



Non-Wood Forest Products (NWFPs) in Arasbaran Biosphere reserve, Iran

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Abstract

NWFPs contribute significantly to the livelihood of local people and as an important source of cash income for rural households in or near forests. There is little information on the important NWFPs in the forest regions, production, value, the processing situation of them, and etc. Information on the main woody species, medical uses, processing situation, processing industries, and market level was collected in eight times field visits during May to November 2012, through interviewing 17 local persons and ten researchers and key informants to verify the information obtained from interviews. Criteria used and discussed for listing the main woody species are: abundance, importance as a food resource, economic importance, and existence of their products in markets, and other benefits for the local people. There are 22 forest woody species where NWFPs are obtained and subsequently processed and sold in the markets. Processing situation of these fruits was in little or no processing class. Most of fruits were locally processed and then consumed or sold. The results showed that just two species are sold in the regional and international market and others have local and national markets.

Keywords:

Production; processing; medical uses; Non wood forest products; Arasbaran biosphere reserve

1. Introduction

Forests do provide a wide range of products and services. The multitude of products and services provided by forests can be classified into three categories: Wood products, Non-wood Forest Products (NWFPs), and services (Babulo et al., 2006). NWFPs contribute significantly to the livelihood of local people (Sunderlin et al., 2005, Adepoju & Salau, 2007, Mamo et al., 2007, Jensen, 2009, Paumgarten & Shackleton, 2009) and as an important source of cash income for rural households in or near forests (Babulo et al., 2006, Viet Quang & Nam Anh, 2006, Kamanga et al., 2009, Paumgarten & Shackleton, 2009). These products provide an important means for economic growth, specifically to man-made resource poor and forest resource abundant geographical areas (Greene et al., 2000). Recently, there has been an increasing interest in getting a better understanding of the importance of NWFPs because of different uses e.g. food, medical, etc (Andersen et al., 2003, Babulo et al., 2006, Adepoju & Salau, 2007). Use of NWFPs in traditional medicine is still recognized as the first health care system in many rural communities because of its effectiveness, lack of modern medical alternatives, and cultural preferences. Many rural peoples possess traditional knowledge of medicinal plants (Andersen et al., 2003, Shrestha & Dhillon,

2003). The growing interest in NWFPs have attracted the attention of many Policy makers, managers, and researchers all over the world, despite these findings, in most cases the importance of these products are largely unknown because of a substantial lack of data (Viet Quang & Nam Anh, 2006, Cai et al., 2011). There is little information on the important NWFPs in the forest regions, production, value, the processing situation of them, and etc (Adepoju & Salau, 2007, Croitoru, 2007, Mamo et al., 2007). World Bank in a study about estimating the cost of deforestation in Iran, found no data on NWFPs, except for firewood sold on the market (Croitoru, 2007). Statistical data at the local and national level are usually incomplete, scattered or not comparable among countries (Croitoru, 2007, Paumgarten & Shackleton, 2009). Lack of information about NWFPs is an obstacle to the optimal economic returns, and also it led to dominating other land use such as agriculture, industry, and etc for forest (Saeed, 1992, Greene et al., 2000). For those reasons, identification of NWFPs was given the highest priority in research. NWFPs are usually processed and then used and sold (Avatefi & Shamekhi, 2006, Adedayo et al., 2010). Processing play a main role in value addition (Pettenella, 2001, Mayett et al., 2006, Jensen, 2009, Saha & Sundriyal, 2011), income (Gram, 2001, Kalu & Rachael, 2006), employment (Kalu & Rachael,

