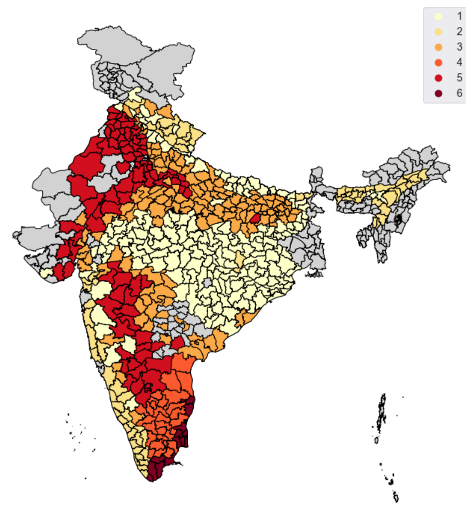
# Predicting Fertilizer Input for Rice Cultivation in India

Home to over 1.38 billion people, India is tackling a severe hunger crisis. Though the country has achieved self-sufficiency in grain production, nearly 14% of the population is still undernourished. India's agricultural landscape is primarily rural, where widespread poverty, low literacy rates, and poor infrastructure lead to questions over its sustainability. **Indiscriminate use of fertilizers has led to significant irregularity in crop production despite consistent agricultural subsidies.**

With the current global shortage of fertilizers, precision farming is vital to eliminate redundant costs and streamline resources to ensure equitable food access for all communities. Here, we **assist policy-makers in their decisions through models predicting the fertilizer consumption (nitrogen, phosphorus, and potash) required to obtain a specific rice yield.**




Rice is the staple food crop for over 50% of India's population. Being a hardy crop, rice can be cultivated on a variety of soils, including clays, silts, and gravel. Typically, rice crops are planted at the onset of the monsoon season (June – July) and harvested during November – December every year.

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) maintains a district-level database that contains up to 26 years (1990 – 2016) of India's rice cultivation and environmental data. **We segmented India into six different clusters for rice cultivation** by utilizing seasonal values of various ecological features (precipitation, runoff, wind speed, minimum and maximum temperature). All districts within the same cluster share similar environmental characteristics, thereby permitting a joint analysis of their historical rice yield data.

Our data, while quite noisy, reveals a fluctuating relationship between the historical mean fertilizer input per unit area and the resulting rice yield. Consequently, for a given target rice yield based on population requirements, **our models enable decision-makers to place intelligent cluster-specific budget constraints on fertilizers, and minimize their indiscriminate use.**

Future extensions to our model will incorporate soil nutrient data, solar irradiance, and knowledge of off-season farming practices (e.g., crop rotation) to improve the accuracy of our estimated fertilizer inputs.