Investigation of Sericulturists' Knowledge and Attitude towards Function of Different Types of Silkworm Eggs Distributed in Guilan Province

Seyed Hossein Ghorashi Fallah Roudbaneh[1], Mohammad Karim Motamed[2]*, Seyed Hossein Hosseini Moghaddam[3], Fatemeh Ghorbani Piralidehi[4]

Abstract

One of the important innovations in sericulture is utilizing the hybrid silkworm eggs that with a clearer view about it, may assist extensional experts in the development of sericulture. This study aimed to explore the agriculturists' knowledge of and attitude on the silkworm eggs distributed in Guilan province. This is a quantitative, applied and descriptive-survey research. Due to the expansion of sericulture in Guilan province, to do the multistage sampling, Langaroud and Shaft, were chosen, due to them having the highest number of sericulturists. Then through simple random sampling, 168 cases from Langaroud and 184 cases from Shaft were picked. Researcher-made questionnaire was collected in five categories (individual-professional characteristics, knowledge, and attitude, satisfaction and factors contributing to satisfaction). Face and content validity was confirmed through consultations with 10 professors as well as with sericulture specialists and reliability was confirmed using Cronbach's alpha. Studies showed no significant difference in sericulturists' knowledge and performance with regard to different types of distributed eggs. It indicated that sericulturists' location has no impact on their attitude on the usage of the distributed eggs. However, the type of used silkworm egg, does impact the farmers' attitude, resulting in a statistically significant difference. The majority of sericulturists are moderately satisfied with sericulture practices in Guilan province. Furthermore, individual characteristics as well as access to facilities and financial and moral support most significantly affect their satisfaction. Sericulturists' equal attitude of hybrid types, despite their unique features of each type, indicates their knowledge of raising are poor and limited.

[1] . M. Sc. Student, Department of Agricultural Economics, Faculty of Agricultural Sciences, University of Guilan, Rasht, Iran

[2] . Associate Professor, Department of Agricultural Economics, Faculty of Agricultural Sciences, University of Guilan, Rasht, Iran

[3] . Associate Professor, Department of Animal Science, Faculty of Agricultural Sciences, University of Guilan, Rasht, Iran

[4] . Assistant Professor, Department of Agricultural Extension and Education, Faculty of Agricultural Sciences, Sari Agricultural Sciences and Natural Resources University, Sari, Iran

*Corresponding author; Email: motamed@guilan.ac.ir, Tel: 09111347350

Keywords: Sericulture Activities, Attitude, Empowerment, Satisfaction**.**

Introduction

The main driving force nowadays to boost the economy as well as the productivity, is development of knowledge-based economy. In the economic domain as a result, generation of knowledge along with its successful spread and practical application in production system has turned into a worldwide goal. Investments in scientific research are generally to share the knowledge and skills with society and market (Etzkowitz, 2006; Oh et al., 2016; Fini et al., 2018).

Researchers believe introduction to innovation means taking a step forward because competition is not solely based on inside research and developments rather it is based on the ability to form connections with other outside strategic activists in the chain of knowledge. Therefore, institutions which take part in innovation, count on their cooperative network with other research institutes and state organizations and in doing so improve the performance and bring about competition (Fontanari and Sacchetti, 2020). After years of research, researchers have found some of the reasons contributing to inhibiting innovation. The reasons include, lack of a culture which supports and encourages innovation, a lack of sense of belonging to organization on the part of the managers, lack of a comprehensive process leading to innovation, lack of sufficient resources allocated to the process, lack of skilled and talented instructors and managers in innovation teams and lack of a creative managing system (Hsu et al., 2017). Researchers also believe that technologies and innovations shall be general, simple and compatible. They should also be needed by the target receiving population and eventually enjoy greater potential to be utilized in the market (Chen et al., 2011). Researcher assume to share and transfer the recent findings two major paths may be taken which include a vertical and a horizontal transfer. In vertical transfer of new findings and technologies, first the basic needs are recognized, then fact checking and prioritizing are done. Eventually, according to priorities and features, technologies would be utilized one by one and through different techniques. Vertical transfer of new findings and innovations requires two types of technologies i.e., 1. Production technology, 2. Transfer technology. Production technology is developed by the research sector including research and academic institutions. This type of technology should be evaluated in terms of compatibility before being transferred to field of practice and its insufficiencies should be dealt with in production sector. Once the new findings are proved to be compatible with requirements and facilities of the producer, such findings are

transferred to the producer via transferring technologies. In case it turns out efficient, it will spread among beneficiaries as the path for horizontal transfer of new findings. In horizontal transfer of a new finding, the target audience should prepare themselves to spot and fulfill the needs of the society and acquire the relevant knowledge. Therefore, in addition to the knowledge about new findings, transfer of such knowledge is also important. So the target population must equip themselves to receive more and better services based on new findings (Malek Mohammadi et al, 2021). To understand and accept new findings, target population and promoters must provide vertical and horizontal paths to transfer new findings. In so doing, they need to acquire positive and appropriate knowledge and attitude on new and technological findings.

Knowledge is a set of information which human beings make use of in their life (Trivella et al., 2015) and which was categorized, with its development, and then resulted in forming various specialized fields of knowledge (Litvaj and Stancekova, 2015). Knowledge is a combination of experiences, values, information and attitudes. attitude in turn means long-term organization of motivational, emotional, perceptual and cognitive processes with regard to some environmental aspects in which the individual is situated. Therefore, an individual's attitude is indicative of their way of thinking, emotion and reactions that they have towards their environment (for instance towards farming and its surrounding environment) (Sanayeei and Shafeei, 2012). Since attitude is a concept that reflects positive and negative perceptions about work and about various aspects of an individual's work environment, having a positive attitude is important in achieving individual and organizational success (Ramayah and Muhamad, 2004). attitudes play a significant role in preparing and forming behaviors, generating motivation and directing attitudes, therefore they constitute a major part of social psychology (Ajzen, 1991; Kouyoumdjian and Plotnik, 2011).

