SARUS CRANE CONSERVATION ACTION PLAN (2021-2025)

Government of Nepal
Ministry of Forests and Environment

Department of Forests and Soil Conservation
Babarmahal, Kathmandu

Department of National Parks and Wildlife Conservation
Babarmahal, Kathmandu

July 2021

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Government of Nepal
Ministry of Forests and Environment
Department of National Parks and Wildlife Conservation

Date: 4 July 2021

Foreword

Nepal Biodiversity Strategy and Action Plan (NBSAP) has envisioned to formulate the conservation action plans of various endangered wildlife species. Sarus Crane is globally and nationally threatened species. It is listed in schedule-I of National Parks and Wildlife Conservation Act, 1973 and is included in Appendix-II of Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). It is flagship species of agro-ecosystem in Nepal. Despite being a protected species, it has received least priority in conservation as it mainly inhabit in farmland and wetland that lies outside protected areas. Its population is threatened due to the degradation of wetlands, disturbances to nests by farmers, illegal eggs collection, electrocution, over use of chemical fertilizer and pesticides.

The government of Nepal has produced this first Sarus Crane Conservation Action Plan (2021-2025) with the main purpose to conserve the Sarus Crane population and associated habitat in Nepal. It also identifies existing and emerging threats for the conservation of the species and prioritizes immediate actions needed to address those threats. This plan focuses on enhancing the understanding and knowledge of conservation status, ecology, and habitat dynamics of Sarus Crane. It also designs the action for restoration of the critical habitat of Sarus Crane and rational management of agro-ecosystem. This plan will guide all stakeholders to work on common platform for conservation of this species.

I am thankful to the technical team of the Department of National Parks and Wildlife Conservation, team of consultant and reviewers for formulating this action plan. I would especially like to extend my gratitude to Mr. Man Mohan Chaudhary, Mayer of Lumbini Cultural Municipality; Mr. Venerable Metteyya Sakyaputta, Vice-Chairman of Lumbini Development Trust; and Mr. Arjun Kurmi, local conservationist from Lumbini Area for their support during plan preparation. I would like to greatly acknowledge the contribution of local government, conservation partners, local communities, academia, NGOs for their commitment for the successful implementation of this action plan. I am hopeful effective implementation of this action plan will contributes to halt the declining population of Sarus Crane and restore its habitat through collaborative effort.

4 July 2021

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Department of Forests and Soil Conservation
Babarmahal, Kathmandu

Date: 4 July 2021

Foreword

Nepal's bird diversity is astonishing considering its small size. Nepal has made good progress in species focused conservation by preparing and implementing species conservation action plans, many species are yet to be included in the process. Sarus Crane is culturally entrenched, charismatic, and tallest flying bird resident to agricultural field and wetland of central and western Tarai in Nepal. This species is listed in schedule-1 of National Parks and Wildlife Conservation Act, 1973 and Appendix-II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

Sarus Crane is inhabitant of wetland, agricultural field and marginal land. Wetlands have been lost and degraded due to agricultural expansion, industrial development, invasion of alien invasive species, and pollution. The rivers are polluted with sewage, garbage and chemical effluents coming from industries and urban centers. Land plotting and mining of river bed materials further endangering to its habitat. Electrocollision, Electrocution, poisoning, and illegal eggs collection are another threats for conservation of this species. Cattle grazing or trampling destroys Sarus Crane's eggs and nests. So, realizing these facts of threat to the Sarus Crane, the Government of Nepal has produced this first Sarus Crane Conservation Action Plan (2021-2025) for the conservation of this species.

This Conservation Action Plan aims to conserve Sarus Crane population against continuing and emerging threats and recuperate its habitat. It also focuses to enhance the understanding and knowledge on conservation status, ecology and habitat dynamics of this species. This plan also highlights to strengthen cooperation and coordination on Sarus Crane conservation at the national and international level.

I am confident that the implementation of this action plan will contribute in conserving and managing Sarus Crane and their habitat and wish all success to ensure that Sarus Crane population remain secure against emerging threats in Nepal.

With great appreciation, I would like to extend my sincere thanks to the technical team of the Department of National Parks and Wildlife Conservation for preparing this Conservation Action Plan. The Government of Nepal greatly acknowledges the contribution of wildlife conservation partners, local communities, academia, and expects their continuous support and commitment for the successful implementation of this plan.

04/July/2021

Man Bahadur Khadka
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Contents

Abbreviations and Acronyms

BCN	Bird Conservation Nepal
CBOs	Community Based Organizations
CFUGs	Community Forest User Groups
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMS	Convention on Migratory Species
DNPWC	Department of National Parks and Wildlife Conservation
DoA	Department of Agriculture
DoFSC	Department of Forests and Soil Conservation
GoN	Government of Nepal
IBA	Important Bird Area
IUCN	International Union for Conservation of Nature and Natural Resources
MoFE	Ministry of Forests and Environment
NGOs	Non Government Organizations
NPWC	National Parks and Wildlife Conservation
NTNC	National Trust for Nature Conservation
PAs	Protected Areas
TU	Tribhuvan University
WHO	World Health Organization
WWF	World Wildlife Fund
ZSL	Zoological Society of London


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Executive Summary

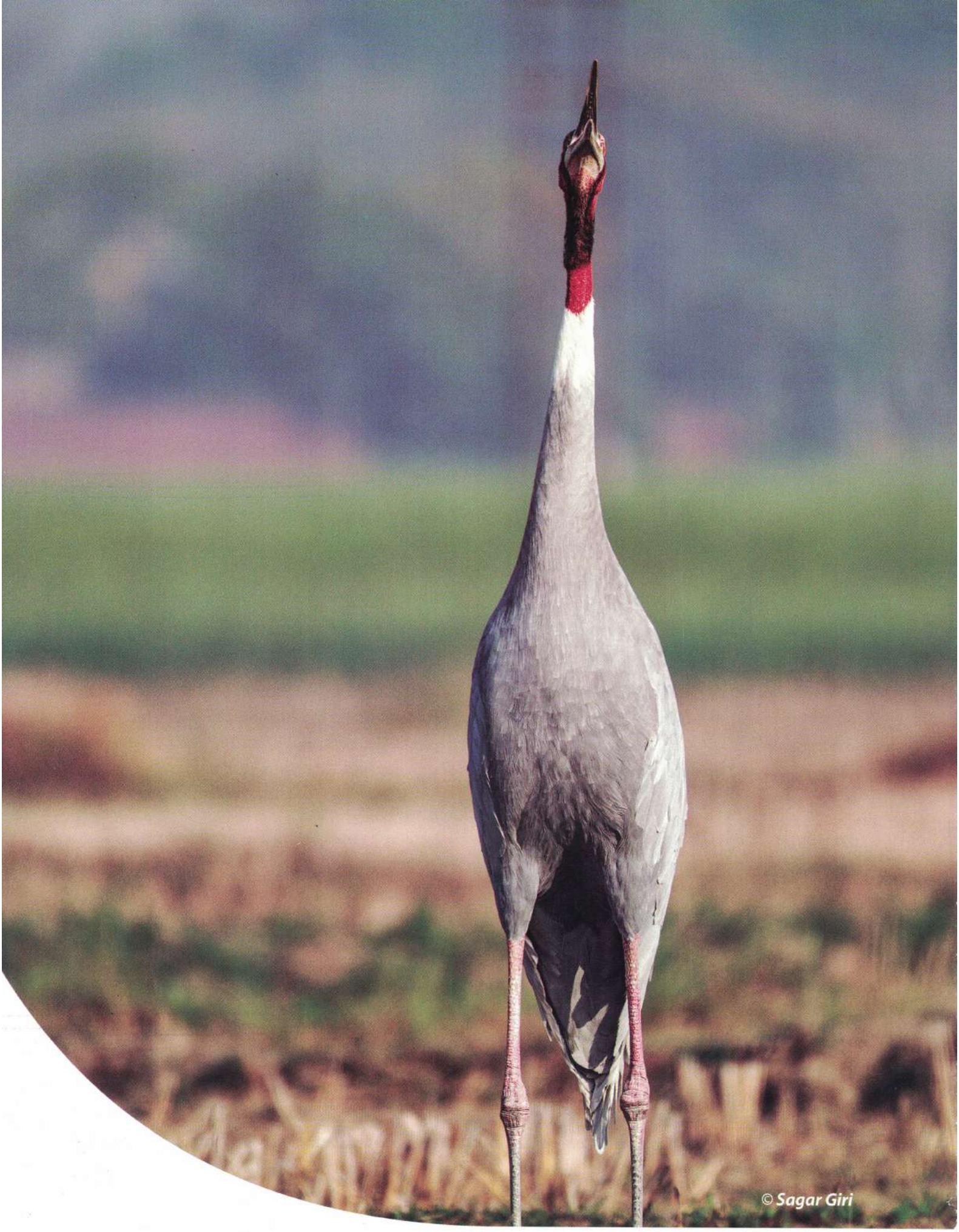
Sarus Crane is the tallest flying bird of the world. Globally, there are three disjunct populations that are sometimes treated as subspecies of *Antigone antigone* (Synonym *Grus antigone*). They are *Antigone antigone antigone* distributed in Indian subcontinent, *Antigone antigone sharpii* distributed in South-East Asia and *Antigone antigone gillae* is distributed in Northern Australia. Historically, *Antigone antigone antigone* was widely distributed in lowlands of Nepal from east to west; however, at present it has been confined within nine districts of Central and Western Nepal.

Both International Union for Conservation of Nature and Natural Resources (IUCN) Red List and the National Red List of Birds of Nepal have recorded its status to be vulnerable. It has been listed in appendix-II of both Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and Convention on Migratory Species (CMS). The government of Nepal has given special focus for its conservation by enlisting in schedule-1 of National Parks and Wildlife Conservation Act, 1973.

Conversion of agricultural land and wetland into other land use type, grazing, land plotting, mining, excessive use of chemical fertilizer and pesticides, industrial pollution, electrocollision and electrocution, intentional and unintentional poisoning, egg collection and nests destruction are the major threats for the conservation of Sarus Crane in Nepal. Prevalence of all these threats is site specific. The conservation of this charismatic and culturally embedded bird in Nepal depends upon the degree of these threats addressed in near future.

The conservation action plan has been formulated with the goal to conserve Sarus Crane and its associated habitat in Nepal. Action plan sets the objective to increase knowledge base and understanding, maintain and enhance population of Sarus Crane, increase awareness to local people and stakeholders, and involve all relevant stakeholders at local, provincial, national and international level for the conservation of this species. Each objective is further detailed out with actions and expected outputs.

