# Indigenous knowledge and utilization of arid and semi-arid rangelands by Iranian pastoralists

Abdolhamid Papzan[1], M. Reza (Fariborz) Hamzeh'ee[2], Nashmil Afsharzadeh[3]

1. Associate professor of Razi University, College of Agriculture, Ag. Extension and Education, Kermnashah, Iran and Guest Researcher of FU, Berlin, BC-Care, Berlin, Germany.
2. Assisstant Professor of Razi University, College of Agriculture, Ag. Extension and Education, Kermnashah, Iran.
3. Ph.D. student of Razi University, College of Agriculture, Ag. Extension and Education, Kermnashah, Iran. Papzanabdolhamid89 @gmail.com

**Abstract:** This paper aims to study the indigenous systems of natural resource management, specifically utilization strategies of rangelands, among the Kalhor nomads in Kermānshāh province. In the last few decades, the natural resources in arid and semi-arid nomadic regions of the Kalhor have been seriously damaged by the negative impact of modernization, industrialization and destructive natural forces. The results are drought, flood and environmental pollution. This ongoing situation is threatening the survival of the nomads, forcing them to abandon their traditional way of life, and adding to the inhabitants of the slums around big cities. This article argues that in spite of the negative effects of artificial and natural factors on rangelands in the above area, the use of indigenous systems of natural resource management will inevitably improve the conditions of the rangelands, leading towards a sustainable development. It is believed that the combination of short term and a long term strategies that was initiated by the nomads will contribute to the improvement of the rangelands. The conclusions of this paper show that their survival depends upon systems of indigenous management. This type of management is locally initiated, flexible, and sustainable, which requires the full participation of the nomads in the utilization and preservation of their natural resources. **[**Abdolhamid Papzan, M. Reza (Fariborz) Hamzeh'ee, Nashmil Afsharzadeh. **Indigenous knowledge and utilization of arid and semi-arid rangelands by Iranian pastoralists.** *J Am Sci* 2012;8(8):102-110]. (ISSN: 1545-1003). http://www.americanscience.org. 17

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## Introduction

The Kalhor are a southern Kurdish speaking tribe living in some regions of Middle Zagros mountain chain. Until the twentieth century, the Kalhor were thought to be the largest Kurdish nomadic tribe in all countries where the Kurds live. The majority are Shiites, and some small groups still follow a version of ancient Iranian religions.

Until recently most Kalhor were nomadic, but nowadays only a minority of the tribe migrates. They traditionally migrate about 150 miles between two ecological zones, from the west part of Kermānshāh at the heart of Zagros Mountains (high land, summer pastures) to near the border of Iraq (low land, winter pastures). They raise sheep and goats, which are still the basis of their economy. In addition, most of them cultivate cereals for domestic consumption (Hamdhaidari and Wright, 2001). One or two members of the family may enter into other niche activities at different times of the year.

Nomads are considered the third largest community in Iran, after urban and rural ones (Hamdhaidari, 1998). According to Tapper (1997), in 1987 the first ever comprehensive and reliable census of migrating nomads in Iran estimated their numbers at about 1.2 million of 59 million. Considering the latest published census in Iran, the number of nomads who continue to migrate is put at 1.304.089 of 70 million. It is estimated that there are about 90 million hectares of pastoral land in Iran. It constitutes approximately about 60% of the whole area of the country (Moqadam 2001).

Nomadic societies in Iran are not simple-structured societies. As a matter of fact, these societies are highly specialized production units with a positive relation to their natural environment. According to Varjāvand (1991), this relation was disturbed as the process of cultivation intensified and the level of industrialization and urbanization rapidly increased. Therefore, nomadic migration should not be regarded as a simple adaptation to a rough and unpredictable nature. It is a question of conscious planning, with the aim of organizing basic variable resources. Migration, in fact is a complicated, long-term scheme for feeding cattle. One of the main goals is to achieve maximum weight gain for the cattle during the period of growth of grass, and the minimum weight loss when there is little or no vegetation available.

In the existing pre-industrial economy of Iran and within the remaining system of pastoral nomadic economy, the tribes are supplying the largest part of national demand for protein products. Therefore the importance of their economic role within any project

for social and economic development is evident. They are considered to be one of the most vital factors if a sustainable economic development is to succeed (Afshārzādeh, 2007).

