



Recultivation of abandoned agricultural lands in Ukraine: Patterns and drivers



Anatoliy Smaliychuk^{a,b,*}, Daniel Müller^{a,c,d}, Alexander V. Prishchepov^{c,e,f},
Christian Levers^a, Ivan Krulov^b, Tobias Kuemmerle^{a,d}

^a Geography Department, Humboldt-Universität zu Berlin, Unter den Linden 6, 10099 Berlin, Germany

^b Geography Department, Ivan Franko University of Lviv, Str. Doroshenka 41, 79000 Lviv, Ukraine

^c Leibniz Institute of Agricultural Development in Transition Economies (IAMO), Department of Structural Development of Farms and Rural Areas, Theodor-Lieser-Str. 2, 06120 Halle (Saale), Germany

^d Integrative Research Institute on Transformations of Human-Environment Systems (IRI THESys), Humboldt-Universität zu Berlin, Unter den Linden 6, 10099 Berlin, Germany

^e Department of Geosciences and Natural Resource Management, University of Copenhagen, Øster Voldgade 10, DK-1350 København K, Denmark

^f Institute of Steppe of the Ural Branch of the Russian Academy of Science (RAS), Pionerskaya str. 11, 460000 Orenburg, Russia

ARTICLE INFO

Article history:

Received 16 November 2015

Received in revised form 25 January 2016

Accepted 26 February 2016

Available online xxx

Keywords:

Land-use change

Agricultural expansion

Post-Soviet agricultural abandonment

Boosted regression trees

Spatial statistics

MODIS

ABSTRACT

The recent rise in agricultural commodity prices and the expectation that high price will persist have triggered a wave of farmland expansion in regions where land resources are still available. One such region is the former Soviet Union, where the collapse of socialism caused massive agricultural abandonment and where some of these lands are now being brought back into production. Yet, the extent and spatial patterns of recultivation, and what determines these patterns, remains unclear. We examined the extent of recultivation of abandoned agricultural land in Ukraine since 2007 using a new, satellite-based recultivation map and assessed the effect of biophysical and socioeconomic determinants on recultivation patterns using boosted regression trees. We found key predictors of recultivation to be related to the suitability of land for agriculture (i.e., soil quality, temperature). Accessibility to major cities was also important, with most recultivation happening closer to settlements, but this influence varied across Ukraine. Variables related to agricultural management (fertilizer input, mechanization) and demography were negligible in explaining recultivation in our analyses. These factors suggest that recultivation patterns were primarily driven by factors related to land productivity, with recultivation focusing on the most promising areas. Given the remaining large amount of unused agricultural land in Eastern Europe and the former Soviet Union, and considering that much abandonment occurred in areas only marginally suited to agriculture, our findings provide important insights into where recultivation can be expected to happen and thus for assessing the potential socioeconomic and environmental impacts of recultivation.

© 2016 Elsevier Ltd. All rights reserved.

1. Introduction

Agriculture provides humans with essential food, fiber, and biofuel, but it is also a key driver behind the loss of ecosystem services and biodiversity (Foley et al., 2005). Although agriculture is still expanding in many tropical regions (Laurance et al., 2014), agricultural abandonment has become a common land-use change process, both in temperate regions such as Western Europe (Hatna and Bakker, 2011; MacDonald et al., 2000) and the United States

(Ramankutty et al., 2010), as well as in some tropical areas, including Latin America (Izquierdo and Grau, 2009) and Asia (Zhang et al., 2014). Agricultural abandonment often occurs in more marginal areas, whereas agricultural production concentrates in fertile, accessible regions where profits from farming are larger. Moreover, agricultural abandonment can result not only from the outmigration of people from rural to urban areas but also from the displacement of agricultural production abroad (Kastner et al., 2014; Meyfroidt and Lambin, 2011). Where abandonment occurs, opportunities for restoring ecosystem services, such as carbon sequestration, soil stability and native biodiversity, arise (Cramer et al., 2008; Kurganova et al., 2014), and it is therefore important to understand the spatial patterns and fate of abandoned agricultural land.

* Corresponding author at: Ivan Franko University of Lviv, Geography Department, Str. Doroshenka 41, Lviv 79000, Ukraine. Fax: +380 3 2272 2644.

E-mail address: a.smaliychuk@gmail.com (A. Smaliychuk).

Abandonment of agricultural land has been particularly pronounced and rapid in Eastern Europe and the former Soviet Union following the demise of socialism (Alcantara et al., 2013; Griffiths et al., 2013; Prishchepov et al., 2012). The transition from planned to market-oriented economies led to a strong withdrawal of government support for agriculture, price liberalization of inputs and outputs, the disappearance of formerly guaranteed markets, tenure insecurity, and increasing competition on globalizing agricultural markets (Hartvigsen, 2014; Rozelle and Swinnen, 2004). Additionally, rural areas experienced aging populations and high rates of outmigration to cities (Philipov and Dorbritz, 2003). Together, this has led to widespread agricultural abandonment, with 31 million ha (Mha) of abandoned cropland in European Russia, Ukraine, and Belarus (Schierhorn et al., 2013) and more than 50 Mha of abandoned farmland in Central and Eastern Europe (Alcantara et al., 2013). Whether these lands are permanently abandoned or only set aside for future use remains unclear.

A number of studies have assessed the spatial patterns of post-socialist land abandonment throughout Eastern Europe and the former Soviet Union, revealing substantial variation regarding the relationship between abandonment and its spatial determinants. For instance, in temperate European Russia, higher abandonment rates between 1990 and 2000 were associated with the lower grain yields of the late 1980s, larger distances from settlements, and lower population density (Prishchepov et al., 2013). Similarly, in post-communist Albania and Romania, abandonment rates

increased further away from settlements, although more fragmented fields were prone to abandonment in Albania but not in Romania (Müller et al., 2009; Müller and Munroe, 2008). In Western Ukraine, higher abandonment rates between 1989 and 2008 were found in flatter areas, in close proximity to cities, and where population declined (Baumann et al., 2011). Overall, post-Soviet abandonment was often more widespread on more marginal lands (Prishchepov et al., 2013). However, institutional factors (e.g., land reforms, EU accession) affected abandonment patterns strongly in some regions.

