Investigation of Rahimabad pistachio (Pistacia vera L.) forest of Mashhad, Iran

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Abstract: *Conservation of natural pistachio forests considering internal villages by community forestry management are substantiated. Pistachio as a raw material are applied in industry, nutrition (such as nut), anti oxidant and other material in some diseases and in economic specially. Rahimabad pistachios (Pistacia vera L.) forest of Mashhad has 1882 hectares. Method of sampling is compilation for estimating of cover vegetation percent and density is executed. Transect with 300 m length in northern along direction of net inventory for diameter of cover (d.o.c) of trees more than 2 m plus one sample with 1000 m^2 area is situated. In this samples characteristic of woody species that d.o.c of them less than 2 m are measured and documented. Mean of density is 160.72 stem per hectares and cover average is 4.54%. Results showed that 30% of tree cover is belong to Amygdalus spinosissima, 26% to Pistacia vera, 25% Atraphaxis spinosa, 14% Zygophyllum sp and 5% other species. Regeneration of Pistacia vera was estimated 13%. For economical protection of rural region and prevention of migration should be established reclamation and improvement of rangelands and forest development by seeds and seedlings along promotion and teaching of this forest. Corporations in social forestry could be executed and supervised activities for conservation of forest, correct utilization, trade, maintenance and seeds preparatory and etc.*

Keywords: nature pistachio, forest, Khorasan Razavi, economic.

1. Introduction

Arid environment has plant cover such as pistachio forest. Common pistachio tree (*Pistacia vera* L) is one of 11 species of pistachio genius have edible nut (Zohary, 1952). Pistachio trees of *Anacardiaceae* family are two basic veins prominent on both surfaces of pistachio leaf (Ghahreman, 1982, 1998 Mozaffarian, 2004). Pistachios over time have been injustice and density of trees and the amount of fruit and freshness and purity of fruits have dropped). Surveys of natural pistachio forests are not very precise, but there appears to be over 50 000 hectares of such forests in Khorasan Rhazavi, Iran (Forestry and plantation office database 2011). The most common cultivated species of pistachio is *P.vera*, it has been domesticated and is now cultivated over a large area (Iran-nejad parizi 1993). Pistachio cultivation in Iran covers more than 360 000 hectares (Pistachio Research Institute 2011). These forests occur across the Iran-Turan border (Marvi Mohajer 2005). Genetic similarity has been identified between various pistachio cultivars (Alipour and Ghaffari Moghaddam, 2011). Natural distribution of pistachio occurs just northeast of Khorasan near the Iran, Afghanistan and Turkmenistan border (Sabeti 1992). Pistachio has become established naturally in the northern hillsides of Koppehdagh and part of the mountainous area occupying a region of 750 to 1200 m (Ramezani 1998). Pistachios thrive in geographical latitudes more than 29° N (Alavi 2008). They grow in salty, dry and warm regions and have wide-ranging distribution in the Middle

East, Mediterranean countries and the United States (Garcia et al. 1992, Shokraii 1977). The popularity of pistachio, as raw brain matter, has risen among people in deserts of the East and Europe (Woodroof 1967). It has anti oxidant and antigenic properties that can help to reduce arterial occlusive disease (Hu and Willett 2002, Seeram et al. 2006). The *Asteraceae* family has 47 species and genera in the genus *Astragalus* and *Cousinia* growing in Khajeh forest. Therophytes (55.6 percent), hemi cryptophytes (26.4%) and cameophytes (9.2 percent) were the most important groups of bio shaped structures (Saberi et al. 2010). The final quality of harvested pistachio is determined by the type of tree (Tavakoli-Pour et al. 2008). Mulch was determined as significant in terms of maintaining soil moisture and depth of pistachio trees. The most practical way to keep moisture in the soil is with sand cover (Eslamu and Farzamnia. 2009). Plant response to stress from environmental cold is point to conservation of pistachio and induced growth (Salek et al. 2009). Distribution of Mastic pistachio on areas with maximum slope in the forest floor was 45 percent or more. The highest level distribution was recorded in the northwest and the southwest of the region. And the lowest level distribution was in the northern region. The highest level distribution was in cold semi-arid climatic conditions and the lowest in cold wet conditions (Davarpanah et al. 2009). Slope, aspect and elevation each had a significant effect on the characteristics of pistachio forest canopy in Khajeh forest (Khosrojerdi et al. 2009). The northern and eastern slopes both had a significant effect on number of seedlings. Areas under

