Geographical developmental specificities of aggregative resource potential of farm economies of Ukraine throughout 2011–2017

Valerii P. RUDENKO, Myroslav D. ZAYACHUK, Stepan V. RUDENKO

Abstract: *The study focuses on the analysis of geographical developmental specificities of the potential of Ukrainian farm economies over seven years period (2011–2017). We assessed the average annual cost estimate of interconnected labor, material, and land resources that form the aggregative potential for the development of farms in Ukraine. Labor, material, and land resources were assessed through the cost estimate (money value). The cost of a commodity is defined as social labor embodied in the same. The cost is measured by money. Hence, money estimates are labor estimates. Labor resources and the units of labor produced by an average annual farm employe were counted through the labor's funds analog, that is, through the annual totality of employees' wages divided by the normative coefficient of efficiency of capital investments. Agricultural machinery, i.e., tractors, combine harvesters, corn harvesters, forage harvesters, seeders, windrowers, etc., available on farms in 2011–2017, were the basis for the assessment of material resources (capital assets). Bringing non-recurring (capital) costs to a per-year basis (to be comparable with other resources) was carried out by way of counting percentages of the current production assets following their established efficiency standard (0.15). Estimation of land resources based on natural productivity of Ukrainian lands, that is, on crop capacity gained on condition that crop rotation, was observed. The range of works on the mechanical treatment of arable land was applied, and no fertilizers were added. The Ukrainian farms' aggregative resource potential was presented as a sum of the potentials of labor, material, and land resources. According to our calculations, the aggregative potential throughout 2011–2017 was 52 019 million hryvnias, or 2 771 million euros.*

Keywords: *farm economies of Ukraine, aggregative resource potential, money value*

Introduction

Social-geographic study of farm economies of Ukraine stays to be an important area of scientific research since characterizes one of the major categories of agricultural producers. Farm economies in this country represent the form of people's entrepreneurial activity held in the status of juridical person. It is those individuals who decided to produce commercial output, process and realize it to gain profit from land areas provided to them for farming. In particular, farms shared 8.7% of all categories of economies engaged in agricultural production in Ukraine in 2015–2017. The total area of agricultural lands now amounts to 41.5 million ha (69% of the country's territory), where 32.5 million ha are arable lands. All these lands are cultivated by agrarian enterprises (companies) (49.8%), and individual farmers (38.1%), while 10.6% account for the reserve and the lands yet not appropriated to ownership or permanent use, and 1.5% for other use. The aforementioned farmers used 10.7% of the country's agricultural lands, and nearly 13.3% of arable lands (Ukrainian Agriculture in 2017, 2018). Ukrainian farmers accounted for 8.44% of agricultural production, in particular, 11.0% of plant production and nearly 2.0% of the livestock breeding complexes. It was in the last two and a half decades that farms ramped up the production of grain crops by 15, potatoes by 18, and sunflower by 28 times. Their contribution to the production of

_____

sunflower (20%), rape plant (18%), buckwheat (17.5%), soy (16%), barley (15%), panic grass (14%) etc., was most essential. Ukrainian farm economies now employ nearly 100 000 people.

The present-day trend of reduction of the number of farm economies with the simultaneous growth of agricultural lands in their use witnesses the process of farm consolidation. The farms' area today grew to reach 110 ha on average (7 times more if compared to 1995). Farms using 20–50 ha (over 30%) form the core in the classification of economies by their average agricultural areas. These are followed by farms using 10–20 ha (10%), 50–100 ha (10%), and 100–500 ha (13%). Agricultural lands of over 1000 ha are used by nearly 1000 farms (Ukrainian Agriculture in 2017, 2018).

Family farming is understood in the countries of the European Union as any farm managed by the family where 50% of labor or more is provided by its members (Agriculture, forestry, and fishery statistics, 2018). A similar concept of family farms was pronounced by the Food and Agriculture Organization of the United Nations saying: "Family Farming (including all family-based agricultural activities) is a means of organizing agricultural, forestry, fisheries, pastoral and agricultural production that is managed and operated by a family and is predominantly reliant on the family labor of both women and men. The family and the farm are linked, co-evolve and combine economic, environmental, social and cultural functions." (FAO and IFAD 2019).

The actuality of study/solution of the problem of worldwide family farms that use over 9/10 of agricultural areas and produce 4/5 of agricultural food products in cost equivalent has made the United Nations declare the Decade of Family Farming 2019–2028 and develop its Global Action Plan (FAO and IFAD 2019). The final aim of the Global Action Plan is the vision of a world with flourishing stable food and agricultural systems allowing stable urban and rural communities to enjoy a high quality of life in conditions of equality and dignity with no hunger and poverty.

Undoubtedly, the harmonic development of family farms is called to become the decisive basis in reaching these goals. Key steps in the progress of family farming are expected to be as follows: formation of an enabling policy environment; youth support in farming families; promotion of gender equity; improvement of social-economic inclusion; resistance to external influences; stable and responsive management and use of natural resources, in particular, for climate-resilient food systems (FAO and IFAD 2019).

The countries of the European Union pay the closest attention to the growth of family farming. Family farms are now predominantly concentrated in Romania (1/3 of the total), while 1/7 are active in Poland and 1/10 – in Italy. Among 10.5 million farms within the EU, 2/3 of them produce only 1% of the total output, and 304 thousand – nearly 3/5 (Agriculture, forestry, and fishery statistics 2018).

Farm economies in Ukraine possess powerful resource potential. However, the amount and the structure of lands, as well as the efficiency of land use significantly differ in its economic rayons and administrative oblasts.

It should be recognized that social geographers still pay little attention to disclosure of geographical regularities in the development of the potential of Ukrainian farms and their inner reserves; substantiation of perspective directions of growth of the farming movement, production and marketing diversification, multi-functionality, neo-productivism, etc.

Questions of agricultural growth in Ukraine based on long-awaited reforms were continuously discussed by economists and geographers. It is, in the first turn, Nagirna and Rudenko (2016), Topchiev, Malchikowa and Yavorska (2015), Džatko (2002), Faccioni, Sturaro, Ramanzin and Bernues (2019), Krammer and Rohrmoser (2012), Makovnikova et al. (2020). Their studies represent the closest view on the issues of needful transformations in agriculture of Ukraine in particular and Europe overall, as well as a disclosure of the potential of its (agriculture) development. The authors focus on the assessment of the potential of agro-ecosystems services rendered within the regions and throughout the country. It is emphasized that the cost of services in agro-ecosystems is pre-conditioned by geographical factors, e.g., climate, natural fertility of soils, slope exposition, etc. The majority of European countries have taken the concept of agro-ecosystems services

as the basis for strategic plans of their national policies on the preservation and renewal of the potential of nature and productive resources, in particular, in agriculture.

The work by Mathijs and Noev (2004) where the authors analyzed the effect of farms' size on the total agricultural output in the countries of Central and Eastern Europe is another study in the trend of our research. Csaba and Csaba (2009) emphasized large-scale changes in the agricultural sector of the states of the Central and Eastern Europe and former USSR republics but pointed to problems of the unbalanced agrarian sector, absence of mutual cooperation between small farmers and multi-national wholesale networks, hard competitiveness between and stiff pressure on small farmers in Bulgaria, Czech Republic, Estonia, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia, and Ukraine.

