

The Impact of Economic Forces on Resource Use, State of Conservation, and Productivity of Rangelands in Northeastern Balochistan***Nek Buzdar, Ph.D.****Abstract**

In Musakhel and Barkhan districts of Balochistan and along the western slopes of the main Sulaiman mountain range, Baloch tribes raise animals, mainly sheep and goat, on rangelands that are commonly owned. This paper looks into the impact of economic forces such as income, prices, interest rates, and taxes on an individual animal raiser's behavior towards resource use and productivity. An individual animal raiser's behavior towards resource use expressed in number of animals raised per unit of rangeland/stocking rates/use rates, directly impacts rangeland productivity or carrying capacity because the rangelands in Balochistan are generally overgrazed. Under such overgrazed conditions an increase in stocking/use rates leads to a decrease in range carrying capacity or productivity and a decrease in stocking/use rates leads to an increase in carrying capacity or productivity of the rangelands. The paper analyzes changes in economic forces that lead to changes in animal raiser behavior and changes in animal raiser behavior that lead to changes in range carrying capacity and productivity.

Based on theoretical and quantitative analysis the following conclusions are drawn: (i) The interest rates are determined through the Nimsudi share cropping system of borrowing and lending of female animals.

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The Nimsudi system provides that, at the end of the year, the net gains in animal off spring, are equally shared by the borrower and the lender.

The Nimsudi system of sharecropping provides insurance against risk to both the lending and the borrowing parties. There is no incentive to increase the stocking rates, thus positively affecting the state of resource conservation and productivity. (ii) There are, at present, no government taxes, but the tribesmen are obligated to pay taxes and contributions to the religious people, to the needy kin, to the tribe (collective ransom and fines), and to the tribal chief (Bijjar). Almost all these tribal and religious taxes and contributions are progressive in nature. The progressive taxation system as it exists in the traditional areas discourages accumulation of large numbers of animals. The net effect of the progressive taxation system, therefore, is less overstocking and less depletion of the resources. (iii) Conservation economic theory indicates that as the prices of depleting products rise it leads to depletion of resources and as the prices of conserving products rise it leads to conservation of resources. In the area sheep prices are generally high but sheep are intensive grazers and during lean years completely remove the vegetation cover and expose the soil to erosion and depletion. The quantitative data reveal that the non-traditional areas, where more sheep than goats are raised, are more depleted since the mean carrying capacity or productivity of these rangelands is low. Goat prices are relatively low but they are also extensive grazers, hardy and more mobile. The quantitative data reveal that the rangelands where more goat than sheep are raised are less depleted and the mean carrying capacity or productivity of these rangelands is high. (iv) Higher income levels in the traditional areas are associated with low stoking rates and higher carrying capacity.

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In the non-traditional tribal areas low income levels are associated with higher stocking rates and low range carrying capacity or productivity.

As expected the poorer non-traditional area herders will resort to overgrazing and depletion more often than their richer traditional area counterparts. (v) In the non-traditional areas, due to more exposure to market forces and demonstration effects, expenditure on necessities of life are high. Higher expenditure on basic necessities of life results in higher stocking/use rates and thus in the depletion of the rangeland resources.

Introduction:

Study Objectives

The paper looks at the impact of economic forces on rangeland productivity and state of conservation in a tribal, pastoral, and nomadic environment. Koh-i-Sulaiman in the mountainous north-eastern Balochistan is part of the general tribal areas along the Afghanistan-Pakistan border and extends from Afghanistan/Waziristan border in the north to Sindh-Punjab borders 250 miles to the south. The region has some of the best natural rangelands in Balochistan and the Balochi and Pashto speaking tribes depend on these rangelands not only for raising sheep and goat but also for fulfilling their basic needs of energy and shelter. Range and animal productivity as well as the living standards of the animal raising tribesmen have been rapidly deteriorating in recent years. The crucial factor that determines animal productivity as well the living standards of animal raisers is rangeland productivity or carrying capacity. Rangeland productivity, on the other hand, is determined by environmental factors as well as by the institutional and economic factors that influence behavior towards resource use.

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Studies to collect data on various economic factors, on rangeland use/stocking rates, and on rangeland productivity/carrying capacity were carried out among twenty rangelands. Due to many historical factors and vicinity to a main road system, some sections of tribes have partially abandoned the traditional institutionalized systems of resource use regulation. The twenty rangelands selected for studies included ten where traditional resource use related institutions were followed and ten, termed as non traditional, where such institutions have weakened or were not followed.

