BIOGASDONERIGHT™

AND SOIL CARBON SEQUESTRATION

SCALING UP BIOGAS & BIOCH$_4$ IN ITALY: SUCCESS STORIES

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OUTLINE

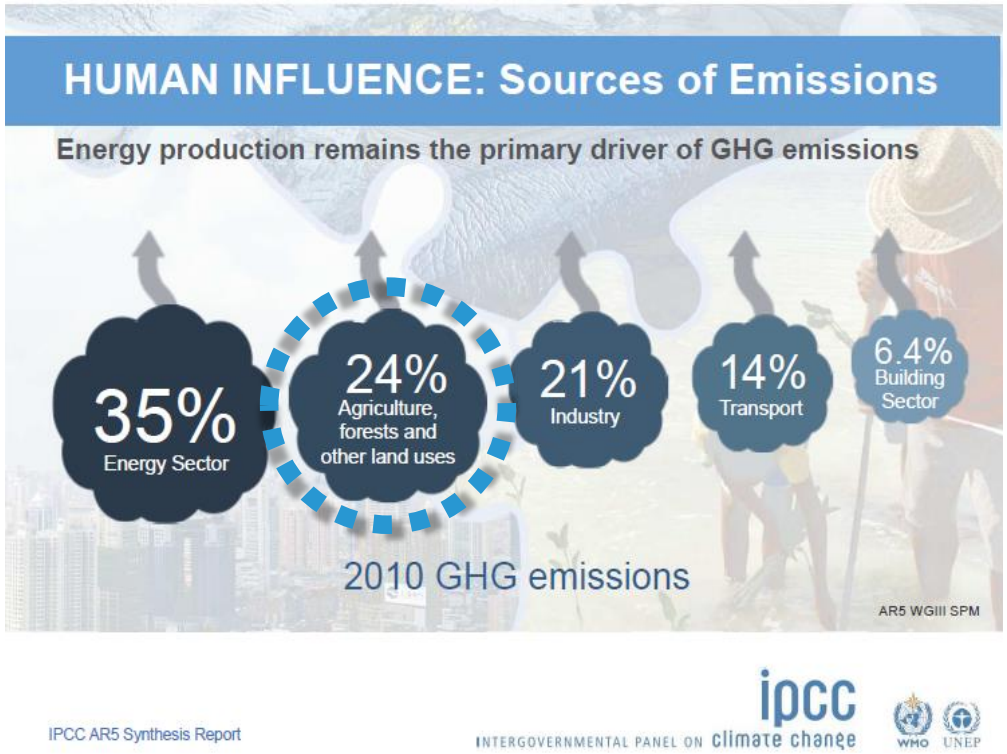
- Why GHGs emissions & climate change matter
- What is Biogasdoneright™
- Biogasdoneright™ carbon footprint
- Biogasdoneright™ land efficiency
- Biogasdoneright™ scalability
- Conclusions

WHAT IS BIOGAS TODAY IN ITALY?

A success story:

- 3rd biogas sector globally
- > 7500 GWh el produced (2014)
- > 2,2 billion Nm3 bioCH4 equivalent per year (2015)
- > 4 Billion € invested in 5 years
- 12.000 direct, good jobs created
- > 30 Million m3 digestate (biofertilizers) per year
- Helped farmers to avoid boom burst market cycles

