ISAAC

INCREASING SOCIAL AWARENESS AND ACCEPTANCE OF BIOGAS AND BIOMETHANE

www.isaac-project.it info@isaac-project.it

Deliverable D4.6:

Preliminary report on workshops with farmers

Work Package:	*WP4 – Overcoming fragmentation*
Task/s:	*WP4.3*
Responsible Partner:	*AzzeroCO$_2$*

Document history

Version	Date	Authors	Reviewers
V1	*22/06/2017*	*Enrico Giovanni Facci*	*Serena Drigo*

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691875

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Premise

Farmers and breeders produce large quantities of waste biomass and sub-products and can benefit from the realization of anaerobic digestion plants that can improve the company management and rise the incomes.

During the meetings organized for these stakeholders, the lecturers, after an introduction to AD, gave some specific information on cogeneration and upgrading plants, on plant management and on the benefits for the crops deriving from the use of digestate. Other stakeholders, such as technology providers and local administrators, were invited to the events to give a more comprehensive information, put the parts into contact and make the debate more effective.

1. Ragusa

The first event took place on the 9th of March at the conference room of the 'G.Ferraris' technical school with the participation of 2 delegates of Confagricoltura, one of Coldiretti (both are associations of farmers and breeders) an agronomist representing some farms, an engineer experienced in anaerobic digestion plants, 2 technicians of a plant installation company and 20 students of the technical school for chemists and agronomists (the attendance sheet was collected). Farmers were invited through their associations CIA, Confagricoltura and Coldiretti. Participation was lower than expectations (7 participant stakeholders with a minimum target of 15) and in the forthcoming events the associations will be involved also in the events organization stage to increase the number of participants.

Figure 1 Conference in Ragusa

The first speech, by G. Croce, was focused on general aspects of the anaerobic digestion, its role in climate change mitigation and on the importance to consider AD as a part of a circular economy that include also agricultural production, reuse of sub-product, energy use and green chemistry (bio-based products and biorefineries). The second speech, by L. Maggioni, was focused on the state of the art of biogas and biomethane, on technical aspects of AD plants and on public incentives to biomethane. The third speaker talked about the potential of the province of Ragusa; in particular Mr. Facci showed the type and quantities of agricultural sub-products produced in the area, the theoretical number of plants that could be realized to exploit this biomass. The slides used during the event are enclosed in Attachment 1.

The speakers answered to some questions from the audience about:

- the advantages/risks of the use of digestate in agriculture;
- the quantities of biomass required to feed a digester and the minimum plant size suggested;
- the interaction of AD plants with traditional farming practices;
- the limitation to use some specific biomasses such as olive pomace or citrus fruit pulp.

In the end, using the information provided by an attendant, the calculation tool was used to verify the techno-economic feasibility of a plant feed with the sub-products of 2 neighbouring farms.

Figure 2 Poster of the event in Ragusa

2. Eboli

The second workshop was in Eboli (SA) the 19/05/2017 during the opening day of “Festambiente agricoltura” and was attended by 18 people.

After a introduction on anaerobic digestion the lecturers shortly presented the objectives of ISAAC project, the main characteristics of the territory, the biogas potential of Salerno’s Province using agricultural residues/sub-products and the economic and environmental benefits.

Figure 3 Communication material used in Eboli

Figure 4 Debate during the workshop in Eboli

Much time was devoted to the debate and to answer to audience's question. The main discussion themes were:

- recent variation in crop cultivation in Salerno Province with a strong reduction of corn and a rise of horticultural waste and how this change affect the biogas potential;
- the small dimension of most part of breeding farms and the consequent necessity to associate;
- the concentration of buffalo breeding farms in small areas, in particular in the municipality of Capaccio, is producing environmental problems and requires solution for the nitrogen management;
- technical issues on the treatment of digestate to improve its quality and reduce the environmental impact, in particular on aquifers;
- the added value for organic farming of anaerobic digestion, reuse of waste (circular economy) and use of digestate;

At the end of the event a short questionnaire (Attachment 2) was distributed to evaluate its effectiveness and 7 persons filled it. The questions are:

a) *Do you think that the topic of the meeting was interesting?* mark from 1 to 5 (1=No, 5=very interesting)
   Mean answer: 5
b) *Was the topic covered in a clear and comprehensible way?* mark from 1 to 5 (1=not at all, 5=very much)
   Mean answer: 4,15
c) *What aspects should be improved?*
   5 suggestions:
   - more time for the debate;
   - an in deep analysis of the biomass sources and of the local resources of waste/sub-products;
   - focus on plant authorization and administrative issues;
   - focus on the foreseen biomethane decree;
   - focus on financial schemes and incentives to overcome financial problems of farms.
d) *After this event, do you think an anaerobic digestion plant could be a good opportunity to improve the business of your company?* Yes/No
   Answers: 5 Yes, 0 No, 2 didn't answer
e) *After this event, would you be willing to associate with other farms to build an affordable anaerobic digestion facility to maximize the benefits and reduce the risks?*
   Answers: 5 Yes, 1 No, 2 didn't answer

Attachment

- Attachment 1: Slides Ragusa
- Attachment 2: Evaluation questionnaire

Attachment 1: Slides Ragusa

INCREASING SOCIAL AWARENESS AND ACCEPTANCE OF BIOGAS AND BIOMETHANE

Introduzione alla digestione anaerobica

Ragusa 09/02/2017

Beppe Croce.

ISAAC

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691875

CAMBIO DI CLIMA

“perseguire gli sforzi per limitare l’aumento della temperatura di 1,5° C rispetto ai livelli pre-industriali”

Accordo di Parigi – art.2

sottoscritto da 175 Paesi - aprile 2016

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691875

BIOGAS perché

- Ridurre emissioni gas serra ***(clima)***
- Da rifiuti inquinanti a risorse ***(chiudere i cicli)***
- Azoto organico e altri elementi ***(fertilità)***
- Energia rinnovabile autoprodotta e distribuita ***(dipendenza)***

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MATERIE PRIME

- **residui** (agricoli, zootecnici, agroindustriali, da frazione organica da rifiuti solidi urbani),
- colture dedicate di secondo raccolto

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691875

DIGESTATO

N – P - K e microelementi

UNA GRANDE OPPORTUNITA'

PER RECUPERARE FERTILITA'

DEL SUOLO

ISAAC

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DA CENTRALI ELETTRICHE A BIORAFFINERIE

L'Europa ha un potenziale di produzione di biometano di 150-250 Gm3/anno

Deutsches Biomasseforschungszentrum (DBFZ)

(consumo gas naturale UE 2014: 410 Gm3)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691875

BIORAFFINERIA

DIGESTIONE ANAEROBICA

UPGRADING

AMMENDANTI FERILIZZANTI

BIOMETANO

CO_2

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CHIMICA VERDE

una ricchezza di molecole e composti notevolmente superiore a quella degli idrocarburi derivati dal petrolio.

ISAAC

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Ragusa, 09 marzo 2017

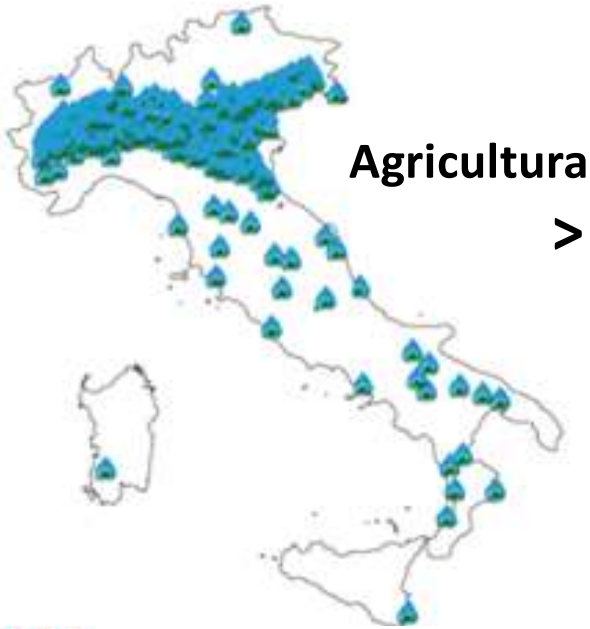
INCREASING SOCIAL AWARENESS AND ACCEPTANCE OF BIOGAS AND BIOMETHANE

Consorzio Italiano Biogas
(Italian Biogas Consortium)

The CIB - Italian Biogas Consortium, formed in March 2009, has national coverage and is the reference point in the Italian biogas and biomethane sector.

MEMBERS

~ 130 companies



Agricultural biogas plants

> 600

European projects

GREEN GAS GRIDS — http://www.greengasgrids.eu/

BIOSURF Fuelling Biomethane — http://www.biosurf.eu/

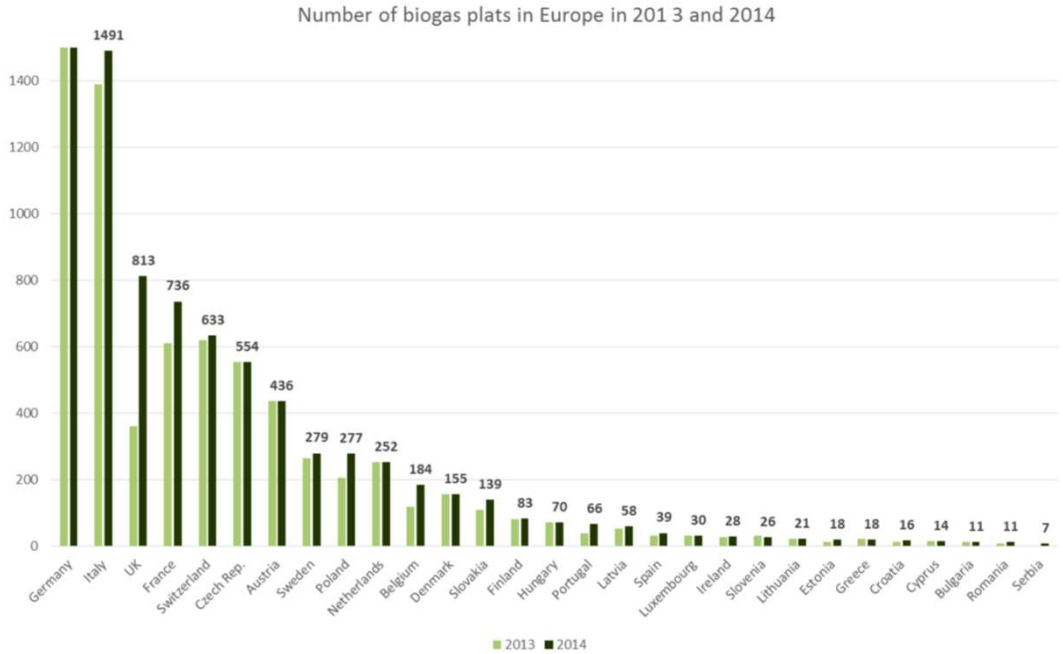
ISAAC — "Increasing Social Awarness and ACceptance of biogas and biomethane"

STATE OF THE ART
Biogas in Italy

- **2nd European market after Germany**
- **> 4 Billion € invested in the last 6 years**
- **> 1.700 biogas plants built *(agriculture + sewage + waste + industrial).***
- **> 1.300 MW_{el}** *(for the moment biogas used only for electricity production!)*
- **About 3 billion Nm^3 Biomethane equivalent utilized per year**
- **12.000 qualified green jobs created thanks to biogas**

PRESENT SITUATION
Biogas in Europe

In Europe, at the end of 2016, the number of biogas plants raised to over 18500 (installed capacity: more than 14500 MWel)



Germany with 9035 plants still dominates the market, although its development slowed down significantly, mainly due to the new Renewable Energy Law
The second place in a number of plants is taken by Italy with 1555 plants (dati CIB 2016)

Currently the total biogas production in Europe corresponds to about 14 billion m³ in natural gas equivalent.

ACRONYMS & DEFINITIONS

UPGRADING UNIT

CH_4: 55-65%

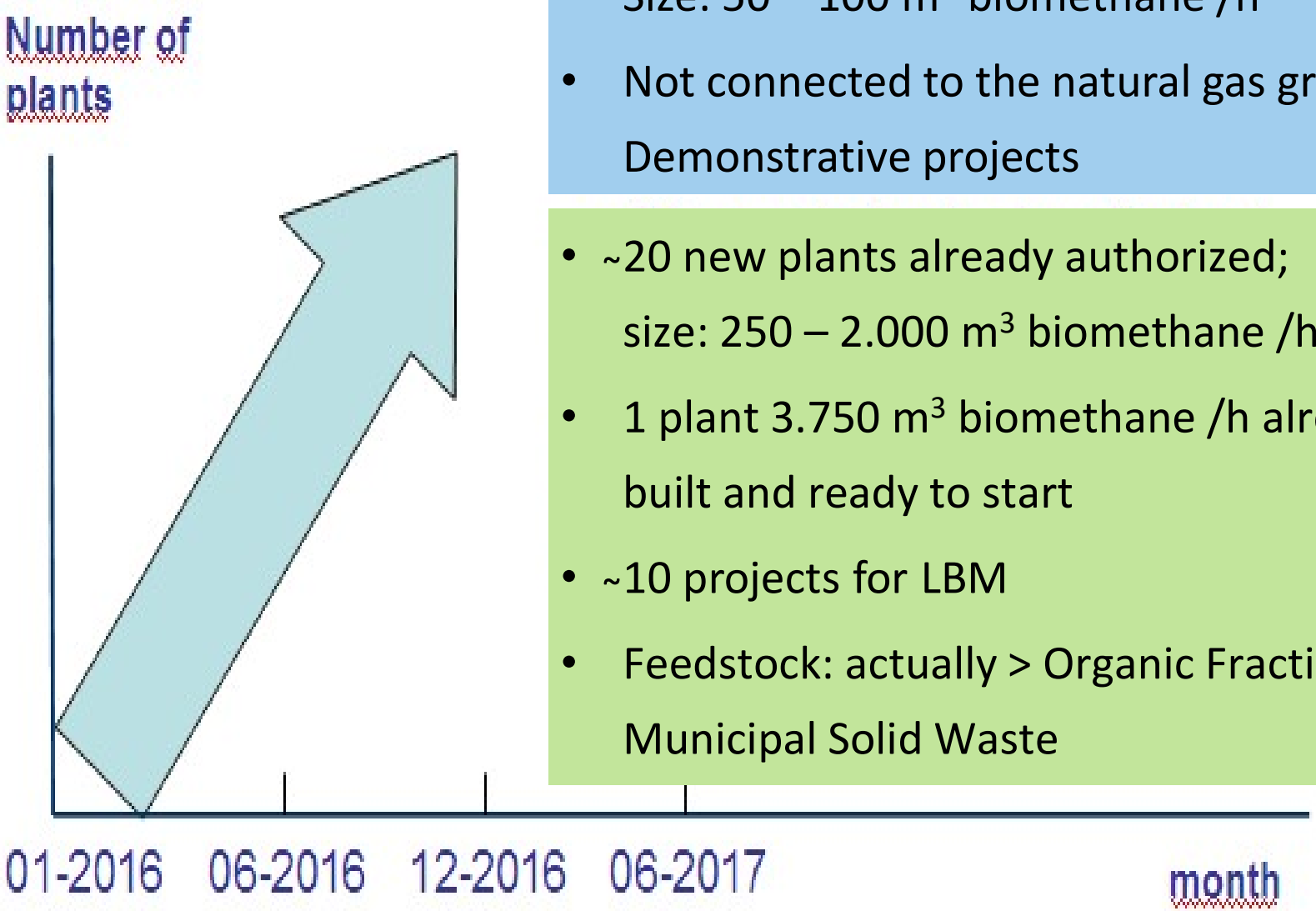
CH_4 > 97%

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. CH4>97%***

STATE OF THE ART
Biomethane in Italy

- 7 existent biomethane plants
- Size: 50 – 100 m^3 biomethane /h
- Not connected to the natural gas grids. Demonstrative projects