Department of National Parks and Wildlife Conservation (DNPWC) and Department of Forests and Soil Conservation (DoFSC) will coordinate with different stakeholders including Department of Agriculture (DoA), and conservation partners to ensure the effective implementation of this action plan at national level. At provincial level, Ministry of Industry, Tourism, Forests and Environment and Ministry of Land Management, Agriculture and Cooperatives will have an important role in the implementation of this action plan incorporating proposed actions in program and activities of Division Forest Office and other stakeholders. Further, this action plan guides local government for the implementation of site specific program in coordination with Community Forest User Groups (CFUGs), Non-Governmental Organizations, and Community Based Organizations (CBOs). The total estimated cost for the five years plan is NPR 125,735,000.00.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Chapter 1

Introduction

1.1 Relevance of Action Plan

Sarus Crane *Grus aantigone antigone (Linnaeus, 1758),* the tallest flying bird in the world, is a local resident bird in central and western Tarai belts of Nepal. Government of Nepal (GoN) has been focusing on flagship species conservation at landscape level. National Biodiversity Strategy and Action Plan (NBSAP 2014-2020) of Nepal also targeted for preparation of species conservation action plan for long-term conservation of threatened species. Site specific conservation program were implemented by government agencies, CBOs and NGOs for the conservation of Sarus Crane in scattered manner and ad-hoc premises. Nonetheless, these efforts are insufficient to ensure the conservation and long term survival of this species. Planned and coordinated efforts are imperative at local, provincial, national, and landscape levels. This conservation action plan has been formulated to fulfill this gap and guides the conservation policy and program and their effective implementation.

1.2 Action Plan Development Process

The GoN allocated the program and budget for preparation of conservation action plan. The technical committee under the Department of National Parks and Wildlife Conservation (DNPWC) representing official from the Department of Forests and Soil Conservation (DoFSC), National Trust for Nature Conservation (NTNC), World Wide Fund for Nature (WWF), Nepal and Zoological Society of London (ZSL) Nepal recommended preparation of conservation action plan for Sarus Crane. Based on this recommendation, a meeting headed by the Director-General of DNPWC decided to prepare a conservation action plan of Sarus Crane. Then, DNPWC prepared and approved the Terms of Reference (ToR) for the consulting services and designate the consultant.

The consultant team prepared a draft of conservation action plan based on literature review, focus group discussions, interviews, field visit, and consultation meetings at local, province and central level. During the plan preparation process, local level of Rupandehi and Kapilvastu districts including Lumbini Cultural Municipality were duly consulted. Other institutions and NGOs likewise Lumbini Social Service Foundation, Lumbini Crane Sanctuary, Lumbini Development Trust were consulted by team of consultant. It was followed by consultation with DFOs, provincial line ministry, Ministry of Industry, Tourism, Foresst and Environment (MoITFE), Ministry of Land Management, Agriculture and Cooperatives (MoLMAC), Provincial Forest Directorate (PFD) of Lumbini Province. Central level workshop involving the representatives of MoFE, DNPWC, DoFSC, DoA, NTNC, WWF, ZSL, TU and other stakeholder was held in Kathmandu to collect issues related to Sarus Crane conservation.

The draft of conservation action plan was shared to the technical committee and team of expert designated by DNPWC for review. Comments and feedbacks from the technical committee and reviewer were incorporated and the plan was finalized.

1.3 Scope of the Action Plan

This action plan has been guided by the National Biodiversity Strategy and Action Plan (2014-2020), National Forest Policy (2018), National Agro-biodiversity Policy (2007), National Wetland Policy (2012), National Ramsar Strategy and Action Plan, Nepal (2018-2024), National Parks and Wildlife Conservation Act (1973), Forest Act (2019). This action plan is the first guiding document of GoN to save the globally threatened and nationally protected Sarus Crane in Nepal.

From the beginning, the planning process has brought all stakeholders together in one platform. It incorporates socio-cultural, economic and ecological values of Sarus Crane. It provides sightsaw about threats, challenges and conservation efforts related to the species. It provides guidelines for national governmental agencies, local and provincial governments, I/NGOs, and other relevant conservation partners to move in comprehensive and collaborative way for the achievement of planned common goal and objectives for the long-term conservation of Sarus Crane in Nepal. The effective implementation of this action plan with adequate resource allocation will ensure not only the conservation of Sarus Crane but also other threatened flora and fauna of wetland and agricultural ecosystems.

Chapter

2 Background

2.1 General Introduction

Sarus Crane, the tallest of the flying birds, standing at a height up to 1.8 m, 240 cm wing span and weighing 6.8–12.24 kg (Archibald et al. 2003) is a conspicuous species of open wetlands in South Asia, seasonally flooded *Dipterocarp* forests in Southeast Asia, and Eucalyptus-dominated woodlands and grasslands in Australia. It is distinct in appearance, with a red skin-covered head, throat and upper neck.

2.2 Taxonomy

Sarus Crane is a member of the order Gruiformes that consists of 143 bird species belonging to 12 families and 40 genera (Ripley and Beehler 1985). The Sarus Crane has geographically separate populations in southern Asia and Australia that are believed to be geographically allopatric and intraspecific variation within the species has been the subject of ongoing debate (Nevard et al. 2020). Blyth and Tegetmeier (1881) had first reported the Indian and Myanmar's population as distinct species, based on plumage (the Indian Sarus Crane has a white upper neck and tertials) and body size. Sharpe (1894) retained this distinction but shortly afterwards Blanford (1895) combined them into one species with two subspecies, *Grus antigone antigone and Grus antigone sharpie* respectively, a classification which has since endured. Sarus Cranes were observed in Australia in 1966 (Gill 1967) and placed in *A. a. sharpie* but were subsequently described by Schodde (1988) as a new subspecies *G. a. gillae*, on the basis of distinct plumage and a larger ear patch. The systematic classification of Sarus Crane found in Nepal is as follow:

Kingdom:	**Animalia**
Phylum:	**Chordata**
Class:	**Aves**
Order:	**Gruiformes**
Family:	**Gruidae**
Genus:	***Grus***
Species:	***antigone***
Sub Species:	***antigone***
Local Name:	**Sarus, सारस**

2.3 Status and Distribution

2.3.1 Global

Globally, there are three disjunct populations that are sometimes treated as subspecies of *Antigone antigone* (Synonym *Grus antigone*). They are *A. a. antigone* distributed in Indian subcontinent (Southern Pakistan, Northern India, Nepal and Bangladesh); whereas *A. a. sharpii* is distributed in South-East Asia (Myanmar, Cambodia, S. Laos and S. Vietnam); the third one, *A. a. gillae* is located in Northern Australia (Archibald et al. 2016) with a total world population estimated at 13000 – 15000 matured individuals and occurs as an occasional vagrant species in Bangladesh (BirdLife International 2016). It is estimated to be 8,000-10,000 individuals in India, Nepal and Pakistan; 800-1,000 in Cambodia, Laos and Vietnam, 500-800 in Myanmar, and about 10,000 breeding adults of Sarus Crane in Australia (BirdLife International 2016).

In the Indian subcontinent its range has contracted towards the north and west of the Subcontinent (Sundar et al. 2000) and its population is considered to be in decline (Archibald et al. 2003). Subspecies *sharpii* occurs in South-East Asia where its range has declined dramatically, now being confined to Cambodia, extreme southern Laos, south Vietnam and Myanmar (Wetlands International 2006). Despite past declines, recent counts have shown some increase in the South-East Asian population, however Population Viability Analysis of cranes in Tram Chin shows the population is highly unstable and prone to extinction if current rates of habitat degradation continue (Archibald et al. 2003). The Australian population (*gilliae*) is confined to the north and east of the country (Garnett and Crowley 2000). It has been extinct in Thailand, Malaysia, the Philippines and probably China.

2.3.2 National

In Nepal, Sarus Crane occurs frequently within the altitudinal range between 150 – 300m (Inskipp et al. 2016). However, it has been recorded vagrantly up to the elevation of 545m (Khanal 2019). In the past, Sarus Crane was distributed in the entire lowlands from east to west; however, at present, its distribution is recorded only from central to western Nepal (Baral 2009, Inskipp et al. 2016). The first Nepal record of the species was in 1877 when it was found to be common in the central Terai (Scully 1879). In 1992, a Terai survey of the species showed that its distributional range stretched from Shuklaphanta National Park in the far west to Chitwan National Park (Suwal and Shrestha 1992) in the east. At present the farmlands of Rupandehi and Kapilvastu Districts is the major habitat area where it breeds regularly (Aryal et al. 2009, Inskipp et al. 2016, Katuwal 2016). The sighting of Sarus Crane within the protected areas system of Nepal is rare (Khanal 2019) and there is an occasional record from Shuklaphanta National Park, Bardia National Park, Banke National Park and Chitwan National Park areas.

The estimated total minimum and maximum population of Sarus Crane in Nepal is 450 to 700+ respectively (Inskipp et al. 2016). A survey of the species, carried out from October to December 2003, counted 76 adults and 23 immatures in Rupandehi District and 55 adults and 13 immatures in Kapilvastu District (Aryal 2004). A total of 62 distinct individuals was recorded in Kapilvastu District between 16-27 April 2007, with a flock of 23 in the Banganga R. grassland (Cox 2008). A 2009 survey of the farmlands of Lumbini IBA, which lies in Rupandehi and Kapilvastu Districts, found the species density was 0.516 cranes per km^2 and, based on this figure, the population was estimated to be 503.69 cranes (Paudel 2009). This density of Sarus Crane was found to be declined as compared to Suwal (1994) which had estimated

the density of Sarus Crane to be 0.6 per sq. km. The largest concentration of 104 birds was found at Dano River, Lumbini, Rupandehi District in April 2009 (Ramond and Giri 2009). Similarly, 11 individuals of Sarus Crane were observed in 2003 only three individuals were found in a survey carried out in 2010 at Suklaphanta National Park (Baral et al. 2012). Recent surveys have recorded greater numbers of the species, but this may be due to coverage of greater areas than previous studies, and better and more consistent effort in counting (Karmacharya et al. 2020). Similarly, a survey in 2014 counted 166 and 71 individuals in Rupandehi and Kapilvastu districts, respectively (DK Karmacharya in litt. 2015).

Other localities where it has been recorded include 11 in Beldandi area in April and May 2003 (Hem Subedi pers. comm.) and five there in October 2012 (Dutta Rana in litt. to HS Baral), and a pair bred near Kalikitch Tal in 2010 (Prakash Man Shrestha pers. comm.). Two were sighted at Badhaiya Tal, Bardia District in July 2011 (Ram Shahi pers. comm.); two at Nepalgunj, Banke District in August 2010 (Shahi 2010), 25 from July to September 2013 and December to January 2014 and two pairs successfully bred (photographed) at Nepalgunj in 2015 (Seejan Gyawali pers. comm.); also a flock of 27 in Bhagwanpur, Rupandehi District (Dikpal K. Karmacharya in litt. to C. Inskipp, May 2015). A pair of Sarus Crane was photographed in Motipur of Dang District on 15 August 2015 which was the first confirmed record of it from Dang (Khanal 2019).

