

Social Capital Drives Beekeeping as Livelihood Diversification Strategy: A Study of Pastoralists in Northeast Iran

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ABSTRACT

Beekeeping on rangelands is considered as a key approach for sustaining pastoral livelihood and reducing pressure on grazing lands. Previous studies are mostly focused on the ecological contributors of apiculture and the social criteria are not treated in much detail. The current research, therefore, uses the case of Sarayan Arid Rangelands in northeast Iran to examine the importance of social capital in adaptation of beekeeping as a pastoral livelihood diversification strategy. Through a random sampling procedure, 180 herders were selected in the study area. Questionnaires were used to collect data on trusts, collaboration, and solidarity as the main determinants of social capital and also herders' interests in beekeeping. Stepwise linear regression method was employed to estimate the relation between herders' interest in beekeeping and their social capital. The results show that about 33% in variance of motivation on beekeeping as a livelihood diversification strategy could be explained by the cooperation, trust, and solidarity among the rangeland users. Therefore, it is vital to introduce policies and measures to support collaboration and social networks among the rangeland users.

Keywords: Apiculture, Cooperation, Rangeland users, Solidarity, Trust.

INTRODUCTION

Rangelands are the source of livelihood for millions of people around the world and provide important ecosystems services. There are around 83 million hectares of rangelands in Iran, which are used as natural ecosystems for grazing livestock and sources of livelihood for over 916,000 families (Hasanpori *et al.*, 2019). The average stocking rate is 3 time more than rangeland carrying capacity and more than 60 million of animals rely on pastures at least for 7 months a year (Abdolalizadeh *et al.*, 2020). Long-term national rangeland monitoring data reveal significant decline in quality and quantity of the pastures over the last six decades (Figure 1). As shown in Figure 1, the total rangeland area were 100 million hectares

in 1967 and declined to nearly 83 Mha in 2020. Furthermore, the country experienced nearly 70% decrease in its productive pastures in the past half century. There were around 19 Mha of rangelands with vegetation cover over 50% in 1967 and this figure has declined to 5.4 Mha in 2020.

In response to increasing pressure on rangelands due to animal overstocking and overgrazing, land conversion and degradation, and the adverse impacts of drought and climate change, it is crucially important to introduce supplementary livelihoods strategies to improve the adaptation capacities of range-users and reduce destructive grazing pressure on rangelands.

Beekeeping potential of rangelands have been comprehensively examined in recent

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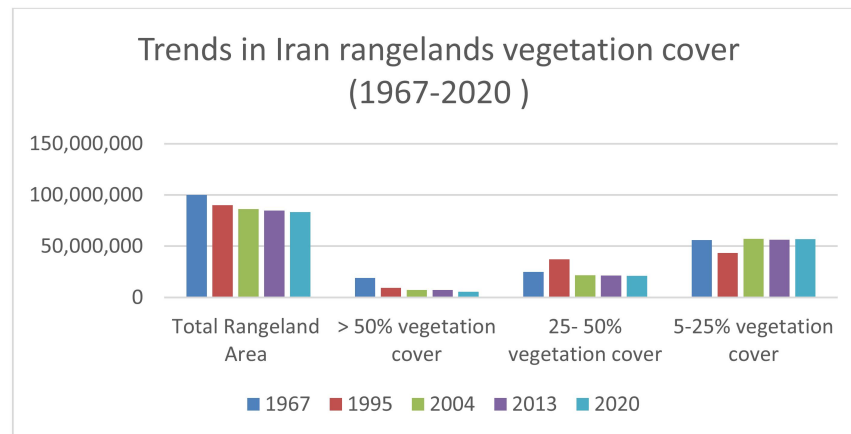


Figure 1. The trend in Iran rangeland vegetation cover (1967-2020). Sources: (Niknam, 1967; TRORNWO, 1995, 2013; EBRNWO, 2004, 2020).