Sericulture or silkworm rearing is an old side activity of agriculture in Iran that along with other primary agricultural practices in each region contributes to the production of silk cocoons as a valuable product worldwide. This profession is the foundation for crafting various silk products including shawls, headscarves, local clothes, *chador shab* (an Iranian artifact; it is basically a piece of colored cloth primarily made and used in the northern provinces of Iran), etc. offering a financial incentive, it may provide the economically active and passive population of the villages with employment opportunities, hence enabling these potential working population to earn a decent income with value added. Nowadays, with population growth, which in turn led to growth in the fundamental needs of people, the income earned from a single product neither suffices nor fulfills

these essential needs. The favorable climate and adequate facilities to develop sericulture and silk products in Iran, the creation of jobs in the field and engaging the disguised unemployed and the workforce in villages, as well as proper expansion of the profession may adequately address the economic and social problems that the farmers encounter (Rahi, 2011). 2685 households in Iran are silk farmers. With 560 tons of cocoon in 1399, Guilan province comes in first with approximately 34% production of the cocoon and enjoying the most silk farmers in the country, Guilan province is the industrial park in Iran. However, this indicates a 40% reduction in cocoon production, compared to the last two decades. In the last decade, nevertheless, the public reception of silk production has increased, rising from 300 tons to 550 tons. This rise has been especially significant in the past two years (Silk and Caterpillar Department, 2022).

Similar to other farming practices, sericulture has also encountered various new and innovative findings that aim to enhance efficiency and functionality of production including, introduction of different types of hybrid silkworm eggs. With hybrid eggs produced in research centers, sericulturists are now provided with an opportunity to earn more money through breeding of silkworms. Silkworm farmers' lack of awareness of and minor familiarity with this innovation has posed some problems for its expansion and advancement. Since sericulture is a side job for farmers, it has enjoyed less support and attention so far. Most of the research in the field of sericulture and silk industry have solely focused on selective breeding of berry trees, silkworms, etc. including Zhao et al., 2007; Kumari and Tripathi, 2017; Ruzi and Almanza, 2018; Nasirillaev and Umarov, 2018; Khudayberideva et al, 2021; Umarov et al., 2021; Fambayun et al., 2022. While very few studies have been carried out on educational-social content and also on investigation of knowledge, attitude and satisfaction indexes. Studies in Iran are neither an exception; with the majority of the research conducted on selective breeding of silkworms, berry tree, pests and diseases. No comprehensive study has been carried out on either sericulturists' social-educational matters, or on factors like knowledge, attitude, satisfaction and utilization of different hybrid eggs. Research studies in this domain seem necessary. The present study aims to investigate the knowledge, attitude and satisfaction of sericulturists in Guilan with regard to modified silkworm eggs (hybrid cases) whose findings may revolutionize the rearing and breeding methods the villagers are currently using. Clearly presenting the state of the sericulturists in Guilan province with respect to their knowledge, attitude and satisfaction, findings and results of this study can also help administrators and executives responsible for rural development in future planning;

furthermore, contributing to an increase in their income, it can improve their livelihood. To accomplish this principal objective, the following specific goals are set which in the present study are probed into.

1. To compare knowledge of the sericulturists of utilization of silkworm eggs (hybrid and local types) distributed in Guilan province.
2. To explore and compare farmers' performance and attitude regarding the function of eggs distributed in Guilan province.
3. To investigate the function and productivity of hybrid (foreign) distributed eggs from the point of view of the sericulturists.
4. To compare farmers' satisfaction with sericulture practice in Guilan province.
5. To examine farmers' level of satisfaction with sericulture practice in Guilan.
6. To investigate factors contributing to farmers' satisfaction with productivity and function of silkworm eggs distributed in Guilan province.

Review of the Literature

In his study, Tzenov and Grekov (2007) explained how in Bulgaria, sericulture has come to a halt in a significant part of the rural community, therefore the related job opportunities and relative income have inevitably been lost. This is contrary to the fact that Bulgaria has true potential for developing the sericulture industry, due to its favorable climate and socioeconomic conditions. Nevertheless, rapid political and economic changes in this country hinder such development. The development of the silk industry, transforming from a traditional form to an industrial form, has commercial and economic approaches. Therefore, every activity related to the development of sericulture is considered a long-lasting crop and industry. A study was carried out in a state in India, on a population of rural middle-aged subjects who mostly had an average level of literacy and knowledge. This study showed that the limited reception of technology was caused by insufficient knowledge, the unavailability of the technologies, and their high costs (Geetha, 2008).

Sericulture development centers help people live physically, psychologically, and mentally better lives. This is done through presenting advanced technology, precisely defining and identifying their problems, helping them with acquiring knowledge and providing them with the necessary guidance to minimize the casualties and increase product as well as efficiency (Singh et al, 2009).

The study conducted by (Gowda et al, 2011) shows that sericulturists can be in a rising market; not only a local market but a global one, if they use modern and low-cost tools in the silkworm rearing process as well as in the breeding and harvesting of mulberry trees.

Researchers believe knowledge management brings many advantages for organizations, including the agricultural extension system, So success of extensinal plans to improve behavior requires familiarity with knowledge and attitude; and having knowledge and optimistic attitude can be a contributory cause for a change in behavior. For instance, better understanding of knowledge, attitude and performance of the farmers in their use of pesticides is absolutely essential for establishing more effective policies aimed at general hygiene and environment conservation (Jin et al., 2017). Knowledge is so significant that in their studies Nuttavuthisit and Thogersen (2017), researchers have found out that knowledge and general understanding in behavioral intention to use technology (using organic products) is effective.

Pour Hossein (2002) has stated that silkworm rearing in Iran is still based on old methods and unfruitful local mulberry varieties, besides, sericulturists lack the required knowledge to prevent and control silkworm diseases and mulberry pests.

In their study to determine the educational requirements of sericulture farmers in Guilan province, Charmchiyan Langeroodi, and Chizari (2006) have found there is a positive significant relationship between the following factors: the frequency of contact with the sericulture department as well as with other silkworm farmers, participation rate, obtaining scientific information from sericulture department, methods of getting information, mulberry farm ownership type, visiting other mulberry farms, attending training courses, getting scientific information through radio, television, educational magazines and journals.

Pezeshkirad et al. (2006), demonstrated that the economic state of the farmers is another factor that impacts their reception of the new production technologies. Researchers showed that the economic variables, as well as the technical and professional characteristics, impact farmers' attitude on their reception of such innovations.

In their investigation of farmers' behavior towards pressurized irrigation in Dashtestan town, Behbahani Motlagh et al. (2017) concluded that the most influential factor in farmers' acceptance of the pressurized irrigation was related to the variable of knowledge with an overall effect of 0.359.

