SHRUBS AND TREES REGENERATION IN SILVOPASTORALE SYSTEMS IN THE COUNTIES OF BIHOR AND ARAD

L. S. DOROG *, G. C. CRAINIC *

University of Oradea, Faculty of Environmental Protection
26 Gen. Magheru St., 410048 Oradea; Romania, e-mail: dorogs@yahoo.com

Abstract: *Agroforestry systems are present both in Europe and on other continents, which are preferred by private owners and not only to diversify products and increase revenues on the same unit area through sustainable land management. Research has aimed at the study of regeneration in silvopastorale systems with specific features for plain areas intensively grazed and hill areas less affected by grazing and anthropogenic influence. The beggining of this research was older observations related to the mode of dissemination and development of seedlings of cvercinee on land bordering the forest fund, mainly it is about land and pastures abandoned. As the method used for the study on the first transect tree limit up to 100 metres outside the forest where regeneration occurs in the vicinity of it and in cases where it was found the emergence of tree species at greater distances were studied aggregation mode in biogrupe species. All species have been inventoried shrubs and trees with measuring distances from the boundary of the forest. The work is based on observations and measurements from two locations: Păuşa-Miersig, (Bihor county) and Vârfurile (Arad county). The regeneration of tree species in the forest is done over distances ranging from 6-15 meters results obtained on the basis of observations and statistical processing. For appreciable distances compared with existing forest it was found that the regeneration began in the middle of pioneer species which are beginning the natural regeneration. The research results are limited by the small number of locations but the processes have highlighted significant differences in terms of the plain-land from the hill-land. Part of measurements and observations were made on the basis of contracts with the socio-economic environment. The work is important because it is studying how to make naturally regeneration in silvopastorale systems and it is also a starting point for research that uses nurse plants for trees regeneration.*

Key words**:** *agroforestry, silvopastoral system, sustainable management, regeneration, biogrup*

INTRODUCTION

Agroforestry systems are present both in Europe and on other continents, which are preferred by private owners and not only for product diversification(ROCKY L., 2009) and to increase revenues obtained from the same unit area through sustainable land management. There are several types of agro systems, some cereal crops combined with woody plants(VASILESCU, M. M., C. TEREŞNEU, B. CANDREA, 2007), which in turn are used for the production of fruits, grains, woods and other combining with the animal breeding(FRANZEL S., COOPER P., DENNING G.L., 2001, DUFOUR-DROR J.M., 2007). As a general idea of land use in such systems are focused on maintaining local practice sustainable management.

To note that the main idea for all agroforestry systems is that ecological factors are used in a higher degree(MERCER D.E., 2004) than monocultures and also lead to the diversification of production. Regarding the beneficial action of agroforestry systems can be mentioned the following: they reduce erosion, prevent landslides, erosion reduced organic material and helps maintain soil physicochemical properties(MADUREIRA, L., SILVA, P.G., MARINHO, C., SÁ, J. OLIVEIRA, R. DIELS, J., 2013).

Regarding silvopastoral(IBRAHIM M., GUERRA L., CASASOLA F., NEELY C., 2010) these systems are combined in a harmonious development of woody plants and animal breeding(ANDRADE H.J.,2007). Mainly these systems are focused on grazing in the alternative produce fruits and wood(IBRAHIM M., VILLANUEVA C., CASASOLA F., ROJAS J., 2006). To maximize income derived from woody plants such as fruits and wood they will be supported in terms of regeneration and assortment of species that are well represented woody component. The partially degraded lands and abandoned land situations were observed in addition to herbaceous and shrub vegetation appeared through natural regeneration of tree seedlings of the species in the area. It is interesting to note that in almost all cases sapling trees appeared as shelter for plants shrubs(TOBAR D., IBRAHIM M., 2010).

Sustainable management implies judicious use of land so that the same surface serve as animal feed, production of fruits trees and shrubs that use wood production uses in their own households(Pantera A., 2014). All these will be organized by the management so that the three components to stimulate mutual relations without any embarrassment.

