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Assessing the forced labor risk of US fruit and vegetable commodities

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Abstract

Studies on sustainable food consumption to date have largely focused on promoting human health within ecological limits. Much less attention has been paid to social sustainability, in part because of limited data and models. The aim of this research is to assess the forced labor risk of fruits and vegetables consumed in the US by compiling new datasets and developing a new forced labor risk scoring method. Several steps were needed to compute forced labor risk per serving, including compilation of trade, labor intensity, and price data; qualitative coding of risk associated with food production for each commodity-country combination, and quantitative risk characterization (i.e., S-LCA impact assessment). Because commodities had multiple origin countries, weighted means and ranges of risk were calculated. Our analysis of 292 country-commodity combination enabled us to identify the varying level of forced labor risk associated with each using the metric of medium risk hours equivalent. Our method and results represent the first attempt, to our knowledge, to estimate the risk of forced labor across a diverse set of foods. Our findings point to the importance of using and further developing granular data for social risk assessment of foods.

Keywords: forced labor; social life cycle assessment; LCA; fruit and vegetable consumption

Introduction

An estimated 1.7 million workers globally in agriculture and fishing are subjected to forced labor, defined as "situations in which persons are coerced to work through the use of violence or intimidation, or by more subtle means such as accumulated debt, retention of identity papers, or threats of denunciation to immigration authorities" (ILO 2017). While eliminating forced labor in food production is of clear policy importance, there is a paucity of research on this topic. This can be attributed in part to limitations in metrics, models, and data available to estimate social risks in a similar framework to environmental impacts of foods. Social life cycle assessment (S-LCA) has emerged to fill this gap (Benoît and Mazijn 2009; Benoît Norris et al. 2018) but its systematic application to foods has been limited to date.

Lacking data on social risks means that interventions to improve health outcomes or reduce environmental burdens of diets may result in unintended consequences. The objective of this research is to assess the forced labor risk of fruits and vegetables consumed in the US by compiling

new datasets and developing a new forced labor risk scoring method, which is synergistic with those used by the Social Hotspots Database (SHDB). The Social Hotspots Database was the first comprehensive database for Social LCA. It pioneered many of the methods used for integration of social data in the LCA framework. It is widely used in the LCA community and is one of two existing options (the other is PSILCA).

Material and methods

To compute forced labor risk, we first compiled supply and origin data for US fruit and vegetable consumption. Second, we assessed the labor intensity per serving by multiplying worker hours from the SHDB and average US retail food prices. Third, we qualitatively coded the forced labor risk of fruit and vegetable production for each country-commodity combination using a tiered approach, with the most granular data available used in the final assessment. Finally, we applied the SHDB impact assessment method to convert to medium risk hours equivalent (mrh eq) and compute risk per serving. Detailed steps, variables, and data sources are described in the remainder of this section. The overall calculation for forced labor risk per serving of fruit or vegetable is described by Eq. (1-2):

$$CF_{i,k} \times WrkHrs_i \times Price_k = FL_{i,k} \quad (1)$$

$$\sum_{i=1}^{n} FL_{i,k} \times Prop_{i,k} = MeanFL_k \quad (2)$$

where each fruit and vegetable commodity is denoted by *k* and each country of origin is denoted by *i*; CF is the risk characterization factor assigned to commodity *k* from country *i*; WrkHrs is the labor intensity for the vegetable and fruit sector in country *i* (hours per dollar); Price is the retail price of commodity *k* (dollars per serving); FL is the forced labor risk per serving for each commodity *k* from origin country *i* (medium risk hours equivalent; mrh eq); Prop is the proportion of supply of commodity k accounted for by country *i*; and MeanFL is the weighted average forced labor risk per serving for each commodity *k* (mrh eq).

