

Visualizing and Predicting Agricultural Production due to Climate Change

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Highlights

- Securing food for the future is imperative with the changing climate and population shifts to not aggravate current world hunger
- Controlling for country and year in our dataset is an important factor in understanding environmental factors that contribute to rice production
- Temperature, precipitation, cropland area all appear to have a relationship with rice production

Background

Food insecurity is a humanitarian problem with 2.3 billion people in the world being food insecure in 2020. In addition, global population is expected to reach 10 billions by 2057. Climate change can have a large effect on our future food supply.

Data and Processing

Rice production and environmental factors data were collected.

Sources: United Nations & World Bank
Type: Population, Climate, Cropland, Natural Disasters, Rice Production

Pre-processing: Standardize country names and ISO codes
Merge: On ISO codes (country codes) and year
Cleaning 1: Keep only data in which rice production is available (1961 – 2019)
Assumptions: Missing natural disasters' data assumed to be zero
Cleaning 2: Further drop data in which no climate data available

Final dataset:
140 countries & 1961 - 2012

Insights

We leverage our datasets to gather insights on the global level to guide us how to proceed to our models.

Figure 1. 90% of the global rice production between 1961 and 2012 is produced by only 14 countries.

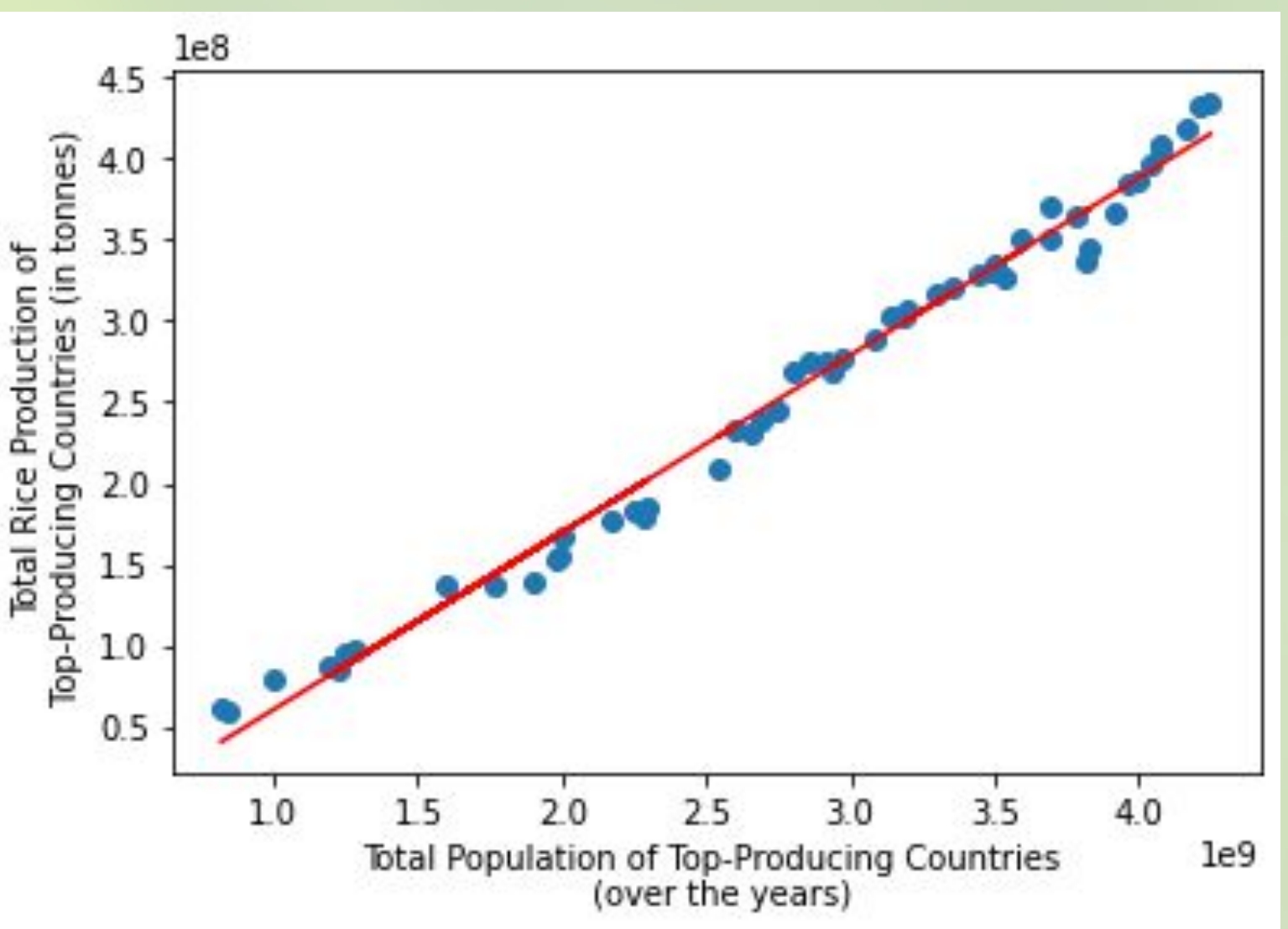
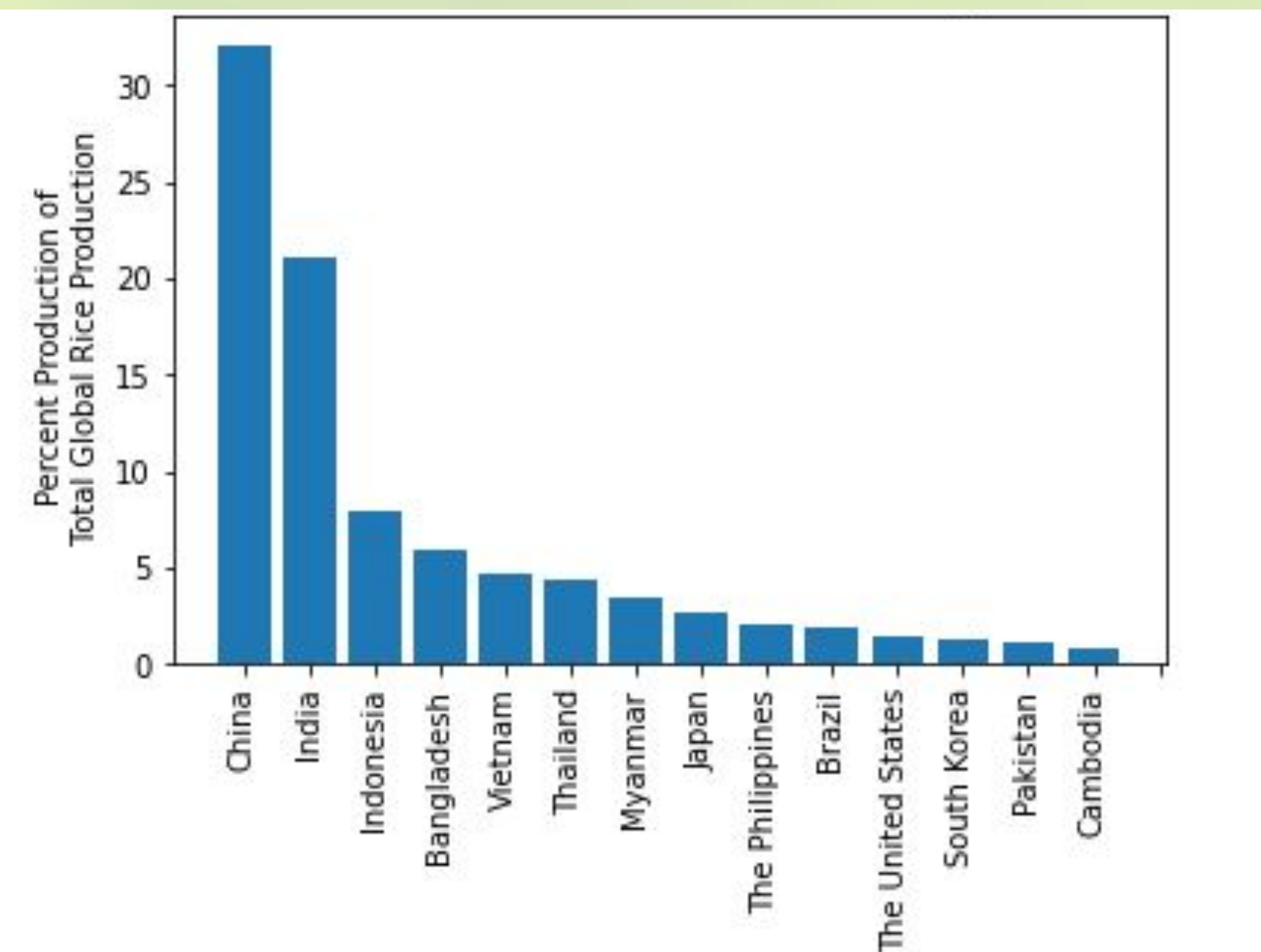
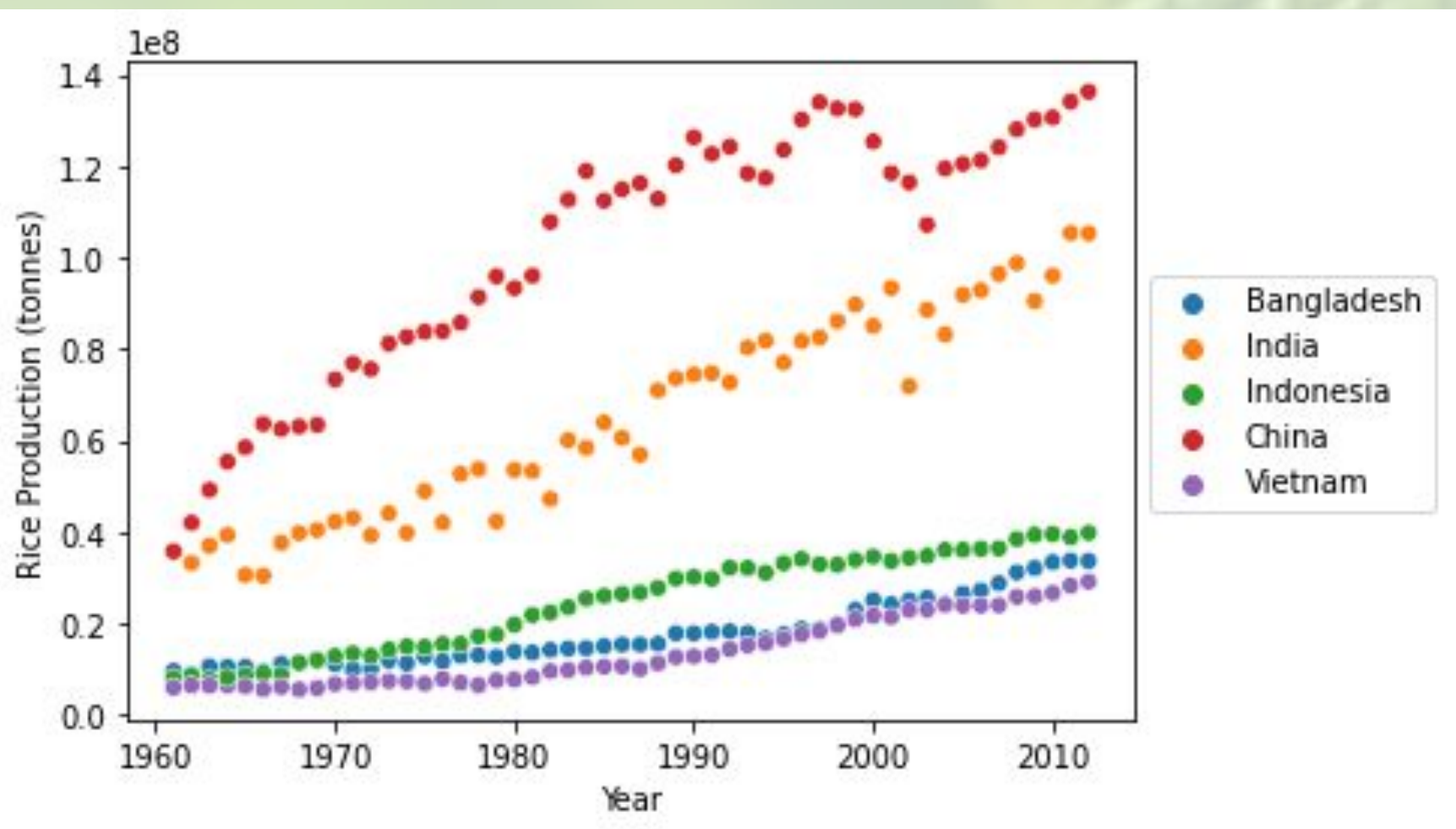


