

# ASSESSMENT THE UPDATE OF ESTIMATED PEDOLOGIC- ECOLOGICAL UNIT IN SELECTED CADASTRAL AREA OF TESCHEN SILESIA

SZTURC JAN, PODHRAZSKA JANA

Department of Applied and Landscape Ecology

Mendel University in Brno

Zemedelska 1, 613 00 Brno

CZECH REPUBLIC

xszturc@mendelu.cz

*Abstract:* The article deal problems of development of soil characteristics and his impact on the pricing of land in two cadastral areas of Teschen Silesia. It concisely describes the evaluation method of soil based on soil ecological units (EPEU), and procedures for updating them. The article also evaluates the evolution of prices of soil in accordance with applicable regulations in years 2002, 2008 and 2013. It is also based on a comparison of the original and update EPEU evaluated the difference in the price of the land according to valid regulations 441/2013 Sb. The results show that the prices of estimated pedologic-ecological unit are currently increased in average about 50% compared to 2002. Furthermore, it can say that in these areas may lead to reduce of prices EPEU due to processes, which means for property owners substantial economic losses.

*Key Words:* soil, cadastre, EPEU, updates EPEU, the price of land

## INTRODUCTION

Definition of estimated pedologic-ecological units (hereinafter EPEU) were conducted in the years 1972–1980 under Government Resolution no. 101/1971 Sb., as a logical outcome of a completed comprehensive exploration of the Czech lands.

Parameters of the exploration of bonitation were given to the needs of the developing agriculture, his mass production character and simultaneously to the forefront imposed deadline execution, evaluation and completion of the assigned task. After 1989, when there were significant changes in the ownership of the agricultural property and the restoration of property rights to land, it turned out that the definition used precision estimated pedologic-ecological unit (EPEU) is inadequate particularly with regard to the emerging field of landscaping and needs of valuations exchanged land. At the same time it was necessary in some cases to chart a supplement phenomena arising in connection with soil degradation of natural and anthropic origin. Since first Central Land Office of the Ministry of Agriculture (MZe CR), since 2013 on the basis of the law no. 503/2012 Sb. national land office. Bonitation provides comprehensive evaluation system of soil. Its use is particularly wide in the civil service, but also for the treatment of various analyses, studies, projects carried out by research and commercial organizations.

The system of EPEU, is the main base for the qualitative differentiation of soil and climatic condition and agricultural land in the Czech Republic. EPEU system has been production valued by the parameterized natural gains of the nine major kinds of field crops, arranged to valuation type structures on arable land. Estimated pedologic-ecological unit (EPEU) is primarily agronomic indicator. This means that it is defined on the basis agronomically important characteristics of the particular climate, soil, terrain configuration, so that it was possible to assign a parameterized data about the production potential of the main crops and crop production as a whole. EPEU system that captures the essential basic characteristic combination and in the short to medium term, few variable characteristics farmed ecotopes, which are each very different and therefore provide even different production and economic effects. Basic system currently allows define estimated podologic-ecological unit (EPEU) 2199, for which there are also economic parameters to evaluate them. This system was, according to the recent methodology (Novotný, Vopravil 2013), expanded by 138 new codes EPEU, as it was in the context of updating the methodology canceled 59 codes, that are no longer justified.

Altogether it is defined codes 2278 EPEU. All 2278 EPEU codes will be used in practice after their economic valuation and assignment class of protection (SOWACGIS).

### Estimated pedologic-ecological unit code structure

It is five-digit code which expresses the soil and climatic conditions that affect the productive capacity of the land hers economic evaluation. Legislation fixing these characteristic, the procedure for their leadership and update Decree no. 327/1998 Sb. As amended by Decree no. 546/2002 Sb. EPEU valuation is done by Decree no. 441/2013 Sb.

*Defining digits of EPEU code:*

1. The first digit of the code EPEU means belonging to the climatic region (marked with code 0–9, climatic regions were allocated on the basis of documents Hydro-meteorological Institute in Prague exclusively for the purpose of bonitation agricultural land resources (BALR) and include areas with approximately identical climatic conditions for the growth and development of agricultural crops). In the Czech Republic was defined a total of 10 climatic regions.
2. The second and third digit defines the membership of a main soil unit (01–78). The main soil unit is the purpose groupings soil forms, related to environmental performance, which are characterized by morphogenetic soil type, subtype, soil-forming substrate, grit and some MSU pronounced slope, depth of soil profile and stoniness.
3. The fourth digit provides a combination of slope and exposure of land to the world sides.
4. The fifth digit indicates the combination of the depth of the soil profile and his stoniness (Mašát 2002), (SOWACGIS).

