

## **EFFECTIVENESS OF ARABLE LAND USE IN UKRAINE**

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***Abstract:** Ukraine is famous for its fertile soils and demonstrates growing yields through the last 15 years; however increased intensive agricultural use raises concerns. Current statistics of the land fund use are analyzed in the paper together with general threats and consequences of land concentration. Special attention is paid to the evidence of insufficient crop rotation and implementation of soil exhausting techniques.*

***Keywords:** arable land, fertility, crop rotation, sustainability.*

### **INTRODUCTION**

Ukrainian agriculture nowadays experiences slow economic revival after decades of losses and despite political instabilities demonstrates stable growth. In 2015 it produced 14% of the countries value added which is more than 10 bln US dollars. One of the major problems that prevents from quicker development and reduces attractiveness for outside investment is the absence of sales land market and low transparency of rental market. The ban on the land trade is considered necessary to keep it in the hands of Ukrainian people however in this paper we will analyze the efficiency of land management in Ukraine through last decades especially in terms of preserving its value and natural fertility. The aim of the article is to create better understanding of the problems with the arable land use in Ukraine and determine possible threats for preserving its natural

fertility. The following tasks are set for its solution: analyze the condition of the arable lands in Ukraine and basic indicators of the intensiveness and the efficiency of their use; to justify possible directions of the Ukrainian land fund rational use.

## **MATERIALS AND METHODS**

Fundamentals of the economic efficiency of the land use are presented by the following researchers: Andriychuk V., Atamanchuk G., Fedorov M., Sabluk P., Tregobchuk V., Tretyak A. and others. Practical issues of evaluating the effects of erosion and intensive crops were analyzed by Gordiyenko V., Marmul L., Nazarenko O, etc. At the same time, in spite of significant scientific achievements in the mentioned questions, the problem of the efficiency of the land fund use, based on sustainable approach under conditions of modern social and economic processes, has not been solved yet.

## **RESULTS**

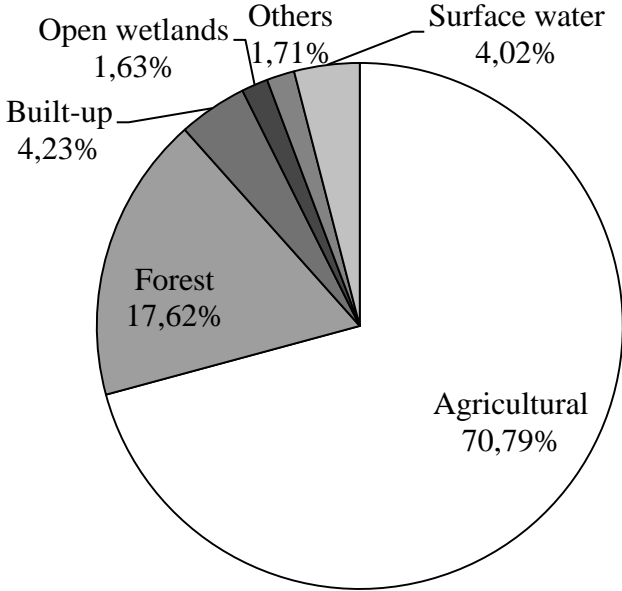
Land resources are the major part of natural resource potential of the region and are indispensable as the territorial basis for the placement of the economy and serve as the main means of production to the needs of agriculture.

While describing the economic efficiency of the land use one should first examine the resource availability and the degree of its utilization.

In Ukraine, all land is included into state land fund regardless of the purpose of land and its use in economic activities. Classification based on the intended and functional use includes agricultural land; forests and wooded areas; built-up areas for the industrial and transport facilities, housing, streets, etc; land covered with surface waters; other lands. Owners are not officially allowed to change land purpose unless specially permitted by regional authorities.

The area of Ukraine is 60.35 mln ha which is second largest in Europe. The composition and structure of the land fund is presented in Figure 1. Thus the major part which is 42726.4 ths ha is agricultural land, most of which is arable – 32541.3 ths ha, or 53.9 % of total. Forests and other forest covered

areas occupy 10633.1 ths ha, built-up land, which includes land for housing, industrial purposes, mines, public, recreational facilities – 2552.9 ths ha total, open wetlands – 982.3 ths ha. Area of 2426.4 ths ha is covered with surface water, 1033.8 ths ha are classified as “others” and include desert areas.



