Objectives

Goals

The prices of food in Canada has changed over the years. The ojective of this study is to investigate the trend of the changes in food prices in Canada over the years, exploring if Covid-19 had any effect on the change, and what the possible contributor in the changes of food prices.

Hypothesis

The assumption for this study is that food price has changed due to several factors such as season, location, labor cost, gasoline cost, change of consumer behavior etc.

In order to understand the consumer behavior, Consumer Price Index (CPI) and CPI variations over the years and the changes in retail prices of different food categories are employed in this study.

Data Preparation:

Data Source

The used is this study is publicly available on Statistics Canada (https://www.statcan.gc.ca/en/start).

The following data were used for the analysis-

a. Retail food prices (2017 to 2024)
b. Consumer Price Index (1995 to 2024)
c. Retail e-commerce sales (2017 to 2022)

Data Qualtiy

Given that the data was publicly available from the ministry, the data source is considered reliable. All data was downloaded as .csv format for analysis. All data were imported, cleaned and loaded into Jupyter Notebook using Python programming.

Tools Used

After the data import, dataframes were created using Pandas and Numpy was used for mathematical processing, matplotlib was used for visualization. Each dataframe were carefully checked for missing data, null-cells, date/time formatting before continuing any analysis. After the preliminary exploration, the data quality was found to be satisfactory.

Challenges

A few challenges while preparing the dataframe are listed below-

a. Dates were not in the date/timestamp format, which made it difficult to manipulate the data for grouping and plotting figures.

b.   Retail food prices data contained product description in a (product description, unit) format. Which needed to be split into another column to separate the units. Additionally, the unit prices were inconsistent for a few cases (e.g., price of potatoes 'per kilogram' and 'per 454 gm' etc.). Thos per unit prices were converted into uniform unit (e.g., per kilogram).

c.   There were several unnecessary columns in each dataframe, which were dropped to keep the dataframe easy to work around.

d.   Dates were in monthly format, which made the x-axis labels cumbersome. Hence, processing the x-axis to display in yearly format was challenging at first.

e.   The CPI data is in per month of each year. Calculating YoY %CPI for each year and for each product/ food item was challenging. But, it was done eventually using 'shift' in pandas.

Analysis:

Consumer Price Index (CPI):

The Consumer Price Index (CPI) is an indicator of changes in consumer prices experienced by consumers. It is obtained by comparing, over time, the cost of a fixed basket of goods and services purchased by consumers. The CPI is widely used as an indicator of the change in the general level of consumer prices or the rate of inflation (Source: Bank of Canada).

The Consumer Price Index (CPI) can be used as an indirect indicator of changes in consumer behavior over the years. While CPI primarily measures price changes over time, it can reveal shifts in spending patterns and priorities. For example, an increased CPI for healthy food products might indicate growing consumer interest in healthier lifestyles.

From the substitution effect of CPI, consumer behavior can be observed. Such as, if prices of certain items increase (e.g., Eggs), consumers may switch to alternatives (e.g., plant protein). Changes in the composition of CPI weights or specific item demand indicate consumer adaptation to price shifts. Tracking individual categories (e.g., different types of food) over time can show changes in spending priorities. Stable or declining CPI for tobacco products may suggest reduced consumption due to health awareness. CPI data by province or region highlights localized consumer behavior.

The CPI uses data from the most recent national Household Final Consumption Expenditure series, the Survey of Household Spending and alternative data sources to calculate the proportions of various items in the CPI basket of goods and services which represent the total expenditures of the average Canadian consumer.

Basket weights were derived primarily using consumer expenditures since 1995. Below are the eight major components of CPI:

