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Analysis of trust and social participation network among activists of sericulture in Guilan Province, Northwestern Iran and sustainable development in sericulture industry using Ucinet software

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ABSTRACT

Trust and social participation are the basic prerequisites for achieving sustainable agricultural development, which creates sustainable employment, sustainable income and empowerment of the rural community. Sericulture is an important tool in achieving sustainable development in such societies, and in this regard, the position of the network of activists is important. This study has been conducted with the aim of analyzing the network of social trust and participation among activists of sericulture in Guilan Province, Northwestern Iran to achieve sustainable agricultural development. The statistical population was composed of two groups. The first included 7310 silk farmers in 16 counties of the province out of them, 365 farmers were selected by simple randomization. The second included 12 sericulture activists whose work activity was related to the sericulture industry of the province. A questionnaire was the main research instrument whose validity was examined by a panel of 15 experts and university teachers and its reliability was estimated at 0.81 by Cronbach's alpha. The results showed that most silk farmers report their social trust at low level, while their social participation at moderate. The analysis of other sericulture activists reveals that the coherence and stability of social trust are at moderate level, while the coherence of the participation network is at weak level and its stability is at good level. Agriculture-Jahad Organization in Iran is also the most trusted activists in the social trust and participation network of silk farmers as it has the highest in-degree centrality, whereas the activists express that the cocoon-drying factory and the silk-extraction factory are at the lowest level among the activists of the trust network, while the silk extraction factory and the private service sector are at the lowest level in the participation network.

Keywords: Participation, Sericulture activists network, Social trust, Sustainable development.
Article type: Research Article.

INTRODUCTION

Many researchers argue that development is a general concept that has implications in different aspects of human life including cultural, social, political, administrative, economic, and so on and encompasses their specific concepts. Since development is not limited to merely economic growth, a systemic, holistic, dynamic, and organized view on the issue of development states that all economic, political, cultural, and social aspects of society should necessary grow in a simultaneous and organized manner. In this respect, it is necessary to accept all consequences of accomplishing all-inclusive development in order to promote to the optimal state and exploit all capacities and potential facilities optimally and soundly. One of the important capacities is social trust and social participation, which are platforms for social interactions, relations, and capital (Jalali 2013). Trust and participation are important dimensions of social relations and the manifest of observing rules, regulations, and mutual respect. They are vital concepts in social science and factors involved in the inter-personal interactions between different generations. Social trust and participation can facilitate human relations at both micro and macro

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levels (Mohseni *et al.* 2011). Trust is a fundamental element of social relations and an essential precondition for the economic, social, cultural, and political development of any society (Mirfardi & Ahmadi Gharnaiee 2017) and constitutes the foundation for all theories of participation and inter-personal relations. The lack of trust will make it impossible for people to participate with one another to initiate investment, maintain friendly relations, and establish mutual relations. Indeed, trust seems very important for the emergence of healthy and safe relations. The development programs of any society depend on the trust of social groups in one another and their participation with each other. In other words, trust and social participation are the basic prerequisites for development and sustainable agriculture. The development of sustainable agriculture is considered a priority at the EU level and the importance and role of agriculture in general and sustainable agriculture in particular is undeniable. In order to achieve sustainability in agriculture in rural areas throughout the European Union, the European Union Commission has developed common agricultural policies and guidelines until 2030 (Hurduzeu *et al.* 2022). The concept of sustainable development should be imagined as a system. This system increases the quality of the environment and natural resource reserves, while properly managing and using resources to meet human food needs. This system is economically and managerially dynamic and can be realized when it is technically possible, economically justifiable and acceptable, while it is politically appropriate and managerially applicable, socially acceptable and compatible with environmental issues (Ghorbani *et al.* 2010). The concept of sustainable social development has been noticed since the 1980s. At the beginning of the emergence of this concept, the dimensions and elements that were considered under the title of this dimension of sustainability were limited and related to the realization of two other dimensions in the concept of sustainability. A comparison of the dimensions of sustainability in three historical periods shows that the concept of social sustainability has received less attention compared to the economic and environmental concepts of sustainability (Colantonio 2009). However, social sustainability is a multidimensional concept. This dimension of sustainability deals with several social issues such as inequality, displacement and low quality of livability. Since this concept includes various topics and belongs to philosophical, political and practical fields, therefore, determining its boundaries and defining the exact meaning of social sustainability is complex (Marta & Giulia 2020). However, noteworthy, social sustainability, which is defined as maintaining or improving the well-being of people in the current and future generations, is a pluralist concept. This means that while we should acknowledge the importance of the general concept, a wide range of possibly conflicting operationalization patterns may be both justified and empirically correct given their specific contexts (Janssen *et al.* 2021). Social trust and participation are investigated in the context of a network of activists. An activist is a person or object that takes an action. The term activist transcends a narrative personality because an activist may be a human, object, group, or even abstract term (Alavi Moghadam & Poursharam 2009). Activism focuses on different activities in political, economic, social, and biological contexts aimed at making changes in these systems. The activities related to activism have a wide range. In their efforts to make changes and revisions in rules, some activists prefer to encourage people to change their behaviors instead of putting pressure on governments (Shaw 2001). Parsons (1937) in his book entitled "Structure of Social Action" argues that although an activist acts within the framework of a system, his/her act is voluntary and intellectual and has creativity, authority, and appraisal force. Indeed, he suggests that there are two methods or practices at a person's disposal – one is based on personal motives and the other is an act that relies on social benefits. A social act has an intellectual element and people usually pursue a totality and goal in their behaviors (Tavassoli 2010). Various researchers have investigated the network of activists. For example, Ghorbani *et al.* (2015b) concluded that the stability of the relations and the balance of the network were weak and the trust and participation links were not institutionalized among the people optimally. The placement of over half of the users in the perimeter of the network, the slow speed of trust and participation circulation, and the lack of solidarity among the people were other important challenges in organizing participatory rangeland management in the study site. In another study, Ghorbani *et al.* (2015a) reported that the rangeland users' social trust, participation, solidarity, and capital were at a poor level. Based on their findings, the rate of trust and participation exchange and circulation was estimated at a low level. Also, the central and perimeter activists were classified based on the centrality index. The solidarity and coordination were found to be much greater among central activists than among perimeter ones. Naderi Mahdei *et al.* (2015) studied the relationship between social capital dimensions and efficiency. They measured social capital by five components (social trust, social solidarity, voluntary participation, common norms and values, and network of relations) and social trust at three levels (interpersonal trust, trust in strangers, and trust in

