Human Health, Environment Sustainability, Food Security and Farmers' Income Trade-offs in Global Diet Shifts

Presenter:

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Dietary shifts are crucial for human health and environmental sustainability in the process of food system transformation. Numerous dietary options have been proposed as guidelines for to foster healthier and more sustainable dietary transitions, e.g., The planetary health diet, The mediterranean diet, and The DASH diet. In addition to global and regional, national food-based dietary guidelines (FBDGs) offer context-specific advice on healthy diets, reflecting local culture, geography, and demographics. While many countries have developed such guidelines, actionable countries are those with the capacity to provide political and financial support for their implementation.

These actionable countries also need to consider potential impacts on national food security and farmers' income during the food system transition according to the just transition principle. Dietary transitions reshape the national production scales and structures of food sectors, further affecting national food production and farmers' income in specific food sectors. For example, the reduced consumption of red meat in some European and American countries during dietary shifts could lead to a decline in their domestic meat production, futher affecting countries' meat industry and potentially resulting in higher unemployment among its farmers.

However, identifying food choices that can simultaneously benefit the human health, environment, food security and farmers' income is challenging. Debates around encouraging consumers in rich countries to reduce meat consumption for climate change and health benefits frequently raise concerns about potential economic impacts on farmers, especially those involved in livestock and feed crop production. Proposals promoting plant-based diets have been met with resistance, often perceived as threats to farming livelihoods and freedom of choice. Thus, fostering healthier and more sustainable dietary transitions must go hand-in-hand with measures supporting a fair transition to alleviate adverse impacts on affected food security and farmer, which is poorly understood in the literature.

Here, we collected the per capita food consumption data for 17 food categories in 77 actionable countries in 2017. Some Low-Income Food-Deficit Countries (LIFDCs) currently do not have the capacity to transform their food systems and need to focus on the main problem of food insecurity in their own countries. We then employed the

Global Trade Analysis Project (GTAP) model to characterize the mechanisms of household consumption structure adjustments and simulated the impact of transitioning current consumption towards the FBDGs. In order to better simulate the impact of adjustments to the dietary structure of residents in each region, **our study introduces the impact mechanism of residents' consumption preferences to characterize the impact of changes in residents' consumption structure.** In the standard model, residents' consumption is mainly affected by the total income of residents and the consumer prices of products in various sectors. However, given product prices and income conditions, residents' consumption awareness and habits change, and the actual consumption of products will also change. Our findings reveal that the dietary transition will lead to benefit human health, decreasing most nations' blue water usage, mitigating their greenhouse gas (GHG) emissions, and reducing their land use. However, the impact of dietary transformation on national food security and farmers' income differs from that of resources and environment. Some specific food production and farmers' income decline in most countries. Moreover, the countries with different income levels or major agricultural activities perform different in human health, environment, food security and farmers' income of dietary shifts. We further analyze the mechanism by food categories and major countries. Finally, we simulate various intervention strategies, including productivity improvements, trade structure adjustments, and alternative dietary patterns, to promote dietary transitions and alleviate the trade-offs among health, environmental sustainability, food security and farmers' income during the process of dietary transition.

This paper offers a novel perspective on evaluating global dietary transitions, emphasizing the need to account for trade-offs involving human health, environment, sustainability, food security and farmers' income. Dietary transitions may adversely affect specific food sectors in certain countries and negatively impact farmers' incomes. Therefore, designing a comprehensive set of policy tools is crucial to address the potential trade-offs among human health, environmental sustainability, food security and farmers' income associated with dietary transitions.