

MEASURING THE EFFECT OF FOREST LAND CONSOLIDATION IN BULGARIA. CASE STUDY OF NORTH-WESTERN STATE ENTERPRISE

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Abstract: *Land consolidation in forest areas is a problem that has been sought in Bulgaria in recent years. This is a problem in all forests where ownership is distributed between the state, municipalities and private owners. Timber harvesting and exportation is much easier and cheaper when access is easier. This article summarizes the main results of forest land consolidation, highlighting the leading effects of the land consolidation campaign in Bulgarian Forestry. The purpose of the study is to calculate some basic outcomes of consolidation that allow determining the economic effectiveness of it. The study showed that at this stage the goals set by the state for achieving forest consolidation have been partially achieved. The effects are mainly on improving the management of forest areas, especially in the part of those that are not aimed at harvesting and profits. The results for the local communities are not satisfactory and solutions in this direction must be sought. Current paper is the first step of developing an optimization model in purpose of supporting the forestry units in Bulgaria and in other countries which have undertaken such an uneasy task.*

Key words: *forest, land, consolidation, measurement, management, methodology.*

1. Introduction

Bulgarian forestry is a state structure functioning as a private corporate organization. The whole sector is divided

into six companies. They finance their own activities. Decisions for the development of the sector are entrusted to managers. Forest management and timber use are activities that require positive economic

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efficiency. This is the reason why management teams seek the development of enterprises through different solutions. The forest land consolidation can be considered as one of them. According to Demetriou [2] the land consolidation is the one of the primary and most effective land management instruments for rural sustainable development. The main goal of forest land consolidation is often to improve the usability of the area for commercial forestry, but depending on the country and the location, environmental issues may also be important [8]. The increasing fragmentation of privately-owned forest land represents a main challenge for the future supply of wood raw material in the forest-based sector [7]. In this context, land consolidation means a comprehensive reallocation procedure of a rural area consisting of fragmented agricultural or forest holdings or their parts [13].

To date, there is no clearly formulated methodology for assessing the effects of forest land consolidation in the Bulgarian forest sector. The consolidation procedures carried out so far by the Bulgarian forest authorities aimed at achieving greater efficiency for timber harvesting and other objectives with non-economic effects. The main purpose of the consolidation process, officially published was to foster the steering of the forests mainly with protective functions. The so-called first stage in 2016 was a kind of experiment with consolidation of forest areas. Its combined effect is still not clear neither for the authorities nor for the academics. In some bureaucratic way the Ministry of Agriculture, Food and Forestry decided to repeat the "experiment". At present, the so-called second stage of

consolidation, for which 1,000,000 Euro has been allocated, has already been finished. The previous stage, carried out in 2016, was in amount of 350,000 Euro. The consolidation process was initiated with an "Order of the Minister of Agriculture, Food and Forestry". The Order covered all six state forest enterprises in the country. It was based on the Law on Forests under art. 163 [14]. Following the publication of the Minister's Order, the rules for consolidation were published. They observed the general algorithm/procedure of land consolidation campaign, but with some specific requirements. Only land properties in forest territories, owned by individuals, with an area of a separate property between 1 and 50 decares [15], are purchased with the funds (which have been subsidised) of the State Enterprise. Through this main requirement the state intended to spread the effect to as more as possible individuals in the territory of the state enterprise. In fact, the consolidation investigated here is the first of the three campaigns. The beginning of the second one was in 2019, but results were partially published until 2021, so it is still under assessment. All the procedures during the three campaigns are almost identical and the same in each state enterprise. They included:

- Introduction. The public was informed about the upcoming campaign. Information was provided on the size of the properties and the features they must have. People from local communities could apply;
- General requirements for the documents and application procedure. One of the most important elements of the procedure was the requirements to the property

documents and their forest assessment characteristics. The proximity typical of consolidation with state forest parcels was sought;

- Criteria, evaluation and ranking. In fact, the most of the criteria were covered under the preliminary stage in documents requirements. The main criterion was the difference between the price of the parcel given by its owner and the expert evaluation – the greater the evaluation, the greater chances State Enterprise to purchase the parcel;
- Purchase of forest parcels. The parcels had been chosen after the selection procedure was purchased by the enterprise.