- o Food;
- o Shelter;
- o Household operations, furnishings and equipment;
- o Clothing and footwear;
- o Transportation;
- o Health and personal care;
- o Recreation, education and reading;
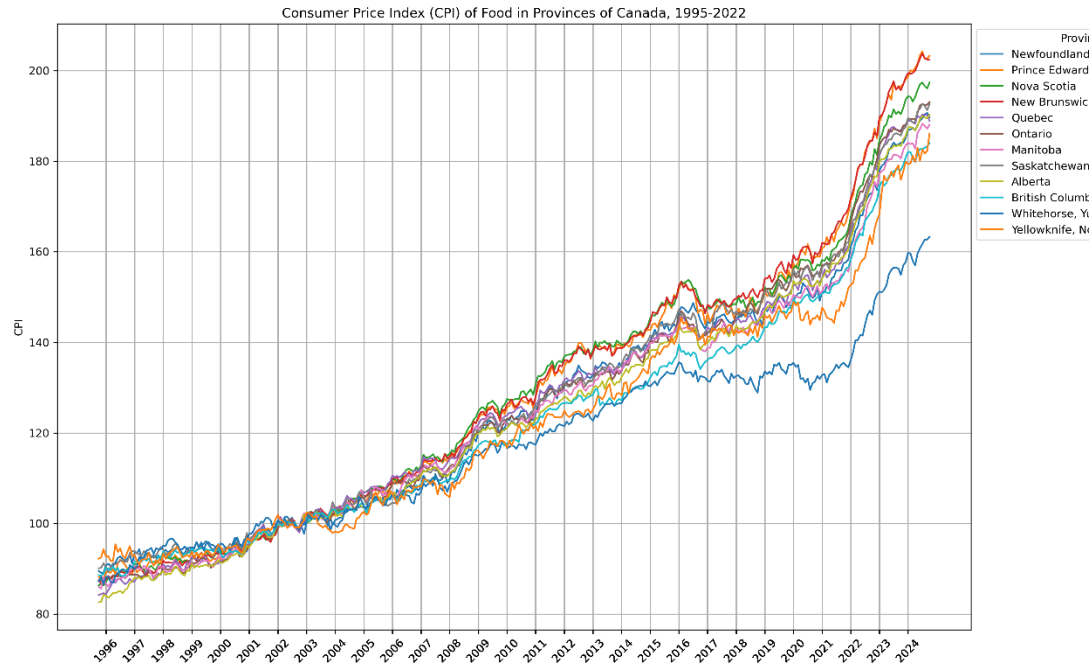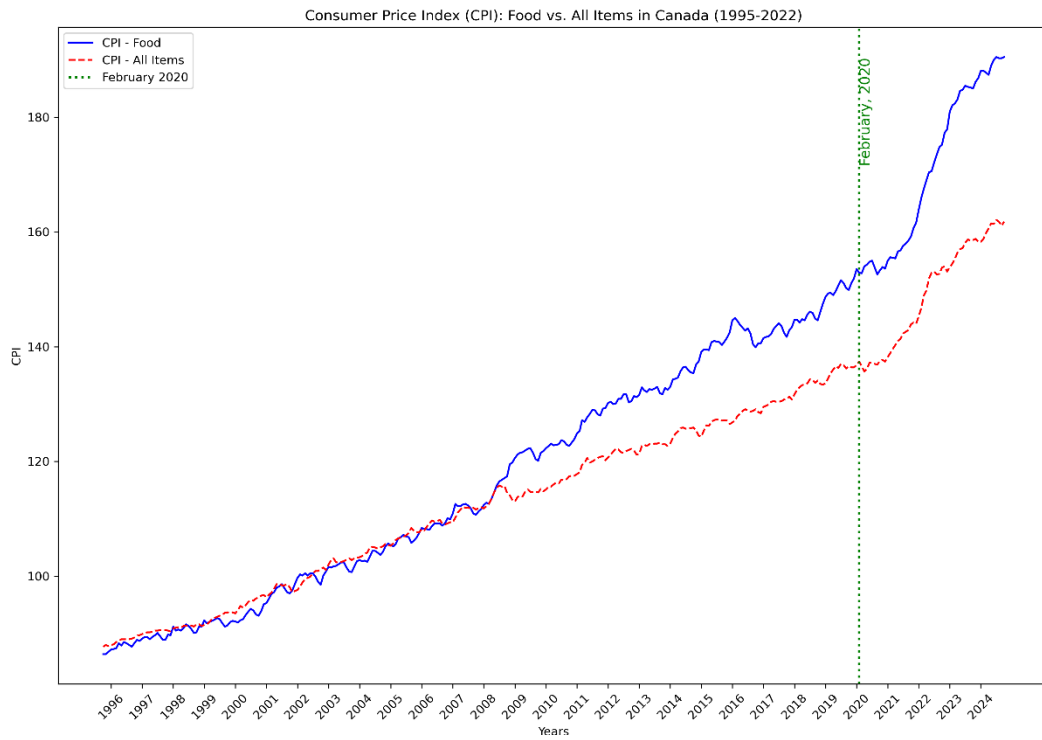- o Alcohol beverages, tobacco products and recreational cannabis.