institutions). The results revealed significant relationships between all components of social capital and efficiency. It was found that social solidarity exhibited more influences on efficiency than social trust and social participation. In a study on the assessment of social capital components, Tavakoli *et al.* (2015) concluded that public trust, formal trust, informal trust, and formal participation were the key components of social capital in the study site. They also reported that social capital was in a better condition in some aspects including informal participation. They revealed that the two factors of population and physical distance of the village from the town were among the factors influencing rural people's social capital. Rokneddin Eftekhari *et al.* (2015) conducted an investigation to develop a spatial pattern for social capital. They report that sustainable rural development is possible only if there is appropriate capital (specifically social capital) collected through social participation and trust. They employed the techniques of regression analysis and determination coefficient to determine the relationship between the independent (social capital) and dependent (rural development) variables, as well as the effectiveness of the independent variable on the dependent variable. The results revealed a statistically significant relationship between these two variables. Alibabaee Omran *et al.* (2017) stated that centrality indices are effective in specifying activists with a central situation. In a survey, they used a questionnaire to build trust and participation matrices, measure the centrality index, and finally, determine the geometric position of each activist in the network. Activists play a key role in a network of social trust and participation. Indeed, the mutual understanding, cooperation, and all-inclusive participation of the activists involved in a network can influence all other variables. Sericulture is a commercial and industrial activity related to farming (Kakoti 2012). Silk farming is a sustainable economic activity in rural areas that can generate a proper income for smallholders (Shukla 2012). In Iran, it is necessary to consider secondary activities, like silk farming, given the demographic structure of the country, its abundant job-seeking young people, the inadequate income of main farming jobs, and rural people's income needs (Abedi Parijani *et al.* 2014). The implementation of an optimal management system for the development of the sericulture industry needs an effective relationship among sericulture activists and subsequently, the presence of proper social trust and participation. Coherent social trust and participation among activists is an important aspect of social capital, which is regarded as the core of an activist-network. This study aims to analyze the social trust and participation of sericulture activists regarding the development of this industry in Guilan Province, Iran. The main goal is to analyze the social trust network and the participation network of sericulture activists with an approach of developing sericulture industry in this province, which can play a key role in reviving and developing this industry, increasing the farmers' income, and coping with the existing issues and problems. By introducing the sericulture industry as a sustainable farming activity, it can take an effective step towards rural development and improving rural lives as well as empowering rural women and the youth in particular.

MATERIALS AND METHODS

The methodology adopted in this study is quantitative in general approach and applied in goal. The statistical population was divided into two groups. The first was composed of 7310 active silk farmers in 16 counties of Guilan Province (Anonymous 2018), out of them, 365 farmers were sampled by simple randomization based on Bartlett *et al.* (2001). The second was composed of sericulture activists whose activity was somewhat related to the sericulture industry in the province. Based on interviews with experts and scholars at the province level, 12 key activists in sericulture industry were identified and studied in the province. Data were collected with a self-designed questionnaire, which was composed of four sections. Section 1 included 24 items asking about participants' demographic, social, and economic characteristics. Section 2 used 24 items – scored on a Likert scale from very low to low, moderate, high, and very high – to measure social trust with its indices (intra-group, extra-group, and institutional trust) from silk farmers' perspective. Social participation was also measured considering its indices (planning, decision-making, and decision implementation) using 8 items on a Likert scale (very low, low, moderate, high, and very high) from silk farmers' perspective. The last section of the questionnaire dealt with the silk farmers' work relations with other organizations and agencies related to the sericulture industry in the form of social and participation networks. So, the silk farmers were asked to specify how strong their relationship is with other activists of the sericulture industry, and their responses were investigated on a Likert scale (no, weak, moderate, strong, and very strong relationship). The questionnaire of activists was also developed in two sections. Section 1 was related to their demographic characteristics including age, educational level, marital status, study field, job, and experience in their jobs. In the next section, they were asked to specify the extent of the work relationship of their respective organization/agency in the context of social trust about silk farmers with