times as a main approach to range-holders' livelihood diversification and enhancing their resilience to external pressure and stressors. Many of these studies (Amiri and Arzani, 2012; Muya, 2014; Arzani and Heshmatolvaezin, 2018; Gorgi *et al.*, 2019) have examined the determinants of range suitability for beekeeping and focused on environmental factors, water availability, and vegetation cover. Abou-Shaara *et al.* (2013) reviewed the criteria of range suitability for beekeeping and introduced climate, water resources, and land cover as the most important factors. Sarı and Ceylan (2017) introduced slope, elevation, aspect, distance to water resources, roads and settlements, precipitation and flora criteria for site suitability analysis. Caro *et al.* (2014), in connection with agricultural measures and dynamics of honey bee activities, announced the location of colonies as the most crucial factor. Karadas and Birinci (2018), in a research on assessing suitability of range for beekeeping, in Aqadir Province, Turkey, introduced seven indicators, including production, marketing, financial status, policy and climate conditions.

Some other researchers also have focused on factors affecting the motivation of herders for adoption of beekeeping as an alternate livelihood source. Hecklé and

colleagues (2018) argued that access to information, land and beehives, availability of alternative income-generating activities, perceptions of beekeeping outcomes and performance, access to market, and cultural norms are the main factors affecting the decision of smallholder farmers to take up beekeeping. Wagner *et al.* (2019) argue that social features and indicators such as theft of hives and lack of land, capital and knowledge are major constraints for adoption of honey production. Berhe and colleagues (2017) addressed the community's perception on beekeeping and recognized the social barriers and the indicators such as illiteracy and lack of women's participation as the key factors. Hecklé *et al.* (2018) further highlighted the importance of socio-cultural networks and local support, awareness raising and knowledge sharing for promotion of beekeeping among smallholder farmers. Reda *et al.* (2018) found frequent droughts, weak promotional services, low access to advanced technology, and deforestation as the main limitations in their studied area and argued that, in transmission from traditional beekeeping practice, considerations of socio-cultural criteria are essential. They also suggested for social mobilization (setting up local cooperatives) aiming at extending this type of land-use in the area and considering

social criteria in assessing the rangeland suitability for beekeeping.

Ultimately, beekeeping is examined as a strategy for strengthening households' livelihood (Carroll and Kinsella, 2013; Chazovachii *et al.*, 2013; Gorgi *et al.*, 2019; Harianja *et al.*, 2023), resource conservation (Bosma *et al.*, 2017; Musunguzi *et al.*, 2018; Kassa Degu and Regasa Megerssa, 2020), and poverty allocation (Amulen, D'Haese *et al.*, 2019).

The notion of livelihood diversification is defined by Hussein and Nelson (1998); cited from Gebretsadik and Teklemariam, 2020). as 'attempts by individuals and households to find new ways to raise incomes and reduce the economic, environmental, and social risks, which sharply differs by the degree of freedom of choice (to diversify or not) and the reversibility of the outcome'(Hussein and Nelson (1998) as cited from Gebretsadik and Teklemariam, 2020). In the context of pastoralism and herding livelihood, diversification refers to any activities within or outside the rangelands to generate additional income to the households(Achiba, 2018). Furthermore, pastoral livelihood diversification is seen as a key adaptation strategy in response to socio-economic and climatic challenges and stressors, including pastoral drought (Tahmasebi *et al.*, 2013). Lemi (2005) argued that the motivation and interest of rural households in diversifications were not uniform. Demographic factors, such as gender and age of the household head, household size and dependency ratio and also the number of female household members were contributing factors. He further highlighted that the intensity of diversification is subject to the number of animals, size of land owned, and the income level of household from crop production. (Pandey *et al.*, 2017) suggest that the interest for livelihood diversification varies significantly by the cultural and socioeconomic conditions and even the ecological conditions on which the herders rely.

Due to collective nature of herding and land right on rangelands, social capital plays an important role on pastoral livelihood. Jeppesen and Hassan (2022) argue that social capital is one of the fundamental factors for accessing pastures for pastoralists in Kajiado County in Kenya . In the context of livelihood diversification, Nguyen *et al.* (2020) found that the farmers' in Vietnamese Northern Mountains diversify their livelihood by combining livelihood strategies for agricultural intensification, agricultural extensification and migration. Diedrich *et al.* (2019) research shows that social capital had a stronger influence relative to other forms of capital in transitions to sport fishing tourism in small-scale fishing communities in Papua New Guinea.

