1. INTRODUCTION

1.1 Background

Nepal, a Himalayan country, lies between the latitudes 26°22' to 30°27' north and longitude 80°4' to 88°12' east in the southern slopes of Himalayas. The country is surrounded by two big countries of Asia; India in the south, east and west and China in the north. Geographically Nepal is a transitional mountain area located between Indogangetic plain in the south and Tibetan plateau bounded in the north. The northern part lies snow capped peaks of Himalayas including world's highest peak Mount Everest (8848 m). The length of the country is about 885 Km and an average width is about 193 Kms.

The climate of the country is tropical to alpine. Climate of the Terai and Bhabar experiences tropical, whereas the midland experiences subtropical to temperate and the high Himalayas experiences subalpine to alpine. Stainton (1972) divided Nepal into 6 main phytographical division based on topography, climatic condition, vegetation type and floristic composition. Similarly Dobremez (1972) divided Nepal into 6 bioclimatic zones and eleven sub-zones. Thus, the extreme topographical difference and climatic condition resulted into variability in vegetation composition and biodiversity as well. Its ecosystems can be divided mainly into terrestrial and wetland ecosystems.

Wetlands sites are distinguished by presence of water, often have unique soils that differ from adjacent uplands and support vegetation adapted to the wet condition (hydrophytes). They comprise a wide range of inland, costal and marine, however only inland type of wetland habitats present in Nepal. Ramsar Convention defines wetlands as an 'area of marsh, fen, pet land or water, whether natural

or artificial, permanent or temporary, with water static or flowing, fresh, brackish or salt, including area of marine water, the depth of which at low tide does not exceed six meters (Ramsar Convention Bureau, 1971).

In context to Nepal, “Wetlands denote perennial water bodies that originate from underground sources of water or rains. It means swampy areas with flowing or stagnant fresh or salt water that are natural or man-made, or permanent or temporary. Wetlands also mean marshy lands, riverine floodplains, lakes, ponds, water storage areas and agricultural lands” (National Wetland Policy, 2003).

In December 1987, Nepal became the 46th Contracting Party to the ‘Ramsar Convention’ treaty by depositing Koshitappu Wetland Wildlife Reserve as the 384th wetland in the Convention List. The Convention on Wetlands came into force in Nepal on April 17, 1988. The three sites in Nepal designated as Wetlands of International Importance on 13 August 2003 are Beeshazar and Associated Lakes in the buffer zone of Chitwan National Park, the World Heritage site Ghodaghodi Lake area in Kailali district, and Jagadishpur Reservoir in Kapilvastu district. These sites are among the 10 wetland sites in the Terai highlighted in the 2002 Nepal Biodiversity Strategy, and recommended as meriting legal protection (Bhuju etal 2007). Presently there are nine Ramsar site in Nepal (Bhandari, 2009).

The values of wetlands can be grouped into two broad categories (1) Ecological values or indirect use values derived from the function of wetlands as wildlife habitats, and from their essential contribution to the maintenance of environments and ecological balance in the immediate area and beyond. (2) Economic use values or direct use values derived from the use of wetlands as production system for sustainable harvest of their resources (Chaudhary, 1998).

Nepal is rich in wetland resources such as permanent rivers to seasonal streams, high altitude glacial lakes to low lands oxbow lakes, ghols to swamps and marshy lands, river flood plains, paddy field and manmade reservoirs and ponds. Most of the wetlands are present in the lowland (Terai) of the country which is most densely populated and developed zone of Nepal. Wetlands in Nepal cover about 7437 sq. km. (approximately 5% of the total area of the country). In addition it has been estimated that 80,000 hector of surface water area will be added as reservoirs if the hydro electric power potential of the resources of the major river system of the country is exploited (Sah and Sah, 1999).

In Nepal there are altogether 240 wetland sites of which 163 are in plain lowland (Terai). About 25% of the estimated 7000 species of vascular plants are directly or indirectly linked to wetland (Bhandari, 1992). Moreover, Nepalese wetlands house about 42 species of globally threatened species, 17 endemic faunal species out of 20 are wetland dependent (IUCN, 2004). Over 193 species of birds are dependent on wetland (IUCN 1998). Similarly, a large number of species of reptiles, amphibians, fishes and invertebrates are also inhabited on wetland. Nepal's wetlands harbour 11 globally threatened plant species among 91 globally threatened species and 26 endemic species of flowering plants. Many wetland plants and animals are also under the governments protection and CITIES list (IUCN, 2004). 172 species of the major wetland plants are listed by IUCN (IUCN, 1996).

Kailali is one of the large district lying in plain area of Far Western Region between latitude 28.22° to 29.5° north and longitude 80.30° to 81.18° east. The altitude of the district ranges from 170 m to 1950 m. The total area of the district is 324791 hector including 216437.5 hector of forest area. The geographical boundaries of the district are Karnali River, Bardia and Surkhet districts in the east; Kanchanpur and

Dadeldhura districts in the west; Doti, Dadeldhura and Surkhet districts in the north and Uttar Pradesh state of India in the south. Physiographically the major southern part of the district is Terai plain and northern part is Churia hills with few parts lying in the Mahabharat range. Kailali district is rich in wetland ecosystems. The major wetlands of the district are Ghodaghodi Tal, Nakhrodi Tal, Devriya Tal, Chidiya Tal, Dudhia Tal, Baishawa, Sunpokhari, Budhi Nakhrodi and Rampur, Beheda Baba, Tilke, Koiliya, Ghodatalia Tal, Baisawa Tal, Chandra Bijara Tal, Rampal Tal, Rupainiya Tal, Sonia Tal and Beni Tal. The Karnali, Mohana, Khutia, Kadha, Kanara and Patharia are the main rivers of this district (DDC, Kailali, 2006).

BPP/HMGN (1995) reported 21 major wetland sites from Kailali district, while Chitwan containing nine wetland sites is the second to it. BPP in 1995 merited four wetland sites namely Ghodaghodi, Nakhrodi, Rampur and Devriya for protection. Out of four, Ghodaghodi is included in Ramsar list of International importance in 2003.

1.2 Justification

Devriya wetland lies close to the district headquarter the Dhangadhi municipality. It is one of the famous ecotourism and recreational sites in the district. Due to rapidly growing population around this area, its natural resources have been under excessive pressure for livelihood and subsistence farming. It is being degraded due to eutrophication and human encroachment.

Till date there is no any study related to floral diversity. The present study will be helpful for making inventory of plant diversity of wetland. Furthermore, this work will also help to enrich the floral database of country.

1.3 Objectives

The general objective of the study is to inventory the status of wetland vegetation of Devriya wetland, of Kailali.

The specific objectives are:

1. To enumerate the species diversity of macro-phytes of Devriya wetland.
2. To document the resources use pattern and ethno-medicinal use of plants among local community of the Devriya wetland.

2. LITERATURE REVIEW

2.1 Wetland concept and classification

A number of definitions and classification of wet land are in use. According to Ramasar Convention Bureau (1971), wetlands are areas of marsh, fen, pet land or water, weather natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine the depth of which at low tide does not exceed 6 m. Latter the informal group of Nepal defined wetland as "A land mass saturated with water due to high water table through either groundwater, atmospheric precipitation or inundation. It may be natural or artificial, permanent or temporary, static or flowing fresh water or brackish" (Bhandari et al, 1994). The different concepts of wetland create difficulty in classifying them. As a result a number of classification systems are derived from these definitions.

Scott (1989) classified wetlands into 23 categories for describing the Asian wetlands but latter, based on the range of wetlands which come under the Ramsar convention, 30 categories of natural wetland and 9 artificial (manmade) ones have been recognized by Dugan (1990). For Nepalese wetlands, the classification accepted by Bhandari (1992), has 7 categories: (1) lake, (2) pond, (3) reservoir, (4) river flood plain, (5) swamp, (6) marsh and (7) rice fields. But latter Sah (1993) in his work in Koshi Tappu, Nepal, maintain 8 categories of Nepalese wetlands, including rivers in above classification.

A classification adopted by BPP/HMGN (1995) is as follows.

Type no.	Lacustrine systems
13	Ox-bow lake often associated with swamp forest (swamp forest are seasonally inundated

	areas with associated tree species adapted to these condition).
14	Fresh water lakes and associated marshes
	Palustrine system
15	Permanent fresh water marshes
15	Seasonal fresh water marshes
11	Perennial rivers and streams
11	Seasonal and irregular rivers and streams
	Manmade systems
14	Aquaculture ponds
14	Reservoirs

2.2 Status of wetlands in Nepal

Wetland is known as Simsar in Nepal. Although Nepal is a land locked mountainous country, it has many wetlands scattered in mountains and Terai regions. APROC (1986, cited in Bhandari, 1992) has estimated that 731,500 ha of land (5% of total) are covered by water bodies which include irrigated rice fields. According to this estimation, river cover 359,000 ha (54%), lakes 5,000 ha (0.7%), reservoirs 1500 ha (0.2 %), ponds 5,000 ha (0.7 %), and rice fields 325,000 (44.4%). Similar type of data was presented by McEachern (1993).

Regarding the distribution of wetlands in Nepal, little study has been done. Scott (1989) described only 17 sites of wetlands. Latter, Bhandari (1992) compiled several data and listed 295 wetland sites. Since that was the first attempt for inventory of wetlands in Nepal, it was not a complete list. Since the list was based on the literatures,

most of the wetlands, mentioned in the list, might have either dried or converted into other land.

Fifty-one wetlands sites were surveyed in 12 districts of Terai by Biodiversity Profile Project Team (BPP/HMGN, 1995) to prepare assessment of Terai wetlands. Many (42 sites) of them were ox-bow lakes, 5 were small in size (less than 1 ha), 17 lakes were over 10 ha and 7 lakes were in excess of 100 ha. Among 51 wetland sites 21 were in Kailali district alone. In addition, it should be also noted that most of the 21 sites in Kailali district are hydrologically interconnected, which provide important ecological services of national importance through their scenic view and rich biodiversity.

2.3 Wetland vegetation around world

Wetlands are characterized by the presence of certain species and communities. Floral composition and relative abundance of the component of wetland plant communities change in time and space due to the effect of several biotic and abiotic factors.

Whittaker's (1975) study in American wetland has shown that each plant species is distributed in a unique pattern in the landscape and that this pattern results from the interaction of each species with its physical and biological environment. As a result the composition of plant community change more or less continuously along environmental gradients as changing conditions cause species to enter or leave.

Perera (1982) in his study found the change in species composition of the vegetation in the area, where ecological conditions of soil, water and micro-relief change within short distances. Similarly Handoo and Kaul (1982) studied frequency, density, standing crop and IVI in four wetlands of Kashmir differing in depth and fluctuation of water level.

The seasonal change in floristic composition and relative frequency and density of the species in four wetlands were significantly different between the sites. The density decreased rapidly after Sep. with the onset of cold weather in one site while it decreased from Jun. to Sep. in other three sites. The study also showed a gradual increase in species richness from 1.2 to 4.76 with decrease in water depth. The gradual increase in species richness with decrease in water depth was also found by Grime (1973) and Van der Valk & devis (1976). According to Van der Valk et al. (1983), however, lowering and rising water levels do not have the same consequences for many wetland species. When mean water level is lowered all species are able to shift down slope rapidly through a combination of clonal growth and seed germination. This is possibly because wetland species can tolerate low water level for some period.

Sankhla and Vyas (1982) studied moist bank community of Banghela tank of Udayapur, India and observed 21 species of angiosperms belonging to 20 genera and 12 families. In their study, the highest no of species in the community occurred in Sep., while lowest no of species in Mar. and Apr.

Thiobodeau (1985) recognised that in any wetland the the hydrology of the area shapes distribution of vegetation pattern. Studies showed that there are often distinct grouping of species associated with different degree of flooding. According to Nickerson (1991), wet land vegetation depends on fluctuation of water level over time period for its survival. Reduction of size of any wetland by whatever means results in increased stress on its wildlife inhabitants, a change in its water regime and a slow but inevitable change in its vegetation cover. Nickerson and Thibodeau's (1985) study in shrub swamp in Tewksburry, Masschuettes, USA, showed that inundation and draining

were important causes for the change in the vegetation in the shrub swamp.

Van der Valk and Peterson (1989) studied in the delta marsh in Manitoba, Canada and observed that high water periodically eliminates most of the emergent vegetation and a subsequent period of low water allows emergent to establish on exposed mud flats. It means an emergent survives primarily in shallow water along the peripheries. Latter Van der Valk (1990) observed that emergent and submerged species were able to shift their position in relation to change in water level. He stated that the coenocline has only three zones; wet meadow, emergent and submerged. These three zones are found commonly in fresh water wetlands and each of them usually has a unique assemblage of species. The wet meadow species can tolerate periods of standing water of a year or so but not permanent inundation. The emergent species can tolerate permanent inundation and also a year or more free of standing water. The submerged species is normally found in standing water but it can survive in short draw downs also.

