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Extended Abstract

Food Loss within Supply Chains

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Abstract

The increase in global population and food demand poses a massive challenge for food security and sustainability. Approximately one-third of the food produced worldwide (1.3 billion tons) gets lost or wasted annually. Research indicates that saving even one-fourth of this lost or wasted food can feed 870 million people worldwide. Thus, reduction in food loss and waste can play a significant role in ensuring food security. The present study aims to identify the significant contributors to food loss and investigate the relationship between them to gain insights that can aid in reducing food loss. The supply chain locations and activities which contribute to food loss are identified and classified across crops and regions worldwide to analyse the impact of these factors on food loss.

Keywords: Food loss, food security, post-harvest loss, supply chain

JEL Codes: O13; O19; O57; Q01; Q18; Q19

1. Introduction

The increase in global population and food demand poses a massive challenge to food security and sustainability (Porter and Reay, 2016). According to the United Nation's Committee on world food security, food security is a situation where "all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy lifestyle" (IFPRI, 2021). Many countries globally, especially from the developing world, are facing severe food insecurity.

Approximately one-third of the food produced worldwide (1.3 billion tons) gets lost or wasted annually. Research indicates that saving even one-fourth of this lost or wasted food can feed 870 million people worldwide (Vaqué, 2015). Thus, reduction in food loss and waste can play a significant role in ensuring food security (Dora et al., 2021). Additionally, food production has a high environmental impact (Vittuari et al., 2019); therefore, reducing food loss and waste is critical to increasing the efficiency of the food supply chain and making it more sustainable. Accordingly, the United Nations Sustainable Development Goals (SDG) to address poverty, inequality, environmental degradation, climate change, and justice (United Nations Development Programme, 2021) aims to reduce food loss along the supply chain and food waste at the retail and consumption by 50% (United Nations, 2021).

Hence, the urgent need for the reduction of FLW has generated significant interest among researchers on issues ranging from impact of food loss to the causes of FLW. To add to this area of research, in this study we utilize FAO food loss data for 2000-2017 from countries across the world to analyse the impact of various factors such as region, crop, supply chain location, and activity on food loss. Through this empirical work, we aim to identify the significant contributors to food loss and investigate the relationship between them to gain insights that can aid in reducing food loss.

2. Literature Review

Various studies have been conducted across regions worldwide looking into the impact of food loss and waste, the causes of food loss, and how to reduce them. There has been a rise in research in the area of Food Loss and Waste in the recent past due to its impact on food security and climate change, and we discuss some of the relevant work below.

(Abbade, 2020) estimate the nutritional loss due to the food loss to assess the number of people worldwide who can be fed with the food lost. The study points out that amount of food loss shown by FAO is sufficient to feed around 939 million adult population. (Kuiper and Cui, 2021) analyses the impact of food loss reduction on food security and the environment and examines the impact of the region, crop basket, and the supply chain stage on it. According to the authors, the leverage point of reducing food loss is at the primary stage for fruits and vegetables in low-income regions.

Food loss can occur at various stages in the supply chain and can be driven by various factors ranging from climatic conditions, diseases, worker shortage, and infrastructural shortcomings. Though it is challenging to eliminate food loss, understanding the causes of food loss can help in reducing food loss through various interventions.

According to (Parfitt et al., 2010), challenges relating to FLW vary based on the development status of the country. Post-harvest losses are significantly high in developing countries due to spillage and storage. Out grading due to quality standards is the leading cause of loss in developed countries. (Affognon et al., 2015) combine the Post-Harvest Losses (PHL) reported in various sources with statistical meta-analysis to estimate the PHL mean. The analysis shows an 11-53% loss in the monetary value of roots and tubers, which can be associated with harvesting, handling, storage, and transportation. Fruits, vegetables, and fish also incur a substantial loss in monetary value due to quality deterioration. According to (Sheahan and Barrett, 2017), the losses relating to cereals are during handling and storage. While for fruits and vegetables and animal products, the loss is concentrated at the processing and distribution stages. (Dora et al., 2021) conduct an in-depth root cause analysis by synthesising the research published worldwide from 1998-2018 to identify the causes of the loss and waste along the supply chain in both developing and developed nations. Over-production due to poor forecasting of demand is one of the primary reasons for food loss in the developed world, while lack of technical skill and infrastructure contribute to the same in less developed countries.

It is now well established that food loss reduction plays a crucial role in ensuring food security and sustainability; thus, it is essential to identify the key factors that significantly contribute to food loss and analyse them to help develop policy initiatives that can aid in reducing food loss. Hence, in this work, we aim to identify the impact of the region, crop, supply

chain activity, and location on food loss and investigate the relationship between these factors to gain insights that can aid in reducing food loss.

3. Methodology

We now conduct a OLS regression to estimate the multivariate relationship between the dependent variable of food loss and the independent variables of region, crop type, activity and location. The following equation is used for the same:

$$Loss = \alpha + \beta_1 Region + \beta_2 Crop + \beta_3 Activity + \beta_4 Location + \varepsilon$$

Here *Loss* represent the percentage of food loss. *Region* represent the region to which the country belongs. *Crop* represent the crop type for which the food loss is measured. *Activity* is the supply chain activity during which the loss occurs, and *Location* represents the supply chain location at which the food loss happens. Since the data is for seventeen years, the year dummy is included in the model as a control variable to control any time trend.

6. Conclusion

Understanding the key areas in which the food loss occur along the supply chain is crucial in reducing food loss and ensuring food security. This study utilizes global food loss data from the Food and Agricultural Organization (FAO) to identify the significant contributors to food loss.

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