The procedure did not include any evaluation of the effect. Even for the enterprise itself. It was not clear and still it is not whether the procedures caused any short-term effects or not. These campaigns included interference in rural regions. The North Western State Enterprise (NWSE) is fourth by size with forests area of 512022 ha of total 1961426 ha. On its territory are situated many of the protected areas in the Old Mountain region. In the same time, it covers the poorest region in the EU – North-Western region in Bulgaria. By these aspects the assessment of the campaign not only by the criteria in the Minister's Order would reveal the potential of consolidation like a tool for improving the sustainability of vulnerable regions like the North Western in Bulgaria. The purpose of the present study is, based on the available information, to make a summary assessment of the effect of the consolidation carried out on the investigated enterprise and on the region in which it is located. The NWSE continued

to consolidate parcels after the campaign with its own financial sources. This is the reason to be topical to reveal the effect on these actions during the years of campaign for the region.

2. Material and Methods

In the current study is implemented the Sustainable Development Index in order to reveal the effect on local communities and the region and the Data Envelopment Analysis in order to clarify the effect on the NWSE, mostly if the campaign caused lack of efficiency in it. Sustainable development index approach is quite suitable and allows comparison with next campaigns. The study period in the present study covers the sub periods 2013-2015, which immediately precedes the consolidation and the period 2016-2017, after it. The information needed to calculate the indices and DEA is based on the consolidation data from the enterprise, the annual financial statements and data from the forestry documentation. In the study are isolated and included in the SDI only those factors that may arise from the consolidation and from the overall activity of the NWSE, influencing the region.

3. Sustainable Development Indicators

According to Harmsen and Powell [5] there exists a many of sustainability indices, indicators, and metrics, as well as tools and methodologies for implementation. Some authors like Dobrota and Iancu [3] explore sustainable development and place theoretical framework that could be used to industrial organizations as well as for agribusiness of forestry. According to Landeta Manzano et

al. [9], Lu et al. [10] and Hemdi et al. [6] provide index including stepwise-arranged indicators. Authors like Gospodinova and Krachunov [4], Nedeva [12], propose to be implemented an index for sustainable development with indicators needed to the particular economic system or goal. In the study have been used Sustainable development index approach proposed by Nedeva [12], Gospodinova and Krachunov [4], and implemented by Neykov et al. [11] for the entire Forestry sector in Bulgaria. Methodology is suitable for grouping and assessing sustainability of particular economic system in dynamic aspect with usage of increments (growths) than any static indicators. The index includes sum of weighted indicators:

$$\sum_1^1 q_1 = 1 \quad (1)$$

The index of sustainable development (SDI) is following:

$$SDI = q_1 \cdot l_1 + q_2 \cdot l_2 + q_3 \cdot l_3 \quad (2)$$

where:

q_i are weights of the l_i ;

l_i – average of individual increment ratios of Economic, Environmental and Social possible outcomes after the consolidation for the group;

i – number for the indicators group: 1 for Economic, 2 for Environmental and 3 for Social.

The indicators for Economic, Environmental and Social outcomes after the consolidation are following:

A. Economic

- Net annual increment of stock;

- Increment of forests for wood supply;
- Increment of forests for non-wood supply;
- Increment of area of Forest available for wood supply;
- Increment of area of Forest not available for wood supply;
- Increment of welfare in the poorest region;
- Increment of welfare total.

The weights selection is a key process for the index. They can be chosen in various ways, but according to Böhringer [1] shares can be equal, expertly determined or just subjective. In this research, we use three approaches: by share of number of the indicators of each group in all indicators; share of the increments sum of each group into the sum of all increments of all groups.

B. Efficiency Ratios

The Efficiency Ratios of the Northwestern State Enterprise:

- Y_{1j} = Annual Revenues/Fixed assets;
- X_{1j} = Annual Revenues/Subsidiaries for Fixed assets;
- Y_{2j} = Annual Revenues/Land Properties;
- Y_{3j} = Annual Revenues/Investments in Land Properties;
- X_{2j} = Annual Revenues/Expenses for fixed assets.

