ORCHARD PLANTATION FROM PEȘTERE, CARAȘ-SEVERIN COUNTY. CASE STUDY

Cristina TOȚA, Daniela SCEDEI, Delia Sorina DRĂGOI, Casiana MIHUȚ, Valeria CIOLAC
[1] University of Life Sciences "King Mihai I" from Timisoara
Corresponding author: casiana_mihut@usab-tm.ro

Abstract. *The purpose of the work is a case study carried out in a private fruit orchard in Peștere, Constantin Daicoviciu commune in Caraș-Severin county, in a total area of 80 hectares, being occupied with various fruit species. The studied material refers both to the skeletal rendzine type soil and to the planted fruit tree species, namely apple, plum, cherry and sour cherry, along with other fruit tree species. When describing the soils identified within the farm, both data from the field and a series of data taken from OSPA Timișoara and Contantin Daicoviciu City Hall were used. In the work, the following were taken as objectives: the geographical description of the plantation; identification and characterization of soil type; description of the orchard and the productions obtained. Morphologically, the Constantin Daicoviciu commune is located in the Timișului Valley, and the plantation in the Peștere locality is on the Cornului Hill, at an altitude of 570 m, in the northern part of the commune. The plantation is ecological, being grassed, and the phytosanitary treatments used are those accepted for ecological agriculture. As limiting factors of the fertility of this soil, there are: low useful edaphic volume (low thickness and high skeleton content), low useful water capacity. These soils are difficult to work, which is one of the reasons why the maintenance of the soil through black field has been abandoned.*

Keywords*: Peștere, soil type, fruit plantation, obtained productions*

INTRODUCTION

Fruit growing plays an important role in agriculture due to the fact that in Romania, there are favorable pedoclimatic conditions and established fruit orchards, with tradition and high production potential (RADULOV ISIDORA, 2007). In the years 1965 and 1979, the censuses of the viticulture and fruit plantations were carried out, which allowed a detailed inventory of the viticulture heritage. After 1990, radical transformations took place in the structure of Romanian agriculture and, implicitly, in the structure of the viticulture sector. (TOTI MIHAI ȘI COLAB., 2017). These changes were highlighted by the results of the General Agricultural Census from 2010 and the Structural Surveys in Agriculture from 2013 and 2016 (DRAGOESCU URLICA, A. A., & STEFANOVIĆ, S., 2018).

The climate, along with the pedological factors, is the determining factor in the increase or decrease in the productivity of fruit agro-ecosystems (FLOREA N.,MUNTEANU I., 2012; MIHUȚ, C., 2018; NIȚĂ, L., GROZAV, A., ROGOBETE, GH., 2019; OKROS, A., 2015; IANOȘ GH., GOIAN M., 1995). In this context, monitoring the impact of climate change on fruit crops requires the improvement of scientific knowledge and capacities, so that the management of climate characteristics includes the current assessment of climate data, as well as the analysis of risks and opportunities. (BORLAN Z., HERA C., 1994; CANARACHE A., 1997; FLOREA N.,1994; ȚĂRĂU D. ȘI COLAB., 2007; MIRCOV, V. D., VUXANOVICI, S., COZMA, A., OKROS, A., PINTILIE, S., NICHITA, A. I., MOISESCU, C. I., 2016).

Research on the impact of the environment on the behavior of plants is very topical because the change in the climate of the globe and the concentration of carbon dioxide in the atmosphere has been predicted, but we have very little information (SMITH ET AL., 1997), and in many cases none, about how how plants will respond in the future.

In the natural system climate - plant - soil, it is generally difficult to separate the particular effect of the components on the growth and development of the plant. However, the effect of several environmental factors on growth has been well researched: carbon dioxide,

mineral elements, light as an energy source and factor influencing morphogenesis, water supply to maintain turgorescence, as well as oxygen and favorable temperatures for numerous physiological processes (RUSU RAUL ARIAN, 2007; IANOȘ GH., PUȘCĂ I., GOIAN M., 1997).

