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Economic Assessment of the Poverty-Environmrental Quality Nexus: A Case Study of Malakand Division

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Abstract
Poverty is blame to be one of the major cause and effect of environmental degradation/Deforestation. This bi-directional relationship is seems to be existing in the rural communities all over the world in a little bit stronger form. This study was conducted to find out the empirical relationship of rural poverty and Deforestation in Malakand division of Khyber Pakhtunkhwa province. The study was under taken by collecting primary data from 180 respondents randomly selected from all the seven districts of the division concerned. A well structured questionnaire was used for data collection comprising the questions regarding personal details, economic details, natural resource dependence, extent of forests degradation and poverty environment nexus etc. Non recursive two stage linear regression model was used for data analysis. The regression analysis was performed by statistical software SPSS Version 20. The result verified the existence of poverty and environmental degradation in the form of deforestation. The study indicates a key role of poverty in deforestation and vice versa. It was also concluded that rural community have low income level and depends mostly on forest resources for their basic needs and livelihood purposes. The study also indicates the severity of environmental degradation in the form of deforestation in the study area and most of the people were found unaware of the knowledge and importance of environmental conservation.

INTRODUCTION

Background

The debates of poverty environment quality nexus originate in 18th century. According to Malthus (1798), the poor continuously degrade their surrounding environment and seldom think about the future. Poverty-environment relationship has been studied extensively by many scholars in many regions. The central theme has been the negative impacts of poverty on the environmental quality**.** The poverty environment relation is seldom explored systematically (Lele, 1991; Reardon and Vosti, 1995). This is one of the central questions that whether the different types of the poor improve or degrade environment in different ways (Forsyth *et al*, 1998). This is one of the important questions when specifically looking at chronic poverty**.**

The relationship between poverty and environment is complex. This has been recognized by many Nations. For example, India in its National Environmental Conservation Policy 2004 states that “Nexus of poverty with environmental degradation is a key challenge that the country faces". It emphasizes that on one hand, both the rural and urban poor becomes more and more poorer with degradation of natural resources while poverty itself can bring out environmental degradation on the other hand. The poorest people of the world occupy the most threatened environmental areas of this land (Pearce and Warford, 1993). The extent of poverty can influence the rate of withdrawal of different natural resources**.** Conversely, the poverty and deprivation level of the poor depending on natural resources increase with deforestation, ground water depletion and exploitation of biodiversity. The assumption behind the relationship between poverty and environment is based on the fact that abundance of natural resources and suitable environmental conditions contributes to the development of well being. This assumption has been tested by scientists and development practitioners in many different ways and it has been found to be a fundamental truth (Dasgupta and Maler, 2004).

There is a general concept that poverty is a key component of environment and natural Resources degradation. Traditionally the poor are blame for causing many social problems and environmental degradation. The Logic of “Vicious Circle” is that, poor intensively use resources triggers environment that increases poverty which reinforces degradation. According to Bruntland Commission Report (1987), it was stated that poverty is the major cause of environmental degradation. The report stated that “Poverty reduce the capacity of people to use natural resources in a sustainable way; it increases pressure on the environment” (World Commission on Environment and Development, 1987). The World Bank Report 1992, stated that, “The poor who have to meet their basic needs, exploit natural resources by unwarranted cutting of Forests for firewood and failure to conserve soil nutrients” They destroy the natural resources faster due to inability of access to other types of man-

made items. They cannot reached their life needs through purchases hence forced to use natural resources specially for food and fuel purposes (Duraiappah, 1996).

At the same time, it is crystal clear that destroying the natural resources and environment gave harm to the poor themselves. These are the poor that suffer most from the cost of pollution and natural resources degradation (Kadekodi, 2001). The loss of natural resources particularly scarcity of drinking water and forest wood affects the poor more. Environmental poverty decreases the poor's income by diverting their time to routine household activities such as collection of fuel wood and by depressing productivity of the environmental resources which is the major source of living of rural poor people. They are the most vulnerable to natural disasters, environmental degradation and ecological disorders. Thus, deterioration of environment is the major cause of inducing poverty (Pearce and Warford, 1993).

The interaction of extreme poverty and environmental degradation sets off a downward curve of ecological deterioration that threatens economic well-being and health of the world's poorest people. They suffered from the lack of adequate nutrition, disease, illiteracy, short life expectancy and high rate of infant mortality (Ekbom and Bojo, 1999).

Being a natural resources rich division, Malakand is facing rapid environmental degradation especially in forest and agriculture sector. Poverty of the people might be the major cause of such degradation. Little work has been done on poverty environment degradation nexus. No empirical study has been taken in this field in the concerned division. This work shows the empirical evidence on poverty environment quality nexus in Malakand division.

