

## **Environmental Awareness for the Conservation of Juniper Forest: Case Study of District Ziarat, Balochistan**

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### **Abstract**

Pakistan suffers far more severe forest scarcity than most of the South Asian countries. Pakistan holds about 4.8 percent covered by the natural vegetation, which is equal to more than 4.2 million hectares of the total land area. In district Ziarat, about 100,000 hectares are covered by Juniper Forest, with a total forest area of 150,000 hectares. The distribution of vegetation is substantially affected by precipitation and surface temperature. Besides this lack of experimental research on nursery raising, unorganized tourism and low investment, the lack of awareness and coordination are the main problems for the conservation of natural vegetation. This study assesses people's perceptions towards the Juniper forest in a changing climate and suggested policy recommendations. The survey conducted from households using the Binary Logistic regression model. Findings showed that dealings with the environment are crucial to developing awareness among the people, encouraging affordable energy, and appropriate methods for afforestation and reforestation. The study revealed that voluntary participants in environmental protection activities are more aware than non-participants. Environmental awareness fosters a sense of responsibility

towards the environment. People realize that they are an integral part of the ecosystem and their actions have consequences. This understanding encourages them to make conscious and actively contribute to conservation efforts.

**Key words:** Juniper Forest, Environmental perceptions, Binary Logistic regression, Climate change, Conservation

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## 1. Introduction

The crucial issue that affects mankind is the problem concerned with land degradation associated with climate change. Climate change and the rapid growth of the population have enhanced the pace of land degradation, which has resulted environmental problems. Forests are vigorous to maintain ecological balance and environmental services. Forest plays an important role in the provision of wood and non-wood production including water, medicinal and aromatic plants, maintaining wildlife habitats, control of erosion, watersheds, ecotourism, and provision of countryside recreation, conservation of soil, and sequestration of carbon. The elements that constrain the natural vegetation of Pakistan are the inconsistency of precipitation and illegal cutting by timber mafias, which hinder the growth of vegetation (Atta Muhammad Sarangzai et al. 2012). Furthermore, the lack of coordination and awareness among the institutions, unorganized tourism, low investment, and experimental research especially on nursery rising, insufficient seed germination and reforestation are the leading issues. Some of the previous research discusses visitors' choices and socioeconomic determinants to provide insights that can be used to enhance visitors' awareness (Iranah et al. 2018). Higher levels of education are correlated with greater willingness to pay for environmental and vegetation conservation. Regardless of the subject matter, it is much needed to participate rationally and physically in building a healthy environment. Any variation in one parameter affects the other parameters whether directly or indirectly and on the contrary, it affects living organisms like humans and other habitats by destabilizing the ecology. Human effects on the environment and the environment have potential effects on humankind (Tanzer, Ruocco, and Ruocco 1966).

Pakistan suffers far more acute forest scarcity than most of the other South Asian countries. Pakistan holds about 4.8 percent covered by natural vegetation, which is equal to more than about 4.2 m ha of the total country land (Ministry of Environment 2003), i.e., very small as compared

with 30% of the world (FAO 2001). Balochistan has the only juniper forest in the Ziarat region. Some of the oldest juniper forests have 2,500 to 3,500 years old trees in district Ziarat (Marcoux 2000). Therefore, 100,000 hectares of covered by junipers of the total forest of 150,000 hectares in district Ziarat, which has global importance (IUCN 2011). The management of Juniper excelsa aims to ensure the conservation of forest biodiversity and maintenance of ecosystem functions including combating natural disasters, regulation of water resources, improvement of habitats in protected areas, mitigation of climate change, the greening of the urban environment, and promotion of ecotourism. The factor that degrades and depletes the juniper excelsa forest is the low capacity of natural regeneration in district Ziarat (Atta Mohammad Sarangzai et al. 2012).

Climatic parameters consist of precipitation, humidity, temperature, number of rainy days, sunshine hours, wind velocity, cloudiness, pressure, etc. Rapid Climate Change (CC) associated with a rise in Green House Gases (GHGs) emissions (Intergovernmental Panel on Climate Change 2015) influences the current and future vegetation patterns, and coupled with other human-influenced factors are also involved (Sala et al. 2000). The rise in the population is known to be the main motive of regional changes in climate (Pielke 2003). Primary vegetation tends to be more resilient to climate change and anthropogenic changes than secondary vegetation and plantations (Thompson et al. 2009). Instant climate change over the next 100 years is likely to lead to key changes in the distribution of natural vegetation.