In this study, only focus was given to the CPI evolution of food in Canada.

CPI of Food vs. All Items

The data contains monthly CPI from 1995 to 2024. The red dotted line represents the CPI of all-items (eight major components), and the blue line represents the CPI of food only. It is evident that the CPI of both increased almost at the same rate since 1995 till 2009, from where the CPI of the food increased drastically till now. Even though there was a slow-down portion around the 2020 year, the CPI still kept increasing.

CPI of Food in All Provinces

If the CPI of food is compared among the provincial data, a similar increasing trend can be seen. However, New Brunswick and King Edward Island showed the higher CPI, whereas, Whitehorse in Yukon decreased quite a bit in 2016 and kept the CPI steady till 2020. After 2020, there was a sudden drop which picked up from 2022.

Consumer Price Index (CPI): Food vs. All Items in Canada (1995-2022)

Consumer Price Index (CPI) of Food in Provinces of Canada, 1995-2022

YoY % CPI of Food in Canada

Many factors are contributing to food inflation, including supply chain disruptions, erratic weather, labour shortages and wage pressures, rising prices for farm input etc.

The year-over-year (YoY) percentage change in the price of food on a monthly basis and the YoY percentage change in consumer prices excluding food on a monthly basis. The y-axis shows the percentage change in prices, from a minimum of -8.0% to a maximum of 22.0.
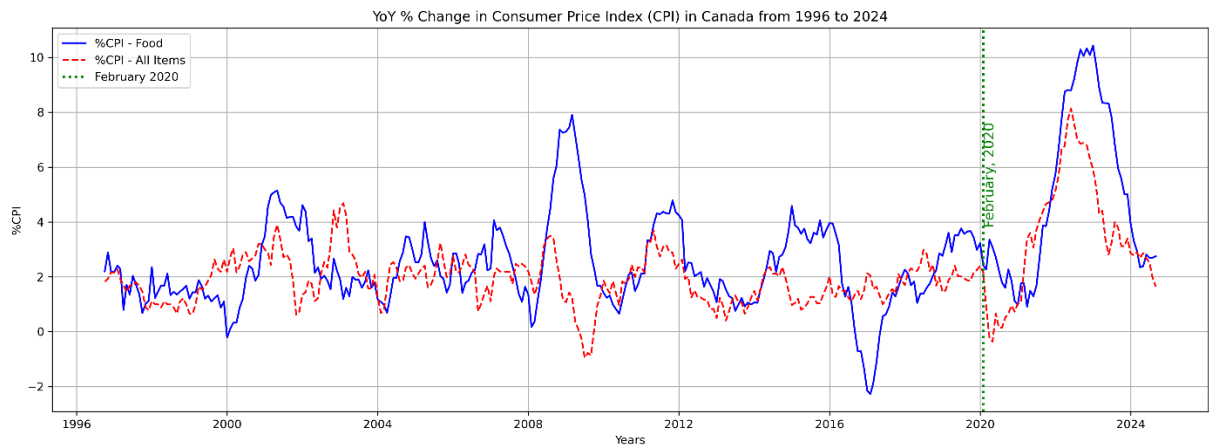

YoY % CPI by Different Food Type

The figure shows the YoY %CPI change from 2019 to 2022 for different food types. The February 2020 mark indicates the Covid-19 timeline. A clear decrease in Fruits and nuts products can be seen during the Covid-19 period. An increase can be observed for meat consumption and dairy products. A drastic drop in vegetables can also be seen during the covid-19 period. This might reflect the fact that consumers were more reliant on protein and dairy products as those food type could be deemed as safe due to the fact that they are cooked in high temperatures. Whereas, the raw fruits and vegetables could have been associated with contamination, hence, consumers were averse to purchase those type of food during the pandemic.

