



INVESTIGATION OF PLANTATION AND REGENERATION SUCCESS IN SEVEN- YEAR PLANTATION OF ANIMAL HUSBANDRY REGIONS IN THE MASHLAK FORESTRY PLAN IN NOSHAHR- IRAN

^aMohammad Rezvani, ^bSaeedeh Eskandari

^aDepartment of Environment and Natural Resources, Payam Noor University, Tehran, Iran,

^bDepartment of Forestry, Sari agricultural sciences and natural resources University, Sari, Iran,

Full postal address: No. 6, Masoud khani Alley, eastern fifth Bostan, Estakhr Street, the Fourth Square of Tehran pars, Tehran, Iran, PC: 165564516

ABSTRACT

This was a study to investigate regeneration in animal husbandry regions with attention to the qualitative and quantitative status of both the natural regeneration of seedlings and those in plantations. The investigation was done in the animal husbandry regions of the Mashlak forestry plan over seven years and the results were studied to assess the regeneration state of the region. Results showed that 48.8 percent of the seedlings were from natural regeneration and 59.2 percent of the seedlings became established after seven years. *Acer* species was identified as the most successful plant to regenerate within the range that was studied both naturally and from artificial regeneration (plantation). In addition, *Acer* had the highest percentage of crown cover crown among the various species in the plantation. This shows that *Acer* species was successful both from natural regeneration and plantation in competition with other species and was the dominant species in the area. The results also showed that the highest percentage of seedlings (either regeneration or plantation) were from the diameter class of less than 2.5 centimeter (<2.5 cm) and the height class of less than one meter (<1 m). Additionally, most of the seedlings regeneration and plantation had a good degree of quality (quality degree 1) and only a limited number were limited quality degree 3 (both natural regeneration and plantation). There were a higher percentage of seedlings from plantations in the 1 degree category than there were naturally regenerated seedlings. This demonstrates the success of plantations to produce good seedlings in the study area. Consequently, plantation can be recommended as a good strategy for forest restoration in this area.

KEYWORDS: Quantitative evaluating, qualitative evaluating, seedling, Iran

INTRODUCTION

The clearing of livestock from the European forests occurred over two centuries ago. Traditional methods of husbandry were substituted by industrial animal husbandry and as a result exported meat and dairy products to all parts of the world and implemented forestry planning that led to extensive wood production. Traditional animal husbandry is now redundant as a less viable method of meat and milk production and due to its detrimental impact on areas of forest whereby forests are used inappropriately leading to the destruction of forested areas from the prevention of natural regeneration, soil press and the consumption of wood for fuel. This problem leads forestry experts to design and implement a suitable reorganization plan to clear livestock from forests. Therefore steps were taken to begin this process in 1997 in Mashlak (Jabari Izadi, 1997). Thus, farmers cleared their livestock from the forests on receipt of their rights determined by the Executive Plan to designated regions for animal husbandry, which were free of tree cover. Restoration of these areas to regions with a canopy of forest trees should be done with correct management and planning from the best possible model with the lowest cost. Animal husbandry regions were usually established in areas with low slopes or no slopes and high regions that have fertile soil due to a close proximity to natural water

sources. Gentle slopes with sufficient light provide good conditions for the establishment of regeneration and appropriate growth of plantation seedlings. Site-specific actions such as shrub and tree planting, water table restoration and increasing vegetation diversity can improve the quality of Nature (Đurđić et al., 2011). Plants respond biologically to various parameters in the holocoenotic environment. Besides this, many extrinsic factors, e.g. the time of phenophase and seed dispersal, are very important in distribution, survival and success in the establishment of a species in the community (Suresh and Paulsamy, 2010). Investigation of species culture, species adaptation and silviculture operations in the plantations are the most important operations in forestry to increase production and to provide wood needs (Gorjibahri and Hemati, 2005). So far studies have been done in the field of forestry regeneration for different species. Doost Hosseini (1976) investigated regeneration in the Kheyroud Kenar Forest and concluded that there were higher numbers of smaller seedlings and the most of the seedlings were below 30 centimeters in height. Furthermore, despite an abundance of small maple seedlings, those more than a year old were rarely observed in the forest. Sagheb Talebi (1987) in an investigation of *Acer* concluded that *Acer* seedlings are rapidly established in every part of the forest where gaps appear and first year seedlings of *Acer* were

