Section 9. Economics of nature management

*Popovych Andriy,
IAEM NAASU, PhD Candidate
E-mail: apopovych@kse.org.ua*

Hedonic price modeling of agricultural land valuation in Ukraine

Abstract: The article applies hedonic method to the pricing of agricultural land in Ukraine as an alternative to the existing practice of regulatory monetary valuation. Using data from the sale ads the study establishes the main driving factors of agricultural land prices.

Keywords: agricultural land, hedonic pricing.

Rational use of land resources is impossible without establishing their true value normally considered being the market price. However, in absence of free land market there are other methods such as the regulatory monetary valuation practiced in Ukraine. This methodology utilizes standard approach to assessing the value of agricultural land by modeling it as the present value of discounted income expected from the sale of farm products. However, empirical evidence suggests that agricultural land is often exchanged at prices that exceed the capacity of land to produce income [1; 2]. Moreover, the use of the standard model of supply and demand is constrained by the assumption of homogeneity of land parcels which is violated by numerous characteristics that distinguish one plot from the other. This makes hedonic pricing method based on the hypothesis that customers value goods for their specific characteristics through the implicit prices for each attribute [3] particularly suitable for the evaluation of differentiated and heterogeneous land parcels.

The vast body of academic research using hedonic pricing of agricultural land has already established a large number of factors affecting the price of agricultural plots. For example, it was revealed that area, density of pig farms, and distance to the major cities have a definite negative impact on the price of land while soil fertility, per capita income and population density have a positive impact [4; 5]. Moreover, the analysis of different land qualities confirms the significance of the effects of neighborhood characteristics, profile of market participants, and proximity to the market [6; 7].

Increasing size of a land parcel is expected to have a negative impact on the selling price per unit of area because the greater the area under cultivation, the less additional space is necessary to create preconditions for

further development. Therefore, farmers' willingness to pay for the additional area unit with the purchase of large tracts of land decreases [5]. The size and selling price per area unit are negatively correlated because of the need of significant financial resources to purchase larger tracts of land while they also require additional capital expenditures on machinery and equipment for production and processing, which limits the number of potential buyers in the market. The smaller size and topographical features of parcels also can affect the value of agricultural land due to increasing marginal benefits from the use of smaller plots of land connected with the possibility of growing crops in the more expensive niche [8].

Of the many factors which determine the efficiency of agriculture and have direct impact on the land value the soil fertility is considered as the primary determinant of the agricultural productivity and profitability and expectedly correlates with prices for farmland. In Ukraine, the soil productivity score and economic value of land are the measures of soil fertility obtained from a special survey held in 1995 and remain unchanged to this day. Due to lack of data on soil quality characteristics of individual plots, for the practical reasons the fertility score of agricultural lands is aggregated to the regional level.

The effect of distance from the metropolis or big city on the land value is ambiguous. The proximity to populated areas can affect the income of farmers positively because access to the market and higher prices for agricultural products, as well as negatively because of the inefficiency of agricultural production caused by higher wages, higher prices for equipment and materials, lack of agricultural infrastructure. The real value to the buyers of agricultural land can have a future change to non-agricultural use and expectation of higher revenues from industrial, commercial and other non-agricultural

activities, which is generally enhanced by the urban proximity and therefore should translate to higher sale prices.

It is established that the price of agricultural land increases when farmers' income grows because of the increasing number of potential buyers [9]. The income effect is conventionally measured by the gross regional product per capita compiled by the State Statistics Committee of Ukraine reflecting the general economic development of the territory and the purchasing power of local residents.

The weather and climatic factors, soil fertility, melioration and reclamation positively affect the price of land [10]. Irrigated farmlands are expected to be more worthy, since it is mainly the most productive land and are less vulnerable to production risks in times of drought [11]. In this regard, the availability of the reservoir, centralized system of irrigation and water supply should be considered as a factor increasing the value of land parcel.

The price of farmland not least depends on proximity to roads and other transport communications and the price per unit area decreases as the distance to paved roads increases [12]. Infrastructure, means of communication, quality of roads have positive impact on the value of agricultural land by facilitating access to markets for farmed products.

To analyze the pricing of agricultural land in Ukraine factors of importance confirmed by previous studies such as the plot size, soil fertility, distance from the regional center, the regional product per capita, availability of water and access roads were used. Based on prior analysis and the availability of data the parsimonious approach was taken in the formulation of regression equation, which means including a smaller number of independent variables, only the most prominent ones [7].

Table 1. – Specification of the model

№	Parameter	Variable	Description	Type
1		PPST	the price of land for a hundred	Dependent
2	β_1	SIZE	size of a land parcel	Independent
3	β_2	BONT	soil quality score	Independent
4	β_3	DFCY	distance from the regional center	Independent
5	β_4	RPPC	gross regional product per capita	Independent
6	β_5	ATWT	presence of water	Independent
7	β_6	ATRD	access road	Independent
8	β_0			Intercept

Table 2. – Descriptive statistics

Variable	Unit	Mean	St. deviation	Minimum	Maximum
ppst	\$/are	413.6553	274.1441	91	1500
size	are*	156.6062	353.4856	10	3455
bont	score	40.08293	6.485489	27	55
dfcy	km	45.94390	35.80085	5	200
rppc	\$/person	3564.598	2381.066	1666	8139
atwt	dummy	0.5658537	0.4962499	0	1
atrd	dummy	0.4951220	0.5005870	0	1

Note: * — one hundredth of hectare.

