

LANDUSE CHANGES IN THE LAST DECADES IN THE FALCIU ELAN HILLY AREA

Daniel Condorachi

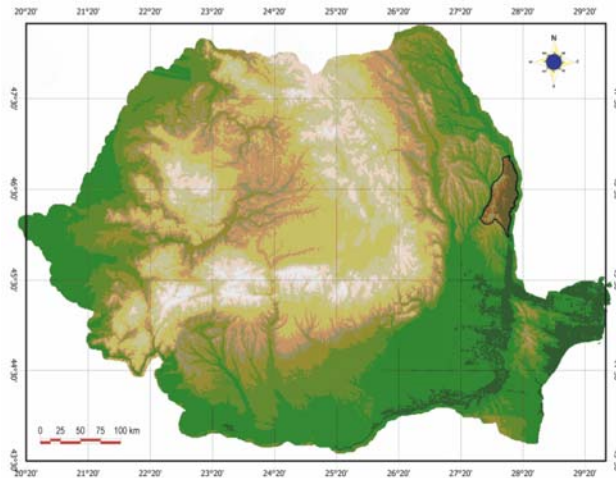
Abstract

Landuse has well-known dynamics. Most of them are dictated by human socio-economic needs but also by actual geomorphologic processes, climate, soil properties, etc. All these changes can be tracked using different cartographic sources, starting with topographic maps and, recently, with the aid of GIS and satellite images. Below is an analysis of these landuse changes since 1975 until present with a brief review for past centuries.

Key words: landuse dynamics, GIS/RS, Corine Land Cover, social and political changes.

Introduction

The study area was the topic for my Ph.D. thesis which was finalised in summer 2004. This region is situated in the eastern part of Romania between 45°58' and 46°52' north latitude and between 27°38' and 28°18' east longitude. It is a part of the Moldavian Tableland and its smaller subdivision of Bârlad Tableland.



This hilly region has a fragmented topography and is located within a temperate continental climate with excessivity trends. There are some particular features about landuse dynamics over past centuries connected with, among other issues, historical conditions and population density.

Forested areas largely shrank in the past two centuries due to socio-economic system influence. Arable land compensated this forest dwindle and today is the main feature of the landscape except the western hilly longitudinal axis of the area (the Fălciu Hills) in which forest

is still characteristic. Arable land use has undertaken deep transformations after 1950, by socialist cooperativisation, with specialised land exploitation, according with pedoclimatic potential. It is visible the extent of permanent plantations, often within large complex land uses, according with the topographical conditions and, at the same time, dramatic losses in grassland and pasture land. The latter, especially in the large major river beds of Prut and Bârlad.

Recent law for former landowners reinstation produced and still produces deep alterations within land use structure with the tendency to recreate old traditional agrarian structures (multicrops associated with extensive animal breeding) along with some areas of specialised agriculture especially in north, south and south-east part of the area in order to satisfy urban needs (some farmland companies).

Research methodology

For past centuries there were used data from historical, geographical, statistical or general papers, monographies and some old cartographic materials. Most of these data were synthesized (V. Băican, 1996) especially for forests. Some more precise information can be extracted since the end of the 18th century (scales 1:288,000 – F.G.Bawr map – 1769-1772, 1:420,000 - russian map – 1828-1829, 1:200,000 – topographic maps – 1915). The measurements were made with a polar planimeter.

GIS exploitation of these old maps is quite difficult regarding the variety of projections used, which are hard to define in a GIS, various scales of drawing etc.

The use of GIS for land use was made with proper quality on topographic maps of Romania (ed. 1972-1974) at scale 1:50,000 and at scale 100,000 (ed. 1996). Additionally, we used satellite imagery from LANDSAT 5 and 7 (1987, 1990, 1996, 2000, 2001) and SPOT (1996, 1997) on which EEA Corine Land Cover methodology was used.

The software we used is TNTMips v. 6.3 and 7.0 from Microimages Inc. (Lincoln, NE, USA) which helped us to make the analysis and layouts.

