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# Socio-economic factors for adoption of medicinal plants cultivation in Eshkevarat region, north of Iran

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Major research for mass cultivation of medicinal plants in Iran had not been taken. In this context, review of factors affecting adoption of agricultural cultivation of medicinal plants was studied. This study has also been accomplished for the purpose of identification of socio-economic factors effective on the adoption of medicinal plants cultivation in the Eshkevarat region of Iran. A survey was conducted using a stratified random sampling to collect data from farmers of Eshkevarat region, north of Iran. The questionnaire validity and reliability were also determined to enhance the dependability of the results. The subjects under study were divided into two groups of adopters and non-adopters. A total of 50 adopters and 40 non-adopters were studied for effective factors. Results showed that the most important socio-economical factors that influence the adoption of medicinal plants cultivation in Eshkevarat region of Guilan province are marriage status, number of farm patches, yearly income from agricultural activities and utilization system.

**Key words:** Adoption, medicinal plants, farmers, Eshkevarat region.

## INTRODUCTION

In recent years, more attention had been paid to herbaceous medicines and their origin namely medicinal plants mainly due to the proof of these side effects of chemical and the human tendency to use more natural products to maintain their health. The problems of modern medicinal systems such as pharmacologic high costs, the use of non-renewable resources such as fossil resources and environmental pollution by pharmaceutical industry for making human inability of some drugs that normally exists in plants have also caused much more attention to medicinal plants (Moradi et al, 2008; Ghandali and Mirhosseini, 2008; Naghdi et al., 2006; Akhoundzadeh, 2004; Kessler et al., 2001). Medicinal preparations derived from natural sources, especially from plants, have been in widespread use since time immemorial. In fact, plants remain the main source of

medicines for a large proportion of the world's population, particularly in the developing world, despite the advent of the pharmaceutical chemistry during the early twentieth century, which brought with it the ability to synthesize an enormous variety of medicinal drug molecules and allowed the treatment of previously incurable and/or life-threatening diseases (Ahmad et al., 2006). The strategies that herbal practitioners adopt to prevent illness or restore health in their patients are different in the many and varied herbal traditions across the planet, but the effects that herbal medicines have within the body to improve health do not vary. There are many thousands of medicinal plants in use throughout the world, with a tremendous range of actions and degrees of potency. Most have a specific action on particular body systems and are known to be suitable for treating certain types of ailments (Chevallier, 1996).

World trade volume of medicinal plants is more than 43 billion dollars and has been predicted to reach to 5 trillion dollars in 2050. The financial circulation of this trade has raise up to 100 billion dollars and about 25% of the world pharmaceutical market in 1996, worth approximately 250

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**Figure 1.** Medicinal plant of *Echium amoenum* in Eshkevarat region. (Picture by: Dariush Ashoori Latmahalleh).

billion dollars is allocated to drugs derived from plants. Iran's share of this market is about 60 million dollars (Ebrahimi, 2008). Existence of 11 climates from 13 known climates of the world, having 300 sunny days a year and temperature difference between 40 to 50°C between the coldest and warmest zone in Iran has provide favorable conditions for the country in terms of having an exclusive ecology. These conditions predispose the growth and development of wild and medicinal plants (Akbarinia et al., 2007; Niroumanesh et al., 2008). During the accurate study of all Iran's plants that list in the book "glossary of Iran's plants names", it has been identified that nearly 569 geniuses of all Iran's plants geniuses are medicinal that include approximately 2300 species. Some of them introduce to Iran or have been imported that are not among common and traditional medicinal plants. 80 geniuses of these plants are among the plants imported to Iran and have been planted in different parts of the country. 116 geniuses among these plants are aromatic and smelly that includes 836 species often belonging to the families *Compositae*, Mint and *Apiaceae*. Altogether, these plants can publicly fit into 130 families that 19 families of them are through implanted herbs. Among the current medicinal plants of Iran, 136 geniuses include trees and shrubs that their secondary products are definitely consumed or their products placed among everyday foods and fruits consumption of families, these plants are used regardless of their pharmaceutical functions (Mozaffarian, 2008).