2006), diversity of products (Mayett et al., 2006), appropriate storage (Pettenella et al., 2007), prevention of perishability (Pettenella et al., 2007), and new opportunities in markets (Stoian, 2005, Jensen, 2009). Commercialization and new opportunities in markets of NWFPs has been more recently expressed by governments, as a means to achieve rural livelihood improvement in an environmentally sound way (Belcher et al., 2005). As markets develop, demand and consumption of these products increase (Alexander et al., 2011). Market value and demand for NWFPs has grown considerably in last two decades (Greene et al., 2000). Because of high economic importance of processing and marketing, our studies also focus on processing situation, existence of processing industries, markets of NWFPs. Forests in Iran comprise 7.4 percent of the whole country with an area of about 12.4 million ha. Recently, the per capita forest area was equal to one-third of the world's per capita average (0.2 ha as compared with 0.6 ha). Although Iran's forest cover is considered poor in comparison with other countries, it is unique regarding plant diversity. The country's climatic diversity has resulted in five distinct forest zones: Hyrcanian, Arasbaran, Zagros, Irano-Turanian and Khaliho-Omanian. The Arasbaran forest zone, with semi humid forests, has been identified as a global biosphere reserve because of its plant diversity. The conditions of the region and the richness of the biodiversity have resulted in various ecosystems and plant features in the region. However, abundance of villages, conversion of forest areas to farmland, firewood collecting, traditional husbandry and agriculture have extensively changed the natural landscape (Sagheb-Talebi et al., 2004). This is a conservation/protected zone and wood is not harvested either industrially or commercially. Local people usually use NWFPs. The traditional husbandry and agriculture activities and their low efficiency increase pressure on NWFPs to meeting household needs. Despite the socioeconomic importance of NWFPs in Arasbaran forests, statistical data about them is very low. Therefore, the objective of the study is: 1) to identify and list all of the important NWFPs, 2) collect data about price and cost, and 3) collect information about medical uses, processing situation, processing industries, market level, and existence of management plan.

2. Methods and Materials

2.1. Study area

Arasbaran forests with an area of about 153 thousand hectares are located in North West of Iran and border of Azerbaijan and Armenia (FAO, 2010) (Fig. 1). The most important woody plants in this area are as follows: oak (*Quercus petraea*), *Q. macranthera*, Yew tree (*Taxus baccata*), Pliant tree (*Viburnum lantana*), and Wig tree (*Cotinus coggyria*), Juniper (*Juniperus foetidissima*) and Cornelian cherry (*Cornus mas*). The mean annual temperature is 14°C and annual rainfall

ranges from 300 to 500 mm (Sagheb-Talebi et al., 2004).

2.2. Concepts and Definitions

The term NWFPs can be defined as all goods and services for commercial, industrial and subsistence use, other than wood, derived from forests and their biomass which can be sustainably extracted (Chandrasekharan, 1995, FAO, 1995, Aiyeloja & Ajewole, 2006). It includes a wide range such as fruits, seeds, leaves, game, rattan, resins, essential oils, latex, nuts, honey, and etc (Aiyeloja & Ajewole, 2006, Adam et al., 2013). Different categories have been done in the literature (Chandrasekharan, 1995, Andersen et al., 2003, Avatefi & Shamekhi, 2006, Adepoju & Salau, 2007, Croitoru, 2007, Pettenella et al., 2007, Avocèvou-Ayisso et al., 2009). At this study, NWFPs produced in Arasbaran forests can be grouped into two main categories: the edible and non-edible. Depend on subsistence use and trade; these products were classified in the different categories. The edible category includes mainly fruits, honey, wild vegetables, mushrooms, and essential oils. The non-edible category includes medical and ornamental plants. The plant parts used for medical preparations are bark, flowers, fruits, leaves, rhizomes, roots, sap, seeds, stems, and young shoots (Shrestha & Dhillon, 2003). The ornamental category includes types of ornamental plants such as viola, primula, etc. the non-edible category can be grouped into subsistence use and trade. Given the rich diversity of NWFPs, more products should be considered but this study focus on fruits and medical uses of woody species.

