POM642

Sustainable Supply Chain Management and Logistics

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1. Question and sustainability objective.

Objective:

Explore why and how food gets wasted, including looking at food labels and where the food comes from. The goal is to help businesses and others in the food industry find ways to reduce waste and encourage more sustainable practices.

Research Questions:

1. **Do wasted foods have or don't have Organic on the Label?**
- **Objective**: Investigate the correlation between the presence of organic labels on food items and the likelihood of those items being wasted.
- **Rationale**: Understanding whether organic labeling influences food waste can guide businesses in adjusting marketing strategies or supply chain practices to align with consumer preferences and reduce waste.

2. **Does the source and food type play a role in if the food is wasted?**
- **Objective:** Examine the impact of both the source (where the food comes from) and the type of food on the likelihood of wastage.
- **Rationale:** By identifying specific sources or types of food associated with higher waste rates, businesses can tailor their sourcing and inventory management practices to minimize waste and enhance sustainability.

Sustainability Objective:

The sustainability objective is multifaceted:

1. **Reduction of Food Waste:**

- **Goal**: Identify key factors contributing to food waste, enabling businesses to implement targeted strategies for waste reduction.

- **Importance:** Minimizing food waste not only aligns with environmental sustainability goals by reducing the ecological footprint of the food industry but also enhances economic sustainability by optimizing resource use.

2. **Promotion of Sustainable Practices:**

- **Goal:** Encourage the adoption of sustainable practices throughout the food supply chain.

- **Importance:** Sustainability goes beyond waste reduction and encompasses ethical sourcing, responsible production, and environmentally friendly practices. Promoting sustainability in the food industry supports long-term viability.

3. **Consumer Education and Engagement:**

- **Goal**: Educate consumers about the impact of their choices on food waste and sustainability.

- **Importance**: Informed consumers can drive demand for sustainable products and practices. Education empowers individuals to make choices that align with broader sustainability objectives.

4. **Collaboration Across the Supply Chain:**

- **Goal**: Foster collaboration between different stakeholders in the food industry.

- **Importance**: Achieving sustainability goals requires coordinated efforts across the supply chain. Collaboration facilitates the exchange of best practices, innovation, and the development of holistic solutions.

5. **Data-Driven Decision-Making:**

- **Goal**: Promote the use of data analytics to inform decision-making in the food industry.

- **Importance:** Leveraging data allows businesses to make informed choices regarding inventory management, sourcing, and marketing, leading to more efficient and sustainable operations.

In summary, the research questions aim to uncover specific aspects of food waste, while the sustainability objective outlines the broader goals of the study, emphasizing the importance of reducing waste and fostering sustainable practices throughout the food supply chain.

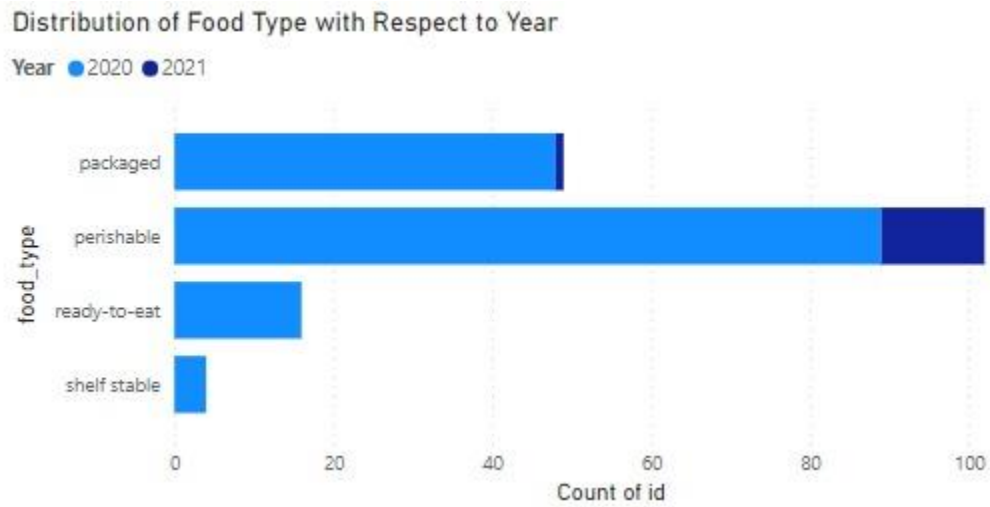**2. EDA and Data Interpretation:**

1.

