

**PAYMENTS FOR ECOSYSTEM SERVICES:  
A CASE OF FORESTS IN THE KHYBER PAKHTUNKHWA PROVINCE**

**Anwar Hussain, PhD**

Associate Professor

Pakistan Institute of Development Economics (PIDE) Islamabad

Email: [anwar@pide.org.pk](mailto:anwar@pide.org.pk)

**Muhammad Nasir, PhD**

Senior Research Economist

Pakistan Institute of Development Economics (PIDE) Islamabad

Email: [nasir84@pide.org.pk](mailto:nasir84@pide.org.pk)

**Global Change Impact Studies Center (GCISC)**

**Ministry of Climate Change**

**Government of Pakistan**

**2018**

## EXECUTIVE SUMMARY

Forest ecosystems provide many services such as provisioning, regulating, cultural and supporting. Some of these services are not properly monetized and resultantly are left out of the provincial and national income accountings. This study attempts to monetize the key services of forest ecosystems in the Khyber Pakhtunkhwa (KP) province of Pakistan. In the *provisioning services*, we included timber, medicinal plants, honey, morels/mushrooms, pine nuts, kachnar, walnut, persimmon, pomegranate, kachnal, resin, mazri, firewood and employment. In the *regulating services*, we considered protection against floods and soil erosion, and environmental benefits. In the *cultural services*, we covered recreation/tourism while in *supporting services*, the contribution of forest ecosystem for habitat and biodiversity protection has been taken into account. For the monetization of forest ecosystem services, the study used secondary data from various reports, government documents and other relevant literature. The market approach has been adopted in the valuation of services. However, for the economic and environmental benefits of different trees, the National Tree Benefits calculator has been used. The findings revealed that the forest provided timber worth Rs. 11766.5 million during the period 2004-05-2016-17. The selected ten different trees provide a combined annual average benefit of PKR 185502. Variety of medicinal plants exist in KP forest and has good market in the country. The afforestation can save the flood losses (Rs. 99625 million) and reconstruction cost (Rs. 179844 million). Majority of the tourists visit KP for recreation and social call (combined 68% of the total tourists) and adds significant revenue to the total provincial income amounted to Rs. 11648 million in the year 2009. Moreover, afforestation can also save cost of land sliding in the province. The forests also provide shelter for millions of animals and birds and employ the local labour force in the province.

Afforestation is a viable option to ensure its economic and environmental benefits for the provincial and subsequently for national economy. For a more in-depth analysis, the study recommends to keep the record of biodiversity, trees by area and type, and prices and quantities of medicinal plants. Besides, there is need to record information and conduct studies for valuation of additional forest services such as water purification and recycling, pest regulation, disease regulation, pollination, waste absorption, aesthetic values, and soil formation. Future research should also identify the potential tourist spots in KP and should estimate their economic and environmental contributions. The farmers in KP collect their produce in crude form losing the fair prices. They need to be trained in the production, collection, marketing, and standardization of their produce, which would resultantly increase the value forest ecosystem services.

## 1. INTRODUCTION

Forests are one of the basic components of the natural capital making valuable contributions to society in many ways. According to the [Forest Development Corporation \(2018c\)](#) globally 80-90% of 1.2 billion people living in extreme poverty rely on forests for their livelihood. Majority of the world forests (47%) are tropical while the boreal, subtropical and temperate are 33%, 9% and 11% respectively. About 60% of the world's forests are located in seven countries namely Brazil, Canada, China, Indonesia, Russian , United States, and Democratic Republic of Congo ([Forest Development Corporation, 2018a](#)). Forests provide mainly four type of services; provisioning, regulating, cultural and supporting. The provisioning services include fuel, fiber, food, and medicinal plants etc. The regulating services cover air quality maintenance, climate and water regulation. These also regulate pest, diseases and protect against flood, storms and landslides. The cultural services include aesthetic values, cultural heritages, and tourism/recreation. The supporting services consist of natural habitat protection, soil formation and water recycling. These services have both use and non-use values which needs proper valuation. The researchers used different approaches such as market based, revealed preference and stated preference approaches to value different services ([De Groot et al., 2012](#); [Fu et al., 2011](#); [Vo, Kuenzer, Vo, Moder, & Oppelt, 2012](#); [GD Xie, Zhen, Lu, Xiao, & Chen, 2008](#)). The non-availability of data and selection of appropriate valuation methods provide different results even for the same services provided by forests. However, the role of these forest services to the society cannot be ignored and efforts are required to value these services for the green national accounting.

Although the forest sector in Pakistan is growing at a rate of 7.17 percent ([Government of Pakistan, 2018](#)), the values of many forest ecosystem services have not been documented properly. This highest forest growth rate is due to the increased timber production in the Khyber Pakhtunkhwa province during 2017-18 ([Government of Pakistan, 2018](#)). The province has a forest cover of 1.31 million hectares ([Government of Pakistan, 2015a](#)) which constitutes more than 31% of the total forest area in Pakistan ([International Growth Center, 2015](#)). In Pakistan, majority (43%) of the forests are coniferous followed by Scrub forests (39%) ( see Table 1).

These forests are the main source of livelihood for millions and provide many services such as timber production, medicinal plants, recreation etc. These forests contain diverse habitat supporting flora and fauna in the province ([Janjua, 2014](#)) and is also a source of watersheds and soil conservation ([Wildlife Conservation Society, 2018](#)).

**Table 1: Distribution of Forest Types in Pakistan**

Forest type	Area (1,000 ha)	Percent of total
Coniferous forests	1,870	43
Scrub forests (dry subtropical broad leaved and tropical thorn forests)	1,683	39
Irrigated plantations	200	4
Riverine forests	290	7
Coastal mangroves	283	6
Others (linear plantations mazri, etc.)	40	1
Total	4,366	100

Source: [Food and Agricultural Organization \(n.d-a\)](#)

The medicinal plants provided by the forests are also the important source of foreign exchange earnings. The developing countries are exporting more of these plants than the developed countries (Table 2). This is because of the facts that developing countries have more forest area as compared to developed countries. In developing countries, about 80% of the population rely on medicinal plants for their health care ([Food and Agricultural Organization, n.d-b](#)). Due to the increasing demand for medicinal plants, the global sale of herbal products increased to USD 60,000 million ([WHO, 2003](#)). Pakistan is also earning handsome revenue from the exports of medicinal plants (Table 2). In Pakistan more than 6000 medicinal plants are grown in which about 2500 are grown in Swat ([Sher, 2018](#)). Alongside these services, the forests are also facing challenges such as increase in the demand for fuelwood, overexploitation of forest resources, lack of good governance, water scarcity and loss in the biodiversity.

The Khyber Pukhtunkhwa province has 4650561 acres area under forest with growing stock of 54 million Cft worth Rs. 1100 billion. The annual harvests is 10 million Cft ([Forest Development Corporation, 2018a](#)). The major forest areas of the province are Abbottabad, Swat, Dir, Malakand and Kohistan (Table 3). Considering the current challenges of climate change, deforestation and loss of natural habitat, the Pakistan Tehreek-e-Insaf Government launched a green growth initiative in the forestry sector in KP Province with Billion Tsunami Afforestation Project (BTAP) in the year 2014 to restore and planting trees on 350,000 hectares area ([Government of Khyber Pakhtunkhwa, 2018a](#)). The project covered the regions of D.I. Khan, Bannu, Kohat, Peshawar, Mardan, and remained successful on many fronts (Table 4).

**Table 2: World exports value of Medicinal plants (million US Dollar)**

Year	World	Developed Countries	Europe	Developing Countries	Pakistan	Pakistan global share in %
1991	1136	338	203.3	797.8	8.4	0.74
1992	1297	427.8	238.5	869.6	5.8	0.45
1993	1176	376.4	207.7	800	5.1	0.43
1994	1396	406.6	238.2	988.9	3.1	0.22
1995	1525	481.5	279.5	1043.6	5.5	0.36
1996	1406	454.9	256.6	951.5	4.7	0.33
1997	1321	454.4	264.9	866.5	2.8	0.21
1998	1224	483.4	308.8	740.1	3.8	0.31
1999	1102	427.1	252.2	675.3	3.7	0.34
2000	1097	4172	243.3	679.8	3.5	0.32
2001	1016	381.7	225.7	634.5	5.4	0.53
2002	1035	407.9	244.4	627	3.4	0.33

Source: [Food and Agricultural Organization \(n.d-b\)](#)

**Table 3: District Wise Forest Area Including Private Plantation Area (in Acres)**

District	2013-14	2014-15	2015-16
Abbottabad	199710	199710	199710
Bannu	35587	35587	35587
Battagram	246839	246839	246839
Buner	273765	273765	273765
Charsadda	176877	176877	176877
Chitral	125677	125677	125677
D.I.Khan	74525	74525	74525
Dir Lower	133858	133858	133858
Dir Upper	694333	641306	641306
Hangu	128618	181645	181645
Haripur	140082	184271	184271
Karak	52253	87604	87604
Kohat	70654	70654	70654
Kohistan	481064	481064	481064
Lakki	17917	44430	44430
Malakand	101181	30479	30479
Mansehra	536423	536423	536423
Mardan	162432	91729	91729
Nowshera	72088	178142	178142
Peshawar	72719	55043	55043
Shangla	180430	180430	180430
Swabi	110371	109888	110371
Swat	497969	409247	409591
Tank	65189	188919	188919
<b>Total Khyber Pakhtunkhwa</b>	<b>4650561</b>	<b>4649734</b>	<b>4650561</b>

Source: [Government of Khyber Pakhtunkhwa \(2017b\)](#)

**Table 4: Area, Species and Achievements of the Billion Tree Afforestation Project**

Forest Division	Size of area (ha)	Sub-Division/ Areas Covered	Prominent Species	Achievements			
				Plantation (in ha)	Sowing (in ha)	Enclosures (in Nos.)	Free Distribution (in Millions)
D.I.Khan	900500.00	I. Khan, Paharpur, Tank, Sheikh Buddin, Paroa Range	Prosopis spicigera, Tamarix aphylla, Zizyphus mauraitiana, Tamarix dioica, Capparis aphylla, Salvadora oleoides, Acacia nilotica, Acacia modesta, Dodonea viscosa	16745.00	1500.00	166.00	4.71
Bannu	438025.00	Bannu, Lakki		12342.00	0.00	70.00	5.03
Kohat	699258.25	Kohat, Karak, Hangu, Teri Range, Thall	Acacia nilotica, Zyzyphus jujoba, Salvadora Oleidies	10138.00	1500.00	246.00	4.49
Peshawar	399910.06	Peshawar, Charsadda, Nizampur		7173.00	1000.00	68.00	12.50
Mardan	3166.00	Lower Swat Canal Forest Sub Division with headquarter at Mardan, Upper Swat Canal Forest Sub Division with headquarter at Katlang, Swabi Forest Sub Division with Headquarter at Swabi, Gadoon Forest Sub Division with headquarter at Bada, Rustam Forest Range with head quarter at Rustam		7478.00	1000.00	118.00	11.84

Source: [Government of Khyber Pakhtunkhwa \(2018a\)](#)

## 1.1 Understanding Payments of Ecosystem Services

Payments for ecosystem services (PES) is a complicated phenomenon ([Jennifer M. Alix-Garcia & Wolff, 2014](#)): however, [Wunder \(2005\)](#) defined Payments of Ecosystem Services as, “*the voluntary transactions in which a well-defined environmental service, or a form of land use likely to secure that service, is bought by at least one buyer of that ecosystem service, from a provider of that service*”.

Due to increasing deforestation at local, national, and global level, PES programs are designed to conserve forests and lessen the dependence on forests. The buyers of ecosystem services can be classified into three distinct groups: local, regional, and global ([Jennifer M. Alix-Garcia & Wolff, 2014](#)). The existing evidence show that PESs which are financed at local and national level focus hydrological ecosystem services (for example, Mexico’s PSAH, Panama’s Forest Re, and Ecuador’s PROFRAFOR) while global PESs (i.e., Deforestation and Forest Degradation (REDD), Clean Development Mechanism (CDM)) mostly focus on carbon sequestration and biodiversity ([Jennifer M. Alix-Garcia & Wolff, 2014](#)). Moreover, the suppliers of ecosystem services are mostly the individuals or communities having access to forest resources.

To control the deforestation, the compensation amount should equal the opportunity cost of deforestation. Technically, social cost of deforestation is greater than the private cost.<sup>1</sup> Unfortunately, the existing literature on payments does not answer the question on how the payments are made in various interventions worldwide. One method which has been examined by researchers ([Ajayi, Jack, & Leimona, 2012](#)) is implementation of auctions to allocate contracts among least-cost landholders. Theoretically, payments at the end of contract are optimal in case of forest eco-payments ([Salas, Roe, & Sohngen, 2013](#); [Salas & Roe, 2011](#)). But in practice, PES is made on yearly basis in 5-20 years long contracts.