MATERIAL AND METHODS

On the basis of this work stand older observations on how disseminate and appearance of seedlings oaks bordering forest land, and mainly abandoned land and pastures.

As material was studied areas of land bordering of the forest and how it began regeneration. First colonization began with the shrub species: *Prunus spinosa, Crataegus monogyna, Rosa canina, Rubus hirtus, Ligustrum vulgareetc, Pyrus pyraster* etc, followed by trees species. It is interesting to note that in almost all cases observed on the ground was found that specimens of species of trees have grown around the shelter and shrub species. A distinct role in the emergence of shrubs and specimens of species of trees they had realized how the seed dissemination was made. Basically pioneer species seeds generally small and light winds helped dissemination, while those with larger seeds (oaks) were most likely spread by birds and mammals.

As the study method was used the transect method for the first tree limit up to 100 meters outside the forest. All species were inventoried shrubs and trees to measure distances from the forest boundary.

In Hereduţ-Valea Rea (Arad) location the study was made on orthophotomap regarding the distribution tree and shrub vegetation on the forest land from the existing isolated compact biogrups.

The situation at the location Hereduţ-Valea Rea (Vârfurile - Arad) is a typical example for how forest vegetation has colonised from the existing forest areas to appreciable distances on land used for grazing. It's interesting how the biogrups with trees from species like *Quercus sp., Carpinus, Betulus, Populus* and *Robinia* was developed at a distance of 1.8-2.2 km from the compact forest land.

The work is based on observations and measurements from two locations: Păuşa-Miersig, (Bihor) and Hereduţ-Valea Rea (Vârfurile-Arad).

The data collected in the field were processed using the Kyplot program. Determination has been made known by descriptive statistics and also have made comparative analyses between various comprising transects from the same location.

RESULTS AND DISSCUTIONS

In Arad location between the eleven points taken into study the differences between the distances compared from compact forest, the range of species that make the biogrups are extremely large. It is observed that nature as it worked generally prefers mixed biogrups composed by one or two copies of the main species and two or three copies of the mix and pioneer species. Pioneer species are the first to colonized the land along the bushes and facilitate installing the main species seedlings. From the 11 points analysed only 4 are composed by single specie, the rest are combinations of 2-3 main species and 2-3 shrub species.

Figure1 – Distances from the compact forest to biogrups regeneration - Vârfurile Arad(orthophotomap)

Comparative analysis between the 11 locations indicates extremely large differences between them in terms of distances, number of copies and the range of the species. By Kruskal-Wallis test application to distribution in the field of biogrups of trees and shrubs were obtained extremely large differences between locations in terms of distances and homogeneity of variances (see table 1).

Table 1

Kruskal-Wallis test and Bartlett's Test for Homogeneity of variance in Hereduț-Valea Rea, Arad County for trees and shrubs biogrups

Location	Hereduț-Valea Rea(Arad)		
Trees	Kruskal-Wallis Statistic		
	Chi^2	15.85422575	*** (P<=0.001)
	Probability	6.841359409E-005	-
	Bartlett's Test for Homogeneity of Variance		
	Values	63.41738701	*** (P<=0.001)
	Probability	1.672353637E-015	-
Shrubs	Kruskal-Wallis Statistic		
	Chi^2	15.86322361	*** (P<=0.001)
	Probability	6.80890773E-005	-
	Bartlett's Test for Homogeneity of Variance		
	Values	60.86686541	*** (P<=0.001)
	Probability	6.106808372E-015	-

From the multivariate regression analysis it was found that the coefficients of determination are very small which means that both trees and shrubs in forest distances location Hereduț-Valea Rea, Arad are not interesting and heeded at this type of vegetation distribution (see table 2).

