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RESEARCH ARTICLE

THE STAND STRUCTURE AND FACTORS AFFECTING THE SUCCESS OF NATURAL REGENERATION APPLICATIONS IN SCOTS PINE (*PINUS SYLVESTRIS* L.) FOREST STANDS IN YOZGAT-AKDAGMADENI FOREST OPERATION DIRECTORATE

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ABSTRACT

The current study aims at analysing the basic learning methods of Montessori kids and comparing the methods of learning between boys and girls. The Montessori education is concentrated on the self-directed activity, hands on learning and scientific observation of children. The two Montessori's of south Bangalore Leo kids and Samskruti were selected as the study area. The age group considered was from 3-5 years and were grouped as PKG (Pre Kinder Garden), LKG (Lower Kinder Garden), and UKG (Upper Kinder Garden). Out of 115 children, 67 were boys and 48 were girls. The performance level of boys and girls were analysed under four different tasks and activities classified under identification criteria, memory skills, physical ability and mathematical ability. The total percentage of performance level of boys was 82.09% and girls was 83.66%. The ANOVA - one way classification was used between groups and within groups. The f value was calculated and was compared with F critical value. In the conclusion drawn, there is no significant difference between the performance level between boys and girls at early age of Montessori education.

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INTRODUCTION

There are pure and mixed natural forest resources, which are highly valuable due to the presence of various climatic and physiographic conditions, in our country. According to 2016 data, total forest area of our country is 22.7 million hectares. This figure is equivalent to 28.1% of the country's surface area. In terms of quality, 50% of our forest resources are degraded high forests and degraded coppice (Anon., 2016). As can be understood from these figures, the natural structure of a large part of our forests has been disrupted due to various biotic and a biotic factors such as excessive exploitation, faulty technical interventions, fires and damages caused by snow and storm, and also their productivity has decreased. Depending on this decrease in the productivity of our natural forest resources, the amount of products obtained from such resources has also been decreasing in each passing year. As a matter of fact, according to the recent data, 15 to16 million m^3 of timber volume can be obtained from our country's forests. This value corresponds to an increase of approximately 0.750-0.800 m^3/ha per year (Urgenc vd., 1989). Ensuring a significant rise in this ratio and increasing the share of forestry sector in our national income can only be possible by rehabilitating our natural forest resources, which are degraded due to various reasons and thus became unproductive, in terms of both quality and quantity through successful regeneration activities (natural and artificial regeneration),and by making those degraded forests productive again through afforestation activities (Odabasi *et al.,* 2004). According to the 2006 data of the General Directorate of Forestry, it is reported that 629.189 ha forest lands are subject to regeneration activities in terms of ecological, technical and social aspects. These lands, which are subject to natural and artificial regeneration activities, constitute 2.97% of the forest area of our country. In our country, regeneration activities were carried out on a total of 1,000,200 ha area, of which 485,185 ha was natural and 515,015 ha was artificial, until the 7th Five-Year Development Plan period (1973-1994). During the 7th Five-Year Development Plan period (1995-2000), regeneration activities were carried out on a total of 232,122 ha area, of which 105,656 ha was natural and 126,466 ha was artificial. During 8th Five-Year Development Plan period, regeneration activities were carried out on a total of 280,000 ha area, of which 125,000 ha was natural and 155,000 ha of artificial (Anon., 2016). The fact that Turkey's forests have quite large variations in terms of species diversity and stand structures depending on different habitat conditions is directly affecting the determination of the techniques to be applied in the regeneration and maintenance works as well as the success

of these works. Therefore, it is necessary to determine the local habitat conditions (climatic, edaphic and physiographic conditions) prevailing in the forest lands, where the silvicultural interventions to be performed, and stand structure characteristics (stand structure, density, stratification, mixture, etc.) (Dasdemir, 1987; Oliver and Larson, 1996). In order to provide this information, habitat studies and stand structure analysis should be performed (Wehrli *et al.,* 2005). Although it is very important to obtain detailed information on the habitat conditions and stand characteristics, this information alone is not sufficient to obtain successful results from the regeneration and maintenance works to be done.

As well as the information obtained from the studies and stand analyses performed, it is necessary to know the silvicultural demands of the species to be intervened. For this purpose, many studies have been conducted in the natural forests of our country (Pamay, 1962). In these researches conducted in natural forests, regeneration practices and juvenility biology (juvenility number, distribution, height growth, diameter development etc.) were also examined (Caliskan *et al.,* 2004). This is because the natural and artificial regeneration works constitute the first stage of the studies conducted on ensuring the continuity of the existing forests and establishing new forests. For this reason, it is very important to bring the juvenile generation consisting of healthy and high quality individuals at sufficient number and with homogeneous distribution to the field after the regeneration studies, and to make them retained by the stand (Tegelmark, 1998).

