Ref. Ares(2021)6512177 - 22/10/2021

EUROPEAN COMMISSION
DIRECTORATE-GENERAL FOR AGRICULTURE AND RURAL DEVELOPMENT

Directorate G. Markets and observatories
G.3. Animal products

MEETING OF THE
«CDG ANIMAL PRODUCTS – PIG MEAT»
Meeting via videoconference (Interactio)
On Friday 05 November 2021 from 10h00 to 15h30

The sustainability of the Italian pig industry

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Battacone Gianni, *Dipartimento di Agraria, University of Sassari*

Bava Luciana, *Dipartimento di Scienze Agrarie e Ambientali, University of Milano*

Maiolo Silvia, *PF consulting*

Rossi Andrea, *Associazione Industriali delle Carni e dei Salumi*

Zucali Maddalena, *Dipartimento di Scienze Agrarie e Ambientali, University of Milano*

Università degli Studi di Sassari

Università degli Studi di Milano

CARNI Sostenibili

ASSICA Associazione Industriali delle Carni e dei Salumi

Rationale

- general description of the italian pig sector
- the LCA to quantify the environmental impact of heavy pig farming
- strategies for impact containment
- renewable energies are crucial tools for net_zero pig farming
- final remarks

The Italian pig sector

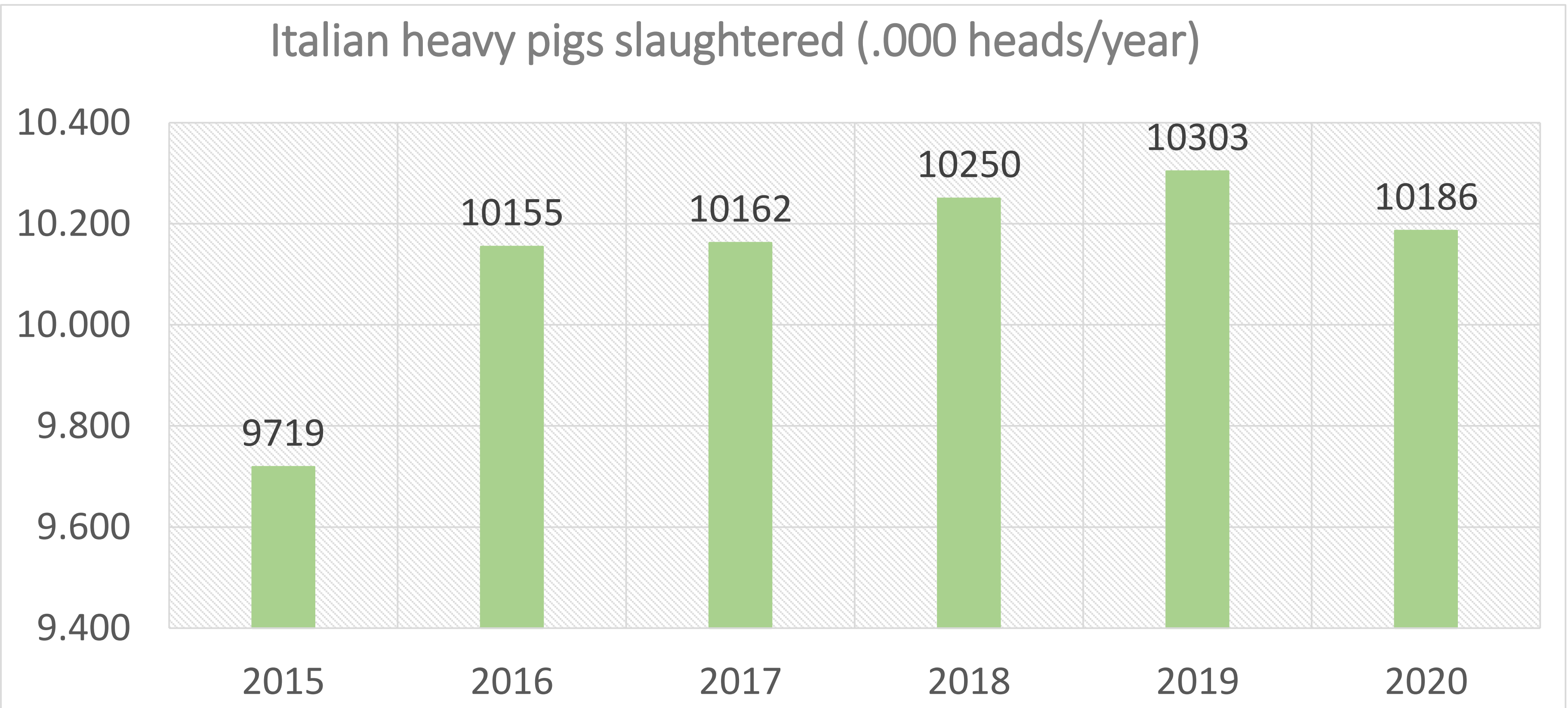
In Italy, about 8,834,000 pigs reared in 30,750 farms (at 30.06.2021) **[523,000 sows and 113,000 gilts]**

density of piggeries
(*farms/km2*)

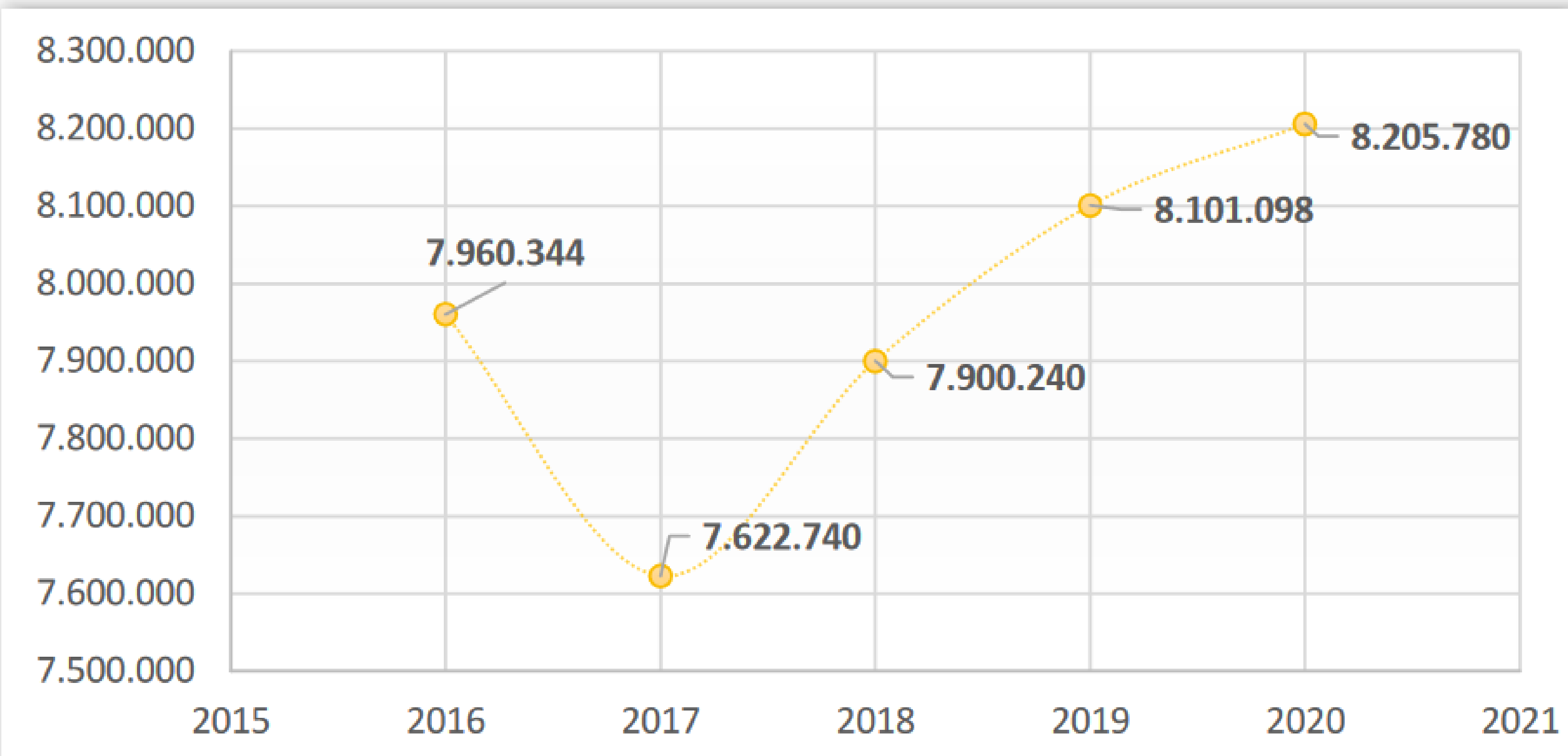
density of pig
(*heads/km2*)

Data from: Anagrafe Nazionale
Zootecnica - Statistiche

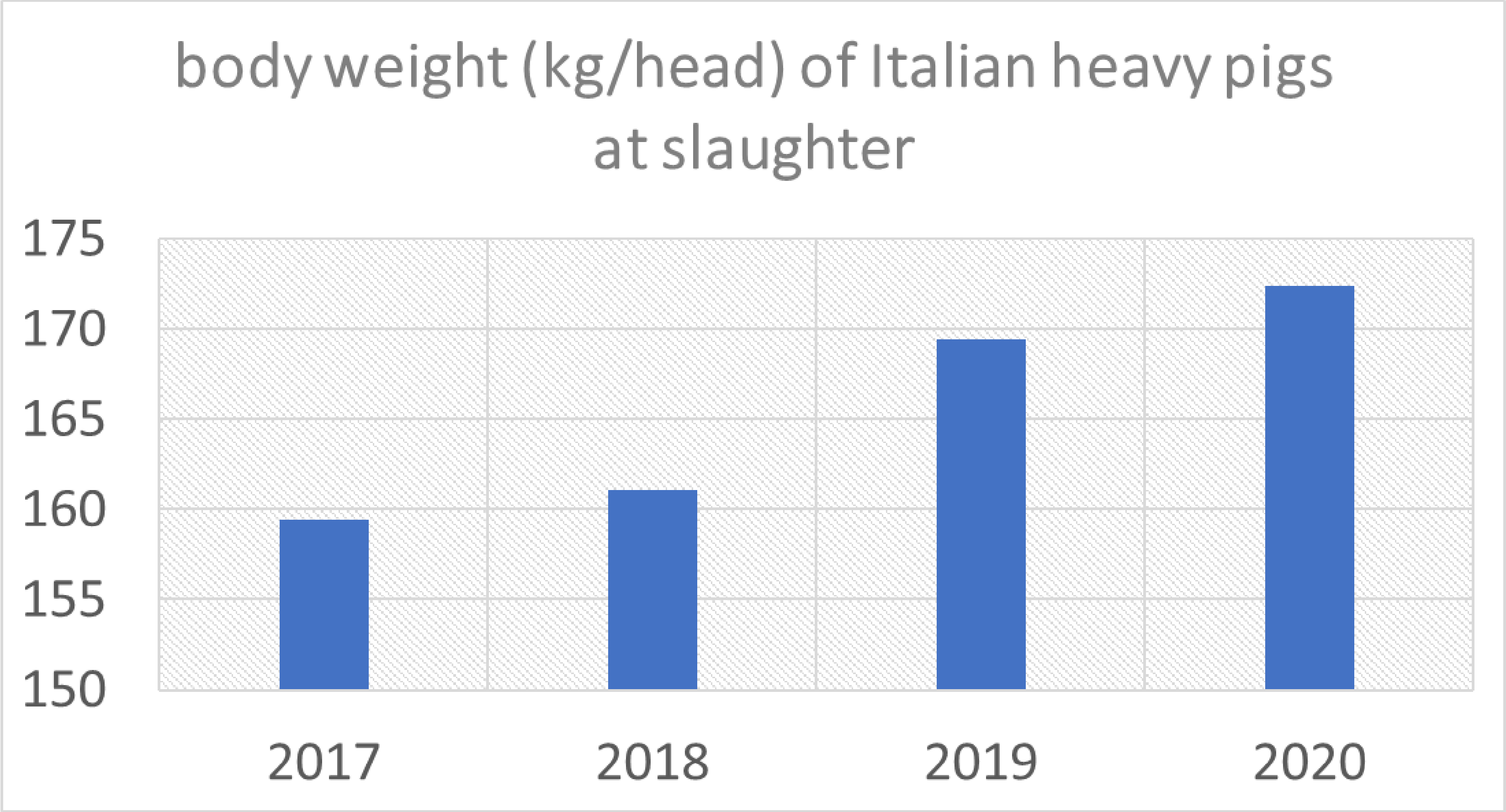
The 97% of pig carcasses produced in Italy are classified in the category heavy "**H**" (weight over 110.1 kg).



