# Clarifying the challenges of agricultural sustainability What role for national accounts?

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# Clarifying the challenges of agricultural sustainability
# What role for national accounts?

1. **Context and motivations**
2. **Inclusive GDP (with externalities) : theory and methodology**
3. **Application to agriculture**
   a. **Agricultural Environmental Value Added with Carbon Emissions**
   b. **Agricultural GHG Footprint**
   c. **Next steps : disaggregated food products, other ecosystem services**
4. **Conclusion and recommendations**

# 1. Context and motivations

# Context: controversies about regulations promoting better ecological practices

Michel Barnier, Prime Minister of France, has heard farmers' call to simplify the standards governing production. “These farmers, who are affected by health crises and poor harvests, deserve to be encouraged. They're fed up. Fed up with constraints, rules and controls. So, we're going to take a break from standards,” he promised on France 2's ‘L'Evénement’ program. A deconcentrated power to prefects will be put in place “to relax rules” such as those on land-spreading, for example.

He also announced that his government would “resume without delay” the draft law on agricultural sovereignty. It places agriculture at the top of the list of major public interests, sets up a one-stop shop for the installation of new farmers, and facilitates the construction of livestock buildings or water retention projects.

From the press (October 4, 2024)

# Need to highlight the controversies about agricultural standards…

Multiple questions:

-on the legitimacy of environmental constraints

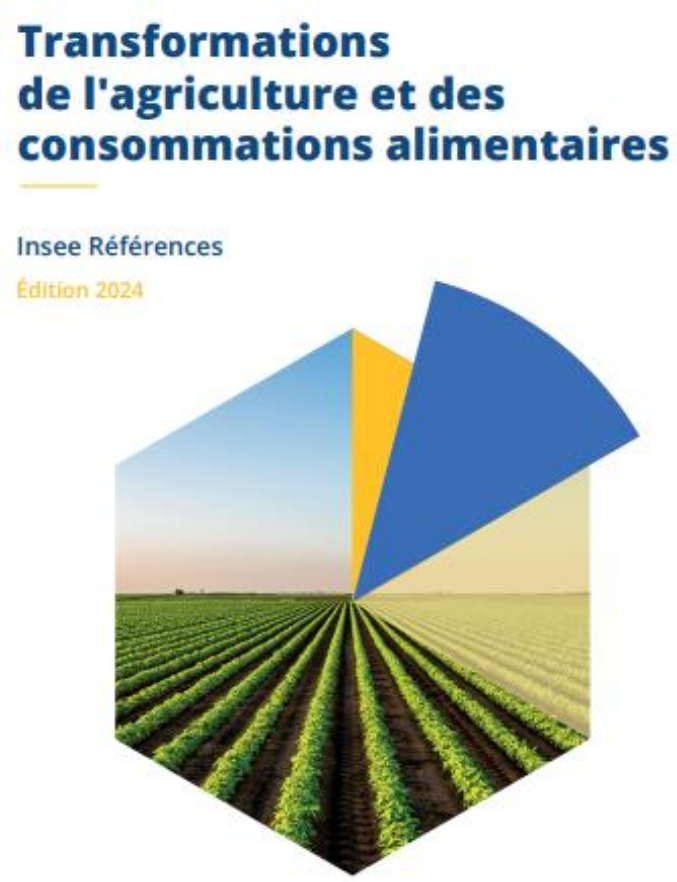
-on the type of promoted solutions (agro-ecology)

-on the choice of instruments

-about the lack of accompanying measures to deal with distributive and competitive issues

…but, primarily, need of accurate estimates of the genuine value added created by agriculture, neither ignoring its environmental pressures nor its efforts to reduce them.

# ...by going beyond the juxtaposition of GDP measures and physical environmental accounts



# Agriculture accounts

| Principaux postes du compte de l'agriculture en 2023 | | Valeur 2023 (en milliards d'euros) | Évolution 2023/2022 (en %) | | |
|---|---|---|---|---|---|
| | | | Volume | Prix | Valeur |
| **Production hors subventions** | **(a)** | **95,5** | **2,9** | **-3,7** | **-0,8** |
| **Produits végétaux** | | **56,6** | **6,1** | **-10,1** | **-4,6** |
| Céréales | | 13,0 | 5,8 | -28,4 | -24,2 |
| Oléagineux et protéagineux | | 3,4 | 4,2 | -24,8 | -21,6 |
| Autres plantes industrielles[1] | | 2,1 | -0,8 | 8,5 | 7,6 |
| Fourrages | | 7,1 | 19,7 | -7,2 | 11,0 |
| Légumes, pommes de terre, plantes et fleurs | | 12,0 | 6,2 | 1,6 | 7,9 |
| Fruits | | 3,7 | 0,2 | 7,5 | 7,7 |
| Vins | | 15,3 | 3,3 | -1,1 | 2,2 |
| **Produits animaux** | | **33,2** | **-2,5** | **7,9** | **5,2** |
| Bétail (bovins, porcins, ovins, caprins, équidés) | | 13,9 | -5,1 | 9,7 | 4,1 |
| Volailles et œufs | | 6,3 | 0,7 | 5,8 | 6,5 |
| Lait et autres produits de l'élevage | | 13,1 | -1,2 | 7,1 | 5,8 |
| **Services[2]** | | **5,7** | **0,0** | **5,4** | **5,4** |
| **Subventions sur les produits** | **(b)** | **1,1** | **-2,9** | **2,6** | **-0,4** |
| **Production au prix de base** | **(c) = (a) + (b)** | **96,6** | **2,9** | **-3,6** | **-0,8** |
| **Consommations intermédiaires** | **(d)** | **57,2** | **-0,9** | **3,5** | **2,5** |
| dont achats | | 47,7 | -3,6 | 5,7 | 1,8 |
| **Valeur ajoutée brute** | **(e) = (c) - (d)** | **39,4** | **7,9** | **-12,3** | **-5,3** |
| Subventions d'exploitation | | 8,4 | | | 1,8 |
| Autres impôts sur la production | | 1,9 | | | 5,4 |
| dont impôts fonciers | | 1,1 | | | 11,2 |
| **Valeur ajoutée brute au coût des facteurs** | | **45,9** | | | **-4,5** |
| Emploi agricole[3] | | | -0,5 | | |
| **Valeur ajoutée brute au coût des facteurs par actif** | | | | | **-4,1** |
| Prix du produit intérieur brut | | | | 5,4 | |
| **Valeur ajoutée brute au coût des facteurs par actif en termes réels** | | | | | **-9,0** |

1 Betteraves industrielles, tabac, lin textile, houblon, canne à sucre, etc.

2 Production des entreprises de travaux agricoles, des coopératives d'utilisation de matériel agricole, services entre agriculteurs, agritourisme, etc.

3 Mesuré en unités de travail annuel (équivalents temps plein de l'agriculture).

**Lecture :** La production de la branche agricole hors subventions s'élève à 95,5 milliards d'euros. La valeur ajouté brute recule de 5,3 % en 2023.

**Source :** Insee, compte prévisionnel de l'agriculture arrêté en novembre 2023.

# 2. Inclusive GDP (with externalities)
# Theory and methodology

# Objective

Include the various externalities in the national accounts, and in particular in GDP, the key measure of the wealth created:

- In other words, include any indirect effect of a production or consumption activity on a utility function, a consumption unit or a production unit.
- An indirect effect means: firstly, that the effect is created by an economic agent other than the one affected; and secondly, that it is not compensated for by a market transaction between the polluter and the polluted.

