

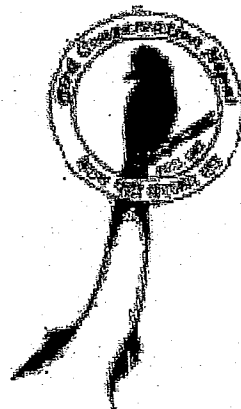
Status and Population of Sarus Crane (Grus antigone antigone) in lowland of West-Central Region of Nepal.

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A Report Submitted to Oriental Bird Club (OBC), UK.



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**Status and Population of Sarus Crane (*Grus antigone antigone*) in lowland of West-Central Region of Nepal.
(Rupandehi and Kapilvastu district of Nepal)**

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Cover Photo: Adult Sarus Crane, By Achyut Aryal



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Summary

Sarus Crane (*Grus antigone antigone*) is globally threatened birds of Nepal which found in the low land of Nepal. The research was concentration in Rupandehi and Kapilvastu district west central region of Nepal. The main aim of this project is to assess the status and population of Sarus Crane and provide management prescription to ensure long-term survival in its natural habitat.

The direct observation in every potential habitat was used to count the population of Sarus Crane in the study area. Questionnaire survey was also carried out with surrounding area's people of the potential habitat of Sarus Crane.

In Rupandehi district, distribution of Sarus Crane is high in Surrounding of Lumbini area; Jogada VDC, Masina VDC, Marcharbar site, and Kamariya VDC. Sarus Crane population is distributed western part of district up to Kapilvastu district as well as eastern part of district up to Nawalparasi district therefore, as Rupandehi district is central district where Sarus Crane population concentration is high as compare to other part of Nepal. Adjoining area between Rupandehi and Kapilvastu and Marchawar site is one of the most potential habitats of the Sarus Crane.

Total 168 population of Sarus Crane were counted, out of them 100 numbers of Sarus Crane found in Rupandehi district and 68 number of Sarus Crane found in Kapilvastu district. The density of Sarus Crane in Rupandehi district is 0.115 Crane/ km², while Population density of Sarus Crane in Kapilvastu district is .0725 Crane/ km². Population of Sarus Crane is decline since few years. Chicken survival % in Rupandehi district is 24%, while the Kapilvastu district is 22.02%. 70% Sarus Crane are using farmland and only 30% Sarus Crane are using wetland of the study area.

Current threats of Sarus Crane population are habitat loss and degradation, high electrical cable line, Sugar Cane cultivation, Dam and cementation in water canal, Pollution/insecticide, pesticide, chemical fertilizer, environmental contamination and other anthropogenic causes. There is lack of awareness regarding this species as well as wetland conservation. Activities like killing of Adult Sarus Crane and stealing of eggs of Sarus Crane is high in Muslim Society as compare to Hindu Society.

Abbreviations and Acronyms:

OBC- Oriental Bird Club.

BCN-Bird Conservation Nepal.

NPWC-National Park and Wildlife Conservation.

NPWR-National Park and Wildlife Reserve.

IUCN- The World Conservation Union.

BRTF- The Biodiversity Research and Training Forum.

WTI- Wildlife Trust of India.

VDC- Village Development Committee.

LDT-Lumbini Development Trust.

LCS- Lumbini Crane Sanctuary.

ICF- International Crane Foundation.

DDC- District Development Committee.

NGO- Non-Governmental Organization.

INGO- International Non-Governmental Organization

DAO-District Administration Office

Chapter one:

1. Introduction on Nepal:

Nepal is situated on the southern slopes of the central Himalayas and occupies a total area 147,181km². The country is located between latitudes 26°22' and 30°27' N and longitudes 80°40' and 88°12' E. The average length of the country is 885km from east to west and the width varies from 145km to 241km, with a mean of 193km north to south. Hills and high mountains cover about 86% of the total land area and the remaining 14% are the flatlands of the Terai, which are less than 300m in elevation. Altitude varies from some 60m above sea level in the Terai to Mount Everest (Sagarmatha) at 8,848m, the highest point in the world.

1.2. Biodiversity:

Nepal's rich biodiversity is a reflection of this unique geographic position as well as its altitudinal and climatic variations. It incorporates Palaeartic and Indo-Malayan biogeographical regions and major floristic provinces of Asia, creating a unique and rich diversity of life. Although comprising only 0.09% of global land area, Nepal possesses a disproportionately large diversity of flora and fauna at genetic, species and ecosystem levels. This diversity is found in the dense tropical monsoon forests of the Terai, the deciduous and coniferous forests of the subtropical and temperate regions, and the sub-alpine and alpine pastures and snow-covered peaks of the Himalayan mountain range (Nepal Biodiversity Strategy, 2003). Nepal has in the rich biodiversity, the number of flora and fauna found in Nepal are shown in the following table:

Table: 2 Flora and fauna of Nepal

GROUP OF ORGANISM	NUMBERS OF SPECIES		REFERENCE	NEPAL REPRESENTATION (%)
	GLOBALLY	NEPAL		
Lichens	20,000	465	Sharma 1995	2.3
Fungi	69,000	1,822	Adhikari 1999	2.4
Algae	26,000	687	Baral 1995	2.6
Bryophytes	16,600	853	Compiled from Kattel and Adhikari 1992; Mizutani <i>et al.</i> 1995; Furuki & Higuchi 1995	5.1
Pteridophytes	11,300	380	Iwatsuki 1988	3.4
Gymnosperms	529	28	Koba <i>et al.</i> 1994; Akiyama <i>et al.</i> 1998	5.1
Angiosperms	220,000	5,856	Koba <i>et al.</i> 1994; Akiyama <i>et al.</i> 1998 ²	2.7
Platyhelminthes	12,200	168	Gupta 1997	1.4
Spiders	73,400	144	Thapa 1995	0.2

Butterflies and Moths	112,000	640	Smith 1994, 1997	2.6
Other Insects	751,000	2,253		0.7
Fishes	18,150	5,052	Thapa 1997	1.0
Amphibians	4,184	182	Shrestha 2001	1.0
Reptiles	6,300	43	Shah 1995	1.6
Birds	9,040	100	Shah 1995	9.5
Mammals	4,000	861	BCN, 2004	4.5
		181	Suwal & Verheugt 1995	

Nepal is also rich in the avifauna diversity, where 861 (BCN, 2004) found. The distribution of birds in Nepal should be considered from three dimensional zonation: altitude, South-north and east west, with a complication of topographical, climatical and vegetation factors. The lowlands support the richest diversity of avifauna similar to the Indian realm and the high regions maintain much northern form originated from Palaearctic. Large birds such as raptors, ducks, cranes, gulls and even some small perching birds fly over the high mountains (Masatomi, 1994).

648 birds species have been recorded in the Terai according for 76% of all species recorded for Nepal (BPP, 1995). By far the richest areas for Nepal's birdlife are lowland tropical forest below 300m where over 500 species have been recorded (Inskipp and Inskpp, 1991). The highest concentration of confined species (111), are found in the Terai and Siwaliks with only 29 species in the midhills and 24 in the highlands. Confined Terai and Siwaliks bird species are mainly Indo-Malayan and include: Asian Fairy Bluebird (*Irena puella*), Blue-eared Barbet (*Megalaima australis*), Rufous-faced Warbler (*Abroscopus albogularis*) and Pale-headed woodpecker (*Gecimulus grantia*) confined to Terai Sal forest in the east. Little Spiderhunter (*Archnothera longirostra*), Pompadour Green pigeon (*Treron pompadora*), and Black Baza (*Aviceda leuphotes*) are confined to both central and east. A further 16 species reach the western limits of their world ranges between the Kali Gandaki River in center Nepal and the western border of Nepal (BPP,1995).

Some important breeding bird species in Terai wetland are Lesser Adjutant (*Leptoptilos javanicus*), Black-Necked Stork (*Ephippiorhynchus asiaticus*), open-billed stork (*Anastomus oscitans*), Great stone Plover (*Esacus recurvirostris*), Sarus Crane (*Grus antigone*), Bengal florican (*Houbaropsis bengalensis*), Crested serpent Eagle (*Spilornis cheela*), Grey headed Fishing Eagle (*Ichthyophaga ichthyaetus*), Lesser fishing Eagle

(*Ichthyophaga humilis*), Lesser spotted Eagle (*Aquila pomarina*) and Grass Owl (*Tyto capensis*). The globally threatened Swamp Partridge (*Francolinus gularis*) breeds in the in the wetland of Koshi tappu. The forest birds are Blue peafowl (*Pavo cristatus*), Giant Hornbill (*Buceros bicornis*), Pied Hornbill (*Anthracoceros albirostris*), Great Slaty Woodpecker (*Mulleripicus pulverulentus*), Stork Billed Kingfisher (*Halcyon capensis*), Long-tailed broadbill (*Psarisomus dalhousiae*) and Hill Mynah (*Gracula religiosa*) (Suwal, 1999).

The river and oxbow lakes of Koshi, Narayani and Karnali and the wetlands of beesa Hazaar tal, Banganga Reservoir and Ghodaghodi lake is visited by number of waders and waterfowl species during the fall migration and or winter. That includes Black Stork (*Ciconia nigra*), Eurasian curlew (*Numenius arquata*), Mallaard (*Anas Platytyrhynchos*), Red-crested Pochard (*Rhodonessa rufina*), Northern Pintail (*Anas acuta*), Common Teal (*Anas Crecca*).

Nine Bird species are protected by NPWC ACT 1973. It includes two species of Stork, three pheasants, two florican species, one crane and a hornbill. The scientific name of the Sarus crane has been mistakenly addressed as *Grus grus* in the NPWC ACT 1973. Black Stork and Sarus Crane occurs in the Wetlands of Lumbini. Sarus Cranes are resident and breeding and a nesting species. Black Stork is the wintering species from Europe (Suwal, 1996).

