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# Radiant floor heating system for broilers in Portugal

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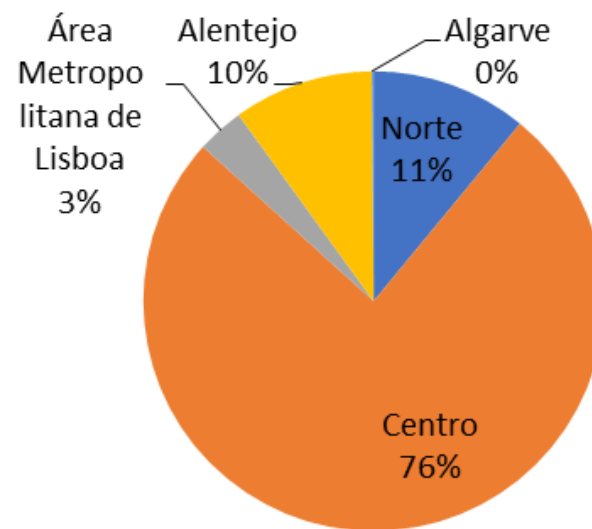
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- Poultry production in Portugal

- 6,7% of national agriculture product;
- 20.254.000 broilers (60% of total poultry);
- Portugal is self sufficient in poultry meat.



# General considerations

- For meat production energy is consumed for:
  - Feed production and processing
  - feeding
  - ventilation
  - heating
  - illumination
  - manure removal
  - animal healthcare,
  - ...

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Final energy consumption (FEC) and FEC of agriculture (including forestry) for the years 1998 and 2008 according to the Eurostat data (Gołaszewski et al., 2012).

Country	Total FEC in PJ		FEC of agriculture* in PJ		FEC of agriculture* in % of total FEC	
	1998	2008	1998	2008	1998	2008
EU-27	46 658	49 205	1 257	1 071	2.7	2.2
Denmark	630	649	31	29	5.0	4.5
Finland	1 005	1 083	30	35	3.0	3.2
Germany	9 428	9 386	114	42	1.2	0.4
Greece	761	890	45	46	6.0	5.1
Netherlands	2 082	2 139	157	132	7.5	6.2
Poland	2 526	2 606	198	152	7.8	5.8
Portugal	2 526	2 606	25	15	1.0	0.6

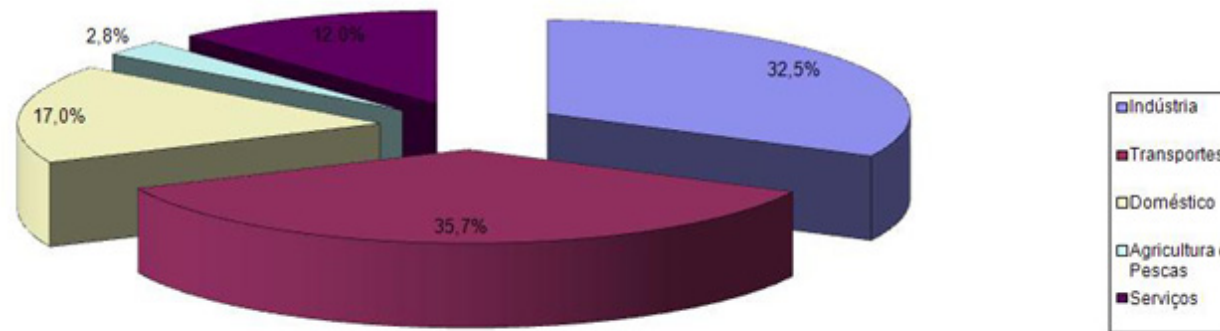
# Energy Consumption

Eurostat data presented is not sufficient to describe the energy consumption of the European agriculture for various reasons:

- Not all the energy required for the production of agricultural products is allocated to the sector "agriculture/forestry" in the Eurostat statistics (p.e. FEC of fertilizer production is allocated to the sector "industry");
- The production of agricultural products requires a variety of forms of energy such as heat, electrical energy, besides the fuel for combustion engines.

