



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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What Is the Issue?

The European Commission (EC) has unveiled its Farm to Fork and Biodiversity Strategies that would impose restrictions on European Union (EU) agriculture through targeted reductions in the use of land, fertilizers, antimicrobials, and pesticides. The Farm to Fork and Biodiversity Strategies (European Commission, 2020) and which we refer to as “the Strategies,” represents a fundamental shift in EU food and agriculture policy, with correspondingly fundamental implications for the structure and productivity of the EU food and agriculture industry. As the EU is a major agricultural producer and participant in international agricultural trade, this policy shift is likely to affect international markets for agricultural commodities and, consequently, the broader food and agriculture system.

What Did the Study Find?

Our analysis, which examines three adoption scenarios—EU-only, middle (adoption by some countries, and including explicit EU trade restrictions against non-adopters), and global adoption—suggests that the EC’s 10-year plan of targeted reductions in the use of land, antimicrobials, fertilizers, and pesticides would lead to a reduction in EU agricultural production and reduce its competitiveness in domestic and export markets. If the plan were adopted beyond the EU, those impacts would also expand with consequences for worldwide welfare and food insecurity. In summary, we found that by 2030:

- The decline in agricultural production in the EU, as shown in the summary table, would range from 7 percent (global adoption) to 12 percent (EU-only). Impacts on production would be smaller worldwide, except in the case of global adoption, when production would decline by 11 percent.
- The decline in agricultural production would tighten the EU food supply, resulting in price increases that impact consumer budgets. Prices and per capita food costs would increase the most for the EU, across each of the three scenarios. However, price and food cost increases would be significant for most regions if Strategies are adopted globally. For the United States, price and food costs would remain relatively unchanged except in the case of global adoption.
- Production declines in the EU and elsewhere would lead to reduced trade, although some regions would benefit depending on changes in import demand. However, if trade is restricted as a result

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of the imposition of the proposed measures, the negative impacts are concentrated in regions with the world's most food-insecure populations.

- The declines in production and trade, coupled with the projected increases in food commodity prices, would significantly reduce the EU's gross domestic product (GDP), especially if adoption was limited to the EU. In that case, the EU's decline in GDP would represent 76 percent of the decline in the worldwide GDP. If the Strategies were adopted beyond the EU, however, the EU's share in decline of worldwide GDP would drop to 49 percent in the middle scenario and as low as 12 percent if globally adopted. The effects on the GDP of the United States would be smaller than for the EU and worldwide under all adoption scenarios.
- Food insecurity, measured as the number of people who lack access to a diet of at least 2,100 calories a day, increases significantly in the 76 low- and middle-income countries covered in our analysis due to increases in food commodity prices and declines in income, particularly in Africa. By 2030, the number of food-insecure people in the case of EU-only adoption would increase by an additional 22 million more than projected without the EC's proposed Strategies. The number would climb to 103 million under the middle scenario and 185 million under global adoption.

How Was the Study Conducted?

To examine the prospective market and food security impacts of the EC proposal, we focused on several selected agricultural input reductions specified in the Strategies: reduction of pesticide use by 50 percent, reduction of fertilizer use by 20 percent, reduction of antimicrobial use for livestock by 50 percent, and removal of 10 percent of existing farmland from agricultural use. To capture the potential impacts of not only EU adoption of the Strategies but also “the global transition to sustainable agri-food systems through its trade policies and international cooperation instruments” (European Commission, 2020), we used the three different adoption scenarios noted above.

The first scenario assumes the EU alone implements the Strategies and trade is permitted normally—the EU-only scenario. The second scenario, a “middle scenario,” extends the restrictions on agricultural inputs to those EU trade partners who depend on food and agricultural exports to the EU. This scenario simultaneously assumes the EU restricts 50 percent of imports from regions that do not adopt the Strategies to simulate the use of trade policies to support the Strategies. In the third scenario, the “global scenario,” the study considers the impacts of the extreme case of global adoption of the Strategies, as suggested by the EC's pledge to support a global transition.