C. The DEA analysis

The Efficiency ratios are compared year to year in order to determine whether the Enterprise was efficient in the particular year. The methodology of comparison is Data Envelopment Analysis (DEA), which is appropriate to estimate the efficiency in each year by comparing it to the most efficient year within the period.

- Each year is called Decision Making Unit in the model.
- The Enterprise is efficient if in the particular year the Total Efficiency (θ) is equal to 1.

The model:

$$\min \theta \tag{3}$$

Subject to:

$$\sum_{i=1}^n \lambda_j x_{ij} - \theta x_0 \leq 0 \tag{4}$$

$$\sum_{i=1}^n \lambda_i y_{ij} - y_0 \geq 0 \tag{5}$$

where:

λ_j are individual year weights, calculated by the model;

X_{ij} – inputs - the calculated efficiency ratios for “Subsidiaries for Fixed assets” and “Expenses for fixed assets” under number i for the year j;

Y_i – outputs are calculated efficiency ratios of Fixed assets, Land Properties under number i for the year j.

4. Results

The indicators, included in the index of sustainable development for the period after consolidation, are presented in Table 1.

Table 1

Indicators-increments included in the SD index for 2016-2017

Increments	Economic	Social	Environmental
Net annual stock increment			5.88%
Forests for wood supply	1.55%		
Removals	4.17%		
Forests for non wood supply			11.05%
Area of Forest available for wood supply	3.47%		
Area of Forest not available for wood supply			3.21%
Welfare in the poorest region		0.022%	
Welfare total		0.016%	

The presented results show that the economic factors of development have improved by a total of 9.19%. The economic development of the region depends on yields, and they have increased by 4.47%. In the interest of truth, this increase is not an isolated result of the consolidation, but a joint effect of the overall activity of the enterprise. As mentioned, the purchase of forest properties continued after the campaign and partially led to changes in Table 1. As can be seen in Table 1, the social indicators, namely the money went to

local communities, as a result of consolidation are quite small in terms of growth - 0.022%. The index also includes the overall increase in welfare in the country for the studied periods and shows that the region is ahead of overall welfare improvement of the country for the years of consolidation with 0.08%. The table reveals that the most significant increase is in the group of indicators improving the environment on the territory of the enterprise - 20.14%. The data from the Table 2 show the impact of consolidation on the selected indicators. It was mostly

on environmental manner. But whether the consolidation improved something is revealed by the SDI, calculated with data before the consolidation (Table 2).

Table 2

SDI with different preferences and comparison to SDI before consolidation

Preferences	Index [%]	Weights [%]		
		Economic	Social	Environmental
By number	9.79	37.50	25.00	37.50
By share	13.11	38.22	0.16	61.62
On universal purpose	8.62	33.00	33.00	33.00
Comparison				
By share 2016-2017	13.11	12.65	0.04	13.43
By share 2013-2015	1.97	12.18	0.00	-4.36

The results in Table 2 show that the index increases with increasing weights of economic and environmental effects, but not of social ones. Changing the weights is a process of setting preferences on some group of increments. Social impact improved only by 0.04% after the consolidation period. The social effects must have a very significant increase, at least as much as the economic factors or approximately 9% to become a real output of the consolidation. This is a proof that whatever the preferences are set in the calculation of the index, it does not lead to an indication of social development. The obvious result is that the SDI after 2016 is higher, than of previous period. Here are involved influences of many other factors that are not possible to be excluded according to available data, but it is fact that the NWSE faced changes just after the consolidation and especially in improvement of territories not economically valuable. It is interesting that the influence of economic factors – increments remain almost unchanged, which proves the sustainability of economic activity.

Analyzing the forest enterprise in the most backward region of Bulgaria, it can be seen that some inefficiencies have occurred. Figure 1 shows the economic ratios for the study period in the enterprise.

The ratios reveal the diminishing efficiency ratios of some of the assets. Financing for fixed assets reveal the state influence, it fell in about 14 EUR. The enterprise has been created to function independently by the state. The independence was partially reduced during the campaign and afterward the ratio for financing-subsidiaries remained stable in amount of 4 EUR. Expenses for purchasing fixed assets are getting more efficient for the whole period. The enterprise began investing in forests not in any other land or kind of properties that are not connected to the forest activities just after the consolidation campaign. The curve changed direction and achieved in the end of the 2018 60 EUR. This is a result of the low costs made by the Enterprise for documentation preparation, external services and taxes. All the outcomes described above are contradictory and here comes DEA. It is not clear whether

NWSE became more or less efficient after the consolidation. The results are presented in Figure 2.