Nohara and Tsuchiya (1990) studied the effects of water level fluctuation on the growth of *Nelumbo nucifera* in Kasumigaura Lake in Japan and showed that *Nelumbo nucifera* was widely in Japanese eutrophic waters. Other plant species associated with *Nelumbo nucifera* were *Trapa natans*, *Phragmites australis*, *Typha angustifolia*, *Myriophyllum* sp. and *Hydrocharis dubia* etc.

On the other hand Pandit (1984) studied in Kashmir wetland in India and stated that macrophytes play a key role in determining the structure and function of the wetland ecosystem. Fresh water macrophytes have a dominant influence upon the physical environment than the terrestrial plants. Because of the changes in some of this physical environment, with the decrease in total number of species of

macrophytes 54 in 1963 to 1982, *Nymphea alba* and *Sparaganum erectum* are being chief colonizer replacing economic plants like *Nelumbo nucifera*. He also states that the presence of macrophytes is an important factor in the conservation of water resources.

The occurrence of plant species on the landscape can be drastically change by human disturbances like forest practices, agriculture practices, urban development, drainage population and other human activities (Tiner, 1991). According to Mehrotra et al (1991), human activities which can change the vegetation structure and reduce cover are lopping and fires.

Similarly, Vin (1991), in his study of a reserve in Israle, found that to maintain biological diversity, the authority had to reintroduce grazing and charcoal practice on controlled basis. In contrary to this, Shrestha (1993) pointed out that the disturbances cause the loss of vegetation, thus loss of biodiversity.

2.4 Wetland vegetation in Nepal

Studies on wetland flora in Nepal started with work of Don (1825), Hooker (1872) and Burkil (1910) pioneered the study of aquatic macrophytes. Stainton (1972) mentioned some wetland vegetation types in his Forests of Nepal. Similarly, Bhatt and Shrestha (1978) in Suklaphanta Wildlife Reserve and Dinerstan (1979) studied in Rapti River and Karnali-Bardiya Wildlife Reserves, provided some information on wetland plants of Nepal.

Scott (1989) while describing the Nepalese wetlands mentioned high mountains lakes are oligotrophic and support only few species of aquatic macrophytes, whereas in mid mountains and Terai range, mesotrophic to eutrophic and show rich growth of aquatic macrophytes.

Baral (1992) studied the aquatic macrophytes in Ghodaghodi Tal and observed that *Nelumbo nucifera* dominated in summer and *Nymphea* sp., *Trapa bispinosa* and *Pistia stratiotes* in rainy season.

Maskey (1992) studied in Royal Chitwan National Park (RCNP) and reported 16 oxbow lakes, which are shallow and eutrophic with luxuriant groth of aquatic vegetation. The dominant species include water hyacinth (*Echornia crassipes*), *Polygonum plebeium*, *Cyperus spp.*, *Persicaria barbata* and *Arundo-Phragmities* association. *Themedia villosa* forms a tall grass cover at the fringes.

BPP/HMGN (1995) in "Bio-diversity assessment of Terai wetlands" reported 235 plant species in 36 wetland sites of Nepal. Major vegetation reported from Devriya lake are *Echornia crassipes* and *Azolla imbricata* as free floating; *Ceratophyllum demursum*, *Chara fragilis* and *Hydrilla verticillata* as submergent; *Marsilia quadrifolia*, *Marsilia minuta*, *Ipomoea aquatica* and *Nymphoides indica* as rooted floating; *Schoenoplectus mucronatus* subsp. *mucronatus, Ranunculus trichophyllus* as emergent; *Vetiveria zizanoides*, *Chrysopogon aciculatus*, *Cynodon dactylon* as shrubbery and grassland and *Shorea robusta*, *Mallotus philippensis*, *Terminalia alata*, *Syzigium cumini*, *Syzigium jambos* and *Adina cordifolia* as forest trees.

Siwakoti and Varma (1998) carried out a study on aquatic flora of the plains (Biratnagar-Dharan) of eastern Nepal represented by 141 species; out of these 67 belongs to dicotyledons and 74 species to monocotyledons. Similarly 126 species were amphibians, 10 species were floating and 5 species were submerged. Most of the recorded hydrophytes were economically important.

2.5 Use of resources

Heinen, (1996) mentioned that resource use patterns of indigenous, ethnic groups and immigrants draw attention for sustainability of resources. Non indigenous peoples can cause more significant change in biodiversity of the wetlands. Understanding cultural perspectives of resource use and how they influence conservation attitudes provides insights for strategic management. In recent years, because of Maoist insurgency, political instability, centralized development, infrastructure development and better livelihood opportunities, many people have migrated from hills to plains. Large scale migration causes ethnic, economic and cultural heterogeneity, which will influence resource use patterns and problems. Similarly Shreckernberg, (1999) states immigration disrupts ecosystems thus hastening the exploitation of resources to an unsustainable level.

Bhuju *et al* (2007) states Nepal's bio-resources in the international trade are mostly wild in origin. The 188 biomaterials commonly found in international trade consists of various plant parts such as roots and tubers (39 plants), barks (seven plants), leaves (26 plants), flowers (14 plants), fruits and seeds (61 plants), whole plants (12 plants), gums and resins (eight plants), and miscellaneous other plants (11).

Study of Brown, (1997) shows that culture plays an important role in natural resource management. The dependency on resources could be a function of culture. The indigenous Tharus are more dependent on natural resources than other groups in South Asia. Anderson, (2001) writes, understanding cultural perspectives of resource use and how it influences conservation attitudes provides insights for strategic management. Traditional rituals and customs of tribal people can impose restrictions on the exploitation of resources.

Sah & Heinen, (2001) carried out an attitudinal survey in Ghodaghodi Lake area shows that conservation attitudes are mainly influenced by education and resource-use patterns, and only secondarily by ethnicity.

Baral, (2011) in his study in Begnas and Rupa Tal of Kaski district found male and female respondent ratio as 53 and 43 respectively. He also found that More than half (51.4%) of the respondents were Brahman followed by Occupational Castes (24.8%), Chhetri (14.3%) and Indigenous (9.5%). The reason for majority of Brahman respondents was due to the majority of Brahmans in the settlements around the Lake.

Bhattarai *et al,* (2011) in their study in Tharu community of Kanchanpur district mentioned seven major types of forest resources. The resource use weight was as fuel wood (9.74), wild food (9.49), thach (5.47), Timber (5.338), leaf litter (5.21), fodder (4.36) and medicinal plants (1.88)

2.6 Ethno-medicinal plants

Kunwar and Bussmann (2008) stated, In contrast to an average of 21 to 28% ethno-botanically/ethno-medicinally important plants reported for Nepal, about 55% of the flora of the study region had medicinal value.

Gautam (2011) reported 87 species of ethno-medicinal plants from Panchthar district. The investigation revealed the medicinal properties of 87 species belonging to 84 genera under 53 families. Lamiaceae is the dominant family (7 species.), followed by Asteraceae, Papilionaceae and Liliaceae (4 species each). The other 34 families contributed two or one species each. Among all the species, herbs were found to be highest (35) followed by trees (24), shrubs (23) and climbers (5).

Study of Rijal (2008) in mid hill of Nepal shows people were using 435 different plant species for 845 various uses. Stems had the highest number of uses (180) followed by whole plants (163) and leaves (134).

Fodder had the highest number of species (198) followed by edible plants (136) and medicinal use species (115). 246 species had single-uses while 189 had multiple-uses.

Achrya and Achrya (2009) in their study on Tharu community of Rupandehi district found Altogether 45 different species of plants belonging to 31 families and 42 genera were documented and majority of them were trees. In terms of plant and plant parts use, seed or fruits and leaf are in top priorities. These plants are used to treat different ailments ranging from gastro-intestinal to headache and fever, respiratory tract related problems to dermatological problems, snake bite to ophthalmic and cuts and wounds.

Dangol and Gurung (1991) in their study in four Tharu villages (Meghauli, Bangain, Baghmara and Sauraha) of Chitwan district of Nepal and their adjoining areas in cooperation with tribal medicine men, called “Guruwas”. A total of 71 plants were identified to be of medicinal use to the Tharus. The plants were used to treat a range of diseases including headache, diarrhoea, and problems associated with menstruation and pregnancy. Most of the plants were commonly used by all four groups of Tharus.

3. STUDY AREA

3.1 Locations

Devriya wetland is situated at ward no. 7 (the north -east corner) of Dhangadhi municipality of Kailali district at a distance of 5 kilometre far from the centre of Dhangadhi Bazar. It is linked to Market by motorable gravelled road. The wetland lies between the latitude 28°42’02” to 28°42’46” and longitude 80°37’09” to 80°38’12”. This wetland contains a complex of three lakes, namely *Jakhor Tal*, *Murphutta Tal* and *Murphutti Tal*. *Jakhor Tal* is greatest among three. On the south boundary of the *Jakhor Tal* lays a temple known as *Jakhor Baba*.

3.2 Topography

The whole area is flat and elevation ranges from 105 to 110 metre from mean sea level. The wetland system covers about 50 hector area and depth ranges from 2 to 4 metre. It is an eutrophic oxbow lake with associated grassy marshes surrounded by a dense forest from three sides and a cultivated land from the southern side. The lake fed direct rains, surface flows of cultivated land and small seasonal streams. The outlets of Jakhor Lake flow into *Murphutta* and *Murphutti* from its south and south-east side respectively.

3.3 Climate

The area has tropical monsoon climate. The average annual rain fall ranges between 1630 mm to 1705 mm at Dhangadhi. About 80 to 85%

Table 1: Geographical Position, Area and Perimeter of Devriya Wetland.

S.N.	Name of Lake	Geographical position	Area of lake (ha)		Perimeter (m)	
			Open water	Marsh land	Open water	Marsh land
1.	Jakhor Tal	2842'11'' to 2842'36'' N 8037'09'' to 8037'35'' E	7.50	13.5	1830	3382
2.	Murphutta Tal	2842'14'' to 2842'15'' N 8037'24'' to 8037'34'' E	0.65	1.9	414	707
3.	Murphutti Tal	2842'04'' to 2842'12'' N 8037'28'' to 8037'35'' E	1.40	2.2	554	814
	Total		9.55	17.6		

Source: Field study, 2009, 2010, 2011

of total rainfall occurs during the monsoon period (mid Jun to late Sep.). In winter, the area receives small amount of rain brought by the south-westerly winds from Arabians Sea (GoN/DDC, Kailali 2009). Similarly, the area lies in Thermoxerochimenic bioclimatic zone represented by hot (mean daily temperature greater than 15° c) and humid bio-climate with 5-6 dry months (GoN/DPRO, Kailali 2007). The average monthly maximum temperature ranges from 21.9 °c to 37.2° c and minimum temperature from 5.4° c to 25.8° c. The temperature rises during the pre monsoon season (Feb. to May) and declines during the post monsoon season (Oct. to Jan.) with the lowest temperature recorded in Jan. (GoN/DHM, 2009).

3.4 Vegetation

The study area consist tropical forest dominant with *Shorea-Terminalia* Type. *Shorea robusta* and *Terminalia alata* are the dominant species with second layer of *Mallotus philippensis* and *Holarrhena pubescens*. (GoN/DPRO, Kailali 2007).

3.5 Fauna

The wet land is a winter habitat for several species of water fowl and provides a staging area for for many species during their migration. The common resident bird species are *Gallinula chloropus* (Indian Moor Hen), *Nettapus coromandelianus* (Pigmi Goos), *Halcyon Smyntensis* (White Breasted Kingfisher), *Pelargopsis indicus* (Stork-billed King fisher), *Ardieola grayii* (Pond Heron), *Streptopelia chinsis* (Spotted Dove) etc.(GoN/DPRO, Kailali 2007).

The mammals recorded are *Macaca mulata* (Rhesue Monkey), *Presbytis entellus* (Human langur), *Felis chaus* (Jungle cat), *Canis aureus* (Jackal), *Bandikota indica* (Jungle Rat), *Cervus duvauceli* (Swamp Deer) etc. (GoN/DPRO, Kailali 2007).

The fish species found are *Cirrhinus sp.* (Rawa), *Labio rohita* (Rohu), *Amphipnous cuchia* (Andha bam), *Acrossocheilus hexagonalipis* (Katle), *Chauna gachura* (Bhoti), *Mastacembelus sp.* (Bam), *Chauna punctatus* (Garahi), *Tor putitora* (Mahasir) and *Tor tor* (Sahar). (GoN/DPRO, Kailali 2007).

3.6 Demography

Total population of Dhangadhi Municipality of kailali district is 67,447 with 36,228 male and 32,219 female. (CBS 2001)

According population census 2001, population of ward no. 7 of Dhangadhi municipality (adjoining human settlement of study area) is 2178 from 484 household with average household size 4.5. Total literacy of the population is 54% (Table 1 and 2).

The ethnic composition of the study area is dominated by indigenous people (Chaudhary, Dagaura, Rana, Tharu and Raji) followed by Bahun-Chhetry and Dalits (Table 3).

