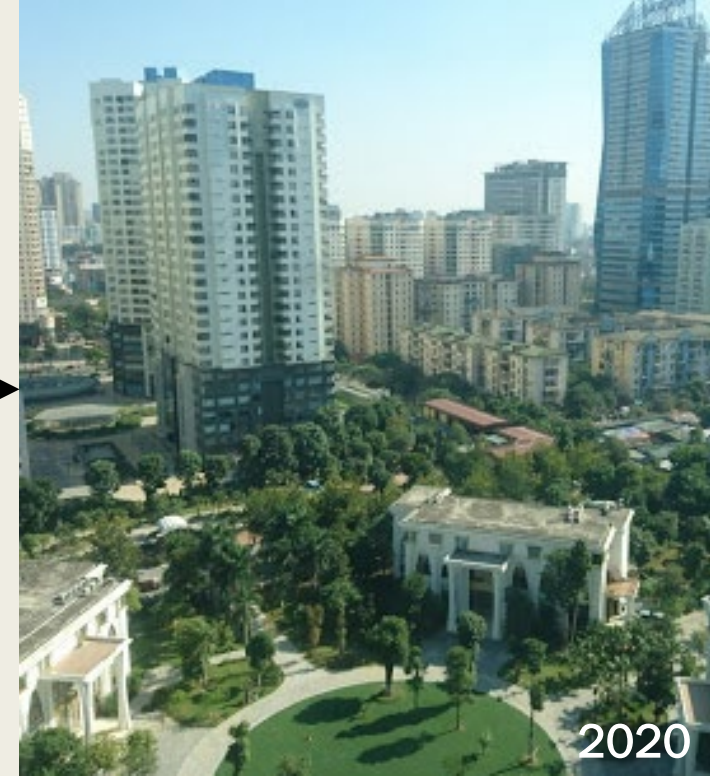


LAND COVER/LAND USE CHANGE TRENDS IN VIETNAM AND IMPLICATIONS

Stephen Leisz, Vin University, Hanoi

International Meeting on Land Cover/Land Use Change in South/Southeast Asia and Synthesis, 31st January – 2nd February, Hanoi, Vietnam



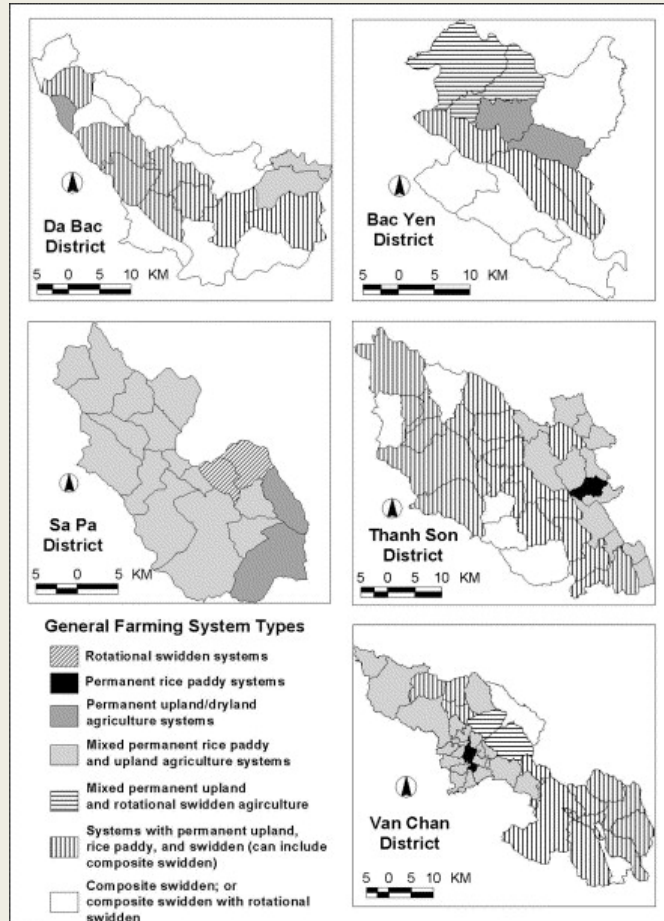
Overview

- Introduction
- Background – Previous work
 - *LCLUC in the Northern Mountains: 1992 - 2000*
 - *Hoa Binh Case Study: changes in upland farming systems: 1997 - 2023*
- Land-Use Trends in Vietnam – 2000 - 2024
 - *Northern Mountains*
 - *RRD*
 - *Central Highlands*
 - *Central Coast and Southeast*
 - *Mekong Delta*
- Implications of trends in LCLUC
- Questions