2.3. Data collection and analysis

At the first, list of wood species was collected by literature review including library documents and research plans of Forest, Rangelands and Watershed Organization (FRWO) and Department of Environment (DOE) of Iran. About 774 plant species were in forest areas and 87 species were woody species (DOE, 2001). And then, to list the main woody species, field visits was done eight times during May to November 2012. Information on the main woody species was collected through interviewing 17 local persons. Seven researchers in centre of research for natural resource of East Azerbaijan province and three key informants in natural resource bureau of Kalibar County were consulted to verify the information obtained from interviews (Foppes & Ketphanh, 1997, Shanley, 1999, Majule et al., 2010). Criteria used and discussed for listing the main woody species are: abundance, importance as a food resource, economic importance, and existence of their products in markets, and other benefits for the local people (Foppes & Ketphanh, 1997, Adam et al., 2013). Finally, 22 species were selected. For these species were collected information of sale price, amount of production, processing situation, existence of processing industries, market levels, and existence of management plan. Value of fruit was estimated using direct

market prices (Rodríguez et al., 2006, Croitoru, 2007, Cai et al., 2011, Saha & Sundriyal, 2011). The market price per kg was gross revenue. The retail trading price for each fruit was recorded by way of both market observations and interviews with the buyers and sellers in the local markets (Mahapatra & Tewari, 2005). When market price data were not available, cost-based approaches were used. The unit price of eight fruits was calculated by dividing per day wages given to the collectors with per capita quantum harvested per day (Croitoru, 2007, Saha & Sundriyal, 2011). Harvest costs include the costs of extraction and transport to the roadside (Mahapatra & Tewari, 2005). Harvest costs data were collected by literature review in the similar region (Mahdavi et al., 2009). When cost data were not available, cost of similar fruits was used. The value in Iranian rials was converted into the USD equivalent according to the current exchange rate in 2009. One US dollar equaled 9500 rials in 2009. For each fruit, Net Present Value (NPV) was estimated by the following formula (Armitage, 1998, Avocèvou-

$$\text{Ayisso et al., 2009): } NPV = \sum \frac{GR_t - TC_t}{(1+r)^t}$$

Where, NPV: Net Present Value, GR = Gross revenue, TC = total costs, r = discount rate. NPV is derived by subtracting the present value of costs from the present value of gross revenue (Armitage, 1998). Analysis was done based on basic year 2009. NPV divided by hectares equal net revenue per hectare. In order to determine annual potential revenue in the whole area, in the form of \$/year, we multiplied the price of the fruits (\$/kg) in the collection area (ha) and yield (kg per ha) (Damnyag et al., 2011, Dejene et al., 2013). Information on medical uses, processing situation, processing industries, and market level was collected through interviewing 17 local persons and three key informants in natural resource bureau of Kalibar County. Processing situation was considered by FAO classification (FAO, 1995). NWFPs offer the full range of processing options, from little or no processing (fresh foods, nuts and spices), to relatively simple technologies (preserved foods and handicrafts), to intermediate processing (traditional medicines, vegetable oils, etc), to more complex, expensive

process (essential oils, gums, balsams) that usually require centralized facilities (FAO, 1995). Markets are segmented from many aspects such as geographic, demographic, behavioral, and psychographic. This paper focuses on geographic markets. NWFPs are sold in the local, national, regional, international markets (FAO, 1995).

3. Results

3.1. Main woody species for NWFPs:

There are 22 forest woody species where NWFPs are obtained and subsequently processed and sold in the markets. Table 1 lists name of main species, price, harvest cost, and annual potential revenue in the whole area. In general, the local people in Arasbaran forests collect these products for both selling and their own consumption. The number of products solely collected for sale is very few. Almost, fruits of these species were collected by local people. Women and girls generally collect, process, and sell these products. Annual potential revenue in the whole area was not calculated for some of species because of lack of data on collection area and price.

3.2. Processing situation and management plan

Processing situation of these fruits was in little or no processing class. Most of fruits were locally processed and then consumed or sold. Most fruits were simply dried, preserved, shelled, and stored such as *Cornus mas*, *Juglans regia*, *Corylus avellana*. They were further processed into sauce from *Punica granatum*, jam from *Ficus sp*, *Cratagus sp*, fruitbar from *Prunus sp*, and pickled from *Cornus mas*. Just two species, *Cornus mas* and *Rhus coriaria*, were processed by small scale industries in Arasbaran region. In other region of Iran have been established many private companies in the processing industry. These companies (e.g. Shafanoosh, Jangali, and Pakdis) use fruit, leaves of forest species such as *Juglans regia*, *Pistacia*, *Prunus*, *Cornus*, *berberis*, *ficus*, and *Vitis*. These products have high processing potential for example raspberry fruit are used in soap, syrup, skin cream, and jam. Management plans have been written and carried out for just three species *Cornus mas*, *Rhus coriaria*, and *Rosa canina*.

