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# Sustainable Rangeland Management:

# Pastoralists' attitudes toward integrated programs in Iran

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**Abstract:** The goal of this survey study was to understand pastoralist attitudes toward sustainable integrated rangeland management (SIRM) in Tehran province, Iran. Using multi-stage stratified random sampling, 1280 pastroralists participated in the study. Data were collected using a researcher-made questionnaire. A panel of experts approved the content validity and Cronbach's alpha coefficient was used to test the reliability of the questionnaire. Results revealed that most of the pastoralists held a positive attitude toward teamwork and collaborative behavior. Moreover, regression analysis indicated that education level, attitudes toward other pastoralists, teamwork and collaboration with administrative officials, significantly affected pastoralist attitudes toward SIRM. Furthermore, path analysis showed that attitude to other pastoralists indirectly affects attitudes toward SIRM and collaboration with administrative officials. This study concluded that if sustainable rangeland management is a goal, human factors should be considered as a key element.

**Keywords:** sustainable rangeland management, integrated management, pastoralist attitudes, emic view, human factor.

## 1. Introduction

### *1.1. Sustainable integrated rangeland management*

Although an increasing volume of literature deals with the science of rangeland management, the utility of rangelands for domestic purposes has been questioned worldwide on the grounds of conservation and sustainability (Grigg, 1995). This is, in part, because the adaptive management research used to determine appropriate practices for integrated rangeland management (IRM), is just at the operational stage since it is based on the premise that the adoption of new grazing systems requires a change in the management system. In fact, IRM aims to provide sufficient tools in order to enhance land management and restoration. It also tends to explore appropriate and ethical land management options, determine the impact of invasive species on rangelands and develop an integrated management plan. Simulation models and decision support systems are increasingly used to explore different alternatives in IRM (Azadi et al., 2009a,b).

Savory and Butterfield (1999) emphasized that a purely bio-physical approach is not sufficient to understand and implementing a suitable grazing management and that socio-economic factors need to be taken into consideration. This, in turn, would lead to more sustainable and integrated rangeland management (SIRM) which offers an alternative approach to overcome this dilemma. SIRM is based on interactive participatory management approaches. It creates an atmosphere in which active stakeholders in rangeland management (pastoralists, extension officers, researchers and administrative officials) share their ideas, fears, benefits and responsibilities. Creating such an atmosphere not only calls for interaction with pastoralists (Ho and Azadi, 2010), but also requires a more systemic approach with active participation of different (multi) stakeholders (Azadi et al., 2007; 2011; Taylor, 1998). In other words, a

successful rangeland management seeks to engage diverse attitudes from different interactors that include not only the etic views (outsiders' views; e.g., policy makers and scientists) but also the emic attitudes (insiders' views; e.g., farmers and pastoralists) (Borrini et al., 2000; Chambers, 1997).

*1.2. Pastoralist attitudes toward SIRM*

Attitude is a fundamental concept in the management science that helps to explain individuals' decisions and actions toward an object. It is determined by the beliefs that are salient or important to a person (Willock et al., 1999). Attitudes are formed by what an individual perceives to be true about the attitude-object. This perception may be based upon information and knowledge and/or an emotional reaction toward the object. Many beliefs and values may underpin an attitude. Psychologists define it as a tendency to evaluate a particular entity (the attitude object) with a certain degree of favor or disfavor. The psychological tendencies and evaluative responses that are assumed to underlie them differ not only in terms of direction (positive or negative) but also intensity (a very positive evaluation is likely to have a very different impact on behavior compared to a slightly positive one) (Frewer et al., 2004).

Despite decades of empirical research, many scholars, decision makers and public are not yet ready to listen to pastoralists (Hesse and Odhiambo, 2006; Azadi et al., 2009b). Although early rangeland management studies were mainly pursued by anthropologists focused on pastoralist values and attitudes (Dahl, 1981), the indigenous knowledge and constructive experience of the pastoralists' have barely been addressed by the authorities including both "policy makers" (responsible for establishing legislations, regulations, policies and plans in rangeland management) and "administrative officials" (responsible for implementing such laws and policies). Instead, pastoralists are often