Two bird species are endemic to Nepal. Nepal Wren Babbler (*Pnoepyga immaculate*) is found in the central and eastern Midhills. Spiny Babbler (*Turdoides nipalensis*) is found from the eastern to the western border of Nepal between 915 and 2135m, migrating between the Terai/Siwaliks and the Midhills (Inskipp and Inskipp, 1991)

Sarus Crane:

1.3. Introduction and Taxonomy:

The Sarus Crane is the only resident breeding crane in India, Nepal and Southeast Asia, and is the world's tallest flying bird. Three subspecies are recognized, with a total estimated population between 13,500 and 15,500 (Meine et. al, 1996). The Indian Sarus Crane (*G. a. antigone*) is still common in northern India, rare in southern part terai region of Nepal but has been extirpated from large portions of its historic range and continues to decline in areas where it still exists

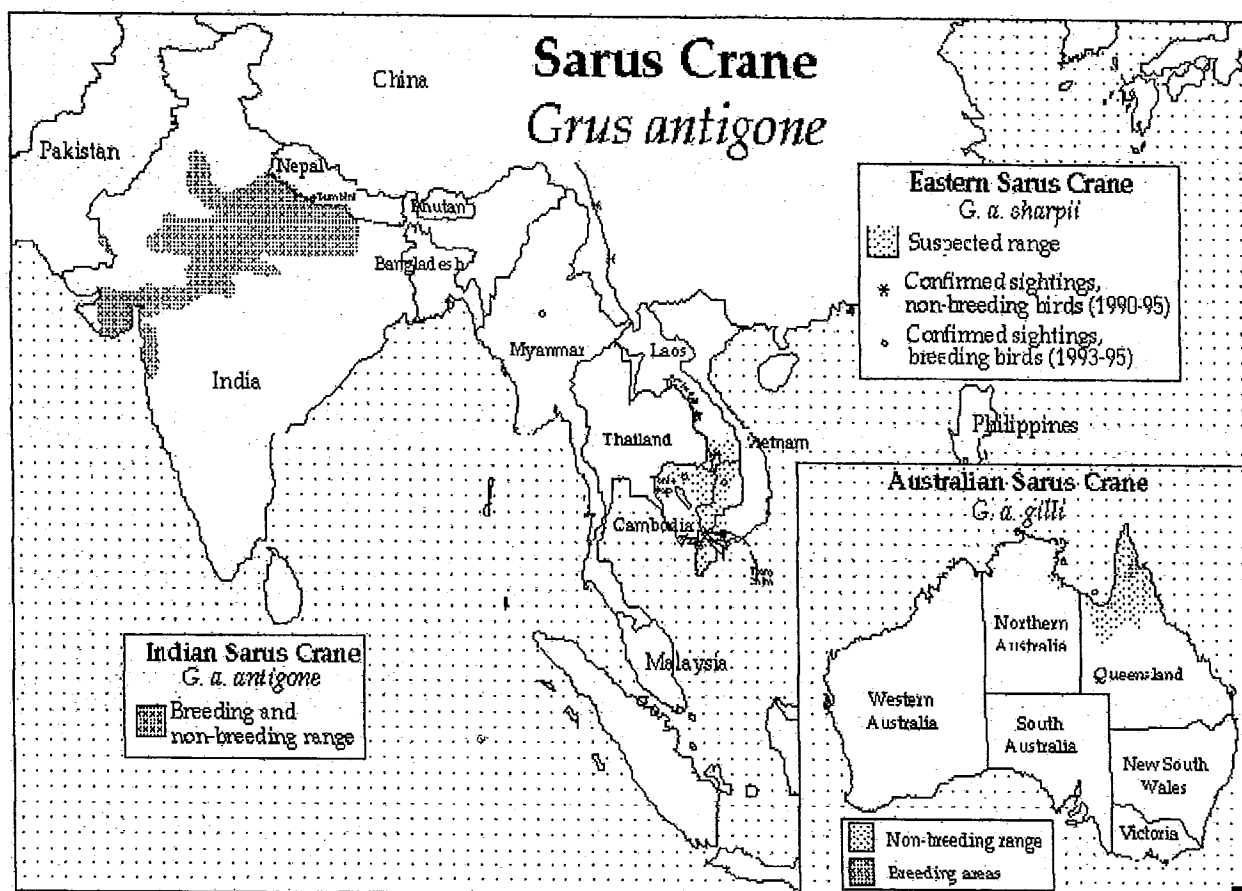
Sarus belongs to the phylum: Chordata, Class: Aves, Order: Gruiformes, Family: Gruidae. Family Gruidae have altogether 15 species belonging to four genera and two subfamily. Cranes are found in all the continents except in South America and the Antarctica. Among these only four species of Cranes have been recorded from Nepal. Common Crane (*Grus grus*), Demoiselle Crane (*Anthropoides virgo*), are the high altitude passage migrants from the Palaearctic region. Black necked crane (*Grus nigricollis*) a vagrant individual has been recorded in Nepal. They are Tibetan highland species, and a small population migrates to Bhutan, The Sarus Crane (*Grus antigone*) is a non-migrant sub-species of Indian sub-continent (Inskipp and Inskipp, 1991), There are three sub species of Sarus Crane (*Grus antigone*).

1.4. Globally distribution and population of Sarus Crane

Sarus Crane (*G. a. antigone*)

The current range of the Indian Sarus Crane includes the plains of northern, northwestern, and western India and the western half of Nepal's Terai lowlands. The population has declined sharply over the last several decades. Sarus Cranes are most common and densely distributed in the Indian states of Uttar Pradesh, Rajasthan, Gujarat, and Haryana; they are less common in Bihar and Madhya Pradesh (Gole, 1989). In India Percentage of breeding Sarus Cranes is maximum in Gujarat state though the maximum number of Sarus Cranes breeding is in Uttar Pradesh (Choudhury et. al, 1999). There are probably fewer than 500 in all of Nepal and their range has been slowly shrinking for the last decade (Suwal, 2000). In Pakistan, India's Punjab, and western Bangladesh, the Sarus Crane now occurs rarely (Meine et. al, 1996)

Fig.1 Distribution of Sarus crane in world



Source: Ellis, et. al., 1996.

1.5. Distribution of Sarus Crane in Nepal:

In Nepal it is found in Kanchanpur, Royal Sukla Phanta Wildlife Reserve, Kailali district, Dahngahdi, Royal Bardia National Park, Banke district, dang district, Rupandehi district, Kapilvastu district Nawalparasi Royal Chitwan National Park (Bird life international, 2001, Suwal, 1999).

1.6. Previous Studies on Sarus Crane in Nepal:

1.6.1. Population status of Sarus Crane in Nepal, 1996.

Pratima Shrestha (1996) carried out the study on the population status of Sarus Crane in Rupendehi and Kapilvastu district of Nepal. The main aim of this was obtain information on population status of Sarus crane in the Terai zone of Nepal. The distribution of Sarus cranes in Rupandehi and

Kapilvastu districts was determined by censuses conducted during the 1995 and 1996. She used only accessible road where vehicle could reached as a transect to census the population. She recorded 128 and 131 Sarus Crane in 1995 and 1996.

1.6.2. Study on the Habitat preference, Movements, Nesting and population

Dynamics of Sarus Crane of Lumbini, of Nepal in 1999:

This study was carried out by Rajendra Nar Sing Suwal in 1999. He carried out study on seasonal and annual diurnal habitat utilization, monthly, and seasonal diurnal area coverage and linear movements, study on nesting dynamics, and population of Sarus crane.

1.7. Running project for the Crane conservation in Nepal.

Lumbini Crane Sanctuary:

Adjoint effort between Nepalese Crane Conservationists and International Crane foundation (ICF) was initiated in 1989 to study the status of Sarus Cranes in Nepal. The research identified that natural ecosystems of the Lumbini Development Trust (LDT) and the surrounding area was an ideal site for crane congress held in 1989 recommended LDT set aside lands at the Lumbini Garden for the Conservation of Crane and the natural ecosystems of the Terai. On December 25, 1994 an agreement between LDT and ICF was signed for a 50-years lease of 265 acres in the northern third of Lumnini to establish the Lumbini Crane Sanctuary (LCS). On behalf of the LDT, Nepal, late Prof. Soorya Bahadur Shakya, the then Vice-Chairman and Dr. George Archibald, Executive Director on behalf of ICF signed the contract agreement. The purpose of the LCS is to combine the Buddhist percepts of environmental harmony with Lumbini's religious, Cultural, and environmental restoration, The LCS activities include restoration and management of the sanctuary and Sarus Crane Conservation out reach to the villages of the Lumbini region (Suwal, 1999, Suwal, *et. al.*, 2003)

Chapter Two:

2. Objective:

2.1. Project aims and objectives:

The main aim of this project is to assess the status and population of Sarus Crane and provide management prescription to ensure long-term survival in its natural habitat.

Specific objectives of the study are to: -

- a. Assess the population status of Sarus Crane in Study Area.
- b. Assess the present status and distribution of Sarus Crane within study area.
- c. Outline current threats to Sarus Crane population and their habitats.
- d. Provide management recommendation for future course of actions.
- e. Provide the necessary base line data towards its conservation

2.2. Justification:

Sarus Crane is one of the world's tallest flying birds, which is one of the protected birds of Nepal. It falls under the globally threatened bird, listed in Red data book of IUCN and APPENDIX-II of CITES.