In Kapilvastu District seven were seen in April 1993 (Baral 1993); the species was reported to regularly feed in fields adjacent to Khadara Phanta (Cox and Giri 2007). Sarus Crane has also been recorded at Jagdishpur Reservoir, (e.g. 11 December 2006 (Giri 2010), two in December 2007 (Shahi 2010) and eight in March 2008 (Giri 2010)). Four were seen in Pakadi and four in Nandanagar village of Rupandehi district in October 2014 (Dikpal K. Karmacharya in litt. to C. Inskipp 2015). In Nawalparasi District seven were sighted in Namuna Community Forest, Chitwan National Park buffer zone in January 2008 (Chaudhary 2010). The species was considered a vagrant to Chitwan National Park by Baral and Upadhyay (2006). One was seen at Tamar Tal in the park in 2011 and three near Dorangi village, Bacchauli VDC, in the buffer zone in June 2009 (Hem Subedi and Bishnu Mahato pers. comm.).

Recently initiated robust long-term monitoring in Rupandehi and Kapilvastu has shown the following attributes of the Sarus population, which require consideration prior to comparing counts from surveys directly (Inskipp et al. 2016): (i) roadside counts provide large variations seasonally, which are due to movements related to seasonal changes in water conditions, and not the population; (ii) numbers are lowest during the monsoon, which is the breeding season of the species; this is also the season when most previous counts have been conducted leading to greatly fluctuating numbers reflective of the Sarus' habit of hiding when with young chicks, and not a reflection of population changes; (iii) breeding success of residential pairs varies with rainfall each year, which in turn changes birds counted during the breeding season and the winter immediately afterwards; (iv) flocks of Sarus outside of summer months are non-breeding birds, with many being young from the previous year of breeding, and constitute >40% of the population – these numbers are a reflection of different breeding year, and not of changing populations. Following the uncharacteristically long rainfall in 2014, breeding success of Sarus Cranes was exceedingly high, providing over 700 birds during regular monitoring counts. Numbers have reduced in recent years reflecting the dispersal behavior of non-breeding Sarus Cranes.

Karmacharya et al. (2020b) predicted the distribution and abundance of Sarus Crane in entire tarai belt of Nepal based on available literature data, online presence only data and filed data since 2014 using the 81 predictors including bioclimatic variables. It has been reported that, higher congregation of Sarus Crane is in Lumbini area and most of the hot spots lies in the western side of southern Nepal but the model has predicted still existence of suitable potential niche for Sarus Crane in the eastern region as well.

2.4 Conservation Status

From the year 1994 to 1999 Sarus Crane was categorized as a lower risk/least concern species by the BirdLife International, the official IUCN Red List authority for birds. In the year 2000 it was evaluated as a vulnerable species due to its rapid population decline, which is projected to continue, as a result of widespread reductions in the extent and quality of its wetland habitats, exploitation and the effects of pollutants. And this evaluation is consistent from then to the last assessment made in the year 2016 (BirdLife International 2016). It has been listed in appendix-II of both CITES and CMS. It occurs many protected areas throughout its range, importantly in Ang Trapeang Thmor, Cambodia, and Tram Chim National Park, Vietnam, which seasonally support the majority of the Indochinese population (BirdLife International 2016). At present this is the only protected bird species of Nepal whose more than 90% country's population is outside protected area (Baral 2009).

2.5 Habitat and Ecology

2.5.1 Habitat

Sarus Crane is a local resident bird in central and western Tarai belts of Nepal managed for common use (Archibald et al. 2003 Sundar and Choudhury 2003). At one time, Sarus were considered as wetland cranes (Johnsgard, 1983). Later, this notion was modified based upon the observation that cranes were using agriculture fields as both nesting and foraging grounds (Sundar and Choudhury 2003). Vyas (2002) and Gole (1989) reported that the most favored habitat were wetlands (73- 85%) as compared to crop fields (27-15%). Sundar et al. (2000) reported that most of the Sarus Crane were seen in agricultural fields (53%) in both summer as well as winter in Utter Pradesh, India. However, recent studies in Utter Pradesh also showed that cranes are found mainly in wetlands (77%) than that of in the agriculture fields (14%) (Jha 2014). It had been reported that seasonal change affects population fluctuations of Sarus Crane (Mukherjee 1999).

2.5.2. Ecology

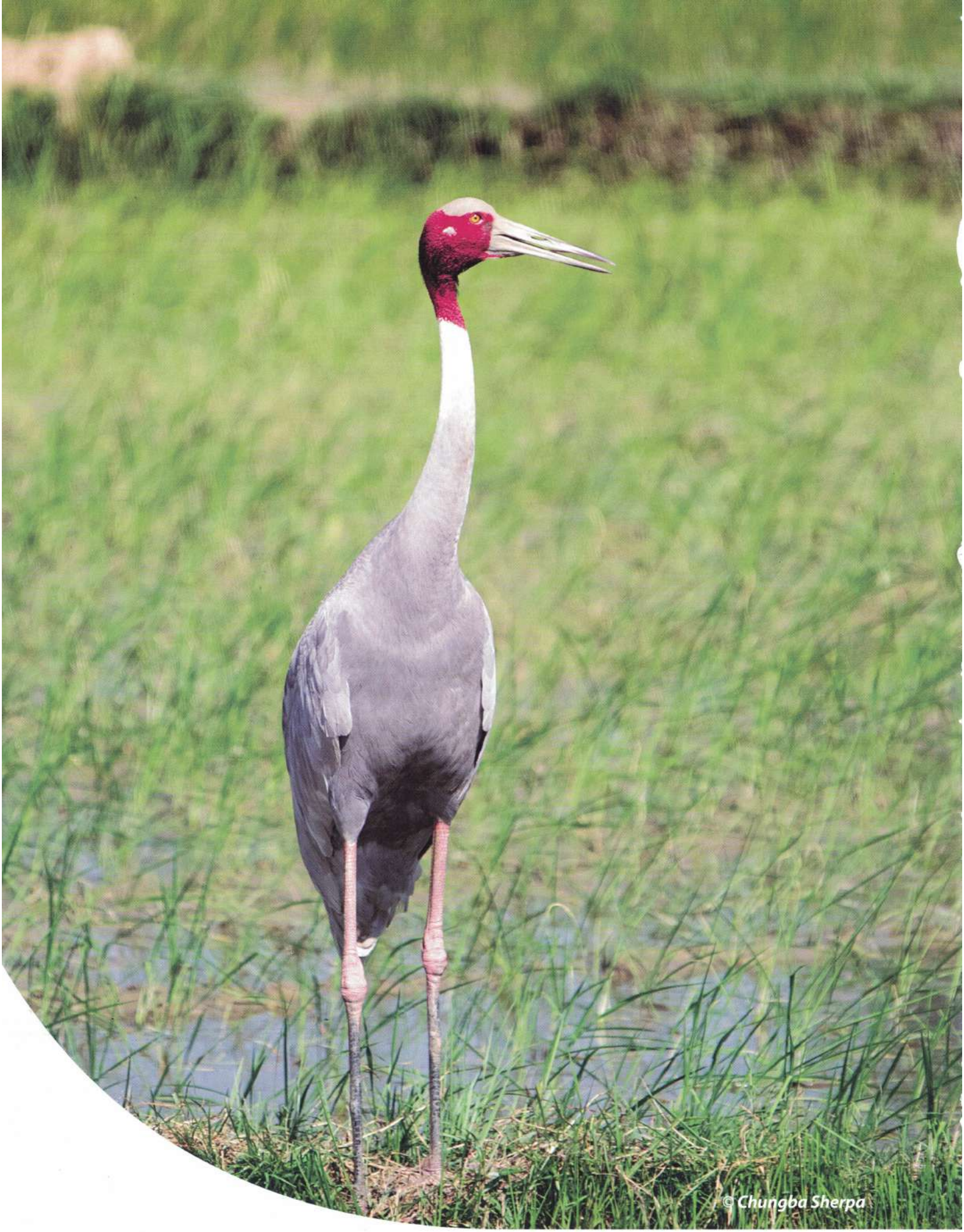
The Sarus Crane is a monogamous (Baral 2009), social and omnivorous bird that feeds on aquatic plants, seeds, roots, tubers, cereal crops, invertebrates, crustaceans, butterflies, insects pests, molluscan pests, fishes, frogs, occasionally water snakes and rarely eggs of birds and turtles (Chauhan and Andrews 2006, Johnsgard 1983, Sundar 2000, Verma et al. 2016). They forage on marshes and shallow wetlands usually with less than 30 cm depth of water or in fields, frequently probing in mud with their long bills. They roost in shallow water, where they feel safe from some ground predators (Johnsgard 1983). Adult birds do not moult their feathers annually, but feathers are replaced about once every two to three years. They are easily distinguished from other cranes by its contrasting red head and upper neck.

They form long-lasting pair bonds and maintain territories within which they perform territorial and courtship displays including loud trumpeting calls, leaps, and dancing movements. Their breeding season is during the rainy season. The pair builds an enormous nest "island," a circular platform of reeds and grasses nearly two meters in diameter and high enough to stay above the shallow water surrounding the nest in wet marshes or paddy fields (Borad et al. 2001). The clutch is one or two eggs rarely three (Sudar 2009) which are incubated by both sexes (Sundar and Choudhury 2005) for about 31 days (Sudar 2009). Eggs are chalky white and weigh about 240 grams (Johnsgard 1983). Most of the successful pairs raise one or two chicks rarely three. The chicks are fed by the parents for the few days, but are able to feed independently after that, and follow their parents for food (Lahiri 1995). The breeding pairs and successfully fledged juveniles depart from territories and join non-breeding flocks congregating in few remnant wetlands in the dry season. Non-breeding birds form flocks varying from 1–430 birds (Livesey 1937, (Prasad et al. 1993) Sundar and Choudhury 2003). They are largely non migratory, although some populations do migrate short distances. Migratory populations are also known from Southeast Asia and Australia (Archibald et al. 2003, Grant 2005). In captivity, Sarus Cranes have been known to live for as long as 42 years (Flower 1938, *Ricklefs 2000*).

2.6 Ecological and Socio-economic importance

They are the biological controller of insect and molluscan pests, hence, directly contribute to the agricultural productivity. It is believed that a plot of land where a Sarus Crane builds a nest produces higher crops due to the control upon agricultural pests (Karmacharya et al. 2020b). They are the symbol of marital fidelity and eternal unconditional love because it is widely believed that the Sarus Crane pairs for life and that death of one partner leads to the other pining to death due to sorrow and the tragedy (Kipling 1904).