regarded as irrational people who are ecologically destructive and economically inefficient producers (Dahl, 1981; Ho and Azadi, 2010), and who have too limited awareness or capability to be productive (Fratkin and Roth, 2004), or as a deprived minority who occupy vast areas of relatively invaluable land and produce inefficiently (Chambers, 1997). It is therefore not surprising that pastoralists and their interests were not considered significant in national policy agendas. Accordingly, the etic view of ecologists has been the basis for understanding the presumed link between rangeland use and degradation of grazing lands while the emic view of pastoralists (which is perceived to be unscientific) has largely been ignored (Pierotti and Wildcat, 2000; Oba et al., 2000). Gradually however, there has been a shift from etic to emic views (Ho and Azadi, 2010). During the last two decades, anthropologists as well as human geographers and social scientists, have increasingly spent time and efforts putting pastoral behavior into a more holistic context. As Oba and Kotile (2001) correctly stated, many experts now believe that pastoralists have developed elaborate methods for assessing and managing rangelands that should be discussed in the framework of SIRM. Consequently, pastoralist values have become more important as they could largely govern the successful achievement of the goals of SIRM.

Indeed, many studies (Fernandez-Gimenez, 2000; Oba and Kotile, 2001; Azadi et al., 2009b; Ho and Azadi, 2010) show that pastoralists have their own special attitudes toward sustainable livestock grazing and potential grazing capacity of individual landscapes that should be appreciated by both scholars and policy makers when taking any actions toward SIRM. While it is imperative to study the attitudes of pastoralists who have the greatest stake in launching a successful SIRM, little considering has been given to fund such studies. The funded studies were mainly focused on the etic rather than the emic view.

This study tries to shed light on pastoralists' attitudes toward SIRM in Tehran province, Iran. Recently, the country has been more frequently reported for its unsustainable rangelands management induced by both bio-physical and socio-economic drivers. While the former drivers have widely been studied by many Iranian scholars, little is known with regard to the latter (Azadi et al., in press). Among other socio-economic drivers, many rangeland policy makers in Iran are currently getting more aware of the importance of including the emic views in the success of their plans like SIRM. However, no studies have been conducted with regard to pastoralists' attitudes toward SIRM.

### *1.3. Hypotheses*

Four hypotheses were formulated and tested in this study:

- Pastoralists have positive attitudes toward collaborating with administrative officials;
- Pastoralists have positive attitudes toward other pastoralists;
- Pastoralists have positive attitudes toward teamwork; and
- The above mentioned attitudes can influence pastoralist attitudes toward SIRM.
- The above mentioned attitudes have direct and indirect effects on pastoralist attitudes toward SIRM.

## 2. Rangeland management in Iran - past and present

By the latest estimation, the condition of Iran's rangelands (90 million ha) is classified as follows: only 10.3% (9.3 million ha) in good condition; 41.4% (37.3 million ha) in fair; and 48.3% (43.4 million ha) in poor condition (Farahpour and Marshall, 2001). In a normal year, the country's rangelands produce around 10 million tons of dry matter, of

which 5.8 million tons may be available for grazing. This can support 38.5 million animal units (au) for the duration of only 8 months. Despite grazing permits are issued for 689,000 pastoralists' households that allow nearly 55 million au on 56 million ha of the rangelands, they are being utilized by 916,000 households (Badriour, 2006). The aforementioned figures prove that the rangelands are being overgrazed at three times more than their peak capacities. Such severe overgrazing can result in rigorous rangeland degradation which in turn accelerates soil erosion that further exacerbates the chronic and acute droughts (Ho and Azadi, 2010; Zarafshani et al., 2012).

According to Badriour (2006), before the enforcement of the law on nationalization of Iran's natural resources in 1963, the people had cadastral documents. The rangelands were their asset which was used in a sustainabe manner. Landlords even used to lease rangeland to livestock holders for a fixed period and a certain number of livestock. The landlord understood that if his rangeland were degraded, he would earn less money in the following years. So landlords did not let anyone degrade their rangeland and checked it periodically. The nationalization law reduced the authority of landlords in this respect, such that there was no strict control to prevent over-utilization of the rangeland.

