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# ECONOMIC ANALYSIS OF USING THE FOREST LAND TO ENSURE RURAL DEVELOPMENT IN UKRAINE

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**Abstract.** After the reform, which implemented a system of "decentralization of power" through the creation of rural communities, an important issue arose to identify additional sources of filling local budgets. One of the items of filling in this case are forestry enterprises. According to the current system of tax payment regulation, local governments can replenish their budgets by collecting rent for special use of forest resources (except wood from felling for general use), income tax, personal income tax, land tax, property tax, single tax. Given the changes taking place at the present stage and the implemented reforms affecting land management, the calculation of economic efficiency of forest land use in decentralization of power is a prerequisite for making appropriate management decisions for rational and cost-effective use of existing natural resources. During the research we implemented the following tasks: created digital cartographic models of rural communities with the reflection of forest lands on them; identified the areas of forests located within the relevant rural communities of Ukraine; the probable economic effect of the use of forestry lands is calculated and, as a result, the amount of fiscal revenues to the budgets of rural communities from forest use by enterprises is determined.

**Keywords:** forest land use, decentralization, rural development, economic efficiency.
**JEL code:** Q15

## Introduction

Since 2014, Ukraine has come a long way in territorial reform and made a number of decentralization changes. The initiated governance reform at all levels defines a clear direction of decentralization. During this time, decisions have been made and implemented regarding the consolidation of municipalities and deeper fiscal, administrative and political decentralization. Profitability of forest use is the main criterion for assessing theoretical and practical recommendations for management decisions in the field of nature management in the context of decentralization.

The research was conducted on the basis of 888 established united territorial communities (hereinafter UTC) with a total area of 216.4 thousand square meters. km (i.e. 38.7% of the total area of Ukraine). About 9.1 million people live within the UTC, 26.0% of the total population of Ukraine which was affected by the relevant reforms.

UTC itself has been given a number of new powers: new ways of exercising local self-government, the distribution of basic and additional resources that fall into UTC, the general management of its own land fund (Decentralization. About uniting..., n.d.).

Thus, according to the current regulatory system, UTC can fill the budget through forest use by collecting rent for special use of forest resources (except for collection from felling for primary use), income tax, personal income tax, land tax, property tax, single tax (Oborska A. E. et al., 2017).

Therefore, the whole mechanism of rational financial and economic use, preservation and reproduction of UTC forests must comply with the principle of efficient nature management by financing appropriate measures, economic incentives for the restoration and improvement of forest resources. At the same time, given the changes and reforms in our country, calculating the efficiency and profitability of forestry in

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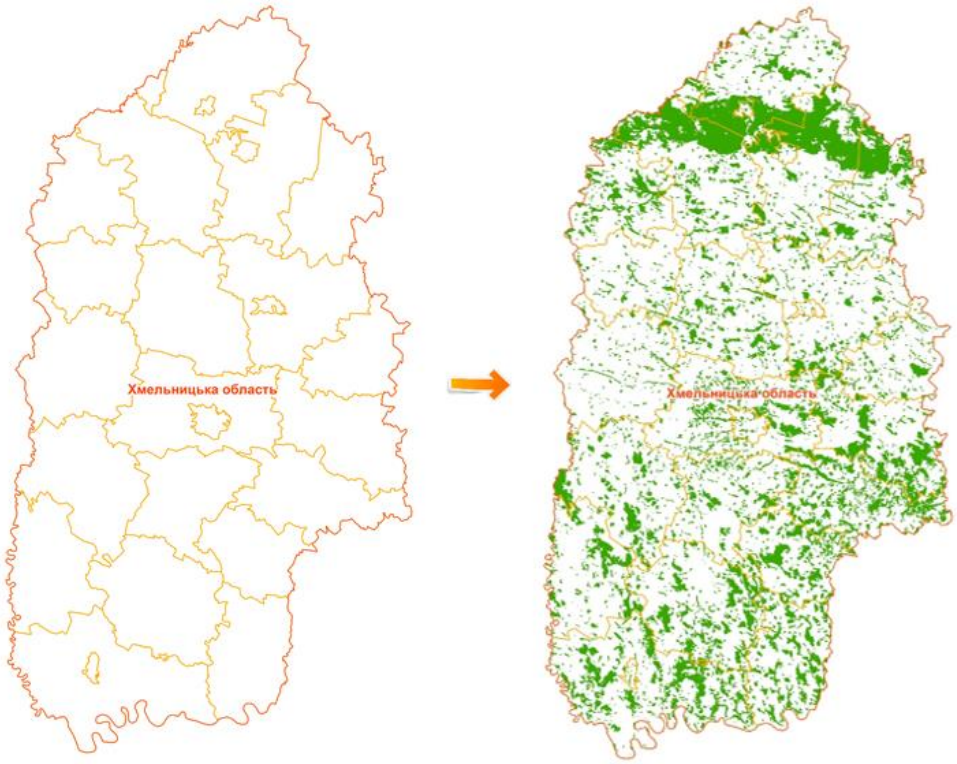
decentralized UTC is a necessary condition for not only productive management decisions, but also for the rational and cost-effective use of existing natural resources (Openko, I., 2019b).