other activists on a Likert scale (no, weak, moderate, strong, and very strong relationship). The validity of the questionnaire was investigated by a panel of 15 sericulture experts and scholars in Guilan Province who provided some comments on the questionnaire, which then were applied. To check the reliability of the questionnaire too, a pilot study was conducted in which 30 questionnaires were administered to silk farmers who were similar to the study people, but outside the statistical sample. The data collected by these questionnaires were inputted into SPSS25, and Cronbach's alpha was estimated at 0.81, confirming the reliability of the questionnaire. The social trust and participation of the sericulture activists in Guilan Province were studied by Ucinet software, which is one of the most widely used software packages for the analysis of social and participatory networks used for drawing these networks, as well as creating and displaying numerous relationships in these networks. The software uses nodes, which represent research variables, and ties between the nodes to display the relations and draw social and participatory networks. These networks can quantify qualitative data by mathematics, so they show differences by some indices and allow comparison and analysis (Alizadeh & Seddiqi 2013). There are plenty of indices for the analysis of social and participatory networks. One of the main indices is centrality, so that, in-degree centrality represents the reputation and authority of an activists and out-degree centrality represents the social or political influence of an activists. In addition, indices like density, reciprocity of ties, transitivity, and network size were used in the present study (Table 1).

Table 1. Important indices used in analyzing social trust and participation networks.

Index	Description
Density	It represents the ratio of all available ties to all possible ties. So, density refers to the ties of a certain node – in other words, the nodes that have ties with the node in question.
Centrality	It represents the strength of a node based on the ties that it establishes in the network. Centrality can represent the position of the node, its ties, and the extent of its relations.
In-degree centrality	It represents the number of nodes that an actor receives. A high in-degree centrality represents the individual's reputation or authority.
Out-degree centrality	It represents the number of nodes exiting from an actor. A high out-degree centrality represents the individual's influence, which is mostly discussed in information-sharing networks.
Tie reciprocity	It plays a role in determining the stability of the network and is obtained from the interaction of the activists
Transitivity	This index is obtained from sharing the ties among three individuals in which one is a linking bridge between the other two individuals. The more the number of people transmitting the ties, the higher this index, showing the stability and durability of the ties of the activists.
Network size	The number of ties in a network of relations. The more the number of ties is, the higher the density will be in a network of relations.

Source: Bodin & Crona (2009) and Ghorbani *et al.* (2012).

RESULTS

Silk farmers' demographic, social, and economic characteristics

Some important demographic characteristics of the silk farmers in Guilan Province, Iran were investigated, and the results showed that most of the silk farmers were middle-aged (51.31 years on average) and married (92.6%) and had a work experience of about 22 years. Most of silk farmers had diploma level literacy (131 people), the average number of dependents was 2.9 people and their main occupation was agriculture (172 people). Most of silk farmers used their personal orchards to supply mulberry leaves for consumption, while only 78 of them did not have these orchards. In total, 105 people from silk farmers used the silk company, while 204 people from their friends to provide consumable mulberry leaves. The average annual income of silk farmers from their main job was 480 million Rials (IRR), while from sericulture job 163 million IRR. Silk farmers had an average of 22.6 years of experience in sericulture farming and every year they prepared 1.59 boxes for breeding silkworm eggs. Silk farmers also harvested 26.89 kg of fresh cocoons from each box. They had an average of 892.85 m^2 of land and all of them had an old store house with an average area of 31.7 m^2 for their sericulture activities.

Demographic characteristics of other sericulture activists (other than silk farmers)

Examining the personal characteristics of other sericulture activists (other than silk farmer) showed that the average age of these activists was 49.17 years and most of them were married (91.7%). Most of the activists had a bachelor's degree or higher (91.7%) and studied in different fields of study (agriculture, animal science, plant medicine, law, mapping 8.3% each, management 25%, accounting and rural development 16.7%).

Measurement of social trust from silk farmers' perspective in Guilan Province

Social trust as a variable was investigated with three indices of intra-group, extra-group, and institutional trust. This variable was measured by 24 items on a Likert scale (very low, low, moderate, high, and very high). Fig. 1 summarizes the silk farmers' mean responses to these items.