Table 1 Information on Main Woody species of Study area

No	Scientific name	Local name	Collection area (ha)	Yield (kg/ha)	Price (Rial/kg)	Harvest cost (Rial/kg)	NPV (Rial/kg)
1	<i>Juglans regia</i>	javiz	NA	100	24670	4535	20135
2	<i>Ficus carica</i>	anjir	NA	250	8033	8033	0
3	<i>Viburnum lantanum</i>	garmashu	6054	5	NA	4535	NA
4	<i>Fragaria vesca</i>	wild strawberry	NA	2	NA	4535	NA
5	<i>Vitis sylvestris</i>	uzum	NA	30	NA	11337	NA
6	<i>Prunus sp</i>	alcha	NA	150	11510	3886	7624
7	<i>Amygdalus fenzliana</i>	badam	NA	3	115100	6801	108299
8	<i>Crataegus sp</i>	yemishan	NA	350	25000	6801	18199
9	<i>Punica granatum</i>	nar	1000	1500	15000	1606	13394
10	<i>Cornus mas</i>	zogal	16450	350	10000	8394	1606
11	<i>Corylus avellana</i>	findikh	186	200	85530	52047	33483
12	<i>Celtis australis</i>	daghdaghan	90	450	20080	3213	16867

13	Rhus coriaria	Sumakh	385	30	50000	11337	38663
14	Pistacia atlantica	Saghiz aghaji	2177	50	8220	4535	3685
15	Berberis vulgaris	zarish	50	25	140000	10710	129290
16	Cerasus avium	gilas	163	5	32132	21421	10711
17	Ribes biebersteinii	garaghat	500	5	100000	107109	-7109
18	Malus orientalis	Alma/armit	200	400	5000	5441	-441
19	Mespilus germanica	azgil	1038	10	8033	32132	-24099
20	Rubus sp	burutgan	2035	50	16060	32132	-16072
21	Rosa canina	itbirni	Na	20	12000	27248	-15248
22	Quercus sp	palit	33006	2500	1151	1360	-209

Table 2 Medical uses, processing situation, and market level of main woody species in the study area