Some four years later (in 1967), the government decided to start introducing Rangeland Management Plans (RMPs). An RMP is defined as a compiled management program through which not only soil and water resources are preserved but also the sustainability of rangeland productions is guaranteed. It is characterized by a series of management activities that seek five main objectives: conservation, restoration, adjustment, development and utilization of a given rangeland. The RMPs include some instructions to direct pastoralists toward conserving their rangeland resources while taking the greatest possible benefit without any damage to the range. In fact, all measurements

applied for range management, range improvement and its suitable utilization are supposed to be met in an RMP (Eftekhari et al., 2012). To be eligible to have an RMP, one of the main pre-requisites is to be a real "pastoralist" as the first main economic activity (Rahimi Sooreh and Sadeghi, 2005). Based on this plan, the Forest, Range, & Watershed Management Organization (FRWO) would make a contract with the specified households, which is valid for 30 years. If the instruction is followed properly, it can be extended for another term. By now, RMPs cover over 25 million ha of the country's rangelands.

## 3. Methodology

A descriptive-correlational research design was used in the study. Data were collected using a researcher-made questionnaire via face to face interviews with pastoralists in Tehran province.

### *3.1. Study site*

This study was conducted in Tehran province; one of the 31 provinces in Iran covering 18,909 $km^2$ in the north central plateau of Iran. With a population of 12,150,742 inhabitants, Tehran province comprises 13 townships, 43 municipalities, and 1358 villages. The highest point of the province is Mount Damavand at an elevation of 5,678 m while the lowest point is the plain of Varamin which is 790 m above sea level. The climate in the southern areas is warm and dry, but in the mountain region, it is cold and semi-humid with long winters. The hottest months of the year are from mid-July to mid-September when temperatures range from 28-30°C while the coldest months experience 1°C around December–January, but at certain times in winter it can reach -15°C. The average annual rainfall of the province is 200 mm.

Currently, Tehran is ranked among the 20-most populous metropolitan cities in the world with over 7 million inhabitants. In terms of geographical location, the Tehran county borders on the townships of Shemiranat to the North, Damavand to the east, Eslamshahr, Pakdasht, and Ray to the South, and Karaj and Shahriar to the west (Fig. 1).

[insert Fig. 1]

In total, the province covers 847,858 hectar (ha) rangeland, of which, according to the Natural Resource Organization of Tehran Province (NROTP), 25% is known in "good", 42% in "fair", and 33% in "poor" status. The total livestock population (mainly sheep and goat) in this province is estimated at 879,455 au (animal unit (au) is defined by Glossary of Terms Used in Range Management (2002) as an "average" live body weight equal to 1000 lbs (453.59 kg)).

Serious efforts and investment in the restoration of rangeland in Tehran province have been undertaken with a low level of social participation, making the current study of even greater importance. Among others, the RMPwhich was launched in 1985 by the FRWO offered a significant approach to SIRM.

*3.2. Study sample*

The population of this study consisted of pastoralist families (N = 4020) in Tehran province. Using Cochran's formula, 1280 pastoralist families were selected through a multi-stage stratified random sampling method. The families were first selected based on the cities that were distributed across the townships of Karaj, Shahriar, Damavand, and Shemiranat. Then, the NROTP was consulted to determine which pastoralists had RMP certificates (issued by the NROTP) and lived in individual households in a

sedentary system which aimed mainly at producing, at the village level, a mixture of red meat and wool. Those who did not have the certificate were excluded from this study. In each family, the household head was interviewed. Accordingly, the final distribution of the study sample was determined across the selected townships as follows: $n_{Karaj} = 250$; $n_{Shahriar} = 208$; $n_{Shemiranat} = 414$; $n_{Damavand} = 408$; $n_{Total} = 1280$.

The data collection lasted three months using face to face interviews with the pastorlist household heads (who were all male) with 90% response rate (see Baruch and Holtom, 2008; p. 1155). All the interviews were conducted in Persian; i.e. the native language of both the pastoralists and interviewers.

*3.3. Data analysis*

The data were analyzed using SPSS (Version 16). Pastoralist attitudes were measured using two scales: a personal attributes scale (10 statements) and a non-personal attitude scale (42 statements). The latter consisted of four sub-scales: attitude toward collaborating with administrative officials (8 statements); attitude toward other pastoralists (10 statements); attitude toward teamwork (10 statements); and attitude toward SIRM (14 statements). The attitude scale was measured using a Likert-Type continuum. After consulting a panel of experts to assess the validity of the questionnaire, the above statements were condensed respectively to 5, 6, 5, and 7 statements which were approved by the panel. The reliability of the main indices of the study was confirmed using Cronbach's alpha coefficients as shown in Table 1.

[insert Table 1]

Different data analyses were used to test the hypotheses of the study. Some descriptive analyses were employed to assess pastoralist attitudes toward different aspects of SIRM.

