Digestibility and nitrogen balance in Cinta Senese growing pigs fed different protein levels

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Cinta Senese: a native Tuscan pig breed

First documented presence — **1340**

Extinction risk — **1980**

Recovery programs — **1990**

Anagraphic Register — **2001**

PDO on fresh meat — **2012**

3 boars
81 sows

Cinta Senese D.O.P.

143 farms

5000 animals

but…

Few studies on its nutritional requirements

Cinta Senese: nutritional requirements

- **Feed cost affects up to 60-70% of the rearing cost**
- **Formulations calculated on selected pig breed performances**
- **Native pig breeds have slower growth rates and lower potential for lean tissue development**

Commercial breeds	Native breeds
16 % crude protein (CP)	?

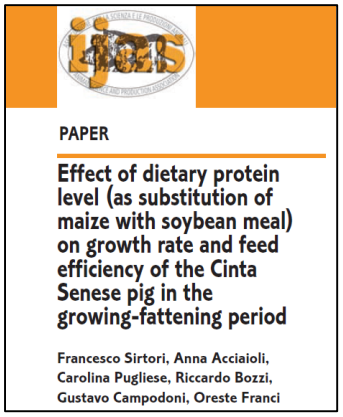
Which are their real protein requirements?

Cinta Senese: nutritional requirements

What we know…

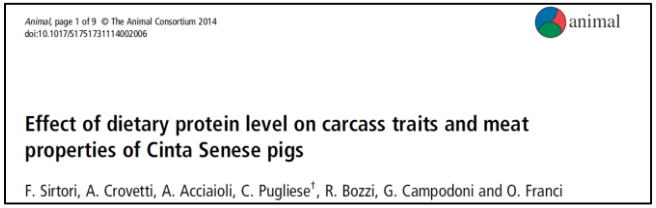
- **Over 70 kg of l.w., a 10% CP diet was the best compromise for growing-fattening of Cinta Senese pigs**

- **8% CP diet resulted in excessive carcass fatness, lightness, yellowness and cooking loss in 145 kg l.w. Cinta Senese pigs**


PAPER

Effect of dietary protein level (as substitution of maize with soybean meal) on growth rate and feed efficiency of the Cinta Senese pig in the growing-fattening period

Francesco Sirtori, Anna Acciaioli, Carolina Pugliese, Riccardo Bozzi, Gustavo Campodoni, Oreste Franci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animal

Effect of dietary protein level on carcass traits and meat properties of Cinta Senese pigs

F. Sirtori, A. Crovetti, A. Acciaioli, C. Pugliese†, R. Bozzi, G. Campodoni and O. Franci

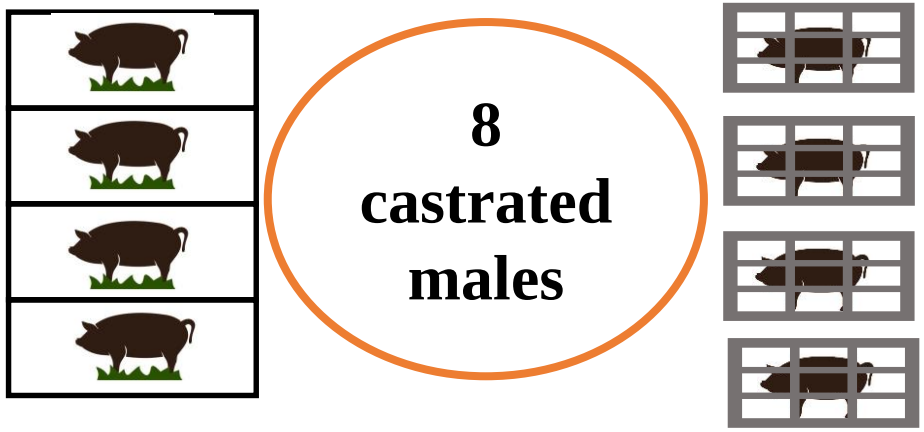
Which is the protein requirement in the growing stage?

Aim

The aim of this study was to evaluate the protein digestibility and the N retention of four diets, containing 12, 14, 16 and 18 % of CP in Cinta Senese growing pigs.