The data are analyzed and relationships or associations between various economic factors and stocking rates on the one hand and between stocking rates and carrying capacity are interpreted. The differential impact of the economic forces on the two institutionally different areas are also compared, analyzed and interpreted.

Conservation-Economic Behavioral Model Used

A model first developed by Ciriacy Wanhtrup (Wanhtrup, 1952) and later followed by James Gray (Gray, 1968) and others, postulates that economic forces like income, interest, prices, insurance and taxes influence an individual resource user's behavior in ways that lead to either depletion or conservation of the resources. The influences of some important economic forces and their expected outcomes, as explained by Wanhtrup and Geray, are stated below. A rise in interest rates tends to encourage or force a heavier use rate of range resources for two reasons. First, when money is borrowed at a high interest rate, the animal raiser will need greater returns from his enterprise to be able to pay back the principal and interest and still be able to retain a satisfactory return for his management and labor. The method mainly used to increase returns is to increase the stocking/use rates. In case of income, as income increases, the animal raisers are in a better position to lower their use rates.

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If income decreases animal raisers may attempt to increase their stocking rates. If future prices of products (animals) are expected to rise, the animal raisers will normally stock heavily and retain marketable livestock as long as possible. If there is an atmosphere of general uncertainty in prices, the animal raisers hold on to the livestock, they would have sold otherwise, hoping for a price recovery. Uncertainty or increases in prices of products that the animal raisers buy also encourages overstocking. Increases in prices of depleting products (animals) may lead to substitution of depleting animals for non-depleting or less depleting animals. Generally higher taxes encourage overstocking and depletion of rangeland resources. Progressive taxes discourage overstocking and regressive taxes encourage higher use rates.

The Prevailing Pastoral Economic System Among the Koh-i-Sulaiman Baloch

Almost 100 percent of the population in the study area depend on animal raising for a living. The rangelands are, for the most part, commonly owned and are managed under traditional institutionalized arrangements. The hierarchical tribal leadership regulates resource use and enforces laws with regard to annual closing periods, rotational grazing, and mandatory tribal taxes and contributions. Traditionally, the Baloch nomadic economic system has been characterized by subsistence form, equal access to rangeland resources, no accumulation of wealth, and a general absence of inequality among the members of a tribe. A large part of the food and other needs of life came directly from within the range and from the animals raised. Only a small portion of the animals were sold or bartered to obtain the few necessities of life which were not produced locally and had to be purchased from areas outside of the tribal territories.

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The animals surplus to the immediate requirement, were used for economic purposes as insurance systems through the loaning of animals and for social purposes as sacrifices and contributions towards the tribe and the religion. In recent years, however, among the tribes at the periphery and those exposed to outside influences traditional institutions have either disintegrated or have been, significantly, weakened.

Assumptions

Range management scientists (Gray, 1968, Stoddart, 1943) recommend that range utilization levels should not exceed the carrying capacity of the rangelands. If the current levels of utilization exceed the carrying capacity, production in subsequent years will be reduced, because the vegetation would have lost its ability to produce leaves, roots and seeds at the same rate as before. At these levels any increase in stocking rates normally leads to decreases in productivity, and conversely any reduction in stocking rates normally leads to increases in productivity. The existence of certain physical and economic indicators as well as empirical studies of rangelands in Balochistan, (Ali 1966, Bhatti 1970) show that, in general, stocking rates over the rangelands of Balochistan tend to be at levels beyond their carrying capacity or at levels where higher numbers of animals per range area, normally, leads to lower productivity while a downward stock adjustment leads to increased economic productivity.

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Range Carrying Capacity, Optimal Utilization Rate and Quantitative Analysis

Data on economic factors such as income, interest rates, prices, insurance, and taxes were collected through field surveys, interviews, and observations. To determine the forage productivity or carrying capacity of rangelands, field surveys of rangelands was carried out and data regarding the following items was collected (1) total range area in acres. (2) Percentage surface covered by vegetation (3) density of vegetation (percentage). (4) Vegetation palatability percentage. The product of all the items (1x2x3x4) gives the total range forage acreage. The forage acreage obtained through this method when divided by the forage acreage requirement per animal gives the carrying capacity of a given rangeland in animal units per time period. According to the Livestock department, Government of Balochistan (Ali, Bhatti) the requirement for a sheep/goat is 0.257 forage acres. The carrying capacity of each tribal rangeland calculated in this manner is compared with the actual use rates or actual number of animals being raised in a given tribal rangeland. A rangeland is considered overstocked when actual use rates exceed the carrying capacity, under-stocked when use rates are lower than the carrying capacity and optimally utilized when use rates are equal to the carrying capacity of the rangelands.

