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## THE AGRICULTURAL LANDSCAPE – SPATIAL CHARACTERIZATIONS

### ABSTRACT

The agricultural landscape is a subject of analysis as a special kind of heritage, its multi-functionality generating individual and social welfare, as resource and asset for sustainable development. The dynamics of the agricultural landscape is the materialization of the land and economic policies and inherently of a social dynamics characteristic for the agrarian society over time; in other terms, we can consider that the agricultural landscape represents a social and juridical history of the rural area.

The agricultural landscape is a social construction, tributary to the natural environment, determined by a series of political and social processes. Within the agricultural landscape, the members of a rural community can meet their economic needs through the establishment of (resource-related) productivist relations or existential relations (related to the identity construction within the parameters provided by the collective memory).

The agricultural landscape can be also decoded through the political dimension: it reflects the economic/agricultural/land governance effects; it is a real lesson of the way in which the territory is politically managed and a concrete representation of the type of relationships that prevail in a certain period.

**Key words:** agricultural landscape.

**JEL Classification:** Q19, Q24.

### 1. INTRODUCTION

The agricultural landscape has a noticeable dynamics, imposed by the macro-structuring of the 1990s, by the exodus of the rural population of working age, influenced by the rate of changes of the main rural activity, agriculture.

Agriculture has a double role: main actor of landscape changes and beneficiary of landscape diversity. In the context of the Common Agricultural Policy objectives, the traditional agricultural landscapes are integrating part of the natural and cultural heritage, which determines the major interest in the cultivated landscapes subject to the preservation and protection process.

The entire agricultural landscape is characterized by territorial cooperation, both inside the farming activities and in the relational framework defined by agriculture and related activities. The possible threats, some of which have become

functionable, are focused on the agricultural landscape integrity, being concentrated in three directions: i) loss of local traditional farming practices; ii) soil change, intensification of farming practices and techniques; iii) climate change, loss of biodiversity and agro-biodiversity. The analytical perspective can be completed by decoding the many positive and negative effects produced by farmland utilization modality and agricultural practices.

## 2. STATE OF KNOWLEDGE

In the literature, the agricultural landscape is a capital for farmers, being the result of their work and knowledge, including those generated by previous generations (*Concevoir son batiment agricole avec le paysage-Guide pratique. Enjeux et recommandations-22 mars 2015, Becanson*). The operational definition of the agricultural landscape, as seen by Deffontaines and Prigent (1987), is founded on the hypothesis that this type of landscape represents the support of the original information referring to the functioning and dynamics of systems.

The visual indicators of the agricultural activities are the landscape elements or combinations of these, relevant for the specific aspects of the agrarian system functioning and evolution, mainly those implemented and consequences of the technical operations achieved by farmers. We can distinguish 6 groups of visual indicators:

- land cover (type of vegetal cover and built-up area)
- farm practices (ongoing interventions or lack of past interventions)
- environment (characteristics of physical environment)
- agrarian structures (parcelling and built-up area configuration)
- environment (two-way relationships between the elements of the landscape and the connections established at distance)
- ownership (legal regime of land and buildings into ownership).

The conceptual perspective is amplified by the social dimension of agricultural landscape; within the agricultural landscape, the members of the rural communities can satisfy their own economic needs by establishing productivist relationships (linked to resources) or existential relationships (linked to the identity construction in the parameters offered by the collective memory) (Jouve, Ph., Cassé, M-C., 2000).

It becomes a “symbolical field in which the actors invest values, coming from collective representations, in which they project and identify themselves” (Fortin, M-J., Cagnac, C., 2002).

## 3. MATERIAL AND METHOD

The methodological idea is that, in certain spatial contexts (regional and local), in certain temporal sequences (1990, 1995, 2000, 2005, 2015), the evolution

of territorial structures was influenced by the convergent action of the economic and social fields.

*The methodological parameters* used in this approach are:

– complexity/simplification: the parameter that describes the measure in which each field (economic, human and natural) is produced, is accumulated and distributed/redistributed to the rural communities (to their territorial structures implicitly),

– resilience/fragility: the parameter identifying and describing the adaptability of the economic domain (with focus on farms) to the macro-social economic changes and fluctuations,

– connectivity/fragmentation: the temporal parameter establishing the various forms of integration and interlinking between the human domain and the other domains (Cavallo, A., Marino, D., 2014:174).

The set of *utilized methods* consisted of:

*Methods for data collection*: data collection was based on two instruments, the Commune Fiche (applied to the local councils of selected communes) and the Statistical Observation Fiche (applied to the county agricultural directorates).

*Processing methods*: Excel workbooks and files created in the SPSS processing program. As a comparative analysis was made of the agricultural landscape evolution, it was necessary to create cross tabulation and specific evolution indices; this methodological approach was imposed in order to demonstrate the extent to which the changes produced are the result of the convergent actions of the characteristic domains.

