

FORESTS FROM THE WEST PLAIN FOREST STEPPE – AN ALTERNATIVE FOR AGRICULTURE?

Lucian DINCĂ¹, Voichița TIMIȘ-GÂNSAC²

e-mail: dinka.lucian@gmail.com

Abstract

The present paper has taken into account data from forest management plans realized for 13 national Forest Districts during 1995-2008 for all forests located in the West Plain. The following elements were analysed: the surface occupied by oak stands, the species that compose them, age, field slope, altitude, flora and forest type, soil and station type. The study has shown that forests from the 3^d Subcategory (Forests with protection functions against harmful climate and industrial factors) occupy a total surface of 7059 ha in the West Plain. Amongst them, the first place is occupied by the 1-3A functional category Forest steppe (situated between the steppe and silvosteppe area with the exception of parks and meadow forests) covering 3911 ha. Pedunculate oak (*Quercus robur* L.) is the most widespread species in these forests, occupying a surface of 2770 ha (71% of the entire surface). Oak forests from the forest steppe cover approximately 1/2 of the total area occupied in the West Plain by forests with protection functions against harmful climate and industrial factors. The altitude for these stands is specific to plain areas, ranging between 90 and 167 meters. The fields from the West Plain are medium plane, while the soils on which they vegetate have an in-depth humidity excess (stagnic luvisol, stagnosol, luvic stagnosol, mollic gleic arenosol). This aspect proves the fact that forests occupy surfaces that are better supplied with water in these areas characterized as dry. *Poa pratensis* is the most widespread plant and it is considerate indicator flora for oak stands.

Key words: stands, West Plain, altitude, structure, soil type

West Plain occupies the west extremity of our country, being the east part of a large plain that goes beyond our borders. The area is neighbored by Ukraine in the north, Serbia in the South and by Serbia and Hungary in the East. The West Hills and Occidental Carpathians border them on the east. The West Plain is characterized by low plains and sinuous hills or plateaus that reach an average altitude of 200-300 meters. The forest steppe climate has a general continental character, with very cold winters and hot, dry summers. The temperature differences between winter and summer are significant and can oscillate between -15 °C in January and +30 °C in July. The harsh climate conditions, combined with leachy soils and continuous winds, cause many drought months over a year. As a consequence, trees lack altogether, with the exception of areas situated along rivers, near humid areas or in the west limit where the vegetation mixes with temperate and sub-Mediterranean forests. In their absence, the landscape is dominated by extended field stripes covered with grass and other drought resistant plants.

Romania's surface is of 23.839.071 hectares, from which agricultural fields represent 61%. The largest agricultural surfaces are arable (64% of the agricultural field), pastures and meadows (33% of the agricultural field). Forests occupy a surface of 6.800.872 ha, representing 29% of the country's territory, with 0.32 afforested ha per inhabitant (National Statistical Institute).

Romania is mainly an agricultural country, with more than half its surface being used in this purpose. The largest part of agricultural fields is arable, and the agricultural surface amounts to 14.7 mil ha (from which 9,38 mil ha are arable – occupying the fifth place in Europa).

Romania has at its disposal an important agricultural potential for the culture of prime materials necessary for the fabrication of bicarbonates and bio liquids. Agriculture continues to represent an important sector of the Romanian economy and is at the same time one of the branches that will be highly affected by climatic changes. As such, it is mandatory to take all measures for removing all climatic changes and for reducing gas emissions that have a hothouse effect. A good solution could be represented by the agro-

¹Marin Dracea National Institute for Research and Development, Brasov, Romania

²University of Oradea, Faculty of Environmental Protection, Oradea, Romania

forestry systems (Marușca T., 2012; Mihăilă E., 2012), which could be utilized also in West Plain.

Forest steppes are dynamic ecosystems, highly susceptible to changes in climate, disturbances (Feurdean *et al*, 2021)

Based on the pollen analysis, it was possible to establish the relationship between pollen and vegetation in forest steppe in south-eastern Romania (Dobrogea) (Grindean *et al*, 2019).