Furthermore, some inferential analyses (mainly regression and path analyses) were applied respectively to discover factors influencing pastoralist attitudes toward SIRM and to realize direct and indirect effects of predictor variables on attitudes.

## 4. Results

### *4.1. Personal attributes*

According to the findings of this study, the average age of pastoralists was 51.4 years. More than half of the pastoralists were adults (range: 31-75; mean: 56.7 years) whereas 8.2% were young (range: 18-30; mean: 25.5 years). The majority of the respondents held primary education (36.4%) while more than one-fourth (26.4%) were illiterate. Pastoralists with secondary and post-secondary education comprised only 10% and 7.3% of the respondents, respectively. The average land-holding of pastoralists was 154 ha. Herd composition for 18.3% of the pastoralists consisted of less than 100 au, for 37.6% between 100-200 au, and for 15.6% more than 200 au. Each pastoralist kept an average of nine monthly communications of which five were with relatives. The frequency of monetary communication was estimated to be one time per month while non-monetary communications remained as twice per year.

### *4.2. Pastoralist attitudes*

#### *4.2.1. Attidudes toward collaborating with administrative officials*

Overall, pastoralists were willing to collaborate with the administrative officials. As shown in Table 2, most of the collaborative items fell in the categories “much” and “very much”. For example, conducting field work was considered as important (‘much’ and ‘very much’ categories) by 24.8% and 19.3% of respondents respectively; consulting government bodies was understood as important by 23.6% and 47.3% of

those questioned respectively; sharing indigenous knowledge was recognized as important by 13.1% and 56.1% of respondents respectively, and listening to extension agents to improve pasture was perceived as important by 31.8% and 40.9% of those questioned. In particular, pastoralists showed interest in sharing their indigenous knowledge and consulting government bodies for information. However, they were least interested in receiving financial aid.

[insert Table 2]

*4.2.2. Attitude toward other pastoralists*

As shown in Table 2, pastoralists had a positive attitude towards other pastoralists. For example, the majority were (36.1% "much" and 24.1% "very much") willing to participate in conservation, restoration, and utilization of resources with other pastoralists. In this regard, more than one-third (37.0% "much") and one-fourth (25.9% "very much") respectively believe in organizing pasture with other pastoralists. As well, there is a high degree of trust (23.1% "high" and (21.3% "very high") among the pastoralists so that they are willing to help each other when facing problems (39.2% "much" and 26.5% "very much"). Around one-third (31.1% "much") of the respondents believed in the technical knowledge of other pastoralists.

*4.2.3. Attitude toward teamwork*

The respondents' attitude toward teamwork was also investigated. As shown in Table 2, around one-third of the pastoralists perceive teamwork as efficient (34.9% "much" and 28.4% "very much") and that it has improved their relationships (30.6% "much" and 20.4% "very much"). The extent to which final decisions are made based on group dynamics is recognized by half of them (50.0% "very much"). Also, more than one-

third (33.9%) and around one-fourth (23.4%) believe teamwork can increase group learning and improve learning process (32.1% “much” and 27.5% “very much”).

*4.2.4. Attitude toward SIRM*

The attitude of pastoralists’ toward SIRM was another issue which was investigated. As Table 2 shows, almost all the respondents “agreed” (50.5%) or “fully agreed” (45.9%) that rangelands belong to future generations and should therefore be preserved. Moreover, half of the respondents (49.5%) and more than one-third (35.5%), believe in plant and soil protection. Interestingly, almost all of the respondents “agreed” (48.1%) or “fully agreed” (45.3%) with the importance of creating an equilibrium between livestock and rangeland by respecting the carrying capacity of rangelands. Finally, the results revealed that more than half (53.2%) and around one-third (31.2%) of the respondents found the existing rules and regulations established by the FRWO constructive.

*4.3. Factors influencing pastoralist attitudes toward SIRM*

As Table 3 shows, from the eleven independent attributes considered for regression analysis (backward method), four predictor variables (attitude toward collaborating with administrative officials, education level, attitude toward teamwork, and attitude toward other pastoralists) can explain 31% of the “attitude of pastoralists toward SIRM” as the outcome variable (F = - 12.88; Sig. = 0.00). According to Table 3, if there is one unit increase in the standard deviation of the “attitude toward collaborating with administrative officials”, “education level”, “attitude toward teamwork”, and “attitude toward other pastoralists”, there will respectively be an increase of 0.28, 0.26, 0.17, and 0.12 in the standard deviation of pastoralist attitudes toward SIRM.