**The aim** of the study is geoinformation and cartographic modelling of the distribution of forestry land in UTC and to determine the probable tax revenues to UTC budgets from the use of forest lands by specialized enterprises.

To achieve this goal, appropriate tasks have been identified: to create digital cartographic models of UTC with the reflection of forest lands on them; identify the areas of forests located within the relevant rural communities of Ukraine; to calculate the probable economic effect of the use of forestry lands and, as a result, to determine the amount of fiscal revenues to UTC budgets from forestry enterprises.

Economic efficiency of forest land use is the main criterion for assessing theoretical and practical recommendations for management decisions in the field of nature management in the current direction of decentralization of power. The calculation of tax revenues to fill local budgets includes the identification of several components, including not only those related to the area of forested areas, but also the existing methodology for managing these lands and the climatic conditions in which UTC is located.

The research algorithm included: formation of an information database using spatial data obtained from satellites and the Internet resource Open Street Map (Fig. 1) (Open Street Map, 2018); digitalization of forests with the use of geographic information technologies; determination of the actual boundaries of the united territorial communities according to the information provided on the official website of decentralization (Decentralization. UTC map..., n.d.); use of ArcGIS software for overlaying information layers: forests Ukraine, UTC border; determination of the area of forestry with the help of the geoinformation software product ArcGIS for the whole territory of Ukraine in the context of each individual UTC; creation of a unique register containing data on forest land accounting in the context of UTC; determining the possible economic effect of the use of forestry lands and calculating the amount of probable tax revenues to community budgets from forestry enterprises.




***Source: created by the author based on Open Street Map, 2018***

Fig. 1. **The process of creating digital models of forested areas within the Khmelnytsky region**

The archive of spatial data of Landsat 8, IRS P7, SPOT 6, SPOT 7, Cartosat-2F, IKONOS-2, EROS A, EROS B, QuickBird and online resources of the Open Street Map were used to form the information base (Open Street Map, 2018).

The following methods were used in the study: collection, analysis, generalization of information, visualization using cartographic models and geographic information technologies, axiomatic method for the concepts of income and tax revenues and comparison of results obtained during the study. The information base of the study is the legislative and regulatory framework of Ukraine, statistical data on united territorial communities, digital database of forest land use in Ukraine developed using ArcGIS software and summary reports on the implementation of the production plan for forestry in the form of LG-10 (Barladin O., Skavronskyi V., Skliar O., 2010).

**Research results and discussion**

Determination of the area of forestry by ArcGIS allowed to obtain data that later served as an information and analytical basis for calculating the economic efficiency of forestry enterprises within UTC.

According to research published in the research within the FLEG II project ("Law Enforcement and Management in the Forest Sector of the Eastern Region of the European Neighbourhood and Partnership Instrument") (Decentralization. UTC map..., n.d.), in Ukraine 12.95% of forests of the total forest area (state form of ownership) are used by specialized municipal forestry enterprises. Thus, in Sumy region 34.2% of forests out of the total share of communal forests of Ukraine; Chernihiv region – 32.6%; Vinnytsia region – 29.8%; Zhytomyr region – 27.2%; Khmelnytsky region – 25.9%; Lviv region – 21.0%; Ternopil region – 13.5%; Ivano-Frankivsk region – 13.4%; Cherkasy region – 6.5%.