The definition of social capital varies significantly among researchers, but the conceptualizations by Bourdieu, 1986; Coleman, 1988; and Putnam, 2000) are mostly raised in the academic literature. Bourdieu looks at social capital as a form of capital that reflects the interaction and collaboration of the members of an organization, which, along with cultural capital, can be used to gain economic capitals (Bourdieu, 1986). He considers social capital as property of the individual rather than the collective(Carrillo Álvarez and Riera Román, 2017). Coleman considers social capital as a set of socio-structural qualifications "that have two characteristics in common: they all consist of some aspect of the social structure. And they facilitate actions of individuals who are within the structure", and he further explains that "Unlike other forms of capital, social capital inheres in the structure of relations between persons and among persons" (Coleman, 1988). Despite Bourdieu and Coleman, Putnam (1993) sees capital as collective properties of social groups and defines it as 'features of social organizations, such as networks, norms and trust that facilitate action and cooperation for mutual benefit'. Thus, for Putnam, social capital is a public good—the amount of



participatory potential, civic orientation, and trust in others available to cities, states, or nations. Over the last decades, however, a general agreement has emerged that social capital has both an individual and an aggregate component. In other words, an individual has a degree of control over some aspects of social capital, but little control over other aspects (Claridge, 2020).

Furthermore, social capital is conceptualised differently at different levels of analysis and that these levels are highly interrelated. In general, the level of analysis could be classified in three levels of Macro: community or national, Meso: groups or organizations, and Micro: individual (Falk and Kilpatrick, 2000).

As stated above, the rangeland licenses are usually issued by national organization for a group of herders that share traditional use right on specific rangelands. Their social interactions and conflicts play a crucial role in their livelihoods and adopting any new initiatives such as beekeeping plan. Thus, we employed the definition of social capital by Putnam and treated it as property of a group of herders with shared pasture. We conceptualized social capital as composite concept consisting of three dimensions, namely, cooperation, solidarity, and trust. Therefore, with the social capital in this research, we refer to the cooperation, trust, and solidarity among the range-users whose livelihoods are connected to the same natural resources and exercise agencies on their livelihood strategies.

From the literature, we can conclude that despite a lot of research on apiculture on rangelands, fewer studies have examined the collective nature of rangeland ownership and use right and its impacts on honey beekeeping. Although the social interactions and relationships of herders play a crucial role in their livelihood strategy, much remains unknown about the importance of their social capital in motivation on honey beekeeping as livelihood diversification strategy. The assumption that social capital could be a determinant of beekeeping by range-users is rooted in the fact that many herding activities and decisions on pastoral livelihood strategies are usually decided and practiced in groups (Abolhassani, 2011; Achiba, 2018). Therefore, the present study used

the case of arid and semi-arid rangelands in South Khorasan Province in Iran to contribute, firstly, to the existing literature on social capital to elucidate the importance of cooperation, trust and solidarity on tendency to livelihood diversification strategy among the range-users. Secondly, to further contribute to rangeland management by providing further insights on social determinants of rangelands multiple-uses.

MATERIALS AND METHODS

Study Area

The baseline survey for this study was carried out in Sarayan County in South Khorasan province of Iran. As shown in the Figure 2, around 60% (8,551,000 ha) of the area are covered by rangelands. The range-users are the rural households whose livelihoods are mainly based on combination of crop farming and herding. The average annual rainfall in the area is about 190 mm, which makes the pasture vegetation cover very seasonal and temporary. Accordingly, these rangelands are usually used as winter pasture or “Gheshlaq” and the herders take the animal to the “Yeilaq” in highlands of Shas-koh, Kamarsorkh and Ahangharan Mountain in early spring and summer time.

Data Collection and Analysis

There are around 2,500 range-user households in the study area. The sample size of 180 households was calculated using Cochran formula and considering 95% confidence level and 0.07 margin of error. A stratified random sampling method was used to gather data from 4 cluster (see Table 1).