Distribution of Food Type
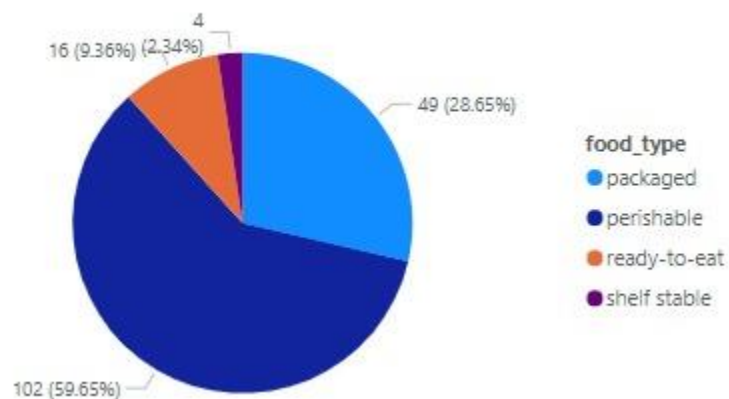
Interpretation:

This analyzation shows all the food types mentioned in the dataset and depicts that pershiable food is being waste more followed by packaged food
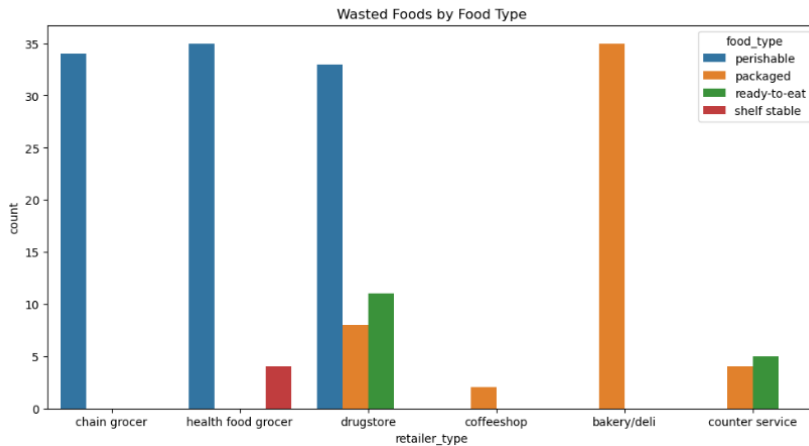
2.

Distribution of Food Type with Respect to Year

Year ● 2020 ● 2021

Interpretation:

The above visualization depicts the year 2020 in light blue and 2021 in dark blue. The x-axis has count of id and y-axis shows food type. It interprets that most amount of food was wasted in the year 2020 and it is perishable type, followed by packaged.

3.

Wasted Foods by Food Type

Interpretation:

Similar to the first graph, this one focuses on the distribution of wasted foods across various sources (types of retailers). Each bar represents a different retailer type, and the stacked bars show the count of wasted foods, differentiated by food type. It helps to identify the composition of wasted foods within each retailer type.

3. I considered two hypothesis situations here and they are as follows:

1. **Organic Label and Food Waste:**

- **Null Hypothesis (H0):** There is no significant association between wasted foods and having an "Organic" label.

- **Alternative Hypothesis (H1):** There is a significant association between wasted foods and having an "Organic" label.

The p-value obtained from the chi-square test is approximately 4.64e-20, which is much less than the significance level (alpha = 0.05). Therefore, you reject the null hypothesis. This suggests that there is a significant association between wasted foods and having an "Organic" label.

Interpretation:

The low p-value indicates that there is a significant relationship between the 'food_type' and 'food_detail' variables. In other words, the type of food appears to be associated with specific details related to that food.

Question 2: Does the source and food type play a role in if the food is wasted?

Answer: Phrasing hypotheses in a report is a crucial step, as it sets the stage for the analysis and communicates the research questions.

Hypotheses:

1. For the Association between 'food_type' and 'retailer_type':

•Null Hypothesis (H0): There is no significant association between the type of food ('food_type') and the retailer type.