Trade data were from Kim et al. (2019), the UN Food and Agriculture Organization's (FAO) Food Balance Sheets (FAO 2020), and FAO Trade Matrix (FAO 2020b) . Countries that accounted for < 5% of each commodity's import volume to the US were excluded from the analysis. FAO commodities were mapped to the fruits and vegetables in the U.S. Department of Agriculture's Loss-Adjusted Food Supply data series (n=84; the unit of analysis).

We used labor intensity data (worker hours per $1 of country-specific sector output) from the SHDB (Benoît-Norris et al. 2019). We used average US retail prices per cup equivalent (i.e., per serving) (USDA 2018). Prices include preparation yield loss or gain.

We qualitatively coded the forced labor risk of fruit and vegetable production for each country-commodity combination using a tiered approach, with the most granular data available used in the final assessment. Risk was only assessed at the farming stage. The three levels were 1) commodity-country specific risk (e.g., fresh strawberries from the US), 2) sector-country specific risk (e.g., agriculture in the US), and 3) country-level risk (e.g. US). Two researchers independently coded each data source by applying qualitative codes that corresponded to a numeric risk score to specific and standardized language, with inter-rater reliability set at .90.

For level one, forced labor risk was qualitatively coded using known occurrences data from two sources (Verité 2017; DoL 2019). To assess risk for levels two and three, we integrated government

response data (DoS 2019) to act as a counterweight when known occurrences are cited in a country with strong governance protections. When both data types were available, a weighted average risk code was calculated (85% known occurrences, 15% government response), otherwise risk from one type was used (Benoît Norris et al. 2019). Level two codes were developed for known occurrences data (DoS 2018). Level three risk data were sourced directly from the SHDB. To convert risk levels to medium risk hours equivalent (mrh eq) per serving, we applied characterization factors from the SHDB, where Very High Risk = 10, High Risk = 5, Medium Risk = 1, Low Risk = 0.01 mrh eq.

Results

37% of the 292 country-commodity combinations for the 84 commodities had commodity-country specific risk data available. Only 0.3% (n=1) required using country-level data. Therefore, the majority of combinations were assessed using level two, or country-sector level data sources.

Fruits with the highest risk of forced labor included various forms of pineapple, as well as mangoes and avocados (Figure 1). Pineapple products were sourced from five countries: three were very high risk (Thailand, US, Costa Rica) and two were high risk (Philippines and Indonesia). Mangoes were sourced from five countries, whose risk varied from low (US) to high (Mexico and Peru). 82% of the US mango supply was high risk. For avocados, 62% of supply was high risk (Mexico and Chile), with the remainder being low risk from the US. The US was low risk for mangoes and avocados but very high risk for pineapples because the latter had commodity-country specific data, while the former relied on level two data (government response only).

Fruits with the lowest risk of forced labor included various forms of apples, peaches, and watermelon. The supplies of each of these foods were assessed as medium risk, with the US the primary country of origin. Overall, the combination of medium risk coding and relatively low labor intensities per serving contributed to the low risk assessment for these foods.

For vegetables, asparagus, okra, and bell peppers had the highest risks of forced labor in their supplies (Figure 2). 77% of the asparagus supply was assessed as high risk (Peru and Mexico), while 95% of the okra supply was high risk (Mexico). For bell peppers, 38% of the supply was coded as very high risk (Mexico). The remainder of the supply was coded as low (57%, US) or medium (5%, Canada) risk. The combination of high labor intensity per serving and high or very high levels of coded risk resulted in high relative risk for these foods.

Vegetables with the lowest risk of forced labor included potatoes, and cauliflower. 85% of the potato supply was coded as low risk (US), with the remainder medium risk from Canada. For cauliflower, 99% of supply was coded as low risk (US). Low risk coding, in combination with low labor intensity, contributed to low risk for these foods relative to other vegetables.