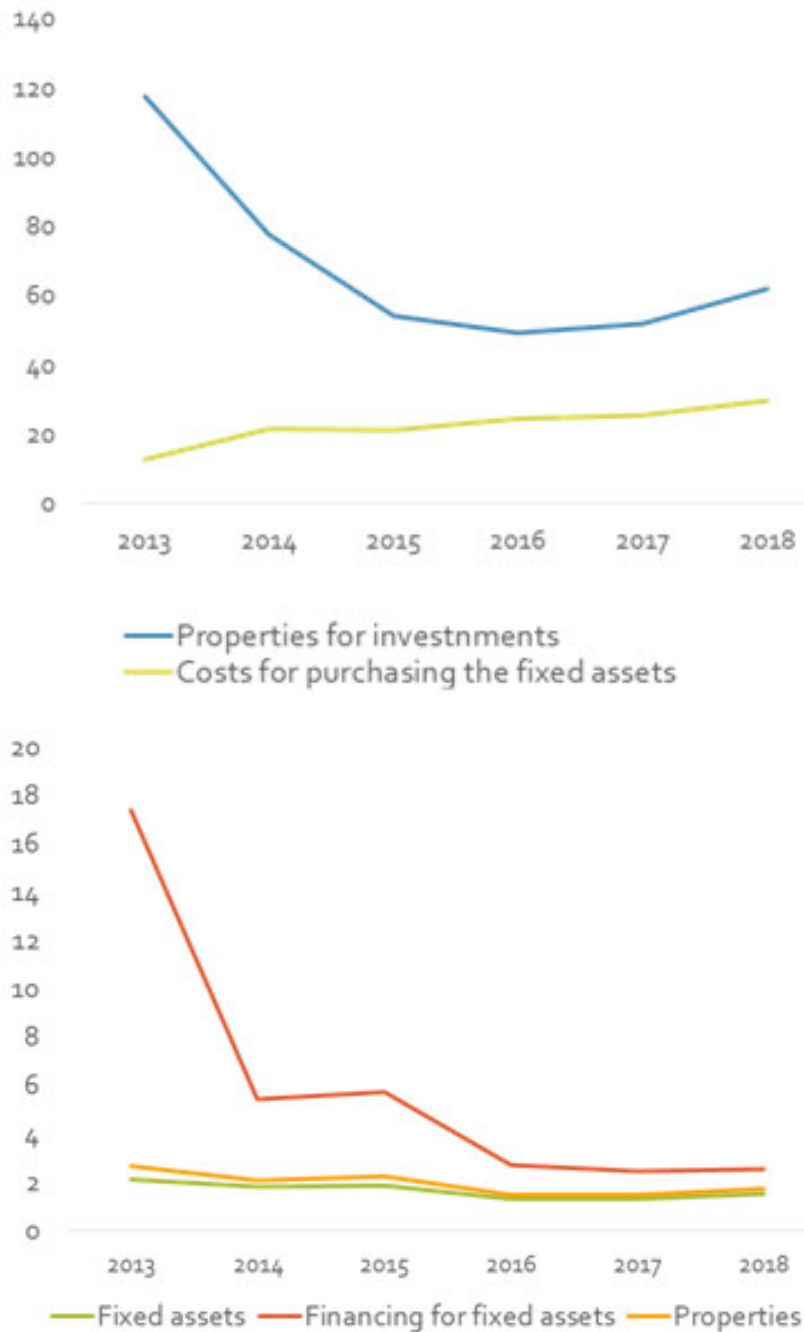


Fig. 1. *The economic ratios included in Data Envelopment Model for the Northwestern State Enterprise in Bulgaria*