•Alternative Hypothesis (H1): There is a significant association between the type of food ('food_wasted') and the retailer type.

2. For the Association between 'food_type and 'food_detail':

•Null Hypothesis (H0): There is no significant association between the type of food ('food_type') and the specific details of the food.

•Alternative Hypothesis (H1): There is a significant association between the type of food ('food_type') and the specific details of the food.

Interpretation:

If the p-value for the chi-square test for 'retailer_type' is less than the chosen significance level (commonly 0.05), the null hypothesis would be rejected. This would suggest that there is evidence of a significant association between the type of food and the retailer type.

Similarly, if the p-value for the chi-square test for 'food_detail' is less than the chosen significance level, you would reject the null hypothesis, indicating evidence of a significant association between the type of food and the specific details of the food.

The null hypothesis typically posits no effect or no association, and the alternative hypothesis suggests the presence of an effect or association. The interpretation of the p-value is key: a low

p-value (typically less than 0.05) suggests that the observed association is unlikely to be due to random chance alone.

Sustainable Supply Chain Recommendations:

1. Organic Label and Food Waste:

Recommendation: Given the significant association between wasted foods and having an "Organic" label, businesses should consider optimizing their organic product inventory. This could involve adjusting procurement practices, improving demand forecasting, or implementing marketing strategies to reduce organic product waste.

2. Source and Food Type in Food Waste:

Recommendation for 'retailer_type': Businesses should collaborate with different types of retailers to tailor inventory management strategies. For instance, understanding that certain types of retailers contribute more to food waste can guide collaborative efforts to optimize supply chain practices.

Recommendation for 'food_detail': Tailor inventory and production strategies based on the type of food. For example, if specific food items are consistently associated with higher waste, suppliers and retailers can work together to optimize order quantities and production schedules.

3. Collaboration Across the Supply Chain:

- **Objective:** Foster collaboration among retailers, suppliers, and distributors.

- **Implementation:** Establish regular communication channels and collaborative platforms where stakeholders can share insights, challenges, and best practices. Encourage joint planning sessions to develop strategies that minimize food waste collectively.

4. Data-Driven Inventory Management:

- **Objective:** Implement data-driven inventory management for optimized stock levels.

- **Implementation:** Integrate real-time data analytics into inventory management systems. Utilize technologies like RFID, IoT sensors, and advanced analytics to monitor stock levels, track product shelf life, and make informed decisions about procurement, distribution, and product placement.

5. Educate Stakeholders:

- **Objective:** Raise awareness about the impact of food waste.

- **Implementation:** Develop educational programs for retailers, suppliers, and consumers. Highlight the environmental and economic consequences of food waste. Provide training on best practices for handling, storing, and managing inventory efficiently. Engage consumers through marketing campaigns to promote responsible consumption.

6. Continuous Monitoring and Improvement:

- **Objective:** Establish a system for continuous improvement.

- **Implementation**: Implement Key Performance Indicators (KPIs) related to food waste reduction. Regularly monitor and evaluate supply chain practices against these KPIs. Use feedback mechanisms to identify areas for improvement. Foster a culture of continuous improvement by encouraging feedback and adapting strategies based on changing conditions.

7. **Sustainable Packaging:**

- **Objective**: Explore sustainable packaging options.
- **Implementation**: Research and adopt eco-friendly packaging materials that enhance product shelf life. Consider innovations such as biodegradable packaging, compostable materials, and recyclable options. Collaborate with packaging suppliers to find solutions that align with sustainability goals.

These recommendations collectively aim to create a sustainable supply chain by fostering collaboration, leveraging data for informed decision-making, raising awareness, ensuring continuous improvement, and adopting environmentally friendly packaging practices. They contribute to reducing food waste and promoting efficiency throughout the supply chain.

Resources:

- "Food waste statistics": https://www.epa.gov/sustainable-management-food
- "Causes of food waste": https://www.wri.org/insights/whats-food-loss-and-waste-got-do-climate-change-lot-actually
- "Reducing food waste": https://www.epa.gov/sustainable-management-food
- "Sustainable food supply chains": https://sustainabledevelopment.un.org/topics/foodagriculture
- "Food waste initiatives": https://www.un.org/en/un-chronicle/we-can-all-help-reduce-food-loss-and-waste