The dominant species from this forests steppe are pedunculated oak (*Quercus robur* L.), Turkey oak (*Quercus cerris* L), Hungarioan oak (*Quercus frainetto* Ten.), maple (*Acer platanoides* L.), silver linden (*Tilia tomentosa* Moech.), and ash (*Fraxinus excelsior* L.) (Apostol E.N. *et al*, 2016; Budeanu N. *et al*, 2016; Ioniță L. *et al*, 2017). Soft oak (*Quercus pubescens* Willd.) also appears at the contact with silvosteppe. Cleared forests were replaced by secondary, mesophyll pastures where they weren't replaced by agricultural cultures.

Forests have a very important role in the entire world, bringing together important benefits such as sheltering half of the Earth's species, and reducing climate change by stocking and retaining carbon dioxide. Furthermore, they are important sources for wood products, being an essential food and water source. At the same time, their aesthetic and spiritual purposes are proved for millions of people. Even from their beginning, forests have played an extreme role in our planet's life, having a decisive contribution to the development of human societies.

Currently, the majority of forest steppe plains from Romania (probably more than three quarters) were grubbed and transformed into arable lands. The main cultures are wheat, corn, oat, barley, sugar beet, sunflower and vegetables.

Forest shelterbelts for protecting plains are again of interest in Romania in the current conditions of reducing forest surfaces and climate drought (with desertification tendencies in some areas). Their purpose is essential: slowing down wind's speeds, with direct implications in reducing evapotranspiration; accumulating snow smashed by wind; reducing soil erosion; reducing damages caused on agricultural cultures; increasing agricultural productions; improving local climate; offering an additional supply of wood mass for rural population; reducing the costs for irrigations; improving the habitat for game and helpful birds; beautifying landscape (Adam I., 2012). Forests also ensure a good conservation of soil water in

these extreme dry areas over the entire year (Constandache C. *et al*, 2018)

Grazing is one of the impediments in the proper development of forests from plain areas. However, this phenomenon is not so developed in Romania, unlike other Balkan countries (Hinkov G. *et al*, 2019). Forests also ensure a good protection against erosion phenomenon (Dincă L. *et al*, 2019; Kachova V. *et al*, 2015), complemented by numerous ecosystem services that constitute an additional income source for inhabitants from steppe areas (Popov E. *et al*, 2017; Timiș-Gânsac V. *et al*, 2018; 2018; Ciontu C.I. *et al*, 2018; Pleșca I.M. *et al*, 2019; Vechiu E. *et al*, 2019; Dincă L. *et al*, 2020).

In recent times, climate phenomenon is more pregnant in all areas of the country and especially in steppe ones (Constandache C. *et al*, 2018; Dincă L. *et al*, 2018).

The aim of the study was to analyzed the surface occupied by forest steppe, relief form, altitude, flora, soils, type of forest, age of stands, composition of stands, structure, class of production.

MATERIAL AND METHOD

The investigations were realized in forests steppe from the West Plain.

In this work were studied a number of 1453 stand elements, in order to identify and analyse forest steppe.

These data come from the forest management plan of 13 state forest districts (Carei (2008), Livada (2001), Satu Mare (2004), Oradea (2007), Săcueni (2008), Tinca (2004), Ceala (2001), Chișinău Criș (2001), Radna (1995), Săvârșin (2005), Luca Timișului (2007), Timișoara (2007), Lugoș (1999) .

The data was centralized and process through Excel and have been analyzed several stand and environmental characteristics corresponding to this area (relief form, altitude, flora, soils, type of forest, age of stands, composition of stands, structure, class of production).

For the elaboration of this study, was also taken into account. the functional zoning of forests.

Romanian forests are grouped based on the functions they fulfill in:

-functional groups (with 2 main functional groups: Group 1. Forests with special protection functions and Group 2. Forests with production and protection functions);

-functional sub-groups (for example, the functional Group 1 is divided in 5 sub-groups amongst which we mention sub-group 3 – *Forests with protection functions against harmful climate and industrial agents*);

-functional categories (sub-group *Forests with protection functions against harmful climatic and industrial agents* has 11 functional categories that include category 1,3A= functional category Forest steppe (situated between the steppe and silvosteppe area with the exception of parks and meadow forests).

RESULTS AND DISCUSSIONS

Forests from *Subgroup 3. Forests with protection functions against harmful climate and industrial agents*, occupy in West Plain a total surface of 7059 ha. Amongst them, the first place is occupied by the 1-3A functional category

(*Forests Steppe between the steppe and silvosteppe area with the exception of parks and meadow forests*), with a surface of 3911 ha, followed by the 1-3C category (1970 ha) and 1-3G category, *Dispersed forest bodies from the plain area with surfaces under 100 ha* (1178 ha). As such, oak stands from forest steppe situated from the limit between steppe and silvosteppe from the West Plain are widespread on approximately 1/2 of the total surface occupied by forests with protection functions against harmful climate and industrial agents (*figure 1*).