Climate and natural vegetation seem to have reacted to past global climate change (Rajagopalan et al. 1997). Surface temperature and monsoon precipitation significantly affect the distribution of natural vegetation (Sarkar and Kafatos 2004). Since natural vegetation requires precipitation, favorable temperatures, and moisture, it may characterize regional weather. Natural mountainous forests are susceptible to the more severe effects of climate change (Gopalakrishnan et al. 2011). Besides this, the forest cover area expansion depends on the amount of precipitation received by vegetation, and in turn, it affects the environment (Tiwari 2006). Climate change's impact on forest ecosystems is crucially important in long-term forest planning (Ravindranath et al. 2006).

The Forest and Wildlife Department of Balochistan faces many challenges, like deforestation, loss of natural habitats, prolonged drought, degradation of watersheds, overuse of rangelands, desertification, pollution, and the complex land tenure system, the dependency of the population

on biomass for energy, ineffective enforcement, and lack of inter-departmental coordination. About 32% of the total energy requirements of the country are met by biomass fuels. The development of the world population is aware of and concerned about the environment with its associated problems so that the population will have the knowledge, attitudes, skills, motivation, and commitment to work collectively and individually towards solutions.

This study assesses the awareness of the local community regarding the natural vegetation of district Ziarat, Pakistan, which has not been measured before. To emphasize the importance of the matter of how the people (whether aware or unaware) of Ziarat respond to land degradation and its policy guideline on a large scale. This study aims to measure the impact of socioeconomic and environmental factors on the awareness of the local community for the conservation of Juniper Forest. It is highly crucial for the environment of the province of Balochistan to draw policy implications and suggest alternative solutions for the loss of vegetation.

## **2. Data And Methodology**

### **2.1. Introduction to Study area**

Balochistan is one of the largest (area-wise) among the four provinces of Pakistan. The warmest month in Ziarat is July with 28 °C of temperature and the coolest is January at -9 °C. Second, the largest *Juniperus excelsa* forest in the world is to be found in district Ziarat and adjoining Quetta and Harnai districts (Khan et al. 2022).

### **2.2. Collection of Primary Data**

Primary data collected from the questionnaire through informant interviews and focus group discussion through multistage random sampling techniques from the households of district Ziarat. To examine the perception of respondents of Ziarat district towards land cover change and need for its conservation and protection. The population of District Ziarat is 189,535 (Census 2023). A total of 22,894 Households (HH) with a 95% confidence level and 6% marginal error, which is estimated from the Arkin and Colton (1963) formula to survey 265 households from the study area.

### 2.3. Analytical Model for Awareness

A binary logistic regression model used to examine the awareness of households toward the conservation of the environment around them.

$$\text{Log} [p / (1 - p)] = \alpha + \beta_i x_i$$

$$EAW = (\alpha_0 + \alpha_1 \text{Edu} + \alpha_2 \text{UR} + \alpha_3 \text{P} + \alpha_4 \text{L} + \alpha_5 \text{LS} + \alpha_6 \text{EX} + \alpha_7 \text{M} + \alpha_8 \text{EH} + \alpha_9 \text{WTP} + \alpha_{10} \text{EV} + \varepsilon_i)$$

Where alphas are the coefficients to be estimated via a logistic model, and description of the dependent and independent variables is given in Table 1. The dependent variable is Environmental awareness for the conservation of vegetation. Whereas Education, Urban/Rural, Participation, Media, Environmental Harm, and Earnings affected by natural vegetation are binary variables, Livestock, Land size, Expenditure, and Willingness to Pay (WTP) are scale variables.

### 2.4. Profile of Respondents

This table describes the frequencies and percentages of respondents' profiles. The results revealed that two-thirds of the respondents aware of environmental issues in their surroundings. About 56% are literate and 19% live in urban areas. Mostly participated in the protection of the environment which is 87.9% of the total respondents and about half of the respondents have access to media that are aware of climate change and greenhouse gases. A total of 42% were environmentally harmed by the climate change around them and approximately half of the respondents earned directly or indirectly affected by the vegetation. The maximum number of livestock held by a single household is 250 and the Willingness to Pay (WTP) ranges from 0 to 2000 Pakistani Rupees per household. Whereas the land size of houses ranges from 0.002 to 20 acres and on average households receive \$159.42 (44,638 Pakistani Rupees) income.