## 1.2 Existing Evidence on PES

We start with the seminal work of [Ferraro and Pattanayak \(2006\)](#) which calls for the impact evaluation of conservation investments. It argues that evaluation of environmental interventions lags other policy fields such as poverty, criminology and health. Despite an early call, the existing evidence on impact evaluation of environment related interventions is still embryonic. Fewer studies comprehensively study the interventions for preservation of ecosystems. For example, [Le Velly, Sauquet, and Cortina-Villar \(2017\)](#) also evaluate PSA-H, a program on payments for forest

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<sup>1</sup> Private cost does not include the societal costs like, erosion, bad air quality, higher carbon, etc.

resource conservation implemented in Mexico. It studies the impact of this program through various cohorts and finds negative association between PSA-H payments and deforestation. Moreover, it finds overall 2.45% reduction in deforestations in cohorts where program was implemented. Interestingly, it also studies the leakages affect and find that deforestation increases in cohorts where program was not implemented. However, in another study, [Costedoat et al. \(2015\)](#) observe about 12-15 percent increase in forest cover for areas where PES program was implemented in Mexico. Conversely, [Pattanayak, Wunder, and Ferraro \(2010\)](#) find that PES payments have no effect on reversal of deforestation. Moreover, [Arriagada, Ferraro, Sills, Pattanayak, and Cordero-Sancho \(2012\)](#) evaluate the impact of PES on forest farm cover for Costa Rica and note a substantive increase in farm cover from 11% to 17% over the eight years. Similarly, [Robalino and Pfaff \(2013\)](#) analyze Costa Rica's PSA program and find moderate impact of eco-payments on deforestation.

Likewise, [Jayachandran et al. \(2017\)](#) study the PES program implemented in Uganda as a Randomized Control Trial (RCT) for two years. Using the satellite imagery data on forest cover, it finds that payments to forest land-owning households reduce deforestation and forest degradation. The study also reports *no leakages effects* related to tree-cutting. Finally, [Jennifer M Alix-Garcia, Sims, and Yañez-Pagans \(2015\)](#) assess the effects of conditional environmental cash transfers on deforestation and livelihoods of local community. It finds that the program has significantly reduces the expected land cover loss but generates minimal effects on poverty reduction. Unfortunately, as reported by [Jennifer M. Alix-Garcia and Wolff \(2014\)](#), no study attempts to value the benefits of biodiversity, soil and air conservation, and carbon sequestration increased because of forest related eco-payments.

### **1.3 Valuation of Ecosystem Services**

As mentioned above, the literature on payments of forest ecosystem services does not explicitly talk about the methods, which decide the specific amount of payment. However, there is a large body of literature, which try to estimate the economic value of use and non-use forest ecosystem services. Apparently, both the literatures are building in complete isolation.

Studies have used diverse techniques for valuation of environmental services provided by forests. For example, many studies (see, [Cerda, Ponce, & Zappi, 2013](#); [Lew & Wallmo, 2011](#); [Meyerhoff, Liebe, & Hartje, 2009](#)) use choice experiments for economic valuation. Other studies use travel cost method ([Chae, Wattage, & Pascoe, 2012](#); [Hayati, Salehnia, Hossenzad, & Dashti, 2010](#)),



contingent valuation method ([Kumar & Kant, 2007](#)), and replacement cost methods ([Mashayekhi, Panahi, Karami, Khalighi, & Malekian, 2010](#); [Nahuelhual et al., 2007](#)) to value different forest ecosystem services. In this section, we report studies, which try to estimate economic value of forest ecosystem services.

**Table 5: Evidences on forest ecosystem services valuation**

S.No.	Service of Forest ecosystem	Country	Valuation findings	Source
1.	National park	India	The net economic value of the park lies between 13-148 million dollars per annum	<a href="#">Ninan and Kontoleon (2016)</a>
2.	Beijing forest	China	Beijing forest contribute 4 percent to its GDP	<a href="#">Gaodi Xie et al. (2010)</a>
3.	Whakarewarewa forest	New Zealand	The benefits from the visitors are \$8 million	<a href="#">Turner, Dhakal, Yao, Barnard, and Maunder (2011)</a>
4.	Ayubia National Park	Pakistan	The recreational value of the park is around Rs. 200.6 million	<a href="#">Khan (2006)</a>
5.	Vegetation structure of the temperate forests of Neelum valley	Pakistan	the fuel wood consumption of the area as 3.11 kg/capita/day obtained from the forests	<a href="#">Shaheen, Aziz, and Dar (2017)</a>
6.	Tunisian forests	Tunisian	The total economic value of the forests under study was USD 142 million	<a href="#">TEEBcase (2013)</a>
7.	Kangchenjunga landscape	Nepal	Forest ecosystem services in the three districts was around USD 125 million	<a href="#">Pant, Rasul, Chettri, Rai, and Sharma (2012)</a>
8.	Forests of NCC's Kenauk property in Great Lakes–St. Lawrence forest region of Quebec	Canada	The approximate value of this forest is \$20,000 per hectare per year	<a href="#">TD Economics &amp; Nature Conservancy of Canada (2017)</a>
9.	Forests and woodland in Britain	UK	The total annual and capitalised values of the social and environmental benefits is £ 1022.92 and £29226 respectively	<a href="#">Willis et al. (2003)</a>
10.	Forest natural capital of the Beijing municipality	China	The flow value of annual output of forest ecosystem goods and services of Beijing was 47.9 billion yuan (US\$6.3 billion).	<a href="#">Wu, Hou, and Yuan (2010)</a>
11.	East Mau forest ecosystem	Kenya	The indirect use value of East Mau forest worth US\$219 million	<a href="#">Langat, Maranga, Aboud, Cheboiwo, and Onilude (2018)</a>
12.	Forest ecosystem services	USA	Total revenue was amounted to US \$1.9 billion in 2007	<a href="#">Mercer, Cooley, and Hamilton (2011)</a>
13.	Non-Timber ecosystem services	Georgia	Non-use values of private forest was amounted to US\$11.2 billion annually	<a href="#">Moore, Williams, Rodriguez, and Hepinstall-Cymmerman (2011)</a>
14.	Use value of wilderness protection	USA	The use value of wildness protection was \$12/visitor day	<a href="#">Walsh and Loomis (1989)</a>
15.	Hunting permits	USA	The hunters' willingness to pay was \$11 and \$36.25 for fall and spring turkey hunting permits respectively	<a href="#">Brunke, Hunt, Grado, and Parks (2006)</a>
16.	Recreational value of forests	USA	The total recreational value was \$6 billion per year	<a href="#">Barnhill, Irwin, and Craven (2000)</a>
17.	National Forests	USA	The recreational value of national forest was \$90 per head per trip	<a href="#">Bowker et al. (2009)</a>
18.	old-growth forest protected from fire	USA	The annual willingness to pay for old-growth forest protected from fire ranged \$49.5 to \$99 million	<a href="#">Loomis, González-Cabán, and Gregory (1996)</a>
19.	New Hampshire, northeastern deciduous forest	USA	The average annual willingness to pay for a state gypsy moth was \$70 per household	<a href="#">Miller and Lindsay (1993)</a>

There is a need to recognize and monetize the services of forest ecosystem for effective decision-making. Many studies have been conducted in various countries to value forest services ([Chiabai, Traversi, Ding, Markandya, & Nunes, 2009](#); [Costanza et al., 1997](#); [Hein, Van Koppen, De Groot, & Van Ierland, 2006](#)) but unfortunately, in Pakistan little attention has been made to monetize the forest services. This study is an attempt to bridge this gap by trying to quantify some of the forest ecosystem services followed by identifying some potentials areas of forest ecosystem services for valuation.

## **2. DATA AND METHODOLOGY**

The study is based on secondary data obtained from published statistics and literature. We are using different approaches to value the forest ecosystem services, which have been proposed by literature. A brief description of the forest ecosystem services and valuation procedures are illustrated in Table 6. The National Tree Benefit Calculator is utilized to calculate the annual benefit of a tree of particular species. This calculator requires name of the species to which the tree belongs, the diameter in inches, and the land use type. Inserting these information into the calculator produces the per annum per tree value for a particular species. Using this calculator, we have estimated the per tree annual benefits for several major species for which this relevant data were available in the KP province.

There are some additional important services provided by forests such as water purification, pest regulation, disease regulation, pollination, waste absorption, aesthetic values, soil formation and water cycling. However, due to non-availability of data, these have not been included in the analysis.

**Table 6: Type of Forest Ecosystem Services and Valuation Methods**

Type of ecosystem services	Examples of services provided	Sources of data and Methodology
Provisioning Services	Timber	The timber production, sale and revenue valued at market prices was obtained from Forest Development Corporation, KP and Development Statistics of Khyber Pakhtunkhwa
	Medicinal plants	The main and commercially important medicinal plants valued at market prices have been obtained from secondary data used in literature.
	Honey	The market value of honey has been obtained by taking quantity and price of honey from literature
	Morels/Mushrooms	The value of Morels/Mushrooms has been estimated using market prices
	Pine Nuts (Chilghoza)	The value of Pine Nuts (locally called Chilghoza) has been estimated using market prices
	Kachnar	The value of Kachnar has been estimated using market prices
	Walnut	The value of Walnut has been estimated using market prices
	Persimmon	The value of Persimmon has been estimated using market prices
	Pomegranate	The value of Pomegranate has been estimated using market prices
	Kachnal	The value of Kachnal has been estimated using market prices
	Resin	The value of Resin has been estimated using market prices
	Mazri	The value of Mazri has been estimated using market prices
	Firewood	The value of Firewood has been estimated using market prices
Employment	One of the contributions of forest is to employee millions in rural areas. The study estimated the annual monetary value of forest in providing employment to the population using secondary data.	
Regulating services	Protection against floods and soil erosion	Although it is difficult to estimate the forest ecosystem services against floods, but this study used defensive expenditures approach because more forest means to save more floods expenditures. The floods losses and landslide expenditures have been collected from Provincial disaster management authority (PDMA) and The Emergency Events Database (EM-DAT).
	Economic and environmental benefits of trees	the National Tree Benefit Calculator consider contribution of trees in controlling the storm water runoff, raising the property value, conserving energy, absorbing the pollutants and reducing the atmospheric carbon while estimating annual benefits of the trees in monetary term. This study also used this calculator to derive the annual benefits of selected trees due to non-availability.
Cultural services	Tourism/Recreation	Secondary data has been used to assess the contribution of forests in generating revenue through providing recreational services. The data has been obtained from secondary sources.
Supporting services	Protecting habitat and biodiversity	The value of various animals and birds has been reported from literature to highlight the role of forest ecosystem service in protecting the habitat and animals.

### 3. RESULTS AND ANALYSIS

#### 3.1 Timber Production Services of KP Forests

Producing timber is one of the most important contributions of forests. The KP province had total standing stock of 97 million m<sup>3</sup> with average number of trees of 25.9 per hectare in the year 2003-04 ([UNDP Pakistan, 2010](#)). These forests not only meet the growing demand of wood but are also the key source of revenue generation for the government. In the past, the timber production and revenue declined substantially due to numerous reasons including low plantation in the province (Tables 7 & 8). Overall, these statistics show significant contribution of forests in providing timber and revenue.

**Table 7: Extraction and Sale of Timber Production**

Seven years annual average	Timber Production	Timber Sale (million Cft)
1980-81 to 1986-87	3.615	3.647
1987-88 to 1993-94	5.414	4.761
1994-95 to 2000-01	1.179	2.070
2001-02 to 2007-08	0.691	0.633
2008-09 to 2014-15	1.153	1.227

Source: [Forest Development Corporation \(2018b\)](#)

**Table 8: Plants Distribution and Monetary Value of the Timber Produced by Forest Department in Khyber Pakhtunkhwa**

Year	Number of Plants distributed (Millions ) <sup>[1]</sup>	Quantity (cft) <sup>[2]</sup>	Value (Rs. Million) <sup>[2]</sup>
2004-2005	37.85	16,73,765	1440.389
2005-2006	27.077	16,94,598	796.942
2006-2007	27.874	16,57,555	900.755
2007-2008	35.181	17,59,944	824.096
2008-2009	20.84	16,39,835	617.928
2009-2010	23.5	21,60,524	847.930
2010-2011	11.237	16,05,933	685.000
2011-2012	9.708	13,95,744	731.645
2012-2013	11.765	13,25,800	704.594
2013-2014	14.826	17,16,809	1442.601
2014-2015	22.76	7,17,345	565.133
2015-2016	186.944	14,80,413	1857.150
2016-2017	-	8,93,192	352.335

Source: [1] [Government of Khyber Pakhtunkhwa \(2017b\)](#) [2] [Government of Khyber Pakhtunkhwa \(2017a\)](#)

The forests not only provide timber production but also contribute in controlling the storm water runoff, raising the property value, conserving energy, absorbing the pollutants and reducing the atmospheric carbon. In Pakistan, the GHG emissions from land use change and forestry sector was

10.39 MT CO<sub>2</sub>-equivalent in the year 2015 ([Pak-INDC, 2016](#)). The afforestation can be converted into opportunities if the GHG emissions are reduced through market mechanism such as Clean Development Mechanism (CDM). Currently, Pakistan has approved 14 CDM projects while more than 60 are in pipeline which is expected to bring US \$ 345 million foreign investment along with 3.35 million tonnes of GHG reduction per year ([State Bank of Pakistan, 2010](#)). As the KP province has more forest cover compared to other provinces, it has more potential to generate revenue through CDM projects. The efforts of KP government to initiate Green Pakistan and afforestation Programs are instrumental in reducing emissions and increasing the revenue through CDM.

