Land Degradation by Erosion and Its Economic Consequences for the Region of South Moravia (Czech Republic)

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Abstract

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The quality of agricultural land fund in the Czech Republic is assessed via a valuation system based on the ecological-productive land evaluation. This system was established in the 1960–1980s after a complex survey of agricultural land. It provided integral information on the agricultural land quality and on the price of agricultural land parcels derived from their productive capacity. Starting from the 1990s, evidence in the database of Evaluated Soil-Ecological Units (ESEU) has been regularly updated. Intensive cultivation of wide-spaced crops, namely in extended, largely sloped land parcels, has resulted in degradation of land characteristics by the effects of erosion. The ESEU updating makes it possible to detect these changes and their quantification by differences in land price. This approach was applied to evaluate the economic impacts of erosion at two model localities in intensively exploited agricultural areas, in the region of the most productive soils of the Czech Republic. We compared the price per 1 m² of land according to the land characteristics determined by the first land valuation with the current soil price based on the ESEU update. We also compared changes in the land characteristics. In the GIS environment, we established the mean long-term soil loss by erosion based on the original ESEU and compared it with the calculated soil loss based on the updated ESEU. The calculation method used was in accordance with the valid methodology for erosion calculation in the Czech Republic.

Keywords: erosion; evaluated soil-ecological units; soil price

Soil as a basic means of agricultural production and a carrier and regulator of processes in various spheres of the environment, requires our attention, but namely our protection. The loss of high-quality agricultural land is perceived worldwide as an extensive problem touching not only the developing countries. The main threat to the environment and agriculture reported by PIMENTEL et al. (1995) is water erosion. This phenomenon is defined as a process of release, transport, and deposit of soil particles by flowing water. Soil erosion leads to soil fertility loss, reduction of depth of the rooting zone, and loss of nutrients and moisture (LAL 2001). Consequences of the erosive processes are manifested both directly (on site) by crop losses and indirectly (off site) as sedimentation effects and eutrophication of water

bodies. The direct consequence, with a particular impact on the land owners, despite that they may not be its cultivators but only tenants, is the fall in prices of agricultural land due to the loss of its quality and fertility.

In the Czech Republic (CR), water erosion potentially threats almost 50% of agricultural land, out of which 18% is at extreme or high risk; about 20% is at risk of wind erosion, out of which almost 5% at extreme or high risk. At present, the maximum soil loss in the CR is estimated to be approximately 21 million tons of arable land per year, which may be expressed as an economic loss of 4.3 billion CZK per year. According to the Situation and Prospective Report of the Ministry of Agriculture of the Czech Republic of 2012, about 40% of soil in the

CR has above-average productivity. Due to the land degradation processes, namely erosion, these most productive regions gradually depreciate. The soil fertility decreases, requiring higher nutrient supplies, especially in the form of chemicals. Further escalation of the erosion events leads to transportation of these chemicals along with the washed-away soil into water recipients and in communal sewerage systems; sediments settle in undesirable areas and their deposits have to be eliminated. The adverse effects of accelerated erosion, enhanced by industrialization and urbanization processes, are reflected not only in the risks to the land, but they also represent a threat to another basic natural resource – water.

MATERIAL AND METHODS

Selection of model localities. For analyses of the temporal changes of land characteristics caused by intensive management two model localities in the region of South Moravia were selected. These localities are characterized by soils with high productive quality and frequent occurrence of water erosion. The first locality is represented by a land block (Figure 1) situated at the borderline of cadastral areas between Starovice and Hustopeče in the district of Břeclav; the second locality (Figure 1) is situated in the cadastral area of Malenovice in the district of Zlín.