It is found in the wetland and cultivated fields of West-Central terai. They have disappeared from eastern Nepal only a few decades ago. The conservation of Sarus Crane is difficult since they are found outside the protected area of Nepal and proper protection outside the protected area is lacking. It is found mostly in crop fields and natural marshlands, in that order, habitat loss is evidently the biggest pressure on crane populations; other anthropogenic interventions like egg lifting are impeding growth of the Sarus population

Sarus Cranes have been hunted in portions of their historic and present range (mainly the Philippines, Young, Vietnam, and some portions of India). Although hunting is no longer a critical threat in most countries, eggs and chicks are still stolen for food or for pets in Nepal, Cambodia, and possibly Laos (Birdlife International, 2000), The impact of these

activities is unknown, but it may be a critical factor affecting the Eastern Sarus Crane's recovery

Local traditions and religious beliefs have played a significant role in protecting the species (Gole, 1989). Especially in northern India, West-Central terai region of Nepal, and Vietnam, they are regarded as sacred birds. However, in some of these areas—especially where development and population pressures have recently stimulated emigration—these traditions of veneration have been eroding (R. Suwal pers. Comm., 2003).

In 1870s Sarus Crane was apparently common in the terai, and often kept in confinement in Nepal valley (Birdlife international, 2000). It is now largely confined to the South-central lowland where recent surveys conducted that it is sparsely distributed, uncommon and declining on basis of local reports, perhaps because of wetland loss and hunting. In Rupendehi and Kapilvastu districts 73 individuals were counted in 1990 and 79 in 1992 (Birdlife international 2000). Optimistic expected population of this species in Nepal is about 200-500 and the range has been slowly shrinking for the last decade (Suwal, 1999). The primary causes for decline is pesticide, poisoning, developmental activities and direct human persecution (Suwal, 1999).

According to literature and local people, they are declining from the study area so it is necessary to find out the causes of the decline, its status and its population in the study area for its proper management. This research work will help to bring out the conservation measures for Sarus Crane and assess the threats.

Chapter Three

The Study area

3.1. Study area:

Study areas were Rupandehi and Kapilvastu district of Nepal.

Rupandehi district lies in the Terai region and situated in Lumbini Zone of western development region on Nepal and geographical position is at 27° 20' - 27° 45' Latitude and 83° 10' - 83° 30' Longitude. Palpa district lies to North; Kapilvastu district lies in West; Nawalparasi district lies in East; and Uttar Pradesh (a state of India) lies in South of Rupandehi district. The district is ranging from 100 meters to 1219 meters attitude, having 1401 Square kilometer areas. Major rivers of the district are Tinau, Baghela, Dano, Kotliham, Kanchan, Kothi, Mahab, Rohini, Telar, etc. (District Profile, 2003). It consists of 69 VDCs and 2 municipalities.

Kapilvastu district lies in adjoining district of western boundary. According to LRMP Survey in 1987 district occupies 1651.32km² areas. Geographical position is at 27° 25' - 27° 44' Latitude and 82° 55' - 83° 14' Longitude. Dang districts lies in west and Argakhachi district lies in north, Rupandehi district lies in the East and India lies in South. It consists of 77 VDC, 1 municipality. (District profile, 2003)

3.1.1. Climate:

The districts experience tropical sub-tropical type of climate according to the altitudinal variation. Climatically, the year can be divided mainly into three seasons such cold, hot and rainy season. The maximum temperature is 42.4 degree Celsius and minimum temperature is 8.75 degree Celsius and average rainfall is 1391 mm (DDC, 2000) in Rupandehi district. In Kapilvastu district, maximum temperature 43 degree Celsius and minimum temperature is 4.5 degree Celsius and average rainfall is 1500mm (DDC, 2000).

3.1.2. Land use:

There are six major landuse types found in Rupandehi district. Dominant landuse type is cultivation (60.21%) followed by forest (21.56%). There are small area Covered by Churia hills and cliffs i.e. (0.29%) and river, river banks and grazing land covers (8.02%) (Table...). Among them Cultivated land, and wetland area selected for the study.

Table: Landuse types found in Rupandehi district:

S.N.	Landuse Types	Area in (ha)	Percentage
1.	Cultivation	85122	60.21
2.	Forest	30484	21.56
3.	Grassing Land (Grassland)	8882	6.28
4.	River	2460	1.74
5.	Hills and Rocky cliff	414	0.29
6.	Settlements	5953	4.21
7.	Others	8052	5.71
Total		141367	100

In Kapilvastu district, there are also six major land use types found. Dominant landuse type is Cultivated land (56.04%) followed by forest and shrub land (41.44%)

Table: Landuse types found in Kapilvastu district:

S.N.	Landuse types	Area in Km ²	Percentage	Remarks
1.	Cultivation	925.41	56.04	49.87% area of its area is wetlands.
2.	Grass land	8.77	0.56	
3.	Forest and Shrub land	684.21	41.44	
4.	River/ pond	3.86	0.23	
5.	Sand Gravels and boulders	27.40	1.66	
6.	Settlements urban areas and built up areas	1.67	0.10	
Total		1651.32	100	

3.1.3. Cultivation: Terai is the main food producing area of Nepal. Cultivation area coverage us greater in Rupandehi district than other landuse types. After eradication of Malaria from Terai in 1960s, most of the people immigrated from midhills to lowland Terai.

The farmers chiefly grow paddy crops during the monsoon season. Sugar Cane is also major crop in some part of the Kapilvastu district and Rupandehi district. Most of the lands are left barren during other time of the year except some sugarcanes, winter wheat,

lentils and mustards, are grown in some arable fields. Many insects, amphibians, snakes, fished, birds and mammals are found in these fields. The mutual interaction of all the components found in the farmland helps to stabilize the agriculture ecosystem, which is also termed as 'eco-agriculture' the new concept in agriculture field. The irrigation is available from the local river, streams and the artesian wells.

3.1.4. Forest: Rupandehi and Kapilvastu landscapes consists generally two types of forest one is natural forest and another is artificial forest (plantation).

Sal Forest (*Shorea robusta*): Sal forest is associated with *Terminallia tomentosa*, *Terminallia beleria*, *Anogeisus latifolia*, *Largerstomia parviflora*, *Dillenia pentagyna*, *syzygium cumini*, and *Semicarpus anacardium*.

Acacia catechu- *Dalbergia sissoo* forest: Found on newly deposited alluvium, often gravely along streams and rivers of the study area.

Other riverine forest: Small strips of forest are found in moist localities near streams. This forest type includes tropical evergreen forest *Michelia champaca*, *listea spp*, *Phoebe canceledata*, *Actinodophae angustifolia*, *Cinnamomus spp*s and tropical deciduous riverine forest, usually dominated by *Bombax ceiba*, *Holoptelea integrifolia* and *Trewia nudiflora* together with other species found in the sal forest. The area occupied by this type of forest is not large and does not extend far from the stream banks.

Plantation forest is situated inside the Lumbini Garden, private land and some community forest area which is chiefly composed of Sissoo (*Darbergia sissoo*).

3.1.5. Population & Community: According to National population census 2001, the total population of the Rupandehi district is 543302, of which 263680 Female and 279622 are male. The district is rich also for religions. Most of the people (90.09%) follow Hindu religion, followed by Islam (Muslim) (8.21%), and Buddhist (1.54%).

Kapilvastu district, total population of district is 481976, of which 247875 male and 234101 female, where Muslim population is high than Hindu as compare to Rupandehi district of Nepal.

Chapter Four

4. Methodology:

4.1. Methodology:

The Preliminary survey was carried out to find out Sarus Crane's potential areas before the actual field work started. And I reached in very VDC of study area to find out the potential study area and presence and absence of Sarus crane in their VDC and questionnaire survey was carried out with concern and knowledgeable person; Villagers, local leader, District forest office staffs and Lumbini Crane sanctuary staffs.

Method for the population count was use direct observation in its all potential habitat of both districts which was carried out October- December 2003. After find out potential habitat of the Sarus Crane, I and my assistants reached to every potential area and count the Sarus Crane number (Chicken and adult, and egg). The population was counted with the assumption that during that period Sarus Crane activities were remaining within the fixed the territory (breeding period) so that it reduce the double count of same species of Sarus crane. I used Motorbike, bicycle and foot walk for the reaching the potential habitat of Sarus Crane and also used binocular for observation of Sarus Cranes. Population density of Sarus Crane was find out by using the following formula. I counted Sarus Crane in all potential areas of both district, therefore, total available habitat of Sarus Crane which comprising open area of cultivation, wetlands, rivers and riverbank.

$$\text{Population density of Sarus Crane} \longrightarrow \frac{\text{Total Number of Sarus Crane observation}}{\text{Total Available habitat area}}$$

Lumbini Crane Sanctuary (LCS) Provided the Sarus Crane number of surrounding the Lumbini area which was carried out by LCS.

Questionnaire survey (Appendix: 1) also carried out in the surrounding area of Sarus Crane potential habitat.

Distribution pattern identified on the basis of direct observation, interview of local people and other knowledgeable person, District forest office staffs, Lumbini Crane sanctuary staffs and naturalist.

I had taken 1-2 people from each VDC for the interview where Sarus Crane was present.

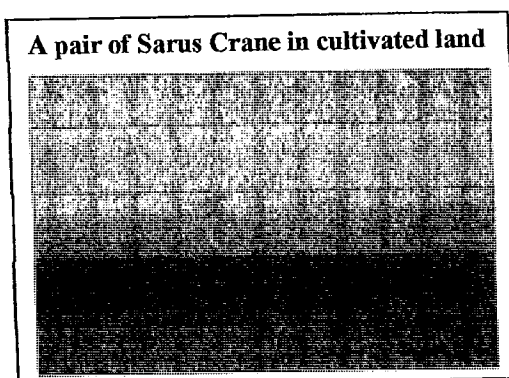
Secondary Data Collection: Secondary data relevant to the study were collected from various published and unpublished documents.

Chapter five:

5. Result and discussion:

5.1. Distribution of Sarus Crane in the study area:

Sarus Cranes are distributed southern region of study area, especially in the south-central region. Northern part of study area has Sal and mixed forest with the Churia range, therefore, Sarus Cranes are not recorded in the northern part of study area.