# Energy Consumption

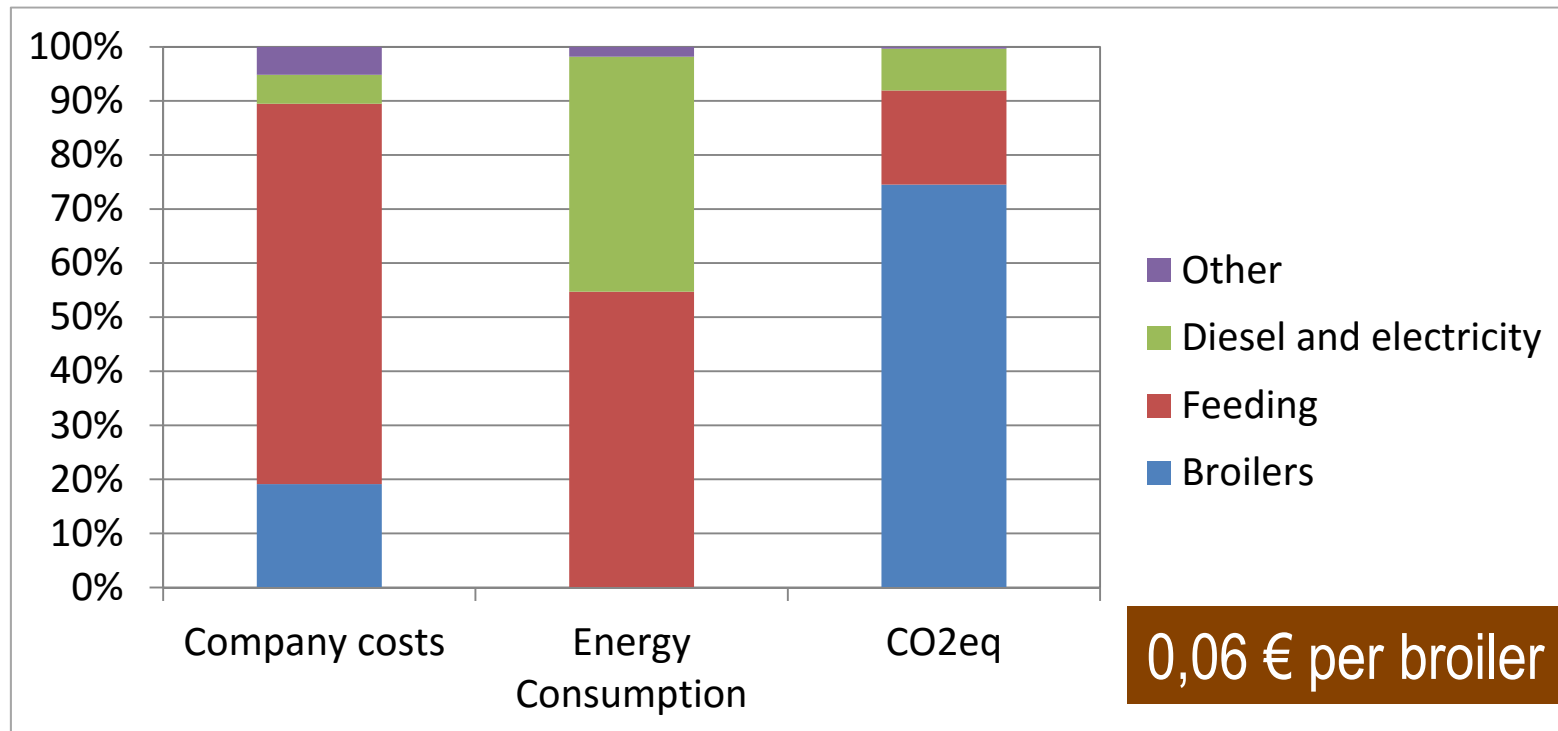
Consumo de Energia Final por Setor 2012 (%)



[www.dgeg.pt](http://www.dgeg.pt)



