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[Research]

Determination the structure of oriental beech, *Fagus orientalis* Lipsky stands (Case study: Asalem watershed forests, north of Iran)

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ABSTRACT
Modification of stands' structure and managing them using silvicultural methods close to nature and single selection system require information on status of structure, determining the target diameter, basal area and suitable volume to result in long-term equilibrium and sustainability. So, this study was conducted using the selection sample statistical method by selecting five 1-ha sample plots in mixed oriental beech *Fagus orientais* Lipsky forests of Asalem watershed, located in the west of Guilan Province, Northern Iran. Quantitative and qualitative features of the studied stand were recorded in relation to each sample plot. The results from analysis of the curves related to diameter classes, volume and basal area of the stands with their annual growth showed that 26 to 28 $m^2.ha^{-1}$ and a volume of 300 to 350 $m^3.ha^{-1}$ with a target diameter of 75-80 cm was suggested for the purposeful removal and avoiding taste markings in order to modify and guide the structures of Northern Iran's oriental beech stands.

Keywords: Beech, Mixed stand, Northern iran, Stand structure, Target diameter

INTRODUCTION
Sustainable and survival of earth's largest ecosystem, namely forests, especially the Caspian forests as the biosphere's reserve depend on consistently performing the right managerial actions, along and compatible with nature, in order to be able to maintain its sustainability in the long-term and reach a climax.

One of the most abundant and economically important hardwood genera in the northern hemisphere temperate forests is *Fagus* (Sagheb-Talebi *et al*. 2011; Ertekin *et al*. 2015). Moreover, oriental beech, *Fagus orientalis* Lipsky is one of the climax species, valuable and industrially important in Northern Iran's forest stands (Sagheb Talebi *et al*. 2003a; Sagheb-Talebi *et al*. 2014). Beech forests account for approximately 17.6 % of the total forest area, 30 % of the standing volume and 23.6 % of the stem number in the Hyrcanian forests in Iran (Rasaneh *et al*. 2001). Since the uneven-aged method has been recognized as the best method for managing natural oriental beech stands in the Northern forests of the Iran (Sagheb-Talebi & Schuetz 2002; Marvie-Mohadjer 2005; Hassani & Amani 2009), having some information on the best condition in terms of stem number, basal area, suitable volume per hectare and also determination of the appropriate target diameter as a long-term desirable specified pattern of sustainability of the stand can prevent markings.

Researches show that the determination of target diameter, basal area and suitable volume or in other words, drawing the equilibrium curve is only possible in forests managed using the uneven-aged and control methods (one hundred percent inventory in specific periods or through fixed sample plots) (Schuetz 1999). The optimum curve stands of management by a single selected system is shown by the equation $N=Aq^{(n)}$ which is a geometric progression equation presented by

De liocourt. It has been defined an uneven-aged forest in equilibrium state as a forest in which if the current growth is harvested periodically, the remaining diametric distribution and the initial volume of the forest will not change (Hush *et al*. 1963). Studying the intact Iranian oriental beech forest stands, located in the high areas of the Caspian Sea, Asli & Eater (1969) argue that major part of these heights is covered with irregular uneven-aged forests with more than two storeys. Other studies conducted in the beech stands also confirm the uneven-aged structure of these forests (Fallah 2000; Sagheb Talebi *et al*. 2001; Mataji & Namiranian 2002; Delfan Abazari *et al*. 2004; Eslami 2007). Colette (1951) considered 70 cm diameter as the target diameter and the De liocourt coefficient as 1.46 in high forest under uneven-aged forest management and the control method in hard wood forests of Southern Belgium (Ardenne & Lorraine region) during four one-hundred percent inventory periods in one area in order to achieve the equilibrium curve. However, Rohanson believes this number to be much higher for Southern Belgium's forests and suggests an under 20 m^2 cumulative basal area in equilibrium state. Schuetz (1999) proposes a relationship for determining the equilibrium curve in Emmental forests of Switzerland which is important in achieving the equilibrium state in the stands. During researches conducted in Longola forest in Germany in order to determine the equilibrium curve, Schuetz & Rohanson (2003) predicted a 60 cm diameter as the target diameter, while the suggested amount was 70 to 90 cm in the oriental beech forests in Switzerland. Based on the study conducted by Eslami *et al*. (2007) in the oriental beech forests of Neka Zalemroud area (Neka county, Mazandaran province), the target diameter was predicted as 80 to 85 cm under normal condition. In this regard, the present study has been discussed modification of structure and leading the stands toward long-term sustainability and equilibrium.