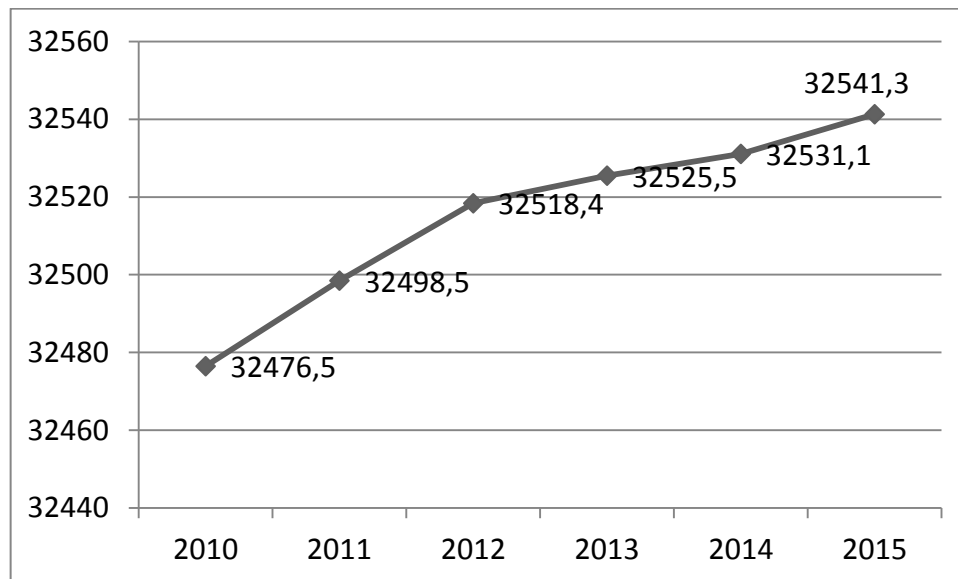
**Figure 1: Structure of the land fund in Ukraine, Jan 1, 2016**

*Source: Data provided by the State Service of Ukraine for Geodesy, Cartography & Cadastre*

Land resources of the country are characterized by relatively high bioproductive potential with high proportion of chernozem soil type, which creates favorable conditions for productive agriculture. The structure of the agricultural land includes following soil types: black soils are the most fertile and occupy almost 73%, gray and black ashed soils - over 12%, brown - about 4%.

The indicator of land provision is 100 ha of agricultural land for 100 population or 247 ha of arable land for 100 rural population, which is rather high in comparison to the world and this indicator is growing because of a dramatic reduction of the Ukrainian population and rural population especially, which is observed for the last 25 years due to natural reasons and high rates of economic emigration.

Major part of agricultural land is arable and its area is growing because of the increased profitability of agricultural production. According to official data in 2015 almost 89% of all agricultural companies were profitable and average Profitability level of operating activities was 43.1 % which made companies extremely active in search for even better profits which stimulated the increase of arable land (Fig.2).



**Figure 2: Arable land, at end of year; thousands hectares**

*Source: Data provided by the State Service of Ukraine for Geodesy, Cartography & Cadastre*

At the same time, according to experts, Ukrainian farmers obtain 79% of profits through the natural fertility of the land and only 21% - as a result of modern technology [6,7].

High yields at this stage are combined with a significant load on the biological system. The intensity of the land use can be analyzed through the following indicators [1]:

- the degree of economic use of land, which is calculated by dividing the agricultural land by the entire land area;
- the degree of tillage, calculated as the share of arable land and perennial plantations cultivated of the area of agricultural land;

- degree of ameliorativity as the ratio of the area of reclaimed land (irrigated, drained) to the total area of agricultural land;
- proportion of intensive crops (sugar beet, flax, potatoes, vegetables, sunflower, grain maize, hemp) in the total sown area of enterprises;
- the re-use of land, which is determined by the ratio of the cultivated area to area re-planting during the year.

The degree of economic use of land for agricultural production has slightly grown up to 71% in 2015 and the share of arable land and perennial plantations in total agricultural land did not change greatly and accounted for 82%. These indicators are among the highest in Europe with only Moldova demonstrating higher degree of economic use – 75%. As for the degree of tillage – many countries demonstrating even higher levels – up to 99% in Finland, but the part of their agricultural land in the total land area is not high.

When comparing total arable and perennial crop land to the total we may see that again Ukraine takes the leading place – 58% - second after Moldova (64%) , same as Denmark, with the size of Ukraine more than 10 times bigger.

Ukrainian land is intensively used for agricultural production, but the share of the tilled land in the total land of agriculture is not very high which might result in future increase in terms of profitability of crop growing.

