

Rhino movement outside the protected area: Habitat Suitability and People Perception for Long Term Conservation

The Rufford Foundation
UK



(Activity Report)

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1. Introduction

Rhinoceros unicornis (hereafter Rhino), mega herbivore threatened with extinction (Appendix-1 CITES 2005), vulnerable (IUCN 2008) and nationally protected (NPWC/Act 1973) species, are restricted in few pockets with fluctuated numbers (IUCN 1997; DNPWC 2009 & 2015). CNP and its surrounding area support about 24% of its global population and more than 93% of Nepal (DNPWC 2014 & 2015). Once widely distributed its population dropped less than 100 individuals in 1966 (HMG 2006). Recent count (2015) found 605 rhinos in and outside CNP however; population trend shows huge instability. There were 503, 408, 372 and 544 rhinos in 2011, 2008, 2005 and 2000 respectively (HMG 2006; DNPWC 2009 & 2015). Slow recovery was also seen in 2000 but within 5 years population downed unbelievably. So, sustaining increased population by ensuring safe habitat and raising public participation is more crucial rather than population increase.

Rhino habitat inside park in Chitwan is decreasing (Pant 2015; Bhattarai and Paudel 2012; Kafle et.al. 2009; HMG 2006; CNP 2012, 2014, 2015) due to proliferation of invasion species (Murphy et al., 2013). Grassland has reduced from 20% to 4.7% of CNP (R.H.Emslie_pers._Comm. in Talukdar et.al, 2008). Habitat degradation in natural estate (Joshi et al. 2016) enhances wildlife movement outside parks or new areas in searching of food and shelter (Budhathoki, 2004; Gurung et al., 2008; DNPWC, 2012; CNP, 2013) which finally escalates human wildlife conflicts (Inskip and Zimermann, 2009). Increase population in new areas bring both positive and negative aspects which directly concerns with population sustainability and human-rhino coexistence. Conflict between human and wildlife is one of the most challenging issues throughout world (Woodroffe et al. 2005; Dowie 2011; Anand and Radhakrishna 2017; Silwal et al. 2017) that often result retaliatory killing and hostility against the wildlife (Acharya et al. 2016) and ultimately affects local participation in conservation (Lamichhane et al. 2018; Silwal et al. 2017). Potential carrying capacity of CNP is 500 rhinos (IUCN 1997) which came true in 2015 because rhino count (2015) found rhino's distribution outside protected areas with increased population (DNPWC 2015). Nepal has eliminated the poaching of rhinoceros since 2011 (Acharya, 2016) but issue of habitat condition is still matter of concern. Several studies have showed the increased wildlife populations stimulate the conflict and people are in less favour to increase population. So, it is requisite to understand critical issues of habitat (HMG 2006; GoN

2014; Pant 2015); outside habitat is adequately safe for sustaining population or not? How does community perceive increased population? To respond these vital issues for sustaining increased population, project came into sight.

2. Rationale

In Nepal, participatory approach is the main basis for the conservation achievements. Sustainable conservation can be expected only with local involvement. People do not participate in conservation program until and unless they perceive the change positively. So, it is crucial to know grass root level information and sensitize local people to create harmony for coexistence. If major issues; local views are ignored, conservation program cannot be launched successfully and sustaining rhino population becomes uncertain.

CNP has already experienced serious decline in both quantity and quality of rhino habitat where grassland coverage, rhino's prominent habitat, has dropped severely (Talukdar et al. 2008). Most of the attacks occurred outside the park closed to the boundary (Silwal et al. 2017). This indicates outside CNP is becoming upcoming habitat to harmonize increased population. Special conservation attention is essential to this area in current context because increase population also brings negative aspects with positive which directly concerns with sustainability and coexistence of human and rhino. Many conservation institutions are emphasizing CNP and bufferzone and so we targeted outside areas. Rhino Action Plan (2006-2011) has also claimed habitat suitability/condition and people's perception/involvement are the key factors to restore and sustain population. Habitat monitoring with public involvement is essential to respond threats (IUCN 1997; HMGN 2006; Bhattarai and Paudel 2012; Pant 2015). So, project was designed for assessing habitat condition; food availability and potential threats to rhino in these areas. Increase population can raise human-rhino conflict; crop raiding, encounters, human casualty, in the area which may create aggression. Local people may have misinterpretation to rhino. The rhino, important to enhancing eco- tourism industry and conservation efforts in Nepal poses a number of challenges to the local people residing park (Sedhain and Adhikary, 2016). Therefore project has focused to appraise local perception toward increasing population in their locality. We hope appraised finding will support conservationist, decision makers, manager and other stakeholders

