AGRICULTURAL LAND USE/COVER CHANGE TRENDS IN VIETNAM AND IMPLICATIONS

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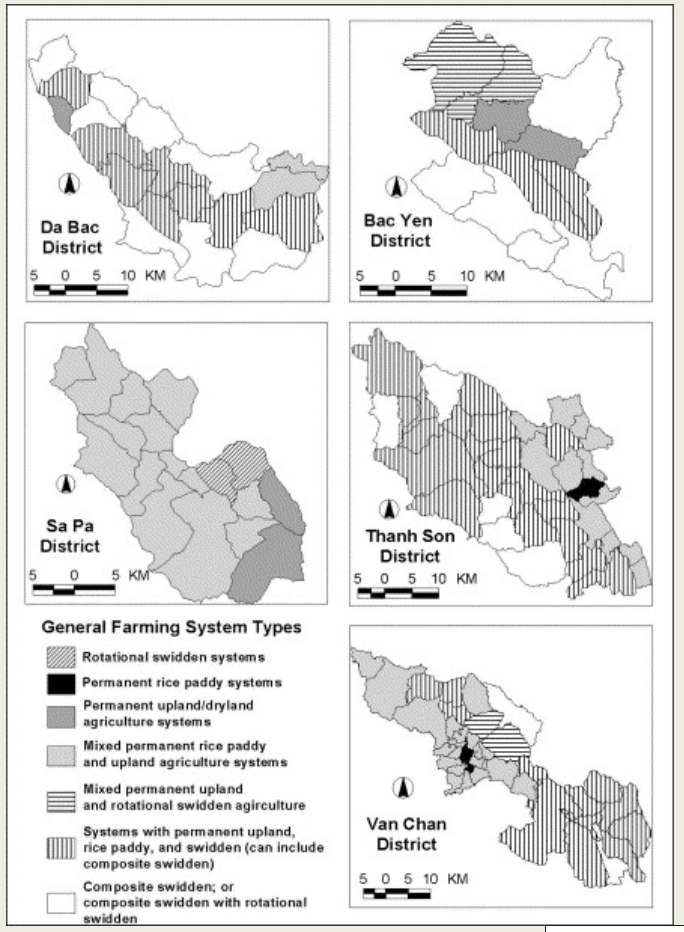
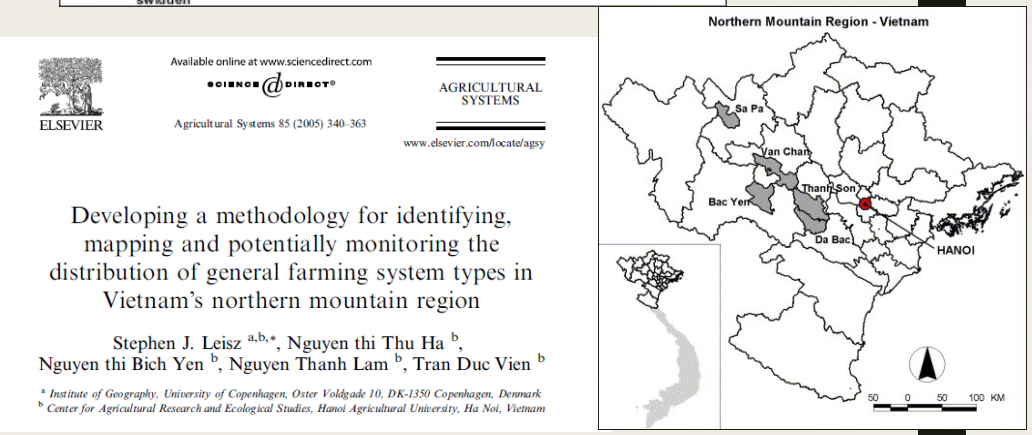
Overview

- Introduction
- Background – Overview of previous work
  - *LCLUC in the Northern Mountains: 1992 - 2000*
  - *Hoa Binh Case Study: changes in upland farming systems: 1997 - 2019*
  - *Anticipated future LCLU in the Northern Mountains: 2007*
- Looking back: Land-Use Trends in Vietnam – 2000 - 2020
  - *Northern Mountains*
  - *RRD*
  - *Central Highlands*
  - *Central Coast*
  - *Mekong Delta*
- Implications of trends in LCLUC regarding contributions to pollution / GHG
- Questions