Table 2: Population of Ward no. 7 of Dhangadhi Municipality

S.N.	Age group	Female		Male		Total	
		Number	percent	Number	Percent	Number	percent
1	0-15	370	17%	349	16%	719	33%
2	15-60	632	29%	607	28%	1239	57%
3	>60	109	5%	111	5%	220	10%
4	Total	1111	51%	1067	49%	2178	100.00%

Source: CBS 2001

Table 3: Literate Population by Educational Attainment.

S.N.	Educational Class Level	Female	Male	Total	Percent
1	School (1-5)	348	414	762	35%
2	School (5-10)	109	218	327	15%
3	College (>10)	33	54	87	4%
	Total	490	686	1176	54%

Source: CBS 2001

Table 4: Number of Households by Ethnic Group.

S.N.	Ethnicity	House Holds	Percentage
1	Indigenous	359	74%
2	Dalit	25	5%
3	Bahun-Chhetri	100	21%
4	Total	484	100%

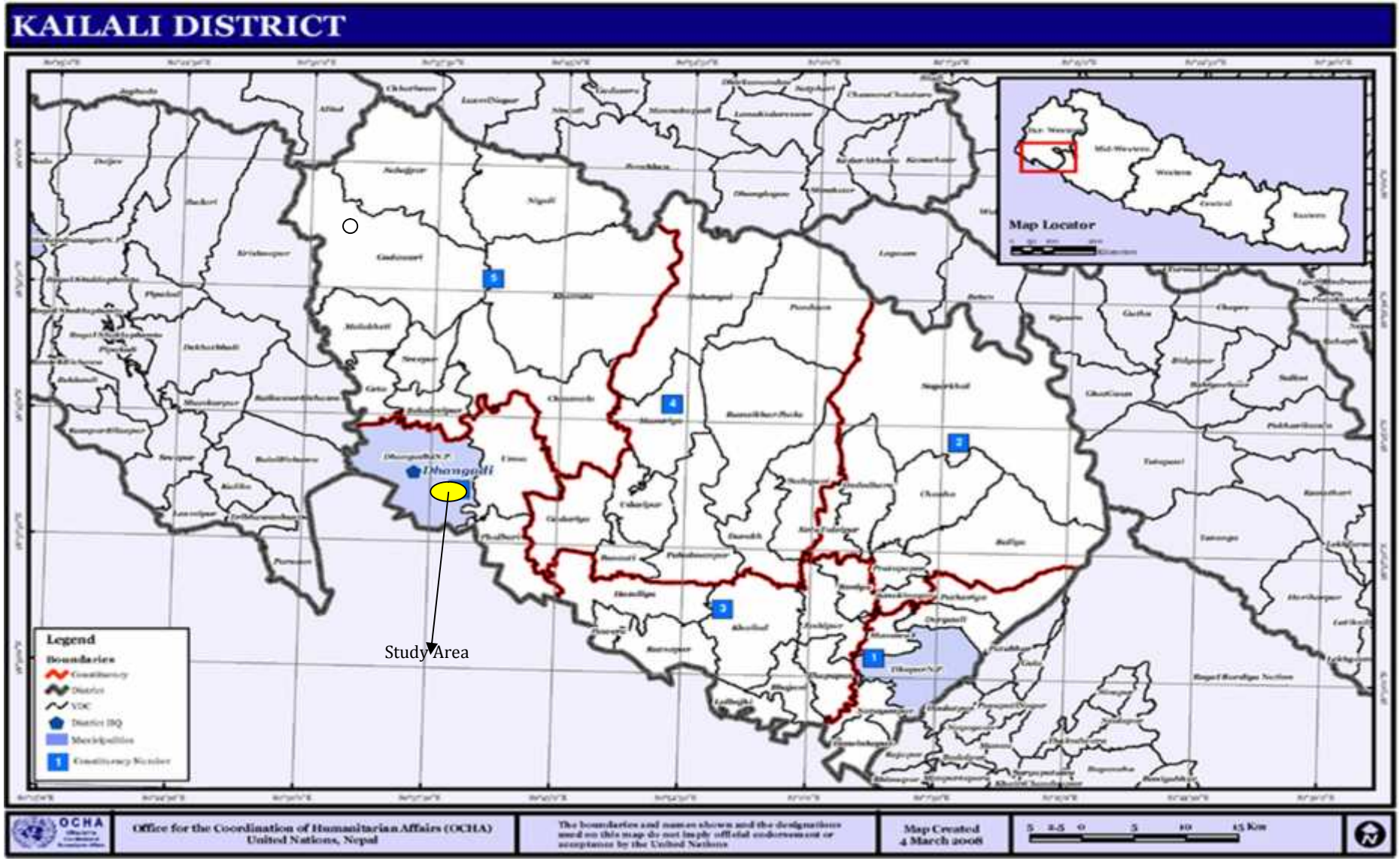
Souce: CBS 2001

2.7 Mythology about Lake and Temple

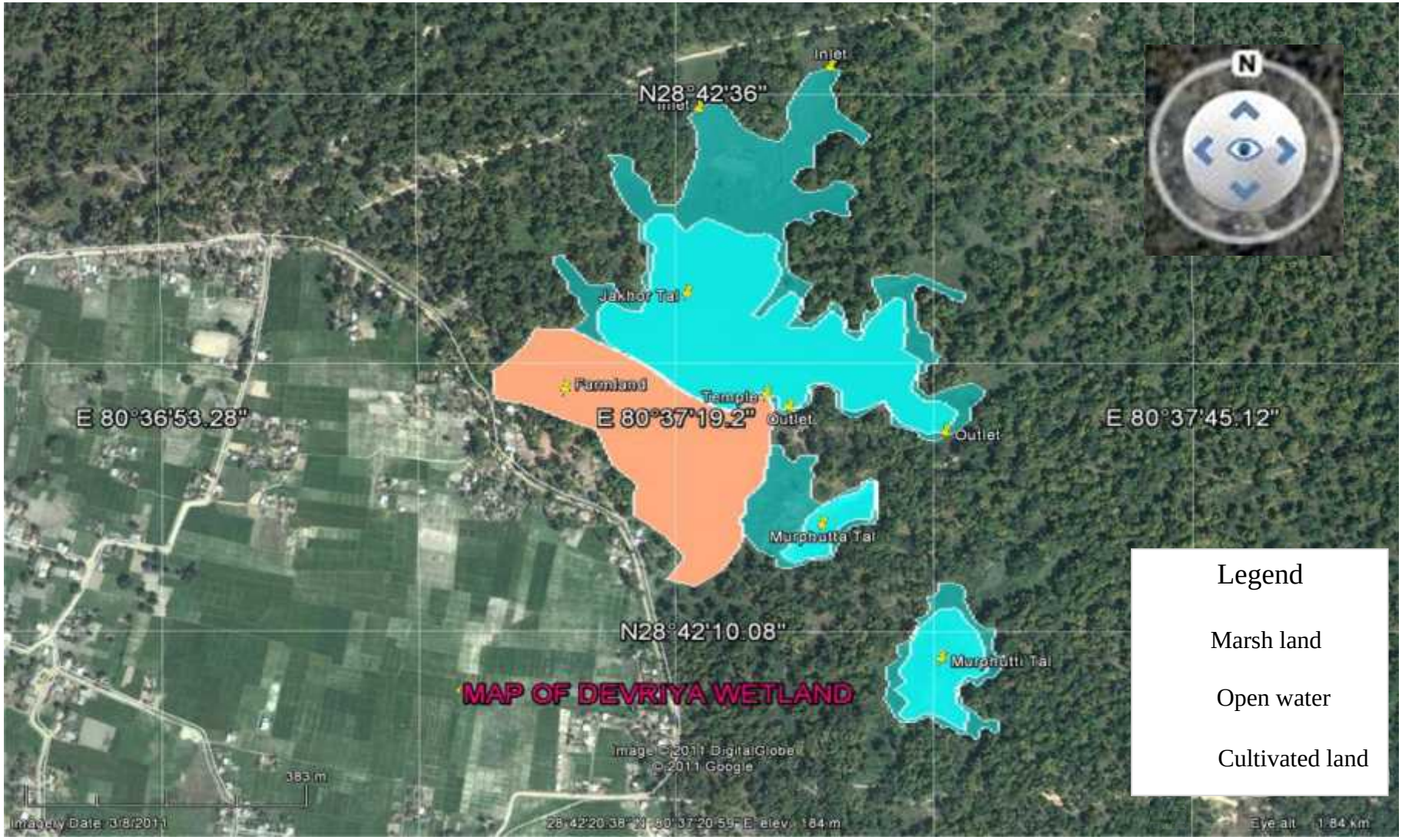
In the remote past, there was a childless old couple named *Jakhor* and *Jakhania*, who were devotee of lord Shiva, used to live at the south side of the Devriya Lake. They used to keep a beautiful peacock with them (locally called *Mor*) and love it very much. One day when the peacock was playing at nearby forest, one of villager hunted it. This event made the couple woeful. They cursed the villager and took suicide drowning in the lake. Due to curse of the old couple various diseases spread on village and people started to die. One day the old couple came into dream of hunter and told him to make a temple after their name to get rid of diseases. The people accordingly made a temple and give it a name Jakhor Baba Mandir. They also gave one of lake the name *Jakhor Tal* and *Murphutta* and *Murphutti Tal* to rest two lakes after the name of mythological old couple and peacock. People at *Shivratri* worship this temple celebrating a local fair (Source: Mr. Kali Rana, Dhangadhi-7).

2.8 Conservation status of the wetland

This wetland system with three lake lies inside the Devriya Botanical Garden established in 1996 by Government of Nepal, Ministry of Forest and Soil Conservation. The District Plant Resources Office (DPRO) Kailali is assigned as local authority for the management of this garden. DPRO, Kailali in coordination local forest user group controls the illegal activity and over harnessing of resources and is active for controlling of invasive plants, promotion of controlled fish farming, boating, picnic spot development, and track route construction.



Map 1: Kailali District with Study Area



Map 2: Map of Devriya Wetland

4. METHODS AND MATERIALS

Methods and materials used during the study are as follows.

4.1 Reconnaissance Survey

The comprehensive reconnaissance field survey was taken once after every two months. Altogether 12 visits were made from Nov. 2009 to Oct. 2011 (2066 Mangsir to 2068 Poush). During reconnaissance survey plant specimens were collected and GPS reading of three lakes were taken. The people found fishing and harvesting other resources were consulted for necessary information. Photographs of fishes and study area were taken during survey.

4.2 Collection and herbarium preparation

The lake and its inundation area during rainy season is delineated for the collection of plant specimens. Plant specimens were collected from all sides of three lakes of Devriya wetland. Plants found in flowering and fruiting stages were only collected for herbarium preparation. At least three set of specimens for each species were collected from study site and field notes were taken. The specimens were pressed with wooden press, dried in sun and mounted on standard size herbarium sheet. Herbarium were prepared using standard technique (Lawrence, 1967) and deposited on Tribhuvan University Central Herbarium (TUCH).

4.3 Identification of plant species

The plants specimens were identified using standard literature-identification keys, Floras, fascicles and reports (Siwakoti & Varma, 1999). The voucher specimens were identified at Tribhuwan University Central Herbarium (TUCH), Kitripur. For plant that were not identified, the National Herbarium and Plant Laboratory Godavari (KATH), Lalitpur was consulted for further identification.

4.4 GPS survey and preparation of map

The altitude and geographical position (Latitude and Longitude) of periphery of three lakes were taken with the help of Garmin GPS unit. The GPS reading were taken at each end of the straight line of Lake Boundary. The area of open water that remains longest throughout the year was taken for the measurement of open water area and the area from open water to shrub land was taken as marsh area. To prepare the map of study area the GPS reading were downloaded to computer and plotted on Google map using Google earth program. Finally the area and perimeter of the lakes was calculated.

4.5 Socio-demographic survey

The Population Census Report, 2001 of CBS was followed for demographic data. The name of head of household and their income group rank was taken from the work plan of community forest user group of Devriya wetland (Srijana Women's Community Forest User Group). The income group rank of household was based upon the six factors (Area of land owned, annual income, educational status of head of house, nature of employment, food security and type of house), (Annex 3).

4.6 Resource use survey

The wetland resources that were being used by community are categorized into 8 types (timber, fodder, firewood, thatch grass, fishes, vegetables, fruits and soil). Participatory rural appraisal (PRA) with local people was held on B.S. 2067/8/20 (Dec. 6, 2010) during their regular community forest user group (CFUG) meeting to collect data about resource use by households. Altogether 46 member were present on the PRA. The type of resources being used by household was tabulated by CFUG member after detailed discussion.

The data related to ‘use of resources by household’ and whether a household have any role in wetland management or not was also taken in PRA. The data were analysed with the help of software Microsoft Excel.

4.7 Consultation with peoples and agencies

For some species that could not be collected at proper time or were damaged during preservation or poorly preserved, District plant resources office, Kailali was consulted for herbarium specimens. The herbaria were returned safely after study. Likewise for the information like wetland boundaries and maps, District Forest Office, Kailali was consulted.