Model locality Hustopeče-Starovice. This area is part of the Hustopeče Uplands. From the climatic aspect, it belongs to the warm zone; warm and dry region with mild winters and relatively short sunshine. The parental substrate in the main part of the soils is represented by loess. The loess and the mixed substrates gave rise to Haplic, Calcaric, and Arenic Chernozems. Unfavourable natural conditions

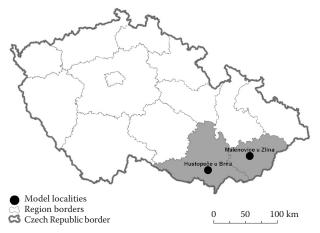


Figure 1. Localities of interest in the Czech Republic

(broken and relatively sloping topography with high erosion risk) and large-area management of undivided surfaces of arable land contributed to the development of both wind and water erosion.

Analyses of the erosion risk and changes in land characteristics based on the ESEU updating were done at the land block that by its nature (block size, sloping, type of management) belongs to typical localities with intensive agricultural management in South Moravia. The locality is situated at the altitude of 228 m, its area covers 1 004 771.86 m² (100.5 ha), its length at the right angles to the contour is 1061 m and its average slope is 6.7%.

Model locality Malenovice. The locality is situated in the district of Zlín, on the slopes of the western extremities of the Vizovice Hills. Climatically, it belongs to the warm zone; warm and moderately wet region with mild winters. Geologically, the locality is part of a region represented namely by rocks of the Carpathian Flysch, in the southern and eastern part overlaid by loess of various thickness. The rocks of the Carpathian Flysch are mainly represented by flysch of heavy texture in typical development of alternating sandstones and slates, usually slightly carbonic. The prevailing soils are very deep or deep. Agriculturally, the area is characterized by large land blocks and intensive management, allowing development of erosion and other degradation processes.

Analyses of the erosion risk and changes in land characteristics based on the ESEU updating were done at the land block covering 731 966.38 m^2 (73.2 ha). The altitude of the locality is 249 m, the average slope is 10.5 %, and the length of the major thalweg is 987 m.

Evaluation of changes in land characteristics. To evaluate agricultural land and its productive capacity expressed in prices, in the 1970s, the Czech Republic introduced the "Land Evaluation Information System". This system contains basic data on the land defined using a 5-digit code, forming together the Evaluated Soil-Ecological Unit (ESEU). Each of the digits (or pair of digits) expresses a particular land characteristic. The system of evaluated soil-ecological units reflects all characteristics and differences in a particular agronomical area (soil, climatic, and morphological conditions). Regionalization of the individual ESEU and their corresponding codes is done based on a digital collection of ESEU maps, using the borderlines surrounding the individual ESEU surfaces with their numerical designation.

The structure of the ESEU code is defined in the following way:

A.BB.C.D.

A – climatic region code (0-9)

BB – code of the main soil unit (0-78)

C – collective sloping and exposure code

D - collective skeletality and soil depth code

Starting from the 1990s, data in the database of the ESEU has been regularly updated (MAŠÁT *et al.* 2002).

Based on the long-lasting experience obtained during land evaluation we can state that the changes in the land characteristics caused by erosion are namely manifested by the shortening soil profile, growing skeletality, and changes in the main soil unit classification. By comparing the land condition before and after the ESEU updating we can see the changes in land characteristics and quantify them using the valuation decree (Decree No. 441/2013 Coll.). This approach was applied to assess the economic impacts of erosion at the model localities Hustopeče in the Břeclav region and Malenovice in the Zlín region, in intensively agriculturally exploited regions in Moravia - the most fertile land of the Czech Republic. We then compared the price per 1 m² of land according to the original ESEU with the price after the ESEU updating. In the GIS environment we additionally assessed the mean long-term soil loss by erosion based on the original ESEU and its comparison with the calculated soil loss based on

the updated ESEU – according to the methodology valid in the CR (Janeček *et al.* 2012).

The model land block in Hustopeče was evaluated in 1978. In 2013, the land characteristics were updated. The period between the first definition of the land characteristics and their re-evaluation therefore lasted 30 years, during which this land block was intensively managed in order to achieve maximum production at minimal costs.