Introduction

- Change in Vietnam since 1986
 - *Doi Moi (renovation)*
 - In the lowlands and deltas (1986 onwards)
 - In the uplands (early 1990's onwards)
 - *Land Laws and Forest Land Laws*
- Research background
 - *1997 – 2024: looking at northern upland land-use systems*
 - *2000 - 2007: investigating changes in north central upland systems*
 - *2014 – 18: investigating land use changes in central Vietnam*
 - *2018 – 2024: investigating land use changes in the Red River Delta*

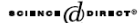
1992 - 2000 - Upland Farming Systems



- Investigated farming system change in five districts from 1992 - 2000
- 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
- Findings:
 - *Most communes contain mixed systems*
 - 1992: Two communes with permanent upland ag.
 - 2000: 99 communes with at least some permanent upland agriculture
 - *Decadal trend: change from swidden dominated systems to permanent upland or wet rice dominated systems*



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AGRICULTURAL SYSTEMS

Agricultural Systems 85 (2005) 340-363

www.elsevier.com/locate/agry

Developing a methodology for identifying, mapping and potentially monitoring the distribution of general farming system types in Vietnam's northern mountain region

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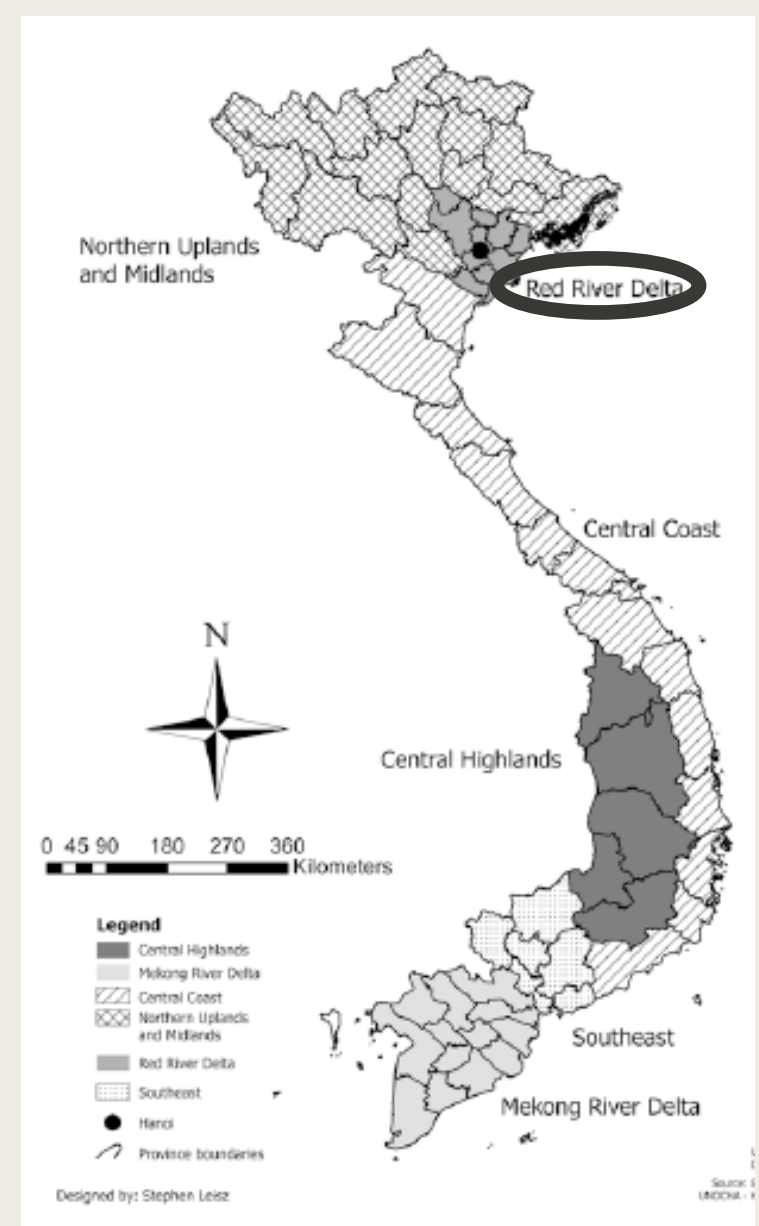
1997 – 2023 Hoa Binh