Introduction

- Change in Vietnam since 1986
  - *Doi Moi (renovation)*
    - In the lowlands and deltas
    - In the uplands
  - *Land Laws and Forest Land Laws*
- Research background
  - *1997 – looking at northern upland land-use systems*
  - *2007 – investigating changes in north central upland systems*
  - *2014 - 18 - investigating land use changes in central Vietnam*
  - *2018 – 2021 investigating land use changes in the Red River Delta*



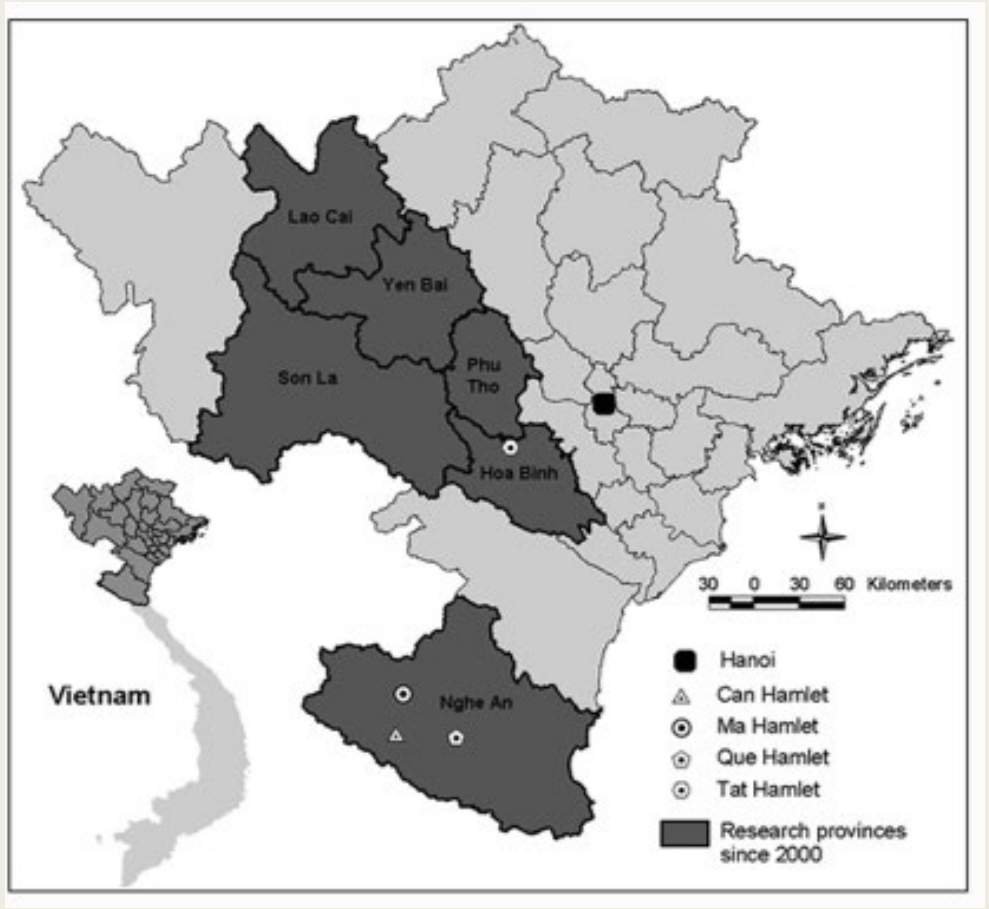


1992 - 2000 – Upland Farming Systems

- Investigated farming system change in five districts from 1992 – 2000
- Methods: field interviews and remote sensing analysis; 126 communes investigated
- Identified farming types: extensive rotational swidden; permanent wet rice fields; permanent upland fields; composite swidden (mixed upland swidden and permanent wet rice); mixed permanent upland fields and swidden fields
- Results:
  - *Most communes contain mixed systems*
    - 1992: Two communes with permanent upland ag.
    - 2000: 99 communes with at least some permanent upland agriculture
  - *Change from swidden dominated systems to permanent upland or wet rice dominated systems*