grazing (grazed and none grazed were 100% and 77% respectively), and factors of grazed land, none grazed land and gradient amplitude effected the viability percentage and survival of seedlings by 69%, 100% and 90% respectively (Khosrojerdi et al. 2001). Resistance of the Mastic variety to environmental conditions contributed to higher incidence in pistachio forests in southern Khorasan (Ramezani et al. 2001). Slope has no effect on the sensitivity of *P.lentiscus* to pest (Auslander et al. 2003). Exchange rate, prices of domestic production and export price on the world market all had a positive effect; competitors' production and price of Iranian pistachio exports and production alternatives had a negative effect on the comparative advantage of exporting this product (Mehrabi Basharabadi and Neshat 2010). At present about 55 percent of production and more than 60 percent of world exports of Iran are non-oil exports of which pistachio nuts constitutes about 14% (Kholdi et al. 2011). For first time a Pistachio forest resource management plan in Iran was prepared in 1996 Kalat Nader, Khajeh pistacio forest (Omrani 1996). Then in natural resources and watershed administration of Khorasan Razavi decided to prepare a plan for other Pistacio forest in that province. Rahimabad forest resource management plan was proved in technical committee of natural resources administration of Khorasan Razavi province (Tahlilgaran Mohit Co, 2000). Objectives of this study are quantitative and quality characteristics with view of ecological and economical aspects.

2. Material and Methods

The study area: The study area is about 100 km eastern south of Mashhad under Rahimabad pistachio forest's resources management covers 1882 hectares. The geographical location of the area is 60° 27' to 60° 34' E and 35° 43' 31" to 35° 50' N. Samples for the study were predominantly taken from areas with an average height of 1243 m, an average slope of 23.6% and with a western aspect. The average range of annual rainfall was 251 mm and the average annual temperature was 13.3° C, The area of forest under evaluation in this study is Cretaceous period including Los. Climate of this area with Amberje and de martin methods are cold arid and arid zone respectively (Tahlilgarane Mohit Co, 2000). Prominent wind is eastern south.

Method: Forest that covers the study area, except those of northern of Iran, is in semi arid regions and conservation is the most important concern. Estimation of vegetation cover was determined by transects with the plot method. Assessments were also made for basic health and crown condition on a scale of 1 to 3 degrees. By data using ArcGIS software and parcel classification map was provided and biometry was established. Key areas of expertise and type of pasture area estimates are investigated. Using local research and questionnaire data were collected from the area and were consistent with the county statistics. Forests of the arid and semi-arid, mostly sparse and its conservation is used more than any other aspect of, sample fusion vector (a Transect - plots) to estimate the level of cover and number acres of trees in the forest were conducted. Inventory method, combined with the sample and the sample taken from the sample is a constant vector plots. Regular grid network is designed to comply with UTM, which is actually the starting point of each grid intersection points of a line - plots can be found on the map. Then, at the confluence of the sides of the grid 300 meters long along the north side of the network was implemented.

The details of the wooden elements with a diameter of 2 meters and a canopy over it and part of the crown on transect will be recorded. In addition, during the first transect (cross over network) to within 20 meters (10 meters on each side of the line) and length of 50 m along the transect an area of 1000 square meters plot was implemented that this plot characteristics of woody species by crown diameter less than 2 meter were measured and recorded (Forest resources affairs office, 2004). The formula for calculating the number of stem per hectares, surface cover, percentage of cover for Statistical analysis of wooden elements in the plot are presented in Table1.

Table1. Formula for analyze

$$N_{L_i} = \frac{10^4 \times \sum_{i=1}^{n}\left(\frac{1}{CD_{i_L}}\right)}{L} \qquad \text{Equation.1}$$

$$CC_L = \frac{\pi \times 2500 \times \sum_{i=1}^{n} CD_{i_L}}{L} \qquad \text{Equation.2}$$

$$N_{P_i} = \frac{n_{P_i} \times 1000}{s} \qquad \text{Equation.3}$$

(Zubairi, 2002)