**Objectives of the research**

The system of nomadic pastoralism is a type of animal breeding economy in which animal breeding is based on organizing rangelands and after-grazing on what remains on the already harvested agricultural land.[1] Therefore, given the importance of grazing and its relation to the level of destruction or restoration of rangelands, this research examines the following topic and assumptions:

*Rangeland utilization management by the nomads in the Kalhor region,*

*Sustainability of the rangelands cannot be achieved without the full participation of the nomads as the main users of the natural resources,*
*Long-term survival of the nomads depends upon the indigenous systems of natural resource management, specifically, rangelands utilization strategy.*

Although a great deal of research has been carried out among the Iranian tribes in the last century, so far no systematic research has been done on the indigenous knowledge systems among the nomads about management of natural resources, specifically in the Kurdish regions. The present research aims to open a new chapter concerning the validity of the traditional system in utilizing the rangelands in a nomadic tribe in Iran.

**1) Management of Grazing**

By management of grazing we mean interference in the process of changing the ecosystem of pasture through practicing control the intensity or timing of grazing. The aim of management is to achieve a certain degree of intensity or a combination which produces maximum productivity, in order to make cattle breeding relatively profitable for nomads. (Moqadam, 2001: 53) It seems that grazing management is an absolute necessity for the following reasons:

Movement of the cattle has a considerable effect on the pasture. The effect depends on the type of soil, the phenologic situation of the vegetation, soil humidity and the grazing capacity. The rate of grazing may change the combination of flora of the vegetation or grasses in the pasture or. It may replace the more resistant and long lived vegetation with short lived or one year living ones, which consequently reduces the production of the nomads. Intensive grazing may result into soil erosion and desertification. (Keya, 1998)

**1.1) Systems of Grazing**

There are two systems of grazing:

**a) Free Grazing.**

In this MODE of grazing cattle are left inside the grazing land throughout the period of grazing. Therefore, there is no interference in the process of grazing. This system has several disadvantages: As the grazing land is not limited or fenced, animals usually search for the best quality of grass throughout the grazing land. As a result the grasses of the best quality are least likely to remain in place and they eventually get weaker and weaker. Therefore the best quality of grass gradually disappears. At the same time, those grasses which are considered to be of class III prevail. This type of grass is used only after those of class I and II, are mostly consumed. If these grasses are consumed afterwards, they lose a considerable part of their nutritional value.

**b) Enclosure Grazing.**

In this type of grazing, pasture land is divided between different plots. Cattle are left to graze within each plot of land so long as it is estimated to be sufficient for this purpose. As against the first method, this type of grazing has the following advantages:

1) Due to enclosure of the pasture land the grass of classes I, II, III are used up in equal measure. Thus the grasses of class (I) are given enough chance to grow again.
2) As the grass of classes I and II are used at the best stage of their growth, they possess the greatest nutritional value. It is clear that in this way, the highest level of utilization of existing resources is achieved.
3) When a plot of land is enclosed, the consumption of all different types of grass remains equal. It means that the less edible grasses are also consumed by the animals.
4) Moreover, in an enclosed plot of land, less trampling and crushing of the land and grass take place. In addition to that, animals do not walk around, losing energy and weight, as much as in unenclosed spaces.
5) Due to the lesser amount of trampling, fewer plants and grasses are destroyed. (Moqadam, 2001: 284-285)

**2) Indigenous Knowledge**

[1] At the end of summer, after an agricultural land has been harvested, it is rented out to the cattle breeders for grazing for a short period of time.

Nomads generally have excellent knowledge about the useable niches in their area. Some investigations are indicating that the nomads are familiar with the types of grass growing in their regions. The well known Maasai tribe of Africa has been studied in this respect. It has been reported that due to a constant contact of this tribe with nature, they are very familiar with the types of grass growing on their pasture. They can explain the edibility of each grass for different animals. They are also familiar with season of growth and nutrition value and different kinds of poisonous or medicinal herbs. (UNESCO, 1994-2003)