Table 2

Coefficient of determination, correlation coefficient and adjusted coefficient of determination for trees and shrubs from Hereduț-Valea Rea, Arad county

Correlation Statistics	Trees	Shrubs
R^2 (Coefficient of Determination)	0.002039518313	0.09622665024
R (Correlation Coefficient)	-0.04516102648	-0.3102042073
R*^2 (Adjusted R^2)	-0.1088449797	-0.004192610841

In Păușa-Miersig location from Bihor County the stage of regeneration is slightly different than the location of the Arad County in the sense that here the regeneration is in an early stage, some areas particularly adjacent to the forest are regenerated well with shrubs and saplings near compact forest while at greater distances, with few exceptions, the shrubs are well represented. Most of them are well spread: *Prunus spinosa, Crataegus monogyna* and *Rosa canina*. Also appear underrepresented species such as: *Pyrus pyraster* and *Ligustrum vulgare*.

In this location there was observed better than in the previous case, the colonization of land abandoned and unattended pastures is done by starting with the shrub species that appear in the middle of which begin to regenerate copies of tree species.

Statistical processing carried out for this location is presented somewhat identical meanings with the previous case, the differences are extremely large variances, significance testing as the Bartlett test presents a very significant differences (see table 3). Regarding transects that worked for the regeneration of tree species were obtained insignificant while shrubs differences are very significant. This can be explained by the fact that copies of the trees are grouped at distances ranging between 6 and 15 to 20 meters. At greater distances than these the copies were encountered only sporadically, mostly being common *Robinia pseudacaccia*.

The determination and correlation coefficients were positive, but they are close to zero (see table 4), which indicates on one hand a relatively low relationship with regeneration

distance from compact forest and on the other hand the fact that there are other elements that were not taken into account for the calculations done. One of the factors it will take into account in the future research will be conditions for regeneration which are extremely important alongside the dissemination of seeds.

Table 3

Kruskal-Wallis test and Bartlett's Test for Homogeneity of variance in Păușa-Miersig, Bihor County for trees and shrubs biogrups

Location	Păușa-Miersig (Bihor)		
Trees	Kruskal-Wallis Statistic		
	Chi^2	11.84552246	N.S. (P>0.05)
	Probability	0.2221587928	-
	Bartlett's Test for Homogeneity of Variance		
	Values	262.5693373	*** (P<=0.001)
	Probability	3.717448576E-052	-
Shrubs	Kruskal-Wallis Statistic		
	Chi^2	37.50539801	*** (P<=0.001)
	Probability	2.137705158E-005	-
	Bartlett's Test for Homogeneity of Variance		
	Values	212.2578124	*** (P<=0.001)
	Probability	8.871515969E-041	-

Table 4

Coefficient of determination, correlation coefficient and adjusted coefficient of determination for trees and shrubs from Păușa-Miersig, Bihor county

Correlation Statistics	Trees	Shrubs
R^2 (Coefficient of Determination)	0.3908691914	0.0961742091
R (Correlation Coefficient)	0.6251953226	0.310119669
R*^2 (Adjusted R^2)	0.3299561105	0.005791630011

CONCLUSIONS

The two locations are vastly different in terms of regeneration distribution. At the Vârfurile(Arad) it was achieved appreciable distances from compact forest (1.5-2.5 km), in Păușa-Miersig(Bihor) the distribution was made compact in terms of specimens of species trees , being influenced by the dispersion of seeds.

Another very important thing is that the submission of copies of the species mentioned in this paper are the first to colonize the land, which in time are beginning to create conditions conducive to the occurrence and development of the tree specimens.

Comparative analysis between the 11th locations from Vârfurile(Arad) area presents extremely large differences regarding distances from biogrups towards compact forest. The same results of comparative analysis were obtained for specimens of trees and distribution range of the species.

In Păușa-Miersig(Bihor) location specimens of trees species are grouped in terms of regeneration at distances ranging between 6 and 15 to 20 meters. At greater distances than these, trees were encountered only in isolation. Comparative analysis of the locations also shows extremely large differences regarding distances and the range of the species.

The results obtained are interesting from the perspective of building silvopastoral systems in areas where high value agriculture cannot be carried out successfully, and grazing combined with the growth of trees in biogrups would be beneficial to diversify income and productions.

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