Abedi Parijaei et al (2017) stated that sericulture is a side rural activity with short-term cultivation periods and high income which required low investment. Due to the favorable climate, it has great potential to expand in Mazandaran province. Besides, considering land scarcity and the limitation of existing technologies for production is one of the most suitable opportunities to develop the industry, and boost the efficiency of sericulture entities.

In his study which intended to identify the causes contributing to the experienced farmers' participation in development plans of the value chain in Guilan, Kavoosi Kalashami et al (2018) stated that planning, taking an approach, adopting an effective solution for the development of the industry, and to form a value chain requires one to have a comprehensive knowledge and picture of the professions' state as well as of the sericulturists' attitude. Considering the influence of the farmers' individual characteristics and parameters related to the production system will be efficient in establishing policies about the cocoon value chain.

Savari (2019) showed that there is a positive relationship between the following variable: income levels, farming experience, the farming land measures, interest rates, usage of communication networks and media, concern for natural environmental issues, motivation to take part in plans to protect the natural environment, making use of educational and promotional journals on agriculture and soil management. On the other hand, there is a negative relationship between the numbers of land stripes with farmers' attitude.

Abdolahi Ezatabadi and Hosseinifard (2019) stated that it is possible to broaden the farmers' knowledge and enhance its effectiveness in the efficiency of manure by increasing the quality and quantity of education, raising the quality level of human forces involved in agriculture, revision of instruction for water and soil resource protection, as well as a revision in allowance payments. The prerequisite for that though is the management renovation through worldwide prosperous experiences in agriculture.

Ghasemi et al (2019) conducted a study to experiment with the effective factors on farmers' knowledge of and attitude on the relative advantage of farming products. Using the logit model, he found out that education, attending promotional courses, and taking part in promotional visits had a positive influence while contact with farming promoters had e negative effect.

In a study Ataei Asad and Movahedi (2020), researchers stated that the variable of knowledge, with attitude and behavioral intention as the mediation, has a positive and significant effect on the behavior of the farmers. This indicated their willingness to acquire knowledge and information

about the efficient usage of chemical manures. Other findings illustrate that their opinion about the efficient usage of chemical manures has a positive and significant effect on their behavior toward chemical manures. So it can be concluded that with a change in the attitude of potato farmers on chemical manure usage, it is possible to modify their behavior towards chemical manure usage.

In a study that aimed to analyze the sustainability of the sericulture industry in Guilan, Motamed, and Ghorbani Piralidehi (2021) revealed that the social solidarity of sericulturists in Guilan was poor to moderate, social participation was moderate and the social relations were good. Moreover, qualitative analysis of the data indicated that government support, creating moneymaking job opportunities, and organizing and coordinating the activists are three key approaches to achieving sustainability in the sericulture industry in this province.

In her study, Eidie et al (2021) indicated that factors determining the farmers' viewpoint on sustainable management of agricultural water resources, included economic factors, plans, and promotional activities. Therefore, offering direct financial incentives, devising support plans, and educating the farmers by running various courses helps to increase the level of capability, skill, knowledge, and technical information of the farmers about sustainable management of water supplies and other related measurements. This in turn causes the farmers to have a better viewpoint respecting sustainable management of water supplies and consequently, feel more responsible in this respect.

Sahneh et al (2022) stated that the development and expansion of sericulture depend on minor changes that occur in livelihood capitals. Sericulture is composed of agriculture, animal husbandry, and the textile industry. The sericulture industry's success heavily relies on the availability of experienced and skilled human forces. It can be said that the development and growth of sericulture may help improve the sustainable livelihood of rural households and population preservation through the creation of rural careers, especially for women, the expansion of green spaces in the village, and the protection and preservation of the natural environment.

Research Methodology

The present study was carries out to investigate sericulturists' knowledge, attitude and satisfaction with regard to productivity and function of silkworm eggs (hybrid and local) distributed in Guilan and to compare their viewpoints. This is a quantitative applied study. The

approach adopted for data collection was that of a descriptive –survey research conducted within a one year period (farming season 2022-2023). The statistical population is composed of approximately 2000 sericulturists from Langaroud as the representative for east of Guilan and approximately 2200 sericulturists from Shaft as the representative for west of Guilan. The majority of the silkworm egg farmers are located in the aforementioned towns (sericulture development center, 2020). To select the villages from these two particular towns, multistage sampling was used. The samples were randomly selected from among the villagers. According to proportional allocation, 168 sericulturists from Langaroud and 184 sericulturists from Shaft were picked as the research sample. Number of statistical sample was n=352. Necessary information was collected using library study and questionnaire which is the key tool in this study. Face validity and content validity of the researcher-made questionnaire was confirmed by 10 professors from agriculture economy department in University of Guilan as well as sericulture specialists and officials of silk research center in Guilan province. Reliability of the questionnaire was calculated by Cronbach's alpha as 0.75-0.93 which is indicative of a reliable researcher-made questionnaire.

The researcher-made questionnaire was designed in a five-section format. The first section specified some individual and professional characteristics of the farmers including the age, gender, marital status, number of children, income earned from sericulture, income earned from other professions, production quantity, region (east or west of Guilan province), and the used silkworm egg type. In the second part of the questionnaire, ten questions were posed, regarding the sericulturists' knowledge of the distributed silkworm egg's function. Using the 5-point Likert scale, 12 questions were presented in the third section. The sericulturists were asked to give their opinion about the distributed silkworm eggs' function, each point corresponding to different degrees from 1 being the lowest to 5 being the highest (very low=1, low=2, average=3, high=4, very high=5). Measuring their satisfaction with sericulture activities, 7 questions were posed in the fourth section. Once more 5-point Likert scale question type was used with each number corresponding to different levels of satisfaction (very low=1, low=2, average=3, high=4, very high=5). The last part of the questionnaire consisted of 22 questions in the format of a 5-point Likert scale (very low=1, low=2, average=3, high=4, very high=5) to investigate the effective factors of sericulturists' satisfaction with the distributed eggs. To analyze the data through descriptive statistics and inferential statistics, Excel, and $SPSS_{25}$ software were used. The presentation of general information on individual and professional characteristics through

descriptive statistics was followed by an investigation of data for normality, using referential statistics. Then, using parametric statistics such as the independent t-test, the analysis of variance F-test, Spearman's correlation coefficient, and multiple linear regression to analyze the data. Moreover, in the inferential statistics, to investigate the degree to which the farmers had a feeling of contentment, equation 1 was used, in which m=mean, Sd= standard deviation, and D=expected amount.

