

LANDSCAPE STRUCTURE AND WATER SUSTAINABLE MANAGEMENT IN THE CZECH REPUBLIC

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Introduction

The cultural landscape is typical by permanent development controlled mainly by man. The changes were always realized according to man's need and possibilities [4]. The rural landscape mosaics had been developed by long-termed opinions of the farmer's generations. The principles of water management, soil conservation, etc. were necessary part of their knowledge [5]. One of the basic principles was organization (dislocation) of the permanent structures (forest, pasture, meadow,...) in rural matrix.

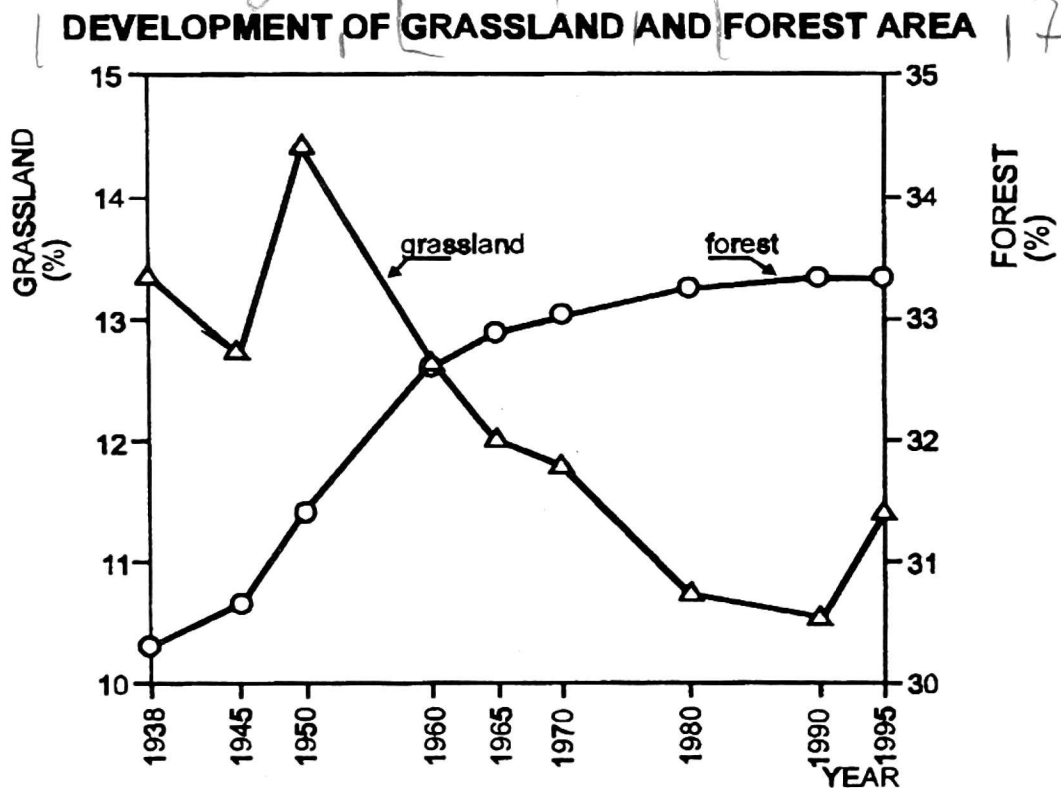
5 The organization of landscape structure has two aspects:

- preventive: land use in the form of permanent structures plays the role of retarding and retention zones in the basin. The reasonable dislocation of the permanent structures and their sufficient portion of the basin area prevent from the excessive runoff accumulation and intensive water erosion;
- stabilizing: the portion of permanent structures in flooding area should accept probability of overbanking and level of protection of surroundings.

During fifty years passing interruption of the logical landscape development the amount of hectares of meadows and pastures (grassland) rapidly decreased (-

21.3 %). In comparison with that is the increase of the forest area (+10.1 %) [1] in the same period (fig. 1).

Fig.1 Development of permanent structures in Czech republic between 1938-1995



The sum of both of these categories (grassland and forest) increased about 1.1 % (84 000 hectares) between the years 1938 and 1997.

However very serious result of this development is an apparent reduction of fragmentation of land use (i.e. landscape heterogeneity) [2], [3].

Material, methods and conclusions

If we can exactly evaluate space changes of the permanent structures acreage in the area of the Czech republic very easy, the exact quantifying of the decrease of landscape heterogeneity for the same area is almost impossible. That is why I evaluated both of the factors in the case study. The model area (800 ha) is located in North Bohemia (Obora, District Louny). The fig. 3 shows dislocation of the permanent structures in two time levels - 1938 (before collectivization) and 1997 (after 50 years of collectivization). The decrease of meadows portion along the river (Ohre) is very remarkable and serious. These two time levels are characterized by following values of the attributes:

LANDSCAPE ATTRIBUTE	1938	1997	DIFERENCE [%]
area of grassland [ha]	131.5038	62.5831	-52.4
area of forest [ha]	25.6238	27.2652	+6.6
sum of permanent structures [ha]	157.1276	89.8483	-42.8
number of permanent structures	45	28	-37.8
average area of perm. structure element [ha]	3.4917	3.2089	-8.0
total length of „active edges“ [km]	45.6	29.5	-35.3
total number of plots	1550	605	-61.0
average area of plots [ha]	0.5161	1.3223	+158.8