- Focus on Tan Minh Commune, Da Bac District
- 1997 Composite swidden dominated landscape
- Revisited commune bi-yearly from 1997 – 2019 and 2022 - 23
 - *Revisited GPS locations*
 - *Interviews*
 - *Satellite image interpretation*
- Results:
 - *Decrease but continuing swidden, some permanent upland fields*
 - *Expanded wet rice, extension of terraces and bunds*
 - *No rice swidden; cassava and arrowroot in swidden*
 - *Tree planting in swidden areas harvested for industrial use*
 - *REDD+ project*



LCLUC Trends: 2000 to 2023

- Review of 61 articles and book chapters (Google Scholar search)
- Government statistics yearbooks for 1999, 2015, 2019, 2022
- Changes in government land use laws (1993, 2003, 2013, 2015, 2024 [January])
- Trends Identified
 - *Red River Delta:*
 - Expansion of urban areas and peri-urban areas; but more densification of these areas
 - District towns developing into urban centers
 - No large loss of agriculture land, land consolidation into larger plots has taken place, **change in crops grown**
 - *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 Binh Yen



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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

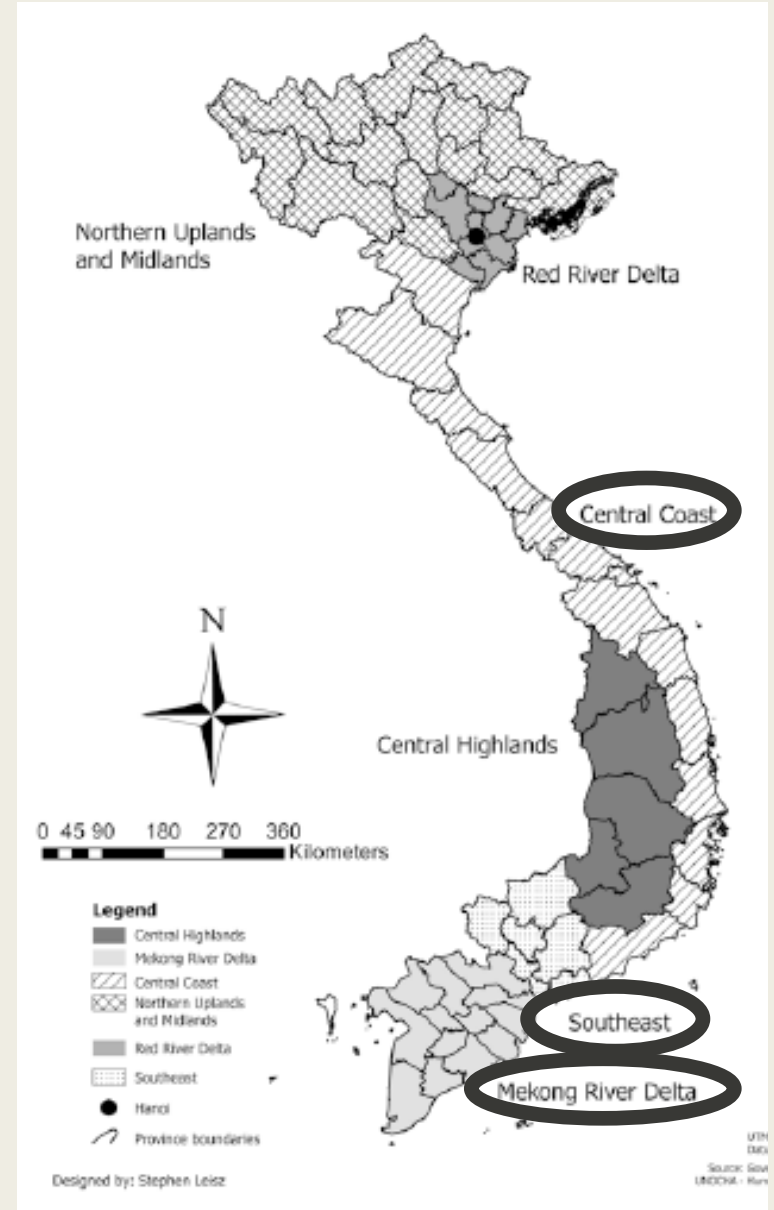
■ Trends Identified

– *Central Coastal Lowlands and Southeast:*

- Expansion of urban/peri-urban areas
- Growth / expansion of district towns
- No wholesale land-use changes outside urban and peri-urban areas
- Transformation of coastal **agriculture land to aquaculture** (predominantly shrimp farming)
- Transformation of **mangrove to aquaculture** (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 rice cultivation land; increase in land devoted to aquaculture
- Transformation of **mangrove to aquaculture** (shrimp farming)
- Increase in diversification of crops grown on agriculture land
- Expansion of urban/peri-urban areas; towns transitioning to urban centers