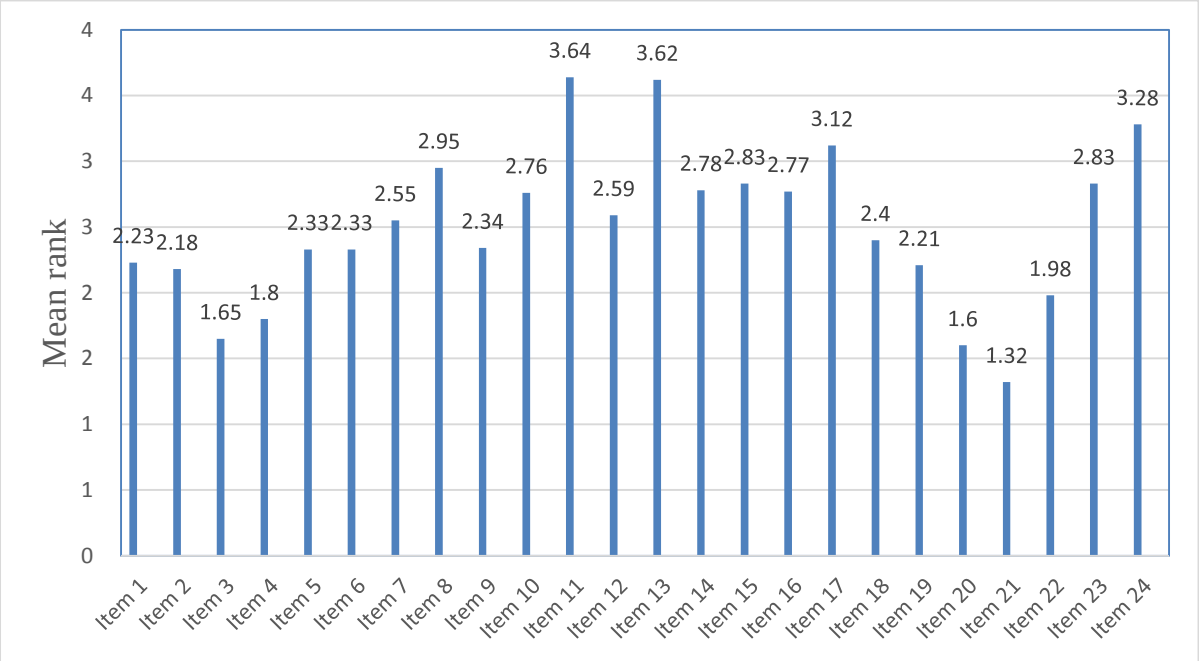

Fig. 1. A summary of social trust items from silk farmers' perspective in Guilan Province (n = 365).

Based on the results, the silk farmers had the highest agreement with the item of '*I will guide newly coming silk farmers about silk farming*' and the lowest with the item of '*The employees of Silkworm Department have illegal requests for the services they provide*' among all items of social trust. In total, the mean social trust of the studied farmers was evaluated to be 2.50 with a standard deviation of almost 0.36. To make a more precise and interpretable summary, the social trust scores of the silk farmers were divided into three categories of low, moderate, and high. The following equations were used to calculate social trust:

$$\begin{aligned} &\text{Social trust at a low level} \rightarrow D < M - \tfrac{1}{2}SD \\ &\text{Social trust at a moderate level} \rightarrow M - \tfrac{1}{2}SD \leq D \leq M + \tfrac{1}{2}SD \\ &\text{Social trust at a high level} \rightarrow D > M + \tfrac{1}{2}SD \end{aligned} \quad (1)$$

where M is the mean and SD is the standard deviation. The results as to the silk farmers' social trust are presented in Table 2.

Table 2. The amount of social trust from the silk farmers' perspective in Guilan Province (n = 365)

Amount of social trust	Frequency	Percentage
Low	182	49.86
Moderate	174	47.67
High	9	2.47

According to Table 2, most silk farmers perceive that their social trust is at a low level in the present conditions. To analyze the network of social trust more deeply, two important indices of the coherence and stability of this network were explored.

The network of social trust among the activists of the sericulture industry in Guilan Province

To study the network of social trust among the activists of the sericulture industry in Guilan Province, 365 silk farmers in the province were requested to specify their work relationship with other activists on a Likert scale (no, low, moderate, high, and very high relationship). The results are shown in Table 3.

Table 3. The network of social trust among the activists of the sericulture industry from the silk farmers' perspective in Guilan Province (n = 365).

activists	Abbreviation of participants names	Items	Frequency	Percentage
General Sericulture Department in Guilan Province	GSD	No relationship	69	18.90
		Low relationship	70	19.18
		Moderate relationship	84	23.01
		High relationship	80	21.92
		Very high relationship	62	16.99
Agriculture-Jahad Organization in Guilan Province	AJO	No relationship	69	18.90
		Low relationship	66	18.08
		Moderate relationship	79	21.64
		High relationship	85	23.29
		Very high relationship	66	18.08
Rural Cooperative Management in Guilan Province	RCM	No relationship	66	18.08
		Low relationship	89	24.38
		Moderate relationship	80	21.92
		High relationship	68	18.63
		Very high relationship	62	16.99
Agribank	AB	No relationship	68	18.63
		Low relationship	90	24.66
		Moderate relationship	82	22.46
		High relationship	63	17.26
		Very high relationship	62	16.99
Private-Sector Crop Insurance	PSCI	No relationship	68	18.63
		Low relationship	85	23.29
		Moderate relationship	80	21.92
		High relationship	69	18.90
		Very high relationship	63	17.26
Islamic Council and Village Administration	ICVA	No relationship	67	18.36
		Low relationship	87	23.83
		Moderate relationship	78	21.37
		High relationship	66	18.08
		Very high relationship	67	18.36
Silk Extraction Factory	SEF	No relationship	104	28.49
		Low relationship	97	26.57
		Moderate relationship	86	23.56
		High relationship	78	21.37

		Very high relationship	0	0
Cocoon Drying Factory	CDF	No relationship	131	35.89
		Low relationship	122	33.42
		Moderate relationship	112	30.68
		High relationship	0	0
		Very high relationship	0	0
Private-Sector Service Enterprise	PSSE	No relationship	96	26.30
		Low relationship	109	29.86
		Moderate relationship	83	22.74
		High relationship	77	21.09
		Very high relationship	0	0
Plant Protection Management in Guilan Province	PPM	No relationship	96	26.30
		Low relationship	104	28.49
		Moderate relationship	86	23.56
		High relationship	79	21.64
		Very high relationship	0	0
Guilan Department of Veterinary Medicine	GDVM	No relationship	97	26.57
		Low relationship	103	28.22
		Moderate relationship	87	23.83
		High relationship	78	21.37
		Very high relationship	0	0
Department of Environment	DE	No relationship	103	28.22
		Low relationship	96	26.30
		Moderate relationship	86	23.56
		High relationship	80	21.92
		Very high relationship	0	0

Note: Likert scale: 1 = no relationship, 2 = low relationship, 3 = moderate relationship, 4 = high relationship, and 5 = very high relationship.