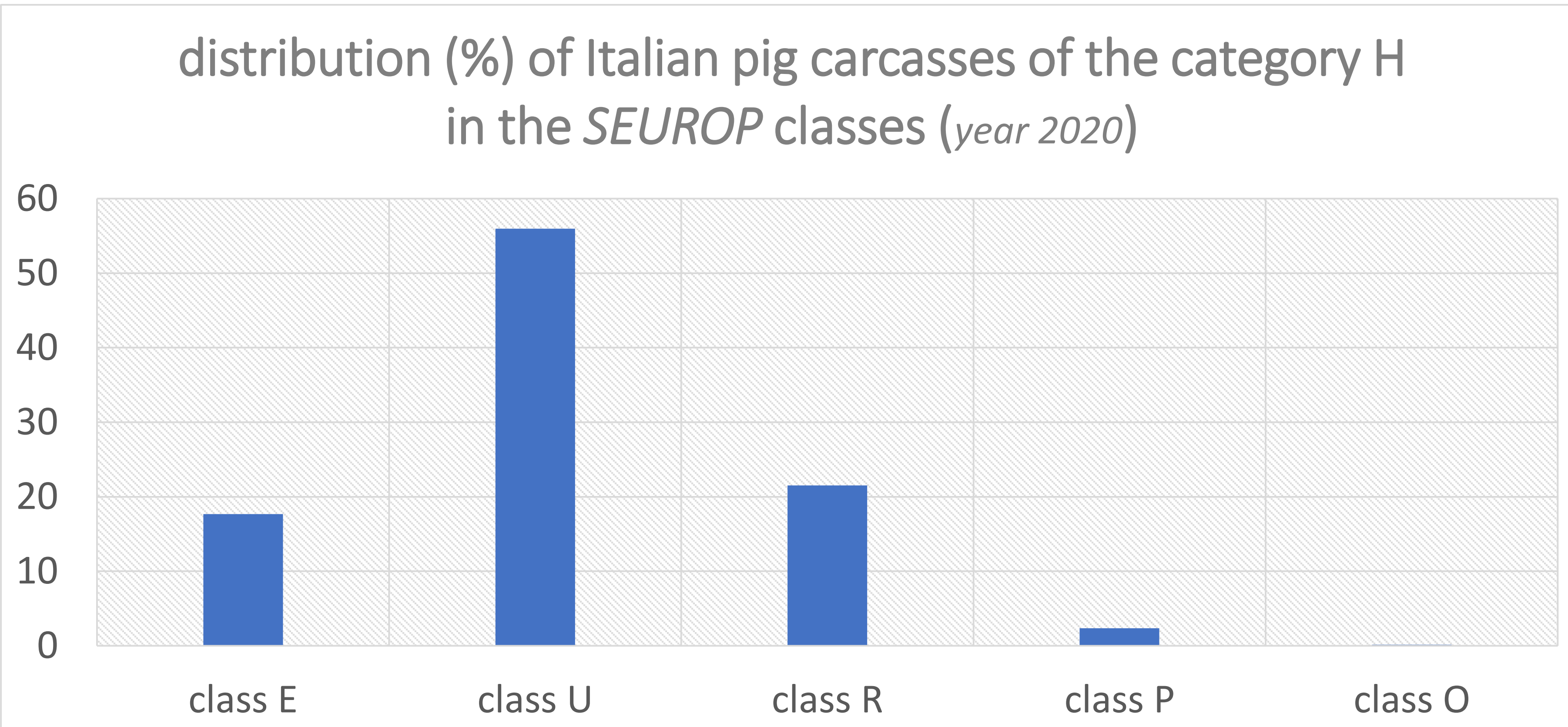
Around 80% of heavy-pigs are certified for DOP in 2020



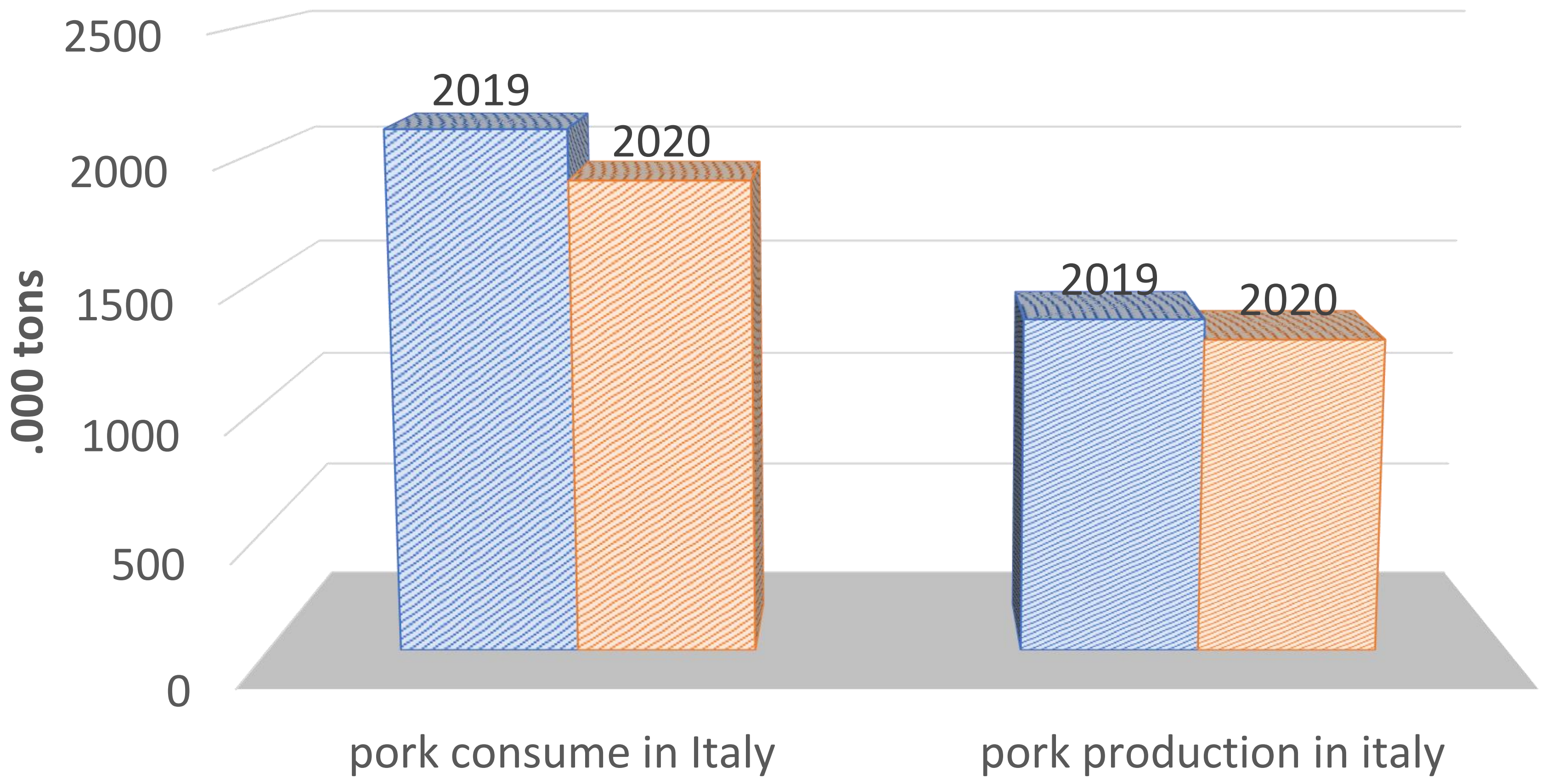
The weight at slaughter is increasing



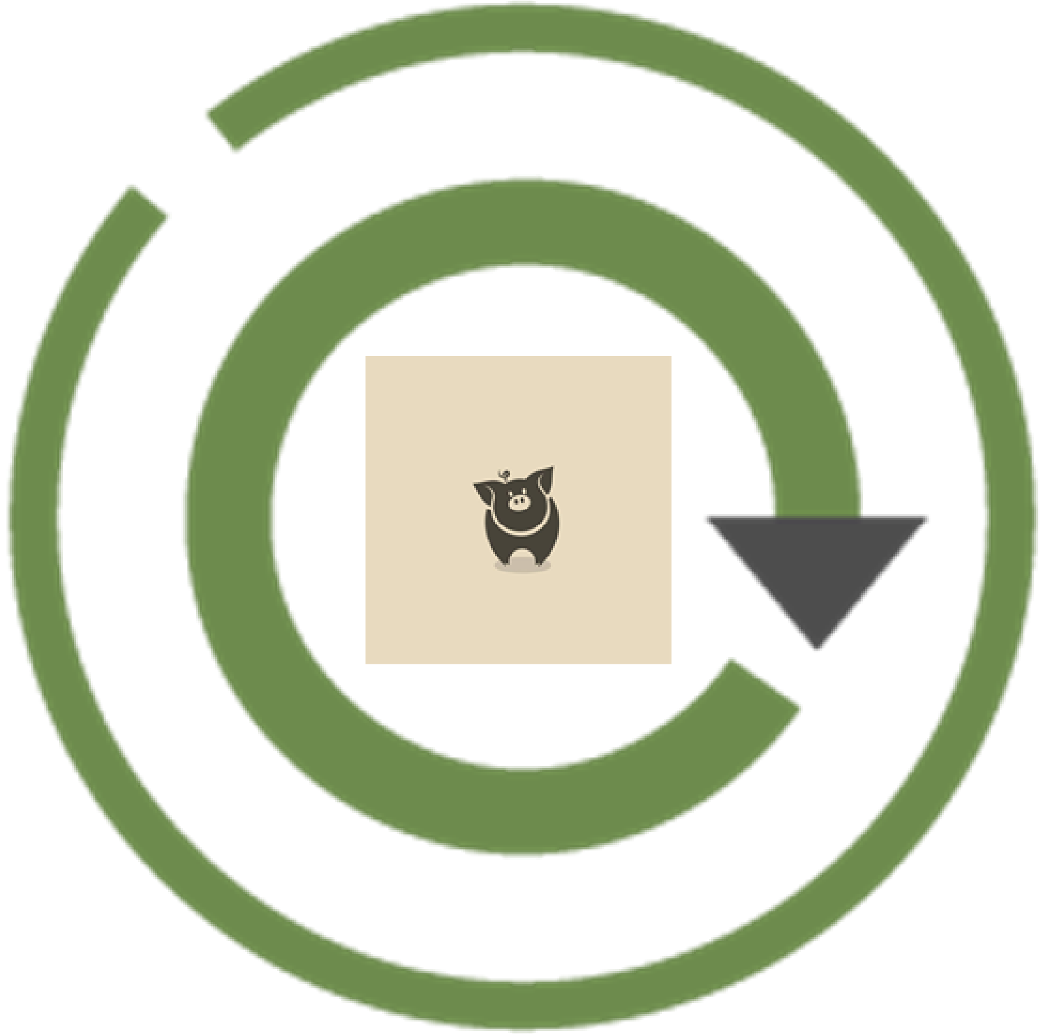
The 75% of carcasses are SEUROP-classified as E and U