No	Scientific name	Processing situation	purpose of use	Market level	Parts used (medical use)
1	Juglans regia	low	C*+S	L	Leaves(antiseptic Cough, laxative, constipation, diarrhea, anaemia , skin disorders such as eczema and herpes, and hair restorer (Jarić et al., 2007; Karaman & Kocabas, 2001; Kültür, 2007)
2	Ficus carica	low	C*+S	L	Leaves(laxative, hemorrhoids, gout, diuretic, Respiratory regulation and wound healing, Gastrointestinal disorders (Karaman & Kocabas, 2001; Murad, Ahmad, Gilani, & Khan, 2011))
3	Viburnum lantana	No	No	NS	Leaves and fruits (astringent)
4	Fragaria vesca	no	C	NS	Leaves, fruits, rhizomes (astringent, anemia, diuretic, laxative, digestive disorders, diarrhea, hemorrhoids (Jarić et al., 2007)
5	Vitis sylvestris	low	C	NS	Leaves and fruit (constipation, gout, astringent, diarrhea, menopause regulation, antiseptic, cutaneous abscesses (Dulger & Gonuz, 2004))
6	Prunus sp	low	C	NS	Fruit (astringent, laxative, diuretic, constipation)
7	Amygdalus fenzliana	No	C	NS	Seed (urinary inflammations, high cholesterol (Cakilcioglu & Turkoglu, 2010))
8	Crataegus sp	low	C	NS	Fruit (Strengthens the heart, regulates its rate, lowers blood pressure and treat for fever (Jarić et al., 2007))
9	Punica granatum	Low	C*+S	L	Fruit (astringent, diuretic, hematopoietic, diarrhea, heart regulation, Gastrointestinal disorders (Karaman & Kocabas, 2001; Murad et al., 2011))
10	Cornus mas	low	C+S*	N	Fruit (astringent, treats for fever, bowel disorders, cholera, diarrhea, Nephritis, cardiac diseases, laxative (Dulger & Gonuz, 2004; Jarić et al., 2007; Kültür, 2007))
11	Corylus avellana	low	C*+S	L	Fruit (increasing blood pressure, Strengthens the intestine and stomach, astringent, diaphoretic, treat for fever, diarrhoea and regulation menstruation (Jarić et al., 2007))
12	Celtis australis	low	C+S*	L	Leaves (Anti high cholesterol, Hypertension, Gastrointestinal disorders (Bonet, Parada, Selga, & Vallès, 1999; Murad et al., 2011))
13	Rhus coriaria	low	C+S*	R	Fruit (astringent, intestine and stomach disorders, diarrhea, treat for fever, hemorrhoids, rheumatism (Cakilcioglu & Turkoglu, 2010; Dulger & Gonuz, 2004; Karaman & Kocabas, 2001))
14	Pistacia atlantica	no	C	NS	Fruit (antiseptic, diuretic (Cakilcioglu & Turkoglu, 2010))
15	Berberis vulgaris	low	C	NS	Fruits and leaves (kidney and liver disorders, lowering blood pressure (Zolfaghari, 1380))
16	Cerasus avium	low	C	NS	Fruit (Nephritis, diuretic, kidney stones (Kültür, 2007))
17	Ribes biebersteinii	low	C	NS	Fruit (Hypertension (Delazar et al., 2010))
18	Malus orientalis Pyrus elaeagnifolia	low	C	NS	Fruit, (Earache, Nephritis, diabetes, laxative (Cakilcioglu & Turkoglu, 2010; Kültür, 2007))

19	Mespilus germanica	no	C	NS	Fruit (astringent, sore throat, Cough, cold, flu (Kültür, 2007))
20	Rubus sp	low	C+S*	L	Fruit (cold, cough, flu (Kültür, 2007))
21	Rosa canina	low	C+S*	I	Fruit and flower (increasing body resistance against disease, insomnia, calming nerves, reducing uric acid, gout and Nephritis, astringent, diuretic, stomach disorders, cold and influenza (Cakilcioglu & Turkoglu, 2010; Ertuğ, 2000; Jarić et al., 2007; Karaman & Kocabas, 2001; Kültür, 2007))
22	Quercus sp	no	C	NS	-

Market level: "NS": No Sale; "L": Local; "N": National; "R": Regional; "I": International; "C": Consumption; "S": Sale; "*": larger quantity of either sale or consumption.

3.3. Analysis of market level:

In general, the households collect these products for both their own consumption and selling in the markets. The collection of fruits in this area is mainly for household consumption, because as shown in Table 2, the quantity consumed is larger than quantity sold in the markets. The number of fruits sold in the large markets e.g. national or international markets is low. Market level of products sold varied from local markets for raspberry, walnut, fig, pomegranate, to national for cornelian cherry, sumach, to regional for sumach and dog rose, and to international for dog rose. The most important regional market for sumach and dog rose is Nakhchivan in Azerbaijan Country. Dog rose is exported to Ukraine country and Nakhchivan.

3.4. Medical uses:

Medical uses and parts used of the main woody species are presented in Table 2. Of these species, the most important species were Punica granatum, Cornus mas, Ribes biebersteinii, and Rosa canina. Most commonly used parts of the plants were fruit and leaves. In the traditional medicine, Rosa canina and Ribes biebersteinii teas were used by local people. In addition to these species, others were in this region e.g. Hypericum perforatum, Mentha longifolia, Anchusa italica, Mentha longifolia, and etc. these species are used in traditional medicine for decreasing fever, stomach disorders, cold, and flu.