# Muller, Mendelsohn and Nordhaus (AER, 2011)

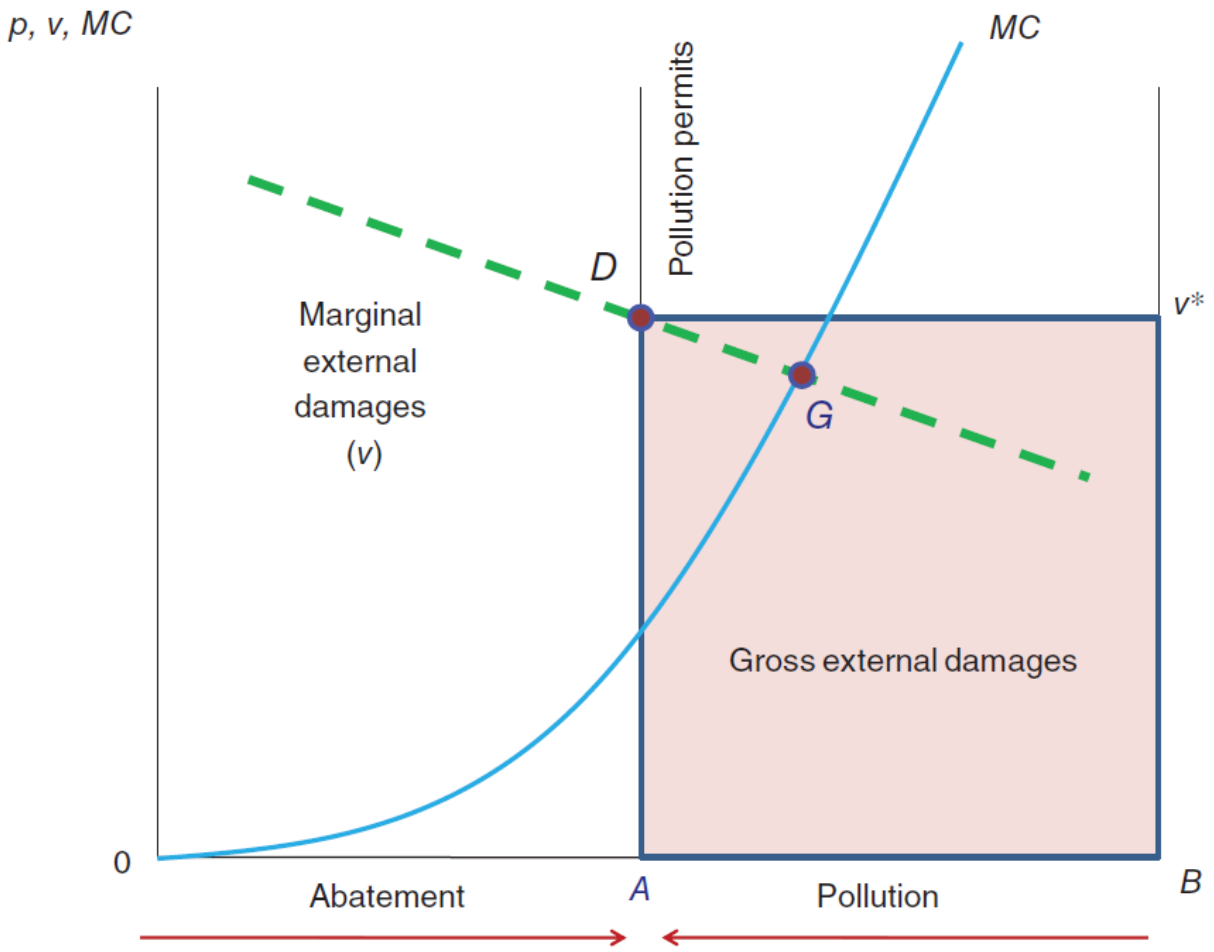
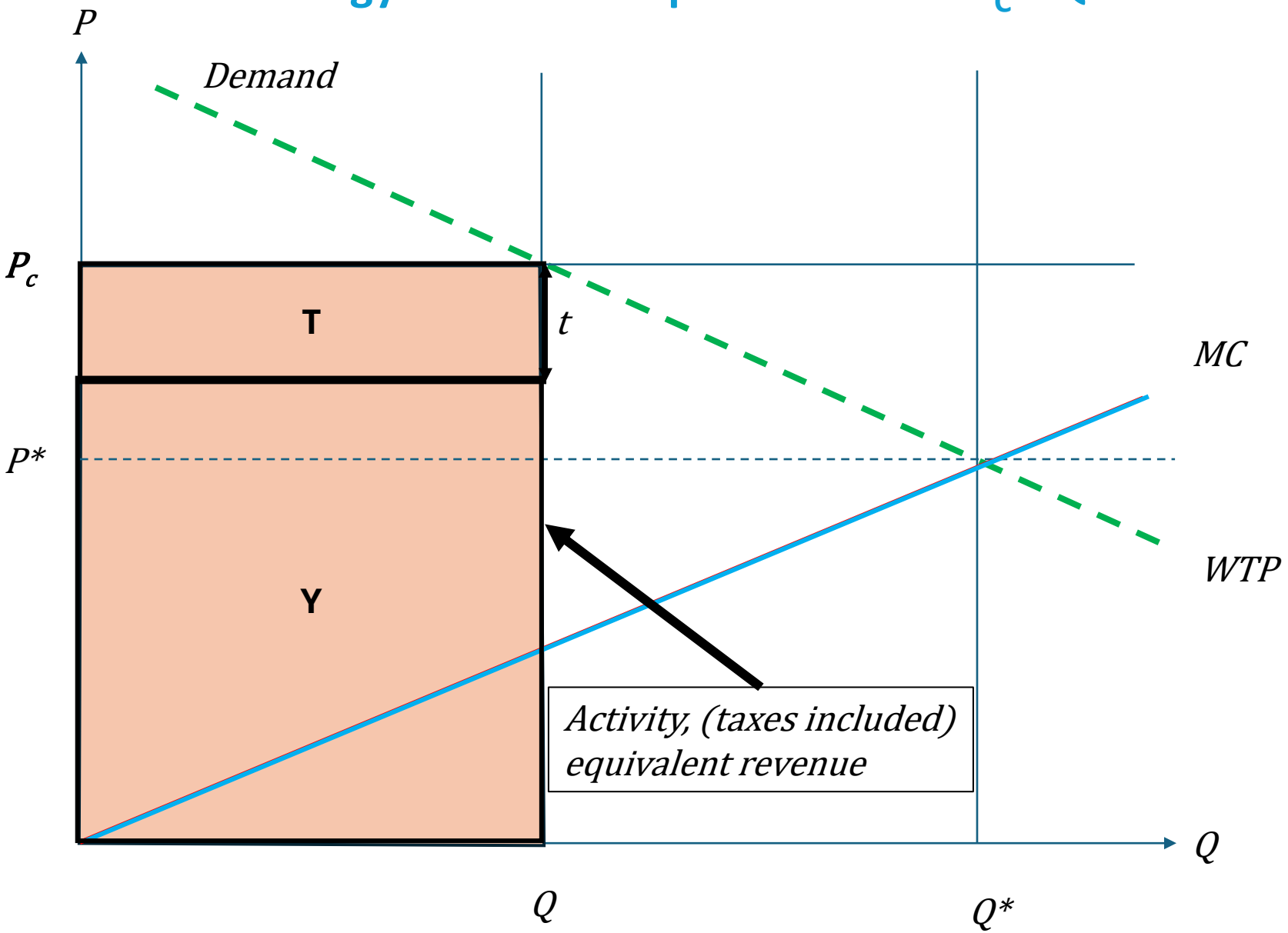



FIGURE 2. DAMAGES FROM POLLUTION

Inclusive VA of a pollutant product $= Usual\ VA - GED$

# Analogy with market products: $\delta W = P_C . \delta Q$



# Adding the supply/use balances of pollutions and non-market services

Non-market product: bees (Q)
MB pollination for fruit producers: 2
MB landscape amenities: 1
→ V=3

## Services provided by Honey production (Q=10)

| $Y'_{Honey}$ Production of bees | M | T | $IU_{fruit\ prod.}$ Pollination service | FC Landscape amenities | X | I |
|---|---|---|---|---|---|---|
| 30 | | | 20 | 10 | | |

## Degradation due to pollution ($Q_{poll.}$=-5)

| $Y'_{Crops}$ (Use of Neonicotin.) | M | T | $IU_{fruit\ prod.}$ Pollination service | FC Landscape amenities | X | I |
|---|---|---|---|---|---|---|
| -15 | | | -10 | -5 | | |