5. RESULTS

5.1 Species composition

Altogether 120 species belonging to 55 families and 105 genera were reported from the study site out of them plants 5 species belong to Pteridophytes, 33 to monocotyledons and 82 to dicotyledons. Gymnosperms were not found in the study area. (Appendix 1)

Out of 105 genera Cyperus was the largest genus with 6 species followed by *Urticularia* with 3 species.

Out of 55 families, Poaceae was the largest family with 13 species followed by Asteraceae with 10 species, Cyperaceae with 10 species and Fabaceae with 8 species (Table 6)

Table 5: Number of Family, Genus and Species in Different Groups

	Pteridophytes	Dicot	Monocot	Total
Families	5	41	9	55
Genera	5	75	25	105
Species	5	82	33	120

Source: Field study, 2010

On the basis of habit, 77 species were herbs, 14 shrubs, 8 climbers and 21 species were trees. (Fig. 1)

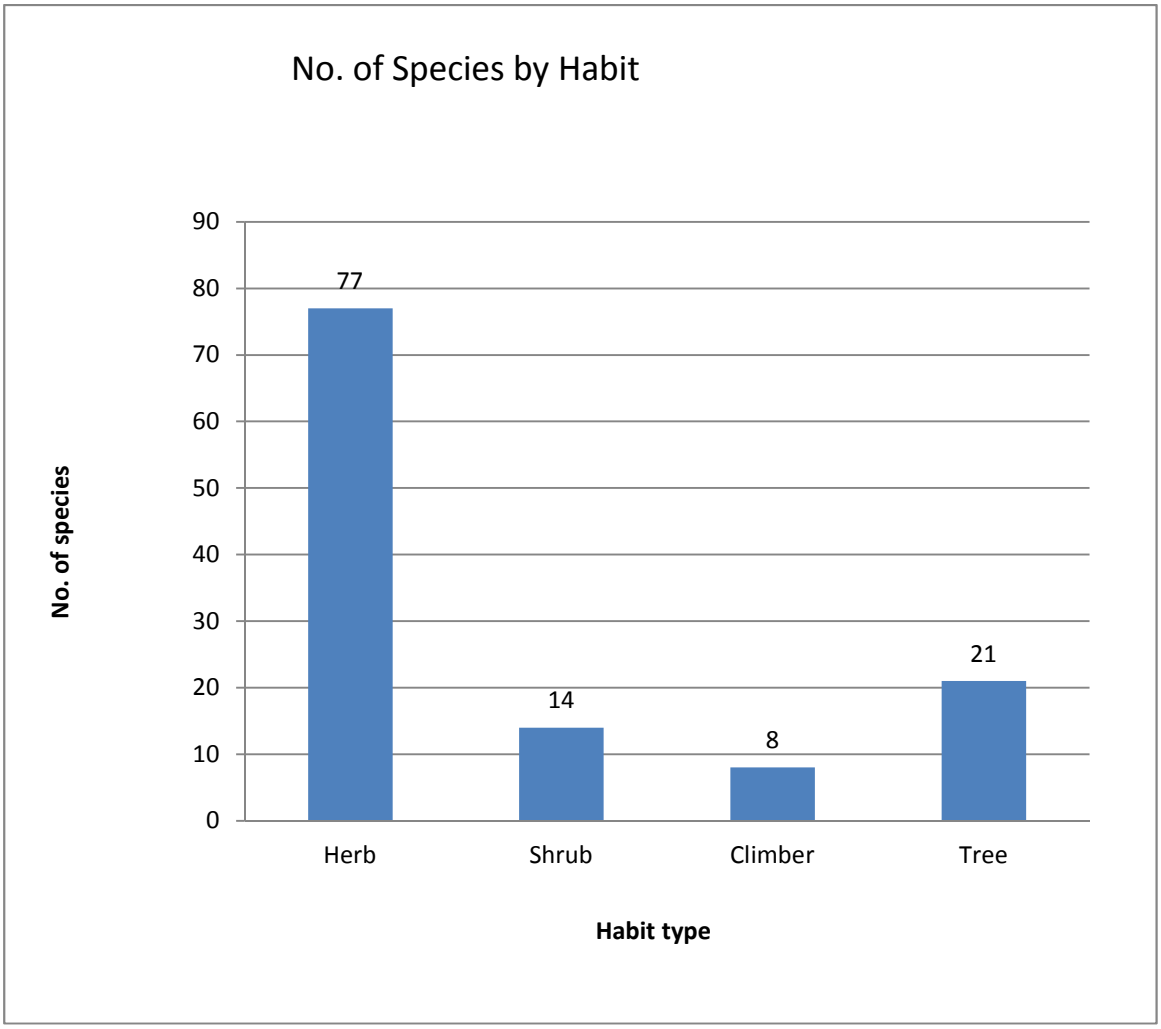


Fig. 1: Number of Species by Habit Type

The growth forms of the plant species was found as 105 emergent, 6 floating and 9 submerged (Fig. 2).

The use category of the plant species was found as 4 timber, 11 fodder, 35 medicinal, 3 religious, 9 vegetable and foods, 6 fruits, 5 thatch and broom, 2 fish poisoning and 1 species each in smoking, beverage and composting. 10 species of plants were found to have multiuse category and 52 species were found not used (Fig 3 and Annex 1).

Table 6: Number of Genus and Species withen Families

S.N	Family	Species	Genus
1	Poaceae	13	12
2	Asteraceae	10	10
3	Cyperaceae	9	4
4	Fabaceae	8	8
5	Scrophulariaceae	5	5
6	Polygonaceae	4	3
7	Convolvulaceae	3	2
8	Euphorbiaceae	3	2
9	Lentibulariaceae	3	1
10	Pontederiaceae	3	3
11	Rutaceae	3	3
12	Amaranthaceae	2	2
13	Apocynaceae	2	2
14	Araceae	2	2
15	Combretaceae	2	1
16	Commelinaceae	2	2
17	Hydrocharitaceae	2	2
18	Lamiaceae	2	2
19	Moraceae	2	1
20	Myrtaceae	2	1
21	Nymphaeaceae	2	2
22	Rhmnaceae	2	1
23	Verbinaceae	2	2
24	Acanthaceae	1	1
25	Apiaceae	1	1
26	Azoliaceae	1	1
27	Burseraceae	1	1
28	Cannabinaceae	1	1
29	Capparidaceae	1	1
30	Ceratophyllaceae	1	1
31	Chenopodiaceae	1	1
32	Dioscoreaceae	1	1
33	Dipterocarpaceae	1	1
34	Ebenaceae	1	1
35	Gentianaceae	1	1
36	Hypoxidaceae	1	1
37	Lecythidiaceae	1	1
38	Liliaceae	1	1
39	Loranthaceae	1	1
40	Lytharaceae	1	1
41	Malvaceae	1	1
42	Marsileaceae	1	1
43	Meliaceae	1	1
44	Onagraceae	1	1
45	Ophioglossaceae	1	1
46	Oxalidaceae	1	1
47	Papaveraceae	1	1
48	Potamogetonaceae	1	1
49	Primulaceae	1	1
50	Pteridaceae	1	1
51	Ranunculaceae	1	1
52	Sapindaceae	1	1
53	Solanaceae	1	1
54	Thelypteridaceae	1	1
55	Urticaceae	1	1

Source: Field studty, 2010

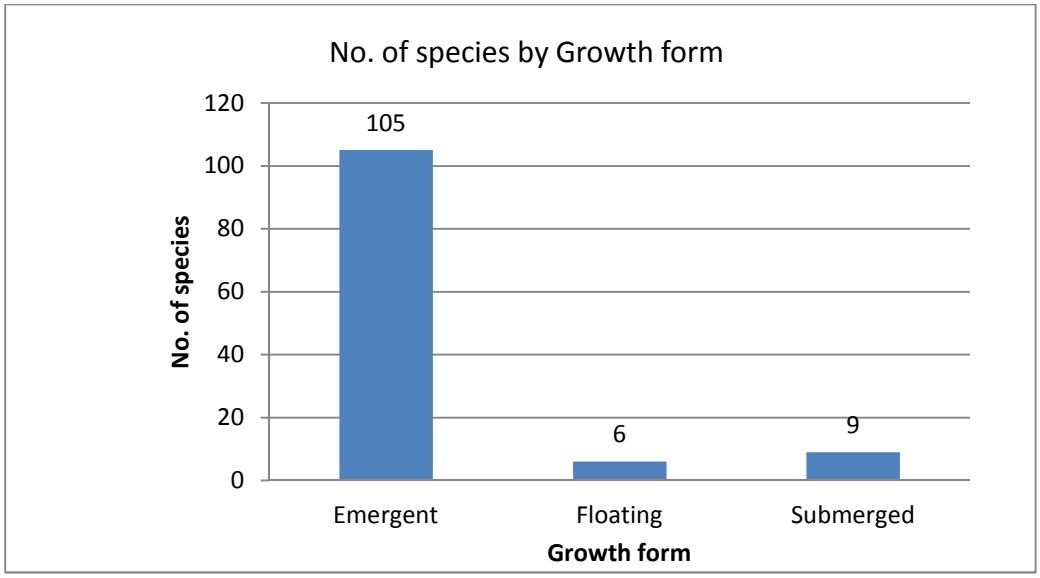


Fig. 2: Number of Species by Growth Form

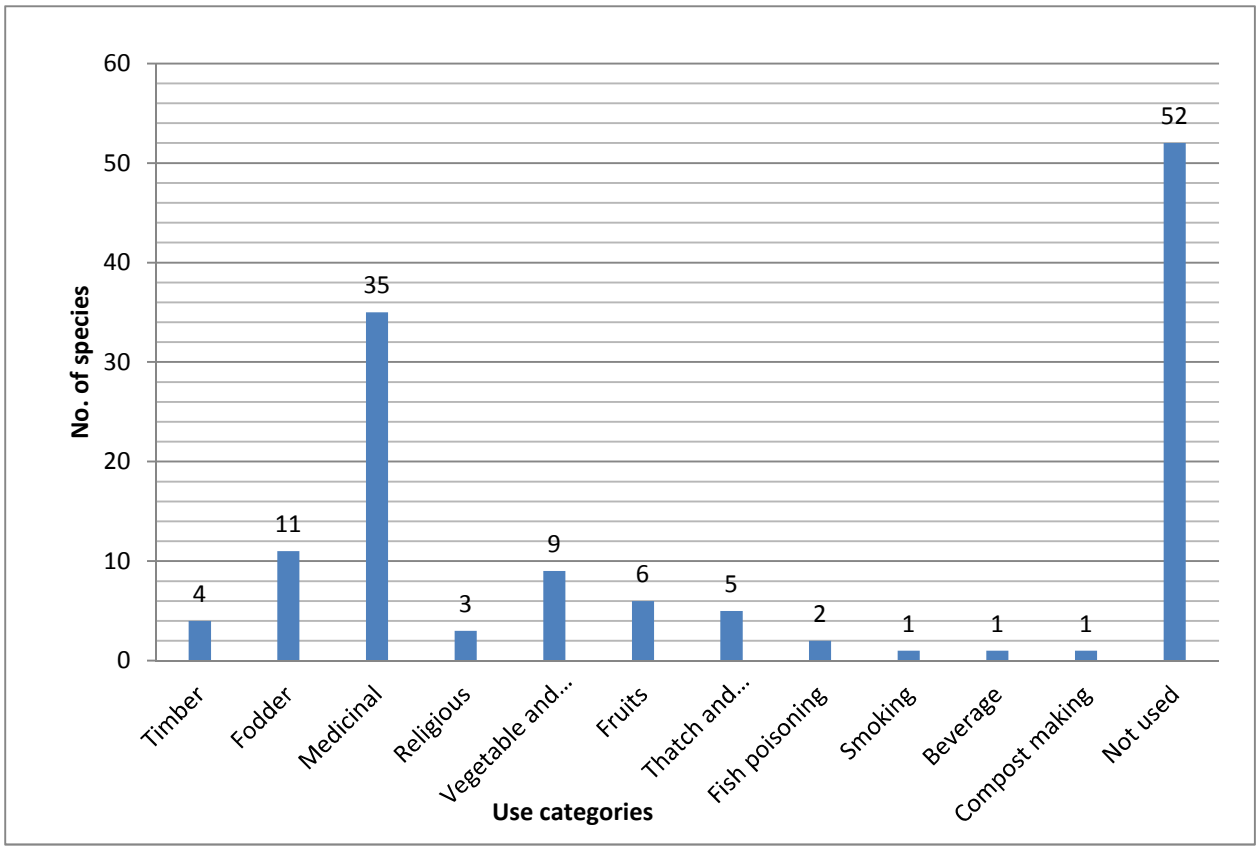


Fig. 3: Number of Species by Use Category

5.2 Utilization of resources.

Out of the selected eight type of resources (timber, fodder, fire wood, thatch grass, fishes, vegetable, fruits and soil) timber was the most used resource (by 100% HH,) followed by fire wood (by 93% HH) and fodder (by 81% HH). The vegetable, soil and fruits were the least used (by 62% HH each). (Table 6)

Among the three income groups (High, Medium and Low) the Low income group was comparatively more dependent on resources (100% HH on timber and fire wood, 99% on fodder, thatch grass and soil each). In Low income group the percentage exceed more than 91 even in the case of vegetable, soil and fruits. The high income group was less dependant on wetland resources except timber and fire wood. The Medium income group was found intermediate in resources consumption except timber. (Table 6)

Table 7: Households Using Wetland Resources Based on Income

Income Group	No. of HH	% of HH using wetland resources							
		Timber	Fodder	Fire wood	Thatch grass	Fishing	Vege-table	fruits	Soil
High	79	100	16	71	8	5	4	5	6
Medium	116	100	82	91	62	45	23	28	13
Low	289	100	99	100	99	96	94	91	99

Source: Field Study, 2010

The High income group HH which were less in number (16%) have high (77%) participation in resource management and the Low income group HH which were highest in number (60%) have low (9%) participation. (Table 7)

Table 8: Role of Households in Wetland Resource Management by Income Group.