[insert Table 3]

*4.4. Path analysis*

Path analysis, utilizing PATH2 Software, was used to determine the direct and indirect effects of factors influencing pastoralists' attitudes toward SIRM. As shown in Table 4 and Figure 2, "attitude toward other pastoralists" indirectly affects pastoralist attitudes towards SIRM ($r = 0.28$, $p = 0.05$) through the "attitude toward collaborating with administrative officials" ($r = 0.12$, $p = 0.05$).

[insert Table 4]

[insert Fig. 2]

**5. Discussion and conclusion**

Prior to the nationalization law of 1963, landlords across the country owned the rangelands and rented their rangeland them out to livestock breeders. Their rent was based on grazing duration, but after establishment of the law, the government tried to eliminate the landlords' role in this regard. At that time, the landlords were real managers and the rangelands were their asset so that they did their best to maintain them (Badriour, 2006). However, this traditional system was replaced in 1963 by a new "official" system that was aimed at increasing governmental control over rangelands. While the old system was based on pastoralists' empowerment, the new system reduced their authority. Consequently, the pastoralists felt no significant motivations to invest in and improve their rangelands. Over time, increasing mistrust formed between the pastoralists and the authorities/laws. Furthermore, the (early) RMPs failed to reconcile this mistrust because they did not address socio-economic aspects, specifically, they did not include the emic views of the pastoralists. This has resulted in a weak link between pastoralists and the authorities/laws.

In line with the above discussion, our research revealed that the current link between the pastoralists and administrative officials is still very poor. Like the study carried out by the OECD (2008), our study has shown that the authorities do little to acknowledge the fact that rangelands have been managed by these pastoralists for many generations. There has been a severe mistrust between the local pastoralists and the authorities since the nationalization of the natural resources because the authorities limited the livelihood opportunities of the pastoralists. Earlier attempts were made to establish different forms of community-based organisations. However, many such initiatives were frustrated by opposition political forces and conservation authorities (Azadi et al., 2010). This has weakened the effectiveness of the RMPs in attaining their goals. Since the pastoralists are keen to enhance their communication with administrative officials, it is therefore recommended that they hold briefing sessions with interacttors (see the end of section 1.1) so that a more effective flow of information is in place. Furthermore, the pastoralists are very interested in teamwork. Extension agents should consider this as an opportunity to facilitate SIRM. These agents should encourage more interactors to take the lead in training sessions. Accordingly, during the sessions, the agents should act as facilitators, while the pastoralists could be the focus of such sessions. The findings also show that the pastoralists are mainly adults who may resist establishing effective communications. However, among the pastoralist families, there are some young educated individualswho can take part in the training of others using material from the administrative officials. Additionally, the representatives of the RMPs could act as an effective channel to communicate with other interactors. This is in line with the studies of Mahler et al., (2008) and Mohai and Twight (1987) who concluded that younger and educated individuals show more sympathy toward natural resources.

Furthermore, this study showed that the interactors have a low level of education. This can easily hamper the communication between different stakeholders. One way of overcoming this challenge might be to use local channels. For example, based on their relative advantage and feasibility, local elites such as religious leaders or innovators can enhance effective communication within the community. Taking their high social acceptance into account, these local channels would greatly improve the communication flow across the region. Azjen (2001) showed that attitudes are a strong predictor of behavior. Given that the pastoralists have positive attitudes toward SIRM, the RMPs' goals should be more easily attaine. In other words, the pastoralists should be willing to consider the long-term use of their pastures.

The regression analysis showed that the variation in pastoralist attitudes toward SIRM can be explained by their attitude toward each other, education level, their mentality towards teamwork and finally their willingness to collaborate with administrative officials. This finding is confirmed by Stroup and Baden (1983) who showed that there is a strong association between beliefs, values and norms on the one hand, and the attitudes toward the conservation of natural resource management, on the other. Furthermore, Kerhoft's (1990) study indicated that income, education and the age of pastoralists have a positive association with the conservation of natural resources. Education level, according to Kunagy et al. (1994), Milbrath (1989), Mohai and Twight (1987), was the most influential variable affecting sustainable rangeland management. Although Mahler et al. (2008) and Mohai and Twight (1987), showed that "age" was a significant predictor in sustainable rangeland management; it was not identified as significant in our study.