the most common to appear among the seedlings growing on the forest floor, but they invariably died from a lack of light in subsequent years and only a few remained. Duryea (2005) evaluated forest regeneration methods (natural regeneration, seeding and plantation) for four species of pine in Florida in the U.S.A. The results showed that in the natural regeneration method, pines had the most growth and that those that received the same amounts of light had equal growth patterns. Sowing seeds directly in comparison with natural regeneration provides the possibility of new species diversity and more control becomes possible. But planting seeds has lower productivity than tree planting for two reasons; firstly that seeds planted in a plantation program grow faster than those that grow naturally; secondly, wood productivity is more viable in a plantation method because the product can be harvested earlier. Kolahi et al. (2007) investigated the Quantitative and Qualitative Characteristics of Torogh Forest Park. They used a random-systematic sampling method with a grid of 80×110(meters). To identify soil type and its role in trees, vitality, three profiles in each type of habitat were investigated. Results indicated that hardwood and conifer species make up to 79% and 21% of the park's tree cover respectively, where *Platanus* (33%), *Pinus* (21%), *Robina* (19%) and *Fraxinus* (18%) represent the highest frequency. Analysis of parameters through PCA method showed that the soil had medium texture and contained lime, causing the rareness of nutrients besides a loss of humidity. So due to these shortcomings most of trees suffer from medium to weak vitality and up to now approximately 18% of the trees have inevitably been cut. Forouzesh Sotgavaberi et al. (2010) studied quantitative and qualitative characteristics of 19-year old plantation of Caucasian alder (*Alnus subcordata*) in Siahkal region. In this research random-systematic sampling method was used. Diameter at breast height (DBH), tree total height (TTH), crown height (CH), stem quality (SQ) and crown vitality (CV) were measured for all trees. Results showed that Arithmetical mean of DBH, TT and CH were 13.11 cm, 13.8 m and 5.3 m for Caucasian alder, respectively. The mean annual diameter and height increment of trees were 0.66 and 71.54 cm, respectively. Also the results showed that, from the viewpoint of SQ, 34.6%, 45% and 20.4% of trees were first, second and third classes, respectively. Also results showed that the amount of annual growth of alder trees in comparison with similar plantation is low, because silviculture practices, specially thinning operations were not carried out in the studied plantation. Khosrojerdi et al. (2010) evaluated the effects of physiographical factors on some qualitative and quantitative characteristics of *Pistacia vera* L. at Khajeh Kalat forest in Khorasan Razavi province in Iran. In order to study the effect of physiographical factors (aspect, slope and altitude) on qualitative and quantitative characteristics (crown area, viability and vigority) of pistachio, a land survey was conducted. Sampling performed by 48 plots in random design established on overlaid maps of aspect, slope, and altitude, created by GIS software. Results showed that slope, aspect and altitude have significant effect on crown area of pistachio. Aspect and slope showed significant effect on pistachio vigority. Results

RESULTS

also showed that slope, aspect and altitude had no significant effect on viability. Vaidhayakarn and Maxwell (2010) investigated the Ecological status of the lowland deciduous forest in Chang Kian Valley, Chiang Mai in northern Thailand. To properly assess the overall health of forested areas, several parameters were used. These factors included the species diversity and their abundances, canopy height and tree density, understory and ground flora densities, seedlings and coppices (DBH and height). Results showed that The degree of degradation was serious and it would continue to deteriorate unless effective protective and remedial action is done. With attention to the importance of research in the plantation and regeneration situation in animal husbandry regions, this study investigated the qualitative and quantitative status of natural regeneration seedlings and plantation seedlings in some animal husbandry regions of Mashlak forestry plan after seven years. This was a final stage to study the success of forest regeneration in these regions. The purpose of this study was to establish the best method for the reconstruction of vacant spaces and the best method of forest restoration with attention to an investigation of successful plantation practice.