Agricultural Land-Use Trends in Vietnam 1990–2020



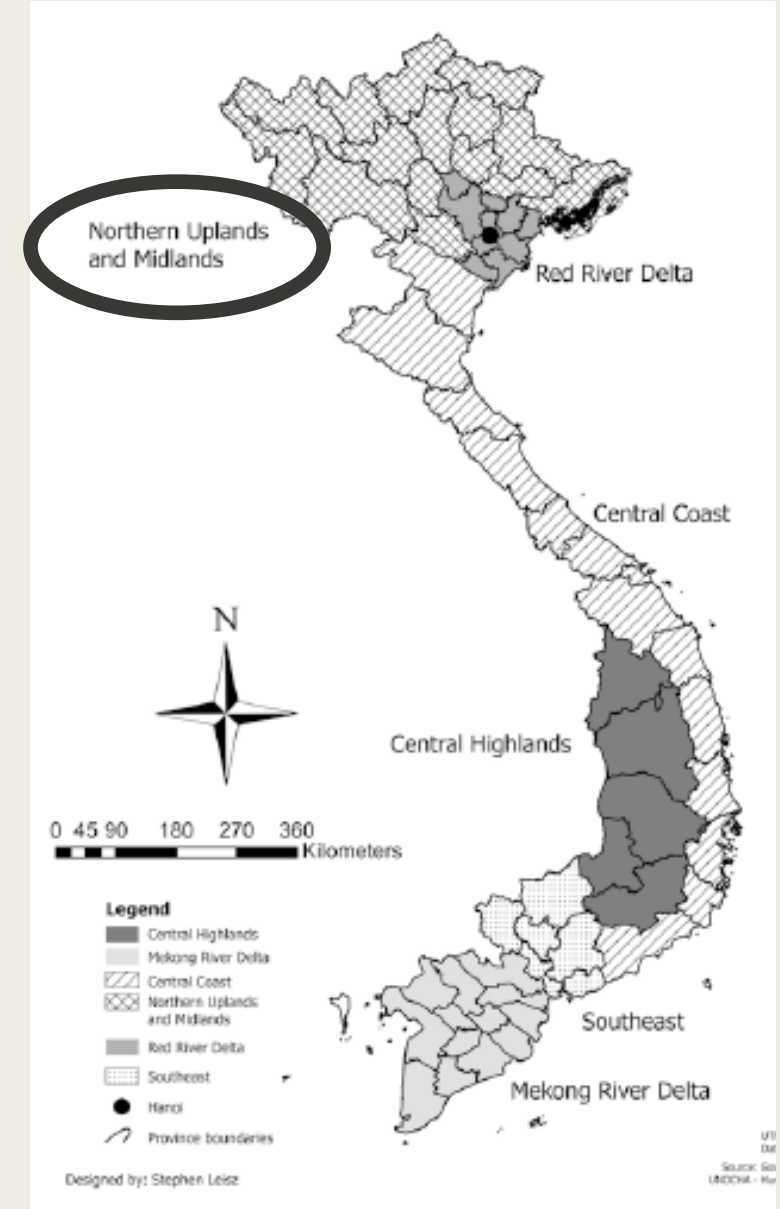
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■ Trends Identified

- *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 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
- District and Province towns transitioning to new urban centers;