Results

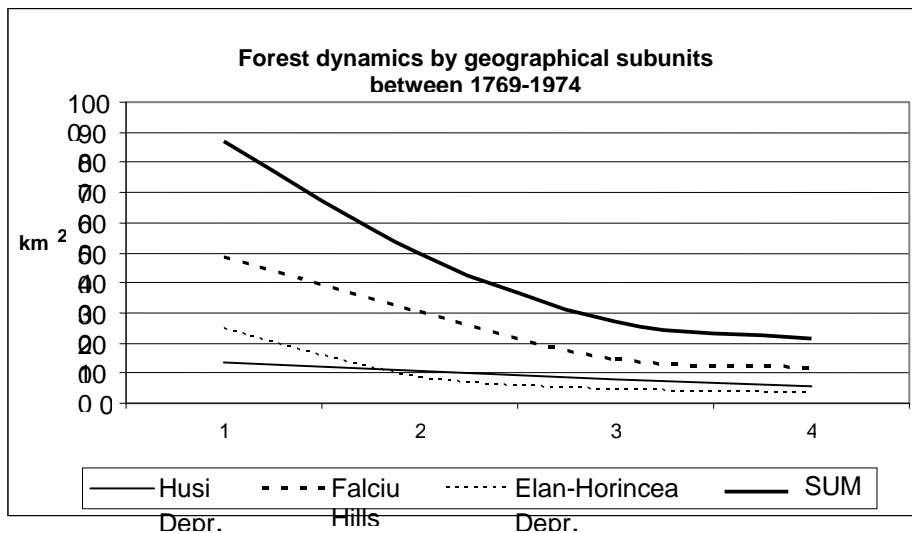
From topographic maps we have made several layers with the land use types (polygons with topology) and mostly visual interpretation for satellite imagery according with EPA Corine Land Cover methodology. For Elan drainage basin we have made the layer for the year 2000 (in 2003), completed recently for the entire area with the published shapefile from EEA web site (Corine land cover, Romania, DDNI, 2004). Some errors were identified, corrected and were sent to EEA for validation. The same thing was done for 1990 CLC shape file.

Historically, the forest was the most affected. Causes were different like: getting new areas for crops, tribute for the Otoman Empire (timber), some manufacturing to obtain "potasă" by burning trees, wood crafting, street paving, even laws which encouraged the extension field crops etc.

In the table and the graph below are illustrated the results of these measurements, sliced on geographic subunits and drainage basins.

Table. no.1. The evolution of forested areas by geographical subunits between 1769-1974 (sqkm and %) (after V. Băican, 1996)

Geographical subunit	Total surface (km ²)	Drainage basin	Total surface (km ²)	Forested areas							
				1769-1772		1828-1829		1915		1972-1974	
				km ²	%	km ²	%	km ²	%	km ²	%
1	2	3	4	5	6	7	8	9	10	11	12
Moldavian Central Tableland	461,2	<i>Prut</i> Huși Depression	461,2	133,51	28,95	105,42	22,86	80,0	17,35	59,2	12,84
Fălciu Hills	600,0	<i>Bârlad</i>	451,2	359,90	79,76	196,38	43,52	76,0	16,84	53,6	11,90
		<i>Elan</i>	148,8	124,11	83,94	108,41	70,84	70,0	47,04	67,6	45,43
		SUM	600,0	484,01	-	304,79	-	146,0	-	121,2	-
Depresiunea Elan-Horincea	1171,2	<i>Prut</i> <i>Sărata-Elan-Horincea</i>	1171,2	251,32	21,46	86,64	7,40	43,6	3,72	33,2	2,83
GENRAL SUM	2232,2	-	2232,2	868,84	-	496,85	-	269,6	-	213,6	-



There can be noticed the dramatic decrease of the forested areas which had the well known consequences upon soil and relief, with the whole pack of degradation processes.

In order to illustrate actual state of the landuse structure there were processed data for the villages in the studied area (I. Muntele, 1996) and was made a hierarchical ascendent classification. For the whole area we can say that the most important changes were for the arable land while forested areas and other landuses remained relatively stable.