- ~20 new plants already authorized; size: 250 – 2.000 m^3 biomethane /h
- 1 plant 3.750 m^3 biomethane /h already built and ready to start
- ~10 projects for LBM
- Feedstock: actually > Organic Fraction Municipal Solid Waste

CURRENT AND COMING REGULATIONS

Ragusa, 09 marzo 2017 Lorenzo Maggioni ricerca@consorziobiogas.it

CURRENT AND COMING REGULATIONS

CURRENT

Decree 05 December 2013

SERIE GENERALE

Anno 154° - Numero 295

GAZZETTA UFFICIALE

DELLA REPUBBLICA ITALIANA

PARTE PRIMA — Roma - Martedì, 17 dicembre 2013

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: Comunità europee (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.

Entry into force *(art. 9 of the Decree)* :
18 december 2013

Duration: upgrading plants that will be in service by
17 december 2018

NEW

Early 2017

Maximum biomethane production with subsidies: 1,1 billion m^3/year

CURRENT AND COMING REGULATIONS

CURRENT

Decree 05 December 2013

Agriculture

Organic Fraction Municipal Solid Waste

DIFFERENT SCENARIOS DEPENDING ON FINAL USE OF BIOMETHANE

1) Biomethane injected into the natural gas grids
2) Biomethane used in high efficiency cogeneration plants
3) Biomethane used in transport sector

NEW

Early 2017

The same + methanation

Better chance for LBM than in the old decree

NOW WE HAVE ALL THE TECHNICAL RULES NEEDED FOR BIOMETHANE PRODUCTION

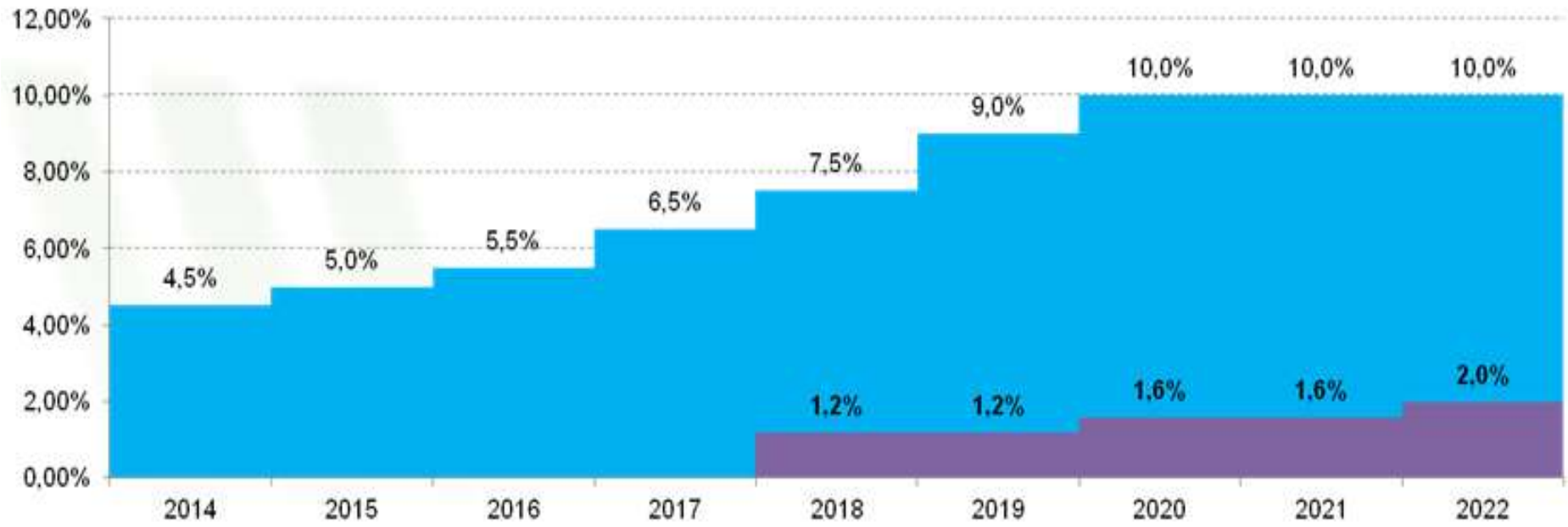
1) ~~Biomethane injected into the natural gas grids~~
2) ~~Biomethane used in high efficiency cogeneration plants~~
3) **Biomethane used in transport sector**

More interesting subsidies if you produce "advanced biomethane"

CURRENT AND COMING REGULATIONS

ADVANCED BIOFUELS MANDATE

Decreto 10 ottobre 2014



biofuels **Advanced biofuels**

(actually 92% = biodiesel. Only 5% made in Italy)

In 2018 it means ~225 Mm³ biomethane *(compressed or liquified)*

POTENTIAL DEVELOPMENT

POTENTIAL DEVELOPMENT
Biomethane in Italy

According to Italian Biogas Consortium a **realistic development plan** of methane/biomethane **within 2020** should include:

- doubling NG service stations to 2000;
- Doubling current consumption of CNG methane for transport sector up to about **2 billions Nm³** by 2020 (using **preferably LNG**) ;
- Increasing biomethane consumption up to 25% of the total consumption, **about 500.000.000 Nm³/year** (bio-CNG or bio-LNG)

HEAVY TRANSPORT: POSSIBLE SCENARIO IN 2030

Potential replacement of traditional fuels with 10% of LNG (up to 20% in an optimistic scenario) or LBM.

In Italy LNG and LBM will cover a market volume of **3.2 Mton.**

POTENTIAL DEVELOPMENT
Biomethane in Italy

Biomethane development

and the decarbonisation strategy in Italy

Position Paper of Consorzio Italiano Biogas - Snam - Confagricoltura for COP 21 - Paris

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PIATTAFORMA BIOMETANO

Maximum technical potential

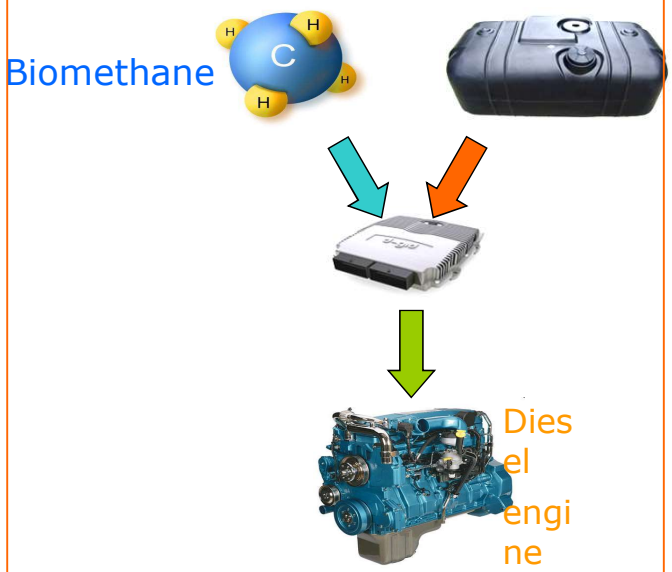
8×10^9 m³/y

POTENTIAL DEVELOPMENT

Biomethane in Italy

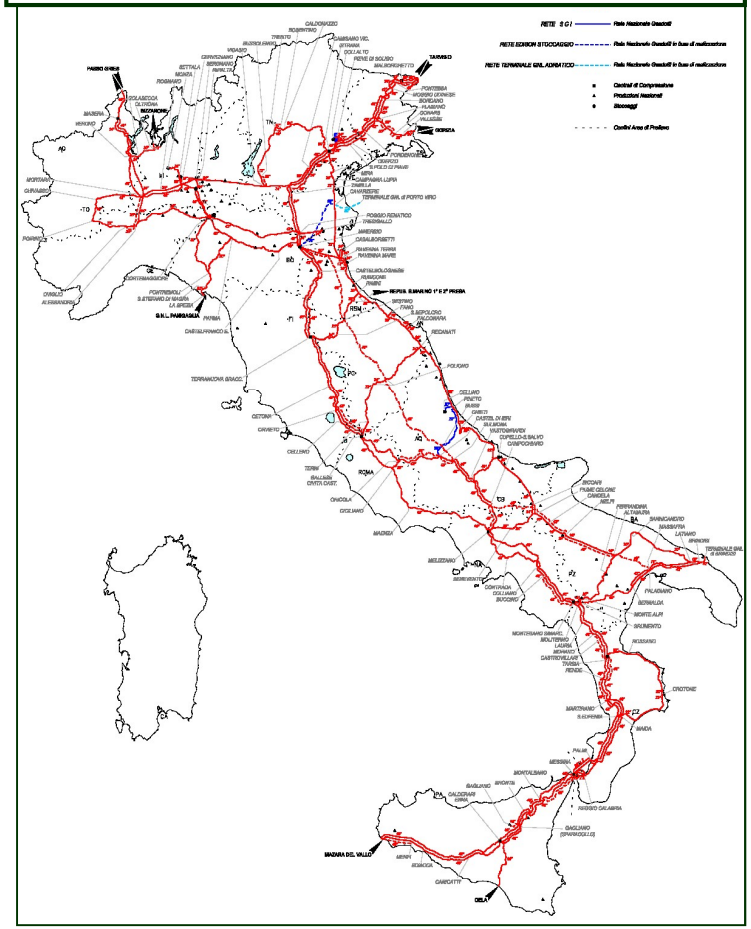
1° biomethane tractor (bio-CNG)

Dual Fuel: Biomethane + diesel



Italian Gas Grid infrastructure data:

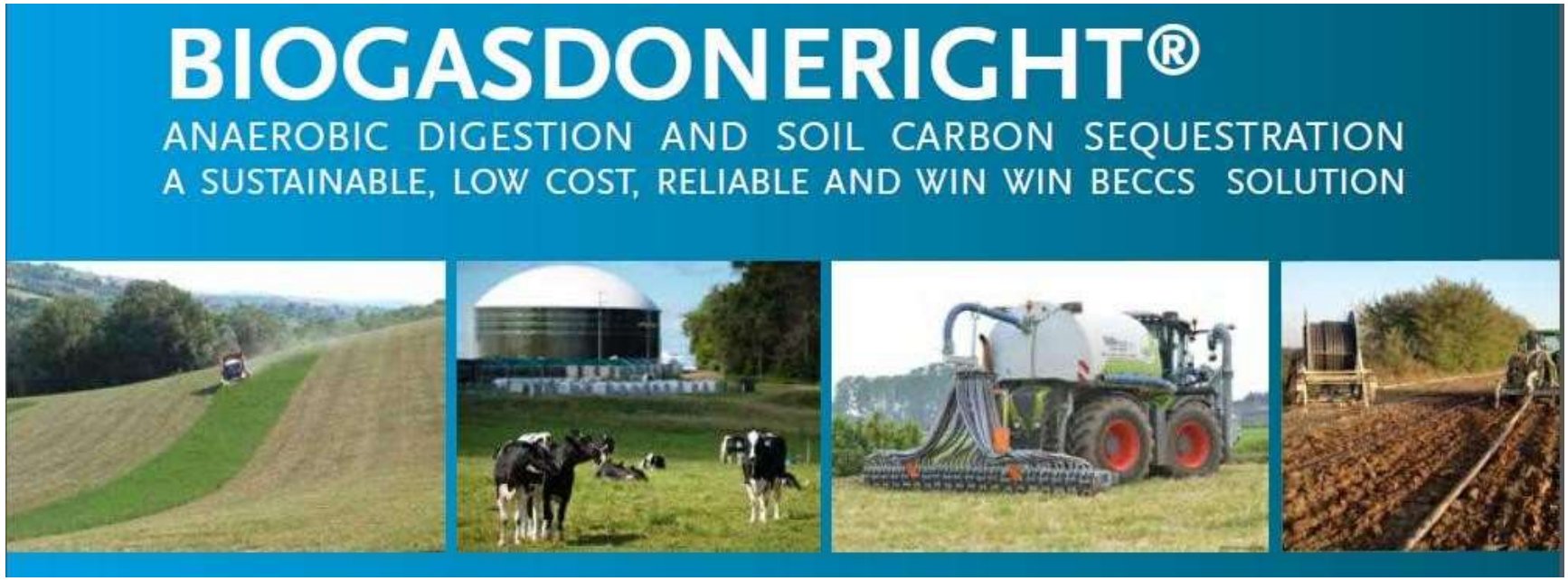
- Primary transport network: 34,000 km;
- Distribution: 250.000 km networks.



