

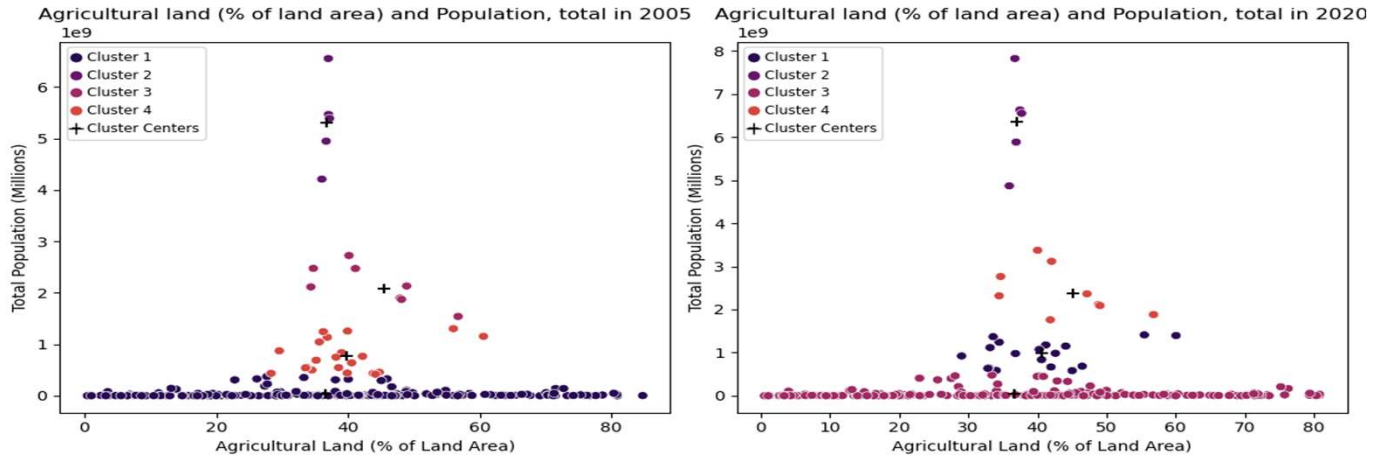
Forecasting Population and Agricultural Land Area Growth: A Data-Driven Analysis with Projections for 2025

Abstract:

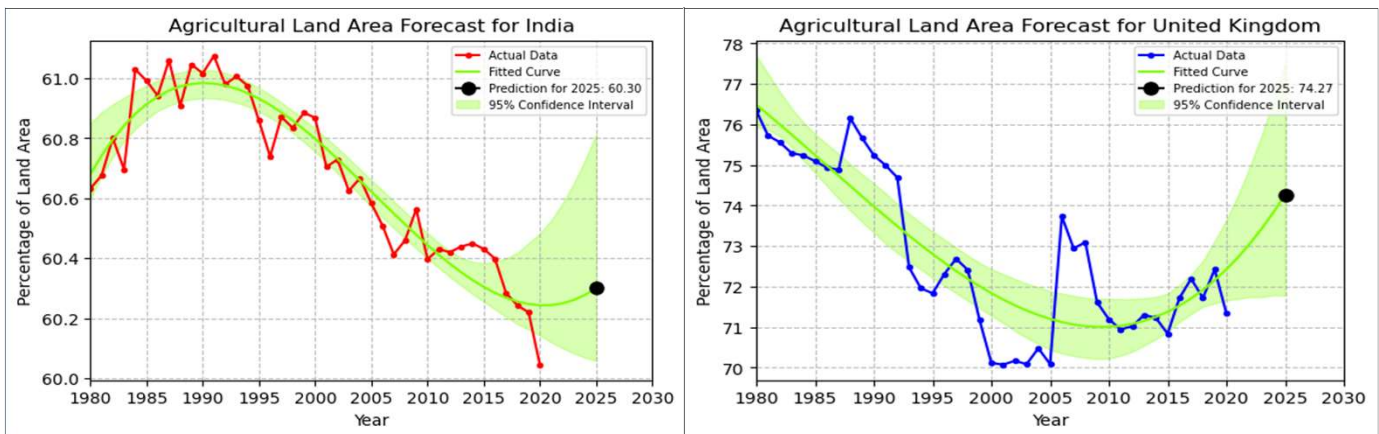
This study thoroughly investigates the correlation between the agricultural land area and total population of countries. We employ statistical methods to delve into this relationship, utilizing KMeans clustering to unveil patterns and groups, revealing distinctive trends. Furthermore, we apply polynomial regression to predict agricultural land area for individual countries. These statistical approaches enhance our comprehension of the data, offering valuable insights into the interconnection of agricultural practices and population dynamics. The visualized results provide a nuanced perspective, facilitating strategic decision-making in the realms of agricultural and demographic planning.