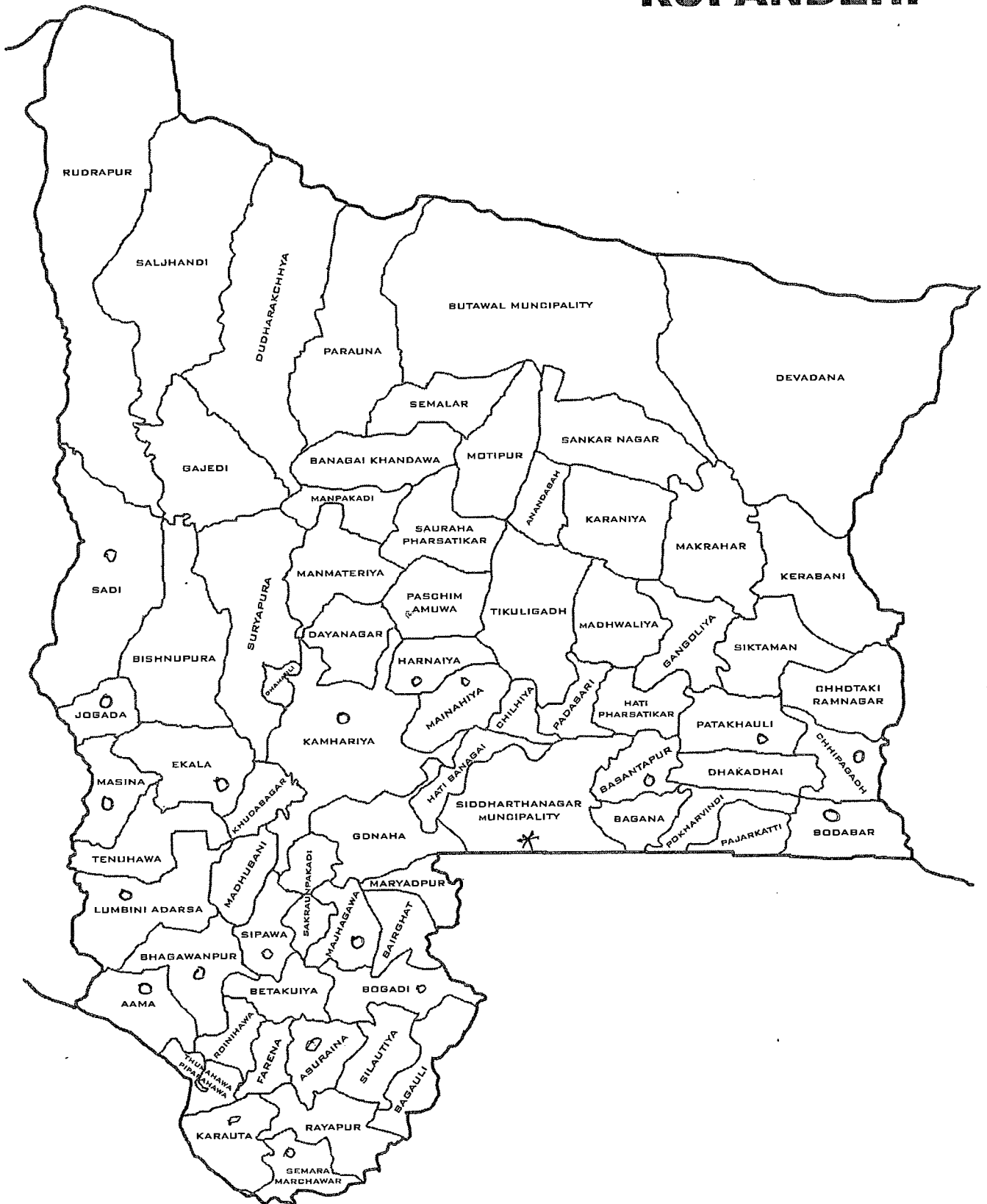


In Rupandehi district, distribution of Sarus Crane is high in Surrounding of Lumbini area; Jogada VDC, Masina VDC, Marcharbar site, and Kamariya VDC. Sarus Crane population is distributed western part of district up to Kapilvastu district as well as eastern part of district up to Nawalparasi district therefore, as

Rupandehi district is central district where Sarus Crane population concentration is high as compare to other part of Nepal. Before 10 year Sarus Cranes were distributed almost all VDC except some northern VDCs of Rupandehi district, such as Rudrapur, Saljhandi, Dadharakchhya, Devadaha VDCs and Butwal municipality because there were high Sal *Shorea robusta* and mix forest, which is northern part of district. Present distribution areas of Sarus Crane in the Rupandehi district has been shown in the following map:

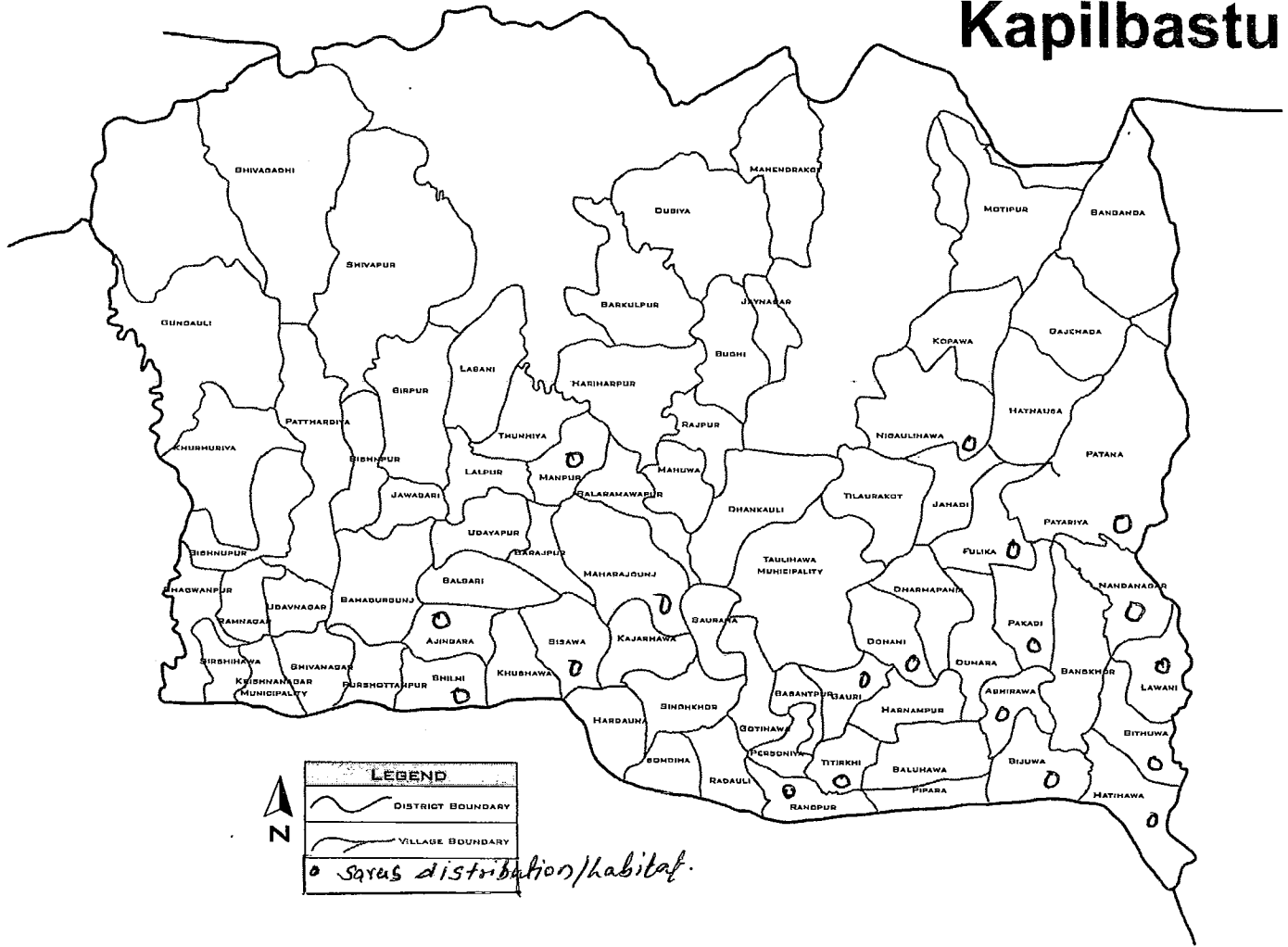
In Kapilvastu district, in the past time Sarus Cranes were distributed in all VDC except some Northern dense forest area of district such as Gungauli, Shivagauhi, Shivapur, Dubiya, Mahendrakot, Motipur VDC. Population of Sarus Cranes weren't seen in different VDC of Kapilvastu district where previously Sarus Crane population were permanently resident, those VDCs are Bhagwanpur VDC, Vidyanagar, Ramnagar, Shivanagar, Kushhawa, sihokhor, etc. Presently Sarus Crane are Concentration in the south-eastern part of district, there are high number of population distributed in the patariya VDC, Lawani VDC, Hatihawa VDC, Bithuwa VDC, Pakadi VDC of the district. Present distribution of Sarus Crane has been shown in the following Map of the district:

RUPANDEHI



LEGEND	
	DISTRICT BOUNDARY
	VILLAGE BOUNDARY
	Sarus habitat / distribution
	Domesticated

Kapilbastu



5.2. Population status:

The population count of Sarus Cranes was carried in October- December 2003. There are total 168 number of population of Sarus Crane in Rupandehi and Kapilvastu district of Nepal.

In Rupandehi district, 100 Sarus Cranes were counted, Out of them 76 were Adults and 24 were Chicken.