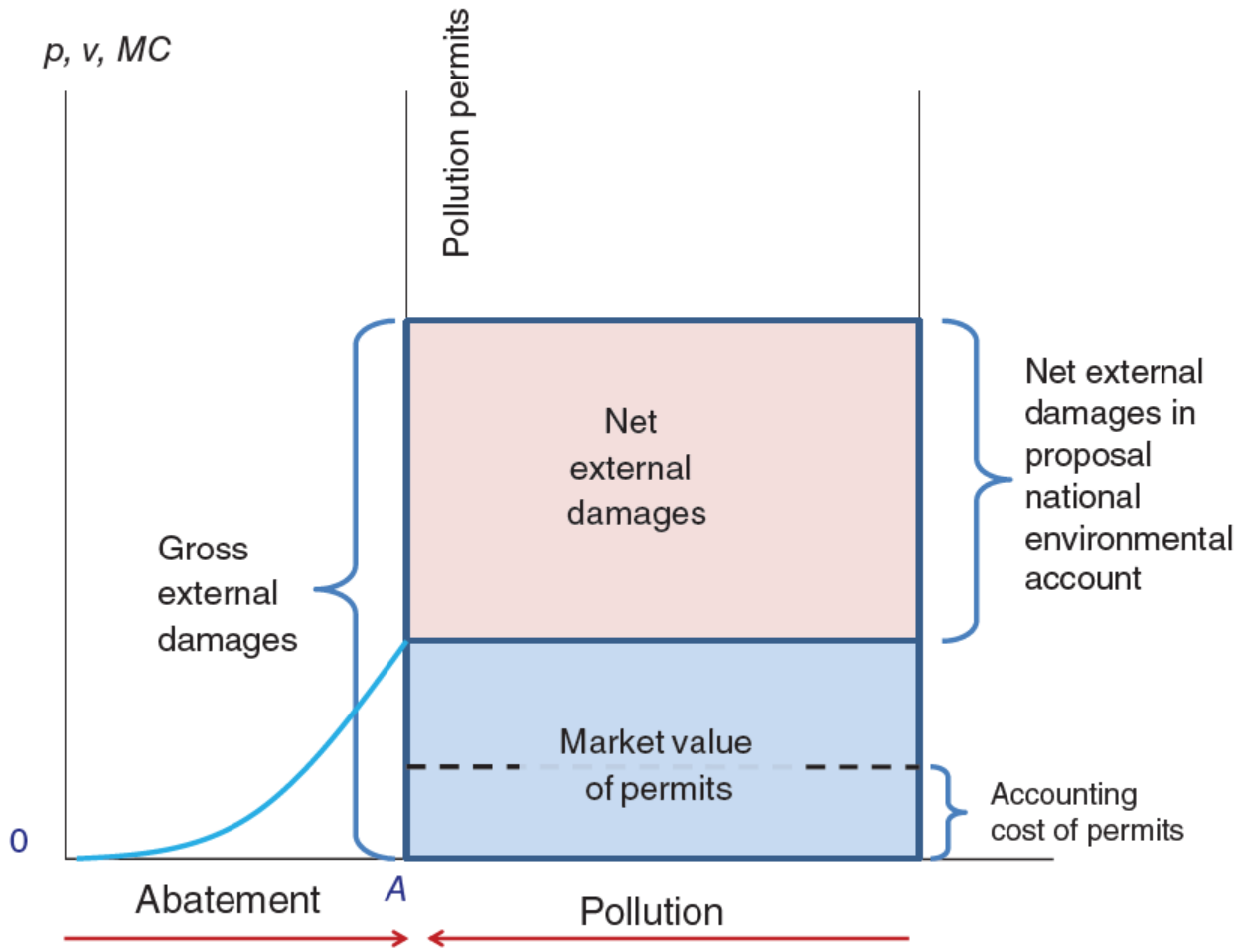
# From GED to GDP corr.

## VA corr. of the different production units

| Production units | Value of provided non-market services | Value of the associated intermediate consumptions | Correction of the VA of the production units |
|---|---|---|---|
| Honey | 30 | | +30 |
| Fruits | | (20-10) | -10 |
| Crops | -15 | | -15 |

## GDP corr.

| Approach | Impacts | Total: GDP corr. |
|---|---|---|
| Production | +30 (Honey); -10(Fruits); -15(Crops) | +5 |
| Expenditures | +10-5 (FC) | +5 |




$$VA_{i\,corr} = VA_i - NED_i \text{ with } NED_i = v.E_i - \tau_i E_i$$

$$GDP_{corr} = \sum VA_{i\,corr} + T - \tau E$$

# Integration of Carbon Emissions

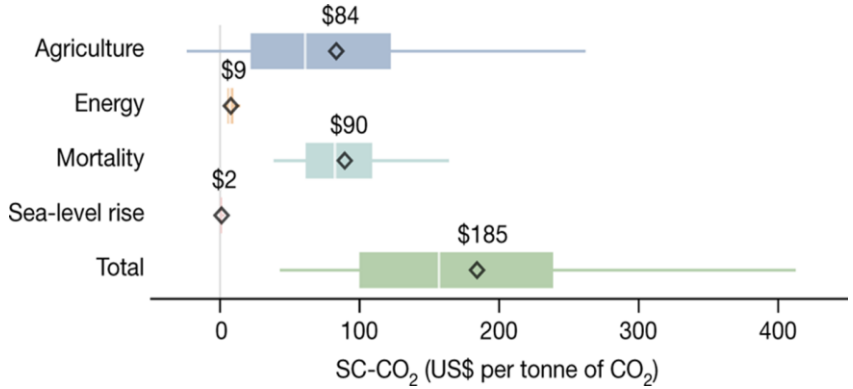
$$PIB_{corr} = PIB - SCC.E$$

$$GS = S - SCC.E = S - (s.E + s^*.E)$$

$$\dot{K_{atm}} = -E - E^* - CCF_{atm}$$

$$SCC = \partial V / \partial K_{atm}$$

***Valuation of climate emissions***: $\boldsymbol{s(E + E^*)}$ (Rennert *et al.*, 2022)




***From Emissions to Carbon Footprints***

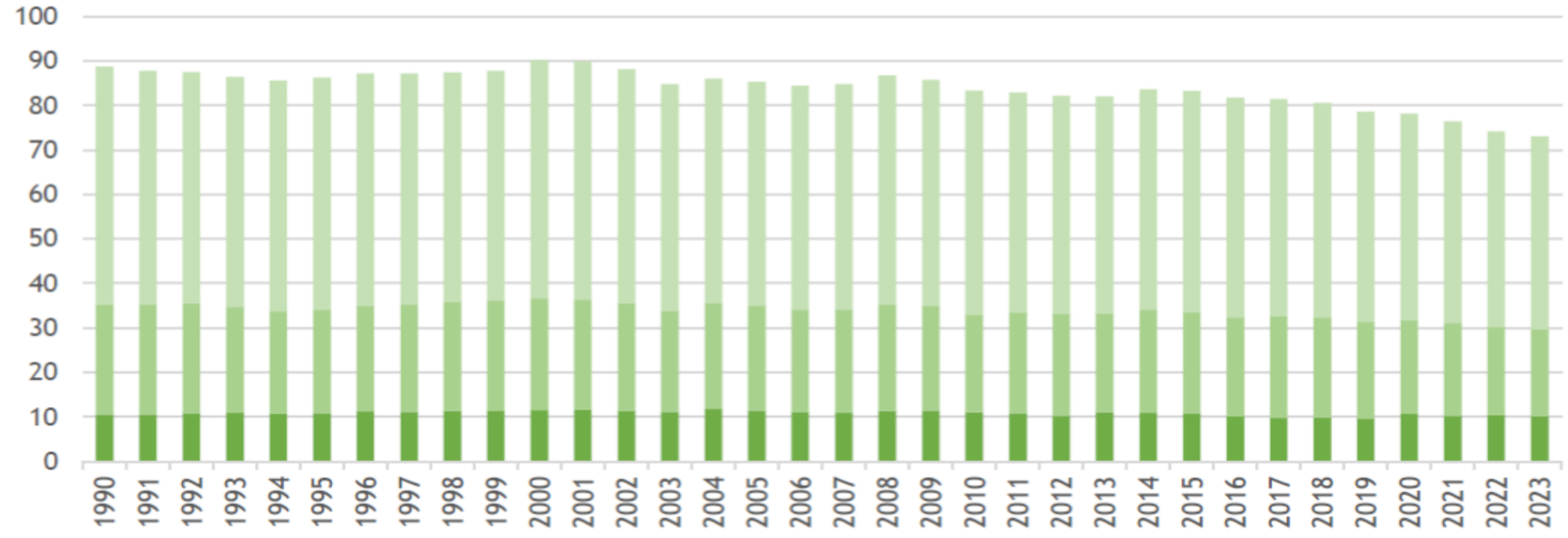
$$E = F_{CF} + F_I + F_X - F_M = F_{CF} + F_I + BCC$$