Pastoralists also have good knowledge about the relation between the quality of soil and growth of grass. For example, the behavior of the Wodaabe, who systematically use their knowledge, also proves their deep knowledge about the soil. They use the advantages of sandy light soil in the beginning of rainy seasons, which helps the *tribulus terrestis* to cover the land rapidly. They manage their movement in such a way as to prolong the period of availability of fresh food with high nutrition value. Due to their traditional knowledge about grass cycles and the relation between nutritional value and stages of growth, the Wodaabe make maximum use of the periodical changes in the availability of natural resources. For that sake they first make seasonal migrations to regions with sandy soil, where sprouting takes place earlier. In the beginning of rainy season they then migrate to regions with firm soil, where the sprouting takes place later. (Schareika, 2001)

Another example of efficient pastoral management is observed in Himalayan villages. There the existing pastoral land is divided into several blocks. Each block is meant to be used for 5 to 7 days of grazing. The utilization of such blocks is possible if long term revitalization of such blocks is carefully assured.

Previously, in Iran an assessment of availability of grass and water used was made by those nomads who possessed common pastures. They used to meet in a certain time of the year to select experienced men or experts to study the situation before the start of the migration. In their meetings they might also make an assessment on the basis of experiences and observations of previous years. The oral history of each tribe and narratives formed another basis for group decisions regarding the mode and time of migrations (Amiri & Emādi, 2004).

It has been observed among the Qashqāi tribe of central Iran, that they organize an assembly of experts each year, in order to estimate the capacity of their pastures. They then estimate the possible capacity for grazing in summer or winter pastures. The pasture is divided into units called *bor*. Each *bor* is traditionally thought to have the capacity for grazing 300 sheep. In case the numbers of sheep are more than 300, then another plot of land is allotted to them (Safinezhād, 1994). Also, in some parts of Boir Ahmad, in the South West of the Qashqāi region, the term *bor* is used for the capacity to feed 200 to 300 cattle.

In case of the nomads of Zābol, in the south-east Iranian province of Baluchistan, experts are sent to estimate the condition of the pastures before the time of migration. These experts must check the availability of water and grass. The term used for this is *pol gardi*. (Organization for Nomadic Affairs in Sistān and Baluchistan, 1999).

It is true that indigenous knowledge, like formal knowledge and science, may face certain types of limitations. Despite that, it is clear that the existing ecological problems need to be dealt with multi-faceted strategies in the field of management. There have only been few practical projects to study the development and systems of nomadic management that have proved to be successful. (Savadogo, 2006)

It is quite difficult to work in regions with ecologically sensitive and complicated conditions. Many research projects for the development of nomadic societies in different parts of the world have failed to achieve success (Swift 1994). Some of these projects indeed became factors contributing to the destruction of people's traditional way of life. Some others contributed to the deterioration of the ecological conditions as compared to the previous period. The traditional system of land management and cattle breeding should be adjusted to modern scientific findings in order to be able to face the challenges resulting from market forces on the one side, and ecological problems on the other. Insufficient attention has been paid to the existing capacity of indigenous knowledge as a contributor to the advancement of ecological science.

## Materials and Methods

The present study is based on a qualitative method of research, and follows a naturalistic approach. Moreover, by the use of Participatory Rural Appraisal (PRA) and Rapid Rural Appraisal (RRA) (Chambers 1996), the method of Focus Groups was applied. Subjects of the study were male members of a clan of the Kalhor tribe. The migration region of this tribe is located in the Gilān district of the province of Kermānshāh in western Iran. As statistical sampling is not used in qualitative research, purposed sampling was used for the study. In this type of sampling it is tried to use those persons as "key informants who are supposed to be "information

rich" or highly informative. Following the process of purposed sampling, the method known as "chain sampling" was applied. Therefore in order to find key informants, the cooperation of the Public Department for the Affairs of the Nomadic Tribes of Gilān District was sought. After contacting the selected informants, these were asked to introduce further key informants. The process of sampling was continued until the level of "saturation" was achieved. In general the data were collected with the help of experts among two branches or *tira* (clan) of the Kalhor tribe, the Shirzādi and Ardashiri. These are thought to be the largest braches of the tribe.

In order to "triangulate" the sources of data, cooperation of a further branch of the tribe, the Siyā Siyā, was sought. Finally, by following PRA and RRA techniques, three focused groups were formed, consisting of 32 persons. The analysis of the data was made simultaneously with the collection, following the above techniques.