Trend of Poverty in Malakand division

People of Malakand division are mostly poor and about 39.03% of the people living below poverty line (Pakistan Economic Survey, 2013-14). The table below shows District wise percentage of the total population and population living below poverty line in Malakand division according to 1998 census

Table 1.1 Total population (1998 Censes) and population living below poverty line in Malakand Division

S.NO	District	Total Population	Population below poverty line	Percentage (%)
1	Swat	1257602	343325	27.30
2	Lower dir	717649	248450	34.62
3	Malakand	452291	177225	39.19
4	Chitral	318689	130535	40.96
5	Bunir	506048	229644	45.38
6	Shangla	434563	220714	50.79
7	Upper Dir	575858	314015	54.53
	Total	4262700	1663908	39.03

Trend of Environmental Degradation in Pakistan and in Malakand Division

Forests occupy 4.6 million hectares of the total land area of Pakistan (Government of Pakistan, 2005). This includes 1.96 million hectares of the coniferous forests (43%), 1.72 million hectares scrub forests (37.2%), 0.234 million hectares irrigated plantations, 0.297 million hectares riverain and 0.35 million hectares mangroves in the delta of Indus river (Qazi, 1994). 40 % of the country total forests is found in Khyber Pakhtunkhwa Province, 15.7% in Northern Areas and 6.5% in Azad Jammu and Kashmir. The forests in Khyber Pakhtunkhwa Province are distributed in the mountains of Himalayas, Hindukush and Karakorum. The mountain areas especially Dir and Swat districts in Malakand division and Mansehra district in Hazara division consist of many valleys with scrub and coniferous forests on the upper slopes, and alpine pastures on the ridges (Ali *et al*., 2006).

Between the year 1990 and 2000, Pakistan lost an average of 41,100 hectares of forests per year with the annual deforestation rate of 1.63%. From the year 2000 to 2005, the rate of deforestation increased from 1.63% to 2.02% per annum. In total, from the year 1990 to 2005, Pakistan lost about 24.7% of its forest cover, or around 625 thousands hectares. The total rate of habitat conversion from the year 1990 to 2005, Pakistan lost 14.7% of its forest and woodland habitat (Bhatti, 2011).

Based on such a high rate of deforestation, according to a government report, it is feared that this valuable natural resource would be totally lost within the next 15 years. The major cause of forest degradation in Pakistan is high consumption of forest wood for fuel and timber purposes. Pakistan is the second highest rate of deforestation in the world, leading to the massive disappearance of forest trees, shrubs and ground flora and fauna. In Pakistan the rate of deforestation is alarmingly one, intimidating the lives of the rural community who are dependent upon them for their basic livelihood needs (Bhatti, 2011).

The Khyber Pakhtunkhwa province having seventeen percent of the total area under forest which is rapidly moving towards deforestation due to excessive cutting of trees and forests for different purposes. Similarly, the timber mafia during the recent turmoil in forest rich Malakand division had cut down

more than 0.5 million trees in the forests. The timber has been stored in different godowns in Malakand division especially in Chakdara, Thana and Batkhela (Jamal, 2006).

Objectives of the Study

To assess the benefits the poor derive from natural resources and to analyze the mutual relationship of rural poverty and deforestation in Malakand Division.

Literature Review

Causality and Linkages of Poverty and Environmental Degradation

The literature that links poverty with environmental degradation usually focuses on the "Vicious Circle" between poverty and degradation; where farmers, pushed by poverty and population increase extend cropping to a fragile marginal land results in degrading them (Mink, 1993; Pearce and Warford, 1993; Dasgupta and Maler, 1994). Reardon and Vosti in 1995 brought out in a new dimension to the link between poverty and environmental degradation when they introduced the concept of 'Investment Poverty' and related them to other measures of poverty. According to them the direction and strength of the poverty-environment nexus in rural areas are different based on the composition of the property held by the poor in rural areas and the types of environmental problems they face (Reardon and Vosti 1995). The link between poverty and environment degradation in under developed and developing countries has been gaining increasing attention of the policy maker and an international development agency (Angelsen, 1997). A lot of studies have concluded that the rural poor in developing and in under developed countries highly depends on common natural resources for their subsistence (Jodha, 2000; Cavendish, 2000; Shiva and Verma, 2002; Narain, Gupta and Veld, 2005).

The poor depend heavily on natural resources like forests, pastures, water resources and over exploit them (Jodha, 2000). Sheep and goats that is a capital resource for the poor living in the rural areas degrade the vegetation and soil more severely than the livestock like cows and buffaloes of the richer rural population (Rao, 1994). This cyclical relationship is commonly known as the poverty-environment nexus (Duraiappah, 1998; Dasgupta *et al*., 2003; Nelson and Chomitz, 2004). Beck and Nesmith (2000) and Veldeld *et al*., (2004) have tried to quantify that, how dependence on common natural resources varies with the level of household income. It was concluded that dependence on common resources declines with increase in income. In another study data was collected from 197 households in different villages in Zimbabwe, much higher rates of dependence was noticed in poor households deriving 40% of their incomes directly from forests and natural resources (Cavendish, 2000).

According to Lopez (1992) poverty is that the major source of forest, land and biomass degradation. The rural poor tend to be highly dependent on common natural resources for their survival. According to Lopez hypothesis, the rural poor who make up about two thirds of the total world's poor (World Bank, 1992) extensively consume natural resources for their survival, for example, cutting trees for fuel wood, bush burning practices and unsustainable cultivation practices. In this regard poverty and destruction of these resources reinforce each other. Due to extreme poverty the poor through their livelihood activities such as indiscriminate cutting of forest trees for firewood and bad farming practices deplete resources at rates that are incompatible with long-term sustainability (Holden *et al*., 1996). In such cases, degradation of these resources causes a "downward spiral," results in further reduction in the income of the poor (Durning, 1989; Pearce and Warford, 1993). Rapid population growth, coupled with insufficient means or incentives to intensify production, may induce over-exploitation of fragile lands. Again, a downward spiral can ensue (World Bank, 1992).