The model land block Malenovice was evaluated in 1980 and the update took place in 2000. Here, the past 20-year period was also characterized by intensive agricultural management with minimum expenses invested into protection against accelerating erosion.

The ESEU update delineated new polygons and borderline courses between individual land blocks and described their characteristics. The newly defined ESEU were analyzed for erosion loss and the price of the land parcel (land block) before and after the updating (Figures 2 and 3) was compared.

Tables 1 and 2 describe the land characteristics at the investigated localities identified during the first land evaluation and after the ESEU updating.

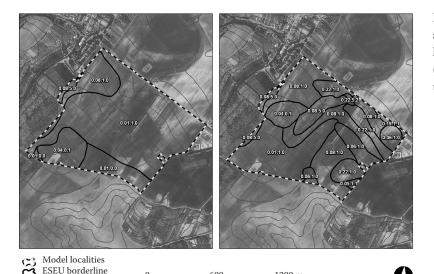
Assessment of erosion risk. The main erosion-causing factors are the climate, topography, vegetation, soil, and the human factor – type of land management. Each of these factors displays certain

Table 1. Soil characteristics identified at the locality Hustopeče-Starovice

Year	ESEU	Description
	0.01.0.0 0.01.1.0	flat and moderately sloped Haplic Chernozems, soils with thick humus horizon, with crumb to granular structure, developed from loose carbonate substrates, deep soils
1978	0.04.0.1	Arenic flat Haplic Chernozems, lighter dehumidified soils, deep to medium deep
	0.08.1.0	washed-off (eroded) Haplic Chernozems with cultivated substrate covering more than 50% of moderately sloped area
	0.08.5.0	washed-off (eroded) Haplic Chernozems with cultivated substrate, in sloped terrain
	0.01.1.0	modal flat and moderately sloped Haplic Chernozems, soils with thick humus horizon, with crumb to granular structure, developed from loose carbonate substrates, deep soils
	0.04.0.1	flat Arenic Chernozems, lighter dehumidified soils, deep to medium deep
	0.05.1.1	Carbonic Chernozems on highly permeable bedrock, medium heavy to lighter
2013	0.06.1.0	Vertic Chernozems, heavy to highly heavy, on heavy bedrock
	0.08.1.0	washed-off (eroded) Haplic Chernozems with cultivated substrate covering more than 50% of moderately sloped area
	0.08.5.0	washed-off (eroded) Haplic Chernozems with cultivated substrate, in sloped terrain
	0.19.1.1	Calcaric Cambisol, medium heavy to heavy
	0.22.1.0	Cambic Arenosol at lighter, dehumidified, non-water-retaining substrates
	0.22.5.2	Cambic Arenosol at lighter, dehumidified, non-water-retaining substrates, in sloped terrain

Contour line

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600

1200 m

Figure 2. Investigated arable land block at the locality Hustopeče with the highlighted Evaluated Soil-Ecological Units (ESEU) before (left) and after (right) updating

variability, according to the local conditions. Therefore, the more detailed is the investigation of the area, the more effective is the determination of erosion risk. The effects of the above-mentioned factors on erosion loss can be expressed mathematically using the "Universal Soil Loss Equation" (USLE) (WISHMEIER & SMITH 1978). Interpretation of the universal equation factors in the conditions of the CR was done by several authors, and USLE was applied to the conditions of the Czech Republic by Zdražil (1965), Holý (1978, 1994) Pasák (1984), TOMAN (2000), and JANEČEK *et al.* (2012). The calculated value represents the quantity of soil that can be released by water erosion in the long term in particular conditions.

The USLE equation was applied in the ArcGIS – ArcMap 10.2 interface developed by ESRI (http://www. esri.com/about-esri). This method allows investigating the entire surface of the land block. However, the quality of entry data is decisive for the calculation accuracy. The individual factors of the universal equation were calculated according to the currently valid methodology in the CR (JANEČEK et al. 2012). The following values of individual USLE equation factors were established for the investigated localities:

R factor was set according to the methodology valid for the Czech Republic (JANEČEK et al. 2012): R = 40 MJ/ha.cm/h.