**Findings of the investigation**

At the end of the field study, a large amount of data was collected on natural environment and on the life context of the members of the Kalhor tribe. According to the collected data the following statements can be made:

**Classification of pasture on the basis of grazing system**

The Kalhor classify their pasture according to several indicators. Among these different classifications, one is based on the grazing system. In this case, pasture is divided into two main categories: *Tāqat khwar*[2] or *dānga khwa*r, and *waralā khwar* or *halachiyār*.

*Tāqat khwar* and *dānga khwar* are Kurdish terms, which are used for to a grazing system similar to "enclosure system" which was described earlier. The Kalhor divide their pasture into plots of grazing land called *tāqat* or *dānga*. *Tāqat* means "endurance" and *dānga* means "share". The word *khwar* refers to "feeding". The *tāqat* is one plot of land providing grass for one portion of feeding the cattle. The extent of *tāqats* varies depending on the quality of the land. In relatively good pastures the extent of one *tāqat* is equal to a whole cycle of grazing. When a pasture is thinly covered, the size of each *tāqat* is larger.

The Kalhor use this method mostly for winter quarters. It is also a preferred method for *paschar*, i.e. grazing on agricultural land after the harvest. In this case-depending on the grazing capacity of agricultural land-one *tāqat* may be divided into one, two or three hundred *pasi;* meaning that a plot has grazing capacity for one, two or three hundred sheep.

*Waralā khwar* and *halachiyār* are terms referring to the method of free grazing. As was mentioned earlier, in this system the flock is left in the pasture to graze freely. The method is practiced by the Kalhor only in a region called "Miyān Band", which literally means pastures lying in the middle of two ecological zones.

**Advantages of *Tāqat Khwari***

This system of grazing is more or less similar to the Enclosure System. As was mentioned earlier, several studies emphasize various advantages for enclosure grazing. In the present study attempts were made to find out whether the same advantages exist for *Tāqat Khwari*. It was found that here also animals use different varieties of grass. At the same time - similar to the free grazing system- in *waralā khwari* only better varieties of grass are eaten by the flocks.

Another similar finding between Kalhor *tāqat khwari* and 'enclosure grazing', concerns the level of trampling and crushing of the pasture. Trampling and treading on pasture in enclosure grazing is supposed by the members of Kalhor, to be less good than free grazing. They add another merit for this system, viz. that in *tāqat khwari* the level of pollution of pasture is much lower. There have been cases of illness spreading when the level of pasture pollution was high. Pollution may also cause reduction of appetite and eventual losing of weight.

In addition to the above-mentioned merits of *tāqat khwari* as compared to free grazing, the Kalhor mention the following advantages:

a) When pasture and *paschar* (the remainder of grass on agricultural land after harvest), are divided into different plots, nomads are in a position to assess the length of time the plot affords for the grazing of their flocks. It means that in this way they can count how long the cattle can be fed. This makes planning for their winter and summer quarters easier.

b) Another merit of the *tāqat* system concerns overfeeding by animals. In the case of free grazing the possibility of overfeeding and eventual illness of animals is relatively high. But in cases where grazing grounds are divided and flocks use all three types of grass, the risk of overfeeding is much smaller.

**Defining the Capacity of Pasture**

The Kalhor calculate the capacity of pasture land on the basis of the number of *tāqat*. Furthermore, the number of *tāqat* depends on the density of vegetation and availability of edible grass. The Kalhor assess pasture capacity on the basis of the availability of water and grass. At the same time,

[2] Transliteration of the Kurdish words and names follows a simplified method suggested by Oriental Institute of Hamburg.

other factors may be taken into consideration beside the above-mentioned assessment; e.g. weather conditions and the level of security. Security is an important factor for the tribe, because their pastures are located in the border region between Iran and Iraq.

Since the traditional social and political system of all Iranian tribes have gone through changes, the function of assessing pasture is no longer carried out by the traditional tribal elites. [3] In the past decades, the assessment of pasture has become the duty of certain important families in the tribe. These families are called *gāura māl*, meaning "great family". One of these families, which usually possess large number of cattle, sends an experienced person called *sarbeshu* (knowledgeable) to assess the condition of the pastures. The time of migration is decided after consultation with such experts.