Income Group	Total HH		Participation	
	Number	Percent (%)	Number	Percent (%)
High	79	16	61	77
Medium	116	24	64	55
Low	289	60	26	9
Total	484	100	151	31

Source: Field study, 2010

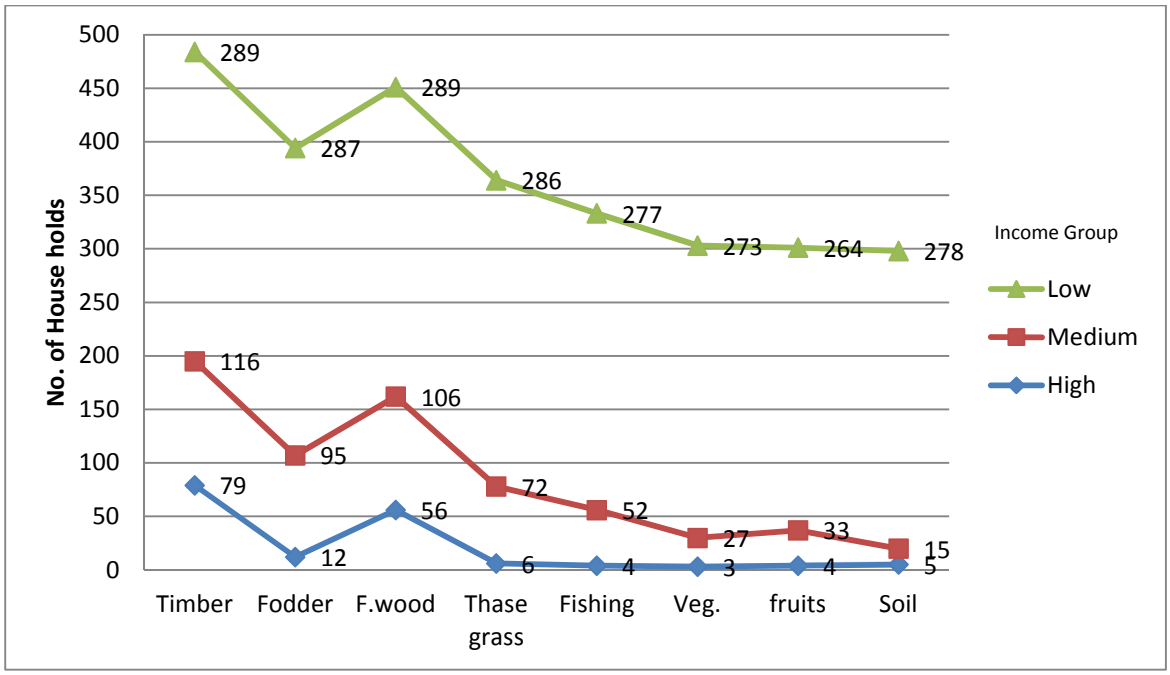


Fig. 4: Number of Household Using Wetland Resources by Income Group

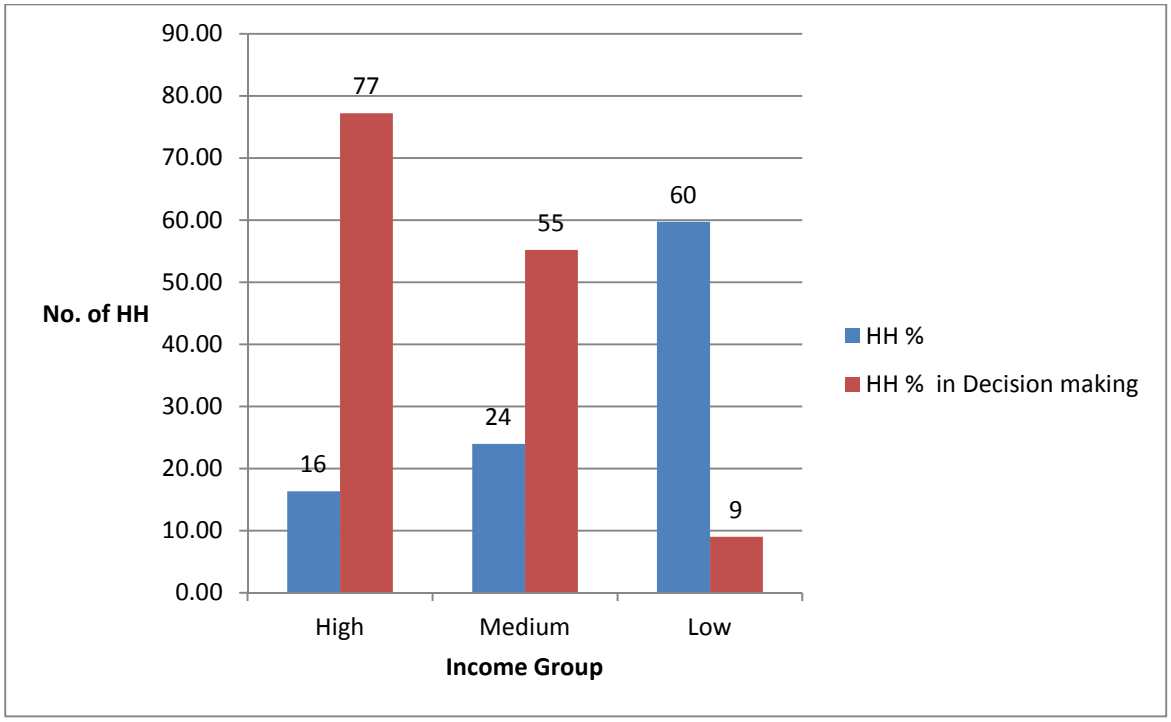


Fig. 5: Role on Decision Making in Resource Management by Income Group

5.3 Ethno-medicinal plants

Altogether 35 species of wetland plants with ethno-medicinal importance were found in study area (Annex 2). Among them 12 herbs, 8 shrubs, 3 climbers and 8 trees were recorded (Fig. 6).

Eight type of plant parts were recorded being used in local ethno-medicinal trends. 6 species were found with multi parts in ethno-medicinal use (Fig. 7 and Annex 2).

Among the 8 categorized plant parts, leaves followed by fruits and seeds were found in 9, 8 and 6 species respectively. The use of flower was found only in 2 species (Table 8).

Table 9: No. of Ethno-medicinal Plant species by Parts Used

Parts used	No of species
Exudates	4
Flower	2
Fruit	8
Leaf	9
Root	4
Stem	4
Whole plant	4
Seed	6

Source: Field study, 2010

The types of health problems for which the plants were being used were categorized as 15. Maximum number of plant species was used for abdominal problem followed by jaundice and pain category (Fig. 8).

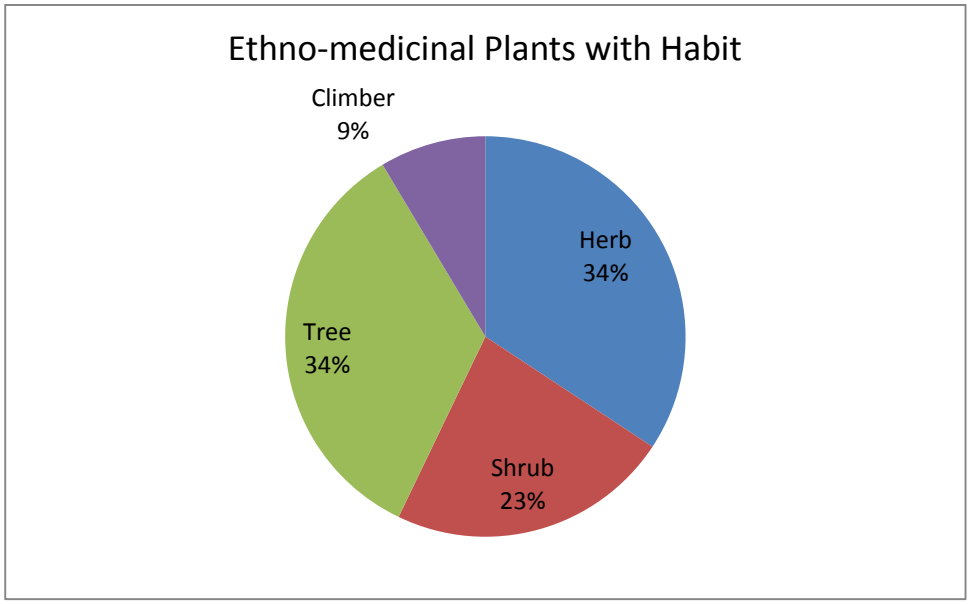


Fig. 6: No. of Ethno-medicinal Plant Species by Habit

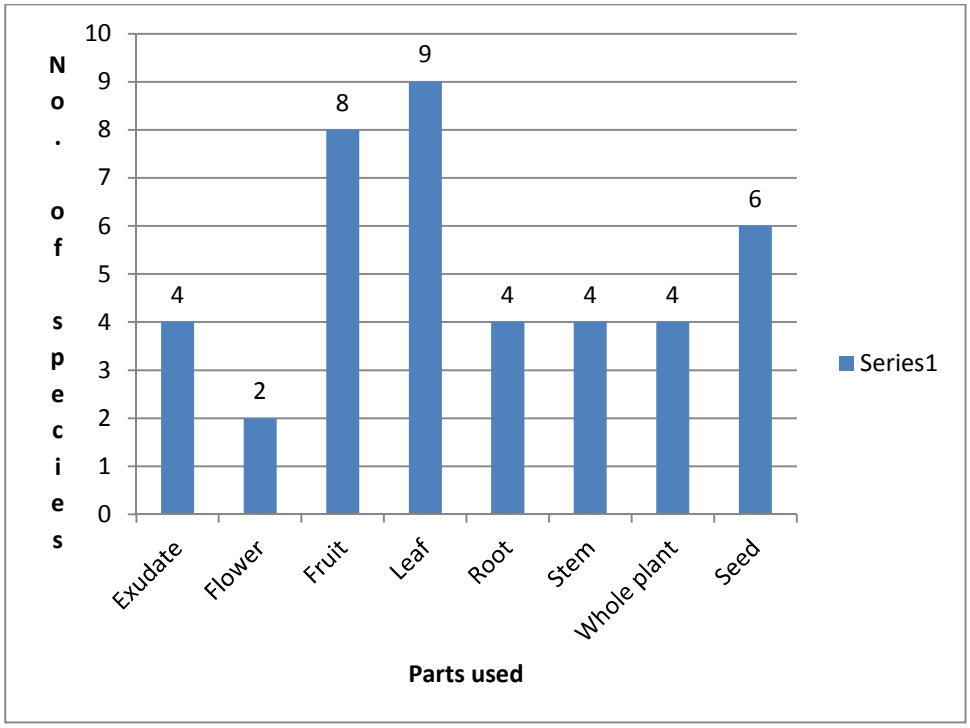


Fig.7: Ethno-medicinal Plant Species by Used Parts

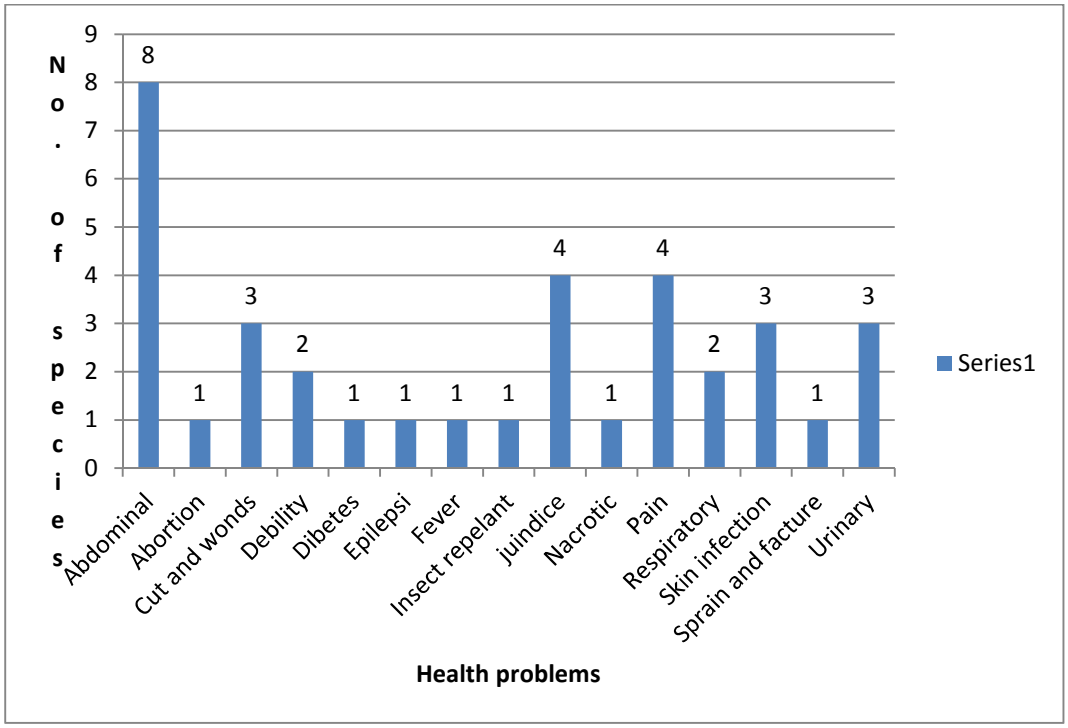


Fig. 8: Ethno-medicinal Plants by Health Problems

6. DISCUSSION AND CONCLUSION

6.1 Discussion

Knowledge on flora of any area is important for their sustainable utilization and conservation. The wetland being directly related to livelihood of people is threatened due to human activity and environmental change. The knowledge about the species present, status of resources being used and the geographical position and map of wetland is important for its conservation and sustainable utilization.