It should be also remembered that, besides natural-climatic conditions, agriculture to a great extent depends on social-economic factors, e.g., on state support of the farming movement, and the social-geographic analysis of said movement should therefore be considered in the trend of at least five or seven years of growth.

Following the above, our research aimed at the assessment of the amount, structure, and cognition of geographical particularities of aggregative resource potential in farming economies available in administrative oblasts and economic rayons of Ukraine over a seven-year (2011–2017) period (Zastavnyj 2010).

Study methods and data

The aggregative resource potential should be understood as generalizing quantitative parameter covering interconnected labor, material, and natural resources, which predefine the possibility of reaching an objectively conditioned level of development of farm economies in Ukraine.

There were several principal approaches formed in the process of elaboration of methodical bases to help define the value of aggregative resource potential of the national economy. All approaches are based on the use of the index method, regressive models, and the cost estimation of labor, material, and natural resources. The questions of the appropriateness of approaches were repeatedly taken up beginning from the pioneering work by Strumilin (1963), followed by Cloke and Park (1985), Darnhofer (2010), Lee and George (2002), Paskhaver (1982), etc.

Indices represent statistical relative values that in this case characterize the spatial proportion of social-economic phenomena, the so-called territorial indices. These are used to compare directly incomparable conditions of different genesis. Comparability is gained through the appropriation of common (cost) measures to the components of the resource potential. Models of regression allow for better applicability of the previously mentioned methods and avoidance of problems connected with homogeneous data handling.

At the same time, with more experience gained, we now see that when it comes to counting, the prospects of the index method and the regressive models are very limited. Paskhaver had convincingly proved that, on the one hand, like all methods of variation statistics, the regressive analysis assesses the contribution of the factor into the variation of resultant estimate around the average level but not in the level proper; on the other hand, regressive estimates are valid only within the plurality covered by one model (Paskhaver 1982). The resources' regressive estimates distort the economic commensurability of production resources and are highly unstable in temporal and territorial aspects.

We regard that cost (money) estimation of labor, material, and natural resources is a more adequate method when it bases on the Labor Theory of Value. The cost of company's product (goods) is determined by the social labor embodied in it. The measure of cost, that is, the measure of the directly social (abstract) labor embodied in goods is represented by money. Our study bases on official data available with the State Committee for Statistics, Ukraine. The array of stages to study aggregative resource potential is schematically presented in fig. 1.
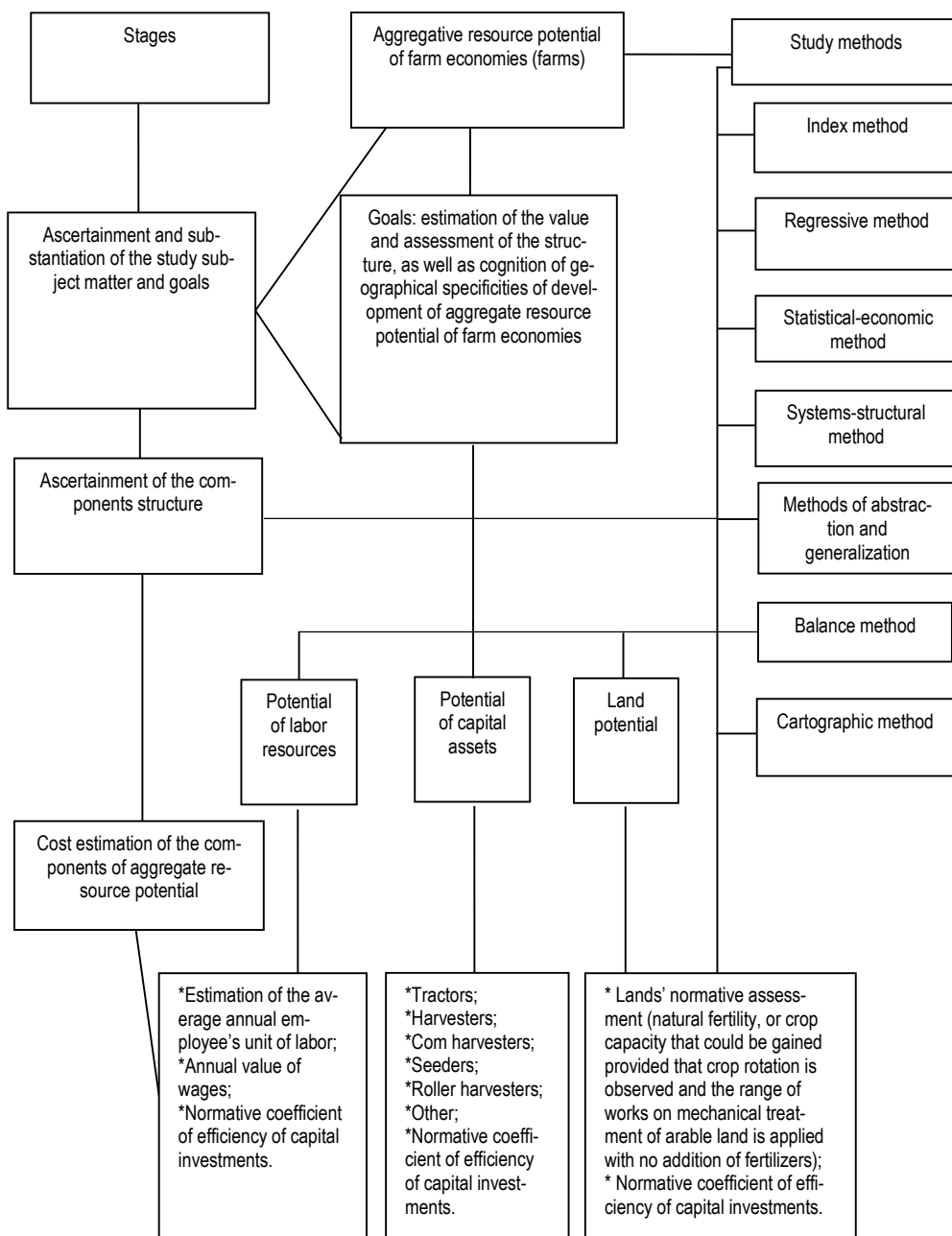
Stages	Aggregative resource potential of farm economies (farms)	Study methods

Ascertainment and substantiation of the study subject matter and goals

Goals: estimation of the value and assessment of the structure, as well as cognition of geographical specificities of development of aggregate resource potential of farm economies

Index method

Regressive method

Statistical-economic method

Systems-structural method

Ascertainment of the components structure

Methods of abstraction and generalization

Balance method

Potential of labor resources	Potential of capital assets	Land potential	Cartographic method

Cost estimation of the components of aggregate resource potential

*Estimation of the average annual employee's unit of labor;
*Annual value of wages;
*Normative coefficient of efficiency of capital investments.