Empirical Literature on Poverty

A person is said to be poor when his personal income fall below a specified 'poverty line' (Coudouel and Hentschel, 2000). Poverty is a relative term and has been defined according to what is prioritized as a 'need'. From income point of view, people are called poor when "their average monthly income is less than that required to meet basic needs of life". Poverty is the inability to access basic and essential goods and services. In the 1960s consumption of goods and services was used as a superior poverty indicator, as it is more stable over time than income (Lipton and Ravallion, 1993). Despite successive expansion of the definition of poverty, consumption remained the most commonly used indicator (Baulch, 1996).

In Pakistan poverty is mainly a rural phenomenon. Poverty is highly fluctuated in rural areas of our country. In Khyber Pakhtunkhwa province the incidence of poverty in rural areas is greater than in urban areas. In the year 2005, 26.1 % poverty in urban areas while 41.9 % in rural areas was reported (Word bank, 2006). Poverty incidence was 26.5 % and 41.4 % in Urban and Rural areas of Khyber Pakhtunkhwa respectively (Anwar, 2006).

Poverty-Environment Quality degradation Nexus

Many studies have established the link between poverty and environmental quality by analyzing the heavy

dependence of rural people in developing countries on the common natural resources. Such studies have been done using data from different countries by Rao, 1994; Cavendish, 2000; Jodha, 2000; Escobal & Aldana, 2003; Narain, Gupta and Veld, 2005. Other studies have analyzed the effect of income levels of rural community on natural resource management practices and environmental degradation in under developed countries (Dasgupta *et al*., 2003; Nelson and Chomitz, 2004).

Most of these studies considered forest as the measure of environment; a few studies also have pointed out various other aspects of environmental degradation like water quality, fragile soil, indoor and outdoor air pollution etc (Nelson and Chomitz, 2004). Mathews in 1991 stated that there are indeed close connections between poverty and environmental degradation. Poor people generally have no other option but to exaggerate the natural resources, even when they are fully aware of the terrifying future effects. On the other side, environmental degradation creates poverty. These two problems are so deeply tangled that successfully addressing one demand a simultaneous attack on the other (Mathews, 1991).

Amita Shah (2001) evaluates the linkages of poverty and environment from western Indian states. She concluded that poor in that area mainly depend on the natural resources for their livelihoods. On one hand too much dependence on common resources devalue the environment and on the other hand a total neglect of land also have a negative impact on the environment. It is therefore necessary to planned up certain strategies through which poor people can find out employment and income from a combination of activities without degrading the environment**.**

The poverty and environmental degradation nexus has also been noted by the Environment Protection Agency in 2002. Poverty has been seen as the major socio-economic cause of environmental degradation and fighting this should therefore be directed at interventions for poverty reduction (EPA, 2002).

Swinton *et al*. (2003) found that poor and wealthy are both involved in the degradation of natural resources in Latin America. They exploit agricultural soils, rangeland and forests. They concluded that rising rural populations are intimidating the sustainability of the common natural resource in most of Latin America.

Serven *et al*. (2007) prepared a report for African policy maker and put forward that bio capacity is negatively related with poverty that is, that when bio capacity decreases, poverty increases. In other words, poverty increases when the environment is degraded. More specifically, human poverty index increases by 0.26% when bio capacity decreases by 1%.

Fondo sikod (2009) concluded that poor in Cameron are involved in degradation of environment through their livelihood activities. Lack of alternative economic activities and ignorance of natural resources conservation is the major cause of their exploitable nature. The poor degrade environment through over hunting, over grazing, conversion of forest into farm land and excessive use of non timber forests.

Aggrey *et al*., (2010) studied the relationship between poverty and environmental degradation at district level in Katanga basin in Uganda. It was concluded that there was a strong correlation between environmental degradation and poverty. Poverty have positive relationship with deforestation and land degradation. The result showed that the welfare of poor districts would seem to be most significant.

Tabbasum *et al*. (2012) conducted a study on the impact of degradation of communal natural resources on socio economic status of rural women in semiarid mountainous belt of district karak. The results showed that there is a greater degree of interdependence between natural resources and socioeconomic status of women. It was also concluded that besides causing severe damages to the environment, degradation of natural resources also because a major threat to the subsistent living of the poor women headed households. The symptoms of poverty are apparently high in the area as well; there is high prevalence level of undernourishment, infant mortality and other consequences of deprivation. In this situation, inhabitants of the area have no option than to mercilessly exploit the available environmental resources for their

Nakpa (2012) studied the bidirectional link between poverty and environmental quality degradation in Lambussie-Karni district of Ghana. It was concluded that poverty causes environmental degradation and in turn environmental degradation spurs rural poverty in the study area.

MATERIAL AND METHODS

The Study Area (Malakand Division)

Malakand division is one of the biggest division (area wise) of Khyber Pakhtunkhwa province. It extends 71.43^0 South to 73.85^0 North and 36.07^0 West to 36.40^0 East. It covers an area of 29,872 km2, which makes 40.1 % of the total area of Khyber Pakhtunkhwa province. It lies in the north west of the province and shares boundaries to the east with Gilgit Baltistan, district Kohistan and district Battagram of Hazara division, to the west with Afghanistan and Bajaur agency, to the North with Nooristan district of Afghanistan and to the south with District Mardan and Charsadda districts. Total population of Malakand division is 4262700 (according to 1998 census). More than 80 % of the population lived in the rural areas therefore it is considered as a rural area. More than 70% of the population is engaged in agriculture and other related activities. The major crops are wheat, maize, rice, potato and tomato and major fruits of the division are apple, pear, peach, plum, citrus, walnut, persimmon and

apricot. Livestock grazing specially sheeps and goats is commonly practiced throughout the division (Govt. of KPK, 2009).