To derive the annual overall benefits of the trees, the National Tree Benefit Calculator consider all these dimensions and provide the overall annual benefits of the trees in monetary term. The annual benefits for selected trees planted in KP are reported in Table 9. The estimates show that the forest trees provide significant contribution to the provincial economy if the benefits of all trees are taken into account.

**Table 9: Economic Benefits of Different Trees in KP**

Type of Tree	Diameter (inches)	Overall benefit in \$ per year per tree (when trees is at Park or other vacant land) <sup>[1]</sup>
Cedar Eastern Red (Deodar)	24	76
Fir (Conifer evergreen large)	24	164
Fir (Conifer evergreen Medium)	24	121
Fir (Conifer evergreen small)	24	76
White Oak	20	161
Holly	20	118
Walnut	20	161
Ash	20	154
Maple	20	196
Willow	20	154

Source: Estimated through National Tree Benefit (NTB) Calculator

(<http://www.treebenefits.com/calculator/treeinfor.cfm?zip=&city=&state=&climatezone=Midwest>)

Note: The NTB calculator can provide more accurate estimates of the annual benefits if the number of trees by type with actual diameter are available. There are some additional trees but due to non-availability of data, their estimates are not reported. The separate calculator can be developed to derive the exact benefits of the forest ecosystem in KP.

### 3.2 Provision of Medicinal plants

Globally, 70-80% of the population use medicinal plants for the treatment of ailments and diseases ([Ajose, 2007](#); [Alves & Rosa, 2005](#); [Farnsworth & Soejarto, 1991](#)). The use of medicinal plants for healthcare has been increasing over the years and this is the reason that the global market for

medicinal plants amounted to US\$ 60 billion which is expected to reach to US\$5 trillion by 2050 ([Shinwari, 2010](#)). [Lange \(2006\)](#) reported that the annual global export of pharmaceutical plants is worth US\$ 1.2 billion. These medicinal plants are mainly provided by the forests' ecosystem. The areas like northern Punjab, Murree Hills, KPK, Azad Kashmir, Northern Areas, and upland Balochistan house most of the medicinal and herb flora ([Pakistan Agriculture Research Council, 2014](#)). The detailed list of flora in KP is attached as appendix-A The livelihood of the rural population living in fragile ecosystems in the country is dependent on the collection and sale of medicinal herbs and other products ([Government of Pakistan, 2009](#)). It houses more than 6000 plants species in which about 600-700 species are used as medicine ([Shinwari, 2010](#)). About 12% of Pakistani flora is used in medicines and more than 300 medicinal plants are traded while high value plants worth US\$ 10.5 million are also exported annually ([Sher, Aldosari, Ali, & de Boer, 2014](#)). The annual consumption of 10 leading Dawakhans were more than 2 million kg of 200 medicinal plants in 1990s and their consumption has been increasing over the time ([S. Hussain, Malik, Khalid, Qayyum, & Riaz, 2012](#)). According to [Government of Pakistan \(2009\)](#), these 10 Dawakhana are using medicinal herbs worth 20 million rupees annually. Besides, there are 50,000 registered Tabibs/Hakims, and other unregistered practitioners who are using these medicinal plants.. The supply of these plants are mainly coming from Swat and Chitral ([Martins Christine \(Ed.\), 2016](#)). A survey was conducted by Pakistan Forest Institute which concluded that 500 tons of medicinal plants are produced in Hazara and Malakand, 16 tons in Murree Hills, 38 tons in Azad Kashmir and about 24 tons in Northern Areas ([Saeed, n.d](#)).

Although the KP province has good potential for producing high valued medicinal plants (see Table 10), it still faces some challenges in this sector such as marketing, use of technology, low pricing and research ([Latif & Shinwari, 2005](#)). There is a lack of coordination between academia and medicinal health association ([S. Hussain et al., 2012](#)). The country is dependent more on imports of medicinal plants and imports about 90% of the total herbs used ([Saqib & Sultan, 2005](#)). The medicinal plants further needs value addition and most of the medicinal plants are collected and sold in the local markets losing the fair prices ([SMEDA, 2009](#)). Besides, the local people collect medicinal plants and sell them without proper gradation. They need proper trainings for the value addition to get fair prices for their produce ([A. Hussain & Rahman, 2015](#)). Keeping in view these issues, the KP government prioritized to“ Maintaining Biological Diversity of Medicinal Plants in Arid Zones of Khyber Pakhtunkhwa”(Government of Khyber Pakhtunkhwa, 2017e).

**Table 10: Important Medicinal Plant Species of Kashmir, KP and Baluchistan Forests**

Plant names	Parts used	Approximate Annual Yield (Kgs)	Price/Kg	Value Rs. in million
<i>Aconitum chasmanthum</i>	Roots	5000		
<i>Aconitum heterophyllum</i>	Roots	1000	10000	10
<i>Acontium sp.</i>	Leaves	7000		
<i>Adiantum capillus</i>	Whole plant	120000		
<i>Angelica glauca</i>	Roots	7000		
<i>Artemisia vulgaris</i>	Leaves/ shoots	148000	4000	592
<i>Atropa acuminata</i>	Roots	74000		
<i>Berberis lyceum</i>	Roots	300000		
<i>Dioscorea deltoidea</i>	Rhizome	148000		
<i>Dioscorea deltoidea</i>	Twigs	233000		
<i>Geranium wallichianum</i>	Roots	18000		
<i>Myrtus communs</i>	Fruits	45000		
<i>Paeonia emodi</i>	Rhizome	99000		
<i>Podophyllum emodi</i>	Rhizome	55000		
<i>Polygonum amplexicauler</i>	Roots	27000		
<i>Rheum emodi</i>	Roots	259000		
<i>Saxifraga ciliate</i>	Roots	37000		
<i>Thymus serphyllum</i>	Leaves	7000		
<i>Valeriana wallichii</i>	Rhizome	148000		
<i>Zizyphus vulgaris</i>	Fruits	30000		

Source: [Saeed \(n.d\)](#)

Majority of the medicinal plants are obtained from the wild ([Sial, nd](#)) which may cause declining of some of the plants such as *Valerina wallichii* and *Dioscores deltoidea*. The government should take steps to increase the cultivation of medicinal plants in general while exporting medicinal plants in particular.

The cultivation of different varieties of medicinal plants, which are suitable for the different agroecological zones in Khyber Pakhtunkhwa, needs to be assessed. To this end, the Pakistan Forest Institute, Peshawar and Pakistan Agriculture Research Council (PARC) can play active and leading roles.

### 3.3 Other Forest Ecosystem Services in Khyber Pakhtunkhwa



The forest in Khyber Pakhtunkhwa also provide honey, morels, pine nuts, kachnar, walnut, persimmon, pomegranate, kachnal, resin, mazri (Table 11) which has good market. Among the non-timber forest ecosystem services, honey plays important role. Globally, China ranked first in producing honey as it produced 436,000 MT followed by Turkey with 88,162 MT in the year 2014 ([Government of Pakistan, 2015c](#)). In the year 2013, Pakistan exported honey amounted to US\$ 8.799 million to Saudi Arabia, United Arab Emirates, United States of America and Kuwait ([Government of Pakistan, 2015c](#)). The export of Pakistani honey to the Gulf States in the year 2015-16 was 600 containers with quantity of 11,760,000 kg. The per container cost was Rs300,000 with freight and taxes but due to heavy duty by the Saudi Government this reaches to Rs. 500,000 reducing the profit of the exporters. The Pakistani honey first reaches Yemen where it is properly graded before exporting it to Gulf States thereby increasing the cost of Honey from 50-400 to 30-100 Saudi riyal per kg ([Zeb, 2016](#)). To maintain the international standards, the government should focus on the standardization of honey.

There are many varieties of honey, which are produced in different areas of Khyber Pakhtunkhwa including Swat, Naran, Kaghan, Peshawar, Mardan, Karak, Kohat, and Haripur. There are about 50,000 to 60,000 bee farms in the province earning foreign exchange amounted to Rs. 5 billion per annum ([Zeb, 2016](#)). According to [Latif and Shinwari \(2005\)](#), the annual production of honey in Khyber Pakhtunkhwa is 850 to 950 tonnes with average price of 100 to 350 rupees per kg<sup>2</sup>. However, its value at 2016 prices worth Rs. 247.50 - 1440 million in Khyber Pakhtunkhwa (Table 11).

Walnut is famous food item of Khyber Pakhtunkhwa and about 82% of the total production of walnut production of Khyber Pakhtunkhwa is produced in Malakand division ([Rahman et al., 2015](#)). The local people believe that walnut is good for brain, liver, kidney, blood pressure and cardiovascular diseases ([DAWN, 2011](#)). Although it has a good market contributing Rs. 4125.30 million to the province (Table 11 ), yet deforestation, non-plantation of new trees and attack of stem-borer has endangered this great asset ([DAWN, 2011](#)).

Resin is another important industrial product obtained from tapping chir pine (*Pinus roxburghii*) trees planted on about 80,000 hectares area of Khyber Pakhtunkhwa ([Sial, nd](#)).

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<sup>2</sup> The prices of honey depends on the quality of honey ([Latif & Shinwari, 2005](#)).

Mazri is used for various handmade items such as baskets, ropes, mates etc., and is an important source of livelihood for many local people in Khyber Pakhtunkhwa. It's current production worth Rs. 17.96 million (Table 11). On average, one acre produces 5-6 mounds of mazri, and the price of one mound could range between Rs2,000 to Rs3,000 (Zia, 2013). Still is there is a need for further value addition and the farmers should be given proper training in collection, processing and marketing.

**Table 11: Additional Non-Timber Forest Ecosystem Services of KP Forests**

Other KP forest Ecosystem services species	Unit	Quantity	Price in Rs. per kg	Value (Rs. in million)
Honey	Kg	850000 – 950000 <sup>[1]</sup>	250-300 (Palusa honey) <sup>[2]</sup> 1,200-2,000 (Bair honey) <sup>[2]</sup>	247.50 1440.00
Morels/Mushrooms	Kg	42000 <sup>[3]</sup>	5000-5500 <sup>[4]</sup>	220.50
Pine Nuts (Chilghoza)	Kg	185000 <sup>[5]</sup>	1800-2400 <sup>[6]</sup>	388.50
Kachnar	Kg	20000 <sup>[7]</sup>	10 <sup>[8]</sup>	0.2
Walnut	Kg	13751000 <sup>[9]</sup>	300 <sup>[10]</sup>	4125.30
Persimmon	Kg	24584070 <sup>[11]</sup>	50 <sup>[12]</sup>	1.23
Pomegranate	Kg	1734000 <sup>[13]</sup>	150 <sup>[14]</sup>	260.10
Kachnal	Kg	20000 <sup>[15]</sup>	10 <sup>[15]</sup>	0.20
Resin	Kg	950000 <sup>[15]</sup>	72.7 <sup>[16]</sup>	69.07
Mazri	Kg	2851000 <sup>[15]</sup>	6.3 <sup>[16]</sup>	17.96
Firewood	kg	208872586.9 <sup>[17]</sup>	4.49 <sup>[18]</sup>	2506.47

Notes and Sources: [1] (Latif & Shinwari, 2005) [2] (Zeb, 2016) [3] About about 55 to 65 tonnes of dried morels are collected annually in Pakistan (Latif & Shinwari, 2005) in which about 70% of the total is produced in Khyber Pakhtunkhwa (Iqbal, 1991). The value has been estimated by multiplying 70% of the average total produce with the average prices.

[4] Latif and Shinwari (2005) [5] Pakistan produced 3,700 Metric Tons of Pine Nuts during 2017-2018 (Pakistan Pine Nuts, 2018) while the country 95% of the total pine nuts are produced by Balochistan (Sial, nd). Although a little bit over estimated, this study considers 5% of the total pine nuts for estimating the production in Khyber Pakhtunkhwa.

[6] DAWN (2010) [7, 8] Latif and Shinwari (2005) [9] Government of Pakistan (2016) [10] A. A. Shah (2015) [11] Computed from Small & Medium Enterprise Development Authority (2009) [12] Asad (2016) [13] Government of Pakistan (2016) [14] Government of Khyber Pakhtunkhwa (2018b) [15] Sial (nd) [16] Latif and Shinwari (2005) [17] According to Government of Khyber Pakhtunkhwa (2017d), the total population is 30523371 with average household size of 7.9 in Khyber Pakhtunkhwa. The total number of households has been multiplied by the firewood annual average quantity consumed by all households. [18] The monthly average quantity consumed was 54.06 Kg in Pakistan with average price of 4.49 per Kg (Haq, Sajjad, & Iqbal, 2018).

There are some other food products such as gurgura (*Reptonia buxifolia*); deela (*Capparis aphlla*), pelu (*Salvadora oleoides*), jujube (*Zizyphus spp.*), sumal (*Berberis lycium*), guch (*Viburnum nervosum*), wild fig (*Ficus glometra*) and mulberry (*Mows alba*) alongside some vegetables such as Suhanjna (*Moringa oleifera*), Kunjai (*Dryopteris felix-*

*mas*), Caraway (*Carum carvi*), Soap-nut, Walnut bark, Palosa gum, Basketry, Neem leaves and seeds which are provided by forests ([Sial, nd](#)) but are not monetarized properly in the provincial and national accounts.