The national self-sufficiency ≈ 64%



The LCA to quantify the environmental impact of heavy pig farming



Science of the Total Environment 565 (2016) 576–585

Contents lists available at ScienceDirect

Science of the Total Environment

journal homepage: www.elsevier.com/locate/scitotenv

Environmental impact of heavy pig production in a sample of Italian farms. A cradle to farm-gate analysis

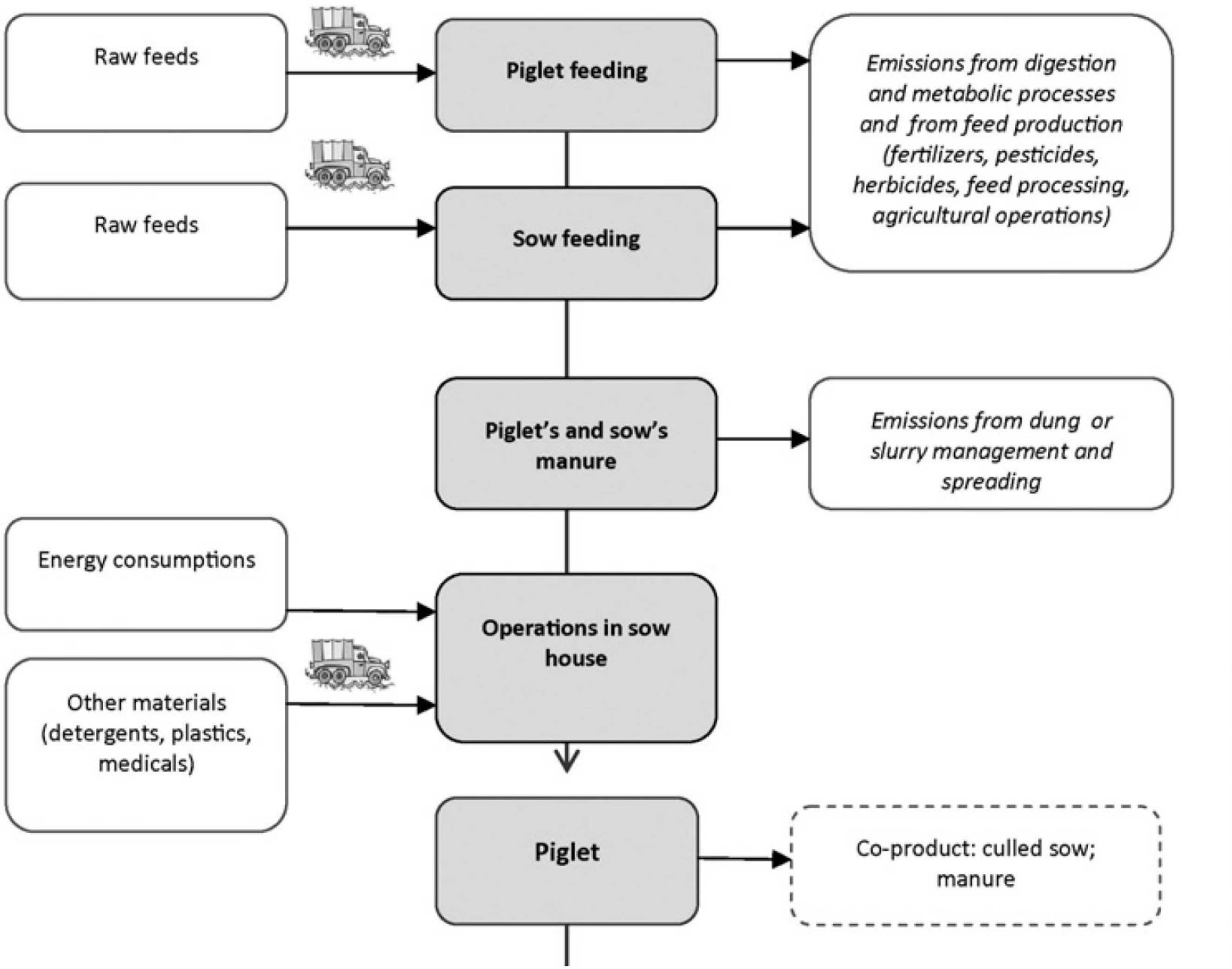
G. Pirlo [a,*], S. Carè [a], G. Della Casa [b], R. Marchetti [b], G. Ponzoni [b], V. Faeti [b], V. Fantin [c], P. Masoni [c], P. Buttol [c], L. Zerbinatti [d], F. Falconi [e]

LCA methodology adopted to study the environmental impacts of the Italian heavy pig rearing system for production of Italian cured hams, which comprises two phases: breeding phase for production of piglet and growing-fattening phase

4 breeding piggeries

8 growing-fattening piggeries

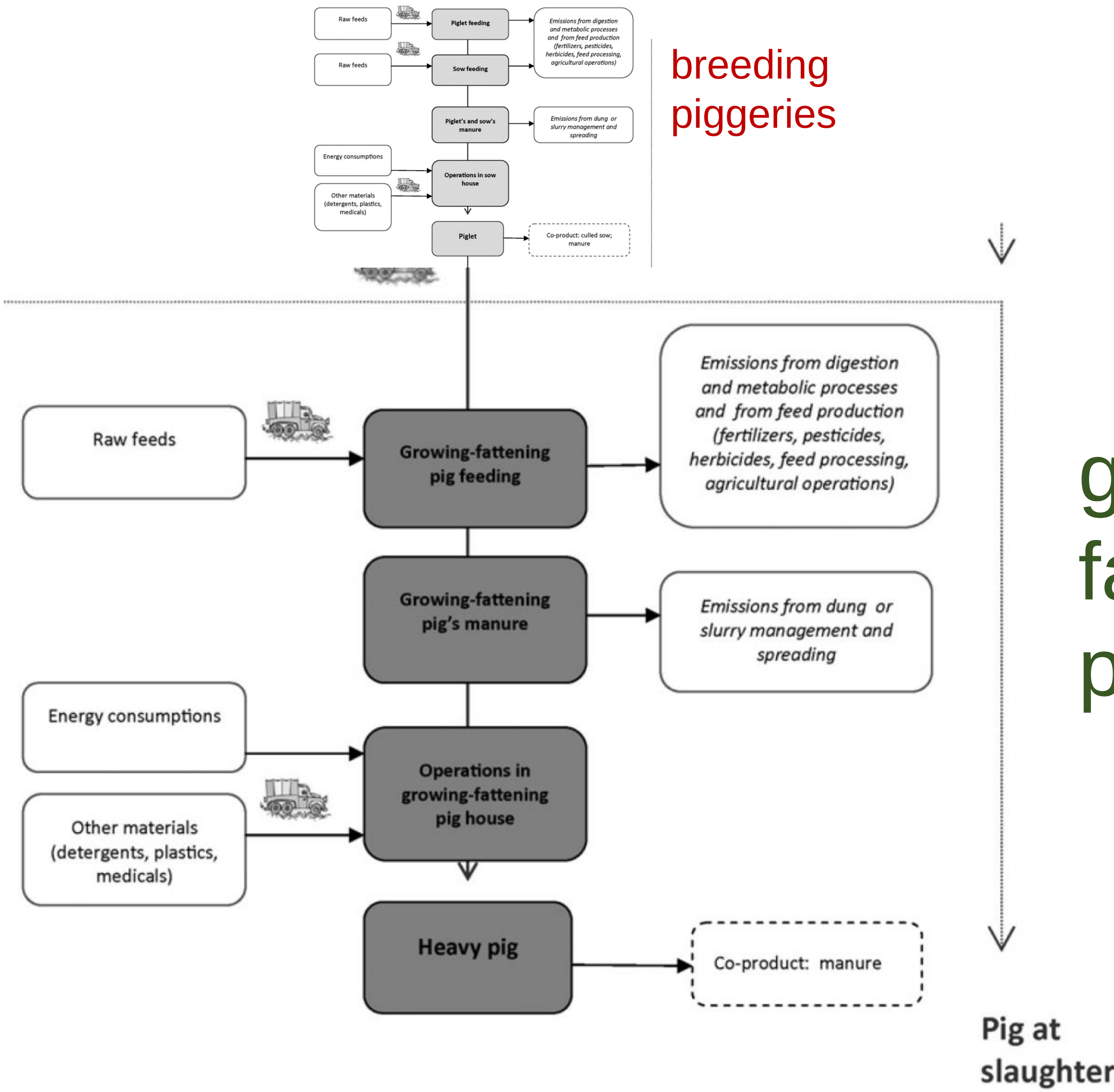
System boundaries of heavy pig production



breeding piggerie s

Pirlo et al. / Science of the Total Environment 565 (2016) 576–585

System boundaries of heavy pig production



growing-fattening piggeries

Pirlo et al. / Science of the Total Environment 565 (2016) 576–585

Environmental impact of the production of 1 kg of body weight of **piglet.**

Impact category	Unit	Piglet	
		Mean	CV (%)
Global warming	kg CO_2eq	4.20	8.78
Acidification	kg SO_2eq	6.48 E − 2	5.29
Eutrophication	kg PO_4^{3-} eq	3.74 E − 2	8.48
Abiotic depletion	kg Sbeq	3.91 E − 3	22.9
Photochemical ozone formation	kg C_2H_4eq	2.14 E − 3	28.5

Pirlo et al. / Science of the Total Environment 565 (2016) 576–585

Feed Conversion Rate (FCR) in the breeding phase

Piggery	kg of feed fed to each sow per piglet	Kg of prestaster per 1 kg of piglet at weaning
BF1	51,47	2,23
BF2	47,69	1,52
BF3	76,13	1,18
BF4	55,71	2,53
mean	**57,75**	**1,87**
st dev	12,68	0,62

Environmental impact of the production of 1 kg of body weight of **heavy pig** (growing-fattening phase).

Impact category	Unit	Heavy pig (growing-fattening)	
		Mean	CV (%)
Global warming	kg CO_2eq	3.15	9.63
Acidification	kg SO_2eq	4.30 E − 2	16.2
Eutrophication	kg PO_4^{3-} eq	2.86 E − 2	11.1
Abiotic depletion	kg Sbeq	3.75 E − 3	29.3
Photochemical ozone formation	kg C_2H_4eq	1.62 E − 3	28.9

Pirlo et al. / Science of the Total Environment 565 (2016) 576–585

FCR in the growing-fattening phase

Piggery	FCR
GF1	3,97
GF2	3,22
GF3	5,04
GF4	3,44
GF5	3,30
GF6	3,47
mean	3,74
dev st	0,688

Environmental impact of the production of 1 kg of body weight of **heavy pig** (whole chain).