The results as to the network of social trust from silk farmers' perspective at the province level show that most farmers have no or little relationship with some sericulture activists in the province including Silk Extraction Factory, Cocoon Drying Factory, Private-Sector Service Enterprises, Plant Protection Management, Department of Veterinary Medicine, and Department of Environment. The relationship of most silk farmers about social trust is low to moderate with Rural Cooperative Management (24.38 % low, 21.92% moderate), Agribank (24.66% low, 22.46% moderate), private-sector crop insurance (23.29% low, 21.92% moderate), and Islamic council and Village Administration (23.83% low, 21.37% moderate). Also, most silk farmers have a moderate to high relationship with General Sericulture Department and Agriculture-Jahad Organization of Guilan Province.

The network of social trust from the perspective of other sericulture activists in Guilan Province

In addition to studying the network of social trust from the perspective of silk farmers, this important network was also analyzed from the perspective of other activists. Therefore, 12 activists in the sericulture industry of the province were selected to answer questions as to their work relationship with other activists on a Likert scale (no, low, moderate, high, and very high relationship). The results are presented in Table 4. The analysis of density at the whole social trust network level reveals that this index is 41.42% at the general level of social trust ties (Table 4). This value implies a moderate density of social trust ties in the network of sericulture activists in the province. Therefore, social coherence is at a moderate level, too. Based on the results, the network size shows 497 out of the total expected ties (720 ties). Since the higher the network size, the higher its density. So, the network size shows that the density and social coherence are at a moderate level. Another index used to study social coherence

is network centrality based on input and output ties. The network density based on input ties versus output ties in the social trust network does not change, so that in-degree- and out-degree- centrality values are equal.

Table 4. The indices for analyzing the social trust network from the perspective of sericulture activists in Guilan Province.

Tie type	Number of organizations	Total expected ties	Network size (Number of existing relations)	Density (%)	Tie reciprocity (%)	Transitivity (%)	Network centrality based on input ties (input)	Network centrality based on output ties (output)	Centrality
Social trust	12	720	497	41.42	66.67	81.67	15.04	15.04	30.08

Source: Research findings.

This means that the conditions are identical based on input ties (or the reception of network trust) and output ties (or the dispersion of network trust), and social trust is not peculiar to certain people and there is uniform social trust among activists. In general, the social coherence of the social trust network is assessed to be moderate given the indices of network density, size, and overall centrality. The results show that the tie reciprocity index is 66.67% in the social trust network of silk farmers in the province. Accordingly, it can be said that the social trust network of the activists is moderate. In addition to the tie reciprocity index, the transitivity index also points to the stability of the network. This index was estimated to be 81.67%, reflecting the good stability of the social trust network. In general, the two indices of tie reciprocity and transitivity indicate that the network stability is moderate. To study the role of different organizations in the social trust network, the relations of the activists were drawn by NetDraw software (Fig. 2). The relations were also analyzed by comparing the values of in-degree and out-degree centrality values as depicted in Fig. 3.

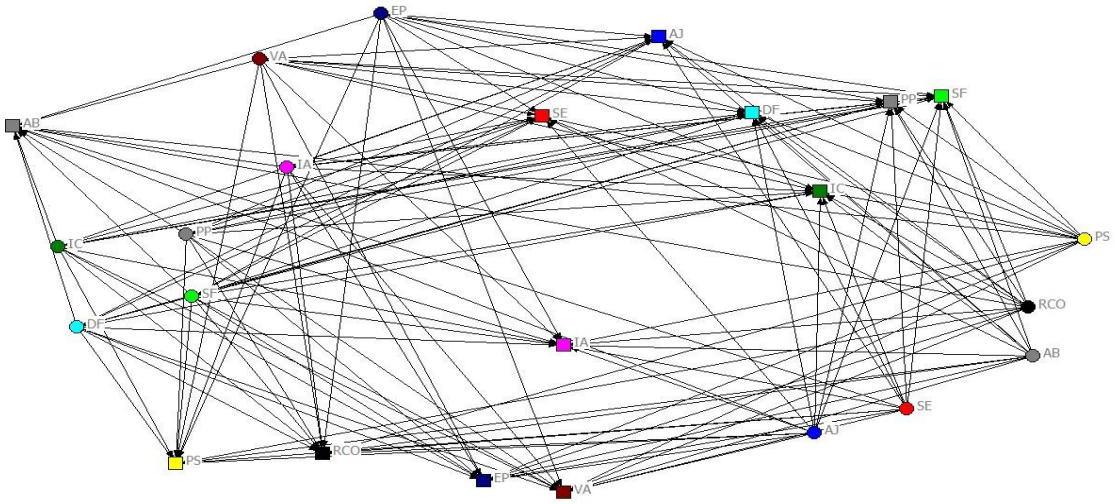

Fig. 2. The relationships of sericulture activists of Guilan Province in the social trust network.