MATERIAL AND METHODS

Study area

Total area of the seven-year-old plantation area was 12265 square meters. The general direction of this area is north and northwest. The minimum height above sea level is 540 meters and the maximum height above sea level is 720 meters. The main species in the region are *Diospyros*, *Acer*, *Fraxinus*, *Carpinus*, *Alnus*, *Prerocarya* and *prunus*.

Inventory method

A random-systematic method was used for plot inventories. Firstly, the area border was identified on 1:1000 map and then a network of inventory sizes (10 meter * 10 meter) was randomly thrown on to the map. Then the network inventory was transferred to nature and positions of lines crossing the inventory network, which were the centers of the plots identified in nature. Each of the plots was measured as a circular area with a 2.8 meter radius and 25 square meter area in nature. Since each 100 square meters (10 meter * 10 meter = network inventory size) were considered as one plot, the percentage of inventory was 25%.

Data collection method

All seedlings of natural regeneration and plantation were evaluated point of quality and quantity within each plot. A tape meter was used for measuring DBH and height of the seedlings. Metal meter and compass were used for implementation of the network inventory and plastic rope was used for implementation of the circular plots. The range plots on a slope were measured by clinometers and height above sea level was measured by gauge-height.

Data analysis method

Excel software was used for data analysis and to draw the charts.

Regeneration situation

According to Figure 1, 48.8 percent of seedlings were naturally regenerated and 59.2 percent of seedlings in the area were established from plantations in the study area after seven years.

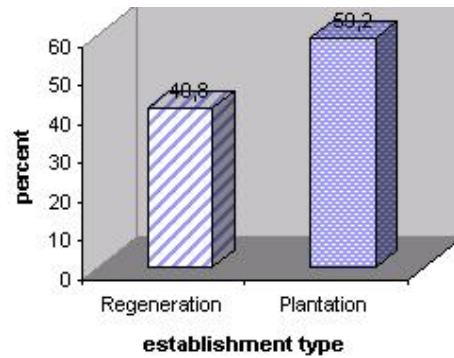


FIGURE 1: Regeneration situation in the study area

Mixture of species

The results show that *Acer* species had the most success in natural regeneration and artificial regeneration (plantation) among the various species in the study area (Fig. 2).

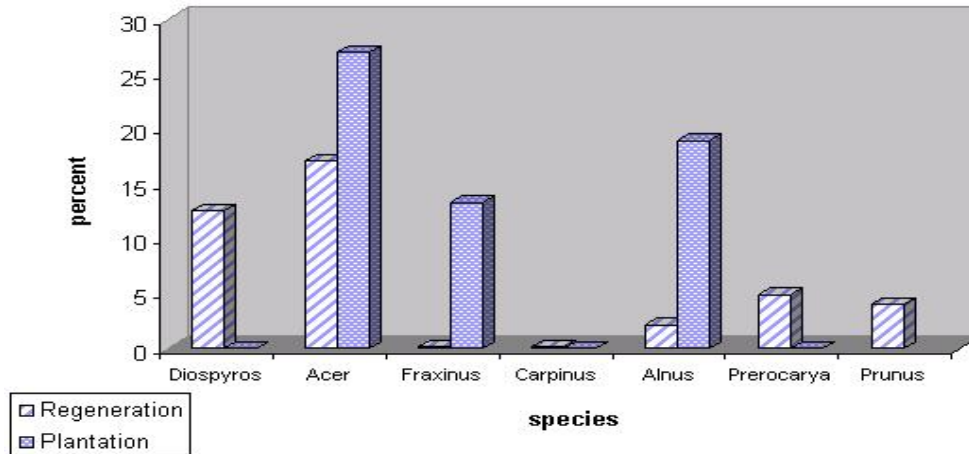


FIGURE 2: Mixture of species in the study area

Diameter in breast height (DBH) of species

According to figure 3, most of the seedlings were set in the diameter class <2.5 centimeters. Then most of the seedlings were in the diameter class 7.5 to 10 cm.

