American-Eurasian J. Agric. & Environ. Sci., 3 (2): 194-199, 2008
ISSN 1818-6769

The Challenges of Sustainable Management in Renewable Natural Resources in Iran: A SWOT* Strengths

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Abstract: The renewable natural resources constitute the main buddy of Iran's economy. The exploitation system of these resources, however, faces great challenges. In this study, we put together all available data and information for investigating positive and negative aspects regarding management of rangelands in a SWOT framework. Climate and biodiversity, vast and wide spread rangelands, educated labor force and high educated experts, government financial and technical supports, besides reduction of population growth rate, government good financial position and possibility of developing other side activities considered to be positive factors or strengths and opportunities in rangeland management. Inappropriate rangeland utilization system, weakness in fodder plant production and climate change and desertification, ambiguity in property rights, over capacity grazing, early grazing and bush cutting realized to be weaknesses and treats for sustainable use of rangelands.

Key words: Rangelands · sustainability · SWOT · Iran

INTRODUCTION

Iran is a vast country with an area of 165 million hectares of which more than 80% can be classified as arid, semi-arid and sub-humid regions. Its renewable natural resources that constituted a good part of our natural environment were well protected and exploited by our ancestors in an almost sustainable manner. The inhabitants of ancient Iran had learnt how to use their limited, fragile resources of arid lands wisely and safely and as long as the population was in balance with the resources there was no threat of degradation. But, when demographic, political and economic transformations begin in the last century, the situation altered, since that time, Iran experiences a hard transition era in utilization of natural resources. In fact, as a consequence of population explosion and economic and social problems in Iran in last decades, the rate of utilization of renewable resources has been accelerated in such a way that could be nominated as a rebellion against nature. According to United Nations Development Program report: Iran is facing serious environmental challenges; environmental and natural resources have been substantially degraded, mainly due to unsustainable development and consumption patterns, overpopulation, institutional fragmentation, inadequate enforcement and a number of socioeconomic root causes [1]. Degradation of environmental and natural resources includes deforestation, destruction of rangelands, desiccation of rivers, decreasing the level of underground waters. This internal situation, beside the global treats such as: climate changes, reduction of rainfall, global warming, created dark prospects for sustainable use of resources and needs more attention from government as well as livestock holder and other related organizations and institutes.

After land reform in Iran, in early 1960s, the natural resources came to control and property of state (called nationalization of natural resources) and from that time government is owner of all the resources. But in fact, the users of the renewable resources (particularly rangelands) are people of the regions in which resources located and government has not been able to control and posses the resources in practice. This subject is one of the chronic problems in natural resources management that exacerbated degradation and non-sustainability.

MATERIALS AND METHODS

In this study we focus on the Iran's rangelands management (although the base problems is the same for all renewable resources) and provide a SWOT (Strengths, Weaknesses, Opportunities and Treats) analysis for the challenges face sustainability of this renewable natural resource. There exists little sound factual data on the

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situation and changes of rangelands, however there is, documented evidence of the decline and apparent extinction of several species of the rangeland, mammals, as well as photographical and anecdotal evidence of changes in vegetation structure [2]. We put together all available data and information from different sources to clarify positive and negative aspects regarding management of rangelands in the SWOT framework.

DISCUSSION

A brief list of more important issues regarding Iran's rangelands which could affect sustainable use of this renewable natural resource has been presented in Table 1. Climate and biodiversity, vast and wide spread rangelands, educated labor force and high educated experts, government financial and technical supports, beside reduction of population growth rate, government good financial position and possibility of developing other side activities considered positive factors as strengths and opportunities in rangeland management. Inappropriate rangeland utilization system, weakness in fodder plant production, non-availability of house fuel for pastoralists and climate change and desertification, ambiguity in property rights and over capacity grazing mentioned as weaknesses and treats.