*Analysis methods*:

i) evaluations – its neutrality enables spatial (regional, local) contextualization and historical contextualization (the important moments in the transformation of the agricultural landscape).

Domain	Specific evaluation indices
Land	Utilization modality indices
Economic	Agricultural production indices by sectors and ownership forms
Social	Labour force employment indices
Legislative/institutional	Legislative efficiency indices

ii) comparative – it ensures the ample context for the analysis of the interactional mechanism between the determinative domains for the changes of agricultural landscape. The analysis is based on the evolution of indices specific for each domain in part; land utilization modality will represent the main element of cross tabulation.

*Data sources*: in order to obtain relevant data and congruent data series, local sources were used (local councils – formal documents and own records), county sources (agricultural and rural development directorates) and regional sources. These added to the statistical information coming from censuses (agricultural censuses inclusively) and structural surveys.

*Utilized instruments:*

1. The investigated commune fiche applied in the rural communities: Cazasu, Deleni, Izvoru, Bistreț, Balotești, Tureni, Porumbacu de Jos, Tureni.
2. The statistical observation fiche of the county applied in the counties: Brăila, Vaslui, Argeș, Dolj, Ilfov, Sibiu, Timiș.

#### 4. RESULTS AND DISCUSSIONS

The territory is under permanent process of spatial and qualitative restructuring, and the territorial reality becomes increasingly complex. The territory is the support of human existence, and on the other hand it is the framework in which different biological, physical and anthropic processes develop. Thus, the territory has natural components, identified with the natural environment, and social, economic, cultural components, identified with the anthropic environment, the two components being in permanent interaction.

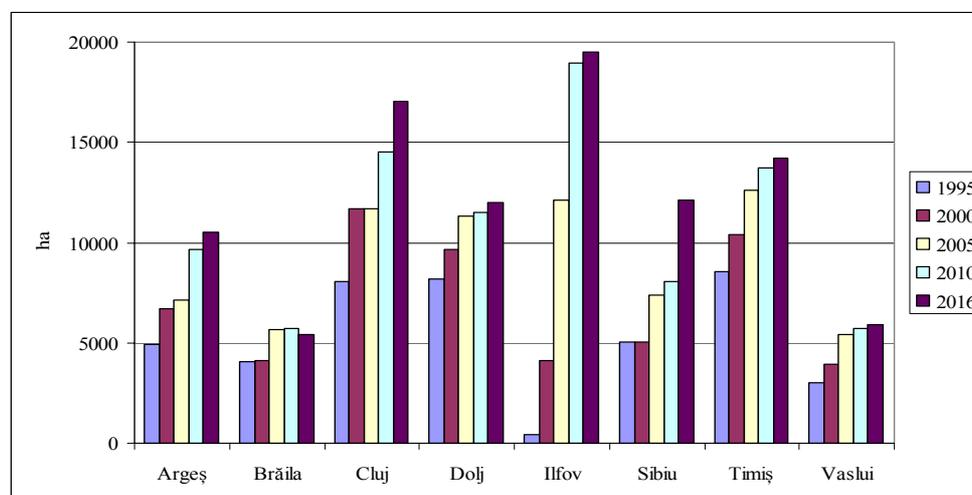
##### 4.1. AGRICULTURE – AGRICULTURAL LANDSCAPE DIVERSITY

A conclusive example of the territory modification is the impact of the ownership relations; in the period 2000-2014, the dynamics of the existing ownership relations in the agricultural space had determinative fluctuations in the reconstruction of the agricultural territory; the counties in which the share of agricultural ownership relations decreased are the following: Argeș (decrease by 6.16%), Cluj (4%), Timiș (2.13%), Brăila (1.19%), Vaslui (0.59%), Sibiu (0.18%), Dolj (0.05%). (Figure 1.)

The only county in which a percentage increase of these relations was noticed is Ilfov: 5.48%. While in legal terms this means the translation from the private ownership domain to the State public/private ownership domain, in reality this means the modification of the entire agricultural landscape.

The land utilization modality has changed lately, determining the increase of the natural landscape fragmentation. The main cause of natural area fragmentation is represented by: *conversion of land for urban expansion, transport infrastructure development, development of agriculture, industry and tourism.*

The continuous and fast urban expansion is threatening the ecological, social and economic equilibrium of a territory, producing modifications in the natural landscape. Thus, the two divisions categories of land utilization are the built-up area and land outside built-up area (unincorporated area). The built-up area is used for constructions, while the outside (unincorporated) area is mostly used for growing crops, being located outside the locality.



Source: NIS, www.tempoonline, TEMPO GOS102A.

Figure 1. Evolution of built-up areas in the 8 counties.