**Table 1**

**The intensiveness of the land use for agriculture in Europe, 2014,  
1000 ha**

	Area, 1000 ha			Indices		
	Land area	Agricultural area	Arable land and Perennial crops	Agricultural/Total	Arable & Perennial/Agricultural	Arable/Total
Albania	2740	1174	696	43%	59%	25%
Andorra	47	20,9	2,8	44%	13%	6%
Austria	8252	2714	1417	33%	52%	17%
Belarus	20291	8632	5788	43%	67%	29%
Belgium	3028	1331	839	44%	63%	28%
Bosnia and	5128	2162	1117	42%	52%	22%

Herzegovina						
Bulgaria	10856	4977	3613	46%	73%	33%
Croatia	5596	1508	890	27%	59%	16%
Czechia	7721	4216	3219	55%	76%	42%
Denmark	4226	2629	2436	62%	93%	58%
Estonia	4239	974	659	23%	68%	16%
Finland	30389	2267	2234	7%	99%	7%
France	54755	28766	19328	53%	67%	35%
Germany	34890	16725	12704	48%	76%	36%
Greece	12890	8175	3725	63%	46%	29%
Hungary	9053	5346	4585	59%	86%	51%
Iceland	10025	1872	121	19%	6%	1%
Ireland	6889	4466	1059	65%	24%	15%
Italy	29414	13162	9121	45%	69%	31%
Latvia	6218	1872	1215	30%	65%	20%
Lithuania	6265	2952	2384	47%	81%	38%
Netherlands	3369	1839	1081	55%	59%	32%
Norway	36524	986	811	3%	82%	2%
Poland	30619	14424	11304	47%	78%	37%
Portugal	9160	3701	1885	40%	51%	21%
Republic of Moldova	3287	2458	2109	75%	86%	64%
Romania	23008	13830	9203	60%	67%	40%
Russian Federation	1637687	217721	124721	13%	57%	8%
Serbia	8746	3506	2793	40%	80%	32%
Slovakia	4808	1924	1413	40%	73%	29%
Slovenia	2014	614	237	30%	39%	12%
Spain	50021	26578	17188	53%	65%	34%
Sweden	40731	3032	2597	7%	86%	6%
Switzerland	3951	1522	425	39%	28%	11%
The former Yugoslav Republic of Macedonia	2522	1263	452	50%	36%	18%
Ukraine	57929	41272	33424	71%	81%	58%
United Kingdom	24193	17232	6278	71%	36%	26%

Source: Calculated by the author based on the data provided by <http://www.fao.org>

In terms of proportion of intensive crops in the total planted area figures illustrate that most land is used for them.

Producers direct their resources towards growing most profitable crops with low capital and labour intensiveness. As a result in 2015 80% of planted land was used for three main grain crops (maize, wheat and barley) and two

industrial crops (sunflower and soya). But in regional dimension this proportions were more severe – southern regions are more suitable for sunflower while northern are used for maize production so that in most regions only three crops were prevailing.

**Table 2**

**Area of basic crops in Ukraine, % from total sown area**

	2000	2005	2010	2011	2012	2013	2014	2015
Wheat	20,68	25,59	23,94	24,51	20,76	23,59	22,25	25,53
Sunflower	10,83	14,37	16,96	17,13	18,68	17,83	19,30	18,98
Maize for grain	5,02	6,57	10,05	13,08	16,64	17,27	17,22	15,33
Barley	14,67	17,28	16,71	13,69	12,32	11,86	11,16	10,50
Soya	0,24	1,68	3,99	4,10	5,31	4,84	3,24	8,02
Potatoes	5,99	5,81	5,22	5,20	5,18	4,90	4,95	4,80
Perennial grasses sown in previous years	10,99	6,54	4,59	4,36	4,30	4,07	4,11	3,82
Rape plant	0,79	0,79	3,37	3,14	2,04	3,59	6,63	2,54
Vegetables grown in the open	1,98	1,79	1,71	1,80	1,78	1,70	1,70	1,64
Annual grasses (including winter crops for green feed)	6,50	3,42	2,16	1,92	1,79	1,66	1,50	1,46
Maize for silage, green feed	7,07	2,97	1,75	1,61	1,79	1,39	1,27	1,15
Leguminous	1,50	1,62	1,59	1,35	1,14	0,99	0,83	0,93
Sugar beet	3,15	2,50	1,86	1,92	1,65	0,99	1,22	0,88
Oats	1,92	1,80	1,21	1,04	1,12	0,89	0,91	0,79
Feed root crops	1,05	1,13	0,91	0,85	0,83	0,79	0,79	0,79
Rye	2,46	2,39	1,06	1,02	1,09	1,00	0,68	0,56
Buckwheat	2,11	1,64	0,83	1,12	1,08	0,67	0,51	0,49
Millet	1,61	0,54	0,35	0,61	0,69	0,35	0,38	0,42
Rice	0,10	0,08	0,11	0,11	0,09	0,08	0,04	0,04
Flax	0,08	0,10	0,00	0,01	0,01	0,01	0,01	0,01

*Source: Calculated by the author based on the data provided by the State Statistics Service of Ukraine*

Many farms fail to comply with crop rotation, allowing deviation from scientifically reasonable farming systems. Soil cultivation technologies are often violated, affecting their ecological status. There is no consensus in the world about the consequences of such farming practice and optimal crop rotations.