# Energy Consumption



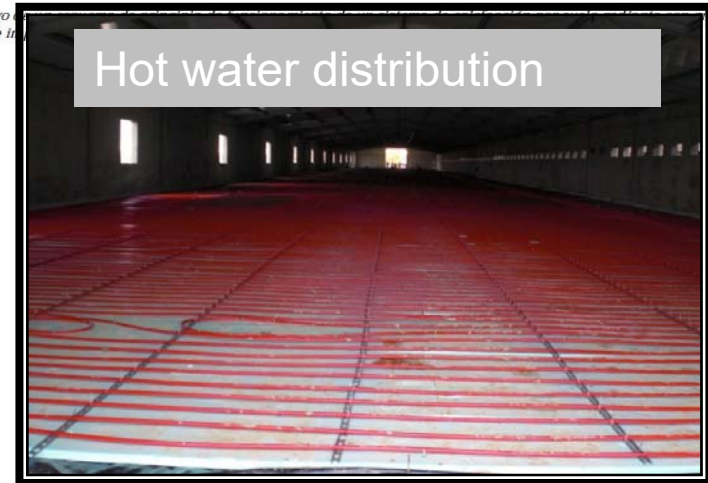
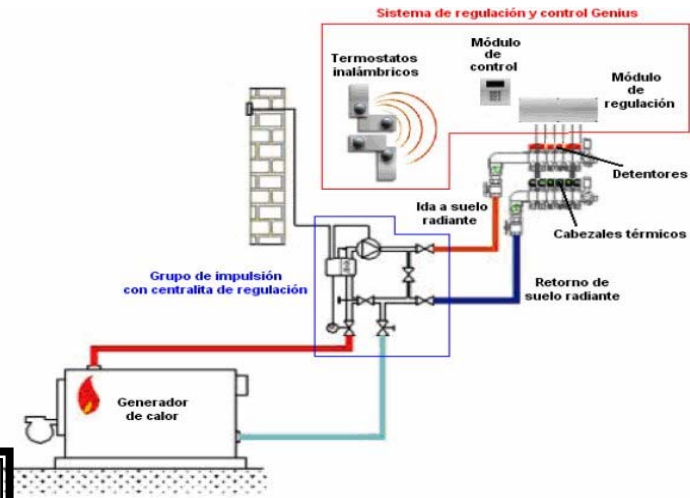
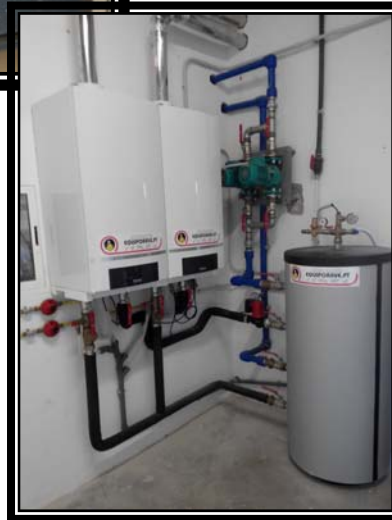
Relative contribution of different inputs to economics, energy use and greenhouse gas emissions (GHG). **Broiler farm with air heaters.** Other include bedding straw, veterinary and water. (Meyer-Aurich et al, 2012)