$$PIB_{corr} = PIB - SCC.E = (CF + I + X - M) - SCC.(F_{CF} + F_I + F_X - F_M)$$

# 3. Application to Agriculture

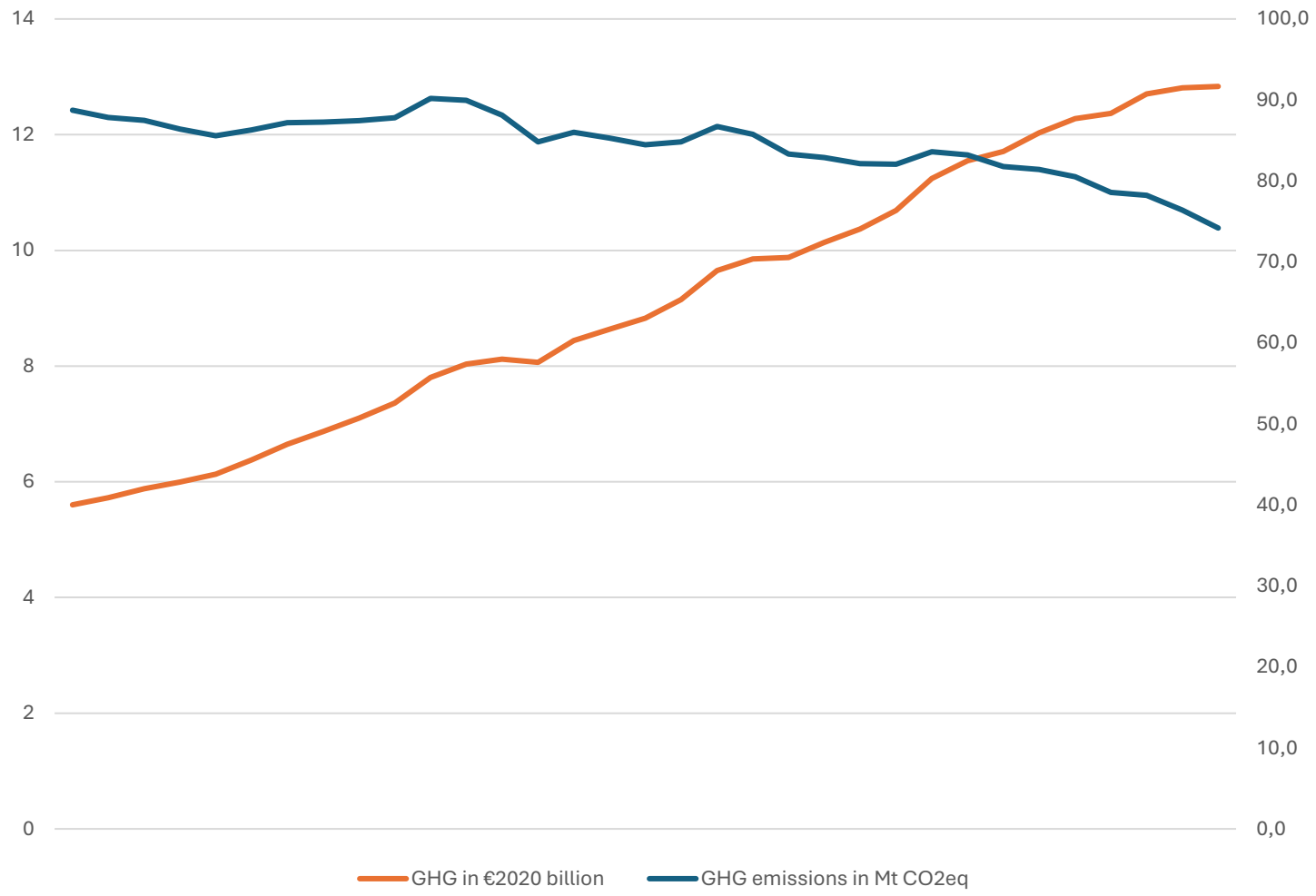
## 3.a Agricultural EVA with carbon emissions