Designation of estimated pedologic-ecological unit code:

X.xx.x.x.	code of climatic region (0–9)
x.XX.x.x.	code of main soil unit (01–78)
x.xx.X.x.	associated code of slope and exposure (0–9)
x.xx.x.X.	associated code of stoniness and soil depth (0–9)

## MATERIAL AND METHODS

Working procedure consists of the following stages:

- preparatory work - collecting data for updating estimated pedologic-ecological unit
- own fieldwork associated with defining and mapping EPEU
- processing of result of field research - preparing the draft change processing map (ZM) EPEU
- results processing for updating the national database:  
(Update tab, Change Sheet, vectorization districts EPEU approved ZM EPEU)

### Preparatory work

*Subject of mapping, unit mapping and updating goals*

Subject of mapping is agricultural land by type of land, etc. arable land, permanent grassland, hop etc. Their acreage is given to “extract the data from the land registry,” to the date of commencement of the update. Subject of mapping is also a registered non-agricultural land, which is clearly used for agricultural crop production, no matter in what kind of land, is registered in the land registry. It may be a long-term fallow land, wetlands, field trips, draws, limits, hills and various reclaimed land. The basic unit for mapping work is the cadastral area. Cadastral area boundaries are marked in the cadastral map, possibly even in the current state map derived 1: 5000 (State Map Derived – 5). The aim of bonited mapping is to define EPEU and plotting to working maps. The result is always the basis for the design of modified maps EPEU.

*Initial information for defining and updating EPEU*

These are materials Comprehensive soil exploration in part descriptive, graphical and analytical. These materials are either in respective land offices, or they are available in a data warehouse Research institute for soil and water conservation (VÚMOP) Prague.

*The preparation of maps for field exploration and update*

The basis for updating the mapping are eg.:

- EPEU map called Green print “A” paré, map SM 1: 5000
- cadastral map (graphic, digital or digitalized)
- copies of maps of land cadastre in scale of cadastral maps
- state map derived from 1: 5000 to the most recent issue of the current topographic elements of cadastral maps and elevation
- slope and exposures maps
- an overview of the updated EPEU by individual c. a.
- other necessary elements from the data warehouse VÚMOP, v. v. i. and from geo-information portal SOWAC GIS.

Preparing map basis for fieldwork includes defining the object of updating, etc. agricultural land and types of land.

**Fieldwork**

- reconnaissance of cadastral area
- the own bonitation field exploration

*Reconnaissance of area*

The authority (the competent regional landscaping) announces on its official board (incl. electronic) start of updating EPEU. Responsible person from the authority, release for workers, which are working on update work, the permission to the enter on land (§ 6, sec. 9 law. no. 139/2002 Sb.). Reconnaissance of the terrain consists of verifying the cadastral boundaries, boundaries of non-agricultural land, checking slope conditions, identifying the occurrence of complex geological and pedological conditions, waterlogging, rocky, outcrops, etc., sledding and condition of roads to individual parcels. To determine the work schedule is very important to note areal distribution of individual crops on the land. In the case of enclosed areas (pastures, orchards, forest, nurseries, springs, etc.) are traced owners and they provide input on land.

*Landscaping bonitation exploration update*

Systematic work at the detailed definition estimated pedologic-ecological unit is based on an evaluation of the individual partial descriptions of soil profiles the soil punctures. Punctures by the probing rods in homogeneous soil conditions, they are performed with a frequency of 1 per 1 ha puncture. In more complex soil conditions (change MSU, the incidence of skeletal or waterlogging), the frequency of stitches per hectare increases as required location punctures proposal EPEU was recorded by the device using GNSS, along with other information required to evaluate EPEU (eg. the beginning or end of a certain repose, increased stoniness or waterlogging).

*Description of soil profiles*

Description of soil profiles shall be based on defined and selected soil classification system (Němeček 2011).

*Accuracy of defining EPEU - the density of soundings*

Updating the definition of EPEU should theoretically allow definition of differences from the prevailing mapped EPEU. According to the scale, which is used on map basis, time limits and financial cost and practical effectiveness to assume secluded area objects, if their area does not exceed 0,5 hectares, with lone linear objects if their width perpendicular to the longitudinal axis does not exceed 50 m. When processing the update, these areas cover EPEU districts.