$$C_{i_p} = \frac{(D_1 \times D_2) \times \pi}{4} \qquad \text{Equation.4}$$

$$CC_P = \sum C_{i_p} \qquad \text{Equation.5}$$

$$CC_{p\,ha} = \frac{CC_P \times 1000}{s} \qquad \text{Equation.6}$$

$$\%CC_{p\,ha} = \frac{CC_{p\,ha} \times 100}{10000} \qquad \text{Equation.7}$$

N_{L_i} : number of woody species per hectares in L transect, L: length of transect, CD_{i_L} : crown diameter of i tree perpendicular on L transect, CC_L: cover area per hectare for transect, n: number of trees and shrub that cover or shade of them cross to transect, N_{P_i} :density (stem per hectare of woody species), s: plot area, n_{P_i} : number of woody species per plot, C_{i_P} : cover area of woody species i in plot p, D_1: large diameter of cover , D_2: small diameter of cover, CC_P : cover area in plot, $\%CC_{p\,ha}$: percent of woody species cover per plot

The results of calculating the number of hectares of each transect with results of plots pluses and density per hectare is estimated for transect-plot, i.e. $N_{t_i} = N_{L_i} + N_{P_i}$. Also, to get

the percentage cover of each sample line - plot, the results of calculating the percentage cover of each line with The results of calculation of the percentage cover of each plot gathered together and the resulting number by the percentage cover of each sample line - Platt estimate i.e. :

$$\%CC_{t_i} = \%CC_{L_i} + \%CC_{P_i}$$ (Zobairi, 2002,1994). In each instance the properties that plot size was recorded include line numbers - the plot, the coordinates of the starting point, the date and time of the inventory, the name of the area above sea level, the average percent slope, for most geographical scope, type Thus, the gender of the base, crown diameter, crown health and happiness, the state of the health body, the number and type of regeneration, regeneration status, quality, forms silviculture, forest type, covering the floor, degradation of the drift and erosion. In figure 1 study area is shown.
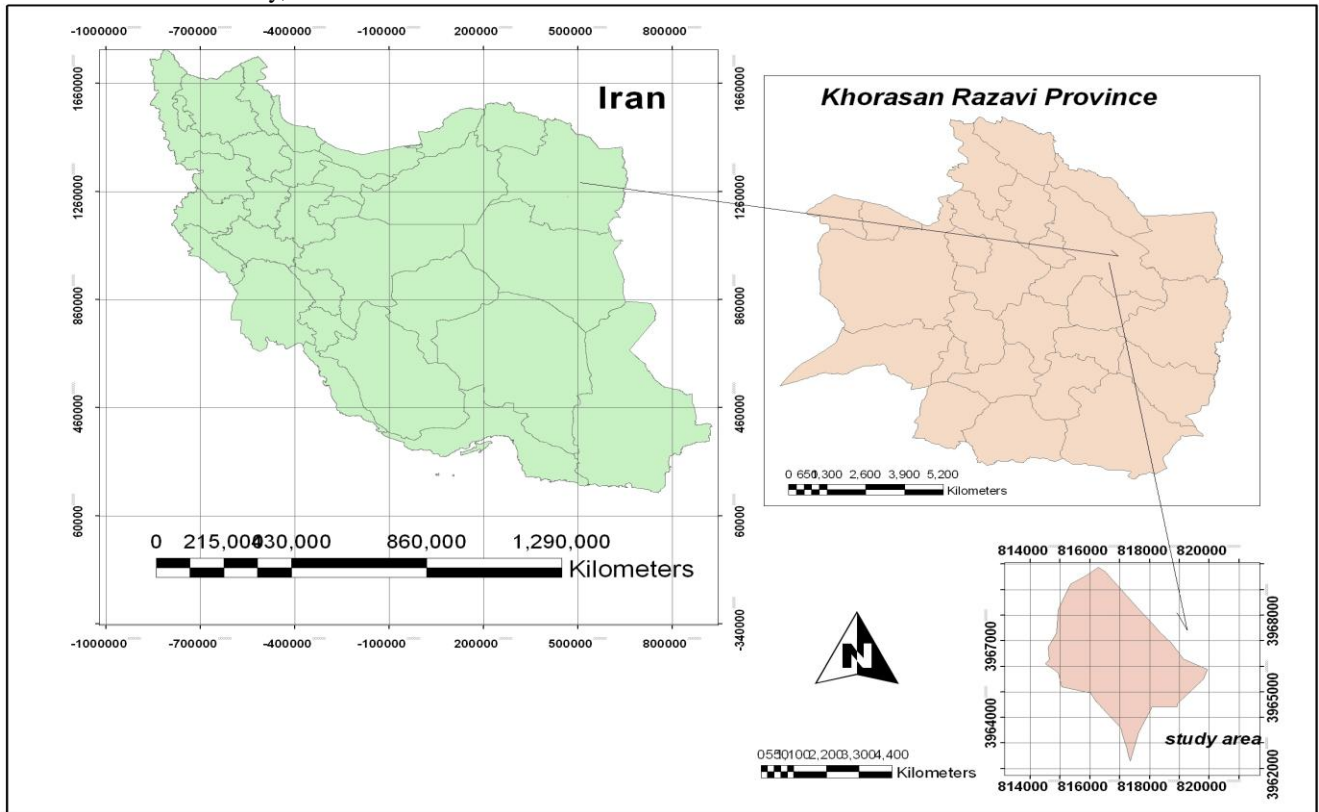

