Assessing the Ammonia Mitigation Potential from the Indian Agriculture Sector for Improving Air Quality in India

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Introduction and Objective

- NH_3 being an important precursor, has the greatest impact on $PM_{2.5}$ formation (Thakrar et al., 2020).
- Agriculture, a major sector, responsible for global anthropogenic ammonia emissions (Zhang etal.,2020; Sahoo et al., 2024).
- The objective of the study is to develop/compile/use emission inventory and estimate ammonia emissions from agriculture sector using GAINS model.

Methodology

Develop/Use/Compile EI in GAINS

Sector and Pollutant	Data collection	Emission factors
• Non-energy: Agriculture • Pollutant: NH_3	• State-wise activity data for 2022	• Source sector - specific EF in GAINS

Data Collected for 23 Regions

Activity Data
- Dairy Cows
- Other Cattle
- Other Livestock (sheeps, horses)
- Pigs, Poultry
- Mineral N fertilizers use (exc. urea)
- Urea Application
- Mineral N fertilizers production
- Other NH_3 Emissions (incl. humans and pets)

Baseline Emission Estimation (2022)
- Develop baseline scenario for 2022
- Simulation in GAINS

→ Urea Substitution
→ Covered storage
→ Low emission housing
→ Air scrubber and low ammonia application

Validation

Baseline emissions comparison with EDGAR gridded emissions data for 2022

Results

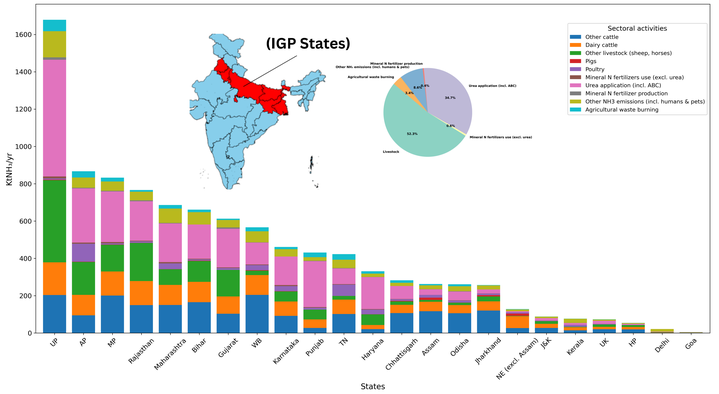

Figure 1: Agricultural NH_3 emissions by all states

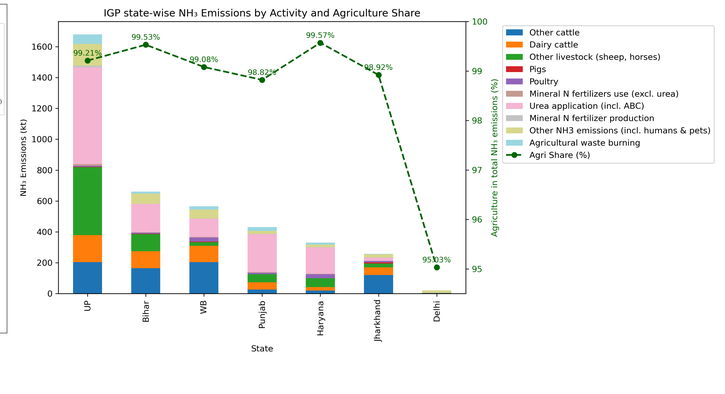

Figure 2: Agricultural NH_3 emissions by IGP (Indo-gangetic Plain) region

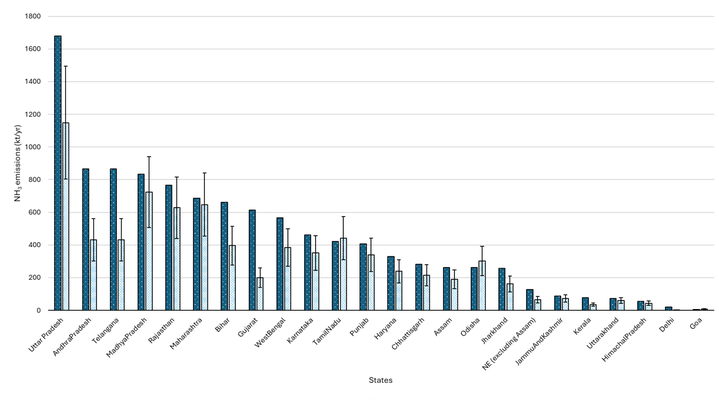

Figure 3: Comparison of GAINS emissions with EDGAR

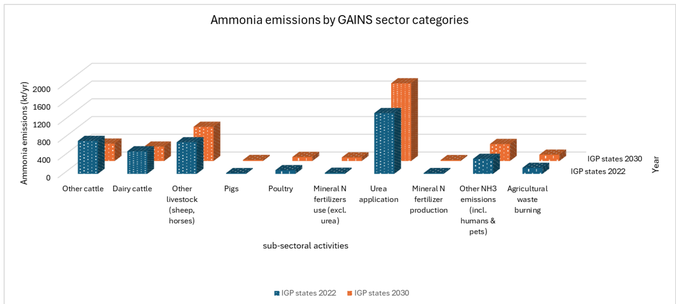

Figure 4: Agricultural NH_3 emissions by IGP (Indo-gangetic Plain) region

Conclusion

- Uttar Pradesh accounts for the highest ammonia emissions from the agriculture sector.
- There has been an increase in the total ammonia emissions in 2030 as compared to 2022 under current policy scenario. However, applying different control technologies for Uttar Pradesh such as urea substitution, covered storage, low emission housing and low ammoni application results in 16% reduction in ammonia emissions for 2030 .

Outcome

Development of ammonia emission inventory at regional level for whole India.
Emission mitigation potential for the most polluting state by applying different control strategies.