Impact category	Unit	Heavy pig (whole chain) Mean
Global warming	kg CO_2eq	3.3
Acidification	kg SO_2eq	4.9 E−2
Eutrophication	kg PO_4^{3-}eq	3.1 E−2
Abiotic depletion	kg Sbeq	3.7 E−3
Photochemical ozone formation	kg C_2H_4eq	1.7 E−3

Pirlo et al. / Science of the Total Environment 565 (2016) 576–585

70 to 80% of impacts occur in the growing-fattening phase in the Italian heavy pig industry

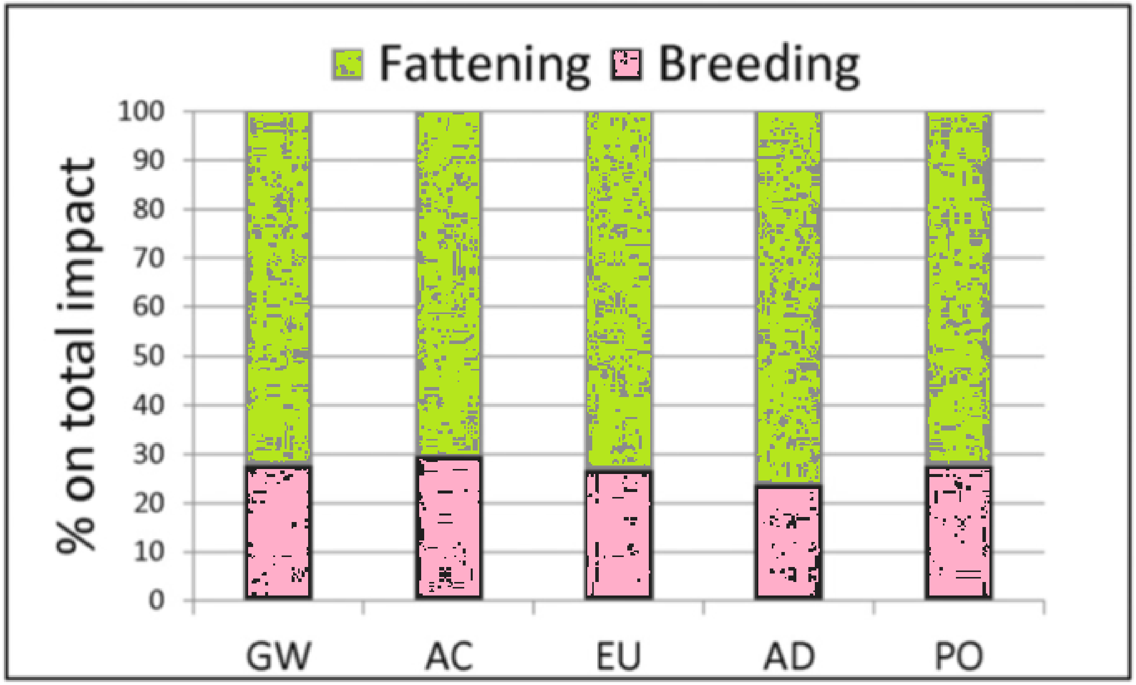


Fig. 2. Contributions of breeding and fattening phases to global warming (GW), acidification (AC), eutrophication (EU), depletion of abiotic resource (AD), and photochemical ozone formation (PO) of entire pig production chain.

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Piglets' mortality rate has been found to be a key factor influencing the environmental performances of breeding farms

*Simulation: estimate how much the environmental impact is reduced for the piggery with the worst piglet mortality rate (**18.2%**) if this rate improves reaching the level (**11.8%**) of the best piggery*

	kg/kg of live weight gain	value from LCA	value after reduction of mortality rate	Diff. (%)
global warming	CO_2 eq	4.25	3.91	-8
acidification	SO_2 eq	6.18 E-2	5.69 E-2	-7.9
eutrophication	PO_4^{3-} eq	3.40 E-2	3.13 E-2	-7.9
abiotic resource depl.	Sb eq	4.21 E-3	3.88 E-3	-7.9
photochemical ozone depl.	C_2H_4 eq	2.69 E-3	2.48 E-3	-7.9

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Journal of Cleaner Production 140 (2017) 685–691

Contents lists available at ScienceDirect

Journal of Cleaner Production

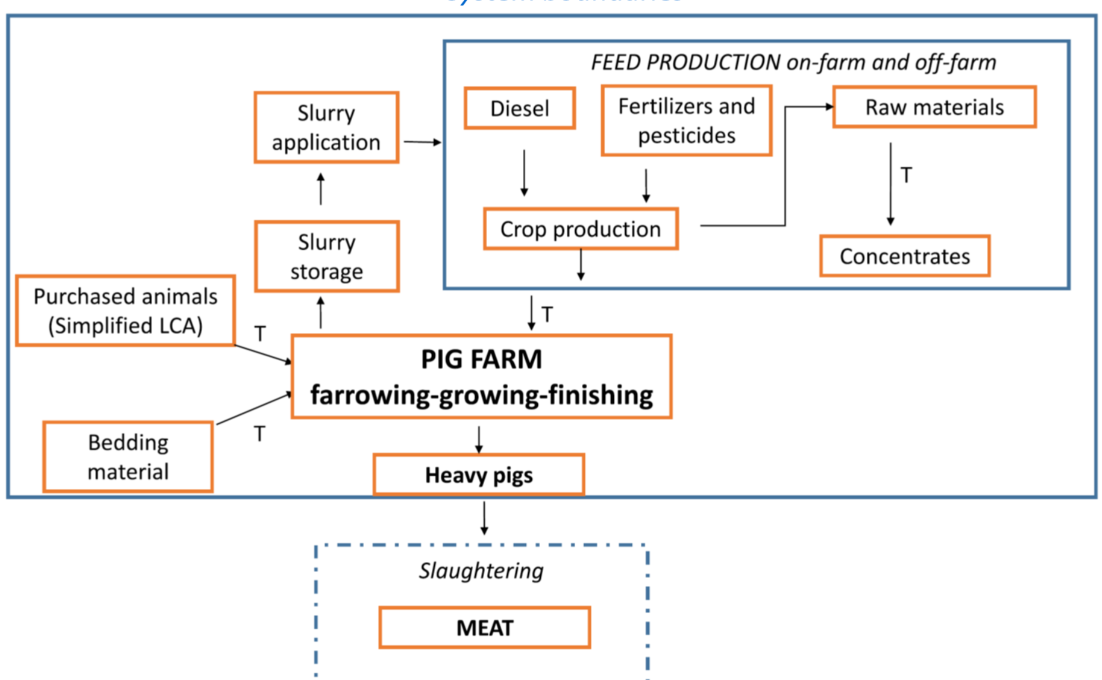
journal homepage: www.elsevier.com/locate/jclepro

Environmental impact of the typical heavy pig production in Italy

Luciana Bava, Maddalena Zucali, Anna Sandrucci*, Alberto Tamburini

Dipartimento di Scienze Agrarie ed Ambientali, Università degli Studi di Milano, Via Celoria 2, 20133 Milano, Italy

System boundaries



The main findings of the study

Table 1
Herd traits and performances in the six farms under analysis.

Farm		1	2	3	4	5	6[a]
Heavy pigs produced	no./year	30,000	18,895	3523	3400	4900	4128
Slaughter LW[b]	kg	169	170	162	170	170	171
Dressing percentage	%	78.0	80.0	79.5	78.4	80.0	79.0
Sows	no.	1500	925	190	320	405	
Piglets born/sow	no./year	25.9	28.0	22.5	26.0	29.4	
Stillbirths	%	1.3	1.5	2.4	4.0	4.2	
Piglets weaned/sow	no./year	22.4	26.5	20.2	22.0	25.2	
Weaning age	days	25	21	33	22.5	31	
Litters/sow	no./year	2.15	2.42	2.29	2.00	2.10	
LW[b] produced/sow	kg/year	3679	3550	3134	2209	2148	

[a] Grow-to-finish farm.
[b] LW = live weight.

Environmental impact potentials of 1 kg LW in the farms under analysis

Farm		1	2	3	4	5	6
Global warming	kg CO_2 eq	2.69	3.73	4.50	4.22	5.81	4.58
Eutrophication	g PO_4^{3-} eq	16.7	22.6	24.6	27.6	31.4	28.6
Acidification	g SO_2 eq	20.0	27.7	34.4	37.1	37.9	39.2
Non-renewable energy	MJ	14.0	18.5	33.4	23.9	28.0	23.3
Land occupation	m^2	5.54	7.15	7.46	8.48	12.1	9.61
Abiotic resource depletion	g Sb eq	0.003	0.004	0.005	0.005	0.005	0.005
Terrestrial ecotoxicity	kg 1.4-DB eq	0.026	0.006	0.007	0.006	0.008	0.006
Ozone layer depletion	mg CFC-11 eq	0.189	0.341	0.387	0.383	0.256	0.382

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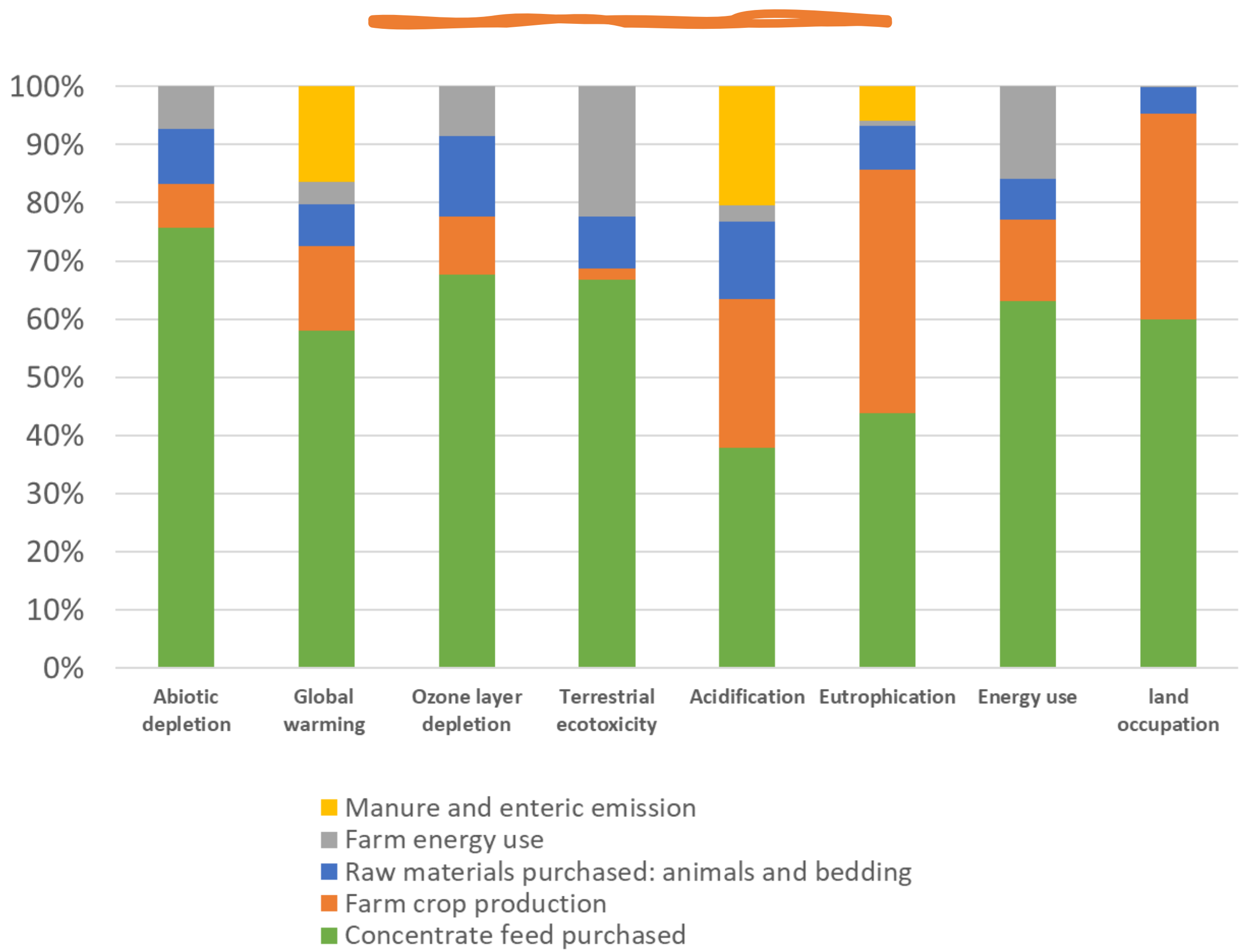
Feeds are the main environmental source of all impact categories