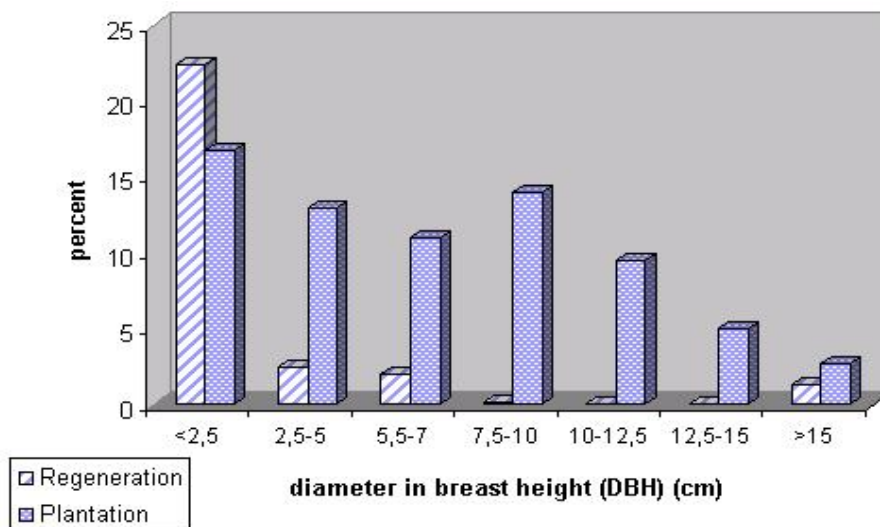


FIGURE 3: DBH of species in the study area

Height of species

With attention to Figure 4, most of the naturally regenerated seedlings had a height of less than 1 meter but most of the plantation seedlings were set in the height class 5 to 10 meters in the 7-year-old plantation.

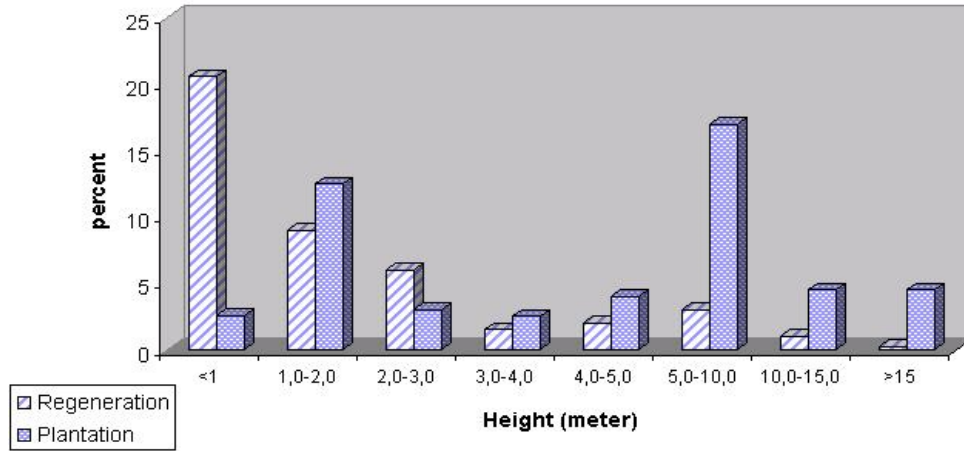


FIGURE 4: Height of species in the study area

Canopy of species

Results show that *Acer* species and *Alnus* species had the higher percentages of canopy in plantations, respectively (Fig. 5).