$$D < m - \frac{1}{2}sd$$

$$m - \frac{1}{2}sd \leq D \leq m + \frac{1}{2}sd$$

$$D > m + \frac{1}{2}s$$

Equation 1) classification of the study sample

Findings and Discussion

Descriptive Analysis

The most important personal and professional characteristics of the studied sericulturists show that 184 of the farmers are from Shaft (52.27%) and 168 from Langaroud (47.73). moreover, the majority of the studied sericulturists are middle-aged men with an average age of 50 and elementary education levels, holding diplomas, while only 30 people (8.5%) have bachelor's degrees or maybe graduate education. All the cases were married and on average there is 3.05 children in each household. The annual income earned from sericulture is 150 dollars and the income from other sericulture activities is on average 200 dollars. Generally 29 kilo grams of fresh cocoon is harvested from each frame. All the silkworm farmers own mulberry farms with around 338 trees for sericulture activities. Most of them (about 88%) use foreign hybrid silkworm eggs. All the sericulturists reported their mulberry leave reserve as sufficient. All the silkworm farmers in this study regarded sericulture as their side job, i.e., they are all practicing another profession that they deem to be their main job.

Inferential analysis

In the first stage of inferential statistics the normal state of the data was examined. Then, specific objectives of the study were investigated.

Investigating the normality of data:

The normality of the data was investigated based on Kolmogorov-Smirnov and Shapiro-Wilk tests. The results of the normality tests are displayed in Table 1. The statistical significance of the two tests (Kolmogorov-Smirnov and Shapiro-Wilk tests) indicates a normal distribution of the data.

Table 1. Investigating the normality or abnormality of data distribution.

Variables	**Kolmogorov–Smirnov test**		**Shapiro-Wilk test**	
	Statistic	Significance	Statistic	Significance
The knowledge of the sericulturists about the function of distributed silkworm egg	0.25	0.40	0.92	0.20
The attitude of the sericulturists on the function of the distributed silkworm eggs	0.32	0.31	0.75	0.32
Satisfaction of sericulture activities	0.33	0.32	0.74	0.33

Investigating specific objectives of the study:

1. Comparing the knowledge of the sericulturists in Guilan of utilizing the distributed eggs (hybrid and local) in Guilan.

A comparison of the knowledge of the sericulturists in Guilan of the distributed eggs in the Province in two regions (Langaroud and Shaft) and with two egg variations indicated no significant difference between the two groups of sericulturists. In other words, the two groups of sericulturists in the province (east or west of the province) and the cultivated egg type (local or foreign) had no impact on their function (Table 2).

Table 2. Comparison of the knowledge of the sericulturists in Guilan with regard to distributed silkworm egg variations (local or foreign) in Guilan.

Dependent variable	Independent variables	Investigated groups	Mean rank	Statistic t	Significance level
Knowledge of the sericulturists	Studied region	Guilan east	17.27	-0.43	0.67
		Guilan west	17.27		
Knowledge of the sericulturists	silkworm egg	Iranian (local)	17.48	1.28	0.21
		Foreign	17.20		

2. Investigating and comparing the function and attitude of the sericulturists in Guilan regarding the function of the distributed silkworm eggs in Guilan province

Investigation and comparison of the function of the distributed silkworm eggs in the province (Langaroud and Shaft towns) indicated no statistically significant difference between different regions (table 3).

Table 3. Comparison of the function of the distributed eggs in Guilan.

Dependent variable	Studied regions	Mean rank	Statistic t	Level of significance
Function of the distributed silkworm eggs	East of Guilan province	2.91	0.91	0.32
	West of Guilan province	2.90		

The comparison of the attitude of the sericulturists in Guilan showed no significant difference between silkworm farmers in the west or east of the province with regard to the distributed silkworm eggs. While there is a significant difference between the attitude of the sericulturists who used the local silkworm eggs from those who utilized foreign variations. The mean rank of the majority of the farmers who use foreign eggs (2.98) also indicates their positive view of foreign silkworm eggs (table 4).

Table 4. Comparison of sericulturists' attitude on the function of the distributed silkwrm eggs in Guilan province.

Dependent variable	Independent variables	Investigated groups	Mean rank	Statistic t	Level of significance
Sericulturists' attitude	Investigated regions	East of Guilan province	2.93	-0.94	0.35
		West of Guilan province	2.97		
Sericulturists' attitude	silkworm egg	Local (Iranian)	2.87	-3.06	0.003
		Foreign	2.98		

3. Investigating the foreign distributed silkworm eggs' function from the sericulturists' viewpoint

Investigation of the distributed foreign eggs' function from the viewpoint of 310 silkworm farmers who used foreign hybrid silkworm egg variations showed no significant difference among the function of the 8 variations of the hybrid eggs (Qiufeng×Bayu ،Bayu× Qiufeng ،871×872 ، 872×871 ،Minghu×Suju ،Suju×Minghu ،Qiufeng A×Bayu ،Bayu B×Qiufeng A) in the last five years.

Table 5. Comparison of foreign silkworm eggs distributed among Guilan's sericulturists.

Sum of squares	Degree of freedom	Mean square	F distribution	Level of significance
In-group	7	1.42	4.89	0.12
Inter-group	302	1.29		
Total	309			

4. comparing the satisfaction of the sericulturists in Guilan with sericulture activities

Investigation and comparison of the satisfaction of the sericulturists in Guilan with sericulture activities indicated no significant difference between the two groups of silk farmers. In other words, neither the region (whether east or west of Guilan province) nor the silkworm egg type (Iranian or foreign) had no impact on the farmers' satisfaction in either group (Table 6).

Table 6. Comparison of the satisfaction of the sericulturists in Guilan with sericulture activities.