The main indicators of cost-effective forestry are gross income and net income from forest use. To calculate them in terms of UTC used the principle of multiplying the total forest area in UTC by the amount

of gross income and net income from 1 ha of forests in the region, taking into account preliminary results on forest land use efficiency by forest enterprises in Ukraine (Table 1). Preliminary results of the results of forest use and indicators of gross income of forestry were obtained from the analysis of statistical reporting form LG-10 ("Report on the implementation of the production plan for forestry in 2017"). The net profit from the use of forest areas of the respective areas is calculated according to formula 1.

$$P = D - G \quad (1)$$

Where:

P – the total net profit of forestry within the region;

G – total gross income from the use of forests within the region;

C – total costs for the development of forest areas and the necessary work to improve the overall condition of the forest fund within the region.

Table 1

**Efficiency of forest area use in UTC**

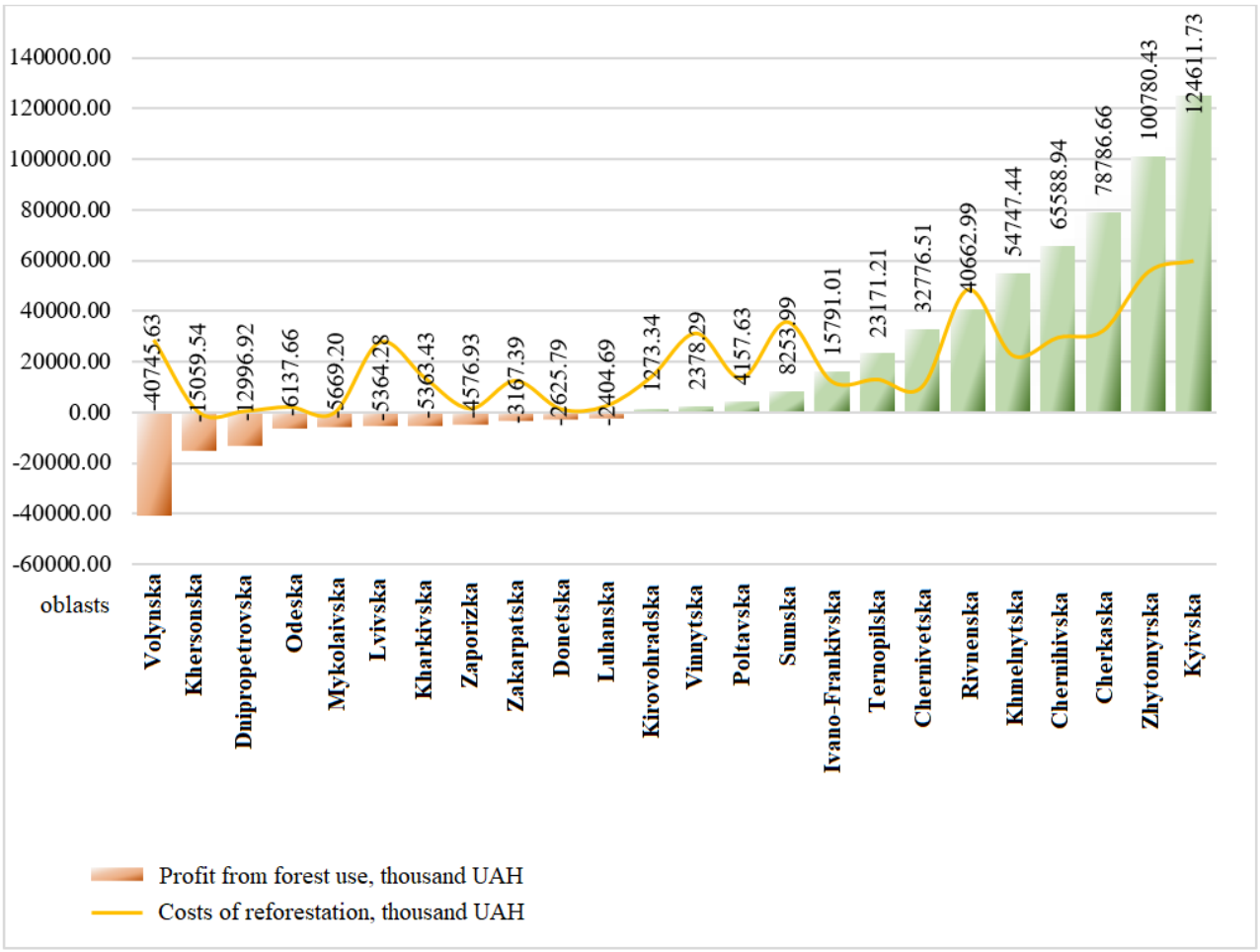
| Region | Proceeds from forest use, million UAH (Openko, I., Stepchuk, Ya., Tsvyakh, O., 2019b) | Forest area of united territorial communities determined by the author, thousand ha | UTC area of the respective region, thousand ha | Profit from forest use in UTC, million UAH |
|---|---|---|---|---|
| Kyiv region | 1913.054 | 98.941 | 531.322 | **124.612** |
| Zhytomyr region | 1116.406 | 788.456 | 2005.923 | **100.78** |
| Cherkasy region | 356.815 | 163.492 | 836.351 | **78.787** |
| Chernihiv region | 626.511 | 583.583 | 1947.808 | **65.589** |
| Khmelnytsk region | 411.785 | 194.478 | 1216.577 | **54.747** |
| Rivne region | 391.397 | 282.755 | 728.415 | **40.663** |
| Chernivtsi region | 262.403 | 134.324 | 372.613 | **32.777** |
| Ternopil region | 119.673 | 103.13 | 679.475 | **23.171** |
| Ivano-Frankivsk region | 187.957 | 167.615 | 385.917 | **15.791** |
| Sumy region | 299.036 | 216.017 | 994.967 | **8.254** |
| Poltava region | 118.632 | 135.738 | 934.857 | **4.158** |
| Vinnytsa region | 96.767 | 62.356 | 441.362 | **2.378** |
| Kirovohrad region | 31.936 | 30.426 | 497.269 | **1.273** |
| Luhansk region | 14.807 | 67.321 | 873.727 | -2.405 |
| Donetsk region | 7.718 | 65.172 | 683.793 | -2.626 |
| Transcarpathia region | 4.078 | 38.964 | 65.073 | -3.167 |
| Zaporizhzhia region | 5.893 | 56.303 | 1708.381 | -4.577 |
| Kharkiv region | 54.104 | 92.234 | 650.649 | -5.363 |
| Lviv region | 127.41 | 133.339 | 492.386 | -5.364 |
| Mykolaiv region | 6.611 | 50.868 | 1148.707 | -5.669 |
| Odesa region | 20.151 | 85.293 | 975.048 | -6.138 |
| Dnipropetrovsk region | 15.877 | 99.984 | 1812.73 | -12.997 |
| Kherson region | 11.334 | 92.062 | 933.176 | -15.059 |
| Volyn region | 420.629 | 432.866 | 1118.522 | -40.746 |