In a relatively short period, of just over two decades, the built-up area increased more than twice in the counties Sibiu, Argeș and Cluj. In Vaslui county, the built-up area increased almost twice, in Timiș county 1.7 times, in Dolj county 1.5 times, while in Braila county the built-up area increased 1.3 times. Ilfov county ranks 1<sup>st</sup> among the eight counties under analysis as regards the increase of the built-up area, taking into consideration that this was 46 times bigger in 2016 as compared to that in the year 1995.

This situation is explained by the fact that Bucharest, Romania's capital city, is located in Ilfov county, and this city is under continuous urban expansion. The localities around Bucharest were communes in the 1990s, while at present they are towns; in the year 1990 there was only one town in Ilfov county, while in the year 2017 there were 8 towns. The built-up areas of these towns, as well as of the communes in the compenonce of this county increased exponentially.

Table 1  
Evolution of the land fund in the 8 counties – ha

	1990	1995	2000	2005	2010	2014	2014/1990
Argeș county							
Total	682631	682631	682631	682631	682631	682631	0
Agricultural	345133	345035	344975	344879	341033	342347	-2786
Non-agricultural	337498	337596	337656	337752	341598	340284	2786
Brăila county							
Total	476576	476576	476576	476576	476576	476576	0
Agricultural	381204	381272	385996	388428	387363	388783	7579
Non-agricultural	95372	95304	90580	88148	89213	87793	-7579

Cluj county							
Total	667440	667440	667440	667440	667440	667440	0
Agricultural	424377	424355	423984	424453	426213	432835	8458
Non-agricultural	243063	243085	243456	242987	241227	234605	-8458
Dolj county							
Total	741401	741401	741401	741401	741401	741401	0
Agricultural	590073	588572	588944	585699	585469	585135	-4938
Non-agricultural	151328	152829	152457	155702	155932	156266	4938
Ilfov county							
							2014/2000
Total	-	182115	158328	158328	158328	158328	-23787
Agricultural	-	117372	113056	110184	102122	101453	-15919
Non-agricultural	-	64743	45272	48144	56206	56875	-7868
Sibiu county							
Total	543248	543248	543248	543248	543248	543248	0
Agricultural	307975	307974	307149	306192	305458	303619	-4356
Non-agricultural	235273	235274	236099	237056	237790	239629	4356
Timiș county							
Total	869665	869665	869665	869665	869665	869665	0
Agricultural	702424	702369	702326	701225	693417	691299	-11125
Non-agricultural	167241	167296	167339	168440	176248	178366	11125
Vaslui county							
Total	531840	531840	531840	531840	531840	531840	0
Agricultural	388704	387309	402205	401507	400984	400721	12017
Non-agricultural	143136	144531	129635	130333	130856	131119	-12017

Source: NIS, www.temponline, TEMPO AGR101A.

*The increase of the built-up areas in the 8 counties under analysis was the result of the diminution of areas outside the localities.* For a deeper analysis of the change of land destination, it is interesting to see how the land areas by the two great categories (built-up areas and unincorporated areas) evolved over time in the 8 counties under analysis, starting with the year 1990 until the present moment, the last available year in the official statistics being 2014.

There are counties where the agricultural area diminished (Argeș, Dolj, Sibiu and Timiș) and counties where this increased (Cluj, Brăila and Vaslui). Ilfov county is a particular situation, due to an administrative change. In 1996, (Law 24/April 12), the name of Ilfov Agricultural Sector was replaced by Ilfov County, and as a result of the application of Law 50/April 9, 1997, it passed into the category of counties, thus becoming the smallest county of Romania. This fact led to the diminution of its total area from 182115 ha to 158328 ha at present. Thus, major changes were also produced as regards land destination, the agricultural land of the county losing twice more of its area compared to the non-agricultural land.

The set-aside of areas from the agricultural circuit and their entering in the non-agricultural circuit:

– increase of areas under buildings, communications ways and degraded land: counties Argeș, Timiș and Ilfov;

– in Dolj county this was based on the increase of areas under forests and forest vegetation (85308 ha in the year 2014 as against 81547 ha in 1990), of those under buildings and of degraded areas;

– in Sibiu county the land area under buildings increased.

On the other hand, removing the land from the non-agricultural circuit and its entering in the agricultural circuit:

– in Cluj county, the areas under pastures and hayfields increased;

– in Brăila county, the arable area increased;

– in Vaslui county, the arable area and the land under pastures increased.

The land use for farming activities imprints essential specificities to the counties' territory.

– The land fund of *Argeş county* totals 682,631 ha, accounting for 2.8% of the country's area and 19.8% of the area of South-Muntenia development region. The agricultural area of Argeş county is 342,347 ha, out of which 50.8% is arable land, 28.5% pastures, 14.3% hayfields, 0.28% vineyards and 6.01% orchards. The agricultural area decreased by 0.81% from 1990 until 2015. The evolution of the agricultural land use experienced several changes in the investigated period: the area under vineyards decreased by 75.5% and the area under fruit trees by 29.1%, the arable areas increased by 0.8%, the area under pastures by 0.1% and the area under hayfields by 16.8%. The cultivated area of Argeş County decreased by 17,269 ha (by 10.09%). Fallow land represents 3.3% of total arable land, to reach 5,095 ha in 2015 from 236 ha in 1990.