According with the above-mentioned author there can be identified 4 types of landuse structure, relatively well contoured:

- *agricultural - with vineyard and berry trees specialisation*, well delimited in the east part of the area (Prut valley – Huși area, and along the Lohan cuesta).

- *agricultural, forest in subsidiary*, specific especially in NW half of the studied area, with lower altitudes and some forests (15-20%, on average) and with arable land and pastures.

- *agricultural, with some vineyard and berry trees specialisation*, is the most extended, especially in central – south areas and cover almost entirely the Fălciu Hills.

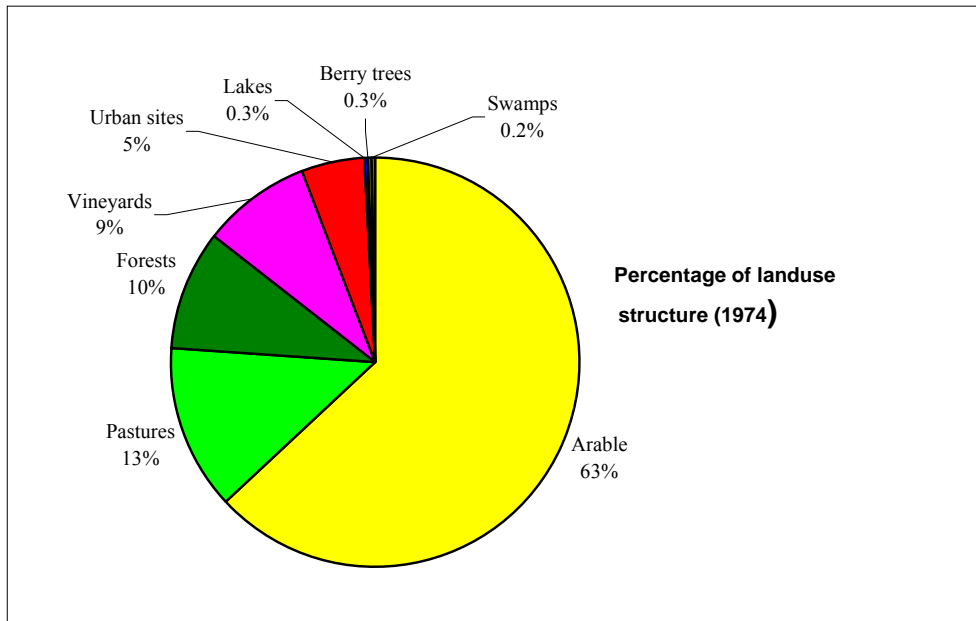
- *largely agricultural*, especially in lower areas (Elan and Huși Depressions) then in the hilly areas, almost completely deforested from the south part of the Fălciu Hills.

Arable land can reach 65-70% on average, with a maximum of 91,8% at Berezeni village. Some of the areas were irrigated, facilities partially abandoned after 1990.

Landuse structure extracted from topo maps scale 1:50,000 (ed. 1972-1974) has the following distribution:

Table no.2. Landuse structure in 1974

Landuse	Surface (km²)
Arable	1,384.140
Urban surfaces	108.158
Lakes	7.089
Berry trees	6.624
Swamps	4.144
Forests	211.650
Pastures	288.867
Vineyards	188.758
SUM	2,202.832



By geographical subunits, in the same year the percentage of the landuse structure was the following:

- *Huși Depression* – had 58% arable land, 19% vineyards (the most extended surface in the whole studied area), pastures 10%, urban areas 7% (due to Huși city), forests 5%, berry trees only 15, smaller areas are occupied with lakes and miscellaneous.