Primary Data

Primary data was collected on different related parameters from respondents from all the seven districts of Malakand division through close ended, well-structured questionnaire. The Contingent Valuation (a survey technique that is primarily used to place monetary values on products and services for which market prices do not exist or are not reflective of the goods actual social value) (Swallow *et. al*., 1994) was used to assess the willingness to pay for natural resources deterioration since natural resources do not attract market value. A number of formats have been used to elicit the value of environmental goods with the CVM technique. In this study open ended and iterative bidding format was used (Duan and Clark, 2000). The rational for choosing this one is, it involves a straight forward estimation and maximum willingness to pay is obtained in this format. In this method the general public who depends on natural resources asked directly so that how much they are willing to pay (WTP) for the conservation of the natural resources.

Secondary Data

Secondary data were collected from already existing literature on poverty and environment relationship from theses, journals, published and unpublished documents, books and news papers. However data regarding poverty in Malakand division was taken from Economic survey, Govt. of Pakistan.

Sampling

Malakand division was chosen as the study area because it is one of the largest division of Khyber Pakhtunkhwa. Being a rural area most of the people depends on natural resources for their basic needs. The heterogeneous collection of forest trees provides all domestic requirements for cooking and burning. The shrub and grasses are used as a fodder for livestock. The major economic activity in the area is subsistence farming and forest cutting and selling. In the 2nd stage of sampling the respondents were selected covering all the seven districts. The reason for selection of the all the seven districts of Malakand Division was to reached maximum variation. The number of the respondents interviewed was based on the population of the concerned district. The table 3.1 shows the number of the respondent selected along with the population of the concerned district.

Table 3.1 Population (1998 Census) and number of respondent selected from all the seven Districts of Malakand division.

S. No:	District	Population	No: of Respondent
01	Swat	1257602	45
02	Dir Lower	717649	30
03	Dir Upper	575858	25
04	Bunir	506048	25
05	Malakand	452291	20
06	Shangla	434563	20
07	Chitral	318689	15
	TOTAL	4262700	180

The respondents were mostly heads of their households. A total of 180 respondents were interviewed from all districts.

Sample Size

A sample size of one hundred and eighty (180) respondents was drawn from the target area where most of the population is the users of natural resources. In all, respondents each had an equal chance of being interviewed in each district. There are enough similarities among the population in terms of income, educational levels, uses of fuel etc.

3.4.2 Survey Instruments

The study was conducted by face to face interaction in which a self- administered questionnaire was used. Other types of data collection procedure were not looking suitable due to high illiteracy in the study area. The questionnaires administered comprised three main parts as under for collecting data on these categories.

1. **Socio-economic indicators**: Age, Gender, Marital status, Education, Household size etc.

2. **Economic livelihoods indicators**: Primary occupation, Employment status, Income levels, ability to cater for basic household needs etc.

3. **The state of the quality of the environment**: Impact of household's livelihood activities on the environment and the extent of forest resources degradation in Malakand division.

Econometric Model Specification

The model of Alvarez and Glasgow (1999) was used to estimate the impacts of poverty on deforestation and in turn of forests degradation on poverty level of rural community in Malakand Division. The specified model is Non Recursive two stage linear regression model as under;

$SF = \beta_0+\beta_1 Inc+\beta_2 Fam+\beta_3 Edu+\beta_4 Pnm+\beta_5 Up+\beta_6 Wtp + \varepsilon$ 1

$INC = \alpha_0+\alpha_1 SF+ \alpha_2 Fam+ \alpha_3 Edu+ \alpha_4 Pnm+ \alpha_5 Up+ \alpha_6 Wtp+\varepsilon$ 2

While

SF=Source of Fuel (Proxy for Deforestation)
Inc=Household monthly income
Edu=Educational attainment
Fam=Household size
Pnm=Percentage of basic needs met
Up=Usage Pattern of Fuel Wood
Wtp=Willingness to pay

Income levels and poverty has inverse relationship. With increases in household income a decrease occur in poverty level. Also there is positive relationship between deforestation and poverty. Higher poverty in rural community makes them dependent on forest resources in the areas where farming and cutting of fuel wood is the main source of livelihood. This causes forest resources to degrade more and vice versa. The coefficient of estimation is expected to be positive. Also education and deforestation has an inverse relationship. Higher education demand for better environment because educated people have a lot of knowledge of environmental conservation and about the dangers and effects of a degraded environment specially of deforestation. Therefore the sign of the beta is expected to be negative.

In the second model, the relationship between deforestation and poverty is expected to be positive. Highly degraded forest sector reduces yields for farmers and results in increasing poverty. The regression coefficient is expected to be positive. Also education and poverty have an inverse relationship. Higher education implies high income levels and therefore increases households' heads capacity to provide the basic needs to its family members. Therefore the sign of the beta is expected to be negative. Household size and poverty has direct relationship in the case where majority of the members are illiterates and unemployed. Also ε denotes the stochastic term and α, β denote the parameters to be estimated.

