Food loss and nutrition loss nexus in the Lusaka City Food Region

In the dynamic landscape of urbanisation and development, the issue of food security has become increasingly pertinent, especially in rapidly growing urban centers like Lusaka City. As urban populations increase, so too do the challenges associated with ensuring equitable access to nutritious food. Within this complex web of concerns lies the interconnected phenomena of food loss and nutrition loss, which represent significant barriers to achieving food security and optimal health outcomes.

Food loss and waste represent a pressing challenge facing humanity today. It is estimated that globally about one third of the food that is produced is lost or wasted before it reaches the consumer (FAO, IFAD, UNICEF, WFP and WHO. 2022). This translates to approximately 1.6 billion tons of food worth about $1.2 trillion being lost or going to waste (Hegnsholt *et al* 2018). This loss was estimated at approximately 24% of the calories meant for human consumption or 614 kilocalories per person each day (Kummu *et.al* 2012). It is appalling to think that about one third of food that is produced is lost or wasted when more than 800 million people (one in ten people) go hungry each day (Hensel 2022).

Food loss and waste refers to the decrease in quantity or quality of food along the food supply chain (Rezaei 2017). Food loss is considered to occur in the initial stages (harvest to retail but not including retail) of the food supply chains whereas in the case of food waste it is in the last stages of retail and consumption (Cattaneo *et al.* 2021). Though food loss and waste is a global phenomenon, there are variations across countries. The former is more experienced in developing countries such as sub-Saharan Africa (SSA) and the latter occurs more in developed countries (Ishangulyyev, Kim and Lee 2019). The inclusion of food loss and waste in the United Nations Sustainable Development Goals (SDGs) shows the global importance attached to the issue of food loss and waste.

SSA was reported to have the highest percentage (21.4%) of food loss in 2020 (UN Stats 2022). The value of food loss after harvest was estimated at 4 billion USD in 2011 (World Bank 2011). It has been claimed that this amount is an equivalent of the annual caloric requirement to feed 48 million people, a number slightly larger than the entire population of Spain (Agie 2023). Food loss has multifaceted impacts such as economic, environmental and social. The economic and environmental impacts of food loss are the most discussed. This study focusses on the social impact. It aims at exploring the intricate nexus between food loss and nutrition loss within the Lusaka City Food Region.

Methodology

This study used a mixed method approach that involved surveys and interviews conducted with 2000 smallholder farmers in the Lusaka City Food Region and other key actors in the urban agrifood chains respectively. Focus Group Discussions were also conducted.

Data Analysis

Calculation of Food Loss

Value chains for the four selected major products (vegetables, tomatoes, beef and milk) in Lusaka City Food Region were considered. The following were the stages of the value chain: harvesting, packaging and loading, transportation and marketing. The losses in weight at the various stages of the value chains were calculated.

Calculation of Nutritional Loss

Using the Zambia Food Composition Tables (2009), lost quantities of selected nutrients were estimated. These included the three macronutrients (carbohydrates, lipids in form of fats and proteins) and micronutrients. The micronutrients included minerals (calcium and iron) and vitamins (Vitamin A, thiamine, riboflavin and nicotinic acid). The nutritional loss was determined per 100 grams of each product (See Table 1). Therefore, the nutritional loss in relation to a nutrient i was denoted as NL_i. The following formula was used to calculate the nutritional loss. 〖NL〗_i=(T/100)×FC_i

Where, T is the total amount of concerned food lost (in grams, milligrams or micrograms), and FC_i is the amount of nutrient i per 100 grams.

Results

Figure 1 shows the most dominant products on farms in Lusaka City Food Region. Close to half (47%) of the respondents reported that fresh vegetables was the major product on their farm. The share of food loss by product is shown in Figure 2. About one third (35%) of fresh vegetables were lost. Figure 3 indicates the loss of fresh vegetables at various stages of the supply chain. The highest loss (1015.5kg) was on the farm. This translates to 22.0% of the total loss. The loss in all the remaining products was highest at the farm. The weights were as follows: tomato - 2590.9kg, beef - 268.6kg and milk - 232.7l.