According to Fig. 3, Agriculture-Jahad Organization in Guilan Province, which has the highest in-degree centrality (49%), has higher authority and reputation and is regarded as the most trusted activists in the social trust network of silk farmers in the province. In the case of the activists, the cocoon drying factory and the silk extraction factory with the lowest in-degree centrality scores exhibit the lowest ranks in social trust. Based on Fig. 2, Agribank (with an out-degree centrality score of 49%) is the main activists in terms of social influence and displays the highest public relations with other activists in the field of social trust. General Sericulture Department in Guilan Province reveals the second rank after Agribank in social influence. Agriculture-Jahad Organization is placed in the last rank of social influence in terms of social trust whereas it is the main and most trusted activists in terms of in-degree centrality.

The network of social participation from the perspective of sericulture activists in Guilan Province

The social participation network was also analyzed. Equation 1 was used to scrutinize the social participation of silk farmers (Table 5). The mean social participation score is 2.95 with a standard deviation of 0.59.

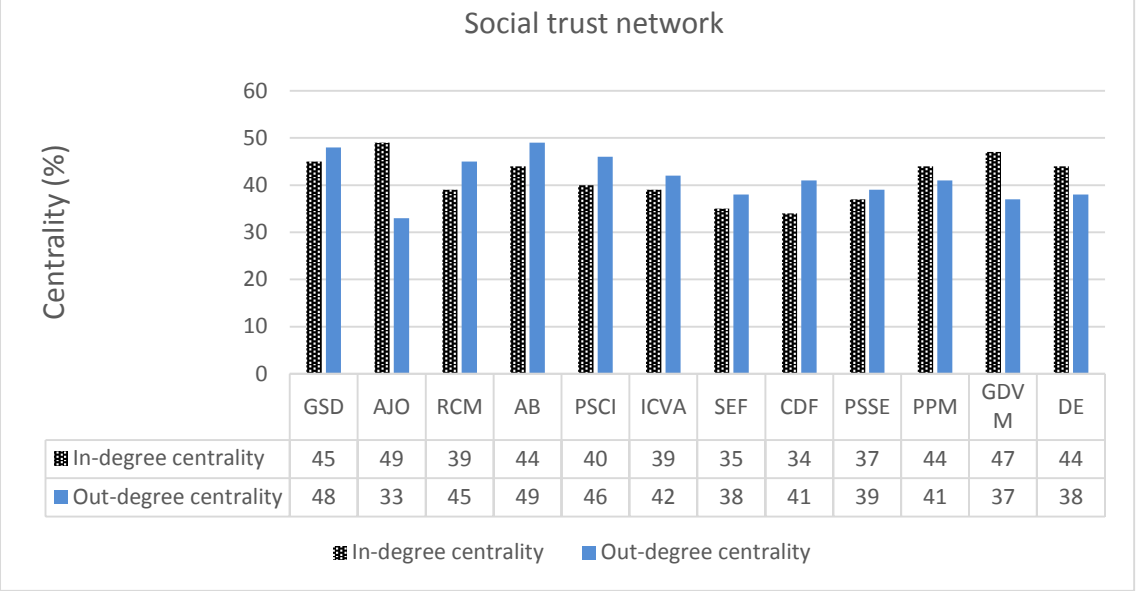

Fig. 3. In-degree and out-degree centrality values in the social trust network of sericulture activists in Guilan Province.

Table 5. The social participation from the perspective of silk farmers in Guilan Province (n = 365).

The amount of social participation	Frequency	Percentage
Low	112	30.68
Moderate	131	35.89
High	122	33.42

According to Table 5, most silk farmers had moderate social participation. The silk farmers' opinions about other sericulture activists were also examined (Table 6).

Table 6. The network of social participation among the activists of the sericulture industry from the silk farmers' perspective in Guilan Province (n = 365).

Activists	Abbreviation of activists names	Items	Frequency	Percentage
General Sericulture Department in Guilan Province	GSD	No relationship	108	29.59
		Low relationship	80	21.92
		Moderate relationship	93	25.48
		High relationship	84	23.01
		Very high relationship	0	0
Agriculture-Jahad Organization in Guilan Province	AJO	No relationship	88	24.11
		Low relationship	62	16.99
		Moderate relationship	84	23.01
		High relationship	69	18.90
		Very high relationship	62	16.99
Rural Cooperative Management in Guilan Province	RCM	No relationship	97	26.57
		Low relationship	104	28.49
		Moderate relationship	85	23.29
		High relationship	79	21.64