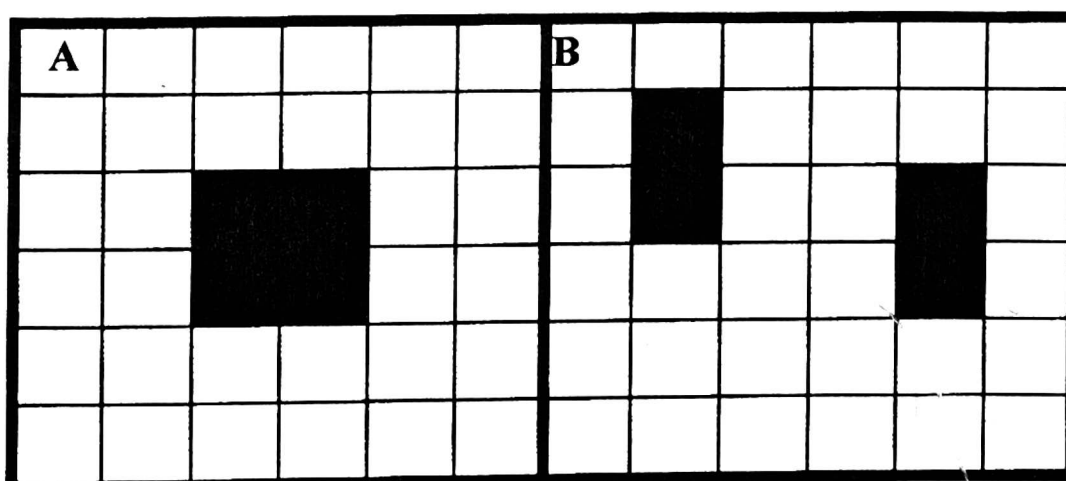
Explanatory note:

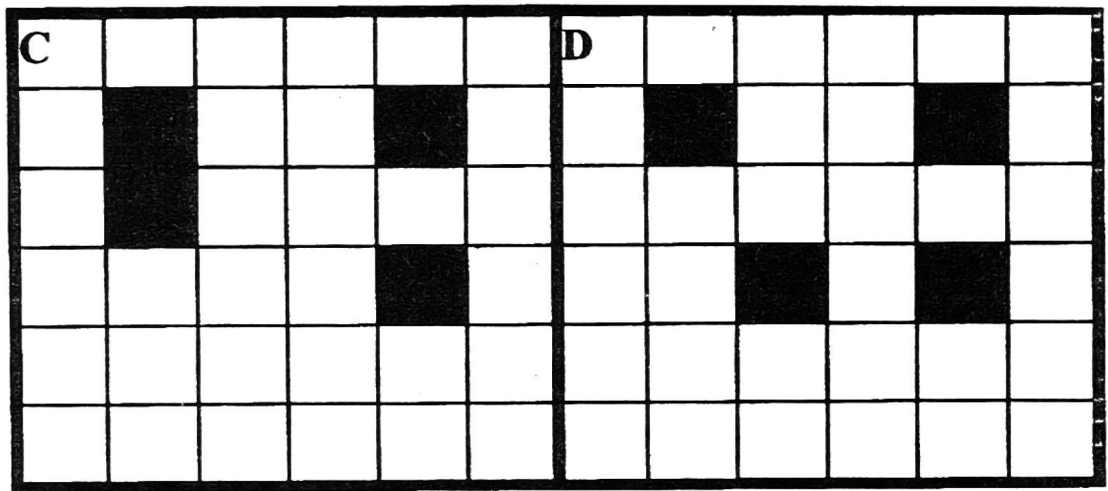
The values were obtained by GIS method (Topol for Windows, version 4.001).



„active edges“ - boundaries between permanent structures and matrix (arable land)

There is a relevant coincidence between the landscape-ecological principles and principles of the water sustainable management. The fig. 2 shows dependence of the factor „length of active edges - LAE“ on the „number of permanent structures elements - NPSE“. „Total area of permanent structures - TAPS“ is constant. AAPS is average area of permanent structures.

Fig. 2 Scheme of dependence of LAE on NPSE





 element of perm. struct.
  matrix (arable land)