Medicinal plants are the valuable resources of every community. Identification, cultivation and domestication of important species is memorable in order to reduce the pressure incurs to natural resources and to preserve the genetic resources (Akbarinia et al., 2006). As respects, the vast land of Iran has tendency to culture and produce many species of medicinal plants due to having different climates (Akbarinia et al., 2007), but there has not taken any major step for identification, domestication and mass cultivation of these plants (Bagheri et al., 2008). In this context, review of factors affecting adoption of agricultural cultivation of medicinal plants and domestication of wild medicinal plants in different regions of Iran is very important. This study has also been accomplished for the purpose of identification of socio-economic factors effective on the adoption of medicinal plants cultivation in the Eshkevarat region of Iran (Figure 1).

**MATERIALS AND METHODS**

The data reported here were collected to identify socio-economic factors critical to adoption of medicinal plants cultivation. This study was carried out by survey during May and June, 2009 in selected villages of Eshkevarat region in Guilan province near to Caspian Sea, north of Iran (Figure 2). Eshkevarat region selection was due to major role of this place for medicinal plants cultivation in northern part of Iran. Medicinal plants are self-grown in this region besides being cultivated. The Eshkevarat region of Roodsar County situated in the point of 36°50′ N latitude and 50°10′ E longitude in an area in scale of 300 Km². Average annual precipitations is 662-1202 mm; altitude is 1400-2000 m, minimal temperature is -5°C in winter and maximum temperature is 35°C in summer.

The sampled population in each village was stratified into two categories: Adopters - those who adopted and continue to practice medicinal plants cultivation and non-adopters - those who have never adopted medicinal plants cultivation. From each village list, a random sampling approach was used to select the respondents. This sampling technique was used to avoid conscious or unconscious bias in the selection of sampled households and ensured that the selected sample was representative of the population. According to Bartlett et al. (2001) table and with keeping 5% error due to classified questions selected 90 farmers as sample size. In total, 90 farmers were selected of which 50 (55.6%) were medicinal plants cultivation and 40 (44.4%) non-adopters (Table 1).
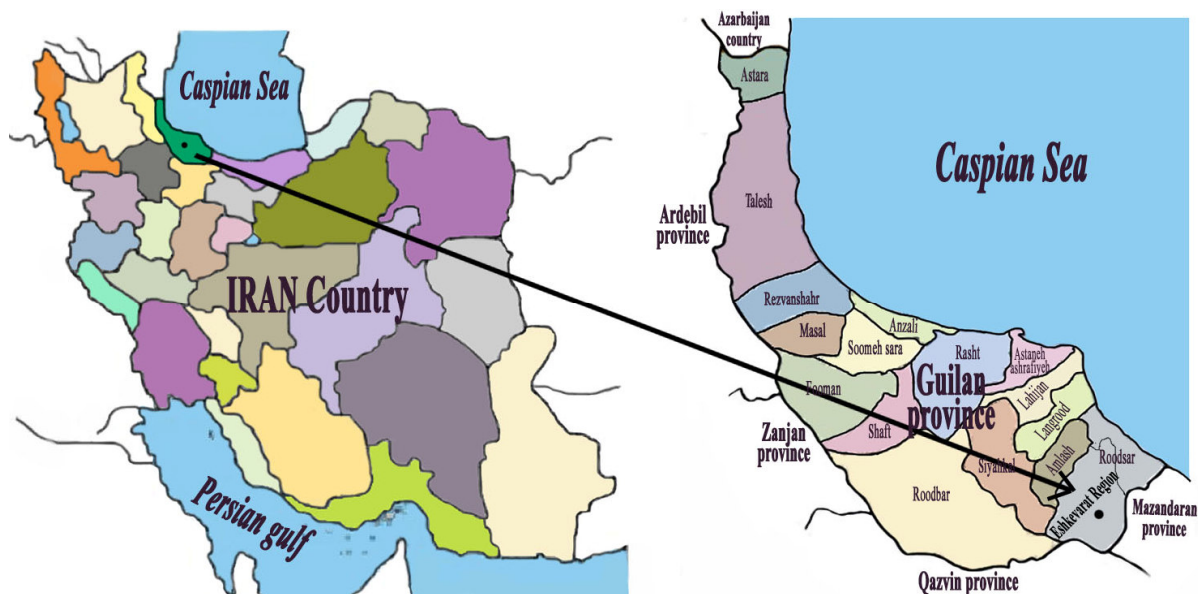
**Figure 2.** Location of studied region in north of Iran.