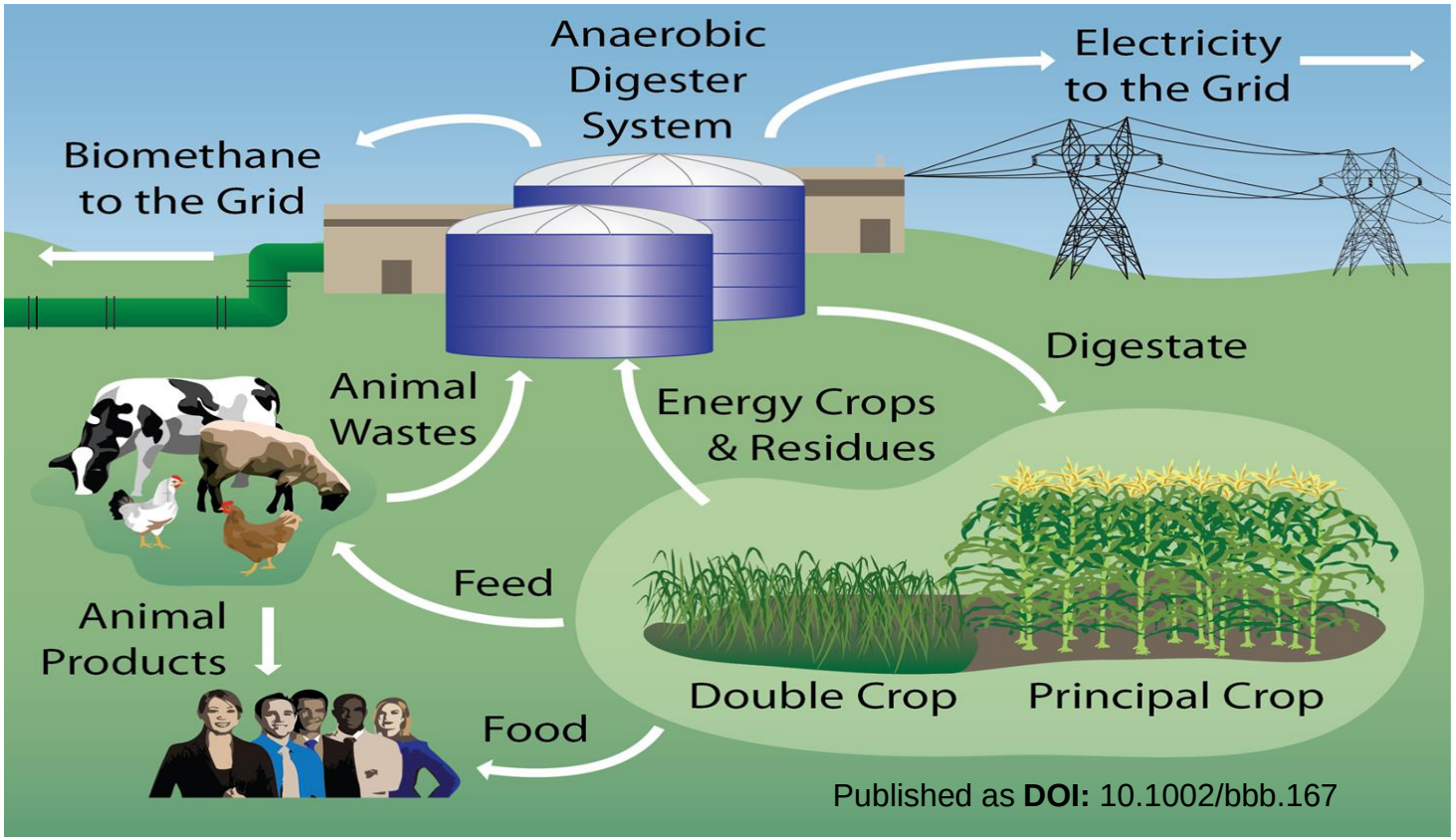
IPCC MITIGATION REPORT 2014



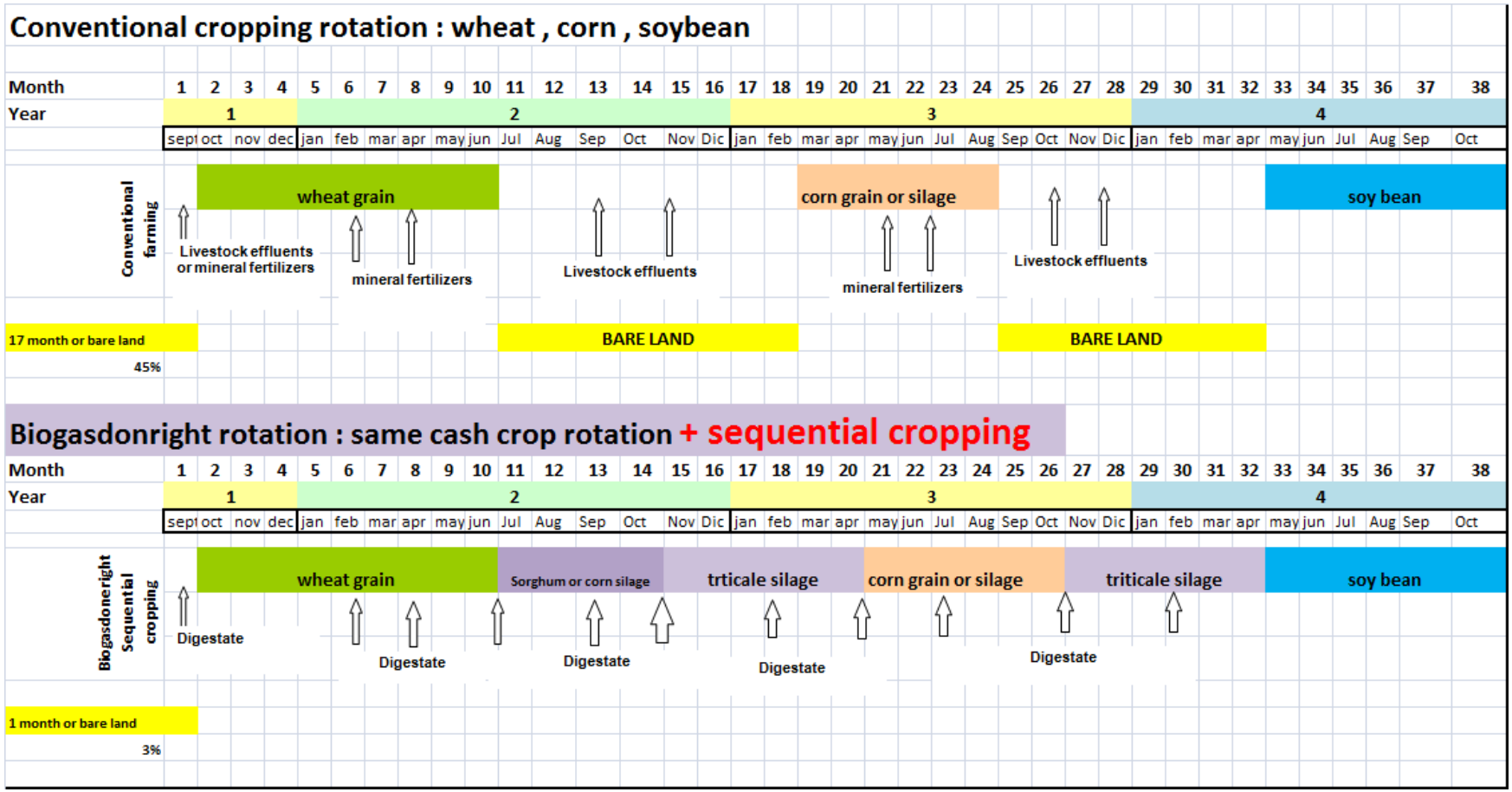
Agriculture alone is responsible for 12% of the GHGs emission globally

BIOGASDONERIGHT: PRODUCING FOOD AND BIOGAS FEEDSTOCK USING SEQUENTIAL CROPPING

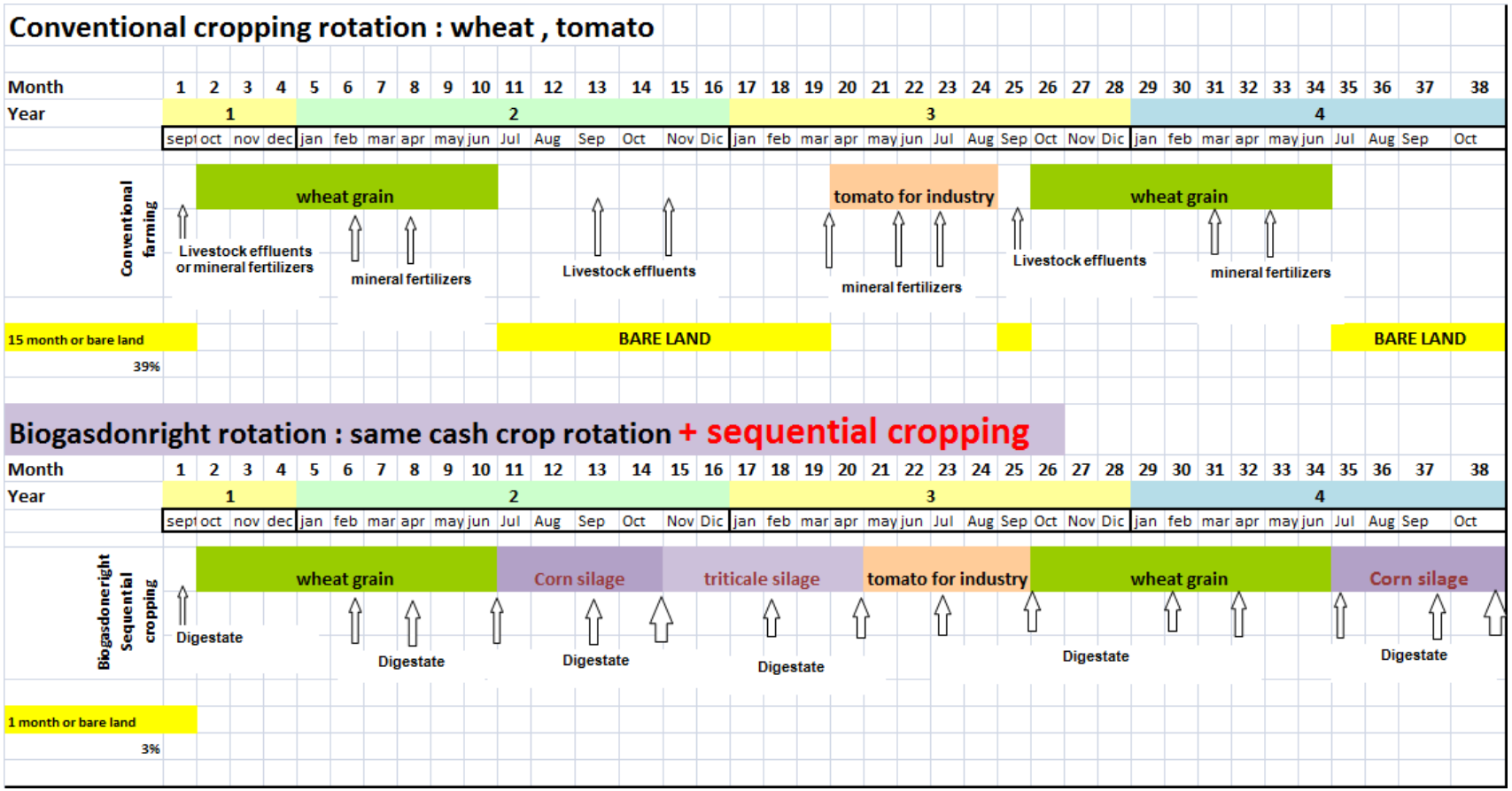
- Sequential cropping: harvesting two crops instead of one on the same field in a single year
- NO “food vs. fuel” conflict. Farm produces same food plus biogas feedstock
- Nutrients are recycled back to the field through biogas digestate
- Use byproducts, livestock effluents & side streams



