Regional Implication of Global Fertilizer Supply Restrictions

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Introduction

➢ **Research Question:**
- What is the regional (U.S.) impact of global fertilizer constraints?

➢ **Importance:**
- Fertilizers provide essential nutrients to crops to enhance their growth and productivity.
- Recent market developments, trade policy decisions, and longer-term sustainability policy objectives suggest potential constraints on fertilizer availability.
- However, excess use of fertilizers adversely impacts surface water quality and ecosystem productivity, suggesting a need for policy instruments to address over-consumption

➢ **Objectives:**
- Apply a detailed global land use model to assess the impact of fertilizer constraints on fertilizer use
- Assess the regional implications of global fertilizer constraints driven by market anomalies or policy restrictions
- Identifying key policy design considerations for balancing the effective and sustainable use of fertilizers in agriculture.

Methods

➢ This research will build on recent efforts to further develop the Global Biosphere Management Model (GLOBIOM) for global-to-local economic modeling.

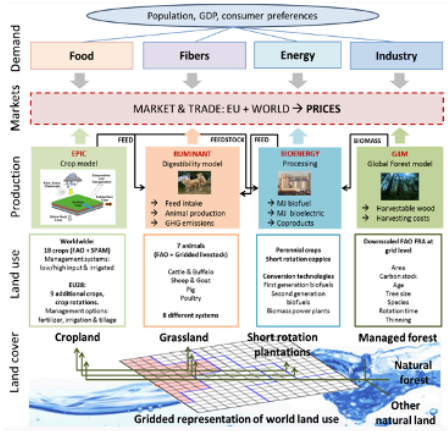

Figure 1 GLOBIOM Model Structure

➢ **Methodological innovation:**
- Re-calibration of global agricultural trade flows,
- Adjusted land use constraints to assess optimal crop production and fertilizer consumption patterns across regions.
- Incorporation of global and regional fertilizer (quantity) constraints to mimic supply limitations or global policy targets.

SCENARIOS	CONSTRAINT
Phosphorus(P) Fertilizer Constraint	95%
	90%
Nitrogen(N) fertilizer Constraint	85%
	80%
P&N Fertilizer Constraint	75%

Figure 2 Scenario labels and Constraints

Results

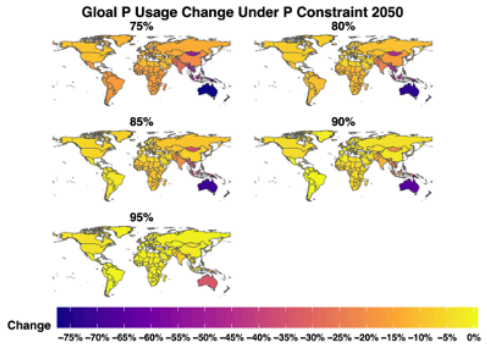

Figure 3 Global P Change Map

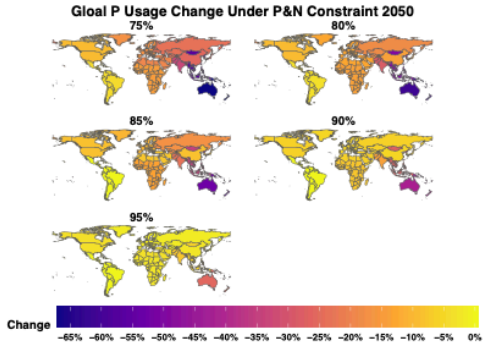

Figure 4 Global P Change Map

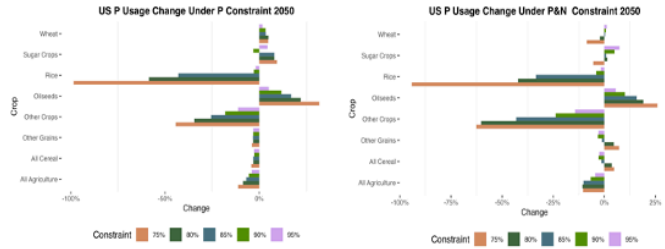

Figure 5: US P Consumption Change across Global Fertilizer Restrictions

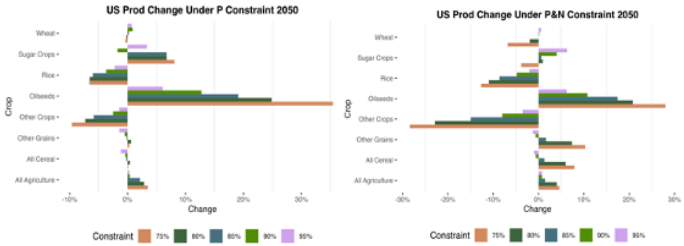

Figure 6 US Food Production Change

Discussion

➢ Global fertilizer restrictions impact regional production patterns and agricultural trade flows.
➢ North America always has a lower P fertilizer reduction rate than the global constraint because of its comparative advantage in agricultural production and exports relative to other regions.
➢ Global fertilizer constraints have the largest impact on Oceania in percentage terms, but this represents a small fraction of global P use.
➢ In the US, P fertilizer usage in production sees has the highest decrease across all scenarios.
➢ US fertilizer use and production of Oilseeds will increase under all scenarios to compensate for global responses to fertilizer restrictions.
➢ Nitrogen fertilizer constraints can impact P use and production as crop mixes shift away from the most N-intensive crops
➢ Conclusion: The impact of fertilizer constraints on fertilizer usage varies across regions and crops, highlighting the need to consider regional differences when designing mitigation strategies.

Acknowledgements
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