Material and methods: animals management

Week	Group 1	Group 2
1	Box diet A	---
2	Cage diet A	Box diet D
3	Box diet B	Cage diet D
4	Cage diet B	Box diet C
5	Box diet C	Cage diet C
6	Cage diet C	Box diet B
7	Box diet D	Cage diet B
8	Cage diet D	Box diet A
9	---	Cage diet A



Adaptation in box: 10 days

Metabolic cage:
- **2 d adaptation**
- **3 d sampling**

55 Kg
5 months

65 Kg
7 months

Material and methods: diet ingredients

Daily feed amount adjusted before every cycle according to their metabolic weight (90 g DM/kg MW)

		Diets			
		12 % CP	**14 % CP**	**16 % CP**	**18 % CP**
Ingredients	**%**				
Maize	«	73.50	68.00	69.95	57.40
Soybean meal	«	9.00	14.50	19.50	25.00
Wheat bran	«	10.00	10.00	10.00	10.00
Maize oil	«	2.00	2.00	2.00	2.00
Bentonite	«	2.00	2.00	2.00	2.00
Lysine	«	0.45	0.45	0.45	0.50
Methionine	«	0.05	0.05	0.10	0.10
Mineral vitamin premix	«	3.00	3.00	3.00	3.00

Material and methods: diet composition

		Diets			
		12 % CP	14 % CP	16 % CP	18 % CP
Composition	**%**				
Dry matter	«	87.92	88.18	88.16	88.07
Crude protein	«	13.34	15.58	17.86	20.37
Ether extract	«	4.87	4.71	4.73	4.76
Crude fiber	«	5.08	4.03	3.57	4.64
NDF	«	19.91	18.89	19.38	17.69
ADF	«	6.60	7.37	7.63	8.61
ADL	«	1.46	1.79	2.11	1.99
Free N	«	69.90	68.11	66.15	62.55
Ash	«	6.81	7.58	7.69	7.68
Lysine	«	0.99	1.15	1.30	1.46
Methionine	«	0.31	0.34	0.42	0.44
Gross energy	MJ/Kg	18.296	18.27	18.40	18.57

Material and methods: sampling

107 samples: Twice a day

Chemical analysis (moisture, protein, ehter extract, ash, NDF, ADF, ADL) + Acid Insoluble Ash (A.I.A)

Indicator method (Van Keulen and Young)

Total tract apparent digestibility = ($\frac{(Cf - Ca)}{Cf}$ *100)

97 samples: Once a day

N determination

Kjeldhal method

Nitrogen utilization

Nitrogen Balance

Material and methods: data analysis

Data were analysed by GLM Procedure (SAS, 2007) using the following model:

$$Y_{ijkl} = \mu + D_i + S_j + b*P_k + c*X_{jk} + E_{ijkl}$$

Where
Y = l^{th} observation on j^{th} subject;
D = fixed effect of the i^{th} day of sampling (1, 2, 3)
S = fixed effect of the j^{th} subject;
P = continuous effect of k^{th} protein content of diet.
X = continuous effect of Metabolic weight at entry in cage;
E = random error.

Results were reported as LSmeans along the regression line at the specific level of CP, the significance of linear and quadratic regression was tested.

Results: animals and diets

	Diets				P	RSD
	12 % CP	14 % CP	16 % CP	18 % CP		
Animals						
Final wieght (Kg)	64.70	65.11	65.52	65.93	ns	235.2
ADG (g/d)	372	353	334	315	ns	41.59
Digestibility (%)						
Dry matter	86.83	86.33	85.83	85.33	ns	2.27
Organic matter	89.88	89.45	89.01	88.58	ns	1.99
Protein	85.89	86.39	86.89	87.39	ns	2.51