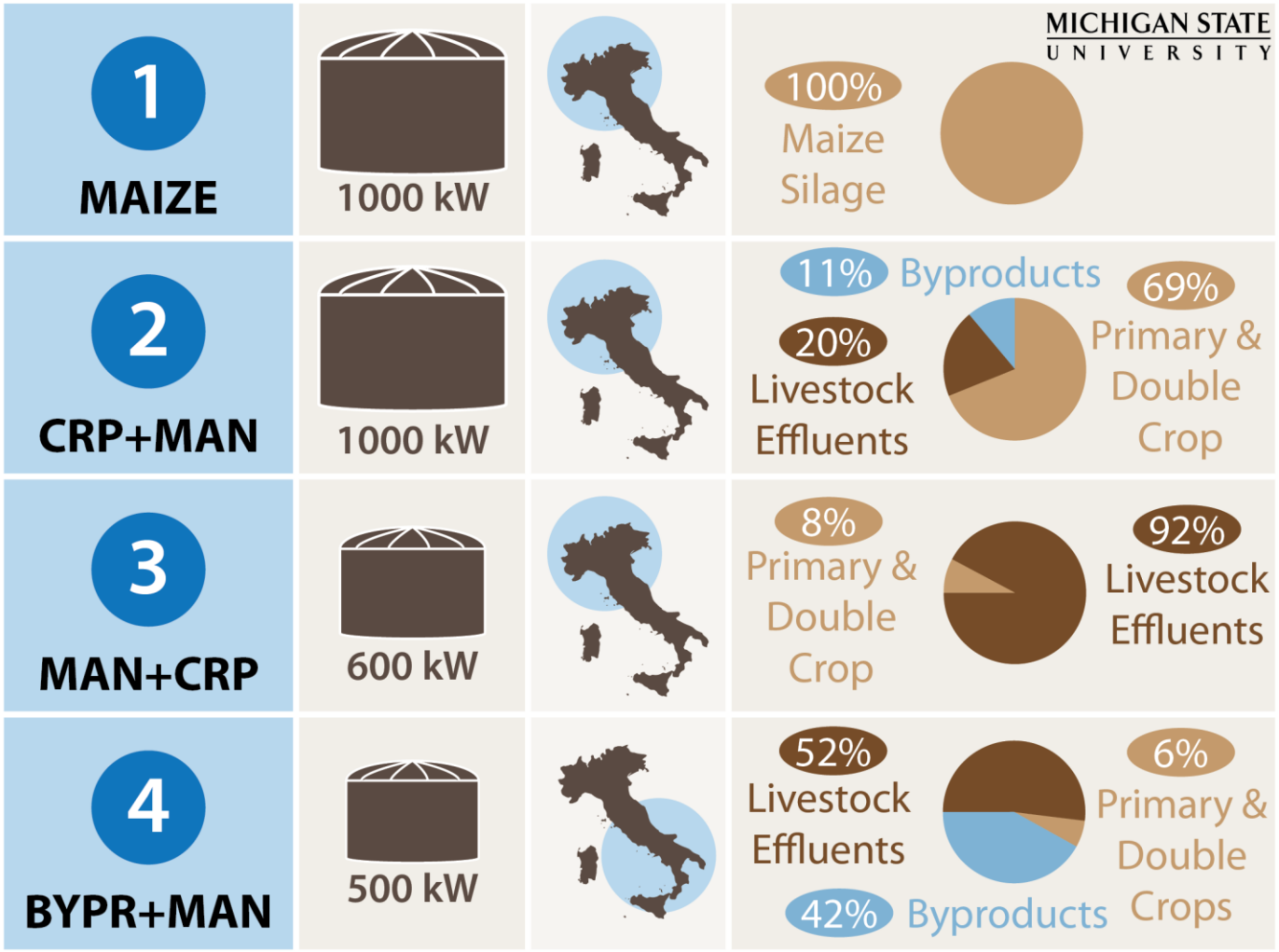
CONVENTIONAL CROP ROTATION COMPARED WITH SAME CASH CROPS PLUS BIOGAS FEEDSTOCKS



ANOTHER EXAMPLE: WHEAT & TOMATOES OR WHEAT, TOMATOES & BIOGAS FEEDSTOCKS (SILAGES)