Fig1. Study area and province and country

Basic health and happiness on the basis of the crown (vigourity) is studied. Degree1: more than 50% of crown is green, degree2: between 20-50% is green, degree3: less than 25% of crown is green. Trunk position with regard to such pests' scurry, scrape of peel, burns, diseases and other injuries that led to the destroyed trees or shrubs or psychological weakness is examined in three grades. Method of inventory is shown in figure 2.
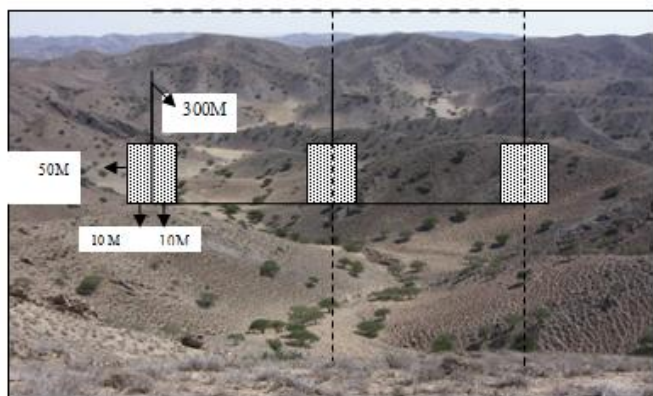

Fig2. Method of biometry in pistachio forest schema

To define and separate tree regeneration, the collar diameter of 2.5 cm higher than the trees and the diameter of the collar 2.5 cm less define seedling and the diameter of the largest branch of the fork points in a given resolution. General characteristics of the sample and the results of their calculations and inventory separately for each and every line in each line plot were calculated.

3. Results

After investigating of instances, 30% of woody plants were occupied by thorny almond shrub, 26% Pistachio, 25% spiny atraphaxis, 14% dollar bush and 5% other species. Density of mentioned species were obtained 48, 42, 40, 23 and 8 stem per hectar respectively. Under storey species are *Artemisia.aucheri-Poa.bolbosa* type that comprises 60% of area. *Artemisia.aucheri - Petropyrum.ausheri- Pistacia.vera* types are 13% of study area. Third type is *Artemisia.aucheri-Poa.bolbosa - Salsola.tomentosa by 20% and Artemisia.aucheri-Poa.bolbosa- Pistacia.vera* with 7% of study area. Condition of rangelands is weak and have negative trend. Average production of these ranges is 120 kg per hectare. In this more 101 species were detected that more than was pulvinate and cushion plants. A list of woody flora of the study area is presented in Table1. all of species belong to Iran-Turan region cryotype.

Table 1. Floristic list of study area

Cryophyte	Land form (Mosadegh, 2010)	Scientific name	Family
IT	Nano phanerophyte	*Amygdalus spinosissima*	*Rosaceae*
IT	Nano phanerophyte	*Atraphaxis spinosa*	*Polygonaceae*
IT	Micro phanerophyte	*Cerasus khorassanica*	*Rosaceae*
IT	Nano phanerophyte	*Ephedra intermedia*	*Ephedraceae*
IT	Micro phanerophyte	*Pistacia vera*	*Anacardiaceae*
IT	Micro phanerophyte	*Tamarix androssowii*	*Tamariccaceae*
IT	Micro phanerophyte	*Tamarix korolkowii*	*Tamariccaceae*
IT	Nano phanerophyte	*Zygophyllum eurypterum*	*Zygophyllaceae*
IT	Nano phanerophyte	*Zygophyllum gontscharowii*	*Zygophyllaceae*