In the first phase of our study, we used a specific Computable General Equilibrium (CGE) model, the Global Trade Analysis Project–AgroEcological Zones (GTAP-AEZ) model, to examine the potential market and economywide impacts from the adoption of the Strategies. GTAP-AEZ divides the world into 18 agroecological zones and explicitly accounts for land use by allowing cropland to compete with other land applications. We assumed a medium-run horizon; thus, the results could be interpreted as to impacts that might occur over 8–10 years. To examine potential food security impacts from the adoption of the Strategies, in the second phase of our study, we used the estimated changes in gross domestic product (GDP) and food prices from the CGE model as inputs into the USDA, Economic Research Service's International Food Security Assessment (IFSA) model, which estimates changes in food consumption in developing countries.

Our study was limited to an analysis of agricultural input reductions under the Strategies and does not consider other important aspects of the EC's proposal, for example, increased land in organic production or reductions of food waste and greenhouse gas emissions. In addition, while our results indicate the potential market and food security impacts from the Strategies stemming from proposed input reductions, they do not provide any information about the potential benefits and costs to the environment and human health. Evaluation of environmental and human health (benefits and costs) under the Strategies is subject to ongoing debate. However, estimation of the market impacts of the Strategies can serve as an important tool to assess policy aims.

Summary of the main impacts of the Strategies under the three scenarios¹

	European Union	United States	Worldwide
Scenario: EU adoption only			
Production (percent change)	-12	0	-1
Prices (percent change)	17	5	9
Imports (percent change)	2	-3	-2
Exports (percent change)	-20	6	2
Gross farm income (percent change)	-16	6	2
Increase in food cost (annual per capita change in U.S. dollars)	153	59	51
Increase in food insecurity ² (millions of people)	na ¹	na	22
GDP (change, in billions of U.S. dollars)	-71	-2	-94
Scenario: middle³			
Production (percent change)	-11	0	-4
Prices (percent change)	60	1	21
Imports (percent change)	-10	-7	-9
Exports (percent change)	-10	-2	-9
Gross farm income (percent change)	8	1	4
Increase in food cost (annual per capita change in U.S. dollars)	651	16	159
Increase in food insecurity (millions of people)	na	na	103
GDP (change, in billions of U.S. dollars)	-186	-86	-381
Scenario: global adoption			
Production (percent change)	-7	-9	-11
Prices (percent change)	53	62	89
Imports (percent change)	-5	-15	-4
Exports (percent change)	2	3	-4
Gross farm income (percent change)	15	34	17
Increase in food cost (annual per capita change in U.S. dollars)	602	512	450
Increase in food insecurity (millions of people)	na	na	185
GDP (change, billions of U.S. dollars)	-133	-74	-1,144

Notes: ¹na = not applicable; ²Food insecurity is estimated for 76 low- and middle-income countries and not the full set of countries in the Global Trade Analysis Project – AgroEcological Zones (GTAP-AEZ) model; ³In the middle scenario, we assume that trade partners who depend on food and agricultural exports to the EU or that have close colonial ties adopt the Strategies to maintain their trading relationship with the EU. The regions that we assumed adopt the Strategies in this scenario are European Free Trade Association (EFTA) countries (Iceland, Liechtenstein, Norway, and Switzerland); other European countries; Turkey; Ukraine; the Middle East and North Africa; and Africa.

The gross farm income calculation is based on the returns to agriculture from changes in prices and quantities. Those returns are not going to all farmers, but probably those that own land.

Source: USDA, Economic Research Service calculations using the GTAP-AEZ model and USDA, ERS's International Food Security Assessment Model.

¹Percent change represents a one-time change from the counterfactual values (i.e., no policy change); all annual changes expressed in U.S. dollars represent the impacts evaluated over the period of a year after the changes have occurred.