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Full Length Research Paper

Comparing sericulture extension models for silkworm cocoon production management in Iran

Mehdi Charmchian Langerodi[1]*, Iraj Malakmohammadi[2], Mohammad Chizari[3] and Alireza Seidavi[4]

[1]Department of Agricultural Extension and Education, Science and Research Branch, Islamic Azad University, Tehran, Iran.
[2]Department of Agricultural Extension and Education, University of Tehran, College of Agriculture, Karaj, Iran.
[3]Department of Agricultural Extension and Education, Tarbiat Modares University, College of Agriculture, Tehran, Iran.
[4]Department of Animal Science, Islamic Azad University, Rasht Branch, Rasht, Iran.

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This study compares sericulture extension models from the views of extension agents and sericulturists for silkworm cocoon production management in Iran. To achieve this aim, 316 sericulturists were selected through stratified random sampling technique and 58 sericulture extension agents were studied by census. Research methodology applied in this study was a combination of descriptive-analytical and quantitative methods and statistical method included path analysis. The results showed that the affecting factors for silkworm cocoon production management from the sericulturists' view were effective in training presentation and participation, respectively. Based on the extension agents' model, the affecting factors on the production management of silkworm cocoon were extension agents' training methods, effective training presentation to extension agents and infrastructures. Accordingly, effective training should be presented for extension agents and sericulturists. In the extension agents' model, the most important impacts on the sericulture extension resulted from the marketing and extension agents' training methods. Also, in sericulturists' model, marketing had effect on attitudes towards extension. Therefore, both sericulturists and extension agents believed that extension department should improve sericulture marketing activities.

Key words: Sericulture extension, silkworm cocoon, management, Iran.

INTRODUCTION

Reduction of rural poverty continues to be a paramount goal of the developing countries like Iran. Creating rural industries such as sericulture can effectively reduce poverty and bring about rural development (Ntaanu, 2008). Sericulture is a labor intensive industry in all its phases. It can generate employment up to 11 persons per days for every kilogram of raw silk produced. Out of which more than 6 persons-days are women (Lakshmi, 2007).

Iran has many abilities for production of cocoon and silk fibers. The most important of these factors are cheap and abundance work force, mulberry trees, experience and acquaintance of sericulturists with this profession and carpet-weaving workshops (Pourhossein, 2003). According to statistics of Iran Silkworm Rearing Corporation, production of cocoon had been more than 5000 tons in 1980s (Iran Silkworm Rearing Corporation, 2007) and 730 tons in 2009 (Pourhossein, 2009a), so production of cocoon has decreased to lower than one sixth. Also number of rearers has decreased from 80000 in 1995 (Moradianfar, 2000) to 25389 in 2007 (Iran Silkworm Rearing Corporation. 2007). The extent of Iran mulberry fields have decreased from 17000 hectares in 1995 (Moradianfar, 2000) to 11305 hectares in 2007 (Iran Silkworm Rearing Corporation, 2007). The demand for

*Correspnding author: E-mail: Mcharmchian@gmail.com.

rearing silkworm during recent years has had a significant reduction and reached to about 27 thousand silkworm egg boxes in 2009. Iran fresh cocoon production and raw silk rate was respectively 730 and 108 tons in 2009. Iran Silkworm Rearing Corporation has a potential power to produce 230000 F1 silkworm egg boxes (Pourhossein, 2009b).

It should be emphasized that the company's produced silkworm eggs have a good qualification in a way that they have been exported to Tajikestan, Gorjestan and Greece during the past years (Iran Silkworm Rearing Corporation, 2007).

Sericulture in Iran has begun from the Sassanid Ages and reached to its peak in the Safavid Ages (Moradianfar, 2000). In Safavid ages, the country raw silk production has reached to 3000 tons per year and Iran was the third world silk producer. After Islamic Revolution in 1978, Iran Silkworm Rearing Corporation has begun its activity in 1980 (Seidavi and Bizhannia, 2006).

The main roles include: procurement, production and supply of the silkworm eggs, production and supply of the improved sapling of mulberry, providing technical services, training of the technical staffs and sericulturists, helping for establishment of mulberry garden, purchasing of the fresh cocoon from sericulturists on the basis of the guaranteed prices (Iran Silkworm Rearing Corporation, 2007).

