Farming System Transitions in Vietnam's North Central and Northern Mountains

Systems’ resiliency and farmer vulnerability

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Overview

- Evidence for farming system changes
  - Government policies
  - Observed changes from satellite data
- Trends regarding what swidden systems are transitioning to
- Potential impacts of changes
  - Resiliency of farming systems
  - Vulnerability of upland farmers
- Conclusion

North-Central and Northern Mountains Vietnam
Upland Farming Systems

- Traditional system – swidden/fallow farming
- Cultivated areas provide rice; fallow areas provide other products (these were traditionally used for subsistence purposes; increasingly they are being marketed)
Evidence for farming system changes

- Government views of swidden
- Government policies
  - 1960s to present – Sedentarization and fixed
  - Cultivation program
  - 1986 – Upland management regimes
  - (production, protection, special use forests)
  - 1992 – 327 Program
  - 1994 – forest land allocation
  - 1998 – 5 million hectare program
Observed changes from satellite data

- Image analysis provides insight into both land-cover and associated land-use
- Landscape metrics were determined for each commune area
- Farming System types associated with commune landscape metrics
- Each commune was assigned a farming system classification
- Analysis was done for two points in time
- Farming System change between two dates was assessed

Example location (within 127/45)
Scattered upland clearings indicate cultivated swidden.

Large cleared areas near water/on flat land indicate paddy.

October 21, 1992

November 4, 2000
Examples of landscape patterns associated with farming system land-use types

Spatial land cover pattern:
Scattered upland agriculture, near rice paddy,
With large amounts of fallow land

Spatial Landcover pattern:
Small areas of paddy surrounded by large continuous areas of upland agricultural land,
little fallow land or tree/forest cover
## Landscape metrics identifying farming system type by commune

<table>
<thead>
<tr>
<th>General Village Level Farming System Type</th>
<th>% of landscape under cultivation</th>
<th>Ratio of upland fields to rice paddy</th>
<th>NLSI of upland NLSI of rice paddy</th>
<th>Landscape pattern guidelines for visual interpretation*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pure systems</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Rotational swidden system (RSA)</td>
<td>Less than 25%</td>
<td>Greater than 10:1</td>
<td>&gt;0.27</td>
<td>&gt;0.40 Little rice paddy (very scattered); upland ag. (0.3 ha to 10 ha) patches; regrowth and trees intermixed with patches of upland ag. and paddy.</td>
</tr>
<tr>
<td>Permanent rice paddy system (PRP)</td>
<td>Greater than or equal to 40%</td>
<td>Less than 1:7</td>
<td>Not important</td>
<td>&lt;0.20 Little upland ag.; rice paddy (large areas); other land cover (large continuous areas)</td>
</tr>
<tr>
<td>Permanent upland agriculture system (PUA)</td>
<td>Greater than or equal to 40%</td>
<td>Greater than (+/-)8:1</td>
<td>&lt;0.20 Not important</td>
<td>Little rice paddy; permanent upland cultivation (large areas); other land cover (large continuous areas)</td>
</tr>
<tr>
<td>Mixed Systems</td>
<td>General Village Level Farming System Type</td>
<td>% of landscape under cultivation</td>
<td>Ratio of upland fields to rice paddy</td>
<td>NLSI upland</td>
</tr>
<tr>
<td>-------------------------------</td>
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</tr>
<tr>
<td>Systems with Paddy and Permanent Upland Agriculture</td>
<td>Greater than 25%</td>
<td>Roughly equal; can be more 7:1 or 1:7</td>
<td>&lt;0.20</td>
<td>&lt;0.20</td>
</tr>
<tr>
<td>Systems with Permanent Upland and Rotating Swidden Agriculture</td>
<td>Between 25% and 50%</td>
<td>Greater than 10:1</td>
<td>Between N/A</td>
<td>+/− 0.20</td>
</tr>
<tr>
<td>Systems with Permanent Upland Agriculture, Paddy and Rotating Swidden (can be Composite Swidden)</td>
<td>Between 25% and (−/+)40%</td>
<td>Usually roughly equal; can be more 3:1 or 1:3</td>
<td>Between 0.20 and 0.28 (can be &gt; 0.28; determined by visual analysis)</td>
<td>&gt; 0.28</td>
</tr>
<tr>
<td>Composite Swidden or mixed with Rotating Swidden in the same commune</td>
<td>Less than 25%</td>
<td>Greater than 1.5:1</td>
<td>&gt;0.27</td>
<td>&gt;0.27</td>
</tr>
</tbody>
</table>
Example Results District Level Farming Systems change 1992 to 2000

Thanh Son District 1992

- Black: Rice paddy systems
  - Systems with permanent upland, rice paddy, and swidden (can include composite swidden)

Thanh Son District 2000

- Grey: Mixed rice paddy and permanent upland agricultural systems
- White: Composite swidden; or composite swidden with rotational swidden agriculture
Trends in upland farming and livelihood system changes

- Permanent cultivated fields (year-on-year cultivation)
- Tree crops
  - Pulp trees (acacia, eucalyptus, pine)
  - Rubber
  - Other tree crops (fruit, bamboo)