Table 1: Strengths, weaknesses, opportunities and treats of rangeland management

Strengths
Climate and biodiversity
Vast and wide spread rangelands
Educated labor force and high educated experts
Government financial and technical supports
Weaknesses
Inappropriate animal husbandry system
Weakness in fodder plant cultivation
Opportunities
Reduction of population growth rate
Government good financial position
Possibility of developing other side activities
Treats
Climate change and desertification
Ambiguity in property rights
Over capacity grazing
Early grazing
Bush cutting

Strengths

Climate and plant diversity: Iran is a mountainous country, with a total land area of 1,648,195 square kilometers, lies between 25°00' and 39° 47'N and 44°02' and 63° 20'E. Thus the southern half of the country is in the subtropical zone and the northern half of the country in the temperate zone with a desert zone in the middle of the country around 30° N. Iran is in the arid zone, some 65% of its territory has an arid or hyper arid climate and approximately 85% of the country has an arid, semi-arid or hyper arid environment. The mean annual rainfall is about 246 mm. The total annual volume of precipitation equals 413 billion cubic meters of which 44.5 billion could be controlled and managed for utilization. The main climatic zones are: Caspian zone, Baluchi zone, Irano-Turanian zone, subdesertic zone, steppic zone, substeppic zone, xerophilous forest zone and highest mountains zone.

In biodiversity, Iranian habitats support about 8,200 species of plants, of which almost 1,900 are endemic. Also, presence of over 500 species of birds and 160 species of mammals has been confirmed. In brief, because of its large size and varied ecosystems, Iran is one of the most important countries in the Middle East and western Asia for conservation of biological diversity.

The wide diversity in climate, plants and mammals, can provide various alternatives and plans for conservation and reclamation of rangelands. At same time this could be problematic, off course.

Table 2: Rangeland major vegetation types and their attributes

Type	Area (million ha)	Mean DM (kg/ha)	Usable DM (million tons)
Fair-good	14	290	4.0
Poor-fair	60	92	5.5
Very poor-poor	16	26	0.5
Total	90		10.0

Vast and wide spread rangelands: Iran's rangelands cover 90 million hectares, which have been classified as poor (48.3% or 43.4 million ha), fair (41.4% or 37.3 million ha) and good (10.3% or 9.3 million hectares) condition. According to its vegetation types, three classes could be recognized: grasslands; shrub lands; and desert which embrace both, but in low density [3]. Table 2 indicates more details.

As Table 2 shows, the usable dry fodder of the total rangelands toughly equals 10 million ton that can provide feed for about 35 million animal units. This a good potential and could be expanded with pasture plans and projects beside observing the grazing rotation and caring capacity, to cover more production, although

it is inadequate for feeding about 80 millions animal unit and providing all subsistence of more than 10 million people, as in the current time happens.

Educated labor force and high educated experts: Despite all problems raised from the last decades sociopolitical changes, literacy level of all population and particularly rural and rancher population had a fair increasing trend and high education capacities and facilities developed in a extremely growth rate. So that Iran doesn't lack skillful labor force and high educated and experienced experts for planning and implementing rangelands reclamation and conservation.

Government financial and technical supports: There is a project conducted by both the Department of Agronomy-Ministry of Jihad e Agriculture and Technical Bureau of Rangelands under which, the farmers are given free of charge, some perennial range fodder seeds and chemical fertilizers to cultivate their low yielding farmlands which are usually located on hillsides. From its start in 1986, more than 2 million hectares of range and farmland have been cultivated thus. Furthermore, there are many research plans and projects to conserve and reclaim rangelands; beside financial supports and even property transferring of national rangelands for appropriate and economical investment projects.

Weaknesses

Inappropriate animal husbandry systems: There are different animal husbandry systems in Iran, including sedentary system, nomadic and transhumant system and industrial system. The sedentary animal husbandry, a common system in Iran, is mostly practiced by farmers in a system of mixed farming with animals in support of crop production. Herds are taken out from the village to the adjacent communal ranges in the grazing season. Crop residues, weeds, wheat and barley stubbles are other sources of animal feed. A herd usually comprises goats and sheep, while this system as a whole consists of sheep, goats, cattle, donkeys and horses. Cattle, when present, are rather kept on the farms or graze on the plains adjacent to the village, as they cannot move very far from the village, due to the topography of the rangelands. Meat is the main output of the system and milk, directly or in processed forms, is mainly consumed by the households. In this system, usually, small numbers of animals of various households are combined to form a herd kept by a herdsman. Each household contributes to the salary of the herdsman in proportion to the number of animals. There is no clear individual grazing right for the households; and there is no clear limit for the number of animals, on the other side. In the formal way, only lawful livestock holders who have grazing permit are allowed to graze the range; but in practice never this law has been implemented and seems never could be implemented in future. This is an apparent weakness in the present rangeland utilization system that needs an urgent remedy in Iran.