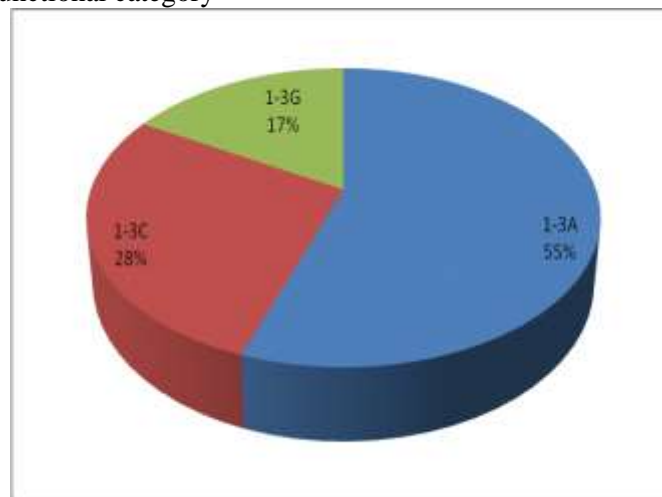


Figure 1 The surface occupied in the West Plain by functional forest categories from the subgroup of forests with special protection functions against harmful climate and industrial agents

Approximately all stands from this category are located in Carei Forest District, with a few exceptions belonging to Oradea Forest District.

The relief form specific for these forests is medium plane (3316 ha). Plateau, depression, dune and inter-dune are other relief forms that cover less than 10% of the surface (*figure 2*).

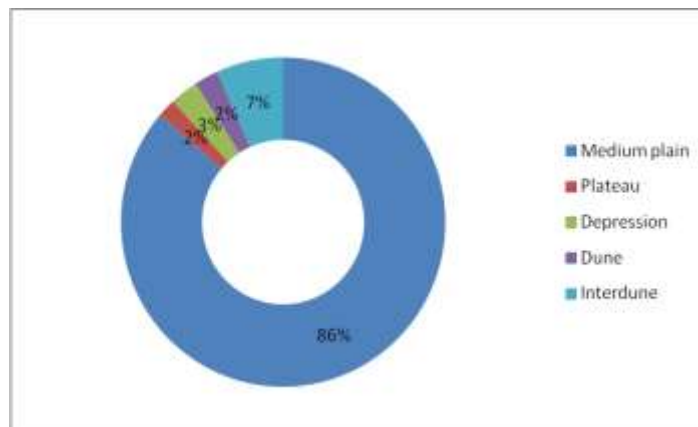


Figure 2 Relief forms in the forest steppe of West Plain

The average **altitude** of stands from this area is a low altitude, specific to plain areas and ranges between 90 and 167 meters.

The **flora** specific for these stands is represented by *Poa pratensis* = 1555 ha, *Carex brizoides-Agrostis alba* = 1117 ha, *Carex pilosa* =

459 ha and *Erachypodium-Geum-Pulmonaria* = 445 ha.

The **soils** on which these stands vegetate have an in-depth humidity surplus (stagnic luvisol = 438 ha, stagnosol = 1551 ha, luvic stagnosol = 1144 ha, mollic gleic arenosol = 527 ha). This fact proves that forests occupy the surfaces well supplied with water from these arid areas.

The most representative **forest types** are the following: *Oak stand with average productivity Rhamnus frangula* = 2238 ha, *Oak stand on sandy fields from the forest area* = 527 ha, *Oak stand with inferior productivity Agrostis alba* = 415 ha, *Meadow oak stand from the plain area* = 178 ha.

The most common **species** from these forests are: pedunculate oak (*Quercus robur* L.) = 2770 ha, black locust (*Robinia pseudoacacia* L.) = 128 ha (figure 3), ash (*Fraxinus excelsior* L.) =

113 ha, black alder (*Alnus glutinosa* (L.) Gaertn.) = 84 ha, and hornbeam (*Carpinus betulus* L.) = 52 ha.