		Very high relationship	0	0
Agribank	AB	No relationship	95	26.03
		Low relationship	106	29.04
		Moderate relationship	84	23.01
		High relationship	80	21.92
		Very high relationship	0	0
Private-Sector Crop Insurance	PSCI	No relationship	71	19.45
		Low relationship	89	24.38
		Moderate relationship	79	21.64
		High relationship	64	17.53
		Very high relationship	62	16.99
Islamic Council and Village Administration	ICVA	No relationship	64	17.53
		Low relationship	83	22.74
		Moderate relationship	89	24.38
		High relationship	66	18.08
		Very high relationship	63	17.26
Silk Extraction Factory	SEF	No relationship	106	29.04
		Low relationship	99	27.12
		Moderate relationship	82	22.46
		High relationship	78	21.37
		Very high relationship	0	0
Cocoon Drying Factory	CDF	No relationship	108	29.59
		Low relationship	95	26.03
		Moderate relationship	82	22.46
		High relationship	80	21.92
		Very high relationship	0	0
Private-Sector Service Enterprise	PSSE	No relationship	107	29.31
		Low relationship	96	26.30
		Moderate relationship	90	24.66
		High relationship	72	19.73
		Very high relationship	0	0
Plant Protection Management of Guilan Province	PPM	No relationship	122	33.42
		Low relationship	131	35.89
		Moderate relationship	112	30.68
		High relationship	0	0
		Very high relationship	0	0
Guilan Department of Veterinary Medicine	GDVM	No relationship	100	27.40
		Low relationship	95	26.03
		Moderate relationship	95	26.03
		High relationship	75	20.55
		Very high relationship	0	0
Department of Environment	DE	No relationship	103	28.22

	Low relationship	98	26.85
	Moderate relationship	88	24.11
	High relationship	76	20.82
	Very high relationship	0	0

The results show that most silk farmers have participation with the private-sector crop insurance and Islamic council and Village Administration only at a low to moderate level and have no or low relationship with other sericulture activists in the province. In addition to studying the participation in network from the perspective of silk farmers, it was analyzed from the perspective of other activists, too. So, 12 activists of the sericulture industry in Guilan Province were selected and their work relationships with one another were explored (Table 7).

Table 7. The indices for analyzing the participation in network from the perspective of sericulture activists in Guilan Province.

Tie type	Number of organizations	Total expected ties	Network size (Number of existing relations)	Density (%)	Tie reciprocity (%)	Transitivity (%)	Network centrality based on input ties (input)	Network centrality based on output ties (output)	Centrality
Participation	12	720	413	34.42	72.92	81.89	17.02	20.99	38.01

The participation network coherence and stability are two important indices used in analyzing this network. The indices of network density, size, and centrality show that the social coherence of the participation network was at weak level. The tie reciprocity index of the sericulture activists' participation network was 79.92%. Accordingly, it can be said that the stability of the activists' participation in network was at a good level. To study the role of different organizations in the participation network, the activists' relationships were drawn by NetDraw software (Fig. 4). Fig. 5 also analyzes these relationships by comparing the in-degree and out-degree centrality values.

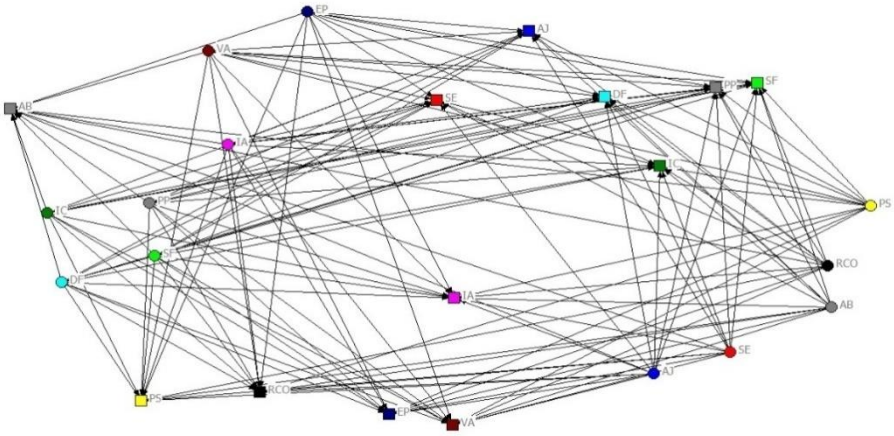

Fig. 4 The relationships of sericulture activists of Guilan province in the participation network.

According to Fig. 5, Agriculture Jihad Organization in the province exhibited the highest in-degree centrality (43), so it has the highest authority and reputation and is the most trusted activist in the participation in network of silk farmers, whereas the silk extraction factory and private-sector service enterprises displayed the lowest in-degree centrality. Also, crop insurance with out-degree centrality of 45 was the main activist in terms of social influence and revealed the strongest public relations with other activists in the field of participation. Agribank was in the second rank of social influence after the private-sector crop insurance.