They are the religious bird; the religious people believed that they carry the soul to the heaven after death of the people because of being tallest flying bird (Adesh and Amita 2017). According to the environmentally engaged Buddhists, there is also a close connection between Buddha and Sarus Cranes which states that, when the young prince Siddhartha was growing up he encountered a wounded crane, injured by a hunter's arrow. He removed the arrow and nursed the bird back to life. But Siddhartha's jealous cousin –Devadatta – eventually shot and claimed it as his own. These two boys argued, but the merciful Prince Siddhartha did not relinquish the bird. Finally, the case was adjudicated by a royal court judge who ruled that custody belongs to the one who saved the bird's life, not the hunter, which reflects the animal rights and conservation since those days (Karmacharya et al. 2020a). They are the source of inspiration, that inspired the poet Valmiki to write the epic Ramayana after he cursed a hunter for killing a Sarus Crane (Leslie 1998; Hammer 2009).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Chapter 3

Major Conservation Efforts and Achievement

3.1 Policy and Legislative Arrangements

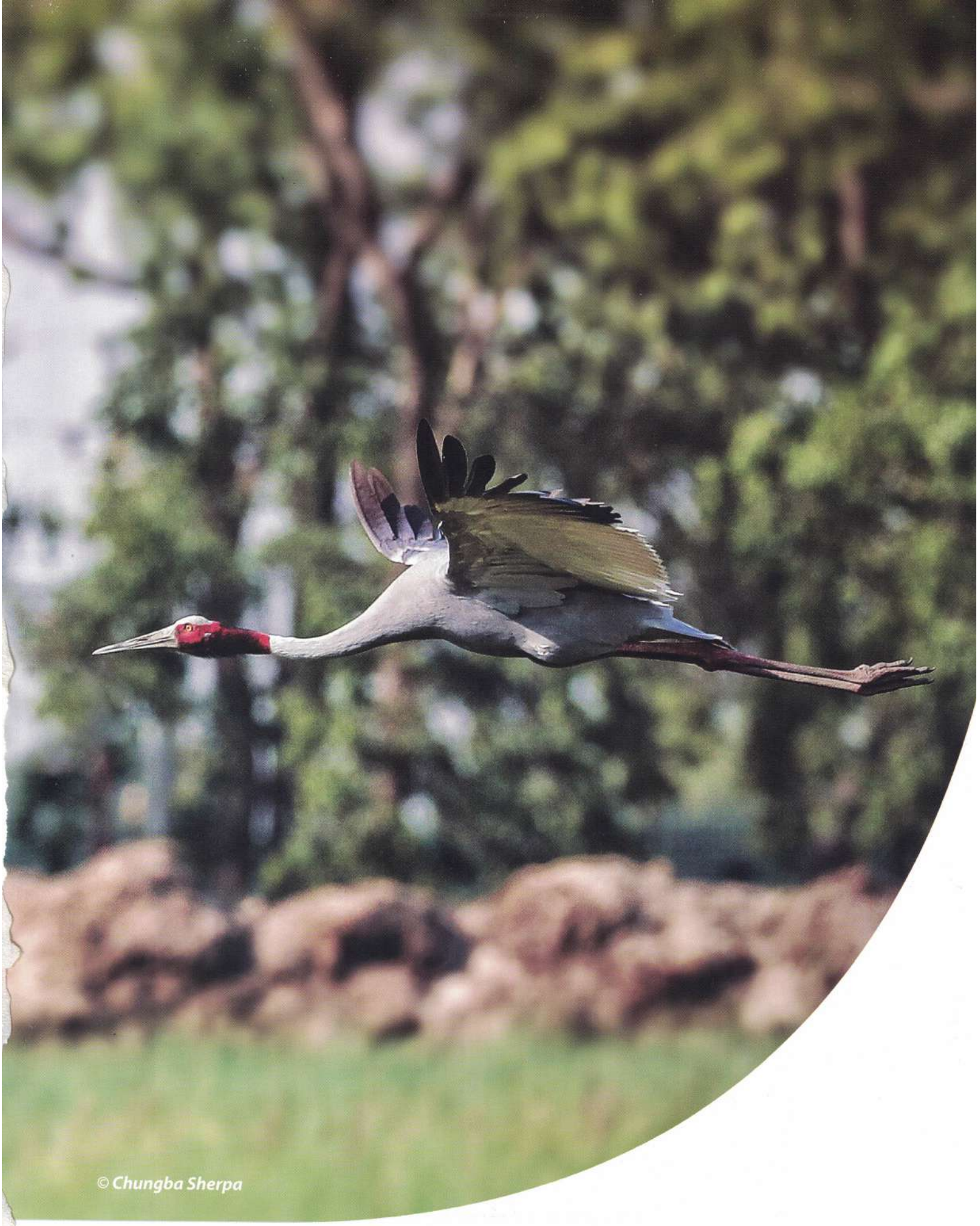
Sarus Crane is listed under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix-II imposing ban on international trade of Sarus Crane or their body parts. Nepal being a state member to this convention is implementing the provision of this convention by endorsing 'An Act to Regulate and Control International Trade in Endangered Wild Fauna and Flora, 2017'. National Biodiversity Strategy and Action Plan (2014-2020), Forest Policy (2018), National Agro-biodiversity Policy, 2007 have made the strong provision to conserve the wetland dependent species. Moreover, the National Parks and Wildlife Conservation Act (1973) has listed Sarus Crane as a protected species. The Aquatic Animal Protection Act (1961) prohibits the use of poison, toxic or explosive materials in a water source, or destroying dam or water system with the intent to catch or kill aquatic life. Thus, it is illegal to kill Sarus Crane or destroy/collect eggs to consume or for sale. The highest penalty for killing Sarus Crane is NRs 30, 000 fine and nine months of imprisonment as provisioned in NPWC act, 1973. In addition, Act on control of International Trade in Endangered Fauna and Flora, 2017 has made provisions maximum of five lakh to ten lakh NRs. fine and five to fifteen years of imprisonment if any person is convicted to a crime of Sarus Crane in Nepal.

Forest Act, 2076 (B.S) has made provision that the GoN shall protect, conserve, promote and manage wetlands in the national forest and ecological tourism development works may be carried out in the wetlands. Further the MoFE may declare any part of national forest of environmental, ecological, scientific or cultural importance which is necessary for the protection and management of the forests, vegetation and wildlife outside the protected area as the forest protection area. Act also made provision of armed forest guard service for the protection and promotion of the national forest and biological diversity, prevention of illicit hunting of wildlife and smuggling of forest products and guarding of the forest heritages.

3.2 Local conservation Interventions

Government of Nepal provided priority for conservation of Sarus Crane. By enlisting as protected species and supporting community outreach, programs conducted at local level by concerned stakeholders . Government has produced postal stamps. Lumbini Development Trust has leased an area of 265 acres for 50 years to the Lumbini Crane Sanctuary (LCS) in 1994 for restoration and conservation of Sarus Crane. The cranes only use the Sanctuary for nesting, and most leave the LCS to forage outside. Majority of Sarus Cranes occur outside the protected areas' system. Himalayan Nature and Bird Conservation Nepal have done some education and awareness programs in Lumbini farmlands which is an Important Bird Area (Baral and Inskipp 2005). Yearly, a transect survey along the east-west highway is conducted to monitor the important bird species including Sarus Crane.

Postal stamp with Sarus Crane image released by government of Nepal in 1996.



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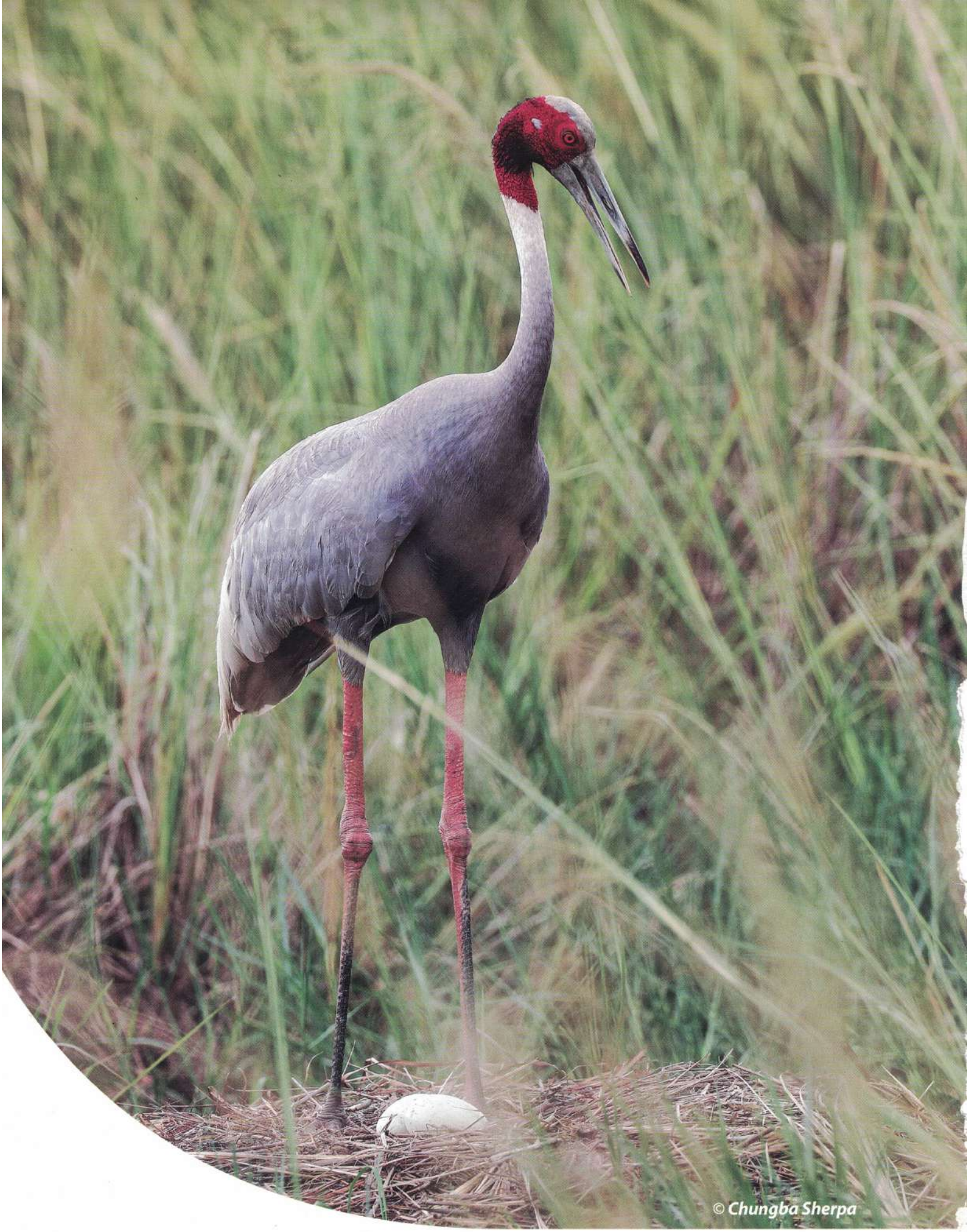
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Chapter 4

Conservation Threats

4.1 Conversion of Agriculture Land and Wetlands

Wetlands have been lost and degraded due to agricultural expansion, industrial development and pollution throughout southern and southeast Asia (Meine and Archibald 1996). Decline in Sarus populations in Nepal is mainly attributed to the loss of wetland habitat (Suwal 1994, Sundar et al. 2003, Aryal 2004, Sundar and Choudhury 2005, Baral 2009, Gosai et al. 2016).

4.2 Grazing and Disturbances

Cattle grazing or trampling destroys Sarus Crane's eggs and nests (Gosai et al. 2016). In Lumbini area there were also reports of Sarus eggs eaten by Python, and destroyed by grazing animals such as Blue Bull referred as trampling effect (Aryal et al. 2009).

