



## **THE IMPACT OF TAXES ON THE REPRODUCTION OF NATURAL FOREST RESOURCES IN UKRAINE**

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### **ABSTRACT**

The research was directed to confirming or disproving the hypothesis that increasing tax pressure on the forest industry encourages the irrational use of forest resources to cover tax payments. The purpose of the study is to develop a methodology for identifying the impact of taxes on the activities of forest enterprises in Ukraine, social and natural capital. In this study, we try to identify the causes of the increased tax burden and the impact of this process on forest conservation. The following decisions of the Government of Ukraine have been taken into account: ban on export of timber products in 2015; an increase in the rent for the use of forest resources in 2016; expiration of special VAT regime from January 1, 2017, introduction of land tax on forest lands from January 1, 2019, increase of deductions from net profit to the state budget from 75 to 90%.



Information bases of research are the survey has been conducted, the statistic reporting, reporting to the State Forest Resources Agency and financial reporting of forestry enterprises. By means of methods of the econometric analysis, it is studied indicators relations of the amount of the paid taxes and the area of logging, the amount of the paid taxes and the area of restoration of the wood from 2010 to 2019. The impact of tax increases on the financial condition of forest enterprises was analyzed. The social effect was analyzed by studying the dynamics of payment of wage taxes, the environmental effect was analyzed by indicators of growth of areas of forest restoration including areas of planting a new forest. By results of the analysis of data of the State committee of statistics and the reporting of 17 state enterprises of the Volyn region which serve 7% of the total area of the woods of Ukraine it is established: tax revenues from forest enterprises have tripled, what is not related to the increase in profitability of their activities; reduction of the number of dividends paid in favor of the state; the total sectorial profitability of the activity decreased more than 6 times; bankruptcy is on the rise, and at the end of 2019 accounts for nearly half (65%) of all operating entities. The constructed econometric model allows us to claim with probability  $p = 0.95$  that the increase in tax payments leads to an increase in the volume of harvesting although taxes should stimulate the economical use of forest resources. The results show that all government decisions as to increasing fiscal pressure on forestry enterprises were unsystematic and lead the industry into bankruptcy. This has a detrimental effect on the ecology of the region as forestry grows. However, instead of developing the industry, these studies indicate a complete decline as enterprises lack the resources to forestry development.

**Keywords:** Forest enterprises; Taxes; Tax burden; Environmental taxation

## 1. INTRODUCTION

The concept of sustainable development, which underlies the "Ukraine-2020" development strategy, requires harmonious development and interaction of three spheres of human activity: economy, ecology, society. The regulator of these processes is a state which influences the needs of society, the environment, and economic development, through taxation and the creation of certain institutions.

Over the 2015-2019 years in Ukraine we have seen many radical steps in forestry reform some of those have been unexpected for businesses. The electronic logging of timber is a major step forward but its effectiveness remains in doubt. New forms of taxation for forestry

enterprises have been introduced. However, the issue of preserving the natural capital of the forest has remained unaddressed as no changes have been made to the sector's reform.

We overlook that the increase in corporate tax payments does not encourage the redevelopment of forests, and their frivolous use to cover tax payments, the basis of which is not related to timber harvesting. In our opinion, the most significant steps that require analysis in terms of their feasibility and effectiveness are banning the export of timber products in 2015; an increase in the rent for the use of forest resources in 2016; expiration of special VAT regime from January 1, 2017, introduction of land tax on forest lands from January 1, 2019, increase of deductions from net profit to the state budget from 75 to 90%. Their impact on enterprise performance, the identification of social, environmental and economic effects of a range of solutions require detailed analysis using a variety of analytical tools.

## **2. LITERATURE REVIEW**

Similar studies have been conducted in the tropical forest (Hansen & Lund 2018), Indonesia (Darusman et al. 2015), Slovakia (Hajduchova et al. 2015), Nepal (Lund et al 2014), Central Africa (Karsenty, 2010), Liberia and Gabon (Krelove et al. 2010) and Ukraine (Garasim et al. 2018). However, their purpose was to study the impact on the financial results of the enterprise's activity, filling the state and local budgets.