**Table 1.** Total sample size used in the study area.

|                          | Frequency | Percent |
|--------------------------|-----------|---------|
| Adopters sample size     | 50        | 55.6    |
| Non-adopters sample size | 40        | 44.4    |
| Total                    | 90        | 100     |

Source: Survey results, 2009.

The instruments used for data collection was questionnaire with open and close questions. The questionnaire was pre-tested by interviewing three farmers. After some modifications, it was tested again with five other respondents.

The dependent variable was the adoption of medicinal plants cultivation among farmers of Eshkevarat region of Guilan province. The dependent variable was dichotomized with a value 1 if a farmer was an adopter of medicinal plants cultivation and 0 if non-adopter. Data analysis was conducted with software of Statistical Package for Social Sciences, 16 version (SPSS 16). Frequency, percent, and standard deviation were used for the descriptive analysis of data. Chi-square test, t-test and Mann-Whitney test were used for inferential analysis data.

The statistical data can be divided into two parts, the parametric and non-parametric data. Parametric tests such as t-test are used for analyzing parametric data which scale interval and ratio. Non-parametric tests such as Chi-square and Mann- Whitney are used for analyzing non-parametric data which are in two forms, nominal and ordinal.

Chi-Square test used responders categorized in two variables for representing whether there is any relationship between two variables or not. In this research, the relationship between dependent variables that are divided into two classes, the adopters and the non-adopters, and independent variables was studied. Therefore the numeral or interval variables were categorized at first and then this test was accomplished.

The independent t-test method is used when we want to compare the means of two groups of people which are different from each other. In this method we tried to specify the differences between

two groups and also to donate their differences as a proportion of variation or among the scores of two collections or groups. In other words, t-test statistical method is one of the parametric methods which used in order to find if the differences between the means of two sets of scores are statistically significant or not.

When the data are ordinal, it cannot use t-test for the comparison of two society means. For this reason t-test replaces to Mann-Whitney test. This method is used for the comparison of informations received from two independent groups. To calculate the differences between two groups, the scores of both two samples are ranked simultaneously regardless of each score belongs to which group. After ranking, the scores of both two groups are calculated together and sum of the ranks of two groups are calculated separately.

## RESULTS AND DISCUSSION

### Descriptive analysis of data

In this study, results of data descriptive analysis in Table 2 showed that mean of responders age was about 46 year. Most of respondents were male (about 80%). More of responders were married (96.7%). 36.7% of the respondents were illiterate, 23.3% were of primary-school level, 18.9% of guidance level, 7.8% have a secondary education and school diploma and 13.3% Collegiate.