# Radiant floor heating system



Different  
types of  
Boilers:  
biomass,  
gas, diesel



# Expectable advantages



Temperature uniformity



Homogeneous distribution of birds



Adequate temperature at animal level since the beginning



Dryer bed materials



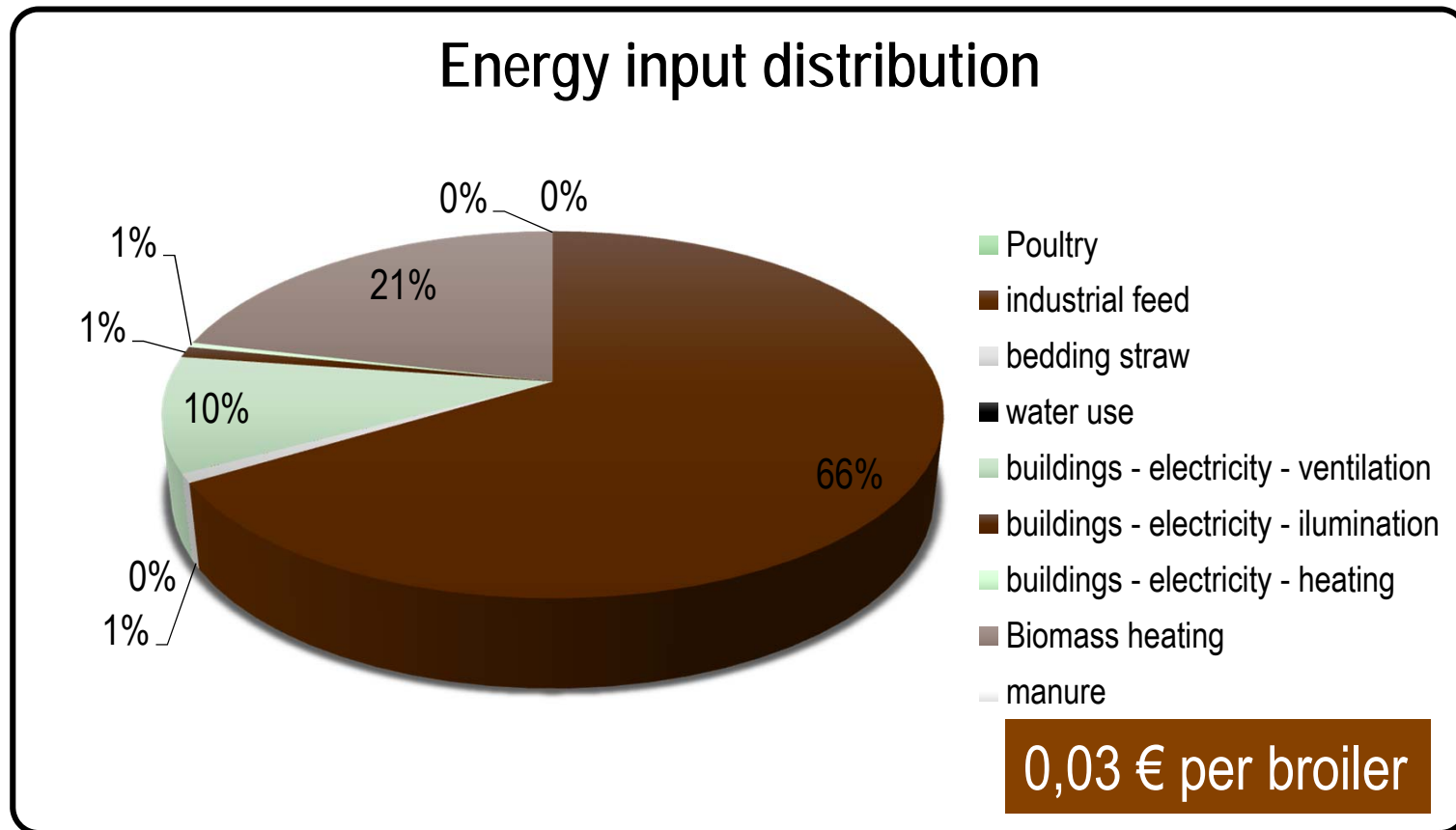


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- 
- Bâtiments  
d'élevage  
de demain**