A questionnaire was developed and modified in accordance to literature review and natural resources experts' viewpoints for data collection. In the first section of the questionnaires, the demographic information of herders such as age, education level, and herders' sources of income were examined. Then, using a three points Likert scale, the

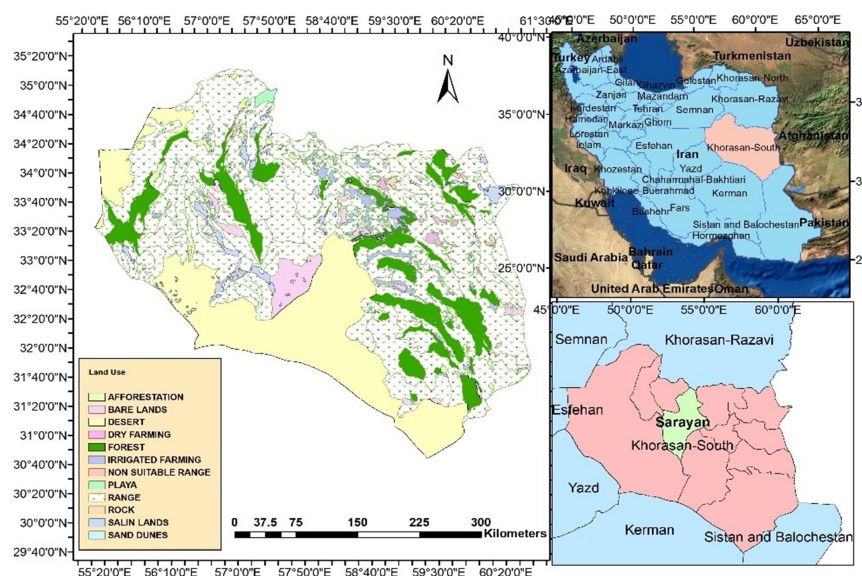


Figure 2. The location and land use map of study area (Sarayan County in South Khorasan).

herders' tendency on beekeeping was examined by three items indicating the willingness: to start a beekeeping project, to exclude part of their pasture for beekeeping, and to participate in beekeeping with other herders (see Table 2). In the last section of our questionnaires, the information on the three dimensions of social capital, namely, cooperation, solidarity and trust among their community, and herders sharing the same patch of rangelands with the interviewee were examined. For analyzing the data, we first used a one-sample t test to examine the difference of sample means from the hypothesized population mean of 2 for each aspects of social capital. Then, a stepwise linear regression method was used to estimate the impact and contribution of

herders' social capitals on their interest on beekeeping.

RESULTS

Income Source and Education

The results show that the average age of the respondents was 47.2 years, and around 73% had over 40 years. Table 3 presents the results of cross tabulation between the education levels of the household head and source of income. As shown in the data, the livelihood of over 64% of households relies on a combination of herding and farming. Around 23% also depend on animal husbandry and do not have any cultivation. Furthermore, nearly 42% of the household head in the study area are illiterate and over 48% have attended some primary school. Only 2.2 % had finished high school and received a diploma or continued to the graduate level. Moreover, the relationship between income sources and education levels were examined by Chi-square test and the result was statistically insignificant at 5% level, [$\chi^2(9) = 6.964, P = 0.641$].

Table1. The stratified survey sampling designed.

Cluster	Household	Sample size
Seghaleh	1155	80
Dostabad	919	70
Zangoee	168	10
Bostagh	256	20
Sum	2498	180



Beekeeping as a Livelihood Diversification Strategy

As discussed earlier, we first examined the willingness of pastoralists on applying beekeeping as livelihood diversification strategy by their interest in beekeeping, willing to exclude part of their rangeland for beekeeping, and to join a beekeeping group in their rangelands (see Table 2). Then, we employed one-sample T-test to examine the mean difference of these three items against the test value of 2 as the population mean. The results show that the average for all three items were positive and statistically significant at 0.05 level. In other words, the herders are willing to undertake beekeeping initiatives, participate in excluding part of their pasture and to join a beekeeping group. Table 4 shows the results of the pair wise comparison of herders' preference to these three measures using repeated measures ANOVA and Bonferroni statistics. From the data in Table 4, it is apparent that the variance for participation with other herders and making a beekeeping group is higher than the other two items, and statistically significant at 0.05 level. One possible explanation for this finding could be the fact that the herders concern about the disagreement and interference of other beneficiaries of the communal rangelands on their individual beekeeping activities. Thus, they prefer to have a joint beekeeping

activity with other herders.

