



RESEARCH PAPER

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Role of indigenous knowledge in conservation of biodiversity in Punjnad region of South Punjab (Pakistan)

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Abstract

The research reported in the study focuses on exploring the existing indigenous knowledge and local population impact on flora and fauna of Punjnad Region, Southern Punjab. Conservation of biodiversity is being taken as protecting the life in its every possible form around the Globe. Special attentions are given on awareness building, attitude, behavior change and action of the people towards. Data was collected through semi structured questionnaires and interviews. Landsat images of last 26 years were acquired on spatial-temporal bases for the years i.e 1990, 2000, 2010 and 2015. Supervised classification and NDVI (Normalized Difference Vegetation Index) were used to measure the scope and thickness of vegetation. The study findings showed that during the last 26 years from 1990 to 2015, vegetation cover and barren land has been decreased 25% and 6% respectively. The agriculture land was increased about 29%. The study indicate that forest cutting, destruction of natural habitat for the agriculture purposes, hunting and killing of wild animals were the main factors in degradation of the biodiversity. In this article the present threats and challenges faced by biodiversity are highlighted. The findings of the study will be helpful for future conservation of various species in the study area.

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Introduction

Every organism of living world is unique and this uniqueness of the individual is the basis of biodiversity. Different places such as hills, forests, and land or sea side, in different parts of the world have their own typical type of the fauna and flora. Loss of the biodiversity is a global concern and is being looked upon as one of the world's most pressing crisis. Biologically rich and unique habitats are being degraded, fragmented and destroyed due to problems caused by exponential growth of human population, over consumption of resources and effects of population.

Bio-diversity is not equally distributed over the surface of the earth and it is richest at the tropics. There are latitudinal gradients in species diversity (Tottensor *et al.*, 2010) and it is larger close to equator due to warm climate and high primary productivity (Richard *et al.*; 2009; Gaston, 2000). These tropical forest ecosystems cover almost 10% of the earth surface and contain about 90% of the world species (Young, 2003). Biodiversity tends to be clustered in hot spots and it is increasing day by day (Rabosky and Daniel, 2009).

Rapid environmental changes usually cause mass extinction relatively 99.9% of all species that ever lived on earth; amounting to over 5 billion species are quantifiable to be extinct (Novacek and Michael, 2014). Estimates on quantity of earth's surface species vary from 10 million to 14 million of that concerning 1.2 million are documented and over 86% have not however been represented. The age of planet is about 4.5 billion years and the period since the emergence of humans has displayed an ongoing biodiversity reduction and a related loss of genetic diversity (Dalrymple and Brent, 2001).

Pakistan is enriched in biodiversity, notably in arid and semiarid regions that covers almost 80% of the area. Biodiversity conservation in Pakistan has become a major concern due to environmental degradations caused by the grazing activities, farming, village expansions and high rate of water logging. All these activities resulted in the loss of forest area which is home to flora and fauna species

(Rizawana *et al* 2007). It is assumed that a large number of undiscovered species are disappearing with the loss of habitats. Exaggerated poverty has forced rural individuals to use diverseness at unsustainable rates. Factors like deforestation, over grazing, wearing away and salinity are posing major threats to remaining biodiversity of the country (Mirza *et al.*, 1992).

A significant issue of concern in biodiversity conservation research is the presence of indigenous people who inhabit these study areas, their impact on the local fauna and flora; and their indigenous environmental knowledge necessary for sustainable management of resources. The issues pertaining to the indigenous people are quite tricky as conservation need to consider their interactions with the environment and how information about the impact of these interactions on biodiversity can be made known to them. It is therefore necessary to know what actually the biodiversity is. It is about imparting knowledge of conservation practices to indigenous people.

The aim of the study was to explore indigenous environmental knowledge and practices in the Punjnad, Southern Punjab, to identify the awareness about the conservation of biodiversity. The study also aims to find the basic causes of degradation of biodiversity.

