EGES® Bilan énergie et gaz à effet de serre

Energy & greenhouse gas assessment

First data on French tobaccos

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Overview - France - 2006

21% of the total amount of GreenHouse Gas (GHG) emissions, but :

- 3% of the CO_2
- 75% of the CH_4
- 90% of the N_2O

Global Warming Potential (GWP)

CO_2 = x 1

CH_4 = x 25

N_2O = x 298

IPCC 2007

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What about the tobacco crop and GHG ?

- Study
  - asked by France Tabac
  - carried out by ARVALIS in 2013

- Goals
  - estimate the **carbon footprint** on French tobacco farms (orders of magnitude)
  - identify hotspots and improve them

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Method EGES®
energy & greenhouse gas assessment

- developed by

ARVALIS Institut du végétal — Terres Inovia l'agronomie en mouvement — Institut Technique de la Betterave ITB

- based on **life cycle analysis** method

  balance inputs / outputs

  - on the crop
  - on the whole crop rotation

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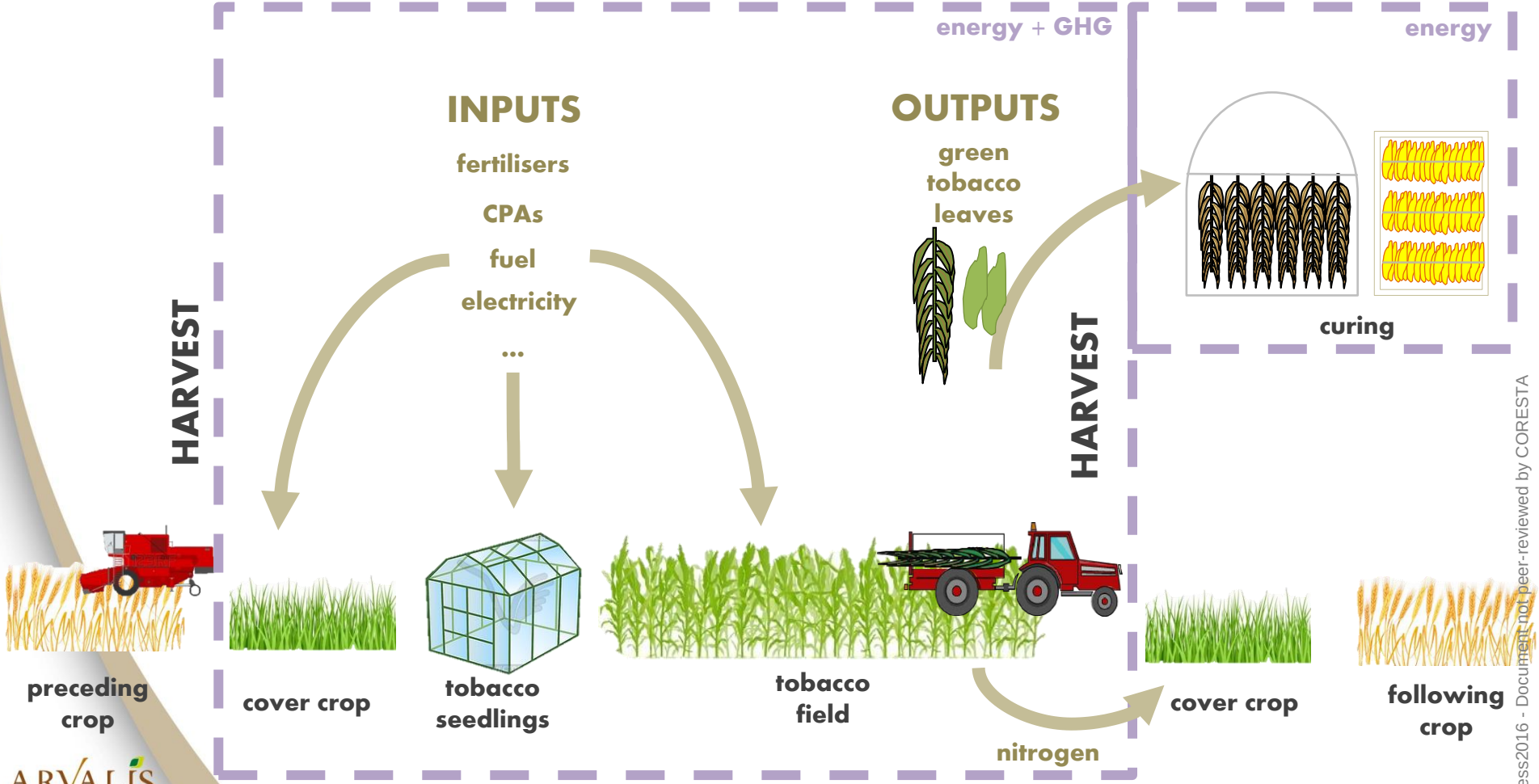
Method EGES

