THE USE OF HIGH-STEM FORESTS AND COPPICE FORESTS DURING SOCIALISM IN ALBANIA AND THE FORMER YUGOSLAVIA

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Abstract

This study investigatesthe use of high-stem forests, coppice forests, coniferous forests, broadleaved forests in socialist Albania and the former Yugoslavia. The inventory data of forests between 1953 and 1990 were used for both countries as well as forest data from remote sensing for three time steps of 1988, 2000 and 2007 for Albania. Method was descriptive statistics. Results showed that high-stem forests and coppice forests were used for industrial wood andfuel-wood. Broadleaved forests were harvested more than coniferous forests for industrial wood and fuel-wood. The share of fuel-wood remained high for Albania and reduced for the former Yugoslavia during socialism. Forest transition of high-stem forests and coppice forests happened in socialist and post-socialist Albania but not in former Yugoslavia.

Keywords: Albania, coppice forests, forest transition, high-stem forests, the former Yugoslavia, socialism

Introduction

Forest transition is important since the increase of forest cover is positively associated with the augmentation of soil protection, climate regulation forest service and resource forest service (Lambin & Meyfroidt, 2010; Thomas K. Rudel et al., 2005). The decrease of forests leads to a loss of biodiversity, the change of climate, and a worsening of livelihoods in rural areas (FAO, 2010a; Foley et al., 2005). Forest transition was firstly studied in Europe (Mather, 1992; Mather & Needle, 1998) and later in Asia and other tropical forest countries (Mather, 2007; Thomas. K. Rudel, 2010; Thomas K. Rudel, Bates, & Machinguiashi, 2002). Researchers that studied forest transitions in tropical forest countries have tried to explain the factors that cause the return of forests. For example, Meyfroidt and Lambin (2010) showed that agriculture expansion and wood exploitation in the uplands,

driven by population growth and migration from lowlands, caused deforestation in Vietnam from the 1970s to 1980s.

Post-socialist countries are worthy to study because governments might have implemented new land use and forest policies during socialism, which could affect the patterns of forest use and the increase of forest cover. Yet, empirical studies on forest use and management in socialism are rare.

The use of high-stem and coppice forestsis studied in socialist Albania and the former Yugoslavia. The inventory data of high-stem forests, coppice forests, broadleaved and coniferous between 1953 and 1990 were used for two countries to calculate the share of broadleaved and coniferousforests used for industrial wood and fuel-wood. The inventory data of high-stem forests and coppice forests were also used forthe transition of these forestsin socialism in the former Yugoslavia. Finally, three time steps satellite images data of high-stem forests and coppice forests were used in addition to inventory data to calculate the transition of these forestsin socialist and post-socialist Albania.

Methods

Albania

The study area is Albania consisting of a total area of 28,748 km^2. The former Yugoslavia had an area of 255,804 km^2. Two countries were under socialist regime from the end of the Second World War until the early 1990s. The former Yugoslavia was split into seven countries due to conflict and political disputes.

The collectivization reform of agriculture land started in 1946 in Albania. Major developments of agriculture sector occurred in 1950s, 1960s, 1970s. During this time, the production of wheat increased, but forestland area decreased. The loss of forest cover was caused by the extension of “new agriculture land” in forested land, which in fact resulted unproductive after the second year of production (deWaal, 2004; World Bank, 2002). The post-socialist agriculture reform distributed the land to local people (Cungu & Swinnen, 1999). Highly eroded agriculture land was abandoned by local people because of their poor soil quality and or was overgrazed (World Bank, 2002).

The agriculture statistics of 1934 and 1935 showed forests and woods covered a land area of 36 percent, pasture of 30 percent, (potential) agriculture land of 23 percent, arable land of 12 percent, and unproductive land of 6 percent (MEK, 1936). In 2005, the area consisted of high-stem forests and coppice forests (27 percent), high-stem forests and coppice forests and brushes (36 percent), and high-stem forests, coppice forests, brushes and other forest land (37 percent) (European Forest Institute, 2009; FAO, 2010b). Estimations from satellite images of year 1988, 2000 and 2007

showed that forests and woodland covered 27 percent of the total land area in 1988, 26 percent in 2000 and 28 percent in 2007 (Table 1) (Suess, 2010). Forests and pasture land were 100 percent state-owned forests in socialism. The new governmental forest reform, which started after the collapse of socialism in 1994, allowed local people and local government to use and manage forests, respectively. About one million people were able to use 60 percent of total forested land by 2003 in Albania(WB, 2011).

