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*

  - *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)
Agricultural Land-Use Trends: 2000 to 2020

- Review of 61 articles and book chapters (Google Scholar search)
- Government statistics yearbooks for 1999, 2015, 2019
- 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)
- **Central Coastal Lowlands:**
  - No large-scale land-use changes outside urban areas
  - Transformation of coastal agriculture land to aquaculture (predominantly shrimp farming)
  - 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
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
- **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)
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