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Means, comparisons and simple correlation analyses are used to determine relationships between economic forces and resource utilization rates as well as between resource utilization rates and forage productivity of rangelands. To determine differential impact of economic forces under different institutional arrangements, half of the twenty tribal rangelands selected for studies practiced traditional resource use related rules and regulations, the other half did not.

Impact of Economic Forces on Range land Conservation and Productivity: A Theoretical Analysis

Interest Rates and the Credit System in the Pastoral Tribal Area

In the tribal areas of Koh-i-Sulaiman all local lending, borrowing and interest charges are in animal terms and no actual monetary transactions take place. In fact the local credit system is nothing but a form of share-cropping or profit-loss sharing arrangement. This arrangement is partly necessitated by the fact that payment or receipt of fixed interest is strictly prohibited among the Muslim tribesmen of the area. The system of borrowing and lending, generally female animals is called "Nimsudi".

Under the Nimsudi system, animals, mainly ewes and female goats, are loaned with the condition that at the end of the usual one-year period, net gains in offspring will be equally shared by the lender and the borrower. The borrower tends the animals and bears all input costs during the year. The input costs mainly involve the borrower's labor and entrepreneurial costs, as the ranges, in most cases, are commonly owned and generally no other inputs are used to increase the productivity of either animals or the resource base. The following example may help understand the concept of share-cropping as prevalent among the Baloch animal raisers of the Sulaiman mountain ranges.

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Suppose 100 mother ewes were advanced by the owner as principal/capital in the beginning of the year and the borrower/herder cared after the sheep and fed and bred them for one full year. During this one year period, say, 80 new lambs were born, but 10 of the mother ewes died, fell victim to predators, stolen or otherwise lost in circumstances beyond the borrower herder's control. At the end of the year the profits or gains and losses are shared by the borrower and lender as follows. First, 10 out of the 80 newly born lambs are selected as substitutes or compensation for the lost principal ewes and given to the owner so that he gets his principal of 100 animals back. The remaining 70 lambs are equally divided between the lender and the borrower so that each gets 35 lambs in gains. The share of gains or returns received by the owner is considered annual interest earnings of 35 percent on his capital of sheep in the above example. The actual interest rates would, of course, be lower because the money value of a mother ewe (assumed principal) is higher than a few months old lamb (assumed interest). The real interest rates could more realistically be 17.5 percent. There is another relatively less important and less prevalent system called, "Zarsari". Under the Zarsari system the animals with a fixed total value are loaned to a borrower in the beginning of the year. The borrower feeds and cares for the animals during the year so that they gain in value. At the end of the year the net gain in value is equally shared by the borrower and the lender.

In general, this system of share-cropping in animals provides insurance against risk to both the lending and the borrowing parties and, therefore, positively affects the state of resource conservation and productivity. It is easy to see that a rational borrower would be able to maximize his gains which are equal to the interest payments to the lender, if rangelands are less overgrazed and the health and higher survival and conception rates of animals are maintained.

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The current credit system in the tribal areas of Balochistan is founded on the traditional Baloch tribal as well as Islamic egalitarian principles. The widespread system over most areas of Balochistan seems to incorporate considerations of economic efficiency and social welfare as well. Considerations might have been redistribution of income from the rich to the poor and conservation of ranges in the interest of both the borrower and the lender as the lender and borrower maxima are the same. Seen this way, the credit system does not provide any incentive to the resource user, the borrower, to overgraze the rangelands.

However, in some areas the traditional credit system has undergone changes due to a variety of factors. In this case, the so called "Amanat" system requires the borrower to tend and care for a certain number of owner's animals without receiving any wages or compensation in any form. The real interest rates that the borrower herder pays to the owner are therefore higher, sometimes significantly, than the nominal interest rates calculated in the above manner. In this case, there is a high probability that the borrower will strive to increase his stocking rates in order to be able to pay the higher real interest and the principal. Here, the economic principle that higher interest rates mean lower present value of future streams of returns, may be applicable. The tribesmen without actually realizing it, may be striving to maintain the current levels of income and are moving their uses towards the present i.e. increasing the stocking rates. This confirms the view that overstocking, overgrazing and thus depletion are likely to be more severe in rangelands where a higher number of animal raisers pay higher interest rates.

Another aspect of the profit loss sharing arrangement as the basis of interest rate determination needs to be further examined.

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This has to do with an economic explanation for the seeming inflexibility (a fixed proportion of the output/returns =50/50) of the interest rates over time. It seems that in Balochistan, the lenders in tribal areas have purely economic as well as non-economic considerations in selecting their borrowers.