Harrison (1998) explored the need and effectiveness of tax incentives for forestry enterprises. He noted that tax support policies must strike a balance between equity and efficiency.. Hansen and Lund (2018) concluded that the same changes in the system of forestry taxation in different countries give different efficiency.. They explain this by the significant influence of the national political and economic factors of each individual country.

It has been argued that in the forest sector it is more appropriate to impose taxes on raw materials rather than on financial results or finished products so that enterprises have incentives to engage in woodworking (Karsenty, 2010). In some studies, the tax was considered as a benchmark to limit deforestation (Chaudhary et al. 2017).

The assessment of the influence of various factors on the volume of deforestation was carried out in the studies, but the activity of local communities was chosen as a factor of influence. (Mohammed et al. 2017). Scientists carried out the analysis about objects from which taxes in forestry of economically developed countries are levied (timber, logging, land, forest rights) was conducted by the guards (Moroz, 2010; Palmer et al. 2010). In our research, we will analyze the impact of taxes on forest reproduction and conservation, the financial

condition of forestry enterprises and the social protection of industry workers. Many researchers study the impact of government decisions on the state of the environment, ecology and forests (Faizul et al., 2017).

The impact of changes in industry management from decentralized to centralized and vice versa was investigated by Baynes et al. (2015), Hyde (2019). Our research provides an information base for making crucial decisions on reforming the taxation of forest businesses.

**The purpose of the study** is to develop a methodology for identifying the impact of taxes on the activities of forest enterprises in Ukraine, social and natural capital. Conservation and augmentation of forests is one way of reducing global environmental problems that must be addressed by governments of all countries. In this study, we try to identify the causes of the increased tax burden and the impact of this process on forest conservation.

### 3. DATA AND METHODOLOGY

We conducted an analysis of changes in the Tax Code of Ukraine dated 02.12.2010 № 2755-VI for 2015-2019 to check the effectiveness and feasibility of the measures taken to increase the tax burden on enterprises in the industry in Ukraine.

In order to identify the impact of each change, a survey has been conducted on the statistics of reporting, reporting to the State Forest Resources Agency and financial reporting of forestry enterprises.

The indicators of report # 3 “Forest Activity” concerning the area of deforestation and the area of reproduction, the volume of logging were taken into account. By means of methods of the econometric analysis, it is studied indicators relations of the amount of the paid taxes and the area of preparation of the wood, the amount of the paid taxes and the area of restoration of the wood from 2010 to 2019. The Fisher test was used to verify the results obtained. To analyze the impact of tax increases on the financial condition of forest enterprises, 17 state-owned enterprises in the Volyn region were selected to operate in the forest sector. Among them, there are 11 forest enterprises, 5 forestry farms and 1 forestry training facility.

The forest area of Volyn region is 702 thousand hectares, which is 7% of the total forest area of Ukraine. The enterprises selected for research occupy more than 80% of the area of all forests of Volyn region. Studying economic effect the ratio of the sum of the factorial Altman received net profit to the total income of the enterprise, the 5th model Tereshchenko (2003) was carried out according to financial statements with the use of the coefficient of financial stability of the enterprise.

The social effect was analyzed by studying the dynamics of payment of wage taxes, the environmental effect was analyzed by indicators of growth of areas of forest restoration including areas of planting a new forest. It should be noted that the areas of the wood from which pass wood procurement officially began to be published by the State committee of statistics only since 2016 that did not allow to use this indicator for the analysis.

In Table 1 it is systematized indicators which are used for the analysis.