**Table 2.** Frequency, percent, mean and standard deviation of socio-economic characteristics of farmers.

| Characteristics | Groups | Frequency | Percent | Mean | Std. deviation |
|---|---|---|---|---|---|
| Age | 20-30 | 20 | 22.2 | | |
| | 31-40 | 17 | 18.9 | | |
| | 41-50 | 18 | 20.0 | | |
| | 51-60 | 18 | 20.0 | 46.60 | 15.50 |
| | 61 through highest | 17 | 18.9 | | |
| | Total | 90 | 100 | | |
| Sex | Male | 73 | 81.1 | | |
| | Female | 17 | 18.9 | - | - |
| | Total | 90 | 100 | | |
| Marriage status | Married | 87 | 96.7 | | |
| | Bachelor | 3 | 3.3 | | |
| | Total | 90 | 100 | - | - |
| Education level | Illiterate | 33 | 36.7 | | |
| | Primary school | 21 | 23.3 | | |
| | Guidance school | 17 | 18.9 | | |
| | High school | 7 | 7.8 | - | - |
| | Collegiate | 12 | 13.3 | | |
| | Total | 90 | 100 | | |
| Family size | 1-3 | 19 | 21.1 | | |
| | 4-6 | 48 | 53.3 | | |
| | 7 t through highest | 23 | 25.6 | 5.10 | 2.09 |
| | Total | 90 | 100 | | |
| Prime occupation | agriculture | 57 | 63.3 | | |
| | Animal husbandry | 7 | 7.8 | | |
| | Other occupations | 26 | 28.9 | - | - |
| | Total | 90 | 100 | | |
| Number of owned farm patches | Lowest through 2 | 36 | 40.0 | | |
| | 2-4 | 33 | 36.7 | | |
| | 4-6 | 10 | 11.1 | | |
| | 6 through highest | 11 | 12.2 | 3.34 | 2.17 |
| | Total | 90 | 100 | | |
| Utilization system | Ownership | 83 | 92.2 | | |
| | Rental | 1 | 1.1 | | |
| | Without farm | 6 | 6.7 | - | - |
| | Total | 90 | 100 | | |
| Numbers of medicinal species collected | Lowest through 2 | 51 | 56.7 | | |
| | 2-4 | 33 | 36.7 | | |
| | 4-6 | 6 | 6.7 | 2.23 | 1.39 |
| | Total | 90 | 100 | | |

**Table 2.** Contd.

| | | | | | |
|---|---|---|---|---|---|
| Amount of farm ownership (per hectare) | Lowest through 1 | 38 | 42.2 | | |
| | 1-3 | 34 | 37.8 | | |
| | 3-5 | 10 | 11.1 | 2.25 | 2.04 |
| | 5 through highest | 8 | 8.9 | | |
| | Total | 90 | 100 | | |
| Yearly income from agricultural activities | Lowest through 5000000 | 32 | 35.6 | | |
| | 5000000-15000000 | 34 | 37.8 | | |
| | 15000000-25000000 | 9 | 10.0 | 14072000 | 16721400 |
| | 25000000-35000000 | 7 | 7.8 | | |
| | Total | 90 | 100 | | |
| Yearly income from non-agricultural activities | Lowest through 5000000 | 50 | 55.6 | | |
| | 5000000-20000000 | 23 | 25.6 | | |
| | 20000000-35000000 | 7 | 7.8 | | |
| | 35000000-50000000 | 7 | 7.8 | 18344000 | 57564300 |
| | 50000000 through highest | 3 | 3.3 | | |
| | Total | 90 | 100 | | |
| Number of domestic animals | 0 | 46 | 51.1 | | |
| | 1-20 | 32 | 35.6 | | |
| | 21-40 | 4 | 4.4 | 13.98 | 48.38 |
| | 41 through highest | 8 | 8.9 | | |
| | Total | 90 | 100 | | |
| Number of visit refer to agricultural services during a year | 0 | 55 | 61.1 | | |
| | 1-3 | 28 | 31.1 | | |
| | 4 through highest | 7 | 7.8 | 0.88 | 1.50 |
| | Total | 90 | 100 | | |
| Membership in social institutions | Yes | 69 | 76.7 | | |
| | No | 21 | 23.3 | - | - |
| | Total | 90 | 100 | | |
| Numbers that went to the city during a year | 1-5 | 55 | 61.1 | 8.77 | 9.14 |
| | 6-10 | 8 | 8.9 | | |
| | 11-15 | 16 | 17.8 | | |
| | 16 through highest | 11 | 12.2 | | |
| | Total | 90 | 100 | | |
| Method of obtaining information on agricultural activities | Promotion bureau | 4 | 4.4 | | |
| | Other farmers | 71 | 78.9 | | |
| | Agricultural input supply stores | 2 | 2.2 | - | - |
| | Radio and TV | 5 | 5.6 | | |
| | Several from options | 8 | 8.9 | | |
| | Total | 90 | 100 | | |
| Method of treatment of diseases | Chemical medicines | 42 | 46.7 | | |
| | Herbal medicines | 37 | 41.1 | | |
| | Chemical and herbal | 11 | 12.2 | - | - |
| | Total | 90 | 100 | | |