### **3.4 Protection against Floods and Soil Erosion**

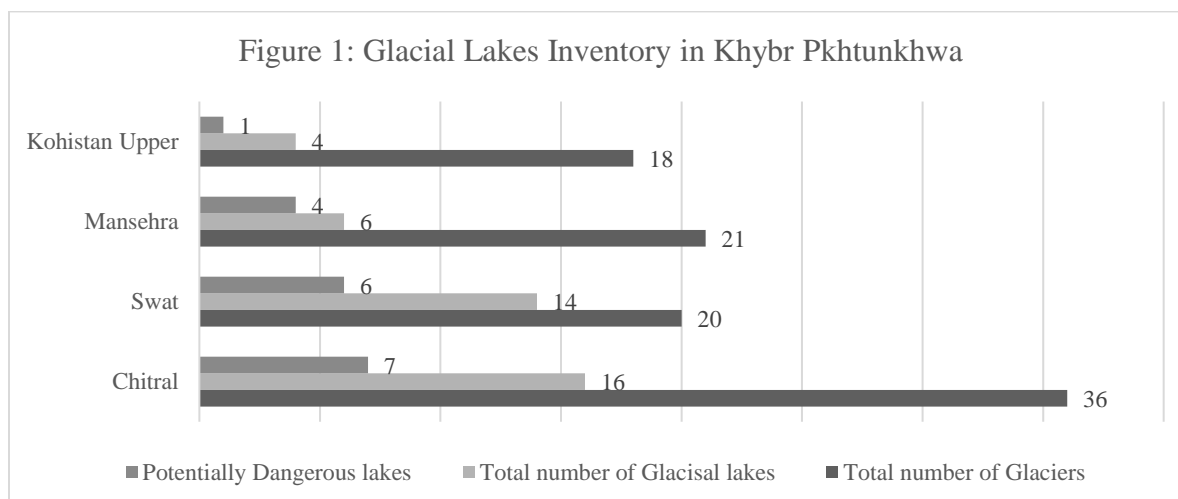
Alongside other ecosystem services, forests also play important role in minimizing the risk of floods, landslides and protect the soil from erosion. The human activities such as deforestation is closely linked with floods ([Center for International Forestry Research, 2005](#)). Although floods are also important for maintaining biodiversity, land fertility etc., but Pakistan is lacking sufficient storage facilities to store the flood water and utilize it for productive purposes. This is the reason that Pakistan faced severe losses and the events such as floods, landslide, extreme temperature and storm, cost Pakistan economy US\$ 18309118 thousands during 2005-2018 (Appendix-B ).

Although, KP is blessed with many natural resources such as forests, rivers, lacks, minerals etc. but the geographical location of KP is also a disadvantage in the sense that it increases vulnerability against natural hazards. There are total 18 lakes which are potentially dangerous in the province (Figure 1).

The 2010-Flood alone cost Pakistan Economy amounted to PKR 854771 million including the cost of Khyber Pakhtunkhwa which amounted to PKR 99625 million. Besides, the flood reconstruction cost of Khyber Pakhtunkhwa ranged from PKR 105957 to PKR 179844 ([Asian Development Bank, 2010](#)). Similarly, in KP in the year 2017, 28 persons died, 33 injured and 232 houses damaged due to the rainfall and floods ([Government of Pakistan, 2017](#)). The losses during June 15 to August 31, 2018 are reported in Table 12.

Alongside other factors, deforestation is one of the key responsible factors of climate change and resultantly the floods and their losses to the country ([Government of Pakistan, 2017](#)). So, the total annual losses along with reconstruction cost can be saved and minimized by afforestation in the province. But unfortunately, in Khyber Pakhtunkhwa forest lost about 74% density over the years due to continuous deforestation ([Ali, 2016](#)).

Forests in Khyber Pakhtunkhwa also provide services for soil protection. In Pakistan, the water erosion affected 11 million hectare area which wash away the soil ([Government of Pakistan, 2000](#)). The afforestation helps to stop land sliding and soil erosion in the province. It is difficult to monetize the forest services for the landslide and soil erosion; however, forest could save the amount of US\$ 18000 thousands in the year 2010 spent on the land sliding in Pakistan (Appendix-B).



Source: [Provincial Disaster Management Authority \(2018b\)](#)

**Table 12: Monsson Losses during June 15 to August 31, 2018**

<b>Districts</b>	<b>Dead</b>	<b>Injured</b>	<b>Houses Damaged</b>
Dir Lower	7	1	1
Mardan	9	14	204
Abbottabad			1
Swabi	3	2	23
Peshawar	2	12	24
Shangla	4		5
Swat			3
Nowshera	1		
Bunner	5	1	15
Chitral			44
D.I Khan		3	2
Laki Marwat			30
Malakand		2	1
Kohat			5
Dir Upper	1	1	2
Charsadda	6	14	28
Hangu	1		
<b>Total</b>	<b>39</b>	<b>50</b>	<b>388</b>

Source: [Provincial Disaster Management Authority \(2018a\)](#)

### 3.5 Protecting Habitat and Biodiversity

Forests play important role in protecting and maintaining the habitat for variety of flora and fauna including forests, wetlands, grasslands, lakes, rivers and croplands. Globally, about 80% of the terrestrial biodiversity is in forests ([IUCN, 2018](#)). The monetary valuation of the forest to serve habitat protection is not simple; however, researchers such as [Pechanec et al. \(2017\)](#), [DePratto and Kraus \(n.d\)](#) and [Hanley, Willis, Powe, and Anderson \(2002\)](#) tried to monetize the protection services of forests for variety of natural habitats.

In Pakistan, there are many species which have high economic significance providing billion of rupees annually ([Government of Pakistan, 2000](#)). There are, however, many species which are facing existential threat (Table 13).

**Table 13: Species Richness and Endemics for Major Plant and Animal Groups in Pakistan**

Species	Total reported in Pakistan	Endemics	Threatened
Mammals	174	6	20
Birds	668	?	25
Reptiles	177	13	6
Amphibians	22	9	1
Fish (freshwater)	198	29	1
Fish (marine)	788	-	5
Echinoderms	25	-	2
Molluscs (Marine)	769	-	8
Crustaceans (Marine)	287	-	6
Annelids (Marine)	101	-	1
Insects	>5000	-	-
Angiosperms	5700	380	-
Gymnosperms	21	-	-
Pteridophytes	189	-	-
Algae	775	20	-
Fungi	>4500	2	-

Source: [Government of Pakistan \(2000\)](#)

In the literature, researchers tried to value various species using various methodologies like contingent valuation method, expert evaluation, and travel cost approaches. [Haghjou, Hayati, Pishbahar, and Molaei \(2015\)](#) estimated the value of tiger as 18.2 million dollars while bear as 6.8 million dollars. [Stevens, DeCoteau, and Willis \(1997\)](#) estimated the value of salmon as \$14.38–21.40 per household annually. [Jakobsson and Dragun \(1996\)](#) found the value of Leadbeater’s Possum as Australian Dollar 29 per household annually. [Boman and Bostedt \(1995\)](#) estimated the

economic value of wolf as 700-900 SEK. There are other many studies, which estimated the economic value of various species<sup>3</sup>.

As a matter of fact, forest hosts different species of economic importance but their services are not taken into account in the national/provincial income accounting. In Pakistan in general and in KP province in particular, there is lack of updated record as well as economic valuation of all fauna. Hence, there is a need to assess the economic value of key fauna in the province for further policy formulation.

### **3.6 Forest and Employment**

Forest also provide employment to millions. Globally, 1.6 billion people depends on forest ([IUCN, 2018](#)). In Pakistan, about 42.27% of the total labour force (10 years & above) is employed in agriculture forestry and fishing while this percentage is 34.56 in the KP province with average monthly payments of Rs. 12423.03 ([Government of Pakistan, 2015b](#)). According to [Government of Khyber Pakhtunkhwa \(2017b\)](#), the total number of population employed in the skilled agriculture and fishery sector was 972433, which means that this sector contributes an annual amount of Rs. 144966.7 million to the employed population only<sup>4</sup>.

### **3.7 Tourism**

Among other prominent ecosystem services in Khyber Pakhtunkhwa, the recreational services provided by forests are worth mentioning. The Province has good potential for tourism and hosts many tourists' spots generating livelihoods for millions. The tourists visit for various purposes such business, recreation, health, education, religion, social calls, meetings, sports, shopping etc. However, majority of the tourists (40%) visit for recreational purpose in Pakistan. Similar situation is also found in the KP province where the tourists mostly visit for recreational and social call purposes (Table 14).

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<sup>3</sup> [Desvousges, Reed, Dunford, Nicole, and Boyle \(1993\)](#), [Loomis and Larson \(1994\)](#), [van Kooten \(1993\)](#), [Boyle and Bishop \(1987\)](#)

<sup>4</sup> To estimate the monetary contribution of the forest sector to the employment, there is a need to segregate the employment further by sectors to derive exact contribution of forestry sector.

**Table 14: Types of Tourism in Pakistan and Share of KP in the Year 2009**

Domestic Tourist Type	Number of Tourist in Pakistan	Share in total (%)	Number of Tourist in KP	Share in total (%)	Share of KP in Pakistan (%)
Business	4515000.00	9.80	692441.00	8.91	15.30
Recreation	6542000.00	14.20	2616800.00	33.66	40.00
Health	4146000.00	9.00	635849.00	8.18	15.30
Education	783000.00	1.70	78300.00	1.01	10.00
Religion	2350000.00	5.10	235000.00	3.02	10.00
Social Calls	23818000.00	51.70	2652835.00	34.12	11.10
Meetings	507000.00	1.10	50700.00	0.65	10.00
Sports	230000.00	0.50	35274.00	0.45	15.30
Shopping	1981000.00	4.30	594300.00	7.64	30.00
Other	1198000.00	2.60	183731.00	2.36	15.30
<b>Total</b>	<b>46070000.00</b>	<b>100.00</b>	<b>7775230.00</b>	<b>100.00</b>	<b>-</b>

Source: [Government of Khyber Pakhtunkhwa \(2017c\)](#)

The scenic beauty of tourists' spots in Khyber Pakhtunkhwa such as Kalam Valley, Khumrat, Malam Jabba, Chitral etc. is closely dependent on forests. The recreational sites mainly in forest areas add millions of rupees to the provincial income (Table 15). Besides, the tourism sector has potential to generate more income and this is the reason that the KP government is planning to open new tourists resorts to generate income from this billion rupees industry ([Tehreek-e-Insaf, 2018](#)).

**Table 15: Economic Impact of Tourism Khyber Pakhtunkhwa for the year 2009**

Tourist Area	Total Economic Impact (PKR million)	Total Economic Impact (USD million) 1 USD= 87 PKR
Swat Valley	4440	51
Kaghan Valley	696	8
Chitral/Dir Valleys	288	3.3
Galliat	549	6.3
Kohistan/Besham	746	8.6
Abbotabad	944	10.8
Mansehra	470	5.4
Peshawar	3516	40.4
<b>Total</b>	<b>11648</b>	<b>134</b>

Source: [Government of Khyber Pakhtunkhwa \(2017c\)](#)

#### **4. CONCLUSION AND POLICY RECOMMENDATIONS**

This study attempts to monetize and evaluate the key services of forest ecosystems in the Khyber Pakhtunkhwa province. These included provisioning, regulating, cultural and supporting services. The study used secondary data and relevant literature to assess the value of these services. The market approach alongside the National Tree Benefits calculator has been used in the valuation of these services. The findings revealed that the forest services such as timber, medicinal plants, honey, firewood etc. significantly contribute to the provincial economy of KP. The forest also host many animals and species that have both economic and environmental significance. Forest also protect the natural habitat and can save the cost of floods, landslide, soil erosion which costs the KP government in millions. The government must continue afforestation to ensure its economic and environmental benefits for both the provincial and national economy.

There is also a need to keep the record of biodiversity, trees by area and type, prices and quantities of medicinal plants to estimate the exact monetary value of these services of forests. Forests also provide the services such as water purification and recycling, pest regulation, disease regulation, pollination, waste absorption, aesthetic values, soil formation; however, the information about these services are not recorded regularly. There is also a need to conduct studies on the valuation of these services. The government and researchers should identify the potential tourist spots in KP and should estimate their economic and environmental contributions. The farmers in the KP collect their produce in crude form losing the fair prices so they should be given proper training for the production, collection, marketing, standardization of their produce.