Example applied to the 2013 tobacco assessment

assessment perimeter



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Method EGES
energy & greenhouse gas assessment

EGES perimeter :

	Raw material	Manufacturing process	Utilisation
Plastic films	✓	✓	
Styrofoam trays	✓	✓	
Fertilizers	✓	✓	fuel
Chemicals	✓	✓	fuel
Engines	✗	✗	fuel
Curing barns / bulks	✗	✗	gas
Irrigation	✗	✗	electricity
…			

soil carbon storage is not accounted

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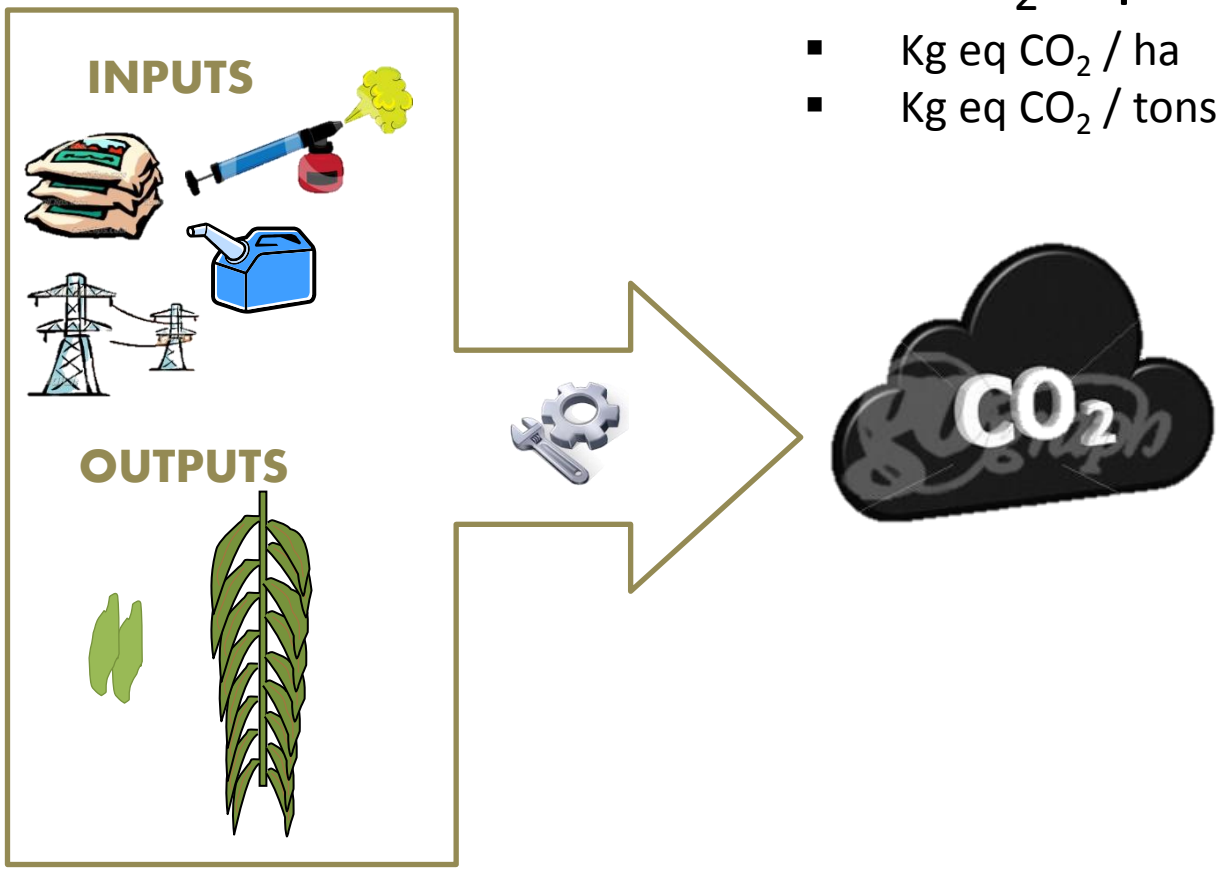
Method EGES
energy & greenhouse gas assessment