*Tractors;
*Harvesters;
*Com harvesters;
*Seeders;
*Roller harvesters;
*Other;
*Normative coefficient of efficiency of capital investments.

* Lands' normative assessment (natural fertility, or crop capacity that could be gained provided that crop rotation is observed and the range of works on mechanical treatment of arable land is applied with no addition of fertilizers);
* Normative coefficient of efficiency of capital investments.

Fig. 1. *Study algorithm*

The unit of labor produced by the average annual farm employee was determined through the labor's funds analog. With the approximation of marginal efficiency of capital investment towards average value, the values of funds analogue are counted as annual amount of employees' wages divided by the normative coefficient of investment efficiency. The potential of non-recurring costs (the ones that can not be confronted with current costs due to

different times of their turnover and different dimensions) was brought to a per-year basis so that it could become comparable to other resources by way of counting percentages of current capital assets of farming economies following the established standard of efficiency. The annual dimension of the potential of land resources allowed for summing it up with the potentials of labor and material resources, and the subsequent establishment of the value of the aggregative potential of Ukrainian farm economies.

Thus, the value of the potential of labor resources was counted as the average annual fund of farm employees' nominal wages in 2011–2017 (Ukrainian Agriculture in 2013–2017, 2014–2018, Statistical Yearbook of Ukraine 2014–2016), and amounted to 195.4 million euros (3668.2 million hryvnias) in 2011–2017 prices.

Capital assets of farm economies represent the second important component of aggregative resource potential. In present-day conditions (due to the absence of proper information), the scope of capital assets engaged in farming activity in Ukraine can be defined only through expert estimates. To do so, we took as a basis all agricultural machinery, i.e. tractors, combine harvesters, corn harvesters, forage harvesters, seeders, windrowers, etc., available in the country's farms from 2011 to 2017.

Bringing the non-recurring (capital) costs to the per year dimension (to be comparable with other resources) was carried out by way of calculating of the percentages of current production assets following the established standard of their efficiency (0.15). The potential of capital assets of the farming economies of Ukraine was thus estimated to amount to 431.8 million euros (8105.0 million hryvnias).

Land resources represent the third component in the structure of aggregative resource potential. The potential of these resources defines the level and the scale of farm development. Taking into account the fact that the land potential of the territory (water area) is very inertial and relatively stable concerning its development on a national scale, natural re-estimation of lands should be carried out not oftener than once every ten or twenty years. The last economic estimation of agricultural lands in Ukraine took place as far back as 1987–1988. A similar situation is with mineral, water, and forest resources. On the one hand, such labor-consuming large-scale work presupposes a huge financial load; on the other, there exists no urgent need for new assessment due to the aforementioned inertia (Rudenko et al. 2013).

In connection with the above, resource researchers shift their attention to the problem of indexation of land cadaster estimates for the 1980s–1990s, and a good solution to the problem is found in the Price of Land by Yukhnovsky and Loboda (2002).

The authors' key assertion is that, in conditions of unstable economics, the normative estimation must be based on the "natural productivity of Ukrainian lands, that is, on crop capacity that could be reached if crop rotation is observed and the range of works on the mechanical treatment of arable lands is applied with no addition of fertilizers". Guided by the data available with the Institute of Soil Science and Agro-Chemistry of the Ukrainian Academy of Agricultural Sciences, and the Institute of Agrarian Economics of the same, Yukhnovsky and Loboda (2002) found the price of tillable lands to amount to 3810 US dollars/ha. With the normative coefficient of efficiency of capital investment averaging 0.15, the value of the land potential of farm economies in this country in the annual dimension shall make 2144.2 million euros (40245.3 million hryvnias).

Methodical approaches to the assessment of aggregative resource potential of farming economies of Ukraine are presented in more detail in Rudenko et al. (2017) and Rudenko (2010).

Results and discussion

The provision for and substantiation of scientific frameworks for sustainable development of farms on the basis of rational use, protection and reproduction of available aggregative resource potential is an important task for present-day researches in this area. Kuhmonen (2020) relates sustainability of Finnish farms to the necessity of provision of balance between severe observance of the requirements of agro-ecological imperatives and their focus on economic development. Czekaj et al. (2020) admit that the majority of existing strategies of sustainable development for small farms in Poland and Lithuania sorely directed to solution of economic problems often to the detriment of ecological and social factors.

At the same time, Maltsoglou et al. (2013), Morris and Bowen (2020) outline family farms as structures that can solve not only technological and industrial but also social, ecological and bio-energetic problems. The same is emphasized by Sikorski et al. (2020) who regard that questions of rural depopulation can be solved at the expense of increasing of servicing functions, in particular, by way of development of tourism potential.

Knickel et al. (2018) convince that only systemic changes in four areas, namely, balance between farms and rural regions; prosperity and well-being; knowledge and innovations; management of resources of agriculture and rural localities would lead to harmony between strategies of farming development and market needs, policy measures and results.

It therefore becomes evident that the ascertainment of farms' resource capacities stays among the major tasks in articulation of the perspectives of their sustainable development.

Guided by the results of our research, we assert that Ukrainian farms possess (in average annual dimension of 2011–2017) the aggregative resource potential (calculated as a sum of the potentials of labor resources, capital assets and land resources) in the amount of 2771.4 million euros (52018.5 million hryvnias) (tab. 1, fig. 2–4).

The body and the proportion of major components of the aggregative resource potential of Ukrainian farm economies are characterized by its component structure where land resources account for 77.3%, capital assets – 15.6%, and labor resources – for 7.1% (tab. 2). The highest aggregative resource potential is found in farms of the Prychornomorskyy and the Prydniprovskyy economic rayons (22.6% and 15.7%), and the lowest – in farms appropriated to the North-Western (1.9%) and the Carpathian (3.7%) economic rayons.

With respect to administrative oblasts of Ukraine, the highest aggregative resource potential was manifested by farm economies of the Kirovograd Oblast (9.3%), and the Dnipropetrovsk Oblast (9.3%), while the lowest such potential in 2011–2017 was observed in the farms of the Zakarpattia (0.4%), Ivano-Frankivsk (0.7%), and Rivne (0.8%) oblasts (tab. 1, fig. 2–4).

It is important to be aware of the territorial specificities of the development of each component in the structure of aggregative resource potential of Ukrainian farms in 2011–2017.

In particular, we cannot but point to the increase in the share of labor resources from the Central Economic Rayon (where it is the lowest in Ukraine amounting to 6.2%) to the Carpathian Economic Rayon (where labor resources share 13.7% of the aggregative potential). Territorial differences are more vivid on the level of administrative oblasts: if the share of labor resources in the Odesa, Kirovograd, and Zaporizhzhia oblasts makes 5.3%–6.1%, the western administrative oblasts of the country (Lviv and Zakarpattia) show the figures ranging from 12.3% to 30.6% respectively (tab. 2, fig.2).

Practically the same territorial specificities, i.e., the increase in the share of the potential from southern, central, and eastern rayons towards north-eastern and western regions characterize the disposition of the potential of capital assets. The polarized situation is represented by the Kherson and the Donetsk oblasts showing 12.3–12.8 % on the one hand, and the Volyn and the Lviv oblasts showing 21.7–39.9 %, on the other (Fig. 3).