BIOGASDONERIGHT™ GHG EMISSION REDUCTION POTENTIAL



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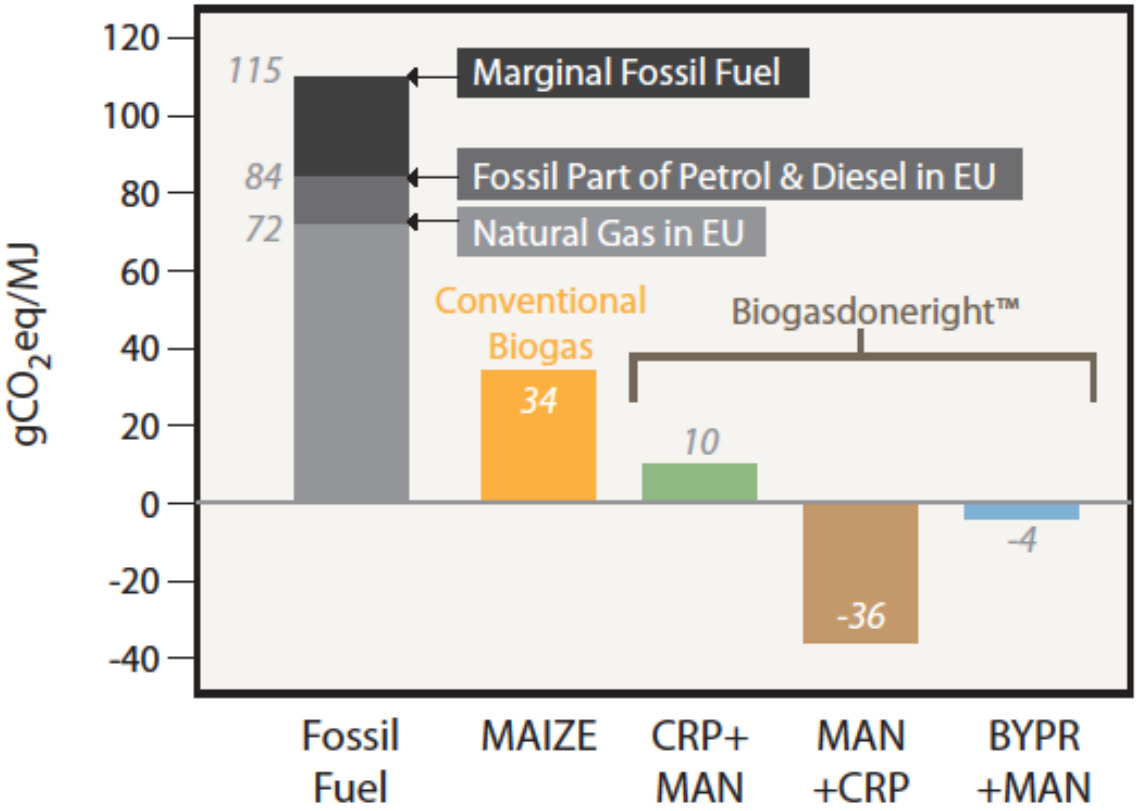
BIOGASDONERIGHT GHG EMISSION REDUCTION POTENTIAL

- Due to the BDR system's
  - biogas conversion efficiency,
  - changed farming practices
  - kind of biomass utilized
- Biogasdoneright has a better carbon footprint that other bioenergies or renewable energy technologies
- Biogasdoneright is a:
  - **Carbon negative bioenergy system**
  - **Which also improves Food Security**



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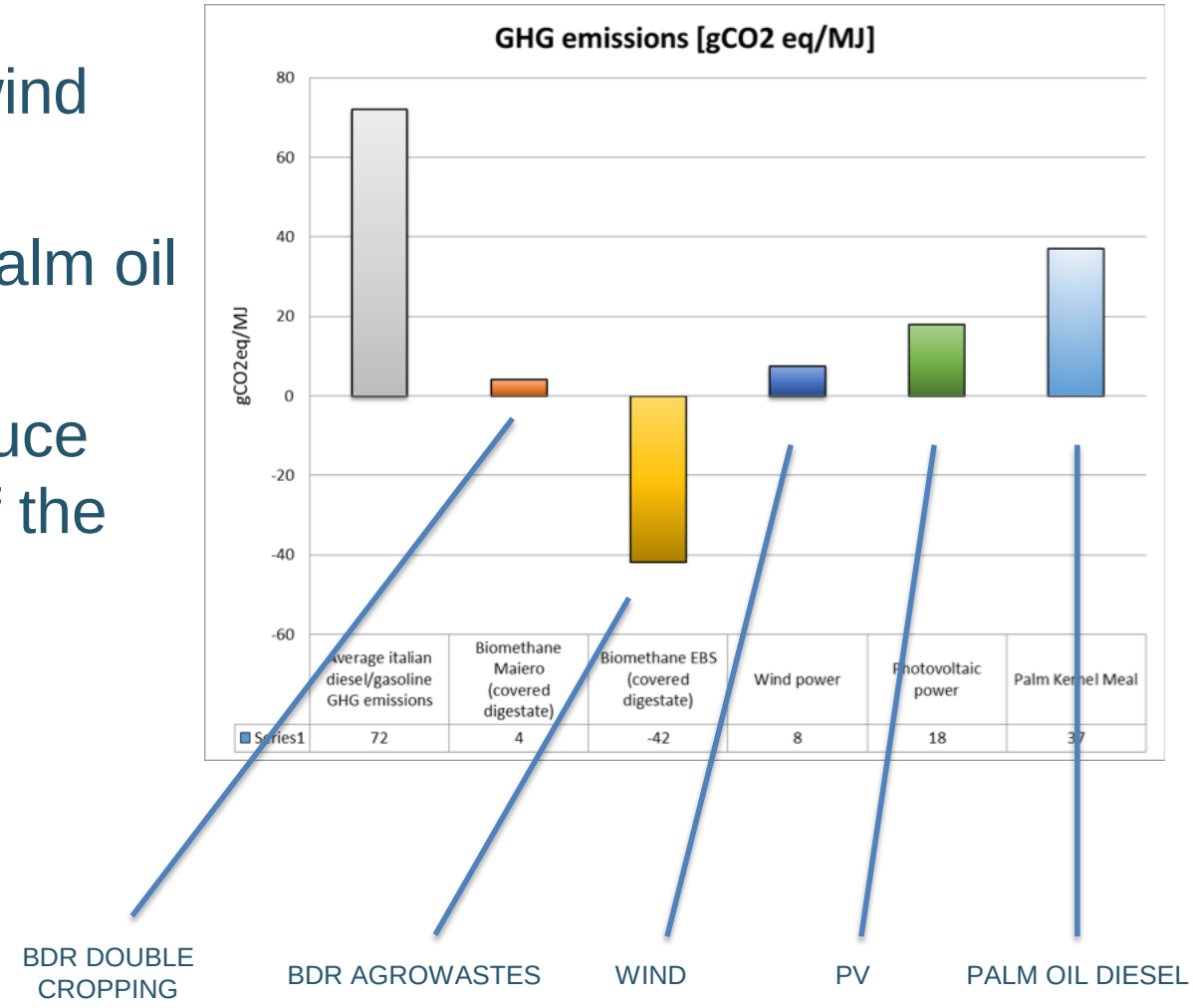
COMPARING BIOGASDONERIGHT™ WITH OTHER ENERGY SYSTEMS

- Better LCA than wind and solar
- Better LCA than palm oil biodiesel
- Best option to reduce carbon footprint of the transport sector
- A big step toward carbon negative agriculture!



BIOGASDONERIGHT IS HIGHLY EFFICIENT AND EASILY SCALABLE

- Biomethane is the key for the future energy mix
- Renewable and sustainable
- Flexible, programmable
- Allows integration of gas and electricity grid
- With Power to Gas stabilizes the electricity grid
- Target for 2030: 8 billions Nm3 BioCH4/year with an ecological agricultural intensification

Biomethane development
and the decarbonisation strategy in Italy

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

The fundamental role of biomethane in the Italian energy transition

The Consorzio Italiano Biogas, Snam S.p.A. and Confagricultura share the vision of a fundamental role for biomethane in the Italian strategy for fighting climate change and for an energy transition towards a low-carbon economy based on sustainability and circularity in the use of scarce resources.
This vision is based on specific elements that characterize the biomethane production and utilization value chain.