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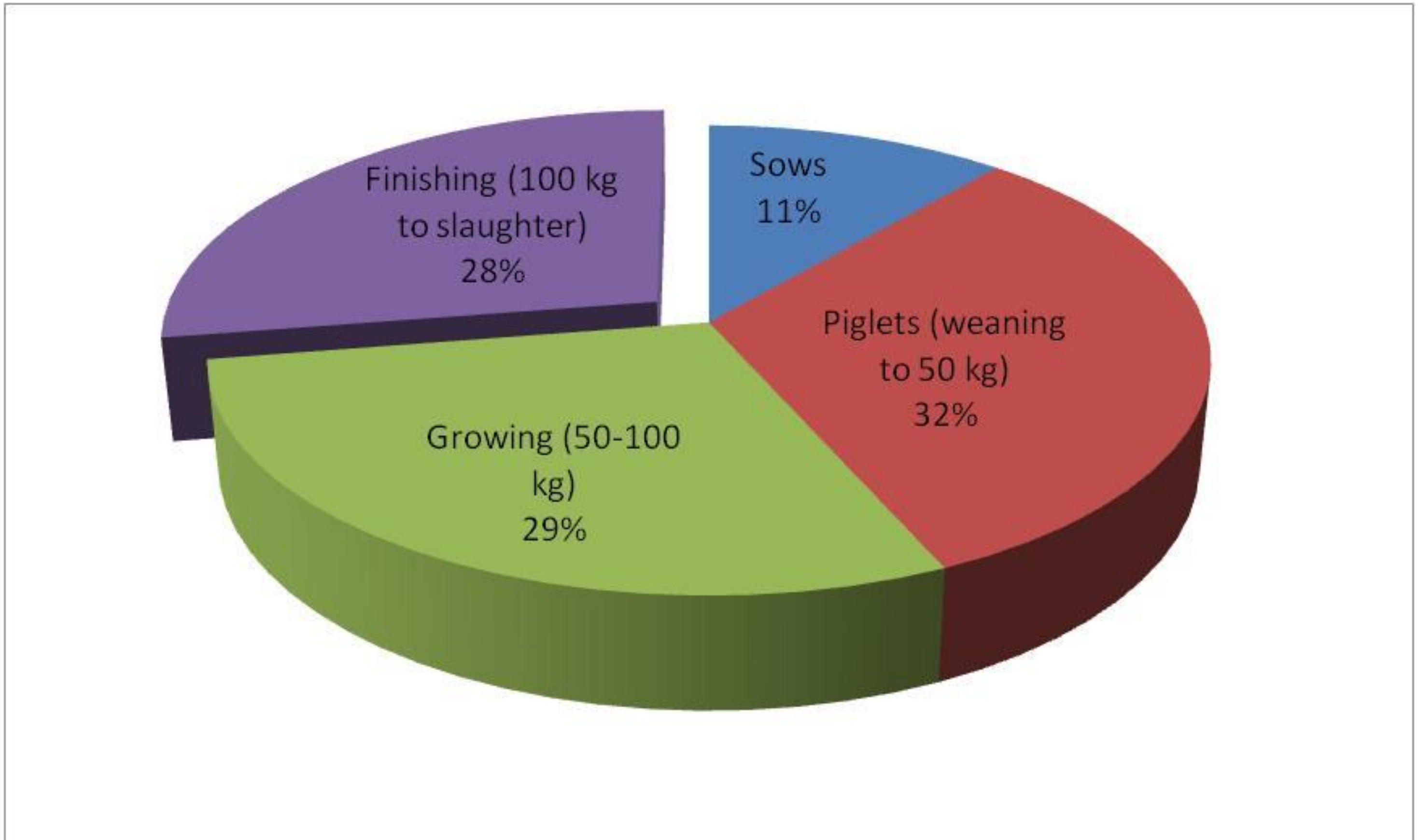
Contributions of different phases to GWP in farm 3



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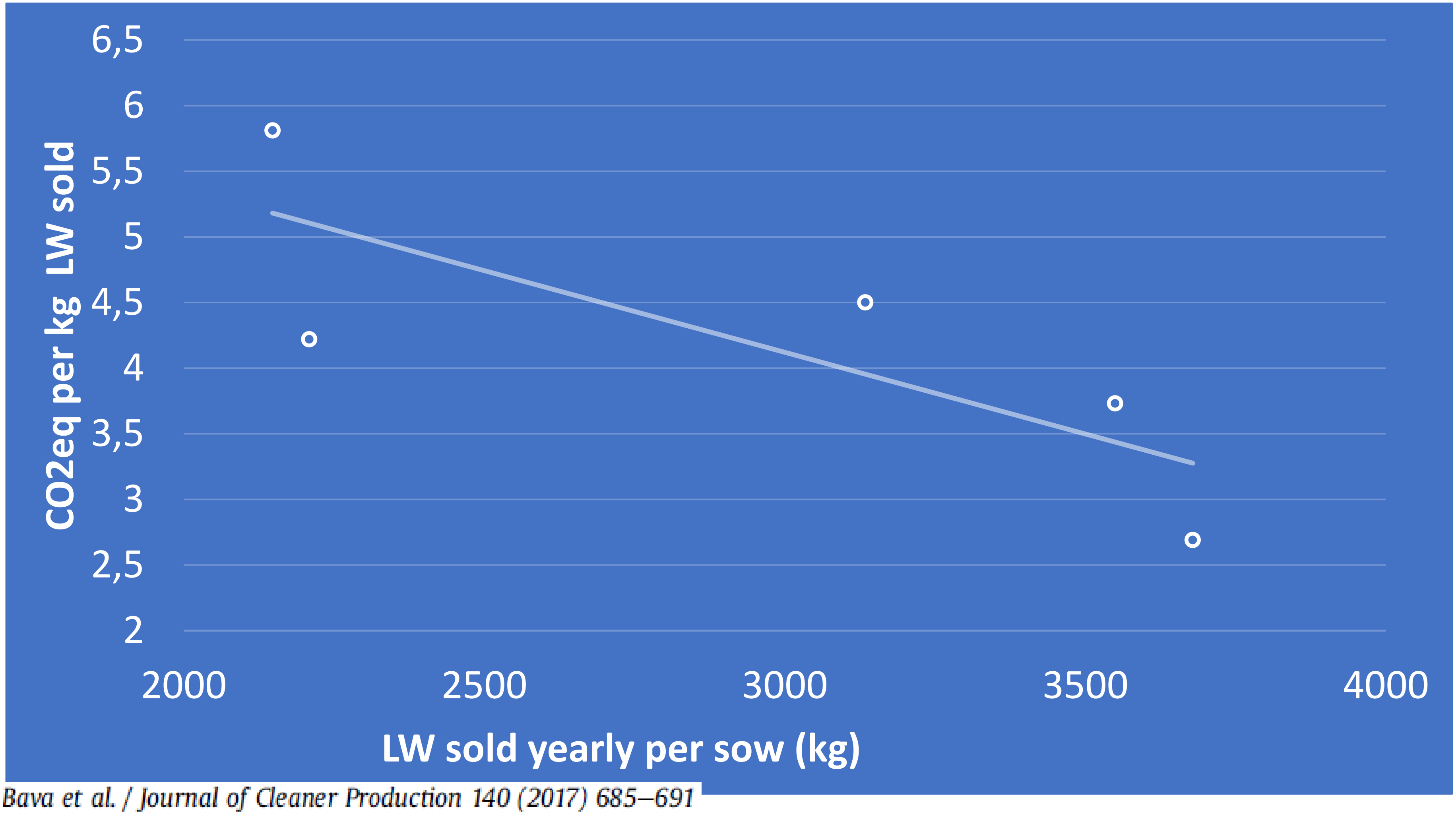
The main driver for CFP reduction is LW sold yearly per sow



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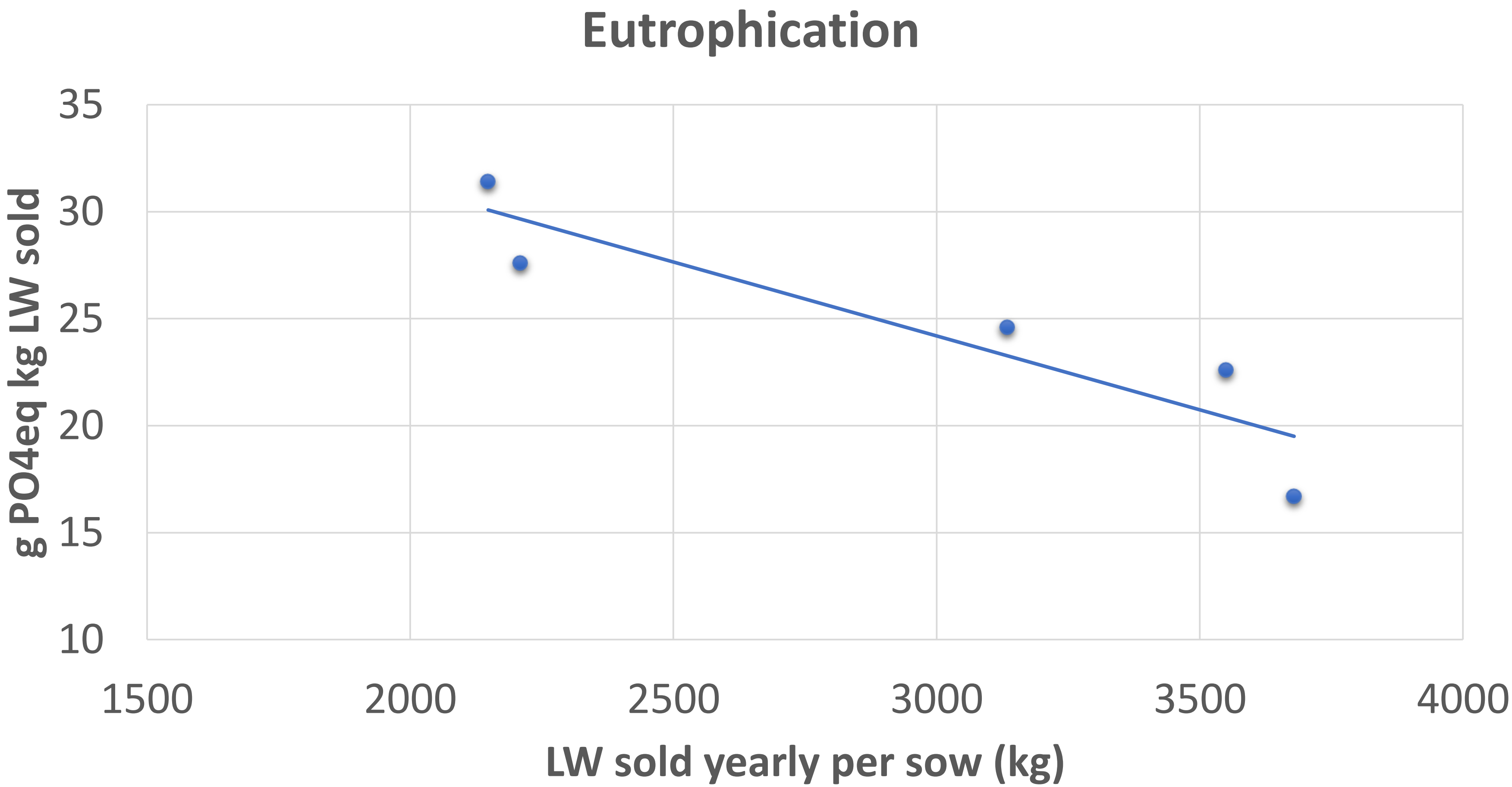
The main driver for eutrophication reduction is LW sold yearly per sow