In order to define the quality of their pasture, the Kalhor consider the following factors:

1- Having enough *lawar*; or 'grazing capacity'. Pasture can be used when the grass coverage is satisfactory.
2- The presence of water basins. In places where water basins exist, grass normally grows better and faster in spring time.
3- Being *naqd* , which literally means 'cash'. The Kalhor consider a ground to be "cash", when its soil contains a high percentage of minerals. As in cases where the land has a water basin, here also the nomads expect the growth of grass to be better and faster in spring time.
4- *Beim*. This is a term used for pasture in which more of those varieties of grass grow, which are thought to be especially rich in nutritious quality.
5- *Gushta zö,* a term meaning 'meaty earth or soil.' It is used for land with deep good soil. This type of land has fine soil and is rich in minerals. There should not be many large stones, or rubble lying around. The color of the soil should be dark. The Kalhor consider pasture of this type to be the best. Therefore, land where a considerable part of it consists of this type of soil is highly appreciated.
6- *Süra zö* is a term used for land that mainly consists of a type of soil which is red in color. Compared to the above-mentioned "meaty soil", this type loses moisture faster and its grass coverage is relatively sparse.
7- *Kāwa zö* or *hālaku*. These two terms are used for a type of land which contains a considerable amount of gypsum mixed with the soil. In their definition of the defects or disadvantages of this type of soil, the Kalhor point to the factor "moisture". *Kāwa zö* loses moisture very fast. It is also thought to be poor in minerals. This type of pasture is recognized by the grey colour of a considerable part of its soil.
8- *Gacha zö* is the name for a pasture whose soil mainly consists of Gypsum. This type of soil which is also called *halati*, is thought to be the worst type of soil. In some areas near the borders between Iran and Iraq, the pastures have gypseous soil. Several clans of the tribe have their winter quarter in these regions.. Sunny or shadowy location. Pastures are divided into two groups; according to the amount of sunshine they receive both during winter and summer seasons. One is called *khwara tāu* meaning 'sunny' or 'sunshine', and the other *nasār* meaning 'shadowy'. The Kalhor have found that, in the winter quarters, a 'sunny' pasture has a grazing value that is more than five times higher than that of a "shadowy" one. However, in the summer quarters the result is said to be the opposite. There the grazing value of a shadowy pasture is higher than that of a sunny pasture.
9- Pasture with mulch. In Kurdish mulch is called *püsh*.

A pasture which has a good amount of mulch is considered to possess the following qualities:
1) It preserves large amounts of water.
2) It is not subject to much erosion.
3) It protects the first or early grasses, which appear after the first spring rainfall, against eventual frost.
4) Such pasture is considered as *beim*. As was mentioned earlier, pastures which possess much grass of high nutritious value are called *beim*. According to the Kalhor, the freshly grown grasses contain mostly water, and have lower nutritious value. They call this kind of grass *leyk*. However, if the flocks are also fed with mulch, this can compensate the above mentioned disadvantage of feeding animals merely with *leyk* grass.

**Timing for entering and leaving pastures**

As already mentioned, the ideal time for migration is determined after consultation with experts who have inspected the situation of pastures. Another important factor is the time of entering the pastures.

[3] Until modern times, nomadic ruling classes were acting like absolutist and authoritarian rulers, not only over their nomadic followers, but also over all sedentary communities living within their territories. Their relation to central government in the capital was limited to the payment of annual taxes and providing certain numbers of fighters to serve in the national army.

The time of entering the pasture is decided on the basis of *pala* and *pesht pala*. These are explained as follows:

a) *Pala* is the first heavy rainfall in autumn. It should rain at least for two or three days. The amount of rainfall should be so much that the rain penetrates the soil deeply enough to enable growth and sprouting of seeds. Other Kalhor say that it should be so much that a lump of soil as big as a water melon would be completely washed away if it stood in the rain. These are traditional methods of measuring the amount of rain needed. At this time of the year the weather is still warm. After the rain, two to three leaves will sprout on each grass plant.
b) *Pesht pala* refers to a second period of rain, which usually takes place about one week after the firs.