**Table 1: Methods of researching the impact of taxes on the activities of forest enterprises**

Directions of regulation	The indicator used for analysis	Data source
Export ban	Logging volumes, thousand cubic meters The volume of logging of rounded timber, fuelwood, area of harvesting, share of finished product balances in total assets of enterprises	State Statistics Service, financial statements of enterprises
Increase in rent for forest resources	Dynamics of rent	Data of the State Forest Resources Agency
Expiration of special VAT regime	Dynamics of accrued VAT of enterprises in the industry	Data of the State Forest Resources Agency
Introduction of land tax on forest land	Dynamics of taxes accrued to state and local budgets	Data of the State Forest Resources Agency
Economic effect	the ratio of the amount of net profit to the total income of the enterprise, net of VAT, the coefficient of financial stability of the enterprise, the analysis of bankruptcy probability	Financial statements of enterprises
Social and environmental effects	Dynamics of payroll taxes, increasing forest recovery areas including planting new forests, econometric analysis of the impact of taxes on logging volumes and forest restoration	Data of the State Forest Resources Agency

Source: compiled by the authors

## 4. RESULTS AND DISCUSSIONS

### 4.1. The ban of export of the wood in Ukraine

The first step in protecting the forest in Ukraine is the ban on the export of untreated timber in 2015. Expected that it would influenced the reduction of volumes of selling of such products by the domestic enterprises as demand for wood resources in the domestic market considerably smaller.

Researches prove (Hansen and Lund, 2018) that the ban of export of logs in other countries reduces the internal competition in the market and according to the price, at the same time it has a negative effect on the restoration of the woods as the enterprises lost incentives to restoration. Instead, export quotas and forest auctions show a positive effect.

Table 2 presents the dynamics of logging volumes and logging areas.

Table 2: Forestry dynamics and forest reproduction at enterprises of Volyn region (Ukraine)\*

Indicator	2014	2015	2016	2017	2018	2019
Logging volumes, thousand cubic meters.	1078368	1127651	1181604	1365095	1496617	1291646
Roundwood	625.9	766.9	813.7	849.9	1002.4	857,6
Fuel wood	452.5	360.7	367.9	515.2	494.2	434,0
Harvesting area, ha	Missing data	Missing data	24 478	31 238	31 332	33368
Area of forest reproduction, ha	4463	5327	5417	6174	5673	7112
Forest area (planting new trees), ha	134	7	-	-	30	17
The volume of harvesting from 1 ha, cubic/ha			53.95	48.99	52.66	42.60

Source: compiled by the authors on according to the State Statistics Service of Ukraine; <http://www.ukrstat.gov.ua>

In Ukraine, the ban on exports has not affected the volume of procurement that is increasing every year.

The share of finished products in the warehouses of Volyn region forest enterprises (Table 3) in the total amount of enterprise assets was analyzed to determine whether the products in the warehouses depend.

Finished goods balances have been increasing since 2015. In 5 of the studied enterprises the situation with volumes of finished goods already is rather difficult as its share, within two last years, already exceeds 15% of the total cost of assets of the enterprise.

The dynamics of residues of finished products of forest enterprises of Volyn region are presented in Figure 1.

Warehouse stock balances are growing at a much slower pace than stockpiles, so export restrictions have not affected the industry's development globally.

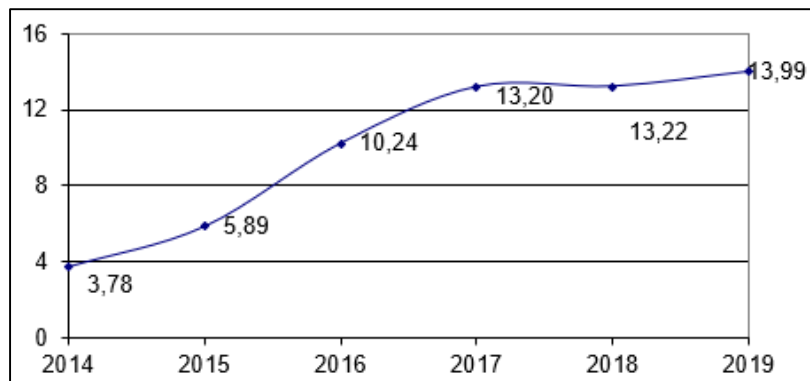


Figure 1: Percentage of finished products in assets of forestry enterprises of Volyn region in 2014-2019 according to selection

Source: compiled by the authors on according to the financial reporting of 17 enterprises

#### 4.2. Cancellation of special VAT tax regime, rent increase

Until January 1, 2017, Ukrainian forests were under the special VAT regime. The amount of value-added tax charged by enterprises was not payable to the budget and remained entirely at the disposal of such enterprises for the purchase of raw materials used in the production. Since 2017 the special mode is canceled, and the enterprises are paying VAT on a general basis.