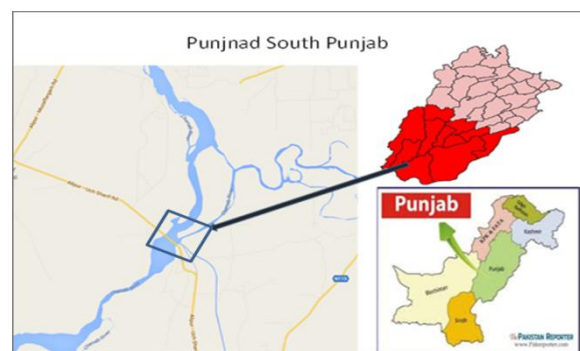


Fig. 1. Map of the study area.

Materials and methods

Research methodology is a fundamental part of each sort of examination. A number of steps were included to achieve the requirements of study including primary as well as secondary data used. GIS software was used to process the satellite maps and images of Punjnad region which were acquired from 1990 to 2015.

Appropriate required data were collected and process whether it is in image format or in statistical data.

Study Area

Punjab is the land known for five river which flow from Himalaya to Punjab Pakistan and finally joins the Indus river to reach at Arabian sea, these five rivers joins together at different points but merged together 10 mile north of Uch Shareef district Bahawalpur Southern Punjab and Head Punjnad is located southern edge of district Muzaffargarh. According to census of 2017 population of Muzaffargarh is 4322009 persons. The area of Punjnad region is considered as arid type of climate having very hot summer and cold winter, as other adjacent region have monsoon is the wettest season for the area from July to September. The average annual temperature is 25.6°C in Muzaffargarh. The average annual rainfall is 157mm. Punjnad is wetland hotspot and also a tourism resort in this region. Geographically it is located at 29°20'47"N and 71°1'11"E and forms a river Punjnad which heads toward mighty Indus River and join it at Mithan kot in district at Rajanpur (Khan, 1991).

Image processing

The satellite images of Punjnad region were derived from United States Geological Survey (USGS). The main approach for the research was to assess the temporal time series data for land use (LU) / land cover (LC) pattern changes for last 26 years with interval of 10 years for first 20 years from base year land last interval of 6 years was taken as in sequence. It was because of the availability of images for specified years as in our research it was very critical and most important issue for the selection of time period of satellite data acquisition. The Landsat Thematic Mapper 5 (TM5), 7 bands images with resolution of 30 meters and Landsat 8 11 bands images with resolution of 30 meters were used. Images consist of seven spectral bands with a spatial resolution of 30 meters for bands 1 to 5 and 7. Eradas imagine 9.2; Arc GIS 9.2 and MS office were used to accomplish the study.

Image Classification

The land use images were grouped in accordance with spatial land use classifications of the area. Considering in mind the extent of the current research and image resolution the subsequent scheme was chosen in order to fulfil the objectives. The study area was classified into four classes i.e forest cover, barren land, site near water bodies and agriculture land.

Results and discussion

The main focus of this investigation was to categories the land use, land cover patterns of the flora biodiversity conservation besides to identify the human encroachment and its role in natural environment.

The total study area is 187.191Km². The first class used in the study area is forest cover which is (39%) 72.0837km², (21%) 38.8km², (27%) 51.4km² and (24%) 26.4km² in 1990, 2000, 2010, and 2015 respectively. Second class which is barren land indicates that (25%) 46.80km² (35%) 66.6km² (21%) 38.4km², and (19%) 34.3km² in 1990, 2000, 2010 and 2015 respectively. Third class used in study area is water area which is (7%) 13.95km², (5%) 8.9km², (3%) 6.5km² and (17.5%) 9.4km² in 1990, 2000, 2010 and 2015 respectively. Where as in class fourth which is agriculture land use class. Total agriculture land is (29%) 54.7km², (39%) 72.9km², (49%) 90.9km² and (58%) 109.1Km² in 1990, 2000, 2010, and 2015 respectively, which is shown in fig. 2, 3, 4, 5 and table 1.