**Table 1:** Summary Statistics of the respondent

|              |                                      |                                     | <b>Environmentally Aware</b> |                   | <b>Environmentally Unaware</b> |                           |
|--------------|--------------------------------------|-------------------------------------|------------------------------|-------------------|--------------------------------|---------------------------|
| <b>S. No</b> | <b>Dependent Variables</b>           |                                     | <b>Frequency</b>             | <b>Percentage</b> | <b>Frequency</b>               | <b>Percentage</b>         |
| 1            | Environmental Awareness<br>(EAw)     |                                     | 174                          | 65.7              | 91                             | 34.3                      |
|              |                                      | <b>Independent binary Variables</b> |                              |                   |                                |                           |
| <b>S. No</b> | <b>Independent Variables</b>         |                                     | <b>Yes</b>                   |                   | <b>No</b>                      |                           |
|              |                                      |                                     | <b>Frequency</b>             | <b>Percentage</b> | <b>Frequency</b>               | <b>Percentage</b>         |
| 1            | Education (Edu)                      |                                     | 150                          | 56.6              | 115                            | 43.4                      |
| 2            | Urban/Rural (UR)                     |                                     | 52                           | 19.6              | 213                            | 80.4                      |
| 3            | Participated (P)                     |                                     | 233                          | 87.9              | 32                             | 12.1                      |
| 4            | Media (M)                            |                                     | 139                          | 52.5              | 126                            | 47.5                      |
| 5            | Environmental Harm EH                |                                     | 113                          | 42.6              | 152                            | 57.4                      |
| 6            | Earning effect by<br>vegetation (Ev) |                                     | 137                          | 51.7              | 128                            | 48.3                      |
|              |                                      | <b>Independent Scale Variables</b>  |                              |                   |                                |                           |
|              |                                      |                                     | <b>Minimum</b>               | <b>Maximum</b>    | <b>Mean</b>                    | <b>Standard Deviation</b> |
| 7            | Livestock (L)                        |                                     | 0                            | 250               | 4.34                           | 16.39                     |
| 8            | Land size (Ls)                       |                                     | 0.002                        | 20                | 0.63                           | 2.11                      |
| 9            | Expenditure (E)                      |                                     | 2                            | 250               | 35.50                          | 24.67                     |
| 10           | Willingness to Pay (WTP)             |                                     | 0                            | 2000              | 262.79                         | 345.107                   |

Source: Author's calculation from survey 2025.

## 2.5. Source of Media available

Media is one of the most influential instruments of communication. It can help to promote the right things at the right time and gives real as well as strong aspects of the world about right and wrong. Today newspapers News Channels, the internet and radio help us to focus on every social matter and assess the realities of life, it has a chance to explore the issues of society more freely and openly (Dwivedi and Pandey 2013). The graph explores the availability of media and how often different media are used by the respondents. On Y-axis shows different types of media available to the people of Ziarat and the X-axis shows the number of HHs used with different intensities.