If these two rainy periods occur on time the nomads wait until the grasses of the summer pasture grow to a height suitable for grazing. For this, they use the expression *bāyda degānā*, meaning 'when the grass is high enough for animals' teeth to cut'. However, this is apparently not very significant for the grazing of sheep. Ideally, edible grass should reach a height known as *gākhwar* i.e. high enough to be cut off by a cow's teeth. This is normally higher than the height needed by a sheep. Thus the height of edible grass is about 10 centimeters.

If the period between the first and second rainfall is longer than one week, then the nomads try to delay the time of entering their pastures as much as it is possible. The decision about leaving the pasture is similarly dependent on the time of rainfall in autumn. They must leave the winter pasture before the time of blossoming and pollination begins. In good years, they leave in the Iranian month of Ordibehesht (i.e. April 21st till May 21st). In dry years blossoming starts earlier. In order to leave the pasture before the beginning of blossoming and pollination, the nomads may leave in the Iranian month of Farvardin (i.e. March 21st till April 21st). Depending on climatic conditions in dry years, they may have to leave even earlier, in the Iranian month of Esfand (i.e. January 21st till February 21st).

Before the time of blossoming begins, no one is allowed to use the summer pasture for any kind of grazing. The Kalhor are very well aware of the consequences when the preservation of pasture in spring time is not strictly observed. Because of these strict regulations, some serious conflicts have occurred between members of the tribe. Such conflicts used to arise when – for whatever reason- a group of nomads was not able to leave their autumn pasture on time. This is because such prolonged grazing reduces the quantity of the seeds for grasses of the coming year. They call the period of protecting the grass *gheykha*.

**Classification of Pastures among the Kalhor**

There are a number of criteria which play a role in determining the grazing value of a pasture. These are: Accumulation of edible grass; nutritional value; edibility; and digestibility of the grass. On the basis of these factors three types of pasture can be distinguished:

**Good Quality Pastures**

These are pastures which have the following characteristics:

a) They are *qarqāut* i.e. all parts of the pasture are intensively covered by useful vegetation.
b) Its soil is mostly of the type called *gushta* or meaty.
c) It is covered with *beim* i. e., nutritious grasses.
d) It has enough edible and digestible grasses.

In a good pasture there are vegetations like lucerne, fairy-cheese, clover, and grass belonging to wheat family (graminaceous), and meadow.

**Middle Quality Pastures**

A pasture is considered to be of middle quality when,

a) It is not as intensively covered with vegetation as. good pasture
b) Only few edible grasses grow there.
c) A considerable part of its soil is of the type called *sura* or 'red soil'.

**Bad Pastures**

In such\ pastures there is not much edible grass with nutritious value. Instead there are types of grass -like *Juwas*- which may even be harmful to the cattle. *Juwas* is a grass which the Kalhor consider to injure the eyes of their animals. In winter quarter, in this type of pasture plenty of grasses like goat's-thorn (*gawan*) are to be found everywhere. Such grasses are considered to be useless for cattle.

**Discussion and Conclusion**

This study aims briefly to describe some of the management strategies of the Kalhor pastoralists of Western Iran. It is interesting that different tribes in various parts of the world apply almost the same strategies in the field of pastoral management. This means that, traditionally, nomads all over the world have treated nature as a limited resource that is not to be exploited. Despite that there is evidence to show that, until only few centuries ago, all western Iranian mountainous regions were covered with thick forests. Not only, there have been lakes and marshlands,

creating a favorable habitat for different animals, birds, plants and other species. There is no doubt that the process of deforestation has taken place very rapidly. There are enough people who believe that pastoralists have also played a negative role in this respect. At the same time it is necessary to mention that the Kurdish nomadic tribes have been living in this area for quite a long time; making mainly seasonal migrations. They have been moving between their villages in the valleys and the mountain heights using the existing resources for several thousands of years. Therefore, they alone cannot have been the reason for the rapid dramatic deforestation we witness here. At this stage it is not possible to say exactly which other factors have been responsible for the present ecological situation. Nor is it possible at this time to claim that nomads have not played any role at all in this development.