Cancellation of a special regime of the VAT, increase in rent, the introduction of land tax gradually - all these increases a tax burden by the enterprises of forestry. The table 3 shows the dynamics of accrual taxes of the forestry of the region for 2014-2019.

Table 3: Dynamics of accrual taxes of forestry in Volyn region for 2014-2019, Thousand UAH

№	Taxes and payments	2014	2015	2016	2017	2018	2019
1.	Total accrued	68808	115109	193672	197429	250605	287271
2.	Forest income	32841	35406	43967	41449	38406	38790
3.	VAT	1682	11041	20617	39564	59892	33540
4.	Income tax	5523	15670	20293	7732	10074	6315
5.	Water and geologist.	50	54	60	57	63	58
6.	Dividends	2424	12908	35171	19997	20028	23604
7.	<u>Budgetary contributions</u>	43345	78214	124948	114553	134554	148009
8.	Income tax	14505	26431	48493	114553	69047	58690
9.	land tax	608	663	2308	3088	3383	8222
10.	Forest income of the local budget	10220	9506	17524	22945	42714	64071
11.	Together with the local budget	25461	36895	68724	82876	116051	139261

Source: compiled by the authors on according to the information Volyn Regional Department of Forestry and Hunting

Figure 2 and Figure 3 presents the dynamics of taxes in thousands of US dollars at the average annual rate of the National Bank of Ukraine to reduce the impact of inflation on the amount of accrued taxes.

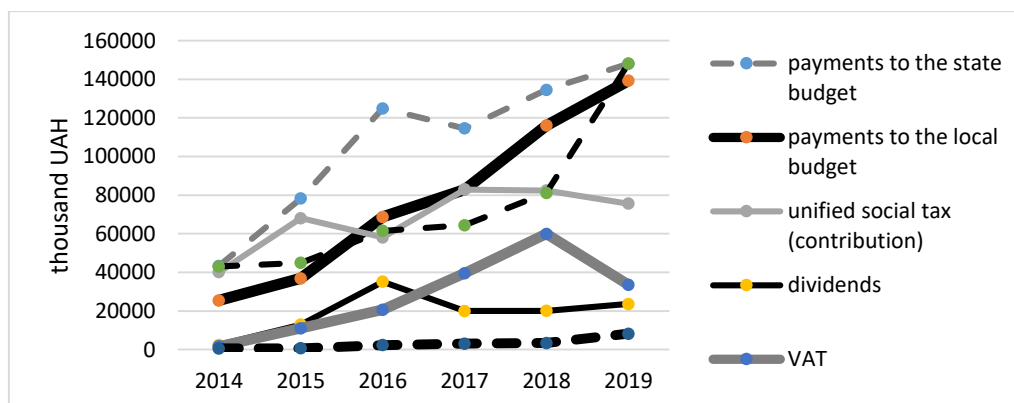


Figure 2: Dynamics of budget payments of forest enterprises in Volyn region for 2014-2019, thousand UAH

Source: compiled by the authors on according to the information Volyn Regional Department of Forestry and Hunting

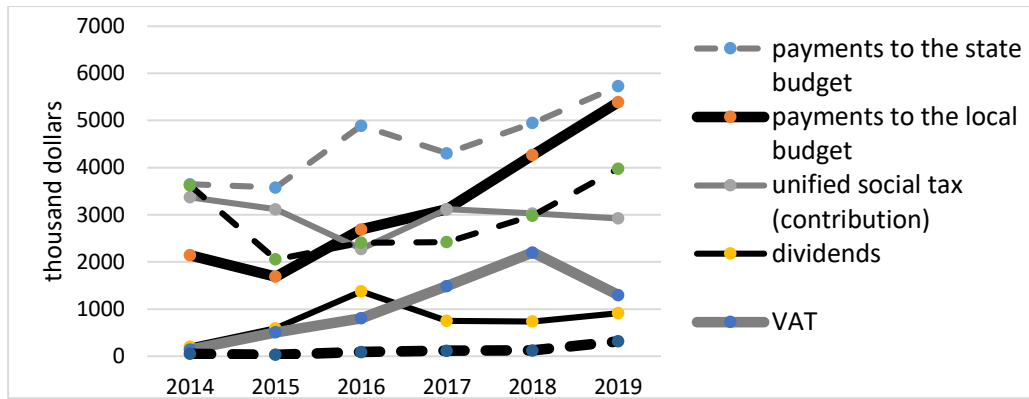


Figure 3: Dynamics of budget payments of forest enterprises in Volyn region for 2014-2019, thousand dollars