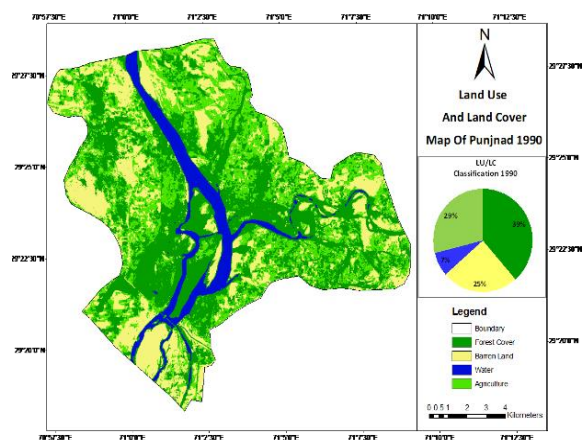


Fig. 2. Land Use/ Land Cover Map of Punjnad Region in 2000.

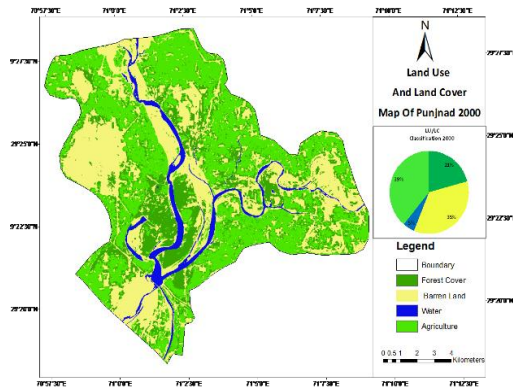


Fig. 3. Land Use Land Cover Map of Punjnad Region of 1990.

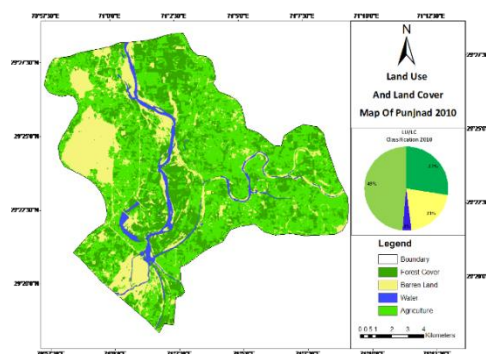


Fig. 4. Land Use /Land Cover Map of Region of 2015.

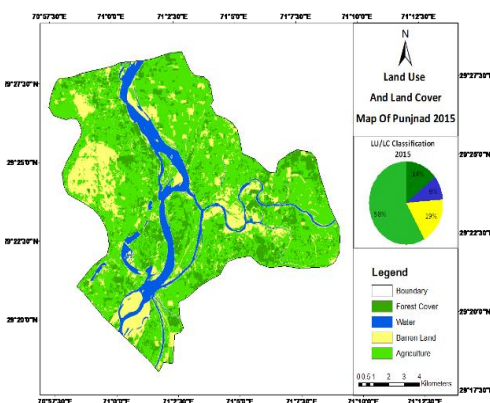


Fig. 5. Land Use/ Land of Punjnad Punjab Region of 2010 Punjnad.

Table 1. Land Use Land Cover Classification of Punjnad region from 1990 to 2015.

Year	1990		2000		2010		2015	
	Area	%	Area	%	Area	%	Area	%
Forest	72.0837	39	38.7963	21	51.4251	27	26.649	14
Barren	46.8036	25	66.5964	35	38.3823	21	34.3008	19
Water	13.9563	7	8.8785	5	6.4863	3	17.4294	9
Agriculture	54.3474	29	72.9198	39	90.8973	49	109.08	58
Total	187.191	100	187.191	100	187.191	100	187.191	100

Table 2. NDVI High Values.

Nam/year	1990	2000	2010	2015
NDVI High	0.497	0.5918	0.4698	0.4545

The water in the study area is continually decreasing until 2015 shown in fig. 5 when there were floods condition in Pakistan and its area increase almost 9%. Agricultural land use patterns have proved to be 20 percent in the last twenty years from 10 percent to 20 percent in year 1990 shown in fig. 3 and in the last decade, there has been a sharp rise from year 2000 shown in fig. 2 to year 2010 shown in fig. 4. Overall, 29% of agricultural land has increased during the past 26 years. Barren land was 25% in the year 1990 but increased in year 2000 to 35% and decreased in 2010 to 21%, which further decreased to 19% in year 2015. Forest land was 39% in year 1990 which decreased to 21% in year 2000, the same increased in year 2010 to 27% which again decreased to 14% in year 2015.