What was described above in the case of the Kalhor seems to be a typical way of treating pasture by semi-nomadic tribes who follow the vertical migration method. It is clear that such groups have a different relationship to their pastures, than those nomads who make horizontal migrations. Some consider the semi-nomadic pastoralists of the Zagros mountain chains, to be mobile agriculturalists. This is because they move only between two places during summer and winter. For that sake, the political structure of Kurdish tribes has always been based on a region or physical location, rather than on the tribe (Bois, 1966: 32; Idem, EI). Many of these tribes also used to be engaged in limited amount of cultivation both in their summer and winter quarters.

According to Barth, Kurdish social organization is based on the endogamous close family marriage under which "no supra-lineage political authority is developed. In such a social organization, no interaction between a lineage and other groups is necessary except for a certain minimum of trade." (Barth 1953: 139). These are typical social and political organizations of peasant societies. From a historical perspective this type of organization prevented them from playing an important role in the history of the Middle East. Yet the same organization can be useful for survival in small units. It can also help them to organize themselves on the basis of modern agriculturalists societies.

During the Pahlavi regime (1925-79), especially from 1920-40, several nomadic groups were forced to settle down. Despite the fact that the forced sedentarization of nomads caused a lot of destruction and pain, such measures were not able to end this way of life completely. On the other hand, over the last two or three decades the rate of abandoning the pastoral mode of production has been so fast that in the next twenty to thirty years there may not be any nomadic groups left. As a matter of fact, this process of sedentarization was not due to a voluntary adoption of agricultural life, as was hoped by the authorities. Most nomads have sold their flocks in order to directly migrate to big cities. The proud nomads of yesterday have become the slum dwellers of today; following only unproductive activities and even engage in illegal trade. This is despite the fact that for over a century Iran has been working hard to overcome its problem of underdevelopment. Such population movements have not contributed to the development of the country, as happened during the time of Industrial Revolution in Europe.

In his research submitted to the University of Kassel (Germany) for an intensive course in international development, it was shown by Hamzeh'ee that until 1970 all important factors of development were present in Iran. Despite that, this country proved the failure of "Modernization Theories". Similarly, after the 1979 Revolution serious attempts were made by several governments - influenced by the "Dependency Theories"- which led to nationalization of all important industries. However, it finally became clear to many Iranian thinkers that none of the 'magical' classical theories can solve the problems of under-development. As a result, the 'no theory' approach of flexible strategies, which is often subsumed under the heading 'sustainable development' is currently favored by several Iranian thinkers.

One of the fields which were completely neglected in the classical theories of development was that of 'indigenous knowledge'. It has now become clear, however, that despite the wave of globalization, regional and local peculiarities, capacities and abilities should not be forgotten. Differences may exist, not only between different countries but also within the same country. In the small west Iranian province of Kermānshāh there are five different climatic zones. This has been the reason for sustaining both agricultural and pastoralist methods of production alongside each other over millennia. In several other studies, like that of Scoones (1994), Schareika (2001), and Leonard (2002), the migration of the nomads is described as a conscious adaptation of the pastoralists to the conditions of changing seasons. In the traditional habitat of the Kalhor in the central Zagros highlands - as in other mountainous countries- agricultural land is to be considered a scarce resource.

Nomad migrations are based on a thorough consideration of the existing conditions of the ecology and organization for utilization of scarce

resources. For the Kalhor, the differences in height and the disparity of rainfalls are key factors. It was found in different parts of Iran that a system like 'enclosure grazing' has been an efficient strategy to preserve good quality grass (Class I) (Moqadam, 2001). As was shown in the present study, the same was found among the Kalhor.

Taking into account the existing studies on the subject, one can say that all over the world, nomads have been aware of the scarcity of pasture ground. The same can be said about tribes that used to make vertical migrations, as they had to come back and use the same pastures every year. Therefore tribes could only survive if their pastures had the ability to regenerate. Perhaps the same could not be said about tribes which make horizontal migrations. There are some historical reports about the invading Turkic and Mongolian tribes pulling out the trees after destroying cities and towns in the Caucasus (Thomas of Metsop, 1978: 20). This may at least partly have been due to a world view that could have developed among tribes with horizontal migration. Still, the destructive activities of these tribes were surely minor compared to those of modern civilization and modernization. In any case, whatever the role of the nomads might have been in the pre-modern age, completely new conditions now prevail. As a matter of fact, the arid climatic conditions of western Iran are as such at present, that a completely new strategy has become necessary concerning the nomads. It no longer seems necessary to encourage the nomadic tribes to settle down. Not only that, they can today be regarded as an important factor achieving sustainable development, and for reducing pressure on the sensitive natural situation of the region. This is because modern industrialized cattle breeding methods need to use resources that are required for other economic sectors and other purposes. Among these resources are water and land. For example they use the same water resources that are needed for the agricultural sector, or for the consumption of settlements.