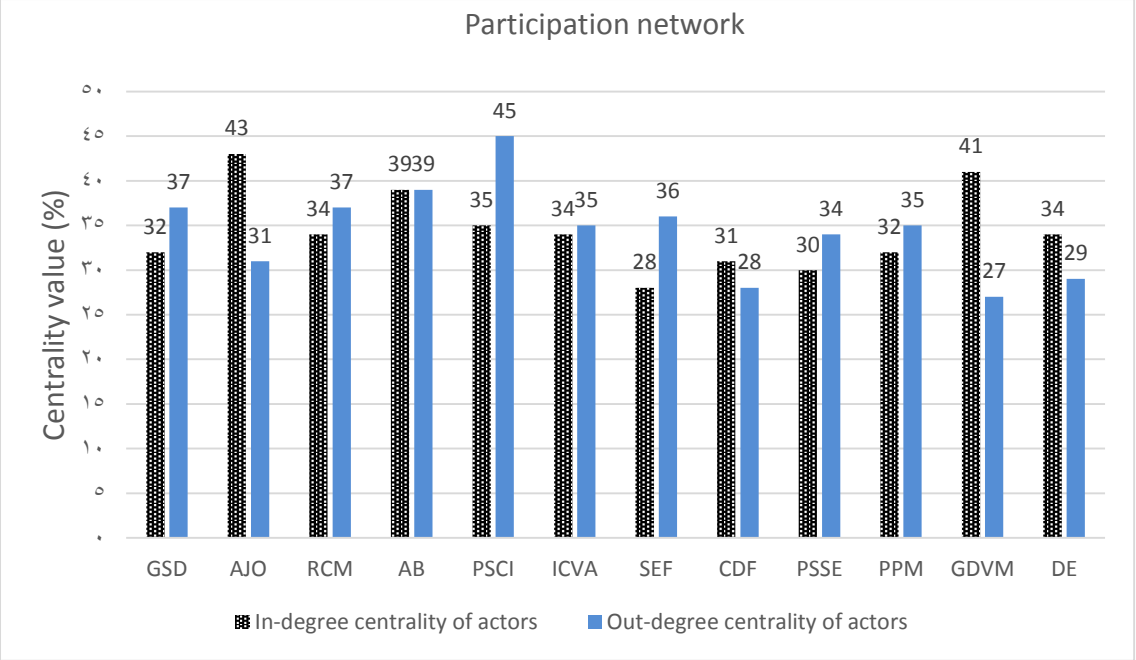

Fig. 5. The in-degree and out-degree centrality values in the participation network of sericulture activists in Guilan Province.

DISCUSSION AND CONCLUSION

Guilan Province is one of the main centers of sericulture and silkworm farming in Iran. However, it has lost its position as a major occupation in recent years and it is not regarded as a sustainable, strategic, and prioritized production activity. This industry can, however, be effective in creating employment, empowering rural women and men, and achieving rural development goals. The success or failure of any activity depends on the mutual understanding and all-inclusive participation of its activists. Similarly, the implementation of an optimal management system in the sericulture industry for its development mainly depends on effective communication as well as high social trust and participation of its activists. This study focused on analyzing the social trust and participation in networks of sericulture activists and its results can contribute to reviving and developing this industry in Guilan Province. Trust and participation are important variables of social capital that change along with social changes. These two variables are studied in the context of the social system. Trust is a prerequisite for participation and cooperation. The survival and stability of relations between activists depend on people's trust in each other. Trust can be very effective in resolving disputes and conflicts among beneficiaries in the governance process (Bodin & Prell 2011). Based on the results, most silk farmers perceive that social trust is presently low level. In addition, it was found that among other sericulture activists, the trust network is reported to be medium in terms of social cohesion and sustainability. The results regarding social participation indicate that it is presently at moderate level from the perspective of most silk farmers, whereas the coherence of the participation network was reported to be at a weak and its stability at a good level by other sericulture activists. The findings as to social trust and participation and their coherence and stability components reveal that the development goals of this industry can be accomplished in Guilan Province by making plans for and investments in these indices. Social trust and participation of the studied sericulture activists can be enhanced by strengthening rapport in their social relations, keeping collective cooperation, laying the ground for and facilitating participation, and nurturing the values and norms of society. The enhancement of social trust and participation in any society shapes consistent and coherent goals, behaviors, and intra- and extra-group relations among the activists of the society for accomplishing predetermined goals and allows the exhibition of proper and purposeful behaviors. The results show that Agriculture-Jahad Organization in the province is the most trusted activists, while the cocoon-drying and silk extraction factories were the least trusted activists in terms of the in-degree centrality of social trust. Also, Agriculture-Jahad Organization was the most trusted activists and crop insurance was the most influential activists in terms of participation, whereas many formal and informal institutions and organizations that should be among the most influential activists, due to their structural nature, were at low levels in terms of in-degree centrality of social trust and participation. Institutional trust and participation are associated with the performance of governmental and informal institutions and are rooted in several concepts such as a positive attitude and feeling,

confidence, and subjective and emotional expectation from the performance of institutions and organizations. To promote institutional trust and participation of formal and informal organizations involved in this industry, it is necessary to radically revise their structural and essential nature. Organizations and institutions need to put modern scientific programs, guidelines, and advice at the top of their mission and tasks to provide conditions for fostering a positive attitude towards their performance. Hence, institutional trust and participation will be enhanced. This will allow institutions and organizations to play more effective roles in the development of this industry. If the enhancement of structural and fundamental factors that influence social trust and participation in this industry and the intra-group and extra-group relationships are recognized, lawful, dynamic, and responsive interventions can be adopted whose effects will be manifested in the behaviors and effective relationship with others. The enhancement of trust and participation at intra-group, extra-group, and institutional levels means that sericulture activists do not pursue only their own benefits in their social relations and exchanges with other activists, but they look for the welfare and benefits of other activists, which will lead to sustainable and purposeful behavior towards sericulture development.

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