Discussion

Our results illustrate significant variation in forced labor risk across fruits and vegetables, with implications for policy, industry, and consumers. For US policy, the Trafficking Victims Protection Reauthorization Act (2005) aims to preclude the import of any goods produced by forced or child labor into the United States; identifying high risk commodities may help target goods for action or further investigation. Our results are an invitation to food companies working within these supply chains to collect primary data and make their labor and human rights commitments and indicators transparent for stakeholders. They are also an invitation for consumers to demand further transparency about the labor conditions in the supply of the produce they purchase.

Due to the novelty and scope of our research, it is difficult to compare our findings against the literature. At the same time, recent media corroborates findings about some of our highest risk commodities, including pineapple (Shah 2020), mango (Poulden 2012), avocado (Dehghan 2019), asparagus (International Labor Rights Forum 2009), and bell peppers (Coalition of Immokalee Workers 2017). Developing methods to include evidence from investigative journalism in forced labor risk assessment is a promising area of future research to fill commodity-specific data gaps.

One key limitation of this research is that we assessed risk only at the level of farming, not yet for the full life cycle of the product. Additionally, results were only provided per serving. Future analyses will include estimates at the level of the entire US fruit and vegetable supplies, including waste and loss. Finally, we will pursue mixed methods approaches that pair our quantitative approach with qualitative analysis of worker narratives to center their experiences and contextualize our findings. Our findings point to the importance of using and further developing granular data for social risk assessment.

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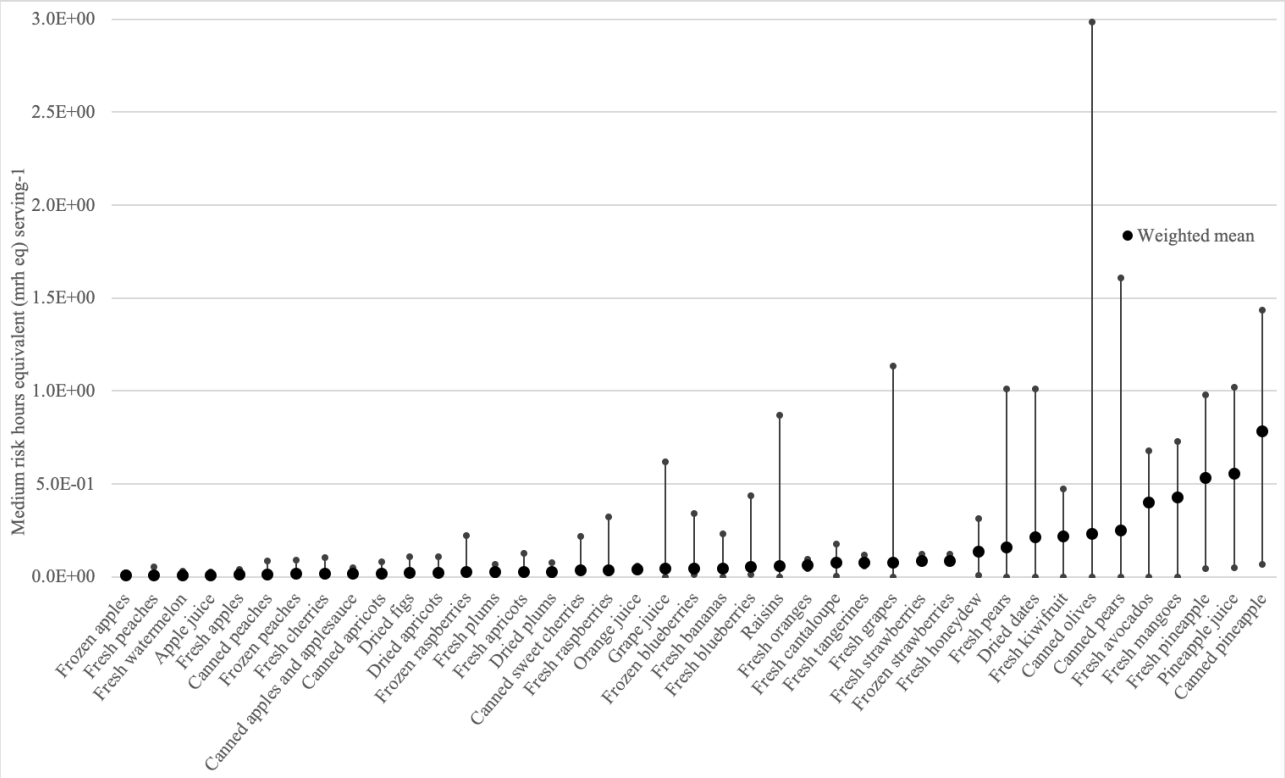