Social Capital and Tendency to Beekeeping

A multilinear regression analysis was used to explore the impacts of range-users' social capital on their tendency on beekeeping. In doing so, first, the compatibilities of data with the required assumptions were tested. Figure 3 shows the correlation between trust, cooperation, and solidarity as the three dimensions of social capital used in this study and the tendency on adoption of beekeeping as a livelihood diversification strategy. From the graph, we can see that the distributions of data are quite well and there are liner regressions between all three predictor indicators and dependent variables and there is no, U or S shapes in the scattering of data.

Finally, we examined the homoscedasticity of data, which assumes that the predictor variables have the same impact on the predicted variable for all levels of the variables. In doing so, we used the scatter plots to examine the regression between standardized residual and standardized predicted value, and the result showed that all data were scattered between -3 to +3 and distributed properly around the regression fit line. The results of multilinear regression analysis was statistically significant and the equation found was $[F(3,176)=28.654, P< 0.000, \text{ with a } R^2 \text{ of}$

Table 2. Aspects and Items of social capital.

Variable	Items
Trust	Lending money to each other
	Keeping their promise
	Lending farming devices
Cooperation	Cooperation in range management activates
	Cooperation in herding and related activates
	Cooperation in farming
Solidarity	Mutual respect
	Consultation and advice
	Mutual help and support in difficult time
Tendency to beekeeping	I am interested in starting beekeeping project
	I agree to exclude part of my owned rangeland for beekeeping
	I am ready to join a beekeeping group

0.328]. Herders predicted tendency in adopting beekeeping as a livelihood diversification strategy is equal to 0.39+0.313 cooperation+0.449 trust+0.209 solidarity, where all three indicators are

measured between 1 to 3. This means participants' tendency in beekeeping increased 0.313 point for each unite of cooperation, 0.449 point for each unite of Trust and 0.209 point for each unite of

Table3. Relation between education level and income sources.

Education		Income source					
		Herding	Farming	H&F	Other	Total	
Illiterate	Count	16	3	54	4	77	
	% Within education	20.8%	3.9%	70.1%	5.2%	100.0%	
	% Within income source	38.1%	25.0%	46.6%	40.0%	42.8%	
	Primary school	Count	22	7	54	5	88
		% Within education	25.0%	8.0%	61.4%	5.7%	100.0%
		% Within income source	52.4%	58.3%	46.6%	50.0%	48.9%
	Secondary school	Count	4	1	5	1	11
		% Within education	36.4%	9.1%	45.5%	9.1%	100.0%
		% Within income source	9.5%	8.3%	4.3%	10.0%	6.1%
Diploma and higher	Count	0	1	3	0	4	
	% Within education	0.0%	25.0%	75.0%	0.0%	100.0%	
	% Within income source	0.0%	8.3%	2.6%	0.0%	2.2%	
Total	Count	42	12	116	10	180	
	% Within education	23.3%	6.7%	64.4%	5.6%	100.0%	
	% Within income source	100.0%	100.0%	100.0%	100.0%	100.0%	

Table 4. Pairwise comparisons of items on herders' tendency to beekeeping. ^a

(I) Tendency2	(J) Tendency2	Mean difference			95% Confidence Interval for difference ^b	
		(I-J)	Std. error	Sig. ^b	Lower bound	Upper bound
1	2	0.189	0.078	0.051	0.000	0.378
	3	-0.400*	0.064	0.000	-0.555	-0.245
2	1	-0.189	0.078	0.051	-0.378	0.000
	3	-0.589*	0.070	0.000	-0.758	-0.420
3	1	0.400*	0.064	0.000	0.245	0.555
	2	0.589*	0.070	0.000	0.420	0.758

^a Based on estimated marginal means, ^b Adjustment for multiple comparisons: Bonferroni, * The mean difference is significant at the 0.05 level.