Source: compiled by the authors on according to the information Volyn Regional Department of Forestry and Hunting

For the years 2014-2019, there is a clear increase in the tax burden on enterprises in the industry, especially VAT. The positive aspect is the filling of local budgets. Tax revenues from forest enterprises have tripled and this is not related to the increase in profitability of their activities. At the same time, there was a decrease in the number of dividends paid in favor of the state. Social contributions to the budget, when measured in dollars, decreased from 2014 to 2019.

In parallel with the increase in the tax burden during 2014-2019, the profitability of forestry enterprises has been steadily decreasing. Thus, if in 2015 there were 8 enterprises with a share of net profit in the sales revenue of more than 10%, then in 2019 in all 17 surveyed enterprises the share of net profit was less than 5%. The dynamics of this indicator for forestry enterprises are shown in Table 4

Table 4: Dynamics of the share of net profit in the income from the sale of forestry enterprises of Volyn region in 2014-2019 according to the sample data

Year	Share of net profit in sales revenue, %			
	up to 5%	5-10%	10-20%	more than 20%
2014	14	2	1	0
2015	2	7	6	2
2016	8	9	0	0
2017	16	1	0	0
2018	17	0	0	0
2019	17	0	0	0

Source: compiled by the authors on according to the financial reporting of 17 enterprises

### 4.3. Economic effect

The dynamics of the share of net profit in sales revenue for all surveyed enterprises are presented in Figure 4.



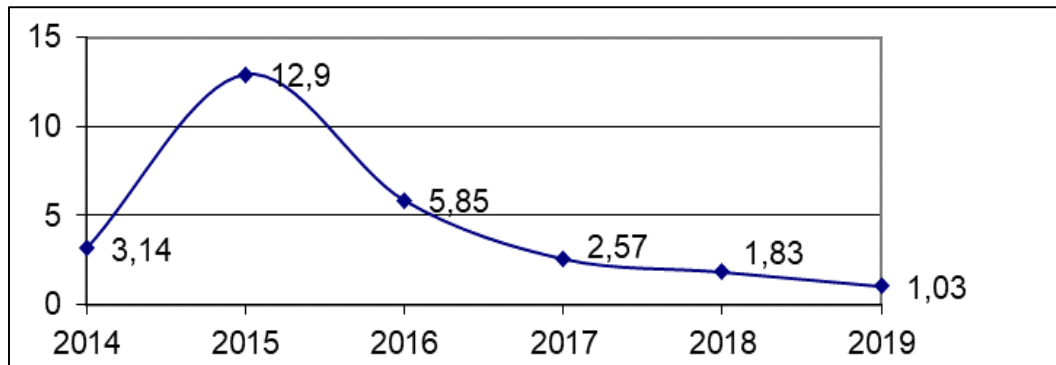


Figure 4: Dynamics of the percentage of net profit in the income from the sale of forestry enterprises of the Volyn region by industry in 2014-2019 according to the sample  
 Source: compiled by the authors on according to the financial reporting of 17 enterprises

During 2015-2019, the total sectoral profitability of the activity decreased more than 6 times, which is a negative trend and indicates a decrease in the efficiency of the activity of forestry enterprises and a deterioration of their financial status (Figure 5). At the same time, logging is increasing.