Interviews with the animal raisers in the tribal areas revealed that in recent years the demand for borrowing animals in the tribal areas of Balochistan has remained very high. The consistent high demand for animals should have bid up the capital price (interest rates) so that the lenders would, for instance, demand a two-third rather than the customary one-half share, as economic theory would suggest. But, we know that the interest rates in terms of a share of the output, have always remained the same in the tribal areas. The reasons can be explained as follows. First, the Muslim tribesmen follow the Islamic system of investment where at the end of the year profits and losses are equally shared by the borrower and the lender. Any different arrangements would be un-Islamic. Second, in the tribal areas of Balochistan economic gains are just part of the gains that the lenders seek in such transactions. They lend animals to their relatives and kinsmen not only to help them out when they need such help but in doing so they are also buying insurance for themselves. This is also true when lending animals to the friends, fellow tribesmen and other favored people. This is like deliberate rationing of the available supply of animals, or in other words, investments in social and political relations. One such investment is the establishment of political alliances and marriage relations with other individuals, groups and sub-tribes. The excess demand situations are coped with in this way, by lending on discriminatory basis and political and social benefits are substituted for economic benefits.

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Taxes and contributions

There are, at present, no government taxes levied and no government services provided in the traditional tribal areas.

However, the tribesmen are obligated to pay customary dues for religious and tribal purposes and to the needy kin, clan, and tribesmen. Because of their almost mandatory nature, their role is similar to taxes elsewhere, and because of their important influence on individual decision making process, these contributions are here referred to as taxes. In the tribal areas the most important taxes and contributions are those paid to the religious people, paid to the needy kin and on behalf of the tribe (collective ransom and fines), and those paid to the tribal chief himself (Bijjar). One particular religious compulsory tax (Zakat) at the rate of 2.5 percent (one out of forty animals) is fixed and proportional. All other tribal and religious taxes and contributions are progressive in nature. This is because of the fact that as the number of animals in the flock increases, the owner's obligations towards the kin, guests, religion, and tribe increase more than proportionately. As the conservation economic theory would predict, the progressive taxation system as it exists in the traditional areas discourages accumulation of large numbers of animals. The net effect of the progressive taxation system, thus, is expected to be less overstocking and less depletion of the resources.

Risk and Assurance and their Impact on Range Utilization and Stocking Rates

The existence of resource use related institutional regulations and enforcement mechanisms in the traditional tribal areas reduce risk and uncertainty and therefore encourage the tribesmen to practice conservative use of the rangeland resources. In the traditional areas when an individual following the institutional rules and regulations

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limits his animal numbers, he has the assurance that all other tribesmen would be doing the same. By reducing the risk and uncertainty, the holders of insurance policies (insurance provided by social institutions in case of tribesmen) are encouraged to practice conservative use of the rangelands.

Another aspect of the insurance problem involves risk avoidance through the share cropping arrangements prevalent among the tribes. Under the share cropping arrangement, as explained above, the net annual gains/benefits are shared equally by the borrower (tenant) and the lender (owner). An animal raiser is faced with an environment of risk and uncertainty, low output and incomes levels, and in poorer years he and his family face the very real danger of starvation. In such circumstances, the main motivating force in a borrower herder's life would most likely be the maximization not of income but maximization of his family's chances of survival. It seems that the share cropping system makes the best out of an inherently uncertain and risky situation faced by both the lender and the borrower. If the animal owner pays the shepherd/borrower a fixed wage or a fixed number of animals for his services, it would be efficient only if the animal borrower always worked hard and it did not cost the owner anything to monitor his work. On the other hand, if the borrower pays a fixed amount of money or a fixed number of newborn offspring to the owner as rent for the borrowed animals, he faces the risk that there will be a particularly bad year caused by a drought, epidemic, or another natural hazard, and there will not be enough animals left over for his family's survival.

Thus, a compromise must be found between the risk to the animal owner; that the borrower will not work hard, and the risk to the borrower; that a fixed payment of animals will be catastrophic for his family during years of drought and other natural hazards.

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Share-cropping thus is another situation of assurance and adaptation to the environmental conditions.

In general, this system of share-cropping provides increased assurance and thus no incentives to increase the stocking rates. But if the animal borrower is somehow made to pay a higher proportion of the output, say 75 percent, to the owner, it may result in higher stocking rates and depletion of the rangelands. In some cases the borrower is, in fact, forced to pay a higher share of output through the 'Amanat' system, resulting in relatively higher stocking rates and on average a lower productivity.