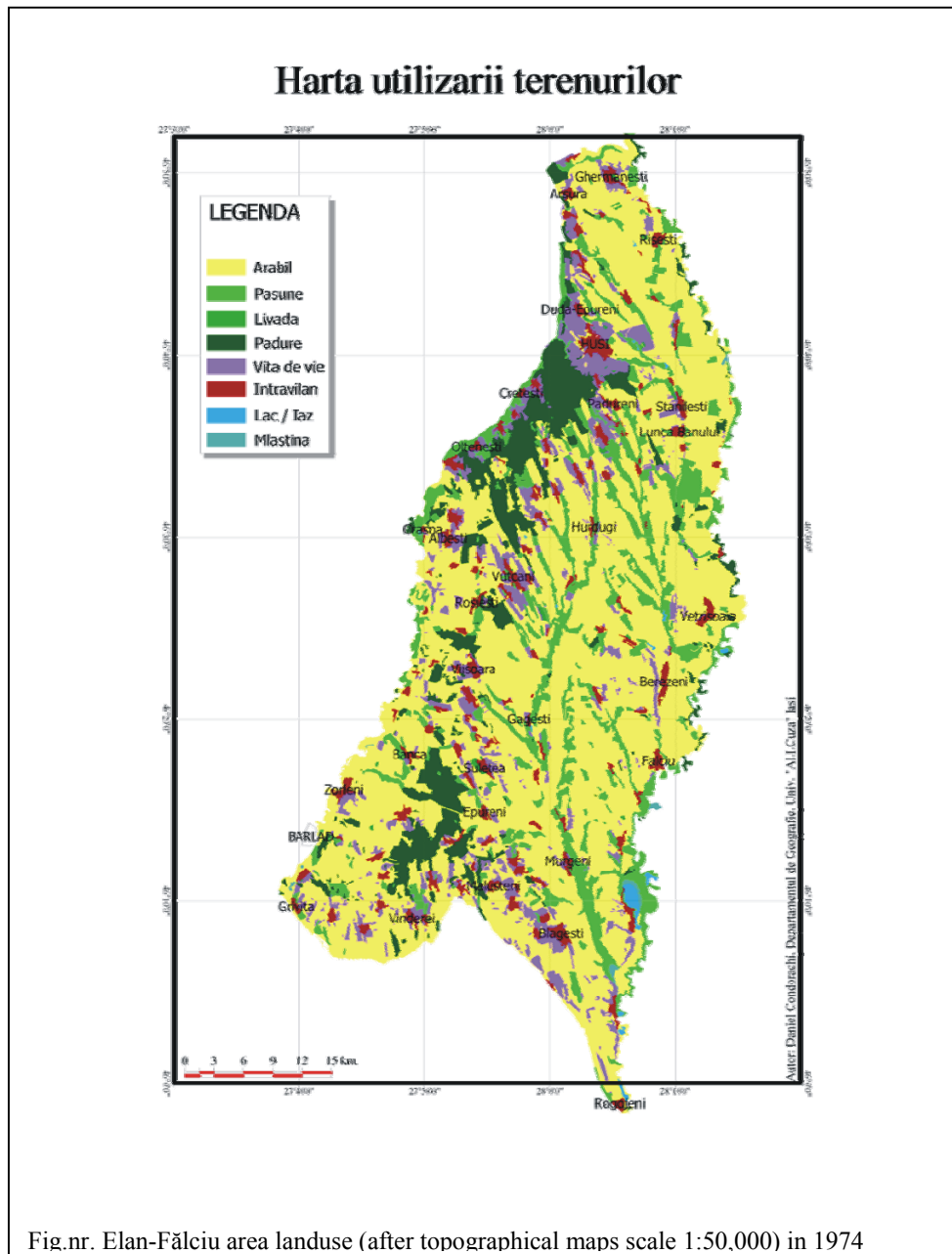
- *Elan Depression* – had 71% arable land, pastures 16%, vineyards only 7%, urban areas 4%, forests only 2%, other landuse types having a very low representation.

- *Fălciu Hills* – are also dominated by arable land (54%), forests have a higher percentage (24%), then is followed by vineyards (11%), pastures (6%) and urban areas (5%).

Regarding this percentage distribution, present landuse structure has undergone minor changes and was especially effective on arable land.

In order to point out the changes which happened from 1990 to 2000 we made a time analysis using EPA Corine Land Cover Project layers which were downloaded from the institution's site. The first layer was corrected of the errors within the studied area and were send to EPA headquarter vor validation. The second layer was partially interpreted and created by us (the Elan river drainage basin) within Ph.D. paper. The rest of the area was completed from the original downloaded file.