> 1.000.000 NGV

High interest from industrial groups SNAM FCA FIAT CHRYSLER AUTOMOBILES

POTENTIAL DEVELOPMENT
Biogasdoneright

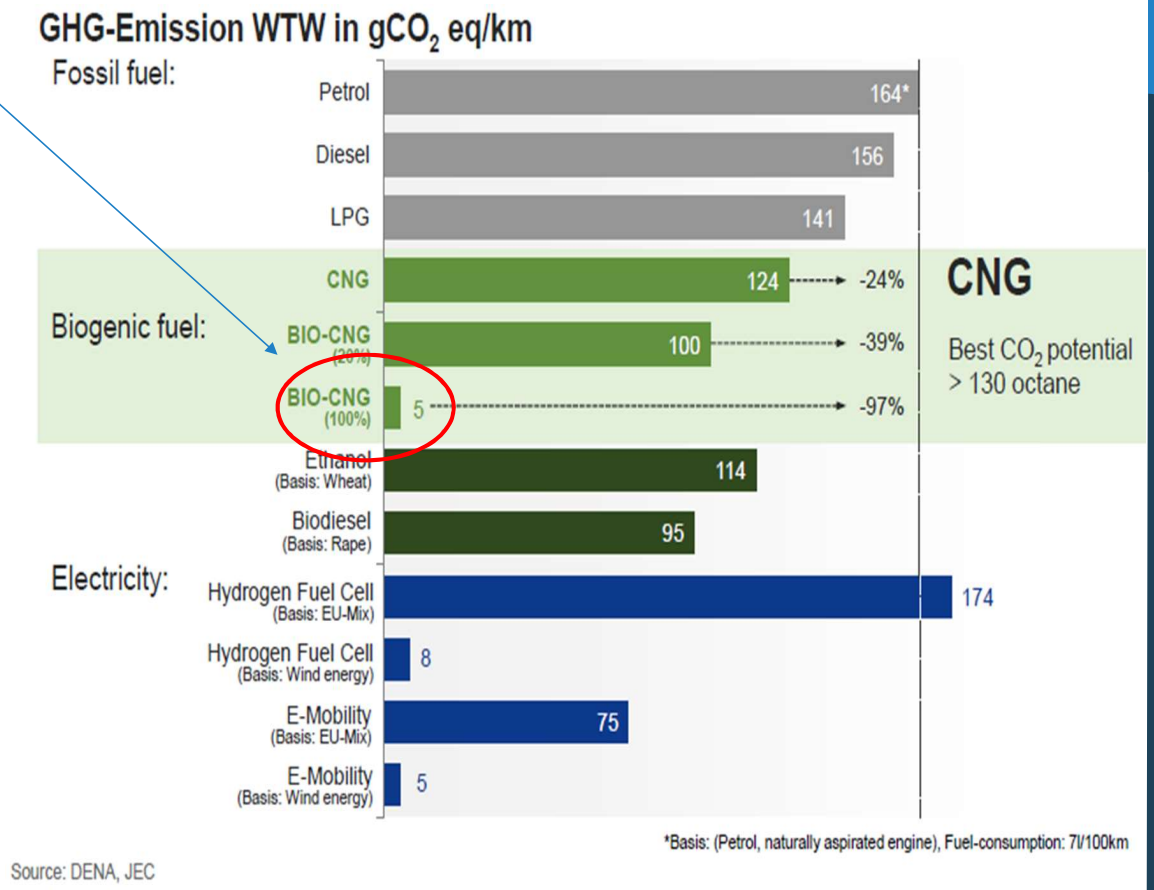


POTENTIAL DEVELOPMENT

Why using biomethane like a fuel?

flexible input material, flexible sale options, storable, efficient, tailored to demand, climate-friendly

- Biomethane has very low emissions
- Car engines are less noisy
- No new distribution infrastructure needed. Grids are available
- Biomethane can be blended at any ratio with natural gas
- Thanks to “biogasdoneright®” model, it does not compete with food and can be produced in your own country
- LBM has better quality than (most) fossil LNG.
- LBM is cleaner and cheaper than other biofuels per energy unit



PERCHE' DIRE SI AL BIOGAS

Il punto di vista del WWF Internazionale

WWF Global | español

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Biogas — saving nature naturally in Nepal

Like 3 | Tweet 0 | Email 0 | ShareThis 85

Posted on 06 March 2007

By Trishna Gurung*

y I woke up and told my husband that I wasn't going to risk my ollecting wood from the forest any more and that we were going to gas stove, even if we had to take a loan," recalls Jari Maya , 41, as she stands proudly next to the first biogas system in her n Badreni, Nepal.

© Trishna Gurung / WWF Nepal — Enlarge

Climate Solver

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  - Fuel Cell Systems
  - Solar Safe Water

Biogas and climate change

Biogas also has a direct positive impact on climate change, helping to reduce greenhouse gas emissions and global warming. According to WWF, a single biogas plant reduces carbon emissions by 4.7 tonnes per year.

http://wwf.panda.org/?95320/Biogas-saving-nature-naturally-in-Nepal

PERCHE' DIRE SI AL BIOGAS

Il punto di vista del Natural Resources Defense Council

NATURAL RESOURCES DEFENSE COUNCIL
THE EARTH'S BEST DEFENSE

NRDC is the nation's most effective environmental action group, combining the grassroots power of 1.4 million members and online activists with the courtroom clout and expertise of more than 350 lawyers, scientists and other professionals.

The New York Times calls us "One of the nation's most powerful environmental groups." The National Journal says we're "A credible and forceful advocate for stringent environmental protection."

Advantages of Biogas Energy

- Air quality improves significantly because the biodigester reduces the smell of manure, turning its volatile organic compounds (VOCs) into odorless methane and carbon dioxide. Hydrogen sulfide, the source of the "rotten egg" odor, is captured in the biogas and destroyed during combustion.
- Cleaner water is an important benefit: biodigesters reduce bacteria levels in animal waste, which means that any runoff to surface waters will be less harmful. Digesters also reduce biochemical oxygen demand (BOD), a measure of the ability of organic wastes to remove oxygen from water. Aquatic species depend on dissolved oxygen in water for survival, so farms that reduce BOD help protect aquatic ecosystems.
- Greenhouse gas reduction is critical in mitigating climate change. Seven percent of methane emissions in the United States come from livestock and poultry manure, most of which in turn comes from swine and dairy operations. Biodigesters eliminate nearly all methane emissions, and as a renewable source of energy they reduce our reliance on fossil fuels.

Biodigesters have the potential to slash methane emissions by 1.8 million metric tons -- the equivalent pollution reduction of taking 6.5 million cars off the road

http://www.nrdc.org/energy/renewables/biogas.asp

PERCHE' DIRE SI AL BIOGAS

Il parere dell'Istituto di Ricerca Svizzero sull'Agricoltura Biologica

FiBL Forschungsinstitut für biologischen Landbau
Institut de recherche de l'agriculture biologique
Research Institute of Organic Agriculture

EXCELLENCE FOR SUSTAINABILITY

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New biogas-handbook for organic farmers

(March 19, 2014) Organic farmers considering investing in biogas production to improve farm income and contribute to the environmental sustainability of their farms now have new tools at hand.

The SUSTAINGAS Handbook:

> gives a compact overview of concepts, farmers' perspectives and best practice examples for sustainable biogas production on organic farms

PERCHE' DIRE SI AL BIOGAS

Biogas ed agricoltura biodinamica in Svezia

On·Farm·Biogas·production·with·solid·manure·in·organic·farming·¶

Evaluation·of·the·two·stage·dry·anaerobic·biogas·plant·production·and·recycling·on·Skilleby·experimental·farm·in·Järna·2004--2010·*Final·report·December·2011*·¶

¶

Artur·Granstedt¶

¶

Biodynamic·Research·Institute·Skilleby,·153·91·Järna,·Sweden¶

¶

http://www.jdb.se/sbfi/files/Rapport_On_Farm_Biogas_production_with_solid_manure_in_organic_farming.pdf¶

¶

Reduce negative impact to the environment

…The lower nitrogen emissions and higher nitrogen efficiency mean that emissions of NH4 N and N2O N are reduced with about 50 %. However the effect on N2O and NO3 N emissions from soil after the use of liquid manure fraction need further study. In the literature lower emissions of CH4 have also been documented.

Effective internal recycling of plant nutrients and improved crop production

The field experiment with additional application in May of 20 tonnes biogas liquid manure ha-1 gave 14 % higher yield of the cash crop winter wheat (15 % higher N yield) and also a corresponding increase of crop residues. In the total balance the nitrogen surplus was 35 instead of 36 N kg-1y-1 thus reducing the total potential nitrogen emissions from the biogas plant system compared to the conventional manure management system. The higher production of crop residues with a high C/N ratio also increases nitrogen immobilisation and in this way also contributes to increased humus content in the soil.

Humus content in soil, long term fertility and production capacity

Biogas ed agricoltura biologica in Danimarca

Renewable Agriculture and Food Systems: Page 1 of 14 doi:10.1017/S1742170512000440

Biogas in organic agriculture—effects on productivity, energy self-sufficiency and greenhouse gas emissions

Siri Pugesgaard*, Jørgen E. Olesen, Uffe Jørgensen and Tommy Dalgaard

Department of Agroecology, Aarhus University, Blichers Allé 20, DK-8830 Tjele, Denmark.
*Corresponding author: siri.pugesgaard@agrsci.dk

A positive farm energy balance was obtained for all biogas scenarios, showing that biomass production for biogas on 10% of the farm area results in an energy surplus, provided that the heat from the electricity production is utilized. The energy surplus implies a displacement of fossil fuels and thereby reduced CO_2 emission from the farm. Emissions of N_2O were not affected substantially by biogas production. Total emissions of methane (CH_4) were slightly decreased due to a 17–48% decrease in emissions from the manure store. Net GHG emission was reduced by 35–85% compared with the current situation in organic agriculture. It was concluded that production of biogas on organic farms holds the possibility for the farms to achieve a positive energy balance, provide self-sufficiency with organic fertilizer nitrogen, and reduce GHG emissions.

PERCHE' DIRE SI AL BIOGAS

Biogas per riscaldare ospedali

Gundersen Lutheran teams with brewery on unique 'green' endeavor

"Healthcare" and "brewery" aren't two words that typically go together. But, Gundersen Lutheran Health System based in La Crosse,Wis., has entered into a unique renewable energy partnership with a local brewing company, City Brewery. In 2009, the two organizations powered up a combined heat and power project that is expected to generate eight to 10 percent of the electricity used on Gundersen Lutheran's campuses in La Crosse and Onalaska, Wis.

Gundersen Lutheran and City Brewery in La Crosse, Wis., powered up a first-of-its-kind combined heat and power project in 2009. The renewable energy project generates three million kW hours per year by using waste biogas discharged from the City Brewery waste treatment process and turning it into electricity.

The renewable energy project uses waste biogas discharged from City Brewery's waste treatment process and turns it into electricity. It is generating three million kilowatt (kW) hours per year. That is equivalent to planting 490 acres of forest or removing 395 cars from the road and is enough electricity to power 299 homes.

Here's how it works. The brewing process creates waste that must be pretreated by City Brewery before it is sent to La Crosse's municipal waste water treatment facility. Biogas, including methane,

Watch a video about this partnership.

22-23 May, Parchi del Garda, Pacengo (Verona), Italy

www.regatec.org

CIB
Consorzio Italiano Biogas e Gassificazione
segreteria@consorziobiogas.it
P.IVA: 09248721004

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Lodi (LO)

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ricerca@consorziobiogas.it

Thanks for you attention!

INCREASING SOCIAL AWARENESS AND ACCEPTANCE OF BIOGAS AND BIOMETHANE

Informazioni tecniche sulla digestione anaerobica

Ragusa 09/02/2017

E.G.Facci.

ISAAC

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Digestione anaerobica: basi

- Cos'è la digestione anaerobica?
  - *Fermentazione batterica in assenza di ossigeno di materiali organici*

- Cosa produce?
  - *Biogas, composto principalmente da metano ed anidride carbonica*
  - *Digestato, ovvero i materiali organici digeriti*

- Cosa può essere utilizzato?
  - *La maggior parte dei residui organici (es. residui colturali, scarti alimentari, liquami zootecnici)*

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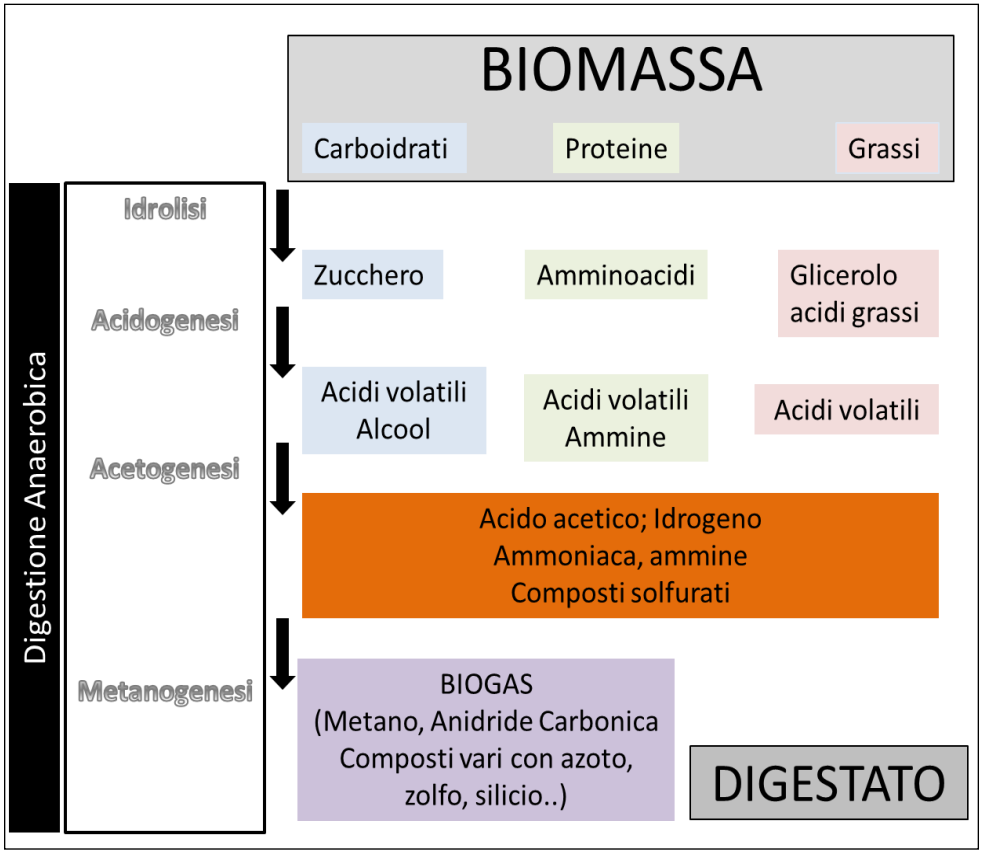
Fasi della digestione