NDVI was used to calculate the impact of vegetation cover on biodiversity using the equation (1) to analyse the trend of vegetation in the study area shown in Table 2: NDVI High Values. According to the result of NDVI Maps. It was revealed that vegetation area has been decreased by agricultural land use expansion which resulted in destruction of the natural vegetation cover. The result showed that vegetation cover was thick in year 1990 and year 2000 but low in year 2010 and year 2015. It shows negative trend for thick vegetation cover, the vegetation is facing worst conditions and complex problems which led it to fauna degradation. According to the fig. 6, 7, 8, 9 showing the NDVI values for the study area. NDVI values are high in NDVI map of study area in year 1990 while values are getting low in NDVI map for Punjnad region for forthcoming years as followed by year 2000, year 2010 and year 2015. NDVI values were estimated at 0.497 for year 1990, 0.5918 in year 2000 and 0.4698 in year 2010 while 0.4545 for the year of 2015. It indicates that thickness and lushness have decreased except in the year of 2000 because in generally two logics one the time of data acquisition of satellite, that was April 15, 2000 and according to classification of image of year 2000 forest cover also decreased as in fig 2.

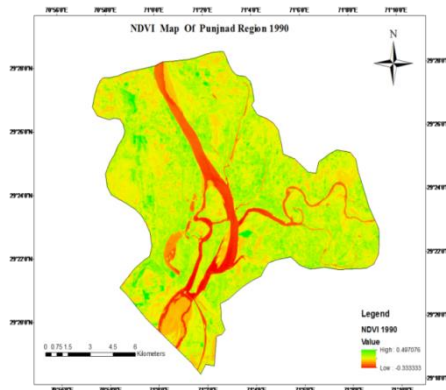


Fig. 6. NDVI Map of Study Area 1990.

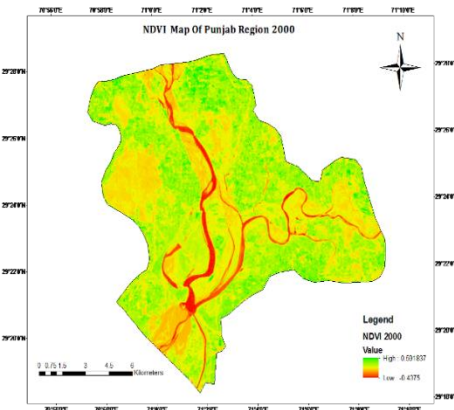


Fig. 7. NDVI Map of Study Area 2000.

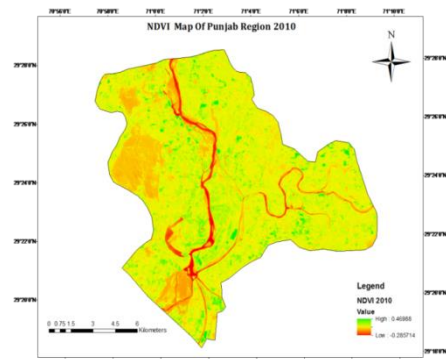


Fig. 8. NDVI Map of Study Area 2010.

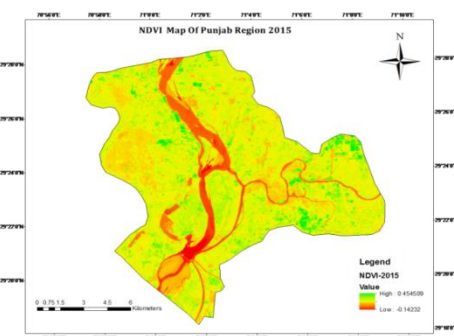


Fig. 9. NDVI Map of Study Area 2015.

Indigenous Knowledge about Biodiversity

The assessment of biodiversity through indigenous knowledge is one of the useful methods. Indigenous knowledge plays an important role to manage and conserves the biodiversity in any area. Current study has been conducted on indigenous knowledge based data through questionnaire in the study area. The respondents were taken randomly from the population of that area to fulfill the questionnaire. The participants perception about the question “What do you know about the biodiversity”? indicate that only 45% of them knew about some of detail about biodiversity and remaining 35% did not know relevant to biodiversity and its conservation while 20% showed hesitation to answer the question which is shown in fig. 10.