size of unit square = 100 x 100 m = 1 ha

A LAE = 0.8 km
 NPSE = 1
 TAPS = 4 ha
 AAPS = 4 ha

B LAE = 1.2 km
 NPSE = 2
 TAPS = 4 ha
 AAPS = 2 ha

C LAE = 1.4 km
 NPSE = 3
 TAPS = 4 ha
 AAPS = 1.33 ha

D LAE = 1.6 km
 NPSE = 4
 TAPS = 4 ha
 AAPS = 1 ha

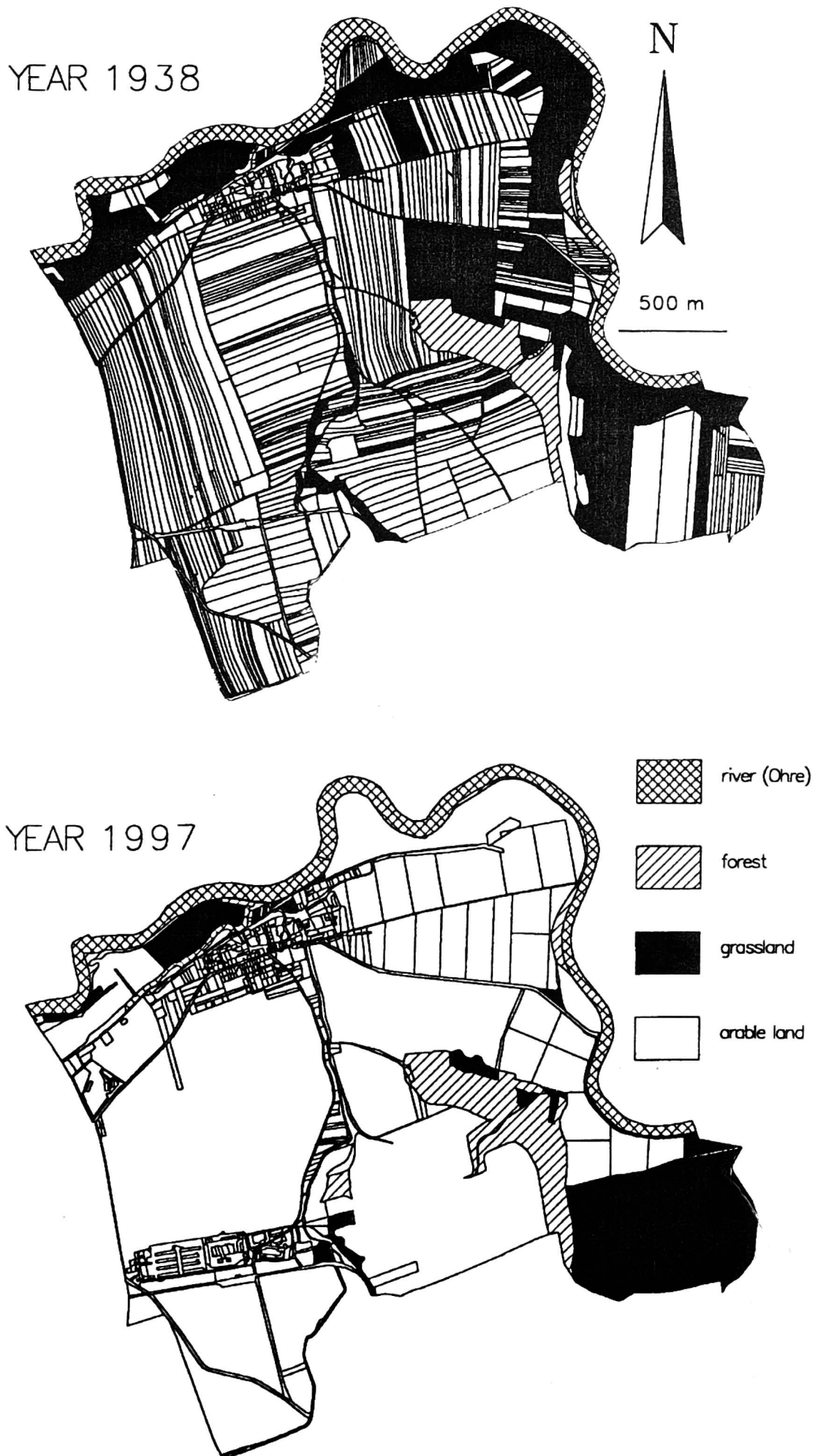


Fig.3. Dislocation of the permanent structures in two time levels - 1938 (before collectivization) and 1997 (after 50 years of collectivization)

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Summary

Organization of landscape structure is one of the most effective factors determining water management of rural areas. The problem should be understood in the landscape-ecological context. The organization of landscape structure has two aspects:

- preventive: land use in the form of permanent structures (forests, meadows, pastures, etc.) plays the role of retarding and retention zones in the basin. The reasonable dislocation of the permanent structures and their sufficient portion of the basin area prevent from the excessive runoff accumulation and intensive water erosion
- stabilizing: the portion of permanent structures in flooding area should accept probability of overbanking and level of protection surroundings.

Until 1950 the acreage of permanent structures and their dislocation in the matrix of rural area had been developed by long-termed opinions of the generations of farmers. During fifty years passing interruption of the logical development the amount of hectares of meadows and pastures had rapidly decreased (-21.3%). In comparison with that is the increase of the forest area (+10.1%) in the same period. Very serious result of this development is an apparent reduction of fragmentation of land use (i.e. landscape heterogeneity).

The contribution shows the practical example of the dislocation of permanent structures (quantitatively expressed in a graphic version) in rural area surrounding the river Ohre (North Bohemia). The development of the area is divided in two time levels - 1938 and 1997.

The permanent structures are the natural landscape elements reducing the runoff on the basin, increasing its infiltration and accumulation which also contribute to the ecological stability of the rural area.

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