Figure 2. Population and rice production have a strong positive correlation.

Figure 3. Top 5 countries have been producing more rice over time but at different rates.



Models

From our findings (see Insights section), we modeled our rice production using:

1. Number of disasters per country per year
2. Number of casualties (from disasters) per country per year
3. Total annual precipitation
4. Average annual temperature
5. Total cropland area per country

Figure 4. A model that considers years separately (average linear model) cannot account for many low- and high-producing countries.

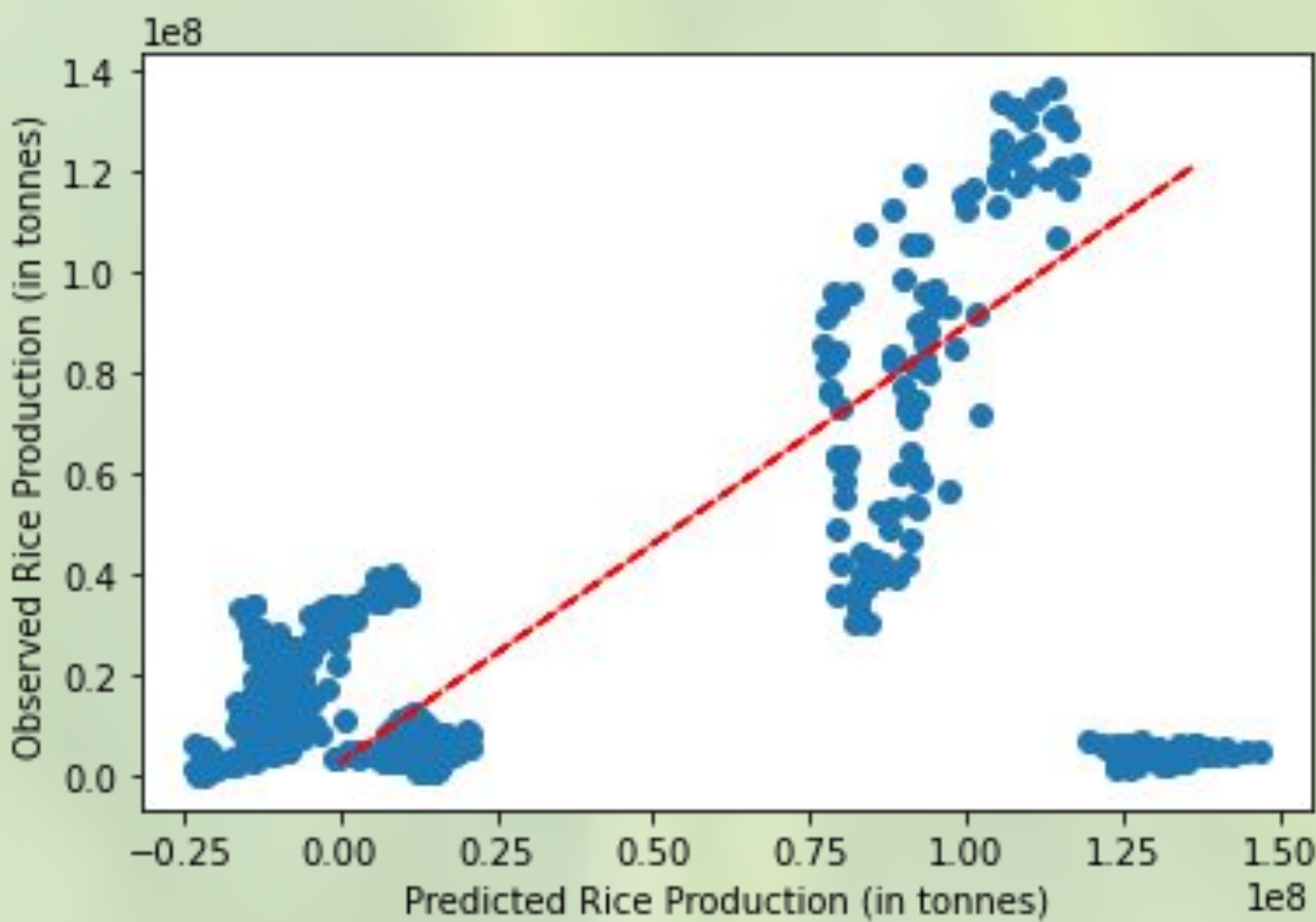