Biomethane is an energy source that is:

• ***renewable***, because it is produced from biomass of agricultural origin that are renewed over time and can be virtually inexhaustible;

• ***sustainable***, because biomasses in their lifetime have incorporated carbon that is contained in the atmosphere: its consumption does not release the carbon sequestered in fossil sources fields, with almost no additional greenhouse gas emissions; and, if produced according to the principles of "biogas done right"[1], it helps to significantly reduce emissions in the agricultural sector, where they account for over 14% of total emissions[2] (in Italy 7%); because its production can take place while preserving biodiversity and the carbon storage function performed by forests and farmlands.

Its use can take place in a way that is:

• ***flexible***, because it can be used in every energy uses, from the production of heat and cold to the generation of electricity, and as a fuel in the transport sector; it can even become a raw material for the production of biomaterials and biochemicals ;

[1] See for instance "*Biogasdoneright and soil carbon sequestration*" www.consorziobiogas.it
[2] IPCC Mitigation Report , April 2014

1

Link

ITALIAN BIOGAS PRODUCTION PLAN 2030

8 + 2 = 10 Bilion Nm3 Ch4 bio

- 10 B Nm3
  - 3.0 B Nm3 from monocrops- **3%** of Italian row crop land
  - 2,5 B Nm3 from sequential cropping
  - 2,5 B Nm3 from livestock effluents
  - 2,0 B Nm3 from Organic wastes
- 10x increase in current NG use as transport fuel
- Approximately 15% of current Italian NG consumption
- ***Average family CH4 demand= 3000 Nm3/year → sufficient to cover > 3,3 million families (1/6th of Italian families)***

Consorzio Italiano Biogas
Italian biogas production plan 2030

		2010	2015	2020	2025	2030
Biometano totale	(Gm3/anno)	0,70	2,20	4,20	5,50	8,00
- SAU	(ha)	85.000	200.000	250.000	300.000	400.000
- SAU	(ha/Mm3 CH4))	121	91	60	55	50
- Resa primo raccolto	(m3/ha di CH4)	6720	6720	6720	6720	6720
LAND EFFICIENCY	(m3/ha di CH4)	8.235	11.000	16.800	18.333	20.000
- Biometano da primo raccolto	(Gm3/anno)	0,57	1,34	1,68	2,02	2,69
- Biometano da biomasse di integrazione	(Gm3/anno)	0,13	0,86	2,52	3,48	5,31
di cui colture di integrazioni	(Gm3/anno)	0,00	0,36	1,52	1,73	2,65
di cui biomasse residuali	(Gm3/anno)	0,13	0,50	1,00	1,75	2,66
- Biometano da primo raccolto	(%)	82%	61%	40%	37%	34%
- Biometano da biomasse di integrazione	(%)	18%	39%	60%	63%	66%

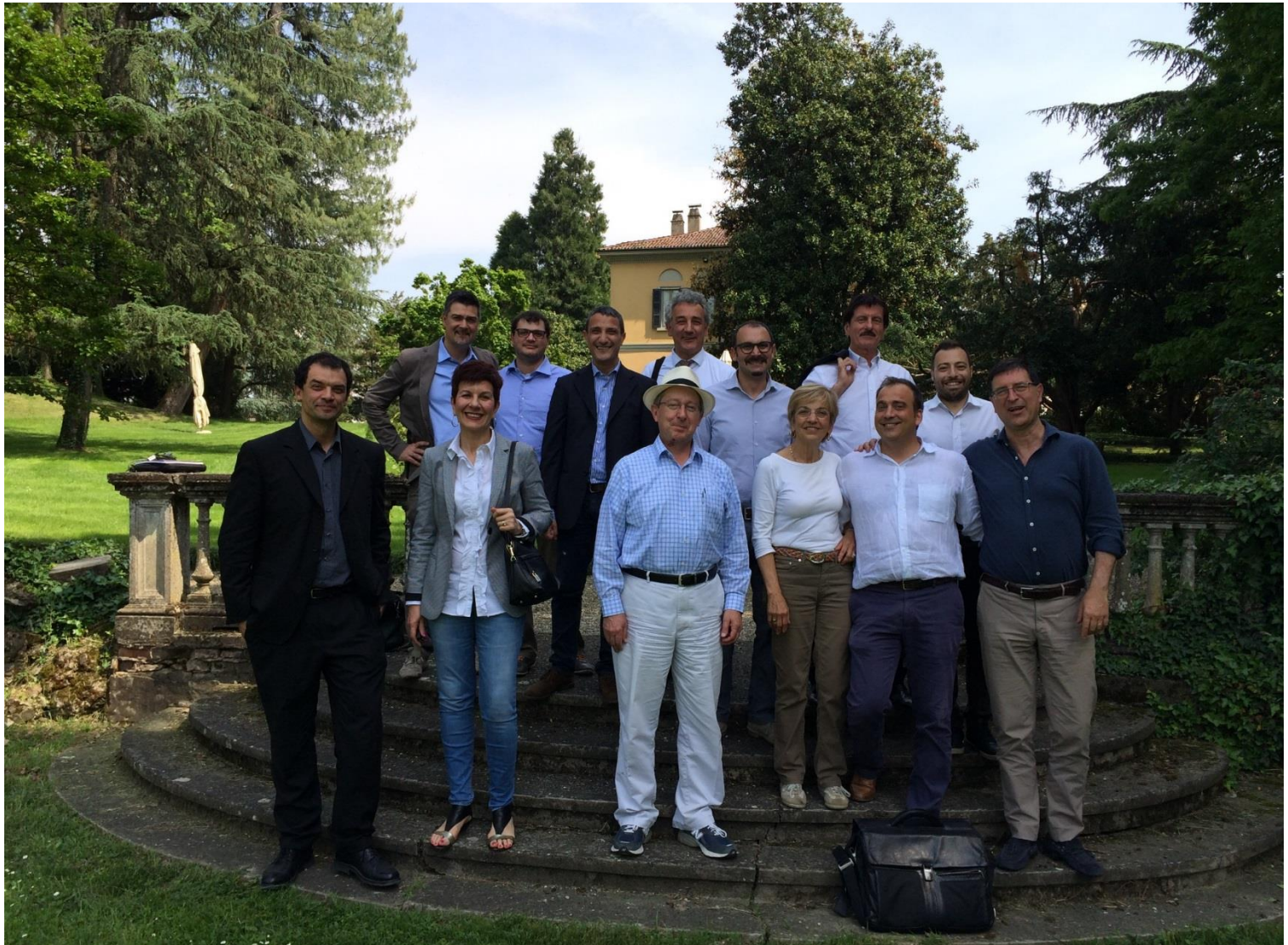
La potenza istallata del biogas agricolo dovrebbe ammontare a circa 1.000 MWe , pari ad una produzione lorda di circa 2,1 Mrd di Nmc