MATERIALS AND METHODS

MATERIALS

Introduction of Akcakisla Forest Operation Directorate: In terms of forest structures, the research area is located in the Euro-Siberian forest region (Mayer and Aksoy, 1998). According to the information obtained as a result of the inventory studies carried out in 2013, total forest area in Siragomu plan unit is9256.7 ha, of which 71.7%has the characteristics of normal forest. When the forests in the plan unit are evaluated in terms of stand structures, 3815.6 ha of the sub-district forests have mixed stand structure, and the forests mostly have pure stand structure. Scots pine trees prevail in the pure forests of the plan unit. Sometimes, drought periods occur before and after the vegetation season. At the research area, which has a transition climate type as a combination of Black sea climate and continental climate, it is possible to encounter early and late frost hazards from time to time.

The geological structure of the area belongs to the Cretaceous Period, and there are gneisses and micaschist formations. Also, karstic areas prevail from place to place. On the other hand, the soil has a deep, sandy-clay-loam texturein general, and it has an acidic, sometimes neutral and slightly alkaline characteristic (MTA, 2002). The stand type of the section number214, where the research is conducted, is Csd_2. The stand, which has a pure and monolayer structure, is facing northwest. The natural regeneration works began in 2014, since the area had homogenous seed trees at sufficient amount. Within this scope, one cut was performed for seeding and one for lighting purposes in the area. The stand has an elevation of 1120m and is located on the middle slope. The slope of the land varies between 25-30% (Figure 1).

Figure 1. Regeneration area in the Akcakislasection number 214 (Photo credit to H.B. OZEL)

Introduction of Kadipinari Forest Management Directorate: In terms of forest structures, the Kadipinari plan unit is located in the Euro-Siberian forest region (Mayer and Aksoy, 1998). According to the information obtained as a result of the inventory studies carried out in 2013, total forest area in the plan unit is 10923.8 ha of which 75.8% has the characteristics of normal forest (Anon., 2013). The research area is located in the transition zone of the Black Sea and continental climate, and harsh winter conditions are encountered because of the elevation in this area (1200-1800m) which is higher than the other sub-district directorate. For this reason, it is highly probable for the forests in Kadipinari region to get broken due to snow and to fall down due to storms. On the other hand, especially during the 5-month period, in which the vegetation period begins, it is possible to suffer from late frost damages at various levels. While the soil is deep in the area, there are some places where the skeletal structure of soil is quite high. The soil formation of the area dates back to Mesozoic planter period among the geological periods, and the soil has a sandy clay and clay-sandy-loam texture. In addition, moderately acidic and partly neutral soil conditions prevail in the area (MTA, 2002). The section number 48 constituting the research area is of stand type Csd_1, and its total area is 6.8 ha. The area is a northeast-facing and monolayer stand with 1350m altitude, and it is located in the middle slope with a slope of 25-30%. Regeneration works were initiated in the area in 2014, and in this respect, one cut was performed for seeding and one lighting purposes (Figure 2) (Anon., 2013).

Figure 2. Regeneration area in the Kadipinarisection number 48 (Photo credit to H.B. OZEL)

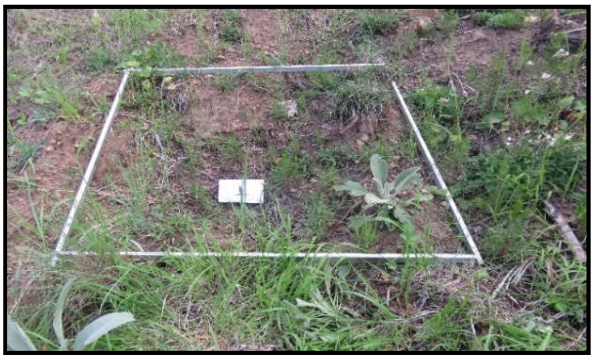

Figure 3. Determination of juvenile number per square meter

METHODS

Characteristics of the Testing Plots: In this research carried out in 2 Forest Sub-District Directorates affiliated to Yozgat-Akdagmadeni Forest Operation Directorate, where the scots pine had established stands with residual characteristics within the framework of its marginal natural distribution area over a year, a total of 30 testing plots were selected from 2 even-aged regeneration areas with different sizes in order to determine the factors affecting the success of natural juvenility and natural regeneration activities. All of the land surveys were conducted in these testing plots.In the research, it was deemed appropriate to select the testing plots of 25x40 m (1000 m^2) considering the research aim, duration, working opportunities and field conditions.