The industrial section of silk production which is mainly invested by the private sector which includes thread production factories and 1300 traditional workshops of manual silk production, turning cocoon into silk and thread (Iran Silkworm Rearing Corporation, 2009).

In order to establish sericulture management, extension should play important roles in transferring new technologies with respect to sericulturists' conditions and promote their information, attitude and skills (Singh et al., 2009).

In spite of transferring the new technologies, extension should be involved in issues such as training extension agents and sericulturists (Srinivasa et al., 2007) with appropriate methods, informing sericulturists (Singh et al., 2009), helping to create grassroots organizations (Chandrakala and Sugun, 2007), involving sericulturists (both men and women) in training programs (Srinivasa et al., 2004), marketing (Kumaresan and Srinivasa, 2005) and developing sericulture infrastructures (Iran Silkworm Rearing Corporation, 2007) and focusing on the factors which are important in technologies adoption (Sezgin et al., 2011).

Extension may be defined as the science of developing capability of the people for sustainable improvement in their quality of life (Singh et al., 2009). Extension is no longer simply focused on improving yields. Large numbers of subsistence farmers have to break out of not just financial but also information poverty, skill and competency poverty and cultural poverty. Extension is not only about to bring change in unfavorable present situation to stakeholders, but also to preventing problem creation for the sake of the prosperous generation as well (Malakmohammadi, 2009). Cocoon is family based produce. Therefore, sericulture extension is aimed to generate interest of individual farmer and the farming community as a whole (Singh et al., 2009).

The overall aim of this study was sericulture extension models comparing to managing silkworm cocoon production in Iranian sericulturists and extension agents' views. To obtain the overall aim, the sericulture extension parts, the components of managing silkworm cocoon production, the affecting factors on sericulture extension parts and managing silkworm cocoon production should be determined.

MATRERIALS AND METHODS

Research methodology applied in this study was a combination of descriptive-analytical and quantitative methods and statistical method including path analysis. The statistical population includes sericulturists and extension agents of Iran Silkworm Rearing Corporation which 58 extension agents were studied by census and 316 sericulturists were selected through stratified random sampling technique. Sericulturists' questionnaire include cocoon production rate, participation times in training courses, the appropriate training methods, awareness, marketing, effective training presentation, technolical presentation, the affecting factors in adopting new technologies, attitudes towards extension, participation, important factors for managing silkworm cocoon production, sericulturists' technical and personal characteristics. In order to reduce the number of variables and attain the appropriate factors, the exploratory factor analysis was used for sericulturists' questionnaires. The variables related to extracted factors from exploratory factor analysis based on the sericulturists' views were given in Table 1.

Extension agents' questionnaire include the effective training presentation, extension agents' abilities, attitudes towards extension, the affecting factors in adopting new technologies, technological presentation, infrastructure, marketing, important factors for managing silkworm cocoon production, suitable training methods and their personal and professional characteristics. In order to reduce the number of variables and attain the appropriate factors, the exploratory factor analysis was used for staffs' questionnaires. The variables related to extracted factors from exploratory factor analysis based on the staffs' views were given in Table 2.

The content validity of questionnaires were measured by a group of extension specialists. In order to investigate the reliability of research questionnaires, 30 sericulturists were randomly selected and they completed the questionnaire. Also 30 questionnaires were given to the extension agents of the Iran Silkworm Rearing Corporation and were completed. Cronbach's alpha and ordinal theta for the sericulturists' questionnaires were 0.89 and 0.91 respectively. Also Cronbach's alpha and Ordinal theta for the extension agents' questionnaires were 0.90 and 0.92 respectively. Data collected was analyzed using the Statistical Package for the Social Sciences (SPSS) and Linear Structural Relationships (LISREL).

RESULTS AND DISCUSSION

The study results showed that the mean of sericulturists' age and their sericulture experiences were respectively

Table 1. Variables related to extracted factors from exploratory factor analysis based on the sericultuirts' views.