Nomadic system is defined as: a type of animal husbandry in which livestock owners follow the irregularities of the weather, in search of drinking water and pastures for their herds and flocks. The vegetation density of semi-arid and arid rangelands is low and the temporal and spatial variation in forage supply and quality is enormous. These large fluctuations, combined with periodic lack of drinking water and very high temperatures, force ranchers to move with their herds continuously. Nomads generally, do not own any specific area, they live at subsistence level and their products are mostly absorbed by the family, so that their contribution to the supply of meat or other animal products is small. This type of animal husbandry is rare in Iran. Another type of nomadic system exists that could be called: transhumant systems. Transhumance is defined as; "a type of animal husbandry in which ranchers regularly graze their herds in two or more geographically separated grazing orbits within a year" [4]. This animal husbandry system takes advantage of the temporal and spatial variability associated with typically altering rainy and dry seasons. In Iran, annual migrations take place from mountainous cold rangelands towards the warmer plains at the beginning of autumn, with the reverse movement in spring, when temperature increases. In the Iranian system of transhumant animal husbandry, two range sites are allocated to a family, one in the cold and the other in the warmer region, the route between the sites is fixed and the right of grazing of available forage along this route is recognized by local farmers and tribes. Transhumant animal husbandry is practiced in Iran predominantly in the Zagros Mountains. Most commonly, households move with their herd, but settled families might hire a herdsman or entrust their animals to other members of the tribe. The government owns the lands, the ranchers however, are granted a grazing permit on both sides of the mountains [5].

The only livestock raised in industrial system is cattle. The livestock raised in this system do not leave the barns yearlong and are totally fed on cultivated fodder and supplements and imported feed. The cattle are usually

Table 3: Contribution of different sources of feed production

Source of fodder	Production (1,000 tons TDN)	Contribution (%)
Fodder plants	4,155	17.5
Crop residues	7,322	30.8
Agro-industrial by- products	6,394	26.9
Range forage	5,885	24.8
Total		100.0

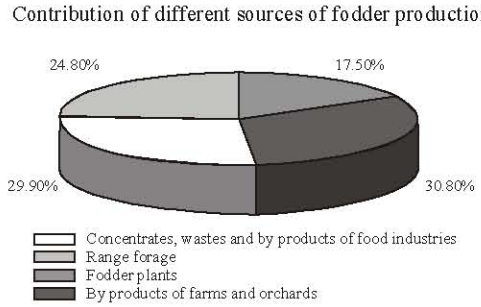

Fig. 1: Contribution of different sources of fodder production in Iran

kept in the vicinity of cities where the veterinary, sanitation and marketing services can be easily accessed. The outputs are both dairy and meat products.

According to Forest and Rangeland Organization's reports, the share of sedentary, nomadic and industrial systems in meat production is 72%, 17% and 11%; and in milk production is 56%, 30% and 16% respectively.

The above animal husbandry systems, obviously, do not mach nowadays need. The share of industrial system (as a non-dependent system to rangelands) is only 11% of meat and 16% of milk production, in other words, rangelands are (directly or indirectly) the production place for some 89% of meat and 84% of milk requirement for 70 millions people and employment place for more than 2,000,000 families. This is not a fair utilization of rangelands; but it is imposed compulsory by lack of other income sources for and wide spread poverty of rural people.

Weakness in fodder plant production: In Iran about 8% of the lands under annual crops were allocated to the production of fodder in of which about 86% is irrigated and the rest (14%) is rained. More than 70% of the land area under the fodder production allocates to the production of Lucerne (alfalfa). The other fodder crops are sainfoin, maize, beet, turnip, sorghum, etc. The total amount of dry fodder production is about 9 million tons; or 4 million ton in TDN. The contribution of different sources of feed is shown in Table 3 and Fig. 1.

As indicated, the fodder plant contribution is less than 18% of total produced TDN and about 25% of TDN has been produced by rangelands. So, the expansion of fodder cultivation is an important tool for decreasing the burden of overgrazing on the rangelands.

Opportunities

Reduction of population growth rate: The population growth now abated, so that the growth rate of 2.5% in 1980s has been reached about 1% nowadays. This is an opportunity for planning a new design in order to adjust population density in rural and pastoral areas and transfer the excess population to other parts and sectors. Such a task needs extensive investment in industry sector, particularly Small and Medium Enterprises (SME) and political and economical stability.