To establish factor K, the information on soil characteristics defined by its code can be used. VOPRAVIL et al.



Figure 3. Investigated arable land block at the locality Malenovice near Zlín with the highlighted Evaluated Soil-Ecological Units (ESEU) before (left) and after (right) updating

Contour line

(2011) assessed the individual equation components for calculation of the K factor of soil samples according to Wishmeier-Smith (1978) and assigned the particular K factor value to each soil unit in the ESEU system.

For the study purposes, factor K was established according to the soil characteristics defined during the land valuation done in 1978 or 1980 and after updating in 2013 or 2000, respectively.

The LS layer factor was calculated using the USLE 2D application (VAN OOST & GOVERS 2004). The method of McCool *et al.* (1987, 1989) with the Flux Decomposition runoff algorithm was applied for the

calculation. The data layer was prepared from the raster layer of the digital terrain model (DTM) and the raster layer of the land block register of the Land Parcel Identification System (LPIS) database accessible at the website of the Ministry of Agriculture of the Czech Republic.

Factor C was determined by assessment of the dependence of the structure of the cultivated crops, and thus of the annual value of factor C, on the climatic conditions of the region according to Kadlec and Toman (2002) as C = 0.307 for the locality Hustopeče-Starovice and C = 0.243 for the locality Malenovice.

Table 2. Soil characteristics identified at the locality Malenovice

Year	ESEU	Description				
	3.24.1.1	Eutric Cambisol on flysch, medium heavy to heavy, slightly skeletal, medium deep to deep, mild slope				
1980	3.24.5.1	Eutric Cambisol on flysch, medium heavy to heavy, slightly skeletal, medium deep to deep, sloped terrain				
	3.41.7.7	strong slopes, medium heavy to light texture, varying skeletability, moisture dependent on climate and exposure				
	3.56.0.0	Eutric Fluvisols, medium heavy, skeleton-less, flat, deep				
	3.08.5.0	washed-off Haplic Luvisols, cultivation of transient horizon or substrate covering more to 50% of slanted area, medium heavy, deep				
	3.08.1.0	washed-off Haplic Luvisols, cultivation of transient horizon or substrate covering more than 50% of moderately sloped area, medium heavy, deep				
	3.11.1.0	Haplic Luvisols, with heavier bottom, skeleton-less, deep, moderately sloped				
	3.20.1.1	Vertic Cambisols on very heavy substrates (clays, flysches), with low permeability, skeleton-less, deep, in places slightly gleyed, moderately sloped				
	3.20.1.4	Vertic Cambisols on very heavy substrates (clays, flysches), with low permeability, medium skeletability, medium deep to deep, moderately sloped				
	3.20.5.1	Vertic Cambisols on very heavy substrates (clays, flysches), with low permeability, skeleton-less, in places slightly gleyed, sloped terrain				
	3.20.5.4	Vertic Cambisols on very heavy substrates (clays, flysches), with low permeability, medium skeletability, medium deep to deep, sloped terrain				
2000	3.24.1.1	Eutric Cambisols on flysch, medium heavy to heavy, slight skeletability, medium deep to deep, moderately sloped				
2000	3.24.5.1	Eutric Cambisols on flysch, medium heavy to heavy, slight skeletability, medium deep to deep, sloped terrain				
	3.41.7.7	strongly sloped terrain, medium heavy to light texture, with varying skeletability, medium deep to deep, moisture dependent on climate and exposure				
	3.48.1.1	Stagni-Eutric Cambisols on flysch, medium heavy-light to medium heavy, skeleton-less, medium deep to deep				
	3.48.5.1	Stagni-Eutric Cambisols on flysch, medium heavy-light to medium heavy, slight skeletability, medium deep to deep, sloped				
	3.49.1.1	Stagni-Vertic Cambisols on flysch geests, heavy to very heavy, moderately sloped, deep to medium dee				
	3.49.5.1	Stagni-Vertic Cambisols on flysch geests, heavy to very heavy, sloped, deep to medium deep				

Factor P of the universal equation was set to the value = 1 (no anti-erosive measures are considered for the land parcel).