1997 – 2019 – Hoa Binh Case Study

- Focus on Tan Minh Commune, Da Bac District
- 1997 Composite swidden dominated landscape (permanent wet rice in valley bottom, rice swidden in mountains)
- Revisited commune bi-yearly from 1997 – 2019
  - *Revisited GPS locations*
  - *Interviews*
  - *Satellite image interpretation*
- Results:
  - *Decreased swidden, increased permanent upland fields*
  - *Expanded wet rice, extension of terraces and bunds*
  - *No rice swidden; only cassava and arrowroot in swidden*
  - *Increased tree planting in swidden areas*



2007 – Trends in LCLU in Northern Mountains

- Investigated farming systems and the components of the systems in north central and northwest uplands
- Reviewed government policies related to the uplands
- Predicted future trends in farming system activities in the uplands and impacts on GHG contributions:
  - *Decrease in swidden/fallow; decrease in fallow length*
  - *Increase in permanent upland agriculture fields (increase in fertilizer and pesticide use)*
  - *Expansion of wet rice fields (rainfed and irrigated, related increase in fertilizer use)*
  - *Increase in animal husbandry (cattle and pigs)*

Farming system activities:
- Swidden/fallow
- Wet paddy (irrigated and rainfed)
- Permanent upland agriculture
- Free ranging animals
- Penned animals (cattle and pigs)

Reg Environ Change (2007) 7:187–208
DOI 10.1007/s10113-007-0037-1

ORIGINAL ARTICLE

The impacts of local farming system development trajectories on greenhouse gas emissions in the northern mountains of Vietnam

Stephen J. Leisz · Kjeld Rasmussen · Jørgen E. Olesen · Tran Duc Vien · Bo Elberling · Lars Christiansen

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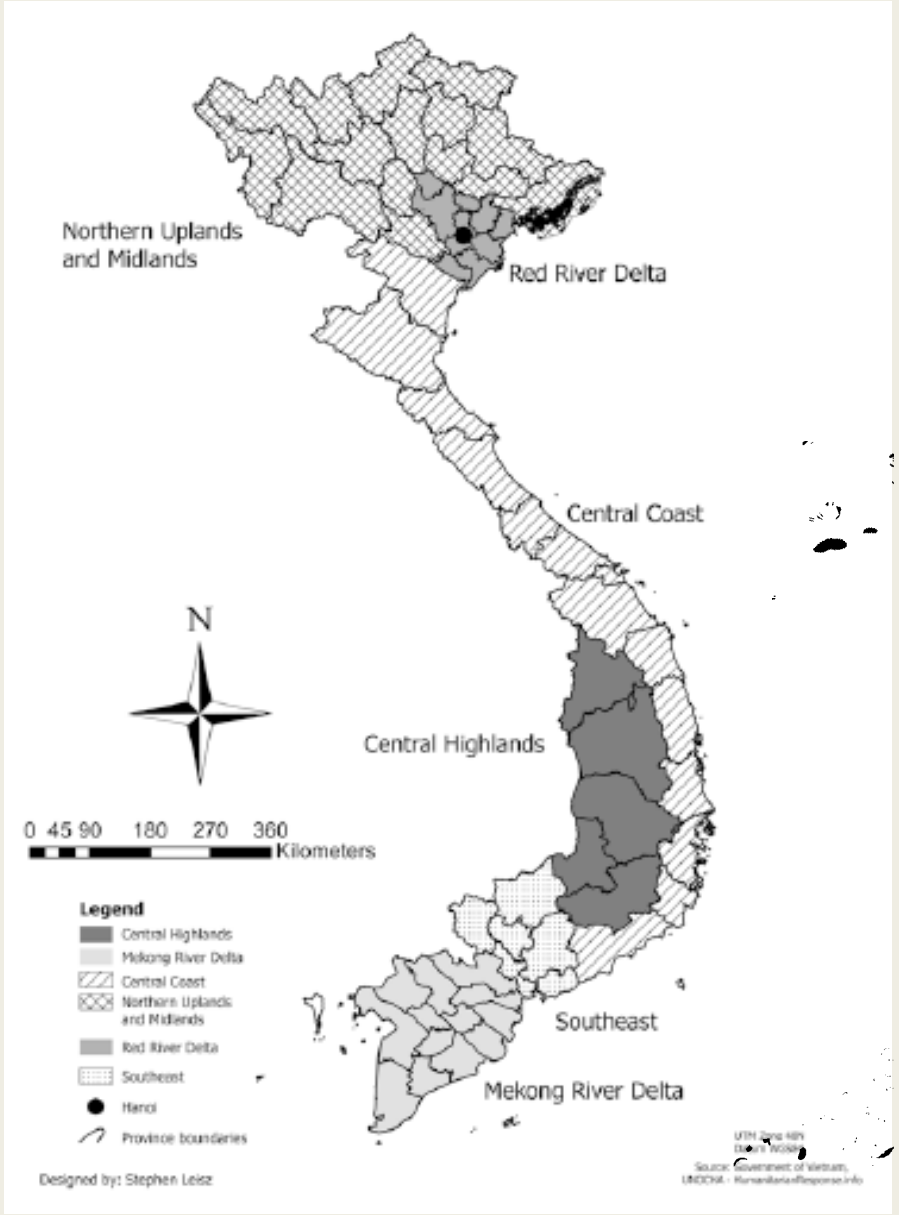
Agricultural Land-Use Trends: 2000 to 2020