Prices

Prices affect the state of conservation and productivity of rangelands in many important ways. Economic theory indicates that as the prices of depleting products rise it leads to depletion of resources and as the prices of conserving products rise it leads to conservation of resources. Goat and sheep are the main types of animals raised by the tribesmen in northeastern Balochistan. Goats fulfill important subsistence needs of those who raise them, while the sheep are less capable of doing so. On the other hand, the market price of a sheep in this area has always been higher compared to a goat of the same age and weight because sheep meat and wool are highly valued by consumers outside of the tribal areas. Because of the above considerations, the tribal areas close to the road system and exposed to outside market influences, have adopted a production system which is more market oriented, raising more sheep and less goats. With intensive grazing, particularly in lean years, the sheep completely remove the vegetation cover and expose the soil to erosion.

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On the other hand the goats are extensive grazers, more mobile, and less depleting under the arid environmental conditions of Balochistan.

A related factor that impacts rangeland productivity is the prices of products that animal raisers buy relative to their own product - the animals. Many studies in the general region (Swift, 1976, Salzman, 1976 Spooner, 1967) have shown that the pastoralists' terms of trade in relation to producers of grain (bread made of wheat grain is the staple food for the tribesmen of Balochistan) have been deteriorating over the last many decades. Such a deterioration of terms of trade has forced animal raisers of Balochistan to raise higher number of animals in order to be able to purchase their basic necessities of life. This may be another factor behind the general overstocking, overgrazing and depletion of rangeland resources witnessed all over Balochistan.

Income Levels

According to our conservation economic model, higher incomes enable animal raisers to lower their stocking rates, and lower incomes force animal raisers to raise their stocking rates. As is shown in table 2. of the appendix, income levels are higher while stocking rates are lower in the predominantly subsistence oriented traditional rangeland areas. Because the traditional area animal raisers average income levels are higher compared to the non-traditional market oriented areas, it is expected that the non-traditional area herders will resort to overgrazing and depletion more often than their traditional area counterparts.

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Income Levels and Interest rates

In a free enterprise economy and under most conditions, people with lower incomes must pay higher interest rates for the borrowed capital. In the Koh-i-Sulaiman area of Balochistan, settlements are dispersed, borrowers and lenders may not live in the same locality, and close monitoring of animal losses and gains is generally difficult. Thus, the whole system of borrowing and lending is based on the trust that the borrower is honest and that at the end of the year he will not hide from the owner any facts about the losses and gains. If the animals die, fall prey to predators, or are stolen or lost due to no fault of the borrower herder, the Nimsudi system provides that the losses are borne equally by the lender and the borrower. A poorer animal borrower is more likely to have the need to sell or consume animals during the year and state at the end of the year that the same were lost due to natural and other hazards mentioned above. Therefore, lenders are less prepared to lend animals to low income people compared to those with high incomes. As shown in table 2 of the appendix, average income levels in the non-traditional areas are lower than in the traditional areas. This may be one of the reasons behind the fact that in the non-traditional areas some kind of conditional animal loaning system is practiced. Under this conditional loaning system the usual profit-loss sharing arrangements are allowed to prevail, but the lender requires that during the year, the borrower must tend a certain number of animals belonging to the owner for free. The system locally called the Amanat system essentially forces the borrower to agree to a higher interest rate payment. One would expect that individuals and groups paying higher interest rates would also tend to have higher use/stocking rates resulting in depletion of resources.

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Income levels and Time Preference rates

Income also affects use rates through time preference rates. The time preference rate has been defined by Wanthrop (Wanthrup, 1968, p.105) as “**the** ratio between the present marginal utility of money in more distant future intervals and the present marginal utility of the same amount of money in intervals nearer to the present”. According to Wanthrop and other economists, people with low incomes tend to consume higher proportions of their incomes at present and save less for future. Thus people with low incomes have high time preference rates than people with high incomes. As presented in tables 2 of the appendix, the average income levels in the areas where traditional institutions have disintegrated are lower than the areas where the traditional institutions are still intact. Therefore we expect that individual animal raisers in the non-traditional areas have high time preference rates and they have a tendency to overstock their rangelands and deplete their resources more rapidly than their fellow tribesmen in the traditional areas. Thus, even if the tribesmen knew that high use rates will decrease future productivity and future revenues they may still continue to have excessive uses to receive high revenues at present due to high time preference rates since they have lower incomes. Also high time preference rates for the tribes in non-traditional areas means that their social saving and investment rates will be lower. On the other hand, in the traditional areas where the institutions empower the tribe as a whole to control the uses of the resources, the tribe collectively will have a tendency to conserve or save resources for future. Also it is more likely that the tribes in the traditional areas will invest more to enhance future productivity of the rangelands.