RESULTS AND DISCUSSION

Results of the ESEU updating. The ESEU updating in the years 2013 (for Hustopeče-Starovice) or 2000 (for Malenovice near Zlín) was executed with higher precision and in more detail, thanks to the better quality of documentation and technology on the one hand and to the purpose of the original ESEU definition, which during the socialist collectivization served for large-surface exploitation of land regardless of the size of proprietary land blocks, i.e. with higher generalization rate, on the other. At present, after returning the land back to its owners, the need has arisen to define the borders of individual land units in more detail, making it possible to establish a liable soil value and thus the price of the owners' land units reflecting the soil productive capacity.

Model locality Hustopeče-Starovice. Land valuations in 1978 and 2013 identified various ESEU surfaces and types (Table 3). Updating in 2013 brought changes in surface delineation of the original units, re-evaluation of land characteristics due to the degradation processes, and extension by new soil units. According to the evaluation decree No. 441/2013 Coll., each ESEU code was assigned the price converted to EUR (Table 3).

The total area of the investigated land block was 1 004 771.86 m² (100 ha). The soil price in this block before updating was EUR 511 744. After updating, considerable land degradation was noticed, namely

due to the long-lasting activity of erosion processes. For instance, the area of washed-off Chernozems (code 0.08..) before the update was less than 12% of the total land block area, and after updating it increased to almost 44% due to the degradation processes occurring in the Modal Chernozems (code (0.01..). The area of soils of the highest quality – Modal Chernozems – decreased from the total of 78% to only 31%.

Modal, Arenic, and Pellic Chernozems (codes 0.04.., 0.05.., 0.06..), found after updating (Figure 3), cannot arise from Modal Chernozems by natural degradation processes. In this case, the original ESEU determination was probably incorrect. However, this fact would be reflected in the soil price, and therefore in the total land block the price decreased. The price of the investigated land block, valuated according to the updated ESEU, is EUR 419 163. The difference in price is therefore EUR 92 582.

To establish the direct economic impact on the change of the land block prices we analyzed the price and area of soils arisen as a result of Modal Chernozem (0.01...) degradation to washed-off Chernozems and Pararendzines (0.08.., 0.19.., 0.22...) (Figure 3), by superposing the layers of polygons of selected land to the prices assigned before and after updating. The resulting drop in land prices due to erosion in the investigated land block is EUR 75 670.81. This clearly shows significant effects of erosion processes on the land price, bringing about considerable economic losses to the land owners.

Model locality Malenovice. The following ESEU were defined during the 1980 and 2000 land valuations (Table 4).

Table 3. Comparison of surfaces and prices per m² for particular Evaluated Soil-Ecological Units (ESEU)

Original lan	d valuation (1978)		After updating (2013)			
ESEU	price per m ² (EUR)	surface area (m²)	ESEU	price per m ² (EUR)	surface area (m²)	
0.01.0.0	0.61	99 668.14	0.01.1.0	0.54	256 949.51	
0.01.1.0	0.54	687 698.24	0.04.0.1	0.27	57 283.18	
0.04.0.1	0.27	96 804.53	0.05.1.1	0.27	7 198.31	
0.08.1.0	0.43	101 692.59	0.06.1.0	0.43	100 072.03	
0.08.5.0	0.37	18 908.37	0.08.1.0	0.43	362 516.25	
			0.08.5.0	0.37	77 597.56	
			0.19.1.1	0.36	9 666.19	
			0.22.1.0	0.24	128 054.39	
			0.22.5.2	0.17	5 434.44	
Total	1 004 771.86	511 744.38	Total	419 162.86	1 004 771.86	