Table 5. Collinearity effect between independent variables coefficients. ^a

Model		Collinearity statistics		Model	Collinearity statistics		Model	Collinearity statistics	
		Tolerance	VIF		Tolerance	VIF		Tolerance	VIF
1	Trust	0.959	1.043	Solidarity	0.995	1.005	Cooperation	0.611	1.636
	Cooperation	0.959	1.043	Trust	0.995	1.005	Solidarity	0.611	1.636

^a Dependent variable: Solidarity



Solidarity. Accordingly, it can be concluded that all three aspects of social capital were significant predictors of the herder's tendency in beekeeping (Table 6).

DISCUSSION

Previous studies (e.g. Watson, 2008; Chazovachii *et al.*, 2013) have emphasized the importance of beekeeping as a livelihood diversification strategy for range-users.

Pastoralist with shared rangeland and grazing right collaborate in different herding activities and build social networks to support their livelihoods. This research, therefore, was designed to determine the effect of social capital on the adoption of beekeeping as a livelihood diversification strategy.

Our results revealed that trust, cooperation, and solidarity among groups of herders sharing a specific area of rangelands have statistically significant contribution to

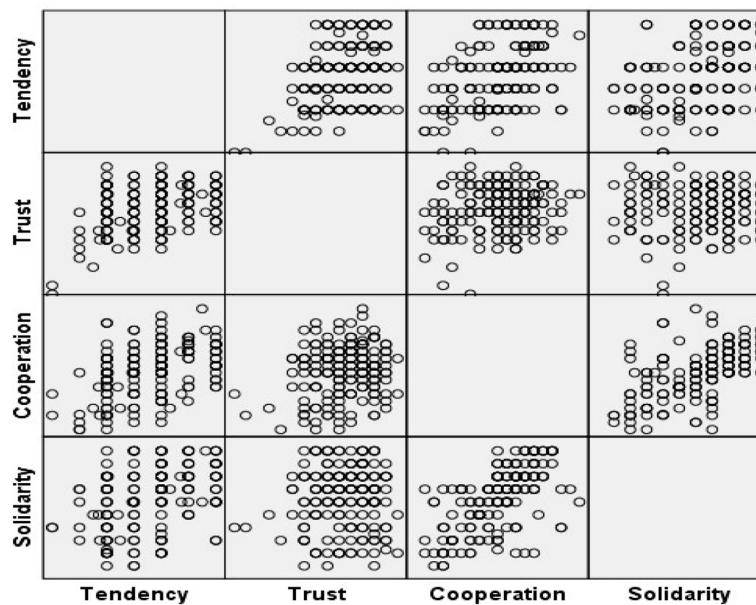


Figure 3. Correlation between aspect of social capital and herders' tendency in beekeeping.

Table 6. Coefficients of variable entered in the model.^a

Model		Unstandardized coefficients		Standardized coefficients	t	Sig.	Collinearity statistics	
		B	Std. error	Beta			Tolerance	VIF
1	(Constant)	1.091	0.166		6.553	0.000		
	Cooperation	0.548	0.080	0.456	6.830	0.000	1.000	1.000
2	(Constant)	0.230	0.236		0.976	0.330		
	Cooperation	0.471	0.077	0.392	6.108	0.000	0.959	1.043
	Trust	0.432	0.088	0.314	4.889	0.000	0.959	1.043
3	(Constant)	0.039	0.243		0.159	0.874		
	Cooperation	0.313	0.097	0.260	3.220	0.002	0.586	1.707
	Trust	0.449	0.087	0.326	5.147	0.000	0.953	1.049
	Solidarity	0.209	0.080	0.208	2.621	0.010	0.608	1.644

^a Dependent variable: Tendency in beekeeping.

tendency to beekeeping as a livelihood diversification strategy. Our findings support the research of Xiong *et al.* (2021) and Naithani and Saha (2021) who also found that the social network and social participation of households had a significant positive impact on their sustainable livelihood ability.