to design appropriate plan/action for creating harmony between rhino and human and encourage local participation in rhino conservation. New area's communities mayn't aware about importance of rhino and possible mitigation measure of human-rhino conflict. If conflict issue between human and wildlife is not properly addressed, community participation in conservation also declines ([DNPWC/MoFSC/GoN 2007](#)). Rhino Conservation Action Plan (2006-2011) has also realized necessity of awareness program in broader spectrum outside protected area/buferzone. Project will organize awareness program as preliminary action which will be signpost to motivate local people for sustaining rhino population.

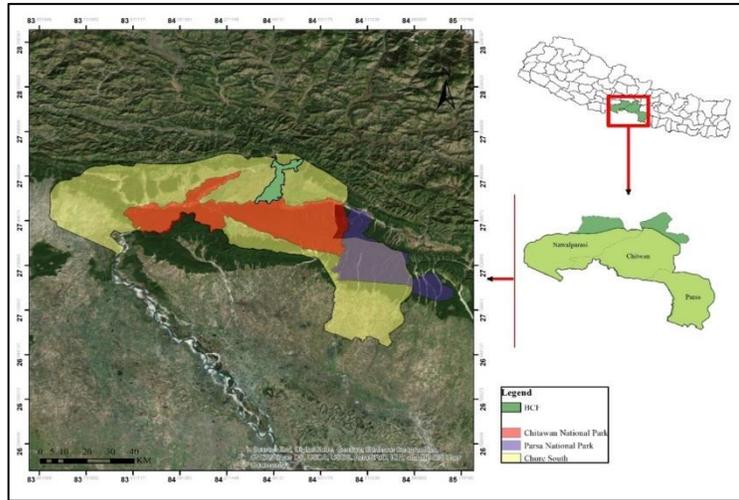
3. Objective

The project has set following objectives;

- Understand habitat suitability outside the protected area in Chitwan
- Assess local perception and conservation issue towards increased population of Rhino
- Educate local stakeholders about the importance of Rhino presence in locality

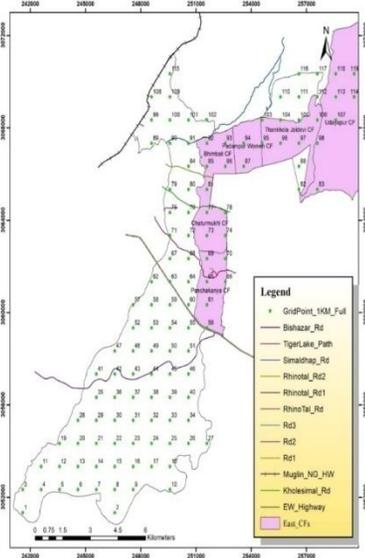
4. Material and Method

To achieve the mentioned objectives, we organized different activities. Firstly, we did reconnaissance survey to find out the areas outside the protected area where rhinos were recorded in last counts. With the inspection of rhino presence, we did consultation with park officials, forest officers, local conservation groups, forest user committee members. Based on the consultation and our direct observation in the site, we fixed Barandhabar Corridor including community forests; Panchakanya, Chaturmukhi, Bhimwali, Padampur, Thangkhola Jaladevi, Udayapur, Jnaneshwor, Satidevi. We did questionnaire survey to appraise local perception toward presence and increase population of rhino in their locality.