Factor	Variable	Factor loading	Extraction sums of squared loadings		KMO	Bartlett's test	P
			Total	Variance (%)			
The methods of acquiring information	Acquiring information by take part in educational course	0.86	2.13	71.02	0.7	289.96	0
	Acquiring information by other sericulturists	0.86					
	Acquiring information by Iran Silkworm Rearing Corporation	0.81					
Awareness	Making occupational motivation in sericulturists	0.79	2.28	57.1	0.76	274.53	0
	Informing about mulberry cultivation around farm lands	0.77					
	Integrated agriculture operation	0.76					
	Adoption of sericulture as a secondary profession	0.69					
Marketing	Help to cocoon processing	0.81	2.53	50.64	0.77	352.12	0
	Help to make cocoon sale cooperatives	0.77					
	Help to investment increase in sericulture	0.69					
	Help to control the dealers in silk and cocoon market	0.66					
	Support for receiving credit facilities	0.6					
Effective training presentation	Effective training presentation about young worms	0.78	2.13	53.27	0.7	230.72	0
	Effective training presentation about cocoon harvest	0.76					
	Effective training presentation about diseases and pests of silkworm	0.74					
	Effective presented training about mature worms	0.63					
Technological presentation	Technological presentation about silkworm nursery	0.85	2.04	67.88	0.69	240.73	0
	Technological presentation about mulberry fields	0.83					
	Technological presentation about silkworm rearing	0.79					
The affecting factors on adoption of technology	Necessary machines	0.76	2.02	50.37	0.7	184.78	0
	The effect of acquaintance about technologies	0.76					
	The effect of sericulture insurance	0.71					
	The effect of presented training about technology	0.6					
Attitudes towards extension	The ability of extension in making contact between executives and sericulturists	0.75	2.04	50	0.73	181.78	0
	The rate of extension focus to sericulturists	0.74					

Table 1. Contd.

Participation	The rate of sericulturists' need to extension for solving problems	0.7	2.18	54.5	0.72	264.55	0
	The ability of extension programs for overcoming new problems	0.67					
	Help to found cooperatives with a complete cycle	0.84					
	Using sericulturists initiatives	0.82					
	Participatory extension	0.7					
	Help to women participation in sericulturists	0.56					
Managing silkworm cocoon production	Decrease the costs of cocoon production	0.89	2.57	64.28	0.76	461.83	0
	Change cocoon to string and silk crops by sericulturists	0.82					
	Coordination before and after cocoon harvest	0.81					
	Increase cocoon production	0.67					

Table 2. Variables related to extracted factors from exploratory factor analysis based on the extension agents' views.

Factor	Variable	Factor loading	Extraction sums of squared loadings		KMO	Bartlett's test	P
			Total	Variance (%)			
Technological presentation	Technological presentation about silkworm nursery	0.85	2.17	12.77	0.71	338.4	0
	Technological presentation about mulberry fields	0.78					
	Technological presentation about silkworm rearing	0.61					
The affecting factors on adoption of technology	Necessary machines	0.79	2.45	14.42			
	Sericulturists' insurance	0.77					
	Sericulturists' interest	0.7					
	Informing on the technologies	0.67					
Attitudes towards extension	The ability of extension programs for overcoming new problems	0.75	2.65	15.56			
	The need for extension to get the new and necessary information for the sericulturists	0.74					
	The ability of the extension programs for improving the research activities	0.73					
	The usefulness rate of extension program in providing new technologies and how to be used by sericulturists	0.69					
	The usefulness of extension to get information on the effects of technology in sericulture	0.67					

Table 2. Contd.