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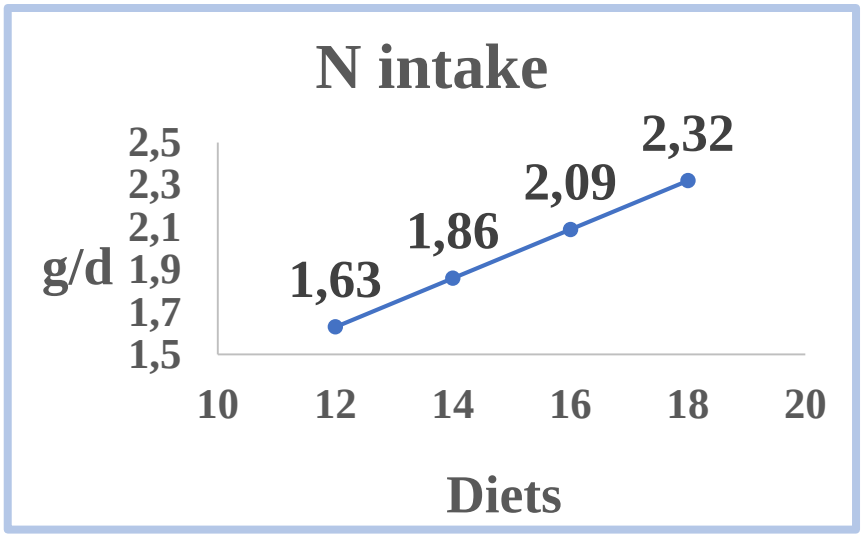
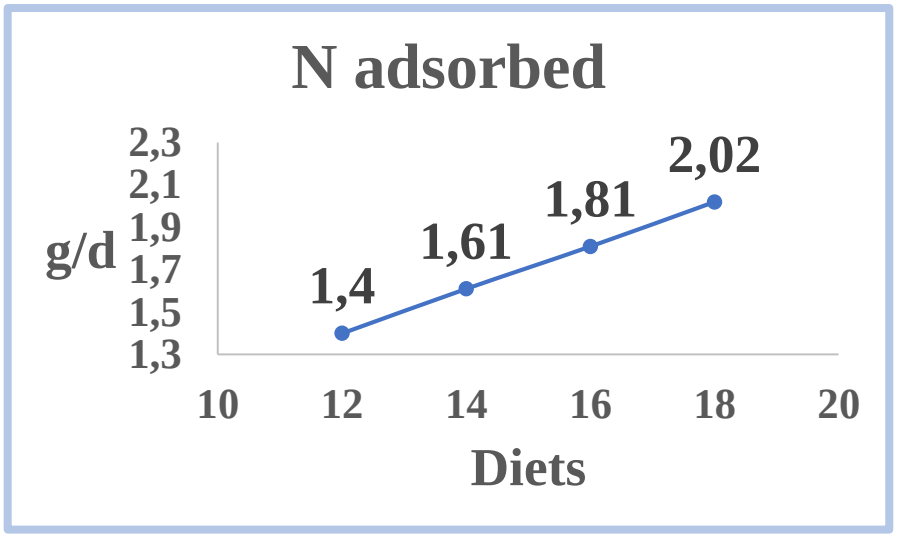