– The land fund of *Brăila county* totals 476,576 ha, accounting for 2.0% of the country's area and 13.3% of the area of South-East development region. The agricultural area of Brăila county is 388,783 ha, out of which 90.2% arable land, 8.3% pastures, 0.02% hayfields, 1.17% vineyards and 0.17% orchards. The agricultural area increased by 1.9% from 1990 until 2015. The evolution of the agricultural land use over time suffered modifications in the period under investigation, the arable land area being the only category in which an increase was noticed (by 3.9%), in the remaining categories a decrease was noticed, namely: pastures by 7.02%, hayfields by 80.5%, vineyards by 32.6%, orchards by 54.08%. The cultivated area of Brăila county increased by 9152 ha (by 2.7%). Fallow land represents 1.1% of total arable land, reaching 5,556 ha in 2015 from 852 ha in 1990.

– The land fund of *Cluj county* totals 667,440 ha, accounting for 2.8% of the country's area and 19.5% of the North-West development region. Cluj county's agricultural area is 432,835 ha, out of which 42.1% arable land, 35.1% pastures, 21.5% hayfields, 0.06% vineyards and 1.05 orchards. The agricultural area increased by 2.0% from 1990 to 2015. The evolution of the agricultural land use was subject to changes in the analyzed period: the arable area decreased by 9.6%, the area under orchards by 47.0% and the area under vineyards by 78.6%; the areas under pastures and hayfields increased by 3.9% and by 41.08% respectively. Fallow land represents 49.1%, to reach 52,386 ha in 2015 from 726 ha in 1990, to the detriment of cultivated areas, which diminished by 47.3% (-95,991 ha).

– The land fund of *Dolj county* is 741,401 ha, representing 3.1% of the country's area and 25.3% of the area of South–West development region. Dolj county's agricultural area totals 585,135 ha, out of which 83.5% arable land, 11.8% pastures, 0.5% hayfields, 2.8% vineyards and 1.2% orchards. The agricultural area decreased by 0.84% from 1990 to 2015. The evolution of the agricultural land use changed over time: the area under pastures decreased by 6.3% and the area under orchards decreased by 40.4%; the arable area increased instead by 0.8%, the area under hayfields by 1.1% and the area under orchards by 5.2%. Fallow land represents 7.6%, reaching 32,585 ha in 2015 from 107 ha in 1990, to the detriment of cultivated areas, which diminished by 12.3% (-59,784 ha).

– The land fund of *Ilfov county* is 158,328 ha, representing 0.6% of the country's area and 86.9% of the area of Bucharest-Ilfov development region. Ilfov county's agricultural area is 101,453 ha, out of which 96.6% arable land, 1.8% pastures, 0.06% hayfields, 0.8% vineyards and 0.6 % orchards. The agricultural area decreased by 15,919 ha in the period 1990–2015, in favour of non-agricultural land and land intended for constructions. The evolution of the agricultural land use was subject to changes over time: the arable areas diminished by 11.1%, pastures by 24.3%, orchards by 74.9% and vineyards by 60.4%, while the area under hayfields increased by 52.6%. Fallow land represents 5%, under decline, to reach 3,236 ha in 2015 from 8,757 ha in 1990. The cultivated area decreased by 31,818 ha (32.9%), under the background of the diminution of arable land area by 11.1%, this area entering the category of non-agricultural land occupied by constructions.

– The land fund of *Sibiu county* is 543,248 ha, representing 2.8% of the country's area and 15.9% of the area of the development region Centre. The agricultural area of Sibiu county is 303,619 ha, out of which 39.03% is arable land, 34.8% land under pastures, 23.5% land under hayfields, 0.9% land under vineyards and 1.66 land under orchards. The agricultural area decreased by 1.4% from 1990 to 2015. The evolution in time of the agricultural land utilization suffered certain modifications in the investigated period: the only category that increased was the arable land, by 1.9%, while the land areas in the other categories decreased: pastures by 1.2%, hayfields by 5.01%, vineyards by 24.5% and orchards by 13.1%. Fallow land represents 39.8%, to reach 29,110 ha in 2015, from 613 ha in 1990, to the detriment of cultivated areas, which diminished by 36.6% (-42,329 ha).

– The land fund of *Timiș county* is 869,665 ha, representing 2.8% of the country's area and 27.1% of the area of the development region West. The agricultural area of Timiș county is 691,299 ha, out of which 76.8% arable land, 17.1% land under pastures, 4.1% land under hayfields, 0.6% land under vineyards and 1.2% land under orchards. The evolution of the agricultural land utilization modality was subject to change in the investigated period: arable areas decreased by 3.3%, hayfields by 2.9%, land under orchards by 9.5% and vineyards by 28.4%, while the areas under pastures increased by 9.8%.