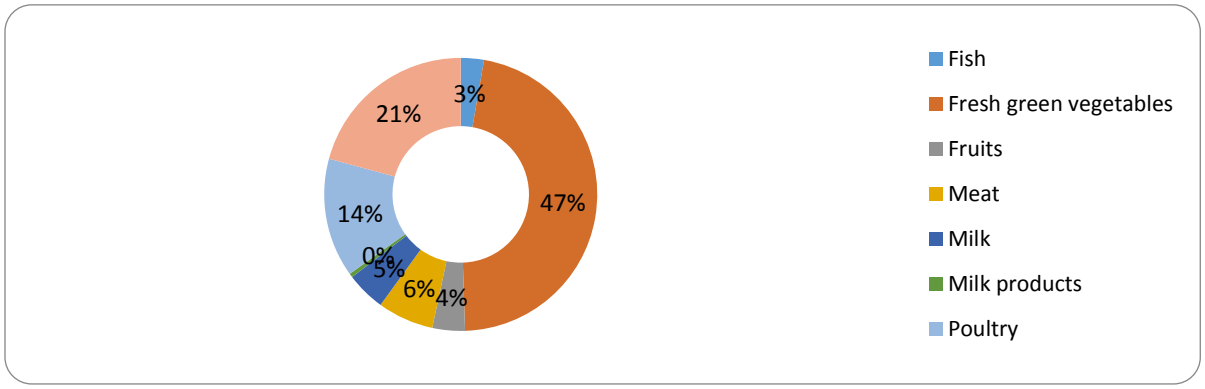

Figure 1: Major products on farms in Lusaka City Food Region

The nutrition loss due to food loss in the fresh vegetables, tomatoes, beef and fresh milk value chains was as follows. The total energy lost was 248,115,701.8cal and the highest loss was from tomatoes (247,545,619.6cal). The total Vitamin A lost was 2,975,018,954µg with the highest loss (2,970,547,435µg) occurring in tomatoes. The total loss in Carbohydrates was 49,570,369.7g and the highest loss (49,509,124g) was from tomatoes. The total protein lost was 12,416,160.4g with the highest loss (12,377,281g) occurring in tomatoes. The total Vitamin C lost was 309,432mg. Since only tomatoes had Vitamin C, the value was not included in the table. The amount of nutrition loss in tomatoes was between 98.0 - 99.9% of the total loss for the rest of the nutrients except fat .

Discussion

Fresh vegetables are the most popular major products on farms in Lusaka City Food Region. This could be because vegetables are increasingly being recognised as essential for food and nutrition security (Schreinemachers, Simmons and Wopereisc 2017). This is particularly the

case in urban areas where the increase in population raises the demand for vegetables. With such a readily available market farmers do not hesitate to seize the economic opportunity thatthey offer. Tomatoes are the second popular product. The possible reason for this is that they are an important component of human diets due to their being a rich source of vitamins and minerals. Actually among all vegetables, tomatoes are considered to be a number one contributor of nutrients to the human diet (Suárez, Rodríguez and Romero 2008). Additionally tomatoes offer high economic returns to the farmers.

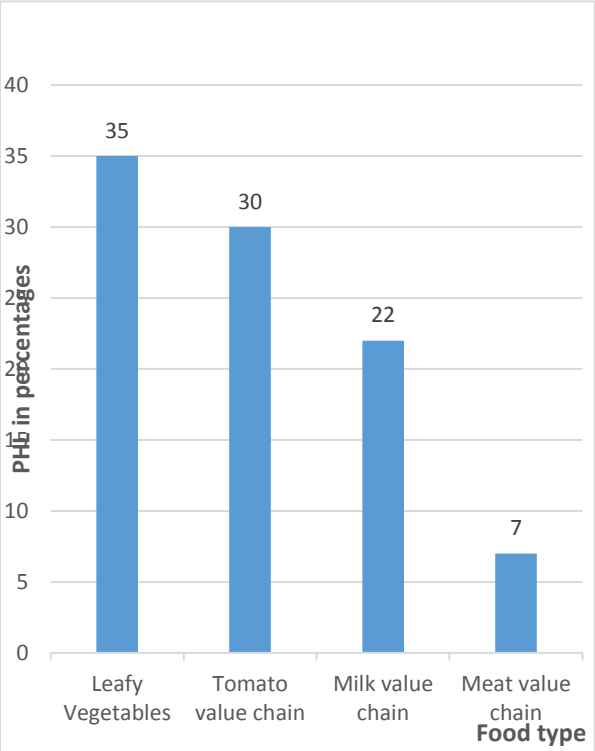

Figure 2: Food loss by product (percent of kg)