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Expenditure on Basic Necessities of Life:

In the end it is the net income of an individual animal raiser that influences his decision-making with regard to conservative or depletive uses of the rangeland resources. This necessitates looking into a tribesman household's expenditure on basic necessities of life, knowing that higher expenditure on necessities means lower net income. In the non-traditional tribal areas higher expenditure on basic necessities of life, and a lower net income, will result in higher stocking/use rates and thus in the depletion of the rangeland resources.

Impact of Economic Forces on Rangeland Conservation and Productivity: A Quantitative Analysis

Quantitative data analyses are performed to determine the following: (i) Relationship between stocking/use rates and range forage productivity (carrying capacity) (ii) Relationship between economic forces and range forage productivity/carrying capacity.

Effects of Stocking/Use Rates on Range Forage Productivity/Carrying Capacity

It is obvious that the more a rangeland area is grazed the less forage will remain and the lower the productivity would be for the rest of the season. But overgrazing also affects next year's and all future years' productivity because grasses and trees might have been damaged permanently and rendered unable to regenerate and re-grow. Table 1. of the appendix shows data on stocking rates (animals per forage acre) and the carrying capacity (total area/forage acreage ratio) in each of the 20 rangelands studied.

Although carrying capacity and forage acreage measures adequately represent the range productivity, total area/forage acreage ratio is considered to be a better measure of relative biological productivity.

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Generally higher ratios in any particular rangeland indicate lower productivity. This ratio when related to animals per forage acre /stocking rates is expected to show relationships between general range forage productivity and stocking rates. To achieve this objective a simple correlation analysis is performed. The correlation coefficient “r” between stocking rates and the total area/forage acreage ratio (carrying capacity) is found to be 0.91. This shows a high correlation between the two variables. From this sample correlation coefficient a statistical inference about the population correlation coefficient “p” can be drawn. A 95 percent confidence interval for “p” is as follows: $0.55 < p < 0.89$. The null hypothesis that $p=0$ or equivalently that the sample correlation coefficient “r” is not significantly different from 0 may be rejected at the 5 percent significance level since the interval does not include 0. The test of significance of the sample correlation coefficient can also be performed as follows: $t = r / (1 - r^2 / n - 2)^{1/2} = 9.30$ and $t_{0.025} (18df) = 2.101$. The t value shows that the sample correlation coefficient is significantly different from zero. The significant correlation between stocking rates and forage productivity indicates that, in general, range productivity and stocking rates are negatively associated (increased stocking rates associated with decreased productivity) as expected.

Effects of Economic Forces on Range Forage Productivity/Carrying Capacity

Using simple correlation analysis, associations between the following variables are determined and interpreted. (i) interest rates-carrying capacity (ii) prices (sheep-goat ratio)-carrying capacity (iii) Insurance (provided by institutions)-carrying capacity (iv) Income levels-carrying capacity.

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Effects of Economic Forces on Productivity Under Different Institutional Settings

Interest Rates

Table 2. of the appendix shows that mean interest rates in the high productivity traditional tribal areas (27.8 percent) are about twice those in the low productivity non-traditional tribal areas (13.8 percent). This is contrary to our expectations, since according to conservation economic theory, higher interest rates are normally associated with lower productivity and vice versa. The main reason behind higher interest rates in the non-traditional and non-market-dominated tribal areas is the non- existence of regular credit markets and the use of the prevailing profit loss sharing system for interest rate calculation. Under the profit-loss sharing system higher economic returns mean both higher productivity and higher interest rates. Therefore under these special circumstances and due to the peculiar method of interest rate determination, higher interest rates are associated with higher range carrying capacity and productivity. In this situation, changes in interest rates do not cause changes in resource use and range productivity as conservation economic theory would suggest, but rather changes in productivity cause changes in interest rates.

Taxes and Contributions:

As is shown in Table 2. of the appendix, average annual amount of taxes and contributions paid in the traditional areas (Rs. 1671.7) are about three times those paid in non-traditional areas (588.9). The conservation economic theory tells us that generally, higher taxes encourage overstocking and depletion of rangeland resources. In case of the Baloch of the Sulaiman mountain ranges, the customary taxes and contributions are higher in the traditional areas simply because productivity and returns are higher in such areas.

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As in case of interest rates, it seems that the higher taxes are the result of higher productivity not vice versa. Many non-monetary and non-economic benefits, for example social and political status and prestige, are also gained when higher taxes and contributions are paid.