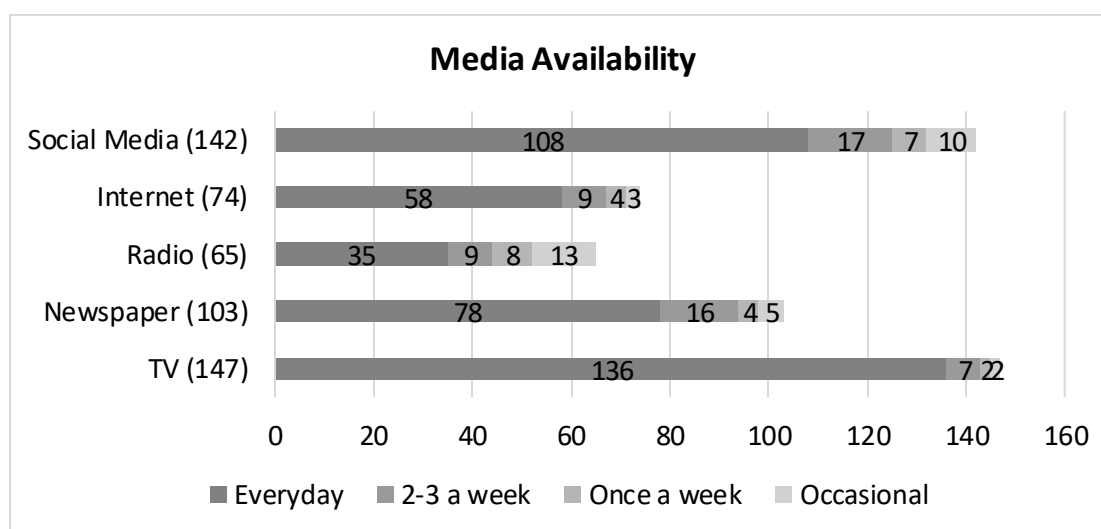


*Figure 1: Media Availability and Usage among the Respondents*

Source: Author's calculation from the survey 2025.

As observed from the graph that TV and social media are mostly available to the people living in district Ziarat. Social media and TV available for more than half of households. TV has the highest number of users, with most households watching it daily. Social media is also highly popular, with 108 respondents using it every day. Newspapers are another important source, with 78 households reading them daily. Internet use is relatively lower, although most Internet users access it daily. Radio is comparatively less popular, with 65 households reporting its use. Overall, the results indicate that TV, social media, and newspapers are the major sources of regular media use among the respondents. Today's media plays a very constructive role in increasing public awareness and collecting views, attitudes, and information about certain issues. It helps to know the current

situation around the world with a strong social and cultural impact on society. Because of its inherent ability to reach a large public, it is widely used to convey messages to build public awareness and perception, it can be used by literate people with the little cost (Dwivedi and Pandey 2013).

## **2.6. Household Suggestions for Conservation of Vegetation**

This graph shows the different suggestions given by respondents for the best solution for the conservation of vegetation in district Ziarat. The most efficient way to deal with the degradation problem is to provide gas facilities to the local community so that they do not use wood for cooking and heating, which is suggested by around three-fourth of the respondents. About 15.1% (40) suggested stopping logging through the implementation of rules and regulations to protect the land from further degradation, while 12.1% (32) emphasized community awareness and 10.6% (28) highlighted government–community coordination. Respondents argued that citizens at an individual level should take care of the management system; while the local community should not blame the government for all its weaknesses. 9.8% of respondents suggested empowering the forestry department to take necessary action for the conservation of natural vegetation in their district, while other recommendations included tree plantation, curing juniper forests from fungi, addressing climate change impacts, and using steel wire mesh to control landslides. Overall, respondents emphasized stronger forest protection, community participation, and institutional support for vegetation conservation.