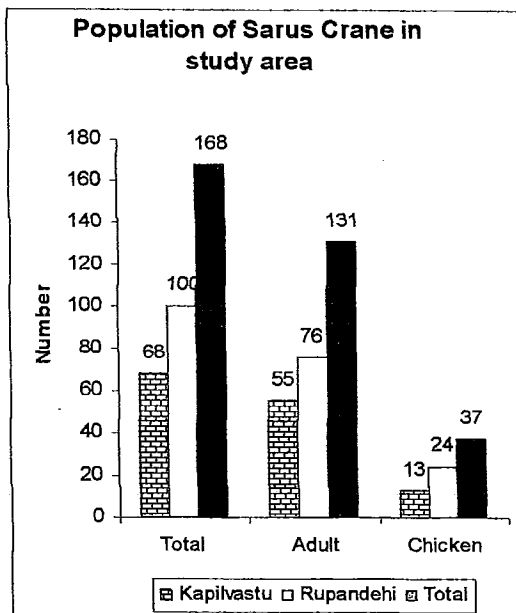
In Kapilvastu district, 68 Sarus Cranes were counted, out of them 55 were adults and 13 were Chicken.

$$\text{Population density of Sarus Crane} \longrightarrow \frac{\text{Total Number of Sarus Crane observation}}{\text{Total Available habitat area}}$$

$$= 100 / 868 = 0.1152$$

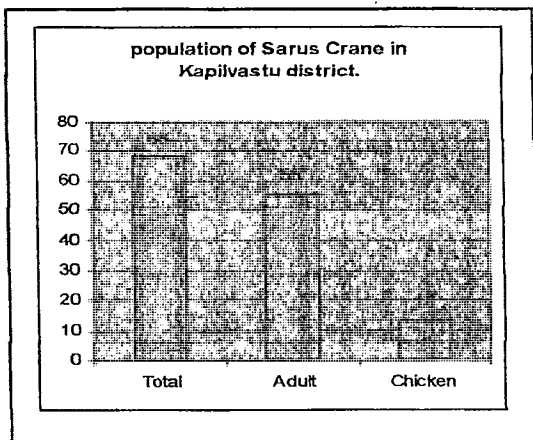
Hence, the density of Sarus Crane in Rupandehi district is 0.1152 Crane/km². Available habitat for Sarus Crane in Rupandehi district is 868 Sq. km, comprising open area of cultivation, wetlands, rivers and river bank.

Population density of Sarus Crane in kapilvastu district is 0.0725 Crane per km². In Kapilvastu district, total available area for the Sarus Crane is 938.04 Sq. km comprising open cultivation land, wetland, rivers and river bank.

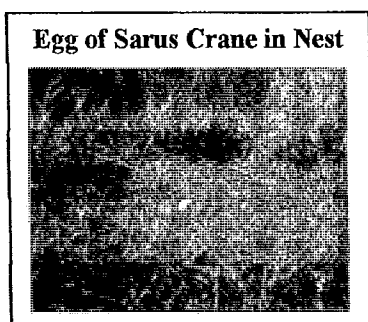


5.2.1. Population status in Kapilvastu District:

No.	VDC	Number of Sarus Crane		Habitat		
		Total	Adult	Chicken	# s.c used farmland	# s.c used Wetland
1.	Patraya	7	6	1	5	2
2.	Lawani	6	4	2	2	4
3.	Bithuwa	4	2	2	2	2
4.	Hatihawa	5	4	1	2	3
5.	Nandanagar	4	2	2	4	
6.	Fulki	3	2	1	3	
7.	Pakadi	4	2	2	4	
8.	Maharajgang	4	4		2	2
9.	Manpur	2	2		2	
11.	Bisanpur	2	2		2	
12.	Agingara	2	2		2	
14.	Sisuwa	2	2		2	
15.	Bhilmi	2	2		2	
17.	Birahipur	2	2		2	
18.	Gauri	2	2		2	
19.	Dohani	3	3		3	
20.	Niglihawa	4	2	2		4
21.	Bhadaukhora	2	2		2	
22.	Titirki	4	4		4	
23.	Rangpur	2	2		2	
24.	Bijuwa	2	2		2	
Total		68	55	13	51	17

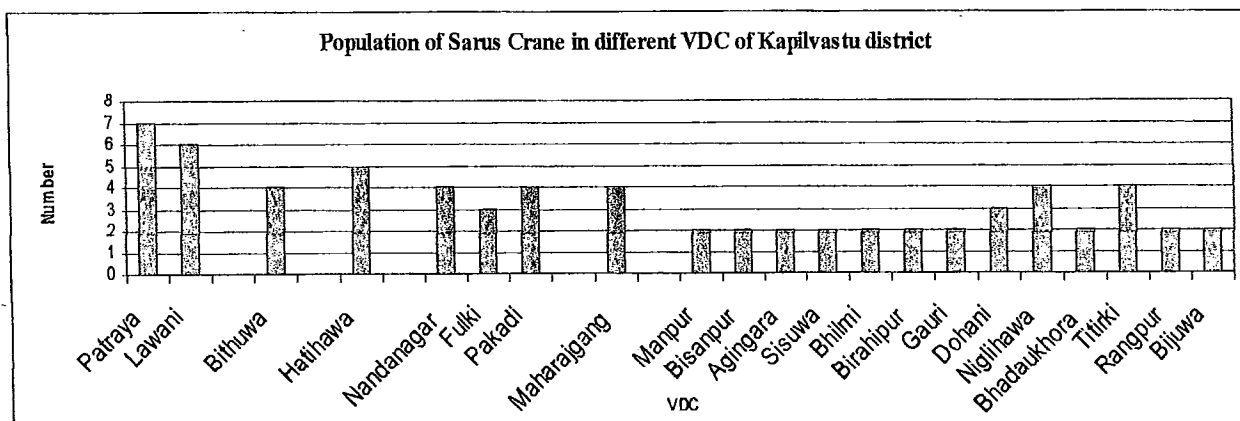


There are total numbers of Sarus crane population in kapilvastu district is 68 with 55 adult and 13 chicken were counted during the field survey. Sarus Crane population concentration is high in the adjoining area of Rupendehi district where the western sides of the district has less in population. In the Krishanagar area there were larger number of



industries and the habitat of Sarus crane is covered by the Sugar Cane cultivation in the farmland and the Sugar cane cultivation activities is increasing in every year for the raw material for Laxmi sugar mill of Krishanagar that make to reduce the habitat of Sarus crane therefore number of Sarus cranes haven't seen by local people since 2 year in the Bahadurejung VDC, Sivanagar VDC, Bhalwari VDC and

surrounding area of Krishanagar. During the field survey, I saw 1 fresh egg of Sarus Crane in about 500m east side of Maharajung village of Maharajung VDC at the wetland of kapilvastu district in 2003-11-1. There is high number of population of Sarus crane in Patariya VDC where I counted 7 with 6 adult and 1 chickens. Population of Sarus Crane concentration is high in Patraya VDC, Lawani VDC, Hatihawa VDC, Nandanagar VDC as compare to other VDC of Kapilvastu district. VDC wise number of Sarus Crane is shown in the following figure:

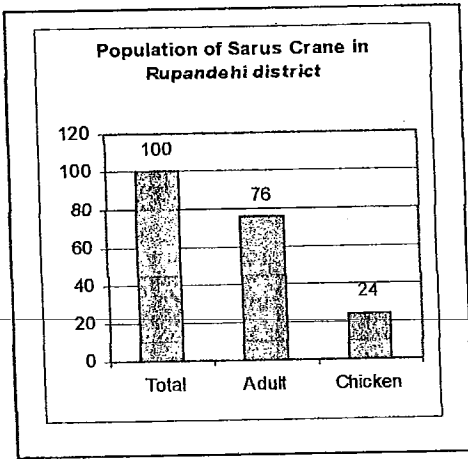


5.2.2. Sarus Crane population in Rupandehi district:

S.N	VDC/location	Number of Sarus Crane			Habitat	
		Total	Adult	Chicken	# S.C. used Farmland	# S.C. used wetland
1.	Bagaha	4	4		2	2
2.	Basantapur	3	2	1	3	
3.	Kamaria	6	6		4	2
4.	Pajarkatti	3	2	1	3	
5.	Bodabar	2	2		2	
6.	Sidharthanagar municipality	4	4		4	
7.	Mainaiya	2	2		2	
8.	Harnaya	4	2	2	4	
9.	Daya nagar	3	2	1	2	3
10.	Sadi	4	4		4	
11.	Masina	5	4	1	2	3
12.	Amma	4	2	2		4
13.	Karauta	2	2			
14.	Patakhauli	2	2		2	
15.	Chhipagadi	2	2		2	
16.	Budhuwa ••	3	2	1	3	
17.	Semari ••	6	4	2	6	
18.	Near Telephone Office of lumbini ••	2	2			2
19.	LCS (dike E) ••	6	4	2		6
20.	Ahirauli ••	2	2			2
21.	Khudabagar ••	6	4	2	6	
22.	Jogada ••	7	4	3	7	
23.	Marchwar taal ••	6	4	2	0	6
24.	Hamauli	2	2		2	
25.	Majhagawa	3	2	1	3	
26.	Bogadi	3	2	1	0	3