CONCLUSIONS

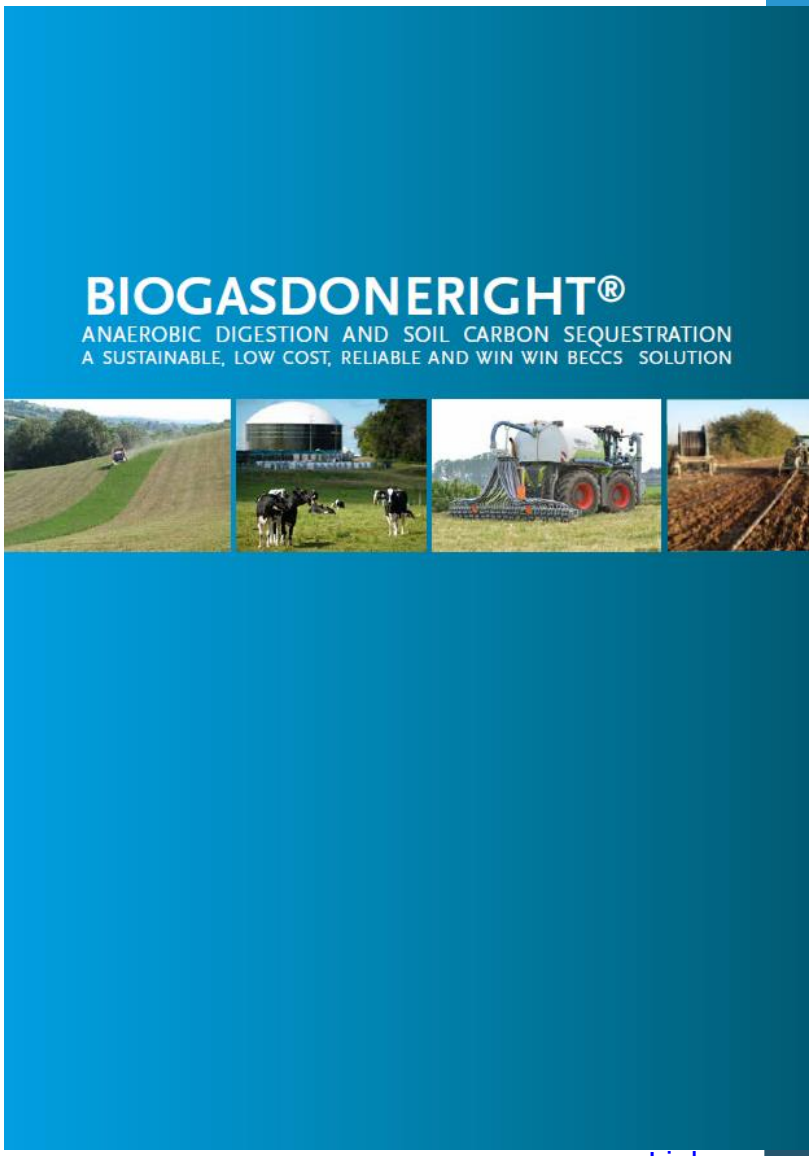
- Biogasdoneright™ is a holistic approach that turns agriculture into a solution rather than a problem
- Bioelectricity is dispatchable power available 24/7
- Biomethane in the gas grid will lower emissions related to natural gas use and it will have a signifcant impact
- If Italy, with one of the worst inhabitant/agricultural land ratios, can do this, then the system is scalable

Example of Biogasdoneright in action: Cooperativa La Torre: 2 biogas plants of 1 MW electric each.
Daily input: 90 tons cow manure, 90 tons cow slurries, 38 tons eggs laying chicken manure, 10 tons rabbit manure, 5 tons spent mushrooms litter, 10 tons sugar beets, 30 tons corn silage, 5 tons rye grass (all wet weights)
Daily output (energy): 48 MWh el

THANK YOU ALL FOR YOUR ATTENTION!