Dependent variable	Independent variables	Items	Mean rank	Statistic t	Level of significance
Sericulturists' satisfaction	Studied region	East of Guilan province	3.10	1.51	0.14
		West of Guilan province	2.95		
Sericulturists' satisfaction	silkworm egg	Iranian	3.007	-0.87	0.39
		Foreign	3.09		

5. Investigating the satisfaction level of the sericulturists in Guilan with sericulture activity

Equation 1-4 was utilized. Farmers' satisfaction was classified into three levels low, average, and high. The results show that most of the silk farmers in Guilan have an average satisfaction with sericulture activities in Guilan province (table 7).

Tale 7. A review of sericulturists' satisfaction level with sericulture activities in Guilan.

Sericulturists' satisfaction level	Studied range	Sericulturists	
		Frequency	Percentage
Low	Less than 2.88	35	9.94
Average	2.88≤D≤3.24	223	63.35
	More than 3.24	94	26.7

6. Investigating the factors contributing to the sericulturists' satisfaction with the silkworm eggs distributed in Guilan province

Twenty-two factors were identified, following a review made of the studies and findings. The studied silkworm farmers were asked about the effectiveness of these factors, through 22 questions presented in a 5-point Likert scale format (ranging from very low, low, average, and high, to very high). To investigate the impact and significance of these factors multiple regression was used. Before employing the multiple regression technique, the relationship between the mentioned factors and the sericulturists' satisfaction was studied, using Spearman's correlation coefficient. Relationships with significant correlation coefficients are represented in table 8. A study of Spearman's correlation coefficient showed that 12 out of 22 factors had statistically significant relationships to sericulturists' satisfaction. Access to items of production such as quality mulberry

leaves and silkworm eggs had a 5% statistically significant relationship to satisfaction. Government support, positive attitude, contact with promoters, more experience, local trustees' encouragement, access to service providers, transformational industries, knowledge of new methods and information, access to transportation means, and possession of the necessary equipment had a 1% statistically significant relationship to the farmers' satisfaction.

Table 8. The connection between satisfaction and the factors contributing to it from the sericulturists' viewpoint.

Variable	Sericulturists' satisfaction	
	Correlation coefficient	Level of significance
Access to quality mulberry leaves	0.314*	0.01
Government support	0.633**	0.000
Personal interest and positive attitude on sericulture activities	0.255*	0.04
Sufficient contact with farming promoters and specialists	0.547**	0.000
Having more experience in the domain of farming	0.502**	0.000
Encouragement and support of the local chiefs and trustees	0.588**	0.000
Access to agriculture service providers	0.549**	0.000
Sufficient transformational and supplementary industries in the province	0.957**	0.000
Knowledge and awareness of new methods of and information about silkworm farming	0.500**	0.000
Access to transportation means to sell the products and buy new production items	0.682**	0.000
Access to proper silkworm eggs	0.283**	0.0.3
Possession of sufficient equipment	0.349**	0.006

In order to do a regression, Gujarati (1995) suggested the tolerance level of the data to be calculated, so as to determine whether there is collinearity between independent variables. The result of the tolerance level of the outputs of the present study was calculated as over 0/1 which indicates non-collinearity between the independent variables, consequently the regression was possible to be done.

Variables with statistically significant relation to dependent variables were used in regression so as to determine how much the dependent variable of satisfaction has changed. The result of the multiple linear regression is presented step by step in table 9.

Table 9. Factors contributing to the satisfaction of the sericulturists with the function of the distributed silkworm eggs in Guilan.

Variables	B	Standard error	ß	T value	Significance
Constant	2.12	0.32	…..	6.70	0.000
Available transformational and supplementary industries in the province	0.58	0.03	0.90	22.82	0.000

Personal interest and positive attitude regarding the sericulture activity	0.29	0.01	0.74	20.63	0.000
Sufficient equipment	0.29	0.03	0.64	11.27	0.000
access to favorable silkworm egg	0.16	0.02	0.22	9.26	0.000
Awareness of new related methods and knowledge of sericulture	0.14	0.009	0.19	15.96	0.000
Available quality mulberry leaves	0.018	0.008	0.025	2.22	0.03
More experience in the field of sericulture	0.017	0.04	0.02	0.45	0.02
Access to agriculture centers	0.015	0.03	0.02	0.35	0.01
Local chiefs' support and encouragement	0.01	0.02	0.01	0.22	0.02

Based on the results presented in table (9), the adjusted R squared value (R^2_{Ad}) indicates that the following variables (proper transformational and supplementary industries, personal interest and positive attitude on sericulture, sufficient equipment, access to favorable silkworm eggs, knowledge of new techniques and about recent information, available quality mulberry leaves, more experience, access to agriculture service centers, and local chiefs encouragement) can interpret 88* of the dependent variable (sericulturists' satisfaction with the function of the silkworm eggs distributed in Guilan) variance. Besides, the F-test is statistically significant at 99% level which means the regression is statistically significant. Also, the outcome of the t-test was calculated and its level of significance shows that the effect of the mentioned variables in 99 and 95% are statistically significant on the farmers' satisfaction with the silkworm eggs distributed in Guilan.

Moreover, a review of the standardized regression coefficients (ß) indicates that the variables "sufficient transformational and supplementary industries in the province", "personal interest and positive attitude on sericulture activities", and "possession of sufficient equipment" respectively, play more important roles in the farmers' satisfaction with the function of the silkworm eggs distributed in Guilan. The positive value of the studied variables shows that with an increase in each of the independent variables such as "suitable transformational and supplementary industries", "personal interest and positive attitude concerning sericulture", "access to sufficient silkworm eggs", "knowledge of and about new methods and information", "available high-quality mulberry leaves", "more experience in the field", "access to agricultural centers", and "local trustees support and encouragement" sericulturists' satisfaction with the function and efficiency of the silkworm eggs distributed in Guilan province will increase.

According to the findings the variables "personal interest and positive attitude about sericulture" and "knowledge of and about new methods and information" are variables that

contribute to the sericulturists' satisfaction with the function of the silkworm eggs distributed in Guilan. Therefore, the third hypothesis of the study proposing that the sericulturists' knowledge of and attitude on the factors that contribute to the farmers' satisfaction with sericulture, is confirmed.

Discussion and Conclusion

Sericulture and silk products are the side jobs that along with other agricultural activities in Iran, play a role in creating jobs and providing new job opportunities and therefore generating income for rural households, this in turn helps fulfill the financial needs of these families. Therefore the present study intended to investigate the knowledge, attitude, and satisfaction of sericulturists of Guilan concerning the function of the distributed silkworm eggs (hybrid and local), and then to compare their opinions about the distributed silkworm eggs (hybrid and local), as well as the level of satisfaction and the influential factors impacting the farmers' contentment in Guilan through 2021-2023.

