Land Use Policy 61 (2017) 329–338

Contents lists available at ScienceDirect

Land Use Policy

journal homepage: www.elsevier.com/locate/landusepol

Farmers and their groves: Will cost inefficiency lead to land use change?

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ARTICLE INFO

Article history:
Received 8 August 2016
Received in revised form
17 November 2016
Accepted 20 November 2016
Available online 5 December 2016

Keywords:
Cost efficiency
FADN data
Forest ownership
Renewable energy policy
Reforestation

ABSTRACT

Increased forest areas and climate change mitigation are policy goals enhanced by expanding private forest ownership. This study shows transfer of land from farms owning forested acreage associated with low quality land and high production costs achieves such goals. Calculated cost efficiency scores show a large gap between the most and least efficient farms, and farms with forests are less cost efficient. Land reforestation through subsidy programs could replace income from agricultural production. We illustrate that farms from the applied FADN panel could reforest 45,000 hectares, binding about 0.5 mln tons of carbon annually without limiting food or feed supply.

1. Introduction

The land reform introduced by the Soviet-imposed government in Poland following WWII re-distributed land from some large estates among farmers, while creating a sizable state-owned farm sector on selected nationalized domains. The seizure of large private estates also involved the nationalization of forests within the natural part of an estate. The state-owned forest sector expanded greatly although the share of forests in the total country's area shrunk. The expansion of state-owned forested areas was accompanied by the rapid expansion of the state forest service, which had already been functioning prior to World War II. By 1985, for example, the state forest service employed 131,000 personnel. The number of employees gradually declined reaching 25,000 in 2009 (Kancelaria Senatu, 2010) and continued to decrease in 2010. Only in 2011–14 did the state forest service employment increase slightly reaching the 2009 level (GUS, 2015).

The transition to the market-driven economy in 1989–1990, left the forest service largely unchanged despite fundamental shifts in ownership of other state-owned assets, especially the state farm sector. While the state farm sector was promptly liquidated, forests remained in the government domain. The state farm sector sustained by government support under the centrally-planned economy (Florkowski et al., 1986, 1988) could not compete with the family farm sector once the administered price and subsidy system was abolished. Large, inefficient state farms were divided into original estates and leased or sold to farmers. The state forest service, in turn, benefitted from freeing prices. Distorted wood and lumber prices subjected to administrative control were abolished with the adoption of the market as the resource allocation mechanism in 1989. Market pricing increased forest service revenues. The primary disturbances faced by the forest service were periodic administrative shifts from one ministry to another. Currently, the forest service is administered by the Ministry of the Environment.

The reallocation of land away from the state to the private sector and subjecting agricultural production to market economy mechanisms forced new and old owners to reconsider farming of less productive land. Price liberalization resulted in a one-time increase of prices in 1989–1991. The inflation rate was 585.5 percent in 1990 and 70.1 percent in 1991 (Barbone, 1992). Price increases led to a decrease in food demand creating a surplus of all types of food, a phenomenon on a scale unknown in Poland in decades of the centrally-planned economy. Farmers faced not only a contraction of food demand, but unfamiliar competition from imported food. The latter was the result of abolishing the monopoly of the state on international trade. Price re-adjustments and weak food demand were associated with the change in environmental policy in the country. Environmental policy was focused on the protection of land and landscape, among others, and stimulated the reforesta-

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http://dx.doi.org/10.1016/j.landusepol.2016.11.032
0264-8377/

tion of poor quality agricultural land. As a result, land classified as Vth (i.e., Va and Vb) and VIth quality (according to Polish land quality classification (Zawadzki, 2002)) could be planted with trees with government assistance. The goal of the policy was to increase the total forested area in Poland, but the result was also the permanent withdrawal of poor quality arable land from production. A number of farmers joined the program and planted trees, benefitting from government subsidies. The program created a substantial privately-owned forested area.

It is plausible that the primary motive of farmers in participating in the program of planting trees was the eligibility for subsidies, while not having to till land that was not suitable for agricultural production. However, since the program was implemented, there has been the lack of a study that examined the effects of reallocating arable land to forestry. Can the re-allocation of land, besides helping to achieve the goal of increasing the share of forested land, increase the efficiency of farms? Farmers were unlikely to re-allocate all their land to forest, but only that of the lowest quality and eligible for the subsidy, especially once the food market started to recover in the first half of the 1990s.