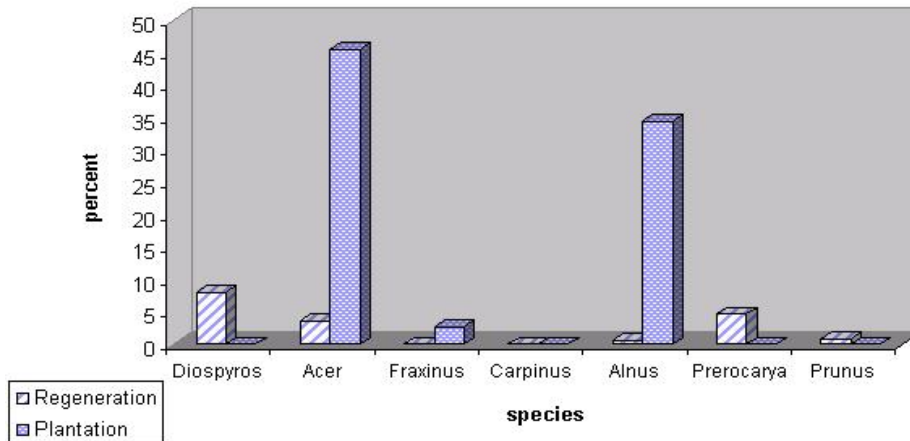


FIGURE 5: Canopy of species in the study area

Qualitative degree of species

The results show that most seedlings both naturally regenerated and those cultivated in plantations were of good quality (Qualitative degree 1). In addition the percentage of degree 1 plantation seedlings was more than degree 1 regeneration seedlings. In total the number of seedlings with quality degree 3 (both natural regeneration and plantation) was very low (Fig. 6).

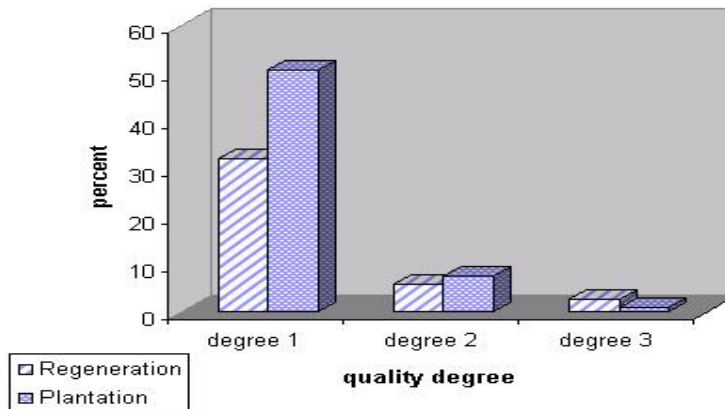


FIGURE 6: Qualitative degree of species in the study area

DISCUSSION

The plantation and regeneration situation should be investigated in animal husbandry regions seven years after

plantation in order to gain an accurate assessment of the success rate. Results of this study showed that 48.8 percent of naturally regenerated seedlings and 59.2 percent of plantation seedlings were established in the study area

after seven years. This shows that the plantation procedure was more successful than natural regeneration in the area. Also, *Acer* species was the most successful at natural regeneration and artificial regeneration (plantation) among all the species in the study area. This shows that *Acer* species was successful at both natural regeneration and plantation in competition with other species and it was the dominant species in the area. Together with *Acer*, the species *Alnus* and then *Fraxinus* also demonstrated successful plantation in the study area. In terms of natural regeneration, after *Acer* species, *Diospyros* species could become well established in the area. The cause may be the existence of better ecological conditions for the establishment of this species. Sagheb Talebi (1987) also concluded that *Acer* seedlings were rapidly established in every part of the forest where gaps have been created and one-year seedlings of *Acer* are the most common seedlings among those on the forest floor.