The climatic conditions in which tree plantations are spread in Romania are varied and strongly differentiated between them: 5-12°C average annual temperatures and 350-1,000 mm of average annual precipitation. A pedo-climatic zoning of fruit growing in Romania has been a desideratum of specialized studies since the 60s. For about four decades, preliminary research, associated or related to this important objective, has been carried out. At the beginning, an attempt was made to quantify the natural resources characteristic of the areas favorable for fruit plantations in the "Bonitarea terenurilur agricultur", coordinated by the academician Dumitru Teaci (TEACI, 1975, 1980), in which only the level of favorability of the land, the importance of the inventory was taken into account quality of the orchards being only mentioned. Later, at ICPA Bucharest (the current National Research and Development Institute for Pedology, Agrochemistry and Environmental Protection), a Pomicolă Ecopedology collective was established, coordinated by Dr. Nicolae Voiculescu, which carried out a series of researches in the field of climate-plant relations -soil (and in some cases, also pollutant), carried out on the entire sequence of natural conditions, according to an original and partially applied methodology in a unitary system, integrated ecosystemically, generating a database that includes the entire orchard heritage of Romania (MIHUȚ CASIANA, RADULOV ISIDORA, 2012).

MATERIAL AND METHODS

The studied material refers both to the skeletal rendzine type soil and to the planted fruit tree species, namely apple, plum, cherry and sour cherry, along with other fruit tree species.

We studied the soil resources and fruit tree species within the farm in Peștere locality, Contantin Daicoviciu commune, Caraș - Severin county.

When describing the soils, we used both data collected from the field and data taken from OSPA Timișoara and Contantin Diaconu City Hall, Caraș - Severin county.

RESULTS AND DISCUSSIONS

The village of Peștere belongs to Constantin Daicoviciu commune, Caraș-Severin county, being located in the meadow area, i.e. in the area that includes the terraces of Timiș and which has a land with a smooth slope towards Timiș, generally grassy, with a degree of fragmentation much lower compared to the other areas of the county.

The plantation was located in an area with a tradition in the agricultural field, i.e. fruit growing, it occupies a total area of 80 hectares and was established in the fall of 1998. As species, the following were planted:

- Cherries, the varieties: Van, Stela Germesdorf and Katalina;
- Apples, the varieties. Generos de Voinesti, Golden Delicios, Starkrinson and Beautiful de Voinesti;
- Plums, varieties: Bistrita, Darjan, Anna Spath, Renglot and Stanley.

In the first 3-4 years after the planting of the trees, the maintenance of the soil was by plowing, plowing and leveling, after which it was left grassy, both on the row of trees and between the rows of trees.

The plantation is in an intensive system, with different planting distances depending on the species, from 4/4 - 6/8 to 8/8 m. Fertilization was carried out only with products accepted in ecological agriculture (biofortifiers, algae extracts and other types of biocompounds). The fight against diseases and pests is carried out in accordance with the forecast and warning charts using ecological control methods approved by the European Union.

When the plantation was established, the achievement of objectives of interest to the village, locals and entrepreneurs were considered, namely: economic, financial, social and environmental objectives.

Economic and financial objectives:

- the employment of the labor force in the respective area, on the one hand due to the volume of works from the technological flow, and on the other hand in the perspective of creating a production distribution network, referring here to processing, conditioning, etc.;

- in the future, the use of up-to-date, productive varieties and hybrids will be considered, which will lead to the reduction of maintenance expenses (disease and pest control, pruning and fruiting, etc.).

Social and environmental objectives:

- the establishment of the plantation contributed to increasing the environmental effect of the area, captured dust and solid emissions from the atmosphere, thus enriching the quality of life;

- biological substances are used to fight diseases and pests, which do not affect the quality of the environment.

- the plantation, falls within the specifics of the area;

- it also created new jobs, both for specialists and for other people in the area in the process of professional reconversion.

Regarding the type of soil on which the plantation is located, it is of the skeletal rendzina type, on compact calcareous rocks, sandy loam\sandy loam (table 1.).

Table 1.

The physical and chemical properties of the skeletal remains from the Cave

HORIZONS	**Am**	**AR**	**Rn**
Depths (cm)	***0-18***	***18-30***	***30-60***
Coarse sand (2.0-0.2 mm)%	24.2	18.4	
Fine sand (0.02-0.02 mm)%	38.2	44.8	
Dust (0.02-0.002mm)%	12.9	20.8	
Clay 2 (below 0.002 mm)%	24.7	16.0	
TEXTURE	**LN**	**LN**	
pH (In H_2O)	5.70	5.72	
Humus (%)	5.70	5.92	
Mobile P (ppm)	0.9	3.9	
Mobile K (ppm)	48	52	
Mobile K (ppm) sol)	12.15	12.29	
Exchangeable hydrogen (SH me/100 g soil) me/100 g sol)	3.23	2.29	
Head. cation exchange (T me)	15.38	14.58	
Degree of saturation in bases (V%)	79.00	84.29	

After studying the triangular diagram of the texture, the texture was determined, which is of the loamy-sandy type on the entire profile.