***Source: calculated by the author***

The table shows that the highest gross income from forest use in the united territorial communities is determined in the Chernivtsi – 8.20 EUR million; Sumy – 9.35 EUR million; Cherkasy – 10.98 EUR million; Rivne – 12.23 EUR million; Khmelnytsk – 12.87 EUR million; Volyn – 13.14 EUR million; Chernihiv – 19.58 EUR million; Zhytomyr – 34.89 EUR million and Kyiv – 59.78 EUR million regions. The calculations are based on the fact that the total area occupied by forests in local communities has a weak correlation with the amount of income from the use of these lands, as evidenced by a correlation coefficient of 0.49.

Analysing the data obtained, we can conclude that the value of gross income from forest use is influenced by the use at all stages of forestry without exception, modern and efficient technologies (Kryvoviaz, E. et al., 2020; Openko, I., 2019a; Shevchenko, O. et al., 2021; Tykhenko, R. et al., 2021).

The chart (Fig. 2) highlights the distribution of profits from forest use by regions of Ukraine, and the graph shows the amount of costs for reforestation on land provided for permanent use.




***Source: calculated and created by the author***

Fig. 2. **Diagram of the distribution of revenues from the use of forests UTC**

The chart shows that the highest rates of income from the use of forest areas within UTC are concentrated in Cherkaska (UAH 78.79 million), Zhytomyrska (UAH 100.78 million) and Kyivska (UAH 124.61 million) oblasts. In general, a positive indicator is also observed in Kirovohradska, Vinnytska, Poltavska, Sumska, Ivano-Frankivska, Ternopilska, Chernivetska, Rivnenska, Khmelnytska and Chernihivska oblasts, which indicates cost-effective forestry in these regions.