- International & standardised **databases**

⇒ tons CO_2 equivalent

- Kg eq CO_2 / ha
- Kg eq CO_2 / tons dry matter



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Crop operations

	Virginia flue-cured	Burley air-cured
cover crop	**Ray grass** *chemical destruction*	**Ray grass** *chemical destruction*
seedlings	**Float bed** *Plastics, polystyrene trays included* *Electricity, pesticides, fertilizers negligible*	**Float bed** *Plastics, polystyrene trays included* *Electricity, pesticides, fertilizers negligible*
soil management	Tillage Rotative row Tobacco planting machine weeder	Tillage Rotative row Tobacco planting machine weeder
fertilizers	chemical fertilizers **100 $N0_3$ units**	cattle manure + chemical fertilizers **285 $N0_3$ units**
CPAs	2 insecticides 1 herbicide 4,5 fungicides 3 sucker inhibitors	2 insecticides 1 herbicide 4,5 fungicides 1,5 sucker inhibitors

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Crop operations

	Virginia flue-cured	Burley air-cured
irrigation	2500 m^3 Mobile gun	2000 m^3 Mobile gun
harvest	**4 harvests** with a harvesting machine *(2 rows)*	1 harvest with a **stalk harvester** *(KIRPY)*
crop residues	Stalks **left on the field**	Stalks **exported**
curing process	**Flue curing** *500 g natural gas / kg dried tobacco*	**Air curing** *No heating, no ventilation*
yield	**2 500 kg / ha** *final RH = 13%*	**2 750kg / ha** *final RH = 19%*

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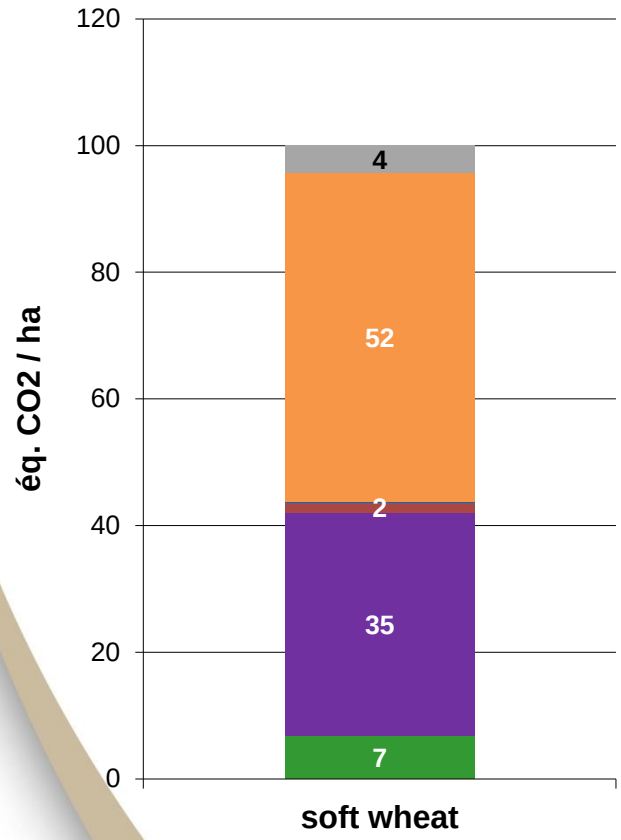
The soft wheat reference : crop operation overview