Individual data from land transactions to assess the above regression equation were picked from the sale ads on the websites «Real estate in Ukraine — the housing market» (web address: dom.ria.com) and «Association Land Union of Ukraine» (web address: www.zem.ua). The absence of formal land market in Ukraine due to the moratorium on the purchase and sale of agricultural land does not deny the existence of certain transactions with farmland while imperfect law allows in some cases to bypass the moratorium. The public ad as announced intention to sell land by its owner may be considered the best alternative to the market data in such case.

For this study, rural land is defined as land outside the major metropolitan areas of ten ares and more with the price not more than \$ 1500 per hundred square meters. The lower limit on the size is introduced due to the fact that the land of smaller area, which, incidentally, dominates in sale ads, more suited for suburban housing rather than agricultural production. The sale price for are above the specified threshold could also indicate that the main motivation for the acquisition of such land lies in the use for commercial or residential construction, not growing crops.

The database consists of 410 selected ads on the sale of agricultural land during the years 2014–2015 in

the form of cross-data distributed across all regions of Ukraine, except the Donetsk and Lugansk region.

Since hedonic pricing models do not require a particular functional form assessing the value of farmland in Ukraine two specifications were used for

empirical econometric equation: linear and semi-log with the dependent variable is the natural logarithm of the price of land. Analysis of paired correlation coefficients of dependent variables indicates the absence of multicollinearity.

Table 3. – Regression results

	ppst Coef.	t	Inppst Coef.	t
size	–0.1142531	–3.87	–0.0003744	–5.19
bont	1.847287	1.20	0.0038904	1.03
dfcy	–2.704792	–9.52	–0.0078998	–11.39
gppc	–0.0041256	–0.96	–0.0000107	–1.02
atwt	153.3623	6.59	0.4227456	7.44
atrd	165.1649	7.14	0.3781925	6.70
_cons	327.9207	4.86	5.66896	34.41
F (6, 403)	61.39		F (6, 403)	76.09
Prob > F	0.0000		Prob > F	0.0000
R-squared	0.4775		R-squared	0.5311
Adj R-squared	0.4698		Adj R-squared	0.5242
Root MSE	199.62		Root MSE	0.48695

The evaluation results of both linear and log-linear functional forms for hedonic model of agricultural land pricing give similar results: most evaluation parameters are of the expected signs and significant. These results support the hypothesis that farmland value is especially sensitive to spatial characteristics such as distance from markets, that the area closer to the big city, the higher the cost per unit of land area, and that the larger surface area of the plot, the less cost-per hectare.

The regression coefficient of soil productivity variable is not significant which may be explained by the fact that the potential transformation to non-agricultural use is much more important for potential buyers than the agricultural soil productivity. The coefficient of variable

of gross regional product per capita or alternative indicator of per capita income by region is also insignificant; therefore the effect of the region's level of economic development the territory and the purchasing power of local residents on agricultural land prices is not confirmed.

Overall, the results of regression estimation on the basis of empirical data to justify the use of hedonic modeling to study the price of farmland in Ukraine and is a reasonable alternative to the existing method of regulatory monetary valuation of agricultural land. But the practical application of this method will be possible only with fully fledged agricultural land market when a sufficient number of registered transactions would allow constructing and evaluating a more detailed model.

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*Serbov Mykolay Georgievich,
Odessa State Environmental University, Ph. D., associate professor
of Department of Management of environmental activities
E-mail: serbov@odeku.edu.ua*

Climate change is our time: an assessment of their role in the socio-economic stability of the region (on the example of water basins of Ukraine)

Abstract: There are considered current problems of estimation of weather and climate factors impact on the development of economic and ecological systems of economic sector of the region. There is submitted the scheme of water basins of Ukraine with the economic evaluation of each. There are given the examples of the influence of meteorological factors and climate change of Ukraine on the separate branches of the economy of the country.

Keywords: weather and climate factors, water basins, economic and ecological systems.

*Сербов Николай Георгиевич,
кандидат географических наук, доцент
Одесского государственного экологического университета
E-mail: serbov@odeku.edu.ua*

Климатические изменения современности: оценка их роли в социально-экономической стабильности региона (на примере водных бассейнов Украины)

Аннотация: Рассмотрены современные проблемы оценки влияния погодно-климатического фактора на развитие экономико-экологических систем хозяйственного комплекса региона. Представлена схема водных бассейнов Украины с экономической оценкой каждого из них. Представляются примеры влияния гидрометеорологических факторов и изменения климата Украины на отдельные отрасли хозяйственного комплекса страны.

Ключевые слова: погодно-климатический фактор, водные бассейны, экономико-экологические системы.

В ряду глобальных современных проблем человечества одно из важнейших мест занимает проблема влияния погодно-климатических условий на экономико-экологическое развитие, как отдельных объектов хозяйствования, так и производственно-хозяйственных комплексов в целом.

Опасные гидрометеорологические явления и неблагоприятные климатические условия наносят существенный экономический ущерб хозяйственному комплексу и населению всех стран мира. По оценкам Всемирной метеорологической организации в течение последних десятилетий порядка 90 %

всех стихийных бедствий на нашей планете в непосредственно связаны с проявлением гидрометеорологических характера, а 65 % общего экономического ущерба от стихии относится явлениями и процессам гидрометеорологического происхождения.

Убытки в мире от опасных явлений погоды составляют около 50–60 млрд. долларов в год, достигая в отдельные годы величины в 180–190 млрд. долларов. За последние 25 лет общее количество пострадавших достигает 130 млн. чел. [3]. Причем потери, связанные с опасным влиянием погодно-климатических факторов с 60 до 90 годов прошлого столетия