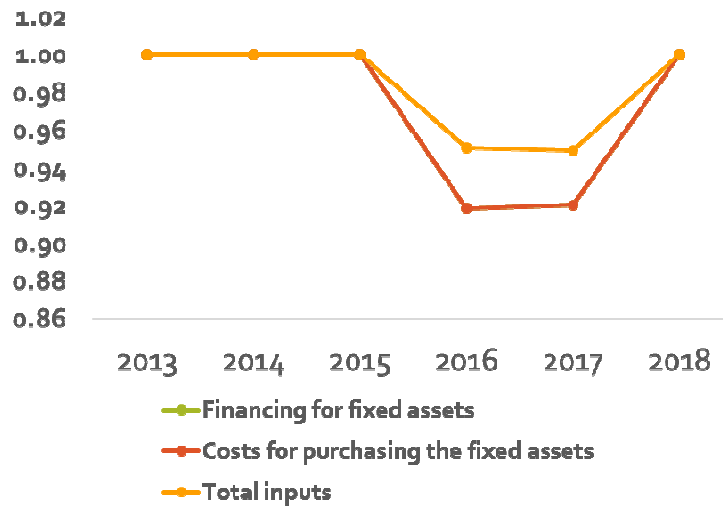


Fig. 2. DEA efficiency scores " θ " for Northwestern State Enterprise, using particular input and total inputs

DEA reveals the lack of efficiency during the campaign. All the years before and after it are efficient - $\theta=1$. Here the results are clearer, than in the ratios. This proves the role of DEA in this analysis. The model also calculates the problematic outputs (ratios as "Efficiency of Properties" and "Efficiency of properties for investments"). The figure shows the positive combine effect of the inputs. The consolidation cannot be undergone without state financing and efficient procedures.

5. Discussion

Results proved that in fact the main purpose of the consolidation was bettering the steering of the territories, than improving the efficiency. The actions taken by the government through funding and instructions for consolidation have had a rather one-sided effect. Of interest is the remaining the environmental condition of the enterprise. The economic

improvement was not in the focus. The campaign was accomplished with slightly influence on the enterprise efficiency, but DEA revealed, that campaign in fact influenced the enterprise. Some of preliminary set goals to improve the efficiency of forest activities were partially met. But in the same time throughout the nature of SDI is revealed the most problematic area, i.e. social. The payments were too insufficient to place an effect on the local communities. That was the reason to be included the economic state of the poorest region not only in Bulgaria, but in EU. If something was about to happen in result of consolidation, there was the most appropriate place this effect to be most obvious. But this did not happen. Again the SDI proved it is applicability in consolidation outputs assessment.

When move to the micro level results proved the assessment SDI. The lower efficiency caused the lower payment for forestry workers and struggles to the management, it is slight, but obvious.

Despite the increase of external financing the efficiency of the Enterprise fell down, because the higher value of some of the parcels. In the same time the Enterprise reaches efficient levels after two years. This can be a result of the remaining economic growth (as can be seen from Table 2) of the enterprise after the consolidation process. The enterprise remained stable, but in a different state. The subsidies became the great part of inbound financial flows and consequently the influence of the state.

6. Conclusions

It may be assumed that the consolidation in the way it is carried out in Bulgaria resulted in quantitative changes and dynamic stabilization. The consolidation process resulted mainly in environmental and slightly social benefits it. It partly gained effect over preliminary placed targets. Implementation of the SDI provides quantitative approach for assessment of consolidation campaigns in the level of the entire country. DEA assessment revealed that subsidiaries were insufficient for the investigated Northwestern State Enterprise. Subsidiaries caused too small effect both on the local communities and the state enterprises. The steering of the territories have been improved since there are significant changes on environmental increments of SDI. The consolidation is quite suitable to enterprises like NWSE where the protected territories are 26%. Enlarging the territories purchased through consolidation campaign in NWSE provided an opportunity to foster the capabilities of forest management interventions through transferring areas

from private owners to state steered ones.

In the current study have been made following recommendations:

- In the case of campaigns to be grant larger subsidiaries. For the national level according to the SDI the subsidiaries could be raised in about 7%, and in the level of particular enterprise: 1% - 10%;
- When consolidation campaign is to be carried out the purposes placed in the preliminary discussions to be assessed by the SDI index;
- DEA to be used for the enterprise level of planning for consolidation activities whenever they are undertaken.

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