**Table 2.** Contd.

| | | | | |
|---|---|---|---|---|
| Amount of land for cultivation of medicinal plants (ha) | 50 | - | 0.15 | 0.27 |
| Species numbers of medicinal plants for cultivation | 50 | - | 1.08 | 0.34 |

Source: Survey results (2009).

**Table 3.** The effect of socio-economic characteristics on adoption of medicinal plants cultivation using Chi-square test.

| Characteristics | $X^2$ | P |
|---|---|---|
| Age | $5.285^{ns}$ | 0.259 |
| Sex | $0.613^{ns}$ | 0.434 |
| Marriage status | $3.879^*$ | 0.049 |
| Education level | $2.650^{ns}$ | 0.618 |
| Family size | $4.255^{ns}$ | 0.119 |
| Prime occupation | $0.960^{ns}$ | 0.619 |
| Number of owned farm patches | $8.319^*$ | 0.040 |
| Utilization system | $8.707^*$ | 0.013 |
| Numbers of medicinal species collected | $2.102^{ns}$ | 0.350 |
| Amount of farm ownership | $4.525^{ns}$ | 0.210 |
| Yearly income from agricultural activities | $8.527^{ns}$ | 0.074 |
| Yearly income from non-agricultural activities | $7.646^{ns}$ | 0.105 |
| Number of domestic animals | $5.742^{ns}$ | 0.125 |
| Number of Visit refer to agricultural services | $4.392^{ns}$ | 0.111 |
| Membership in social institutions | $3.382^{ns}$ | 0.066 |
| Numbers that went to the city | $5.364^{ns}$ | 0.147 |
| Method of obtaining information on agricultural activities | $8.420^{ns}$ | 0.077 |
| Method of treatment of diseases | $0.484^{ns}$ | 0.785 |

Mean of family size was about person 5. Prime occupation of responder farmers more was agriculture and animal husbandry (about 70%). Number of owned farm patches of most respondents was lesser of patch 4 (76.7%). Most of farmers were Padrone of owned farm (92.2%). Uttermost of species six collected medicinal plant by farmers in region that most of respondents collected lesser of medicinal species 4 (93.4%), mean about species 2. Lesser of 3 ha were mean of amount of farm ownership of responder more (80%, mean about 2.25). Mean of yearly income from agricultural activities was about 14 million I.R. Rials while yearly income of non-agricultural activities was about 18 million I.R. Rials. Responders did not owned 51.1% animal. More of animal padrone responders owned lesser of animals 20 (35.6%). Alone 38.9% of respondents go visit refer to agricultural services during a year. More responders were member of In-social institutions (76.7%). Mean of numbers that went to the city was about 8 time during a year. Obtain information on agricultural activities by other farmers was method of responders more (78.9%). Method of diseases treatment among respondents was 41.4% herbal medicines, 46.7% chemical medicines and 12.2 herbal medicines and chemical medicines. Mean of medicinal plant farms among adopters was 1500 m$^2$. Most adopters of medicinal plant cultivation implanted alone one species of medicinal plant.