# GHG emissions of agriculture/forestry in France



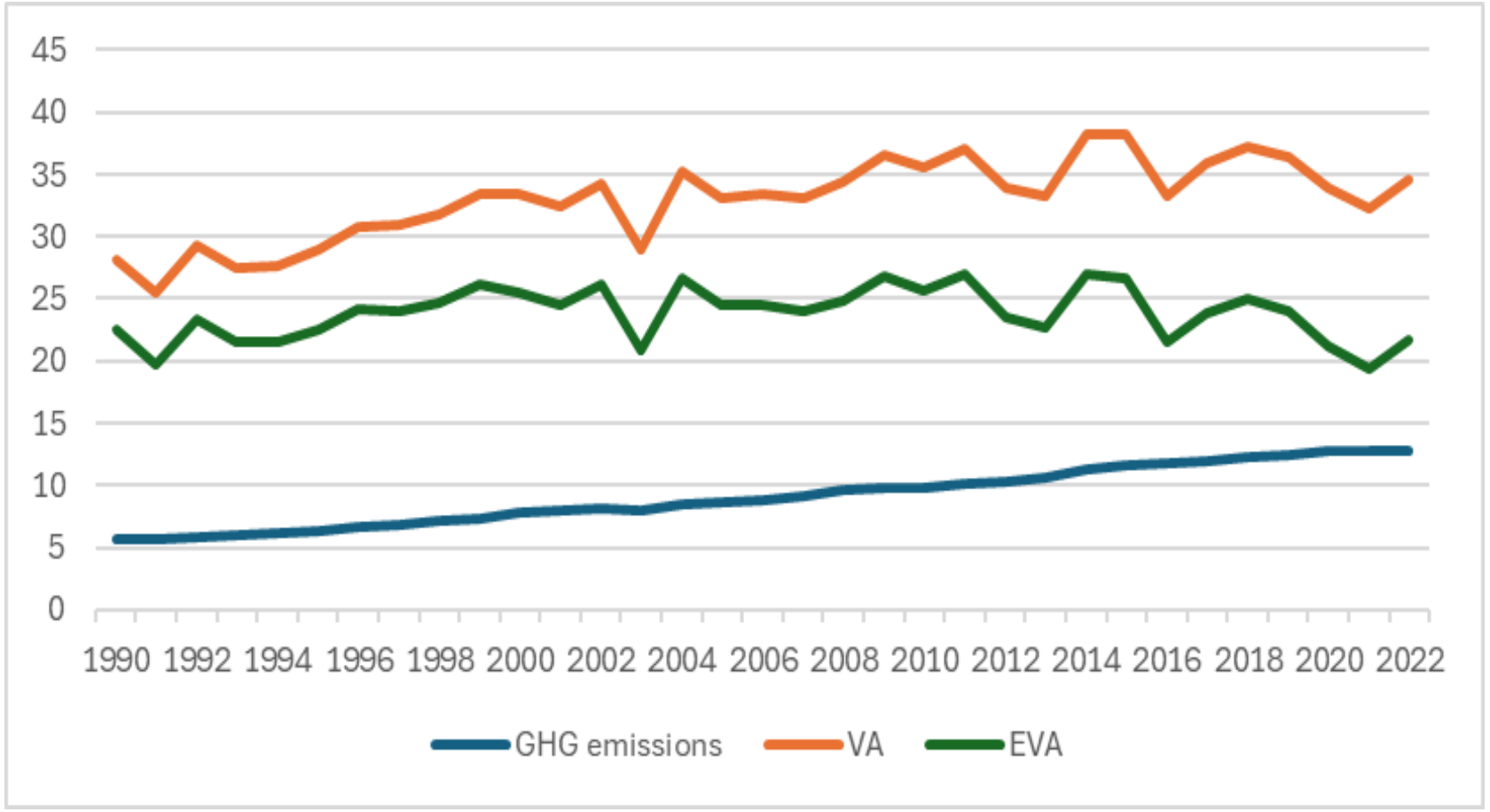

Source: CITEPA-Secten 2024

# From physical measures to GED




Sources: CITEPA-Secten 2024, authors' calculations

# EVA of agricultural (fishing and forestry) activities in France

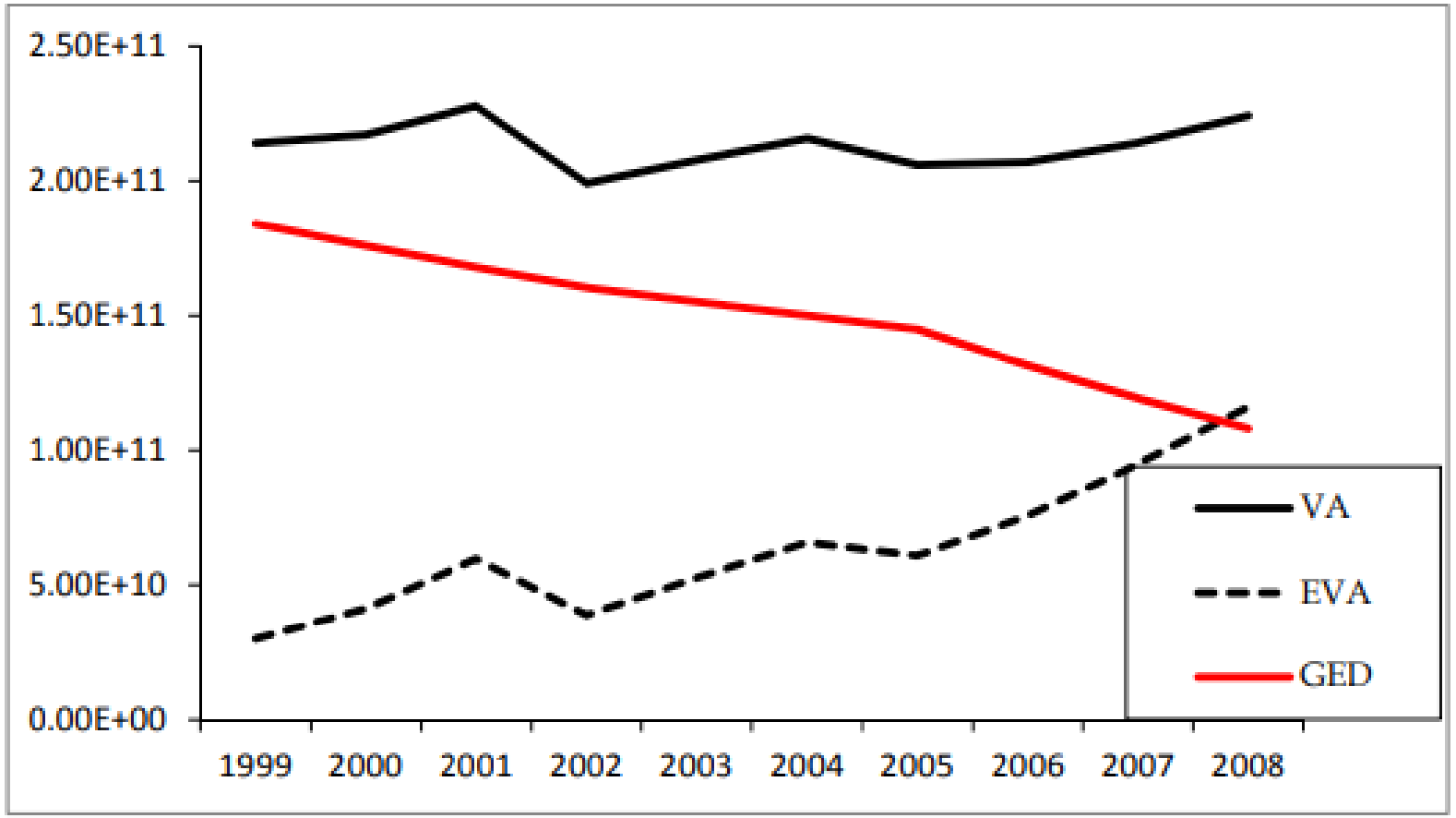



in € billion per year, 2020 prices

Sources: CITEPA-Secten 2024, National Accounts of France, authors' calculations

# Comparison with MMN results

Figure 3: VA, EVA and GED for the Utility Sector



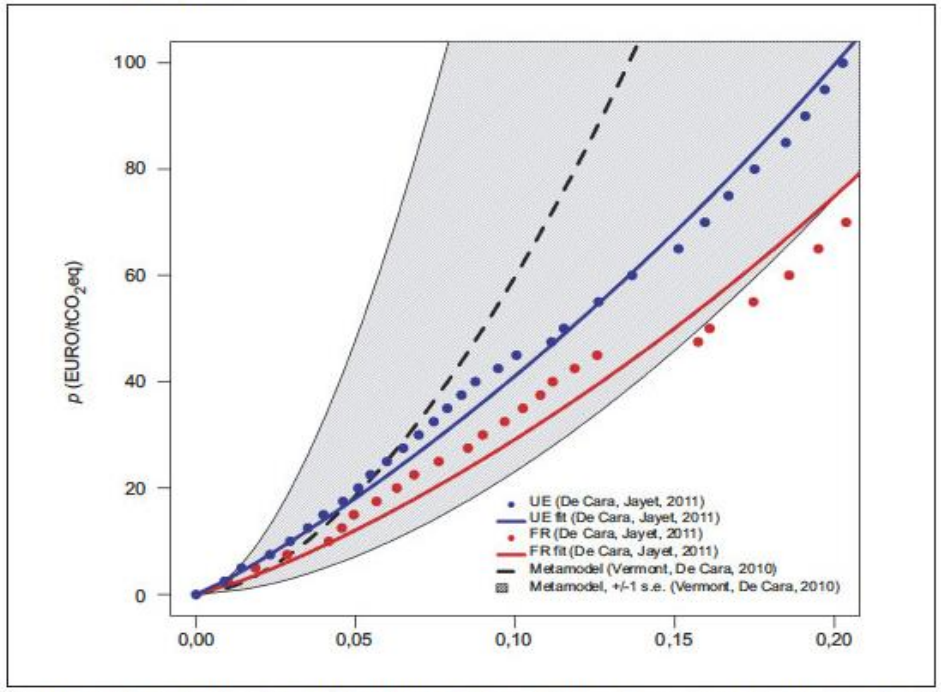

All values in real ($2005)

# Comments

1-Agriculture production is highly intensive in GHG

2-This activity shows limited apparent productivity gains and, also, limited reductions of GHG emissions, despite documented potential of reductions.

Figure 3 - **Courbes de coût marginal d'atténuation (axe des ordonnées) en fonction du taux de réduction des émissions agricoles de méthane et de protoxyde d'azote par rapport aux niveaux de 2005 (axe des abscisses) pour la France (en rouge) et pour l'Union européenne (en bleu) obtenues par De Cara et Jayet (2011)**




Note : les points représentent les résultats en termes de taux d'abattement pour chaque niveau de prix simulé. Les courbes résultent d'un ajustement non-linéaire des résultats des simulations. La courbe en pointillés (noir) correspond au méta-modèle estimé par Vermont et De Cara (2010) pour l'Union européenne à l'horizon 2020 en prenant toutes les variables explicatives à leur valeur moyenne (sauf UE = 1 et BLYR = 2020). L'ensemble grisé correspond à +/– 1 écart-type autour de cette courbe.

# Questions that should be adressed

- Contributions of the different factors determining the evolution of yields (especially Climate change)