BPP/HMGN (1995) recorded 235 plants species from the Terai wetlands of Nepal. Acharya (1997) recorded 138 plant species (4 submerged, 15 floating and 119 emergent) from Ghodaghodi Lake. Siwakoti and Varma (1998) recorded 141 flowering plants (aquatic) species (5 submerged, 10 floating and 126 emergent) from Eastern Terai (Biratnagar-Dharan) of Nepal. All these above study show more plant species than recorded in Devriya wetland. This is because Devriya wetland is small in size in comparison to above study sites. Present study excludes Algae, Fungi and Bryophytes. The number of plant species in Devriya wetland is 18 less than in Ghodaghodi Lake which is a nearby large wetland in the same district. Ghodaghodi being listed as a Ramsar site and greater in size than Devriya, the number of species leading by 18 seems to be usual. This study shows more submerged and less floating plants in Devriya wetland in comparison to Ghodaghodi and wetlands of Biratnagar-Dharan. The sailing of boat by local people should have affected the floating species in Devriya wetland.

Out of the 8 major use categories of wetland resources, timber is found as most widely used category. Almost all of the households, whatever is the income group, use Timber. The timber harvested from Community Forests adjacent to Devriya wetland is distributed to household on the basis of availability. Likewise fodder is the second widely used category. As the

Devriya is near to Dhangadhi city, there is high demand of timber and fire wood in city area. People sell timber and fire wood for earning good amount of money. Study showed that the timber and fire wood yielding plants species were more threatened.

The present study shows medicinal use category of the plant have highest number of species (35) followed by second rank fodder (11species) and third rank vegetables (9 species). BPP/HMGN (1995) from Terai plain of Nepal recorded 10 use category of plant species (45 species for food and vegetables, 30 species for medicine, 13 species for fodders, 12 species for timber/firewood/furniture, 11 species for construction materials, 5 species for broom making, 4 species for fibres, 4 species for religious, 2 species for weaving mats, 1 species for warping tobacco). The plant used for tobacco warping is found same (*Diospyros melanoxylon* Roxb.) with study of BPP/HMGN (1995). The study shows Devriya wetland as important for medicinal plant species.

The adjacent community of Devriya wetland is dominated by Tharu people who are highly depended on ethno-medicinal practice and deserve good knowledge about it. The majority of the respondents (60%) of the Devriya wetland belong to Low income group, so that they prefer ethno-medicine rather than modern. Present study grouped the ethno-medicinal plants into 15 types on the basis of health problems. The plants used in abdominal problems were found highest in number (8 species) followed by the number of plants used in jaundice (4 species) and pain (4 species). The 5 food times within one day, consumption of more raw foods and comparatively less hygienic food habit might cause the Tharu people to have more abdominal problems, jaundice and different pains. Therefore, they use plants that can be used for the treatment of abdominal problems, jaundice and different pains. Acharya and Achrya (2009) also recorded the highest number of plant species used to treat gastro-intestinal problem in Tharu community of

Rupandehi district. Dangol and Gurung (1991) in Tharu community of Chitwan district recorded headache, diarrhoea and menstruation as the major health problems being treated with various plant species.

The medicinal plants used by local community were categorized into eight groups on the basis of parts used. Leaves and fruits were found as the mostly used parts of medicinal plants. Threat to plants species is also related to how and what parts of plants are used by people. The roots are directly related to viability of plants and flowers and fruits are related to breeding, so the use of roots, flowers and fruits of plants as ethno-medicine might cause decrease in number of that plant species. Study shows use of flowers in 2 plant species (*Butea monosperma* and *Dendrophthoe falcata*) and roots in 4 plant species (*Smilax lanceifolia*, *Abrus precatorius*, *Curculigo orchioides* and *Achyranthes aspera*). These plants species needs especial care during collection. *Butea monosperma* is one of threatened plant with IUCN threat category as commercially threatened (CT), so the people of adjacent area should given awareness about the conservation of this plant.

In Devriya wetland area, dependency of people on wetland resource is found varying with income group. Low income group people are more dependable on wetland resource. Low income, owning less farm land and dependency upon cattle keeping makes them collect the firewood, fodder, vegetable and fishes for their daily subsistence. This result is same with work of Acharya (1997) in Ghodaghodi wetland and that of Mahara (1999) in Royal Chitwan National Park.

The study showed that high-income group people have highest and low-income group people have lowest percentage of participation in conservation and management of wetland resources. This trend was found in contrary to the government's policy of giving priority to wetland dependent group for sustainable management of resources. The people

migrated from hilly areas, were more active in resource utilization and management. The steering committee of Community Forest User Group (CF) and wetland Management Committee were dominated by hilly people. The indigenous people (Rana, Chaudhary, Dangaura and Raji) and Dalits, due to low educational and socio-economic status, were getting low opportunity in CF and wetland management.

6.2 Conclusion

It can be concluded that the present study was carried out in Devriya wetland of Kailali district. In this study an enumeration of flowering plants of this wetland was prepared excluding algae and fungi. The status of wetland with resources used and ethno-medicinal plants was also documented.

Devriya wetland is less important on the basis of number of macrophytic plant species but it is important regarding number of medicinal plant and submerged plant species. The open access to resources of adjacent people is affecting the plant diversity of this wetland.

In Devriya wetland majority of the respondents belong to Low income group and dominated by Tharu community. The low income group people are more depended on wetland resources. The wetland resources especially the timber and fodder species are under high pressure of utilization.

Out of the major eight used parts of medicinal plants, leaf followed by fruits and seeds are mostly used. The species having used parts the flower (*Butea monosperma* and *Dendrophthoe falcata*) and the roots (*Smilax lanceifolia, Abrus precatorius*, *Curculigo arhoides* and *Achyranthes aspera*) needs special care during collection as the flower and roots being important parts for breeding and sustaining life of the plant.

Although, the low income group people are highly depended in wetland resources, get few chances to participate in wetland and community forest management committee in comparison to hill migrants. The socio-economic and literacy level of the people influence their role in the management of the resources.

7. RECOMMENDATIONS

For sustainable use, management and protection of wetlands following measures are recommended by after this study.

1. The updated database of flora (with algae, fungi and bryophytes) and fauna should be prepared. Collection of rare and endangered species of flora and fauna should be prohibited.

2. Open access of villagers to the wetland resources should be controlled by wetland management committee in close coordination with District Plant resources Office, Kailali.

3. Awareness program to the user group should be given, for the conservation of threatened plants and for the sustainable utilization of resources.

4. The wetland area should be fenced with clear demarcation of area to control the encroachment.

5. Among the three lakes, Murphutta and Murphutti should be conserved as it is for the sake of biodiversity conservation. The fish farming and boating in Jakhor Tal (that is going on presently) should be continued with people's participation through management committee.

6. The low income group people should be encouraged and given chances to participate in wetland management.

7. By making controlled system of outlet and inlet the water level in the lake should be maintained permanently. A visiting track route around the lake should be prepared with wooden culvert on the gullies.

8. The unauthorized entry of people for recreational purpose should be controlled by fencing the area.

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APPENDIX 1

List of Plant Species Found in Devriya Wetland

Altitude- 170 m.

S.N.	Latin name	Family	Local name	Group	Habit	Grwth form	Uses	Collection no.	Date of collection
1	*Abutilon indicum* (L.) Sweet	Malvaceae	Balu	Dicot	Herb	Emergent terestrial	Medicinal	DEV061	Mar. 10, 2011
2	*Achyranthes aspera* L.	Amaranthaceae	Ultekuro	Dicot	Herb	Emergent terestrial	Medicinal, Used to cure tooth	DEV067	May. 10, 2011
3	*Adiantum philippense* L.	Pteridaceae		Pteridophytes	Herb	Emergent terestrial		DEV044	Nov. 10, 2010
4	*Aegle marmelos* (L.) Correa	Rutaceae	Bel	Dicot	Tree	Emergent terestrial	Medicinal and fruits eaten	DPROK0079	Aug. 8, 2008
5	*Ageratum houstonianum* Mill.	Asteraceae	Ganaune	Dicot	Herb	Emergent terestrial	Fodder during drought/Medicinal	DEV020	Mar. 10, 2010
6	*Alstonia scholaris* (L.) R. Br.	Apocynaceae	Chhatiwan	Dicot	Tree	Emergent terestrial	Medicinal	DPROK0084	Jan. 10, 2009
7	*Alternanthera sessilis* (L.) DC.	Amaranthaceae		Dicot	Herb	Emergent swamp		DEV005	Nov.11, 2009

8	*Amischophacelus axillaris* (L.) Rao & Kammathy	Commelinaceae		Monocot	Herb	Emergent marsh	Fodder	DEV092	Jul. 17, 2011
9	*Argemone mexicana* L.	Papaveraceae	Thakal	Dicot	Herb	Emergent terestrial		DEV034	Jun. 16, 2010
10	*Arundinella nepalensis* Tern.	Poaceae	Banso	Monocot	Herb	Emergent terestrial		DEV045	Nov. 10, 2010
11	*Azolla pinnata* R.Br.	Azollaceae		Pteridophytes	Herb	Rooted Floating		DEV010	Jan.11, 2010
12	*Barleria cristata* L.	Acanthaceae		Dicot	Shrub	Emergent terestrial		DEV091	Jul. 17, 2011
13	*Bauhinia vahlii* Wight & Arn.	Fabaceae	Vorla	Dicot	Climber	Emergent terestrial	Medicinal and fruits eaten	DPROK0044	Jun. 7, 2008
14	*Butea monosperma* (Lam.) Kuntze	Fabaceae	Dhank	Dicot	Tree	Emergent terestrial	Medicinal and religious	DPROK0102	Mar. 17, 2009
15	*Cassia fistula* L.	Fabaceae	Rajbriksha	Dicot	Tree	Emergent terestrial	Medicinal	DPROK0008	Apr. 27, 2008
16	*Centella asiatica* (L.) Urb.	Apiaceae	Ghodtapre	Dicot	Herb	Emergent marsh	Medicinal	DEV100	Sep. 23, 2011
17	*Ceratophyllum demersum* L.	Ceratophyllaceae		Dicot	Herb	Submerged		DEV084	Jul. 17, 2011

18	*Chenopodium* sp.	Chenopodiaceae		Dicot	Herb	Emergent swamp		DEV003	Nov.11, 2009
19	*Conyza bonariensis* (L.) Cronquist	Asteraceae		Dicot	Herb	Emergent terestrial		DEV035	Jul. 16, 2010
20	*Curculigo orchioides* Gaertn.	Hypoxidaceae	Kalomusali	Monocot	Herb	Emergent terestrial	Medicinal	DEV051	Jan. 29, 2011
21	*Cynodon dactylon* (L.) Pers.	Poaceae	Dubo	Monocot	Herb	Emergent terestrial	Medicinal and fodder	DPROK0069	Jun. 7, 2008
22	*Cyperus compactus* (Retz.) Druce	Cyperaceae	Mothe	Monocot	Herb	Emergent swamp		DEV012	Jan. 11, 2010
23	*Cyperus difusus* Vahl.	Cyperaceae	Mothe	Monocot	Herb	Emergent terestrial		DEV070	May. 10, 2011
24	*Cyperus haspans* L.	Cyperaceae	Mothe	Monocot	Herb	Emergent swamp		DEV080	May. 10, 2011
25	*Cyperus iria* L.	Cyperaceae	Mothe	Monocot	Herb	Emergent marsh		DEV063	Mar. 10, 2011
26	*Cyperus* sp.	Cyperaceae	Mothe	Monocot	Herb	Emergent swamp		DEV013	Jun. 11, 2010
27	*Cyperus* sp.	Cyperaceae	Mothe	Monocot	Herb	Emergent swamp		DEV014	Jun. 11, 2010
28	*Desmostachys bipinnata* (L.) Stapf	Poaceae	Kush	Monocot	Herb	Emergent terestrial	Religious	DEV049	Nov. 10, 2010