#### 4.2. INFRASTRUCTURE – CHARACTERISTICS AND IMPLICATIONS ON THE RURAL LANDSCAPE

As regards the *road infrastructure of the investigated counties*, we can notice that only one quarter of roads are national roads, yet their share is on the rise. An exception is Argeş county, where the share of national roads decreased in total roads by about 3%, which were taken over by the county and communal roads, whose length increased (Table 2).

In dynamics, in the period 1990–2015, the road network increased in percentages ranging from 3.3% (Brăila county) to 32.9% (Argeş county). The analysis of the period 1990-2015 reveals a strong increase of the length of modernized road network in the 8 counties, ranging from 16.2% (Argeş) to almost a three-fold increase in Brăila county (Table 3). The expansion and modernization process are mostly noticeable at the level of county and communal roads, where Vaslui and Brăila counties rank first in dynamics.

*Table 2*  
Structure of the road network in 2015 compared to 1990 (km)

County	1990			2015		
	Total	National roads	County and communal roads	Total	National roads	County and communal roads
Cluj	2447	14.0	86.0	2801	19.2	80.8
Sibiu	1485	17.3	82.7	1691	19.5	80.5
Vaslui	2098	18.2	81.8	2202	17.8	82.2
Brăila	1150	18.3	81.7	1188	22.2	77.8
Argeş	2660	19.2	80.8	3536	16.6	83.4
Ilfov				788	32.0	68.0
Dolj	2116	20.0	80.0	2432	19.4	80.6
Timiș	2858	18.7	81.3	3160	25.2	74.8

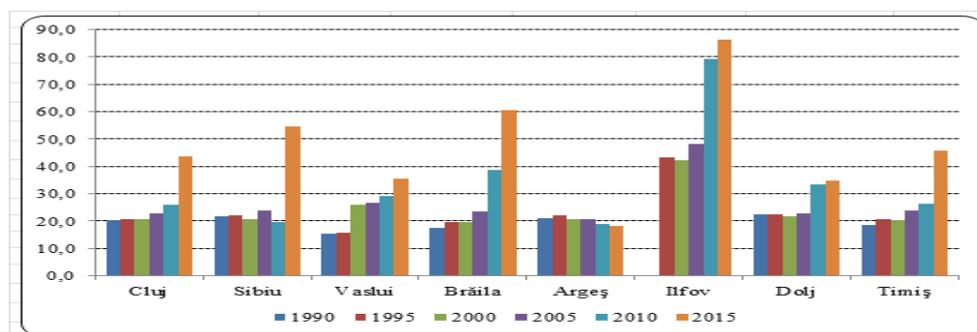
Source: Calculations based on Tempo-Online data, NIS, 2018.

*Table 3*  
Dynamics of the road network length in 2015 as compared to 1990 (%)

County	Total	Modernized	National roads	Modernized national roads	County and communal roads	Modernized county and communal roads
Cluj	14.5	144.6	57.6	62.8	7.5	266.5
Sibiu	13.9	187.9	28.0	32.1	10.9	726.4
Vaslui	5.0	145.8	2.4	8.0	5.5	7333.3
Brăila	3.3	255.9	25.7	45.6	-1.7	1057.1
Argeş	32.9	16.2	14.9	18.1	37.2	4.9
Ilfov	9.1	117.3	103.2	0.0	-10.4	126.5
Dolj	14.9	78.8	11.6	12.8	15.8	330.6
Timiș	10.6	172.3	49.3	110.3	1.7	324.0

Source: Calculations based on Tempo-Online data, NIS, 2018.

In the year 2015, the share of modernized roads in total roads ranged from 18.2% (Argeș) to 86.3% (Ilfov), these shares being on the rise compared to the year 1990 at county level, except for Argeș county (Figure 2).



Source: Calculations based on Tempo-Online data, NIS, 2018.

Figure 2. Evolution of the share of modernized roads in total roads in the period 1990–2015 (%).

While in the year 1990, the counties Cluj (498 km), Argeș (555 km), Dolj (472 km) and Timiș (531 km) were above the 414 km average of modernized roads, in the year 2015, as the result of different investment efforts, both as orientation and intensity, the average length of modernized roads reached 907.5 km, only three of the eight counties being above this average: Timiș (1446 km), Cluj (1218 km) and Sibiu (924 km). Out of the 8 counties, Argeș county followed a downward trend as regards the share of modernized roads in total roads, with around 3%. At the level of national roads, in the period 1990–2015 a visible road modernization trend can be noticed, with percentages that reached up to 100%. From this point of view, the counties Ilfov, Sibiu and Argeș are on the first two places, the modernization degree exceeding 90%, being followed at a short distance by the other counties (Table 4).