YoY % Change in Consumer Price Index (CPI) by Product Group (2019-2022)
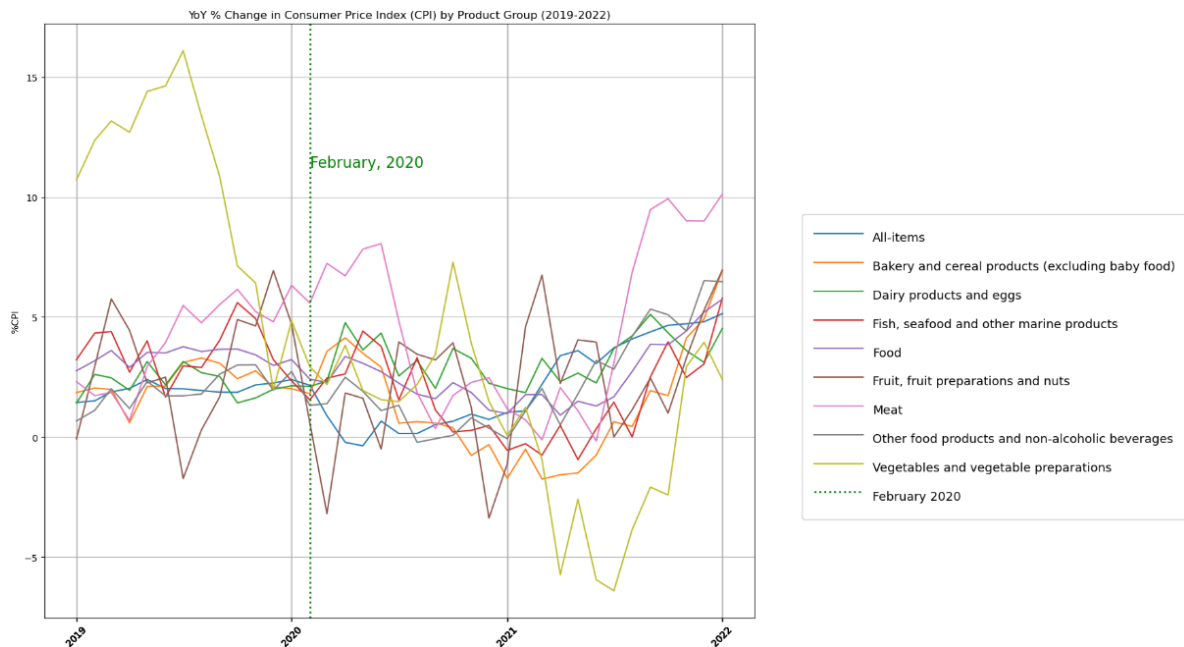
Retail e-commerce sales

The monthly Retail Trade Survey by Statistic Canada published that the e-commerce vs. in-store retail sales increased drastically after the pandemic, which still continues to this day. This data reflects a shift in consumer behavior in general due to the effect of the pandemic.


E-Commerce vs In-Store Sales

https://www150.statcan.gc.ca/n1/pub/11-621-m/11-621-m2023002-eng.html
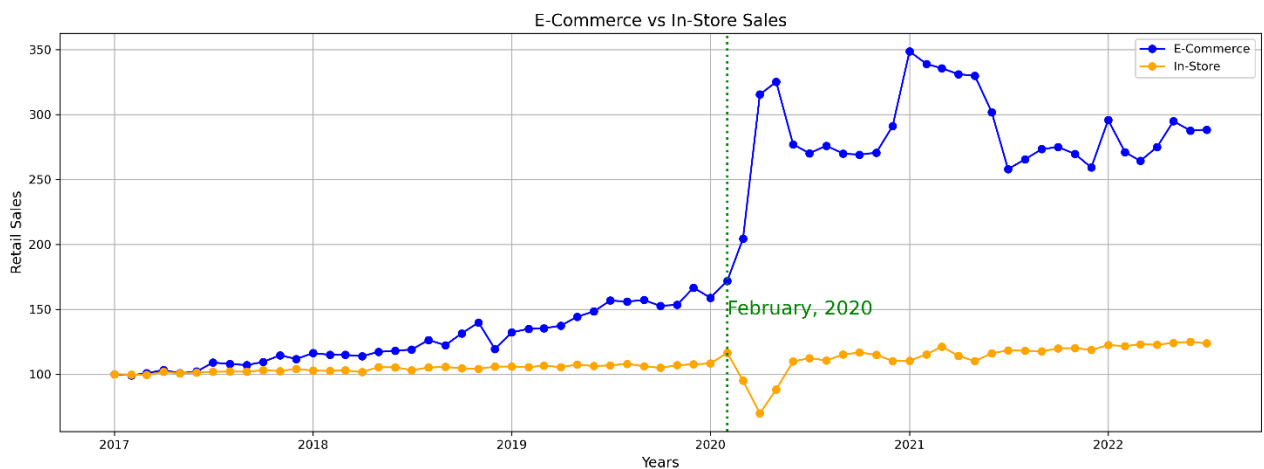
Before and After Effects of Covid-19