- Review of 61 articles and book chapters (Google Scholar search)
- Government statistics yearbooks for 1999, 2015, 2019
- Changes in government land use laws (1993, 2003, 2013, 2015)
- Trends Identified
  - *Red River Delta:*
    - Expansion of urban areas and peri-urban areas; but more densification of these areas
    - No large loss of agriculture land, land consolidation into larger plots has taken place, nature of what is grown has changed
      - *Upper delta: from irrigated rice to mixed farming systems of rice, vegetables, soybean, maize, animal husbandry, and near river aquaculture*
      - *Middle delta: industrial zone growth, peri-urban development, transition of agriculture land to specialized production of fruit trees and flowers, continued rice growing*
      - *Lower delta: from two crops of irrigated rice, to a third vegetable crop, utilizing land near river for sod growing (for sale to housing developments)*

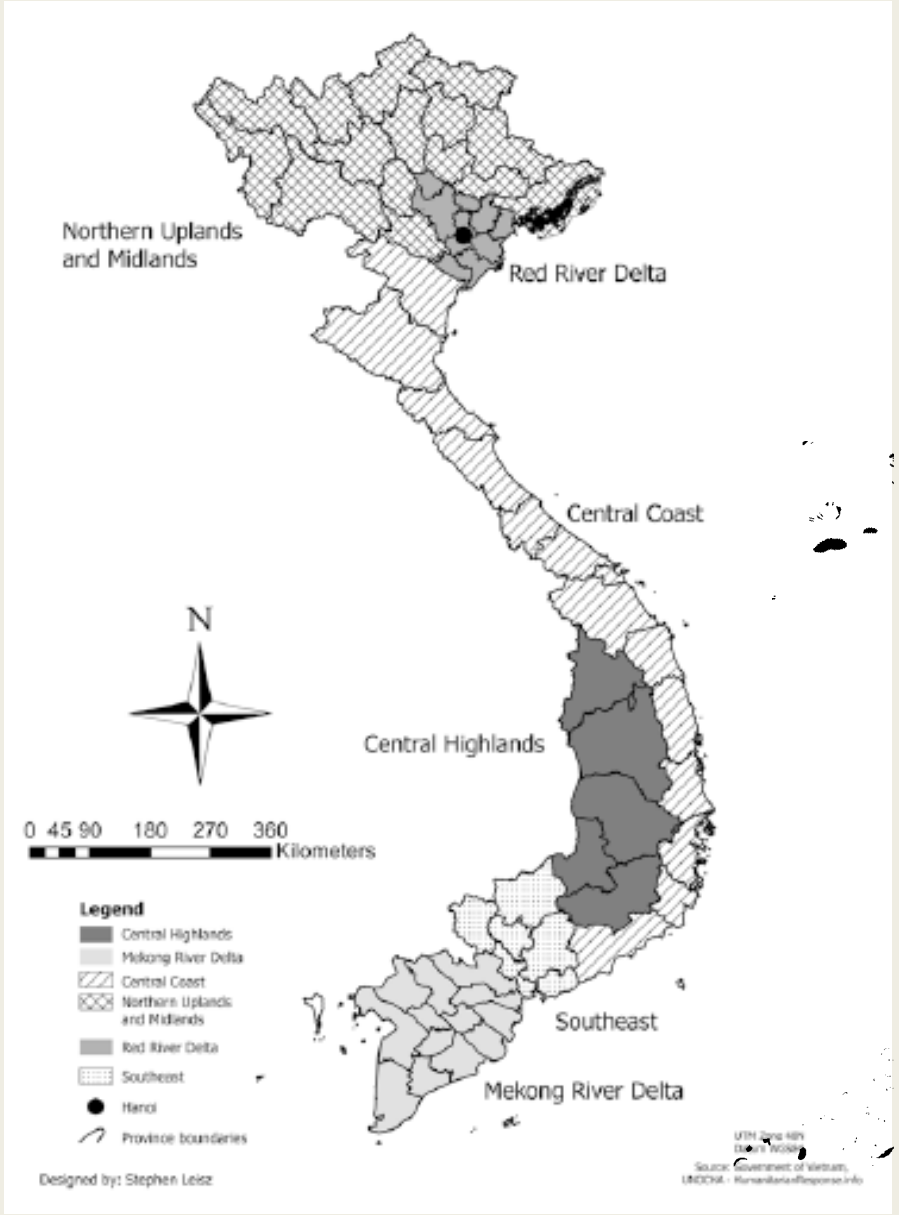


Agricultural Land-Use Trends in Vietnam 1990–2020

Stephen J. Leisz, Nghiem Thi Tuyen, Ngo The An, Nong Duong, and Nguyen Thi Bich Yen

K. P. Vadrevu et al. (eds.), *Remote Sensing of Agriculture and Land Cover/Land Use Changes in South and Southeast Asian Countries*,
https://doi.org/10.1007/978-3-030-92365-5_30

- Trends Identified
  - *Central Coastal Lowlands:*
    - No large-scale land-use changes outside urban areas
    - Transformation of coastal agriculture land to aquaculture (predominantly shrimp faming)
    - Transformation of mangrove to shrimp farming (between 63% and 70% of mangroves in this area lost)
    - Replacement of some rice fields with cassava cultivation
  - *Mekong River Delta*
    - Transition from predominant single rice crop in early 1990s to double and triple crop
    - Consolidation of rice fields into larger plots
    - Decrease in land devoted to rice cultivation; increase in land devoted to aquaculture
    - Increase in diversification of crops grown on agriculture land



