

Agricultural Land Evaluation During Land Arrangements

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Introduction

The agricultural land price accomplishes one from the important functions to express the production and economical potential of agricultural lands situated in different natural conditions. The system of ecological soil-quality units (ESQU) and the price list of arable land rather exactly characterize the production and economical potential of lands expressed by land price. This system finds its use mainly in property rights and fiscal relations, in the land protection, in the qualitative new determination of economical relations between land owners and users, in land arrangements etc.

The prices of agricultural land were calculated for individual ESQU (according to the methodology for agricultural land evaluation) in so called „optimal situation“ it means without other factors being taken in even they directly affect the price. This reality becomes most evident at the administration of land arrangements, when the executors must take other factors into account, which directly influence the land price level, if they evaluate individual parcels of land.

1. Agricultural Land Evaluation

The soil-quality and evaluation of agricultural land in the Slovak Republic is in the present time realized through soil-quality information system which contains these parts:

- physical set of maps for ecological soil-quality units (ESQU) in the scale 1 : 5000,
- set of maps in the data base which can be used by software of some geographical information systems (GIS),
- data base on soil-quality.

The ESQU's were created on the base of soil-science research which was realized for several decades in the past.

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1.1. The Physical Set of Maps for Ecological Soil-Quality Units in the Scale 1 : 5000

The cartographical basis of ESQU maps is so called *State map* derived in the scale 1 : 5000 in coordinate system JTSK (JTSK – Standard Trigonometric Cadastral Network) with different edition years. The complex soil-science research (CSCR) which is the basis of the present soil-science content of ESQU maps, was executed on these maps (mostly scaled down to the scale 1 : 10000). The Slovak Office of Geodesy and Cartography as the editor amends step by step the cartographical basis i. e. the altitude (isohypses) and topography (border of different plots), and the ESQU maps must be permanently corrected according to these amendments, because in many cases these changes are connected with the border of individual ESQU areas.

The subject of ESQU mapping was the agricultural land which is registered under following items: arable land, meadows, pasture land, hop-gardens, vineyards and orchards. Some exceptions are intramunicipal areas which were not searched, because in these localities the soil-search has not been done, but items mentioned above occurs here very often.

This set of maps has ESQU mapping also in intramunicipal areas. But it is necessary to emphasize that in these cases ESQU were specified as professional estimates and they are used only for evaluation of above mentioned items of agricultural land. ESQU in intramunicipal areas are not used for land price specification in the case of land item „gardens“.

The borders of intramunicipal areas, likewise the borders of forestry and other non-agricultural land on the ESQU maps have not legal effect in geodetical and juridistical sense.

They were taken over in many cases from late comprehensive projects of land arrangements and they are only borders up to which the soil research has been done. The borders of user's subjects are not shown on these maps because they change very often.

Exactness of ESQU Mapping

Each ESQU represents real part of land cover which has the same climatic and soil characteristics and the same slopping. The content of maps, on which these units are shown, is boundary lines of individual ESQU with its codes. These boundary lines were created by taking over those boundary lines of land units from the Complex Soil Search which were used for definition of ESQU.

Individual areals of ESQU are planimetric pictures of all significant differences in soil-ecological characteristics of land cover, which are in contrast

cases more than 0.5 ha and in non-contrast cases i.e. similar cases what concerns of characteristics, all areals bigger than 3 ha. Smaller areas than 3 ha or 0.5 ha respectively with different characteristics are not shown on the maps.

1.2. Set of Maps for Ecological Soil-Quality Units in Digital Form

The Characteristic of Data Base of ESQU Maps

The data base contains co-ordinates X, Y of polygons describing borders of individual ESQU areals and of other unit areas: forested areas, water areas, other areas (unprolific areas), intramunicipal areas. The data base contains also co-ordinates of map sheet corners and identification data: numerical codes of ESQU and alphabetical symbols for other areas found on the ESQU maps.

1.3. Data Base on Soil-Quality

Besides ESQU maps, the important part of soil-quality information system is database on soil quality (DBSQ), and software and hardware for using it. The DBSQ contains data about all ecological soil-quality units in the base classification by user (agricultural enterprise with legal status), by cadastral areas of communities and higher units of administrative layout of the state. Database on soil-quality overwhelms all territory of the Slovak Republic and it is managed by the Research Institute of Agricultural and Food Economics and it is permanently updated in cooperation with Institute of Soil Research and Protection.

The data concerning of soil-quality are arranged into several files. Number of these files as well as their extent are not closed. Data base on soil-quality is the open system, which is systematically completed, enlarged and updated.