RESULTS AND DISCUSSIONS

Demographic Characteristics of Respondents

The demographic characteristics of the respondents are Gender, Age, Marital status, Educational level and Household size. In the category of gender the entire respondent selected were male only. Female were not included in the survey because of the conservative culture of the area. Out of 180 respondents interviewed, 2.7 % falls in the age limit 21-30, 28.3% in age limit 31-40, 25% in age limit 41-50, 28.8% in age limit 51-60 and 15% in the age limit of 60 above. Most of the respondents were married. Only 5 (2.7%) out of 180 respondents were single.

Due to prevailing illiteracy among the rural community of Malakand division, most of the respondents were illiterate or having only primary level of education. 41.1% of the respondents having no education at all while 35.0 % have only primary level of education. 15.5% were matriculate and 8.33% were graduates only. In the category of household size, maximum number of respondents having large household size. 86 (47.7%) out of 180 respondents have household size in the range of 11-15 members while 55 (30.5%) families having family members in the range of 6-10. Twenty four families fall in the range of 1-5 members and fifteen families in the range of 16-bove.The result shows greater number of family size in the study area. The summary of socio-economic characteristics of the respondents is presented in table 4.1 as under.

Table 4.1: Demographic characteristics of Respondents

Factor	Sample size (N)=180	Percentage (%)
Gender		
Male	180	100
Female	0	0.0
Age of Respondents		
21-30	05	2.70
31-40	51	28.3
41-50	45	25.0
51-60	52	28.8
60 above	27	15.0
Marital Status		
Single	05	2.70
Married	175	97.2
Educational status		
Nil	74	41.1
Primary	63	35.0
Metric	28	15.5
Graduation	15	8.33
Post-Graduation	0	0
Household size (No of members)		
0-5	24	13.8
6-10	55	30.5
11-15	86	47.7
16-above	15	0.08

Source: Field Survey 2014, Malakand Division

Primary Occupation of the Respondents

Primary occupation of the people in a specific area directly shows the ratio of dependency of those people on natural resources. Being a rural area most of the people of Malakand division are engaged in farming. Farmers mostly depend on natural resources for their livelihood. In the survey, out of 180 respondents, 107 (59.4%) were farmers, 47 (26.1%) were domestic workers, 11 (6.1%) were private servants, 09 (5%) were public servants and 06 (3.3%) were engaged in business profession. The summary of the data is presented below in the table.

Table 4.2 Primary occupation of the respondents

Primary Occupation	Number of Respondents	Percentage (%)
Farming	107	59.4
Domestic Worker	47	26.1
Private servants	11	6.1
Public servants	09	5.0
Business	06	3.3
Total	180	99.9

Source: Field survey 2014, Malakand Division

From the table 4.2 it is clear that majority of the people are engaged in farming which is a major subsistence activity in the study area. The farming is of subsistence level primarily for household consumption only. This is not a significant source of income for the families concerned. Also Subsistence type of farming involves indiscriminate cutting of forest tress, bush burning, soil nutrients exploitation etc which is a key step towards environment and natural resources degradation.

Income level of Respondents

Average monthly income is considered a major determinant of natural resources degradation in rural areas. Most of the respondents had average monthly income less than 5,000 which shows the extent of poverty in the rural community of Malakand division. 57.2% of the respondents had average monthly income less than or equal to 5 thousands rupees. 18.8 % of the respondents fall in the range of monthly income 6000 -10,000 rupees. 17.2% of the respondents had monthly income in the range of 11,000-15,000 rupees while 6.6% of the respondents had average monthly income level of 15,000-20,000 rupees.

Table 4.3 Average monthly income level of the respondents

Monthly Income level	No of Respondents	Percentage (%)
1000-5000	103	57.2
6000-10000	34	18.8
11000-15000	31	17.2
16000-20000	12	6.6
Total	180	100

Source: Field survey 2014, Malakand Division

Access to basic family needs

According to the World Bank (1992) the poor families in the rural areas meet their short term needs by exploiting the natural resources like excessive cutting of forest trees and inability to restore soil nutrients. To find out the extent of severity of poverty and dependence of rural community on forest resources for their livelihood, it was necessary to evaluate how well the poor cater for their family basic needs shelter, food, clothes, health and education etc. A large number of the respondents (51.6%) said that they are able only to meet 51-75 percent of their family basic needs. 33.3 % of the respondents were able only to meet less than or 50 % of their family basic needs. The reason showed for this situation was decline in farm productivity and non availability of permanent employment in the area. Only 14.4 % of the respondents were able to meet 76-100 percent of their family basic needs. Those were the people having permanent job employment or having own established business. It can therefore be concluded that over dependence of the poor on forest resources leads to degradation of environment hence having negative effects on the livelihood of the poor in the rural areas.

Table 4.4 Ability to cater for basic family needs

Percentage of need met	Frequency	Percentage %
≤ 50	60	33.3
51-75	93	51.6
76-100	26	14.4
Total	180	100

Source: Field survey 2014, Malakand Division

Food Consumption Pattern

From the data collected it has been concluded that food consumption pattern is three times a day in all the seven districts of Malakand division. The food consumption pattern shows that poor in the study area severely exploit natural resources. Saving behavior seems not to be practiced in the rural community. During cooking the rural people mostly used firewood or charcoal so maximum number of cooking means maximum use of fire wood hence maximum chance of forest and bush cutting. The table 4.5 shows that 100% of the respondent consume food three times a day in the study area.