29	*Dichrocephala integrifolia* (L. f.) Kuntze	Asteraceae		Dicot	Herb	Emergent marsh		DEV098	Sep. 23, 2011
30	*Digitaria ciliaris* (Retz.) Koeler	Poaceae		Monocot	Herb	Emergent terestrial	Used as fodder before flowering	DEV068	May.10, 2011
31	*Dioscorea bulbifera* L.	Dioscoreaceae	Tarul	Monocot	Climber	Emergent terestrial	Tubers eaten	DEV046	Nov. 10, 2010
32	*Diospyros melanoxylon* Roxb.	Ebenaceae	Tendu	Dicot	Tree	Emergent terestrial	Medicinal and fruits eaten	DPROK0074	Jun. 25, 2008
33	*Dopatrium junceum* Buch.-Ham. ex Benth.	Scrophulariaceae		Dicot	Herb	Submerged		DEV086	Jul. 17, 2011
34	*Echornia crassipus* (Mart.) Solms	Pontederiaceae	Jalkumbhi	Dicot	Herb	Rooted floating	Fodder during drougth	DEV006	Jan.11, 2010
35	*Eclipta prostrata* (L.) L.	Asteraceae	Bhringjhar	Dicot	Herb	Emergent terestrial	Medicinal	DEV042	Nov. 10, 2010
36	*Eleocharis acutangula* (Roxb.) Schult.	Cyperaceae	Mothe	Monocot	Herb	Emergent marsh		DEV055	Jan. 29, 2011
37	*Elephantopus scaber* L.	Asteraceae	Jingra	Dicot	Herb	Emergent terestrial	beverage	DEV088	Jul. 17, 2011
38	*Eragrostis unioloides (*Retz.) Nees ex Steud.	Poaceae		Monocot	Herb	Emergent terestrial		DEV059	Mar. 10, 2011

39	*Ficus benghalensis* L.	Moraceae	Bar	Dicot	Tree	Emergent terestrial	Religious	DPROK0030	Apr. 27, 2008
40	*Ficus palmata* Forssk.	Moraceae		Dicot	Shrub	Emergent marsh	Fodder	DEV050	Nov. 10, 2010
41	*Gamochaeta pensylvanicum* (Willd.) Cabrera	Asteraceae		Dicot	Herb	Emergent swamp		DEV002	Nov.11, 2009
42	*Holarrhena pubescens* (Buch. - Ham.) Wall. ex G. Don	Apocynaceae	Dudhi	Dicot	Tree	Emergent terestrial	Medicinal	DPROK0076	Jun. 25, 2008
43	*Hydrilla verticillata* (L.f.) Royle	Hydrocharitaceae	Panijhar	Dicot	Herb	Submerged		DEV078	May. 10, 2011
44	*Ipomoea aquatic* Forssk.	Convolvulaceae	Kalamisag	Dicot	Herb	Emergent swamp	Green shoots are eaten as vegetable	DEV011	Jan. 11, 2010
45	*Ipomoea fistulosa* D. Austin	Convolvulaceae	Besaram	Dicot	Shrub	Emergent terestrial	Hedge making.	DPROK085	Sep. 27, 2008
46	*Kyllinga brevifolia* Rottb.	Cyperaceae	Mothe	Monocot	Herb	Emergent marsh		DEV060	Mar. 10, 2011
47	*Lagerstroemia parviflora* Roxb.	Lytharaceae	Botdhairo	Dicot	Tree	Emergent terestrial	Used for smoking	DPROK0081	Aug. 9, 2008
48	*Laggera alata* (D. Don) Sch. Bip. ex Oliv.	Asteraceae		Dicot	Herb	Emergent terestrial		DEV097	Sep. 23, 2011

49	*Lindernia parviflora* (Roxb.) Haines	Scrophulariaceae		Dicot	Herb	Emergent terestrial		DEV048	Nov. 10, 2010
50	*Ludwigia perennis* L.	Onagraceae		Dicot	Herb	Emergent	Fodder	DEV033	Jun. 16, 2010
51	*Mallotus philippensis (*Lam.) Mull. Arg.	Euphorbiaceae	Rohini	Dicot	Tree	Emergent terestrial	Used to make compost/Medicinal	DPROK0082	Aug. 9, 2008
52	*Marsilia quadrifolia* L.	Marsileaceae		Pteridophytes	Herb	Emergent swamp		DEV090	Jul. 17, 2011
53	*Mazus pumilus* (Burm. f.) Steenis	Scrophulariaceae		Dicot	Herb	Emergent terestrial		DEV024	May. 09, 2010
54	*Monochoria vaginalis* (Burm. f.) C. Presl	Pontederiaceae		Monocot	Herb	Emergent swamp		DEV095	Jul. 17, 2011
55	*Murdannia nudiflora* (L.) Brenan	Commelinaceae		Monocot	Herb	Emergent terestrial		DEV040	Aug. 26, 2010
56	*Murraya koenigii* (L.) Spreng.	Rutaceae	Karipatta	Dicot	Shrub	Emergent terestrial	Medicinal and fruits eaten	DPROK 0069	Jun. 7, 2008
57	*Nelumbo nucifera* Gaertn.	Nymphaeaceae	Kamal	Dicot	Herb	Rooted floating	Medicinal	DPROK0078	Aug. 9, 2008
58	*Nymphaea stellata* Willd.	Nymphaeaceae	Kamal	Dicot	Herb	Rooted floating	Medicinal	DPROK0077	Aug. 9, 2008

59	*Nymphoides hydrophyllum* (Lour.) Kuntze	Gentianaceae		Dicot	Herb	Submerged		DEV085	Jul. 17, 2011
60	*Ophioglosum reticulatum* L.	Ophioglossaceae		Pteridophytes	Climber	Emergent marsh	Tender shoot eaten as vegetables	DEV038	Aug. 26, 2010
61	*Oryza nivara* Sharma & Shastry	Poaceae	Bandhan	Monocot	Herb	Emergent swamp	Fodder and grains eaten	DEV053	Jan. 29, 2011
62	*Oryza rufipogan* Grif.	Poaceae	Bandhan	Monocot	Herb	Emergent swamp	Fodder	DEV094	Jul. 17, 2011
63	*Ottelia alismoides* (L.) Pers.	Hydrocharitaceae	Panijhar	Monocot	Herb	Submerged rooted		DEV058	Mar. 10, 2011
64	*Paspalum scrobiculatum* L.	Poaceae		Monocot	Herb	Emergent terestrial		DEV081	Jul. 17, 2011
65	*Persicaria barbata* (L.) H. Hara	Polygonaceae	Machha bish	Dicot	Herb	Emergent marsh	Fish poisoning	DEV007	Jun. 11, 2010
66	*Persicaria limbata* (Meisn.) H. Hara	Polygonaceae	Halhale	Dicot	Herb	Emergent marsh		DEV072	May. 10, 2011
67	*Phyllanthus reticulatus* Poir.	Euphorbiaceae	Sikkat	Dicot	Shrub	Emergent terestrial	Cattel beding and fodder for goat.	DEV073	May. 10, 2011
68	*Phyllanthus urinaria* L.	Euphorbiaceae	Bhui amala	Dicot	Herb	Emergent marsh		DEV065	Mar. 10, 2011

69	*Pistia stratiotes* L.	Araceae	Kumbhi	Dicot	Herb	Rooted floating		DEV079	May. 10, 2011
70	*Persicaria* sp.	Polygonaceae		Dicot	Climber	Emergent marsh		DEV001	Nov. 11, 2009
71	*Polypogon monospeliensis* (L.) Desf.	Poaceae		Monocot	Herb	Emergent terestrial		DEV032	Jun. 16, 2010
72	*Potamogeton natans* L.	Potamogetonaceae		Monocot	Herb	Rooted floating		DEV099	Sep. 23, 2011
73	*Pouzolzia zeylanica* (L.) Benn. & Br.	Urticaceae		Dicot	Herb	Emergent terestrial		DEV037	Aug. 26, 2010
74	*Ranunculus sceleratus* L.	Ranunculaceae	Pirpire	Dicot	Herb	Emergent swamp	Vegetable	DEV016	Mar. 10, 2010
75	*Rumex dentatus* L.	Polygonaceae	Halhale	Dicot	Herb	Emergent		DEV031	Jun. 16, 2010
76	*Saccharum spontaneum* L.	Poaceae	Dhaddi	Monocot	Herb	Emergent terestrial	Used to make broom	DEV062	Mar. 10, 2010
77	*Salvia plebeia* R. Br.	Lamiaceae		Dicot	Herb	Emergent terestrial		DEV025	May. 9, 2010
78	*Schleichera oleosa* (Lour.) Oken	Sapindaceae	Kusum	Dicot	Tree	Emergent terestrial	Fruts eaten	DPROK101	Mar. 17, 2009

79	*Schoenoplectus subterminalis* (Torr.) Soják	Cyperaceae	Mothe	Monocot	Herb	Emergent marsh		DEV054	jun. 29, 2011
80	*Scoparia dulcis* L.	Scrophulariaceae		Dicot	Herb	Emergent terestrial	Medicinal	DEV064	Mar. 10, 2011
81	*Sesbania bispinosa* (Jacq.) W. Wight	Fabaceae	Bandhaicha	Dicot	Herb	Emergent marsh		DEV036	Aug. 26, 2010
82	*Shorea robusta* Roxb. ex Gaertn.	Dipterocarpaceae	Sal	Dicot	Tree	Emergent terestrial	Timber and Medicinal	DPROK0098	Mar. 17, 2009
83	*Soliva anthimifolia*(Juss.) R. Br.	Asteraceae		Dicot	Herb	Emergent marsh		DEV027	Jun.16, 2010
84	*Spilanthes paniculata* Wall. ex DC.	Asteraceae		Dicot	Herb	Emergent marsh		DEV017	Mar. 10, 2010
85	*Syzygium cumini* L.	Myrtaceae	Jamun	Dicot	Tree	Emergent terestrial	Medicinal and fruits eaten	DPROK0099	Mar. 17, 2009
86	*Syzygium jambos* (L.) Alston	Myrtaceae	Jamun	Dicot	Tree	Emergent terestrial	Fruits eaten	DPROK0105	Mar. 17, 2009
87	*Terminalia alata* Heyne ex Roth	Combretaceae	Saj	Dicot	Tree	Emergent terestrial	Timber and Fodder	DPROK0066	Jun. 7, 2008
88	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Barro	Dicot	Tree	Emergent terestrial	Medicinal	DPROK0065	Jun. 7, 2008

89	*Thelypteris prolifera*(Retz.) C.F.Reed	Thelypteridaceae	Lieundo	Pteridophytes	Climber	Emergent marsh	Tender shoot eaten as vegetables	DEV039	Aug. 26, 2010
90	*Torenia cordifolia* Roxb.	Scrophulariaceae		Dicot	Herb	Emergent marsh		DEV087	jul. 17, 2011
91	*Urticularia scandens* Benj.	Lentibulariaceae	Chamati	Dicot	Herb	Submerged		DEV021	May. 9, 2010
92	*Utricularia aurea* Lour.	Lentibulariaceae		Dicot	Herb	Submerged		DEV082	Jul. 17, 2011
93	*Utricularia minor* L.	Lentibulariaceae		Dicot	Herb	Submerged		DEV083	Jul. 17, 2011
94	*Vallisneria natans* (Lour.) H. Hara	Pontederiaceae	Panijhar	Monocot	Herb	Submerged		DEV056	Mar.10, 2011
95	*Vetiveria zizanoides* (L.) Hash	Poaceae	Kuchho	Monocot	Herb	Emergent terestrial	To make broom.	DEV075	May. 10, 2011
96	*Vicia anguistifolia* L.	Fabaceae		Dicot	Herb	Emergent terestrial		DEV028	Jun. 16, 2010
97	*Zizyphus mauritiana* Lam.	Rhmnaceae	Bayar	Dicot	Shrub	Emergent terestrial	Fruts	DEV077	May. 10, 2011
98	*Zizyphus rugosa* Lam.	Rhmnaceae	Bayar	Dicot	Tree	Emergent terestrial	Fruts	DPROK0083	Aug. 9, 2008
99	*Canabis sativa* L.	Cannabinaceae	Bhang	Dicot	Shrub	Emergent terestrial	Medicinal and Nacrotic	DEV0100	Sep. 23, 2011

