Findings and limitations of the USDA-ERS study,[1]
Economic and Food Security Impacts of Agricultural Input Reduction under the European Union Green Deal's Farm to Fork and Biodiversity Strategies

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The Economic Research Service of the United States Department of Agriculture (USDA-ERS) recently published a study[2] that simulates the consequences, for European agriculture and economy and for global food security, of the European Farm to Fork[3] and Biodiversity[4] strategies. Mostly negative, the findings of the study have however a limited scope, because only supply-side changes are considered, involving modifications in agricultural production conditions and the market impacts of such changes. The present note aims at making explicit the limitations of the USDA-ERS study, in order to avoid improper interpretations of the consequences of the European Green Deal as a whole.[5][6]

The USDA-ERS study is based on the GTAP-AEZ general-equilibrium model[7] of the world economy, developed by Purdue University and focusing on agricultural markets and food industries. The study converts the European Union (EU) Farm-To-Fork and Biodiversity strategies into reductions of both chemical inputs and farmland, in Europe alone or beyond its boundaries. The study then evaluates the impact of such reductions on output supply for each major agricultural product in world's regions, as well as on international prices of agricultural commodities. In a second step, the USDA-ERS explores the consequences of both European strategies in terms of global food security. It shows that, even when applied to the European context only, the EU Farm-To-Fork and Biodiversity strategies would result in a reduction in agricultural production, an increase in the price of most agricultural products and, at the global scale, in a decrease in food security and consumer welfare.
Such result appears in contradiction with European Union objectives, while being consistent with the fact that (1) only a selection of proposed policies in the European Farm-To-Fork and Biodiversity strategies are considered in the study, and (2) agricultural systems are simulated within a particularly rigid framework, as we discuss below.

A first remark is that two out of three scenarios proposed in the USDA-ERS study consider that the European strategies also apply to trade partners of the EU, or to all countries, irrespective of their state of agricultural development. Imposing a reduction in chemical input use and cultivated area in Africa in particular, seems to be at odds with what is usually considered for promoting this continent's agricultural development.
Furthermore, only a subset of policies associated with the EU Farm-To-Fork and Biodiversity strategies are considered in the USDA-ERS study. Consequently, the latter should not be presented as an impact study of these strategies. Indeed, only the objectives of reducing cropland and chemical input use are

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[1] United State Department of Agriculture – Economic Research Service
[2] https://www.ers.usda.gov/publications/pub-details/?pubid=99740
[3] https://ec.europa.eu/food/farm2fork_en
[4] https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/actions-being-taken-eu/eu-biodiversity-strategy-2030_fr
[5] Lettre économique de la revue des Chambres d'agriculture https://chambres-agriculture.fr/fileadmin/user_upload/National/FAL_commun/publications/National/Lettre_Eco_Novembre_409_APCA_2020.pdf
[6] Site Farm Europe https://www.farm-europe.eu/fr/blog/strategies-de-la-ferme-a-la-fourchette-et-biodiversite-la-commission-doit-faire-de-la-lumiere-sur-limpact-reel/
[7] Global Trade Analysis Project - AgroEcological Zone https://www.gtap.agecon.purdue.edu/about/center.aspx#mission .

considered here, whereas the EU strategies also include a series of objectives associated with the demand side (consumers), and the reduction of food waste and agricultural losses within a comprehensive framework of food systems, embedded in the wider scope of the European Green Deal.[8] More precisely, the USDA-ERS study does not account for current trends in food diets (i.e., the decrease in calorie content and in animal products of Western diets) and for the general reduction in food waste. This is in contradiction with recent studies on food security and sustainability of food systems, which consider demand and supply of agricultural products in a global vision of the food system as a whole. These studies show that, without modifying demand for food, it is problematic to consider a decrease in supply associated with dis-intensification of agriculture (see publications by INRAE[9], IDDRI[10] and the EAT-Lancet Commission[11]).