4. Discussion and conclusion

Information on the availability, amount of products, management plan, the situation of processing, prices and market level is considered essential for assessing the importance of NWFPs and harvesting and managing of species sustainably (Mahapatra & Tewari, 2005, Croitoru, 2007, Avocèvou-Ayisso et al., 2009, Saha & Sundriyal, 2011). As a result, there are 22 main forest woody species where NWFPs are obtained. Among them, just for three species, Cornus mas, Rhus coriaria, and Rosa canina, have been written and carried out the management plan. Little research has been carried out about these species. Croitoru (2007) mentioned World Bank found no data on

NWFPs, except for firewood sold on the market. Also, in the FAO reports about global forest resources assessment, data on NWFPs category is very incomplete (FAO, 2010). Therefore, there is need for more researches about NWFPs in Iran. In addition, more research will identify real potential of them in subsistence use, much processing, and national and international markets. For example, grape vines and maple syrup contribute to the NWFPs industry. Wild blueberries (*Vaccinium* spp.) are one of the top-ranked U.S. NWFP exports and are primarily harvested and sold in USA (Alexander et al., 2011). Collier et al (2004) stated that *Corylus* spp is a main exported species from Turkey to other countries. These genus and species are found in Iran and Arasbaran forest while due to lack of relevant information on these species and other similar species, their potential and economic importance are not defined. The present study indicates that NPV was negative for some species. The low price and high wage level can be mentioned as two possible reasons for negative NPV. Four significant factors influencing low price of fruits in the Arasbaran forests are: (1) the low number of middlemen; many middlemen and competition among them considerably affect prices ((Mayett et al., 2006, Jensen, 2009, Kilchling et al., 2009, Mahapatra & Shackleton, 2011). Almost all of fruits harvested are sold for local middlemen. These people either buy these products in low price or against of fruits bought sell the household goods in high price. This barter system led to false price for products and low benefit of local stakeholders, (2) Low demand; increasing in population and consumers awareness about environmentally friendly products raise significantly demand level ((Mayett et al., 2006, Pettenella et al., 2007, Gold et al., 2008, Paumgarten & Shackleton, 2009). Pettenella et al (2007) mentioned that demand for organic products is increasing in all highly industrialized countries. Also Mayett et al (2006) found consumers unawareness is a main reason for not buying these products. Alexander et al (2011) reported that international trade is a significant driver of demand. As a result, increasing demand due to consumer's awareness and national and international trade caused to high economic benefit, (3) Lack of appropriate market; as markets develop, demand for

these products increase. Development of new markets for NWFPs in Arasbaran forest could increase the local income (Arnold & Perez, 2001, Gram, 2001, Alexander et al., 2011). All these serious problems are found in Arasbaran region. Therefore, it is impossible to increase price and income without increasing competition among middlemen, demand by public awareness, and developing national and international markets. But NWFPs commercialization is recognized as a main factor of overexploitation and decline of quantities and quality of these species (Arnold & Perez, 2001, Mahapatra & Tewari, 2005, Avocèvou-Ayisso et al., 2009, Kar & Jacobson, 2012). In other hand, high wage level led to negative NPV. A number of factors that influence high harvest costs of NWFPs are: (1) people spend time concealing their activities such as agriculture in collection NWFPs. it makes fruit collection increasingly unprofitable due to higher opportunity costs of labor, (2) they search areas that may already have been harvested, This is arguable from an efficiency standpoint; the unlimited number of harvesters in a particular area would increase the harvest costs to individuals if their efforts were coordinated and might improve the quality of the product, thereby increasing the return to the land or the net return to the resource, and (3) the product is harvested as soon as it becomes marketable, not when it has grown to optimal size (Alexander et al., 2002). According to results of our study in Table 2, processing situation of these fruits was in little or no processing class. Most fruits were simply dried, preserved, shelled, and stored. Just two species, *Cornus mas* and *Rhus coriaria*, were processed by small scale industries in Arasbaran region. In this region, NWFPs are not processes in intermediate and more complex level for producing vegetable and essential oils, and etc. while Adedayo et al (2010) stated that women process fruits to obtain ink and edible oils. It is important for local people to engage in processing of NWFPs in order to increase income from these products. But processing always not led to increase benefit. Avocèvou-Ayisso et al (2009) noted that NPV of raw fruit of almond compared with almond processed is high due to the low variable costs of harvest. Some of authors claimed that processing create employment opportunities especially for women (Stoian, 2005, Sunderlin et al., 2005, Kalu & Rachael, 2006). As regards, NWFPs in Arasbaran region are low or no processed. Therefore, local communities' loss advantages of processing e.g. increasing income and employment. Results showed that most of fruits are processed in other region of country. Therefore, the similar processing industries can be launched and developed in this region. To achieve this goal more information on the real potential of production of species along with the establishment cost of industries is necessary. The results showed that just two species are sold in the regional and international market and others have local and national markets (Table 2). As a

