Understanding the effects and consequences of using fertilizers to increase the cumulative yield with the help of effective data from various fields

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Abstract- The team took hours to find a reliable source for the data required. The data was then taken from the Food and Agriculture Organization, United Nations (AQUASTAT), which is a public and reliable source. After studying and analyzing certain patterns, the team insisted on focusing primarily on ten countries, namely, Argentina, China, India, Oman, Singapore, Sweden, Switzerland, Thailand, United Arab Emirates, United Kingdom and United States of America. After receiving the data in the .csv format, the team decided to use Python, a programming language to better map the data in graphs. After spending days, the team found an algorithm and used it to make line graphs. Once the graphs were made, the team interpreted and analyzed the data thoroughly to correlate and corroborate with its aim, and finally drew some conclusions.

Index Terms- Fertilizers, Cumulative Yield, GDP, Python-based, Data research paper, AQUASTAT

I. INTRODUCTION

This research paper focuses on a aspect that governs the entire world, the problem in question being, Will the agricultural yield be able to keep up with the constantly increasing population or will we descend into a state of global anarchy. The idea of fertilizers was first introduced in the early part of 19th Century, and the results came out to be quite astonishing for we always assumed that a constant plot of land can never increase its agricultural yield. In the 21st Century, the use of fertilizers has become a common norm in every village or town, to increase the productivity of the land, and with the ever-growing industry of science and technology, the fertilizers have been modified to increase the yield from 19-76% from crop to crop.

As being brought up in a country like India, where the agriculture plays a staggering 20.2% in our GDP, making not only economic impacts, but also lasting generations through its wide cultural influences, motivated us in working towards the preservation and enhancement of the same.

With the increasing population and limited resource, we as active students, wanted to explore our agricultural sector as it has been the talk of the century, leading to create a sense of our current situation in order to contemplate our next moves, not as a state, not as a country, but as concerned-active people of this world.

II. IDENTIFYING, RESEARCHING AND COLLECTING DATAS & IDEAS

A. Putting Bits and Pieces together

While preparing for any research study, immense preparation is to be put in understanding the problem, and examining all the factors, that are to be taken into consideration, which might affect our primary objective, like a spider in a web.

Our main concern, was our sources to be reputable, while also being reliable, which is why we started scrutinizing the various .gov websites, private websites and other major data sources. While researching, we came to realize that thew Food and Agriculture Organization of the United Nations' website, could be our primary source of information because, it is a international organization which holds all census surveys and studies to corroborate data.

B. Use of Python Language

As Python is considered to be an astonishing language for Data Sciences, while also being easy to apprehend by others, we thought of using python to provide data-frames and consequently plot graphs from the data provided.

After researching on which libraries would be better suited for our research, we subsequently set out to use Pandas and Matplotlib. After receiving the data in a .csv file, we set out to create data frames, to further filter data through certain unique ids. After filtering, we sorted the data using filter for countries. Once this nerve-wracking procedure was finished in pandas, we went on to matplotlib to further set the x axis as the year, y axis as the variable, make the appropriate title, plotting legend, then saved the image using matplotlib. We then clear the plots, and put the process in a loop under loop, until the graphs are plotted.

III. GETTING PEER REVIEWED

As covid forced us to stay homes and conduct our research, we collaborated on online platform Google Meet, having intense discussions, articulate our views, further establish a perfect algorithm, while also correcting and helping those involved.

So, we did not feel the need to distribute the work amongst ourselves, but rather we had online meetings to exchange views, and understand the core problem as a team, while contributing to all and every aspect together. This ensured, that we did not need a specific peer review session – rather our whole work session was our review, analyze and correcting period.

IV. IMPROVEMENT AS PER REVIEWER COMMENTS

The improvements on the asserted reviews happened on the spot in our work sessions. We bounced off opinions, off of our teammates, and solved clashing views in the moment, which made the team insightful to the core problem, making it bond and come out stronger than before.

V. FINDINGS & CONCLUSIONS

The following findings were derived upon analyzing, interpreting and rationalizing the enormous data of the time frame 1998 - 22:

- From the information gathered, we found that in **China**, agricultural permanent land has increased, with decreasing intensity of agriculture but still an increase in Agriculture GDP and the yield is observed.
- From the information gathered, we found that in **India**, agricultural permanent land has increased, with increasing intensity of agriculture and further increase in Agriculture GDP and yield is observed.
- From the information gathered, we found that in **United Arab Emirates**, agricultural permanent land has decreased, with decreasing intensity of agriculture, while also observing a decrease in Agriculture GDP and yield.
- From the information gathered, we found that in **United States of America**, agricultural permanent land had increased till 2012 but decreased ever since, with decreasing intensity of agriculture till 2017 but increase ever since, increase in Agriculture GDP and yield till 2017, but constant ever since has been observed.
- From the information gathered, we found that in **Thailand**, agricultural permanent land has increased till 2012 but stayed constant ever since, with constant intensity of agriculture, with increase in Agriculture GDP till 2012, but constant ever since and increase in the yield, has been observed.
- From the information gathered, we found that in **Oman**, agricultural permanent land has been constant, with increasing intensity of agriculture till 2012, but decreasing ever since, with a constant in Agriculture GDP and increase in the yield is observed.
- From the information gathered, we found that in **Switzerland**, agricultural permanent land has been constant, with increasing intensity of agriculture, with Agriculture GDP staying constant, and increase in the yield is observed.
- From the information gathered, we found that in **Sweden**, agricultural permanent land has been constant, with constant intensity of agriculture till 2012 but increasing slightly ever since, with Agriculture GDP being constant and a slight increase in the yield is observed.
- From the information gathered, we found that in **Argentina**, agricultural permanent land has remained constant, with decreasing intensity of agriculture till 2012 and staying constant ever since, with an increase in Agriculture GDP till 2012 but decreasing ever since, and a constant yield is observed.
- From the information gathered, we found that in **United Kingdom**, agricultural permanent land has remained constant, with drastic increasing of intensity agriculture from 2006-12 but decreasing ever since, but still n Agriculture GDP and the yield being constant is observed.

The following conclusions were derived upon analyzing, interpreting and rationalizing the findings from the data of the time frame 1998 - 22:

- In **Asian Countries**, the agricultural land is increasing with enormous increase in Agriculture GDP and yield, from which we can conclude that the use of fertilizers has led to this increase, which has sustained not only the increasing population of these countries, but also ensuing export to other countries.
- In **Middle Eastern Countries**, the agricultural land is decreasing, with enormous decrease in Agriculture GDP and yield, from which we can conclude that the Middle Eastern Countries have barren land which is not suitable for cultivation of crops, thus they have diversified in the service sector, yet they still cultivate some permanent part of the land which has been constant over the years, but still show a significant increase in yield every year.
- In **Western Countries**, the agricultural land has remained constant to some extent, with increase in Agriculture GDP and yield, from which we can conclude that fertilizers have played a vital role in sustaining some part of the western population while also diversifying into the service sector and booming import.
- Thus, we can conclude that fertilizers have played an important role in sustaining the ever-increasing population, it has helped some countries diversify into other sectors while maintaining or even increasing the yield of their agriculture. But we are afraid of our dependencies on these very fertilizers which do increase the yield, but comes with a certain cost of air and water pollution, barren lands, and their high consumption of water.

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