Table 4.5 Food Consumption pattern of the respondents

Food Consumption	Sample Size	Percentage %
3 times a day	180	100
2 times a day	0	0
1 times a day	0	0

Source: Field survey 2014, Malakand division

Fuel use for cooking, heating and lighting

It is commonly observed that poor people in the rural areas of Malakand division highly depends on forest resources to supplement their livelihood from farming activities. In the study area poor people depends on a wide range of common resources like fruits, vegetables and oils as a food items, forest wood for energy purposes, green grasses and trees for livestock feeding and certain other plant for medicinal purposes.

There is a high demand of fuel wood for cooking, heating and lighting purposes. Economic reason for the use of fuel wood for cooking, heating and lighting is its price and availability of substitute. Income level normally determines the fuel for cooking, heating and lightning. Due to low price of fuel wood its use is highly encourage relative to other fuel substitute.

The table 4.6 shows the summary of the fuel sources for cooking, heating and lighting. Mostly fire wood is used for cooking purposes. Out of 180 household, 130 (72.2%) used fire wood and 35 (19.4%) used gas (LPG) for the said purpose. Use of charcoal, Kerosene and electricity is rare in the study area. Only a small number of the families (8.3%) were reported to use charcoal for cooking purpose.

For heating purpose in Malakand division again fire wood is the major source. 112 (62.2%) of

households used fire wood, 30 (16.6%) used charcoal while 38(21.1%) house hold used gas (LPG) as a source for heating. Heating cold water and heating rooms is common activity in winter season in the study area.

Electricity is the major source of lighting in Malakand division although in certain places due to non availability of electricity other sources like kerosene oil and gas (LPG) are also in use. 118 (65.5%) out of 180 was reported to use electricity for lighting while 33 (18.3%) and 29 (16.1%) house hold use kerosene and gas (LPG) respectively.

Table 4.6 Source and use of fuel in Malakand Division

Activity	Fuel	Sample Size (N)	Percentage (%)
Cooking	Fire wood	130	72.2
	Charcoal	15	8.3
	Gas	35	19.4
	Kerosene	0	0
	Electricity	0	0
Heating	Fire wood	112	62.2
	Charcoal	30	16.6
	Gas	38	21.1
	Kerosene	0	0
	Electricity	0	0
Lighting	Fire wood	0	0
	Charcoal	0	0
	Gas	29	16.1
	Kerosene	33	18.3
	Electricity	118	65.5

Field survey, 2014 Malakand division

Bush Burning

Bush burning is seasonal activity which is commonly observed in winter season (Oct-March) in the mountainous areas of Malakand division. Bush burning is one of the major cause of environmental degradation in the study area. Deforestation, Biodiversity loss and soil erosion is seems to be the direct cause of bush fire. Bush fire mainly caused by human activities like farming, grazing, hunting, charcoal production and wood harvesting (Nsiah-Gyabaah, 1994).

According to the table 4.6 out of 180 respondents interviewed 57 (31.6%) households are involved in bush burning for cooking purpose, 73 (40.5%) households cut bushes for heating purpose, 18.8% used it as feed for their livestock and 8.8% cut down bushes for agriculture purposes.

Table 4.7 Reason for bush burning

Reason for bush burning	Sample size (N)	Percentage %
Cooking	57	31.6
Heating	73	40.5
Livestock feeds	34	18.8
Farming	16	8.8

Source: Field survey 2014, Malakand Division

Wood Harvesting

Wood harvesting is a major activity in the rural areas which has a great effect on the environment and forest degradation and on livelihood of the local community. Wood harvesting is done for different purposes like firewood, art work and furniture, construction and medicinal purposes etc. Piles of cutted wood can be observed in every house in the rural areas for different domestic uses.

When respondents were asked whether they cutted down forest trees, and for what purposes? It was revealed that 99 out of 180 respondents (55%) cutted down forest trees for firewood, 17 out of 180 (9.4%) for ark work and furniture, 19 out of 180 (10.5%) for construction and 45 out of all (25%) replied that they cut down trees for all of the above mentioned purposes. Only 24.4% of the respondents replants tree after cutting them while more than 75% respondents do not care for trees replantation after cutting them for different economic purposes.

Table 4.8 Use of forest wood for economic livelihood

Economic activity	Sample size (N)	Percentage %
Fire wood	99	55
Art work and Furniture	17	9.4
Construction	19	10.5
Medicinal Use	0	0
All of the above	45	25

Source, Field survey 2014, Malakand division

Extent of Environment Degradation in Malakand Division

The respondents were asked for extent of environment and natural resources degradation in the study area and were asked if they have any knowledge about environmental conservation. 26 out of 180 respondents told that environmental and natural resources degradation in Malakand division is highly severe. A large of respondents (66.1%) told that the situation is severe, 17.8% told about less severe and only 1.7% told that it is not severe. Out of 180 respondents 134 (74.4%) were unaware about environmental conservation when they were asked.

Table 4.9 Extent of Environment and Natural Resources Degradation in Malakand Division

Extent of Environment degradation	**Frequency**	**Percentage**
Highly severe	26	14.4
Severe	119	66.1
Less severe	32	17.8
Not severe	3	1.7
Total	180	100

Source, Field survey 2014, Malakand division

Willingness to pay for Environmental Degradation

The Contingent Valuation method through bidding game method was used to find out the willingness of the people to pay for preventing environment and forest degradation. They were asked how much they are willing to pay on cutting of a single tree. Maximum number of respondents i.e. 98 out of 180 (54.4%) were ready to pay only a small amount of Rs. 1000 and 30.5 % were not in a position to pay only a single penny. The details of willingness to pay of 180 respondents are present in the table below.