The study aimed at studying the structure of oriental beech stands by determining the basal area, volume and suitable target diameter considering the annual increment in diameter, the studied stands and finally, the purposeful removal.

MATERIALS AND METHODS

Study Area

The studied region is Nav of Asalem district 2, compartment 25, in western forests of Northern Iran. In terms of state divisions, this region is located in Talesh County, Guilan Province, Iran (Fig. 1).

The altitudinal range of the study area forests is between 1050 to 1320 metres above sea level (m.a.s.l).

Average slope gradient of the area is between 20 to 50%, with northeast-east direction and the soil type is forest brown soil acidic.

The forest type is mixed hardwood species and form of forest is uneven-aged and irregular high stands.

The *Fagetum* level contain *Ruscus hyrcanus* L-*Fagetum.* Mixture of noble hardwood such as maple (*Acer velutinium* and *A. cappadocicum*), alder (*Alnus subcordata*), ash (*Fraxinus excelsior*), linden (*Tilia platyphyllus*), Elm (*Ulmus glabra*), hornbeam (*Carpinus betulus*) and wild cherry (*Prunus avium* syn. *Cerasus avium*) with oriental beech as an interesting point in the *Fagetum* level.

The studied area has been under silviculture management in form of single selection method in two rotations for the past decades.

After primary and general identification of the study area, five sample plots, each covering one ha (100 × 100 m) were selected using selective sampling method (Fig. 2) to analyze the structure and to determine the volume, basal area and target diameter of oriental beech stands.

Since the plots are far from each other with independent information and studied in form of the minimum area required for studying structure of uneven age stands (1 ha) (Eslami & Sagheb-Talebi, 2007), it will be reliable and generalizable.

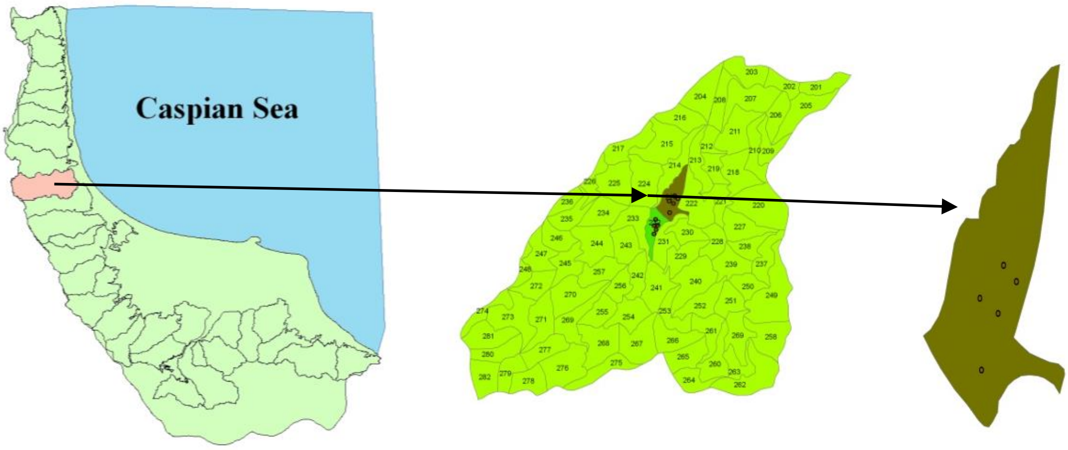


Fig. 1. Study area (north of Iran).

Therefore, quantitative features of the forest stand such as breast height diameter (d.b.h) higher than 7.5 cm, height determination of at least 3 trees in each diameter class and each sample plot in order to calculate the real standing volume; obtaining information related to condition of the habitat such as canopy cover percentage, slope, aspect, height above the sea level (h.a.s.l), determining and counting the regeneration of forest floor in form of two transects with a width of 10 × 100 m vertically and horizontally were measured. Then in each transect, micro plots (3 × 3 m) in every 15 m were selected and their regeneration counted in 4 classes (saplings with a height of less than 1/30 cm, diameters of 0-2.5, 2.5-5 and 5-7.5) were carried out in predetermined forms. To analyze annual diameter increment of the studied stands, for minimising the damage on the trees because of using increment borer, we employed the information of oriental beech trees in Asalem region obtained by Siahipour *et al*. (2001) and Eslami & Hasani (2011). Data analysis was carried out using SPSS 20 and Excel 2007.