4.3 Land Plotting and Mining

Because of the internal migration of human population from mountains to lowland Terai, there is an increasing pressure on land. New human settlements are created by converting the agriculture land into built up areas, thus destroying the habitat of Sarus Cranes. The collection of sand, boulder, and gravel from the river bed also negatively impacts the habitat of Sarus Crane.

4.4 Industrial Pollution

In Nepal, rivers are usually used as a common disposal site for both domestic sewage and industrial waste. The rivers are polluted with sewage, garbage and chemical effluents coming from industries like paper and pulp, cement, rubber factories and distilleries. Although GoN has developed Tolerance Limits for Industrial Effluents to be discharged into Inland Surface Waters (2001), most of the industries do not follow the standard due to weak monitoring mechanism. These pollutants are accumulated in farmlands and wetland which increase chick's mortality and decline fertility of eggs.

4.5 Electro Collision and Electrocution

Recent studies had reported some cases of death of Sarus Crane due to electrocution and electric collision (Gosai et al. 2016). A study conducted in India reported that collision with electric transmission line affected 2.5 to 20% mortality of Sarus Crane (Sundar et al. 2000). Electrocution is a lethal threat to Sarus Crane as electric transmission system in Nepal is through high tension electric lines. Due to the large body size Sarus Crane is prone to electric shock during take-off and landing.

4.6 Poisoning

Poisoning is also a serious threat to global biodiversity. Cranes have been killed through both intentional and unintentional poisoning from agricultural chemicals, primarily pesticides. Documentation of poisoning can be problematic because of lack of reporting and limited resources for testing to verify the cause of death. Farmers actively used pesticides and fertilizers on their farms for agricultural production, which led to food contamination and reduced the food availability for Sarus Cranes (Gosai et al. 2016). Some pesticides have demonstrated particularly severe impacts on birds. Borad et al. (2002) reported mortality of a Sarus chick and an entire Sarus family in a paddy field of India due to excessive use of pesticides and chemical fertilizer. Poisoning of Sarus Cranes in Keoladeo National Park, Bharatpur, India, coincided with the application of aldrin in the agricultural land around the park in winter, when the birds were present (Muralidharan 1993). Aldrin, an organochlorine pesticide, was used to treat soil and seeds such as wheat, mustard *(Brassica and Sinapiss spp.)*, and pea *(Pisum sativum)*, against termites (Isoptera). The Stockholm Convention on persistent organic pollutants prohibited or severely restricted the use of aldrin because of severe health hazard including bird mortalities. Similarly, Monocrotophos, and Carbofuran also known as Furadan are the other agricultural insecticides and pesticides identified as lethal to birds including Sarus Crane (Pain et al. 2004, Richard 2011).

4.7 Eggs Collection

Eggs collection is another threat for conservation of this species. Hunting of Sarus Cranes and the stealing of eggs and chicks are common practices of inhabitants in Rupendehi district. It has been reported that, 26.31% were stolen by people (Gosai et al. 2016). During the field, it was informed that some people illegally collect the eggs and sold into the local market.

4.8 Nest Destruction

Sarus Cranes build their nests on wetland and the paddy fields. The nests cover approximately 2 m diameter in the field. During the flood or raising the water level in the field they pick up the growing paddy and pile up in their nests to increase the height of the nest to prevent their eggs running off from the nest. Hence, the farmers remove their nests to plant the paddy in the land occupied by their nests and to prevent from destruction of their paddy from the Sarus Crane.

Chapter 5

Challenges and Opportunities

5.1. Challenges

5.1.1 Habitat Encroachment and Conversion

Encroachment of natural habitat (agricultural land, wetlands and grasslands) is one of the major problems in conserving wetland species including Sarus Crane in Nepal. Encroachment is mainly due to expanding human settlement as well as due to conversion of forests and grasslands for agriculture and conversion of agricultural land to urban areas. Extension of current electric transmission line and road network without proper planning is one of the prominent challenges as it fatalities of Sarus Crane. Increase in the road network has also resulted in habitat fragmentation and colliding with the speeding vehicles.

5.1.2 Insufficient Knowledge and Research

There are very limited researches on its population and ecological behavior of this species in Nepal and these researches are mostly opportunistic surveys conducted by university students and individual projects without proper coordination with the government authorities and relevant local stakeholders. Therefore, there is a knowledge gap in population status, habitat preference, ecology and genetics. Moreover, we have have limited information on impact of chemical fertilizer and pesticides, and its contribution for agricultural production.

5.1.3 Low level of Awareness, Capacity and Incentives

Although the Sarus Crane is protected by NPWC Act 2029; it has received little conservation attention Most of the habitats are under the private ownership so it is difficult to regulate and manage the sites. Farmers seem to perceive a higher profit if they use their agricultural land and use pesticide, insecticide and chemical fertilizer. On the other hand, economic and social incentives to preserve optimal habitats for Sarus Crane are insufficient to overcome the above-mentioned perceived benefits. The secondary benefits of eco-tourism and the knowledge of the ecological value of Sarus Crane could overcome this which needs to be upgraded. Incidents of nest picking by local people without being aware about the legal aspects of their action are a common evidences. General people are not well aware on the sanctions and punishments that legal framework has provided to discourage the illegal killing of Sarus Crane.

5.1.4 Insufficient Coordination among Stakeholders

Sarus Crane conservation in Nepal involves range of stakeholders ranging from researchers, academicians, government agencies, non-governmental organizations and communities. Successful conservation needs concentrated and cohesive effort from all the stakeholders and agencies. The

Constitution of Nepal (2015) and subsequent Local Government Operation Act (2074) have shared the roles and responsibilities for conservation of flora and fauna to three different tires of government. Collaborative and coordinated effort is lacking in field of land use planning, use of wetland resource, infrastructure development and nature based tourism development. More than 70% of the total Sarus Crane habitat falls outside the PAs in Nepal. Conservation interventions targeting this endangered species are very minimal in the majority of its habitat. This scenario underpins the need of community-based conservation program that ensures the co-existence of both Sarus Crane and human being.

5.2. Opportunities

5.2.1 Sarus Crane as Flagship Species

Sarus Cranes are attractive birds. The courtship display and other activities of Sarus Crane are meditative for human being. They have not been reported with any sort of direct conflict with local people. so, it is easier to convince local community and involve them in conservation of this cuddly species. However, conservation in the wild particularly outside the PAs will only be effective through concerted efforts and collaboration at the local level. Sarus Crane can thus serve as a flagship species for the conservation of entire agro-biodiversity of Terai. In the hot spots where they regularly dwell can be promoted as Sarus Crane observation centers.

5.2.2 Involvement of Local Community

Lumbini Development Trust, Lumbini Crane Foundation, WWF Nepal has working to develop community stewardship in Lumbini area. The birds are protected by the community and have been named the mascot by the Lumbini Cultural Municipality. Involvement of local youths for Sarus Crane Conservation in Lumbini area is astonishing. This encouraging experience of local communities involvement in Sarus Crane conservation have further paved the way to replicate this community-based conservation to other hot spot of Nawalparasi, Rupandehi, Kapilvastu, Banke, Bardia and Kailali districts.

5.2.3 Nature Based Ecotourism

Tourism is an important source of income in Nepal. It is believed that a at least 5 percent of tourist visiting Nepal come for birding. Sarus Crane is an integral part of tourist attraction. Sarus Crane is one of the most charismatic bird and easy to observe in the agricultural field. They therefore offer great opportunities for ecotourism, which can provide an extra source of income for local communities. which could overcome the losses of farmers during breeding season of Sarus Crane Connecting the religious value of Sarus Crane the cultural tourism can be developed. This intervention has been already successful in Lumbini area which could serve as a successful model for further promotion in new areas. However, this species-based tourism should be developed and promoted in highly standard way so that the footprint of tourism activities could be minimal in the long run.

5.2.4 Use of Cutting-edge Technology in Research and Monitoring

Nepal has practiced different cutting-edge technologies likewise camera trapping, satellite tagging and non-invasive genetic studies which provides better opportunity for understanding their habitat, ecological, behavioral, and physiological and genetics aspects of in important mammals and birds. Nepal has good experience of captive breeding of vulture and Gharial and gained wealth of knowledge and lessons learnt about captive breeding for conservation of other endangered species. This experience would be highly important in conservation breeding program for Sarus Crane whenever necessary especially in the rehabilitation and rescue centers and federal zoos or even in the community managed sites.

Chapter 6

The Action Plan

6.1 Goal

Ensure viable population of Sarus Crane and conserve their associated habitat through participatory conservation interventions.

6.2 Objectives

6.2.1 Enhance the Quality of Habitat

Rationale

Sarus Crane mainly depends upon the agricultural and wetland habitat. New human settlement and developmental activities have been deteriorating and squeezing their habitats throughout their distribution range in Nepal. The high-tension electricity lines and electricity extension through the naked electric wire have been posing serious threats for this species. The wetlands have been drying and degrading due to the siltation, eutrophication and the invasive species. Therefore, to address these issues and to improve and maintain the overall habitat quality, the participatory habitat conservation actions are required.

Outputs

1. Potential habitat of Sarus Crane in Nepal is quantified, predicted and mapped.
2. Potential habitat of Sarus Crane habitats conserved, restored and improved.

Actions

1. Assess the existing and potential habitat for Sarus Cranes,
2. Encourage local government to prepare and implement land use plan focusing Sarus Crane conservation,
3. Discourage further land plotting in agricultural land by implementing local land use plans,
4. Declare locally managed 'Sarus Crane Conservation Sanctuary' including critical breeding and nesting sites in Lumbini,
5. Provide compensation scheme to the farmers for the loss of agricultural crops due to nesting and feeding of Sarus Crane,
6. Encourage local people to cultivate Kala Namak and other native rice variety,
7. Restore the dried and degraded oxbow lakes and ponds,

8. Management of of invasive species from the wetlands,
9. Discourage for illegal fishing methods that cause massive death of Sarus Crane such as poisoning, use of electric rods in the wetlands,
10. Installment of repulsive devices in electric transmission lines.
11. Encourage local farmer towards the organic farming, and minimum use of chemical fertilizer,
12. Identify and restrict the trade and use of pesticide which were banned by the national and international legislations as threat to wetland dependent species.

6.2.2 Increase Knowledge Base and Understanding

Rationale

Sarus Crane remains one of the least studied birds in the country despite its social, ecological and cultural significance. There is limited ecological, behavioral and population studies about Sarus Crane. To promote evidence-based conservation actions, it is important to have first-hand information on ecology, population status and habitat requirements of the species. This will help in expanding scientific knowledge on the issues that need addressing for long term conservation of these species.

Outputs

1. Robust scientific information on population, ecology, distribution, threats and importance are assessed and documented.
2. Standardized monitoring system for Sarus Crane across Nepal developed.
3. Database on Sarus Crane available at one platform.