Table 4.10 Willingness to pay for environmental degradation

Amount (Rs)	**Frequency**	**Percentage**
0	55	30.5
1000	98	54.4
2000	7	3.8
3000	7	3.8
4000	8	4.4
6000	3	1.6
8000	1	0.5
10,000	1	0.5
Total	180	100

Source: Field survey 2014, Malakand

Regression analysis result

Regression analysis was conducted using two stage linear equations model on the relationship between poverty and natural resources degradation in Malakand division and the result was presented as under.

Model one (Impact of Poverty on Deforestation)

The Ordinary least square (OLS) estimates below shows the impacts of poverty on forest resources degradation. The higher value of correlation coefficient (R^2 Adjusted=88.2%) is a result of the fact that most of the variation in the model is explained by independent variables. It means that forest degradation mostly depends on income level, education, household size, willingness to pay and usage pattern of fuel wood.

Impact of Poverty on Environmental degradation (Deforestation)

Variables	Parameter Value Coefficients (B)	Std. Error	T-Values	Sig.
Constants	0.673	0.063	10.612	0.001
Household size	0.161	0.043	3.744	0.012
Usage pattern	0.355	0.069	5.174	0.001
Income level of the respondents	-0.290	0.045	-6.451	0.001
Education of the respondents	-0.328	0.63	-5.229	0.001
Willingness to pay	0.152	0.030	5.093	0.001
Percentage of basic needs met	-0.006	0.066	-0.095	0.924

R Square: 0.886
Adjusted R Square: 0.882
F Value: 223.723
Durbin Watson: 1.79
Dependent Variable: Source of fuel

The model used above meets the guidelines for validity testing ($0 \leq R^2 \leq 1$). A minimum R^2 value of 0.15 is satisfied in the model (Mitchell and Carson, 1989).

The relationship of explanatory variables with Source of fuel (proxy for forest degradation) showed in the regression analysis have their expected signs. All the variables included in the model have highly significant affect on environmental degradation at 5% of significant level except percentage of basic needs met, which is not significant. There exist an inverse relationship between income and education of the respondents and source.

The relationship between source of fuel and monthly income is negative which implies that when monthly income of the respondents increases, poverty decreases resulting in low level of environmental degradation/deforestation. As income decrease, poverty level increase and results in higher level of environmental degradation/deforestation. Severe forest degradation causes low yield and perpetuate more poverty among the rural community. Thus the income gets better and to lessen the poverty situation, the probability that community should adopt environment friendly practices thereby alleviates the scenario of forest resources degradation. The result is consistent with the findings of Jodha (2000) and Cavendish (2000).

Usage pattern of fuel wood have positive relation with dependent variable i.e. source of fuel (a proxy for deforestation). This is consistent with priori expectation. Since most of the respondents are engaged in farming and mostly use fire wood for cooking and heating due to non availability of other fuel sources leads to deforestation which is the main cause of environmental degradation. This is consistent with what pertains in Malakand division especially in the mountainous areas. The result is also in line with the findings of Duraiappah (1998).

Household size is positive relationship with sources of fuel. With increase in household size where most of the members are farmers as pertain in Malakand division depends on natural resources for livelihood activities is bound to be high. Therefore dependence of rural community on forest resources in the study area increases because of unavailability of alternative for livelihood. The findings of the study are consistent with the findings of Duraiappah (1998) and Ekbon and Bojo (1999).

The relation between willingness to pay and forest degradation is positive. As most of the respondents are poor, don't care for forest and environment conservation, hence not willing to pay a single penny or very less amount for the protection and conservation of forest resources. The result is similar to the study of Cavendish (2000) and Nakpa (2012).

The adjusted R^2 value (88.2%) is logical considering the recommendation of minimum value of 0.15 (Row and Chestnut, 1983; Mitchell and Carson, 1989). This shows that most of the variation in fuel usage (proxy for deforestation) is explained by the model. The Durbin Watson (DW) value 1.79 shows that auto correlation does not exist in the data to a large extent. From the result of regression analysis it is clear that rural poverty is an agent of deforestation in Malakand division which is a severe threat to environmental quality. The findings of the study are consistent with that of Dasgupta (2003) and Okwi *et al.* (2006).

Model Two (Impact of Deforestation on Poverty)

Table 4.12 shows the results of ordinary least square (OLS) model. The coefficient estimates that provide the best fit between the data and the assumed theoretical model. Variables in the model were included on the basis of priori logic in economic theory and model reports are considered only for variables significant at 5% significant level. The model meets the guidelines for validity testing (Mitchell and Carson, 1989). For a good model a minimum value of R^2 0.15 is satisfied in the model which was recommended by Mitchell and Carson (1989).