The soil reaction is moderately acidic (pH has values between 5.70 and 5.72). The humus content is medium (5.70%). The content of phosphorus (P) is extremely low with values in the Am horizon 0.9 ppm, in the AR horizon 3.9 ppm. The potassium (K) content is very low at 48 ppm in the Am horizon and 52 ppm in the AR horizon. Exchange bases (SB) show values of 12.15 me/100 g soil, :in the Am horizon and 12.29 me/100 g soil in the AR horizon. Exchangeable hydrogen (SH) has low values of 3.23 me/100 g soil in the Am horizon and 2.29 me/100 g soil in the AR horizon. The degree of saturation in bases (V%) having values of 79.00%

in the Am horizon, 84.29% in the AR horizon and 84.36%, we can say that we have a submesobasic soil.

The limiting factors of the fertility of this soil for agricultural crops are: low useful edaphic volume (low thickness and high skeleton content), low useful water capacity.

Rendzins are lent depending on the area in which they are located for meadows, tree plantations and forests. These soils are difficult to work; they can be improved by removing skeleton fragments, combating erosion and fertilizing with organic and mineral fertilizers.

The farm has the following equipment: a tractor, a scythe, a machine for applying phytosanitary treatments and a MIG for applying manure or manure once every 3-4 years. The grass is cut starting from May, when the plantation prepares the land to be able to start harvesting the early cherry varieties (Stela) and is left directly on the land.

Periodically, maintenance work is done on all species and varieties, depending on their condition, season and needs. These works will consist of: cuttings to form and maintain the crown of the trees, watering, fertilizing, mowing, disease and pest control and harvesting.

Table 2 shows the production obtained for all the species present in the plantation.

Table 2.

Total fruit production (in tons)

Fruits– total	**2015**	**2016**	**2017**	**2018**	**2019**
	59464	48340	45365	40060	31917
Plums	43173	29781	31690	28363	21791
Mere	12581	13190	8836	7127	6349
Cherries and sour cherries	1951	1077	1867	1277	1083
Other fruits	157	1124	243	296	208

Regarding the productions obtained, they were located between 1077 tons/ha in 2016 for cherries and sour cherries and 43173 tons/ha for plums in 2015. The best year in terms of productions obtained for most fruit species was 2015 and the worst year, 2019.

CONCLUSIONS

The village of Peștere belongs to Constantin Daicoviciu commune in Caraș-Severin county and is located in the meadow area (terraces of Timiș) and has a land with a gentle slope towards Timiș, generally grassy, with a much lower degree of fragmentation compared to the other areas of the county.

The orchard is privately owned and has an area of 80 hectares. As fruit trees, we have: cherries, sour cherries and apples. In the first years after planting, the maintenance of the soil was a black field, plowing, plowing and leveling were carried out, after which it was left grassy, both on the row of trees and between the rows of trees, which led to a considerable decrease in its maintenance costs. Moreover, after 2005, the plantation is ecological. Fertilization is carried out only with products accepted in ecological agriculture.

The establishment of this plantation led to the creation of new jobs, both for specialists and for other people in the area in the process of professional reconversion.

As for the soil, it is of the skeletal rendzine type. After studying the triangular diagram, it was determined that the texture is loamy-sandy throughout the profile. The soil reaction is moderately acidic with pH values of 5.70 - 5.72. The humus content is 5.70% in the Am horizon

and 5.92% in the AR horizon. The content of phosphorus (P) is extremely low with values in the Am horizon 0.9 ppm, in the AR horizon 3.9 ppm. The potassium (K) content is very low at 48 ppm in the Am horizon and 52 ppm in the AR horizon.

As limiting factors of the fertility of this soil, there are: low useful edaphic volume (low thickness and high skeleton content), low useful water capacity. These soils are difficult to work, which is one of the reasons why the maintenance of the soil through black field has been abandoned. Rendzins can be improved by removing skeletal fragments, combating erosion and fertilizing with organic and green fertilizers. The cut grass is left directly on the field, thus improving soil properties and organic matter content.

Also, the costs of mechanical work and diesel for the establishment of the plantation and then the maintenance of the soil through black field, worked in the first 3 years were quite high. In addition, the active organs of the machines wore out quickly due to the high content of rock fragments, fuel consumption increased and the work was of poor quality.

In the plantation species, the productions obtained in the last 5 years were between 1077 tons/ha in 2016 for cherry and sour cherry and 43173 tons/ha for plum in 2015. The best year in terms of productions obtained in most of fruit species was 2015 and the weakest year was 2019.