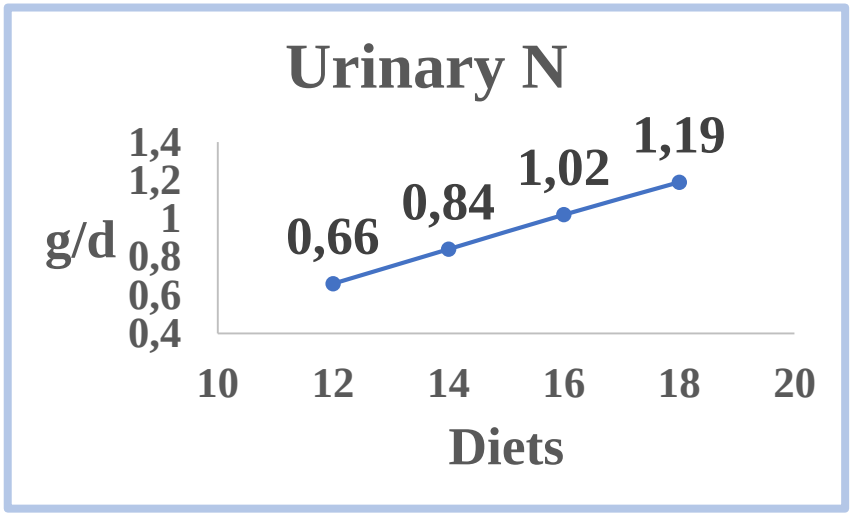
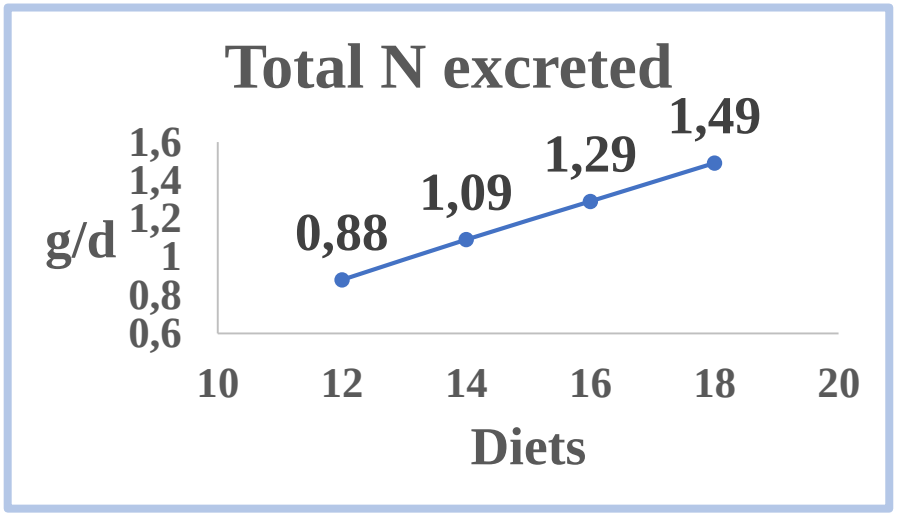
Results: nitrogen balance