The effect of zonal natural and social-economic factors is clearly observed in the disposition of the potential land resources possessed by farms. Unlike the situation with two previous components of aggregative potential, a natural trend of growth in the specific weight of land

resources is observed from the Carpathian and North-Western rayons (where lands share 58.3–68.5%) to the Prydniprovskyy, Central, and Prychornomorskyy economic rayons (76.3–80.4%) (tab. 2, fig. 4).

Analyzing problems of development of the aggregative resource potential of Ukrainian farm economies, we cannot but dwell on averaged characteristics of timelines within the seven years, that is, 2011–2013, 2011–2015, and 2011–2017. The three/five/seven-year periods characterize the movement, accepted in the agrarian sector, towards the analysis of a more stable (balanced) development of agriculture when the effect of unpredictable natural-climatic factors is made average and lesser. If the period of 2011–2013 is taken as a basis, the changes in the development of the potential of farm economies in 2011–2015 and 2011–2017 will have the values presented in tab. 3 and fig. 4.

Tab. 1. *The aggregative resource potential of Ukrainian farm economies (2011–2017)*

Economic rayons, The Autonomous Republic of Crimea, administrative oblasts	Aggregative resource potential, million euros				The share of rayons, republic and oblasts in the country's potential,%
	total	labor resources	capital assets	land resources	
Ukraine	**2771.4**	**195.4**	**431.8**	**2144.2**	**100.0**
Donetsk Rayon	**211.4**	**15.1**	**34.9**	**161.4**	**7.6**
Donetsk Oblast*	112.9	7.7	14.4	90.8	4.1
Luhansk Oblast*	98.5	7.4	20.5	70.6	3.5
Prydniprovskyy Rayon	**434.6**	**29.1**	**73.8**	**331.7**	**15.7**
Dnipropetrovsk Oblast	256.5	18.3	45.1	193.1	9.3
Zaporizhzhia Oblast	178.1	10.8	28.7	138.6	6.4
North-Eastern Rayon	**372.5**	**24.9**	**60.1**	**287.5**	**13.4**
Poltava Oblast	155.8	11.2	25.0	119.6	5.6
Sumy Oblast	69.4	4.9	11.3	53.2	2.5
Kharkiv Oblast	147.3	8.8	23.8	114.7	5.3
Stolychnyy Rayon	**221.9**	**17.4**	**31.0**	**173.5**	**8.0**
Zhytomyr Oblast	43.0	4.0	7.2	31.8	1.6
Kyiv Oblast	117.2	8.8	15.7	92.7	4.2
Chernihiv Oblast	61.7	4.6	8.1	49.0	2.2
Central Rayon	**379.9**	**23.5**	**56.8**	**299.6**	**13.7**
Kirovograd Oblast	257.0	15.0	41.2	200.8	9.3
Cherkasy Oblast	122.9	8.5	15.6	98.8	4.4
Prychornomorskyy Rayon	**625.1**	**42.4**	**80.1**	**502.6**	**22.6**
Autonomous Republic of Crimea*	49.9	3.8	3.7	42.4	1.8
Mykolayiv Oblast	193.5	14.6	26.7	152.2	7.0
Odesa Oblast	230.0	12.6	31.1	186.3	8.3
Kherson Oblast	151.7	11.4	18.6	121.7	5.5
Podilskyy Rayon	**369.0**	**23.8**	**54.3**	**290.9**	**13.3**
Vinnytsia Oblast	203.8	13.2	27.9	162.7	7.3
Ternopil Oblast	68.3	3.6	13.2	51.5	2.5
Khmelnytskyy Oblast	96.9	7.0	13.2	76.7	3.5
North-Western Rayon	**53.3**	**5.0**	**11.8**	**36.5**	**1.9**
Volyn Oblast	29.9	2.9	6.5	20.5	1.1
Rivne Oblast	23.4	2.1	5.3	16.0	0.8
Carpathian Rayon	**103.7**	**14.2**	**29.0**	**60.5**	**3.7**
Zakarpattia Oblast	10.7	3.3	2.2	5.2	0.4
Lviv Oblast	47.8	5.9	19.1	22.8	1.7
Ivano-Frankivsk Oblast	19.2	2.5	3.9	12.8	0.7
Chernivtsi Oblast	26.0	2.5	3.8	18.7	0.9

* no data are available beginning from 2015 for the portions of the Donetsk and Luhansk oblasts occupied by Russia and the Autonomous Republic of Crimea annexed by the same; Based on the data from Ukrainian Agriculture in 2013–2017 (2014–2018), Statistical Yearbook of Ukraine (2014–2016)

Tab. 2. *The component structure of aggregative resource potential of Ukrainian farm economies (2011–2017)*

Economic rayons, The Autonomous Republic of Crimea, administrative oblasts	Potential of resources, %		
	labor resources	capital assets	land resources
Ukraine	**7.1**	**15.6**	**77.3**
Donetsk Rayon	**7.2**	**16.5**	**76.3**
Donetsk Oblast*	6.8	12.8	80.4
Luhansk Oblast*	7.5	20.8	71.7
Prydniprovskyy Rayon	**6.7**	**17.0**	**76.3**
Dnipropetrovsk Oblast	7.1	17.6	75.3
Zaporizhzhia Oblast	6.1	16.1	77.8
North-Eastern Rayon	**6.7**	**16.1**	**77.2**
Poltava Oblast	7.2	16.1	76.7
Sumy Oblast	7.1	16.3	76.6
Kharkiv Oblast	5.9	16.2	77.9
Stolychnyy Rayon	**7.9**	**14.0**	**78.1**
Zhytomyr Oblast	9.2	16.7	74.1
Kyiv Oblast	7.5	13.4	79.1
Chernihiv Oblast	7.5	13.1	79.4
Central Rayon	**6.2**	**15.0**	**78.8**
Kirovograd Oblast	5.9	16.0	78.1
Cherkasy Oblast	6.9	12.7	80.4
Prychornomorskyy Rayon	**6.8**	**12.8**	**80.4**
Autonomous Republic of Crimea*	7.5	7.5	85.0
Mykolayiv Oblsat	7.6	13.8	78.6
Odesa Oblast	5.5	13.5	81.0
Kherson Oblast	7.5	12.3	80.2
Podilskyy Rayon	**6.5**	**14.7**	**78.8**
Vinnytsia Oblast	6.5	13.7	79.8
Ternopil Oblast	5.3	19.4	75.3
Khmelnytskyy Oblast	7.2	13.5	79.3
North-Western Rayon	**9.4**	**22.1**	**68.5**
Volyn Oblast	9.6	21.7	68.7
Rivne Oblast	9.1	22.6	68.3
Carpathian Rayon	**13.7**	**28.0**	**58.3**
Zakarpattia Oblast	30.6	20.6	48.8
Lviv Oblast	12.3	39.9	47.8
Ivano-Frankivsk Oblast	13.2	20.6	66.2
Chernivtsi Oblast	9.8	14.5	75.7