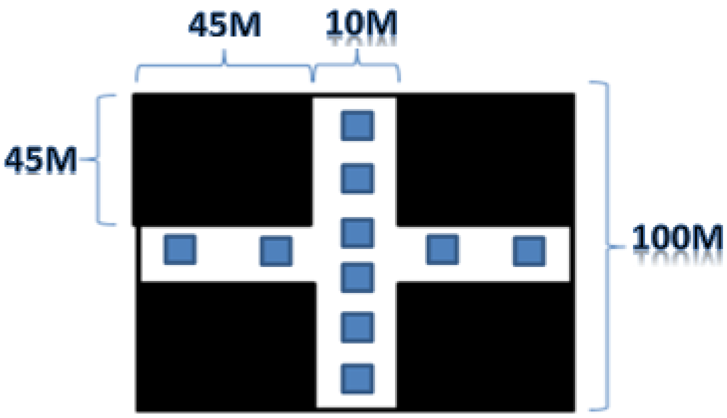


Fig. 2. Sample plot (100 × 100 m), transect (10×100 m) and microplot (3 × 3 m).

RESULTS

To determine the quantitative condition of the studied stands, the trees were divided into 4 diameter classes: small (less than 35 cm), medium (35 – 55 cm), large (55 – 70 cm) and extra-large (higher than 70 cm). Results from average of the 5 sample plots (1 ha), shows that the number of stems per hectare was very high and most of them belonged to the small diameter class (<35 cm), which include 82% of the stems. Volume inventory and basal area of the stand were 404 $m^3.ha^{-1}$ and 37.80 $m^2.ha^{-1}$, respectively, almost evenly divided (if the large and extra-large diameter classes are combined) (Table 1).

Frequency distribution of the stems in diameter classes (average of 5 plot) is presented in Fig. 3. Uneven-agedness state and irregularity in structure of the stand (existence of at least two Gaussian-shaped states or in other words, even-agedness among the diameter classes of 15-30 and 35-50 cm), in oriental beech along with other species (general state) was totally shown in Fig. 3, representing the irregular uneven-aged state, a characteristic of the Caspian forest stands.

To determine the quantitative condition of the studied stands, the trees were divided into four diameter classes. Distribution study of basal area and volume along with distribution number in each diameter class (small, medium, large and extra-large) can help us to select the felling from determined classes and to modify the stand's structure and purposeful removal. As shown in Fig. 4a, the volume distribution was well dispersed in all diameter classes (except for the large class). The most basal area (Fig. 4b) was recorded in the small diameter class followed by the medium and extra-large classes, respectively.

Table 1. Frequency of the trees ($N.ha^{-1}$), volume of the trees ($m^3.ha^{-1}$), basal area ($m^2.ha^{-1}$) in diameter classes.

Diameter classes	Basal area ($m^2.ha^{-1}$)	(%)	Volume ($m^3.ha^{-1}$)	(%)	Stem number ($N.ha^{-1}$)	(%)
Small timber	14.75	39.02	120.38	29.76	535.4	82.19
Medium timber	11.68	30.91	121.91	30.14	90.8	13.94
Large timber	3.07	8.13	39.37	9.73	11.2	1.72
Extra-large timber	8.29	21.92	122.8	30.36	14	2.15
Total	37.80	100	404.47	100	651.4	100

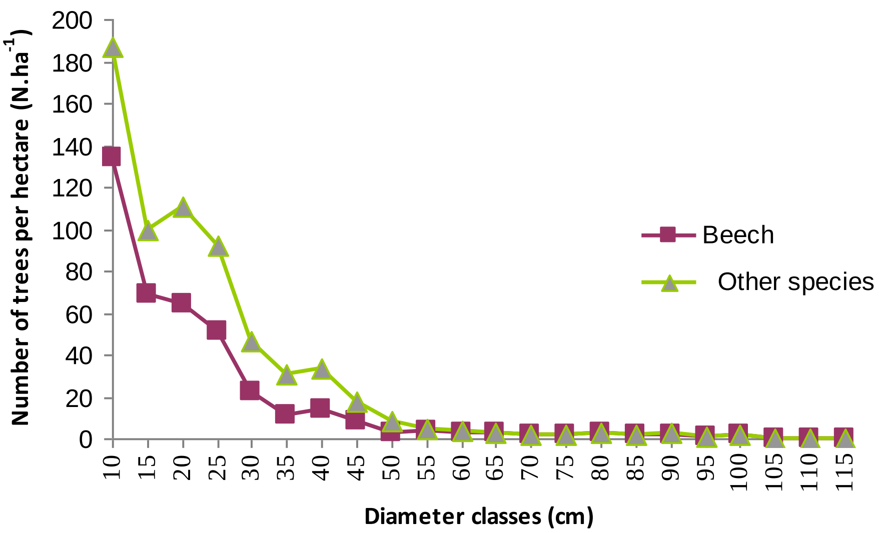


Fig. 3. Distribution of trees in diameter classes, Asalem region, Giulan Province, Iran

