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# COMPARISON OF THE ENVIRONMENTAL IMPACTS OF THE GOOSE FATTY LIVER PRODUCED USING OVERFEEDING OR SPONTANEOUS FATTENING

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**Context :** It is possible to trigger a spontaneous hepatic steatosis in geese using a dietary restriction period followed by a maize distribution *ad libitum*, concomitant with a reduced photoperiod (Guy *et al.*, 2013). This system could provide answers to societal issues concerning overfeeding. But what are its environmental performances ?

**Objective :** Compare the potential environmental impacts related to the production of goose fatty liver in two production systems: the **Alternative System**, in which a fattened liver is obtained spontaneously without overfeeding and the **Conventional system**, in which fatty liver is produced using overfeeding.

## Studied systems

- The test was conducted in an experimental unit in France, and involved 280 male grey geese (*Anser anser*) divided into 2 groups according to two production systems: Alternative and Conventional described respectively by Guy *et al.* (2013) and Arroyo *et al.* (2012).
- Differences concerning rearing practices in both systems are described in Table 1.

Table 1 - Animal performance in both production systems

	Conventional	Alternative
FCR starting-rearing period	4.28	5.73
MCI Overfeeding / Fattening	17.55	54.37
Feed use (kg/geese) [period length, days]		
Starting period	9.3 [1-41d]	8.9 [1-41d]
Rearing period	19.0 [42-97d]	27.2 [42-140d]
Overfeeding/fattening period	14.3 [98-114d]	28.0 [141-224d]
Age at slaughter (days)	115	224
Weight at slaughter (g)	9 280	8 242
Liver weight (g)	815	515
Mortality (%) during starting + growing periods	5	7
during overfeeding / fattening period	1	4

FCR : food conversion rate ; MCI : Maize conversion rate into fatty liver

## LCA methodology

- **System studied:** from the production of egg until the slaughterhouse gate
- **Functional unit:** 1 kg of liver
- **Primary data:** experimental data and surveys
- **Secondary data:** INRA and Ecoinvent database
- **Calculation method:** CML2
- **Software:** SIMAPRO
- Seven potential environmental impacts estimated

## LCA results

Table 2 – Potential environmental impacts for production of 1 kg of liver in Conventional and Alternative systems

Potential environmental impact	Conventional	Alternative
Climate change (kg CO <sub>2</sub> -eq.)	53.02	140.55
Eutrophication potential (kg PO <sub>4</sub> -eq.)	0.37	0.84
Acidification potential (kg SO <sub>2</sub> -eq.)	0.75	1.74
Terrestrial toxicity (kg 1,4-DB-éq)	0.15	0.32
Cumulative energy demand (MJ-éq)	406.66	905.62
Water use (m <sup>3</sup> )	3.44	8.16
Land occupation (m <sup>2</sup> .an)	66.74	142.68

- The impacts are more important in the **Alternative system** than in the Conventional System from + 114% to + 165% depending on impacts, mainly due to a longer lifespan and a greater food consumption of animals for a lower liver production.
- The contributions of category of inputs or production steps to potential impacts are similar for both systems studied: Food and emissions from animal manure explain together more than 90% of impacts and the two production steps that contribute mostly to impacts are the rearing and the overfeeding / fattening periods (80 to 98% of impacts).

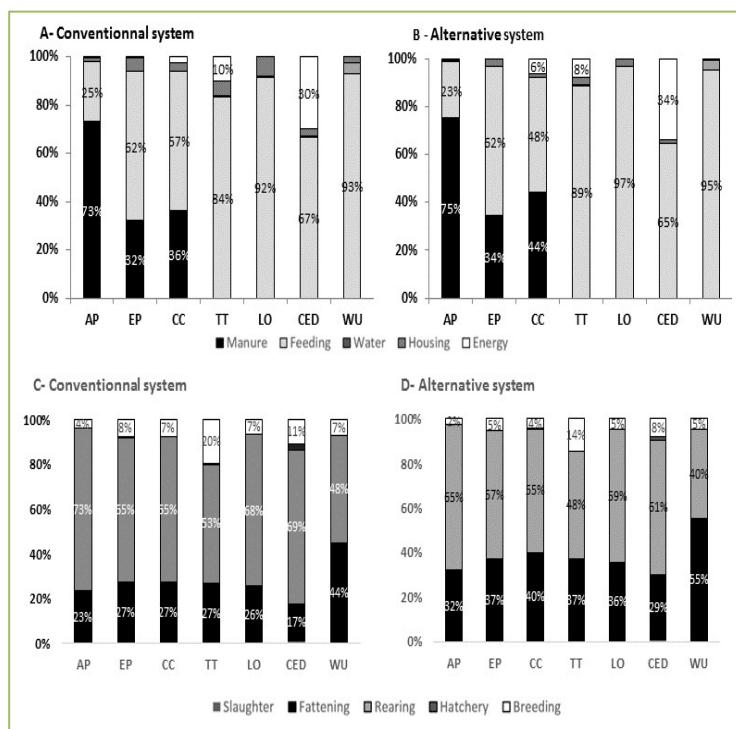


Figure 1 - Contribution (%) of different categories of inputs (A and B) and of the various stages of production (C and D) to the environmental impacts of production of 1 kg of fatty liver obtained using Conventional system (A and C) or 1 kg of fattened liver obtained using the Alternative system (B and D)  
 AP : Acidification Potential, PE : Eutrophication Potential, CC : Climate Change, TT : Terrestrial Toxicity, LO : Land Occupation, CED : Cumulative Energy Demand, WU : Water Use

**Conclusion :** The Alternative production system, which provides a fattened liver without overfeeding, can answer some societal demands concerning the insertion of the feeding-tube into the esophagus. However, in the present state of our knowledge, to produce 1 kg of liver, such a system generates greater potential environmental impacts than the Conventional system especially due to its low productivity and its longer rearing period.