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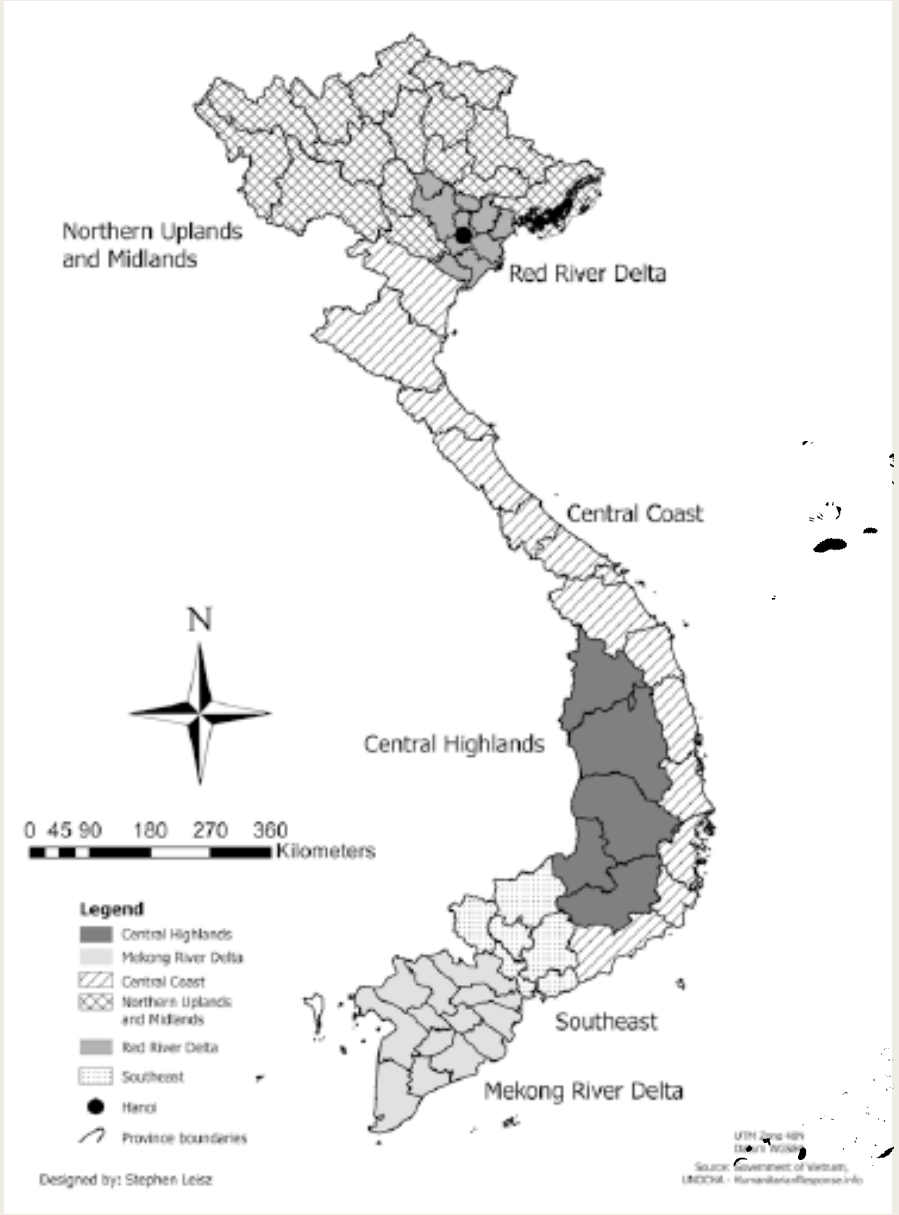
- Trends Identified
  - *Northern Uplands and Midlands, and Central Coastal Uplands*
    - Swidden / fallow systems still found, crops grown changing, length of fallow decreasing
    - Transition from swidden/fallow to land under permanent tree crops (removed from swidden/fallow systems): rubber, coffee, fruit trees
    - Transition from swidden/fallow to permanent annual cropland (maize, cassava, legumes, peanuts, other fodder crops for cattle and pigs)
    - Transition from swidden/fallow to production forest/plantation timber production
    - Transition of fallow land to pasture