CONTACTS AND FURTHER READINGS



Link

https://www.consorziobiogas.it/pubblicazioni/

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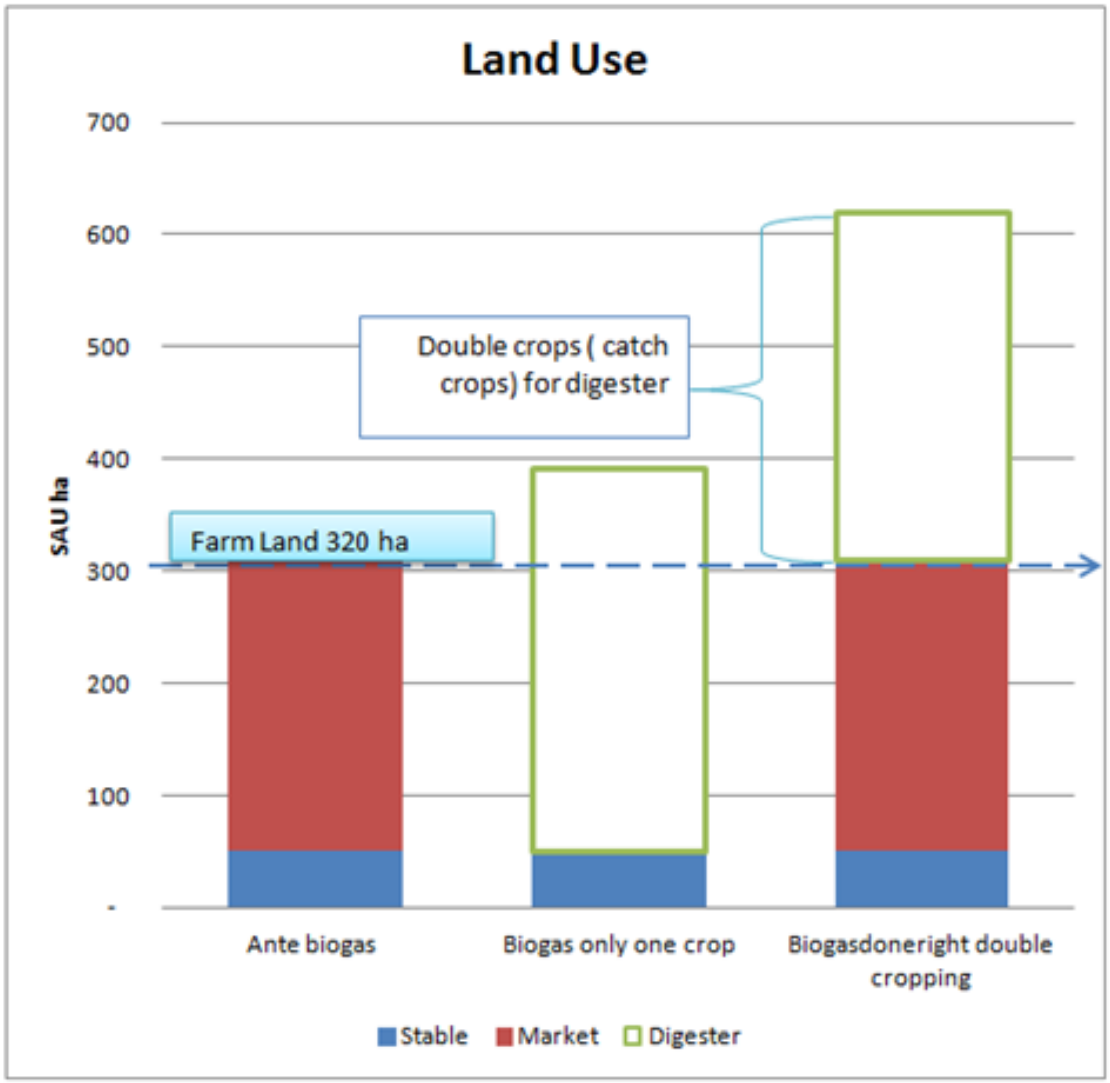
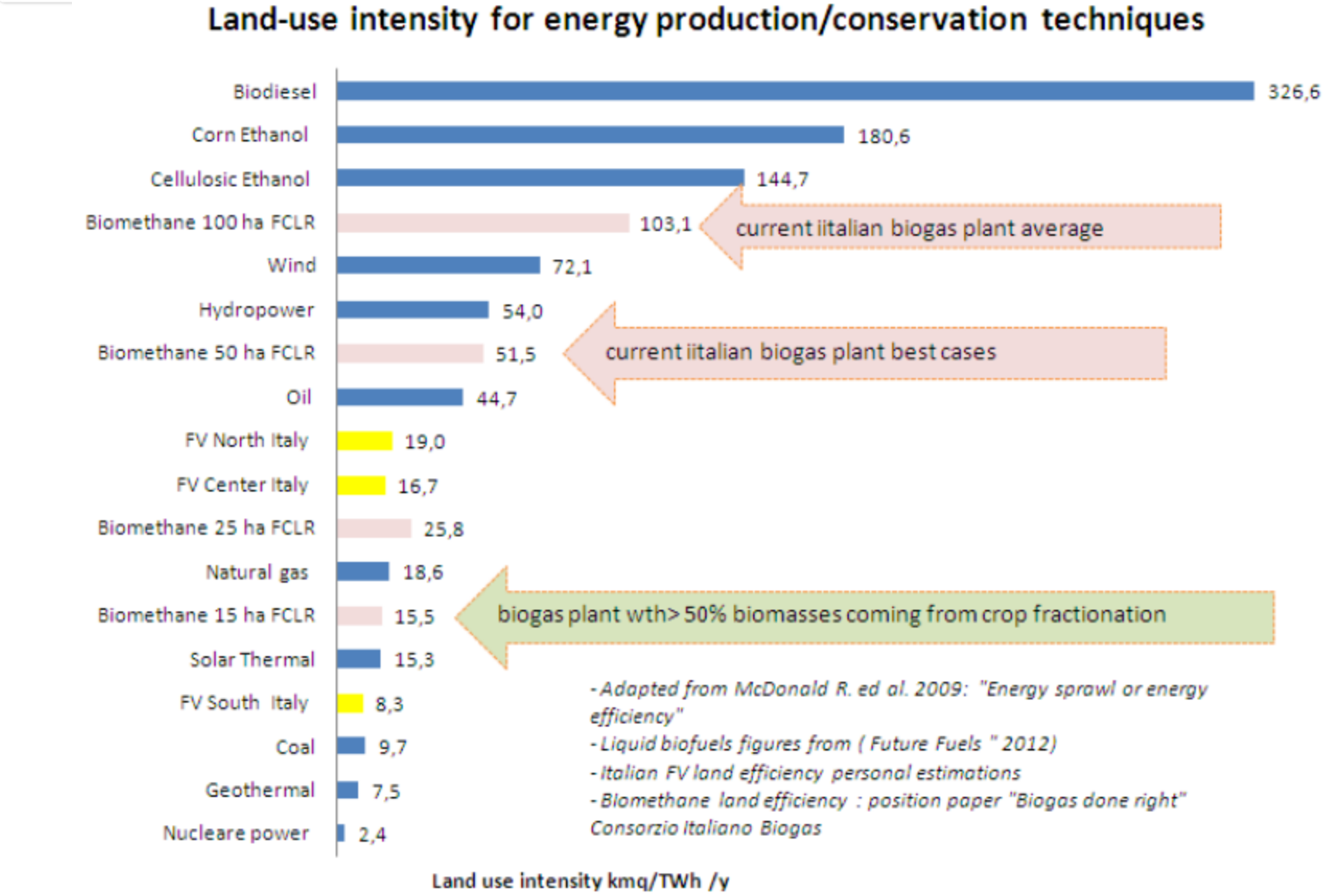
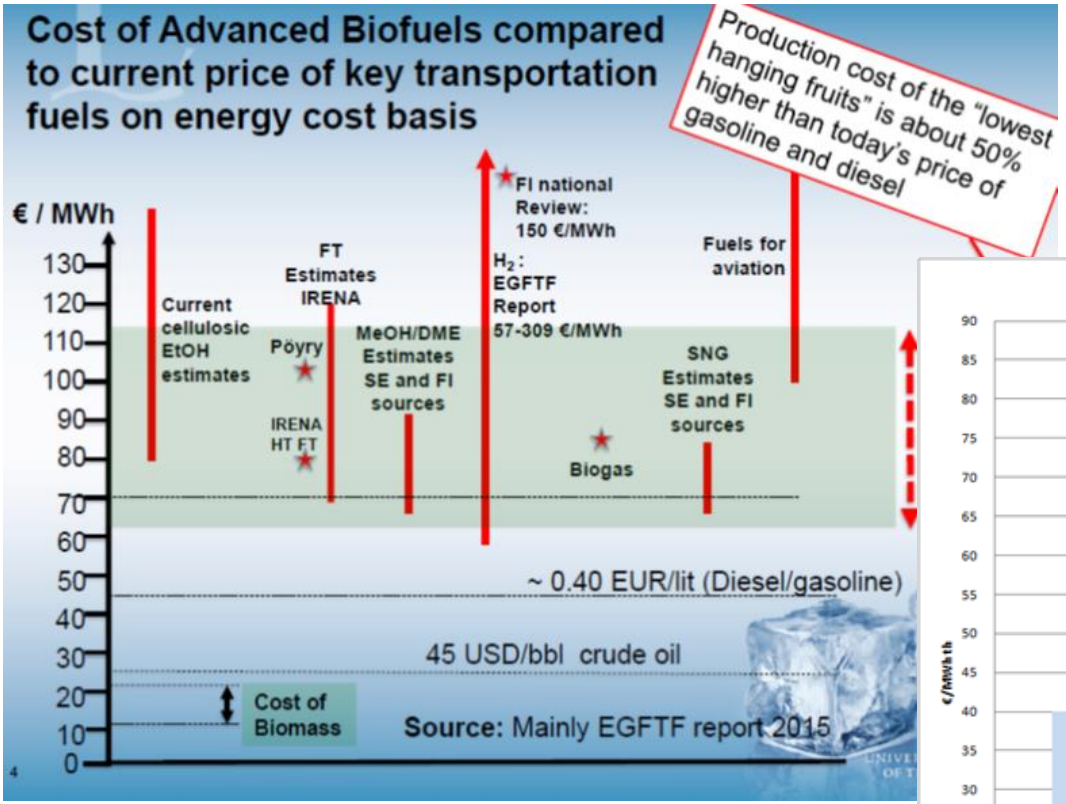
Effects on land use