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### Appendix A- Detailed list of flora in KP Province

Sr. No	Botanical Name	Local Name	Family	Habitat	Ethno botanical Use
1.	<i>Agaricus campestris</i> L	Kharerhay	Agaricaceae	Mushroom	Cooked as food
2.	<i>Achillea millefolium</i>	Birangesif/Jari	Asteraceae	—	Carcing, toothache, tonic, dysentery
3.	<i>Adiantum capillus-veneris</i> L.	Sumbal	Adiantaceae	Herb	Leaf decoction, used for cough and fever
4.	<i>Achyranthes aspera</i>	Lainda	Amaranthaceae	—	Rheumatism, ophthalmia
5.	<i>Avena sativa</i> L.	Jamdary	Poaceae	Herb	Fodder, and use as blood purification. Seeds are nerve tonic. Seeds are used nerve tonic.
6.	<i>Astragalus anisacanthus</i> Bois	—	Fabaceae	—	—
7.	<i>Ajuga bracteosa</i> Wall.ex Benth	Butey	Lamiaceae	Herb	Used to cure pimples, itch and chicken pox.
8.	<i>Amaranthus caudatus</i> L	Ganharsaag	Amaranthaceae	—	Used as blood purifier
9.	<i>Amaranthus spinosus</i> L.	Ganhar	Amaranthaceae	Herb	Use for antipyretic in animal. Young plant is use as a food (saag).
10.					
11.	<i>Atropa acuminata</i> Royle.	Bhange Dewana	Solanaceae	Herb	Used as sedative.
12.	<i>Abutilon indicum</i>	Kangi	Malvaceae	—	Expectorant, diuretic, oral contraceptive, abortifacient, antiasthmatic.
13.	<i>Asparagus adscendens</i> Roxb.	—	Liliaceae	—	—
14.	<i>Asparagus officinale</i>	Shahghandal/Nanoor	Liliaceae	—	Used as Tonic, anthelmintic
15.	<i>Asparagus racemosus</i>	Shahghandal/ Nanoor	Liliaceae		Used in Chicory, diuretic, stomachic, fever.
16.	<i>Asparagus officinalis</i> L.	Tendona	Asphodelaceae	Herb	Use is a food and also use for stomach problem, and blood purification
17.	<i>Artemisia scoparia</i> Waldst & Kitam	Jawkay	Asteraceae	Herb	Young shoots are used as anthelmintic agent in human and livestock also used for diarrhea. Mature shoots are used for making brooms and also used as thatching material. The plant is also used as fuel.
18.	<i>Artemisia absinthium</i> L.	Dhada Tarkha	Asteraceae	Herb	Shoots are used for typhoid. Also used for conceiving pregnancy.
19.	<i>Argyrolobium roseum</i>	Makhni Booti	Fabaceae		Plant is used as fodder for cattle. Leaf and fruit powder is used for treating ulcer and appetite. Leaves are used for treating stomach disorders and jaundice.

20.	<i>Artemisia dubia</i> L.	Dada trkha	Aralliaceae	Herb	Use at the time of female delivery
21.	<i>Artemisia vulgaris</i> L.	Chahu/Javkey	Asteraceae		Extract of its young shoots is used to regulate monthly cycle.
22.	<i>Alnus nitida</i> (Spach) Endl.	Gheray	Betulaceae	Tree	Wood is used in timber and making furniture. Dry leaves are used as fodder for cattle.
23.	<i>Atropabelladonna</i>	Cheela lubar	Solanaceae		Garden lettuce, sedative, diuretic, Antidiabetic
24.	<i>Aristida adscensionis</i> Nees.		Poaceae		
25.	<i>Alisma plantago—aquatica</i> L.	Jabai	Alismataceae	Herb	Leaves are used as tonic, treating diabetes, dysentery, digestive, and renal problems. Also used for treatment of leprosy
26.	<i>Alianthus altissima</i> L.	Spena Bakyanra	Simaroubaceae	Tree	Leaves are used as fodder; wood is used for fuel and for timber.
27.	<i>Achyranthes aspera</i> L.	Spay botay	Amaranthaceae	Herb	Leaves are used as blood purifier.
28.	<i>Acorus calamus</i> L.	Skhawaja	Araceae	Herb	Rhizome used for stomach inflammation constipation and other digestive problems. Also used for asthma.
29.	<i>Actaea spicata</i> L.	Beenakae	Rosaceae		Berries are used as sedative; Extract is Used for the treatment of joint pain
30.	<i>Accacia nilotica</i> (L.) Delile.	Kikar	Mimosaceae	Tree	Gum is used as antihelmentic agent, while flower along with sugar is used for cough. Gum is used for impotency and as tonic.
31.	<i>Aconitum violaceum</i> Jacq. ex Stapf	Ranunculaceae	Atees/Zahar		Powders are used in sciatica and as pain killer
32.	<i>Acacia modesta</i> Wall.	Palosa	Mimosaceae	Tree	Wood is used for fuel.
33.	<i>Aconitum heteropyllum</i>	Patris	Ranunculaceae		specific for guinea worms, rheumatism
34.	<i>Amaranthus viridis</i> L.	Ganhar	Amaranthaceae	Herb	Leaves are cooked as vegetable. Young plants are also used as fodder.
35.	<i>Angelica glauca</i> Edgew.	Chora chora	Apiaceae		Powdered roots used for gastro problems
36.	<i>Aesculus indica</i> (Wall. Ex Camb.) Hook.f.	Jawaz	Sapindaceae	Tree	Dry plants are used as fuel. Fruit is used in abdominal pain. Leaves are used as fodder for cattle. Wood is used for furniture, as timber, and fuel wood.
37.	<i>Adiantum venustum</i> D Don.	Sumbal	Pteridaceae	Herb	Used as Blood purifier, fever
38.	<i>Allium sativum</i> L.	Ogakai	Alliaceae	Herb	Eaten uncooked. Used as spice. Grinded and mixed with maize floor to prepare spicy bread.
39.	<i>Allium humile</i> Kunth.	Jangali piaz	Alliaceae		Fresh plant is taken as salad for gastrointestinal disorders and UTI.
40.	<i>Allium cepa</i> L.	Thoom	Liliaceae	Herb	Cholera, nausea

41.	Allium sativum	Piaz	Liliaceae L	Herb	Antidiabetic
42.	Aloe vera	Kanvar	Liliaceae	_	Phycotropic, stomachic, antispasmodic, sedative, epilepsy, convulsion, cough, cold
43.	AlbiziaLebbekBenth.	BenthSiris	Mimosaceae	_	_
44.	Apiumgraveolens	_	Apiaceae	_	Tonic, diuretic, analgesic
45.	Buxus wallichiana Baillon	Shamshad	Buxaceae		Leaves are used as purgative.
46.	Bupleurum falcatum L	Gill	Apiaceae		The powder of dried plant is taken with warm water for stomach problems. The plant has anti-tumor, anti-allergic, anti-inflammatory properties.
47.	Butea monosperma (Lam.)	Chechra	Fabaceae	_	Fruit gum with milk and sugar is tonic for backache in women after pregnancy.
48.	Bistorta amplexicaulis (D. Don)	Masloon	Polygonaceae		Powder mixed with little salt is used for sore throat, swelling of mouth and tongue.
49.	Bistorta affinis (D. Don) Green	Anjabar	Polygonaceae		Powder is used in fever and body pain.
50.	Berberis lyceum Royle.	Kwaray	Berberidaceae	Shurb	Root bark is used for treatment of hepatitis, blood purifier, in throat infection, and in asthma. The plant is also used as fuel.
51.	Berginia ciliata (Haw.) Scernb	But pewa	Saxifragaceae	_	Latex is applied externally for gum disease.
52.	Betula utilis D. Don	Braj	Betulaceae		Tea made up of young leaves is used for joint pain.
53.	Cupressus sempervirence L.	Sarwa	Cupressaceae	Tree	The fruit is used as warming agent, anthelmintic, and astringent. Cultivated in gardens as ornamental tree. Wood is used as fuel.
54.	Cucurbita maxima Duch. Ex La		Cucurbitaceae		
55.	Cotoneaster nummularia Fiseh & Mey.	Kharawa	Rosaceae	Tree	Fruit is used as astringent and expectorant. Wood is used as fuel. Leaves are used as fodder for cattle.
56.	Convolvulus arvensis L.	Laili	Convolvulaceae	Herb	Use for cancer, fodder. The old woman used root of this plant for the washing of hair to remove dandruff
57.	Capsella bursa-pastoris (L.) Medic.	Gulepancha	Brassicaceae		Aerial parts are cooked and used in diarrhoea; Seeds powder is taken with water to cure high blood pressure
58.	Cotoneaster microphyllus Wall. Ex Lindley.	Mamanrha	Rosaceae	Tree	
59.	Corydalis govaniana Wall.	Desi mamera	Fumariaceae	_	Juice o the plant is used as diuretic powders of flowers are used in treating eye diseases
60.	Chenopodium murale L	Skhabutey	Chenoppdiaceae	H	Vermifuge, gas troubles, abdominal pain

61.	<i>Cichorium intybus</i> L.	Han	Asteraceae	Herb	Use for fever and analgesic and also use as a food (saag).
62.	<i>Chenopodium ambrosioides</i> L.	Skhabotay (Kamasal Bhang)	Chenoppdiaceae	Herb	Juice of shoot is used for fever, especially for malarial fever.
63.	<i>Chenopodium album</i> L.	Sarmae	Chenopodiaceae		Leaves and shoots are cooked and taken to expel worms also to promote evacuation of bowels and urine.
64.	<i>Celtis australis</i> L.	Taghga	Ulmaceae	Tree	Fruit is edible. Used for toothache Wood is used in furniture, for timber and as fuel.
65.	<i>Cichorium intybus</i> Linn.	Han	Asteraceae	Herb	Leaves are used as anti-inflammatory and for hepatic complaints.
66.	<i>Cedrela serrata</i> Royle.	Shnai	Meliaceae	Tree	Leaves are used for digestive problems, as fodder for cattle. Wood is used as fuel.
67.	<i>Carthamus oxycantha</i> M. Bieb.	Azghibotay	Asteraceae	Herb	Leaves are used as antiseptic. Seed are used for skin itching.
68.	<i>Caralluma tuberculata</i> N.E Brown.	Pamankay	Asclepiadaceae	Herb.	Cooked as vegetable. Juice is used for diabetes
69.	<i>Carum carvi</i> L.	Zankai	Asteraceae	Herb	Use for anesthetics and for unconsciousness, carminative and flavoring agent
70.	<i>Casearia tomentosa</i> Roxb	Chilla	Salicaceae		No apparent medicinal use
71.	<i>Capsella bursa—pastoris</i> . (L.) Medic.	Bambessa	Brassicaceae	Herb	The leaves and flowering tops are cooked as vegetables and also used as fodder for cattle. The plant is also used as salad.
72.	<i>Caltha alba</i> Jack. Ex Comb	Baringu	Ranunculaceae	_	Roots infusion is used as mouth wash; young shoots and leaves are cooked as vegetable for and considered as digestive.
73.	<i>Crataegus oxycantha</i> L.	Tampasa	Rosaceae		Fruit and flowers are considered as heart tonic.
74.	<i>Clematis montana</i> Buch.-Ham. ex DC	Zelae	Ranunculaceae	_	Flowers and fruits powder is taken for treating the diarrhoea & dysentery.
75.	<i>Cuscuta reflexa</i> Roxb	_	Convolvulaceae	_	_
76.	<i>Cichoriumintybus</i> L.	Han	Asteraceae		Jaundice, Fever
77.	<i>Cannabis sativa</i> Linn.	Bhang	Cannabinaceae	Herb	Juice of leaves is used for treating malaria and to relieve pain. Leaves are used for male impotency. Also used for flatulence and colic pain. Female plant is used in making hashish (chars).
78.	<i>Cana indica</i> Linn.	Tasfa Botay	Cannaceae	Shurb	Cultivated as ornamental and also used for making hedges.
79.	<i>Cedrus deodara</i>	Diar	Pinaceae	Tree	Bitter, stomachic, anthelminthic, febrifuge.
80.	<i>Calotropis procera</i> (Wild) R. Brown.	Spalmai	Asclepiadaceae	Herb	Paste of leaves in oil is used as pain killer, to cure skin itch, and scabies. The root bark is used for the treatment of cholera and constipation.

81.	<i>Cuscutareflexa</i> Roxb.	Akash Bail	Cuscutaceae	Climb	–
82.	<i>Cephalanthera longifolia</i> (L.) Fritsch	–	Orchidaceae	–	–
83.	<i>Cynodon dactylon</i> (L.) Pers.	Kabal	Poaceae	Herb	Grown in lawns, as fodder for grazing cattle. Crushed shoots are used as haemostatic.
84.	<i>Cydonia oblonga</i>	Bhai	Rosaceae	–	Used for fever and cough, relief of flatulence, vomiting, nausea, diarrhea
85.	<i>Cypripedium cordigerum</i> D. Don	Shakalkal	Orchidaceae	–	Powders are used by experts relieve spasm and as nerve stimulant
86.	<i>Convolvulus arvensis</i> L	Prewatai	Convolvulaceae	Herb	Epilepsy, Cough, Stomatitis, Measles, Dandruff
87.	<i>Colchicum luteum</i> Baker	Qaimatguley/ Suranjane talkh	Colchicaceae	–	Very small amount of powder is given by Hakims (specialist people) in local oils as aphrodisiac and in joint pains, spleen & liver diseases.
88.	<i>Cuscuta reflexa</i>	<i>Cuscuta reflexa</i>	<i>Cuscuta reflexa</i>	<i>Cuscuta reflexa</i>	<i>Cuscuta reflexa</i>
89.	<i>Capparis spinosa</i>	Karir	Capparidaceae	–	Cathartic and anthelmintic, red dye, oral contraceptive, skin diseases
90.	<i>Carum carvi</i>	Kango	Apiaceae	–	Used in oil Caster oil, purgative, contraceptive, skin diseases, antidote in food poisoning
91.	<i>Cymbopogon cirus</i>	Baru	Poaceae	–	Carminative, stimulant, emmenagogue
92.	<i>Cyperus rotundus</i>	Muthar	Cyperaceae		Pulmonary infections, oil in toothache, rheumatism, oil carminative, stimulant.
93.	<i>Cannabis sativa</i> L.	Bhang	Cannabenaceae	Herb	Use for euphoria, sedation and hypnosis. Plant dried and burnt to protect the family members from bad intentions of other people. It is used as narcotic and stimulant
94.	<i>Dryopteris juxtapostia</i> Christ	Kwanjay	Pteridaceae	–	Young shoots are cooked as pot herb and considered as digestive that help in evacuation of bowel more drastically.
95.	<i>Duchesnea indica</i> (Andr) Folke.	Da Zmake thooth.	Rosaceae	Herb	Fruit is used as tonic, especially, as cooling agent. Fruit juice is used for eye infections.
96.	<i>Dodonea viscosa</i> L. Jacq.	Ghwarhaskay/Sanatha	Sapindaceae	Shrub	Ash is used to treat burns and skin infections. Water extracts of leaves is used as antihelmentic. Plant is used as thatching material in building of houses. The plant is a good source of fuel for the locals.

