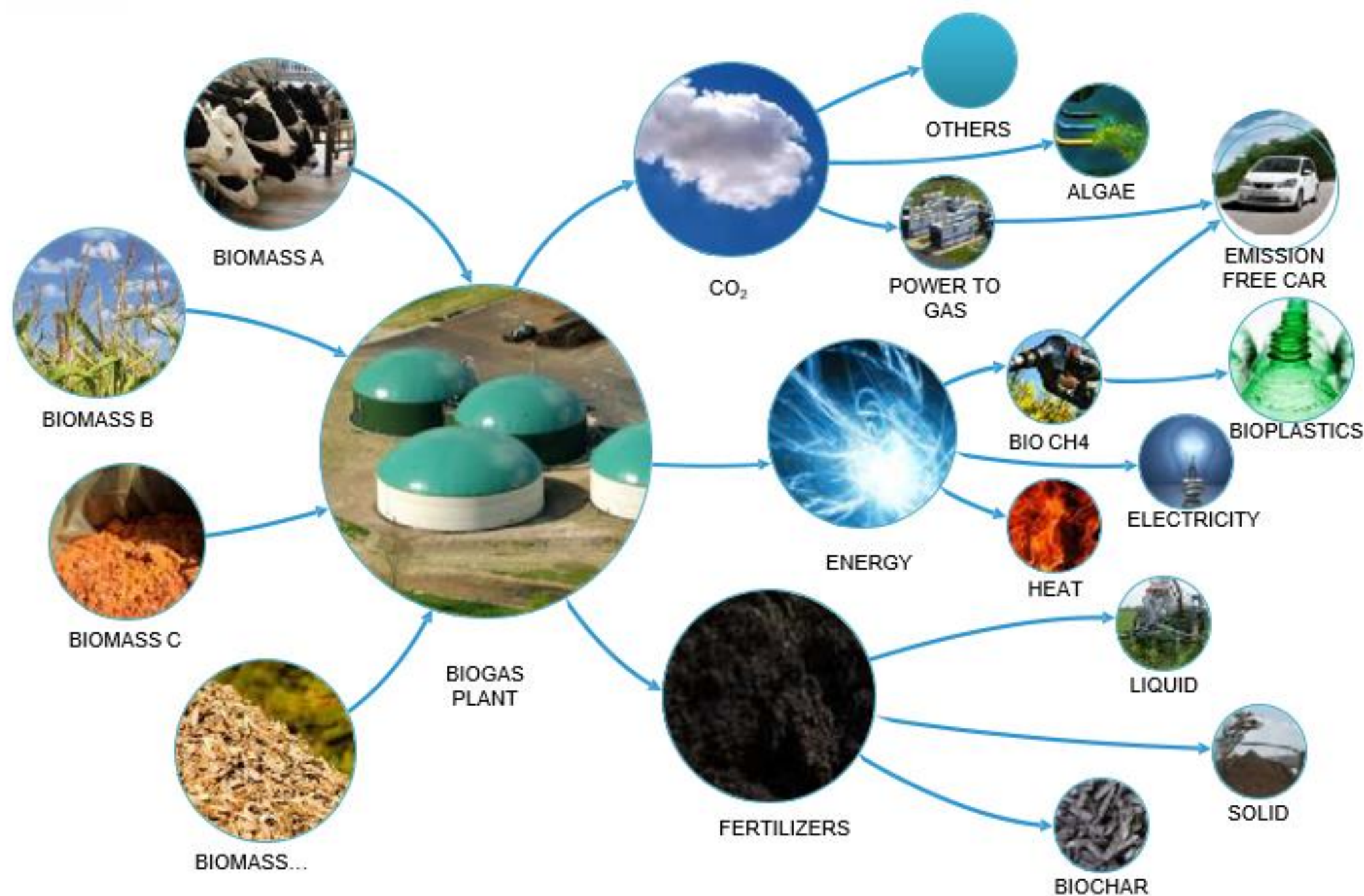
- ➡ 20/26 projects: membrane
- ➡ Feedstock: actually > Organic Fraction Municipal Solid Waste