The change in agricultural supply results from (i) a reduction in chemical input use by 20 percent for nitrogen fertilizer, 50 percent for pesticide and antimicrobials; (ii) a decrease by 10 percent of farmland. The USDA-ERS simulation exercise is performed with constant agricultural production technologies, hence not accounting for possible adaptation of agricultural practices, cropping and livestock systems, nor for potential technical progress over the next decade.

However, research conducted these past few years on the reduction of chemical input use in agriculture reveals that the resulting impact on crop and livestock productivity depends on

- conditions of use of chemical inputs, which determine the efficiency of these inputs. Such efficiency can be enhanced thanks to technological advances in agricultural equipment (spreaders), digital technologies (precision agricultural and livestock systems), and the generalization of decision support systems;
- production systems, landscape and their associated provision of ecosystem services, through ecological processes: crop rotation, role of legume crops, type of soil preparation, association of cropping and livestock systems, organic matter application, landscape management, spatial arrangement of crops, etc.

An increase in production efficiency could therefore allow to cut chemical input use by 10 to 20 percent, without major consequences on average crop yields. To go beyond that level would however entail a modification of production systems and landscape (see, e.g., results from the DEPHY farm network[12], INRA scientific report on pesticides[13], recent research on antimicrobials[14], on nitrogen and legume crops[15]). For example, reducing pesticide use by 50 percent implies that a proportion of farmland be devoted to agro-ecological infrastructures, in order to host and provide subsistence to auxiliary organisms associated with crops, hence reducing crop land.

Furthermore, no technical progress is considered in the simulation scenarios of the USDA-ERS study, whereas one may expect from advances in genetics a greater resistance of cultivated plants and bred animals to biotic and abiotic stress by the year 2030.

Finally, environmental and health-related costs of present agricultural practices are not confronted with the results of the study (as acknowledged by their authors). However, damaging consequences of nitrogen and pesticide use on the environment and for natural resources, as well as on human health, are evaluated with increasing accuracy. This is illustrated at the international scale by research published by the Nitrogen Impact Assessment (Sutton, 2011), and in the case of France, by the scientific report on

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[8] https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_fr
[9] https://www.inrae.fr/actualites/agricultures-europeennes-horizon-2050
[10] https://www.iddri.org/sites/default/files/PDF/Publications/Catalogue%20Iddri/Etude/201809-ST0918-tyfa.pdf
[11] https://eatforum.org/
[12] https://www.nature.com/articles/nplants20178
[13] https://www.inrae.fr/actualites/ecophyto-rd-reduire-lusage-pesticides
[14] https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/cmef/farmers-and-farming/future-eu-livestock-how-contribute-sustainable-agricultural-sector_en
[15] https://www.sciencedirect.com/science/article/pii/S1161030116300995?via%3Dihub

pesticides by INSERM in 2013[16] and findings of the AGRICAN cohort study.[17] The cost to society is expected to be at such a level that it requires accounting for, when considering to maintain or not existing agricultural practices, which today enable the European Union to secure its agricultural production and its international position on export markets.

Because of the static nature of production systems and food demand it imposes, the USDA-ERS study tends to evaluate only the upper bound of potential consequences of the EU Farm-To-Fork and Biodiversity strategies on European agricultural production and international trade and, as a result, on world markets and global food security.[18]

Overlooking non-market effects of chemical input use does not allow for a comprehensive assessment of the full set of EU strategies. It would therefore be worthwhile to complement the USDA-ERS study with a new set of simulation parameters and a wider range of evaluation criteria. This would allow for a complete analysis of the consequences of the European Green Deal on the well-being of the European population and more generally, on the satisfaction of world population needs.

[16] https://www.inserm.fr/information-en-sante/expertises-collectives/pesticides-effets-sur-sante (under review).
[17] https://ecophytopic.fr/concevoir-son-systeme/agrican-etude-de-cohorte-agriculture-et-cancer
[18] Note however that the objective to increase organic farming cultivated area by 25 percent, although included in the European strategies, is not accounted for in the scenarios of the USDA-ERS study.