Currently it contains the following data:

- organization enrolment,
- cadastral area register,
- block of economical information,
- block of information on special plantation (orchards, vineyards, hop-gardens),
- on land affected by anthropogenic activities (irrigation, drainage, emission)
- and on zones of sanitary protection of water resources and protected landscape
- areas (this block is not updated).

2. Methodological Approach to Agricultural Land Evaluation

The criterion for land price determination was economical evaluation of gross yearly rental effects (HRRE) for crop production in given agroecological conditions with prescribed efficiency of farming. The gross yearly rental effects

per area unit (1 ha) of given plant in standard evaluative structure are calculated as follows:

$$\text{HRRE} = \text{CpP} - (\text{nNpP} + \text{nZ})$$

where

HRRE – gross yearly rental effect,

CpP – price of parametrized production,

nNpP – standard costs on parametrized production,

nZ – standard profit (10 %).

Land Price Calculation

Arable land prices are determined directly on the base of calculated HRRE for ESQU with positive values of HRRE (i. e. in better conditions than marginal ones) according to the following pattern:

$$\text{COP} = \frac{\text{HRRE} \times (1 - D)}{U} - \text{COPb}$$

where

COP – arable land price,

HRRE – gross yearly rental effects,

D – supposed tax share on HRRE,

U – chosen interest rate,

COPb – basic arable land price.

The basic arable land price for marginal conditions is 2000 Sk/ha. This figure added as a constant to the partial land price in better than marginal conditions results from current profit derived from crop production costs regardless of realized rental effects.

The minimal price is determined to 5000 Sk/ha. By this price we evaluate lands which are extremaly sloped, stony and shallow, located mainly in higher climatic regions and after complex evaluation also in lower climatic regions.

Price intervals are fixed by 500 Sk/ha, which means 5 hellers per one square meter. Supposed tax share on HRRE as well as chosen interest rate for HRRE capitalization were precised by the commision for land price innovation, and after realization of simulative calculations fixed to the figure which is equal coefficient 0.7 – land tax + profit tax. Chosen interest rate were fixed to 5 % (coefficient 0.05).

This our approach were chosen from the reason that up to now we have not market with land and other information about the land price are inapplicable because they concern mainly to building sites.

3. Land Price Precision at Land Arrangements

Ongoing land arrangements, the creation of proprietary and user relations and the evaluation of plots connected with it at the land change and land consolidation have shown that the official land price is not sufficient. The need of more objective determination of the land price was shown especially the necessity of other factors to take into account.

One group of factors which affects the land price is created by anthropogenic factors at which different restrictions reduce the land price (territories with announced national parks and protected landscape areas, zones of sanitary water protection). Different agrotechnical restrictions in using industrial fertilizers and means of chemical protection results to the lower production. Similarly the areas affected by industrial pollution, which not only damage the plants but after contamination of soil mechanically penetrates into plants and reduce the quality and price of production. The amendment No. 1 to the Act SNR No. 307/1992 Zb. on protection of agricultural land fund deals with these questions.

The second group of factors which affects the land price is created by transport situations connected with farming on land which are a long way or higher from centrum.

The official prices does not give a true picture about significant differences caused by different location of the plots which has negative tokens on the land arrangements, when it is necessary to take these factors into account if the plots are consolidated or changed between owners.

Different prices taking the plot's location into account are calculated as follows:

- on corresponding areas (for example parcel) the subareas of individual ecological soil-quality units are calculated;
- the official prices of individual ESQU are taken from Annex No. 8 of the Notice of Ministry of Finance of the SR (MF SR) No. 465/1991 Zb.;
- the parcel price is the sum of prices of individual ESQU;
- this parcel price is multiplied by adequate coefficient (for distance and altitude) and we get modified price.

3.1. The Average Parcel Price Modified by Coefficients for Distance and Altitude Are Calculated by the Following Pattern

$$PCP_{UVP} = \frac{\sum (V_{ESQU} \times C_{ESQU}) \times K_d \times K_a}{V_{PC}}$$

where

- PCPUVP – average parcel price modified by coefficient for distance and altitude,
 VPC – parcel acreage,
 CESQU – price of relevant ESQU according to the Annex No. 8 of the Notice of
 the SR No. 465/1991 Zb.,
 VESQU – acreage of relevant ESQU,
 Kd – coefficient for distance,
 Ka – coefficient for altitude.

The calculated price of former parcels is compared with the price of designed plots (land consolidation) and eventual differences are solved by the change of acreage or by the change of distance.

In the period to which results are not the part of the price notice of Ministry of Finance of the Slovak republic (amended notice MF SR No. 465/1991 Zb.), the coefficients will be held as a help for designer at the land arrangement.