Actions

1. Identify, mapping and prioritize the potential Sarus Crane habitats,
2. Estimate and monitor Sarus Crane population using molecular method and its nests through the entire distribution range,
3. Develop ecological niche and distribution models of Sarus Crane in landscape level using cutting-edge technology,
4. Estimate home range, diurnal and seasonal activity patterns using satellite tagging,
5. Conduct study on dietary habits and estimate the crop lost due to their nests on the paddy fields,
6. Investigate impact of parasites and diseases in the Sarus Crane,
7. Study on toxic effect of insecticide, pesticide and chemical fertilizer being used in agro-ecosystem,
8. Study the impact of climate change on various ecological aspects of Sarus Crane such as shift and modification in habitats, food and breeding habits, etc.,
9. Document and promote economic, cultural and religious value and belief of Sarus Crane,
10. Develop monitoring protocol for all Sarus Crane monitoring,
11. Establish and strengthen data collection and sharing mechanism including electronic media,
12. Promote citizen scientists, bird watchers and researchers in regular monitoring, record keeping and data sharing.

6.2.3 Reduce Intentional and Accidental Killing of Sarus Crane

Rationale

Although the Sarus Crane has been listed as the protected bird species of Nepal destruction of its nest and illegal eggs collection are prominent challenges for the long term survival of the species. Electrocution and electro-collision in high tension lines, use of insecticides, pesticides and chemical fertilizer on farmland are directly related to the mortality of Sarus Crane. Disposal of industrial effluents, sewage, municipal waste to the wetland further deteriorating wetland habitat and causing fatal disease to Sarus Crane .

Outputs

1. The destruction of nests and illegal collection of eggs reduced.
2. Accidental mortality of Sarus Crane reduced.
3. Hatching success of Sarus Crane increased.

Actions

1. Participatory guarding and monitoring of the nests of Sarus Crane in the field during breeding season,
2. Establish and strengthen 'Sarusko Sathi' group and eco-clubs thoughout its range,
3. Provide training and orientation to local youth, eco-clubs and enforcement agencies and aware them about the ecological, economic and socio-cultural important of Sarus Crane,
4. Ban of trade and use hazardous insecticides, pesticide and chemical fertilizer in agricultural land,
5. Establish mechanism for environmental impact study of industries and implementation of mitigation measures,
6. Conduct regular compliance monitoring of the level of solid waste, industrial effluents and discharge to the major wetlands,
7. Piloting underground or insulated wire transmission line in Lumbini area.

6.2.4 Sensitize Stakeholders and Build their Capacity

Rationale

Local people's knowledge and perceptions can play vital role for getting local support and participation in species conservation. Due to the insufficient awareness, some local people and school kids destroy the nests of Sarus Crane and their eggs. Some poaching and illegal killings of Sarus Cranes by poisoning have also been reported. In some part of their range farmer believed that Sarus Crane destroys their rice fields but actually the Sarus Crane does not harm their paddy fields, instead they eat the harmful insects and pests of their crops and support increasing the crop-yields. Therefore, the community outreach and awareness programs to the locals are essential for the conservation of Sarus Crane. Conservation of Sarus Crane is only possible by collaborative effort of all stakeholders including three tires of government, CBOs, I/NGOs, academia, farmers etc. So capacity of all stakeholders should be enhanced.

Outputs

1. Stakeholders widely sensitized on Sarus Crane conservation issues.
2. Sarus Crane conservation issues incorporated in management/work/operational plans of all stakeholders.
3. Trained stakeholders in Sarus Crane research monitoring and habitat management.
4. Participation and direct involvement of local farmers, youths, media and private sector in Sarus conservation.

Actions

1. Conduct community outreach and school awareness programs throughout the Sarus Crane distribution range,
2. Prepare and disseminate audio-visual program about the Sarus Crane and its importance in agro and wetland ecosystem,
3. Sensitize and engage non-conventional conservation partners such as media houses, corporate and private sector in Sarus Crane conservation,
4. Initiate community outreach program for farmers and youth from its distribution range,
5. Conduct workshops targeting university students to encourage them in Sarus Crane research and conservation,
6. Establish Sarus conservation museum in and around Lumbiniarea,
7. Declare Sarus Crane conservation ambassadors at local and province level,
8. Strengthen existing rescue and rehabilitation centers for Sarus Crane,
9. Develop expertise and provide equipment required for rescue, handling and release of Sarus Crane,
10. Provide technical and financial backup for the Lumbini Crane Sanctuary,
11. Initiate a pilot project on community based Sarus Crane monitoring system,
12. Install the Sarus Crane informative hoarding boards at major tourist destinations,
13. Motivate the farmers for growing organic and endemic crops and vegetables,
14. Established incentive mechanism for crop damage at local level.

6.2.5 Build Partnership at Local, Provincial, National and International level

Rationale

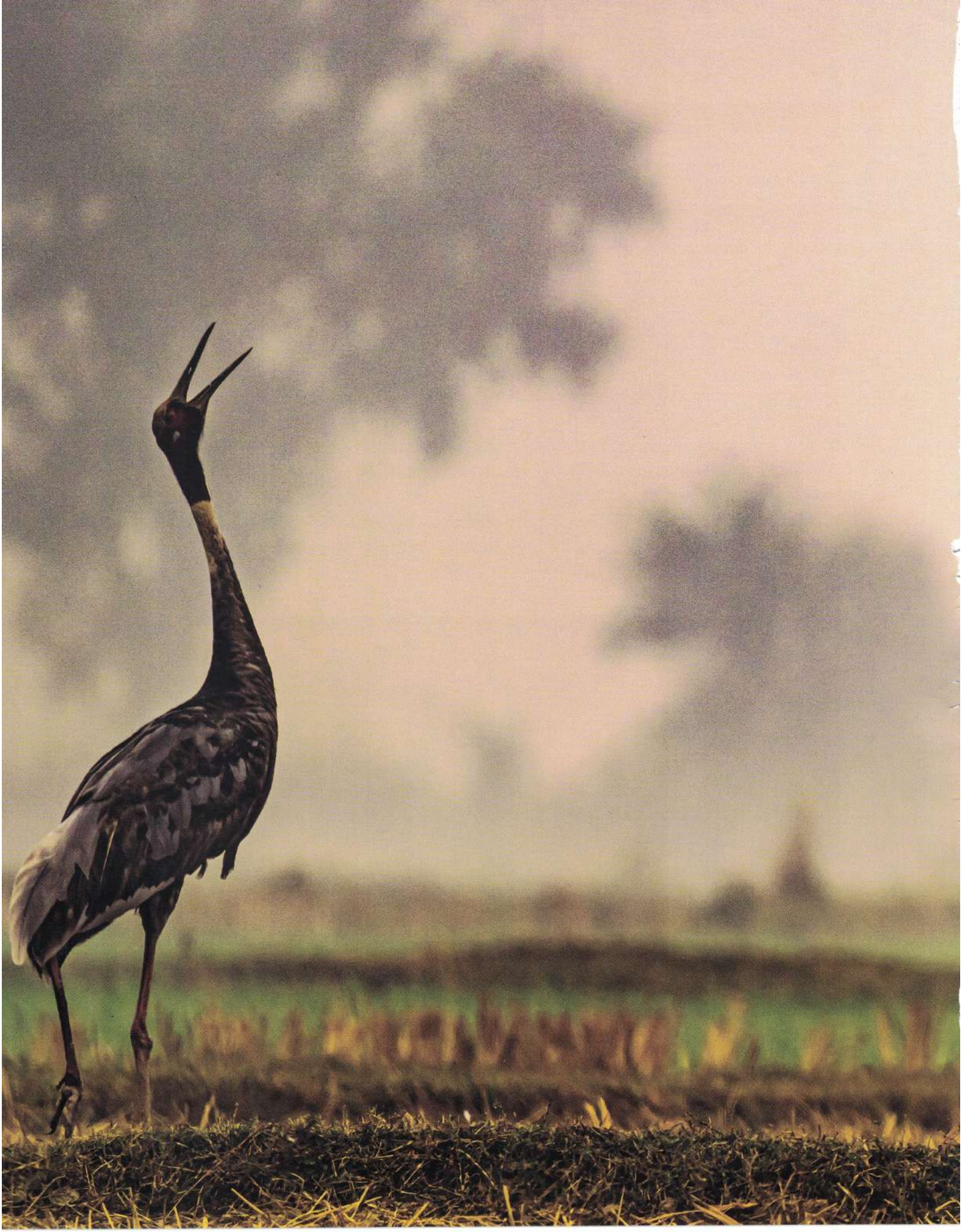
The Sarus Crane predominately depends on the agroecosystem. Involvement of the local farmers, local governments, CBOs and NGOs, and other stakeholders play a vital role for the success of Sarus conservation projects. Equally, harmonization of policy and program related to Sarus conservation at provincial and national level is indispensable. Sarus Crane is a landscape species. It frequently crosses the national boundaries for foraging and breeding. Therefore, it is needed to build a long-term partnership and develop the network with regional and international agencies and donors to implement this action plan effectively.

Outputs

1. Coordination for Sarus Crane conservation at local, national and international level ensured.
2. Capacities to carry out the researches and conservation actions enhanced.

Actions

- Identify the potential local, regional and international partners for Sarus Crane research and conservation,
- Develop mechanism for the involvement of local farmers, youths, CBOs, NGOs, local governments, provincial government agencies in Sarus Crane conservation,
- Discuss Sarus Crane conservation issues and programs at planning workshop of local, provincial and national level,
- Organizing a regional workshop comprising the experts, conservationists and other key stakeholders in Lumbini,
- Discuss Sarus Crane conservation issues in transboundary meeting and international forums,
- Build good contact and relation with the international donors to raise funds for the successful implementation of the action plan,
- Monitor, update and do the public audit and public hearing regularly about the both financial and technical progress of the Sarus Crane Conservation project to all the partners and stakeholders.

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Chapter 7

Plan Implementation and Monitoring

7. Plan Implementation and Monitoring

7.1 Implementing Agencies

The plan will be implemented in coordination with relevant institutions and stakeholder. Ministry of Forests and Environment, Department of National Parks and Wildlife Conservation, Department of Forests and Soil Conservation, Department of Agriculture, Department of Livestock Services will play vital role at national level. At Providence level Ministry of Industry, Tourism, Forests and Environment, Forest Directorate are also responsible for budgeting and coordination. At local level, concerned Division Forest Office, Municipality and Rural Municipality, Lumbini Development Trust, National Trust for Nature Conservation, WWF Nepal, Bird Conservation Nepal, Green Youth Lumbini will be involve for the implementation of plan.

7.2 Financial Plan

Total estimated cost for the implementation of the action plan is NRs 12,57,35,000 (Twelve Crores Fifty -Seven Lakhs Thirty-Five Thousands Rupees only). Detail breakdown of the budget is presented in the appendix 2. This estimated budget will be managed from the regular budget of local, provincial and the federal government. The funds will also be raised through the charity programs and the national and international donor agencies.