The issue of legislative consolidation of forestry lands for communal enterprises acquires special importance in consolidating UTC's financial independence. Given that forestry enterprises, performing direct function, pay the appropriate taxes, which are transferred to the budgets of administrative units (villages and settlements, territorial community, district, regional and state),such fiscal payments include (Oborska A. E. et al., 2017):

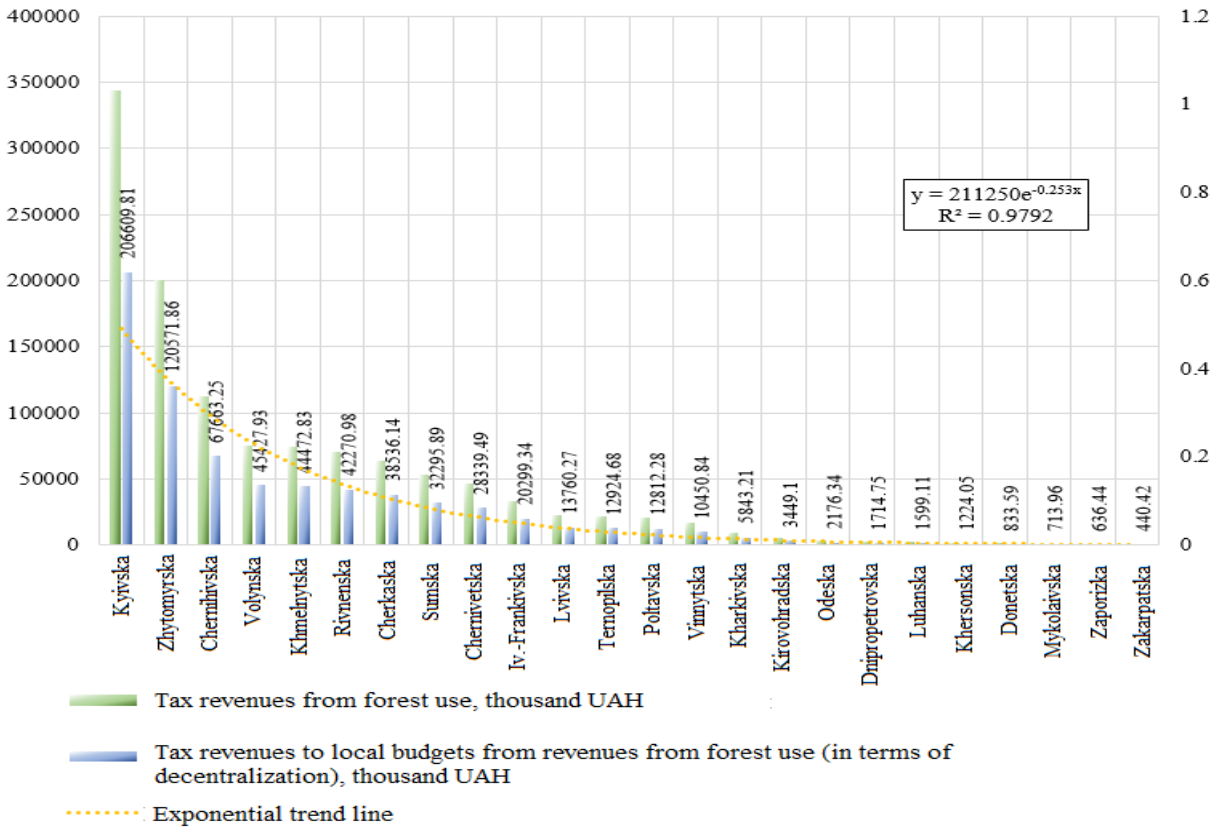
- rent for special use of forest resources (wood from felling of the main use). It is defined in Article 256 of the current Tax Code of Ukraine. At the same time, the rates of rent for the special use of forest resources are distributed equally between regional and state budgets;
- rent for special use of forest resources (except for wood from felling of the main use).