Ability of sericulture extension agents	Ability to attract sericulturists' confidence	0.83	3.03	17.82			
	Understanding various problems of sericulturists	0.77					
	Awareness of sericulturists' psychology	0.76					
	Educational evaluation ability	0.73					
	Knowing the indigenous knowledge of the sericulturists	0.65					
Effective training presentation	Effective training presentation about young worms	0.81	2.99	59.75	0.82	99.14	0
	Effective training presentation about cocoon harvest	0.8					
	Effective training presentation about diseases and pests of silkworm	0.8					
	Effective training presentation about hatch	0.78					
	Effective training presentation about mature worms	0.67					
Infrastructures	Increasing sericulture insurance adoption	0.77	2.51	50.25	0.77	58.92	0
	Helping sericulturists for receiving loans	0.72					
	Present the required inputs for sericulture	0.72					
	Presenting machineries for mulberry garden and sericulture	0.68					
	Expanding cocoon transforming and processing industries	0.66					
Marketing	Cocoon guaranteed purchase	0.81	3.07	51.17	0.8	98.3	0
	Help to cocoon processing	0.75					
	Support for receiving credit facilities	0.73					
	Help to control the dealers in silk and cocoon market	0.72					
	Help to investment increase in sericulture	0.67					
	Help to make cocoon sale cooperatives	0.6					
Managing silkworm cocoon production	Establishing manufacturing plants for silkworm and silk related products	0.84	3.31	55.19	0.79	129.5	0
	Building silk spinning and silk weaving factories	0.81					
	Silk spinning advanced techniques	0.77					
	Increasing silk carpets exports	0.74					
	Preventing cocoon and silk smuggling into the country	0.65					
	Diversity in silk and silkworm crops	0.62					
Training methods	Participating in extension-research projects	0.79	2.12	52.93	0.72	38.38	0
	Visiting the extension activities	0.75					
	Participation in extension conferences and seminars	0.74					
	Reading extension and training magazine	0.63					

Table 3. Total effects in sericulture extension model from the view of the sericulturists.

The path from / The path to	The methods of acquiring sericulture information	Effective training presentation	Participation	Marketing	Awareness
Silkworm cocoon production management	0.07	0.25+0.10	0.36	-	-
Attitudes towards extension	0.01	0.04	0.15	0.14	0.18
Participation	0.06	0.28	-	-	-
Effective training presentation	0.21	-	-	-	-
The affecting factors on adoption of technologies	0.19	-	-	-	-
Presenting technologies	0.05	0.22	-	-	-

52.63 and 26.19 years. 61.6% of sericulturists were illiterate and 82.3% of them performed silkworm rearing by helping of their wives and children. An approach in mulberry sericultural development in Jammu and Kashmir, is client system and farm women. The client system and farm women is composed of farmers, family members and their social, cultural, economic, and prevailing technological environment (Dhar et al., 2008). Also, 70.8% of sericulturists have performed hatching individually. Silkworm nursery situation of 83.7% of sericulturists were traditional. All sericulturists in the study have engaged in silkworm rearing just one time in a year. 50.5% of sericulturists use their mulberry gardens for other crops in the year. So 49.5% of sericulturists use their mulberry garden just for a month and did not use it for other crops in the year. However, five or six other products can be harvested in one year in a mulberry garden (Hosseinimoghaddam, 2005). 93.1% do not change their cocoon to silk productions. The mean reduction in cocoon production by sericulturists has been 154.72 kg during the last three years.

On mean, sericulturists have contacted at least five times during the year with different branches of the Iran Silkworm Rearing Corporation. The mean times in which sericulturists took part in the training courses were four during the year. Also, 81% of sericulturists have considered training courses useful and 90% tended to take part in training programs. Research conducted by Charmchianlangerodi and Chizari (2005) also showed that about 90% of sericulturists would like to take part in training courses.

The mean age of sericulture extension agents was 55.43 years. Also, 90.6% of extension agents were male and 9.4% was women. The mean work experience as extension agent was 14.41 years. Also, 34.5% of extension agents majored in Animal Sciences and 18.2% in Sericulture and only 1% (1.8%) had a college education in the field of Extension. Findings by Sezgin et al. (2010) indicated that the extension staff should be employed in fields appropriate for their specialty and they should receive adequate training in extension regardless of their specialty.

As shown in Table 3, the affecting factors for silkworm cocoon production management from the silk farmers' view which were participation and effective education had the standardized solutions of 0.36 and 0.35, respectively. Findings by Srinivasa et al. (2004) indicated that the variables like participatory extension and training were found to have a significant influence on the cocoon yield.