Table 1 : Summary of the Estimated Budget

Objectives	Budget (NRs,000)	Percentage contribution
Enhance the Quality of Habitat	36,450	28.99
Increase Knowledge Base and Understanding	20,220	16.08
Reduce Intentional and Accidental Killing of Sarus Crane	23,635	18.80
Sensitize Stakeholders and Build their Capacity	36,680	29.17
Build Partnership at Local, Provincial, National and International level	8,750	6.96
Total budget	**125,735**	**100%**

7.3. Review, Monitoring and Evaluation of Plan Implementation

The monitoring and evaluation of the implementation of this action plan will be carried out regularly. The work plan (Annex 2), will guide government bodies, conservation partners and local stakeholders for program development and implementation in the field. Monitoring of the progress will be carried out by the respective implementing partners and that will be shared during the review meetings. In addition, a mid-term and final review will also be conducted by involving a team of independent consultants.

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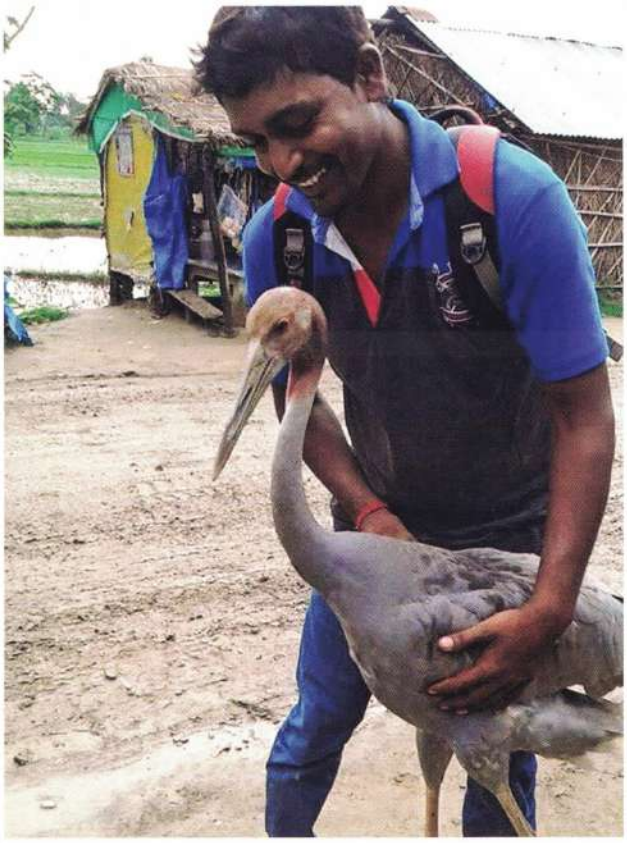
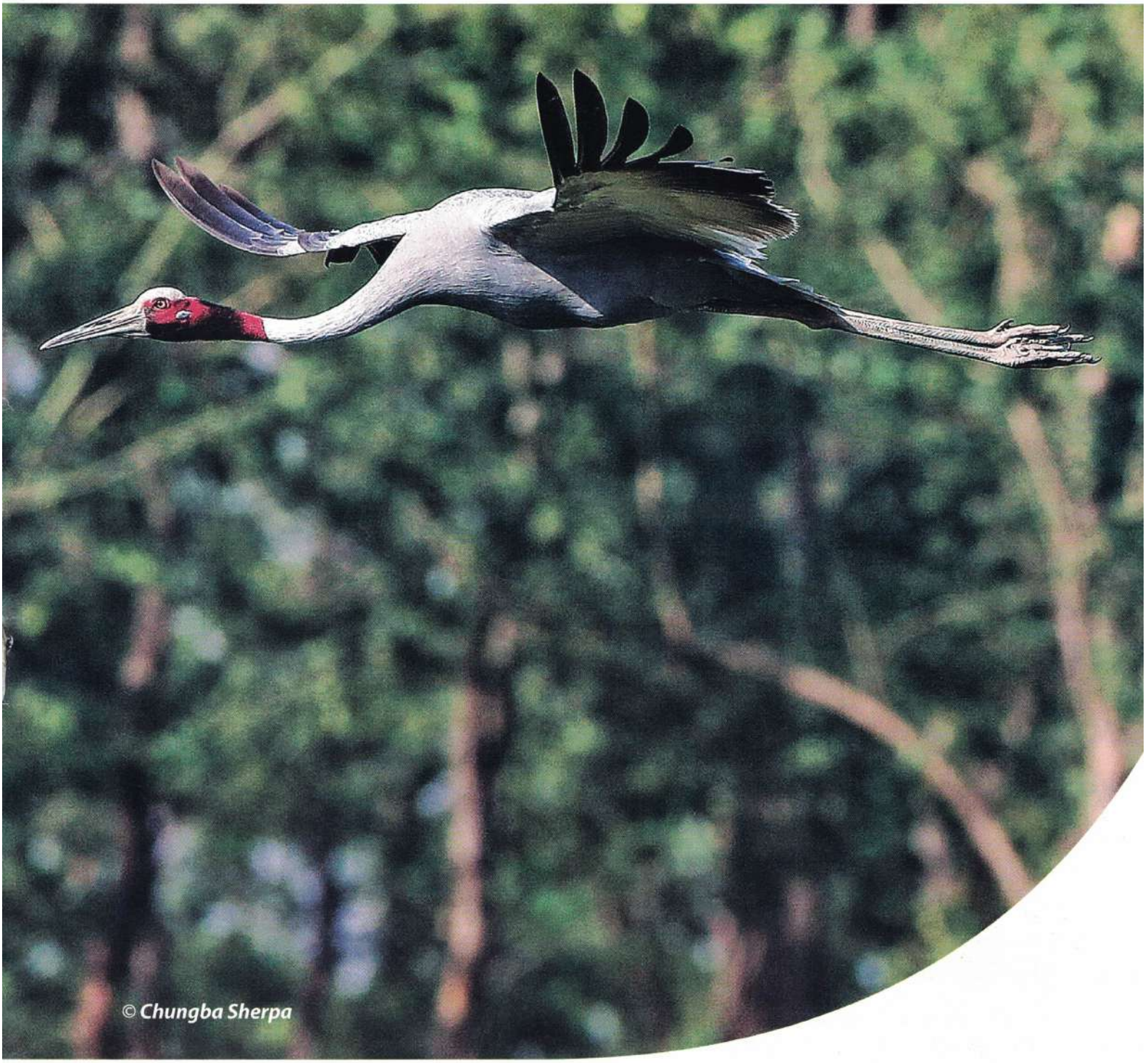


Rescue operation of Sarus Crane by local Green Youth of Lumbini

Annexs

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Annex 1: Logical Framework

Hierarchy of Objectives	Objectively Verifiable Indicator	Means of Verification	Risk/Assumption
Goal:	**Ensure viable population of Sarus Crane and conserve their associated habitat through participatory conservation interventions.**		
Objective 1:	**Enhance the Quality of Habitat**		
Output 1: Potential habitat of Sarus Crane in Nepal is quantified, predicted and mapped.	Number of publication, Distribution maps on Sarus Cranes habitat	Reports from researchers, Scientific articles, Media reports	All conservation stakeholders carry out their share of responsibilities
Output 2: Potential habitat of Sarus Crane habitats conserved, restored and improved.	Increasing number of Sarus Crane, More sightings/ number of Sarus Crane nests recorded	Reports from locals, Scientific articles, Media reports	All conservation stakeholders carry out their share of responsibilities

Actions

- Assess the existing and potential habitat for Sarus Cranes,
- Encourage local government to prepare and implement land use plan focusing Sarus Crane conservation,
- Discourage further land plotting in agricultural land by implementing local land use plans,
- Declare locally managed 'Sarus Crane Conservation Sanctuary' including critical breeding and nesting sites in Lumbini,
- Provide compensation scheme to the farmers for the loss of agricultural crops due to nesting and feeding of Sarus Crane,
- Encourage local people to cultivate Kala Namak and other native rice variety,
- Restore the dried and degraded oxbow lakes and ponds,
- Management of invasive species from the wetlands,
- Discourage for illegal fishing methods that cause massive death of Sarus Crane such as poisoning, use of electric rods in the wetlands,
- Installment of repulsive devices in electric transmission lines,
- Encourage local farmer towards the organic farming, and minimum use of chemical fertilizer,
- Identify and restrict the trade and use of pesticide which were banned by the national and international legislations as threat to wetland dependent species.

Hierarchy of Objectives	Objectively Verifiable Indicator	Means of Verification	Risk/Assumption
Objective 2:	**Increase Knowledge Base and Understanding**		
Output 1: Robust scientific information on population, ecology, distribution, threats and importance are assessed and documented.	Figure of Sarus Crane Population Number of scientific research on ecology, distribution and threats Reports, books and scientific articles on ecological, economic importance of Sarus Crane	High-impact factor research papers in international journals, research reports, University theses Publication of DNPWC, DoFS	Allocated funding secured All the relevant research institution actively participated in research
Output 2: Standardized monitoring system for Sarus Crane across Nepal developed.	Scientific and Standard Sarus Crane monitoring protocol		
Output 3: Database on Sarus Crane available at one platform.	Central Database system fully functionalize All available Sarus Crane location data collated in a single platform and shared	Online database, Data available at central depository	Stakeholders and general people share the data

Actions

- Identify, mapping and prioritize the potential Sarus Crane habitats,
- Estimate and monitor Sarus Crane population using molecular method and its nests through the entire distribution range,
- Develop ecological niche and distribution models of Sarus Crane in landscape level using cutting-edge technology,
- Estimate home range, diurnal and seasonal activity patterns using satellite tagging,
- Conduct study on dietary habits and estimate the crop lost due to their nests on the paddy fields,
- Investigate impact of parasites and diseases in the Sarus Crane,
- Study on toxic effect of insecticide, pesticide and chemical fertilizer being used in agro-ecosystem,
- Study the impact of climate change on various ecological aspects of Sarus Crane such as shift and modification in habitats, food and breeding habits, etc.,
- Document and promote economic, cultural and religious value and belief of Sarus Crane,
- Develop monitoring protocol for all Sarus Crane monitoring,
- Establish and strengthen data collection and sharing mechanism including electronic media,
- Promote citizen scientists, bird watchers and researchers in regular monitoring, record keeping and data sharing.

Hierarchy of Objectives	Objectively Verifiable Indicator	Means of Verification	Risk/Assumption
Objective 3:	**Reduce Intentional and Accidental Killing of Sarus Crane**		
Output 1: The destruction of nests and illegal collection of eggs reduced.	Increase no of successful nesting No of nest protected by local farmers	Field monitoring reports	Local people focus the Sarus Crane conservation
Output 2: Accidental mortality of Sarus Crane reduced	Decrease the case of accidental mortality Amount of transmission line insulated,	Media reports and annual publication of concern agencies	Positive coordination with other stakeholders and development agencies
Output 3: Breeding success of Sarus Crane increased	Increased rate of successful hatching, Decrease in use of hazardous pesticide, No of environmental monitoring	Media reports and annual publication of concern agencies	Positive coordination with other stakeholders and development agencies

Actions

- Participatory guarding and monitoring of the nests of Sarus Crane in the field during breeding season,
- Establish and strengthen 'Sarusko Sathi' group and eco-clubs thoughout its range,
- Provide training and orientation to local youth, eco-clubs and enforcement agencies and aware them about the ecological, economic and socio-cultural important of Sarus Crane,
- Ban of trade and use hazardous insecticides, pesticide and chemical fertilizer in agricultural land,
- Establish mechanism for environmental impact study of industries and implementation of mitigation measures,
- Conduct regular compliance monitoring of the level of solid waste, industrial effluents and discharge to the major wetlands,
- Piloting underground or insulated wire transmission line in Lumbini area.