These payments include rent payments from the special use of secondary forest materials - harvesting of bast and bark, resin, wood sap, stumps, wood greens (Verkhovna Rada of Ukraine, 2019); useful properties

of forests - for recreational, tourism, sports, cultural and research is carried out taking into account the requirements for the preservation of forest environment and natural landscapes in compliance with the rules of architectural planning of suburban areas and sanitary requirements (Verkhovna Rada of Ukraine, 2019); secondary forest uses - haymaking, cattle grazing, apiary placement, harvesting of wild fruits, nuts, mushrooms, berries, medicinal plants, harvesting forest litter, reed harvesting (Verkhovna Rada of Ukraine, 2019), but does not always work well in practice. The corresponding rent rates are set by regional councils (Verkhovna Rada of Ukraine, 2019). Referring to the Forest Tax Handbook, it can be concluded that the funds from this collection can be a significant source of revenue for local budgets and become a basis for improving the well-being of the community;

- income tax (Oborska A. E. et al., 2017);
- VAT (value added tax);
- individual income tax (Markovych H., n.d.);
- fee for land (Oborska A. E. et al., 2017);
- military duty;
- property tax;
- single tax.

According to Article 64, paragraph 1.1 of the Budget Code of Ukraine (Verkhovna Rada of Ukraine, 2010), 60% of VAT – 18% of gross income (Ievsiukov, T., Openko, I., 2014), remain in the UTC budget. Taking into account this norm, the amount of probable fiscal revenues from the use of forest areas within UTC to the budgets of the same territorial communities is calculated (Fig. 3).

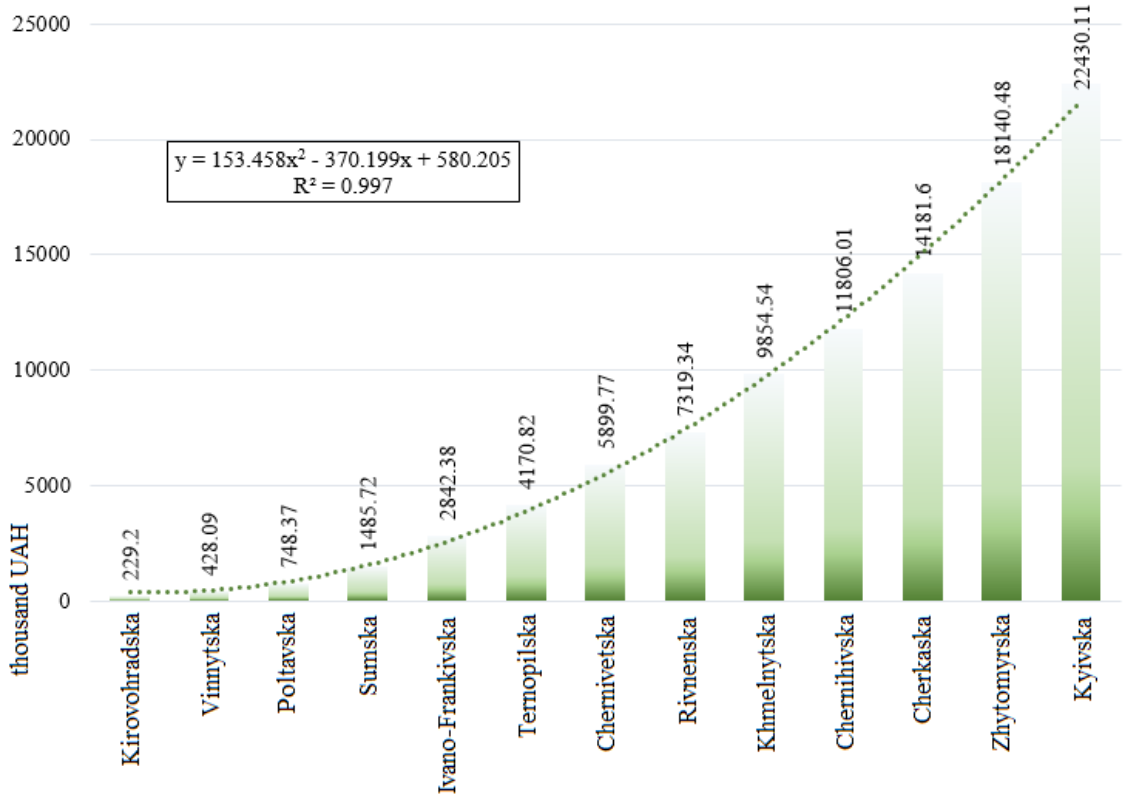



***Source: calculated and created by the author***

Fig. 3. **Diagram of tax revenues from forest use in UTC**

The chart shows that the highest indicators of probable total tax revenues, and hence tax revenues to local budgets from forest revenues, are concentrated in Kyivska, Zhytomyrska and Cherkaska oblasts. Thus, in areas where the exponential trend line is upward, the use of forest areas may become the main source of filling the local budgets of the UTC (Openko, I., Tsvyakh, O., Stepchuk, Ya., 2019).