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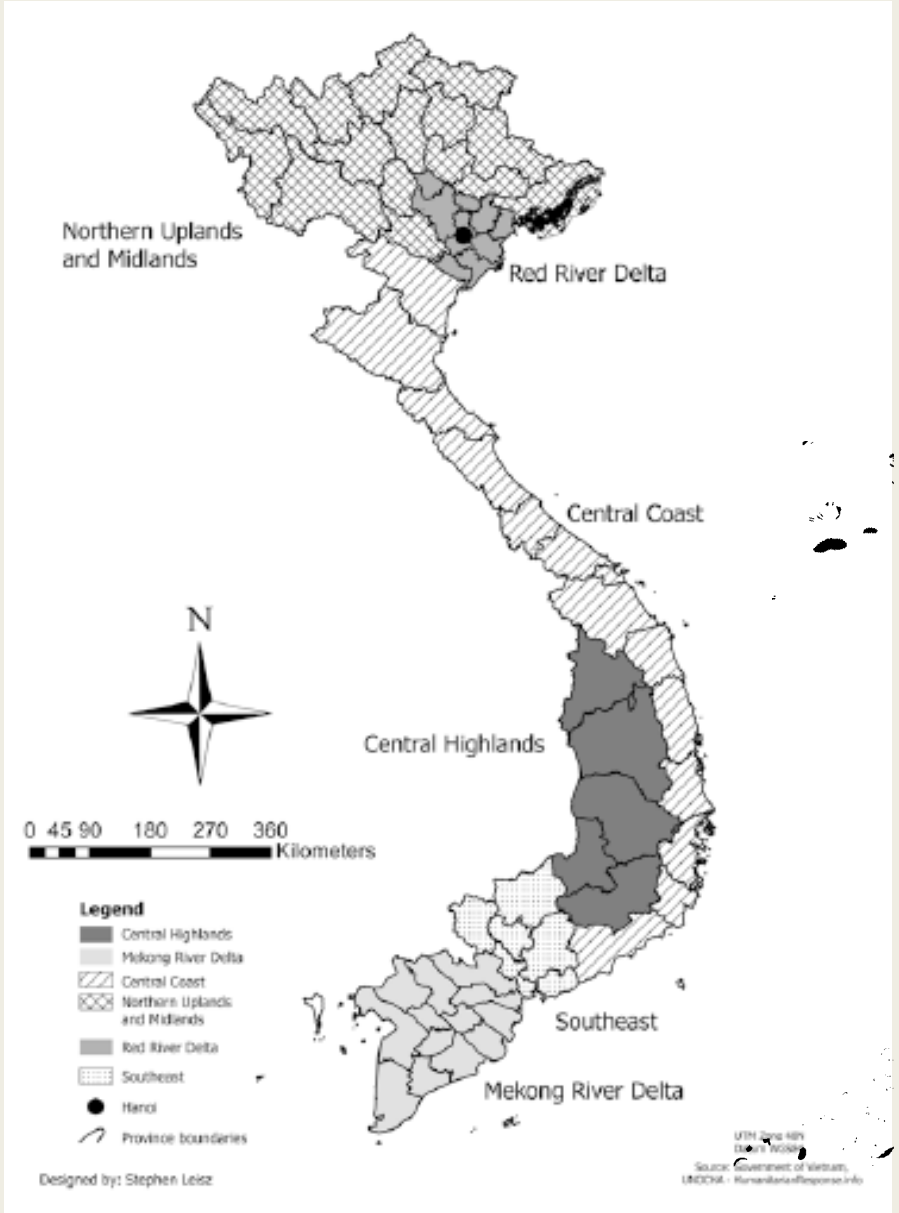
- Trends Identified
  - *Central Highlands*
    - Transition from swidden/fallow land use to tree crops
      - *Coffee trees*
      - *Rubber trees*
      - *Pepper*
      - *Cashew trees*
      - *Most recently fruit tree expansion (durian, avocado, jackfruit)*

      (noted that most forest cover loss driven by tree crop expansion)
    - Transition from swidden fallow to some permanent rice fields and cassava (more land devoted to hybrid cassava than in any other region of Vietnam)



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Possible implications, research needed:

- In uplands: Decreasing swidden / fallow:
  - *Increasing permanent agriculture fields (annual maize, cassava): increase in fertilizer use, increase in pesticide, increase in erosion*
  - *Increase in wet / irrigated rice in valley bottoms: increase in fertilizer and pesticide use and mechanization*
  - *Increasing tree crops: increase in carbon storage above ground and below ground; less biodiversity; impact on erosion*
  - *Increasing pasture areas: impacts carbon storage (decrease); less diverse biodiversity; impact on erosion*
  - *Increasing large animal husbandry / feedlots: impact on solid waste and water pollution*

Possible implications, research needed:

- Deltas and lowlands: Agricultural land use transitions:
  - *Consolidation of rice fields into larger units: increase in mechanization*
  - *Transition of rice fields to mixed farming including other crops – increase or decrease in pesticide and fertilizer use*
  - *Transition from rice fields to fruit tree and flower production – impact on fertilizer use*
  - *Transition from rice fields to cassava – change in agriculture inputs*
  - *Transition from rice fields to aquaculture – increase water pollution*
  - *Replace mangroves with shrimp ponds – shoreline resiliency decrease, biodiversity impacts, ecological impacts*

Questions