* no data are available beginning from 2015 for the portions of the Donetsk and Luhansk oblasts occupied by Russia and the Autonomous Republic of Crimea annexed by the same; Based on the data provided in tab. 1

It thus appears that, on the national scale, the aggregative resource potential in averaged factual (national) prices by the end of the year was 1.39 times higher in 2011–2015 than in 2011–2013, and 1.9 times higher than in 2011–2017. As regards economic rayons, polarized values were observed in the Donetsk (1.32 and 1.72 times respectively) and the Carpathian (1.31 and 2.03 times) rayons, and concerning administrative oblasts, the same manifested in the Donetsk (1.34 and 1.69) and the Lviv (1.31 and 2.35) oblasts. Territorial differences in the values of the aggregative potential and its component structure in the aspect of economic rayons are presented in fig. 5.
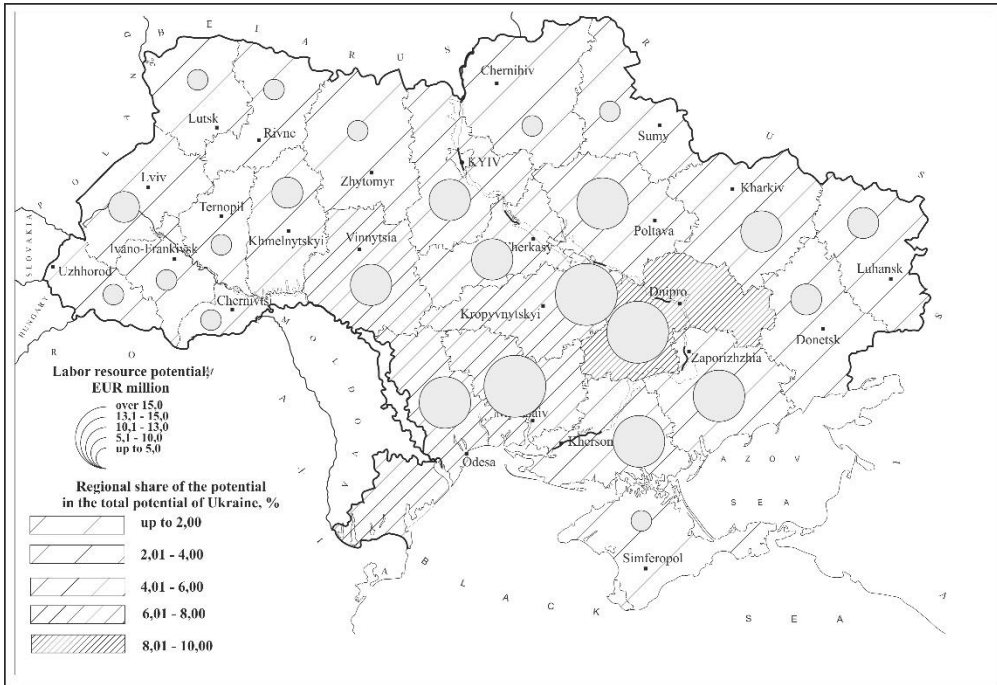
Fig. 2. *The potential of labor resources of Ukrainian farm economies (2011–2017)*
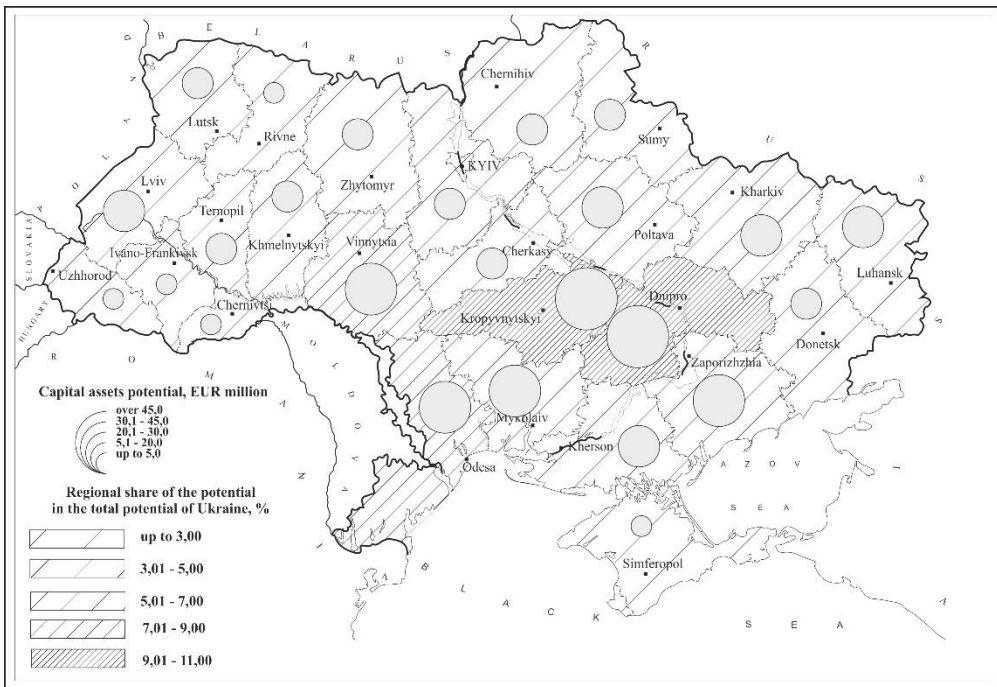*Source: Based on the data provided in tab. 1*

Fig. 3. *The potential of capital assets of Ukrainian farm economies (2011–2017)*
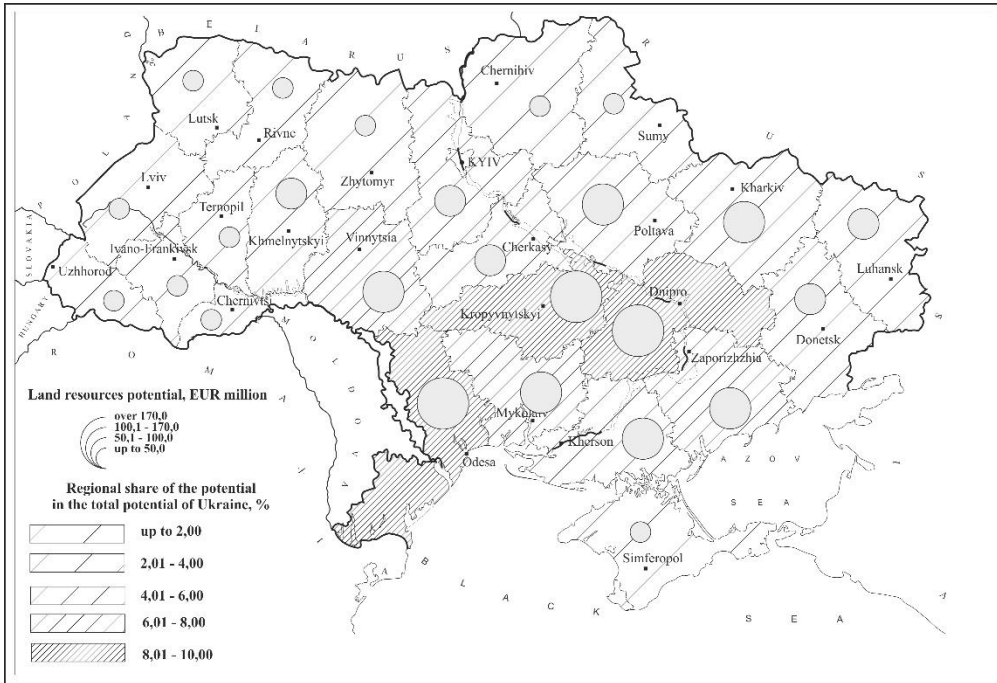*Source: Based on the data provided in tab. 1*

