

# China's Transition to Sustainable Agriculture: Understanding Fertilizer Use in Yunnan Province, China

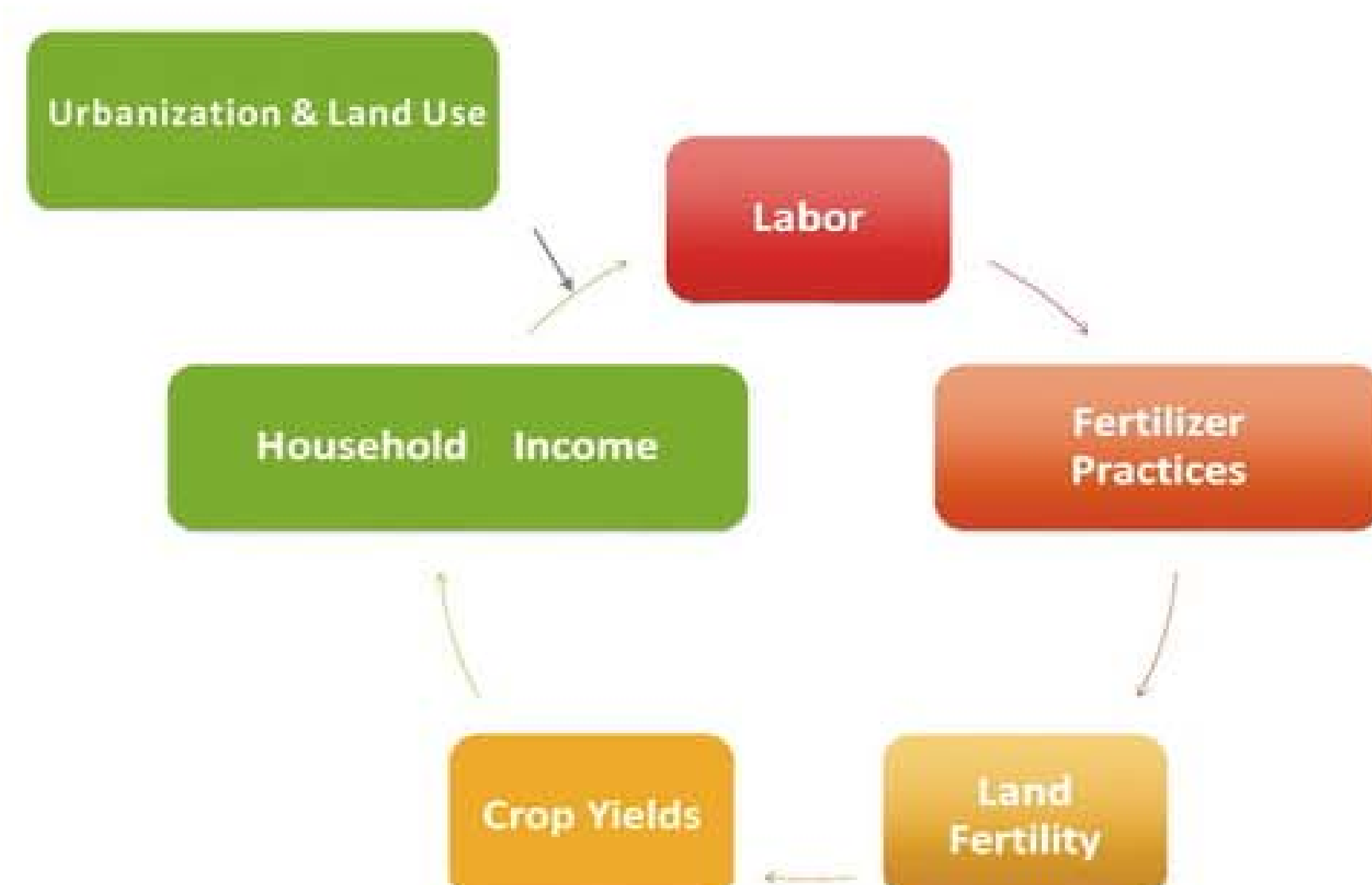
Li Yunju,<sup>a,c</sup> Fredrich Kahrl,<sup>b,c</sup> David Roland-Holst,<sup>b</sup> Su Yufang,<sup>c</sup> Xu Jianchu<sup>a,c</sup>  
<sup>a</sup>ICRAF China; <sup>b</sup>Kunming Institute of Botany, <sup>c</sup>Chinese Academy of Sciences; University of California

## China's Fertilizer Problem

- Chemical fertilizers have played important role in increasing yields in China over past 30 years
- chemical fertilizers have led to significant domestic and global environmental problems, including:
  - eutrophication and nitrate pollution
  - cropland acidification
  - GHG emissions from N production and use
  - large changes in global N cycle
- Growing number of field-based studies have demonstrated the potential to reduce chemical N and P fertilizer use while maintaining yields
- However, household use of chemical fertilizers in China remains poorly understood

## Research Questions

- What are main drivers of fertilizer use across Yunnan Province?
- What explains large differences in chemical N fertilizer use across households?
- What role should policy play in minimizing negative impacts of chemical fertilizer use?