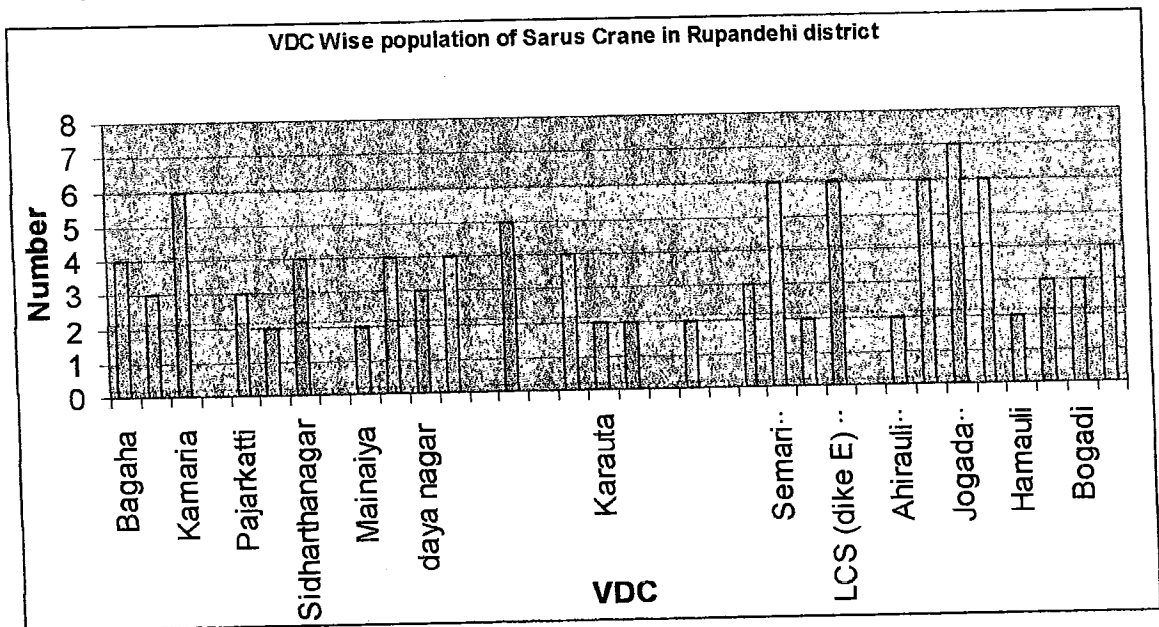
27.	Asuraina	4	2	2	4	0
Total		100	76	24	67	33

•• Data Provided by Lumbini Crane Sanctuary



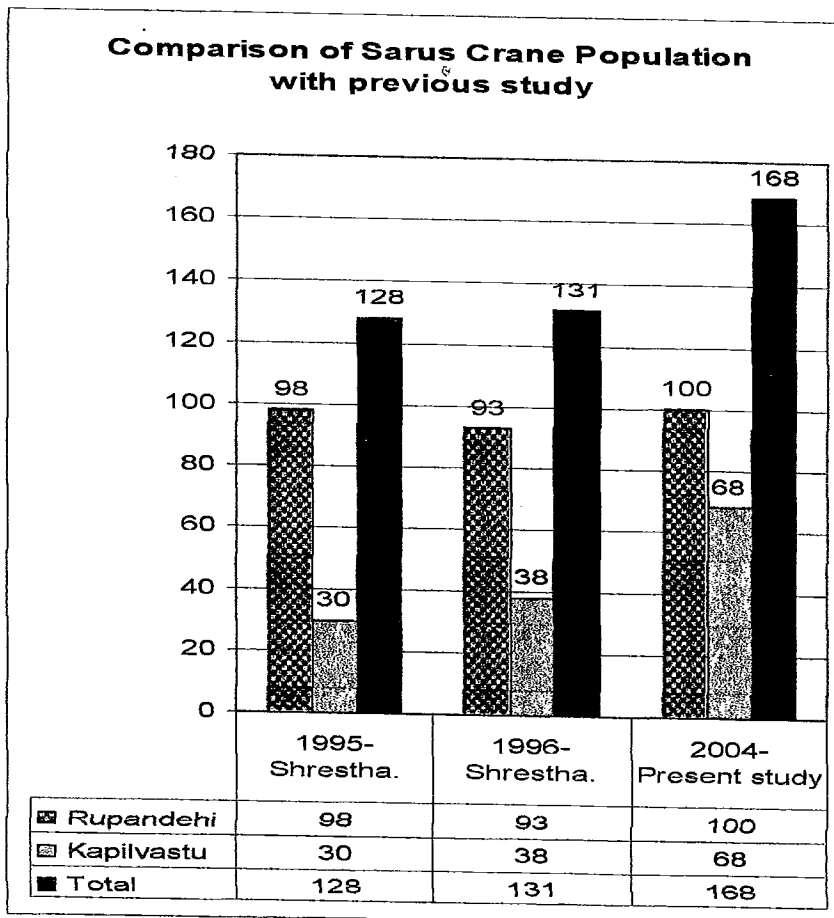
Rupandehi is one of the most important area for the Sarus Cranes population where 100 individual of Sarus Cranes were counted, out of them 76 were adults and 24 were Chicken. Population of Sarus Crane is high in this district which represents the largest population of Sarus Crane of the Country. Kamaria VDC, Masina VDC, Semari VDC, Jogada VDC, lumbini and Marchawar site provided good habitat for the population of Sarus Crane as

compare to other area of district, therefore, concentration of population of Sarus Crane is high in these area. There is an increasing threat to population of Sarus Crane due to the opening of more and more industries in this area. VDC wise Population of Sarus Crane in the Rupandehi district has been shown in the following figure:



5.2.3. Population Change:

Previous survey in 1995 and 1996 which was carried out by the Pratima Shrestha in Rupandehi and Kapilvastu district, she used transect line method for the counting only those accessible road where the vehicle could reach but present survey used direct observation method in its all potential and its presence area. She counted 98 and 93 individual in Rupandehi district and 30 and 38 individual in 1995 and 1996 respectively. She used only accessible road as a transect line at that time all VDC and area of district hadn't accessible road, therefore, that population of Sarus Crane was low count other than it realistic. Present survey show that the number of population is high than past survey because I carried out survey in all potential area of Sarus crane in both district, therefore, number of Sarus Crane showed high as previous study. But the population is decreasing as past which was proof by the social survey, Out of the respondents (N=86), 80.23% agreed that the population is declining gradually since last few year in the study area which has been described in detail in the Population trend title.



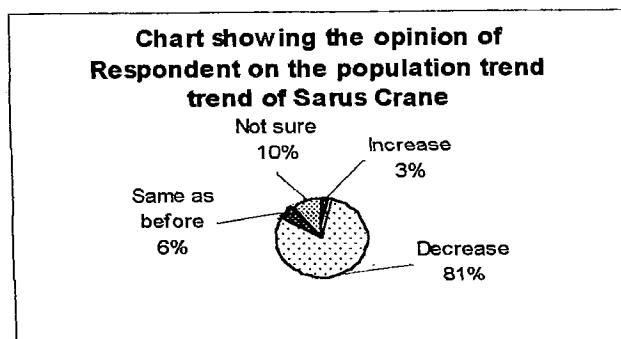
5.2.4. Population Trend:

Table: Opinion of villagers, naturalist and others respondents of study area (N= 86)

Opinion	Response	Percentage
Increase	3	3.48
Decrease	69	80.23
Same as before	5	5.82
Not sure	9	10.46

Table shows the opinion of villagers, naturalist and other respondents regarding the trend of Sarus Crane population in the study area. Most of the respondents indicated that the population of Sarus Crane was declining gradually. Out of the respondents (N=86), 80.23% agreed that the population is declining gradually since last few year, 10.46% indicated they were not quite sure and only 5.82% said that population was same as before. However, 3.48% agreed that the population is increasing gradually. These respondents from the Bithuwa VDC, Hatihawa VDC, Patariya of Kapilvastu, show that there is gradual increase in the number of Sarus Crane in that area than other area. 96% respondents from the Rupandehi district were agreed that there is declining of population of Sarus Crane in the district.

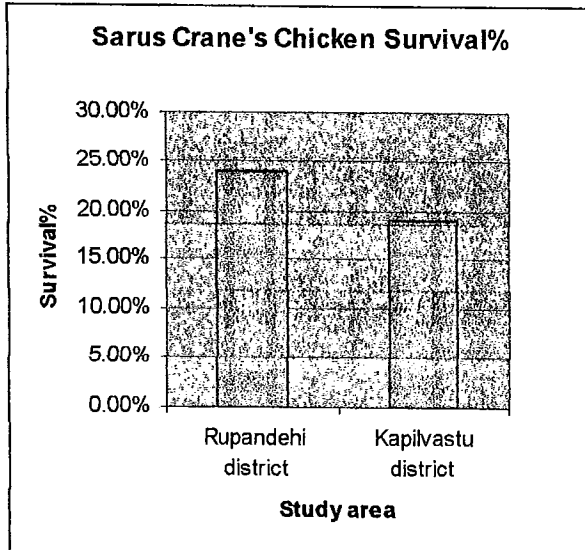
Many respondents blamed that the eggs chicken stealing, habitat destructions and human disturbance in its nesting area are the main cause of its population declining. Generally, Sarus Crane prefer their nest in the farmland (Paddy area), use rice crop for making nest and destroy the rice crop around their nest, due to this most of the farmer are angry with Sarus Crane and they destroy the Sarus Crane nest, as well as take eggs and chicken for food, they also kill the adult as well.



5.2.5. Chicken Survival:

A total of 37 chickens were counted in the study area out of 168 total population of Sarus crane. In Kapilvastu district 13 chicks were counted out of total 68 which showed that 19.11% chicken survived in this year. Similarly, 24 chickens were counted in Rupandehi district out of total 100 Sarus Cranes which showed that Chicken survival rate the Sarus Crane in the Rupandehi district is 24%.

In this way total survival % of chicken of Sarus Crane in study area is 22.02%. According to local people of study area, in this year the number of chicken were high as compared to the past year. It is so due to afraid of MAOIST. During the study period MAOIST activities was high in the both the study area. On interviewing with many adults and children who were previously involved in stealing of eggs and chicken and hunting of Sarus Crane, according to them, in this year they were not involved in the these activities because of afraid of MAOIST. They thought that if they killed Sarus Crane, their eggs and chicken, MAOIST would kill them. This may one of the reasons of Sarus Crane chicken survival % is high as compared to past year.