Table 4. Comparison of surface area and price per m² for particular Evaluated Soil-Ecological Units (ESEU)

Original lan	d valuation (1980)		After updating (2000)			
ESEU	price per m² (EUR)	surface area (m²)	ESEU	price per m ² (EUR)	surface area (m ²)	
3.24.1.1	0.32	60 182.07	3.24.1.1	0.32	259 674.25	
3.24.5.1	0.28	16 065.65	3.24.5.1	0.28	261 261.21	
3.41.7.7	0.05	589.96	3.41.7.7	0.05	9 573.34	
3.56.0.0	0.57	45 137.91	3.20.1.1	0.30	35 781.31	
3.08.5.0	0.35	378 010.69	3.20.1.4	0.21	34 732.33	
3.08.1.0	0.47	190 633.21	3.20.5.1	0.27	2 425.62	
3.11.1.0	0.48	41 346.89	3.20.5.4	0.18	16 409.56	
			3.48.1.1	0.29	22 781.63	
			3.48.5.1	0.24	2 177.45	
			3.49.1.1	0.28	7 116.43	
			3.49.5.1	0.23	30 336.84	
			3.56.0.0	0.57	49 696.41	
Total	292 427.46	731 966.38	Total	223 265.94	731 966.38	

After updating, polygons were defined for the newly established ESEU that arose by re-evaluation of the land characteristics due to the degradation processes. According to the evaluation decree No. 441/2013 Coll., each ESEU code was assigned the price converted to EUR (Table 4).

The total area of the investigated land block was 731 966.38 m² (73 ha). The land price in this block before updating was EUR 292 427. After updating, a considerable land degradation was observed, namely due to the long-lasting effects of erosion processes. For instance, before updating the area of high-quality brown soils (codes 3.08.., 3.11..) represented more than 82% of the land block area. Degradation processes mostly gave rise to Modal Cambisols, Gleyed Cambisols, and Pellic Cambisols, i.e. soils of heavier nature, more difficult to manage (codes 3.24.., 3.20..,

3.48..). After updating, the total loss of the most valuable soils – brown soils – was noticed due to their ablation by water erosion. The price of the investigated land block evaluated according to the updated ESEU is EUR 223 266. The difference in the price therefore represents EUR 69 162.

Results of erosion risk assessment. The soils were divided into six groups by water erosion vulnerability according to VOPRAVIL *et al.* (2011). The higher is the factor K in the USLE equation, the more is the soil vulnerable to the effects of water erosion.

At the model localities, individual ESEU codes were assigned the following K factor values (Table 6). In the next step, we calculated the erosion vulnerability based on the determined USLE values for the investigated land block before and after the ESEU updating. The calculated values of the soil loss are given in Table 7.

Table 5. Soil groups according to erosion vulnerability

Group	Characteristic
1	not vulnerable (K factor lower than 0.20); soils with light texture, water permeable, dehumidified, with low humus content
2	weakly vulnerable (K factor 0.20-0.30); structured soils with high humus content
3	moderately vulnerable (K factor $0.30-0.40$); soils with good moisture regime, humic to waterlogged
4	strongly vulnerable (K factor 0.40–0.50); most fertile soils of the CR, namely on loess
5	most vulnerable (K factor 0.50 and higher); high-quality Chernozems and brown soils, often with sod-podzolic manifestations
6	not assessed (ravines, rock exposures, hydromorphic soils)

Table 6. K factor for the Evaluated Soil-Ecological Units (ESEU) at the land block