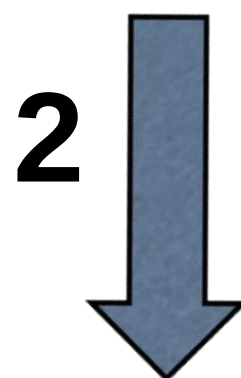
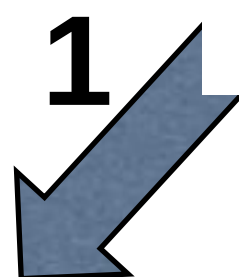
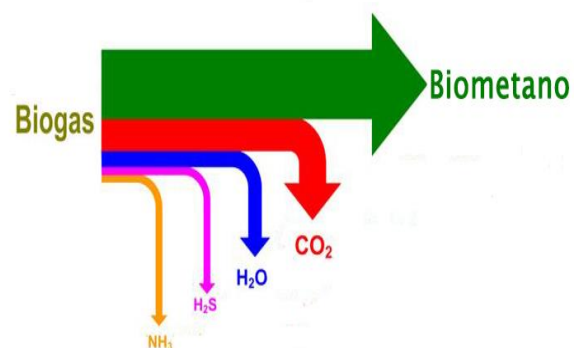




**The first Italian
projects for the
liquefaction of
biomethane**

Biogas refinery a flexible, multipurpose plant





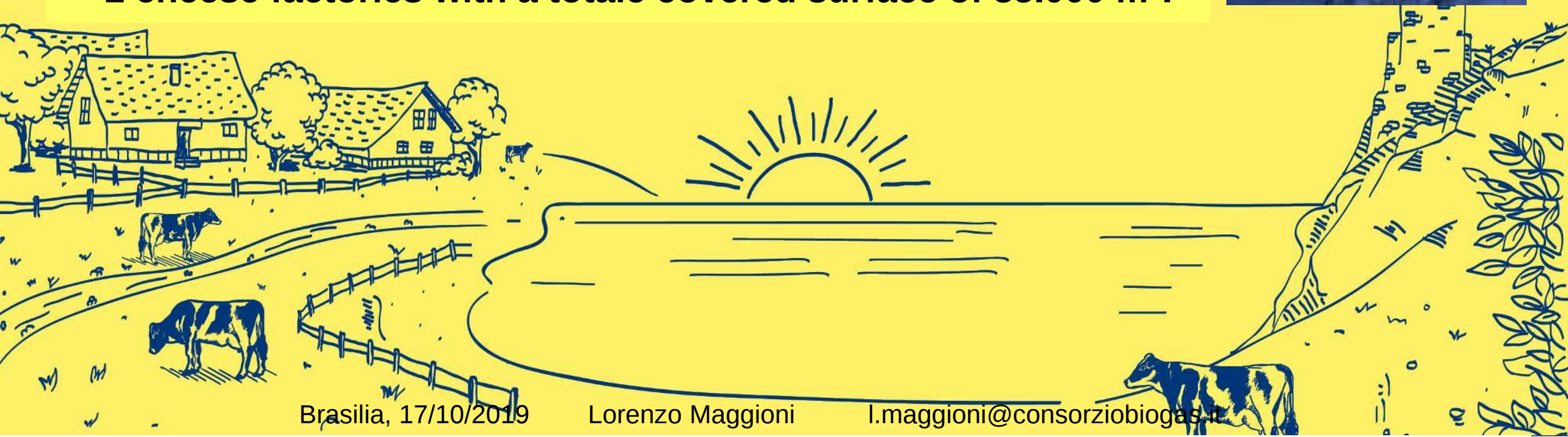


CASE STUDY 1



L'isola felice delle mucche

- Cooperative, founded in 1956, with 248 shareholders owning farms with milk production.
- 50,000 head of Friesian and Brown Swiss cows, with an average milk production of 524.000 liters/day
- 8.000 hectares of forage farm land.
- 150.000.000 € turnover (2014) and 330 employees.
- 2 cheese factories with a totale covered surface of 85.000 m².



CASE STUDY 1

numbers

- Average amount of manure to be treated: 335 m³ / day
- 3 anaerobic digesters with a total volume ~ 14.000 m³
- Raw biogas production: 500 m³ /h di biogas.
- Expected CH₄ average content: 55%
- Expected LBM production ~4,5 t/d
- Average amount of Nitrogen to be removed: ~ 580 Kg / d.
- Total investment for the construction of the plant (*anaerobic digestion, LBM production, distribution and LBM digestate treatment*): ~ 12 million Euro.