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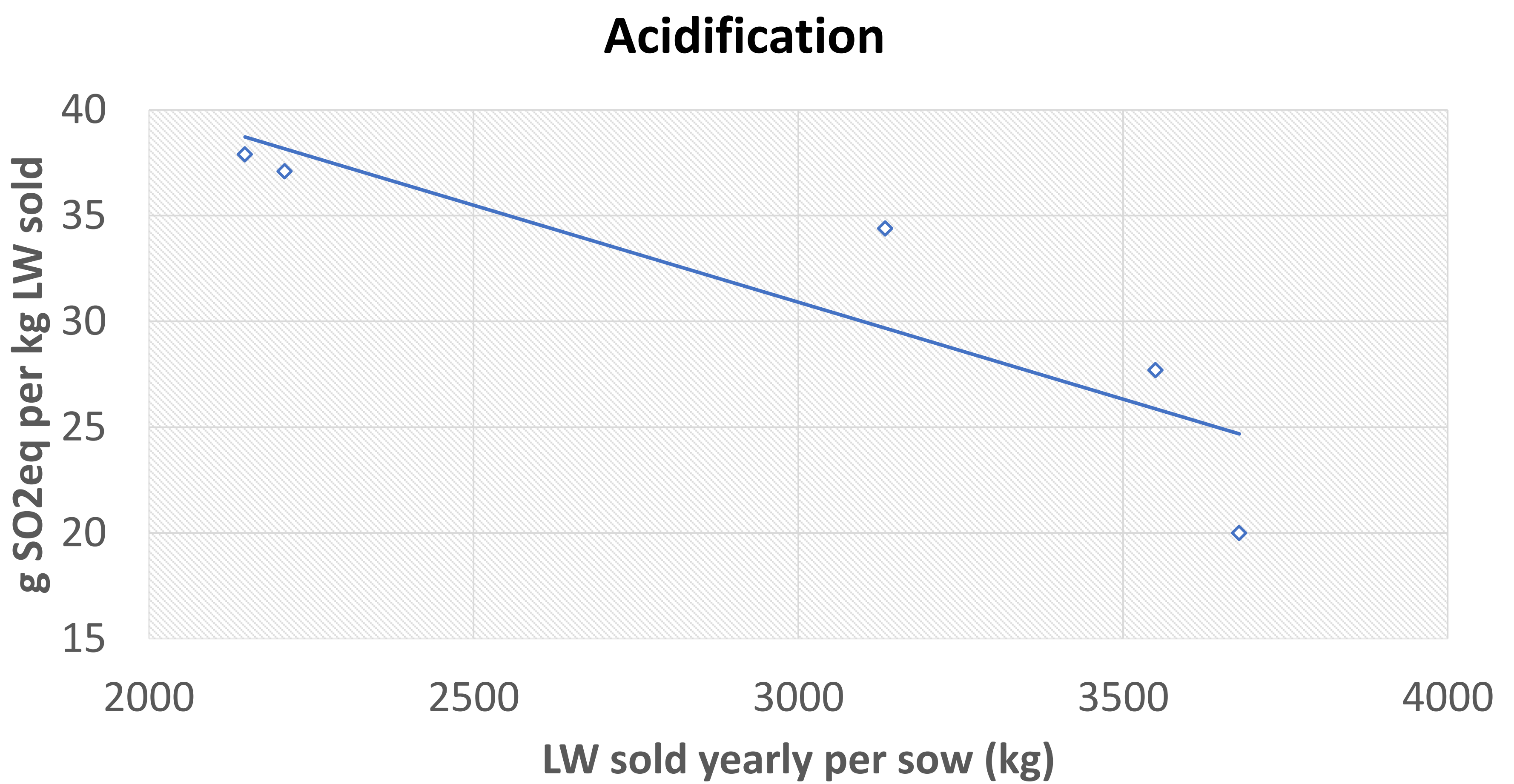
The main driver for acidification reduction is LW sold yearly per sow



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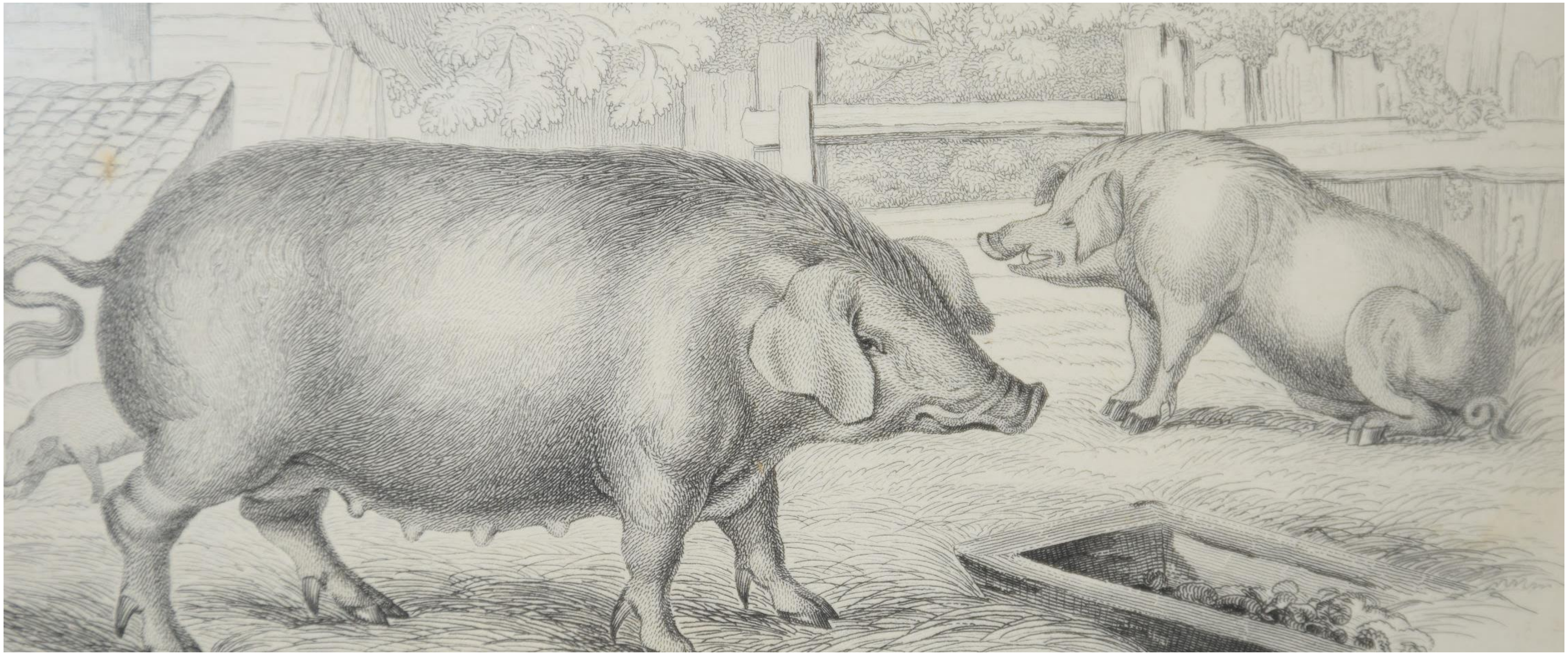
Strategies for containment the feeds environmental impact

- Use of byproducts
- Precision protein feeding
- Use no-deforest soia



Meat Science 114 (2016) 38–45

Contents lists available at ScienceDirect

Meat Science

journal homepage: www.elsevier.com/locate/meatsci

Effect of the inclusion of dry pasta by-products at different levels in the diet of typical Italian finishing heavy pigs: Performance, carcass characteristics, and ham quality

CrossMark

A. Prandini [a,*], S. Sigolo [a], M. Moschini [a], G. Giuberti [a], M. Morlacchini [b]

[a] *Feed and Food Science and Nutrition Institute, Agricultural Faculty, Università Cattolica del Sacro Cuore, Via Emila Parmense 84, 29122, Piacenza, Italy*
[b] *CERZOO, Research Center for Zootechny and the Environment, Via Decorati al Valor Civile 59, 29122, S. Bonico, (PC), Italy*

"*The results obtained in this investigation suggest that the inclusion of dry pasta by-products in the diet of finishing heavy pigs could be an efficient feeding strategy to promote the recovery of wastes of the pasta industry that would otherwise be discarded.* ***Our findings showed that up to 80% of pasta can be included in the diet without adverse effects on the growth performance***"

Animal Feed Science and Technology 208 (2015) 170–181

Contents lists available at ScienceDirect

Animal Feed Science and Technology

journal homepage: www.elsevier.com/locate/anifeedsci

Growth performance, and carcass and raw ham quality of crossbred heavy pigs from four genetic groups fed low protein diets for dry-cured ham production

S. Schiavon[a,*], L. Carraro[a], M. Dalla Bona[a], G. Cesaro[a], P. Carnier[b], F. Tagliapietra[a], E. Sturaro[a], G. Galassi[c], L. Malagutti[c], E. Trevisi[d], G.M. Crovetto[c], A. Cecchinato[a], L. Gallo[a]

[a] *Department of Agronomy, Food, Natural Resources, Animals and Environment, University of Padua, 35020 Legnaro, PD, Italy*
[b] *Department of Comparative Biomedicine and Food Science (BCA), University of Padua, 35020 Legnaro, PD, Italy*
[c] *Department of Agricultural and Environmental Sciences, University of Milan, 20133 Milan, Italy*
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% CP on DM - early fatt: C = 16.7; LP = 13.5 - late fatt: C = 15.0; LP = 11.7

Growth performance, feed consumption, feed efficiency (gain:feed) and P2 backfat depth of pigs of four genetic groups fed restrictively conventional (CONV) or low-protein (LP) diets from 90 to 166 kg BW.[A]

	Initial BW, kg	Final BW, kg	ADG, kg/d	Feed intake, kg/d	Gain: feed	P2 backfat initial, mm	P2 backfat final, mm	Gain in P2 backfat, mm
Diet:								
CONV	88.9	167.8	0.684	2.541	0.269	9.4	17.2	7.8
LP	89.2	165.0	0.658	2.569	0.255	9.2	17.8	8.6
Pooled SEM	0.654	1.476	0.012	0.028	0.002	0.148	0.285	0.307
P	0.75	0.20	0.13	0.49	<0.001	0.25	0.14	0.06

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Italian Journal of Animal Science

ISSN: (Print) 1828-051X (Online) Journal homepage: https://www.tandfonline.com/loi/tjas20

Nitrogen and Energy Partitioning in Two Genetic Groups of Pigs Fed Low-Protein Diets at 130 kg Body Weight

Gianluca Galassi, Luca Malagutti, Stefania Colombini, Luca Rapetti, Luigi Gallo, Stefano Schiavon, Franco Tagliapietra & Gianni M. Crovetto

%CP on DM: C=15.7; LP1 = 11.8; LP2 = 11.0

“The overall experimental data obtained indicate that the LP diets are effective in decreasing N excretion significantly with no detrimental influence on nitrogen retention. Between the two low-protein diets, the LP2 had a lower energy loss in comparison with the LP1.”

Reduction of dietary protein (Source CRPA)

	100-120 alive kg		120-140 alive kg		140-165 alive kg	
Component (*)	C	- CP	C	- CP	C	- CP
Corn (%)	48	48	51	51	52,9	53
Barley (%)	28	36,55	28	36,55	28	36,55
Soybean f.e. (%)	16	7	13	4	11	2
L-Lysine HCL (%)	-	0,25	-	0,25	-	0,25
L-Tryptophan (%)	-	0,02	-	0,02	-	0,02
Crude proteine (%)	14,34	12,34	13,38	11,37	14,23	11,62
Lysine (%)	0,65	0,65	0,59	0,58	0,56	0,56
Dygestible energy (kcal/kg)	3.197	3.160	3.197	3.160	3.194	3.160
(*) 5 kg of bran and 3 kg of supplement must be added to all formulas						

The test was conducted in an experimental station.
The different diets were balanced according to the reduction of about 2% of proteins, with a reduction of soy and the integration of lysine and tryptophan.