97.	<i>Diospyrus kaki</i> L.	Sur Amlok	Ebenaceae	Tree	Fruit is edible and also a source of income for the locals, sold locally and in other parts of the country. Leaves are used as fodder for cattle. Wood is used as fuel.
98.	<i>Dalbergia sissoo</i> Roxb	Sahwa	Papilionaceae	—	—
99.	<i>Daphne mucronata</i> Royle	Ruttikal	Thymelaeaceae		Used for body pains. It is used highly praised as a building material.
100.	<i>Dalbergia sissoo</i>	Talhi	—	—	Used as Antidiabetic
101.	<i>Debregeasia saeneb</i> F.	Ijrhai	Urticaceae	Tree	Wood is used as fuel.
102.	<i>Delphinium roylei</i> Munz.		Ranunculaceae	Herb	Seeds are used as insecticide.
103.	<i>Delphinium uncinatum</i> var. <i>glabrum</i> Qureshi and Chaudhri	-	Ranunculaceae	Herb	Use for anticancer, anti-oxidant and also as a poison
104.	<i>Daphne macronata</i> Royle.	Lighonay	Thymelaeaceae	Shrub	Leaves are used as purgative. Shoots are used as fuel.
105.	<i>Datura stramonium</i> L	Bathura	Simarubaceae	Herb	Narcotic, Asthma, expectorant, Earache.
106.	<i>Dactylorhiza hatagirea</i> (D. Don) Soo	Salap	Orchidaceae	—	Tubers powders are used by hakims as sex stimulant & nerve tonic.
107.	<i>Daucus carota</i>	Gagar	Apiaceae		Used to treat Burns, scalds
108.	<i>Diospyrus lotus</i> Linn.	Amlok	Ebenaceae	Tree	Dysentery, constipation.
109.	<i>Dioscorea deltoidea</i> Wall. Ex Kunt	Kirtha	Dioscoraceae		Tubers Tubers are crushed to powder form and uses as enhancer of excretion and worm expulsion; Also used in butter as tonic.
110.	<i>Euphorbia heliscopia</i> Linn.	Mandanrho	Euphorbiaceae	Herb	Seed are purgative. Latex is used for skin diseases and to extract spine from skin.
111.	<i>Euphorbia hirta</i> Linn.	Jaghje	Euphorbiaceae	Herb	Seeds are used as tonic and for the treatment of diarrhea.
112.	<i>Euphorbia wallichii</i> Hook. f.	Arghamala/ Shangla	Euphorbiaceae	—	Latex is extracted and mixed with milk in small amount and used against worms, to accelerate defecation, promotes circulation and bowel evacuation.
113.	<i>Euphrasia himalayica</i> Wetts.	—	Lamiaceae	—	Local people cook and use it against cold, cough, sore throat
114.	<i>Ephedra gerardiana</i> Wall. ex Stapf	Ephedra	Ephedraceae	—	Powder of the crushed plant and some time its tea is used for TB, asthma, astringent, relaxation of bronchial muscles.
115.	<i>Eremurus himalaicus</i> Baker	Sheela	Asphodelaceae	—	Young shoots are cooked and used as digestive.
116.	<i>Eugenia jamblana</i> Lam.	Jaman	Myrtaceae	Tree	Fruit is edible and used for liver problems. Bark is used as mouth wash, seed are used for diabetes, leaves are used in dysentery.
117.	<i>Equisitum arvense</i> L.	Bandakay	Equisetaceae	Herb	Used for inflammation of urinary bladder and other urine problems.
118.	<i>Eupharsia malaica</i> Wetts	Ghutyalay	Scrophulariaceae	Herb	Cooked as vegetable.

119.	<i>Eucalyptus lanceolate</i> L	Lachi	Myrtinaceae		
120.	<i>Eucalyptus globulus</i>	Gond	Myrtaceae	_	Used as Antidiabetic
121.	<i>Fragaria nubicola</i> Lindl. ex Lacaita	Katalmewa	Rosaceae	_	Juice of it is considered as anti diarrhoeal, anti dysenteric. Also used in diabetes and sexual diseases
122.	<i>Fraxinus excelsior</i>	Sum	Oleaceae		Antidiabetic, digestive disorders, etc
123.	<i>Fritillaria roylei</i> Hook. f.		Liliaceae		Bulb Powder of the dry bulb or in fresh form mixed with butter is used in UTI and to soften and soothe the skin.
124.	<i>Ficus carica</i>	Inzar	Moraceae	Tree	Expectorant, Constipation, aphrodisiac, Blood purifier
125.	<i>Flacourtia indica</i>	Kankoli	Flacourtiaceae		The fruit is diuretic, appetizer and tonic.
126.	<i>Ficus palmata</i> Forssk.	Inzar	Moraceae	Tree	Fruit is edible, eaten fresh as well as dried. The tree is believed sacred and, therefore, the people avoid using it as fuel. Latex is used to extract spine from skin
127.	<i>Fummaria indica</i> (Hauskn) Pugsl	Krachay (Paprha)	Fumariaceae	Herb	Used as blood purifier, for pimples, and inflammation of heals and palms.
128.	<i>Foeniculum vulgare</i> Mill.	Kaga	Apiaceae	Herb	Fruit is used as carminative, used to control vomiting, and as flavoring agent.
129.	<i>Galium aparine</i> L.	Goose grass	Rubiaceae	Climber	Whole plant is used as diuretic, for urinary tract problems, and in fever.
130.	<i>Gloriosa superba</i> L	Sanp booti	Colchicaceae	_	Tubers are sexual stimulant and antidote to cobra bite.
131.	<i>Gymnosporia royleana</i> (Wall)	Lawson.	Sur Azghay	Celastraceae	Shrub Seed are used for male impotency.
132.	<i>Gentiana kurro</i> Royle	Linkath	Gentianaceae	_	Powdered root is used in stomach-ache, as tonic and muscles contraction.
133.	<i>Gentianodes argentia</i> Omer, Ali & Qaiser	_	Gentianaceae	_	Linkathi Root Decoction is used in urinary problems
134.	<i>Gentiana moorcroftiana</i> (Wall.ex G. Don) Airy Shaw	Bhangara	Gentianaceae	_	Powder is used to stimulant appetite
135.	<i>Geranium nepalense</i> Sweet.	Lijaharri.	Geraniaceae	_	Rhizome's powder and decoction of aerial parts are used for the treatment of renal infections and as contraction of uterine muscles
136.	<i>Geranium wallichianum</i> D. Don ex. Sweet	Lijaahari/ Ratan jog/ srazela	Geraniaceae	_	Boiled powder is used in high blood pressure, uterine diseases and stomach disorders. Also considered as tonic
137.	<i>Hedera nepalensis</i> K. Koch	Parvata	Araliaceae	_	_
138.	<i>Hedra nepalense</i>	Arbambal	Araliaceae		Fever, pulmonary infections, antidiabetic, rheumatism, hypoglycemic



139.	<i>Hypericum perforatum</i> L.	_	Hypericaceae	Herb	Tea prepared of young shoots is used in gastric disorders, respiratory and urinary difficulties. Roots powders are used in irregular menstruation.
140.	<i>Hibiscus esculentus</i> L	Bendi	Malvacea	_	_
141.	<i>Hordeum vulgare</i>	Jauo	Poaceae	_	Cathartic, purgative
142.	<i>Hyoscyamus niger</i>	Ajwain	Solanaceae	_	Various uses
143.	<i>Impatiens bicolor</i> Royle.	Gule mehendi/ Atraangey	Balsaminaceae	_	Paste of leaves is used in joint pains. Extract of the plant is regarded as cooling agent and in speeding defecation
144.	<i>Ipomoea purpurea</i> (Linn.) Roth.	Prewata	Convolvulaceae	Herb	Ornamental.
145.	<i>Ipomoea eriocarpa</i>	Budhi bel	Convolvulaceae	_	Powder and extract of the whole plant are used for skin disorders and cancer
146.	<i>Ipomoea hederacea</i> (L.) Jacq.	Speaker Gul	Convolvulaceae	Herb	Ornamental.
147.	<i>Iris hookeriana</i> Foster	Gandech ar	Iridaceae		Minute amount of powder of dried rhizome is used as speeding defecation and urination and in gall bladder diseases.
148.	<i>Indigofera heterantha</i> L	Ghorija	Papilionaceae	Shrub	Scabies, Stomach disorder
149.	<i>Indigofera gerardiana</i> Wall. Ex Baker	Ghawareja	Papilionaceae	Shrub	Leaves are used for colic pain. Woods is used as fuel. Shoots are used for making baskets and other similar articles.
150.	<i>Inula grandiflora</i> Willd.	Kuth	Asteraceae		Both powdered and fresh rhizome is used in gastric disorders, in appetite and as diuretic
151.	<i>Juglans regia</i> Linn.	Ghuz	Juglandaceae	Tree	Fruit is edible and consumed as dry fruit. Peel of bark and roots, locally called Dandasa is used for cleaning teeth and to colour lips. Wood is used for furniture and as a timber.
152.	<i>Justicia adhatoda</i> L	Bhaikar	Acanthaceae	_	Leaf decoction is antispasmodic, expectorant, abortifacient and used in skin diseases and diabetes. Root bark and leaves are used in wound infections
153.	<i>Jasminum humile</i> L.	Topak lakhta	Juglandaceae	Shrub	These plants are poisonous and death occurs in animal
154.	<i>Juniperus communis</i> L.	Gugarr/ Bhenri	Juniperaceae	_	Berries Berry powder is considered as enhancer of urination, gas expulsion and stimulant.
155.	<i>Juniperus excelsa</i> M. Bieb	Juniperaceae	Gugarr		Fruits are used as urinary, venereal, uterine and digestive troubles as well as gleans.
156.	<i>Juglans regia</i> L.	Akhor/Ghuz	Juglandaceae		Nuts are believed to use as brain tonic, bark in toothache.
157.	<i>Lycopus europaeus</i> Linn	. —	Lamiaceae	—	The leaves are used as antiseptics.
158.	<i>Lactuca sativa</i> L.	Salad	Asteraceae	_	Used in Skin diseases, syphilis, rheumatism

159.	<i>Lantana camara</i> L	Panchphulli	Verbenaceae		Crushed rheumatism. leaves are antidote against snake bite. Leaf and fruit infusion is used for tetanus, malaria, inflammation
160.	<i>Leucas cephalotes</i> (Roth) Spreng.	Gomma	Papilionaceae	–	Extraction of the plant is used to dispel fever and chills and also used in scabies, cough and cold.
161.	<i>Lactuca seriola</i>	Dodal	Asteraceae	–	Applied to burns, poultice for rheumatism and gout, internally for Gonorrhoea and urogenital irritation
162.	<i>Lonicera quinquelocularis</i>	Phutt	Caprifoliaceae	–	The leaf extract is used for improving vision and cataract. Leaves are used for wound healing
163.	<i>Luffa Acutangula</i> Roxb	Toree	Cucurbitaceae	–	–
164.	<i>Myrtus communis</i> L.	Asta Ghonay (Manrho)	Myrtaceae	Shrub	Fruits are edible. Leaves are used in colic and in diarrhea.
165.	<i>Myrsine africana</i> Linn.	Monogaya	Myrsinaceae	Shrub	Leaves are used as blood purifier. Fruit is used as antihelmintic, for colic pain. Shoots are used for making hedges
166.	<i>Malva neglecta</i> L	Panerak	Malvaceae	Herb	Constipation, Diagesion
167.	<i>Malva parviflora</i> L]	Sonchal	Malvaceae		Leaves and flowers are aphrodisiac. Leaf decoction is used for cough, fever and constipation.
168.	<i>Monothea buxifolia</i> (Falc) A.DC.	Gwargurah	Sapotaceae	Shrub	Fruit is edible. Plant is also used as fuel.
169.	<i>Morus lavaegata</i> Wallich. Ex Brandis.	Shahthooth.	Moraceae	Tree	Fruit is edible. Leaves are used as fodder for cattle.
170.	<i>Morus alba</i> L.	Spent Thooth	Moraceae	Tree	Fruit is edible. Leaves are used as fodder for cattle. Wood is used for making furniture, for timber, for making agriculture tools and as a fuel.
171.	<i>Morus nigra</i> L.	Tor thooth	Moraceae	Tree	Fruit is edible. Wood is used in making furniture, for timber, for making agriculture tools, and as a fuel. Leaves are used as fodder for cattle
172.	<i>Mirabilis jalapa</i> Linn.	Gule Badi	Nyctaginaceae	Shrub	Leaves are used to treat abscess. Root tubers are used as pain killer and also for treatment of typhoid.
173.	<i>Micromeria biflora</i> Benth.	Shamakay	Lamiaceae	Herb	Leaves used as antiemetic. Also used in flu.
174.	<i>Mentha longifolia</i> (Linn) Huds.	Venalay	Lamiaceae	Herb	Leaves are used to reduce gastric acidity, used as antispasmodic, carminative, and to relieve abdominal pain.