The results of the regression analysis have some important implications for successful rangeland management intervention. Firstly, *policy makers* should take the human

factor into consideration. The emic view; i.e. positive attitude toward other pastoralists, teamwork and willingness to cooperate with administrative officials, may help in designing more effective SIRM plans. Secondly, given the importance of teamwork, *administrative officials* responsible for launching the SIRM should start with those field sites where pastoralists have already shown a positive intention to participate in integrated programs. Thirdly, *practitioners* (e.g. rangeland extension agents) should begin their intervention with those pastoralists who are more positive about other pastoralists, more educated, more interested in teamwork and more willing to collaborate with other pastoralists. All these interventions should aim at highlighting the human factor and emic view in decision and policy making processes. This will tackle the problem of marginalization, which is a root cause of pastoral poverty (IFAD, 2009). Finally, the results of path analysis, which was conducted to explore the non-linear relationships between the predictor variables and the outcome variable, showed pastoralist willingness to cooperate with each other as indirectly influencing their attitude toward SIRM and attitude toward collaborating with administrative officials. This finding shows the importance of the positive attitude pastoralists' have towards each other in establishing successful collaboration with administrative officials that can improve their attitude toward SIRM. Accordingly, the extension agents should consider this as an opportunity to mobilize pastoralists in working for the common good.

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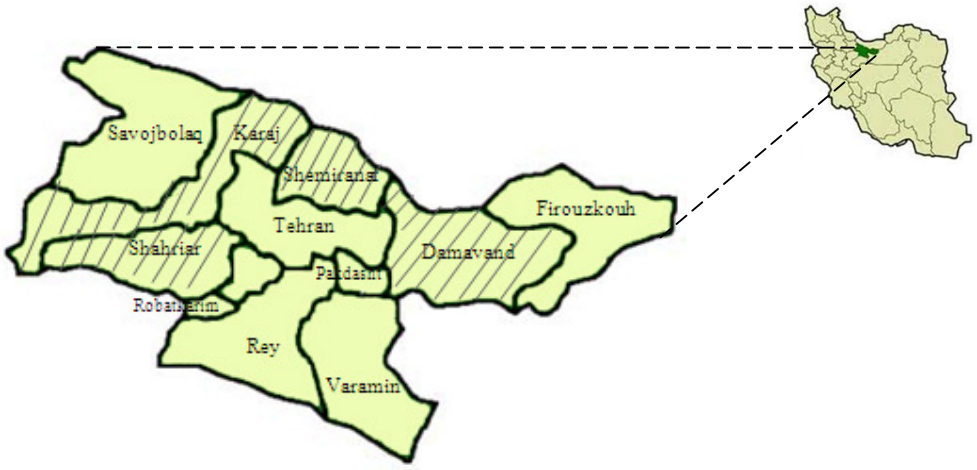


Fig. 1. The study site divided by township.
(Diagonal areas; the study sample: $n_{Karaj} = 250$, $n_{Shahriar} = 208$, $n_{Shemiranat} = 414$, $n_{Damavand} = 408$)

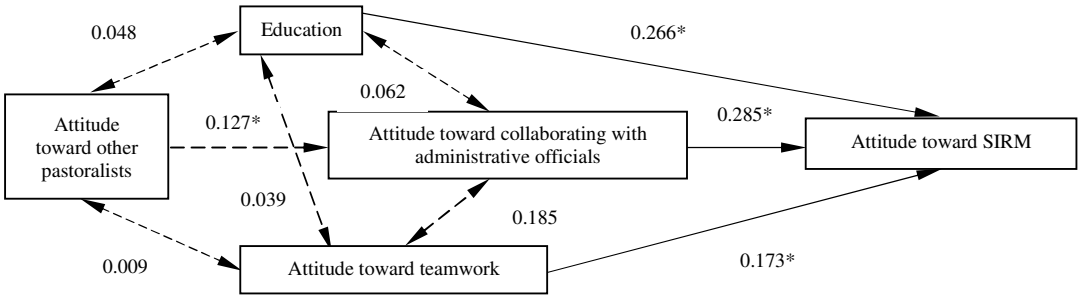


Fig. 2. Path analysis showing the direct and indirect effects of the predictor variables on the outcome variable.

