# FertiliserConsumption_Pakistan

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## 1 Participant

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## 2 Introduction

The report analysis the consumption of fertilser in Pakistan as neutrients mainly nitrogen, phosphate and potash.

## 3 Data Collection

The data in this case study is collected from Food and Agriculture Organisation (FAO). For easiness of readers some data from the data set is shown below whereas the dataset can be downloaded from here.

```python
import seaborn as sns
import numpy
import matplotlib.pyplot as plt
import pandas as pd
```

```python
FertiliserData=pd.read_csv("FAOSTAT_data_1-13-2022.csv")
FertiliserData
FertiliserData.head(10)
```

```
   Domain Code                  Domain  Area Code      Area  Element Code  \
0          RFN  Fertilizers by Nutrient        165  Pakistan          5157
1          RFN  Fertilizers by Nutrient        165  Pakistan          5157
2          RFN  Fertilizers by Nutrient        165  Pakistan          5157
3          RFN  Fertilizers by Nutrient        165  Pakistan          5157
4          RFN  Fertilizers by Nutrient        165  Pakistan          5157
5          RFN  Fertilizers by Nutrient        165  Pakistan          5157
6          RFN  Fertilizers by Nutrient        165  Pakistan          5157
7          RFN  Fertilizers by Nutrient        165  Pakistan          5157
8          RFN  Fertilizers by Nutrient        165  Pakistan          5157
9          RFN  Fertilizers by Nutrient        165  Pakistan          5157
```

```
        Element  Item Code                              Item  Year Code  \
0  Agricultural Use       3102        Nutrient nitrogen N (total)       1961
1  Agricultural Use       3103  Nutrient phosphate P2O5 (total)       1961
2  Agricultural Use       3103  Nutrient phosphate P2O5 (total)       1962
3  Agricultural Use       3102        Nutrient nitrogen N (total)       1962
4  Agricultural Use       3102        Nutrient nitrogen N (total)       1963
5  Agricultural Use       3103  Nutrient phosphate P2O5 (total)       1963
6  Agricultural Use       3103  Nutrient phosphate P2O5 (total)       1964
7  Agricultural Use       3102        Nutrient nitrogen N (total)       1964
8  Agricultural Use       3102        Nutrient nitrogen N (total)       1965
9  Agricultural Use       3103  Nutrient phosphate P2O5 (total)       1965

   Year    Unit  Value (tonnes) Flag  \
0  1961  tonnes           41659   Qm
1  1961  tonnes             500   Qm
2  1962  tonnes             210   Qm
3  1962  tonnes           41160   Qm
4  1963  tonnes           67620   Qm
5  1963  tonnes             630   Qm
6  1964  tonnes            1029   Qm
7  1964  tonnes           84147   Qm
8  1965  tonnes           69242   Qm
9  1965  tonnes            1245   Qm

                                  Flag Description
0  Official data from questionnaires and/or natio…
1  Official data from questionnaires and/or natio…
2  Official data from questionnaires and/or natio…
3  Official data from questionnaires and/or natio…
4  Official data from questionnaires and/or natio…
5  Official data from questionnaires and/or natio…
6  Official data from questionnaires and/or natio…
7  Official data from questionnaires and/or natio…
8  Official data from questionnaires and/or natio…
9  Official data from questionnaires and/or natio…
```

# 4 Data Significance

```
[ ]: FertiliserData.value_counts(["Item"])
```

```
[ ]: Item
     Nutrient nitrogen N (total)        59
     Nutrient phosphate P2O5 (total)    59
     Nutrient potash K2O (total)        54
     dtype: int64
```

Considering the main dataset the above data reveals the number of years for which the data was collected for the given data set. It can be seen the dataset includes N and P205 data for 59 years and for K20 for 54 years from 1961 to 2019. Thus the data is quantitatively strong enough to provide good results.

## 4.1 Summary of Data

```
[ ]: FertiliserData.describe()
```

```
[ ]:        Area Code  Element Code    Item Code    Year Code          Year  \
     count      172.0         172.0   172.000000   172.000000    172.000000
     mean       165.0        5157.0  3102.970930  1990.784884   1990.784884
     std          0.0           0.0     0.812385    16.678775     16.678775
     min        165.0        5157.0  3102.000000  1961.000000   1961.000000
     25%        165.0        5157.0  3102.000000  1976.750000   1976.750000
     50%        165.0        5157.0  3103.000000  1991.000000   1991.000000
     75%        165.0        5157.0  3104.000000  2005.000000   2005.000000
     max        165.0        5157.0  3104.000000  2019.000000   2019.000000

            Value (tonnes)
     count    1.720000e+02
     mean     7.064396e+05
     std      9.709749e+05
     min      1.440000e+02
     25%      2.615950e+04
     50%      2.689255e+05
     75%      9.193622e+05
     max      3.505356e+06
```

The summary of secondary data obtained from FAO given above provides idea of the data to the reader but this summary is still hard to understand for the reader not known of technical and analytical understanding. Therefore in coming sections data will be analysed and represented for both technical and non technical readers.