reference 100



- harvest → fuel
- N2O soil emission → natural process of demineralization in the soil
- irrigation → electricity
- CPAs → extraction of raw materials, manufacturing process, transport, fuel for field treatments …
- fertilizers → extraction of raw materials, manufacturing process, transport, fuel for field treatments …
- cover crop & seedlings → fuel and inputs for cover crop management

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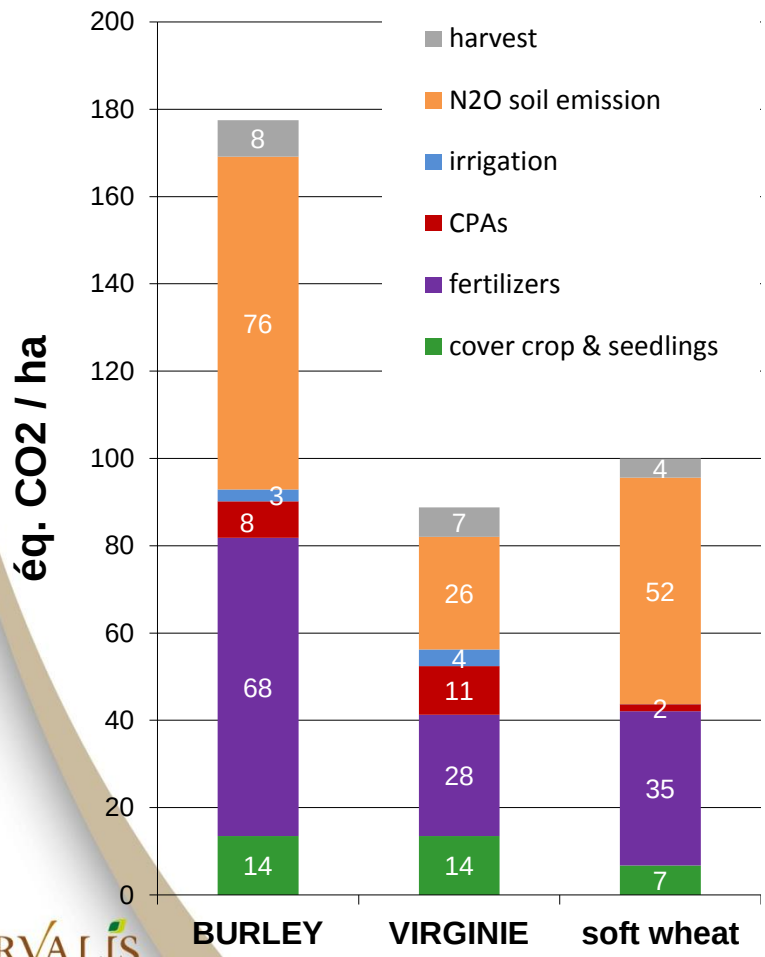
The tobacco main results : crop operation overview / **hectare**



Compared to soft wheat :

- Virginia has the same carbon footprint
- Burley's carbon footprint is **twice more important** than the Virginia and the wheat ones

Burley's footprint is due to

- direct impact of the amount of fertilizers
- impact of fertilizers on N_2O emissions