Besides, the most important influence on attitudes towards extension was awareness which had the standardized solution of 0.18. Factors such as participation and marketing were the next two factors which had the most influence on the attitudes towards extension with the standardized solution of 0.15 and 0.13 respectively. The effective presented training had impact on the participation with the standardized solution of 0.28.

The information acquiring methods had impact on effective training presentation with the standardized solution of 0.21. The methods of acquiring sericulture information had effect on the affecting factors on adoption of technologies with the standardized solution of 0.19. In addition, effective training presentation had impact on technologies

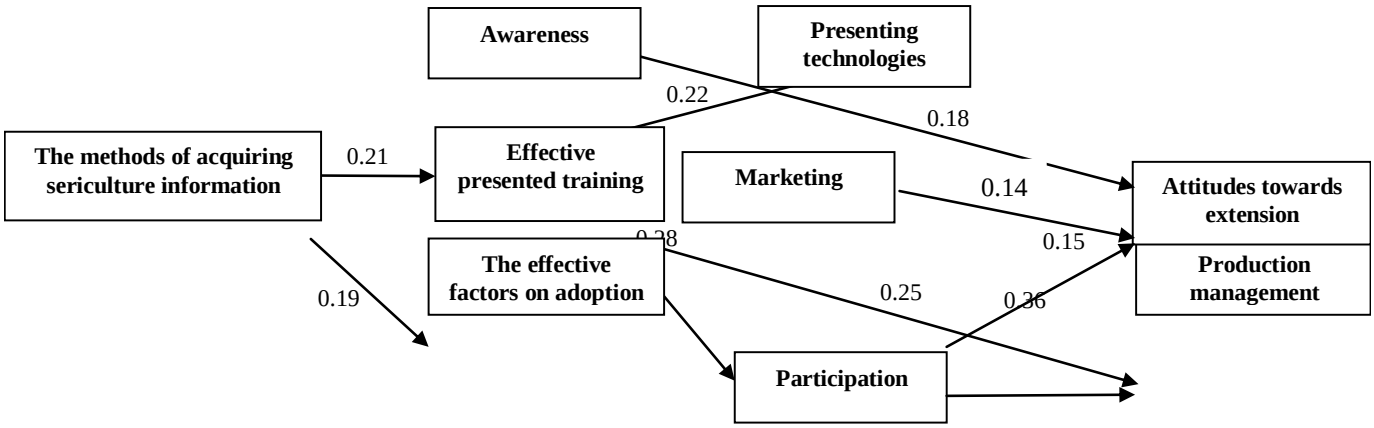

Figure 1. An affecting factors model on silkworm cocoon production management and elements of the sericulture extension from the sericulturists' view.

Table 4. Total effects in sericulture extension model from the view of the extension agents.

The path from / The path to	Marketing	Training method	Infrastructure	Effective training presentation
Sericulture extension	0.42	0.42	-	-
Silkworm cocoon production management	-	0.35+0.25	0.26	0.35
Effective presented training	-	0.71	-	-

presentation with the standardized solution of 0.22. Singh et al. (2009) believed that sericulturists should be trained on the improved technology profits, cultivating mulberry varieties with high yield and appropriate hybrid of seasonal and regional silkworms. An affecting factors model on silkworm cocoon production management and elements of the sericulture extension from the view of sericulturists are shown in Figure 1.

Measures of fit were examined including the Goodness of Fit Index (GFI= 0.98), Comparative Fit Index (CFI= 0.98) and Root Mean Square Error of Approximation (RMSEA= 0.022). Also the ratio of Chi-Square to freedom degree in model was 1.15.

This model appeared to fit well enough, with the GFI and CFI both greater than 0.90, RMSEA less than 0.05 (Hooman, 2008). Also the ratio of Chi-Square to freedom degree was less than 2 (Mansourfar, 2006). Based on the fit indices, it can be concluded that the final model fits the proposed model.

As shown in Table 4, and according to the extension agents' view, the most effective factor on the silkworm cocoon production management which was training methods of extension agents had the standardized solution of 0.60. Factors such as effective training presentation to extension agents and infrastructures had effect on the silkworm cocoon production management with the standardized solution of 0.35 and 0.26, respectively. Kasa (2005) emphasized on the trained personnel and strengthened infrastructures for managing and developing sericulture. Sericulture development in Thailand was made possible through the use of trained experts (Lim, 2002). Training methods of extension agents had impact on effective presented training with the standardized solution of 0.71.