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Reduction of dietary protein (Source CRPA)

- RESULTS
- With the **same performance** (control vs low protein),
- • ADG 746 g vs 717 g (from 98.6 kg to 165 kg) - significant but limited difference (P <0.05)
- • FCR 3.86 vs 3.98
- • Slaughter yield % 83.9 vs 84.2
- • Lean meat % 49.7 vs 49.6

we obtained:

• + 23% of total effluent solids

• - 21.9% of N excreted

• - 18% of N at the field

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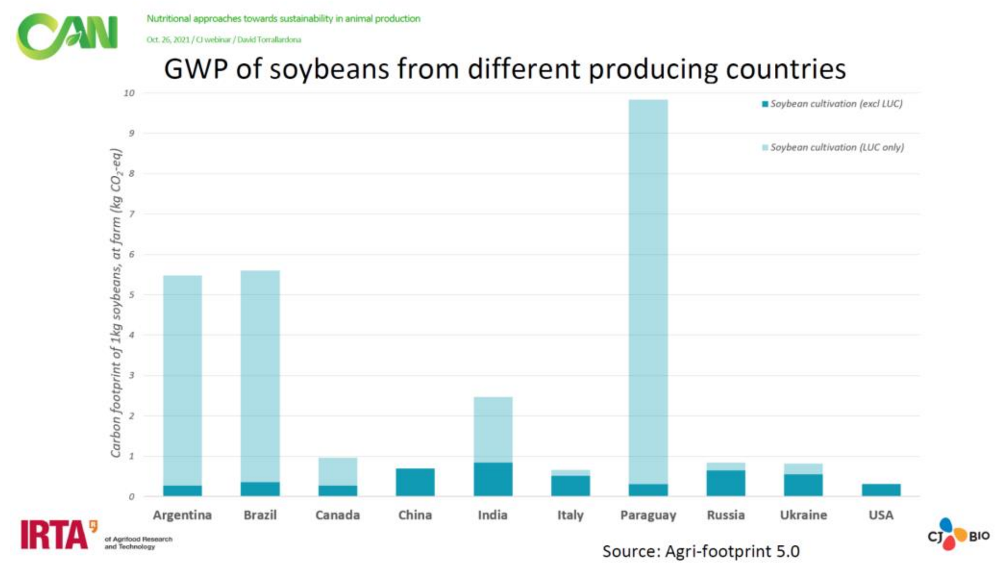
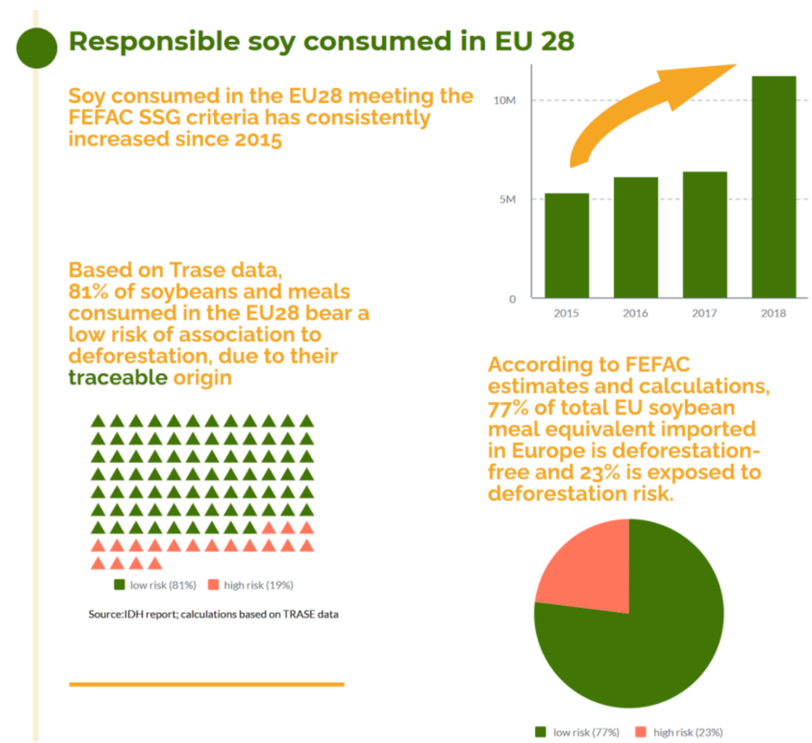
If soybeans certified for low deforestation risk are used, the CFP imported with the feed is greatly reduced





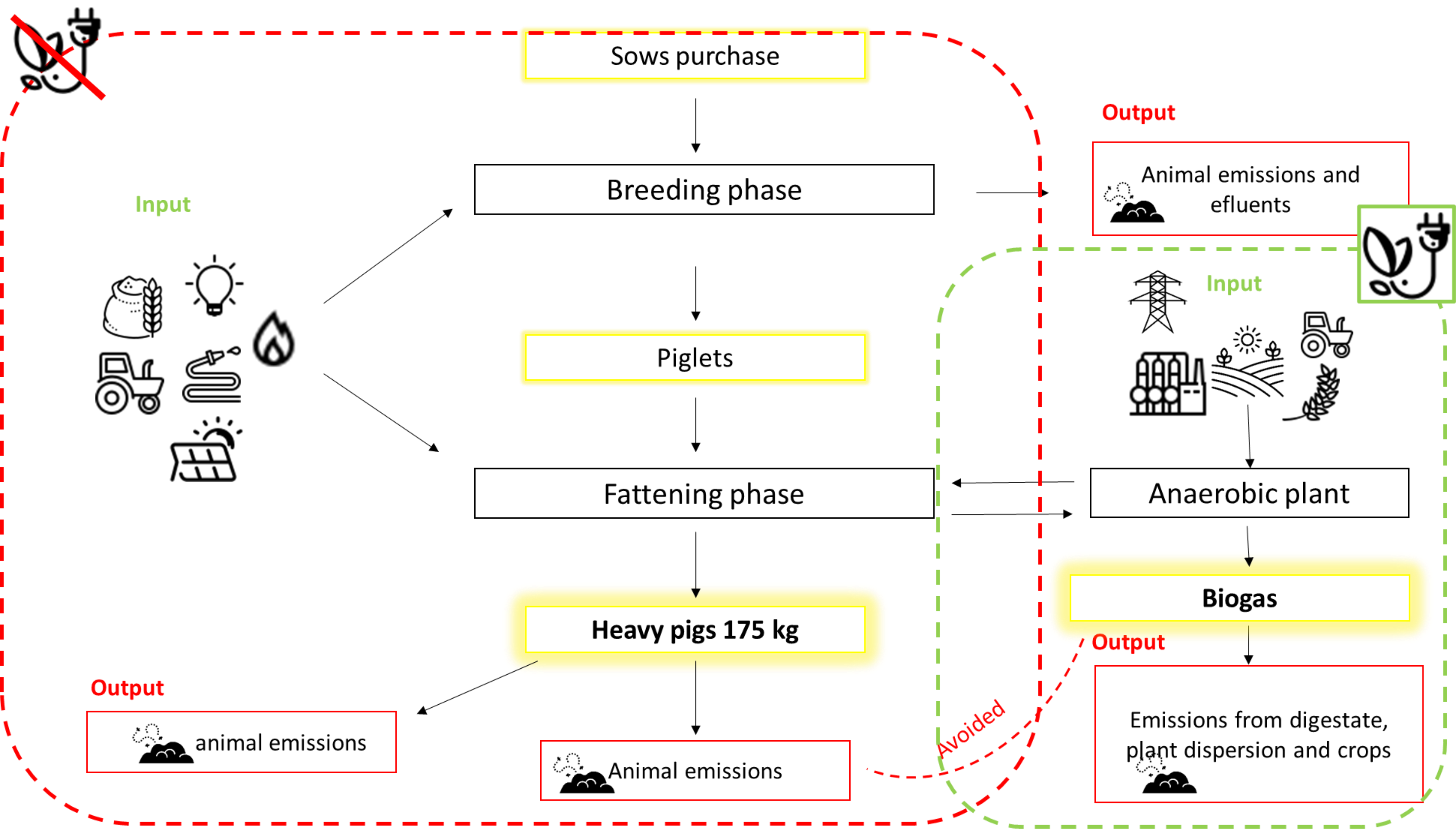
Renewable energies are crucial tools for net_zero pig farming