After verification and eventual corrections we will give the proposal to incorporate correction coefficients into amended price notice of Ministry of Finance of the Slovak Republic.

Table 1

Agricultural Roads of the First Category

Production area	Agricultural item	Distance (km)						
		1	2	3	4	5	6	7
Lowlands	arable land	1.000	0.987	0.885	0.962	0.979	0.936	0.923
	permanent grass land	1.000	0.984	0.856	0.952	0.936	0.920	0.904
Below mountains	arable land	1.000	0.986	0.875	0.958	0.944	0.931	0.916
	permanent grass land	1.000	0.991	0.982	0.973	0.964	0.955	0.946
		8	9	10	11	12	13	14
Lowlands	arable land	0.910	0.898	0.885	0.872	0.859	0.846	0.834
	permanent grass land	0.888	0.872	0.856	0.840	0.824	0.808	0.792
Below mountains	arable land	0.903	0.889	0.875	0.861	0.847	0.834	0.820
	permanent grass land	1.000	0.928	0.919	0.910	0.902	0.893	0.883

The first category roads are:

- state roads used for agricultural transport,
- local thoroughfares.

Table 2

Agricultural Roads of the Second Category

Production area	Agricultural item	Distance (km)						
		1	2	3	4	5	6	7
Lowlands	arable land	1.000	0.986	0.972	0.958	0.945	0.931	0.917
	permanent grass land	1.000	0.983	0.966	0.949	0.932	0.915	0.898
Below mountains	arable land	1.000	0.985	0.969	0.954	0.939	0.924	0.908
	permanent grass land	1.000	0.990	0.981	0.971	0.961	0.952	0.942
		8	9	10	11	12	13	14
Lowlands	arable land	0.904	0.890	0.876	0.862	0.848	0.835	0.821
	permanent grass land	0.881	0.864	0.847	0.830	0.813	0.796	0.779
Below mountains	arable land	0.893	0.878	0.862	0.847	0.832	0.817	0.802
	permanent grass land	0.932	0.923	0.913	0.903	0.894	0.884	0.874

The second category roads are:

- main field roads unfortified,
- field drivers fortified.

Table 3

Agricultural Roads of the Third Category

Production area	Agricultural item	Distance (km)						
		1	2	3	4	5	6	7
Lowlands	arable land	1.000	0.984	0.968	0.953	0.938	0.922	0.906
	permanent grass land	1.000	0.981	0.962	0.944	0.926	0.907	0.889
Below mountains	arable land	1.000	0.982	0.965	0.947	0.930	0.912	0.895
	permanent grass land	1.000	0.989	0.978	0.970	0.957	0.946	0.935
		8	9	10	11	12	13	14
Lowlands	arable land	0.891	0.875	0.860	0.845	0.829	0.813	0.798
	permanent grass land	0.870	0.52	0.833	0.815	0.796	0.777	0.759
Below mountains	arable land	0.877	0.859	0.842	0.824	0.807	0.789	0.722
	permanent grass land	0.925	0.915	0.904	0.893	0.882	0.872	0.861

The third category roads are:

- main field roads unfortified,
- field drivers unfortified.

3.3. Coefficients for Agricultural Land Price Regulation According to the Plot Altitude from Locality

Table 4

Agricultural Roads of the First Category

Production area	Agricultural item	Altitude (m) per 1 km					
		up 40	41–80	81–120	121–160	161–200	over 200
Lowlands	arable land	1.000	0.986	0.969	0.948		
	permanent grass land	1.000	0.990	0.979	0.964	0.965	0.916
Below mountains	arable land	1.000	0.991	0.981	0.965	0.948	
	permanent grass land	1.000	0.995	0.988	0.977	0.963	0.942

The first category roads are:

- state roads used for agricultural transport,
- local thoroughfares.

Coefficients

For next 100 meters of transportation road:

- at the altitude of plot up to 40m/km the coefficient is equal 1.0
- at the higher altitude the land price is reduced for:
 - lowland areas:

arable land	1.98–5.20 %
permanent grass land	1.0 –8.40 %
 - below mountain area:

arable land	0.9 –5.20 %
permanent grass land	0.5 –5.80 %

Table 5

Agricultural Roads of the Second Category

Production area	Agricultural item	Altitude (m) per 1 km					
		up 40	41–80	81–120	121–160	161–200	over 200
Lowlands	arable land	1.000	0.976	0.954	0.923		
	permanent grass land	1.000	0.985	0.968	0.946	0.917	0.874
Below mountains	arable land	1.000	0.987	0.971	0.951	0.922	
	permanent grass land	1.000	0.992	0.983	0.966	0.945	0.913