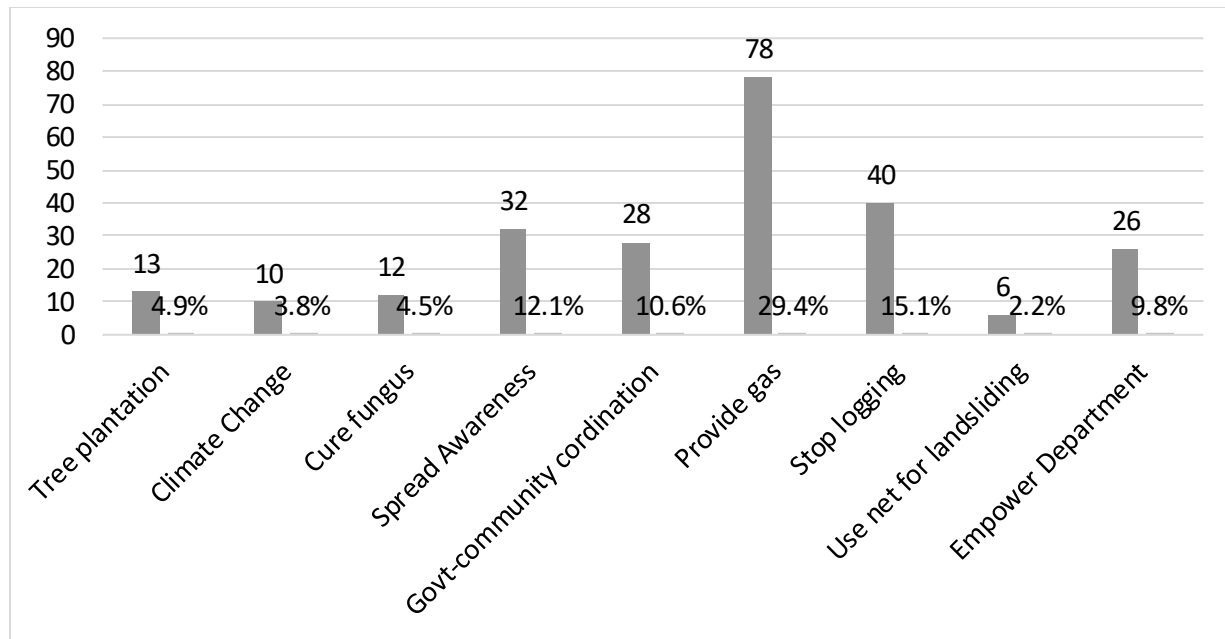


*Figure 2: Suggestions for the conservation of natural vegetation*

Source: Author's calculation from survey 2025.

### 3. Results And Discussion

The socioeconomic factor influences the awareness prevailing among the local community. For the regression in Table 2, SPSS software was used to estimate the results by using a Binary Logistic regression model. The result shows that Land size and Environmental harm were negative, whereas Participation had positive and significant at 5%. Earnings affected by vegetation, Expenditure, and WTP have positive, whereas Urban/Rural has negative with a significance level of 10% for the conservation of vegetation in district Ziarat.

**Table 2:** Results of variables tested through SPSS using Binary Logistic regression

|   | Environmental Awareness | Coefficient | Standard Error | P > /z/ | Exp(B) |
|---|-------------------------|-------------|----------------|---------|--------|
| 1 | Education (Edu)         | 0.256       | 0.294          | 0.384   | 1.291  |
| 2 | Urban/Rural (UR)        | -0.663      | 0.353          | 0.060*  | 0.515  |
| 3 | Participation (P)       | 0.895       | 0.430          | 0.037** | 2.446  |

|    |                                    |        |       |         |       |
|----|------------------------------------|--------|-------|---------|-------|
| 4  | Livestock (L)                      | 0.037  | 0.029 | 0.196   | 1.038 |
| 5  | Land size (Ls)                     | -0.187 | 0.077 | 0.015** | 0.829 |
| 6  | Expenditure (Ex)                   | 0.014  | 0.008 | 0.068*  | 1.014 |
| 7  | Media (M)                          | 0.354  | 0.294 | 0.229   | 1.425 |
| 8  | Environmental Harm (EH)            | -0.717 | 0.300 | 0.017** | 0.488 |
| 9  | Maximum WTP                        | 0.001  | 0.001 | 0.069*  | 1.001 |
| 10 | Earnings Affected by<br>Vegetation | 0.566  | 0.298 | 0.057*  | 1.761 |
| 11 | Constant                           | -0.982 | 0.530 | 0.064*  | 0.374 |
|    | R Square                           | 13.8   |       |         |       |

Source: Author's calculation from survey 2025.

Urban residents have a negative and significant tendency toward environmental awareness. The odds ratios showed that respondents living in rural dwellings were more aware of the environment compared to urban dwellings. The rural community has a close interaction with features such as water, soil, and vegetation that leads to awareness and better observe the land changes over time. More interaction led to more awareness and care about the surroundings. For this reason, urban dwellings were less sensitive to the protection of the natural ecosystem. Urban communities have more public services as compared to rural communities in terms of electricity, gas, water utilities, and health care centers. Urbanization accelerated through greater migration of the population to the urban area to get jobs and avail basic facilities. Urban dwellers were busier schedules to be more progressive towards economic and social lifestyle, compared to environmental lifestyle. For this reason, urban communities have less concern about the environment around them because they are already availing of other necessities.

Participation (P) has significant positive effects on Environmental Awareness. As respondents want physical participation in conservation activities in his/her busy schedules, and then it expected that the same respondents would be aware of the conservation of vegetation. Participation

revealed that respondents who voluntarily participated in vegetation conservation activities were about 2.5 times more aware than those who were unsought to participate. It should be emphasized that settling any objection must be done with the full agreement and participation of the stakeholders in that area (Atta Mohammad Sarangzai et al. 2012). If people participate voluntarily in the protection of vegetation without getting any compensation, then they are more aware and more willing to pay for a better environment.

