Science Societies

Response to "Sustainable agriculture in the U.S. vs. the EU"

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Hilbeck et al. (2013) found similar rates of yield gain in maize for the period of 1995–2012 in the U.S., where transgenic hybrids were dominant; in Germany, Austria, and Switzerland, where transgenic hybrids were not used; and in Spain, where transgenic maize was available. Photo courtesy of Adobe Stock/Thierry RYO.

We write in response to Dr. Scott H. Hutchins's opinion article, "Sustainable Agriculture in the U.S. vs. the EU," published in the February 2021 issue of *CSA News* magazine (Hutchins, **2021**). As researchers with life experience and professional activities in both the United States and the European Union, we welcome analysis and discussion about policies that promote improvements in food security, farm profitability, rural development, environmental quality, and human health. Comparisons of agricultural and environmental policy options and trajectories to achieve sustainable agriculture in different regions of the world can be insightful and should be of interest to many readers of *CSA News*. It was therefore disappointing to find Dr. Hutchins's essay to be inaccurate, incomplete, and misleading. We address four of our major concerns here:

1 Innaccurate and Misinterpreted Data

The data that Hutchins presents are inaccurate and misinterpreted. The maize yields shown in Hutchins's Figure 2 are given in units of "bushels per hectare." A hectare is 2.47 acres and a bushel of maize weighs 25.4 kilograms, so the average U.S. yield of 71 bu ha^{-1} shown for 2019 would be 1,803 kg ha^{-1} (29 bu ac^{-1}), which is where U.S. maize yields were in the late 1930s (USDA-NASS, **2018**). In contrast, the average U.S. maize yield in 2019 reported by the USDA Economic Research Service was 10,788 kg ha^{-1} (172 bu ac^{-1}) (USDA-NASS, **2021**). Hutchins's Figure 2 also shows maize yields for the EU in 2019 averaged 48 bu ha^{-1} (1,219 kg ha^{-1}), whereas the USDA Foreign Agricultural Service noted that average yields for the EU in 2019 were 7,511 kg ha^{-1} (USDA-FAS, **2020**). *(Editor's note: An erratum for the figure showing the corrected units appears in the April issue of* CSA News *magazine at https://doi.org/10.1002/csan.20471.)*

In comparing maize yields in the U.S. and the EU, Hutchins argues that the yield gap for maize between the U.S. and EU can be attributed to the broadscale adoption in the U.S. of transgenic genotypes with traits for insect and herbicide resistance and the lack of adoption of transgenic crops in most of the EU (Spain and Portugal are exceptions). Interestingly, the yield trend lines shown in Hutchins's Figure 2 are roughly parallel, suggesting that gains in maize yields are similar in both regions. Hilbeck et al. (2013) found similar rates of yield gain in maize for the period of 1995–2012 in the U.S., where transgenic hybrids were dominant; in Germany, Austria, and Switzerland, where transgenic hybrids were not used; and in Spain, where transgenic maize was available. By 2010, maize yields in all three regions were at or above 10,000 kg ha^{-1} though they were numerically highest in the European countries not using transgenic maize, intermediate in Spain, and lowest in the U.S. Hilbeck et al. concluded that the use of transgenic hybrids "has not been the dominant determinant of yield productivity." Heinemann et al. (2013) also found similar rates of maize yield gain in western Europe and the U.S. while wheat yield gains were much greater in western Europe than in the U.S. We note further that yield levels and trends over time can vary enormously among regions and countries, both within the U.S. and the EU (Ray et al., 2012). Reliably comparing cropping approaches requires a more informed and careful analysis where, for instance, growing conditions are accounted

According to the author, large-scale damage to off-target organisms due to drift and volatilization by herbicides linked to transgenic crops is one a number of "serious externalities" accompanying the high output of crop and animal products in the U.S. This photo shows wine grape damage due to herbicide drift. Photo courtesy of Shutterstock/Sleepy Joe.

for. Averaging across entire continents may obscure the roles of key factors.

Taken together, these points lead us to have a lack of confidence in the data Hutchins presents and his interpretation of it.

2 Social, Environmental Externalities of U.S. Model Largely Ignored

Hutchins largely ignores the serious social and environmental externalities of the U.S. model of agricultural intensification. High output of crop and animal products in the U.S. has been accompanied by serious externalities, including a lack of market competition due to consolidation of input suppliers and marketing firms

(Howard, 2015; Institute of Medicine and National Research Council, 2015); major shortcomings in health and safety conditions in agricultural fields and meatpacking plants that disproportionately affect people of color (Calvert et al., 2008; Waltenburg et al., 2020); substantial discharges of nutrients from farm fields and concomitant water pollution in places that include the Great Lakes, the Gulf of Mexico, and the Tulare Basin (Institute of Medicine and National Research Council, 2015; Dubrovsky et al., 2010); and large-scale damage to off-target organisms due to drift and volatilization by herbicides linked to transgenic crops (Nandula, 2019). U.S. farms are also important contributors to climate change, responsible for 10% of U.S. greenhouse gas emissions (USEPA, 2021) while generating about 0.6% of the gross domestic product (USDA-ERS, 2020).