According to common Ukrainian practice acceptable standards for periodicity of growing crop at the same field for sunflower is 7 years, as a result its share in the structure of crops may not exceed 14%, and based on the fact that not all regions and arable soils are suitable for its cultivation - the figure should be significantly lower.

A study by Anderson, 2012 also argues that the length of the rotation, the interval between the cultivation of the same culture is an important factor for productivity and soil quality, but the application for a seven-year interval in sunflower cultivation is not unambiguous. So for the research conducted in Akron, Colorado, sunflower gave the best result at the 4-year interval (versus shorter), and at more frequent cultivation yield significantly decreased due to plants diseases (*Phoma oleracea*) [1].

Farmers claim that in market conditions they may determine the sequence of crops on their own and argue that irrelevant of the crop rotation yields are growing each year but such results are still below European figures and are mostly results of proper agronomic practices, decent machinery, high-yield varieties and modern plant protection products.

Government with the support of scientists declares about the need to preserve the land fund of the country and try to monitor the compliance with scientifically based crop rotations. Ukrainian Land Code requires companies to develop special land management documentation for each user of arable land, the violation of which entails administrative liability. But this is rather a formal requirement and failure to comply does not bear serious consequences for producer. In practice, economic activities of following required crop rotations reduced only to the need for developing formal land management projects. A more appropriate from an environmental point of view would be to strengthen the control and responsibility for the deterioration of soil fertility.

Private owner would voluntarily preserve his land and in real circumstances 95.48% of the land is in non-state property, other 4.52% are

owned by state. But very often real owners of the land have nothing to do with land management. After land privatization it was distributed between former members of kolkhozes and some land was owned by the companies. Only a small portion of that land was actually used for individual farming – most of it was soon rented by local agricultural enterprises. As a result of increased profitability of producing at big scale enlargement processes take place in modern agriculture. And by the end of 2015 17.7% of all agricultural land was officially in the use of biggest agricultural enterprises with the area in use above 10000 ha each, mostly rented. Unlike local companies these holdings have no connection with the region and take their decisions based on financial indicators only- regardless for the sustainable development of the local community and preserving and enriching natural fertility of the rented land.

Some sources claim that 100 biggest companies control over 7 mln ha of agricultural land which is 28% of the total [5]. Official statistics does not provide data for separate land renters and data can be only approximate, often based on the official statements of enterprises only.

**Table 3**

**Land in use by the size of land users, % from agricultural land**

Area of agricultural land in use, ha	Percentage to total area of agricultural land, %				
	2004	2010	2013	2014	2015
Below 1000	22,5	21,6	21,7	21	21,9
1000-10000	72,6	67	62,4	58,3	60,4
More than 10000	4,9	11,4	15,9	20,7	17,7

*Source: Calculated by the author based on the data provided by the State Statistics Service of Ukraine*

Agricultural holdings with superscale production organize their activities to implement most efficient growing, sales and management techniques, employ cheap capital on the domestic and foreign markets, and optimize the use of labour and machinery resulting in over 500 \$/ha EBITDA. Scientists predict [3] that before 2020 more than 50% of arable land will be operated by large

agricultural holdings and it's not likely that they will move from land lease to the purchase even in case of lifting of the moratorium on land sales because of high cost of the purchase and operating funds shortage. Production and financial efficiency often comes in contradiction with social benefit. Rational economic behavior and low restrictions on agricultural activity leads to a number of socio-economic problems.

Regarding the problem of land nutrition we can also conclude that through the last years situation has improved in comparison with previous decade and use of mineral fertilizers is now stabilized at the level of 79 kg of active substance per 1 ha of sown area but decrease in the use of organic fertilizers causes the concern. In 2015 organic fertilizers were only used for 2.5% of all sown area with 21.8 t of fertilizers used for 1 ha. Such a low share of the use of organic fertilizers can be a result of problems in livestock production and reduce of the number of mixed farms with crops and livestock. Straw which could also be used for improving the structure of the soil is often burned on the fields which is also very harmful from an environmental point of view [4].

## **DISCUSSIONS AND CONCLUSION**

Based on the results of our research we can make a conclusion that the effectiveness of the land use in Ukrainian agriculture has improved in terms of economic profitability and growing yields but several problems require special attention. These problems include failure in state regulation of crop rotation and a resulting prevail of exhausting intensive crops which can lead to substantial reduction of natural crop fertility. This is also a result of recent changes in the structure of the land users – an increase of the share of agricultural holdings, which operate in many regions of the country and control big land areas. Their intensive techniques, weak interest in preserving the rented land and local communities together with strong lobby in the government raise concerns. The probable solution for that could be better environmental control from the

government and public organizations together with increased responsibility, and systematic support to small farmers.

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