# Some results

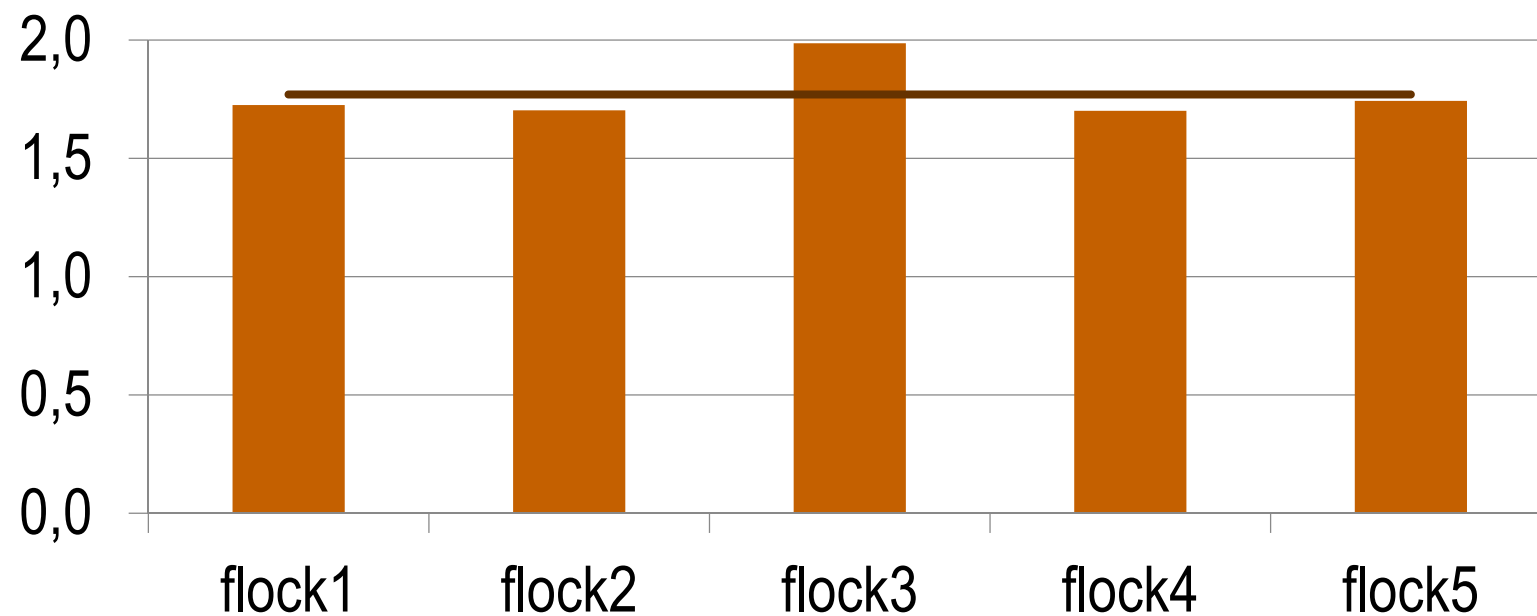


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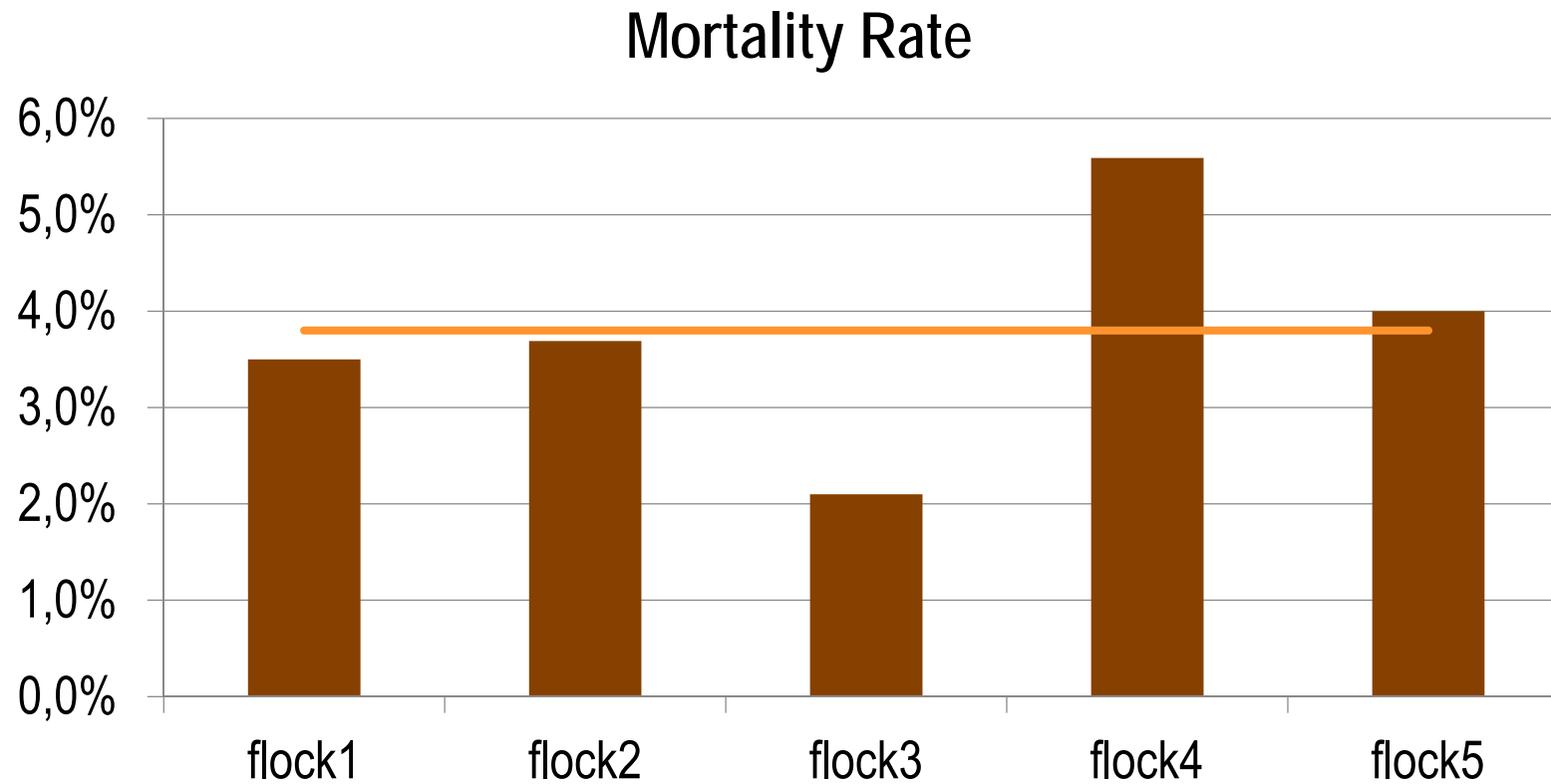