Fasi della digestione anaerobica (Ns. elaborazione)

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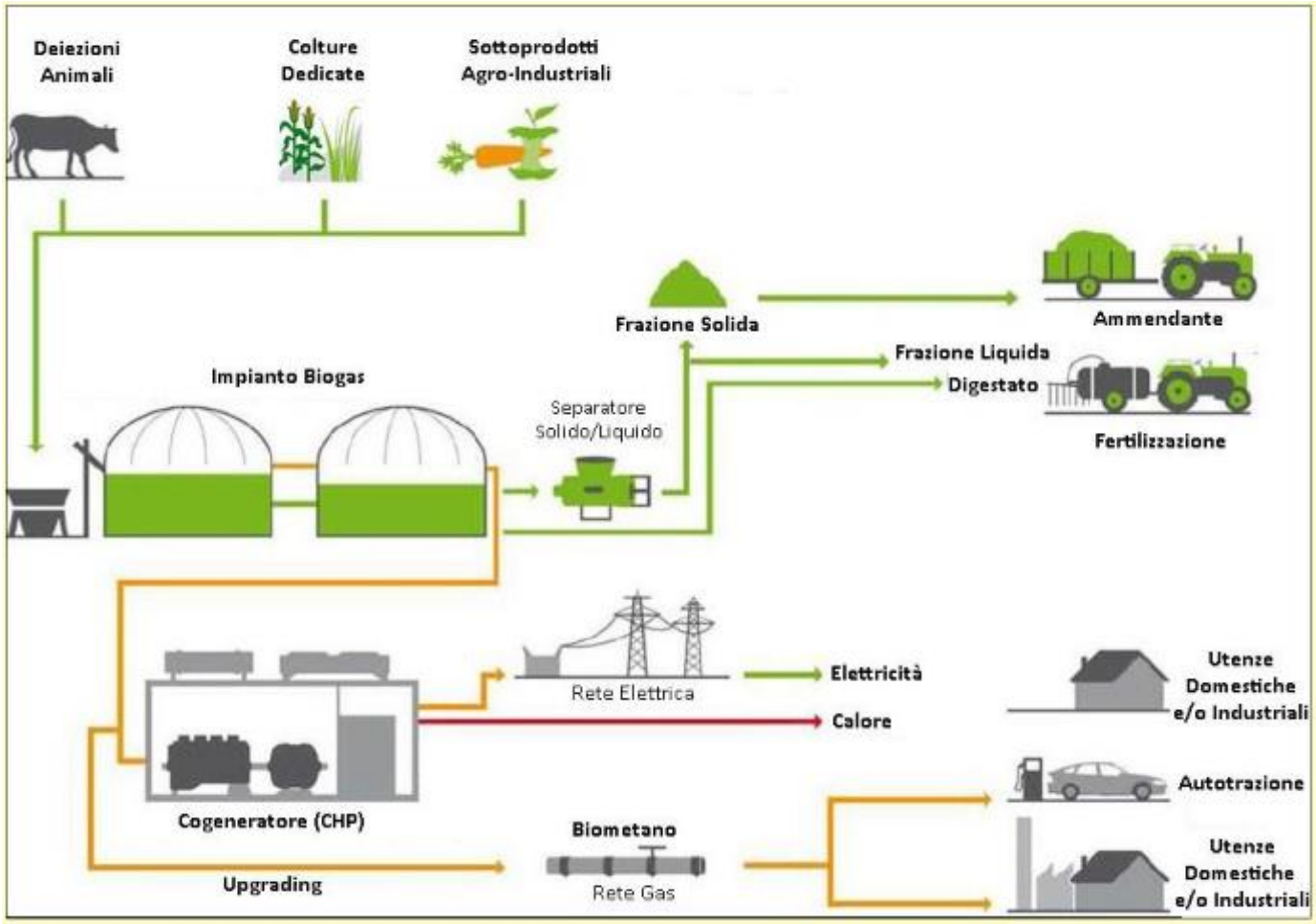
Schema di impianto



Fonte: AA.VV. Elab. CIB, 2012

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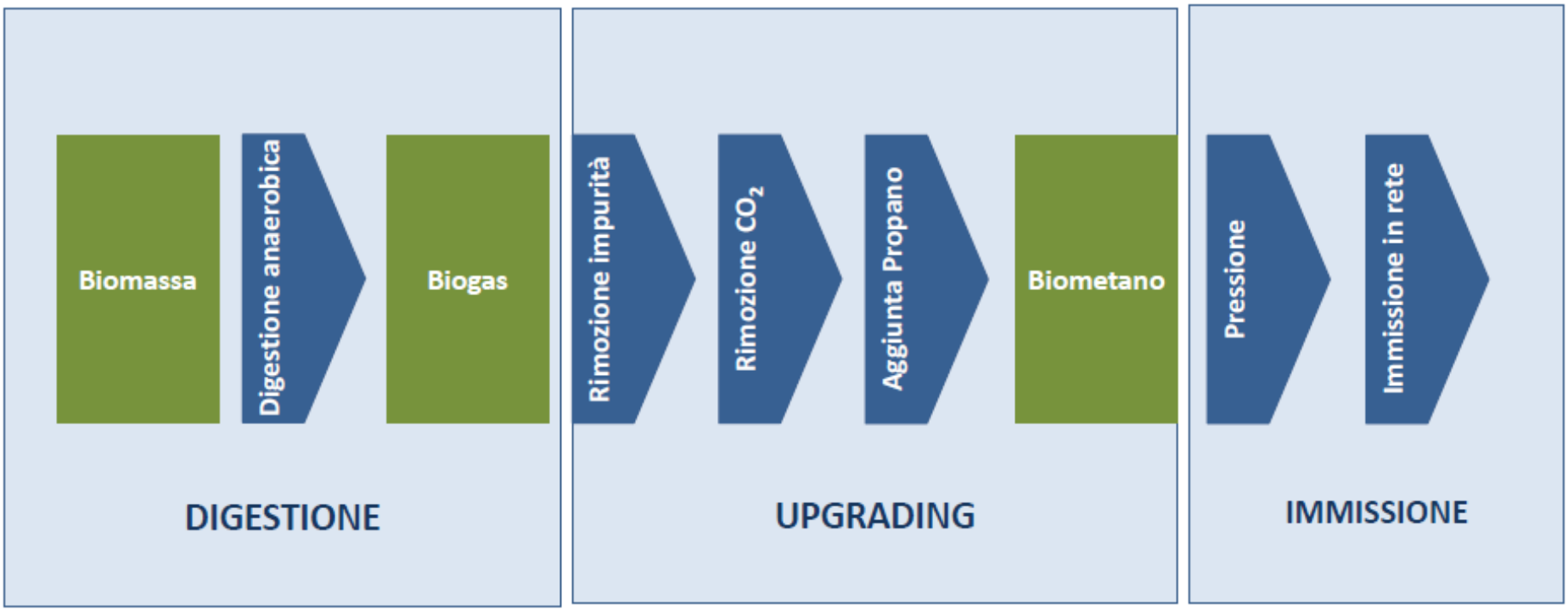
Biometano: schema di flusso



Fonte: SNAM, 2016

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Biogasfattobene®

Il CIB ha elaborato un modello per impianti di DA sostenibili che aiutino anche a sequestrare carbonio nel suolo.

I principi base sono:

- usare meno colture di primo raccolto (facendo crescente ricorso a biomasse di integrazione);
- ridurre le emissioni di gas ad effetto serra delle attività agricole, attraverso il corretto impiego del digestato come fertilizzante rinnovabile che stocca la CO_2 nel terreno;
- l'adozione di pratiche zootecniche e agricole più sostenibili;
- integrare in azienda le produzioni agricole con quelle bioenergetiche ad una scala alla portata degli imprenditori agricoli.

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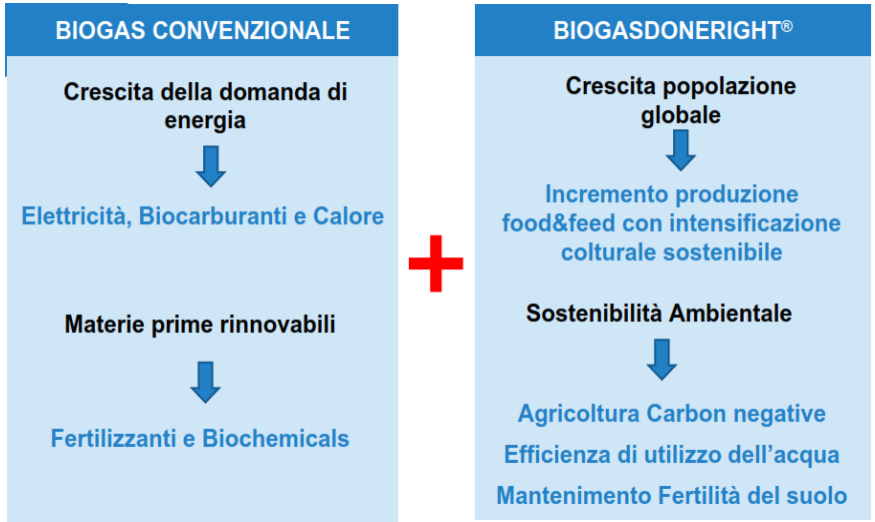
Biogasfattobene®

I risultati dell'applicazione del modello:

- garantire la convenienza per chi realizza l'impianto e la sostenibilità dal punto di vista ambientale;
- mantenere o aumentare la capacità dell'azienda di produrre specie alimentari;
- migliorare la gestione dei terreni.



Vantaggi aggiuntivi del Biogasfattobene® rispetto al biogas convenzionale
fonte: Servizio Agronomia CIB

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Consigli utili

- La produzione di biogas/biometano permette di valorizzare gli scarti e diversificare le fonti di reddito;
- dai priorità all'utilizzo di sottoprodotti e scarti aziendali;
- fai sistema con altri agricoltori o allevatori;
- introduci colture di secondo raccolto aumentando la producibilità dei campi;
- valuta attentamente le alternative (cogenerazione, biometano in rete, vendita per autotrazione);
- considera la possibilità di utilizzare il biometano per i mezzi agricoli;
- utilizza il calore in eccesso per la tua azienda o per utenze limitrofe;
- sostituisci i fertilizzanti chimici con il digestato.

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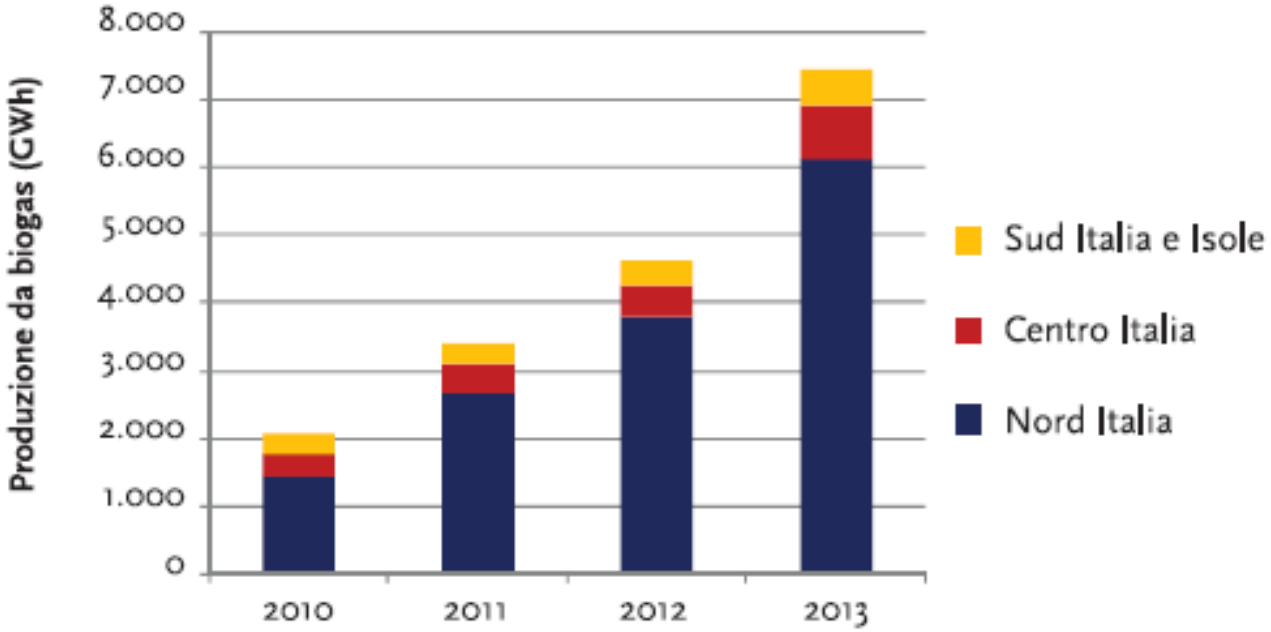
Distribuzione territoriale