In light of growing global demand for agricultural products (OECD/FAO, 2013), an emerging land scarcity (Lambin and Meyfroidt, 2011), and the drastic environmental costs of expanding agriculture further into natural ecosystems, interest in currently unused agricultural land is rising (Lambin et al., 2013; Schierhorn et al., 2014). For example, policies to increase biofuel production and rising commodity prices have resulted in widespread grassland to cropland conversions in both the United States and Europe (OECD, 2008), including the conversion of approximately 1.2 Mha of grassland in the US between 2008 and 2012 (Lark et al., 2015; Wright and Wimberly, 2013). The unused agricultural lands of Eastern Europe and the former Soviet Union have also been shifting into focus, particularly since 2000 when the region recovered economically and global prices of agricultural commodities began to rise (Schierhorn et al., 2014; Visser and Spoor, 2011). As a result, recultivation of idle former farmland is increasing across the region (Griffiths et al., 2013; Kraemer et al., 2015;

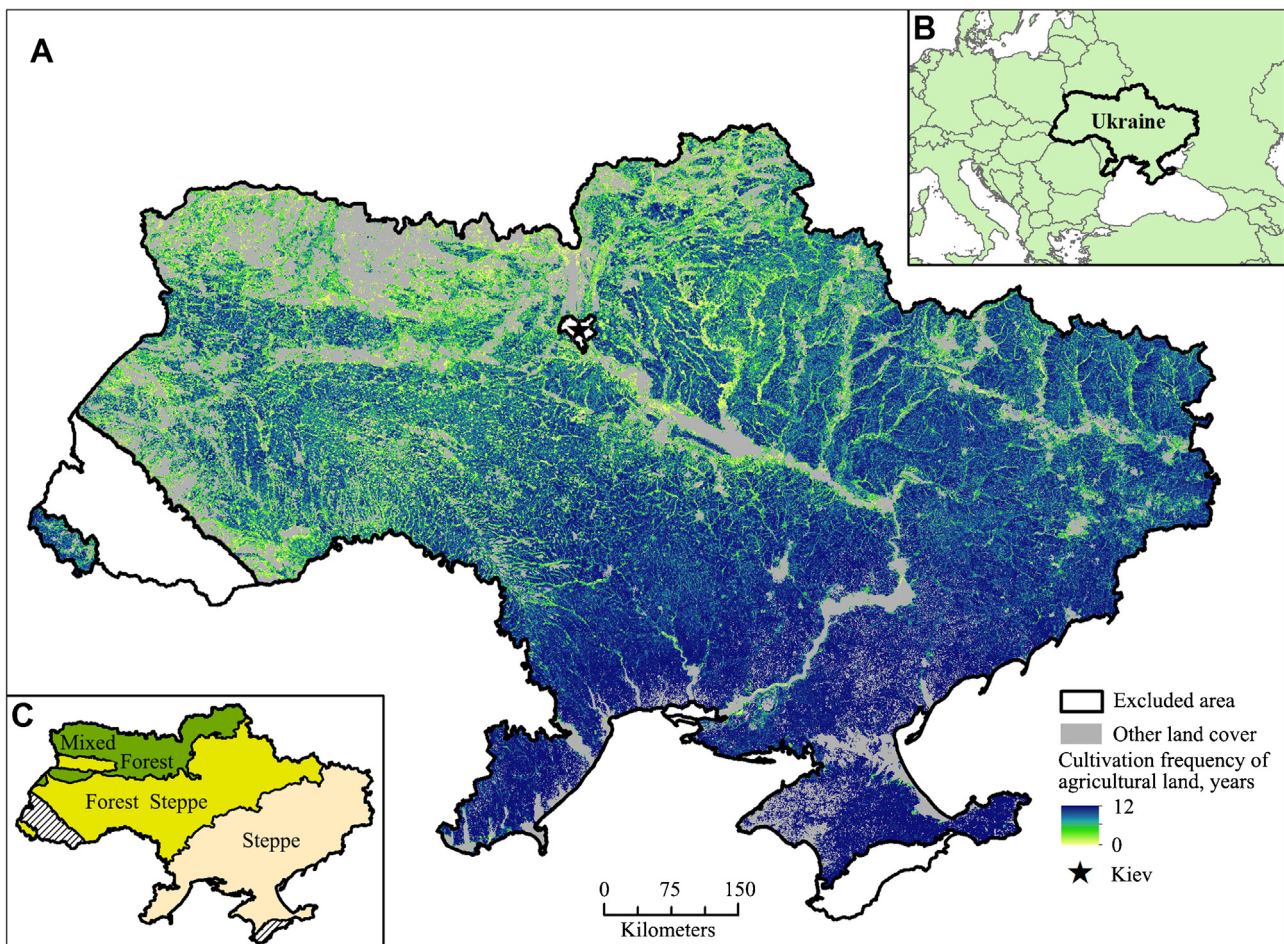


Fig. 1. Study area of Ukraine. (A) Study area boundaries and frequency of cultivation from Estel et al. (2015). (B) Location of Ukraine on the European continent. (C) Environmental zones of Ukraine (Zastavnyi, 1994).

Download English Version:

<https://daneshyari.com/en/article/7469341>

Download Persian Version:

<https://daneshyari.com/article/7469341>

[Daneshyari.com](https://daneshyari.com)