Hierarchy of Objectives	Objectively Verifiable Indicator	Means of Verification	Risk/Assumption
Objective 4:	**Sensitize Stakeholders and Build their Capacity**		
Output 1: Stakeholders widely sensitized on Sarus Crane conservation issues.	Number of awareness program conducted	Media coverage on participatory conservation works	Conservation stakeholders respond positively to community outreach efforts
Output 2: Sarus Crane conservation issues incorporated in management/work/ operational plans of all stakeholders.	Management/work /operational plan incorporated the issues of Sarus Crane Conservation	Management plan/ operational plan of stakeholder, Publications	Local people and school kids cooperate and motivated for conservation
Output 3: Trained stakeholders in Sarus Crane research monitoring and habitat management	Number of training organized	Published Report, media coverage	Projected funding secured and all stakeholder participate in Sarus Crane Conservation
Output 4: Participation and direct involvement of local farmers, youths, media and private sector in Sarus conservation.	Number of group formed and mobilized, Media coverage	Published Report, media coverage	Projected funding secured and all stakeholder participate in Sarus Crane Conservation

Actions

- Conduct community outreach and school awareness programs throughout the Sarus Crane distribution range,
- Prepare and disseminate audio-visual program about the Sarus Crane and its importance in agro and wetland ecosystem,
- Sensitize and engage non-conventional conservation partners such as media houses, corporate and private sector in Sarus Crane conservation,
- Initiate community outreach program for farmers and youth from its distribution range,
- Conduct workshops targeting university students to encourage them in Sarus Crane research and conservation,
- Establish Sarus conservation museum in and around Lumbiniarea,
- Declare Sarus Crane conservation ambassadors at local and province level,
- Strengthen existing rescue and rehabilitation centers for Sarus Crane,
- Develop expertise and provide equipment required for rescue, handling and release of Sarus Crane,
- Provide technical and financial backup for the Lumbini Crane Sanctuary,
- Initiate a pilot project on community based Sarus Crane monitoring system,
- Install the Sarus Crane informative hoarding boards at major tourist destinations,
- Motivate the farmers for growing organic and endemic crops and vegetables,
- Established incentive mechanism for crop damage at local level.

Hierarchy of Objectives	Objectively Verifiable Indicator	Means of Verification	Risk/Assumption
Objective 5:	**Partnership at Local, Regional, National and International Level**		
Output 1: Coordination for Sarus Crane conservation at local, national and international level ensured.	Number of local, province, national and International networks established	Annual report, Signed MOU	Positive coordination with other stakeholders and development agencies
Output 2: Capacities to carry out the researches and conservation actions enhanced.	Financial resources and possible donors identified and relationship extended	Collected and raised funds amount Audited financial report	Many local, regional and international donors funded Sarus Crane research and conservation activities

Actions

- Identify the potential local, regional and international partners for Sarus Crane research and conservation,
- Develop mechanism for the involvement of local farmers, youths, CBOs, NGOs, local governments, provincial government agencies in Sarus Crane conservation,
- Discuss Sarus Crane conservation issues and programs at planning workshop of local, provincial and national level,
- Organizing a regional workshop comprising the experts, conservationists and other key stakeholders in Lumbini,
- Discuss Sarus Crane conservation issues in transboundary meeting and international forums,
- Build good contact and relation with the international donors to raise funds for the successful implementation of the action plan,
- Monitor, update and do the public audit and public hearing regularly about the both financial and technical progress of the Sarus Crane Conservation project to all the partners and stakeholders.

Annex 2: Five years Budget of Sarus Crane Conservation Action Plan

SN	Actions	Year					Total (NRs), 000	%
		1st	2nd	3rd	4th	5th		
Objective 1:	**Enhance the Quality of Habitat**						**36450**	**28.99**
1	Assess the existing and potential habitat for Sarus Cranes		1000		1000		2000	
2	Encourage local government to prepare and implement land use plan focusing Sarus Crane conservation	200	200	200	200	200	1000	
3	Discourage further land plotting in agricultural land by implementing local land use plans	800	800	850	850	900	4200	
4	Declare locally managed 'Sarus Crane Conservation Sanctuary' including critical breeding and nesting sites in Lumbini			1500			1500	
5	Provide compensation scheme to the farmers for the loss of agricultural crops due to nesting and feeding of Sarus Crane	100	100	100	100	100	500	
6	Encourage local people to cultivate Kala Namak and other native rice variety	500	500	500	500	500	2500	
7	Restore the dried and degraded oxbow lakes and ponds	2000	2000	2000	2000	2000	10000	
8	Management of invasive species from the wetlands	1000	1000	1000	1000	1000	5000	
9	Discourage for illegal fishing methods that cause massive death of Sarus Crane such as poisoning, use of electric rods in the wetlands	200	200	200	200	200	1000	
10	Installment of repulsive devices in electric transmission lines		200	200			400	
11	Encourage local farmer towards the organic farming, and minimum use of chemical fertilizer	1000	1100	950	1200	1150	5400	
12	Restrict the trade and use of pesticide which were banned by the national and international legislations	500	550	650	550	700	2950	

SN	Actions	Year					Total (NRs), 000	%
		1st	2nd	3rd	4th	5th		
Objective 2:	**Increase Knowledge Base and Understanding**						**20220**	**16.08**
1	Identify, mapping and prioritize the potential Sarus Crane habitats	1200					1200	
2	Estimate and monitor Sarus Crane population using molecular method and its nests through the entire distribution range		1500				1500	
3	Develop ecological niche and distribution models of Sarus Crane in landscape level using cutting-edge technology			1750			1750	
4	Estimate home range, diurnal and seasonal activity patterns using satellite tagging,		1250				1250	
5	Conduct study on dietary habits and estimate the crop lost due to their nests on the paddy fields			1150			1150	
6	Investigate impact of parasites and diseases in the Sarus Crane				750		750	
7	Study on toxic effect of insecticide, pesticide and chemical fertilizer being used in agro-ecosystem					1230	1230	
8	Study the impact of climate change on various ecological aspects of Sarus Crane such as shift and modification in habitats, food and breeding habits, etc.	500	650	550	700	600	3000	
9	Document and promote economic, cultural and religious value and belief of Sarus Crane		600		550		1150	
10	Develop monitoring protocol for all Sarus Crane monitoring		800				800	
11	Establish and strengthen data collection and sharing mechanism including electronic media			740			740	
12	Promote citizen scientists, bird watchers and researchers in regular monitoring, record keeping and data sharing	1000	1100	1050	1300	1250	5700	

SN	Actions	Year					Total (NRs), 000	%
		1st	2nd	3rd	4th	5th		
Objective 3:	**Reduce Intentional and Accidental Killing of Sarus Crane**						**23635**	**18.80**
1	Participatory guarding and monitoring of the nests of Sarus Crane in the field during breeding season	350	400	450	500	550	2250	
2	Establish and strengthen 'Sarusko Sathi' group and eco-clubs thoughout its range	300	320	350	360	390	1720	
3	Provide training and orientation to local youth, eco-clubs and enforcement agencies and aware them about the ecological, economic and socio-cultural important of Sarus Crane	1500	1600	1650	1700	1750	8200	
4	Promote to ban of trade and use hazardous insecticides, pesticide and chemical fertilizer in agricultural land	700	700	750	800	800	3750	
5	Establish mechanism for monitoring of environmental impact study of industries and implementation of mitigation measures	660	700				1360	
6	Conduct regular compliance monitoring of the level of solid waste, industrial effluents and discharge to the major wetlands	300	325	350	380	400	1755	
7	Piloting underground or insulated wire transmission line in Lumbini area.	2200		2400			4600	

SN	Actions	Year					Total (NRs), 000	%
		1st	2nd	3rd	4th	5th		
Objective 4:	**Sensitize Stakeholdees and Build their Capacity**						**36680**	**29.17**
1	Conduct community outreach and school awareness programs throughout the Sarus Crane distribution range	750	775	800	820	850	3995	
2	Prepare and disseminate audio-visual program about the Sarus Crane and its importance in agro and wetland ecosystem	150	170	200	210	225	955	
3	Sensitize and engage non-conventional conservation partners such as media houses, corporate and private sector in Sarus Crane conservation,	780	790	830	855	890	4145	
4	Initiate community outreach program for farmers and youth from its distribution range	1000	1070	1115	1145	1200	5530	
5	Conduct workshops targeting university students to encourage them in Sarus Crane research and conservation	300	300	300	300	350	1550	
6	Establish Sarus conservation museum in and around Lumbiniarea				2600		2600	
7	Declare Sarus Crane conservation ambassadors at local and province level	500	520	550	570	590	2730	
8	Strengthen existing rescue and rehabilitation centers for Sarus Crane	300	300	300	300	300	1500	
9	Develop expertise and provide equipment required for rescue, handling and release of Sarus Crane	200	200	200	200	200	1000	
10	Provide technical and financial backup for the Lumbini Crane Sanctuary			1050			1050	
11	Initiate a pilot project on community based Sarus Crane monitoring system	200	230	250	270	300	1250	
12	Install the Sarus Crane informative hoarding boards at major tourist destinations	500	500	600	550	550	2700	
13	Motivate the farmers for growing organic and endemic crops and vegetables	500	500	550	550	575	2675	
14	Established incentive mechanism for crop damage at local level	1000	1000	1000	1000	1000	5000	

SN	Actions	Year					Total (NRs), 000	%
		1st	2nd	3rd	4th	5th		
Objective 5:	**Strengthen Partnership at Local, Regional, National and International Level**						**8750**	**6.96**
1	Identify the potential local, regional and international partners for Sarus Crane research and conservation	200					200	
2	Develop mechanism for the involvement of local farmers, youths, CBOs, NGOs, local governments, provincial government agencies in Sarus Crane conservation	300	300	300	350	300	1550	
3	Discuss Sarus Crane conservation issues and programs at planning workshop of local, provincial and national level	100	100	100	100	100	500	
4	Organizing a regional workshop comprising the experts, conservationists and other key stakeholders in Lumbini				2500		2500	
5	Discuss Sarus Crane conservation issues in transboundary meeting and international forums	200	200	200	200	200	1000	
6	Build good contact and relation with the international donors to raise funds for the successful implementation of the action plan	300	300	300	300	300	1500	
7	Monitor, update and do the public audit and public hearing regularly about the both financial and technical progress of the Sarus Crane Conservation project to all the partners and stakeholders.	300	300	300	300	300	1500	
	Total Proposed Budget						**125735**	

Local Green Youth of Lumbini team rescuing injured Sarus Crane due to electrocution


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