The second category roads are:

- main field roads unfortified,
- field drives fortified

Coefficients

For next 100 meters of transportation road:

- at the altitude of plot up to 40m/km the coefficient is equal 1.0
- at the higher altitude the land price is reduced for:

PHO 3. grade – property detriment results sporadically and if so the level is determined by expert;

2. *Protected water conservancy areas:*

property detriment results sporadically and if so the level is determined by expert;

3. *Protected areas and their protected zones from the nature and landscape protection point of view:*

5. grade of protection – $Kz = 0.3$;

4. grade of protection – $Kz = 0.2$;

3. grade of protection – $Kz = 0.1$;

2. grade of protection – property detriment results sporadically and if so, the level is determined by expert.

Coefficients of reduction Kz for contaminated zones:

zone I $Kz = 0.10$

zone II $Kz = 0.20$

zone III $Kz = 0.30$

zone IV $Kz = 0.40$

Table 7

Zones of Contaminated Agricultural Land by Pollution

Indicator	Unit	Contaminated zones and yearly average concentration			
		I.	II.	III.	IV.
SO ₂	μm^{-3}	40–50	51–70	71–100	101–150
NO _x	μm^{-3}	37–62	63–87	88–125	126–187
HF	μm^{-3}	0.30–0.50	0.51–0.70	0.71–1.00	1.01–1.50
Stiff droplet	$\text{t.km}^{-2}.\text{r}^{-1}$	150–300	301–700	701–1 100	1 101–1 500

3.5. The Reduced Average Plot Price in Competent Cadastral Area Is Calculated as Follows

$$\text{PCP}_R = \frac{\sum (V_{\text{ESQU, BL}} \times \text{PCP}_{\text{UVP}}) + \sum (V_{\text{ESQU, SL}} \times \text{PCP}_{\text{UVP}} \times K_R)}{V_{\text{PC}}}$$

where

PCP_R – reduced average plot price,

$V_{\text{ESQU, BL}}$ – ESQU acreage without limitation factor's influence (PHO, CHKO, CHOPAV, SO₂, NP, ...),

PCP_{UVP} – average plot price corrected by coefficients for distance and altitude,

$V_{ESQU,SL}$ – ESQU acreage with limitation factor's influence (PHO, CHKO, CHOPAV, SO₂, NP, ...),

V_{PC} – acreage of plot,

K_R – reduction coefficient which express the intensity of ordered way of farming:

$$K_R = K_{NP} \times K_{CHKO} \times K_{CHOPAV} \times K_{PHO} \times K_{SO_2}^1$$

3.6. The Reduced Average Price of Cadastral Area Is Calculated as the Sum of Reduced Prices of Individual Plots According to the Pattern

$$PCKU_R = \frac{\sum(V_{ESQU,BL} \times PCP_{UVP}) + \sum(V_{ESQU,SL} \times PCP_{UVP} \times K_R)}{V_{KU}}$$

where

$PCKU_R$ – average price of cadastral area – reduced,

$V_{ESQU,BL}$ – ESQU acreage without limitation factor's influence (PHO, CHKO, CHOPAV, SO₂, NP, ...),

PCP_{UVP} – average plot price corrected by coefficients for distance and altitude,

$V_{ESQU,SL}$ – ESQU acreage with limitation factor's influence (PHO, CHKO, CHOPAV, SO₂, NP, ...),

V_{KU} – acreage of cadastral area,

K_R – reduction coefficient which express the intensity of ordered way of farming.

4. Conclusion

The corrected agricultural land price gives the possibility the more objective evaluation of plots compared to formerly valid price in the sense of notice of Ministry of Finance of the SR No. 465/1991 Zb. in wording of later prescriptions.

In a such way corrected agricultural land prices will be used mainly in:

- the evaluation of former plots for the register of original situation,
- the evaluation of replacement plots for the register of new situation,
- the calculation of land price at the execution of land arrangements.

¹ NP – National Parks,

CHKO – Protected Landscape Areas,

CHOPAV – Protected Areas of Underground Accumulation of Water,

PHO – Zones of Sanitary Protection,

SO₂ – Pollutions.

These corrected agricultural land prices give also possibilities to precise the price of individual plots, to precise the average and total price of plot of concrete owners in competent cadastral area.