Government good financial position: At present time, the high price for raw oil as the main source of the state income, created an exclusive opportunity to government for removal of our chronic backwardness and heavy war damages and assistance to poverty control and environment sustainability; that may be not repeated. So, taking advantage from this opportunity is a national duty for all Iranians, particularly governors and policy makers.

Possibility of developing other rangeland side activities: Development of small and medium enterprises related to the rangelands (such as useful herbal drugs and gum tragacanth production, honeybee breeding and the related industries) besides ecotourism development, could provide considerable employment and income, supporting country to the aim of sustainable use of rangelands.

Treats

Climate changes and desertification: Climate changes refer to adverse changes in temperature, precipitation, underground water and sea level. Increment in temperature and reduction of precipitation has direct effect on rangelands vegetation; so that the grazing capacity of rangeland may be reduced gradually; eventually leading to desertification.

Ambiguity in property rights: Prior to the enforcement of the law on nationalization (1963) of natural resources, the people had cadastral documents. The rangelands were their own asset and they behaved well with their asset in its utilization and conservation. Landlords even used to

lease rangeland to the livestock holders for a given period and a certain number of livestock. The lord knew quite well that if his rangeland would be degraded then he would gain less money next year. So he would never let any one degrade his rangeland and used to check the rangeland periodically. But the aforementioned law cut their authority over this valuable resource and the competition to exploit rangelands started while there was no strict control over the range utilization.

After the enforcement of the nationalization law, all natural resources including rangelands were state owned. Government decided to take measures to recognize the lawful and authorized users to issue a grazing permit in order to enable the experts and staff to control rangelands, but the plan was not successful. Four years later (1967), the government decided to start introducing range management plans like the ones implemented in the west. Range management plans included some instructions to push the exploiters toward conserving the range resources while taking the maximum benefit possible. According this plan, the Forest, Range and Watershed Management Organization (FRWO) of Iran and the specified household would make a contract. This contract is valid for 30 years and if the instruction is followed properly, it will be extended for another term. This plan has been not implemented successfully, too. In other word property right of rangelands is not clear after 45 year of nationalization and there is a dispute between government and people, leading to more conflict and degradation.

Over capacity grazing: The grazing capacity of total rangelands of Iran is about 35 million animal units (for 7 month grazing), but currently more than 80 million animal units graze on it, belonging to 2,000,000 families (more than 10,000,000 population) of which livelihood of about 1,000,000 families directly is depended on rangelands. In other words, the number of users conflicts with socio-economic potential of the land, so that the number of people that their livelihoods are depended on rangeland is 5 times more than rangeland real capacity. Nevertheless, the number of livestock in herds is not in commercial size [6]. So, the only way for cutting this excess grazing is development of industrial animal husbandry and creating employment opportunities for related population in other sectors.

Early grazing: Ranchers are usually very anxious in the spring to take livestock out on pasture as soon as the snow melts. Early spring grazing has a considerable effect on production in those pastures during the growing season. Grazing before grass plants reach the third leaf stage causes a reduction in herbage production which can reduce stocking rate and animal performance [7]. Early grazing has been recognized as a main destructive factor in Iran [8]. The long run solution for this difficulty seems to be property rights reform and clarification, but in short rum extension and promotion programs could help ranchers to exploit more cautiously the resource.

Bush cutting: The most rural and pastoral areas in Iran, not only do not access to CNG energy network, but also to the other fossil fuels and electricity for house uses. Therefore, inhabitants of these areas, unwantedly, commit to cut trees and range bushes and shrubs such as Goat's Thorn (Astragalus gossypinus), for warming their house and cooking. This is another effective factor in rangelands degradation. This problem needs an urgent attention from government to provide the initial energy requirements of rangeland inhabitants.

CONCLUSION

Iran (a large country with various climates and extensive number of pasture plants) could exploit its vast range lands for producing huge amount of livestock products, as well as developing small and medium enterprise related to plants of rangelands (such as herbal drug and gum-tragacanth production, honeybee breeding and related industries).

Unfortunately, at present time a set of economic, social, political and environmental problems (such as poverty, population growth, inappropriate utilization systems, ambiguity in property rights, centralized and corrupted administration system and adverse climate changes), leads rangelands to degradation. Improving our econosociopolitcal deficiencies, could provide an opportunity of conserving, protecting and exploiting in a sustainable way our rangelands (and other natural resources). But continuing current path in unsustainable exploitation of renewable natural resources besides depletion of oil reserves could be ended a real disaster in future for our nation.

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