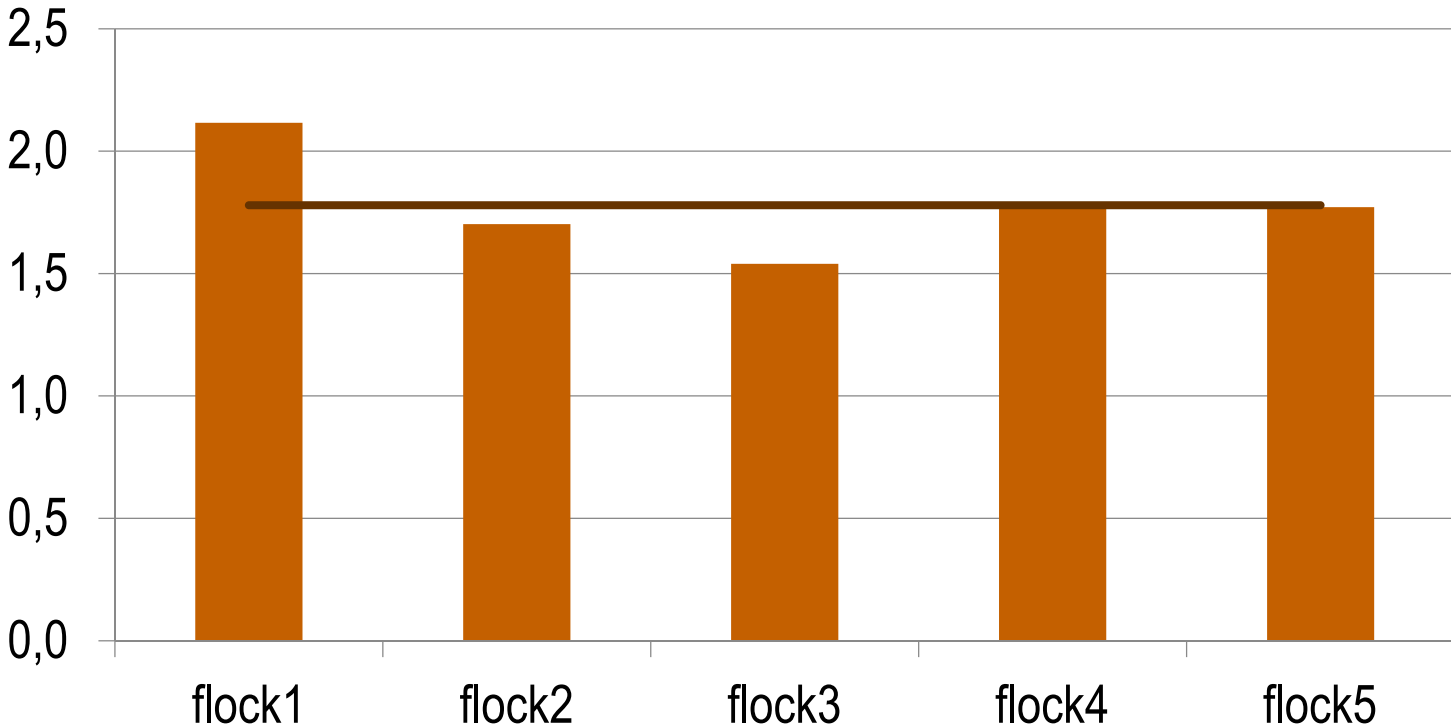
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# Some results

## Custos Normais de Aquecimento (RAVICONFORT)

Data Entrada	Frangos		Pellets Kg	Custo Kg	Euro/Aquecimento por Bando	Media € Bando
04-04-2013	40000	Bando 1	4750	0,15	712,50 €	0,018
31-05-2013	40000	Bando 2	6320	0,15	948,00 €	0,024
19-07-2013	38000	Bando 3	5060	0,14	708,40 €	0,019
20-09-2013	37500	Bando 4	6490	0,14	908,60 €	0,024
28-11-2013	38500	Bando 5	7800	0,15	1.170,00 €	0,030

**0,023 €**

Integrado: Gil Ribeiro ; Amélia Moreira

Building with 120 m × 16 m





**Bâtiments  
d'élevage  
de demain**









# Final considerations

- Radiant floor heating systems seems to be a promising technology
- Systematic scientific studies should be carried out to have experimental validation on:
  - The influence of the heating system on the broilers performance and meat quality
  - The energy consumption and costs
  - GEE emissions
  - ...



# Questions?

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