Other species present in these forests are: wild cherry (*Prunus avium* L.), field maple (*Acer campestre* L.), birch (*Betula pendula* Roth.), manna ash (*Fraxinus ornus* L.), Norway maple (*Acer platanoides* L.), aspen (*Populus tremula* L.), and red oak (*Quercus rubra* L.).

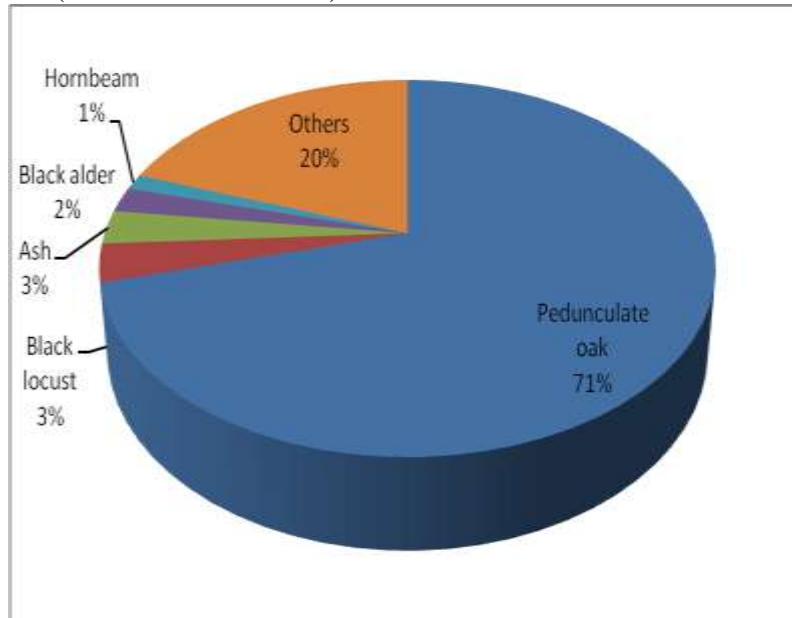


Figure 3 The surface occupied by species from forest steppe in West Plain

The stands' **age** ranges between 5 and 145 years. The most well represented age classes are 20-40 years and 41-60 years (figure 4).

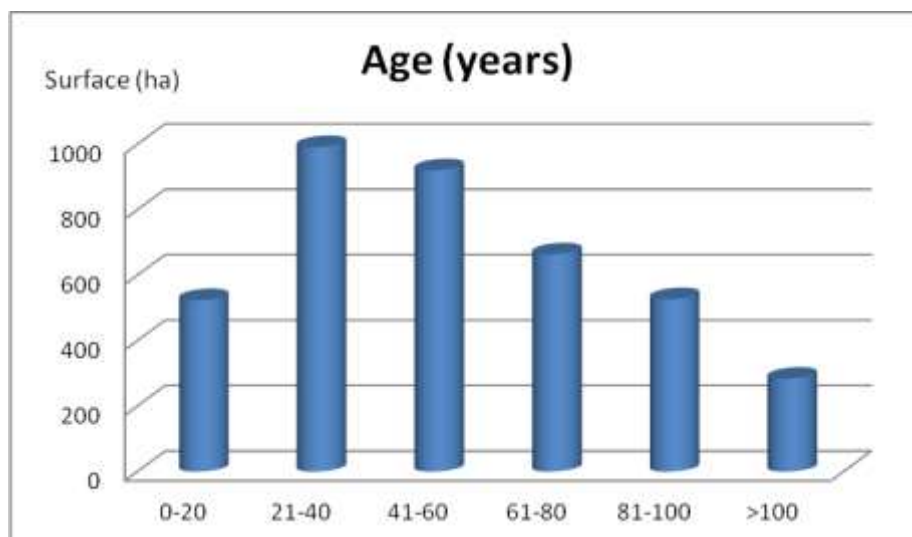


Figure 4 Age stands in the forest steppe of West Plain

The stands' composition is generally mixed (intimate + groups) (figure 5). However, numerous pure stands (composed of only one species) also

exist – 1468 ha, followed by stands in which the dominant species occupy 90% of the surface – 435 ha or 80% - 505 ha.