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OCEŇOVANIE POĽNOHOSPODÁRSKYCH PÔD PRI POZEMKOVÝCH ÚPRAVÁCH

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Ceny poľnohospodárskej pôdy, v zmysle metodiky na oceňovanie poľnohospodárskych pôd, boli pre jednotlivé bonitované pôdno-ekologické jednotky (BPEJ) vypočítané v tzv. optimálnej polohe, čiže bez zohľadnenia ďalších faktorov, ktoré na ňu bezprostredne vplyvávajú. Najvýraznejšie sa táto skutočnosť prejavuje pri vykonávaní pozemkových úprav, keď projektanti pri oceňovaní jednotlivých parciel musia brať zreteľ na existenciu ďalších faktorov, ktoré bezprostredne vplyvávajú na výšku ceny pôdy.

Vlastná bonitácia a oceňovanie poľnohospodárskych pôd v SR sa v súčasnosti realizuje prostredníctvom bonitačného informačného systému, ktorý pozostáva z týchto častí:

- fyzický súbor máp BPEJ v mierke 1 : 5000,
- súbor máp BPEJ vo forme bázy dát využiteľnej programovým vybavením niektorého z geografických informačných systémov (GIS),
- bonitačná banka dát.

Prebiehajúce pozemkové úpravy, formovanie vlastníckych a užívateľských vzťahov a s tým súvisiace oceňovanie pozemkov pri výmenách a scelovaní ukázali, že úradná cena pôdy je nedostatočná. Ukázala sa potreba objektívnejšieho stanovenia ceny pôdy hlavne zohľadnením ďalších faktorov.

Jednu skupinu faktorov vplyvajúcich na cenu pozemkov tvoria antropogénne faktory, pri ktorých rôzne obmedzenia znižujú cenu pozemkov (územia s vyhlásenými národnými parkami a chránenými krajinnými oblasťami, pásma hygienickej ochrany vôd). Rôzne

obmedzenia v agrotechnike, v používaní priemyselných hnojív a chemických ochranných prostriedkov majú za následok zníženie produkcie. Ďalej sú to územia ovplyvnené priemyselnými exhalátmi, ktoré nielenže poškodzujú rastliny, ale mechanicky po kontaminácii pôdy prenikajú do rastlín a znižujú kvalitu a cenu produkcie. Túto problematiku upravuje Príloha č. 1 k zákonu SNR č. 307/1992 Zb. o ochrane poľnohospodárskeho pôdneho fondu v znení neskorších predpisov.

Druhú skupinu faktorov ovplyvňujúcich cenu pozemkov tvoria dopravné pomery spojené s obhospodarovaním vzdialených a prevýšených pozemkov. Úradné ceny nevystihujú významné rozdiely spôsobené rôznou polohou pozemkov, čo sa negatívne prejavuje pri pozemkových úpravách, keď sa pri sceľovaní a výmene pozemkov medzi vlastníkmi ukazuje nevyhnutné brať tieto faktory do úvahy.

Diferencované ceny zohľadňujúce polohu pozemkov sa vypočítavajú nasledujúcim spôsobom:

- na záujmovej ploche (napr. parcele) sa vypočítajú plochy jednotlivých BPEJ,
- z prílohy č. 8 vyhlášky Ministerstva financií SR č. 465/1991 Zb. sa vyhládajú úradné ceny jednotlivých BPEJ,
- súčtom cien jednotlivých BPEJ sa vypočíta cena parcely,
- takto vypočítaná cena sa vynásobí príslušným koeficientom (pre vzdialenosť, prípadne prevýšenie) a dostaneme upravenú cenu.

Vzhľadom na to, že úradná cena poľnohospodárskej pôdy nezohľadňuje ani osobitosti hospodárenia v príslušných katastrálnych územiach – napríklad prikázané spôsoby hospodárenia v chránených krajinných územiach, národných parkoch, pásmach hygienickej ochrany vodných zdrojov, v imisných oblastiach – stanovili sme koeficienty zníženia pre jednotlivé oblasti. Vypočítaná cena pôvodných parciel sa porovnáva s cenou navrhovaných (komasovaných) pozemkov a prípadné rozdiely sa vyriešia zmenou plochy, alebo zmenou vzdialenosti.

Upravená cena poľnohospodárskej pôdy umožní objektívnejšie ocenenie pozemkov oproti pôvodne platným cenám v zmysle vyhlášky Ministerstva financií SR c. 465/1991 Zb. v znení neskorších predpisov.

Takto upravené ceny poľnohospodárskej pôdy budú slúžiť najmä na:

- ocenenie pôvodných pozemkov pre register pôvodného stavu,
- ocenenie náhradných pozemkov pre register nového stavu,
- určenie ceny pozemkov pri vykonávaní pozemkových úprav.

Umožnia spresniť aj cenu jednotlivých parciel, priemernú, ako aj celkovú cenu pozemkov konkrétnych vlastníkov v príslušnom katastrálnom území.