Forest data

Two sources of forest data were used in this study. First, forestry inventory data were collected in 1953, 1958, 1963, 1985 and 1990for Albania and the former Yugoslavia. These data consisted of forest removals for industrial wood and fuel-wood (coniferous forests, non-coniferous forests which are designated as "broadleaved forests" in this study), area of high-stem forests, area of coppice forests, area of agriculture land. All these data were provided for free by the European Forest Inventory (EFI) (forest inventory data were availablefor Albania in 2000 and 2005, but not for the former Yugoslavia) (European Forest Institute, 2009). The data of high-stem forests and coppice forests for Albania and the former Yugoslavia from 1963 to 1990 and of agriculture land for Albania from 2000 until 2007 were missed.

Second, forest cover data of resolution 28.5 m derived from Landsat TM and ETM+ satellite images for ~1988, 2000 and 2007 were processed in the Geomatics Lab at the Humboldt University of Berlin with an overall accuracy of 93% and a kappa indices agreement of 0.85, and were provided from Stefan Suess (2010). The forest class consisted of forest patches greater than 7 pixels of Landsat including semi-natural terrestrial vegetation (broadleaved evergreen forest, broadleaved deciduous forest, coniferous forest and mixed forest), cultivated terrestrial (broadleaved arboriculture, fruit trees, orchards, groves, nurseries, vineyards) and shrub forest of a height of greater than 3 m and covering above the 50 percent of a Landsat pixel. The non-forest class consisted of all non-forest land cover (built up areas, urban and industrial areas, artificial and natural perennial water bodies, aquatic vegetation, beaches, bare rocks/soils, sparse trees and shrubs; rock outcrops, herbaceous crops, vegetated urban areas, grassland) (Suess, 2010)(see also Laze, 2013). Suess (2010) used the approach of Support Vector Machine (SVM) chain classification approach (Knorn et al., 2009) for the satellite images of 1988, 2000 and 2007. The SVMs represent a group of non-parametric algorithms (Huang, Davis, & Townshend, 2002), and is considered as one of the most recent developments in the field of machine learning (Janz, Linden, Waske, & Hostert, 2007). Forest pixels were majority filtered using 3x3 kernel to eliminate noise (areas with less than 7 pixels of

forest were considered as non-forested areas) (see Kuemmerle et al., 2009). All images and vector layers were projected to UTM Zone 34 N, datum WGS84.

Results and Discussion:

Forest use and governance during socialism:

The high-stem forests and coppice forests have been managed and used for fuel-wood and industrial wood in Albania and the former Yugoslavia during socialism. The high-stem forests and coppice forests have been reduced by 11 percent between 1953and 1958 in Albania (Table 1). The high-stem forests have also declined approximately by 9,000 ha during socialism (Fig. 2a). The agriculture land increased from 1953 to 1963 by approximately 1 percent, but it decreased by 18 percent from1963to 1990 (Fig. 2b). Broadleaved forests have been massively used for fuel-wood (77 percent). The share of coniferous forests for fuel-wood was 23 percent. The share of industrial wood was 23 percent for Albania,using approximately 60 percent of broadleaved forestsand 40 percent of coniferous forests (in average between 1953 and 1990)(Fig. 3a).

The high-stem forests have increased by 564,000 hectares in the former Yugoslavia (Fig. 2a). The agriculture land has increased between 1953 and 1963 by approximately 4 percent of the total land area. The share of industrial wood was 40 percent for the former Yugoslavia, using approximately 60 percent of broadleaved forests and approximately 40 percent of coniferous forests (in average between 1953 and 1990) (Fig. 3b).

Forest transition of high-stem forest and coppice forests in Albania:

High-stem forests and coppice forests covered 35 percent of the total land area of Albania in 1953. In 1958, forest cover was reduced by 11 percent. Forest coverhas slightly increased after 1958, indicating a forest transition as defined by Mather (1992) in socialist Albania. The extension of “new agriculture land” in forested land(deWaal, 2004; World Bank, 2002)between 1950s and 1960s could have reduced the forest cover explaining the forest transition in socialism.

Forest transition has occurred in year 2000 in post-socialist Albania (Table 1) using forest data of inventory of 1990, 2005 and two time steps of satellite images2000 and 2007. Laze (2013)showed that forest cut in Albania was mainly driven by subsistence necessities around populated areas between 1988 and 2000, while forest regeneration in post-socialist forest reform of commune forests between 2000 and 2007 have caused the increase of forest cover. Thus, this new forest reform has contributed to the forest transition in post-socialist Albania.