					Leaves are widely used to flavour local food named Gungrhi.
175.	<i>Mentha arvensis</i> L.	Phodena	Lamiaceae	Herb	Leaves are used to reduce gastric acidity and also used as antispasmodic, carminative, and to relieve abdominal pain. Also used to make Chanti and as flavouring agent in a variety of food items.
176.	<i>Mentha piperita</i>	Podina	Lamiaceae	_	Antidiabetic, carminative
177.	<i>Melia azedarach</i> L.	Tora Bekanrha	Meliaceae	Tree	Leaves are used as antiseptic and antibiotic. Water extracts of leaves is used as antilice and antidandruff agent. Wood is used for making furniture and also for burning and for timber purposes.
178.	<i>Menthaspicata</i> L.	Podina	Lamiaceae	Herb	Stomach troubles, Menstruation, nausea, Carminative.
179.	<i>Malva neglecta</i> Wallr.	Paneerak	Malvaceae	Herb	Use as food and also for stomach problem. To remove constipation and enhance digestion
180.					
181.	<i>Malva sylvestris</i> L.	Shonchal	Malvaceae	Herb	Cooked as vegetable.
182.	<i>Matricaria chamomilla</i>	_	Asteraceae		Intermittent fever, heat stroke, colic
183.	<i>Morchella esculenta</i> Fr.	Gojay	Morchellaceae	Mushroom	Used as food. Very expensive, sold to earn. Mainly exported in dry form.
184.	<i>Momordicacharantia</i> L.	Kerela	Cucurbitaceae	_	_
185.	<i>Melia azeairach</i> L	Tora Shandai	Meliaceae	Tree	Diabetes, Lumbago, Vermifuge, Carminative
186.	<i>Mallotus philippensis</i>	Kambeela	Euphorbiaceae	_	Leaves: demulcent, aphrodisiac, laxative, Bark: astringent, diuretic. Seeds laxative, expectorant
187.	<i>Mentha royleana</i> Benth.	Station	Lamiaceae	_	Podina Leaves Mixed in green teas and are used in vomiting, as cooling agent and gas expeller
188.	<i>Nerum oleander</i> L.	Ghanderay	Apocynaceae	Shrub	Plant is usually cultivated for ornamental purposes, leaf aqueous extract is used for skin itching.
189.	<i>Nerium oleander</i>	Kaner	Apocynaceae	_	Antidiabetic, poisonous
190.	<i>Nepeta hindostana</i>	_	Lamiaceae	_	Root diuretic, laxative, stomachic, leaf appetizer, alexiteric, seed tonic carminative.
191.	<i>Nepeta laevigata</i> (D. Don) Hand.-Mazz.	Deijalbhanga/Peeshobutay	Lamiaceae	_	Powders of the dried plant are used to cure cold, fever and headache.
192.	<i>Nasturtium officinale</i> R. Br.	Talmera	Brassicaceae	Herb	Cooked as vegetable. Cooked herb is used in tetanus.
193.	<i>Narcissus poeticus</i> L.	Gule Nargas	Amaryllidaceae	Herb	Flowers are used for ornamental purposes. Grown on graves.
194.	<i>Oxalis corniculata</i> L.	Nainzakai Tarokai	Oxalidaceae	Herb	Eaten fresh and used as spice. Used to remove rust from metallic articles.

195.	<i>Oxytropis cachemiriana</i> Camb.	_	Papilionaceae	_	Rhizome of the plant is traditionally used as a tooth brush to prevent toothache.
196.	<i>Oxyria digyna</i> (L.) Hill.	Tarwakay	Polygonaceae	_	Young leaves and aerial parts are used as source of vitamin C.
197.	<i>Origanum vulgare</i>	Bans/ Ajwain	Lamiaceae		For colic, uterine disorders, epilepsy
198.	<i>Onosma hispidum</i> Wall.	Abai Abai	Boraginaceae	Herb	Root is used as purgative.
199.	<i>Onosma thomsonii</i>	Gao Zuban	Boraginaceae		Root is laxative. Flowers and leaves are tonic for cardiac disorders.
200.	<i>Onosma bracteatum</i> Wall.	Gowzoban	Boraginaceae	_	Powders are taken with water as heart stimulant while decoction is used as anti dandruff.
201.	<i>Olea ferruginea</i> Royle.	Khona	Oleaceae	Tree	Olive oil is use externally as antiseptic and anodyne. Leaves are used in diabetes. Wood is used as fuel and for furniture. Usually cultivated in graveyards. Has become endangered species.
202.	<i>Portulaca oleracea</i> L.	Warkhary	Portulacaceae	Herb	Use for the healing of kidney and also use for uninary track infection
203.	<i>Ocimum basilicum</i> L.	Kashmalay	Lamiaceae	Herb	Leaves are used in cough and flu. Seed are added to cold drinks. Also grown as ornament.
204.	<i>Pyrus communis</i> L.	Nashpatai	Rosaceae	Tree	Food is edible. Fruit is source of income, sold locally and in other parts of the country. Wood is used as fuel.
205.	<i>Protulaca oleracea</i> L.	_	Portulacaceae	_	_
206.	<i>Primula denticulate</i> Smith	Mamera	Primulaceae	_	Powdered rhizome mixed with honey is used to cure various eyes disorders
207.	<i>Pyrus pashia</i> Buch-ham ex. Don.	Batangi	Rosaceae	Tree	Fruit is edible. Wood is used as fuel.
208.	<i>Punica granatum</i> L.	Anangori.	Punicaceae	Tree	Fruit is edible. Ash of fruit rind is used in hepatitis, digestive problems, and urinary problems.
209.	<i>Populus nigra</i> L.	Sperdar	Salicaceae	Tree	Wood is very useful and used in making furniture, used in timber. Branches are used as fuel wood. Leaves as fodder.
210.	<i>Pinus roxburghii</i> Sargen	Chirr	Pinaceae		Resin is used for tumors, cough, bleeding wounds and in soap industry. The bark and leaf powder mixed with cold water is used for dysentery.
211.	<i>Poeonia emodi</i>	Mamekh	Paeoniaceae	_	Demulcent, antidepertieric, refrigerant, antiscorbiotic, diuretic, antiulcer, cardiovascular diseases

212.	<i>Polygonum plebeium</i> R. Br	Baramol/ Noorealam.	Polygonaceae	_	Root Root is boiled and mixed with butter locally for stimulate mammary glands; It is also considered to soothes and protects the alimentary canal
213.	<i>Parnassia nubicola</i> Wall.	_	Parnassiaceae	_	Whole plant is cooked as a vegetable (pot herb) and is exercised in digestive disorders.
214.	<i>Prunella vulgaris</i> L.	Ustakhdus	Lamiaceae		Whole plant both in fresh and dry form is used to relieve respiratory difficulties, in treating joint pains and easing gastric spasm.
215.	<i>Prunus cerasoides</i> D.Don	Alubaloo	Rosaceae	_	Decoction of the bark is taken in biting and fruit as nerve tonic
216.	<i>Prunus persica</i> (L.)	Arru	Rosaceae		Fruit is used to control cholesterol levels. It helps in healthy vision, healthy teeth and bones. It has anti-aging properties.
217.	<i>Plantago ovata</i>	Chmchi pattar	Plantaginaceae	_	Emollient, demulcent, laxative
218.	<i>Plantago himalaica</i> Pilger	Jabae	Plantaginaceae	_	Leaves Paste prepare from fresh leaves is used in skin problems especially soured feet.
219.	<i>Portulaca oleraceae</i> L.	ZangaliWarkhrhay	Portulacaceae	Herb	Cooked as vegetables. Also used as demulcent.
220.	<i>Portulaca quadrifida</i> L.	ZangaliWarkhrhay	Portulacaceae	Herb	Cooked as vegetable.
221.	<i>Potentilla anserina</i> L.	Spangji	Rosaceae	_	Whole plant is used as anti-diarrhoeal and also in intestinal infections
222.	<i>Podophllum hexandrum</i> Royle	Kakorra/ Gangorra	Podophyllaceae	_	A poisonous plant but expert healers use it in a minute amount in mixture with other plants. Its fruit is used to ease bowel movement whilst rhizome is used in the treatment of cancer.
223.	<i>Polygonum aviculare</i> L.	Bandakay	Polygonaceae	Herb	Cooked as vegetable.
224.	<i>Platanus orientalis</i> L.	Chinar	Platanaceae	Tree	Leaves are used in dysentery. Wood is used for making furniture, timber, and also as fuel. Dry leaves are also used as fuel.
225.	<i>Plantago lanceolata</i> L.	Ispeghol/ Jabae	Plantaginaceae.	Herb	Leaves are used for treatment of dysentery and diarrhea. Also used as wound dressing and antiseptic.
226.	<i>Plantago major</i> L.	Jabai	Plantaginaceae	Herb	Leaves are used as tonic and antiseptic, Also used for fever.
227.	<i>Plumbago zeylanica</i>	Chmchi pattar	Plumbaginaceae	_	Diaphoretic, abortifacient, appetizer, diuretic, poultice
228.	<i>Plectranthus rugosus</i> Wall.	Sperky	Lamiaceae	Shrub	Use for fever and headache. Thatching and sheltering honey bee species. And also use for the stomachache. The dried leaves are chewed in mouth to get rid of toothache
229.	<i>Pinus wallichiana</i> L.	Srup	Pinaceae	Tree	Used as Healing agent

230.	<i>Periploca aphylla</i> Decne.	Barrha	Asclepiadaceae	Shrub	Stem is used as laxative. Milky juice of shoot is used in fever.
231.	<i>Pisum sativum</i>	Mattar	Papilionaceae	–	Membrane stabilizing action, carminative, diuretic, immunomodulatory, diaphoretic
232.	<i>Pimpinella diversifolia</i> (Wall.) DC	Tarpakhi/ Watani kaga	Apiaceae	–	Dried plant is crushed to powdered form and used for gas and bowel expulsion. Also used for flavour.
233.	<i>Pistacia chinensis</i> Bunge ssp. <i>Integerrima</i> (J.L.S) Rech. f	–	Anacardiaceae	–	–
234.	<i>Papaver pavoninum</i> Schrenk.	Sur gulay.	Papaveraceae	Herb	Flowers are used as sedative
235.	<i>Paeonia emodi</i> Wall. ex Royle	Mamekh	Paeoniaceae	–	Paste prepared from seeds is used in rheumatism. Powdered rhizome is mixed with sweet dishes and used for the treatment of UTI and backache
236.	<i>Papaver somniferum</i> L	Qashqash	Papaveraceae	Herb	Anodyne, headache, dysentery, Tonic.
237.	<i>Psidium guajava</i> L.	Amrood	Myrtaceae	–	–
238.	<i>Quercus incana</i> Roxb.	Spin Banj	Fabaceae	Tree	Fruits are used for controlling excessive urination and kidney problems, also used for inflammations. Wood is used as fuel.
239.	<i>Quercus incana</i> (Hussken H.N)	Seria	Fagaceae	Tree	Dysentery, diarrhea, Dysuria, Cough.
240.	<i>Quercus dilatata</i> Lindl. ExRoyle.	Tor Banj	Fabaceae	Tree	Fruit is used for digestive problems and asthma. Wood is used as fuel.
241.	<i>Rumex hastatus</i> D.Don.	Tarukay	Polygonaceae	Herb	Leaves used as carminative, diuretic, and used in jaundice. Leaves are cooked as vegetable and also eaten uncooked.
242.	<i>Rumex dentatus</i> . L.	Shalkhay	Polygonaceae	Herb	Cooked as vegetables. Also used to treat constipation in cattle.
243.	<i>Rubus fruticosus</i> Agg.	Karwarha	Rosaceae	Shrub	Fruit is edible. Plants are used for making hedges.
244.	<i>Rubus fruticosus</i> L	Baganrra	Rosaceae	Shrub	Stomachache, digestion
245.	<i>Rosa webbiana</i> Wallich ex Royle	Zangali Gulab	Rosaceae	Shrub	Used for making hedges and as ornament.
246.	<i>Rosa moschata</i> L	Zangli gulab	Rosaceae	Shrub	Stomach disorder
247.	<i>Rosa webbiana</i> Wall. ex Royle	Jangali Gulab	Rosaceae	Shrub	Processed flowers (Arq) are used in respiratory problems while bark is used in wounds healing as well as flavour.
248.	<i>Rubus ellipticus</i> Smith.	Pulwarhi	Rosaceae	Shrub	Fruit is edible and is useful for removal of kidney stone. Plants are grown for making hedges.
249.	<i>Rubus sanctus</i> Schreber	Alish	Rosaceae	–	Fruit is laxative and dysentery; Infusion of leaves and young shoots is used in whooping cough.