However, if forests within territorial communities are used by communal enterprises, which according to the current legislation pay 18% (Verkhovna Rada of Ukraine, 2011) of the tax on communal property income, which is fully transferred to the budget of territorial communities, it is possible to calculate such fiscal revenues in areas where forestry is profitable. In this case, it is Kirovohradska, Vinnytska, Poltavska, Sumska, Ivano-Frankivska, Ternopilska, Chernivetska, Rivnenska, Khmelnytska, Chernihivska, Cherkaska, Zhytomyrska and Kyivska oblasts (Fig. 4).




***Source: calculated and created by the author***

Fig. 4. **Diagram of fiscal payments received from profits from forest utilities within UTC**

These charts show that if tax revenues are collected from revenues from the use of forest areas within UTC, the filling of local budgets will be much more efficient. But today's realities indicate the unprofitability of forestry in some regions due to significantly exceeding the cost of forest development and carrying out the necessary work to improve the overall condition of the forest fund over the resulting income (Openko, I., Stepchuk, Ya., Tsvyakh, O., 2019a; Openko, I., Stepchuk, Ya., Tsvyakh, O., 2019c).

At this stage of development of decentralization changes, the tax on the profit of communal enterprises from the use of forest areas corresponds to the principle of rational management. Effective management of forestry lands, in turn, can not only increase the gross income of utilities and turn the economy into a "profitable", but also open new sources of funding for the budgets of the UTC (Openko, I., 2019c; Openko, I. et al., 2019; Openko, I. et al., 2020).

Thus, different options of tax revenues from forest use within the UTC may have different effects on budgets of the united territorial communities.

**Conclusions, proposals, recommendations**

1) With the help of geoinformation and cartographic modelling the location of forest areas in the context of the united territorial communities of Ukraine was established. At the same time, in the case of the forest land use within the UTC by communal enterprises, which according to the current legislation pay 18% of the profit tax of communal property enterprises, ensure that it is fully received in the budget of the UTC. The calculation of these fiscal revenues was made in the context of the region where forestry production is profitable.

2) The offered economic mechanism for ensuring efficient use of forest lands takes into account the set of fiscal and budgetary relations between forest resources and business entities. The geoinformation approach was used as a basis for the initial data., which enables recording of forest areas in UTC.

3) The application of the financial mechanism will increase the total amount of tax revenues to UTC budgets. The total amount of these revenues may reach EUR 22.34 million (10.2% of actual revenues from UTC's own resources) (Decentralization of the budget as…, 2017). However, the total forest area within UTC covers only 18.95%.