Table 1. Cronbach's alpha for the main scales of the study.

| Scales | α* |
|---|---|
| Attitude toward collaborating with administrative officials | 0.77 |
| Attitude toward other pastoralists | 0.84 |
| Attitude toward teamwork | 0.79 |
| Attitude toward SIRM | 0.82 |

* $\alpha \geq 0.9$: excellent; $0.9 > \alpha \geq 0.8$ good; $0.8 > \alpha \geq 0.7$ acceptable

Table 2. Pastoralist attitudes toward the different items of SIRM.

| Items | The extent of willingness (%) | | | | | |
|---|---|---|---|---|---|---|
| | None | Very little | Little | Somewhat | Much | Very much |
| **Attitude toward collaborating with administrative officials** | | | | | | |
| 1. Conducting field works | 7.3 | 11.9 | 12.8 | 23.9 | 24.8 | 19.3 |
| 2. Consulting government bodies | 2.7 | 0.9 | 2.7 | 22.7 | 23.6 | 47.3 |
| 3. Receiving financial aid | 17.8 | 8.4 | 12.1 | 41.1 | 9.3 | 11.2 |
| 4. Sharing indigenous knowledge | 1.9 | 0.0 | 1.9 | 27.1 | 13.1 | 56.1 |
| 5. Listen to extension agents | 1.8 | 1.8 | 0.9 | 22.7 | 31.8 | 40.9 |
| **Attitude toward other pastoralists** | | | | | | |
| 1. Participation with other pastoralists in conservation, restoration, & utilization | 0.9 | 0.9 | 9.3 | 28.7 | 36.1 | 24.1 |
| 2. Trust other pastoralists | 0.9 | 2.8 | 7.4 | 44.4 | 23.1 | 21.3 |
| 3. Other pastoralists' technical knowledge | 0.0 | 2.8 | 4.7 | 45.3 | 31.1 | 16.0 |
| 4. Other pastoralists' jealousy | 16.2 | 9.5 | 18.1 | 39.0 | 13.3 | 3.8 |
| 5. Help other pastoralists with their problems | 0.0 | 0.0 | 3.9 | 30.4 | 39.2 | 26.5 |
| 6. Organizing pasture with other pastoralists | 0.9 | 0.9 | 8.3 | 26.9 | 37.0 | 25.9 |
| **Attitude toward teamwork** | | | | | | |
| 1. Teamwork usefulness | 0.0 | 4.6 | 2.8 | 29.4 | 34.9 | 28.4 |
| 2. Teamwork improves relationships | 0.0 | 1.9 | 10.2 | 37.0 | 30.6 | 20.4 |
| 3. Final decisions are made based on group dynamics | 0.0 | 0.0 | 3.1 | 34.4 | 12.5 | 50.0 |
| 4. Teamwork increases group learning | 0.0 | 0.0 | 0.9 | 41.3 | 33.9 | 23.4 |
| 5. Teamwork improves learning process | 0.0 | 0.0 | 0.9 | 39.4 | 32.1 | 27.5 |
| **Attitude toward SIRM** | | | | | | |
| 1. Rangelands belong to future generations & should therefore be preserved | 0.0 | 0.0 | 0.0 | 3.7 | 50.5 | 45.9 |
| 2. Rangelands should be used at their full capacity | 0.0 | 12.1 | 21.5 | 22.4 | 39.3 | 4.7 |
| 3. Rangelands are made by God and we have no control over their conservation | 0.0 | 13.3 | 29.5 | 28.6 | 19.0 | 9.5 |
| 4. Rangelands are destroyed because of their less plantation density & more eroded soil | 0.0 | 0.9 | 0.9 | 13.1 | 49.5 | 35.5 |
| 5. Rangeland equilibrium should be made based on caring capacity | 0.0 | 0.0 | 0.0 | 6.6 | 48.1 | 45.3 |
| 6. Rangelands can be conserved or restored if we respect the rules & regulations established by the FRWO | 0.0 | 0.0 | 1.8 | 13.8 | 53.2 | 31.2 |
| 7. Pastoralists will make a loss if they follow these rules and regulations | 0.0 | 16.5 | 24.8 | 38.5 | 8.3 | 11.8 |

Table 3. Factors influencing pastoralists' attitude toward SIRM (backward method).