Result showed that most of the seedlings (both naturally regenerated and plantation) were set in the diameter class <2.5 centimeters. This may be due to less competition between the younger seedlings. Because light competition between the seedlings at the early stages of growth, is much lower than the next stages of growth therefore fewer of them die as a result of plant competition. As can be seen from figure 3, with increasing diameter and growth of seedlings, gradually their numbers decrease and many of them are removed because of light competition. However an exception is observed in the decreasing trend of a reducing number of seedlings in the chart (fig. 3) in the diameter class of 7.5 to 10 centimeters, which may be due to less light competition is in this class. In terms of natural regeneration, most of the seedlings were set in the class of that less than one meter high. This can be attributed to less light competition at an earlier growth stage and consequently the seedlings survival in the lower height classes. Research results of Doost Hosseini (1976) also demonstrated that there were a high numbers of smaller seedlings and that most seedlings had a maximum height of 30 centimeters; this result is similar research results of Forouzesh Sotgavaberi et al. (2010) too. a result that supports this current research. In terms of percentage canopy, *Acer* species and *Alnus* species had the higher percentages of canopy in the plantation respectively. This shows that these species developed more successfully than other plantation species and were well able to expand their crowns. In addition, two plantation species *Acer* and *Alnus* were more successful than their naturally regenerated counterparts. In terms of natural regeneration the species *Diospyros* had more growth, which may be due to better ecological conditions for the establishment of this species. The results also indicate that most regeneration and plantation seedlings were of good quality (Qualitative degree 1) and the number of seedlings with quality degree 3 (both natural regeneration and plantation) was very limit. It is similar the research results of Forouzesh Sotgavaberi et al. (2010). In addition the percentage of plantation seedlings of quality degree 1 was more than numbers of

degree 1 regeneration seedlings. This shows the success of the plantation method for the production of good seedlings in the study area. Consequently, plantation is a good strategy for forest restoration in this area.

REFERENCES

- Doost Hosseini, K. (1976) investigation of regeneration in Kheyroud Kenar forest- Noshahr. MS Dissertation, Tehran University, Iran.
- Duryea, M L. (2005) Forest regeneration methods: natural regeneration direct seedling and planting.
- Đurđić, S., Stojković, S. and Šabić, D. (2011) Nature conservation in urban conditions: A case study from Belgrade, Serbia. *Maejo international journal of sciences and technology* **5** (1), 129-145.
- Forouzesh Sotgavaberi, R., Ahmadi, MT., Etemad, V. and Saeidi, HR. (2010) Investigation on quantitative and qualitative characteristics of 19-year old plantation of Caucasian alder (*Alnus subcordata*) in Siahkal region. *Iranian Journal of Forest* **1** (2), 137-150.
- Gorjibahri, Y. and Hemati, A. (2005) Results of effects of silviculture operations on *pinus tada* and *alnus subcordata* at flat regions in north of Iran. *Journal of research and structure* **63**,2-10.
- Jabari Izadi, Sh. (1997) Booklet of Mashlak Forestry Plan. Forestry technical office of total bureau of Natural Resources of Mazandaran province, Noshahr, Iran.
- Khosrojerdi, E., Darroudi H. and Namdost, T. (2010) Effects of physiographical factors on some qualitative and quantitative characteristics of *Pistacia vera* L. at Khajeh Kalat forest in Khorasan Razavi province. *Iranian Journal of Forest and Poplar Research* **17** (3), 337-347.
- Kolahi, M., Etemad, V., Namiranian, M., Zahedi, Gh. and Khosrojerdi, E. (2007) A. An Investigation of the Quantitative and Qualitative Characteristics of Torogh Forest Park. *Journal of the Iranian Natural Resources* **59** (3), 623-637.
- Sagheb Talebi, Kh. (1987) investigation of habitat needs and live how of *Acer* species in Kheyroud Kenar forest- Noshahr, MS Dissertation, Tehran University, Iran.
- Suresh, D. and Paulsamy, S. (2010) Phenological observation and population dynamics of six uncommon medicinal plants in the grasslands of Nilgiris, Western Ghats, India. *Maejo international journal of sciences and technology* **4** (2), 185-192.
- Vaidhayakarn, Ch. and Maxwell, J. (2010) Ecological status of the lowland deciduous forest in Chang Kian Valley, Chiang Mai, northern Thailand. *Maejo International journal of sciences and technology* **4** (2), 268-317.