5.3. Habitats utilized by Sarus Crane in Study area:

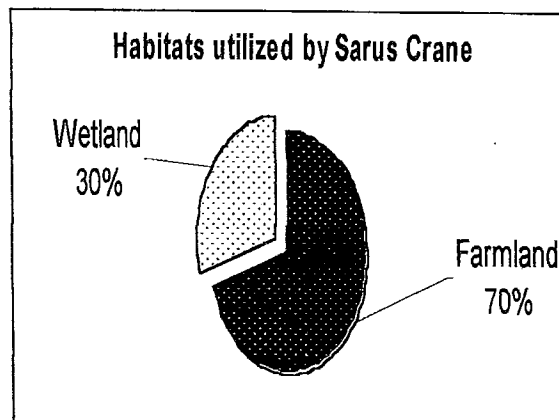
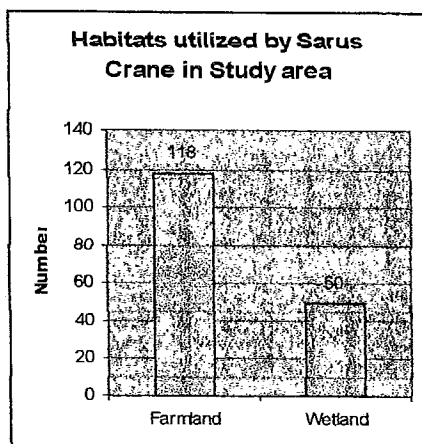
Total 118 Sarus Crane Counted in the farmland and Maximum of the Nest were show in the farmland where as the 50 were counted in the wetland in the Study area. Average area covered by the nest is 1.45 square meters and average height of nest is 20.3 centimeter and the nest height range from 45 cm to 12 cm. The mean depth of water around the nest



Nest with egg in wetland.

is 7.9 cm with maximum depth of 25 cm recorded with one egg at Maharajgaunj of Kapilvastu district.

The Choice of nesting material depends upon the vegetation around the nest. Hence, all nests in the paddy fields used rice plants; in the wetlands and pounds, *Eleocharis*, *Ipomea*, wild rice plants and other vegetation were appropriated and in the grasslands, nesting material consisted primarily of *Imperata grass*. The Plants were plucked from the roots (in the paddy field and wetland) and the grasses pulled out and piled into a mound. The shape of the nest is roughly circular to oval shape, with the mound in the center and a slight depression in the middle. In Kapilvastu district, I counted 51 Sarus Crane in the farmland and 17 in the wetland. And 67 Sarus Crane in the farmland and 33 in wetland in the Rupandehi district. The habitat used by the Sarus Crane is depending upon the food availability. Terai farmland is covered by paddy in June to October, this paddy lands support to survival of the fish, frog, snail and other insect which are the food of the Sarus crane as well as the rice crops itself provide the food for the Sarus Crane, therefore, the concentration of Sarus crane high in the farmland of study area during the June to November.



5.4. Current threats to Sarus Crane population and their habitats:

Wetlands through providing direct utility functions to humankind have attracted attention and like other ecosystems that have uses to humans, have suffered enormously under the pressure of the burgeoning human population. Pollution, overexploitation of biota (e.g. fish), overuse of habitat (e.g. for grazing), and drainage for urbanization and conversion to crop land are the major dangers being faced by wetlands of study area which is the major habitat of Sarus Crane. Wetland loss and degradation are the most significant threats to the Sarus crane in the study area. It is due to mainly expansion of agricultural production i.e. rice, use of pesticide/insecticide and chemical fertilizers and accelerated industrial development. Human population growth and intensified agricultural production also have indirect impacts on wetland habitat, including hydrological changes, high rate of sewage inflow, extensive agricultural runoff, and high levels of pesticide residues. These have significantly affected water and wetland quality in study area. In areas where the human population is particularly high, extreme levels of contact with people-in particular, disturbance of Cranes on their nesting territories may be contributing to low recruitment rates (Gole1989). Eggs and chicks are still stolen for food or for pets in study area. Current threats to Sarus crane population and their habitats in the study area are following:

5.4.1. Habitat loss and Degradation: habitat loss and degradation is the most important causes of threats to the population of Sarus Cranes. Declines in habitat availability and quality affect the distribution, movement, and breeding success of Cranes, and involve all habitat type- breeding grounds, migration stopover points and staging areas, wintering grounds, resident habitats, and roosting areas. Major forms of habitat loss and degradation affecting cranes include the following:

5.4.1.1. Conversion of wetlands: Most of the government wetlands of Study area is encroachment by local people for the cultivation of crop especially for the rice production. Also the public owner wetlands are converted in the agricultural land for the production of high quantity of the crop. Wetlands are being converted in non-agricultural purposes such as road construction. These were occurred in the Bithuwa VDC, Bahadurjung VDC, Ajingara VDC

Patraya VDC, Niglihawa VDC, Manpur VDC of Kapilvastu district. And Suryapur VDC, Kamaria VDC, Sadi VDC, Bishnupur VDC, Maryadpur VDC, Semari VDC of Rupandehi district of Nepal. Due to these activities, habitats have been becoming unsuitable for nesting, feeding, roosting for the Sarus Crane.

5.4.1.2. Over exploitation of wetland resources: The many people of the study area are dependent on wetland resources for their livelihoods. And the human population in the study area are also increasing year by year, therefore, the Sarus Crane population are facing negative impact due to overexploitation of the plants (water lily (*Nymphaea spp.*), water chestnut (*Trapa bispinosa*), makhan (*Eurale ferox*)), animal (i.e., fish, snail) and water resources of these wetlands. Poisoning fish and its over-exploitation from the wetlands is a serious problem for the wetland and Sarus Crane Conservation in the both district.

5.4.1.3. High electrical cable line: In Lawani VDC, Lumbini area, and other many VDC of both district, there are every year numbers of Sarus Crane died due to colliding in the electrical cable line. According to respondents, one Sarus Crane was died at Lawani VDC in August, 2003 due to colliding in the electrical cable line. Similarly, September, 2003, one paired died in Rupandehi municipality which was domesticated by owner of brick industries, in 2002 one pair were died in Patraya VDC. Surrounding the Lumbini area due to this reason Sarus Crane dies generally every year.

5.4.1.4. Sugar Cane Cultivation: Sugar Cane Cultivation is other serious problem of habitat destruction of Sarus Crane in the study area. There are two largest Sugar Cane processing factories in the Study area, one is in the Rupandehi municipality and other is in the Krishnagar site of Kapilvastu district. And one another Sugar Cane Factory is also running in the adjoin district of Rupandehi, i.e. Sunawal in Nawalparasi district. Therefore, these industries consume large

quantity of Sugar Cane as a raw material. They are encouraging to local people to cultivate Sugar Cane, large number of farmer are involving in Sugar Cane cultivation in the farmland. Cultivation of Sugar Cane in the Krishnagar site is high and most of farmland converted into the Sugar cane cultivation land. Similar problem can situation in Rupandehi and Nawalparasi district. Sugar Cane cultivation field is not suitable for the Sarus Crane habitat; therefore, in the krishanagar site there haven't been seen residential Sarus Cranes since 5 years. So the Sugar Cane cultivation is one of the habitat destruction of Sarus Crane in the study area.

5.4.1.5. Development activities and Urban expansion: Agricultural field of the both district has been conversion into village settlements, housing, industrialization and other developments activities (i.e. the highway construction), such activities through out the study area is caused the disturbance to Sarus Crane population and their activities.

5.4.1.6. Dams & Cementation in water Canal: For the irrigation of the agricultural land the department of irrigation, and other INGOs and NGOs are involving in the Construction of Dams and Cementation of water Canal to reduce water linkage. There were open canal system in the past that support survival of wetland flora and fauna in the both side of the canal that open canal were generally used by Sarus Crane for feeding but now these canal are converted into cementation and prevent to leak water out side the Canal therefore, it is threats to wetland species as well as the Sarus Crane habitat.

5.4.1.7. Pollution/ Insecticide, pesticide and Chemical fertilizer and Environmental Contamination: Farmers of both districts are using large quantity of chemical fertilizer, insecticide and pesticide for the high quantity and quality of crop production. These activities are directly affected to the Sarus Crane and the other species of surrounding. Some of pesticide are Malathin, Gamoxin, Metacid, Thaiden, etc. some chemical fertilizers are Urea, potash, Dai, DAP are

currently using by farmers. These types of pesticide/insecticide and the Chemical fertilizer directly kill and reduce the number of small animal and plant that are the food of other birds and animal, these directly effects on the Sarus Crane physiology, reproduction success and food sources. Those 90% farmer don't know its side effects. Other serious problem is the discharge of Industrial wastage. More than 150 large and small industries are present in the Both district (DDC, 1999), Paper Mills, triveni distillery, Resin and tapping industry, Sugar mill and brick industries are the major responsible for the polluting river and air of the study area. They dispose their untreated chemical wastes directly to the river. Dano river, Tinau river, Badganges and others small rivers are facing similar problem. Aquatic lives, some dependent birds (Cranes, Stork, Ibises etc) even cattle and locals have adversely been affected from such polluted water. More than 30 cattle were died of drinking polluted water from Dano River (Suwal, 2003). Therefore, these all activities are also responsible for the declining the number of Sarus Crane.