Fig. 4. *Potential of land resources of Ukrainian farm economies (2011–2017)*
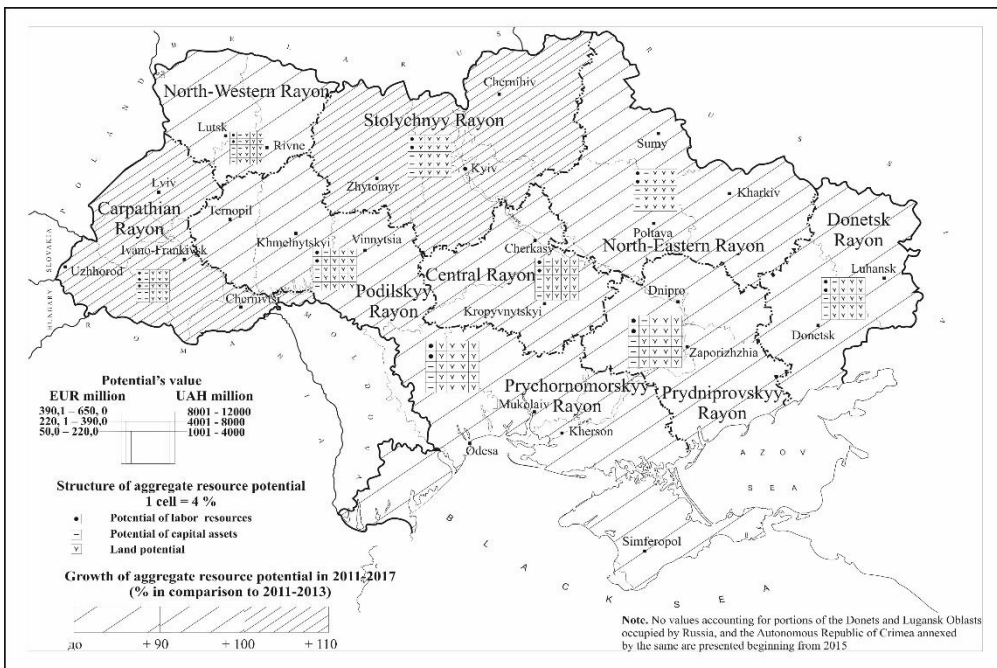*Source: Based on the data provided in tab. 1*

Fig. 5. *The aggregative resource potential of farm economies in economic rayons of Ukraine*
Source: Based on the data provided in tab. 1 and 2

With that, the values of growth of the aggregative resource potential of Ukrainian farms in 2011–2017 in current prices do not take into account the national currency's devaluation and inflation processes that took place within said period. If the EUR/UAH exchange rate was approximately 1:10.67 on the average in 2011–2013, 1:14.55 in 2011–2015, and 1:18.77 in 2011–2017 (Ukrainian Agriculture in 2017, 2018), Statistical Yearbook of Ukraine 2014, 2016).

Hence, the aggregative resource potential of farm economies of the country in average annual dimension in EUR equivalent was reassessed to amount to 2.575 milliard euros in 2011–2013, 2.628 milliard euros in 2011–2015, and 2.771 milliard euros in 2011–2017. The potential's slight increase is to a great extent connected with the annexation of the Autonomous Republic of Crimea which accounted for 3.8% of all aggregative resources of Ukrainian farms in 2011–2013 (Rudenko et al. 2017).

Tab. 3. *Development of aggregative resource potential of Ukrainian farming economies in 2011–2017*

Economic rayons, The Autonomous Republic of Crimea, administrative oblasts	Aggregative resource potential, %		
	2011–2013	2011–2015	2011–2017
Ukraine	**100**	**139**	**190**
Donetsk Rayon	**100**	**132**	**172**
Donetsk Oblast*	100	134	169
Luhansk Oblast*	100	130	175
Prydniprovskyy Rayon	100	139	188
Dnipropetrovsk Oblast	100	139	188
Zaporizhzhia Oblast	100	139	188
North-Eastern Rayon	100	140	197
Poltava Oblast	100	140	200
Sumy Oblast	100	138	198
Kharkiv Oblast	100	140	194
Stolychnyy Rayon	100	141	200
Zhytomyr Oblast	100	137	199
Kyiv Oblast	100	140	195
Chernihiv Oblast	100	145	211
Central Rayon	100	143	195
Kirovograd Oblast	100	144	194
Cherkasy Oblast	100	141	197
Prychornomorskyy Rayon	100	140	181
Autonomic Republic of Crimea*	100	-	-
Mykolayiv Oblsat	100	137	188
Odesa Oblast	100	145	199
Kherson Oblast	100	140	195
Podilskyy Rayon	100	141	198
Vinnytsia Oblast	100	146	200
Ternopil Oblast	100	131	202
Khmelnytskyy Oblast	100	139	193
North-Western Rayon	100	133	187
Volyn Oblast	100	137	204
Rivne Oblast	100	129	170
Carpathian Rayon	100	131	203
Zakarpattia Oblast	100	120	174
Lviv Oblast	100	131	235
Ivano-Frankivsk Oblast	100	135	191
Chernivtsi Oblast	100	134	178

* no data are available beginning from 2015 for the portions of the Donetsk and Luhansk oblasts occupied by Russia and the Autonomous Republic of Crimea annexed by the same; Source: Calculations based on the data available in Ukrainian Agriculture in 2013–2017 (2014–2018); Statistical Yearbook of Ukraine (2014–2016)