Private forests help to achieve important policy goals. First, Poland has a relatively lower share of forested land than many other EU countries and forests are viewed as an important element of a sustainable environment. An increase in forested areas remains a major objective of environmental policies. Second, a non-productive effect of expanding forested area is binding of CO_2, while forest-based resources provide feedstock that contributes to the use of renewable energy to the country's total energy balance. Laws passed in recent years aim at increasing renewable energy's share in total energy produced in the country to 14% by 2020. Increasing domestic agricultural production not only satisfies food security needs, but generates surplus and forces changes in the farm sector. The average farm size has been steadily increasing in Poland in recent decades and the number of farmers has been declining. Most recently (as of April 2016), a new law has restricted agricultural land markets, granting priority of purchase of any farm land to a government agency over its sale to another farmer. Such laws may encourage retiring farmers and their non-farming heirs to retain land ownership. Relatively low-quality land may be converted into timber land, representing a long-term family investment, contributing to the goal of reforestation, and increasing renewable energy feedstock in the future.

To examine the performance of farms with forested land ownership in Poland, this study compares the efficiency of farms with any portion of their operated land as a forest with those that do not have any forested land. It is hypothesized that a farmer with a timber stand operates agricultural land of low quality and reforested the part of the lowest productivity. Farming such land is relatively costly because of the naturally low productivity of such soils, and farms with forested hectares have difficulty competing with farms that lack forested hectares (presumably operating more productive land). Owners of farms with forested hectares are likely to face the problem of transferring the farm operation within a family. High costs limit potential revenues, making farming unattractive for offspring. An option for retaining the ownership of land, besides renting, is reforestation of all owned hectares. Such an operation requires less input, while still generating income and is feasible for absentee ownership of heirs, who migrated to jobs in urban areas as rural areas depopulate in many regions. Reforestation rather than lease helps to achieve important national and EU policy goals. First, reforestation increases the share of forests in the country's total area, a currently stated goal of national policy. Second, a properly selected mix of species enhances the quality and future value of stands. Third, reforested areas become a source of feedstock in the renewable energy generation helping to achieve the EU-imposed mandate regarding the share of renewable energy in the total energy balance. Fourth, the withdrawal of low-quality agricultural land contributes to the national policy of enhancing the quality of the environment because it lowers the use of fertilizers, herbicides, and other inputs that could contribute to the pollution of soil, surface water, or air. Finally, the land is retained as a family asset. Renting the farmland is not likely to generate substantial revenues because of the low quality of soil and, possibly, reluctance of a renting party to invest in improving its productivity. The study focuses on cost efficiency, which was estimated using the fixed effects stochastic cost frontier model. A generalized multiproduct translog cost function represents the deterministic part of the cost function and is estimated using the Farm Account Data Network (FADN). The applied approach recognizes eight different farming operations distinguished in the FADN database and examines the effects of farms with forested hectares on cost efficiency in each type class. Furthermore, the study estimates the potential increase in the area of forests assuming all farms owning a stand and included in the FADN would reforest the operated land and provides an estimate of gain in total forested area of the country.

1.1. Forest ownership in Poland

Historically, forests were owned by nobility or royalty in Poland. After re-gaining independence following World War I, the government organized the state-owned forests as a commercial company on December 30, 1924 (Kikulski, 2016), but it soon (in February 1924) was converted into the state forest service organization. Major changes followed World War II when all forests exceeding 25 ha in size were nationalized. The combination of forest nationalization and re-shaping of Poland's borders meant that nearly 90 percent of forests was state-owned prior to 1989 and concentrated in the western and northern parts of the country.

In 2013, state-owned forested areas accounted for 81.1% of the 9.177 million hectares of total forest area in the country (Leśnictwo, 2014). Not all state-owned forests are operated by the forest service. About 2% are national parks, nearly 1% represents communal forests, and the balance is owned by other government entities. The state forest service manages about 77% of the forested area. The total area of the country covered by forests, which amounted to 38% in 1920 (within post-WWI national boundaries) declined to 20.6% in 1945 (within post-WWII national boundaries), has reached 29.4% in 2013, or 0.1% more than a year earlier. The goal of national policy is to increase the share of forest to 30% of the country's total area by 2020 and 35% by 2050. The expansion of forest area must primarily come from the re-allocation of privately-owned agricultural land.

1.2. Expansion of privately-owned forests

Privately-owned forests accounted for 18.9% of all forests in Poland in 2013 (Leśnictwo, 2014). Under the centrally-planned economy, private forest areas were fairly stable because a larger parcel of land could have been owned only by farmers, who farmed every bit of it. Those who had forests (25 ha or less) seldom were reforesting any of the arable land or pasture because the demand for food was insatiable and of the heavy dependence on own forage supply for livestock due to restrictions placed by the government on family farm access to commercial feed. The centrally-planned allocation system and distorted prices resulted in inefficiencies (Penn, 1989) and those, in turn, encouraged farming of even the lowest quality land.

The adoption of the market economy and the fundamental economic, political, and social changes following the "Round Table" agreement in 1989 in Poland led to the reduction of the state's role in the economy. For example, in 1995, state-owned forested areas accounted for 82.9% of the total forested area in the country. The small portion of forests that remained private after nationalization were small patches of land owned by farmers, whose farms did