Prices and Insurance:

Sheep and goat constitute an overwhelming majority of the animals raised in the tribal areas of Balochistan. The sheep/goat ratio can be used as a proxy for the subsistence or market oriented production because of different relative prices and subsistence value of the two types of animals. In a subsistence economy goats are hardier animals and require less feed and care but fulfill important needs of human nourishment, equipment making and general subsistence, but sheep are less capable of fulfilling these subsistence needs. In a market economy where production is mainly for the market not for self-consumption, higher sale prices and profitability are the main consideration. Thus, data from the areas of study show that institutionally traditional rangelands raised more goats than sheep while the non-traditional rangeland areas raised more sheep than goats. Under overstocked and dry conditions the sheep completely remove the vegetation cover and expose the soil to the eroding forces of wind and water. The goats, on the other hand, usually pick up leaves of thorny bushes and trees like acacia without damaging or hindering the growth and future productivity of the trees and bushes and new leaves are produced after each rainfall. Further, since the vegetation, in general, is sparse and the rangelands are spread over large areas with only a few watering points, the goats are faster and more mobile hence a range with more goat herds than sheep herds will be more balanced in grazing.

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The opposite means that the areas near the watering points and camping areas will be overgrazed and areas farther away in the range remain un-grazed.

So it is only expected that there would be a positive relationship between market orientation and sheep/goat ratio, and a negative relationship between sheep/goat ratio and rangeland productivity. Table 2 of the appendix shows that this ratio is significantly and vastly different in the two types of tribal areas. The average sheep/goat ratio for the 10 non-traditional areas is 12.1 compared to an average ratio of 0.085 in the traditional tribal areas. The table also shows that a higher sheep-goat ratio is associated with a lower carrying capacity and vice versa.

Income Levels and Expenditure on Basic Necessities:

According to our model, as income increases, the animal raisers are in a better position to lower their use rates and as income decreases animal raisers may attempt to increase their stocking rates. Table 2 of the appendix shows that the income of an average family in the traditional areas (20,118) is 27 percent higher than the income of an average family in the non-traditional areas (15,838.1). This leads to the conclusion that since the average income levels are lower in the non-traditional areas, animal raising families will have a tendency to overstock, overgraze, and deplete their rangeland resources more rapidly than their counterparts in the traditional areas.

According to conservation economic theory, higher expenditure on necessities normally leads to higher stocking/use rates and thus in the depletion and lower productivity of the resources. In order to compare the traditional and non-traditional areas with respect to expenditure on necessities of life data from the two areas are presented in table 3 of the appendix.

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The table shows that average annual expenditure on necessities per family of six amounted to Rs. 6,604.1 in the non-traditional areas and Rs. 4,752.3 in the traditional areas. An average family in the non-traditional areas incurs relatively higher expenditure on basic necessities. This is expected to provide an incentive to a family in the non-traditional areas to increase stocking/use rates in order to meet the expenditure on basic necessities. One important reason for a traditional tribal area family to have lower consumption expenditure and thus higher saving and investment may be as follows. Living in remote inaccessible areas, the traditional area families have less knowledge of or demonstration effect on, as far as goods beyond their bare necessities of life are concerned. The traditional area tribesmen save more, their savings are immediately reinvested and result in more capital accumulation in the form of more breeding animals.

Conclusions:

The general conclusion is that economic forces of interest rates, income, taxes, and prices do influence animal raiser's behavior towards resource use which, in turn, affect range carrying capacity and productivity. Analyses show that higher range utilization or stocking rates are associated with lower range forage or carrying capacity and vice versa. An analysis of relationship between income levels and resource use rates reveals that lower average income levels in the non-traditional areas provide an incentive to the resource users to engage in overgrazing and depletion. At the same time, average levels of expenditure on necessities of life being higher in the non-traditional areas also results in non-traditional area animal raisers having a tendency to overstock and overgraze. Tribal and social contributions or taxes instead of influencing resource

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utilization and productivity seem to be themselves influenced by stocking rates and rangeland productivity.

In the traditional rangeland areas, for instance, lower stocking rates per forage acre result in higher productivity as well as in higher social taxes and contributions. The traditional areas have a lower sheep-goat ratio and have a higher physical (carrying capacity) and economic productivity simply because the economy is relatively subsistence oriented. In the relatively market oriented economy of the non-traditional areas the sheep goat ratio is higher, depletion of rangeland resources is severer and productivity is lower simply because sheep are more depleting animals than goats.

In recent years range and animal productivity as well as living standards of the animal raising tribesmen have been rapidly deteriorating. Since rangelands are the only available means of production in these areas, any improvement in the living conditions of the people depends on improving the productivity of the rangelands. Any measures to improve rangeland productivity, on the other hand, require that current uses, management practices, and the state of conservation of the rangelands be studied and their impact on range carrying capacity and productivity be determined. This study of rangelands of Balochistan is therefore a crucial first step towards undertaking programs of economic development for the improvement of living conditions of the poverty stricken tribesmen of Balochistan.