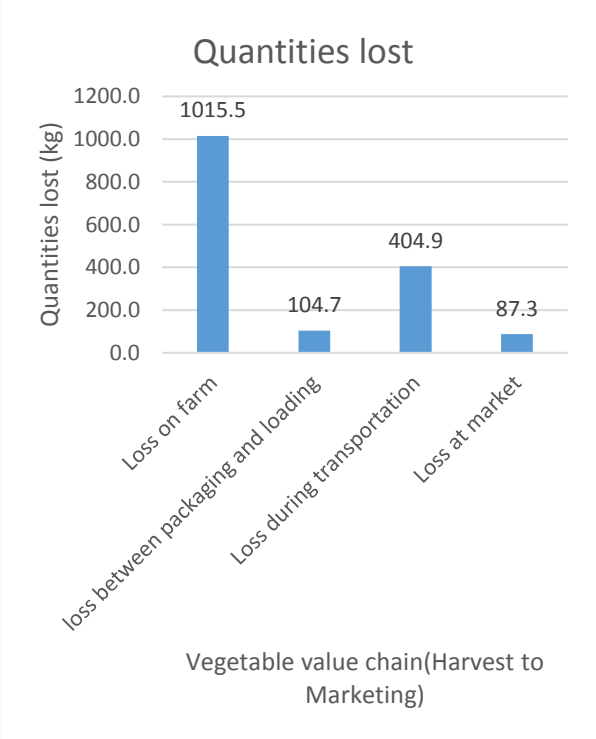

Figure 3: Quantities of food loss at the in the fresh vegetables supply chain

The highest loss of all the products incurred at the farm. Existing literature such as Ishangulyyev, Kim and Lee (2019); Durán-Sandoval, Durán-Romero and Uleri (2023), has established that on farm loss is more experienced in developing countries. Drivers of on farm losses include lack of technology, timely availability of labour and weather (WWF-UK 2021).

Food loss results in a decrease in the food supply available in the market which may in turn raise market prices to compensate the loss in the food quantity. High food prices are more likely to reduce the capacity of vulnerable populations to access the food (Ruten 2013; Zhang, Lee and Chang 2019). Lack of access to food means lack of access to nutrients which are needed for one to enjoy good health. Moreover, high price may result in food staying longer at the market. This in turn may result in nutrition loss. Though the food may be consumed it would have lost some of the nutrients and the consumers may not have the full benefit of consuming such food.

Though the percentage of food loss is highest in the fresh vegetables value chain, tomatoes have the highest amount of food loss in weight. This somehow ties well with the United States of America situation were fruits and vegetables represent the greatest food loss and waste by weight (ReFED 2016; Cooper 2023) Not only are both leafy vegetables and tomatoes highly

perishable in nature but they are also considered to be among the most nutrient-dense foods (Ambuko *et al.* 2017). The high nutrition loss in tomatoes suggest that tomatoes are more nutrient-dense compared to fresh vegetables. They are richer than fresh vegetables in vitamins, minerals and other nutrients important for health (Erika *et al.* 2020; Lichtenstein *et al* 2021). To stress this point Mama, Yemer and Woelore (2016), argue that tomatoes are the richest of all foods in vitamins and that unlike most vegetables they are very rich in all the three important vitamins (A, B and C). The nutrition loss that occurs due to food loss deprives citizens of the highly needed nutrients.

With the Recommended Daily Dietary Allowance (RDA) of 37g and 29g of proteins for an adult man and adult woman, respectively, the total amount of proteins lost translates to 919 and 1,173 adult men and women, respectively, being deprived of proteins for the whole year. The RDA for Vitamin A is 750µg for either men or women. The huge quantities of Vitamin A lost is an equivalent of the annual requirement to feed 10,868 people.

Conclusion

Fresh vegetables followed by tomatoes are the most popular major products on farms in Lusaka City Food Region. The food loss is highest in the fresh vegetables value chain whereas tomatoes have the highest amount of food loss. The high nutrition loss in tomatoes suggest that they are the most nutrient-dense of all the food under consideration. Nutrition loss is depriving some people of the much needed nutrients to help them enjoy good health. Therefore, there is need for the government to come up with strategies that shall help reduce on food loss in Lusaka city and beyond.

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