**Inferential analysis of data**

In this study, results of Chi-square test in Table 3 showed that there was a significant relation between adoption of medicinal plants cultivation and variables of marriage status ($p < 0.05$ and $x^2 = 3.879$), number of owned farm patches ($p < 0.05$ and $x^2 = 8.319$) and utilization system ($p < 0.05$ and $x^2 = 8.707$). But, there was no significant relation between adoption of medicinal plants cultivation and variables of age ($p > 0.05$ and $x^2 = 5.285$), sex ($p > 0.05$ and $x^2 = 0.613$), education level ($p > 0.05$ and $x^2 = 2.650$), family size ($p > 0.05$ and $x^2 = 4.255$), prime occupation ($p > 0.05$ and $x^2 = 0.960$), numbers of species collected ($p > 0.05$ and $x^2 = 2.102$), amount of farm ownership ($p > 0.05$ and $x^2 = 4.525$), yearly income from agricultural activities ($p > 0.05$ and $x^2 = 8.527$), yearly income from non-agricultural activities ($p > 0.05$ and $x^2 = $

**Table 4.** Comparison of some socio-economic characteristics of adopter and non adopter of medicinal plants cultivation using t-test.

| Characteristics | Groups | N | Mean | Std. deviation | t | Sig. |
|---|---|---|---|---|---|---|
| Age | Adopters | 50 | 48.34 | 15.68 | $1.193^{ns}$ | 0.236 |
| | Non-adopters | 40 | 44.42 | 15.17 | | |
| Family size | Adopters | 50 | 5.48 | 2.215 | $1.950^{ns}$ | 0.054 |
| | Non-adopters | 40 | 4.62 | 1.86 | | |
| Number of owned farm patches | Adopters | 50 | 4.00 | 2.18 | $3.382^{**}$ | 0.001 |
| | Non-adopters | 40 | 2.52 | 1.88 | | |
| Numbers of medicinal species collected | Adopters | 50 | 2.16 | 1.62 | $0.584^{ns}$ | 0.561 |
| | Non-adopters | 40 | 2.32 | 1.04 | | |
| Amount of farm ownership | Adopters | 50 | 2.50 | 1.99 | $1.299^{ns}$ | 0.197 |
| | Non-adopters | 40 | 1.94 | 2.08 | | |
| Yearly income from agricultural activities | Adopters | 50 | 17730000 | 20148200 | $2.558^{*}$ | 0.013 |
| | Non-adopters | 40 | 9500000 | 9457060 | | |
| Yearly income from non-agricultural activities | Adopters | 50 | 13900000 | 19543000 | $0.817^{ns}$ | 0.416 |
| | Non-adopters | 40 | 23900000 | 83815700 | | |
| Number of domestic animals | Adopters | 50 | 9.18 | 19.31 | $0.958^{ns}$ | 0.343 |
| | Non-adopters | 40 | 20.00 | 69.32 | | |
| Number of visit refer to agricultural services | Adopters | 50 | 1.04 | 1.59 | $1.068^{ns}$ | 0.289 |
| | Non-adopters | 40 | 0.70 | 1.38 | | |
| Numbers that went to the city | Adopters | 50 | 7.44 | 9.06 | $1.564^{ns}$ | 0.121 |
| | Non-adopters | 40 | 10.45 | 9.07 | | |

$^{ns}$ Non significant, $^{*}$significant at $P < 0.05$ and $^{**}$significant at $P < 0.01$. Source: Survey results (2009).

7.646), number of domestic animals ($p > 0.05$ and $x^2 = 5.742$), number of visit refer to agricultural services ($p > 0.05$ and $x^2 = 4.392$), membership in social institutions ($p > 0.05$ and $x^2 = 3.382$), numbers that went to the city ($p > 0.05$ and $x^2 = 5.364$), method of obtaining information on agricultural activities ($p > 0.05$ and $x^2 = 8.420$) and method of treatment of diseases ($p > 0.05$ and $x^2 = 0.484$).