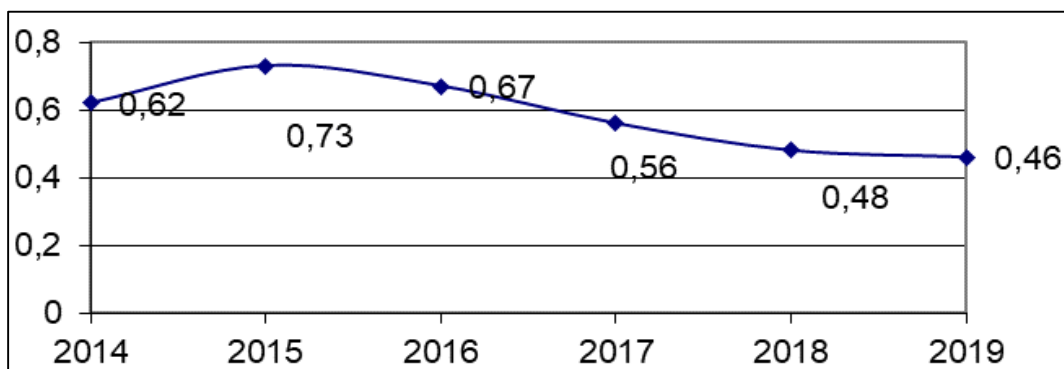


Figure 5: Coefficient of financial stability of forestry enterprises of Volyn region in 2014-2018 according to the sample  
 Source: compiled by the authors on according to the financial reporting of 17 enterprises

In 2019, only 1 of the 17 (6%) surveyed forestry enterprises in the Volyn region had financial sustainability ratios within the regulatory framework, although in 2015 there were 8 (47%). The constant tendency to decrease the value of this indicator indicates the deterioration of the financial position of the enterprises of the forestry industry and the increase of the probability of their bankruptcy.

To assess the likelihood of bankruptcy of forestry companies, we have selected two models: the Tereshchenko model, which is the most adapted for domestic enterprises, and the most common world model, the Altman 5-factor model for non-listed companies. The results of the analysis of indicators of activity of the investigated forestry enterprises of Volyn region according to the Tereshchenko model are presented in table 5.

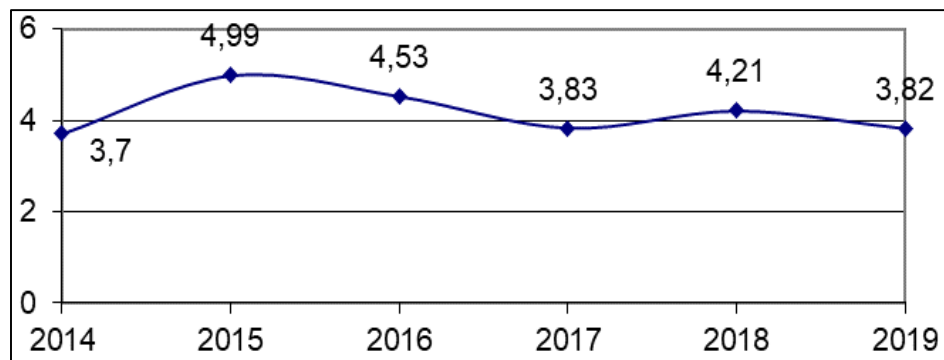
**Table 5: Bankruptcy Assessment of Bankruptcy of Volyn Forestry Enterprises in 2014-2019**

Year	Bankruptcy probability (% of enterprises)		
	The company is financially sustainable	The financial balance of the enterprise is disturbed	Bankruptcy is threatening the company (remedial measures must be taken)
2014	35.3	35.3	29.4
2015	88.2	11.8	0
2016	58.8	35.3	5.9
2017	17.6	47.1	35.3
2018	11.8	41.1	47.1
2019	5.9	29.4	64.7

Source: compiled by the authors on according to the financial reporting of 17 enterprises

These data indicate that during the last 4 years there has been a constant tendency to deteriorate the financial condition of forestry enterprises in Volyn region. The number of bankruptcy taxpayers in the forest industry is on the rise and at the end of 2019 it is almost half (64.7%) of all operating entities.

After analyzing the bankruptcy probability estimation according to Altman's 5-factor model, for the companies of which the shares are not quoted on the stock exchange, a graph was presented that reflects the dynamics of the average value of the financial security indicator of the activity of the studied enterprises (Figure 6).