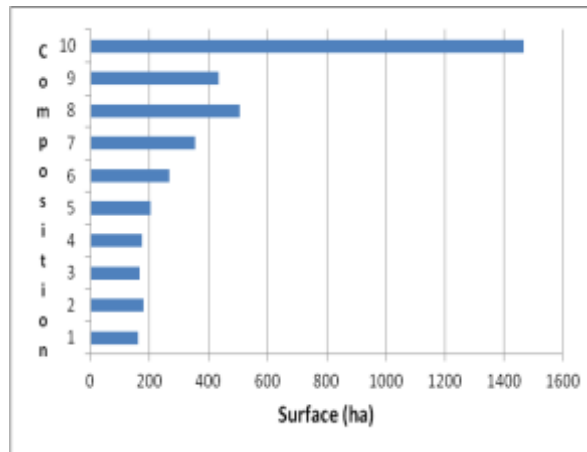


Figure 5 Composition of stand in forest steppe of West Plain

The stands' structure is mainly relatively even-aged (2714 ha), with some even aged structures (959 ha) and relatively uneven-aged ones (174 ha).

The production class of these stands is mainly average (III^d class = 2649 ha), while inferior production stands (IV and V) occupy 637 ha, and superior production stands (I and II) 561 ha.

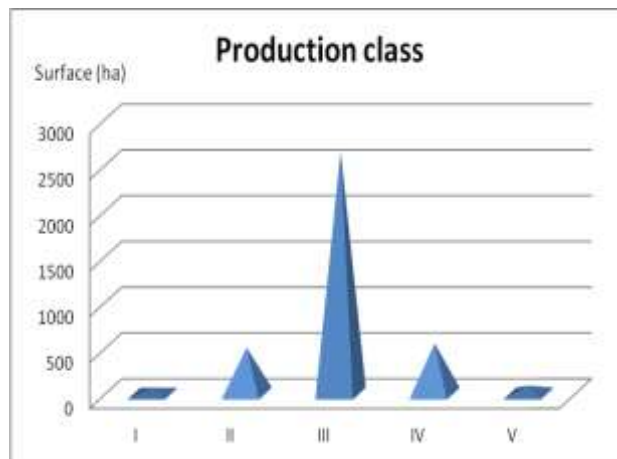


Figure 6 Production class in forest steppe of West Plain

CONCLUSIONS

Forests areas from the Romanian Plain shelter important forests situated in functional groups, subgroups and categories. Forests from Subgroup 3. *Forests with protection functions against harmful climate and industrial agents* occupy a total surface of 7059 ha in the West Plain. Amongst them, the first place is occupied by the 1-3A functional category-Forest steppe (situated between the steppe and silvosteppe area with the exception of parks and meadow forests) with a surface of 3911 ha. The following places are occupied by the 1-3C category (1970 ha) and the 1-3G category - (1178 ha).

Pedunculate oak is the most widespread species from this forest category and occupies 2770 ha in the West Plain. Other species that are present here are: black locust (*Robinia pseudoacacia* L.), ash (*Fraxinus excelsior* L.), black alder (*Alnus glutinosa* (L.) Gaertn.) and hornbeam (*Carpinus betulus* L.).

Stands from the West Plain are located at altitudes between 90 and 167 meters, on medium plane fields and on luvic stagnosol (1551 ha) in most cases.

In these areas characterized as arid, forests occupy the surfaces that are better supplied with water.

REFERENCES

- Adam I., Ivanschii T., Merce O., Turcu D., Cadar N., Cântar I., 2012 - *Înființarea perdelelor forestiere de protecție în zona de câmpia județului Mehedinți*. Revista de Silvicultură și Cinegetica, 30: 23-27.
- Apostol E.N., Dinu C.G., Apostol B., Ciuvăț L.A., Lorent A., Pleșca I., Postolache D., Leca Ș., Enescu C.M., 2016 - *Importance of pubescent oak (Quercus pubescens) for Romanian forests in the context of climate change*. Revista de Silvicultură și Cinegetica, 39 (XXI): 29-33.
- Budeanu M., Achim G., Apostol E.N., Șofletea N., Dinu C., 2016 - *Grafting the grayish oak (Quercus pedunculiflora) in order to establish the*