## 5 Data Filteration

The objective of this case study is to make the data of fertiliser consumption in neutraints understandable for the common viewer. Thus from the above dataset only highly important data is obtained while other data is filtered out.

```
[ ]: # dropping few columns and making new data
```

## 5.1

```
[ ]: FertiliserData2=FertiliserData.drop(["Domain", "Domain Code", "Area Code",⎵
     ↪"Item Code", "Element Code", "Year Code", "Unit", "Flag", "Flag⎵
     ↪Description"], axis=1)
```

```
[ ]: FertiliserData2.head()
```

```
[ ]:        Area          Element                                   Item   Year  \
     0   Pakistan  Agricultural Use      Nutrient nitrogen N (total)   1961
     1   Pakistan  Agricultural Use  Nutrient phosphate P2O5 (total)   1961
     2   Pakistan  Agricultural Use  Nutrient phosphate P2O5 (total)   1962
     3   Pakistan  Agricultural Use      Nutrient nitrogen N (total)   1962
     4   Pakistan  Agricultural Use      Nutrient nitrogen N (total)   1963

        Value (tonnes)
     0           41659
     1             500
     2             210
     3           41160
     4           67620
```

It can be seen in the above data that the technical information that is hardly understandable by the common reader is filtered out. Only the data required for making different observations is included.

## 6 Basic Statistical Analysis

## 7 Mean Values

```
[ ]: FertiliserData2.mean()
```

```
C:\Users\ABDULH~1\AppData\Local\Temp/ipykernel_8940/4286010351.py:1:
FutureWarning: Dropping of nuisance columns in DataFrame reductions (with
'numeric_only=None') is deprecated; in a future version this will raise
TypeError.  Select only valid columns before calling the reduction.
  FertiliserData2.mean()
```

```
[ ]: Year               1990.784884
     Value (tonnes)   706439.558140
     dtype: float64
```

It can be noted that the mean of year is absured as it is not needed whereas the usage of fertiliser over the years is averagely 706439.558140 tonnes irrespective of their type. For understanding data more clearly, data is provided below.

```
[ ]: FertiliserData3=FertiliserData2.groupby(["Item", "Year"]).mean()
```

```
[ ]: FertiliserData3.head(120)
```

```
[ ]:                                        Value (tonnes)
     Item                         Year
     Nutrient nitrogen N (total)  1961         41659.0
                                  1962         41160.0
                                  1963         67620.0
```

```
                                  1964            84147.0
                                  1965            69242.0
    …                                                  …
    Nutrient phosphate P2O5 (total) 2017         1257773.0
                                  2018          1257773.0
                                  2019          1099707.0
    Nutrient potash K2O (total)    1966             144.0
                                  1967             212.0

[120 rows x 1 columns]
```

The above data is more understandable as it shows the yearly average values of each fertilser consumed in nutrient separatly.

## 8  Average Fertiliser Consumption

```python
Av=FertiliserData2["Value (tonnes)"].mean()
Av
```

```
706439.5581395349
```

```python
Av_by_item=FertiliserData2.drop(["Year"], axis=1).groupby(["Item"]).mean()
Av_by_item
```

```
                                 Value (tonnes)
Item
Nutrient nitrogen N (total)        1.598544e+06
Nutrient phosphate P2O5 (total)    4.414284e+05
Nutrient potash K2O (total)        2.128265e+04
```

The above datasets reveals that averagely 706439.5581395349 tonnes of fertiliser is consumed over the years irrespective of type whereas the most consumed among them is nitrogen followed by phosphate and potash.

```python
FertiliserData4=FertiliserData2[FertiliserData2["Value (tonnes)"]>Av].
 ↪groupby(["Item", "Year"]).mean()
```

```python
FertiliserData4.value_counts(["Item"])
```

```
Item
Nutrient nitrogen N (total)       41
Nutrient phosphate P2O5 (total)   13
dtype: int64
```

The above analysis reveals that for 41 years nitrogen is consumed more than comparing to 13 years for phosphate whereas the consumption of potash has always remained below average.