Retail prices of Meat Products

Looking at the retail sales over the year by the food categories and the CPI changes will give a better understanding of the consumer behavior change. The following figure shows the retails sale prices of meat products from 2018 to 2024. The timeframe is narrowed down to observe the difference of before and after the pandemic. It is evident that the meat consumption has increased since 2018, even the pandemic did not reduce the sales. Some of the products has higher price increase than others, i.e., beef compared to chicken.

Retail Food Prices of meat (2018-2024)
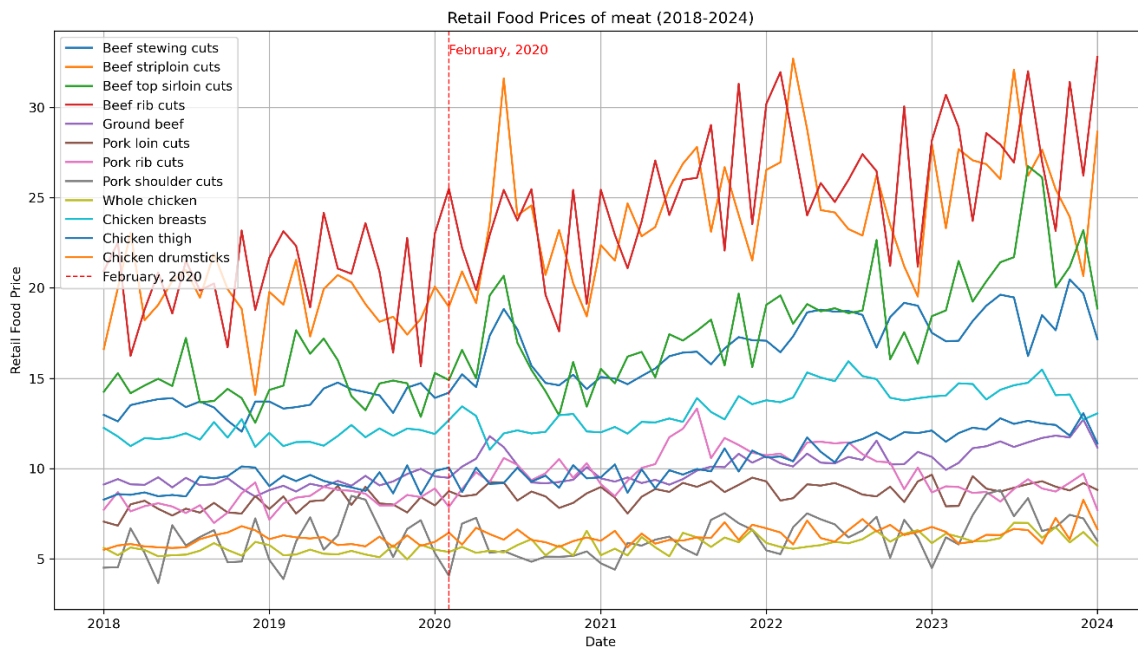
Retail prices of Fish Products

The prices of fish products remained pretty steady during the pandemic and began to rise after 2022. However, canned tuna had a small spike during the pandemic.