Below is presented a graphic with the dynamics of landuse within the last decade af the 20th century.



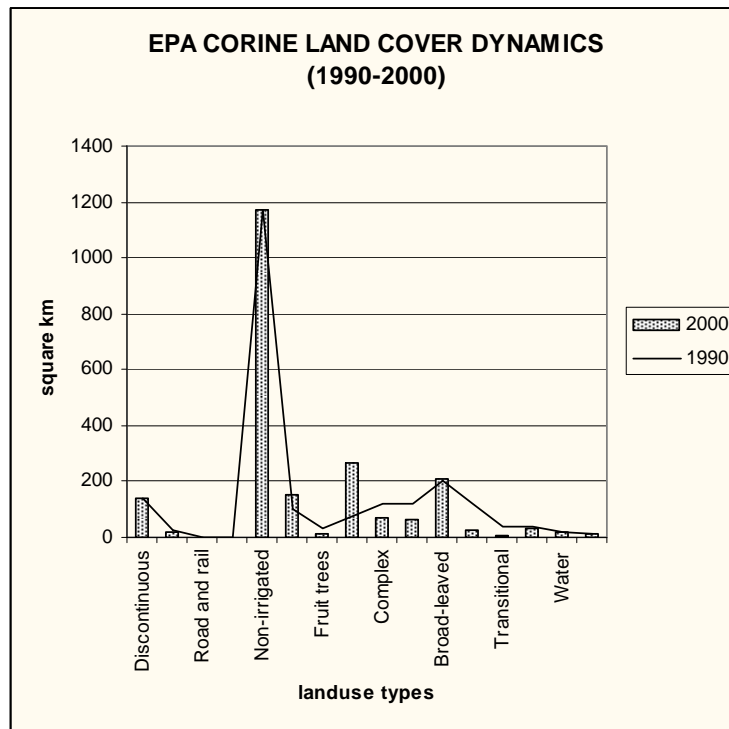
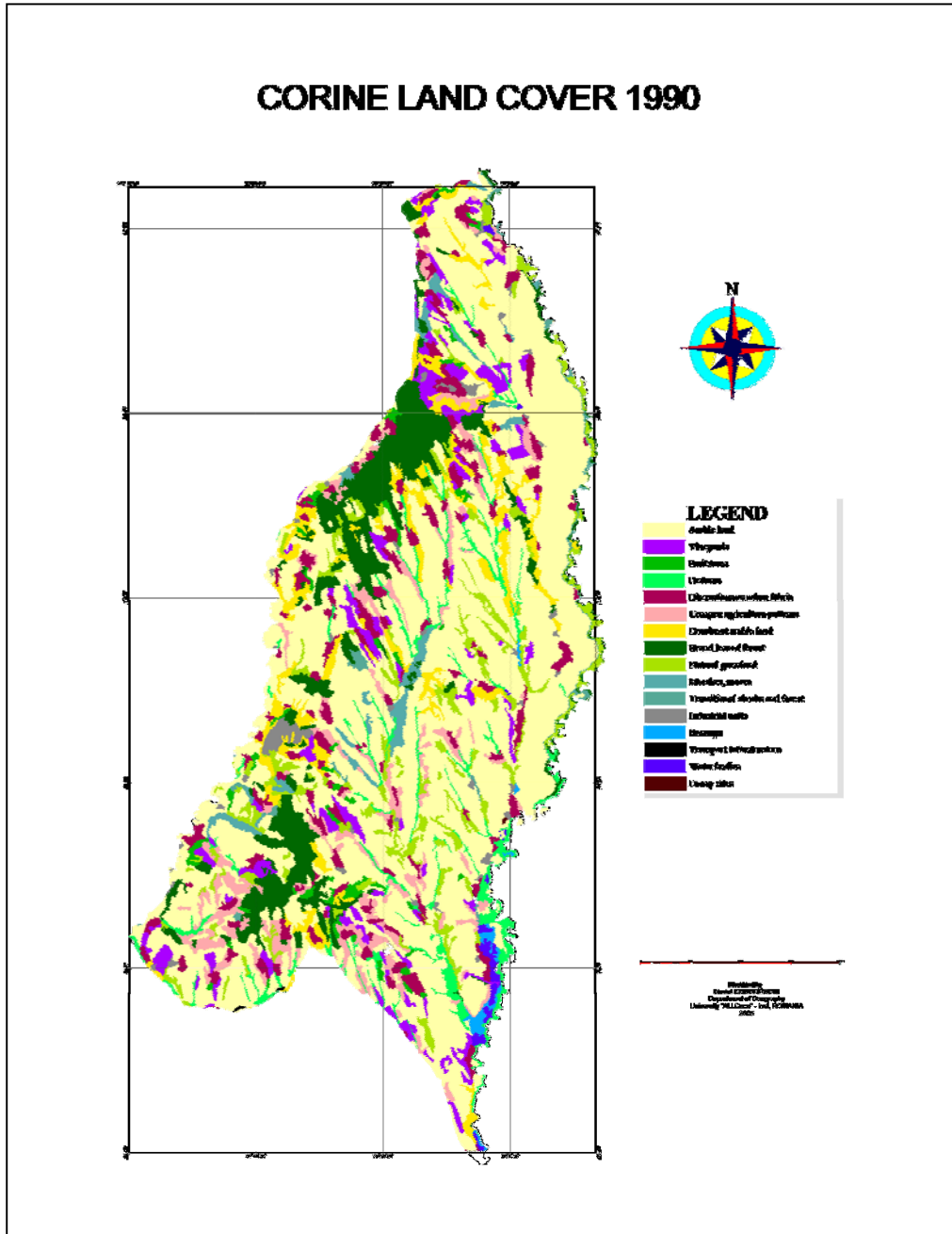
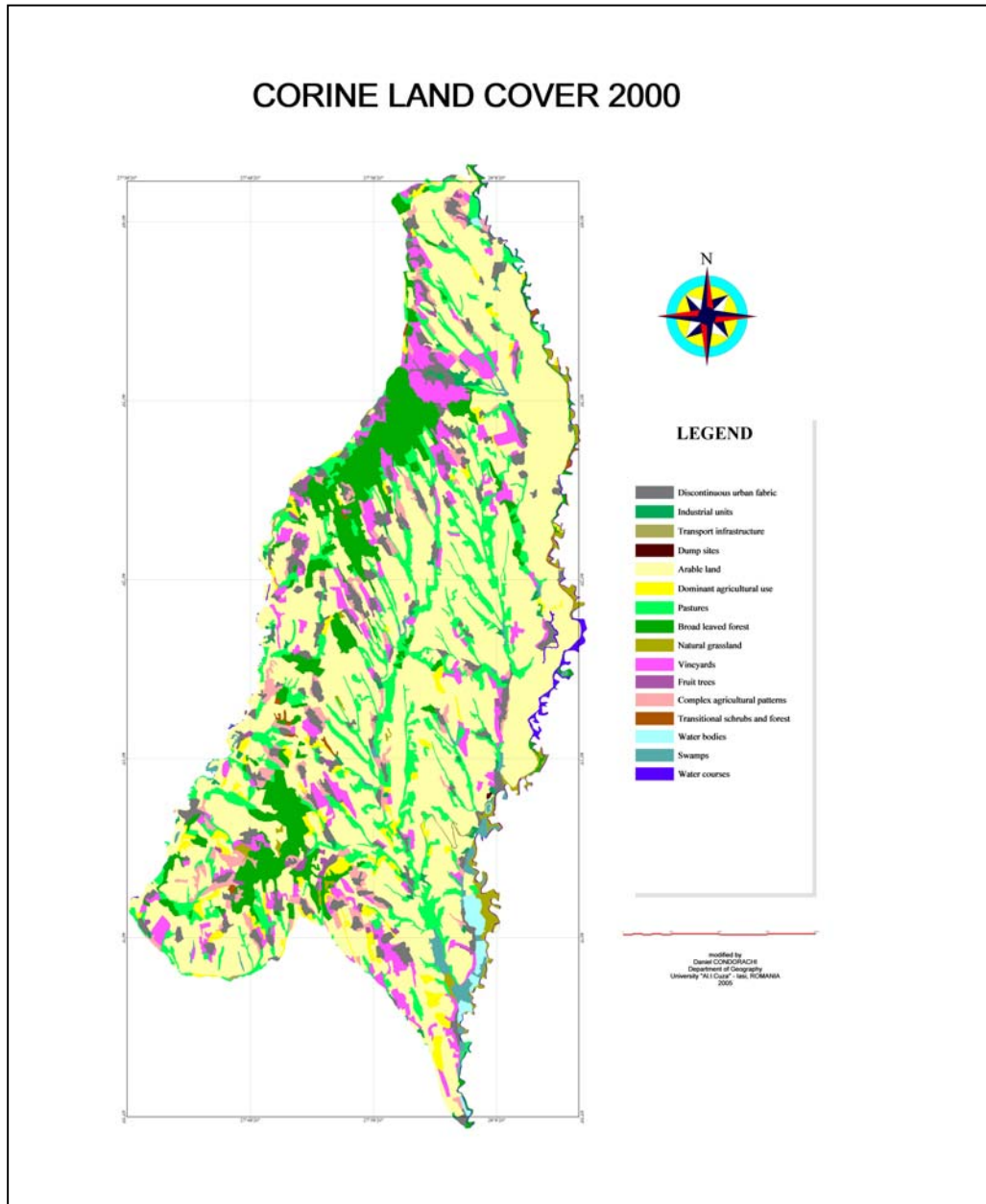