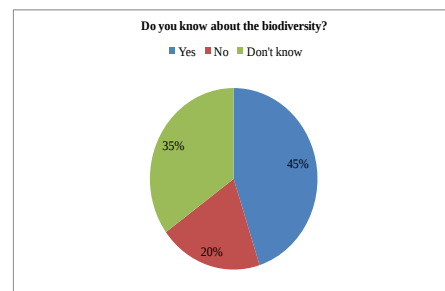


Fig. 10. Field survey results of.

The indicating question was “What do you think the forest area in Punjnad region changed, because of”? Revealed the causes of depletion of natural vegetation change in punjnad region, view of indigenous population depicted the results 23%, 3% blamed on climate change remained 58% said that due to poverty, lawlessness, ignorance native population have degraded the forest cover and 16% told as lack of awareness and lack of education shown in fig. 11.

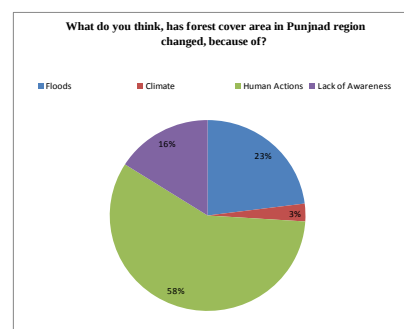


Fig. 11. Field survey results of.

The indicating question is “what are the major causes of depletion, degradation of (fauna) biodiversity”? are as 15% blamed floods, 5% blamed the climate change remained 51% said that due to human action had degraded the fauna biodiversity of the Punjnad area by hunting of the rare animals and cutting of forests and 29% replied that it is lack of awareness and lack of education shown in fig. 12.

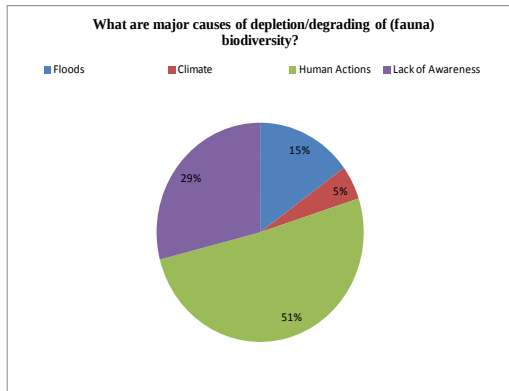


Fig. 12. Field survey results of.

The indicating question “Is the hunting of fauna is common in this region”? revealed that 92% said they have witnessed all of those things such as wild boar/hogs are found in riverine area people used to play dog hunts and kill them without no reason, 5% replied in no and remaining of 3% told that they have not any concern with this issue shown in fig. 13.

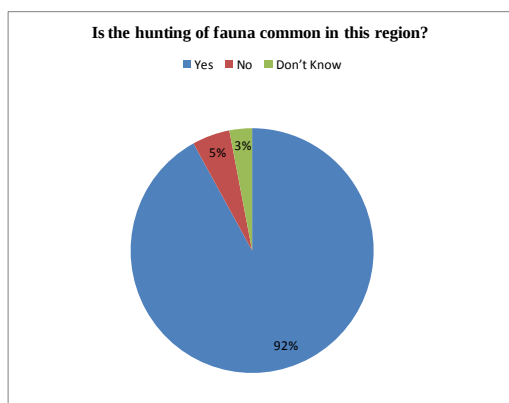


Fig. 13. Field survey results of.

The indicating question is “what is the main cause of the removal of the forest cover and land use pattern change in the Punjnad region”? According to 57% people agriculture is responsible for degradation, 21% said about floods also played an important role in

degradation of natural land cover changed. 20% were in favours that all of this happened due to human actions and 2% only go with the reason of desertification shown in fig. 14.