Many studies have been conducted by many researchers on subjects such as regeneration, maintenance, seed yield and adaptation trials of various species; and the number of testing plots in these researches have been established ranging from 3 to 30, in general (Eyuboglu *et al.,* 1995). Whereas in this research project, it was deemed sufficient to use a total of 30 testing plots from the scots pine regeneration areas established in 2013. The size of the regeneration areas was adopted as the main criterion in the determination of the number of these testing plots in respect of sections where various measurements and determinations were made during the research.

Determination of Habitat Conditions in the Testing plots: Forests, which are living organisms, have a special ecosystem that is formed by the impact of many factors. This life partnership, which is named as the forest ecosystem, may show significant differences between regions and even within the same region, depending on the changes occurring in the factors constituting it (Cepel, 1995). For this purpose, some measurements and determinations were made in the testing plots in order to examine the climatic, edaphic and physiographic characteristics that were effective in the development of habitat conditions in the natural regeneration areas of scots pine. These characteristics were considered as individual factors in the analyses.

Measurements and Determinations Made in Seed Trees: In the seed trees available in the 25x40 m testing plots taken from the scots pine regeneration areas, which constitute the research area, some measurements and determinations were made with regard to age, number of trees, diameter, height, basal area, volume, average annual volume increase, density, mixing ratio, crown form, stem condition, crown width and crown projection area.

Statistical Analyses Used in the Research: In natural regeneration practices, many factors have individual or joint effects on the regeneration success (the number of juveniles per square meter), the development of juveniles(height growth and root collar diameter development) and some morphological features (crown condition and leaf colour) (Long *et al.,* 2004). Especially, the number of juveniles per square meter, which is the most important criterion used in determining the success of regeneration works, gets significantly affected by environmental factors, genetic factors and silvicultural techniques applied. Hence, it is recommended to use multidimensional statistical analyses in determining the factors that are effective on an important quantitative character such as the number of juveniles (Oliver and Larson, 1996; Tegelmark, 1998; Elliott and Knoepp, 2005). Thus, the number of juveniles per square meter was established first, in order to find the factors affecting the success of regeneration in the research (Figure 3). In the research, after the data table for factor analysis was prepared, Principal Component Analysis Model, which is one of the widely used factor derivation methods, was taken as basis to determine the factors explaining the variance in the best way.

Thus, variables with high correlation between them came together and formed those factors. Mostly the “Kaiser” and “Scree Test” criteria were used to determine the number of factors to represent the relationships between variables at the highest degree. In this research, the Kaiser Criterion, which is based on the derivation of the factors, whose eigenvalue (participation amount in variance) statistic is greater than 1, was used. In order to facilitate the naming and interpretation of the factors, it is necessary to subject the unrotated factor matrix obtained by Principal Component Analysis to rotation. For this purpose, the Varimax technique was applied by selecting the orthogonal rotation based on zero correlation between factors, and rotated factor matrix was obtained. The naming and interpretation of factors can be performed according to the common characteristic of one or more variables with a large factor load. Sometimes the variable with the largest factor load is taken as the factor measure (Kalipsiz, 1994).

Taking the aim of the research into account, the common factors are named in three ways, which are symbolic (symbolic) names, descriptive (descriptive) names and causal names (Dasdemir, 1987). In this research, the naming and interpretation of the factors were generally performed based on the variable with the largest factor load. However, in some cases, common reasons lying behind the variables, which were regarded as associated with the factors, were also taken into consideration. In this context, the research was considered to reveal a pre-understanding about the effects of the variables (climatic, edaphic and physiographic variables and seed trees and juvenile related variables), which were obtained during the research, on the number of juveniles. For this purpose, in the multiple regression analysis, which was carried out to determine the effects of all variables established during the data collection process on the number of juveniles, the number of scots pine juveniles per square meter determined in 2017 was taken as the dependent variable. In the multiple regression analysis, the most significant factors (whose participation amount in variance was greater than 1) were used as independent variables. In the application of multiple regression analysis, the *enter* method was adopted.