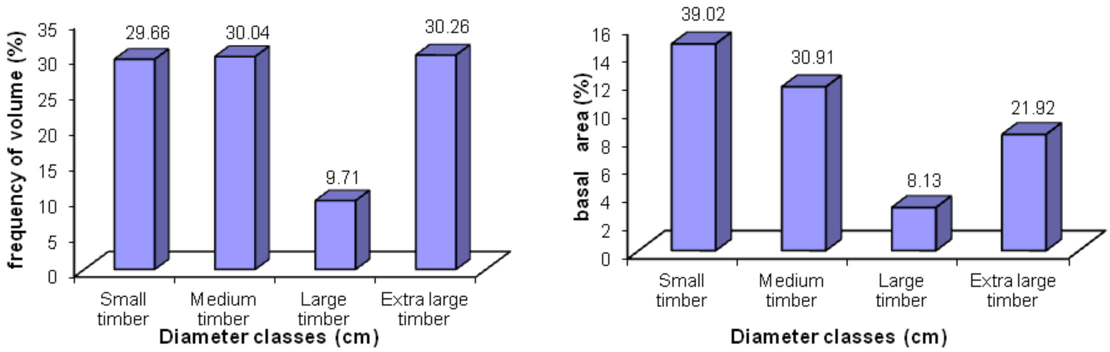
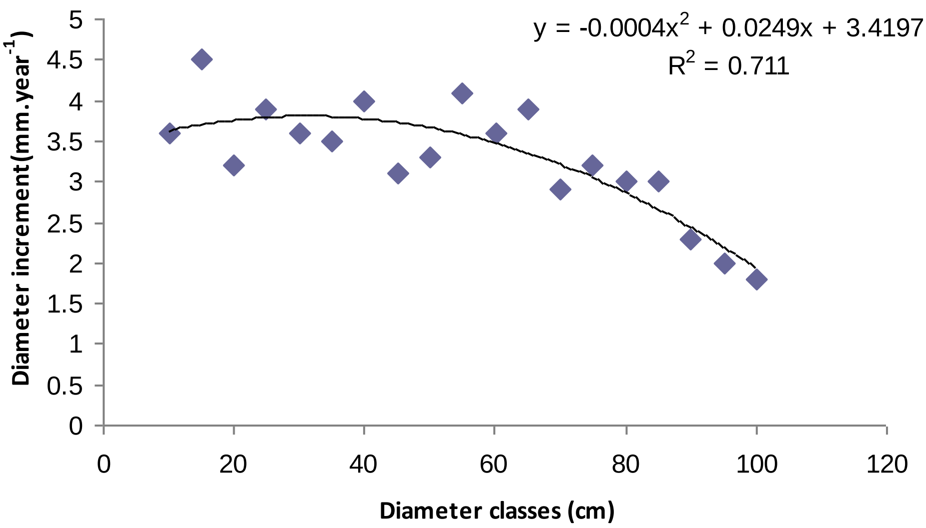


Fig. 4. Proportion of frequency volume (a) and basal area (b) in diameter classes: small (dbh <30cm), medium 35< dbh <50cm), large (55< dbh <70cm) and extra-large (dbh >70cm).

According to results of this research, annual diametric increment (id) in different diameter classes ranged from between 1.8 to 4.5 mm.year^{-1}, an average of 3.28mm.year^{-1}.
This shows the diameter classes which had the highest increment, and determines maintenance of the stems (final diameter increase) until the annual average increment (3.28 mm.year^{-1}) to use the maximum growth in minimum time in the study area. Despite the fluctuations in diameter increment, the 75 cm diameter class had an increment equal to the average increment (Fig. 5a).
Annual diameter increment is from 3.6 mm.year^{-1} and accumulative basal area of 2 (m^2.ha^{-1}) is decreased to about 1.8 mm.year^{-1} with a basal area of 35 (m^2.ha^{-1}).
In this respect, it is determined that the basal area between 17-28 (m^2.ha^{-1}) was consistent with the increment of 3.28 mm.year^{-1} (annual current increment) (Fig. 5b).