Forest transition of high-stem forest and coppice forests in former Yugoslavia:

The reforms on land of the government of the former Yugoslavia have affected the changes in high-stem forest cover contributing to the increase of 2.2 percent from 1953 to 1990 (Fig. 2a). The share of fuel-wood was reduced by 19 percent and the share of industrial-wood was increased by the same figure (19 percent) between 1953 and 1963 (Fig. 3b).Coniferous forests have been used less for industrial wood and fuel-wood in later years, 1990, compared to the beginning of socialism, 1953. Afforestation could explain forest increase in socialism and non-occurrence of forest transition in Yugoslavia.

Conclusion:

Forest service of resources has been very important in socialism. Trigged by the question whether forest transition of high-stem forests and coppice forests had ever happened from the beginning of the socialism time until today, I conducted this analysis to calculate the forest transition only for high-stem forests and coppice forests in socialism and post-socialism. Forest transition has occurred in Albania in periods of socialism and post-socialism, but not in the former Yugoslavia. I conclude that these studies are useful in understudied countries to identify the occurrences of forest transition and to understand the impacts of forest reforms on high-stem and coppice forestcover.

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Tables

Table 1 Forest transition in Albania

Years	1953	**1958***	1990	1988	**2000***	2005	2007
Forest cover in hectares	992000	700000	788800	767000	750000	782400	805000

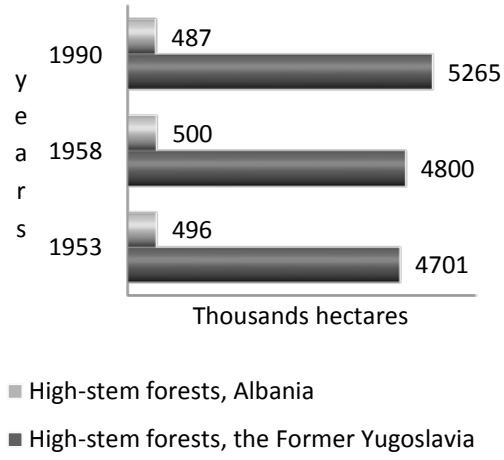
Note: * Denotes forest transition in 1958 in socialism and 2000 in post-socialism based on the definition of forest transition byMather (1992)

Figures

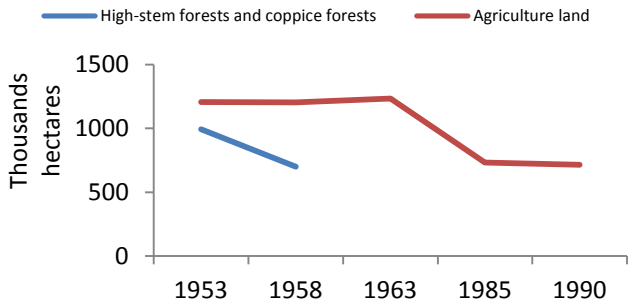
Figure 1 Albania and the Former Yugoslavia

Figure 2 (**a**) The use of high-stem forests for Albania and the Former Yugoslavia(**b**) the use of high-stem forests, coppice forests and agriculture land for Albania(**c**)the use of high-stem forests, coppice forests and agriculture land for the Former Yugoslavia

a)



b) Albania



c) The Former Yugoslavia

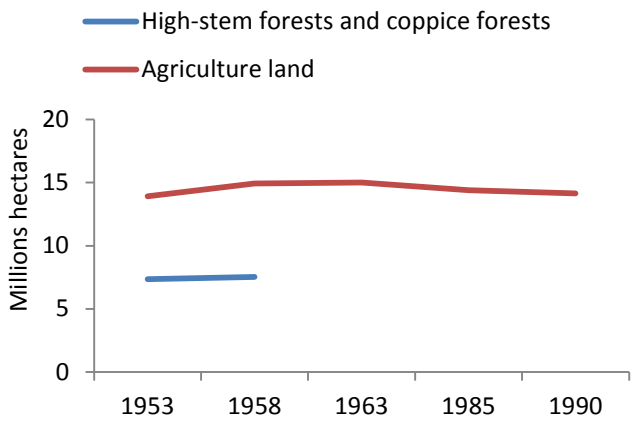


Figure 3 (**a**) Percent of share of industrial wood and fuel-wood for Albania and (**b**) percent of share of industrial wood and fuel-wood for the former Yugoslavia