5.5.2. Direct exploitation:

Sarus Cranes population is threats due to hunting, stealing of eggs and chicken. Stealing of eggs and chicken are done by children more as compare to adults, these activities are high in Kapilvastu district as compare to Rupandehi district. In the Kapilvastu district, Islam (Muslim) people are more than Rupandehi district so that the stealing of eggs and chicken and hunting of the Sarus Crane is high in Kapilvastu district and they aren't know it important; it is done so for the food. Generally Hindu society believes that if the Sarus Crane comes in the farm field crop production become high. Therefore, they are not involves in the killing of it but not all Hindu people of districts, some Hindu people are also involves in these activities. In the lumbini area, there was reported that egg of Sarus crane was eaten by python, and Blue bull and other grazing animal destroy eggs also (Trampling effect).

5.5.1. Other anthropogenic threats:

Interference or disturbance by people can be an indirect cause of reproductive failure and mortality in Sarus Cranes. Such interference can occur in any phase of the Cranes life cycles, but is most critical during the breeding season, when adults are establishing territories and nesting birds and young are most vulnerable (Winter1991). Encroachment upon or disturbance of crane nests renders eggs and young birds more vulnerable to predation.

I used my questionnaire survey to 86 respondents, 93% of respondents are not know its legal status, its conservation status and its importance. And they are not interested to conservation of its. Therefore, public awareness is must necessary to conserve the Sarus Crane in the both districts of Nepal.

Chapter Six: Conclusion & Recommendation

6.1. Conclusion:

1. Total 168 Sarus Crane individual were counted in both district. Out of them 68 Sarus Crane were counted in Kapilvastu district and 100 Sarus Crane were counted in the Rupandehi district.
2. Population density of Sarus Crane in Rupandehi district is 0.1152 Crane per km² and in Kapilvastu district Population density of Sarus Crane is 0.0725 Crane per km².
3. Distribution of Sarus Crane is up to adjoin eastern district of Rupandehi, i.e. Nawalparasi district.
4. Population of Sarus Crane is declining from the both district. Rate of population declining from Rupandehi is high as compare to Kapilvastu district, but hunting, stealing of eggs and chicken is high in the Kapilvastu district.
5. Concentration of Sarus Crane Population high is the adjoin boundary of Rupandehi and Kapilvastu district and Marchawar site.
6. Major threats of Sarus Crane in the study area are use of insecticides/pesticide and chemical fertilizer, conversion of wetland into farmlands and development activities, Hunting, stealing of eggs and chicken, colliding with high electrical lines, lack of awareness.
7. Sarus Crane is one of the globally threatened birds which found out side the protected area of Nepal, there is lack of effective legislation and conservation administration and the legal and political framework to support conservation is weak.

6.2. Recommendations:

1. Sarus Crane Conservation Awareness programme should be conducted in the both district for students, farmer and hunter etc. Conservation awareness programme first there should be carried to the Muslim Society's areas of both districts then other places for its conservation.
2. Restoration and management of the existing wetlands of both districts are required in order to provide habitat for Sarus Cranes.
3. Use of Insecticide/pesticide and chemical fertilizer is high in farmland of both district, in order to reduce use of these materials promotion of the knowledge of biological controllers and expanding native composting techniques for organic farming is needed.
4. Sarus Crane Management action Plan and integrate conservation programmes are required to proper conservation of Sarus Crane in the study area.
5. The Nepal Electricity Authority should put visual markers in their 132 kV and 11 kV transmission cable to avoid bird collision.
6. Suddenly, adjoining area of both districts up to lumbini of Rupandehi district, up to Taulihawa municipality area of Kapilvastu and Marchawar site of the Rupandehi district should be made the Sarus Crane Conservation Area of Nepal. Government of Nepal and other INGOs, NGOs should launch the integrated Conservation programmes for the Sarus Crane Conservation. And the hunting, stealing of eggs and chicken control through effective execution of legal provision by Government of Nepal and awareness programme.
7. Captive Propagation should be carried out within the Lumbini Crane Sanctuary and initiate to re-establish a population in their former range such as Koshi Tapu Wildlife Reserve and other Terai district of Nepal where the habitat is suitable for the Sarus crane.
8. There should be construction wetland to provide additional habitat for Sarus Cranes, and control to wetland from sedimentation in both district.

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Appendix:1

Habitat and status Survey form for Sarus Crane

1. Site Code: Time: Weather: Date:
2. Physical Parameter:
Altitude: Latitude: longitude:
Aspect:
3. Water source: River P/T....Stream P/T....Pound P/T.... Spring P/T...Ditches
P/T.... Other..... Distance bet. water sources..... direction:
4. Wetland Condition: Fair...../good...../ Poor.....
5. Habitat/Vegetation types:
Barren..... Forest..... Shrubland..... Grassland..... other specify.....
Agriculture land..... Private land Government land.....
Crown cover: 0-25%..... 25-50%.....50-75%.....75-100%.....
Land feature: Rolling terrain..... Bowl..... Summit or top..... Broken
terrain.... Stream bed.... Swampy/marsy.... Level ground.....
6. Types of Human impacts: Hunting/snaring .../Trail...../Firewood collection.../
Fodder collection...../Leaf litter/forest residue collection...../NTFP collection.../
Encroachment of land...../
7. Grazing Pressure: Light...../Medium...../Heavy...../
8. Livestock Types: Cow/Buffalo.... Goat...../ others...../
9. Trails: Human trails.... Trekking routes.....Grazing trails.....other....
10. Wild animal impact: Trampling..... other impact
11. Human settlements around site and distance. Permanent.... Temporary.....
Distance.....
12. Level of human impact: None... some..... much..... Others.....
13. Complete wilderness: Yes/ No Others.....
14. Threats points of its habitat:.....
15. Major disturbance of Sarus Crane.....

16. Sign/observation of other animal/birds

Animal	Animal	Birds	Birds

17. List of Vegetation/NTFP in each habitat:

Comments or Notes:

Appendix:2

Interview form for Sarus Crane:

1. Respondents/Name: _____ Age: _____ VDC/village/district:.....
2. Occupation:.....
3. Information Based on Sarus Crane:.....
 - ◆ Do You know Sarus Crane?... Y/N.....
 - ◆ Have you seen the Sarus Crane?
 - Where.....
 - How many.....
 - When.....
4. Do you know about traded of Sarus Crane ?
Which part- eggs...../body.....live/Death.....
5. Do you know about it population trend increase or decrease or same in recent year?
If Increase : previous.....recent.....Decrease: previous..... recent....
6. What is your opinion about Sarus Crane? Good /Bad
Why.....
7. Do you know Sarus are being killed by human/animal in your area?
If yes.....
By Whom-
Why-
8. Does it damage the agriculture crops? If yes
which crop:.....when..... how.....
10. Do you need compensation when Crane damage your Crop? Y/N. if Yes what
Type of Compensations
11. Where is it live in your VDC ? Farmland..... Shrub land.....
12. Do you look it nest in your VDC ? Y/ N . if Y. When Where
13. Does it Come in your VDC ? Regularly or sometime. When.....
14. Do you know its legal status?.....

15. Do you know any INGO or NGO are working for the it's Conservation?
16. What types of pesticides/ fertilizer used by farmer quantity.....
17. In your opinion what is it's threaten causes.....
18. Do you have any idea for good management of it ?.....
19. Other residing wildlife or birds

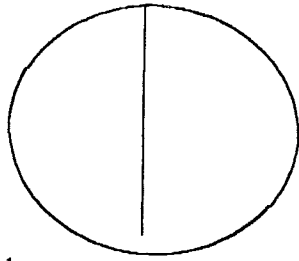
Comments or notes:

Appendices: 3

Population count during the direct observation for Sarus Crane:

Site Code..... Time:..... Date:
 Species.....:
 Number:.....
 General topography:.....
 Temperature:.....
 Weather:.....
 Wind:.....
 Precipitation:.....
 Condition: Resting Flying:.....

If flying in which direction:.....

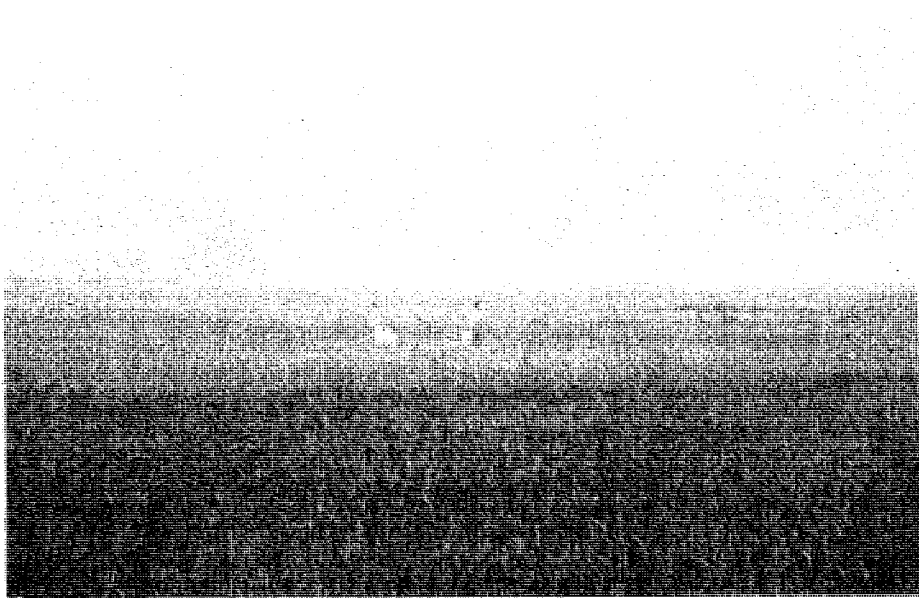


Associated birds/animals:

Comments or note:



pair of Sarus crane in LDT Rupandhi district



pair of Sarus crane in Masina VDC of Rupandhi district.



Showing Sarus crane nest. at Kapilvastu district



Researcher in Jagdishpur reservoir at Kapilvastu district.