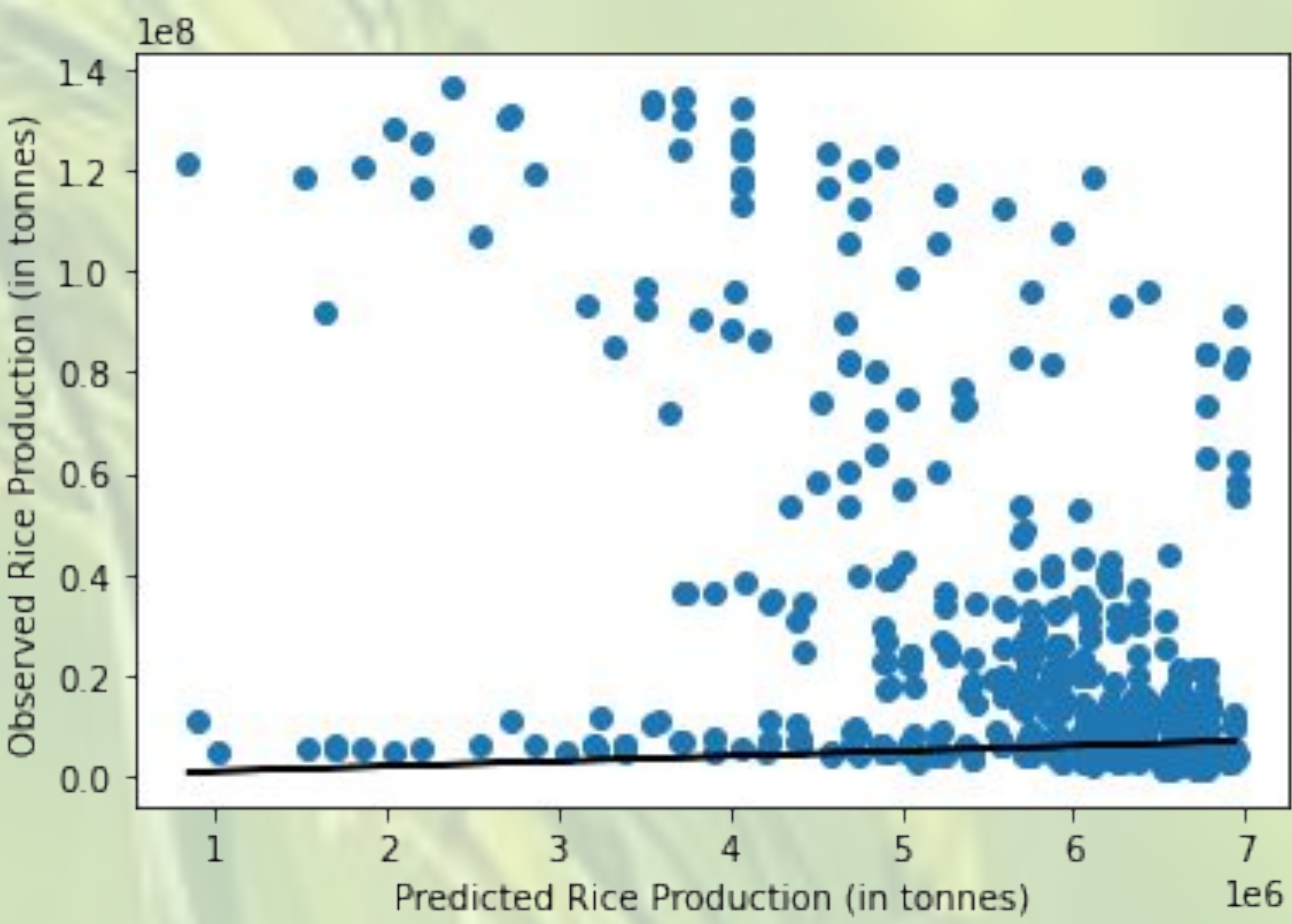


Figure 5. A model controlling for year and country (panel analysis) improves predictions, but it cannot properly predict many of the lower-producing countries (negative values or very large values).

Temperature and precipitation appear to have a negative correlation to rice production whereas cropland has positive correlation. Securing agricultural areas taking future climate conditions would be an important factor for future rice production.

Future Work

- Introducing more factors and tuning to improve our model
- Predicting variation instead of absolute production which can be more beneficial for global traders