result, NWFPs of Arasbaran region are not traded in the large markets e.g. regional and international. Some researchers reported many factors as the entry barriers of these products for large markets. They are following as: (1) lack of information about the potential of production, processing, and market of NWFPs (Collier et al., 2004, Kilchling et al., 2009), this is a reason to not entering the similar species of this region such as Wild blueberries (traded in USA) and hazelnut (traded in Turkey) to the international markets, (2) Consumers unawareness about environmentally friendly products (Collier et al., 2004, Mayett et al., 2006, Kilchling et al., 2009), the local population is not aware of economic, ecologic, and aesthetic importance of NWFPs. It is needed to educate the consumers about them by public communication tools, (3) Strong annual and unpredictable variations of production, it has a negative impact on the processing industries and markets (Kangas, 1999), (4) No access to high technology in harvesting (e.g. tree shakers and fruit mechanical harvesters with aspirators and in processing (e.g. improved techniques for tannin extraction) (Pettenella, 2001), (5) Low quality and unattractive packaging of products: Kilchling et al (2009) noted that the certification labels associated with quality allow for acceptance of higher prices. Also these authors stated that from a marketing perspective, one should not underestimate the importance of attractive packaging and product design, (6) the lack of marketing information; Lintu (1995) noted that increasing the marketing information is considered as an important means of developing market level and sustainable utilization of forest resources (Lintu, 1995). All of these obstacles of marketing of NWFPs in Arasbaran region are found. To enter on the large markets e.g. national, regional, and international, these obstacles should be met. Therefore, local communities' benefit advantages of marketing e.g. increasing income and employment. This study focused on the medical uses of the limited number of species. While Arasbaran region harbors a high diversity of medical plants e.g. *Hypericum perforatum*, *Mentha longifolia*, *Anchusa italica*, *Mentha longifolia*, and etc. due to richness of these plants, the management and operational plans must be prepared and carried out. With launching the small-scale processing industries can provide both the employment opportunities and income for local people. Also, it can be as an important incentive for conserving forest. As Shrestha and Dhillion (2003) stated this requires detail assessment of resource quantities, productivity potential, sustainable harvesting methods, domestication possibilities, and market value of these species. One of the most valuable species in Arasbaran forests is *Taxus baccata*. This species has high medical importance. Raw materials for processing industries are provided by the existent resources and cultivating the important species e.g. *Taxus baccata*, *Hypericum perforatum*, *Mentha*

longifolia, *Anchusa italica*, *Mentha longifolia*, and etc. Recently, cultivation of the medical plants in the natural resources areas such as forests, rangelands, and deserts is supported financially by FRWO. But local people do not tend to the industrial extraction on the medical plants. As Shrestha and Dhillion (2003) mentioned, inadequate knowledge of resources population and the lack of financial resources, and sustainable harvesting methods are as main barriers to the industrial use of medical plants. Acknowledgment We would like to acknowledge the financial support of University of Tehran. We also greatly appreciate from bureau of Natural Resource of Kalibar county and research center of East Azerbaijan, FRWO for supporting us. We are also thankful to all those who contributed for the success of this work. Also, a special thanks to the reviewers whose comments and suggestions helped to improve the manuscript.

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