- first seed orchard in Romania. Revista de Silvicultura si Cinegetica, 39 (XXI): 22-28.*
- Ciontu C.I., Dincă L., Bratu I., 2018** - *Analiza unor specii de interes cinegetic din judetul Calarasi. Revista de Silvicultura si Cinegetica, 43 : 91-95.*
- Constandache C., Dinca L., Tudose N.C., Panaitescu C., 2018** - *Protecting surface water resources through silvicultural methods. International Symposium "The Environment and the Industry", SIMI 2018, Proceedings book Section Pollution Assessment & Management Systems, pp. 276-284.*
- Constandache C., Dinca L., Popovici L., Braga C., Blaga T., 2018** - *The effect of climatic changes over some Romanian forest ecosystems. 18th International Multidisciplinary Scientific Geoconference SGEM 2018. Conference proceedings, 18: 941-948.*
- Dincă L., Achim F., 2019** - *The management of forests situated on fields susceptible to landslides and erosion from the Southern Carpathians. Scientific papers series Management, Economic Engineering in Agriculture and Rural Development, 19(3): 183-188.*
- Dincă L., Buciumeanu E.C., Vizitiu D.E., Enache V., Cociorva D., 2018** - *Main regulations and standards concerning the protection of forests and vinicultural plantations from Romania, with a special focus on improving the effects caused by climatic changes. International Scientific Conference on EARTH and GEOSCIENCES-Vienna GREEN Scientific Sessions, 18(1.5): 719-726.*
- Dincă L., Timiș-Gânsac V., 2020** - *The usage of non-wood forest products - Culinary and artisanal traditions in Romania. Sustainable Development Research; 2(1): 50-57.*
- Feurdean A., Grindean R., Florescu G., Tanțău I., Niedermeyer E. M., Diaconu A.-C., Hutchinson S. M., Nielsen A. B., Sava T., Panait A., Braun M., Hickler T., 2021.** - *The transformation of the forest steppe in the lower Danube Plain of southeastern Europe: 6000 years of vegetation and land use dynamics, Biogeosciences, 18, 1081–1103, <https://doi.org/10.5194/bg-18-1081-2021>.*
- Grindean R. , Nielsen Birgitte A., Tanțău I., Feurdean A., 2019** - *Relative pollen productivity estimates in the forest steppe landscape of south eastern Romania. Review of Palaeobotany and Palynology 264, 54–63*
- Hinkov G., Kachova V., Velichkov I., Dinca L., 2019** - *The Effect of Grazing on Old Oak Forests from Eastern Rhodopes Mountains. Ecologia Balkanica, 11(1): 215-223.*
- Ioniță L., Mirancea I., Apostol E.N., Budeanu M., 2017** - *Preservation of the grayish oak (Quercus pedunculiflora K. Koch) forest genetic resources by biotechnological methods. Revista de Silvicultura si Cinegetica, 40 (XXII): 16-20.*
- Kachova V., Dincă L., 2015** - *Establishment of agro-forestry systems along river basins-Functions and features. Revista de Silvicultură și Cinegetică, 20(36): 64-68.*
- Marușca T., 2012** - *Sustainable Agroforestry System, in the context of global climate warming. Revista de Silvicultura si Cinegetica, 30 (XVII): 67-77.*
- Mihăilă E., 2012** - *Agroforestry systems. Revista de Silvicultura si Cinegetica, 30 (XVII): 122-128.*
- Pleşca I.M., Blaga T., Dincă L., Breabăn I.G., 2019** - *Prioritizing the potential of non-wood forest products from Arad county by using the analytical huerarchy process. Present Environment and Sustainable Development, 13(2): 225-233.*
- Popov E., Hinkov G., Kachova V., Constandache C., Dincă L., 2017** - *A brief review of forest shelter belt establishments in Bulgaria and Romania. Revista de Silvicultură și Cinegetică, 41: 16-23.*
- Timiș-Gânsac V., Enescu C.M., Dincă L., Oneț A., 2018** - *The management of non-wood forest products in Bihor county. Natural Resources and Soustainable Development, 8(1): 27-34.*
- Vechiu E., Dincă L., 2019** - *Forest fruits from Sibiu County. Research Journal of Agricultural Science, 51(3): 163-168.*
- *** **Amenajamentele silvice ale ocoalelor:** Carei (2008), Livada (2001), Satu Mare (2004), Oradea (2007), Săcuieni (2008), Tinca (2004), Ceala (2001), Chișinău Criș (2001), Radna (1995), Săvârșin (2005), Luca Timișului (2007), Timișoara (2007), Lugoj (1999).
- *** **Institutul Național de Statistică,** Raport de expertiză Domeniul 12. Ocuparea și utilizarea terenurilor.