**Bibliography**

1. *Open Street Map*. (2018). Retrieved: https://www.openstreetmap.org/#map=7/49.835/31.825. Access: 28.03.2022
2. Barladin O., Skavronskyi V., Skliar O. (2010). The Use of Geographic Information Technologies for Cartographic Support of Up-to-date Forestry Data. *Lviv Polytechnic Publishing House*, Volume 1(19), pp. 227-232.
3. Budget Code of Ukraine. Information of the Verkhovna Rada of Ukraine. Art. 572 (2010). Retrieved: //zakon.rada.gov.ua/laws/show/2456-17. Access: 28.03.2022.
4. Budget Decentralization as a Factor in Ensuring the Financial Autonomy of Regions and the Formation of Self-sufficient Communities (2017). Retrieved: https://knute.edu.ua/file/NjY4NQ==/1184477cfe14b1a0b3d7485c43c363d0.pdf. Access: 28.03.2022.
5. *Decentralization. About Uniting Communities. Infographics. (n.d.).* Retrieved: https://decentralization.gov.ua/gromadas/gallery. Access: 18.11.2019.
6. *Decentralization. Financial Decentralization: Experts Spoke about the Results of 2018 and Prospects for 2019.* Retrieved: https://decentralization.gov.ua/news/10670. Access: 28.03.2022.
7. *Decentralization. UTC Map. (n.d.).* Retrieved: https://decentralization.gov.ua/map Access: 18.11.2019.
8. *Forest Code of Ukraine. Information of the Verkhovna Rada of Ukraine.* (2019). Retrieved: https://zakon.rada.gov.ua/laws/show/3852-12. Access: 28.03.2022.
9. Kryvoviaz, E., Openko, I., Tykhenko, R., Shevchenko, O., Tykhenko, O., Tsvyakh, O., Chumachenko, O. (2020). Recovery of Losses for Inappropriate Use of Land. Scientific Papers. *Series E. Land Reclamation, Earth Observation & Surveying, Environmental Engineering*, Volume 9, pp. 175–182. Retrieved: http://landreclamationjournal.usamv.ro/pdf/2020/Art26.pdf. Access: 28.03.2022.
10. Markovych, H. (n.d.). Peculiarities of Forming Budgets of United Territorial Communities - Expert's Explanation. Decentralization. Retrieved: https://decentralization.gov.ua/news/3958. Access: 28.03.2022.
11. Oborska, A. E., Zhyla, A. S., Mateiko, I. M., Zhyla, T. B. (2017). *Communal Forest Enterprises and Local Communities. Information guide*. K.: Comprint. p.110.
12. Openko, I. (2019a). Ecological and Economic Productivity of Forest Land Use in Ukraine. *Ahrosvit*, Volume 13-14, pp. 44-52.
13. Openko, I. (2019b). Correlation Analysis of the Impact of the Existing Public Administration System on Forest Land Use in Ukraine. *Ekonomika ta derzhava,* Volume 7, pp. 55–62.
14. Openko, I. (2019c). Ecological and Economic Productivity of Land Use in Ukraine. *Ahrosvit*, Volume 13-14, pp. 44–52.
15. Openko, I., Shevchenko, O., Tykhenko, R., Tsvyakh, O., Moroz, Yu. (2020). Assessment of Inequality to Forest Resources Access in the Context of Sustainable Rural Development. *Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development*, Volume 20(1), pp. 405– 410.
16. Openko, I., Shevchenko, O., Tykhenko, R., Tsvyakh, O., Stepchuk, Ya. (2019). Economic Analysis of Deforestation Impact on the Yield of Agricultural Cultures in Ukraine. *Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development*, Volume 19(4), pp. 233– 237.
17. Openko, I., Stepchuk, Ya., Tsvyakh, O. (2019a). Calculation of Economic Efficiency of Forest Land Use in Terms of Natural and Climatic Zones of Ukraine. *Problemy ekonomiky*, Volume 3(41), pp. 274–280.
18. Openko, I., Stepchuk, Ya., Tsvyakh, O. (2019b). Economic Efficiency of Forest Land Use in the Conditions of Decentralization of Power. *Zbalansovane pryrodokorystuvannia*, Volume 2, pp. 181–191.

19. Openko, I., Stepchuk, Ya., Tsvyakh, O. (2019c). Estimation of Tax Revenues from the Use of Forest Land in the Context of Decentralization of Power. *Economy. Ecology. Society,* Volume 3, pp. 65-72. Retrieved: https://ees-journal.com/index.php/journal/article/view/114. Access: 28.03.2022.
20. Openko, I., Tsvyakh, O., Stepchuk, Ya. (2019). Assessment of Inequality in the Forest Resources of United Territorial Communities in Ukraine. Scientific notes of Tavriya National University named after V.I. Vernadsky, Volume 30(69), pp. 87–93.
21. Shevchenko, O., Openko, I., Tykhenko, R., Tsvyakh, O., Zhuk, O., Kryvoviaz, E., … Volk, P. (2021). Assessment of Economic Losses Caused by Degradation Processes of Agricultural Land Use. *Scientific Papers. Series E. Land Reclamation, Earth Observation & Surveying, Environmental Engineering*, Volume 10, pp. 102–109.
22. Tax Code of Ukraine. Information of the Verkhovna Rada of Ukraine. *Art. 112* (2011). Retrieved: https://zakon.rada.gov.ua/laws/show/2755-17. Access: 28.03.2022.
23. Tykhenko, R., Tykhenko, O., Openko, I., Shevchenko, O., Bavrovska, N., Zhuk, O., Stepchuk, Ya. (2021). The Assessment of Impact Ecological Stability of Territory on the Organization of Rational Land Use of Agricultural Enterprises. *Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development*, Volume 21(2), pp. 685–692.