Table 4

Evolution of the length of national roads and of the share of modernized roads, in the period 1990–2015

Year	Category	Cluj	Sibiu	Vaslui	Brăila	Argeș	Ilfov	Dolj	Timiș
1990	National roads (km)	342	257	382	210	511	:	424	534
	% modernized	87.1	96.9	81.9	76.2	92.8		88.2	70.6
1995	National roads (km)	342	257	382	210	508	124	424	534
	% modernized	87.1	99.6	84.8	81.9	99.6		88.4	73.8
2000	National roads (km)	343	257	379	212	515	128	423	533
	% modernized	87.2	100.0	87.3	81.6	99.4	100.0	88.4	74.9
2005	National roads (km)	345	257	376	264	572	219	423	535
	% modernized	100	100	87.5	88.3	95.1	100.0	88.4	89.9
2010	National roads (km)	502	260	389	263	587	219	470	563
	% modernized	88.2	100.0	85.3	88.6	95.2	100.0	84.5	99.3
2015	National roads (km)	539	329	391	264	587	252	473	797
	% modernized	90.0	100.0	86.4	88.3	95.4	100.0	89.2	99.5

Source: Calculations based on Tempo-Online data, NIS, 2018.

Although under accelerated process of modernization, the share of modernized county and communal roads in total roads ranged from 2.9% (Argeş) to 79.9% (Ilfov), in the year 2015, except for Ilfov county, which has a series of specific particularities linked to neighbouring Bucharest municipality, Brăila county has the highest share of modernized county and communal roads in total roads, more than half being modernized roads (Table 5).

Table 5

Evolution of the modernized county and communal roads in total county and communal roads (%)

	1990	1995	2000	2005	2010	2015
Cluj	9.5	9.7	10.8	11.0	11.6	32.4
Sibiu	5.9	5.9	5.4	9.4	4.1	43.7
Vaslui	0.3	0.3	12.7	14.1	16.9	24.6
Brăila	4.5	6.0	6.1	5.1	24.7	52.6
Argeş	3.8	3.8	3.7	3.2	3.1	2.9
Ilfov		31.6	30.6	28.9	71.6	79.9
Dolj	5.8	5.7	5.5	7.0	21.1	21.5
Timiș	6.6	8.5	8.1	9.1	8.9	27.6

Source: Calculations based on Tempo-Online data, NIS, 2018.

The low investments in the railroad infrastructure resulted in the decline of the *length of the railroads* in most counties, from 0.4% (Vaslui) to 53.1% (Sibiu). In 3 out of the 8 counties, the railroad length slightly increased, yet not exceeding 3% (Table 6).

Table 6

Evolution of the railroad network in the period 1990-2015 (km)

	1990	1995	2000	2005	2010	2015	2015/1990 (%)
Cluj	259	259	232	240	240	240	-7.3
Sibiu	309	309	235	197	145	145	-53.1
Vaslui	250	250	250	258	249	249	-0.4
Brăila	168	168	168	174	158	158	-6.0
Argeş	225	225	225	227	227	227	0.9
Ilfov		182	182	181	180	180	-1.1
Dolj	221	221	221	226	225	227	2.7
Timiș	787	787	786	799	795	795	1.0

Source: Calculations based on Tempo-Online data, NIS, 2018.

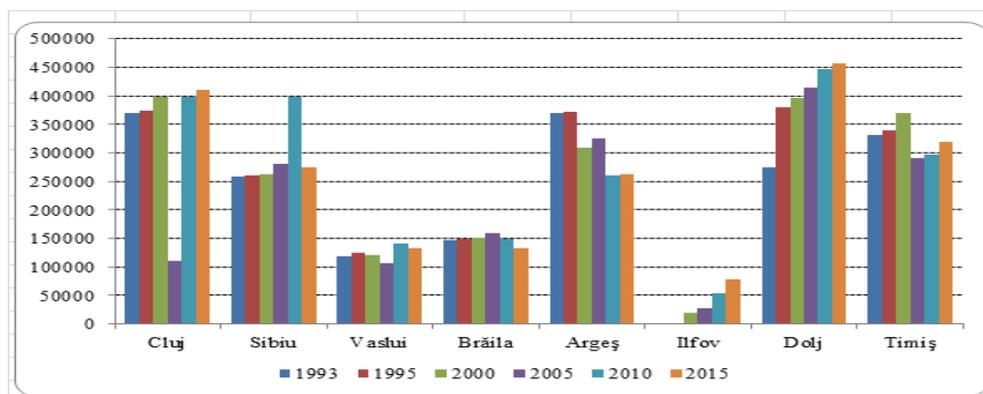
After 1990, a special focus of the investment process was laid on the extension of drinking water supply, sewerage and natural gas supply networks. In the year 2015, *the average length of drinking water network* in the 8 counties totalled 2058 km, the following counties being above this level: Cluj (2831.4 km), Argeş (3595.7 km) and Timiș (3191.7 km). Compared to the year 1990, the drinking water supply network length increased from 65.5% (Argeş) to almost triple (Timiș) (Table 7).