Fonte: elaborazione Althesys su dati GSE

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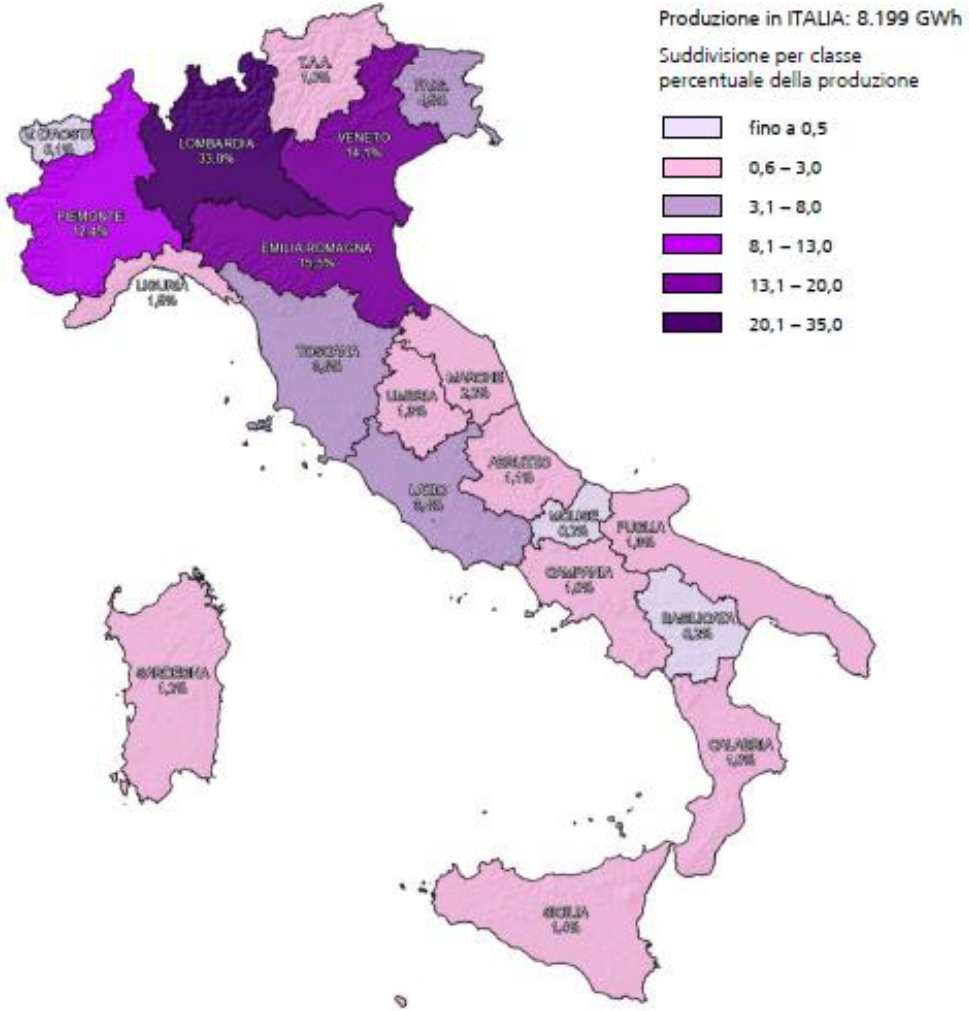
Distribuzione territoriale



- Il Sud Italia + Isole solo per il 6,3% alla produzione nazionale
- Il Centro Italia produce l'11,6% del biogas

Fonte: GSE, Rapporto statistico Energia da fonti rinnovabili 2014

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Ragusa: biomasse utilizzabili

La Sicilia è caratterizzata da una grande frammentazione aziendale

Le coltivazioni che ricoprono più dell'1% della SAU a Ragusa sono:

	Cereali			Vite (*)		Olivo	Agrumi				Frutta a guscio
	Frumento duro	*Orzo*	*Avena*	*Uva da tavola*	*Uva da vino*	*Olive da olio*	*Arancio*	*Mandarino*	*Clementina*	*Limone*	*Mandorlo*
Superficie investita (**) (ha)	14 954	932	708	3 000	1 313	8 197	2 773	497	582	496	1 722
Produzioni totali medie 2006 / 07 (tonn)	37 150	4 330	4 000	74 400	17 150	14 900	69 600	9 000	15 980	15 000	5 775

Principali coltivazioni agrarie nella provincia di Ragusa (fonte: RSE/50, ENEA)

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Ragusa: biomasse utilizzabili

- Sottoprodotti del mandorlo (potature, gusci) non sono digeribili; utilizzabili per combustione diretta.
- Resti della lavorazione dell'uva (raspi, vinacce) sono destinate ad altri usi, es. distillazione.

Le superfici coltivate, oltre ai prodotti, generano i seguenti scarti:

Sottoprodotto	Quantità	
Paglie di cereali	46.899	ton
Sansa	8.940	ton
Pastazzo di agrumi	6.960	ton

Biomassa agricola residuale (rielaborazione dati ENEA)

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Ragusa: biomasse utilizzabili

A fine 2016 la Banca Dati Nazionale dell'Anagrafe Zootecnica censiva 5,800 suini e 77,900 bovini

		N capi
Bovini	vitelli	23.530
	rimonta (12-24 mesi)	13.027
	adulti (>24 mesi)	41.350
Suini	Lattonzoli e magroncelli	1.912
	adulti	3.934

Allevamenti in provincia di Ragusa (fonte: Anagrafe zootecnica)

- **295,000 residenti →23,600 ton/anno di FORSU**

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Ragusa: potenziale massimo

Destinando a digestione anaerobica tutti gli scarti rifiuti e sottoprodotti si possono alimentare:

- 12 impianti da $1MW_{el}$
- di cui circa $740kW_{el}$ da FORSU

Tipologia	Quantità	
Reflui zootecnici	1.398.207	ton/anno
Sottoprodotti agricoli*	46.899	ton/anno
Sottoprodotti agroindustria*	18.339	ton/anno
FORSU	23.600	ton/anno

Biomasse in ingresso agli impianti

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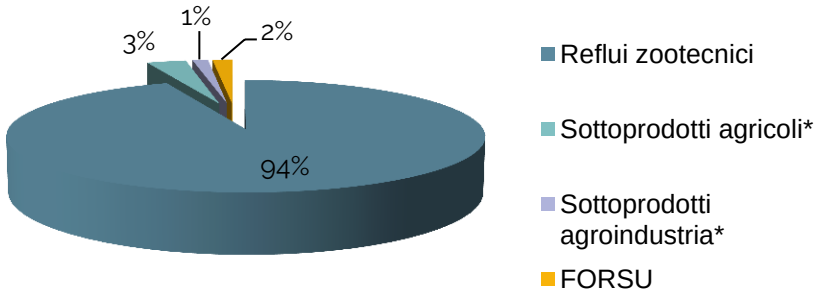
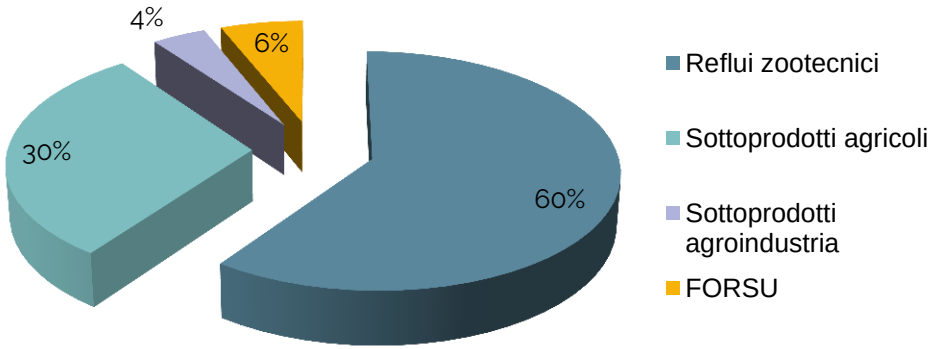
Ragusa: potenziale massimo



Suddivisione biomasse in ingresso



Contributo alla produzione di biogas

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Ragusa: potenziale massimo

- Oltre al biogas gli impianti producono circa **292,000 ton/anno** di digestato da spargere nei campi come ammendante

Considerando:

- di produrre la biomassa ad una distanza media di 10km
- di spargere il digestato ad una distanza media di 20 km

Ogni impianto porta una riduzione di circa **3.300 ton/anno di CO_2** per un totale di 40.000 ton/anno di CO_2

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Ragusa: obiettivo

Cosa succede se….?

- Si riesce a recuperare il 50% delle paglie di cereali;
- Solo il 25% delle deiezioni non può essere utilizzato;
- Pastazzo e sansa sono sfruttati interamente;
- Si introduce una seconda coltivazione (es. sorgo) nel 25% dei campi a cereali;
- La valorizzazione energetica della della FORSU diventa la prassi.

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Ragusa: obiettivo

Tipologia	Quantità	
Reflui zootecnici	1048655	ton/anno
Sottoprodotti agricoli*	23450	ton/anno
Sottoprodotti agroindustria*	18339	ton/anno
Colture vernine (secondo raccolto)	20518	ton/anno
FORSU	23600	ton/anno

Biomasse in ingresso agli impianti

- Biomassa sufficiente per alimentare **9 impianti da 1 MW**

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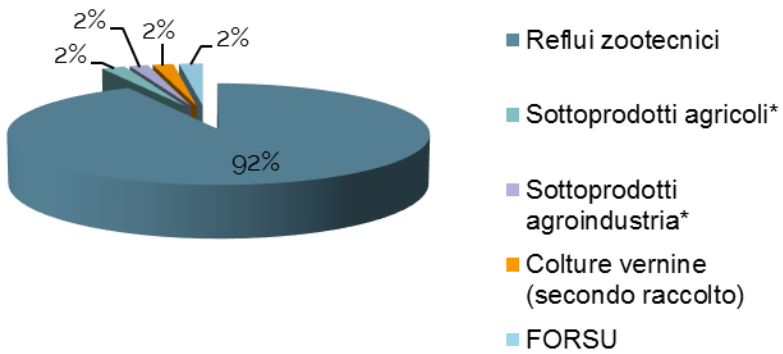
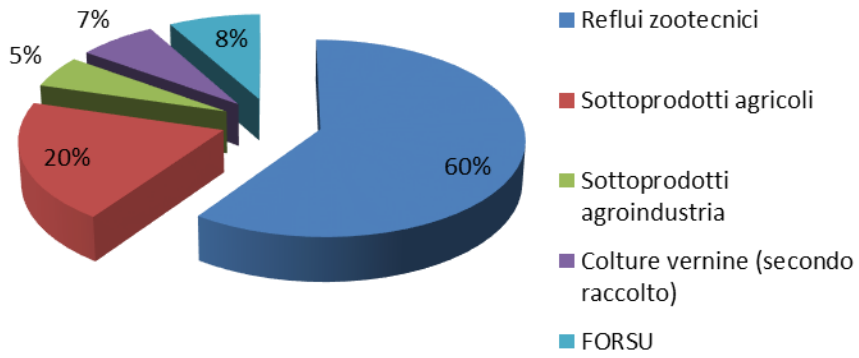
Ragusa: obiettivo



Suddivisione biomasse in ingresso



Contributo alla produzione di biogas

ISAAC

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Il tool di calcolo

- Cosa fornisce?
  - *un report con tabelle e grafici che riassumono le caratteristiche tecniche e le analisi economiche*
  - *avvisi sulle normative da rispettare*
  - *verifiche sui flussi di biomasse (es.: troppo modesti per rendere conveniente l'investimento o eccessivi per le dimensioni dell'impianto)*

N.B.: non è uno studio di fattibilità!

http://www.isaac-project.it/il-tool/

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Il tool di calcolo

- Cosa fa?
  - *calcola i flussi di materia ed energia e le dimensioni dell'impianto,*
  - *fornisce informazioni sulle caratteristiche tecniche degli impianti,*
  - *stima i benefici economici ed ambientali.*

- A chi è rivolto?
  - *agricoltori,*
  - *amministratori comunali,*
  - *aziende agroalimentari,*
  - *allevatori.*

N.B.: non è uno studio di fattibilità!

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Il tool: informazioni richieste

- Informazioni personali e finanziarie
- Tipologia di impianto a cui si è interessati
- Informazioni sulle biomasse disponibili:
  - da aziende zootecniche
  - da aziende agricole
  - da industrie agroalimentari
- Comuni interessati.

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Il tool di calcolo: raccolta dati

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home | il progetto | i risultati | i partner | documenti | il tool | contatti | news | Italiano

Il Tool

ISAAC

Nome: ProvaTredici

Cognome: Facci

Email: enrico.facci@azzeroco2.it

Sono interessato ad un impianto per: Biogas

Regione: Veneto

Provincia: Vicenza

Comune: Schio

Possiedi il terreno? Si

Capitale proprio 60 %

Fin. bancario 40 %

☑ Utilizzando questo strumento chiedo di ricevere una comunicazione con i risultati dei calcoli di fattibilità. Acconsento inoltre al trattamento dei dati personali ai sensi dell'articolo 13 del D.Lgs. 196/2003 ai fini del raggiungimento degli obiettivi del progetto ISAAC.

☐ Iscrivimi alla newsletter

Vai avanti

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Il tool di calcolo: raccolta dati

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Numero aziende zootecniche di cui utilizzare i liquami: 2

Azienda 1

Distanza dall'impianto: 0 km

Tipo di animali	N° Capi
Bovini adulti (Più di 2 anni)	500
Rimonta (Manzi di 1-2 anni)	0
Vitelli (0-12 mesi)	0
Maiali adulti	0
Lattonzoli e magroncelli (<50kg)	0

Avicoli	Tonnellate / anno
Letame (pollina)	0
Lettiera	0

Azienda 2

Distanza dall'impianto: 2 km

Tipo di animali	N° Capi
Bovini adulti (Più di 2 anni)	0
Rimonta (Manzi di 1-2 anni)	600
Vitelli (0-12 mesi)	0
Maiali adulti	0
Lattonzoli e magroncelli (<50kg)	0

Avicoli	Tonnellate / anno
Letame (pollina)	0
Lettiera	0

Vai indietro | Vai avanti

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Il tool di calcolo: Esempio 1

IPOTESI:

- si possiede già il terreno
- possibilità di coprire in equity il 60% delle spese
- si è interessati ad un impianto per il biogas (cogenerazione)
- sono coinvolte 2 aziende zootecniche, 1 agricola ed una agroalimentare
- non si utilizza FORSU

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Il tool di calcolo: Esempio 1

Biomasse a disposizione:

- Liquami e deiezioni di 500 bovini adulti e 600 in rimonta
- 825 ton/anno di stocchi di mais
- 5000 ton/anno di siero di latte
- non si utilizza FORSU

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Il tool di calcolo: Esempio 1

Risultati: principali caratteristiche tecniche dell'impianto

Taglia impianto	300	kW
Costo impianto	1.400.000	€
Costi O&M	98.000	€/anno
Superficie occupata	1,4	ettari
Ore annue di funzionamento	8.000	ore
Biogas prodotto	687.670	Sm^3/anno
Energia elettrica prodotta	1.362	MWh/anno
Calore utile prodotto	1.106	MWh/anno

L'impianto è composto da:

- vasche per la fermentazione
- trincee di stoccaggio della biomassa e del digestato
- sistemi di controllo e gestione
- cogeneratore

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Il tool di calcolo: Esempio 1

Risultati: flussi in ingresso ed uscita

Tipologia	Quantità	
Reflui zootecnici	21065	ton/anno
Sottoprodotti agricoli*	825	ton/anno
Sottoprodotti agroindustria*	5000	ton/anno
FORSU	0	ton/anno