Table. 1. Relationship Between Stocking Rates and Range Carrying Capacity

.Range	Total acres Animals Per Acre	Forage acres Stocking Rate Animal/FA	Total area/ FA ratio	in	Animals range
Non-traditional Areas					
1.	14,782 7.156	198.724	74.380	1422	0.0962
2.	10367 6.151	284.664	36.418	1751	0.1689
3.	16120 7.397	212.912	75.712	1575	0.0977
4.	19258 23.057	135.139	142.500	3116	0.1618
5.	25598 13.191	223.558	114.500	2949	0.1152
6.	9675 4.072	190.564	50.770	776	0.0802
7.	11325 12.774	100.353	112.850	1282	0.1132
8.	4516 12.733	39.976	112.960	509	0.1127
9.	5614 9.606	60.898	92.187	585	0.1042
10.	24598 5.323	414.018	59.413	2204	0.0896

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Mean	14185.3 10.146	186.081	87.169	1616.9	0.1397
Traditional Areas					
1.	16462 2.145	401.309	41.020	861	0.0523
2.	17138 6.290	248.479	68.970	1563	0.0912
3.	12468 3.966	299.269	41.660	1187	0.0950
4.	17774 1.103	1353.429	13.132	1493	0.0840
5.	13757 10.654	136.103	101.070	1450	0.1054
6.	9306 4.190	153.712	60.540	644	0.0692
7.	15512 3.387	344.374	45.040	1165	0.0751
8.	15404 4.681	284.968	54.050	1334	0.0866
9.	22408 5.800	347.829	64.420	2019	0.0910
10.	16163 8.092	203.543	79.410	1647	0.1019
Mean	15639 5.030	377.302	56.931	1336.3	0.0852

Appendix.

Table 2. Effects of Economic Forces on Rangeland Productivity**(Average of five herders and average flock size= 129 sheep/goat)**

Tribe/ Range	Interest Ret/Income Rates	Taxes Sheep/Goat /contr.	Av. Income /Animal	Family Ratio	
Non-traditional Tribal Areas					
1	0.175	921	18333	151.50	10
2.	0.080	762	19629	135.37	
11					
3	0.173	862	15657	122.30	10
4	0.090	700	11764	103.19	12
5	0.130	452	20036	140.10	19
6	0.135	402	15681	161.65	9
7	0.167	542	17234	113.38	13
8	0.130	397	9883	112.30	17
9	0.153	495	12557	155.26	8
10	0.150	350	17588	132.20	12
Mean	0.138	588.9	15838.1	132.73	12.1
Traditional Tribal Areas					
1	0.335	1872	29127	220.60	0.1
2	0.220	1133	13971	121.48	0.03
3	0.330	2091	23598	182.93	0.05
4	0.280	1625	30246	193.88	0.02
5	0.265	1440	12593	89.95	0.10

6	0.290	2020	18600	170.64	0.025
7	0.365	1911	22415	191.58	0.050
8	0.340	1571	18165	153.90	0.300
9	0.117	1700	15639	148.90	0.080
10	0.240	1354	16826	115.25	0.100
Mean	0.278	1671.7	20118	158.91	0.885

Appendix.**Table 3: Annual Expenditure on Necessities (Average Family of Six Members)**

Tribe	Grains Total	Clothing	Sugar/Molasses	Tea
Non-traditional tribal areas				
1.	4,608 6,288	960	480	240
2.	4,840 6,401	741	600	220
3.	5,376 7,308	1,120	512	300
4.	4,200	882	720	320
5.	4,700 6,190	790	440	260
6.	4,580 6,891	920	550	220
7.	5,100 6,891	1,041	500	250
8.	5,402 7,199	812	710	275
9.	4,900 6,630	900	530	300
10.	4,872 6,742	890	800	180

Mean	4,857.8 6,604.1	905.6	584.2	256.5
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Traditional tribal areas

1.	4,300 5,670	940	340	90
2.	3,700 4,912	700	450	62
3.	3,375 4,605	810	390	30
4.	3,080 4,715	1,200	400	35
5.	3,272 4,624	1,050	230	72
6.	3,385 4,619	880	290	64
7.	3,000 4,380	1,000	332	48
8.	3,600 4,799	925	250	24
9.	4,000 5,402	970	400	32
10.	2,500 3,797	885	380	32
Mean	3,421.2 4,752.3	936	346.2	48.9

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