# 9  Data Representation

## 9.1  Line Plot

```
[ ]: sns.lineplot(x="Year", y="Value (tonnes)", data=FertiliserData, hue="Item")
     sns.set_style("darkgrid")
     plt.title("Comparison of Fertilisers over the Years", weight="bold", size=14)
     plt.show()
```
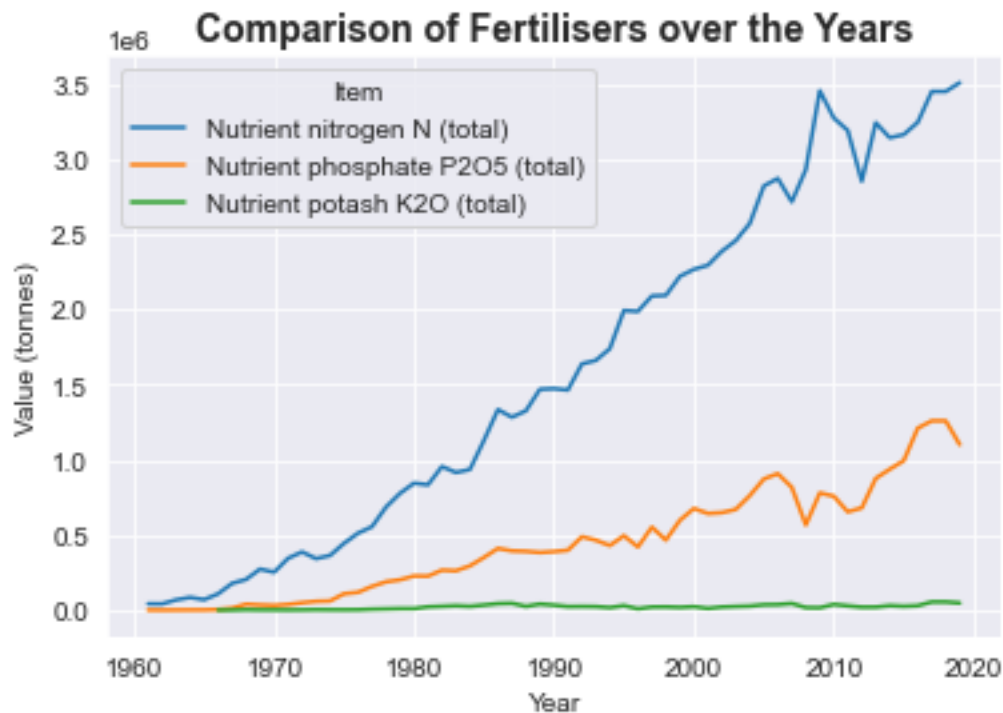


## 9.2  Box Plot

```
[ ]: sns.boxplot(x="Item", y="Value (tonnes)", data=FertiliserData)
     sns.set_style("darkgrid")
     plt.title("Comparison of Fertilisers over the Years", weight="bold", size=14)
     plt.figure(figsize=(5,5))
     plt.show()
```

**Comparison of Fertilisers over the Years**

```
<Figure size 360x360 with 0 Axes>
```
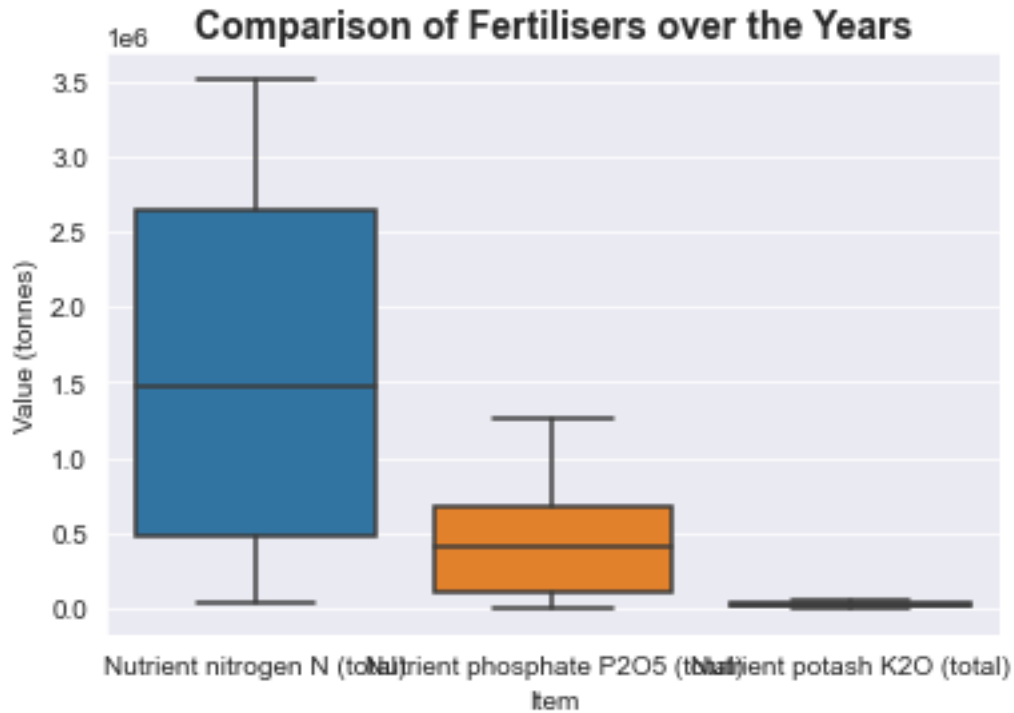
### 9.3 Interpretation

It can be seen from above line plot that consumption of the Nitrogen neutrient has remained dominant on the Phosphate and Potash in each year as well as its consumption has increased over the years. Whereas, phosphate has remained the second choice of the consumers and potash has mostly been neglected.

## 10 Conclusion

The analysis provided above reavealed that all the data in the datasets is not understandable for the viewers thus it is important to select the data that is needed. Further the dataset taken from authentic source of FAO showed that averagely 706439.558 tonnes of fertiliser is consumed for neutrients in Pakistan from 1961 to 2019. Of which, nitrogen is used most as fertiliser for neutrients with second choice of phosphate and small consumption of potash.