100	*Datura metel* L.	Solanaceae	Dhatura	Dicot	Shrub	Emergent terestrial	Medicinal and Nacrotic	DEV0101	Sep. 23, 2011
101	*Melia azadarach* L.	Meliaceae	Bakaino	Dicot	Tree	Emergent terestrial	Medicinal	DEV0102	Sep. 23, 2011
102	*Androsace* sp.	Primulaceae	Bhyagutef ul	Dicot	Herb	Emergent terestrial		DPROK0109	Mar. 17, 2009
103	*Oxalis corniculata* ?	Oxalidaceae		Dicot	Herb	Emergent terestrial	Medicinal	DEV0103	Sep. 23, 2011
104	*Capparis spinosa* ?	Capparidaceae	Jungelahar o	Dicot	Climber	Emergent terestrial		DEV0104	Sep. 23, 2011
105	*Abrus precatorius* L.	Fabaceae	Ratti	Dicot	Climber	Emergent terestrial	Medicinal	DEV0105	Sep. 23, 2011
106	*Garuga pinnata* Roxb.	Burseraceae	Dabdabe	Dicot	Tree	Emergent terestrial	Medicinal	DEV0106	Sep. 23, 2011
107	*Careya arborea* Roxb.	Lecythidiaceae	Kumbhi	Dicot	Tree	Emergent terestrial	Timber	DPROK0108	Mar. 17, 2009
108	*Clerodendrum viscosum* Vent.	Verbinaceae	Vait	Dicot	Shrub	Emergent terestrial	Medicinal	DEV0107	Sep. 23, 2011
109	*Colocasia falax* Schott	Araceae	Ban Ghuinya	Monocot	Herb	Emergent terestrial	Vegetable	DPROK0107	Mar. 17, 2009

110	*Cuscuta reflexa* Roxb.	Convolvulaceae	Akasbeli	Dicot	Herb (parasite)	Emergent terestrial	Medicinal	DPROK0106	Mar. 17, 2009
111	*Dendrophthoe falcata* (Lf.) Etting.	Loranthaceae	Banda	Dicot	Shrub (parasite)	Emergent terestrial	Medicinal	DPROK0105	Mar. 17, 2009
112	*Desmodium oojeinense* (Roxb.) Ohashi	Fabaceae	Sadan	Dicot	Tree	Emergent terestrial	Timber	DPROK0110	Feb. 10, 2011
113	*Lantana camara* L.	Verbinaceae	Banfanda	Dicot	Shrub	Emergent terestrial	Medicinal	DEV0108	Sep. 23, 2011
114	*Pogostemon benghalensis* (Burm.f.) O.Kuntze	Lamiaceae		Dicot	Shrub	Emergent terestrial	Medicinal	DEV0109	Sep. 23, 2011
115	*Smilax lanceifolia* Roxb.	Liliaceae	Chopchini	Monocot	Climber	Emergent terestrial	Medicinal and Vegetable	DEV0110	Sep. 23, 2011
116	*Eulaliopsis binata* (Retz.) C.E. Hubarb	Poaceae	Babiyo	Monocot	Herb	Emergent terestrial	Thatch	DEV0111	Sep. 23, 2011
117	*Themeda arundinaceae* (Roxb.) Ridgley	Poaceae	Khar	Monocot	Herb	Emergent terestrial	Thatch	DEV0112	Sep. 23, 2011
118	*Xanthium strumarium* L.	Asteraceae	Bhainsekuro	Dicot	Shrub	Emergent terestrial	Medicinal	DEV0113	Sep. 23, 2011
119	*Flemingia strobilifera* (L.) Ait.	Fabaceae	Kanni	Dicot	Shrub	Emergent terestrial	Used to make broom	DPROK0104	Mar. 17, 2009

120	*Toddalia asiatica* (L.) Lam.	Rutaceae	Mainfal	Dicot	Tree	Emergent terestrial	Fish poisoning	DPROK0103	Mar. 17, 2009

Source: Field study 2009, 2010, 2011

APPENDIX 2

List of Plant Species with Ethno-medicinal Uses

S.N	Latin name	Family	Local name	Habit	Parts used	Used for	Method
1	*Abutilon indicum* (L.) Sweet	Malvaceae	Balu	Herb	Leaf	To cure boils	Leaf paste applied locally
2	*Achyranthes aspera* L.	Amaranthaceae	Ultekuro	Herb	1. Root 2. Stem	1. for urinary problems 2. Tooth ache	1. Root extract taken orally 2. Stem used as brush
3	*Aegle marmelos* (L.) Correa	Rutaceae	Bel	Tree	Fruit	To cure constipation	Fruit pulp eaten
4	*Ageratum houstonianum* Mill.	Asteraceae	Ganaune	Herb	Leaf	To cure cut wonds	Leaf extract applied locally

5	*Alstonia scholaris* (L.) R. Br.	Apocynaceae	Chhatiwan	Tree	Stem	To cure digestion in cattels	Crushed bark cooked with food given to cattels
6	*Bauhinia vahlii* Wight & Arn.	Fabaceae	Vorla	Climber	Seed	To cure seminal debility in man	Seeds rosted are eaten.
7	*Butea monosperma* (Lam.) Kuntze	Fabaceae	Dhank	Tree	Flowe r	To cure intestinal worms	Dried flower powder taken with water
8	*Cassia fistula* L.	Fabaceae	Rajbriksha	Tree	Fruit	To cure leprosy	pulp of riped fruit applied locally
9	*Centella asiatica* (L.) Urb.	Apiaceae	Ghodtapre	Herb	Whole plant	To cure irritation during urination	Extract of whole plant taken orally
10	*Curculigo orchioides* Gaertn.	Hypoxidaceae	Kalomusali	Herb	Root	General debility	Root paste cooked with milk eaten

11	*Cynodon dactylon* (L.) Pers.	Poaceae	Dubo	Herb	Whole plant	To cure sprain in body part and factured bones	Plant paste applied locally
12	*Diospyros melanoxylon* Roxb.	Ebenaceae	Tendu	Tree	Fruit	To cure loose motion	Fruit pulp eaten
13	*Eclipta prostrata* (L.) L	Asteraceae	Bhringjhar	Herb	1. Exudate 2. Whole plant	1. To cure cut wonds 2. to cure hair fall	1. Latex applied locally 2. plant paste applied locally
14	*Holarrhena pubescens* (Buch. - Ham.) Wall. ex G. Don	Apocynaceae	Dudhi	Tree	Seed	To cure diarrhea	Powder of roasted seeds eaten with hot water

15	*Mallotus philippensis* (Lam.) Mull. Arg.	Euphorbiaceae	Rohini	Tree	Fruit	To cure jaundice	Red fruit dust boiled in water, taken orally
16	*Murraya koenigii* (L.) Spreng.	Rutaceae	Karipatta	Shrub	Leaf	To cure fever	Leaf tea taken
17	*Nelumbo nucifera* Gaertn.	Nymphaeaceae	Kamal	Herb	1.Leaf and stem 2. seed	To cure jaundice	Cap made from leaf and necklace made from put on 2. seeds eaten
18	*Nymphaea stellata* Willd.	Nymphaeaceae	Kamal	Herb	1.Leaf and stem 2. seeds	To cure juandice	1. Cap made from leaf and neckless made from put on 2. seeds eaten

19	*Scoparia dulcis* L.	Scrophulariaceae		Herb	Leaf	To cure repeated urination	Leaf extract applied locally
20	*Shorea robusta* Roxb. ex Gaertn.	Dipterocarpaceae	Sal	Tree	Exudate	To cure cholera and diarrhea	Exudate powder mixed with curd taken orally
21	*Syzygium cumini* L.	Myrtaceae	Jamun	Tree	Fruit	To cure diabetes	Dried fruit powder eaten with water
22	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Barro	Tree	Fruit	To cure infected feet during rainy season	Fruit paste applied locally.
23	*Canabis sativa* L.	Cannabinaceae	Bhang	Shrub	Exudate	To cure stomach ache	Small piece of exudates eaten with water
24	*Datura metel* Linn.	Solanaceae	Dhatura	Shrub	Seed	To cure Insomnia	Small amount of seed extract taken orally

25	*Melia azadarach* Linn.	Meliaceae	Bakaino	Tree	Seed	To cure Intestinal worm	Powder of roasted seeds eaten with water
26	*Oxalis corniculata* ?	Oxalidaceae	Chariam ilo	Herb	Fruit	To cure vomiting	Pickle made from green fruits eaten
27	*Abrus precatorius* L.	Fabaceae	Ratti	Climber	Root	To abort unwanted pregnancy	Root extract cooked and eaten
28	*Garuga pinnata* Roxb.	Burseraceae	Dabdabe	Tree	Exudates	To cure sore foot	Fresh resin applied locally
29	*Clerodendrum viscosum* Vent.	Verbenaceae	Vait	Shrub	Leaf	To cure scabies	Leaf extract mixed with water for bathing
30	*Cuscuta reflexa* Roxb.	Convolvulaceae	Akasbeli	Herb (parasite)	Whole plant	To cure jaundice	Plant extract taken orally

31	*Dendrophthoe falcata* (L. f.) Etting.	Loranthaceae	Banda	Shrub (para-site)	Flower	To cure epilepsi	Flower extract eaten
32	*Lantana camara* L.	Verbenaceae	Banfanda	Shrub	Leaf	To protect grains from insects	Dried leaves are mixed with grains
33	*Pogostemon benghalensis* (Burm. f.) O. Kuntze	Lamiaceae		Shrub	Leaf	To cure pneumonia in child	Leaf extract warmed and applied to chest and that of mixed with honey is eaten
34	*Smilax lanceifolia* Roxb.	Liliaceae	Chopch-ini	Clim-ber	Root	To cure tuberculosis	extract of fresh root bark eaten
35	*Xanthium strumarium* L.	Asteraceae	Bhainse-kuro	Shrub	Fruit	To cure distrophy and cramp	Crushed green fruits cooked with sugar and eaten

Source: Field study, 2010

APPENDIX 3

Criteria for Classifying the Households (HH) into Income Groups

S. N.	Socio-economic indicators	Ranks with scores				Total scores
1.	Area of land owned	0 to 10 Katta (1)	10 to 20 Katta (2)	> than 20 Katta(3)	_	6
2.	Annual income	Rs.0 to 25,000 (1)	Rs.25,000 to 40,000 (2)	40,000 to 60,000 (3)	> than 60,000 (4)	10
3.	Educational status	Up to primary level (1)	Up to school level (2)	Higher level (3)	_	6
4.	Nature of employment	Unemployed (1)	Seasonal (2)	Annual (3)	> than 1 year (4)	10
5.	Food security	Up to 8 months (1)	8 to 12 months (2)	Sufficient (3)	_	6
6.	Type of house	Roof with thatch grass or plastics (1)	Roof with tiles or tins (2)	Roofs with RCC(3)	_	6
	Total score	6	12	18	8	44

HH with 0 to 15 scores= Low income group

HH with 16 to 25 scores= Medium income group

HH with 26 to 40 scores= High income groups

Source: Work Plan of Srijana Wonwn's Community Forest User Group, 2009

APPENDIX 4

Resource use by the HH of Ward no. 7 of Dhangadhi Municipality

Ethnic composition	No. of HH				No. of HH using wetland resources								HH participation *
	Total	Income group											
		High	Medium	Low	Timber	Fodder	Fire wood	Thatch grass	Fishing	Vegetables	Fruits	Soil	
Rana	129	24	57	48	129	102	118	91	90	60	68	59	46
Chaudhary	208	4	10	194	208	204	207	195	194	189	186	192	25
Dagoura	4	0	0	4	4	4	4	4	4	4	4	4	1
Raji	11	0	0	11	11	10	11	11	10	11	10	10	0
Tharu	3	0	1	2	3	2	3	3	2	3	2	2	1
Dalits	25	0	4	21	25	16	23	23	18	20	6	18	7
Bahun and Chhetri	100	52	43	7	100	52	81	34	12	14	23	10	69
Others	4	0	1	3	4	4	4	3	3	2	2	3	2
Total	484	80	116	288	484	394	451	364	333	303	301	298	151

Source: Work Plan of Srijana Wonwn's Community Forest User Group, 2009

*= No. of HH having role in wetland/CFUG management committee in last 5 years.

PLATES

Plate 1: Local People during PRA

Plate 2: Local Rana women.

Plate 3: Jakhor Tal viewed from south side

Plate 4: Wild rice in Devriya

Plate 5: Marshy vegetation and birds in of Jakhor Tal

Plate 6: *Nelumbo nucifera* Gaertn. (Kamal) in Jakhor Tal with Jakhor Baba temple in background

Plate 7: Local Rana Guy ready for fishing in Jakhor Tal.

Plate 8: Student enjoying picnic at Jakhor Tal.