Drivers of Farmland Abandonment in Western Ukraine

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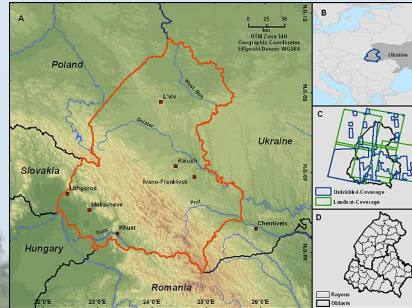
Introduction

- Farmland abandonment affects ecosystem services profoundly and threatens cultural identity and agricultural biodiversity.

- Eastern Europe has experienced drastic political and socio-economic changes since 1990 which resulted in widespread farmland abandonment.

- Different rates and patterns of abandonment across regions raise the question of what drives these patterns?

- Existing work in other regions emphasizes the importance of topography, accessibility, population change, and farming intensity as drivers of abandonment

Figure I:
Study region in the Ukrainian Carpathians. A: Study region boundaries (red), topography, and major population centers. B: Location of the study region in Europe. C: Landsat TM footprints (green) and Quickbird footprints (blue) used. D: Oblast (bold) and Rayon (fine) boundaries.

- Western Ukraine has high variability in environmental and socio-economic conditions and different cultural traditions of land use.

- With this work we wanted to test the following hypotheses for Western Ukraine: abandonment rates are higher
  I. in areas of higher elevation, steeper slope and poorer soils
  II. afar from markets
  III. in areas of decreasing rural population
 IV. where farming intensity decreased most

Methods

Mapping farmland abandonment

- Two-step approach mapping farmland of last socialist years (1986-1988) and farmland abandonment until 2008.
- Landsat TM imagery for classification and GoogleEarth-Quickbird imagery for training.
- Support Vector Machines yielded highly accurate maps (>90%).

Assessing drivers of farmland abandonment

- Analysis using multiple linear regression, with a combination of best subsets and hierarchical partitioning used to determine variable importance.
- Scale of analysis: Rayon (county) level.
- Variable groups: 'environmental', 'accessibility of farmland', 'population change', and 'agricultural input intensity'

Results and Discussion
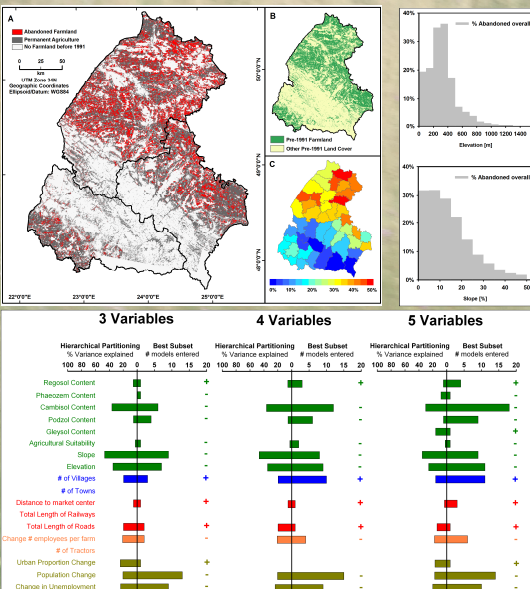
Figure II:
Top left: Classification results for farmland (small) and abandonment (large); and summarized on the district level. Top right: Abandonment rates by slope and elevation. Bottom: Result of the statistical analysis.

- Of 22,350 km[2] active farmland at the end of the 1980s, 6,600 km[2] were abandoned (~30%) by 2008.
- Abandonment rates on the Rayon (district) level vary between 0.2% and 56% (mean: 24.44%, median: 20.69%).
- More abandonment in lower elevations and flatter slopes.
- Regression models explained up to 76% of total variability.
- Environmental and population variables most important; accessibility and farming intensity only with minor importance.

- Better soils and subsistence farming likely explain low rates in the mountains.
- Weak importance of accessibility variables might indicate regional variations of abandonment pattern (in comparison to Muller et al. 2009)
- More abandonment closer to cities reflects outmigration and opportunities of better income in cities.
- Overall, rejection of most of our hypotheses.

Conclusions

- Abandonment in Western Ukraine followed different rules than previously identified.
- Differences between Europe's West and East may reflect fundamentally different underlying causes.
- Large area assessments are important to understand processes.
- Generalization hardly possible, even in regions that suffer from the same economic shock.

References:
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