Figure 1: Weighted mean, maximum, and minimum estimated risk of forced labor per serving of fruits consumed in the US

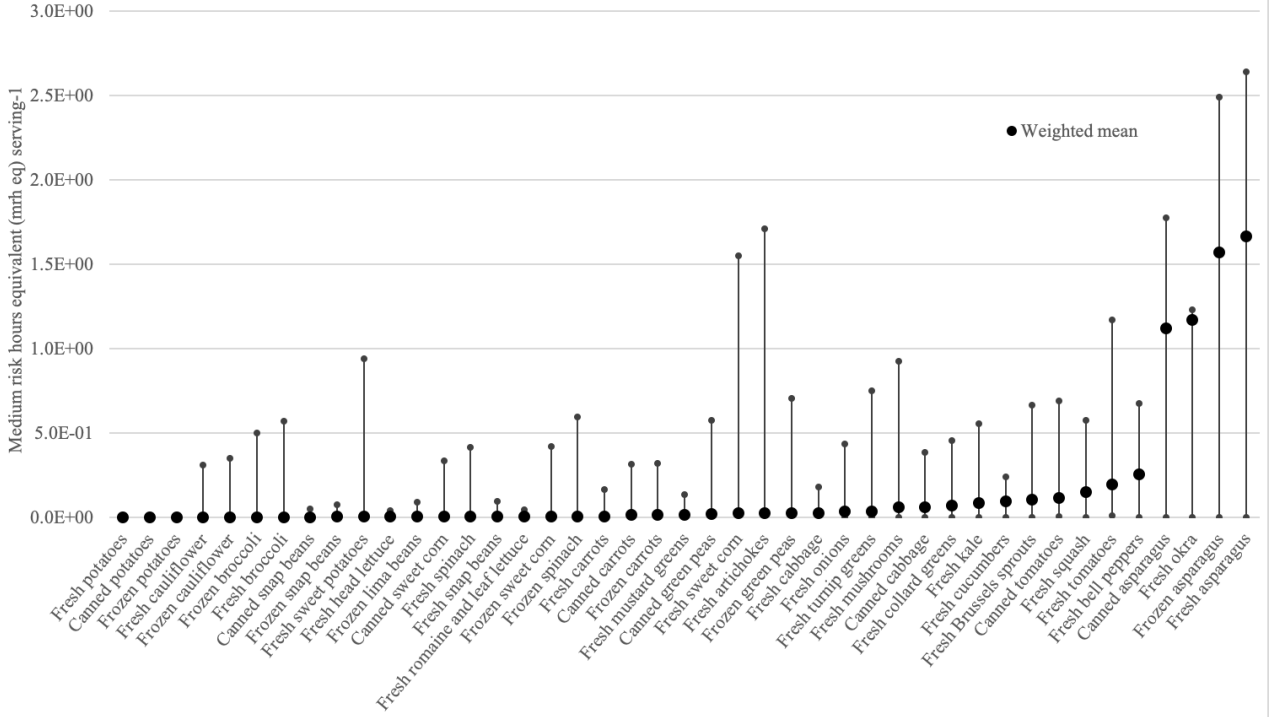

Figure 2: Weighted mean, maximum, and minimum estimated risk of forced labor per serving of vegetables consumed in the US