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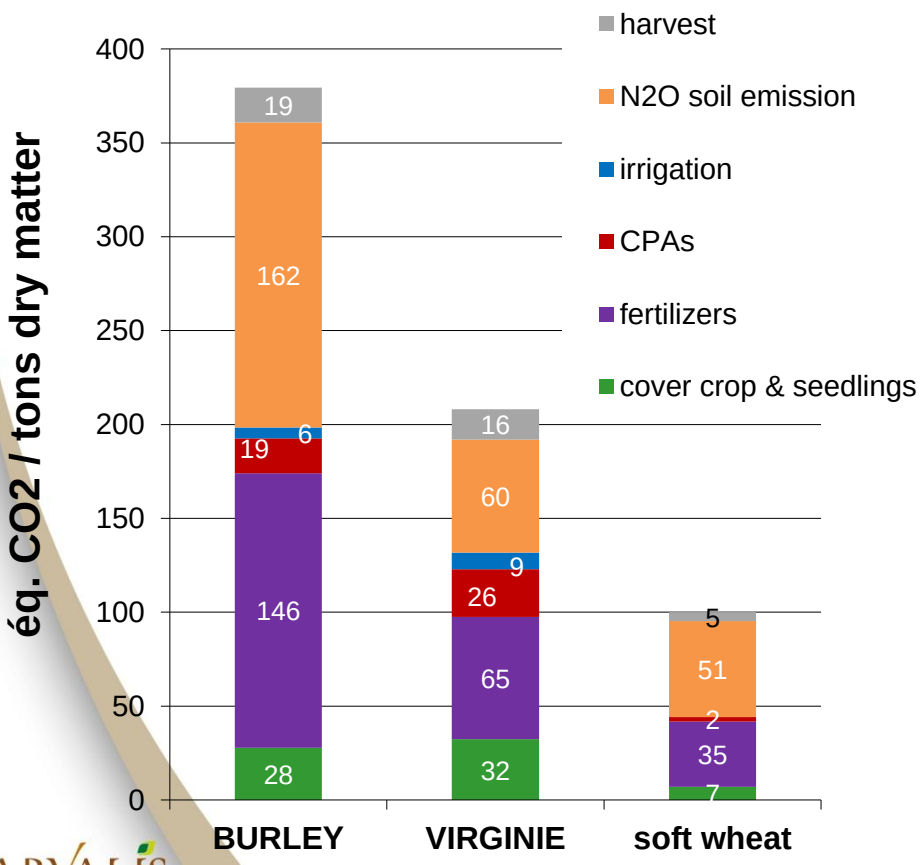
The tobacco main results : crop operation overview / **tons dry matter**



Compared to soft wheat :

- Virginia's footprint is **twice more important** than the has the soft wheat's one
- Burley's footprint is **3,5 times higher**

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What about the curing process ?

Air curing :

⇒ Curing barn (greenhouse) : not taken into account

⇒ Blowing, heating : negligible (not used every year)

Flue curing :