Periodically, maintenance work is done on all species and varieties, depending on their condition, season and needs. These works consist of: cuttings to form and maintain the crown of the trees, watering, fertilizing, mowing, disease and pest control and harvesting.

After a long period of disorganization and decay, this area will have to be revitalized by establishing and replacing some species from the plantation with trees in a modern system, planting new varieties, resistant to diseases and pests but also to the new pedo-climatic conditions in a continuous change, and with the implementation of advanced culture technologies, which will contribute on the one hand to obtaining large, stable and good quality productions and on the other hand, to reduce the negative impact of pollution through the application of ecological measures of diseases and pests.

BIBLIOGRAPHY

BORLAN Z., HERA C., 1994 - Fertilitatea și fertilizarea solurilor. Ed. Ceres, București, 1994;

CANARACHE A., 1997 – Însuşirile fizice ale solurilor agricole din Banat, Lucrări ştiinţifice SNRSS Timişoara, 1997;

DAVID-FEIER, S., MATEOC-SÎRB, N., MATEOC, T., BACĂU, C., DUMA COPCEA, A., MIHUȚ, C., 2020 - AGRICULTURE AND SUSTAINABLE SOIL USE IN TIMIȘ COUNTY, ROMANIA, SCIENTIFIC PAPERS SERIES MANAGEMENT, ECONOMIC ENGINEERING IN AGRICULTURE AND RURAL DEVELOPMENT, 20(1), 207-214.

DRAGOESCU URLICA, A. A., & STEFANOVIĆ, S., 2018 - Ecolinguistic qualities of the optimal English language learning experience. International Journal for Quality Research, 12(2), 537-546.

FLOREA N.,1994 - Pedogeografie cu noțiuni de pedologie, Ediția a II-a, Universitatea D. Cantemir, Facultatea de Geografie, Sibiu

FLOREA N.,MUNTEANU I., 2012 – Sistemul român de taxonomie a solurilor (SRTS). Ed. Sitech, Craiova, 2012;

GOIAN M., 2000 – Agrochimie, Editura Marineasa, Timişoara, 43-44, 2000;

IANOȘ GH., GOIAN M., 1995 – Solurile Banatului-geneză şi caracteristici agrochimice, Editura Mirton, Timişoara, 1995;

IANOȘ GH., PUȘCĂ I., GOIAN M., 1997 – Solurile Banatului-condiţii naturale şi fertilitate, Editura Mirton, Timişoara, 1997;

MIHUȚ CASIANA, RADULOV ISIDORA, 2012 - Științele Solului. Ed. Eurobit, Timișoara, 2012;

MIHUȚ, C., 2018 – Fizica solurilor agricole. Edit. Agroprint, Timișoara 208;

MIRCOV, V. D., VUXANOVICI, S., COZMA, A., OKROS, A., PINTILIE, S., NICHITA, A. I., MOISESCU, C. I., 2016 - Climate records registered in western Romania, European Biotechnology Conference, 1(231):935-942

NIȚĂ, L., GROZAV, A., ROGOBETE, GH., 2019 - Natural and Anthropic Soil Acidification in the West of Romania, Chemistry Journal, Vol. 70(6), 2237-2240.

OKROS, A., 2015 - Fertility status of soils in western part of Romania Journal of Biotechnology, Vol. 208(S63), 3-14.

RADULOV ISIDORA, 2007 - Chimia solului și managementul nutrienților și fertilizanților. Ed. Eurostampa, Timișoara, 2007;

ROGOBETE GH., 1994 – Ştiinţa solului, Editura Mirton, Timişoara, 1994;

RUSU RAUL ARIAN, 2007 – Organizarea spațiului geografic în Banat, Editura Mirton, Timișoara 2007;

SMITH H , GC WHITELAM, 1997 - The shade avoidance syndrome: multiple responses mediated by multiple phytochromes. Plant, Cell & Environment, 1997 - Wiley Online Library

TEACI, 1975, 1980 - I.C.P.A. Metodologia elaborării studiilor pedologice, vol. I, II, III, Bucureşti, 1987;

TOTI MIHAI ȘI COLAB., 2017 – Zonarea speciilor pomicole în funcție de condițiile pedoclimatice și socio-economice ale României. Ed. Invel Multimedia ISBN 978-973-1886-93-0;

ȚĂRĂU D. ȘI COLAB., 2007 – Particularități ale condițiilor ecologice și de restaurare a fertilității solului în vestul României. Ed. Eurobit, Timișoara, 2007;

* * * http:// www.carasseverin.insse.ro