Impact of Environmental degradation (Deforestation) on poverty

Variables	Parameter Value (Coefficients)	Std. Error	T-Value	Sig. Standard error
Constants	-0.194	.023	-8.434	0.002
Household size	0.098	.015	6.553	0.001
Usage pattern	-0.114	.012	-9.500	0.001
Education of the respondents	0.609	.092	6.648	0.001
Willingness to pay	0.177	.048	2.459	0.015
Percentage of basic needs met	0.163	.100	1.627	0.106
Source of fuel	-0.670	.104	-6.451	0.001

R Square: 0.888
Adjusted R Square: 0.885
F Value: 229.564
Durbin Watson: 1.70
Dependent Variable: Income of the respondent

The relationship of the explanatory variables with dependent variable has the expected signs. Except the variables percentage of need met and usage pattern all other variables are significant at the 5% level of statistical significance. Source of fuel, Usage pattern of fuel wood, Household size, Education of the respondents and willingness to pay are the most significant variables determining poverty at 5% statistical significant level.

The relation between income of the respondents and fuel sources (proxy for deforestation) is negative which means that as forest degradation increases income level decreases that implies increase in the poverty level and vice versa. Degradation of forest resources negatively affect yield of the farmers by decreasing it, hence perpetuate more poverty in the rural community. As income of the rural community increase, dependence on natural resources falls. This is because of the fact that with increase in income rural people focus on other economic and livelihood activities other than forest resources exploitation, in order to maintain their improved well being. The findings of the study are similar to the findings of Jodha (2000) and Cavendish (2000).

Household size is positive relationship with income of the respondent. This means as the size of household increases, especially where majority of the members are illiterate and engaged in farming earn low income and poverty bounds to be high. Such type of relationship was previously observed by Allen and Barnes (1985), Ehrhardt-Martinez (1998) and Rudel and Roper (1997).

Also education has the expected positive sign. Income of the people also depends on the educational attainment. Higher educated people have higher income than other. Higher educated people are not involve directly in forest cutting and natural resources degradation. They buy forest product from poor and unemployed people of the community. Instead of degradation and over exploitation of natural resources the educated people concentrate on other profitable activities such as public private services and business etc. The findings of the study are in line with the findings of Moren (1994).

Willingness to pay for environment and forest degradation has the expected positive sign implies that willingness of the people to pay increase with the income level. Rich people are mostly educated knows the consequences of deforestation are ready to pay for environment and forest conservation. The result is consistent with that of Nakpa (2012).

The adjusted R^2=88.5% is reasonable in consideration of minimum value of 0.15 recommended by Row and Chestnut (1983) and Mitchell and Carson (1989). This shows that maximum variation in fuel sources which is proxy for deforestation is explained by the model. Such a phenomenon is typical with many CVM studies (Desvousges et al., 1987).

The Durbin Watson statistic of 1.70 suggests that autocorrelation does not exist among the variables in the model. From the regression analysis it can be concluded that forest degradation increase the severity of poverty in Malakand division.

Conclusion

The objective of the study was to test empirically the inter relationship of poverty and forest resources degradation. Poverty and forest degradation are linked in a vicious cycle. The poor cannot take care for forest resources since they have no alternative for livelihood and other energy purposes hence use unsustainably forest resources for their basic needs. The study was conducted in the rural areas of Malakand division where poverty, wood harvesting, use of fuel wood and bush burning are severe problems. The study based mostly on primary data collected through well structured questioners. Frequency tables, Bar charts and regression analysis were used as analytical tools.

The result of the analysis and the study provide evidence that is consonance with the existing literature that poverty is the main agent of deforestation and in turn forest resources degradation enhance poverty in the rural community. Hence it was concluded that poverty-environment quality nexus exists in the study area.

Furthermore the result indicates that the impact of deforestation on poverty level is less (-.194) than the impact of poverty on deforestation (0.673) in Malakand division. The result shows that rural community in Malakand division strongly depends on forest resources for their livelihood. A significant amount of their income comes from forests and land farming confirming that degradation of forest resources have a greater impact on the poor people than on the rich.

On the question that how rural households are able to cater for their family basic needs such as food, clothes, shelter, health and education etc a large number of respondents (93 out of 180) replied that they are able enough to meet only 51-75% of the family basic needs and 60 out of 180 respondents were not able to meet more than 50% of their family basic needs that is both material and financial concern. On the issue of the reason for the use of fire wood for energy purposes, more than 90 % of the interviewer responded that they have no access to other energy sources due unavailibity in the area concern.

Based on the collected data it was investigated that 41% of the people in Malakand division are illiterate having no education at all while 35% having education only up to primary level. 91.6% of household were found having more than five family members which is quite big size compared to urban households. Poverty is prevailing in rural community. In the study it was shown that 57.2% of the people have monthly income less than 5,000 still 100% of the community consume food three times a day which means that they have low income and high consumption which is not good for any economy. Only 14.4% of the people were found able to meet 100% of their family basic needs. Forest cutting for fire wood, timber and construction purposes was found to a regular activity in the rural areas of the Malakand division. 72.2% of the people used fire wood for cooking purposes while 62.2 % used it for heating as well. Bush burning for cooking and farming purposes was commonly observed. When the respondents were asked for the severity of deforestation and natural resources degradation in the area concerned, 66.1 % replied that it was severe in nature while 14.4% told that it was highly severe. When it was investigated that if the people in the rural community have any knowledge about environmental conservation and willing to pay for it. More than 70% of the respondents were found unaware of environmental conservation and 58.3% of the respondents were not ready to pay only a single penny to the concerned authority for environmental conservation. Regression analysis also showed highly significant result. On the basis of the above facts and findings certain recommendation are put forward for the rural community and concerned authority to at least minimize if not totally tackle down the poverty situation and environmental degradation in Malakand division.

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