The most important findings of the descriptive statistics indicate that all the sericulturists in this study considered this activity as a side work. The sample population consisted of adults, predominantly male (average 50 years old), with basic literacy and low levels of education.

The sericulturists examined in the sample on average gather 29 kilograms of fresh cocoon from each frame and 88% of them use hybrid eggs. All the farmers believe to have enough berry leaves to rear silkworms. Moreover. All of them consider sericulture as a side job.

Findings in inferential statistics showed that farmers have a positive attitude about imported hybrid eggs and considering the difference between the function of the imported hybrids and the local ones, they prefer the breeding of hybrid eggs. This in turn causes a demand on the part of the farmers for foreign hybrid eggs and results in the farmers welcoming the breeding of such eggs. Although, sericulturists in Guilan see no difference among various types of hybrids, in terms of their function and productivity. However, according to the identifications that come along with these hybrids, the farmers are expected to notice a difference in their function. The key point in this respect must be found in sericulturists' knowledge and their breeding techniques. Inferential statistics also shows no significant difference between the rearing knowledge of the two groups of farmers who use foreign hybrid eggs. In other words, they are equally knowledgeable when it comes to breeding silkworm eggs. This finding confirms studies done by other researchers, most

of whom believe knowledge and attitude to be effective in acceptance of innovations and technologies. Old techniques and unfruitful varieties influence every farming practice like it does sericulture; as a result, survival of any form of farming practice necessitates various innovations, acquisition of new knowledge and offering guidance to farmers (Singh et al., 2009). Hybrid caterpillar eggs are introduced as an innovation in the field of sericulture to increase the efficiency. Most of the researchers believe knowledge and attitude are two important factors contributing to acceptance of technologies and innovations as well as to a change in farmers' behavior, so much so one of the main factors causing a resistance towards technologies is insufficient knowledge and a lack of suitable attitude as well as behavioral understanding of using such technologies (Pour Hossein, 2002; Geetha, 2008; Jin et al., 2017; Nuttavuthisit and Thogersen, 2017; Abdolahi Ezatabadi and Hosseinifard, 2019). According of Kavoosi Kalashami et al (2018) A comprehensive representation of the sericulturists' attitude can positively affect the value chain in this industry.

Examining the farmers' educational needs and providing them with information are main objectives of extensional and educational activities. Such extensional-educational activities seek to motivate farmers and improve their attitude, considering this as the key resolution (Charmchiyan Langeroodi and Chizari, 2006; Pezeshkirad et al., 2006; Behbahani Motlagh et al., 2017; Savari, 2019; Ataei Asad and Movahedi, 2020; Eidie et al., 2021).

In addition to the two factors of knowledge and attitude, research results show most of the sericulturists are average satisfied with sericulture practiced in Guilan province. They have positive satisfaction with the function of the distributed cocoon eggs. In other words, neither the location of sericulture practice (either east or west of the province) nor the type of cocoon egg (local or hybrid) has an impact on the satisfaction of the two groups of sericulturists. It can be said the reason for equal level of satisfaction of the two groups of sericulturists is due to their insufficient familiarity with and knowledge of various hybrid cocoon eggs. While according to the accompanying identification documents of the imported hybrid cocoon eggs, and with adoption of correct breeding techniques, the function and productivity of the eggs were expected to be different which would have led to different levels of satisfaction.

Investigations conducted on determining factors behind sericulturists' satisfaction indicated 12 factors contributed to farmers' satisfaction with reading the cocoon eggs distributed in Guilan.

These factors are as follows, proper personal characteristics including personal interest, positive attitude, more experience in the field of sericulture along with having the benefit of various facilities and enjoying financial and moral support of converting and complementary industries; sufficient equipment, access to cocoon eggs, availability of berry leaves, awareness of the new information, access to agriculture service centers and encouragement and motivation of local trustees. Therefore, with regard to findings of the study "efficient converting and complementary industries across the province", "personal interest and positive attitude on sericulture practice" and "possession of essential equipment" are the most effective variables contributing to farmers' satisfaction with function of cocoon eggs distributed in Guilan.

Sericulturists appreciated the opportunity to continue the breeding of cocoon eggs as a profitable side job and are satisfied with their activities in the field.

Recommendation

- To raise the knowledge level of sericulturists regarding imported hybrid eggs, it is recommended to introduce the characteristics of imported hybrid cocoon eggs (including their identification document containing the function, unique breeding conditions, etc.) to specialists and sericulturists involved in their import. This will help to ensure a thorough and accurate evaluation of the function of the eggs.
- Educational-extensional courses on new methods of breeding should be run. In such courses, the characteristics of imported hybrid eggs and local (Iranian) eggs, their advantages and disadvantages should be explained. In addition to extensional trainings aimed at boosting the farmers' attitude and knowledge with regard to proper application of sericulture, it is essential to take into consideration the general knowledge of the sericulturists and continuously enhance their general knowledge.
- Large-scale planning as well as regional planning focused on revival, perpetuation, and promotion of sericulture practices should be carried out since the major factor contributing to farmers' acceptance and their constant appropriate behavior, in line with specified objectives, is their satisfaction. Based on the 12 factors found in this study that positively impact farmers' satisfaction, such planning is required.

- To improve the level of satisfaction, it is required to get all government and non-government supports including financial credit and low-interest loans to fulfill the needs of training centers so as to secure the establishments and to supply necessary equipment and tools. Such supports are also to be used in the presentation of constant training in this field.

Recommendation for future studies

Based on the findings of the present study, there are several suggestions for future research to enhance and extension sericulture. These include:

1. Conducting a comprehensive study across the country to improve the knowledge, attitude, and satisfaction of sericulturists. This study should focus on identifying approaches that can be used to enhance the sericulture industry in the country.
2. Thoroughly studying the characteristics of hybrid cocoon eggs and the breeding and rearing location before introducing any new hybrid cocoon eggs. This will help to ensure that the innovation is feasible and sustainable.
3. Recognizing locations across the country that show potential for sericulture growth and investing in the necessary infrastructure and foundation for enhancement and promotion of sericulture.