| Variables | Beta | B | Standard error B | T | Sig. |
|---|---|---|---|---|---|
| Attitude toward other pastoralists | 0.282 | 0.282 | 0.123 | 2.318 | 0.000 |
| Education level | 0.264 | 0.266 | 0.098 | 2.765 | 0.000 |
| Attitude toward teamwork | 0.215 | 0.101 | 0.071 | 1.675 | 0.000 |
| Attitude toward collaborating with administrative officials | 0.176 | 0.211 | 0.139 | 2.762 | 0.000 |
| Constant | — | 15.94 | 2.002 | 7.962 | 0.000 |

F = -12.88 (Sig.= 0.00)

Table 4. The results of path analysis.
(Direct and indirect effects of predictor variables on attitude toward SIRM)

| Factors | $Y$ | predictor variables | | | |
|---|---|---|---|---|---|
| | | $x_1$ | $x_2$ | $x_3$ | $x_4$ |
| $Y$ | 1 | | | | |
| $x_1$ | 0.285* | 1 | | | |
| $x_2$ | 0.266* | 0.062 | 1 | | |
| $x_3$ | 0.173* | 0.185 | 0.039 | 1 | |
| $x_4$ | 0.127* | 0.127* | 0.048 | 0.009 | 1 |

$x_{1:}$ Attitude toward collaborating with administrative officials
$x_{2:}$ Education
$x_{3:}$ Attitude toward teamwork
$x_{4:}$ Attitude toward other pastoralists

## Appendix

Excerpts from the questionnaire used in this study.

**a) Attitudes toward collaborating with administrative officials**

1. To what extent are you willing to collaborate with administrative officials in conducting field works?
   None Very little Little Somewhat Much Very much
2. To what extent are you willing to consult government bodies to improve your pasture?
   None Very little Little Somewhat Much Very much
3. To what extent are you willing to receive financial aid from government?
   None Very little Little Somewhat Much Very much
4. To what extent are you willing to share your indigenous knowledge with administrative officials?
   None Very little Little Somewhat Much Very much
5. To what extent are you willing to listen to the recommendations of extension agents to improve your pasture?
   None Very little Little Somewhat Much Very much

**b) Attitudes toward other pastoralists**

1. To what extent are you willing to participate with other pastoralists in conservation, restoration, & utilization?
   None Very little Little Somewhat Much Very much
2. To what extent can you trust other pastoralists?
   None Very little Little Somewhat Much Very much
3. To what extent do you believe in the technical knowledge of other pastoralists?
   None Very little Little Somewhat Much Very much
4. To what extent do you believe that other pastoralists are jealous of your pasture situation?
   None Very little Little Somewhat Much Very much
5. To what extent are you willing to help other pastoralists with their problems?
   None Very little Little Somewhat Much Very much
6. To what extent are you willing to organize your pasture with other pastoralists?
   None Very little Little Somewhat Much Very much

**c) Attitude toward teamwork**

1. To what extent do you find teamworks useful?
   None Very little Little Somewhat Much Very much

2. To what extent do you believe that teamwork improves your relationships with other pastoralists?
   None Very little Little Somewhat Much Very much

3. To what extent are final decisions made based on group dynamics?
   None Very little Little Somewhat Much Very much

4. To what extent can teamwork increase group learning?
   None Very little Little Somewhat Much Very much

5. To what extent can teamwork improve learning process?
   None Very little Little Somewhat Much Very much

**d) Attitudes toward sustainable integrated rangeland management**

1. To what extent do you believe that rangelands belong to future generations and should therefore be preserved?
   None Very little Little Somewhat Much Very much

2. To what extent do you believe that rangelands should be used at their full capacity?
   None Very little Little Somewhat Much Very much

3. To what extent do you believe that rangelands are made by God and we have no control over their conservation?
   None Very little Little Somewhat Much Very much

4. To what extent do you believe that rangelands are destroyed because of their less plantation density and more eroded soil?
   None Very little Little Somewhat Much Very much

5. To what extent do you believe that to make equilibrium in rangelands, we should respect their caring capacity?
   None Very little Little Somewhat Much Very much

6. To what extent do you believe that rangelands can be conserved or restored if we commit ourselves to respect the rules and regulations established by the Forest, Range, & Watershed Management Organization?
   None Very little Little Somewhat Much Very much

7. To what extent do you believe that pastoralists will make a loss if they follow these rules and regulations?
   None Very little Little Somewhat Much Very much