Solar roofs +

Biogas +

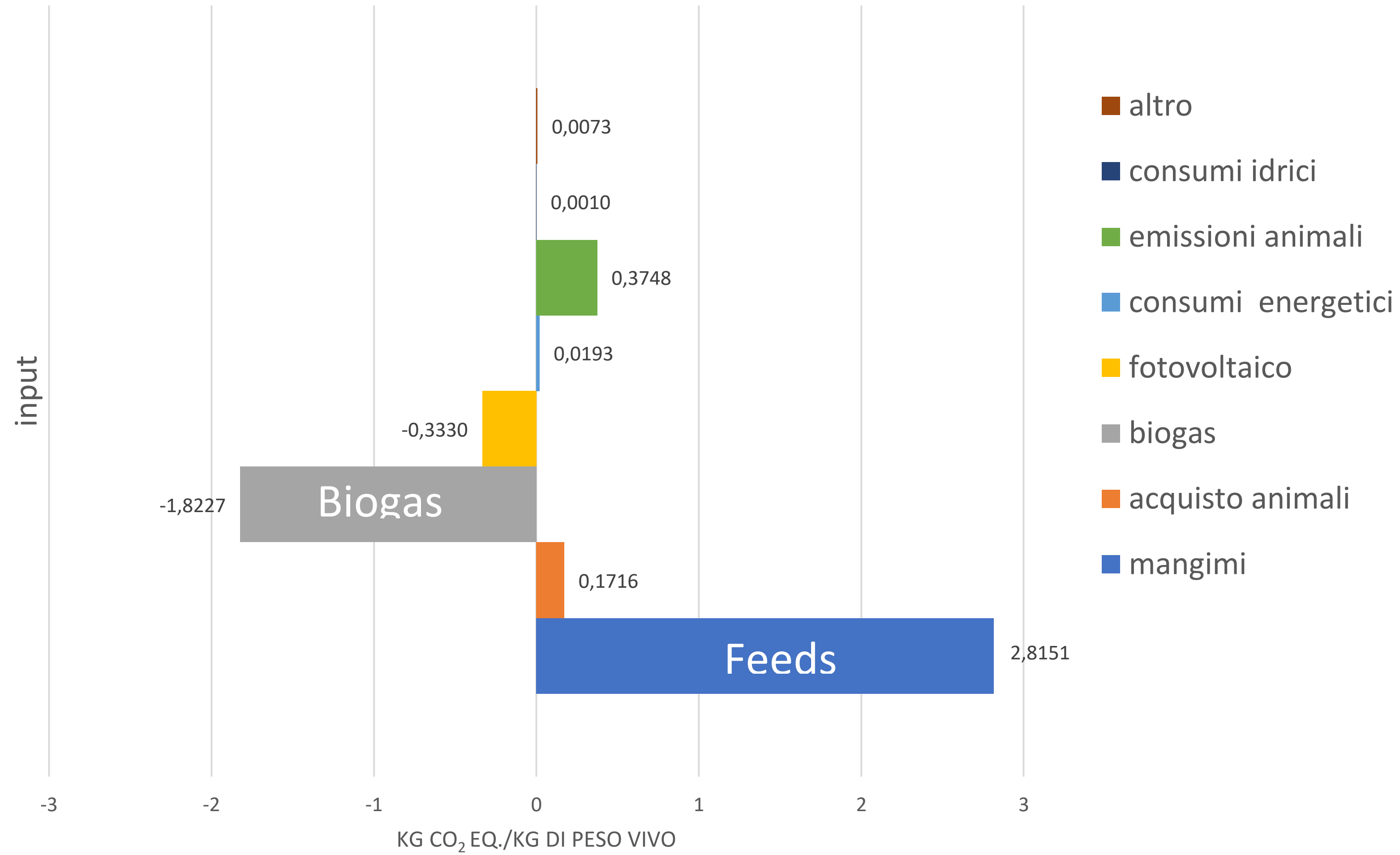
Precision farming = low_C

System boundaries of heavy pig production

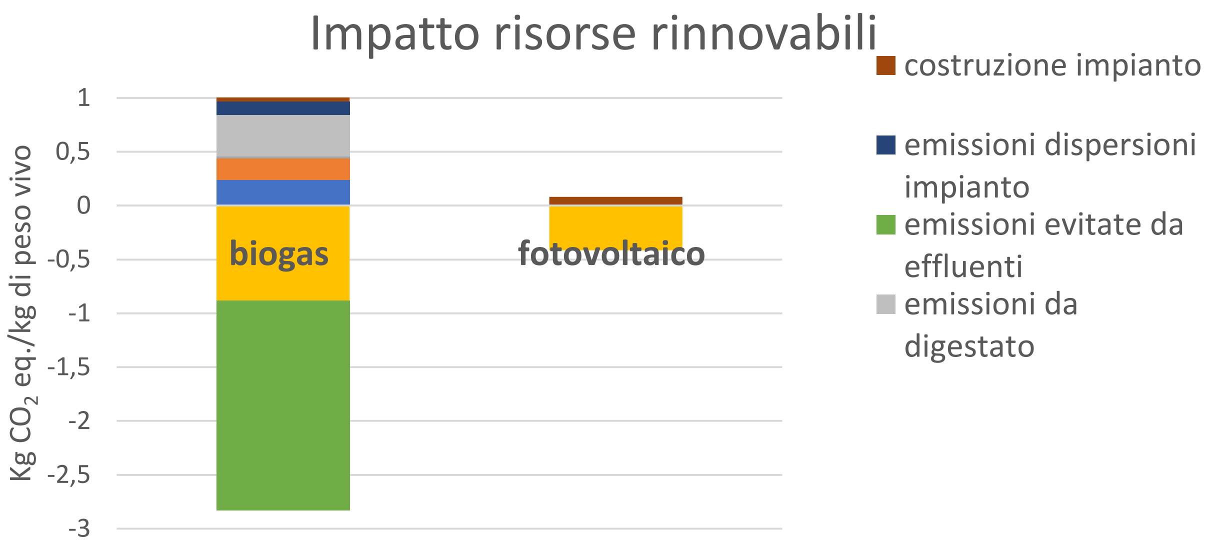


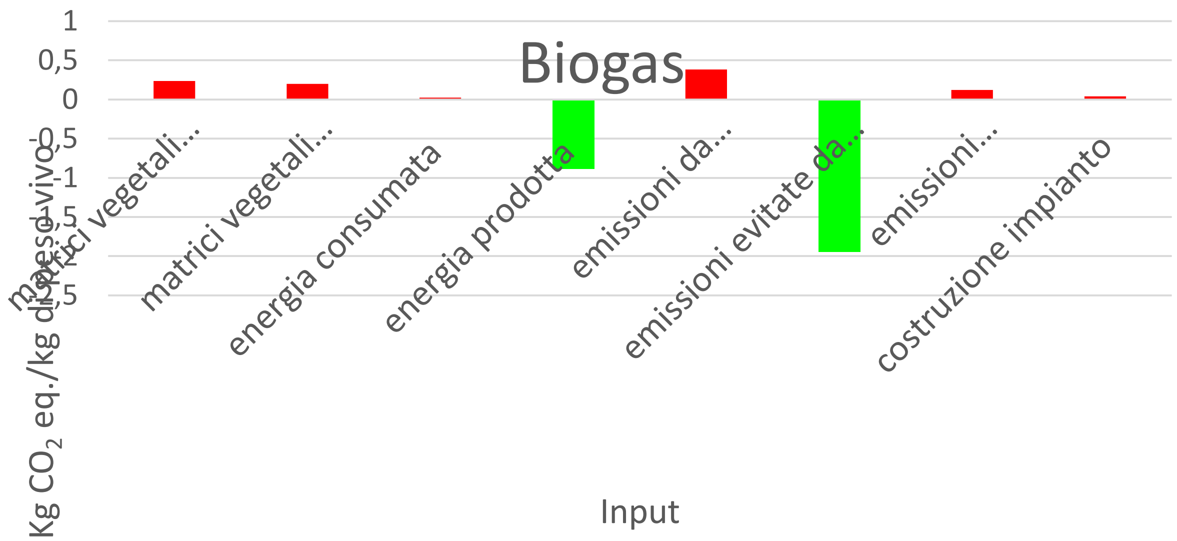
CARBON FOOTPRINT PIGGLY

1.23 Kg CO_2 eq./kg LV



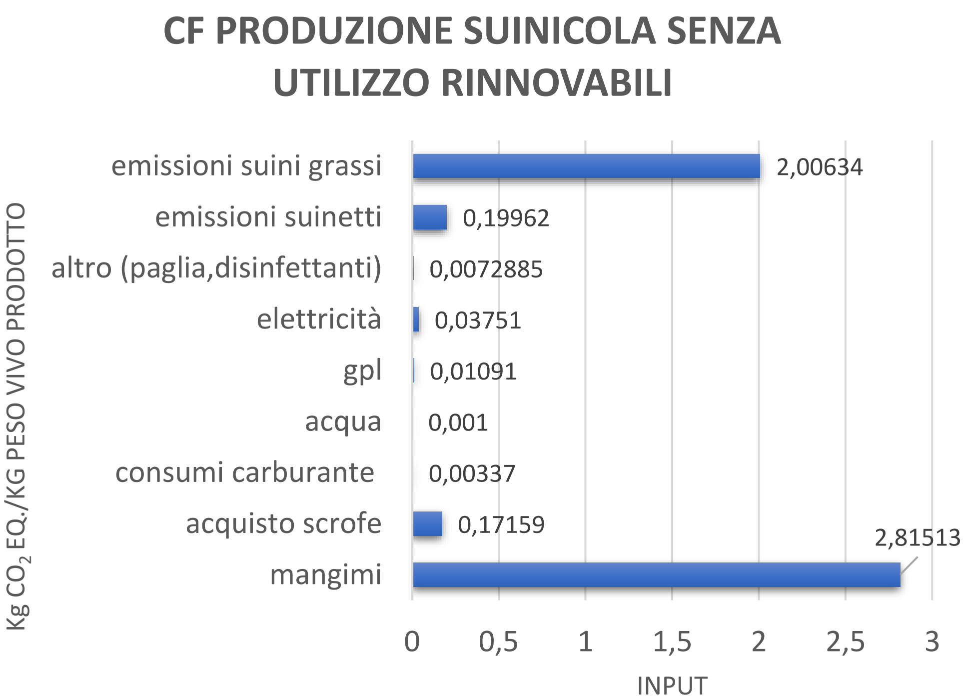
Biogas is the decisive renewable energy investment for reducing the CFP

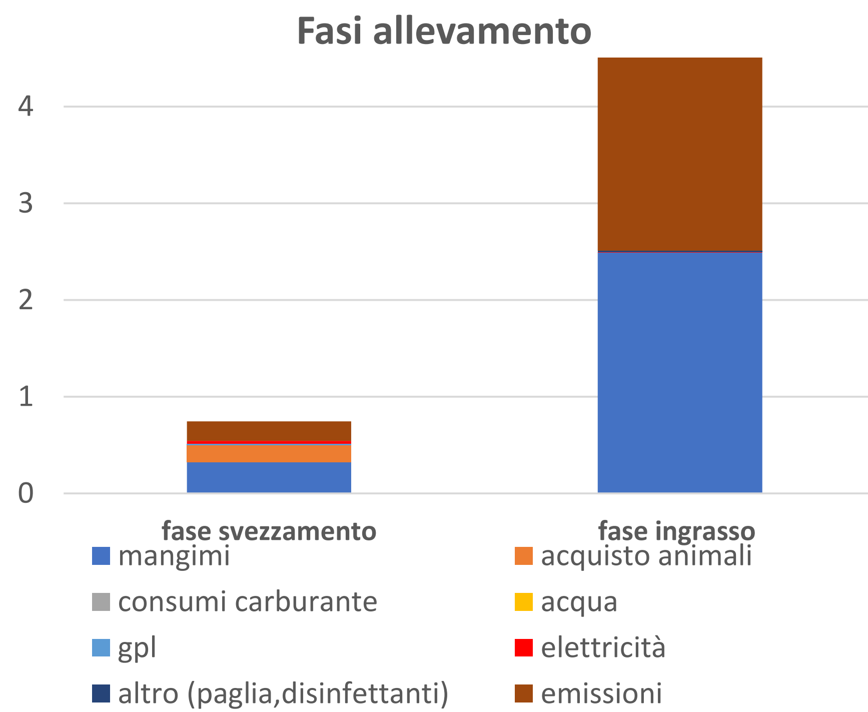




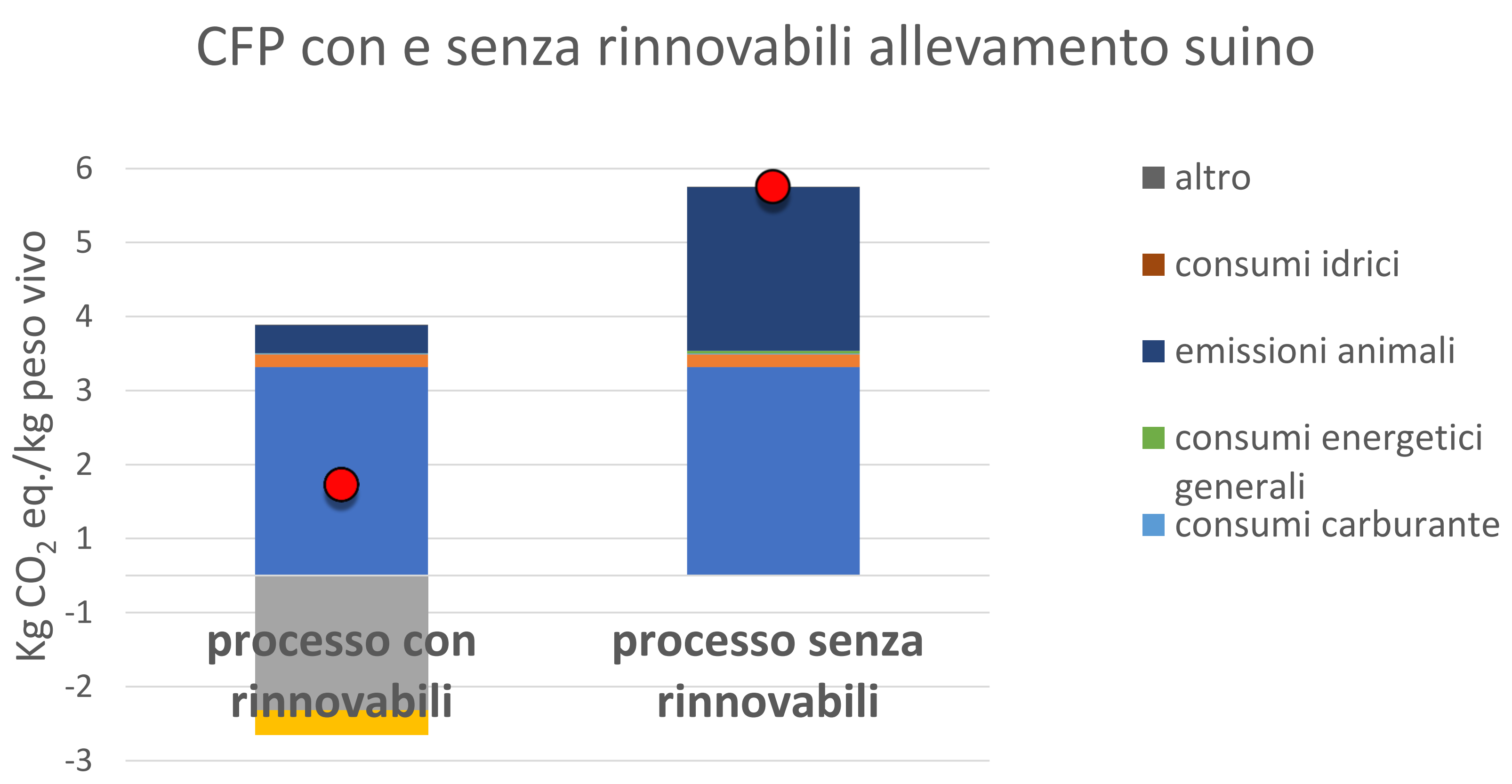
What would have been the impact of farming without renewable energy?

5,25 Kg CO_2 eq./kg LV





Renewable energies are crucial to reduce the impacts of Italian heavy pig farming



Final remaks

1. The Italian pig industry differs from others in the EU in that it is almost totally directed towards the production of heavy pigs.
2. This implies that environmental impacts are higher per kg live weight sold due to longer cycle lengths and higher slaughter weight
3. The greatest scope for reducing unitary impacts comes from higher productivity, reduction in CFP of feed, precision feeding especially for proteins and adoption of biogas on the farm.
4. If C returns to soil from biodigester composts were to be included, the net_zero goal, at least for GHG, may not be far off.

Thank you for your attention

.....and I hope you didn't sleep as soundly as these piglets did.