In his critique of EU policies, Hutchins cites the USDA-ERS report by Beckman et al. (2020), which examined potential impacts on food availability and price of four production-level provisions of the EU Farm to Fork proposal: reduced use of land, pesticides, fertilizers, and antimicrobials for livestock. Importantly, the Beckman et al. report did not consider social and environmental "externalities," whereas the Farm to Fork policy under consideration in the EU explicitly seeks to avoid social and environmental externalities while also meeting farm productivity and profitability goals. Degradation of the environment and damages to human health harm the economy and incur true social costs that should not be omitted from policy considerations. This is a well-established principle in U.S. environmental policy since at least the Reagan administration and Executive Order 12291 (Dudley, 2020; McGartland, 2013). Hutchins's critique of EU policies seems to deny this principle.

3 Narrow View of Tools and Strategies for Food Security, Environmental Quality

Hutchins has an excessively narrow view of the types of tools and strategies needed and available to provide food security and environmental quality. He emphasizes the importance of transgenic crops and other purchased inputs, including fertilizers and pesticides, in maintaining and increasing yields while protecting soil and other natural resources. He also criticizes the EU Farm to Fork proposal for seeking to limit the use of synthetic chemical inputs and other "high tech tools" in pursuit of "natural farming," and for having "abandoned" science. However, there is scientific evidence that inputs are overused and that agroecological approaches can be efficacious. For example, in a study of 946 commercial arable farms in France, Lechenet et al. (2017) found that total pesticide use could be reduced by an average of 42% on 59% of the farms without any negative effects on productivity or profitability. In a second-order meta-analysis comprising almost 42,000 worldwide comparisons of ecologically based versus conventional farming practices, Tamburini et al. (2020) found that in 63% of the comparisons, practices such as crop rotation, intercropping, application of organic matter amendments, microbial inoculation, reduced tillage, and placement of non-crop vegetation in and around fields maintained or increased crop yields while also increasing biodiversity, enhancing pollination and pest control, improving soil fertility and nutrient cycling, and promoting water regulation and carbon sequestration. Thus, a wide range of approaches not limited to biotechnology and synthetic chemicals should be considered as part of the toolkit for building sustainable agriculture systems. Sustainable agriculture can only be achieved through the engagement of scientists from a great number of disciplines (including social sciences) and practitioners in the entire food chain, working together to innovate and redesign our agricultural systems not only technologically, but also ecologically and socially.

4 Societal Context in Which Agriculture Operates Ignored

Hutchins ignores the societal context in which agriculture operates. He cites the Beckman et al. report as evidence that the Farm to Fork approach being considered in the EU would increase food costs and worsen food insecurity. It should be noted, however, that Beckman et al. did not consider important parts of the EU strategy, which includes expected changes in diet, shifts in demand along the food value chain, and reductions in food waste. Beckman et al. also ignored the potential for adaptation in EU agriculture and the role of innovation in farming practices, thereby likely overestimating the costs of the strategy. The adaptation capacities of farmers, industry, and consumers need to be considered as parts of an overall assessment of policy options.

More broadly, it should be recognized that both the U.S. and EU spend huge amounts of taxpayer money to support farms and farmers. Over the past decade in the U.S., farmers received about $18 billion annually for crop insurance subsidies, crop price subsidies, disaster relief, and conservation practices (USDA-ERS, 2021). Consequently, during that period, about 21% of U.S. net farm income came from taxpayers via the federal government (Morgan, 2021). Spending of public funds on farming is even greater in the EU: from 2014 to 2020, expenditures by the Common Agricultural Policy for the farm sector averaged €52 billion ($62 billion) annually, constituting 38% of the EU’s budget for that period (Scown et al., 2020). These expenditures indicate that in both the U.S. and EU, citizens should have a considerable amount to say about how farming is conducted. They can insist on animal welfare, clean water, minimal exposure to toxins, reduced climate impacts, fair wages, healthy working conditions, etc. Determining the types of farming and land use practices should not be the sole domain of agricultural scientists focusing on increasing production and production capability. Agricultural sustainability requires that the preferences and voices of all members of society play a role in shaping the future.

Overall, we applaud Dr. Hutchins for bringing contrasting policy options and trajectories for agriculture, the environment, and human well-being to the attention of readers of *CSA News* magazine. But discussion of the issues involved should be based on reliable assessment of accurate data and consideration of the full range of perspectives that bear on agricultural sustainability.

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