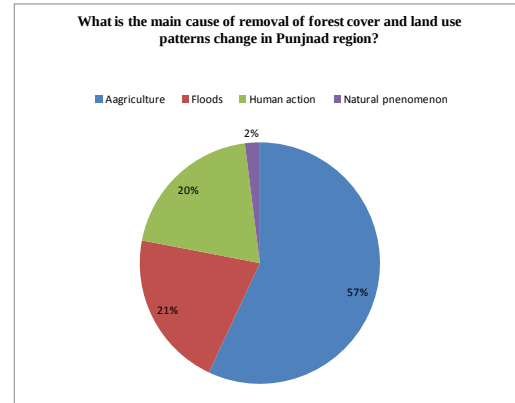


Fig. 14. Field survey results of.

The next indicating question is “What kind of the actions are taken more”? Results of the fig. 15 Government and other NGOs participated in area for afforestation of forest cover area and plantation of trees. 29% of total who told in last question, taking of actions for conservation. 41% told about, some measures were taken by authorities to protect the threatened wild animals and natural biodiversity restoration. The process for conservation of ecosystem also adopted replied by 14%. Rest of 16% told that they don't know.

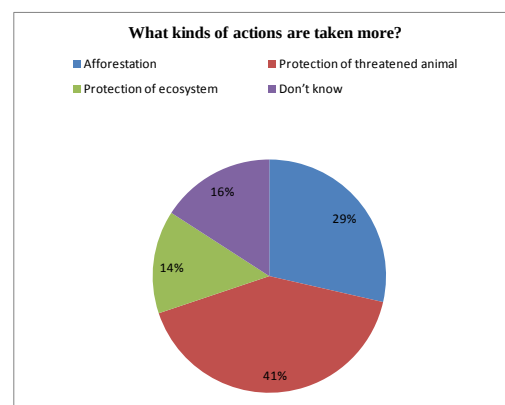


Fig. 15. Field survey results of.

The next indicating question is “Do you have awareness about the laws of biodiversity conservation”? Results of the fig. revealed that only 9% to total answered that they know about the

conservation of the biodiversity for fig. no 5.11 answer. 79% to total told they don't know about biodiversity conservation if even they had idea for what was biodiversity. 12% of left told they don't have any idea shown in fig. 16.

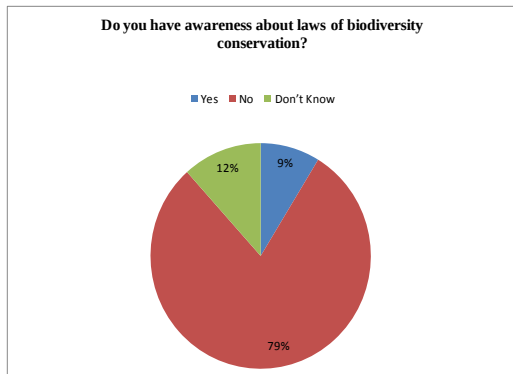


Fig. 16. Field survey results of.

The next indicating question is “Do you think that knowledge about the conservation of biodiversity, can play important role to protect the biodiversity in the region”? According to results fig. no 5.12 the sport of argument 82% replied in favor of statement. 14% told no, it would have no difference of results, if education or awareness would have provided. 4% replied they don't know about shown in fig. 17.

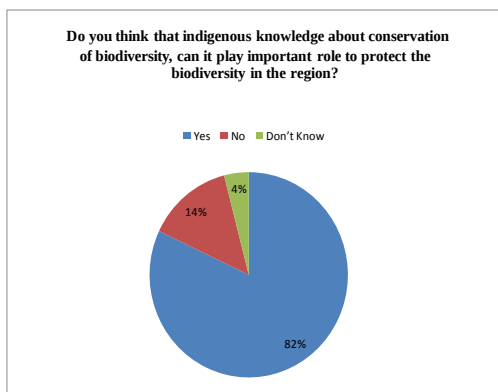


Fig. 17. Field survey results of.

The indicating question was “Have you ever participated in any kind of biodiversity conservation process”? Fig. 5.13 revealed that 10% answered yes they planted trees, in plantation of trees schemes some others revealed about NGOs those followed same schemes. 85% of people told that they did not ever participate. 5% of the total said they don't know about it shown in fig. 18.