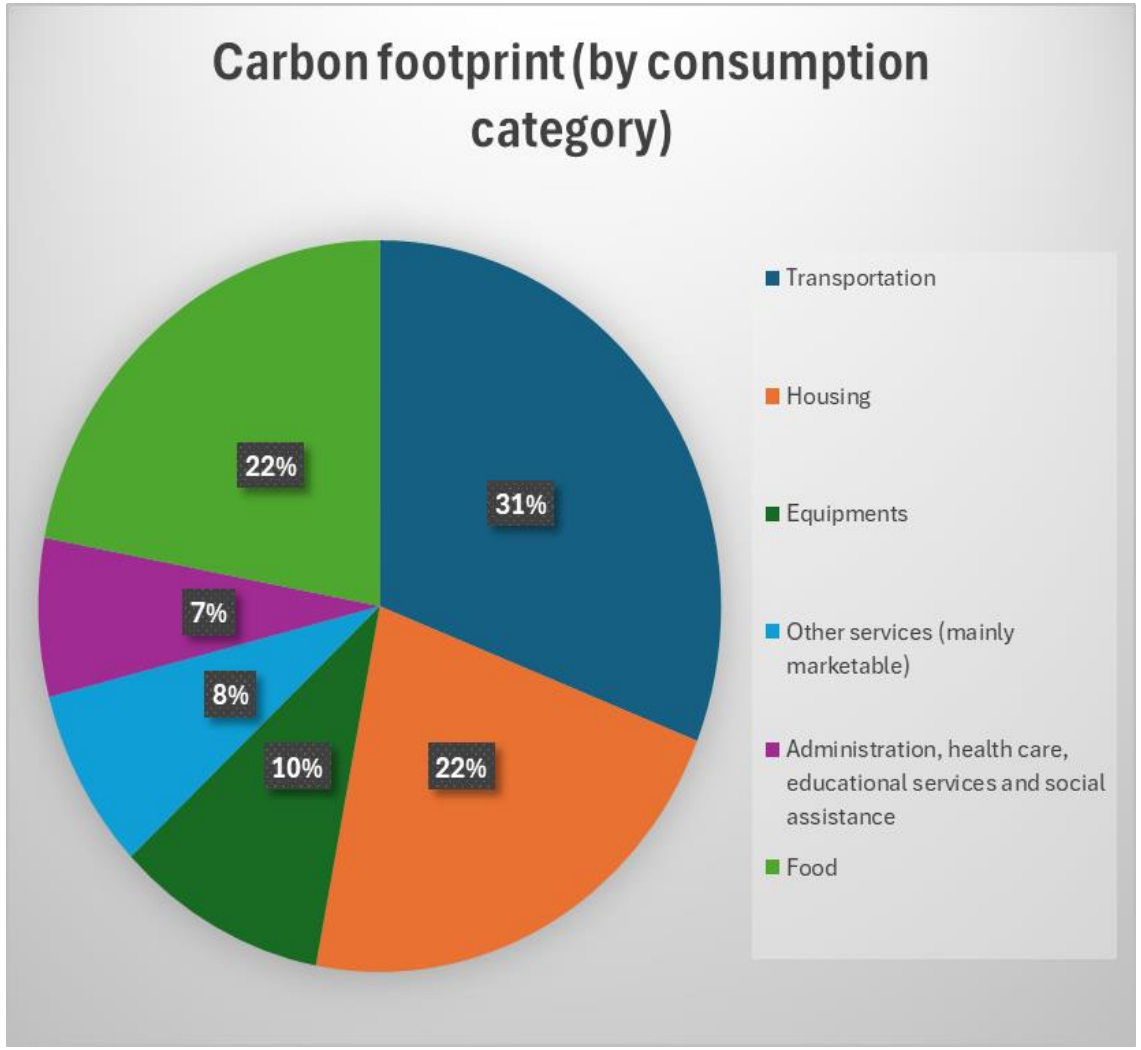
- Evaluation of the ambition and the efficacity of environmental regulations in this sector ?

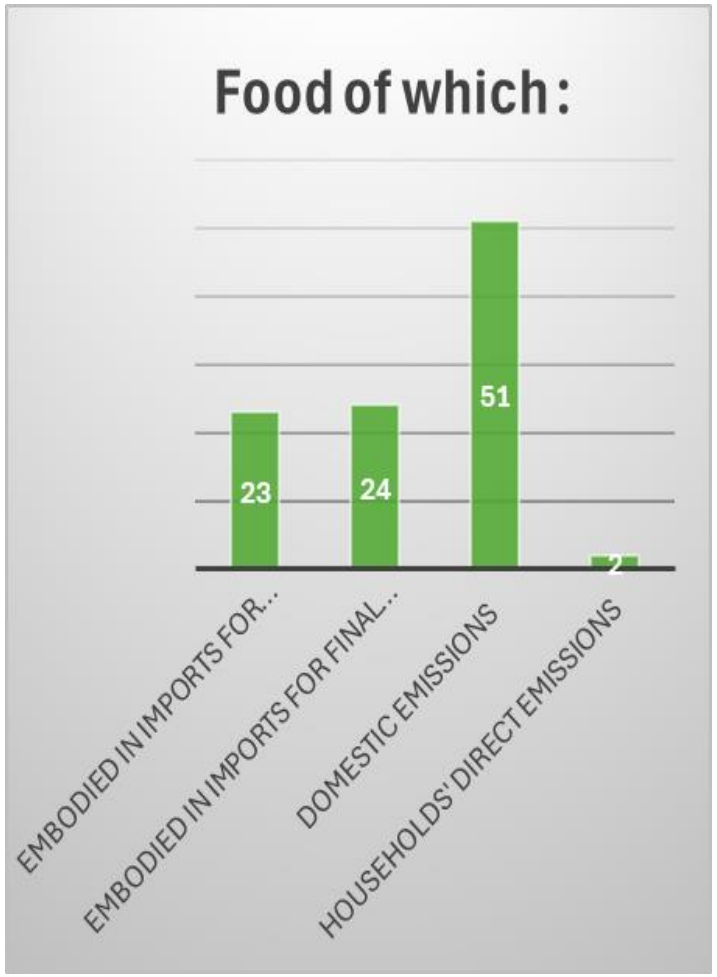
- Analysis of the obstacles against enhanced efforts (Financing constraints, Trade)

# 3. Application to agriculture

## 3.b Agricultural GHG Footprint

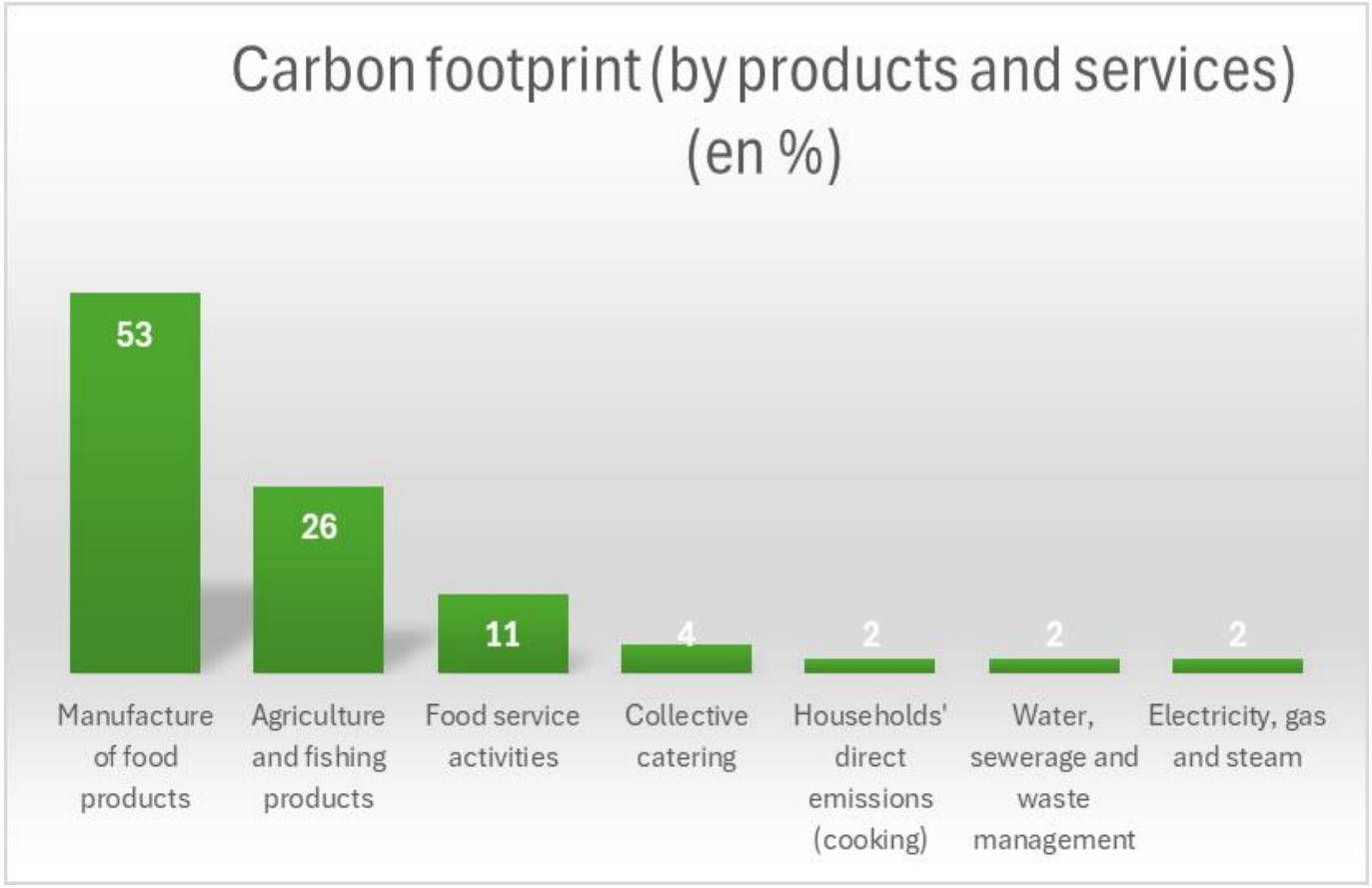
# Carbon footprint of food consumption in France (2018)




Sources: SDES, Citepa, Insee, Eurostat, IEA, FAO, Ademe, Douanes, Ademe, SDES' s calculations.