**Figure 6: The average value of financial security indicator of selected forest enterprises in Volyn region in 2014-2019**

Source: compiled by the authors on according to the financial reporting of 17 enterprises

Based on the obtained graphical data, we can conclude that the calculations made by the Altman model confirm the previously obtained results (by Tereshchenko's model). In the long term, we expect further deterioration of the financial status of the studied enterprises. As in 2019, the financial burden is increasing for forest enterprises. According to the decision of the Ukrainian government, state-owned enterprises are obliged to pay 90% of net profit to the budget from 2019 (in 2015-2018 it was 75%) and a forest land tax is being introduced.

#### 4.4. Ecological effect of tax introduction

To assess the effectiveness of environmental taxation, enterprises of the Volyn region conducted an econometric analysis of the impact of the amount of accrued taxes on the volume of wood. We used data for 10 years, from 2010 to 2019 for the construction of the econometric model (Table 6).

Table 6: Results of constructing of econometric model of influence of taxes on volumes of wood of enterprises of Volyn region (Ukraine) for 2010-2019

Year	Accrued taxes, thousand UAH (X)	Volume of wood, thousand cubic meters (U)	Estimated volume of wood, thousand cubic meters	elasticities	$(X - \bar{X})^2$	$(Y - \bar{Y})^2$
2010	22940.9	976.7	1547.3	5.6	9797511550.5	325589.1
2011	25064.6	974.9	992.0	10.6	9381603891.3	292.4
2012	28629.1	1021.8	997.7	13.9	8703804021.9	581.9
2013	29704.4	1023.4	999.4	14.9	8504321828.5	574.5
2014	68807.6	1078.4	1064.7	77.9	2821275461.9	187.6
2015	115109.6	1127.7	1147.4	204.6	46426235.1	391.8
2016	193672.0	1181.6	1302.9	513.4	5147878821.6	14706.7
2017	197429.0	1365.1	1310.8	530.4	5701113752.7	2946.4
2018	250605.0	1496.6	1428.5	785.6	16558985062.2	4638.2
2019	287270.6	1291.7	1515.8	973.8	27339736231.2	50228.9
Total	1219232.8	11537.8	12306.5		66662920625.7	349908.5
Average value	121923.3	1153.8	1230.6			

Source: compiled by the authors on according to the information Volyn Regional Department of Forestry and Hunting and the State Statistics Service of Ukraine; <http://www.ukrstat.gov.ua>

The model is constructed as a paired regression. On the basis of the value of the coefficient of determination it is established that the most optimal line of dependence is a exponential since the coefficient of determination becomes the largest value of the considered variants of the dependences (  $R^2 = 0.915248$  )/

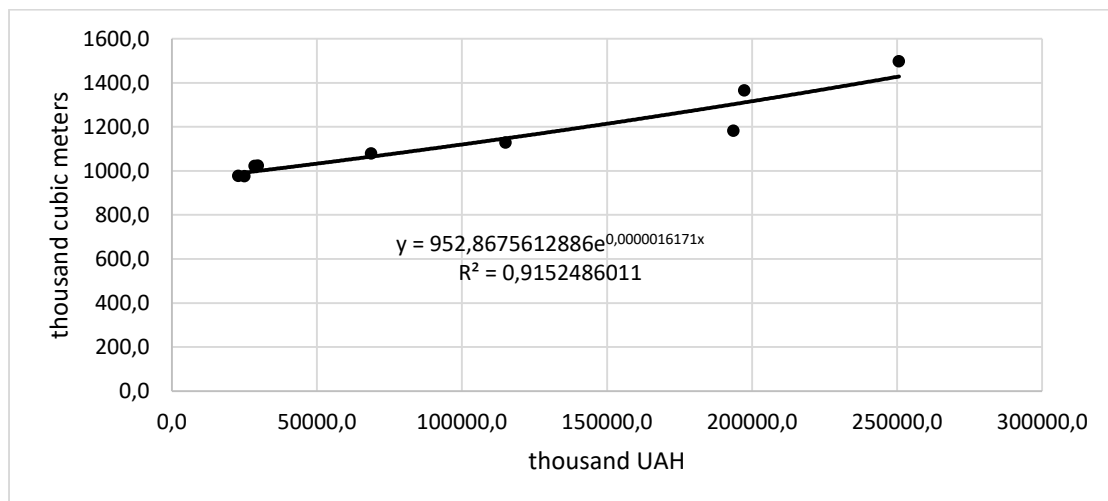


Figure 7: Correlation field and trend line exponential  
 Source: compiled by the authors