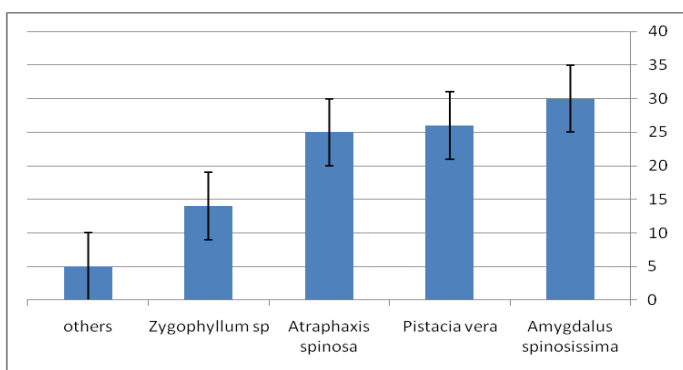Composition of woody plant of study area is presented in figure3.

Fig3. Woody species composition percent in study area with standard error bars

Social economic of study area: Rahimabad Village of Torbat Jam Township has not any population. According to the 2006 census the village population of around villages same as Chahmazarsofla and Chahmazarolya were 340, 415 people and 75, 76 families respectively, but growth rate is -0.8% and 1.3% respectively. The main cause of population decline inhabitants lack of facilities is particularly appropriate communication. Livestock in rural community not is

controlled. Local people cooperated with each other on how to collect Pistachio, creating an understanding and empathy for forest conservation and development. State rent is taken each year from the pistachio harvest. Pistachio nuts are harvested from early August until early October. Average number of trees in each base hectare is 160.72 and the average percentage of forest cover in pistachio Rahimabad was 4.54 percent. (Abkhizgostare Shargh Co, 2009).

Table2. Results of cover and density calculation in each transect -plot

D stem/ha	CC%T^2	CC%T	ID	D stem/ha	CC%T^2	CC%T	ID
167.00	141.45	11.89	23	200.00	8.28	2.88	1
103.33	17.88	4.23	24	78.00	4.20	2.05	2
243.33	77.06	8.78	25	123.33	7.29	2.70	3
213.33	97.37	9.87	26	57.33	4.39	2.10	4
204.00	17.51	4.18	27	78.67	1.28	1.13	5
113.00	11.82	3.44	28	217.00	70.49	8.40	6
95.33	10.79	3.29	29	241.33	79.13	8.90	7
185.33	12.15	3.49	30	243.67	7.70	2.77	8
305.00	37.68	6.14	31	114.33	19.21	4.38	9
120.67	9.05	3.01	32	85.67	10.01	3.16	10
89.67	61.95	7.87	33	115.00	17.32	4.16	11
70.00	24.53	4.95	34	191.67	7.62	2.76	12
30.67	4.77	2.18	35	158.33	11.63	3.41	13
641.67	145.37	12.06	36	120.00	23.46	4.84	14
221.00	18.04	4.25	37	88.00	14.70	3.83	15
246.67	3.30	1.82	38	67.67	8.74	2.96	16
113.33	7.06	2.66	39	48.33	4.04	2.01	17
230.33	13.39	3.66	40	197.00	5.90	2.43	18
173.00	60.06	7.75	41	40.33	0.76	0.87	19
252.00	38.06	6.17	42	270.67	5.24	2.29	20
161.67	15.42	3.93	43	60.67	30.69	5.54	21
				133.67	38.41	6.20	22
6911.00	1205.20	195.37	=Sum				
160.72		4.54	=Average				

4. Conclusion and Discussion

Cover percent always is the most important factor of measurement on arid and semi arid zone. Cover percent of Rahimabad pistachio forest is low due to low density of pistachio forest. . A tree density of 63 per hectare was estimated for Nian Khorasan (Ahani and Mehrabi 2009) indicating lower density of *Pistacia mutica* species in habitat conditions similar to pistachio forest. According to the results obtained pistachio forest cover, is about 4.54%, showing that the fragmentation and dispersion of trees in a field. Mean percentage cover was calculated (4.54%), which is an estimate of the true average error of 95% to 95%, with 18.62%, 3.69% and 5.39% average real cover is located. Rahimabad pistachio forests of tree density, forest is spare. The results of the inventory, the density of ha of forest trees, pistachio trees is equal to 160.72. Seedling regeneration in the Khorasan Razavi forest (for every tree or shrub in this field, there were 7 regenerations) was superior to that of the Rahimabad jungle. Pistachio forest cover percentage in Rahimabad Mashhad was about 4.54 percent; density was equal to the