250.	Rumex dentatus L.	Shalkay	Polygonaceae	Herb	used for wound of heeling. Stomachic, liver disorder, Intestinal colic and also used is a vegetable
251.	Rumex nepalensis Spreng	Ambavati	Polygonaceae	_	Leaves are used as substitute of Rheum australe whilst its root is believed to ease bowel evacuation.
252.	Ricinus communis L.	Harhanda	Ranunculaceae	Tree	Use at the time of delivery and also use for the skin rashes, and arthritis
253.	Robinia pseudoacacia L.	Kikar	Papilionaceae	Tree	Wood is used as fuel. Honey bee plant. Cultivated as roadside shade plant
254.	Rubus plicatus Weihe and Nees	Karwara	Lamiaceae	Herb	Use for blood purification and also use for cathartic. The dry leaf or powder is used for wound of heeling. Stomachic, liver disorder, Intestinal colic and also used is a vegetable.
255.	Ranunculus muricatus L.	Ziar Gulay	Ranunculaceae	Herb	Used for treatment of sciatic pain
256.	Rheum australe D. Don	Chotial	Polygonaceae	_	Leaves and shoots are used as salad for to normalize irregular heart beating, respiratory problems, sore eyes and body strength. Rhizome is cooked and used as wound healing agent and to relieve urinary tract disorders.
257.	Rhododendron hypenanthum Balf.f	Tazak	Oleaceae		Leaves Fresh leaves of it are used in spices as flavouring agent.
258.	Salvia moorcroftiana Wall. Ex Benth.	Khar Kwag	Lamiaceae	Herb	Leaves are used commonly to relieve pain.
259.	Salix acmophylla L.	Walla.	Salicaceae	Tree	Leaves are used externally to relieve pain. Wood is used for furniture, timber, and as fuel.
260.	Sauromatum venosum (Ait) Scoth		Araceae		
261.	Stelaria media (L.) Vill.	Olalai	Carophyllaceae	Herb	Plant is cooked as vegetable, also used for constipation.
262.	Sonchus oleraceus L.	Shawdapai	Asteraceae	Herb	Used as fodder for cattle, believed to enhance milk production
263.	Sonchus asper L.	Shawdapai	Asteraceae	Herb	Used as fodder for cattle.
264.	Solanum surattense Burm.f.	Marhaghonay	Solanaceae	Herb	Seed along with mustard oil is used for treatment of migraine. Ash of plant is used as tonic and pain killer.
265.	Sambucus weigtiana Wall. ex Wight & Arn	Mushkiara	Sambucaceae	_	Decoction and powder is used to relieve respiratory difficulties and inflammatory skin conditions
266.	Solanum nigrum Auct.	Kach Machu	Solanaceae	Herb	Fruit is used for inflammation and liver problems.
267.	Solanum xanthocarpum L.	Maraghone	Solanaceae	_	_
268.	Silene conidia L.	Mangotey	Caryophyllaceae	Herb	Used as vegetables (SAAG).

269.	<i>Silene vulgaris</i> (D.Don) Muell. Arg.	Bashka	Caryophylloceae	Herb	Used to treat stomachache
270.	<i>Sorghum halepense</i> Pers.	Dadam	Poaceae	Herb	Mature plants are used as fodder for cattle.
271.	<i>Sarcococca saligna</i> (D.Don) Muell. Arg.	Ladanrh	Busaceae	Shrub	Plant is used for digestive disorders.
272.	<i>Saussurea albescens</i> Hook. f. & Thoms Asteraceae	Kuth	Asteraceae	_	Roots are cooked in local butters and used as tonic, also use in treatment of stomach as well as pain, and skin diseases
273.	<i>Solanum dulcamara</i> L.	Kachmacho	Solanaceae	Herb	Fruit is used for inflammation and liver problems.
274.	<i>Sonchus asper</i> (L.) Hill	Shodapay		Herb	Use for the production of milk in animal (lactogenic) and the milk of this plant use for the removal thrones
275.	<i>Salix babylonica</i> L.	Walla	Salicaceae	Tree	Leaves are used externally as warming agent to relieve pain.Wood is used for furniture and timber, also used as fuel.
276.	<i>Sassurea costus</i>	Kuth	Asteraceae	_	Used in 'bilious' affection,astringent.
277.	<i>Saccharumspontaneum</i> L.	Kahi	Poaceae	-	-
278.	<i>Solanum nigrum</i> L.	Kachmacho	Solanaceae	Herb	Use as a vegetable and fruit are use for kidney stone and hepatitis.The Leaves in the form of paste are applied to skin to cure eczema. The fruits are edible and are used to cure fever
279.	<i>Skimmia laureola</i> (DC) sieb, Zucc	Nameran	Rutaceae	Shrub	Dyspepsia, antiseptic
280.	<i>Sysimbrium irio</i> L.	Khubkalan	Brassicaceae	_	Seeds are used in throat & chest infection & ease breathing; Paste of leaves is applied to cure sunburn & enhance skin beauty
281.	<i>Smilax china</i>	Bilri	Smilacaceae	_	Demulcent, cardiac tonic,expectorant, astringent
282.	<i>Swertia chirayita</i>	Chirita	Gentianaceae	_	Anodyne, narcotic, mydriatic , diuretic, sedative
283.	<i>Swertia ciliata</i> (D. Don ex G. Don) B. L. Burtt	Chirita	Gentianaceae	_	Powders are used in irregularity or infrequency of passing faeces as well as stomach burn
284.	<i>Typha angustata</i> Bory &haub.	Lukha	Typhaceae	Herb	Plant is used as thatching material. Leaves are used as fodder.
285.	<i>Trifolium repens</i> L.	Shautal	Papilionaceae	Herb	Used as fodder for cattle. The seeds are used for treatment of pimples.
286.	<i>Trigonella foenumgraecum</i>	Methi	Papilionaceae	_	Used for Chest infections, rheumatism.
287.	<i>Tribulus terrestris</i> L.	Markundai	Zygophyllaceae	Herb	Seed are used as general tonic, used in urinary disorders and impotency.
288.	<i>Trachyspermum ammi</i> L.	Spairkai	Apiaceae	xHerb	Fruit is used as carminative, digestive, and in colic pain.



289.	<i>Trillidium govanianum</i> (Wall. ex D. Don) Kunth	Tandhi jarri	Trilliaceae	_	Powdered plant is used as body and sexual tonic
290.	<i>Thymus linearis</i> Benth.	Da Payo Shamakay	Lamiaceae	Herb	Leaves are used in cough, flu, and fever. Seeds are added to milk to preserve it for longer duration.
291.	<i>Thuja orientalis</i> L.	Warha arwa	SCupressaceae	Shrub	Ornamental.
292.	<i>Taraxacum officinale</i> Webber.	Ziarh Gulay	Asteraceae	Herb	Roots are used in diabetes and for kidney problems.
293.	<i>Taxus wallachiana</i>	Burmi	Taxaceae	_	Used as Narcotic, antispasmodic, diuretic, laxative
294.	<i>Tagetes minuta</i> L.	Hamesha	Asteraceae	Herb	Ornamental.
295.	<i>Tussilago farfara</i> L.	Funjiwam	Asteraceae		Aerial parts are cooked and used in respiratory infections
296.	<i>Ulmus wallichiana</i> Planch.	Kahey	Ulmaceae	_	Considered highly medicinal for digestive tract diseases.
297.	<i>Urtica dioica</i> Linn.	Sezonkay	Urticaceae	Herb	Whole plant is used as diuretic, also used in jaundice.
298.	<i>Verbascum Thapsus</i> L.	Khardag	Scrophulariaceae	Herb	Leaves are used externally to relieve pain.
299.	<i>Voila Canescens</i> Wall.	Banafsha	Violaceae	Herb	Leaves are used in fevers, flu, and as expectorant.
300.	<i>Voila biflora</i> L.	Banafsha	Violaceae	Herb	Leaves are used in fevers, flu, and as expectorant.
301.	<i>Vitex negundo</i> L.	Marvandai	Lamiaceae	Shrub	Leaves are used in digestive problems. Wood is used as fuel wood.
302.	<i>Viola canescens</i> Wall. ex Roxb.	Gule banafsha	Violaceae	_	Young shoots are used to promote circulation, dispels fever and chills, relieves muscle tension whilst decoction & infusion is used in sore throat
303.	<i>Vitisvinifera</i> L.	_	Vitaceae	_	Blood Purifier
304.	<i>Viburnum nervosum</i> . D. Dom	_	Caprifoliaceae	_	_
305.	<i>Viburnum cotinifolium</i> D. Don	Taliana	Caprifoliaceae	_	Fruits are taken for reducing uterine irritability and stopping bleeding usually by female
306.	<i>Valeriana jatamansi</i> Jones	Mushki bala	Valerianaceae	Herb	Epilepsy, Antispasmodic
307.	<i>Valeriana pyrolifolia</i> Decne	Mushkbala/Shangeetae	Valerianaceae	_	Powdered rhizome is used to treat spasm and habitual constipation.
308.	<i>Viburnum grandiflorum</i> Wall. Ex, Dc.	Ghazmeva/ Guch	Caprifoliaceae	Shrub	Stomach Disorder
309.	<i>Verbena officinale</i> Linn.	Shamakai	Verbenaceae	Herb	Expectorant, blood purifier, refrigerant
310.	<i>Withania somnifera</i> (L.) Dunal	Koti Lal	Solanaceae	Herb	Roots bark along with sugar is used as tonic, galactagogue. Also used to relieve back ache
311.	<i>Woodfordia fruticosa</i>	Dhawi	Lythraceae		Rheumatism, gout, diuretic

312.	Xanthium stramarium. Linn.	Jishkay	Asteraceae	herb	Leaves are used for treatment of asthma. Stem ash is used as pain killer. The plant is also used as fuel. Leaves are grazed by cattle.
313.	Zizyphus mauritiana Lam.	Mada Bera	Rhamnaceae	Tree	Fruit is edible. Wood is used as fuel.
314.	Zizyphus vulgaris L	Markhanai	Rhamnaceae	Tree	Nose Bleeding, Cough, cold
315.	Zizyphus sativa Gaertn	Markhanry	Rhamnaceae	Tree	Fruit is edible. Leaves and fruit are believed as antibiotic and antidiabetic. Wood is used as fuel wood. Leaves are grazed by cattle.
316.	Zizyphus nummularia	Beri	Rhamnaceae	_	Carminative, Sedative
317.	Zizyphus oxyphylla Edgew	Elanai	Rhamnaceae	Tree	Fruit is edible. Leaves and fruit are believed to be antibiotic and antidiabetic. Wood is used as fuel. Root extract is used for hepatitis. Fruit is also used as heart tonic
318.	Zanthoxylum armatum DC.	Dambara	Rutaceae	Shrub	Fruit is used for treating stomach disorders and also as spices.
319.	Zizyphus oxyphylla Edgew.	Elanie	Vitaceae	Shrub	Use for the treatment of hepatitis
320.	Zanthoxylum alatum stend	Dambara	Rutaceae	Shrub	Pepper, Stomachache
321.	Zizyphus jujuba Mill	_	Rhamnaceae	_	_
322.	Zea mays	Jawar	Poaceae	_	Used in Aurticaria.

Sources: [S. A. Hussain et al. \(2015\)](#), [Hazrat, Nisar, Sher, and Zaman \(2015\)](#), [Hazrat, Shah, Ahmad, Nisar, and Jan \(2010\)](#), [Ahmad, Ibrar, and Ali \(2011\)](#), [Begum and Hamayun \(2015\)](#), [Amjad, Arshad, Saboor, Page, and Chaudhari \(2017\)](#), [Ziauddin and Jan \(2018\)](#), [Waheed et al. \(2018\)](#), [G. M. Shah and Khan \(2006\)](#)

## Appendix-B Disasters' Impact on Pakistan Economy during 2005

Year	Disaster type	Occurrence	Total deaths	Injured	Affected	Homeless	Total affected	Total damage ('000 US\$)
2005	Flood	5	636	470	7523073	3500	7527043	30000
2005	Landslide	1	24					
2005	Storm Extreme	1	58					
2006	temperature	1	84	100			100	
2006	Flood	7	400	525	2000	5600	8125	
2006	Landslide	1	29	5			5	
2007	Flood	6	526	206	2500		2706	327118
2007	Landslide	3	143	3	2		5	
2007	Storm	1	242		1650000		1650000	1620000
2008	Flood	3	83	12	290752		290764	103000
2009	Flood	3	102	80	75000		75080	
2010	Flood	4	2113	2946	20360550		20363496	9500000
2010	Landslide	2	50	72	30333		30405	18000
2010	Storm	1	23		4000		4000	80000
2011	Flood	1	509	755	5400000		5400755	2500000
2012	Flood	3	518	2902	5047662		5050564	2500000
2012	Landslide	2	153					
2013	Flood Extreme	2	268	912	1496870		1497782	1500000
2014	temperature	1	139					18000
2014	Storm Extreme	1	16	82			82	
2015	temperature	1	1229		80000		80000	
2015	Flood	6	367	499	1576991		1577490	1000
2016	Flood	7	369	267	3135	7360	10762	2000
2016	Storm	1	34	191			191	
2017	Epidemic	1	25	2492			2492	
2017	Flood	2	180	817	62200		63017	110000
2017	Landslide	1	9	3	110		113	
2017	Storm Extreme	2	26	113			113	
2018	temperature	1	180					
2018	Flood	1	60					
<b>Total</b>								<b>18309118</b>

Source: [EM-DAT \(2018\)](#)