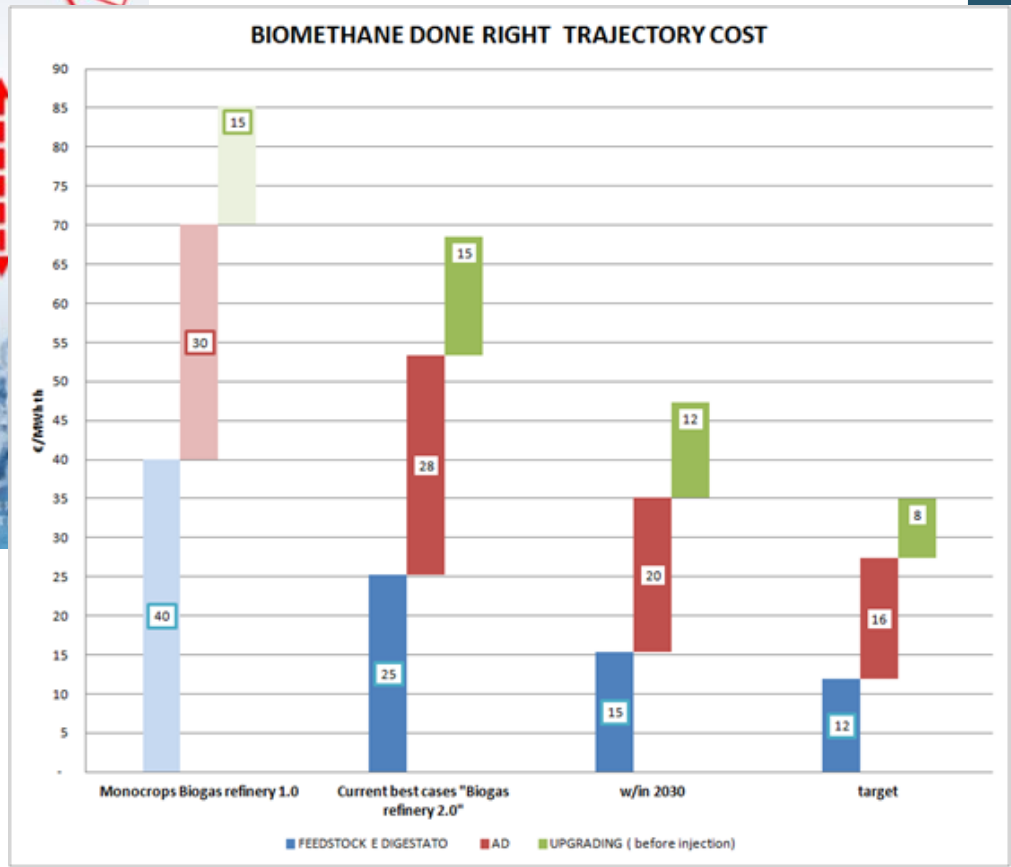


Land intensity Biogasdoneright

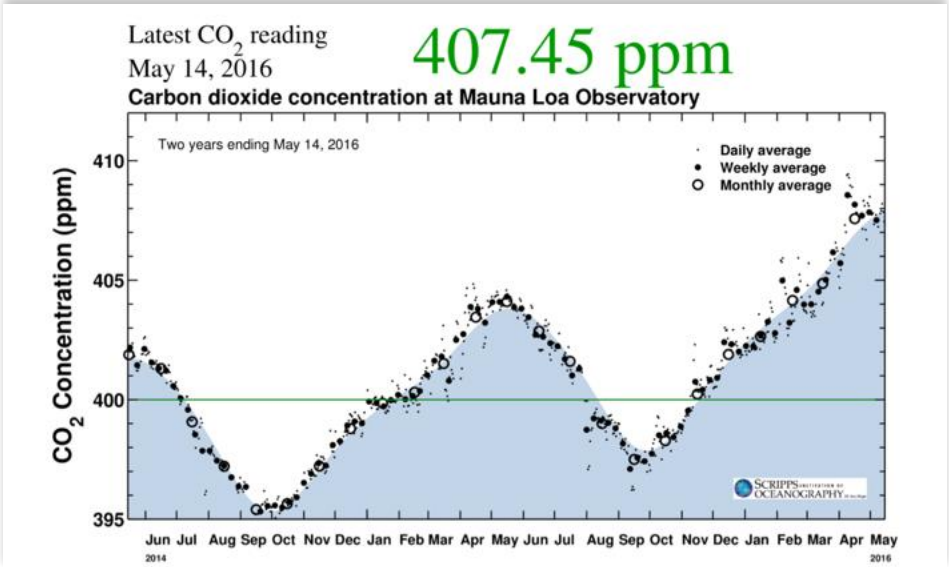


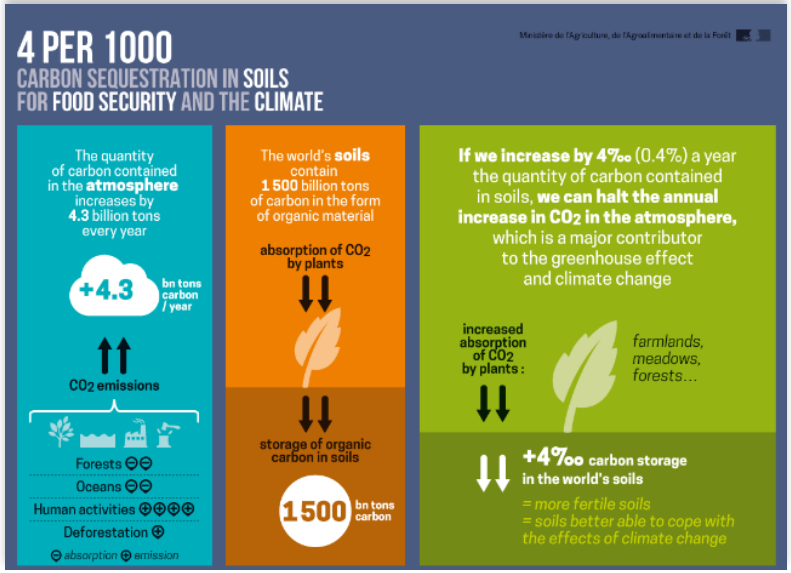
Trajectory cost





WHY AGRICULTURE MUST BECOME MORE PRODUCTIVE, WITHOUT INCREASING GHG EMISSIONS: INCREASING PHOTOSYNTHESIS AND STORING CARBON IN SOIL





We need large carbon negative systems and soil is the most abundant, cheap sink for carbon. Moreover, more carbon in soil fights climate change at the local level and also increases food security

CHP: HEAT ALSO AVAILABLE AS BYPRODUCT…

Rule of thumb: 1 MW el output AD plant in CHP

Biogas energy	MW
Total energy content	2,4
Electricity output	1
Heat output	1,1
AD consumption	0,28
Available	0,82