Retail Food Prices of fish (2018-2024)
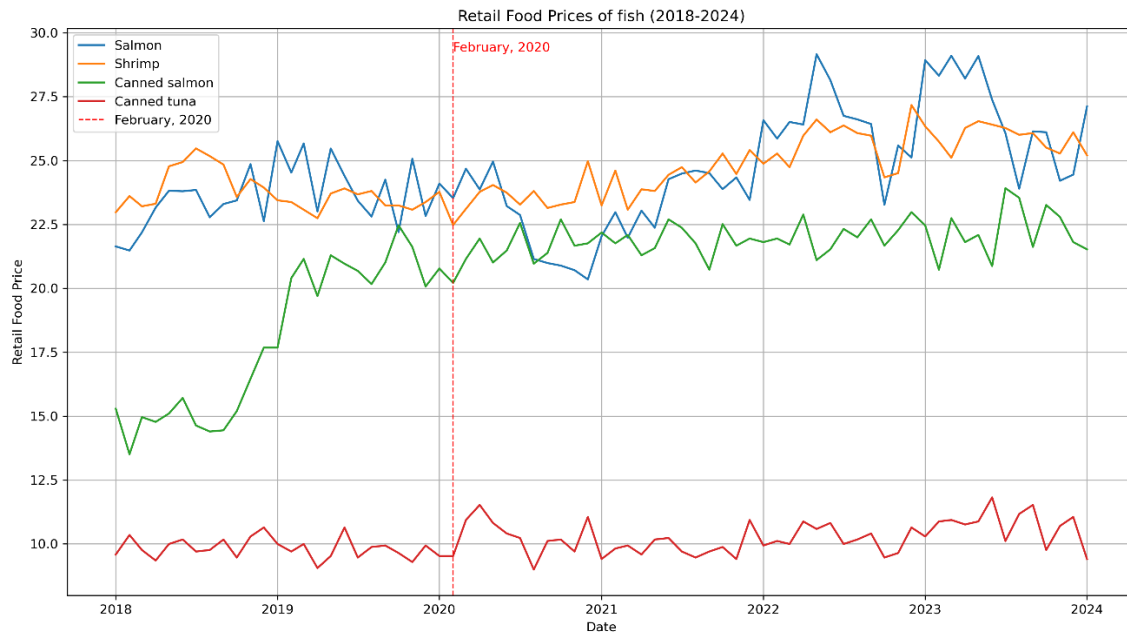
Retail prices of Fruits

A significant drop can be seen for more or less every fruit during the pandemic. However, in case of strawberries, grapes, cantaloupes and oranges had an increase in price right after the pandemic.

Retail Food Prices of Fruits (2018-2024)
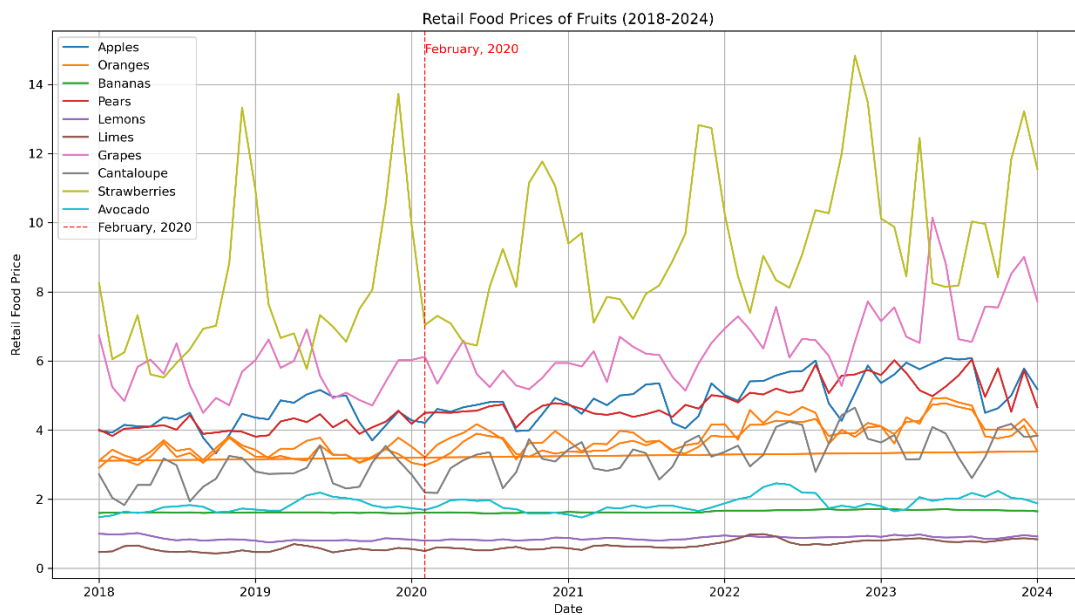
Retail prices of Vegetables

Similar to fruits, vegetables' prices either dropped or remained the same during the pandemic. This is a major contrast with the meat products. From the plot it can be seen that the retail prices has not increased significantly even in 2024, expect for the salad greens.

Retail Price of Vegetables by Product (2018-2024)