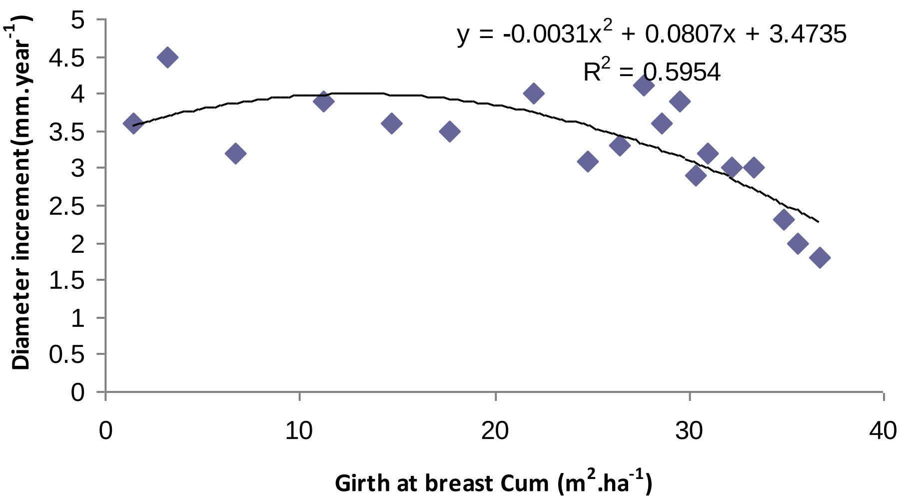


Fig. 5. Distribution of annual diameter increment (id) in a) diameter classes and b) cumulative basal area.

Fig. 6 shows regeneration of the studied stand in four classes. What is interesting is that the number of regenerated stems of other species (other than oriental beech) in the first class (saplings with heights of less than 1.30 cm) was higher than in the beech species. Therefore, this species may form a higher percentage of stems constituting the stand in future and oriental beech will no longer be the dominant species; unless the ecological characteristic of oriental beech, namely cruelty and dominance is realized and this species dominates other species in the other growth stages.

Table 2 shows that European Beech Stands volume distribution in the diameter classes was properly done in compared with Oriental beech stands of Northern Iran.

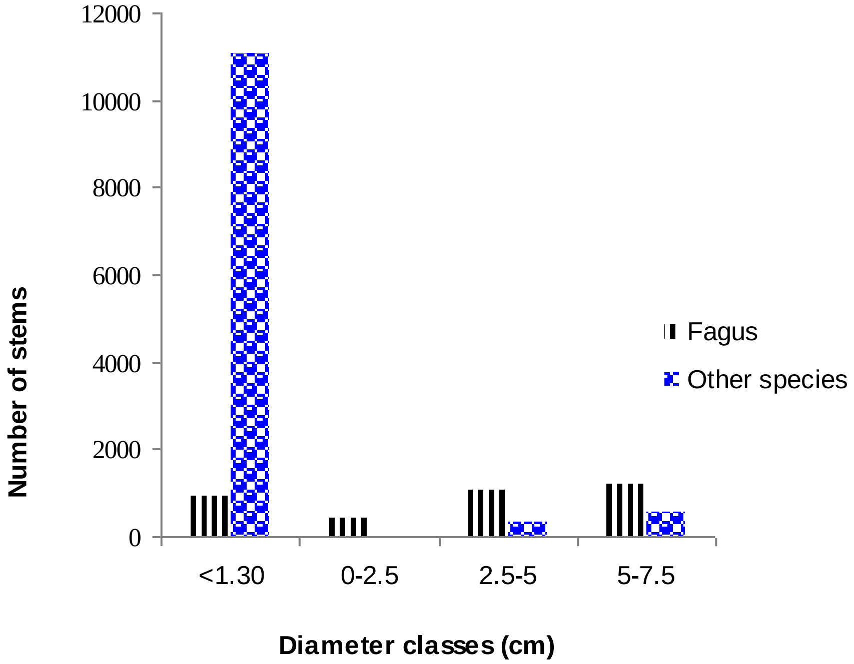


Fig. 6. Number of regeneration stems in four classes.

Table. 2. Comparison between the results of present study and other studies on diameter classes of beech stands.

