CLIMATE CHANGE DUE TO AGRICULTURAL FACTORS

ANALYSIS BASED ON WORLD BANK DATA

GitHub repo Link: https://github.com/sahana248/climate_change.git

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ABSTRACT

Agriculture is a field which is both affected due to climate change and contributes to climate change. Food is a basic need of human; with growing population the demand also increases. At every step, starting from cultivation till the time it reaches our plate, food production results in producing greenhouse gases. The two main greenhouse gases produced due to agricultural activities are methane and nitrous oxide. Methane is produced by livestock during digestion due to enteric fermentation. It can also escape from stored manure and organic waste in landfills. Nitrous oxide emissions are an indirect product of organic and mineral nitrogen fertilisers. According to studies, agriculture contributed almost 10 percent of the greenhouse gases produced in Europe. This number then faced a one-fourth drop from 1990 to 2012 because of better manure management and reducing the number of livestock.

In this report we will be analysing the production of methane and nitrous oxide due to agricultural activities in the developed countries. For this, we are taking a group of countries known as the G7 (Canada, France, Germany, Italy, Japan, UK, USA). G7 nations are the seven leading industrial countries in the world (it was called G8 until the removal of Russia in the year 2014).

ANALYSIS

The following factors were considered to understand the impact of climate change: Urban Population, Fertilizer consumption, Agricultural N_2O emission, Agricultural methane emission, agriculture land area.

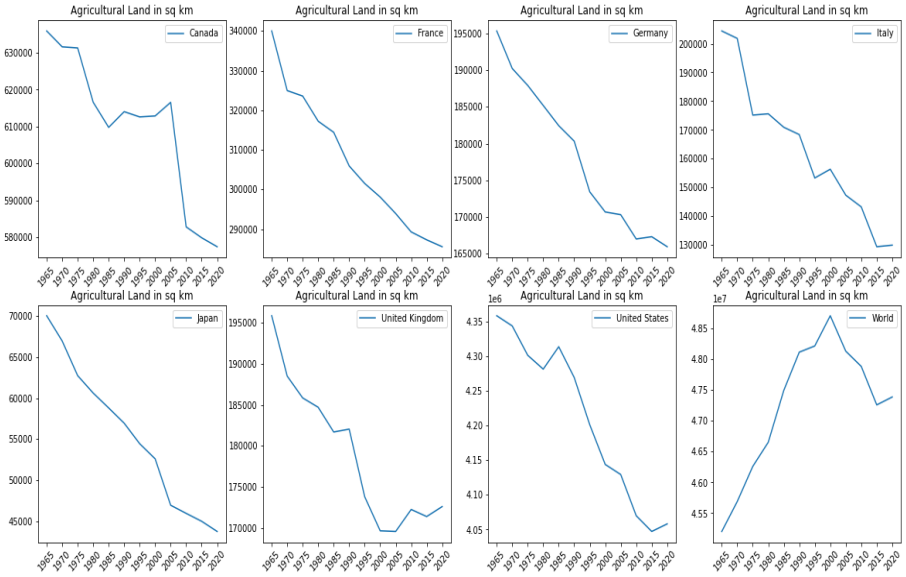

Figure 1: Agricultural Land in sq. km between 1965- 2020 in G7 nations

Country Name	Change in land area
Canada	18067.74
France	17752.12
Germany	10047.67
Italy	23597.34
Japan	8755.49
United Kingdom	8576.22
United States	119625.00
World	1140801.00

Table 1: Change in Agricultural area

When we compare the area of agricultural land in the above-mentioned countries, we can note that there is an overall decrease in the numbers for all the G7 nations, whereas the numbers have increased all over the world. The table shows the average change in area each year starting from 1965 to 2020.