* alcuni scarti possono essere classificati come rifiuti e bisogna tenerne conto nella procedura di autorizzazione

- distanza media di produzione della biomassa: 0,7 km
- input: 8 camion al giorno (da 10 ton) in ingresso

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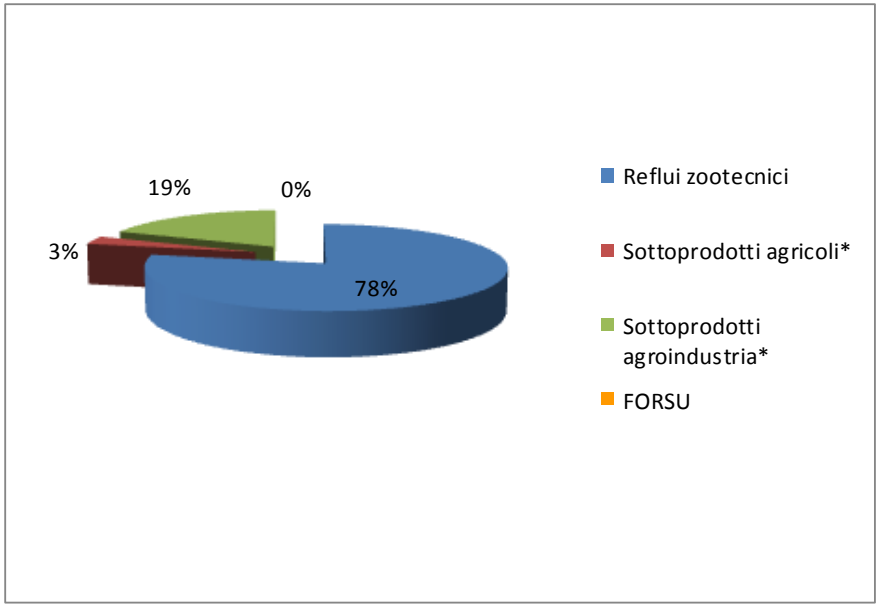
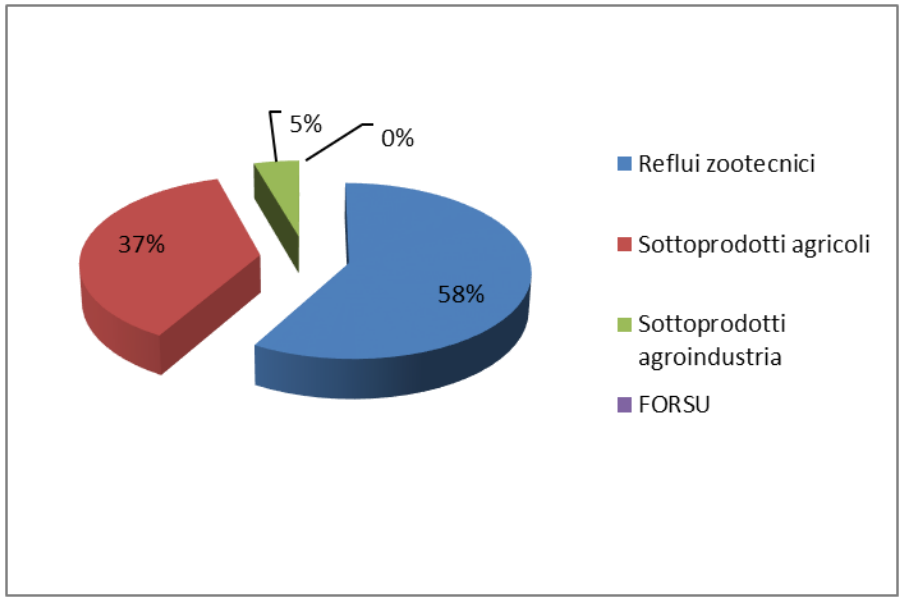
Il tool di calcolo: Esempio 1

Risultati: flussi in ingresso ed uscita



Suddivisione biomasse in ingresso all'impianto



Contributo alla produzione di biogas

ISAAC

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Il tool di calcolo: Esempio 1

Risultati: analisi ambientale

L'impianto permette di evitare l'emissione di circa **607** t/anno di CO_2

Per la valutazione vengono considerati:

- l'energia elettrica e termica prodotte
- le emissioni dei camion per il trasporto della biomassa
- quelle per il trasporto del digestato ai campi (ip. dist. media 20km)

Ulteriore vantaggio: riduzione dell'uso di fertilizzanti chimici

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Il tool di calcolo: Esempio 1

Risultati: analisi economica

Costo impianto	1.400.000	€
Costo terreno	0	€
Capitale proprio	840.000	€
Finanziamento bancario	560.000	€
Tasso su finanziamento	3%	€
Durata finanziamento	10	anni

Caratteristiche dell'investimento

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Il tool di calcolo: Esempio 1

Risultati: analisi economica (utilizzo della sola EE prodotta)

- **Ricavi:** 317.250 €/anno
- **Spese di gestione e manutenzione ordinaria:** -98.000 €/anno

Considerando anche :
- manutenzione straordinaria
- tassazione

ADSCR	non calcolabile
VAN	€ 799.570
PBT	8
MIRR	8,57%

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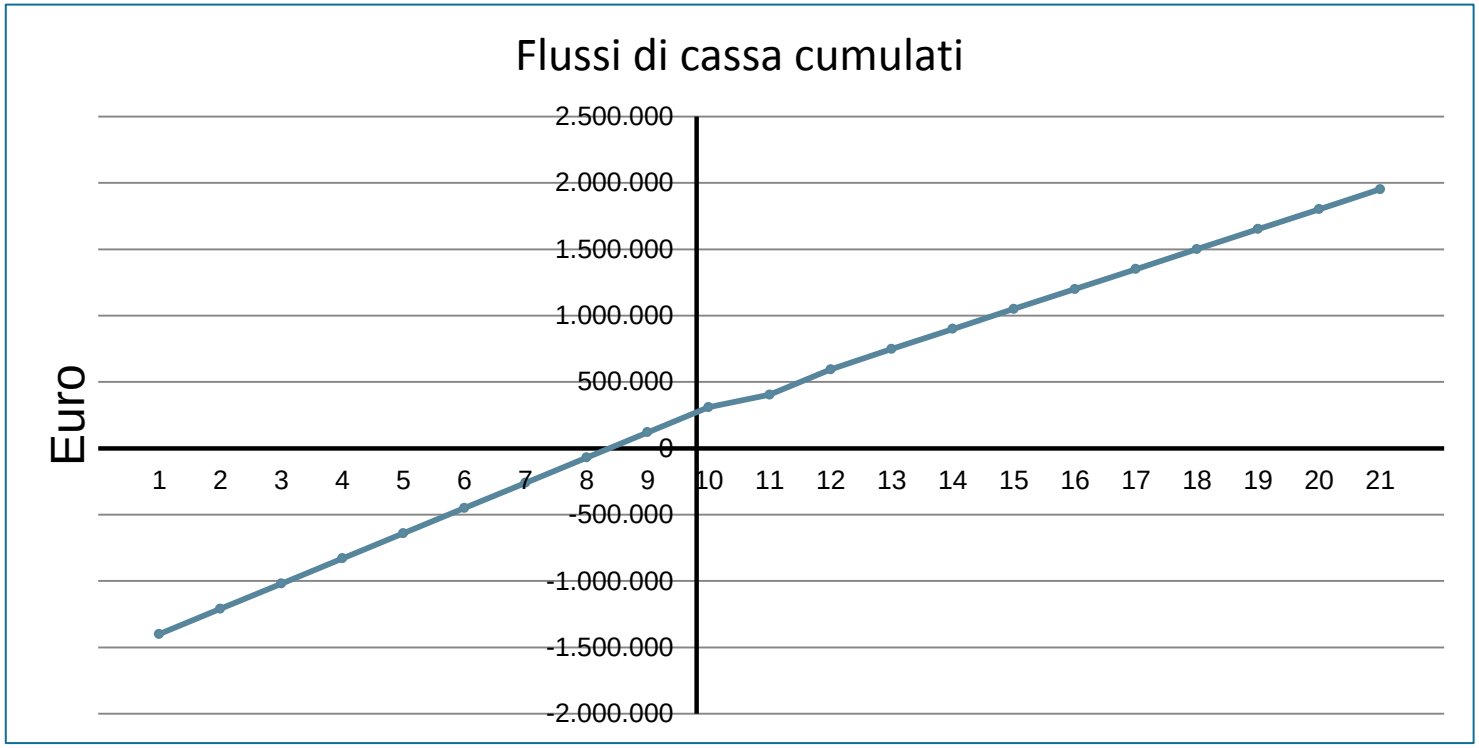
Il tool di calcolo: Esempio 1

Risultati: analisi economica (utilizzo della sola EE prodotta)



Flussi di cassa cumulati

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Il tool di calcolo: Esempio 1

Risultati: analisi economica (utilizzo di EE e calore prodotti)

- **Ricavi:** 361.500 €/anno
- **Spese di gestione e manutenzione ordinaria:** -98.000 €/anno

Considerando anche :
- manutenzione straordinaria
- tassazione

ADSCR	non calcolabile
VAN	€ 1.177.620
PBT	7
MIRR	9,7%

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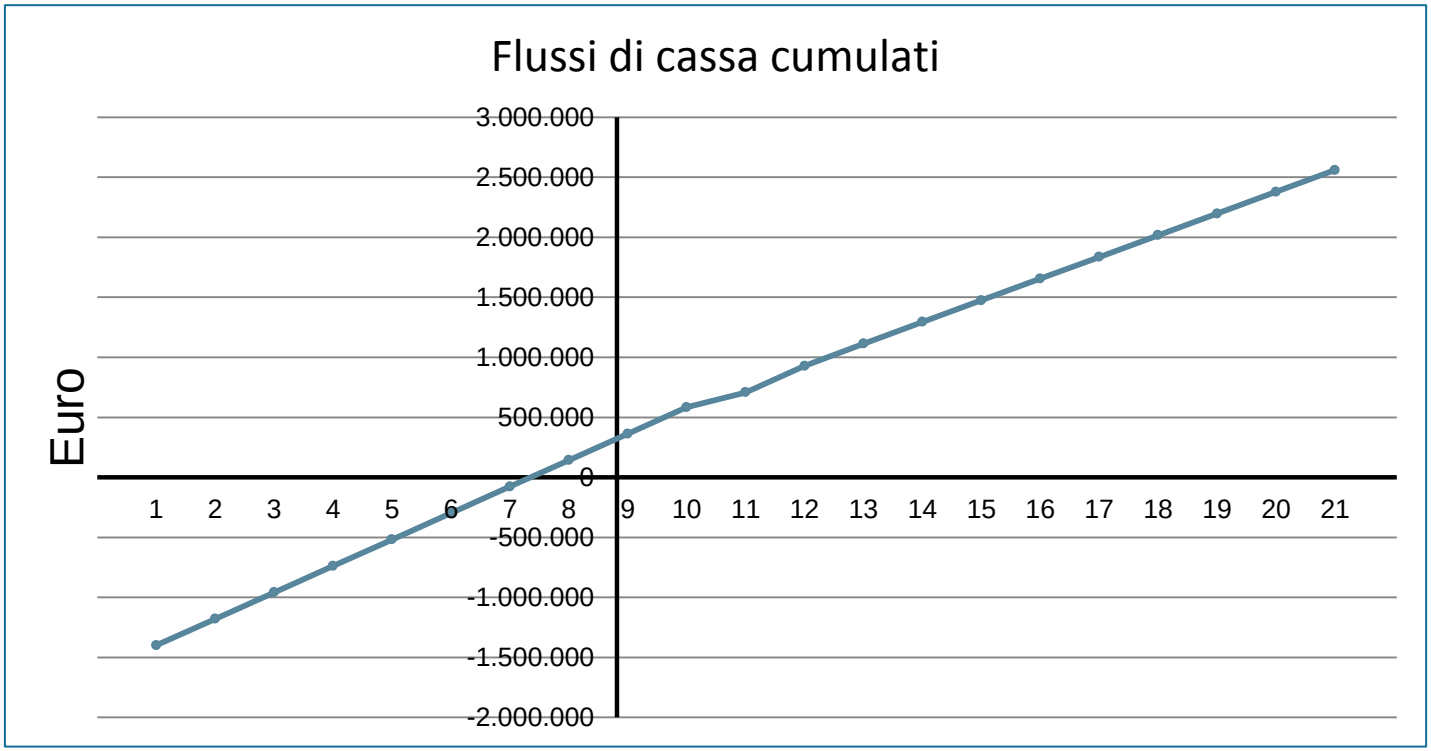
Il tool di calcolo: Esempio 1

Risultati: analisi economica (utilizzo di EE e calore prodotti)



Flussi di cassa cumulati

ISAAC

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Il tool di calcolo: Esempio 2

IPOTESI:

- L'impianto tratta la FORSU di 2 comuni
- si possiede già il terreno dove realizzare l'impianto
- possibilità di coprire in equity il 35% delle spese
- si è interessati ad un impianto per il biogas (cogenerazione)
- sono coinvolte 1 azienda zootecnica ed 1 agricola

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Il tool di calcolo: Esempio 2

Biomasse a disposizione:

- Circa 12.000 ton/anno di FORSU prodotta da 153.000 abitanti
- 1.200 ton/anno di paglia di cereali
- Circa 2.900 ton/anno di liquami suini (700 capi adulti)

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Il tool di calcolo: Esempio 2

Risultati: principali caratteristiche tecniche dell'impianto

Taglia impianto	600	kW
Costo impianto	3.900.000	€
Costi O&M	182.000	€/anno
Superficie occupata	1,8	ettari
Ore annue di funzionamento	8.000	ore
Biogas prodotto	2.053.227	Sm^3/anno
Energia elettrica prodotta	4.291	MWh/anno
Calore utile prodotto	3.611	MWh/anno

L'impianto è composto da:

- vasche per la fermentazione
- trincee di stoccaggio della biomassa e del digestato
- sistemi di controllo e gestione
- cogeneratore

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Il tool di calcolo: Esempio 2

Risultati: flussi in ingresso ed uscita

Tipologia	Quantità	
Reflui zootecnici	2923	ton/anno
Sottoprodotti agricoli*	1200	ton/anno
Sottoprodotti agroindustria*	0	ton/anno
FORSU	12243	ton/anno