Stand	Frequency volume in diameter classes				References
	<30	35-55	55<	Total	
Mixed beech (Asalem forest Guilan)	30	30	40	100	Current Research (2015)
Mixed beech (Neka Zalemrood forest, Iran)	10	21	69	100	Eslami (2007)
Mixed beech (Kheiroud Kenar forest, Iran)	9	14	79	100	Fallah (2000)
Mixed beech (Kheiroud Kenar forest, Iran)	6	13	81	100	Sagheb Talebi (2003)
Beech Stands (Switzerland forest)	15	34	51	100	Schuetz (1995)
Beech Stands (Longola Germany forest)	36	32	32	100	Schuetz (2005)

DISCUSSION

Obviously, structure determination and planning, based on forests present situation is the most important way to obtain a management pattern and proper silvicultural method to lead each forest stand. Structure, in fact determines the construction (vertical and horizontal), mixture and diversity of forest stands. Frequency distribution of the stems provides us with the summary of a useful show of distribution process of the trees in diameter classes of a stand and it is necessary for sustainability and survival of the forest, in order to predict felling and application of silvicultural methods consistent with each stand's structure. The curve of number in diameter classes decreased in all studied sample and the small even-aged groups (being multiple-humped) evokes the group emergence theory of oriental beech. Appropriate number of stems in the first diameter class (n_{10}) (about 180 stems per ha) shows that the forest has a very high potential and interferences during the two past decades has provided the possibility of the saplings' growing and reaching the first countable diameter class (n_{10}). According to the studies conducted in Oriental beech forests of Switzerland and Longola forests of Germany, in order to draw the equilibrium curve (Schuetz & Rohanisch 2003), the number in the first diameter class in Longola area was estimated as about 100 saplings with target diameter of 60 cm and basal area of 21 $m^2.ha^{-1}$. This amount was predicted in more than 150 stems (n_{10}) with target diameter of 70 to 90 cm in Oriental beech forests (with different mixtures) in Switzerland. Another research done by Schuetz (2006) in oriental beech forests of Eastern Germany, suggests 100 stem (n_{10}) in the first diameter class, about 250 to 300 $m^3.ha^{-1}$ volume of standing trees per ha and estimated average basal area of 22 $m^2.ha^{-1}$. The research done by Eslami (2011) in mixed oriental beech stands in central Northern Iran (Neka Zalemroud area), predicted 120 stem (n_{10}) with target diameter of 80 to 85 cm, basal area of 25 $m^2.ha^{-1}$ and volume of 350 to 400 $m^3.ha^{-1}$. In this regard, the studies done in Asalem area (considering the average annual diameter increase and average basal area) predicted 120 to 150 stem in the first diameter class (n_{10}). Therefore, is necessary thinning operations in these stands (considering the average distance of the stems of about 4 metres from each other). Since determination of final diameter (target) along with other diameters is necessary in performing the group single selection method, determination of target diameter must be by considering two important defects in oriental beech wood, namely; red rot and hollow inside. The defects are primarily observed in 55 to 60 (cm) diameter relatively considering environmental conditions (Parsapajooh *et al*. 1996; Sousani 2000). Therefore, considering the mentioned defects, more attention should be given to growing the diameters above 60 cm. But due to the high percentage of the volume and basal area of the trees in the Oriental beech trees in the extra large diameter class (30% volume and 22% basal area), the target diameter can be considered above 60 cm (maximum 80 cm) in the next rotations. Also, it should be considered that the highest diameter increment was observed in 25 to 65 cm diameter classes with an annual increase of 3.6 $mm.year^{-1}$. Annual diameter increase started decreasing from 60 cm diameter and it annually reached 3.2 $mm.year^{-1}$ to 75 cm which is close to the average annual diameter increase (id= 3.28 $mm.year^{-1}$).

Diagrams and curves of volume and basal area of diameter classes in the studied stand compared to the European beech stands (in which silviculture operation was done based on equilibrium curve) (Schuetz 2001) show that volume distribution in the diameter classes was properly done, and unlike most of Northern Iran's oriental beech forests in which the highest basal area and volume are in the large and extra-large diameter classes (Sagheb Talebi *et al*. 2003b; Eslami *et al*. 2007), an almost good structural modification was carried out in the study area due to appropriate silvicultural operations during the two past decades. Therefore, they can be in the state of equilibrium by performing timely tending operations using the group single selection system (without a determined regeneration period) or group selection system (with a long regeneration period) (Sagheb Talebi & Schuetz 2002). Considering the whole analyses and studies performed on oriental beech stands of Asalem area and in order to modify suitable structure and long-term sustainability of the stands in the study area, target diameter could be introduced between 75 to 80 cm in stand and a cumulative basal area between 28 to 29 $m^2.ha^{-1}$ with a volume of about 300 to 350 $m^3.ha^{-1}$. For improvement of the stand structure and becoming closer to equilibrium state, a stem number of around 120 ($N.ha^{-1}$) in the first diameter class (n_{10}), and in at least two 10-year rotation could be predicted. These studies can help us to avoid taste markings and modify of the structure in Oriental beech stands of Northern Iran.