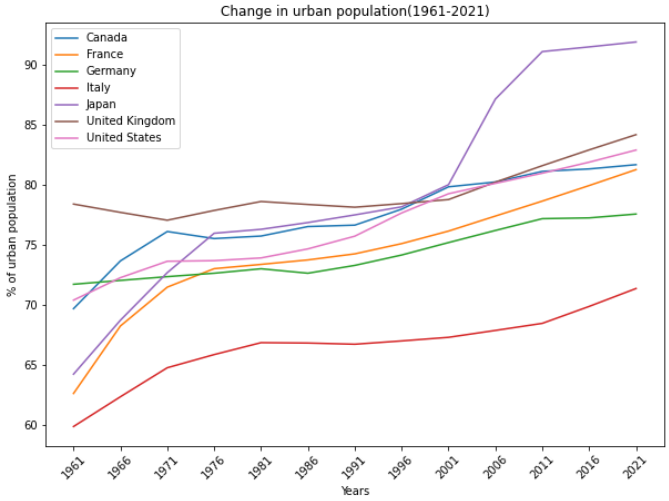

Figure 2: Percent of Urban population between 1961- 2021

From the graph plotted between the percentage of urban population from 1961 to 2021, we can observe that there is an overall increase in the percentage of Urban population. Increase in the urban population is an important indicator to understand the development of a country. Here we can see that in Japan the percentage is nearing 100, in Canada, Italy and US there is a change of 11 to 12%, whereas Germany and UK have the least change of 6 to 7 %. From figure 1 and 2, we can understand that due to economic growth and urbanisation in these countries the agricultural land area has declined and the urban population has increased.

Figure 3 and 4 are the amount of N_2O and methane emitted due to agricultural activities. Both nitrous oxide and methane are greenhouse gases responsible for climate change. Interestingly, agricultural emissions of N_2O in the U.S. account for nearly 80 percent of the total human emissions of this gas. Nitrous oxide is mainly produced to excessive usage of fertilisers and improper management of manure. On the other hand, agricultural methane emission contributes nearly 32% of human-caused methane emission. This is produced mainly from manure and gastroenteric releases of livestock. From the graphs we can understand that the amount of methane and N_2O emission has not changed much over the decades. There is slight drop in the amount of methane produced in all the countries, except for Canada, where the numbers slightly increased during the 2000's and again dropped back in the 2010's.