* alcuni scarti possono essere classificati come rifiuti e bisogna tenerne conto nella procedura di autorizzazione

- distanza media di produzione della biomassa: 7,3 km
- input: 5 camion al giorno (da 10 ton) in ingresso

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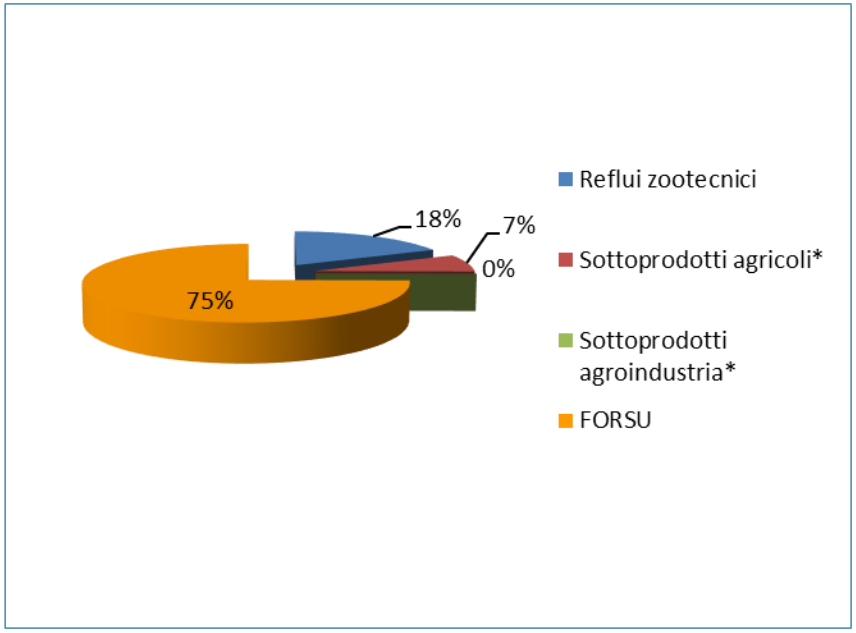
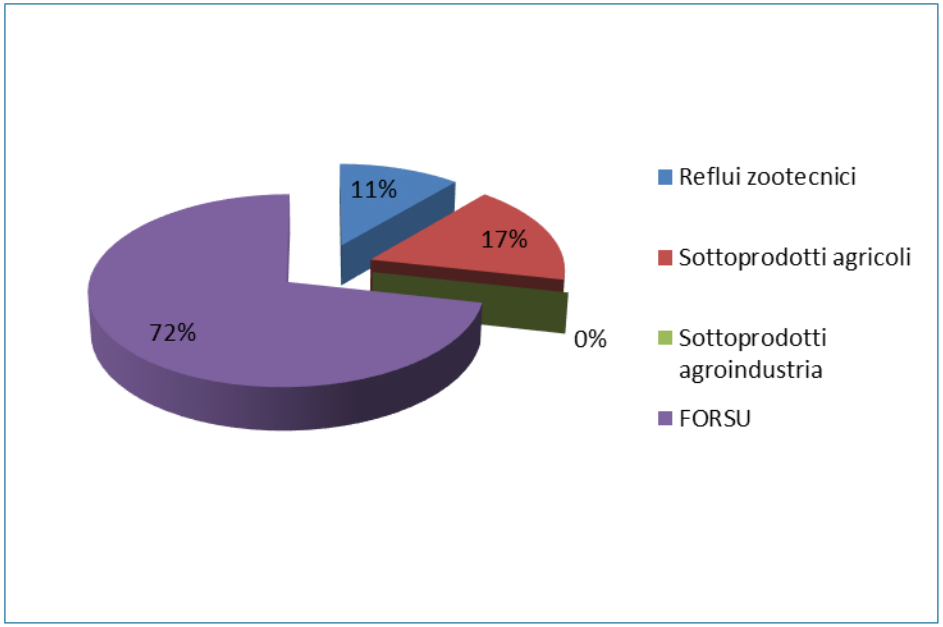
Il tool di calcolo: Esempio 2

Risultati: flussi in ingresso ed uscita



Suddivisione biomasse in ingresso all'impianto



Contributo alla produzione di biogas

ISAAC

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Il tool di calcolo: Esempio 2

Risultati: analisi ambientale

L'impianto permette di evitare l'emissione di circa **1820** t/anno di CO_2

Per la valutazione vengono considerati:

- l'energia elettrica e termica prodotte
- le emissioni dei camion per il trasporto della biomassa
- quelle per il trasporto del digestato ai campi (ip. dist. media 20km)

Ulteriore vantaggio: riduzione dell'uso di fertilizzanti chimici

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691875

Il tool di calcolo: Esempio 2

Risultati: analisi economica

Costo impianto	3.900.000	€
Costo terreno	0	€
Capitale proprio	1.365.000	€
Finanziamento bancario	2.535.000	€
Tasso su finanziamento	3%	€
Durata finanziamento	10	anni

Caratteristiche dell'investimento

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691875

Il tool di calcolo: Esempio 2

Risultati: analisi economica (utilizzo della sola EE prodotta)

- **Ricavi:** 772.500 €/anno
- **Spese di gestione e manutenzione ordinaria:** -182.000 €/anno

Considerando anche :
- manutenzione straordinaria
- tassazione

ADSCR	1,64
VAN	€ 2.146.000
PBT	8
MIRR	10,0%

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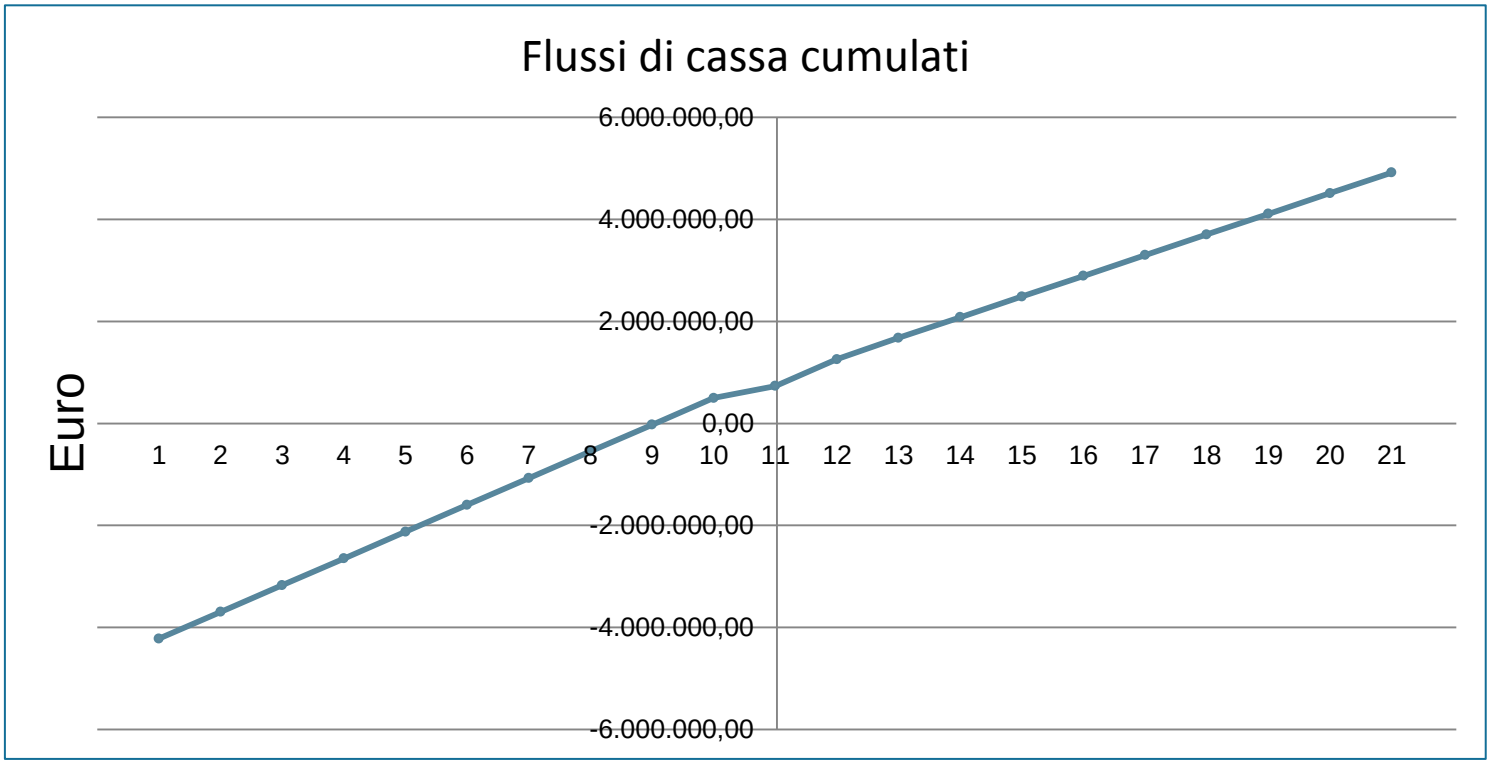
Il tool di calcolo: Esempio 2

Risultati: analisi economica (utilizzo della sola EE prodotta)



Flussi di cassa cumulati

ISAAC

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Il tool di calcolo: Esempio 2

Risultati: analisi economica (utilizzo di EE e calore prodotti)

- **Ricavi:** 917.000 €/anno
- **Spese di gestione e manutenzione ordinaria:** -182.000 €/anno

Considerando anche :
- manutenzione straordinaria
- tassazione

ADSCR	1,98
VAN	€ 3.380.869
PBT	7
MIRR	11,75%

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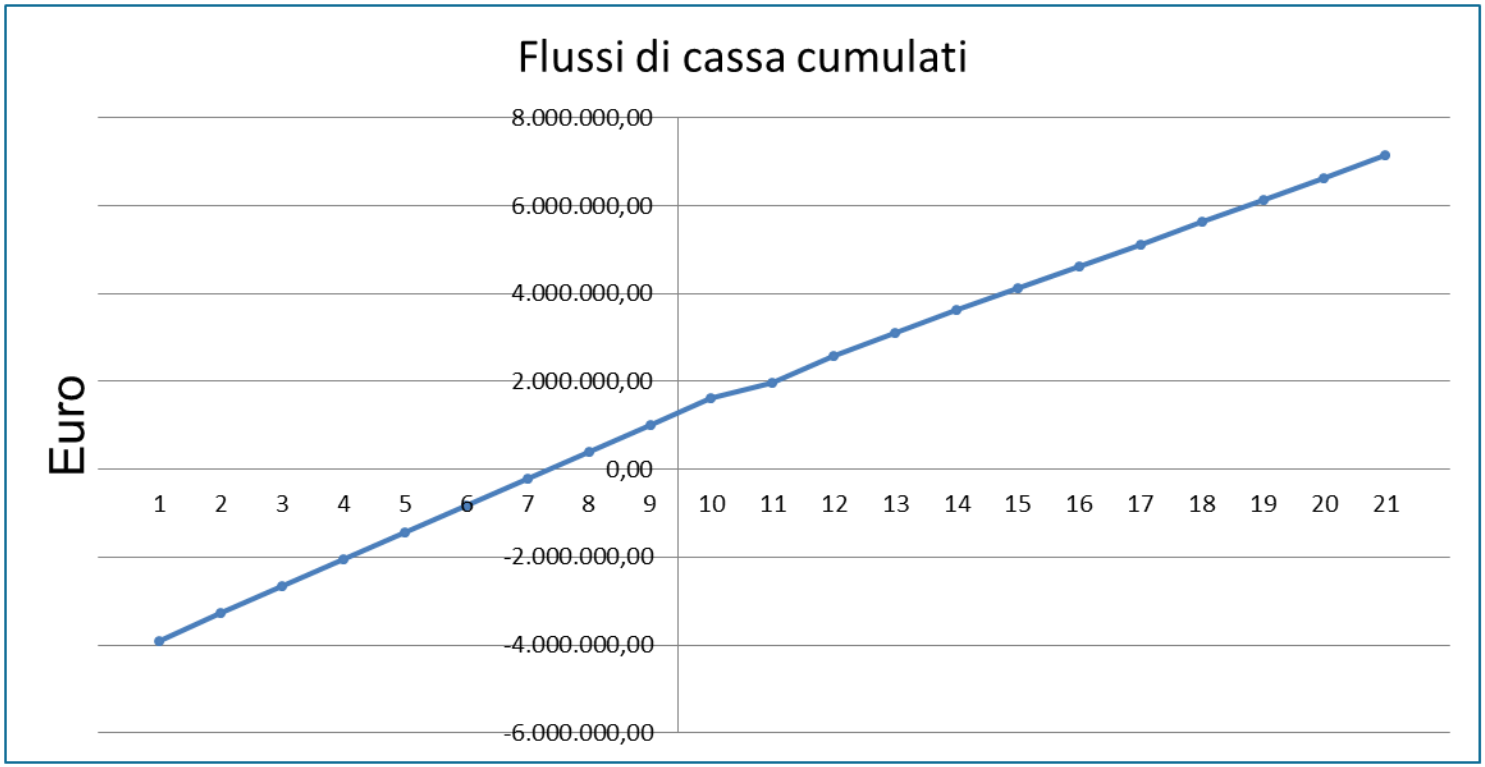
Il tool di calcolo: Esempio 2

Risultati: analisi economica (utilizzo di EE e calore prodotti)



Flussi di cassa cumulati

ISAAC

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Il tool di calcolo: Esempio 3

IPOTESI:

- si possiede già il terreno
- possibilità di coprire in equity il 35% delle spese
- si è interessati ad un impianto per il biometano
- sono coinvolte 1 azienda zootecnica, 2 agricola e tre agroalimentari
- non si utilizza FORSU

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Il tool di calcolo: Esempio 3

Biomasse a disposizione:

- 720 ton/anno di stocchi di mais (60ha)
- 750 ton/anno di paglia di cereali (50ha)
- Circa 7.900 ton/anno di liquami liquami e deiezioni (300 capi adulti)
- 1200 ton/anno di scarti di macellazione
- 250 ton anno di sanse
- 350 ton/anno di scarti di molitura

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Il tool di calcolo: Esempio 3