# Carbon footprint of food consumption (2018)
# Contributions




Sources: SDES, Citepa, Insee, Eurostat, IEA, FAO, Ademe, Douanes, Ademe, SDES' s calculations.

# Risk of leakage (Fournier-Gabela and Fournier, Climate Change, 2023)

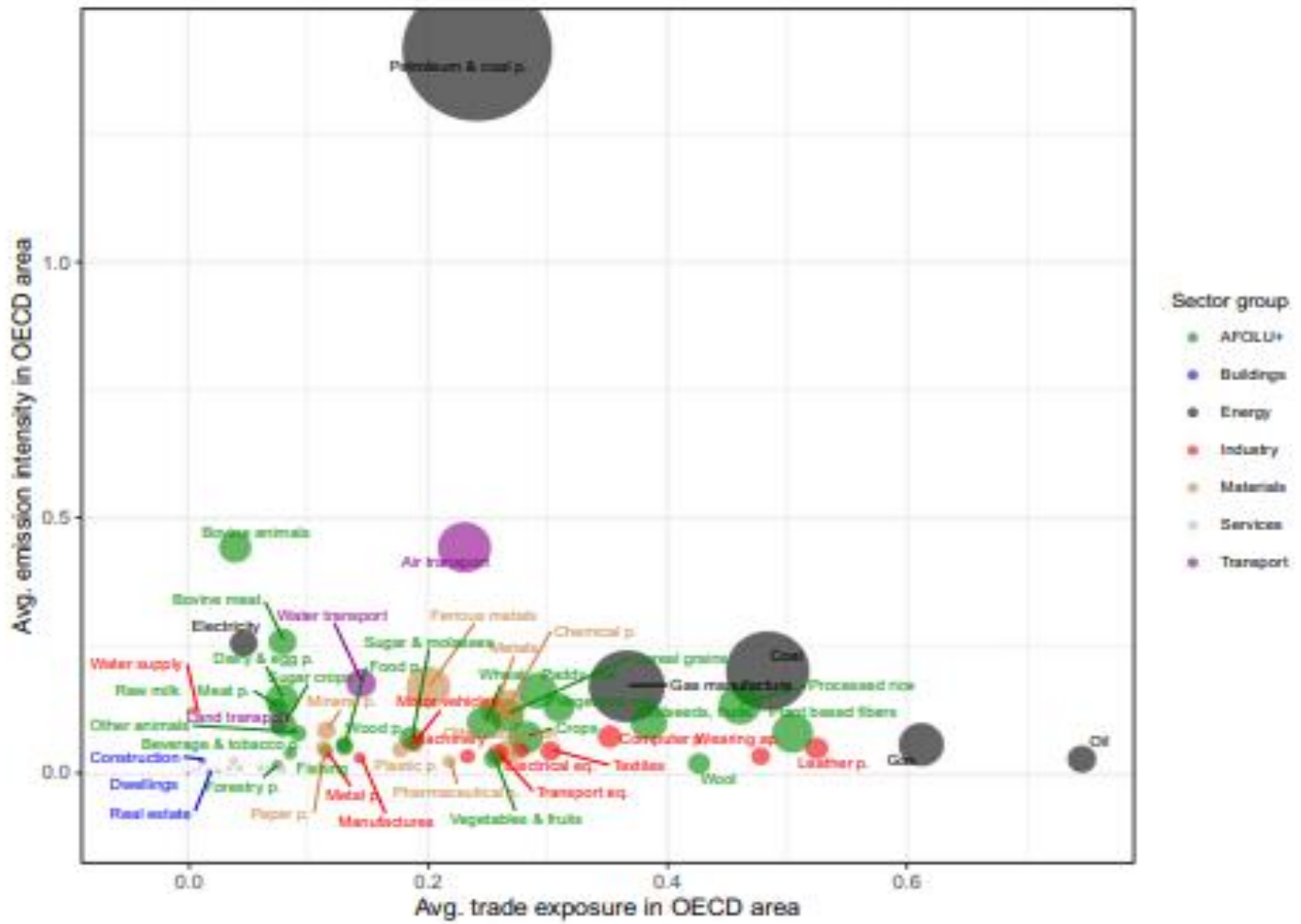



**Fig. 3** Emission intensity vs. trade exposure under the "total" climate policy scenario, OECD country averages by sector. Notes: The circles' area is proportional to the cross-country variation (standard deviation) of the EITE metric in the OECD area. To improve visualization, we omit service sector names

| | F&V +5% | Na -5% | SFA -5% | Added sugar -5% | eq. CO2 -5% | Red meat -5% | All meats -5% |
|---|---|---|---|---|---|---|---|
| Consumers cost (M€) | 466 | 128 | 288 | 152 | 961 | 10 | 76 |
| % food budget | 0.64% | 0.17% | 0.37% | 0.20% | 1.25% | 0.01% | 0.10% |
| DA | 2 507 | 2 852 | 2 140 | 941 | 2 331 | 230 | 245 |
| (95% confidence interval) | (2174, 2844) | (2424, 3293) | (1761, 2514) | (802, 1085) | (1959, 2695) | (192, 267) | (183, 308) |
| % DA for DIETRON diseases | 3.8% | 4.3% | 3.2% | 1.4% | 3.5% | 0.3% | 0.4% |
| Consumers cost per DA (K€) | 186 | 45 | 135 | 162 | 412 | 45 | 311 |
| (95% confidence interval) | (164, 214) | (39, 53) | (115, 164) | (140, 190) | (357, 491) | (39, 54) | (248, 418) |
| Δ eq. CO2 (Kt) | -1 574 | -460 | 259 | 336 | -2 985 | -274 | -513 |
| (95% confidence interval) | (-1861, -1310) | (-600, -324) | (71, 469) | (163, 537) | (-3857, -2303) | (-396, -181) | (-747, -322) |
| Consumers cost to decrease eq. CO2 (€/t) | 296 | 279 | | | 322 | 38 | 149 |
| (95% confidence interval) | (250, 356) | (213, 395) | | | (249, 417) | (26, 57) | (102, 237) |
| Δ eq. SO2 (Kt) | -27 | -4 | -3 | 4 | -67 | -7 | -17 |
| (95% confidence interval) | (-32, -23) | (-6, -2) | (-6, 0) | (1, 8) | (-85, -53) | (-10, -5) | (-22, -14) |
| Consumers cost to decrease eq. SO2 (€/t) | 17100 | 32417 | 104985 | | 14347 | 1442 | 4376 |
| (95% confidence interval) | (14474, 20158) | (22288, 61380) | (51939, -670485) | | (11269, 18135) | (1063, 1976) | (3433, 5581) |

**Table 4:** Comparison of the constraints in terms of consumers cost, effects on health and the environment, and partial efficiency

F&V: Fruit and Vegetables, Na: Salt, SFA: Saturate Fatty Acid.
DA: Death Avoided.

from Irz *et al.*, "Welfare and sustainability effects of dietary recommendations", Ecological Economics, vol. 130, October 2016, pp. 139–155.