*Soil sampling, analysis*

Soil samples were taken from probes to supplement the information for inclusion into the soil MSU (the main soil unit). Soil samples are taken either from the individual genetic soil horizons, dug probes from topsoil horizon up to a depth of 60 cm. Sample weight is about 0.5–1 kg.

## The evaluation work

Processing result of field exploration carried out with respect to the deadline of submission of the proposal change processing map EPEU usually during November and December.

Is performed on the base substrate of working map by the creative way and consists of several phases:

- evaluating the results of analyses of collected soil samples
- comparison and adding newly discovered values with fundamental data, competitions or special probes Comprehensive survey of soil
- confirmation or reclassification of the land to the soil type, subtype, and a manifold and its subsequent inclusion in the system MSU and EPEU
- assessment of elements of relief, repose, and stoniness exposure and demarcation border EPEU on the working map within the tolerances

Processor, based on an assessment field exploration, define to the background maps new lines with descriptions EPEU. These lines subsequently processed into digital form in DGN format to base by the designated authority. This data output, together with used documents use surrenders to the team Bonited information system Research institute for soil and water conservation (BIS VÚMOP).

## Update estimated pedologic-ecological unit card

It is proof of the characteristics identified and mapped EPEU and prepares to the conclusion of the update process. It provides an overview EPEU that were defined in the cadastral area, their characteristics and areas. Sum of the areas must be equal to farmland according to an extract from the cadastre.

## Handover of the results to the contracting authority updates

The authority will receive 2 outputs:

1. Drawing in electronic form in DGN or VFK
2. The modified draft maps (1 paré) in map form on the surface of the land cadastre

Government Land Office then provide a explaining the proposal ZM EPEU for 30 days for public consultation. If it is not approached to reminder control, the updated area is entered into a national database.

## Documentation about termination of updates

The worker performing the update definition EPEU, bonitation of land or other tasks, establish the Change sheet as a document that contains information about the course, completion, handover and closure updates. Change Sheet archives department of bonitation and soil mapping VÚMOP, v. v. i.

## Of solved localities

Teschen Silesia region is a typical agro-industrial and in natural climatic and soil condition shows very substantial differences.

The first locality, where the update was done, is the cadastral area in Smilovice. The village is located at the foot of the steep slopes of 738 m high massif Godula in Moravian-Silesian Beskyd on local roads between villages Stritez and Reka.

The second assessed are Tranovice village, which lies on the river Stonavka. Stonavka rises in the south in Moravian-Silesian Beskyd and ejected from the northern side to the Terlice dam. Tranovice lies on the crossroads of historical traffic routes: Poland – Moravia – Austria (today is I/48) and Slovakia – Moravia (II/474), the meaning and usage continues to grow.

Both cadastral areas are located near the town of Trinec and Frydek-Mistek and Tranovice below under Frydek-Mistek. Both areas are located in the Moravian-Silesian region on the border of Czech Republic, Slovakia and Poland.

C. a. Smilovice has over about a third less of arable land than c. a. Tranovice. Most of the agricultural land consists of permanent grassland. Forest land they have greater representation in comparison to the c. a. Tranovice

Table 1 Total value of land types according to the land registry

Land use of Smilovice	ha	%	Land use of Tranovice	ha	%
Arable soil	172.3	29.4	Arable soil	436.9	50.8
Gardens	22.7	3.9	Gardens	34.5	4.0
Orchards	3.9	0.7	Orchards	12.6	1.5
Grassland	224.9	38.4	Grassland	124.6	14.5
Forestland	104.8	17.9	Forestland	111.3	12.9
Water areas	15.8	2.7	Water areas	21.9	2.5
Build up areas	9.1	1.5	Build up areas	19.2	2.2
Other areas	31.9	5.5	Other areas	99.7	11.6
Total	585.3	100	Total	860.7	100

## RESULTS AND DISCUSSION

Updating the agricultural land resource in the cadastral areas Smilovice and Tranovice was based on subsequently instituted comprehensive land adjust, where update EPEU served for more accurate valuation of land in comprehensive landscaping. This is the first EPEU update in these cadastre, which carried out the Land Office in Frydek-Mistek with 100% guarantee by the VUMOP, v. v. i., Brno. Both areas are in the piedmont area, which means difficult conditions for farmers, who must adapt the selection of crops according to the climatic conditions.

According to the cumulative value of each types of land in the cadastral area Smilovice, are on most agricultural land permanent grassland, which is leading to extensive farming in this are and no such burden. Conversely, in the cadastral area Tranovice, is the most represented surveyed areas included in price groups and they are compared the difference in the prices specified by the regulations in force at different times.