Fig. no. 3 Corine Land Cover dynamics in the Fălciu – Elan area (1990-2000) (modified)





LANDUSE TYPES	1990	2000
Discontinuous urban fabric	137.986	139.873
Industrial or commercial units	24.438	17.791
Road and rail networks and associated land	0.568	2.864
Dump sites	0.25	0.26
Non-irrigated arable land	1173.238	1169.466
Vineyards	102.43	152.968
Fruit trees and berry plantations	29.504	13.804
Pastures	77.452	263.531
Complex cultivation patterns	120.155	72.27
Land principally occupied by agriculture, with significant areas of natural vegetation	120.913	62.858
Broad-leaved forest	200.265	212.098
Natural grasslands	122.252	27.088
Transitional woodland-shrub	35.126	5.506
Inland marshes	35.126	34
Water courses	16.15	17.9
Water bodies	10.575	14.136
TOTAL	2206.428	2206.413

Conclusions

Historically, the forest was the most affected.

For the landuse structure, since 1974, it was made a hierarchical ascendent classification and can be identified 4 types of landuse structure (I. Muntele, 1996), relatively well contoured:

agricultural - with vineyard and berry trees specialisation, well delimited in the east part of the area (Prut valley – Huși area, and along the Lohan cuesta).

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Recent law for former landowners reinstation produced and still produces deep alterations within landuse structure with the tendency to recreate old traditional agrarian structures along with some areas of specialised agriculture especially in north, south and south-east part of the area in order to satisfy urban needs.

Most of the landuse dynamics was a sliding between arable and grazing land. There can

LUCRĂRILE SIMPOZIONULUI "SISTEME INFORMAȚIONALE GEOGRAFICE", NR. 12.
Anal. Șt. Univ. „A.I.I. Cuza” Iași, Tom LII, s.IIc. Geografie, 2006

be noticed a tendency of decreasing areas of fruit trees, vineyards and industrial facilities.

For the whole area we can say that the most important changes were for the arable land while forested areas and other landuses remained relatively stable.

An increased dynamics of the erosional processes, as former land reclamation and irrigation facilities began to decay or mismanaged.

Some tendency for agricultural companies to practice modern agriculture and replacing slowly the low-tech, self-consumption agriculture present in the studied area.

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