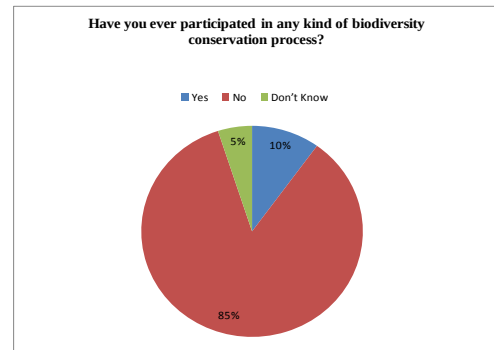


Fig. 18. Field survey results of.

The indicating question is “Have you ever degraded nature or biodiversity”? Fig. no 5.14 indicates 37% of in response to yes of fig. 5.14 they had cut the forest tree or wild plants of the region and 24% told they had hunted wild fauna i.e wild boar hunt, bird catch or hunt, catching of fishes. Remaining 19% told they had played with both flora and fauna shown in fig. 19.

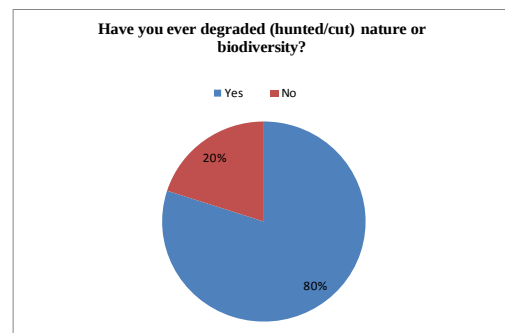


Fig. 19. Field survey results.

Conclusion

Spatial-temporal study for the Punjnad showed that the area of forest cover and thick wild vegetation have declined gradually from 1990, 2000, 2010 and 2015 as 72.08370km² or 39% of total area, 38.7963km² or 21%, 51.4251km² or 27% and 26.649km² or 14% of total study area respectively. These are clear evidences that total land natural wild land cover or study area have degraded 25% between last 26 years. Land use pattern in our targeted area have increased as it was in 1990, population increase and demand for food is forcing native people for land grabbing or acquisition for agriculture sector. Total area of agriculture land use was only 54.3474km² in 1990, 72.9198km² for 2000 90.8973km² in 2010, 109.08km² measured in 2015. Total 29% area has cleared for agriculture use during last 26 years.

On the other hand total 6% barren areas have been depleted during 1990 to 2015. Water body area provides a suitable atmosphere for biodiversity to flourish, but floods also caused mass destruction for both flora and fauna during initial times, that is the reason many species of plants and vegetation have been extinct. Study area is very remote, education level that was measured, was very low in the area 93% of them was ignorant. They were unaware of importance of biodiversity, but 45% of surveyed people have, seen flora and fauna by their own of 1990s and before several decades.

People of study area were recorded in miserable condition, there were mainly divided into two professions either farmer or labour as 63% and 31% respectively. Majority of farmers had small lands for cultivations, only 54% of them their own land. 12% of total get land on rent by some landlords to grow some grains. 66% people have cattle and pet animal; they rear them to get financial benefits. Farmers produce crops to sale and also 88% of total population grow tree for firewood and to sale.

According to local evidences hunting has been common from long ago also degradation of forest cover and riparian vegetation in riverine areas by cutting of trees and clearing vegetation for agricultural uses. Indigenous population played a critical role in destruction of biodiversity.

Indigenous population has innersole feeling on destruction of biodiversity, and argued that it was happened due to lack of awareness knowledge, they had degraded mother-nature by their own hands. 37% have been involved in cutting trees and vegetation (Flora) 24% answered they have been hunting of different animals such as wild boar and rabbit hunting, fishing, swan, gees, waterfowl, and other migratory birds (Fauna) and 19 answered both they have done both.

For conservation of biodiversity Government and forest department tried to grow the forest by a forestation and WWF provide community development and protected areas program from 2004 to 2014.

They compared the present and past, showed keen interest to restore nature, 82% surveyed population replied in favour of getting education, awareness and conservation of biodiversity. 75% population said that they might to know rules and regulation about conservation of biodiversity.

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