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REFERENCES

Asli, A & H, Eeter 1969, Measurement of forest growth. *Journal of Natural Resource Faculty of Tehran University* 30 p. (In Persian).

Colette, L 1951, Le development du hetre – Type en Forest Jardine. *Bulletin de la Societe Royal Forestiere de Belgium,* 49: 415 – 420, (In France).

Delfan Abazeri, B, Sagheb-Talebi, Kh & Namiranian, M 2004, Investigation of development stage of control part in beech forest of Kalardasht (Langa area). *Iranian Journal of Forest and Poplar Research,* 12: 307-326, (In Persian).

De Liocourt, F 1898, De L'amenagement des sapinieres. *Bulletin de la Societe Magazine français – Comte et Belfort,* 4: 396-409, (In France). Ertekin, M, Kirdar, E, Ayan, S 2015, Effects of tree ages, exposures and elevations on some seed characteristics of Oriental beech (*Fagus orientalis* Lipsky), SEEFOR *Southeast European Forestry*, 6: 15-23.

Eslami, A & Sagheb Talebi, Kh 2007, Investigation on the structure of pure and mixed beech forests in north of Iran; Neka - ZaLemrud region. *Pajouhesh & Sazandegi*, 77: 39-46, (In Persian).

Eslami, A, Sagheb Talebi, Kh & Namiranian, M 2007, Determining of equilibrium state in uneven – aged oriental beech forests of Northern Iran. *Forest and Poplar Research,* 15: 104-114, (In Persian).

Eslami, A 2011, Investigation on diameter increment in uneven-aged oriental beech forests of northern Iran. *International Journal of Academic Research,* 3: 1135-1140.

Eslami, A, Hasani, M 2011, On the comparison of diameter increment of Oriental beech (*Fagus orientalis* Lipsky) in different regions of the Caspian forests. *Journal of Food, Agriculture & Environment,* 9: 754 - 757.

Fallah, A 2000, An appropriate model for distribution of diameter classes of natural beech stands in the Sangdeh & Shastkolateh Forests, PhD Dissertation, Department of Forestry, The University of Tehran, Iran, pp. 183-189, (In Persian).

Hassani, M & Amani, M 2009, Investigation on some qualitative and quantitative characteristics of oriental beech in the optimal phase; Sangdeh, Caspian forests of Iran, *Iranian Journal of Forest and Poplar Research,* 37: 4-27, (In Persian).

Hush, B, Miller, C & Beers TWL 1963, Forest Mensuration. New York Ronald Press Co pp. 216-219.

Marvie-Mohadjer, MR 2005, Silviculture. Tehran University Press, pp. 100-120, (In Persian).

Parsapajouh, D, Fazey, M & Taghiepareh, HR 1996, Industrial wood preservation. Tehran University Press, pp. 439-450, (In Persian).

Resaneh, Y, Moshtagh, MH & Salehi, P 2001, Investagation quantitative and qualitative Northern forests of Iran. Proceedings of International conference management north forests and sustainable Chalous, Iran, pp. 56-68, (In Persian).

Sagheb-Talebi, Kh & Eslami, A 2008, Nature-based silviculture—how can achieve the equilibrium state in uneven-aged oriental beech stands. Proceedings of 8th IUFRO International Beech Symposium, September 8-13, Nanae, Hokkaido, Japan.

Sagheb-Talebi, Kh, Eslami, A, Ghourchibeigi, K, Shahnavazi, H & Mousavi Mirkalaie, SR 2001, Structure of Hyrcanian beech forests and application of single selection system. In: Proceedings of 2nd International Meeting of Forest and Industry, Tehran, 5–7 October, pp. 107–138.

Sagheb-Talebi, Kh & Schuetz, JPh 2002, The structure of natural Oriental beech (*Fagus orientalis*) forests in the Caspian region of Iran and potential for the application of the group selection system. *Forestry Oxford*, 75: 465-472.