Table 2 EPEU price development in the period 2002–2014

	EPEU	Price of EPEU by the decree no. 540/2002	Price of EPEU by the decree no. 3/2008	Price of EPEU by the decree no 441/2013	% Difference between the prices of the year 2002 and 2013
Price EPEU in range of 0–2CZK	7.21.13	1.61CZK	2.05CZK	2.35CZK	46%
	8.40.67	0.75CZK	1.06CZK	1.22CZK	63%
	8.48.11	1.68CZK	2.09CZK	2.40CZK	43%
	9.40.78	0.71CZK	1.01CZK	1.16CZK	63%
	9.40.99	0.70CZK	1.00CZK	1.15CZK	64%
Price EPEU in range of 2.1–5CZK	7.22.13	2.58CZK	3.17CZK	3.64CZK	41%
	7.43.00	4.81CZK	5.73CZK	7.77CZK	62%
	7.44.00	4.88CZK	4.86CZK	6.68CZK	37%
	7.46.00	4.99CZK	5.94CZK	6.81CZK	36%
	7.58.00	3.83CZK	4.61CZK	5.29CZK	38%

The Table 2 shows, that prices of EPEU currently increased over 2002 by 36–63%, an average about 50%.

Update EPEU in both areas, was mainly reflected in the change of boundaries of individual soil ecological unit compared to the original status. The result is a new refined bonitation as well as defining new EPEU, which is due to both more accurate and more details of updates, through the effect of the degradation processes occurring on sloping land plowed. Table 3 provides an overview about price difference after the update and awards in accordance with decree no. 441/2013 Sb.

Table 3 Comparison of price land in c. a. Smilovice and c. a. Tranovice

	Smilovice		Tranovice	
	Price (CZK)	Diff (%)	Price (CZK)	Diff (%)
The total price of the original EPEU (by the decree no. 540/2002)	13,055,195.9		30,103,770.2	
The total price of the original EPEU (by the decree no. 441/2013)	18,198,143.1	39%	41,223,702.4	37%
The total price after update of EPEU (by the decree no. 441/2013)	17,790,038.4	-2%	34,621,094.3	-16%

From the Table 3 is clear, that the price of land over the past decade has increased by the revaluation in case of Smilovice about 39%. Due to the changes of boundaries of some EPEU and their recoding after the update occurred in the cadastral area Smilovice to the slight decline in official land prices.

In cadastral area Tranovice the price of land has increased similarly to the price in cadastral area Smilovice, because of update there was a significant decline in official land prices. This significant difference can be attributed to more intensive farming in the cadastral area Tranovice that in sloping areas allows the development of erosion, the consequence is a reduction of soil quality. Valuation of bonitation of land through updated EPEU, can to the certain extent quantify the economic impacts of erosion processes in the period between each bonitation.

## CONCLUSION

Agricultural and environmental characteristic of the territory, are expressed in code of estimated pedologic-ecological units, they are influenced the external factors, in particular way of management on arable land. Czech Republic is characterized by a considerable percentage of arable land and especially by blending originals ownership parcels to the large production blocks. This approach to the use of agricultural land has resulted in long term, the development of erosion processes associated with degradation manifestations on eroded soils. Qualitative changes in these soils, can be determined through field explorations associated with updating EPEU. In many cases, there is a transfer or the original EPEU to other soil profile by the erosion is also reflected in the shifting the number 5 in EPEU code. Reclassification land to other agricultural-environmental categories has resulted a change in price of the parcel by the valuation decree (no. 441/2013 Sb.). Erosion processes may cause the reduction of EPEU price, which for landowners mean significant economic losses.

## ACKNOWLEDGEMENT

The article was prepared with the support of QJ1220054 Impact of a change of climatic factors on the development of wind erosion processes, conceptual solution through the land adjustment measures.

## REFERENCES

- Mašát K. 2002. *Metodika vymezení a mapování bonitovaných půdně ekologických jednotek*. 3<sup>rd</sup> ed. Praha: Výzkumný ústav meliorací a ochrany půdy.
- Němeček J. 2011. *Taxonomický klasifikační systém půd ČR*. 2<sup>nd</sup> ed. Praha: CZU.
- Novotný I., Vopravil J. 2013. *Metodika mapování a aktualizace BPEJ*. Praha: Výzkumný ústav meliorací a ochrany půdy.
- Geoportal SOWACGIS, Základní informace o BPEJ [online]. [2015-14-04]. Available from: <http://geoportal.vumop.cz/index.php?project=zchbpej>