Risultati: principali caratteristiche tecniche dell'impianto

Taglia impianto	75	Sm^3/ora
Costo impianto	1.450.000	€
Costo connessione alla rete o carro bombolaio	270.000	€
Costi O&M	107.800	€/anno
Superficie occupata	1,4	ettari
Ore annue di funzionamento	8.000	ore
Biometano prodotto	460.316	Sm^3/anno

L'impianto è composto da:

- vasche per la fermentazione
- trincee di stoccaggio della biomassa e del digestato
- sistemi di controllo e gestione
- sistema di purificazione (upgrading) del biogas in biometano
- tubature per connessione alla rete del gas naturale

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Il tool di calcolo: Esempio 3

Risultati: flussi in ingresso ed uscita

Tipologia	Quantità	
Reflui zootecnici	7.884	ton/anno
Sottoprodotti agricoli*	1.470	ton/anno
Sottoprodotti agroindustria*	1.800	ton/anno
FORSU	0	ton/anno

* alcuni scarti possono essere classificati come rifiuti e bisogna tenerne conto nella procedura di autorizzazione

- distanza media di produzione della biomassa: 5,9 km
- input: 3 camion al giorno (da 10 ton) in ingresso

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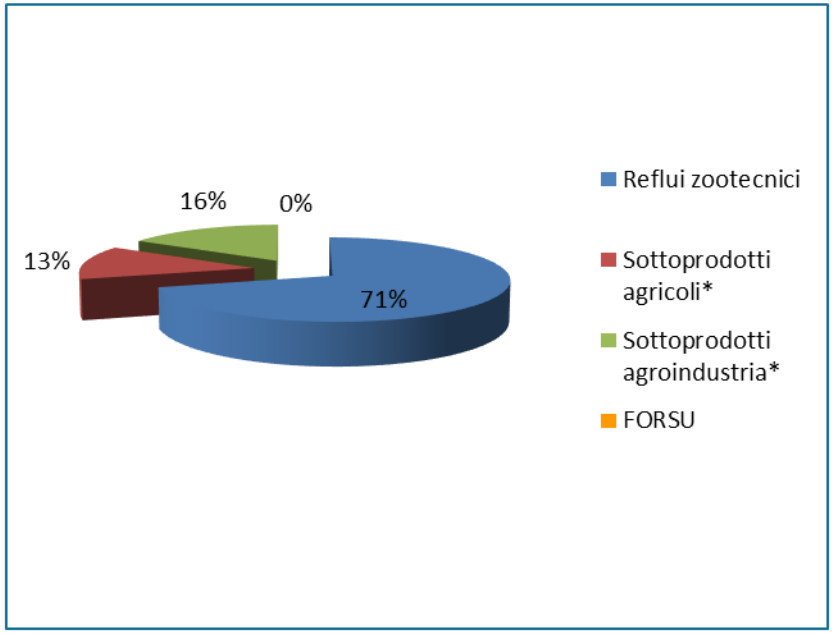
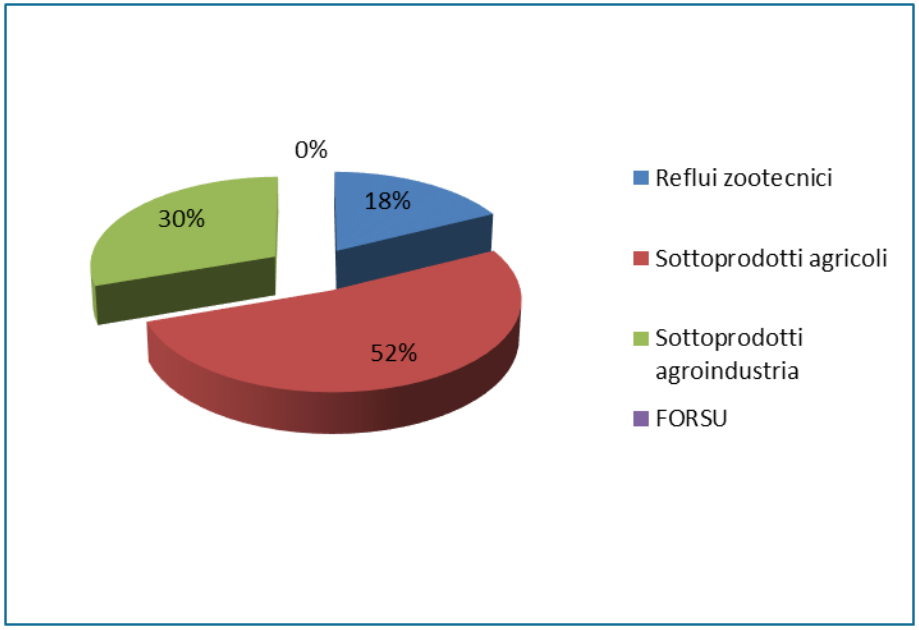
Il tool di calcolo: Esempio 3

Risultati: flussi in ingresso ed uscita



Suddivisione biomasse in ingresso all'impianto



Contributo alla produzione di biogas

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Il tool di calcolo: Esempio 3

Risultati: analisi ambientale

L'impianto permette di evitare l'emissione di circa **750** t/anno di CO_2

Per la valutazione vengono considerati:

- Il biometano immesso in rete
- le emissioni dei camion per il trasporto della biomassa
- quelle per il trasporto del digestato ai campi (ip. dist. media 20km)

Ulteriore vantaggio: riduzione dell'uso di fertilizzanti chimici

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Il tool di calcolo: Esempio 3

Risultati: analisi economica

Costo impianto	1.720.000	€
Costo terreno	0	€
Capitale proprio	602.000	€
Finanziamento bancario	1.118.000	€
Tasso su finanziamento	3%	€
Durata finanziamento	10	anni

Caratteristiche dell'investimento

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691875

Il tool di calcolo: Esempio 3

Risultati: analisi economica (vendita al GSE del biometano prodotto)

- **Ricavi:** 339.695€/anno
- **Spese di gestione e manutenzione ordinaria:** -108.000 €/anno

Considerando anche :
- manutenzione straordinaria
- tassazione

ADSCR	1,50
VAN	€ 702.800
PBT	9
MIRR	9,0%

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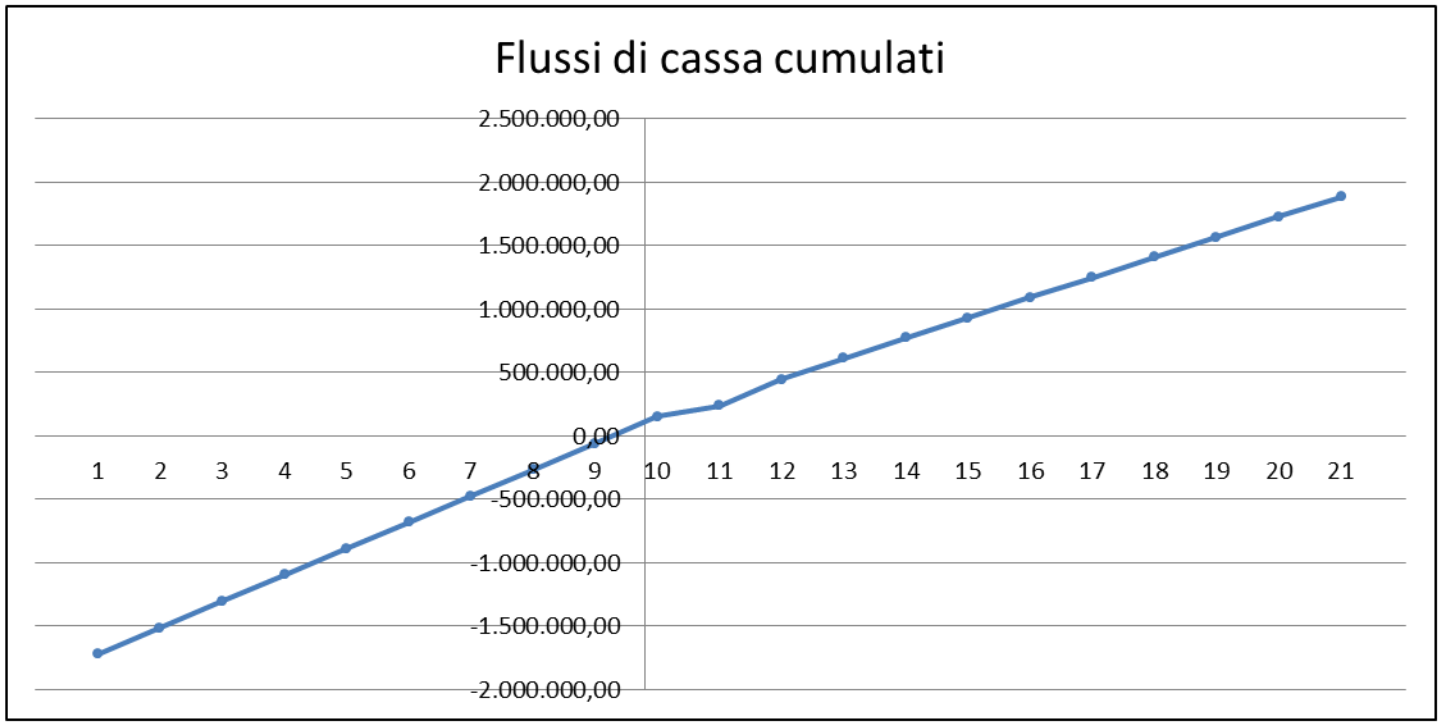
Il tool di calcolo: Esempio 3

Risultati: analisi economica (vendita al GSE del biometano prodotto)



Flussi di cassa cumulati

ISAAC

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Il tool di calcolo: Esempio 3

Risultati: analisi economica (vendita per autotrazione)

- **Ricavi:** 396.000 €/anno
- **Spese di gestione e manutenzione ordinaria:** -107.800 €/anno

Considerando anche :
- manutenzione straordinaria
- tassazione

ADSCR	1,79
VAN	€ 1.185.000
PBT	7
MIRR	10,86%

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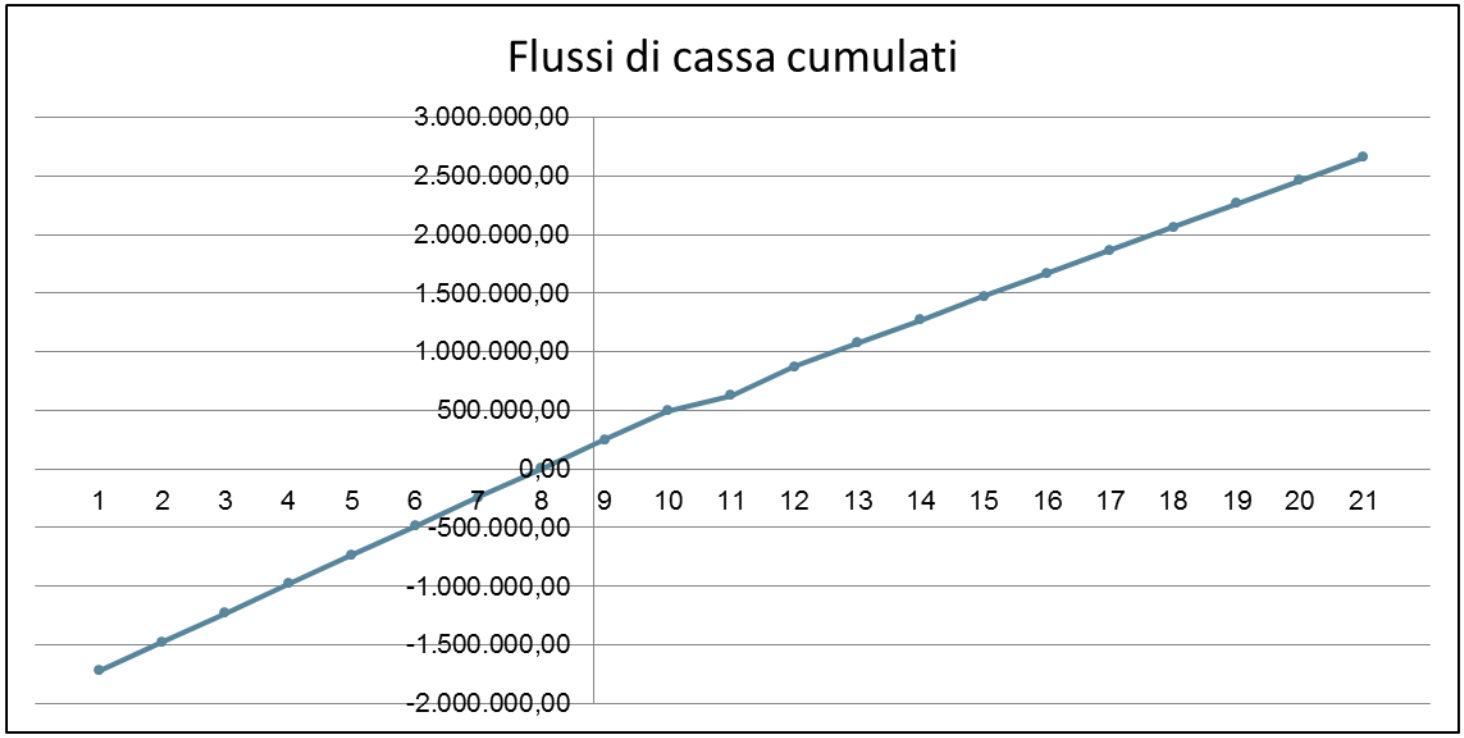
Il tool di calcolo: Esempio 3

Risultati: analisi economica (vendita per autotrazione)



Flussi di cassa cumulati

ISAAC

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Attachment 2: Evaluation questionnaire

Questionario di valutazione

1. Ritieni che l'argomento dell'incontro sia stato interessante? voto da 1 a 5 (1= per nulla; 5= molto interessante)

2. L'argomento è stato trattato in modo chiaro e comprensibile? (1=per nulla; 5= molto)

3. Quale aspetto andrebbe approfondito maggiormente?
   _____
   _____
   _____
   _____
   _____
   _____

4. Alla luce di quanto discusso, ritieni che la possibilità di utilizzare i sottoprodotti agricoli ed effluenti zootecnici in un impianto di digestione anaerobica sia un'opportunità per la tua azienda?

   □ SI □ NO

5. Saresti disposto ad associarti con altre aziende agricole per realizzare un impianto di digestione anaerobica di dimensioni convenienti in modo da massimizzare i vantaggi e ridurre i rischi?

   □ SI □ NO