The most effective factors on the sericulture extension were marketing and training methods of extension agents, each of which had a standardized solution of 0.42. Narayanan (1991) believed that extension will empower farmers to process their products and change their raw materials into products with higher value. Extension can also provide important services to the farmers through giving market information on the prices of products and inputs at various local and regional markets. In Figure 2, an affecting factors model on silkworm cocoon production management and sericulture extension from the view of extension agents is shown.

Measures of fit were examined including the Goodness of Fit Index (GFI= 0.98), Comparative Fit Index (CFI= 1) and Root Mean Square Error of Approximation (RMSEA= 0.000). Also the ratio of Chi-Square to freedom degree in

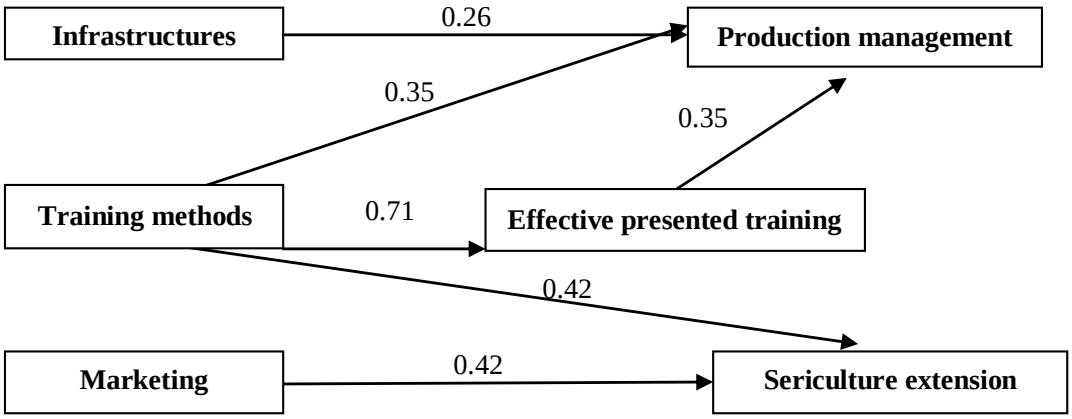

Figure 2. An affecting factors model on silkworm cocoon production management and sericulture extension from the extension agents' vie

model was 0.58.

This model appeared to fit well enough, with the GFI and CFI both greater than 0.90, RMSEA less than 0.05 (Hooman, 2008). Also the ratio of Chi-Square to freedom degree was less than 2 (Mansourfar, 2006). Based on the fit indices, it can be concluded that the final model fits the proposed model.

Conclusion

Sericulture provides two types of employment: one is direct which includes mulberry cultivation, silkworm rearing and cocoon production and the other is indirect industry which involves silk spinning and silk weaving. Therefore, extension department should take into account the direct and indirect employment that sericulture creates for the added value.

Since effective training presentation had impact on the silkworm cocoon production management from the extension agents and sericulturists' views, therefore it is necessary that useful training for young worms, mature worms, harvesting cocoon and silkworm diseases and pests to sericulturists and extension agents be presented. It is also necessary to present training to extension agents and sericulturists on silk spinning and silk weaving for connecting sericulture and silk industry.

Sericulturists' participation (especially women) is necessary in all educational and extension activities. Extension support to foundation and organization of sericulture groups and formation of cooperatives with a complete output cycle that are on the way of costs reduction and income increase which eventually cause to economic profits. Women are required to have a very prominent role from the silkworm egg production to cocoon processing.

One of the areas that the extension should be actively and seriously involved in sericulture management is sericulture marketing. Extension involvement in cocoon post-harvest activities, particularly marketing can have a very important effect on improving the livelihoods of poor and low income sericulturists. Both sericulturists and extension agents believed the extension should assist sericulturists in processing the cocoons, increasing investment in sericulture, controlling the dealers in silk and cocoon market, creating cooperatives for selling the cocoon and receiving credit facilities.

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