Introduction:

This extensive study investigates the intricate correlation between agricultural land area and total population globally, utilizing advanced statistical methods like KMeans clustering and polynomial regression. Individual country analyses, particularly focusing on India and the UK, uncover evolving dynamics influenced by factors such as urbanization, industrialization, and climate change. Through detailed scatter plots and predictive modelling, we decipher complex trends and uncertainties, emphasizing the imperative for adaptive global agricultural strategies to ensure sustainable food production amidst diverse environmental, societal, and economic challenges.



- The two scatter plots show the relationship between agricultural land (% of land area) and population, total in 2005 and 2020. Each point represents a country. The clusters and centroids in the plots show groupings of countries with similar characteristics.
- In 2005, there is a clearer positive correlation between agricultural land and population. Countries with more agricultural land tend to have larger populations. This is likely because agriculture was the primary driver of economic growth in many countries at that time.
- In 2020, the relationship is less clear. There are a number of countries with both high and low populations that have a lot of agricultural land. This suggests that other factors, such as agricultural productivity and trade, are playing a more important role in determining population size.
- The clusters in the plots also reflect this change. The centroids of the clusters represent the average agricultural land and population for each cluster.



- The plot traces India's agricultural land area dynamics over several decades, extending from the 1980's to a prediction for the year 2025.
- The red line reflects actual values, exhibiting fluctuations around 60% with a subtle decline.
- The green line forecasts a decrease to approximately 60.30% by 2025, accompanied by a 95% confidence interval indicating forecast uncertainty.
- A black fitted curve provides a smoothed trend line. Factors contributing to the observed trends include urbanization, industrialization, and the impact of climate change on land utilization.
- It's crucial to exercise caution in interpretation due to variations in data estimates and diverse definitions of agricultural land. The overarching implication of the plot is a discernible downward trend in India's agricultural land, raising concerns about the nation's capacity to sustain adequate food production in the face of a burgeoning population.

- The plot illustrates the UK's agricultural land area dynamics, spanning from 1980 to a projected 2025.
- The blue line represents actual values, fluctuating around 72% of the total land area, displaying a subtle upward trend.
- The green line predicts an increase to approximately 74.27% by 2025, with a 95% confidence interval indicating forecast uncertainty.
- A black fitted curve smoothens fluctuations, offering a generalized trend. Potential explanations for these trends include advancements in agricultural practices, government policies influencing land use, and climate change impacts.
- Caution is advised in interpretation due to data estimation variations and diverse agricultural land definitions. In essence, the plot suggests a modest rise in the UK's agricultural land area, posing considerations for the nation's capacity to meet the growing food demands of its population.

Conclusion:

Globally, agricultural land trends vary. Some countries, like India, exhibit a gradual decline possibly tied to urbanization, while others, like the UK, show a modest increase driven by efficient practices. The 95% confidence intervals highlight projection uncertainties, emphasizing the complex interplay of factors. This underscores the necessity for adaptable, global agricultural strategies to address diverse environmental, societal, and economic dynamics and ensure sustainable food production.

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