Pastoral nomads utilize resources in remote areas which cannot be used by other economic sectors, or for other purposes. Even as far as pollution and other ecological problems are concerned, the nomads' methods are clearly much less polluting than industrial cattle breeding. Therefore, under the changing conditions of modern times, pastoralism apparently is no longer to be considered as a political or ecological problem. Not only that, it should be considered one of the important contributory factors to sustainable development.

Considering the latest published census in Iran, the number of those who still follow traditional methods of nomadic cattle breeding is put at 1.304.089. They possess about 22.6 millions of cattle. It is important to add that these Iranian nomads produce more than 500 thousand tones of dairy products. In addition they also supply an important part of demand for meat (mainly mutton).

It should be emphasized that the economic role of the nomads can by no mean be replaced by the modern industrial units. Still, this important economic role has been neglected owing to the fact that traditional attitudes towards nomadic people as being rebellious have always prevailed among the government officials. These officials have remained ignorant of the changing situation in the last few decades. Therefore, they have so far made political factors their main concern as far as the pastoralists are concerned. This seems to have been the main reason why the changing situation of the nomads has been overlooked by the authorities. Indeed, a novel, negative concept has been added to this, to the effect that nomadic pastoralists are held responsible for ecological problems and deforestation. Therefore it is necessary to make the authorities realize that no nomadic group has posed any political threat to the central government for quite a long time. The latest of such rebellions took place about four decades ago, and involved the Qashqāi tribes of central Iran. At the same time, the number of people engaged in this sector is now drastically reduced to less than two percent of the total population. People, who were not forcibly induced to abandon their traditional life-style, have voluntarily given it up en masse. For this reason indirect governmental interference has become necessary.

Governments can encourage this mode of production through a variety of policies. For most Iranians in rural areas, the concentration of medical and educational facilities in the big cities and their own lack of such facilities, have been important factors encouraging them to leave their ancestral way of life. At the same time the present nomads should be made aware of the conditions and opportunities of the free market economy. They should be encouraged to organize themselves and create relevant cooperatives in order to get better prices for their products. As a matter of fact they can make the best use of increasing demands for organic goods. In contrast to farmers, who need much capital to turn to organic cultivation and market strategies, pastoralists only need to continue their traditional ways of production. Despite that, as was mentioned earlier, Kurdish nomads traditionally have a social and political organization similar to agriculturalists and farmers.

Kurdish pastoralists like the Kalhor, could revive their traditional methods of pasture management. In this way they themselves could

become the protectors of their own natural environment. Moreover, this could not only become the best advertisement for their dairy, wool and leather products, but it could also create new economic niches, such as tourism. Iranian nomadism has always been based on the extraction of a variety of resources (Round Table on Pastoralism, 1992). According to the latest census, the nomadic tribes of Iran have been engaged in agriculture and gardening on more than 450 thousands hectares of land as well of 200 thousand hectares of plantation. In the field of home industry they have produced more than 227 thousand pieces of handicrafts (Amiri and Emādi, 2004). They have traditionally been capable of making use of arising economic opportunities.

Within a dynamic economy, the unique natural conditions of western Iran can make cattle breeding, agriculture and related sectors not just profitable, but also attractive for other sectors. Moreover, the present market situation requires them to try and revive their ancient indigenous knowledge. They can make use of their traditional method of using medical herbs and trees which are available in the Zagros Mountains. The Iranian nomads are able to use their entrepreneur abilities within their own traditional method of production. This could be done in accordance with current national and international market conditions. In this way, they will be much better rewarded than trying their luck in the difficult conditions of big cities. Thus new difficulties such as mostly accompany the process of modernization in the so-called Third World societies, would eventually be prevented; At the same time, the easiest way of employing methods of sustainable development for at least one sector of the economy, would be put in to practice.

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