These suggestions can help to improve the sericulture industry in the country and promote its growth. Further research can be conducted to explore these suggestions in more detail and identify additional ways to enhance and extension sericulture.

Limitations of the Study

Conducting any research encounters limitations; recognizing and stating such limitations not only doesn't impair the quality of the scientific study, rather it assists other researcher in their studies. Therefore, stating the limitations of each study as a guide for other researcher is highly significant. Important limitations of the present study include, lack of sufficient and comprehensive information regarding how to select import of hybrid cocoon eggs. Scientific incompetency of relevant specialists, lack of knowledge or poor knowledge of sericulturists,

traditional techniques for breeding fresh cocoons and wide geographic spread of locations studied in the current research.

Acknowledgements

This article as a part of M. Sc thesis of first author is supported by the Guilan University which is hereby appreciated from that University. Also, present study is financially supported by State's Silk Research Center which is gratefully acknowledged.

References

Abedi Parijaei, A., Motamed, M. K., Kavoosi Kalashami, M and Shabanali Fami, H. 2017. Investigating technical efficiency, allocative and economic of sericulturists, Mazandaran province. *J. of Agric. Econ and Develop*, 25 (99): 79-101.

Abdolahi Ezatabadi, M. and Hosseinifard. S. J. 2019. The effects of nutritional management knowledge of farmers on economic yield of pistachio orchards in Kerman province. *J. of Soil Manage and Sustain Produ*, 9 (3): 91-111.

Ajzen, I. 1991. The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50: 179-211.

Ataei Asad, M and Movahedi, R. 2020. Association of knowledge, attitude and behavioral intention with in potato farmers' fertilizer application behavior in Hamadan, Iran. *Agric. Edu. Admin. Res*, 12 (55): 38-54.

Behbahani Motlagh, M., Sharifzadeh, M. Sh., Abdollahzadeh, Gh and Mahboobi, M. R. 2017. Farmers' adoption behavior of pressurized irrigation technology in Dashtestan county. *Iran Agric. Exten and Edu. J*, 13 (1): 89-103.

Charmchiyan Langeroodi, M and Chizari, M. 2006. Investigating the relationship between educational needs and characteristics of sericulturists in Guilan province. *Scien and Res. J. of Agric. Sci*, 12: 755-766.

Chen, C. J., Chang, C. C and Hung, S. W. 2011. Influences of technological attributes and environmental factors on technology commercialization. *J. of Busi. Ethic*, 104 (4): 525-535.

Eidie, A., Kazemiyeh, F and Zarifian, Sh. 2021. Investigation of Factors Affecting Farmers' Attitude toward Sustainable Management of Agricultural Water Resources (Case Study: Wheat Farmers in Maragheh County). *Agric. Sci. and Sustain. Pro*, 31 (2): 361-375.

Etzkowitz, H. and Zhou, C. 2006. Triple helix twins: innovation and sustainability. *Scie and Pub Poli*, 33 (1): 77-83.

Fambayun, R. A., Agustarini, R and Andadari, L. 2022. Cultivation and breeding techniques for increase silk productivity in Indonesia. Sriwijaya Conference on Sustainable Environment, Agriculture and Farming System, IOP Conf Series: Earth and Environment Sciences 995, https://doi.org/10.1088/1755-1315/995/1/012055.

Fini, R., Rasmussen, E., Siegel, D and Wiklund, J. 2018. Rethinking the commerciazation of public science: from entrepreneurial outcomes to societal impacts. *Acad. of Manage. Per*, 32 (1): 4-20.

Fontanari, E and Sacchetti, S. 2020. The knowledge-based agricultural cooperative: a validation from Trentio case. *J. of Entre. and Organ. Diver*, 8 (2): 46-70.

Geetha,G.S. and Devi R.G. 2008. Technology adoption and training needs of sericulture farmers – A case study in NGO. *Indi. J. of Agric. Res*, 42, 157-163.

Ghasemi, M., Nicknami, M and Rafiei, H. 2019. Factors affecting farmers' knowledge and attitude towards relative advantage of crops in Garmsar city. *Iran. J. of Agric. Econ. and Devel. Res*, 50 (4): 677-690.

Gowda, R.V. Praveena, Murthy, A. N. N. and Muniraju,E. 2011.Technology adoption in sericulture management in India, IUP *J. of Opera. Manage*. 10, 51.

Gujarati, D. N. 1995. Basic econometrics. New York: Mcgraw Hill, Inc.

Hsu, C. H., Chang, A. Y and Luo, W. 2017. Identifying key performance factors for sustainability development of SMEs- integrating QFD and fuzzy MADM methods. *J. of Clean. Pro*, 161: 629-645.

Jin, J., Wang, W., He, R and Gong, H. 2017. Pesticide use and risk perceptions among small-scale farmers in Anqiu county, China. I*nter. J. of Enviro. Res. and Pub. Health*, 14 (1): 1-29.

Kavoosi Kalashami, MHosseinin Moghaddam, S. H., Farzaneh, M and Rahi, M. R. 2018. Factors influencing the participation of Guilan province sericulturists in developing value chain for sericulture products. *Anim. Pro. Res*, 7 (3): 89-99.

Khudayberideva, U., Navruzov, S., Nasirillaev, B., Bekkamov, Ch., Abdukayumova, N and Fozilova, Kh. 2021. Dependence of silkworm productivity indicators on life expectancy of butterflies. E3S Web Conferences 258, https://doi.org/10.1051/e3sconf/202125804049.

Kouyoumdjian, H and Plotnik, R. 2011. Introduction to psychology, Canada: Wadsworth, Cengage Learning Publication, ninth edition.

Kumari, A and Tripathi, N. 2017. Genetic diversity studies in six bivoltine races of *Bombyx mori* L., based on phenotypic characters. *Inter. J. Advan. Res*, 5(1): 1048-1054. doi:10.21474/IJAR01/2851.

Litvaj, I and Stancekova, D. 2015. Decision-making and their relation to the knowledge management, uses of knowledge management in decision making. *Proce Econ and Fin*, 23: 467-472.

Malek Mohammadi, I., Shahbazi, I., Karami, E., Salmanzadeh, S., Yazdani, S and Doorandish, A. 2021. Role of agricultural extension and education eco-compatible technologies in Iran's agricultural production. *Stra. Res. J. of Agric. Sci. and Nat. Resou*, 6 (2): 185-202.