Land size (Ls) is the total size of land in acres by the respondent. The significant negative result showed that the odds ratio 0.829 evaluated as land size increased by one acre leads to reduce awareness by 16.6%. Because landlords get financial benefits from farming apples and cherries, these farming landlords are involved in logging activities and lords are more interested in farming instead of natural vegetation. The outcomes demonstrate that large-scale logging followed by agriculture from 1970-80 was the major cause of deforestation in the Philippines (Kummer and Turner 1994). In Malaysia, agriculture contributed to 90% of the deforestation in the past decades (Repetto 1988).

Expenditure (Ex) demonstrated positive and significant values that describe people with more expenditure will get more conscious about the quality of life, and willing to pay for the purely natural environment around them. Assessing the odds ratio of 1.014 describes that as expenditure increases it contributes just 1.4% more awareness for the preservation of vegetation. The higher the level of monthly income, the stronger the association with better environmental awareness. People with lower salaries might be less concerned about the environment around them since their salaries are just sufficient for survival. People with middle or higher earnings can prioritize pro-environmental behaviors as the self and family security values already availed. Low-income recipients face barriers and are not allowed to purchase solar panels by practicing some pro-environmental behaviors (Philippsen and Angeoletto 2017).

Environmental Harm (EH) has a positive relationship with environmental awareness. The odds ratio describes the respondents who were environmentally affected were almost 1.7 times more aware compared to environmentally unharmed respondents. This binary variable shows whether the respondent or any member of the household member experienced environmental harm or hurt in the past year. Environmental perception perceived exposure to environmental harm tends to

have more impact on individuals' perception of the environment than other sources of information such as exposure to the media (Gooch, 1996).

This study also applied the contingent Valuation Method (CVM) to determine the maximum willingness to pay local people for the preservation of vegetation cover area. Through this method, households were presented with a hypothetical scenario proposing environmental degradation (or improvements) and citizens were asked for the maximum monetary amount that people are willing to pay (or willing to accept) for the environmental change around them. CVM involves directly questioning the local community in a survey of how much they would be willing to pay for the conservation of ecosystems and environmental services. Results indicated a positive relationship with environmental awareness. The significant odds ratio of 1.001 showed a slight increase in awareness as the willingness to pay increased.

Source of earnings directly or indirectly affected by the vegetation showed that as income affected by the vegetation would be 1.7 times more aware of the environment. About 51.7% of respondents' income was affected by the vegetation in district Ziarat. District Ziarat counts among the top tourist destinations in Pakistan. Thousands of tourists visit district Ziarat for the Juniper Forest, Ziarat residency, or Quaid-e-Azam residency (The founder of Pakistan Muhammad Ali Jinnah spent the last days of his life) and for the pleasant cold weather of Ziarat. Their incomes are affected by tourist attractions and want to protect these natural vegetation. The Forest sector of Pakistan contributes 0.3% of the Gross National Product (GNP). The forest-related industrial sector provides 0.5 million employment in Pakistan (Wani 2002). Through highly dense natural vegetation in their area will further accelerate their business, which will lead to more awareness about green vegetation.

Natural vegetation is very important to our life as a source of oxygen production, carbon consumption, rain source, and so on. For these preservations, public awareness is much needed to protect the natural green vegetation. Most people perceive it as the most precious gift to humanity on earth from nature. For this reason, the community must save natural vegetation to save the environment and life on Earth.

## 4. Conclusion

This study suggests the following recommendations:

- Extension of piped gas infrastructure and to promote affordable alternatives to fuel wood, to reduce wood cutting in district Ziarat.
- Encourage affordable energy for fuel consumption, like biogas, wind energy, solar PV, solar concentrators (or solar cookers), and wind thermal.
- Develop awareness among communities on the current and future situations (including population growth, climate change, weather forecast, and water efficient techniques) using data from scientific research methods.
- To expand government agencies and local communities to disseminate and replicate learning to other areas.
- Improve management policy and capacity through the proper management of diseases affecting forest trees, introducing techniques for reforestation and afforestation, and piloting community-based regulation and management on ground realities.
- Raise the productivity of Juniper Forest by restoration of degraded forest and discouraging alien species through the plantation of indigenous species.
- Develop nurseries for plants that are compatible with water and soil.
- Government should work with selected local communities to build government-community partnerships.

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