Hustopeče-Starovice				Malenovice			
original land valuation		after updating		original land valuation		after updating	
ESEU	K factor	ESEU	K factor	ESEU	K factor	ESEU	K factor
0.01.0.0	0.41	00110	0.41	3.24.1.1	0.38	3.20.11	0.28
0.01.1.0	0.41	00401	0.16	3.24.5.1	0.38	3.20.1.4	0.28
0.04.0.1	0.16	00511	0.28	3.41.7.7	0.33	3.20.5.1	0.28
0.08.1.0	0.49	00610	0.32	3.56.0.0	0.4	3.20.5.4	0.28
0.08.5.0	0.49	00810	0.49	3.08.5.0	0.49	3.24.1.1	0.38
		00850	0.49	3.08.1.0	0.49	3.24.5.1	0.38
		01911	0.33	3.11.1.0	0.52	3.41.7.7	0.33
		02210	0.24			3.48.1.1	0.41
		02252	0.24			3.48.5.1	0.41
						3.49.1.1	0.35
						3.49.5.1	0.35
						3.56.0.0	0.40
mean	0.39	mean	0.33	mean	0.43	mean	0.34

The calculated soil losses were then confronted with the limits of erosion loss defined by Janeček *et al.* (2012) for the conditions of the CR as 4 t/ha per year for medium deep and deep soils.

The displayed data show decreasing erosion loss intensity calculated from the ESEU updating. Among other factors, this is given by the fact that the long-lasting erosion effects caused loss of the most valuable, easily erodible soils (Figure 4). The change in land characteristics is associated with determination of the K factor, i.e. the factor of soil erodability. Before updating, the soils with high factor K (soils of category 4 according to Table 5) at the land block Hustopeče-Starovice covered 90% of the area, and after updating it was 69% only. With the mean value of 2300 t of annual erosion loss from the land parcel we may state that from 1978 to 2013, the investigated land parcel, with the area of almost 100 ha, experienced the loss of nearly 70 000 t of arable land.

Table 7. Values of soil loss for calculation variants

Locality	Variant	Mean loss		
Locality	variant	(t/ha/year)	(t/year)	
Hustopeče- Starovice	original land valuation after updating	23.66 22.99	2365.91 2299.11	
Malenovice	original land valuation after updating	24.60 18.53	2459.70 1852.88	

Before updating, the model locality Malenovice contained soils in the vulnerability categories 4–5 (K factor of 0.4 and higher) at 89% of the area, and after updating, occurrence of soils with K factor higher than 0.41 (category 4) was observed, and only in 10% of the area. The value of erosion loss after updating land characteristics has thus significantly decreased. In the period of 20 years, however, with the mean annual erosion loss of 2200 t, the land parcel of 73 ha surface has gradually experienced erosion loss of about 44 000 t of arable land per year.

The comparison of the mean annual soil losses by erosion in both investigated land blocks with a tolerated limit of erosion loss of 4 t/ha per year (Janeček



Figure 4. Shortening of the soil profile as a result of erosion processes at an intensively managed land block (Hustopeče 2012)

et al. 2012) has shown a pronounced excess of this limit. Despite the decreasing intensity of soil loss by erosion due to progressive degradation of the most valuable land, we cannot accept further depreciation of land in these most fertile regions. The land parcels devastated by erosion must be systematically protected by introducing rules of good agricultural practice corresponding to the requirements for adequate extenuation of the erosion processes.

The evaluation of temporal changes in land characteristics has shown both quantitative and qualitative consequences of a long-lasting neglecting of the most valuable soils in the Czech Republic. Land is a nonrenewable natural resource and if the information on every-year soil losses by erosion does not seem to be a convincing argument, the expression of consequences of this process in financial terms represents a particular indicator of irreversible property loss, namely affecting the landowners. At present, new principles of common agricultural policy for the years 2014-2020 are being formulated for the European Union countries, and protection of soil against erosion should be one of the decisive measures aimed at providing sustainable condition of agricultural land. This should be achieved by sparing and precise agriculture policy applied in accordance with the liable guidelines for correct management of agricultural land, respecting the capacities and limits of the individual EU member states.

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