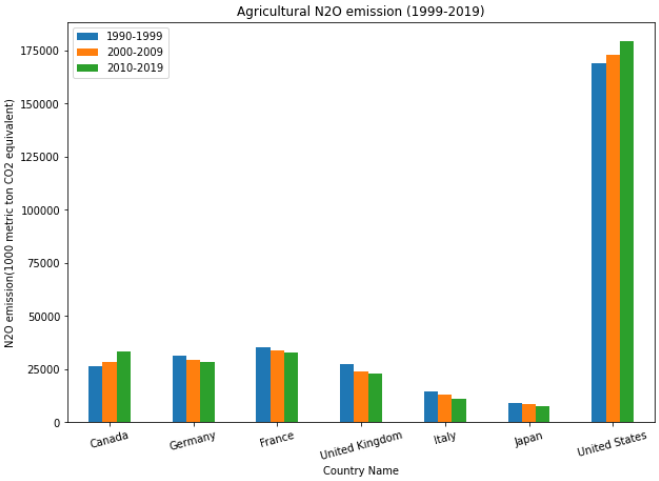

Figure 3: Agricultural N_2O emission between 1990- 2019

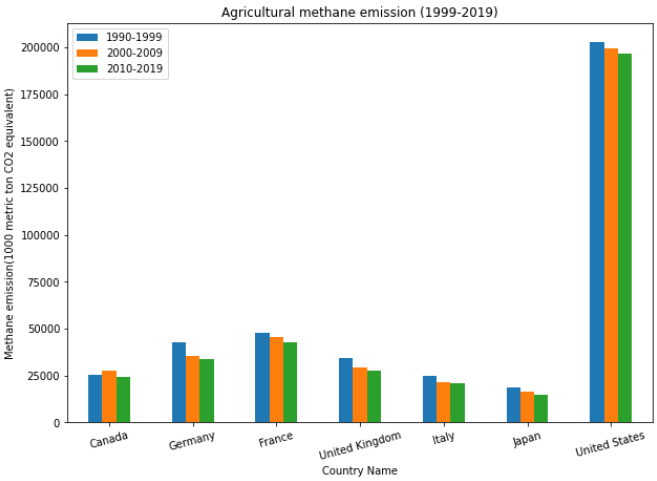

Figure 4: Agricultural methane emission between 1990- 2019

From figure 3, it can be seen that the amount of nitrous oxide produced has dropped in all the European countries and Japan. But there is a slight increase in the amount of methane emitted, both in Canada and the US over the years. Despite the increase in urban population (figure 2), we can still see that there is a drop in the amount of methane or nitrous oxide produced in all the countries considered here. This may be due to the effective handling of fertilisers usage and manure management.

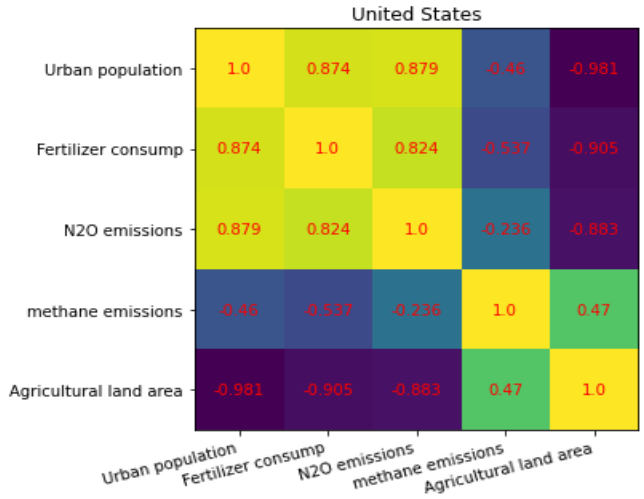

Figure 5: Heatmap of United states

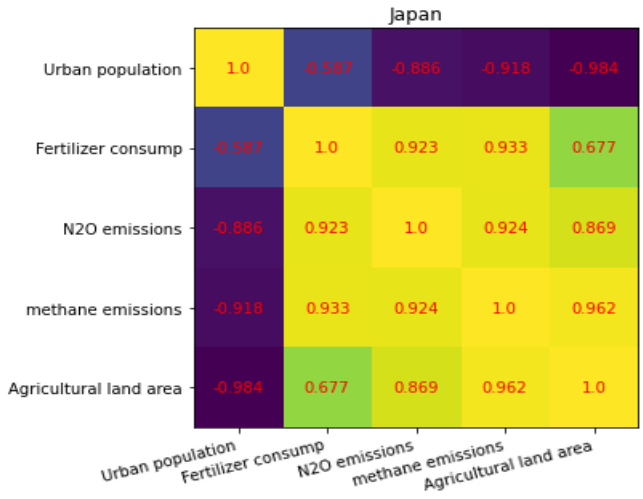

Figure 6: Heatmap of Japan

From the heat map of United states (figure 5), we can see that change in Urban population is somewhat related to nitrous oxide emission and fertiliser consumption. Whereas the agricultural land area is inversely correlated to the urban population. From this it can be inferred that increase in urban population paired with decrease in agriculture land area has resulted in slight increase of fertiliser consumption thus increasing the production of N_2O.

From the heat map of Japan (figure 6), we can see that similar to US the increase in urban population is inversely affecting the agricultural land area, also the methane and N_2O emission are being inversely affected by population. Also, the consumption of fertilisers and agricultural land area are positively correlated to the emission of the greenhouse gases. The growth of urban population doesn't seem to have any effect on the consumption of fertilisers.

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