⇒ Bulk : raw material not taken into account

⇒ **Gas : 500 g / kg cured tobacco**

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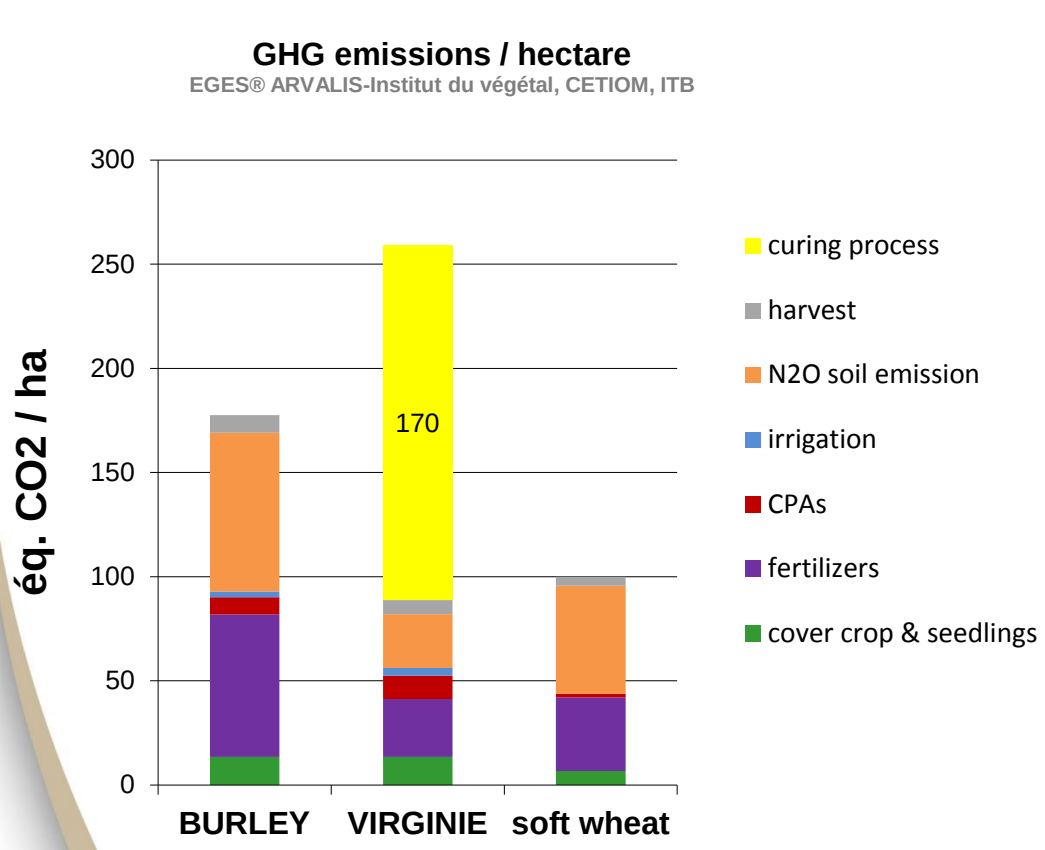
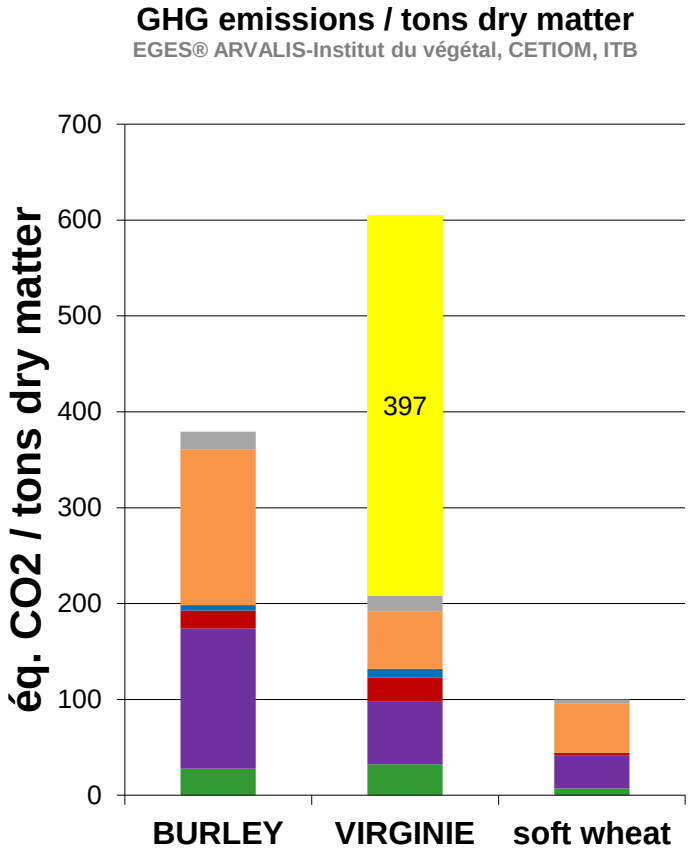
What about the curing process ?





The flue curing's footprint is higher than the field's one

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Conclusion and further issues

Flue-curing

- Improve equipments and efficiency
- Substitute fossil energy / alternative ?

FCV

Field

- Nitrogen fertilization & volatile N_2O consequences

Burley

FCV

⇒ Split fertilization with speed assimilation NO3 forms ?

⇒ Fertigation ?

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Thank you for your attention

For more details or a complete study :

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