number of trees per ha 160.7 which is lower than that of the Khajeh forest (Ahani and Jalilvand 2012). In the Khajeh forest plan annual production was 48.33 tons while in Rahimabad is 1.8 ton, Albeit area of Khajeh and Rahimabad forests is 4680 and 1287 hectares respectively (Abkhizgostare shargh Co, 2009). Average number of trees in Khajeh forest in Khorasan Razavi in each base hectare is 190.4 and about 11% percent cover (Tahlilgarane mohit Co 2011).

Because of the fent forest grazing so there is no problem, but the observations, especially in the border areas of illegal grazing, has been read. Regeneration of pistachio trees is accomplished by deeds. They are propagating sometimes by shoot and asexual propagation. Natural regeneration is not suit because of dormancy and Unfilled seeds. Percent of the total regeneration of trees and shrubs have been measured, is 21% that only 13% of total woody species belong to *Pistacia vera*, So low regeneration of *Pistacia vera* indicating retrospection of this forest. There is the problem of soil erosion, and sometimes the forest floor is covered with sand and rubble. Inventory results showed 64% male and 34% of pistachio trees have sex with their female gender. Pistachio every two years and sometimes every few years to bear fruit while in Khajeh forest 81% of the base material are female, and others are male (Tahlilgarane mohit Co 2011). Regardless of vegetation, the presence of nuts scattered on some points, it is confirmed that the growth potential of pistachio and forest habitat is considered. Two kinds forest damage are: Damage caused by non-living factors such as fire damage, climatic factors, land factors (lack of water and a bit of fertilizer material) and damage of living animals, humans and pests and diseases. Forest pests and diseases are now under severe drought damage in the area. Made in regions of intense destruction, poor soil and lack of food is necessary for plant growth. Taken together, these factors have led to the foundation of a healthy and vibrant with healthy body parts were not very big, but if you just take the crown as a factor for differentiation happiness consider. In the woods about 37% of the base vigourity, 54% of vigor in grade 2, and 9% in grade 3. Vigourity, about Pistachios, 80% of the base happy, 18% of vigourity in grade 2, and 2% were in grade 3. In the trunk of the health of the whole forest, about 79% of the base intact and no damage, 20% in grade 2, and 1% in grade 3 Health shaft, and the pistachio, about 80% of Base safe and no damage, 19% in grade 2, and 1% were grade 3 Health trunk. In Khajeh forest 92% were grade 1 (more than 50% green crown length),; 58 trees were grade 2 (between 50-25% green crown length), and 2 tree 3 (less than 25% green crown length), and the health of the trunk 87% were grade 1 (intact and without damage to the trunk or other injury.), 12% were grade 2 (some damage but to the extent that the tree or shrub is able to survive) and the remaining 3 (tree or shrub damage to life and that compromises the tree and that led to its (Hosseini and Ahani, 2012). The dispersion observed in the case in most western and southern Khorasan in was most frequent in the northern direction (Ahani and Mehrabi 2009). Slope, aspect and elevation have significant effect on the characteristics of pistachio forest canopy in Khajeh