# This suggests that…

- The decarbonization of agricultural processes and the transformation of the products structure of food consumption are more complementary than substitutive policies

- Absolute necessity of instruments to limit carbon leakage

- Need also to clarify potential trade-offs between GHG and health impacts of food products

# 3. Application to Agriculture

## 3.c Next steps: disaggregated products, other ecosystem services

# Subsidies to pollutions?

"Over 80% of the European Union's Common Agricultural Policy supports emissions-intensive animal products"

From Kortleve *et al.* (2024), Nature Food

# Firstly, carbon storage…

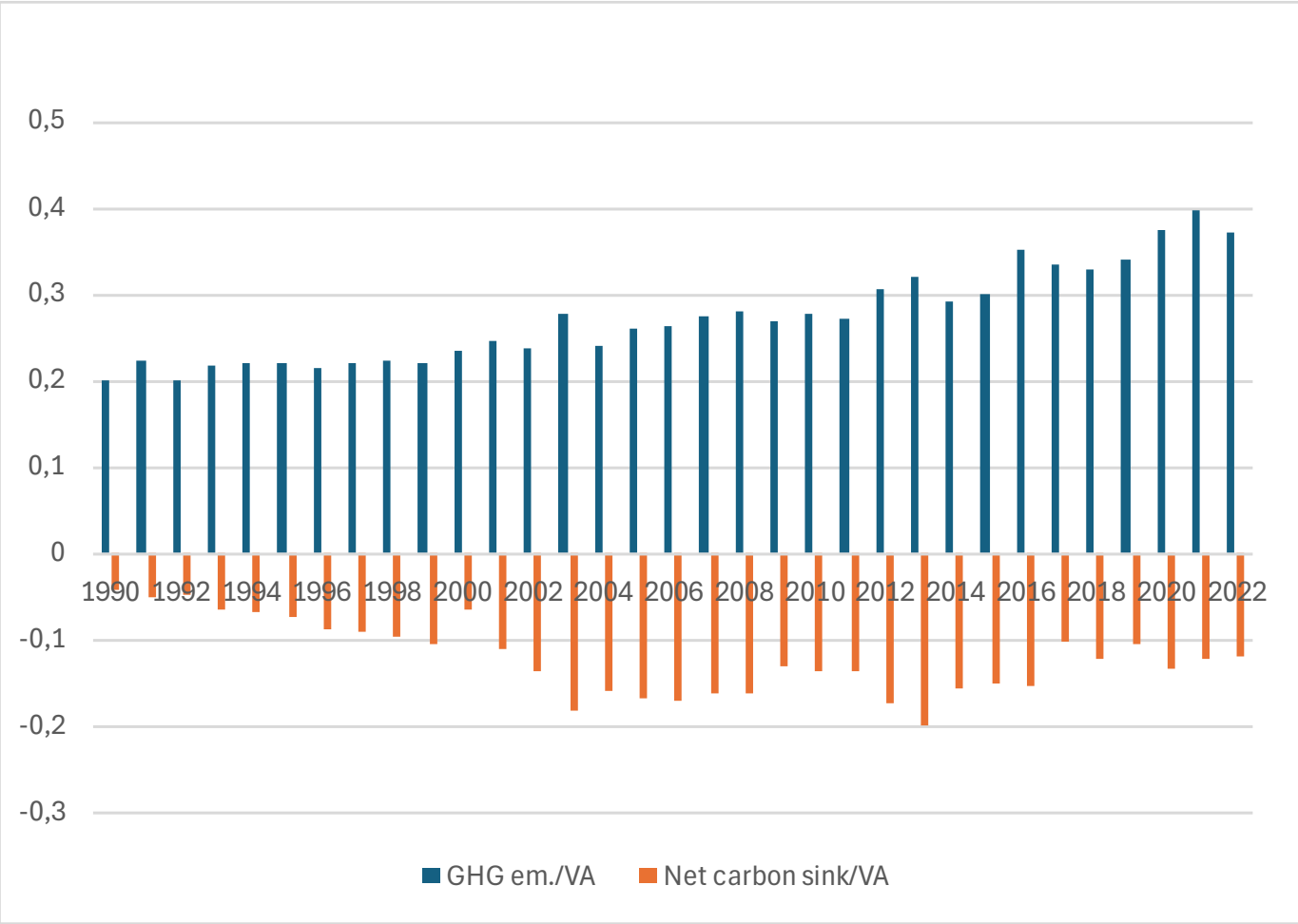



Figure: Agriculture, Forestry and Fishing Activity - GHG Emissions and Net Carbon Sink/ Value Added

in € billion per year, 2020 prices

Sources: CITEPA-Secten 2024, National Accounts of France, authors' calculations

# References for the valuation of ecosystem services or pressures
# The Ecosystem Services Valuation Database (ESVD)

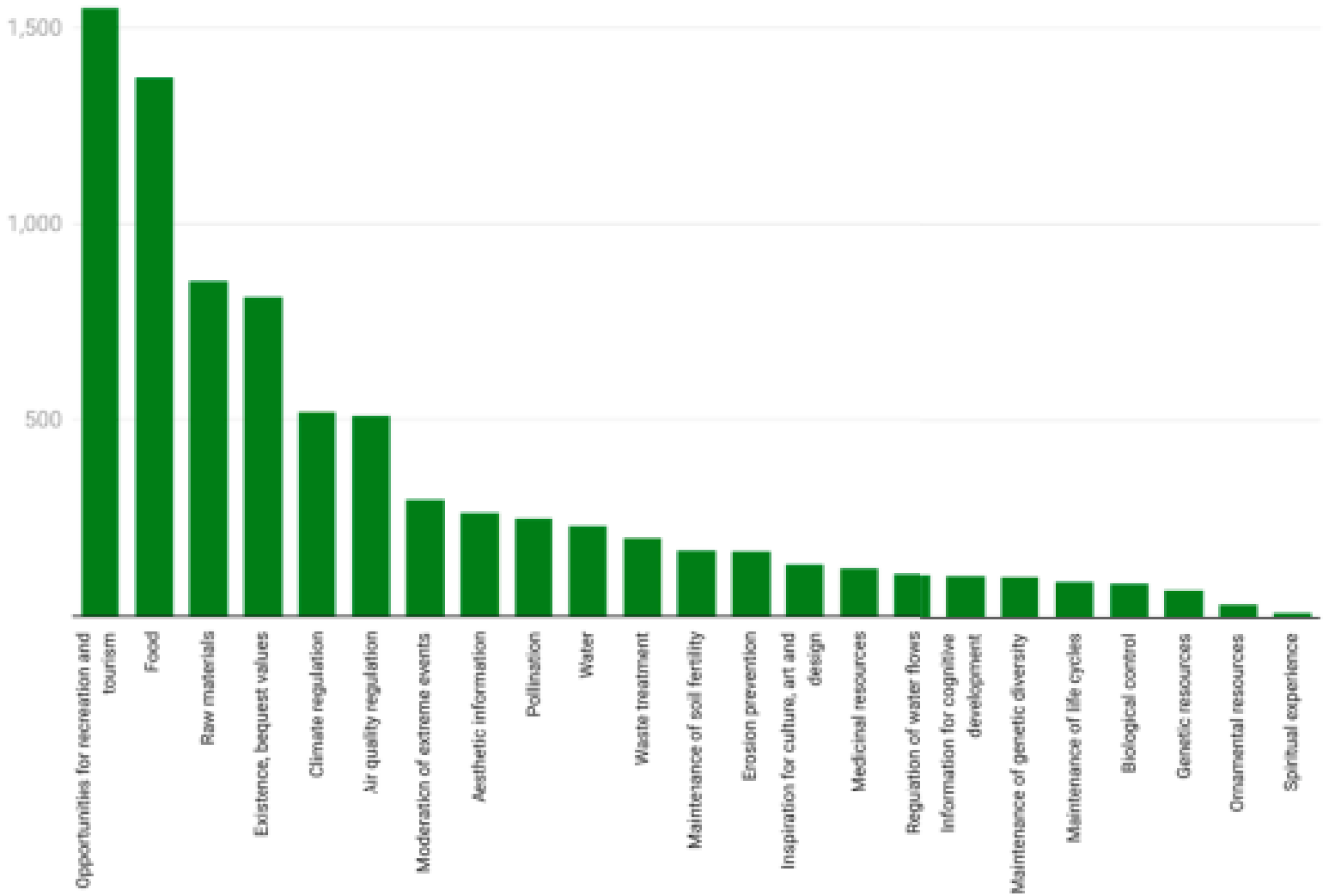



**Fig. 5.** Number of value estimates in the ESVD by ecosystem service.

Brander *et al.* (2024). Economic values for ecosystem services: a global synthesis and way forward, Ecosystem Services

# 4. Conclusion and recommendations

- Inclusive National Accounts have an important role to play for highlighting prospects about agriculture and food transitions by providing objective basic facts,
- in particular for ongoing debates about CAP future and, for exemple, proposals to integrate agriculture in an ETS scheme.
- Our ‘feasibility test’ suggests that principles and data are available to launch the process

# Thank you for your attention

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