RESULTS

Factors Affecting the Regeneration Success: Particularly, the number of scots pine juveniles per square meter in 2017 was taken into consideration as a measure of the regeneration success, and the factors affecting this were examined. Explaining the bilateral relations of the above mentioned variables, which have significant effects on the number of scots pine juveniles, is not sufficient to determine the total effects on the number of scots pine juveniles. For this reason, factor analysis was applied in order to group the highly correlated variables within this complex structure, and thus to reveal the variable groups clearly. In factor analysis, 5 common (main=prime) factors were derived based on the Principal Component Analysis and the Kaiser criteria (Table 1). As can be seen in Table 1, the first 5 factors are derived with an eigenvalue statistic greater than 1. The first factor explains 39.41% of the total variance. The first and second factors together explain 58.81% of the total variance. The five common factors derived explain 88.92% of the total variance.

The rotated factor matrix is used to facilitate the naming and interpretation of the factors (Table 2). Factor loads less than 0.5 are not included in this table in order to facilitate the naming and interpretation. As can be seen in the rotated factor matrix, the correlations between the 16 variables were represented by 5 factors, in total. In each factor, the variable with the highest correlation took the first place. As can be seen from Table 2, all of the 8 variables in factor 1 are related to soil (edaphic) conditions. Hence, the first factor was named as "SOIL STRUCTURE". ORGMAT (organic matter) variable with the highest factor load (0.993) within the group was selected to represent the factor in the multiple regression analysis. Two of the variables in the second factor are related to physiographic characteristics. Therefore, the second factor was named as "PHYSIOGRAPHIC CONDITION". ALTITUDE variable with the highest factor load (-0.945) was selected in the group, in order to represent this factor in multiple regression analyses. 2 variables were included in the third factor. All of these variables are related to climatic conditions. Therefore, the third factor was named as "CLIMATE".

Table 1. Explanation of total variance according to the results of factor analysis

Factors	*First Eigenvalues*			Square of Unrotated Factor Loads Before Rotation			Square of Rotated Factor Loads After Rotation		
	Total	Variance (%)	Accumulated Variance (%)	Total	Variance (%)	Accumulated Variance (%)	Total	Variance (%)	Accumulated Variance (%)
1	16.129	32.321	32.321	16.129	32.321	32.321	16.129	23.176	39.41
2	7.782	16.557	55.066	7.782	16.557	55.066	9.127	19.419	58.81
3	5.153	10.964	66.030	5.153	10.964	66.030	4.571	11.573	70.26
4	2.894	6.156	72.187	2.894	6.156	72.187	4.167	10.442	80.70
5	2.355	5.010	77.197	2.355	5.010	77.197	2.356	8.214	88.92
6	2.026	4.310	81.507						
7	1.208	2.570	84.077						
8	1.163	2.475	86.552						
9	1.086	2.310	88.862						
10	0.881	1.874	90.736						
11	0.657	1.398	92.134						
12	0.628	1.337	93.470						
13	0.573	1.220	94.690						
14	0.443	0.942	95.632						
15	0.370	0.788	96.420						
16	0.320	0.682	97.102						
17	0.251	0.534	97.636						
18	0.219	0.465	98.101						
19	0.179	0.380	98.480						

Table 2. Rotated Factor Matrix

Variables	Factors				
	1	2	3	4	5
ORGMAT	0.993				
NITROGEN	0.985				
PHOSPHORUS	0.976				
POTASSIUM	0.962				
MUTLAKD	0.958				
FIZYOD	0.934				
STRUCTURE	0.918				
TEXTURE	0.910				
ALTITUDE		-0.945			
BOND		0.937			
PRECIPITATION17			0.932		
TEMPERATURE17			0.926		
LITTER17				0.875	
LIVINGCOVER17				0.861	
PH					0.773
SALT					-0.741

Extraction Method: Principal Component Analysis Rotation Method: Varimax with Kaiser Normalization

Table 3. Results of multiple regression analysis

Independent Variables	Regression Coefficients	Standard Error	F	R^2
(Fixed)	0.741	0.423	9.671***	0.86
ORGMAT	0.926*	0.112		
ALTITUDE	-0.00613	0.004		
PRECIPITATION17	0.412*	0.002		
LITTER17	0.396*	0.002		
PH	-0.00218	0.008		

Dependent Variable: SDGS.17
(**): significant at P=0.01 probability level
(***):significant at P=0.001 probability level