The increase in the values of aggregative potential in 2011–2013, 2011–2015, and 2011–2017 can be graphically presented by the Lorenz curve which characterizes the potential's factual distribution over seven years. The X axis, accounting for the periods of 2011–2013, 2011–2015, and 2011–2017, is expressed as percentages of the total time of observations. The Y-axis characterizes the respective time estimates of the aggregative resource potential of farms expressed in percent. The Lorenz coefficient for Ukraine generally makes 0.149 (fig. 6), and 0.123 and 0.201 in its extremes (Donetsk and Lviv oblasts respectively). This fact points to a bigger inequality in changes of estimates of aggregative resource potential over the said period in the Lviv Oblast rather than in the Donetsk Oblast.
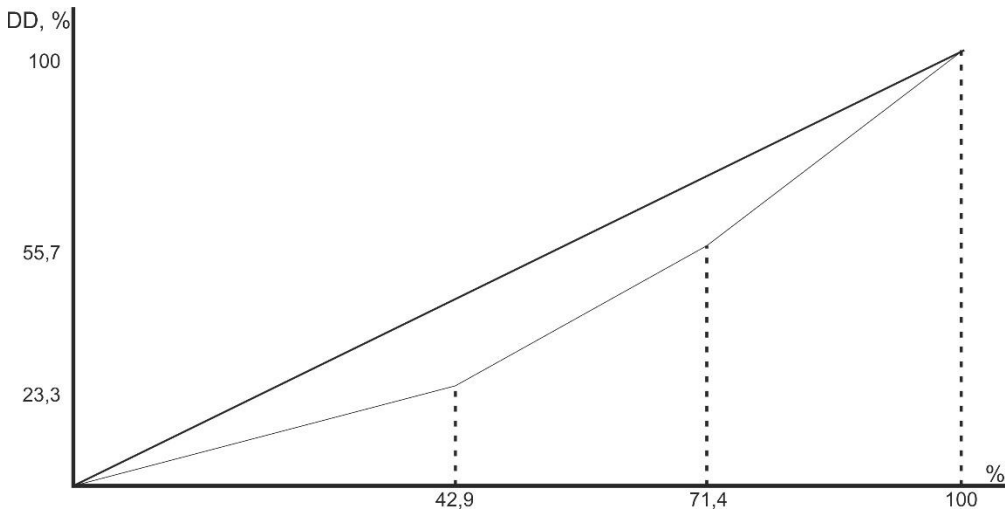
Fig. 6. *Curves of distribution of aggregative resource potential of farm economies in 2011–2013, 2011–2015, and 2011–2017 (Lorenz curves): DD – development difference (compared to the previous stage); Based on the data provided in tab. 3*

It seems appropriate that the analysis of geographical specificities in the development of aggregative resource potential of farm economies of Ukraine in 2011–2017 was supplemented by the estimates of its territorial efficiency in economic rayons. If the cost of the potential per 1 ha of the farm (11.7 thousand hryvnias) is taken as 100 points, the highest efficiency of use of aggregative resources shall be observed in the Carpathian Economic Rayon (135 points), while the least territorial return of the potential is manifested by the farms of the Donetsk (78 points) and the Prydniprovskyy (87 points) economic rayons.

Summarizing the discussion on the assessment of aggregative resource potential of Ukrainian farm economies, we should point to perspectives of its subsequent development through a wider application of the obtained results. For example, Makovnikova et al. (2020), when they define the value of the resource potential of agro-ecosystems, suggested the non-cost estimates. The approach by Stalhammar and Thoren (2019) cannot also be walked past. The authors suggested three perspectives on relational values of nature asserting that "relational value has recently been introduced as a third class of values for understanding values of nature and are thought to sit alongside more familiar axiological categories such as instrumental and intrinsic value". Their three viewpoints on relational values of nature will undoubtedly contribute to the solution of problems in economic ethics, assessment of ecosystem services, and ecological psychology. The authors, however, note that their approach can be opposed to, e.g., anthropology and human geography where a wide specter of predominantly qualitative approaches is used to disclose value-based relations in natural management.

Conclusions

The interconnected labor, material, and land resources that form the aggregative resource potential of the farm economies of Ukraine, amounted to 2771.4 million euros (52018.5 million hryvnias) in average annual dimension in 2011–2017. The component structure of said potential shows the predominance of land resources (77.3%), followed by capital assets (15.6%) and labor resources (7.1%.)

The seven-year period considered within the frame of this study was distinctive for the decrease in the shares of land and labor resources, and relative growth of the weight of capital assets.

The aggregative resource potential of Ukrainian farm economies in averaged factual prices by the end of each year in 2011–2015 was 1.39 times higher than that in 2011–2013 and 1.9 times higher in 2011–2017. In the euros equivalent and in the per year terms, the potential was assessed as amounting to 2.575 milliard euros in 2011–2013, 2.628 milliard euros in 2011–2015, and 2.771 milliard euros in 2011–2017. Such insignificant growth of the aggregative potential is in the first place connected with the annexation by Russia of the Autonomous Republic of Crimea and the parts of the Donetsk and the Luhansk oblasts.

The highest territorial efficiency of the potential is observed in farms of the Carpathian, Podilskyy, and Stolychnyy economic rayons, and the lowest – is in the Donetsk and the Prydniprovskyy rayons.

It was for the first time that geographical specificities of the development of aggregative resource potential of Ukrainian farm economies were analyzed and quantitatively estimated. Besides, the inequality in changes in the values of aggregative potential within the studied period was proved.

Further development of the potential of farm economies in Ukraine as part of Europe and Ukraine as part of the world will rely on the development and realization of the state policy towards the approval of family farmers' rights to balanced use, management, and control over nature, labor and financial resources as recommended by leading scientists such as Knickel et al. (2018), Fienitz (2017), Visser et al. 2019), and envisaged by the Global Action Plan Decade of Family Farming 2019–2028 (FAO and IFAD 2019).

The practical results of this study point out that Ukrainian farms possess essential untouched reserves which can become the basis for further development of farming in Ukraine. Scientifically substantiated specialization and growth in potential productivity are expected to become major developmental trends. The study results may find application in substantiations of rental rates for agricultural land users, as well as in the determination of the size of state financial support of farms in economic rayons and administrative oblasts.

References

AGRICULTURE, FORESTRY AND FISHERY STATISTICS 2018: *Statistical Books*. Luxembourg (Eurostat). 200 p. DOI: https://doi.org/10.2785/340432.

CLOKE, P. J., PARK C. C. 1985: *Rural Resource Management*. London (Croom Helm), 475 p.

CSABA, C., CSABA, F. 2009: Small Farms in Central and Eastern Europe: Is there a future for them? *111. EAAE–IAAE Seminar "Small Farms: decline or persistence"*, Kent (University of Kent), DOI: https://doi.org/10.22004/ ag.econ.52803.

CZEKAJ, M., ADAMSONE-FISKOVICA, A., TYRAN, E., KILIS, E. 2020: Small farms' resilience strategies to face economic, social and environmental disturbances in selected regions in Poland and Latvia. *Global food Security*, 26, 100416. DOI: https://doi.org/10.1016/ j.gfs.2020.100416.

DARNHOFER, I, 2010: Strategies of family farms to strengthen their resilience. *Environmental Policy and Governance*, 20, 212–222. DOI: https://doi.org/10.1002/eet.547.

DŽATKO, M. 2002: *Hodnotenia produkčného potenciálu poľnohospodárskych pôd a pôdno-ekologických regiónov Slovenska.* Bratislava (VÚPOP), 87 p.

FACCIONI, G., STURARO, E., RAMANZIN, M., BERNUES, A. 2019: Socio-economic valuation of abandonment and intensification of Alpine agroecosystems and associated ecosystem services. *Land Use Policy,* 81, 453–462. DOI: https://doi.org/10.1016/j.landusepol.2018.10.044.