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■ Trends Identified

- *Central Highlands*

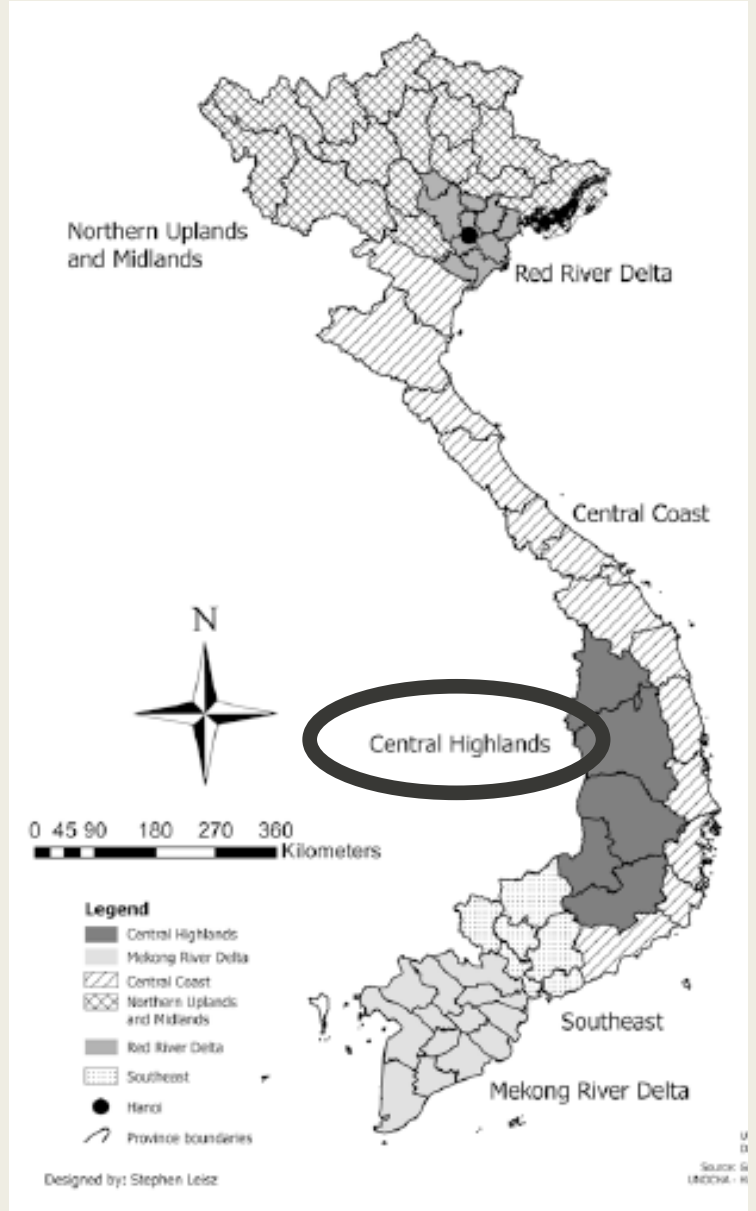
■ Transition from **swidden/fallow land to tree crops**

- *Coffee trees*
- *Rubber trees*
- *Pepper*
- *Cashew trees*
- *Most recently fruit tree expansion (durian, avocado, jackfruit)*

(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)

■ **District town growth; Provincial cities to urban centers**



Agricultural Land-Use Trends in Vietnam 1990–2020



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Possible implications, research needed:

In the Uplands:

■ Human Settlement areas:

- *Changes in district town growth; Provincial cities to urban centers*
 - *Flooding in urban areas*
- *Impacts of Infrastructure growth*
- *Pollution issues (water pollution)*

■ Decreasing swidden / fallow

- *Increase in 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*
- *Increase in tree crops: increase in carbon storage above ground and below ground; less biodiversity; erosion potential*
- *Increase in pasture areas: impacts carbon storage (decrease); less diverse biodiversity; erosion potential*
- *Increase in large animal husbandry / feedlots: impact on solid waste and water pollution (also urban)*

Possible implications, research needed:

Deltas and lowlands:

- Human settlement areas

- *Urban and peri-urban growth around cities*
- *Transition of district towns to urban centers*
- *Impacts of new planned residential communities on hydrology, biodiversity*
- *Pollution flows (air and water)*
- *Mosquito borne diseases (dengue and others)*

- 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*
- *Mangroves replaced with shrimp ponds – decrease of shoreline resiliency, biodiversity impacts, ecological impacts*

Future Research: The Center for Environmental Intelligence at Vin University (<https://cei.vinuni.edu.vn/>)

Environmental Monitoring

- Modeling urban pollution
- Biodiversity and Carbon Stock Monitoring
- Developing Nha Trang, Khanh Hoa, into a “Green City”

Director: Professor Laurent El Ghaoui (<https://vinuni.edu.vn/people/laurent-el-ghaoui-phd/>)

Questions