The third factor was represented by PRECIPITATION17 variable in regression analysis. There are 2 variables in the fourth factor. All variables in this group are related to the soil cover conditions of the regeneration area. Within this scope, the fourth factor was named as "SOIL COVER CONDITION", and in order to represent this factor in multiple regression analyses, LITTER17 variable with the highest factor load (0.875) in the group was selected. The variables in the fifth factor are related to soil reaction. Therefore, the fifth factor was named as "SOIL REACTION", and the PH variable with the highest factor load (0.773) in the group was selected to represent this factor in regression analyses. In the research, multiple regression analysis was performed in order to investigate the effects of the nine most important factors (independent variables), which emerged as a result of factor analysis, on the number of scots pine juveniles. In the multiple regression analysis performed, the number of scots pine juveniles in 2014 (SGS06) was used as the dependent variable. The results of the analysis conducted using the Enter method are given in Table 3. Area is based on these five factors. However, the most important of these factors are ORGMAT, PRECIPITATION17 and LITTER17. According to these results, multiple regression model can be written as follows; However, these results are obtained from 3 year-old scots pine natural regeneration areas. It is not the right approach to make a definitive judgment or to make technical and ecological generalizations regarding the success of natural regeneration activities and the factors affecting this success for the scots pine forests, of which management period is 120 years, even though it varies according to Bonitet classes. In order to obtain more accurate and realistic results regarding this subject, fixed testing plots selected in this research should be preserved, and these studies should be continued. This should be continued for at least 20 to 30 years, and the effects of global climate change on the natural juveniles of scots pine and regeneration success should be examined by using modern ecological models and by assessing different approaches. Within this context, the data obtained from this study carried out in Yozgat-Akdagmadeni region, and the statistical analysis results only provides an approach and a pre-understanding in terms of defining the variables with the most significant effect on the success of the natural regeneration studies carried out forscots pine.

DISCUSSION

As a result of factor analysis applied according to 16 variables in order to determine the factors affecting the regeneration success in the scots pine natural regeneration works started in 2 sections of two Forest Sub-District Directorates affiliated to Yozgat-Akdagmadeni Forest Operation Directorate, it was found that 5 factors were new factors that were significantly affecting the regeneration success, and these factors were renamed.

According to the factor analysis results, the factors affecting the success of regeneration works carried out in the natural regeneration area are as follows; 1. Soil Structure, 2. Physiographic Condition, 3. Climate, 4. Soil Cover Condition and 5. Soil Reaction. As a result of factor analysis, the first factor found to be effective on the regeneration success is soil structure. In general, for all forest tree species to retain their natural and artificial juveniles in the soil and to gain their biological independence, demand for water and organic matter conditions in the soil is higher in the first years compared to the following years. For this reason, due to the extreme ecological conditions in the forests located at elevations of 1000 m and above, such as the research area, within natural succession, the level of organic matter, moisture content, macro and micro nutrients in the soil gain more importance. The findings obtained from this study also come to the forefront in the juvenility of a tree species resistant to extreme ecological conditions such as scots pine. As a matter of fact, in a study carried out in Finland in both pure scots pine stand and in mixed stand of scots pine and Norway spruce, it is emphasized that the source of the organic matter amount in the soil should be sufficient for natural and artificial juveniles to develop and retain their root systems, especially in the first years (Juntunen and Neuvonen, 2006).

The second factor affecting the success of scotspine natural regeneration activities is the physiographic condition. Natural regeneration activities are silvicultural practices that require very hard and intensive work in terms of conducting proper interventions, determination of abundant seed year and maintenance and protection of the juveniles which are to form a new stand upon arrival. Therefore, in order for these works to be successful, some extreme conditions must be eliminated beforehand. The most important of these is the optimal distribution area of the species. For this reason, for the stands to be subjected to natural regeneration activities, they are required to be within the natural distribution area of the species and to have the structural characteristics close to the optimal (Cepel, 1995).In this context, altitude is a physiographic factor which directly and indirectly affect the emergence of geographic variations of the species. This factor may cause differences and changes at different levels in all other habitat conditions, especially precipitation and temperature. In this study, it was found that at high altitudes, the stand structure deteriorated as the alpine forest border approached even in a tree species that could withstand extreme conditions such as scots pine, and that the number of juveniles in the sublayer of the stand and the growth performance decreased. In another study conducted in Finland on this subject, it was reported that depending on the increase in elevation, the level of precipitation and temperature regime changed negatively, germination and growth conditions were deteriorated, and that the water and nutrient economy was disturbed due to lack of