The extension of drinking water supply network was accompanied by the adjustment of drinking water production capacities. In this respect, compared to the year 1993, the first available statistical year, the capacity to produce drinking water increased in 5 of the 8 counties, while in the counties Brăila, Argeș and Timiș the drinking water production decreased. In the counties Brăila and Timiș, this decrease reached maximum 10 %, while in Argeș county the capacity to produce drinking water diminished by almost 30% (Figure 3).

*Table 7*  
Evolution of the drinking water supply network in the period 1990-2015 (km)

	1990	1995	2000	2005	2010	2015	2015/1990 (%)
Cluj	1443	1633.3	1782.6	1939.6	2501.3	2831.4	96.2
Sibiu	530.2	582.1	607.2	847.4	1092.4	1478.9	178.9
Vaslui	525	598.6	691.1	787.5	988.5	1129.4	115.1
Brăila	767.7	1056.7	1180.4	1154.3	1341.5	1270.3	65.5
Argeș	1019	1385.5	1613.4	1972.1	2861.8	3595.7	252.9
Ilfov	:	:	98.2	220.6	577.8	962.8	
Dolj	556.1	703	707.6	824.8	1646.8	2005.1	260.6
Timiș	1356.1	1482.9	1718.3	2027.9	2816.6	3191.7	135.4

Source: Calculations based on Tempo-Online data, NIS, 2018.



Source: Calculations based on Tempo-Online data, NIS, 2018.

Figure 3. Evolution of the drinking water production capacity, in the period 1993-2015 (m<sup>3</sup>/day).

The drinking water supply network modernization, having also in view the diminution of losses in the network, which added to consumption diminution as a result of price increase, led to the decrease of the water quantity supplied to consumers by up to 79%, with oscillations across counties, except for Ilfov county, where the amount of supplied water significantly increased in the period 1995-2015.

Although throughout the period 1990-2015, the quantity of water supplied to population followed the same strong decreasing trend, the water supplied to the

population's households increased in percentage terms compared to the industrial users. Thus, the share of water quantities supplied to the population increased by 33% on the average in each county, while the counties Sibiu, Argeş and Dolj were above this level (Table 8).

In the context of drinking water supply network modernization and expansion, and also out of the need to protect the environment and collect the wastewater, *the sewerage network* was subject to a noticeable expansion process in the period 1990-2015, with oscillations ranging from 44.9% (Vaslui) to 216.1% (Sibiu) in the year 2015 versus 1990 (Table 9).

A significant development rate can be also noticed in the *natural gas supply network*. Thus, at county level, in the year 2015, the counties Cluj, Ilfov, Timiş and Sibiu summed up about 75% of the total length of the natural gas supply network from the 8 counties, following an increasing trend compared to the year 1990.

Table 8

Evolution of water quantity supplied to consumers, out of which for household use, in the period 1990-2015

An	Consumption /% household use	Cluj	Sibiu	Vaslui	Brăila	Argeş	Ilfov	Dolj	Timiş
1990	Total thousand m <sup>3</sup>	95336	66139	29189	48831	95327		76334	87236
	% household use	51.0	34.9	49.8	52.1	50.2		38.3	48.6
1995	Total thousand m <sup>3</sup>	99296	44721	17379	41373	76579	3156	59770	74321
	% household use	63.7	52.2	79.6	73.3	74.4		17.8	53.9
2000	Total thousand m <sup>3</sup>	73912	35354	16504	29499	57449	3765	42995	69460
	% household use	71.8	67.1	83.0	85.4	92.5	87.5	73.3	45.7
2005	Total thousand m <sup>3</sup>	23563	35874	9248	15297	28909	6070	49593	39368
	% household use	81.6	60.4	71.1	75.2	61.4	84.7	51.9	73.3
2010	Total thousand m <sup>3</sup>	48797	29713	8619	13263	24988	6386	46093	34228
	% household use	76.4	77.7	71.5	69.3	73.0	82.6	73.6	75.5
2015	Total thousand m <sup>3</sup>	32502	21092	8632	10457	21889	8339	27370	32971
	% household use	75.3	73.5	79.9	78.2	83.6	84.0	95.2	71.1

Source: Calculations based on Tempo-Online data, NIS, 2018.