Motamed, M and Ghorbani Piralidehi, F. 2021. Analyzing the sustainability of sericulture industry in Guilan province. *Iran. Agric. Exten. and Edu. J*, 17 (1): 85-99.

Nasirillaev, B and Umarov, S h. 2018. Bulletin of agrarian sciences (Uzbekistan), 4 (74): 95-98.

Nuttavuthisit, K and Thogersen, J. 2017. The importance of consumer trust for the emergence of a market for green products: the case of organic food. *J. of Busi. Ethic*, 140 (17): 323-337.

Oh, S. H., Lim, H. Y and Kim, B. 2016. Strategy to promote the effectiveness of thecnology transfer of national R & D programs in Korea: seen through the G7 leading technology development program. *Proce Compu Sci*, 91: 221-229.

Pezeshkirad, Gh., Masaeli, M and Yaghoubi, J. 2006. Investigating the social factors affecting acceptance of integrated control against rice stem borer by farmers of Isfahan province. *Iran. J. of Agric. Sci*, 37 (1): 27-33.

Pour Hossein, M. 2002. Investigating the status and quality of silkworm breeding in different parts of Iran, Research Project Report, Iranian Silk Worm Corporation Company.

Rahi, M. 2011. Investigating the effect of the government's support policies on the activity of sericulture in Guilan province. Master's thesis, Faculty of Agriculture, Guilan University.

Ramayah, T and Muhamad, J. 2004. Technology acceptance: an individual perspective. Current and future research in Malaysia. *Revi of Busi Resea*, 2 (1): 103-111.

Ruzi, X and Almanza, M. 2018. Implications of genetic diversity in the improvement of silkworm *Bombyx mori* L. C*hile. J. of Agric. Res*, 78 (4): 569-579. doi:10.4067/S0718-58392018000400569.

Sahneh, B., Sadin, H and Jahedi, F. 2022. The role of sericulture activity on improving the sustainable livelihood of rural households in Ramian city. *Geog. and Envi. Sustain*, 12 (42): 105-120.

Sanayeei, A and Shafeei, R. 2012. Presenting a model for analyzing and predicting the buying behavior of customers based on the functional theory of attitude (a case study of Iran's automobile industry). *J. of Commer*, 62: 153-192.

Savari, M. 2019. Investigating the attitude of farmers of Diwandreh towards sustainable soil management. *Land Manage. J*, 7 (2): 115-127.

Silk and Caterpillar Department. 2022. Guilan province cocoon production statistics report, Rasht.

Singh, T., Bhat, M and Khan, M. A. 2009. Sericulture extension: principles and management. AHP Publishing Corporation.

Trivella, L., Nasiopoulos, K and Dimitrios, K. 2015. Knowledge management strategy within the high-education. The case of Greece, *Proce-Soci and Behavi Sci*, 175: 488-495.

Tzenov, P. I and Grekov, D.F. 2007. Bulgaria national sericulture development plan, The Black, Caspian Seas and Central Asia Association (BACSA).

Umarov, S., Mirzaeva, Y., Yalgashev, K., Fozilova, K and Khaydaraliev, J. 2021. Importance of breeding mulberry trees under vegetative (in vitro) methods in high-quality silk production in Uzbekistan. E3S Web Conferences 244, https://doi.org/10.1051/e3sconf/202124402034.

Zhao, Y., Chen, K and He, S. 2007. Key principles for breeding spring and autumn silkworm varieties: from our experience of breeding 873×874. *Cas. J. of Envi*, 5 (1): 57-61.

بررسی دانش و نگرش نوغانداران نسبت به عملکرد انواع مختلف تخم نوغان¬های توزیع شده در استان گیلان

سید حسین قرشی فلاح رودبنه ، محمد کریم معتمد *، حسین حسینی مقدم ، فاطمه قربانی پیرعلیدهی

چکیده

یکی از نوآوری های مهم در نوغانداری بکارگیری تخم نوغان¬های هیبرید است که ارائه ی دیدگاه شفاف تر از وضعیت آن می-تواند به کارشناسان ترویج کمک شایانی را در توسعه¬ی آن نماید. این تحقیق با هدف بررسی دانش و نگرش نوغانداران نسبت به عملکرد تخم نوغان های توزیع شده در استان گیلان انجام گرفت. تحقیق کمی، کاربردی و از لحاظ شیوه ی گردآوری داده ها، توصیفی- پیمایشی است. به دلیل گستردگی نوغانداران دراستان گیلان، در نمونه گیری چندمرحله ای ابتدا دو شهرستان لنگرود و شفت به دلیل دارا بودن بیشترین تعداد نوغانداران انتخاب شدند. سپس از شهرستان لنگرود 168 نفر و از شهرستان شفت 184 نفر به عنوان نمونه به صورت تصادفی ساده مشخص گردیدند. پرسشنامه ی محقق ساخته در پنج بخش (ویژگی های فردی- حرفه ای، دانش، نگرش، رضایتمندی و عوامل مؤثر بر رضایتمندی) جمع آوری شد. روایی صوری و محتوایی پرسشنامه با نظرخواهی از 10 نفر از اساتید و کارشناسان نوغانداری و پایایی با آلفای کرونباخ تأیید شد. نتایج تحقیق تفاوت معنی داری را در دانش و عملکرد نوغانداران در رابطه با انواع تخم نوغان های توزیع شده نشان نداد. موقعیت مکانی بهره برداران بر نگرش آنان در بکارگیری تخم نوغان توزیع شده تأثیر ندارد، اما نوع تخم نوغان بومی و انواع هیبرید مورد استفاده در نگرش نوغانداران از لحاظ آماری تفاوت معنی داری را نشان می دهد. اکثر نوغانداران از فعالیت های نوغانداری استان گیلان رضایت متوسطی را دارند. همچنین ویژگی های فردی در کنار برخورداری از امکانات و حمایت های مادی و معنوی در رضایتمندی نوغانداران بیشترین تأثیر را دارند. نگرش یکسان نوغانداران نسبت به انواع هیبرید علی رغم ویژگی های منحصر به فرد این ارقام نسبت به یکدیگر نشان می دهد که دانش پرورش آنان ضعیف و محدود است.