Rubber in northern mountains of Vietnam
Trends in upland farming and livelihood system changes

- Shortened fallow / swidden systems
- Continued medium to long swidden/fallow
- Diversification strategies within swidden systems

Animal husbandry and swidden

Fruit trees in long-fallow

Shortened fallow
Analyzing the resiliency of the farming system change trends

1. How diverse are the production activities within the system?
2. Is the system seeking to optimize the efficient production of an output at the expense of the production of other potential outputs?
3. Is the system open to adopting other production activities?
Permanently Cultivated Field Crops

• System Diversity? Limited
• Seeks efficient production of specific field crops; reliance on inputs; reliance on markets for both inputs and for selling of crop
• Limited scope within farming system for adopting other activities
Replacement Tree Crops

• Farming Diversity? Limited, but not totally eliminated (fallow fields are replaced by rubber, pulp trees, fruit trees, bamboo)
• Tree crops reliant on outside inputs (seedlings)
• System reliant on external markets for selling outputs (and also reliant on market to set price)
• System seeks to optimize production of specific crop (chosen tree crop)
• Potential of the system to adopt other production activities? limited
Shortened Fallow Swiddens

• Diversity of activities – decreased (less options within shortened fallow areas)

• Not seeking to optimize one production activity

• Open to adaptation and adoption? Yes, but limited capacity given stress on system (the shortened fallows)
Continued medium to long-fallow swidden with diversifying of activities

• High diversity
• Not seeking to optimize production of anyone activity
• Actively adopting other activities
Which systems are most resilient?

- Permanently cultivated fields: low resiliency
- Tree crops: depending on the management techniques provide low to medium resiliency
- Shortened fallow systems: medium resiliency (decreasing?)
- Continued medium to long-fallow with diversified activities: high resiliency
Vulnerability?

• Less resilient systems less adaptable to changes in conditions – more vulnerable to shocks

• Climate change projections suggest there will be these shocks: increase in average yearly temperatures and more extreme events

• Trends in changing farming systems suggest more potential vulnerability for upland peoples
Conclusions and Implications

- Two independent lines of evidence show changes in upland farming systems are taking place from swidden systems to mono-cropped permanently cultivated systems.
- Changes are leading to
  - less resilient farming systems in the uplands
  - Increased vulnerability of upland populations who rely on these systems
Acknowledgements

• Center for Agricultural Research and Ecological Studies at Hanoi University of Agriculture
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• DANIDA
References


Methodology – Field Checking Model

Field checking was done in selected communes and villages in order to identify what the land cover and agricultural practices in the communes/ villages. The following methods were used to gather the information:

- District level: interview with relevant district officials to gain permission to do research / gather relevant information from them;
- Commune level: interview with commune officials re: local agricultural practices, whether NTFPs are collected in the area, gain permission to visit villages in the commune;
- Village/hamlet level: targeted interviews re: agricultural practices with headman and selected local farmers, walk transects with local farmers to observe local agricultural system, and use GPS receiver to mark locations of different fields and land cover.
- After fieldwork the results from the interviews and from the field transect observations were discussed and analyzed. A farming system typology for each village/hamlet was identified.
- Transects walked / GPS survey done to collect supplemental ground truth data for accuracy assessment of land-cover classification; recall interviews done with farmers to get land-cover recall information for older images.
Projected Climate Change and Vietnam

• Projected regional changes (IPCC 2007):
  – Increase in average yearly temperatures of 2.5\(^\circ\) C
  – Increase in annual rainfall \~ 7%
  – Increase in extreme (warm and wet) events: 100% and 44% respectively

• Projected for north-central and northern mountains (Trong 2009)
  – Increase in average yearly temperatures of 2\(^\circ\) - 2.5\(^\circ\) C
  – Vietnam’s MONRE project ‘s a decrease in precipitation; Vietnam’s Institute of Meteorology, Hydrology, and Environment project slight increase, but changes by season
  – Increase in extreme events for mountains
## Methodology – Identifying Potential Farming System Areas

### Spatial Land Cover Patterns Identified within Commune Boundaries

<table>
<thead>
<tr>
<th>Land Cover Pattern ID</th>
<th>Land Cover Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Large areas of wet rice agriculture (greater than 20 continuous hectares)</td>
</tr>
<tr>
<td>B</td>
<td>Areas of small to medium continuous wet rice agriculture (1/2 to 20 hectares in size)</td>
</tr>
<tr>
<td>C</td>
<td>Large continuous areas of dry land agriculture fields (greater than 10 hectares) with little or no regrowth within the areas.</td>
</tr>
<tr>
<td>D</td>
<td>Patches of small to medium size dry land agriculture fields (1/3 to 10 hectares) that are interspersed with patches of regrowth or trees/forest land cover.</td>
</tr>
<tr>
<td>E</td>
<td>Large continuous areas of regrowth or trees/forest land cover found.</td>
</tr>
<tr>
<td>F</td>
<td>Little to no areas of regrowth or trees/forest land cover found.</td>
</tr>
</tbody>
</table>