Table 9

Evolution of the sewerage network length in the period 1990-2015 (km)

	1990	1995	2000	2005	2010	2015	2015/1990
Cluj	536.3	571.6	614.6	653.1	903.6	1270.6	136.9
Sibiu	356.1	373.9	392.6	442.7	661.4	1125.5	216.1
Vaslui	300.6	338.4	350.2	368.8	490.3	435.5	44.9
Brăila	212	257	280.3	264.4	307.7	328.8	55.1
Argeş	404.5	620	626.3	724.7	877.7	734.9	81.7
Ilfov	:	76.3	122.1	277	436.8	804.3	
Dolj	437.8	502.8	514	539.2	565.4	712.4	62.7
Timiş	488	525	556.4	727.4	941.5	1215.8	149.1

Source: Calculations based on Tempo-Online data, NIS, 2018.

It can be noticed that the most accelerated expansion of the natural gas supply network comes from Vaslui county, from 5.6 km (1990) to 354.8 km in 2015. Although Sibiu is on the top list of counties with a developed natural gas supply network, its expansion dynamics is only 87.2% (Table 10).

Table 10  
Evolution of the natural gas supply network in the period 1990-2015 (km)

	1990	1995	2000	2005	2010	2015	2015/1990 (%)
Cluj	901.4	1102.2	1364.6	1532.1	2104.6	2631.6	191.9
Sibiu	804	936.9	1120.1	1264.6	1418.2	1505.3	87.2
Vaslui	5.6	56.2	106.8	181.8	259.3	354.8	6235.7
Brăila	107.8	132.7	272.2	327.4	367.2	456.9	323.8
Argeș	284.2	351	520.9	697.1	957.9	1195	320.5
Ilfov	:	59.5	276.3	767	1811.2	2032.7	
Dolj	248.8	310	399.7	508.2	647.1	678.3	172.6
Timiș	238.4	275.2	609.9	1055.4	1463.6	1661.6	597.0

Source: Calculations based on Tempo-Online data, NIS, 2018.

Except for the counties Vaslui, Argeș and Timiș, the quantity of supplied natural gas followed a diminution trend in the period 1990-2015, motivated, among others, by the re-orientation towards alternative fuel sources, as a result of natural gas price increase, correlated with the level of population's incomes, but also with the decline of consumption at the level of economic operators (Figure 4).

The diminution of the total quantity of natural gas supplied, by percentages oscillating from 57.8% (Timiș) to 93.8% (Brăila) is also the result of deep changes in the local economies structure, of the process of privatization of the big economic units and of the re-orientation towards less energy intensive industries.

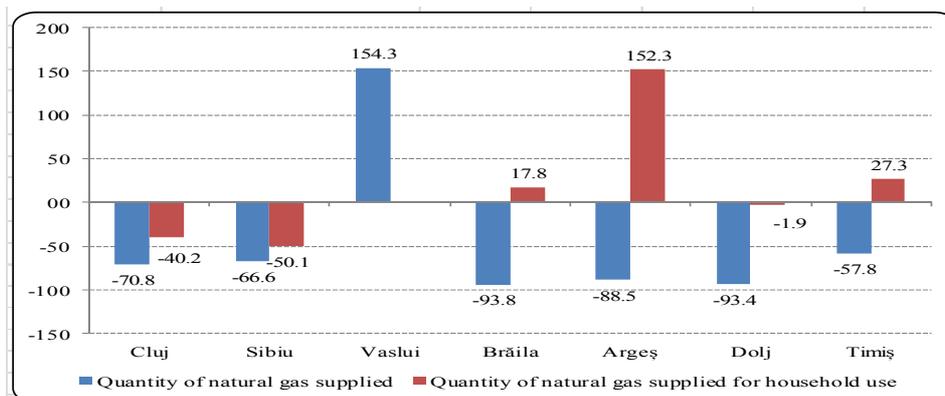


Figure 4. Dynamics of the natural gas volume supplied, in the year 2015 compared to the year 1990 (%)

Summing up the above analyzed aspects, we can state that the technical infrastructure is under continuous modernization process, with direct effect upon

the local development level. However, there are still significant gaps at local level, motivated either by the non-existence of sufficient financial sources at local level, or by the opportunity of investments in certain areas.

The need to expand the technical infrastructure, mainly in the case of public utilities, must take into account, among others, the capacity of citizens to bear the connection and utilization costs. On the other hand, the expansion and modernization of the technical infrastructure is part of the overall economic development process, generating jobs and added value, by reference to the economic activities that can be developed locally and regionally.

## 5. CONCLUSIONS

The evolution of agriculture and rural infrastructure determined the re-configuration of the agricultural and rural landscape. The agricultural landscape changes its own functional significances according to the diversity of territorial actions and to the farmland use modalities. The fundamental element between man and land has changed its own contents and manifestation forms due to the cultural knowledge associated to traditions, traditional practices specific for the local groups, and innovating cultural significance. This is a resilient mobility of the agricultural landscape and a reflection of the social history.

Infrastructure, through modernization and development, has induced changes in the agricultural landscape, and has equally promoted behaviours and attitudes of cultural revalorization of the entire space occupied by the rural communities.

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