Sagheb-Talebi, Kh, Sajedi, T & Yazdian, F 2003a, Forests of Iran. Publication of Research Institute of Forests and Rangelands, Tehran, pp. 205-207, (In Persian).

Sagheb-Talebi, Kh, Mataji, A & Zahedi Amiri, Gh 2003b, Stand structure in pure and mixed oriental beech stands of Caspian forests. Internal report, Research Institute of Forests and Rangelands, 6p., (In Persian).

Sagheb-Talebi K, Mirkazemi Z, Akhavan R, Karimidoost A, Maghsoudloo MK, Moghadasi D 2011, Some structural characteristics in the Far East border of the distribution range of oriental beech (Fagus orientalis Lipsky) stands. In: Wagner S, Fahlvik N, Fischer H (eds.) Proceedings of The 9th IUFRO International Beech Symposium organized by IUFRO working party 1.01.07 "Ecology and Silviculture of Beech", Dresden/Göttingen, Germany, 12-17 September 2011. Institute for Silviculture and Forest Protection, Dresden, Germany, pp.61-63.

Sagheb-Talebi, KH, Sajedi, T & Pourhashemi, M 2014, Forests of Iran. *Publication of Springer*, pp. 112-118.

Schuetz, JPh 1975, Dynamique et conditions dequilibre de publements jardines sur les ststions de la hetraieasapin. Schweiz. *Zeitschrift fuer forstwesen,* 126: 637-671, (In Germany).

Schuetz, JPh 1999, Conditions of equilibrium in fully irregular, uneven-aged forests: The State–of–the–Art in European Plenter Forests. In: Emmin gham, WH (ed). Proceedings of the IUFRO Interdisciplinary Uneven-aged Management Symposium. Corvallis, pp. 455-467.

Schuetz, JP 200l, Derplenterwald and weitere formen strukturierter and jemischter walder. Parey Buchrerlag, Berlin, pp. 176-180.

Schuetz, JP & Rhnisch, F 2003, Steuerunny des wachwuchses wahrend der uber Fuhrung von gleich fromigen Fichten Aufforstung sbestanden in Plenter walder. In: *Tagung der section Ertragskunde des Deu ts chen Verbandes forstliche Forschungsanstalte*. Turgau 2–4 June, 273–291.

Schuetz, JP 2006, Modelling the demographic sustainability of pure beech planter forests in Eastern Germany. *Annals of Forest Science,* 63: 93–100.

Siahipour, Z, Mirbadin, A, Amanzade, B, Hematiand, A & Khanjani, B 2001, Determination of diameter growth of beech (*Fagus orientalis* Lipsky) in Guilan Province. *Journal of Forest and Poplar Research,* 26: 129-101 (In Persian).

Susani, J 2001, Investigation of relationship red rot and hollow inside with diameter breast height in beech forest. *International Conference Management North Forests and Sustainable,* Chalous, Iran, pp. 85-95, (In Persian).

بررسی ساختارتوده‌های راش شرقی(مطالعه موردی: جنگل‌های حوضه‌آبخیز اسالم)

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چکیده

اصلاح ساختار توده‌ها و مدیریت آنها با شیوه جنگل‌شناسی همگام با طبیعت و روش تک‌گزینی، نیازمند اطلاع از وضعیت ساختار، تعیین قطر هدف، سطح مقطع و حجم مناسب برای هدایت آنها به سمت تعادل و پایداری درازمدت است. در همین راستا تحقیق حاضر با برداشت پنج پلات یک هکتاری با روش آماری، نمونه‌برداری انتخابی در جنگل‌های راش آمیخته حوضه آبخیز اسالم، در غرب استان گیلان و شمال ایران انجام شد. سپس در هر پلات، با آماربرداری صد در صد، کلیه مشخصات کمی و کیفی توده مورد مطالعه در فرم‌های مربوطه ثبت شد. نتایج حاصل از تجزیه و تحلیل منحنی‌های تعداد در طبقات قطری، حجم و سطح مقطع توده‌ها با رویش سالیانه آنها نشان داد سطح مقطع ۲۶ تا ۲۸ مترمربع در هکتار و حجم ۳۰۰ تا ۳۵۰ مترمکعب در هکتار با قطر هدف ۷۵ تا ۸۰ سانتیمتر، به منظور برداشت هدفمند و جلوگیری از نشانه‌گذاری‌های سلیقه-ای در جهت اصلاح و هدایت ساختار توده‌های راش شمال ایران پیشنهاد شد.