In this study, results of t-test in Table 4 demonstrated that there was a significant difference between the two groups of adopters and non-adopters of medicinal plants cultivation regarding variables of number of owned farm patches ($p < 0.01$ and $t = 3.382$) and yearly income from agricultural activities ($p < 0.05$ and $t = 2.558$). But, there was no significant difference between the two groups of adopters and non-adopters regarding variables of age ($p > 0.05$ and $t = 1.193$), family size ($p > 0.05$ and $t = 1.950$), numbers of species collected ($p > 0.05$ and $t = 0.584$), amount of farm ownership ($p > 0.05$ and $t = 1.299$), yearly income from non-agricultural activities ($p > 0.05$ and $t = 0.817$), number of domestic animals ($p > 0.05$ and $t = 0.958$), number of visit refer to agricultural services ($p > 0.05$ and $t = 1.068$) and numbers that went to the city ($p > 0.05$ and $t = 1.564$).

In this study, results of Mann-Whitney test in Table 5 demonstrated that there was no significant difference between the two groups of adopters and non-adopters of medicinal plants cultivation regarding variables of Education level ($p > 0.05$ and $z = 0.228$).

Referring to the results of this study, effect of the variables number of farm patches, yearly income from agricultural activities and utilization system on adoption almost have the same direction toward the results of many other researchers wherein the adoption of innovations and different technologies in agriculture namely some researchers outcome like Darvish et al. (2009), Saka et al. (2005), Tabaraee and Hassannejad (2009) and Rostami et al. (2008). It is inferred that such traits could be among limitative factors on adoption of

**Table 5.** Comparison of education level of adopter and non adopter of medicinal plants cultivation using Mann-Whitney test.

| Characteristics | Groups | N | Mean rank | Sum of ranks | Z | Sig. |
|---|---|---|---|---|---|---|
| Education level | Adopters | 50 | 44.96 | 2248.00 | $0.228^{ns}$ | 0.820 |
| | Non-adopters | 40 | 46.18 | 1847.00 | | |

[ns] Non significant, [*] significant at $p < 0.05$ and [**] significant at $p < 0.01$ Source: Survey Results (2009).

medi-cinal plants culture across the non- adopters. Besides the results of current study unto the variables age, sex, education level, family size, amount of farm ownership (per hectare), number of domestic animals, number of visit refer to agricultural services during a year, membership in social institutions were commonly unlike some researchers outcomes (Darban and Iravani, 2007; Tabaraee and Hassannejad, 2009; Faraji and Mirdamadi, 2006; Kapanda et al., 2005; Iravani et al., 2006; Rostami et al.,2008; Joshi and Pandy, 2005; Darvish et al., 2009; Pezeshkirad et al., 2006; Lashgarara and Asadi, 2008; Kohansal et al., 2009; Pezeshkirad and Arayesh, 2001; Mahboubi et al., 2005; Adeogun et al., 2008; Saka et al., 2005; Boahene et al., 1999; Rezvanfar and Mandape, 2000) As regards, in multiple researches, the most of these traits are reported effectively on the adoption of technologies and various innovations, but lack of meaning of these traits in this study signifies that there is no major difference among the groups of adopters and non- adopters in studied region. For this reason, there will not be major restriction in order to adopt medicinal plants culture among the non- adopters of this technology in comparison with the adopters.

## CONCLUSIONS AND RECOMMENDATION

In general, the results of survey indicate that the most important socio-economical factors that influence on the adoption of medicinal plants culture in Eshkevarat region of Guilan province are marriage status, number of farm patches, yearly income from agricultural activities and utilization system. First, as respects of non- adopters difference in comparison with the adopters of medicinal plants culture in Eshkevarat region of Roudsar depends on such these traits and generally is trifling, therefore it is suggested to promote more effective medicinal plants culture. Secondly, as regards, three meaningful variables of four show the economical difference between two groups of the adopters and non- adopters of medicinal plants culture in studied region. It should provide financial resources, facilities and necessary materials so as to develop medicinal plants and make it more valuable. Finally, as plenty of medicinal plants of the studied region are grown wildly, it is suggested to study more on dome-stication of these plants and determining the profitable cultural features in order to specify the requirements of

planting, maintenance and harvesting of these plants. There is hope that the strength of mentioned region farmers' economy will be improved by utilization of medicinal plants cultivated in specific farms.

## ACKNOWLEDGMENTS

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