benefiting from water and organic nutrients sufficiently, especially in all plants because of soil frosts (Valkonen, 2000).As can be seen from these results, the effects of elevation and exposure factors on the success of regeneration are quite different and significant (Atalay and Efe 2010). The third factor affecting the success of scots pine natural regeneration activities is climate. Especially depending on the global climate change, which has been occurring in recent years, there have been significant differences in the ecological demands and geographical variations of forest trees as in all living things. Also in this study, especially during the vegetation season, changes in precipitation and temperature values as well as their state of balance are quite effective in the development and regeneration success of the natural juveniles of scots pine. As this situation is effective on the maturation of scots pine stands, which are to be regenerated, it is also effective in the length of the regeneration period and growth process. Despite being accustomed to extreme conditions, the improvements occurring in the atmosphere and soil due to the increase in precipitation rate positively affect the rate of regeneration as well as the growing performance of juvenile individuals of scots pine. In a study conducted in the scots pine forests of Czech Republic, it was found that seasonal or unexpected climate change would result in highly negative consequences on natural regeneration success (Vacek *et al.,* 2016). According to the findings obtained from the factor analysis applied in the research, the fourth factor affecting the success of the scots pine regeneration activities is the soil cover condition. The soil cover condition constitutes the litter and living cover.When the factor loads obtained from the analyses are examined, it is seen that litter condition is very effective on the success of natural regeneration activities of scots pine compared to the living cover. This is because of the fact that the litter is the source of organic nutrients that are necessary for the scots pine juveniles in their first years.

Here, rather than the presence of a litter cover, its thickness and type are important. For this reason, the presence of litter cover transformed into raw humus under conditions, where organism activities are good, is quite beneficial and supportive for the natural development of scot juveniles. As a matter of fact, in a study examining the mull and raw humus types, it was found that scots pine juveniles consumed the litter cover accumulation in the form of raw humus very quickly because of the rapid growth of the species in juvenility and their biological independence from the early ages (Nyland *et al.,* 2002). In this research, soil reaction was found to be the last factor affecting the success of scots pine natural regeneration activities. Soil reaction is a factor that directly affects anion and cation capacity (Cepel, 1995). For this reason, it was found that due to sudden decreases in pH value, significant clearances were formed in the areas reaching high acidity values in the research area, and that the juveniles could not cluster at the area despite other suitable conditions. In fact, in a study conducted in Finland, it was determined that the scots pine juveniles had difficulty in coming to the area due to the decrease in soil reaction (Hallikainen *et al.,* 2007).

Conclusion

As a result of this research conducted in the scots pine forest natural regeneration areas, which started in 2014 at the Akcakisla and Kadinpinar Forest Sub-District Directorates of Yozgat-Akdağmadeni Forest Operation Directorate, 5 new factors, which significantly affected the implementation of successful natural regeneration practices in ensuring the sustainability of the scots pine forests, which had carried out marginal natural spreading in the research area and a border spreading in the continental transition climate zone, were identified. However this data obtained as a result of this project, where determinations and analyses were performed for preliminary approach or provincial evaluations, are definite and difficult to generalize for the natural juvenility and regeneration activities of scots pine forests at early ages, it provides very important and basic information for the operators responsible for ensuring the continuity of the scots forests in the region.

In this context, natural regeneration activities should be carried out in stands, which have completed their natural biological course under optimal conditions especially in areas, where extreme ecological conditions prevail like in the research area, and have reached management period, such as the scots pine stands. Especially the thin and middle-aged scots pine stands should not be subject to regeneration activities for the sake of completing allowable cut. On the other hand, when a cut performed with the purposes of preparation and seeding, depending on the effects of extreme conditions of the habitat, the stand density and closeness should be conserved in accordance with the normal development period, and should not be reduced to below 0.7.

Nevertheless, especially in scots pine stands located in high terrains, where storms become effective from time to time and which are close to the alpine forest border at 1200 m elevation, the stand cover should break gradually and by spreading over the entire period of regeneration, and wind should not be given the opportunity to catch a grip point. The importance of organic matter and water content, especially in the soil cover levels, for the arrival and retention of scots pine natural juveniles was also emphasized in this research. Within this scope, soil tillage should be carried out on-site with a harrow, no cover should be transported outside of the stand, and the litter cover mineral soil should be mixed well in order to accelerate the decomposition. Regeneration works in the research area should start by the end of August and the regeneration areas should be left by the end of September. Vegetation period, which is about 4 to 5 months, should be used effectively, and for this purpose, the work organization regarding the regeneration and maintenance activities should be planned in advance.

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