The observed correlation between social capital and pastoralist tendency in beekeeping might be explained by the following three main socio-ecological characteristics of pastoralism. Firstly, there is a growing body of literature that recognizes the importance of social capital and network in knowledge transfer and acquisition among local communities (see Upton, 2008; Laursen *et al.*, 2012). Other studies (Mujuni *et al.*, 2012; Serda *et al.*, 2015) indicate that the pastoral community are more acquainted with herding practice and lack the adequate knowledge and skills for honeybee keeping practices. Social capital, therefore, could ease the access of herders to know how and technologies required for the adoption of beekeeping as livelihood diversification strategy.

Secondly, as suggested by Bourdieu (1986), the social capital can be exploited along with cultural capital to achieve economic capitals. In the other words, social capital can translate into economic growth by facilitating cooperation among the community members. Accordingly, the collaboration of herders could significantly facilitate and minimize the costs of beekeeping activities on rangelands, particularly the maintenance and transportation costs of colonies in summer and winter fields, which are highlighted in previous studies as the main economic challenges of beekeeping by range-holders (see e.g. Franca *et al.*, 2019; Arzani *et al.*, 2017; Vaziritabar and Esmaeilzade 2016).

Thirdly, beekeeping in arid and semi-arid rangeland, where the plants mainly flower from April to mid-May, requires coherence and high collaboration of range-users for excluding the suitable pitches of their shared rangelands for beekeeping and finding

suitable places in winter and summer times. Thus, the result of this study further highlights the importance of social capital in beekeeping on rangelands and it is consistent with finding of Caro *et al.* (2014), Sari and Ceylan (2017), Berhe *et al.* (2016), Reda *et al.* (2018), Karadas and Birinci (2018), and Franca *et al.* (2019).

Notwithstanding the relatively limited sample, it can be concluded that social capital has significant implications for adoption of beekeeping in arid and semi-arid rangelands, where the grazing right, herding and range management activities are practiced jointly by group of rang-users. A key policy priority, therefore, should be to advocate and support enhancing collaboration and social networks among the rang-users.

High transportation cost, low level of herders' beekeeping knowledge, and security and communally owned grazing rights are some of the restrictions highlighted by other researchers. This research complements those of earlier studies and argues that enhancing herders' social capital could significantly contribute to addressing some of these restrictions. Further study could assess the role of herders' social networks in enhancing their knowledge and skills, and transition to modern beekeeping.

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سرمایه اجتماعی زنبورداری را به عنوان راهبرد تنوع بخشی به معیشت پیش می برد: مطالعه دامداران شمال شرق ایران

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چکیده

زنبورداری در مراتع به عنوان رویکردی کلیدی برای حفظ معیشت دامداری و کاهش فشار بر مراتع محسوب می شود. مطالعات قبلی بیشتر بر روی عوامل اکولوژیکی زنبورداری متمرکز شده اند و معیارهای اجتماعی با جزئیات زیاد بررسی نشده اند. از این رو، پژوهش حاضر، برای بررسی اهمیت سرمایه اجتماعی در انطباق زنبورداری به عنوان راهبرد تنوع بخشی معیشت دامداری، از مراتع خشک سرایان در شمال شرق ایران استفاده می کند. با استفاده از روش نمونه گیری تصادفی، ۱۸۰ دامدار در منطقه مورد مطالعه انتخاب شدند. برای جمع آوری داده های اعتماد، همکاری و همبستگی به عنوان عوامل اصلی تعیین کننده سرمایه اجتماعی و همچنین علایق دامداران در زنبورداری از پرسشنامه استفاده شد. از روش رگرسیون خطی گام به گام برای برآورد رابطه بین علاقه دامداران به زنبورداری و سرمایه اجتماعی آنها استفاده شده است. نتایج نشان می دهد که حدود ۳۳ درصد از واریانس انگیزه در زنبورداری به عنوان راهبرد تنوع بخشی معیشت را می توان با همکاری، اعتماد و همبستگی میان بهره برداران مرتع توضیح داد. بنابراین، ارائه سیاست ها و اقداماتی برای حمایت از همکاری و شبکه های اجتماعی در میان کاربران مرتع ضروری است.