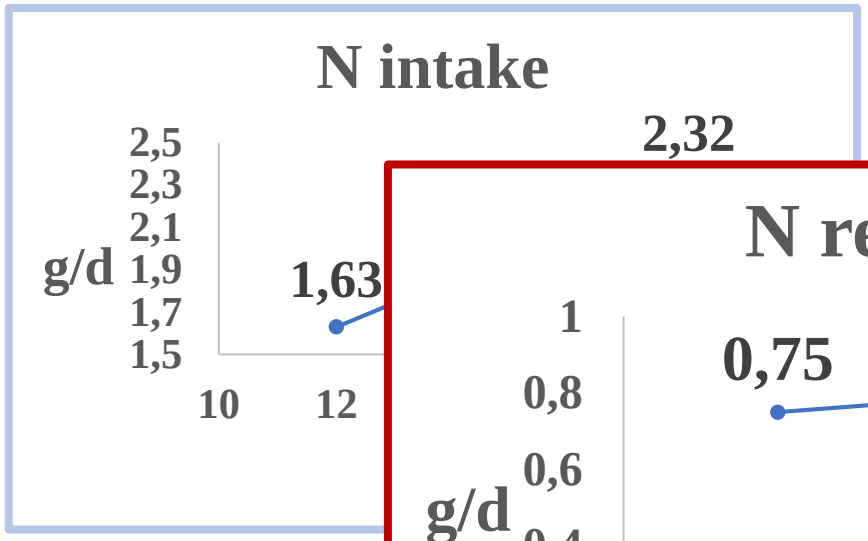


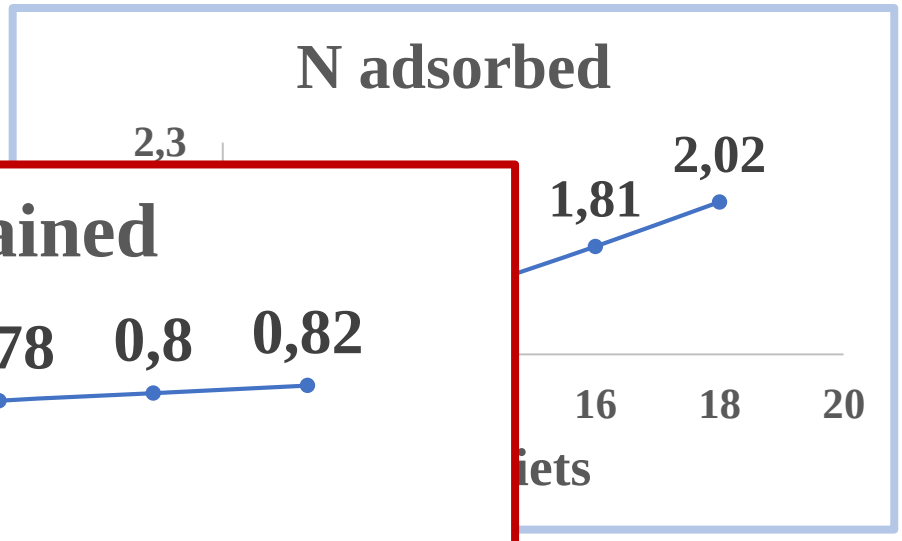


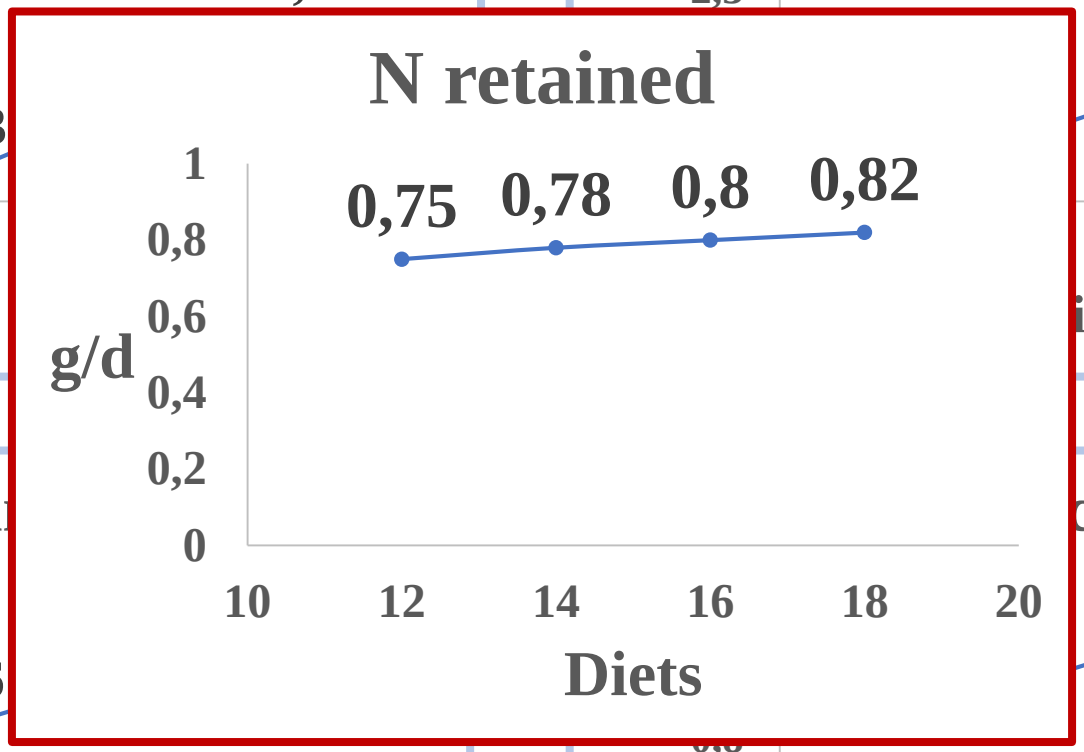




Results: nitrogen balance

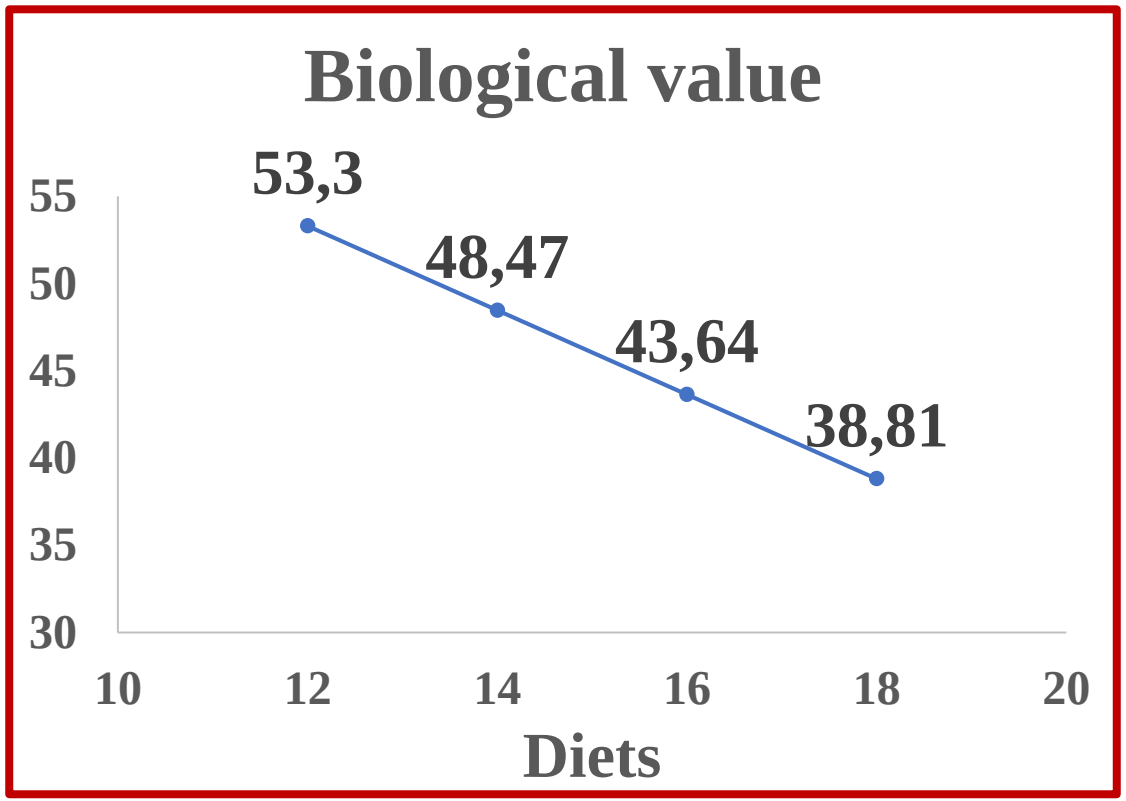






Results: nitrogen balance

$$\text{Biological value} = \frac{(N\ adsorbed - Urinary\ N)}{(N\ intake - N\ excreted)} = \frac{N\ retained}{N\ adsorbed}$$



Results: energy

	Diets				P	RSD
	12 % CP	14 % CP	16 % CP	18 % CP		
Gross energy (MJ/Kg)	18.29	18.27	18.40	18.57		
Energy digestibility (%)	91.22	90.87	90.47	90.09	ns	2.35
Energy metabolizability (%)	90.31	89.52	88.72	87.92	<0.01	2.01

Conclusions

- Same protein and energy digestibility for the four diets
- N intake and adsorption increased as the crude protein content increased
- Cinta Senese pigs were able to adsorb high level of CP, but the N retained did not changed at increasing levels of CP
- The increasing N excreted through urines, negatively affected the energy metabolizability

12% CP diet resulted in the lowest Total excreted N, highest Biological value and Energy metabolizability

Conclusions

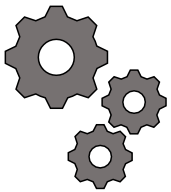
✓ **A CP level of 12% in the diet can fulfill Cinta Senese protein requirements during growing**

✓ **Using an appropriate protein level has multiple returns**

→ **Economic saving for farmers**

→ **Reducing N pollution in the environment**

Preliminary results on *in vivo* performances suggest that the proposed CP level did not affect growth performances



Thank you for your attention!!!