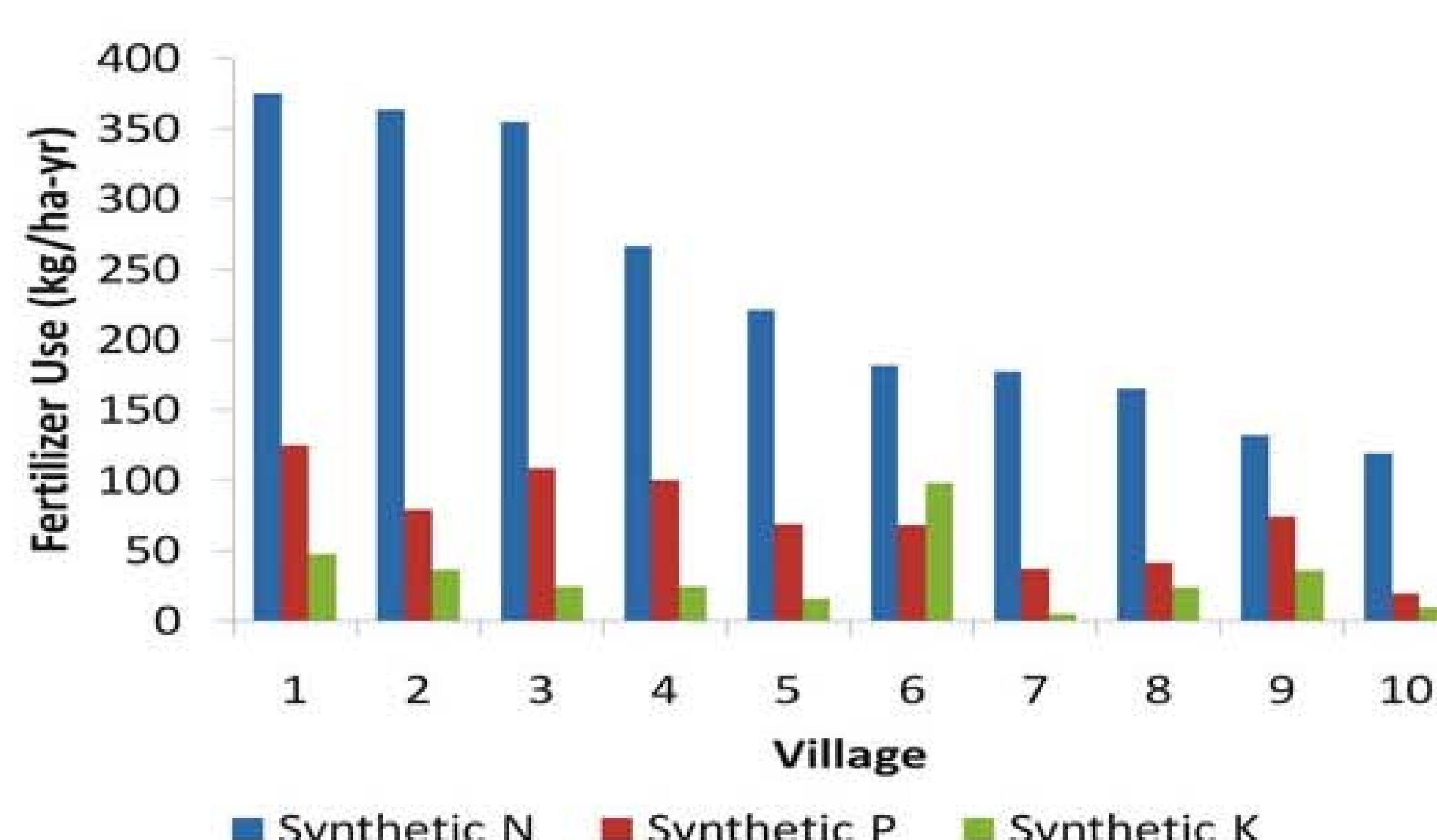
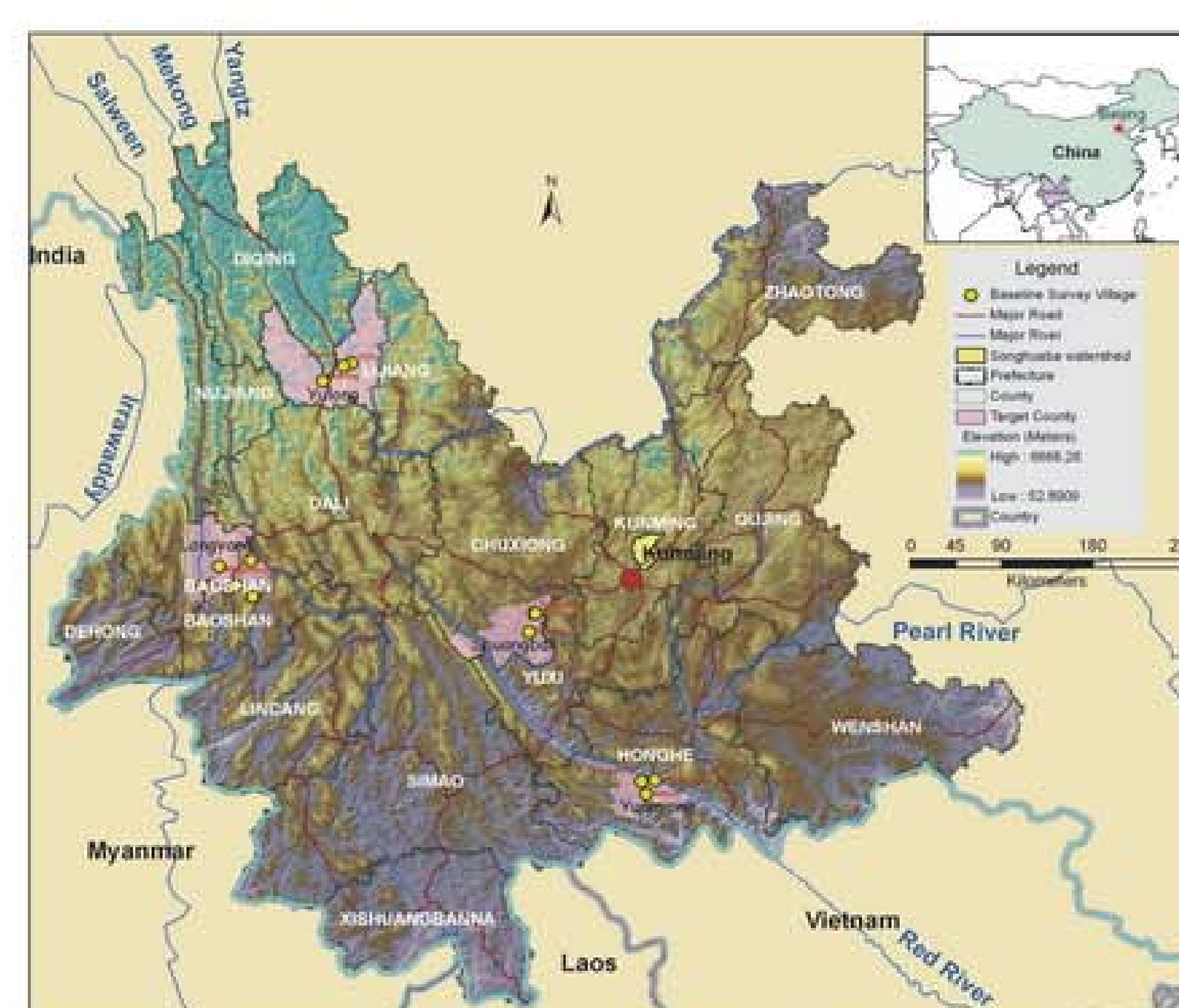


## Key Preliminary Findings

- Significant amount of heterogeneity in household fertilizer application (kg ha<sup>-1</sup>) in survey areas, between crops, households, villages (see above right)
- N fertilizer use strongly tied to land use; small landholders use, on average, more N per ha
- Labor availability and income play less direct roles in fertilizer use decisions
- Organic fertilizer does not appear to be substitute for N fertilizer, but is major source of P and K
- Balancing nutrients important for reducing overuse; strong negative correlation between N and P use

## Methods

- Two large-scale household surveys (1,199 households)
- One intensive survey in Songhuaba Watershed
- One extensive survey across three climate regions (see below map)



## Policy Implications

- Need for knowledge inputs to improve fertilizer efficiency suggests overemphasis on raising fertilizer prices may be detrimental for yields and farmers
- Diversity in household fertilizer practices suggests need for targeted, site specific extension, requiring a rethinking of China's agricultural extension system
- Important to consider need for fertilizer efficiency improvements in context of transition to sustainable agriculture

## Directions for Future Research

- Understanding labor, technology requirements, scale issues in transition to sustainable agriculture in Yunnan
- Understanding price premiums required to support sustainable agriculture, and exploring consumer willingness to pay premiums for sustainable food