FAO AND IFAD 2019: *United Nations Decade of Family Farming 2019–2028. Global Action Plan*. Rome. 74 p.

FIENITZ, M. 2017: Small farms in Europe: viable but underestimated. *Eco Ruralis – Access-ToLand Reports*. Retrieved from: https://www.accesstoland.eu/Small-farms-in-Europe-viable-but-underestimated.

KNICKEL, K., REDMAN, M., DARNHOFER, I., ASHKENAZY, A., CALVÃO CHEBACH, T., ŠŪMANE, S., TISENKOPFS, T., ZEMECKIS, R., ATKOCIUNIENE, V., RIVERA, M., STRAUSS, A., KRISTENSEN, L.S., SCHILLER, S., KOOPMANS, M.E., ROGGE, E. 2018: Between aspirations and reality: Making farming, food systems and rural areas more resilient, sustainable and equitable. *Journal of Rural Studies*, 59, 197–210. DOI: https://doi.org/10.1016/j.jrurstud.2017.04.012.

KRAMMER, J., ROHRMOSER, F. 2012: Im Kampf um ihre Rechte. *Geschichte der Banerń and Bäueninnen in Österreich*. Wien (ProMedia).

KUHMONEN, I. 2020: The resilience of Finnish farms: Exploring the interplay between agency and structure. *Journal of Rural Studies*, 80, 360–371. DOI: https://doi.org/10.1016/j.jrurstud.2020.10.012.

LEE, N., GEORGE, C. 2002: *Environmental Assessment in Developing and Transitional Countries*. New York (Wiley), 290 p.

MAKOVNIKOVA, J., PALKA, B., KOLOŠTA, S., FLAŠKA, F., ORSAGOVA, K., SPIŠIAKOVA, M. 2020: Non-Monetary Assessment and Mapping of the Potential of Agroecosystem Services in Rural Slovakia. *European Countryside,* 12(2), 257-276. DOI: https://doi.org/10.2478/euco-2020-0015.

MALTSOGLOU, I., KOISSUMI, T., ET FELIX, E. 2013: The status of bioenergy development in developing country. *Global Food Security*, 2 (2), 104–109. DOI: https://doi.org/10.1016/j.gfs.2013.04.002.

MATHIJS, E., NOEV, N. 2004: Subsistence Farming in Central and Eastern Europe: Empirical Evidence from Albania, Bulgaria, Hungary, and Romania. *Eastern European Economics,* 42(6), 72–89.

MORRIS, W., BOWEN, R. 2020: Renewable energy diversification: Consideration for farm business resilience. *Journal of Rural Studies*, 80, 380–390. DOI: 10.1016/j.jrurstud.2020.10.014.

NAGIRNA, V. P., RUDENKO, L. H. 2016: Rural locality of Ukraine as a consequence of transformations in agrarian economy. *Ukrainian geographical journal*, 2, 39–47. DOI: https://doi.org/10.15407/ugz2016.02.039 [In Ukrainian].

PASKHAVER, B. Y. 1982: Production Resources and the Efficiency of agriculture. In Vedenichev, P.F. ed. *Efficiency of agricultural nature management*/. Kyiv (Nauk. Dumka), pp. 175–227. [In Russian]

RUDENKO, V. 2010: *Geography of Nature-Resource Potential of Ukraine*. Chernivtsi (Chernivtsi National University). 552 p. [In Ukrainian].

RUDENKO, V., ZAIACHUK, M., PALAMARUK, M. 2013: Nature-Resource Potential of the Carpathian Region of Ukraine and Specificities or its Use by Farming Enterprises. *Natural Resources*, 4, 257–263. DOI: https://doi.org/10.4236/nr.2013.43032.

RUDENKO, V., ZAIACHUK, M., BUCHKO, Z., IEREMIIA, H. 2017: Farming economies in Ukraine by resource potential aggregate. *Human Geographies – Journal of Studies and Reservien in Human Geography,* 11(2), 231–240. DOI: https://doi.org/10.5719/hgeo.2017.112.7.

SIKORSKI, D., LATOCHA, A., SZMYTKIE, R., KAJDANEK, K., MIODOŃSKA, P., TOMCZAK, P. 2020: Functional changes in east central Europe between 2004 and 2016 as an aspect of rural revival? Kłodzsko County case study. *Applied Geography*, 122, 102223. DOI: https://doi.org/10.1016/j.apgeog.2020.102223.

STALHAMMAR, S., THOREN, H. 2019: Three perspectives on relational values of nature. *Sustainability Science,* 14(5), 1201–1212. DOI: https://doi.org/10.1007/s11625-019-00718-4.

STATISTICAL YEARBOOK OF UKRAINE 2014. Kyiv (State Service for Statistics). 400 p. [In Ukrainian]

STATISTICAL YEARBOOK OF UKRAINE 2016: Kyiv (State Service for Statistics). 575 p. [In Ukrainian]

STRUMILIN, S. G. 1963: *Statistics and Economics. Selected Works. Vol. 1.* Moscow (Academic Press, Academy of Sciences USSR), 488 p. [In Russian]

TOPCHIEV, O. G., MALCHIKOVA D. S., YAVORSKA V. V. 2015: *Regional Studies: Geographical Bases for Regional Development and Policy. A Manual.* Kherson (OLDI-PLUS). 372 p. [In Ukrainian].

UKRAINIAN AGRICULTURE IN 2013. 2014: *Statistical Reference Book 2013*. Kyiv (State Service for Statistics), 400 p. [In Ukrainian].

UKRAINIAN AGRICULTURE IN 2015. 2016: *Statistical Reference Book 2015*. Kyiv (State Service for Statistics), 400 p. [In Ukrainian].

UKRAINIAN AGRICULTURE IN 2017. 2018: *Statistical Reference Book 2017*. Kyiv (State Service for Statistics), 400 p. [In Ukrainian].

VISSER, O., DORONDEL, S., JEHLIČKA, P., SPOOR, M. 2019: Post-socialist smallholders: silence, resistance and alternatives. *Canadian Journal of Development Studies*, 40(4), 499–510. DOI: https://doi.org/10.1080/02255189.2019.1688649.

YUKHNOVSKYY, I., LOBODA, G. 2002: Price of Land. *Courier of the Government*, 105, p. 7. [In Ukrainian],

ZASTAVNYJ, F. 2010: *Economic Regions of Ukraine*. Lviv. 208 p. [In Ukrainian].

Authors´ affiliation

Prof., Dr. Valerii P. Rudenko
Yuri Fedkovych Chernivtsi National University
Faculty of Geography
Kotsyubynsky, 58012 Chernivtsi
Ukraine
rudenko_valery@ukr.net

Assoc. Prof., Dr. Myroslav D. Zaiachuk,
Yuri Fedkovych Chernivtsi National University
Faculty of Geography
Kotsyubynsky, 58012 Chernivtsi
Ukraine
zayachukmyroslav@ukr.net

Stepan V. Rudenko, Ph.D.
Yuri Fedkovych Chernivtsi National University
Faculty of Geography
Kotsyubynsky, 58012 Chernivtsi
Ukraine
rudenkostepan@gmail.com