As shown in Table 6, the sums of the statistical and calculated values of the indicator coincide and their dynamics coincide, which indicates that the econometric model is constructed qualitatively. Verification of the constructed econometric model for the adequacy of the experimental data using the Fisher test showed that with probability  $p = 0.95$ ; the constructed model is adequate for the statistical data and is suitable for further analysis and forecasting.

So, if in the next period the tax burden increases, then with probability  $p = 0.95$ , according to the constructed econometric model, the volume of forest harvesting will increase and will be 1515 thousand cubic meters. In this case, budget revenue will increase to 300 thousand UAH. Although taxes should encourage the economical use of forests.

#### 4.5. The social effect of the taxes introduction

The data of the surveyed enterprises show that, along with the deterioration of the financial situation, there is an increase in wage arrears, dismissal of employees. In this case, the amount of wages in 1 cubic meter of harvested forest decreased from \$ 3.16 in 2012 to \$ 2.02 in 2019 (Table 7).

Table 7: Dynamics of wage taxes for forestry workers of the enterprises of Volyn region (Ukraine) for 2010–2019

№	Year	Unified social tax (contribution) thousand UAH	The average dollar exchange rate for the national currency. UAH	Harvesting. thousand m3	Unified social tax (contribution) thousand dollars	Unified social tax (contribution) for 1.cub.m. UAH	Unified social tax (contribution) for 1 cub.m. dollars
1	2010	20425.40	7.94	976.68	2573.89	20.91	2.63
2	2011	24011.40	7.97	974.86	3013.63	24.63	3.09
3	2012	25796.70	7.99	1021.82	3228.21	25.24	3.16
4	2013	25558.70	7.99	1023.41	3197.63	24.97	3.12
5	2014	40080.20	11.89	1078.37	3371.85	37.16	3.13
6	2015	68073.80	21.84	1127.65	3116.26	60.36	2.76
7	2016	58127.00	25.55	1181.60	2274.91	49.19	1.92
8	2017	82876.00	26.60	1365.09	3116.03	60.71	2.28
9	2018	82360.00	27.20	1496.62	3027.89	55.03	2.02
10	2019	20425.4	7.9	976.7	2573.9	20.9	2.6

Source: compiled by the authors on according to the information Volyn Regional Department of Forestry and Hunting and the State Statistics Service of Ukraine; <http://www.ukrstat.gov.ua>

## 5. CONCLUSIONS

The results show that all government decisions as to increasing fiscal pressure on forestry enterprises were unsystematic and lead the industry into bankruptcy. This has a negative impact on the ecology of the region as forest harvesting grows. The greatest added

value is provided by the processing and manufacture of finished wood. That was the purpose of banning the export of timber. However, instead of developing the industry, these studies indicate a complete decline as enterprises lack the resources to implement forestry.

The starting point for introducing reforms should be a comprehensive inventory of the forest with an estimate of the forest stand and stock of wood at the root, not wood resources of the forest (berry-pickers. animal). This will allow them to monitor their conservation and growth while analyzing the effectiveness of the solutions. The current system of taxation in Ukraine does not stimulate environmental behavior of forest users, the economical use of natural resources. For the development of the timber industry, companies that have invested in timber processing should have tax benefits. For today in Ukraine, the rent payment copes with prepared raw materials. Woodworking enterprises should be given an incentive to invest in increasing the volume of treated wood.

Our aggregate indicators show the state of the industry in a comprehensive way. as they represent information from several sources – statistics, enterprise reporting, data from the State Forest Resources Agency. This set of indicators can be used for annual rapid monitoring of the industry.

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