CASE STUDY 2

Agricultural cooperative formed in 1966

Wine Industry



Innovation and quality to serve costumers for the sector



BEVERAGE



ALIMENTARY



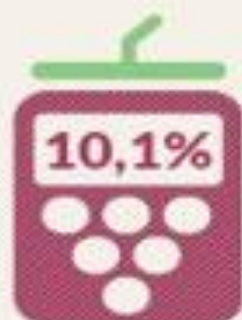
PHARMACEUTICAL

2015



300 M€

Produced grapes of the total italian market



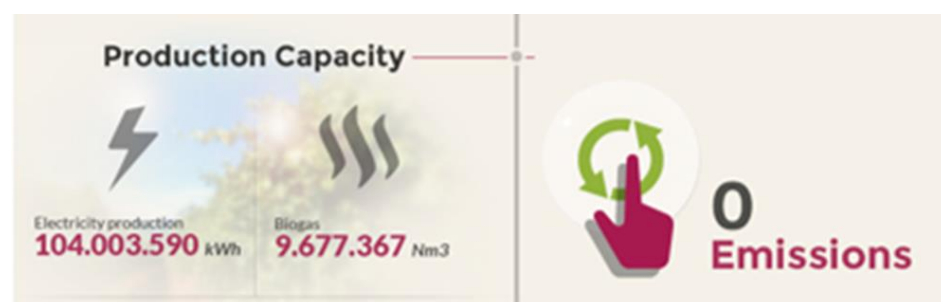
Volumes of wine sold

183 mio di Litri

CASE STUDY 2

Numbers and project

- Total area: 343.000 m² (200.000 m² covered)
Total flows in / out: 800.000 t / y (35.000 trucks/y)
- Electric Consumption : MWh_{el} 30,000 / year
- Steam Consumption: 150,000 t / year

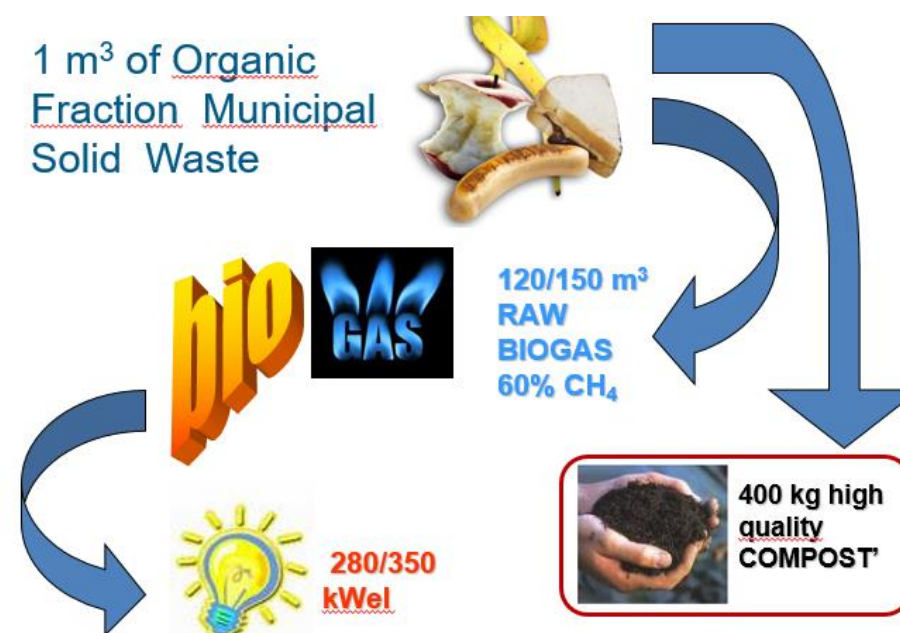


The project:
2 x 1.500 m³/h biomethane (gaseus)
?? LBM

CASE STUDY 3



Based in Veneto region, S.E.S.A. is one of the most important Italian companies involved in the activities of recycling, recovery, disposal and transportation of waste.



In Este (PD) they own a treatment plant with a capacity < 300.000 t/y of Organic Fraction Municipal Solid Waste

CASE STUDY 3

Numbers and project



- An investment in the biomethane sector of 42 million euro, spread over 5 years
- 4.500 m³ biomethane / h (LBM + bioCNG) already authorized
- 2 working plants (500 +1.000 m³ biomethane / h
- > 150 natural CNG and LNG trucks for the collection and transport of waste



BIOGASDONERIGHT®

ANAEROBIC DIGESTION AND SOIL CARBON SEQUESTRATION
A SUSTAINABLE, LOW COST, RELIABLE AND WIN WIN BECCS SOLUTION



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**Thanks for
you attention!**