forest (Khosrojerdi et al. 2009). The northern and eastern slopes have significant effect on the number of seedlings. Also grazing (grazed and none grazed with 100 and 77% respectively) and gradient amplitude (respectively 69, 100 and 90%) had on the viability percentage and survival of seedlings (Khosrojerdi et al. 2001). Slope, aspect and elevation have significant effect on the characteristics of pistachio forest canopy in Khajeh forest (Khosrojerdi et al. 2009). The northern and eastern slopes have significant effect on the number of seedlings. Also grazing (grazed and non grazed with 100 and 77% respectively) and gradient amplitude (respectively 69, 100 and 90%) had on the viability percentage and survival of seedlings (Khosrojerdi et al. 2001). Revive the palatability of plant species, legumes and grasses can be difficult, but the cushion plants are considerable. Vegetation reflects the critical situation in the area is seen. Among the forest of fruit trees, pistachio forests in terms of the breadth and scope base and distribution of the national economy have importance. The evolution of forest biomass, confirmed the baseline trap and human involvement. With regard to the protection of forest ages, the issue of planning and forestry practices on issues and possible cutting of forest harvesting and so on are not considered. In future program sustainable development should be considered. Despite the destruction of this habitat as a forest, a forest able to play the most important role in the first place, role and importance of the habitat, protect the soil and prevent erosion, and is the greatest impact and the importance of groundwater resources and the mitigation and stylized the climate of the region. In addition, pistachio fruit production of the economy is also very important. Rahimabad area of forest and rangeland has restoration and modification a total power capacity of grazing and conservation practices consistent with the plantation. The best fit for the land is forest. Vegetation in this area was weak and in some parts rock is seen. The visiting Khajeh Kalat forest at the same time it was observed that seeds of trees in Rahimabad were smaller, were empty without viability and less of nut. Coppice stand had more fruit than standard forest then trend to conflation of standard and coppice system of silviculture is recommended. Effectiveness of policies supportive, encouraging and inhibiting the market of Pistachio dependent upon the degree and type of each product in the market is a monopoly. Understanding of the market structure, as well as grants and cooperative tools designed to make effective. Understanding of the market structure, as well as grants and cooperative tools designed to make it effective. In the current study, the monopoly in the domestic market of Pistachio studied. To calculate the degree of monopoly in each of the two methods, the pattern of market structure - economic relations firm - performance (market outcomes), and was using new empirical industrial organization. The results showed that the local buyers to examine market structure, firm behavior and market outcomes, all three suggest that there is a competitive atmosphere. While at exporters despite the competitive market structure, firm behavior and market outcome results suggest that there is a monopoly in market. In some cases the pattern of market structure - economic relations firm - it is used in practice

(local shoppers). It is recommended to evaluate the degree of monopoly in the market only focus Pistachio not relies on economic behavior and performance criteria GDP also consider (Abdolahi ezzatabadi, 2010). Like some of Iran's share of world production, importing countries, deviations from the equilibrium exchange rate, trade policies, trade diversion rate and relative prices in the market of Pistachio, Pistachio effect on the share of the world market. Due to sanctions on Iran after the revolution in global market share has fallen nuts. America has one of the largest importers of pistachio and Germany and Japan, respectively, second and third in the world market are the importer of pistachios. Unfortunately, in recent years the share of imports of pistachios in the world, even China with 90% and 5% of America has become. Iran pistachio export competitors are America, Syria and Turkey. Unfortunately, Iranian pistachios sold in the markets of America its name (Mehrabi Basharabadi, 2002). The area of forest pests is not immune from attack. One of the most important bees named nut seed bee-eater (Behdad 1987, Hajian Shahri 1998). Regeneration of 27 stems per hectare based on proper management is considered appropriate in this area. The main reason for decreasing numbers of trees is that there is increased development of forest cover an competition from other woody species. Time of seeding for forest development is proposed early to late October (Jazirehei 2002). Social forestry and agroforestry practices should be applied in this forest in order to conserve pistachio forests as well as to solve socio economic problems. The cooperative in the village near this forest facilitates its protection attracting popular participation in the proposed projects, marketing, maintenance and preparation of seeds, production of seedlings and organization of training programs in the area are all activities that will improve the operational status of the Rahimabad area in terms of, monitoring and implementation.

In rural areas, all technical and financial assistance for the preparation of forage to ranchers be equipped and willing to ranchers grazes their livestock in and around the forests, they found. Traditional livestock husbandry industry is trying to lead. All technical and financial assistance to build a barn or stable in rural areas and with preparation of forage to ranchers graze their livestock willingly given to dairy farmers around the forest, not found. Traditional livestock husbandry industry is trying to lead. Devoted to this area as a forest reserve is proposed to be in the future stability and prosperity of the forest that we required more funding allocated for equipment, facilities, and investment allocation is power. Corporation by forest dwellers could be affecting on conservation this forest. Vegetable oil can be an important addition to the kernel of the product and the creation of workshops that can provide near Rahimabad. It is suggested to be the way to relieve of nut and seed dormancy. The pistachio resistance to drought and salinity in the area is other suggestion. To strengthen the growing international market in the traditional market should have more Iranian companies enter the market exclusive. Conservation of arid environment not establish without preserving of these forests.

5. Acknowledgement

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