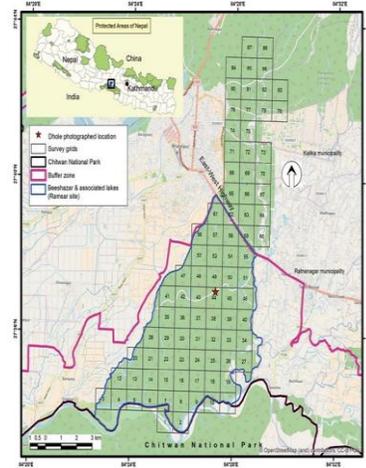


4.1 Habitat Suitability

.1 X 1 km² grid was laid out in Barandhabar Corridor Forest's

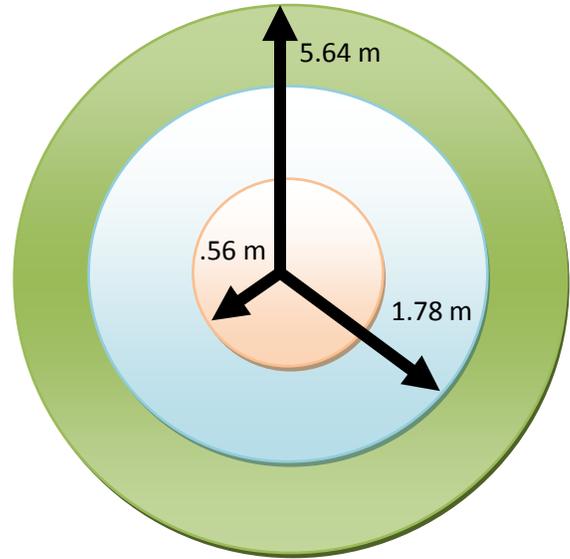


map from where we calculated total 119 grids having 1 km² dimension. Out of 119 grids, 60 (50%) were selected by using Cochran's formula, considering homogeneity of study area for further study. In the second phase, two subplots were laid down in two directions from the center point of the grid in distance of 300 m. Altogether 120 sample plots were surveyed for the presence / absence and vegetation



studies. We collected presence of rhino and their sign in the plots accompanied with environmental variables. In the reference of these presence and environmental variables, we used Maxent model for predicting distribution and appraising habitat suitability.

We established concentric (nested) sample plots for vegetation study where 100 m² plot size having radius 5.64 m for trees species (having 5 cm diameter at breast height), 16m² plot size having radius 1.78 m for shrubs (>1 m height) and 1m² plot size having radius 0.56 m for herbs. We calculate the important value index of recorded vegetation studies to rank the availability of preferred species and the invasion of other species.



Similarly, we also recorded various disturbances; invasion of invasive species, forest fire, bush cutting, sapling cutting and other human disturbances in those plots. We compared the intensity of rhino sign/presence with respect to these disturbances. Besides recording the disturbances within plots, we also visited forest to observe anthropogenic interventions that were happening in the forest but not recorded during vegetation survey or in sample plots.



4.2 People Perception

Local participation is one of the major bases in bringing success stories in conservation in Nepal. Studies and experiences have showed that people will not show willingness in conservation program until they do not know and realize the importance of that species. So, this study has tried to document people perception, their current efforts and willingness to contribute to rhino conservation. We also focused our study on those issues which were seemed to be barrier in

conservation program in current context. Following activities were carried out to achieve the mentioned objectives.

Reconnaissance Survey: In the support of ARP, Australia we targeted those areas where the population was less in previous count and increase in recent counts in bufferzone of Chitwan National Park. In the consultation of local conservation stakeholders and observed the movement of rhino outside the protected area with own eyes, we realized to cover outside the protected area including habitat suitability assessment. So, we developed project for the outside the protected areas in order to cover outside the protected area and submitted to The Rufford Foundation. Consultation with local park staffs, local conservation groups, forest user committee members, we prioritized eastern (Sauraha) and Kasara Sectors from bufferzone and all the community forest outside the protected area where rhino movement is being observed. To collect the people opinion, we have to choose relevant communities and groups. So, we did reconnaissance survey to find out the specific areas where rhinos were recorded in last counts. In addition with scrutiny of rhino presence, we did consultation with park officials, forest officers, local conservation groups, forest user committee members.



Sharing Meeting: Participatory approach enhances effectiveness so local stakeholders and students were encouraged for participation in our activities sharing meeting. 3 sharing meetings were organized to share objectives and working strategies of project with local stakeholders, conservation students and academician. The stakeholders were conservationists, bufferzone user groups, representative of conservation institutions, youth clubs, teachers, students etc.

Key Informant Interview: We interviewed those key informants to get the overview information of the sites, communities nearby forest, schools, ethnic groups who mostly depending on forest resources and agriculture. This information became helpful to organize further



activities. The key informants were teachers, leaders, local conservationists, representatives of bufferzone user committee, government officials, bufferzone forest user committee etc.

Questionnaire survey: Reliable and valid information only assure productive output so it is essential to go grass root level (upto individual household level). Perception and understanding level can differ individually so we organized the survey to gain the individual responses. Altogether more than 200 people of different groups; ethnic, castes, occupation, age, education level, were taken for the questionnaire survey. A semi-structured questionnaire having question related to local perception, rhino conservation issue, willingness and expectation for sustaining increased population of Rhino was developed and entertained with household respondents.



Focus Group Discussion: Individual responses differently as per their level of understanding. Some people may not answer properly or rightly which may divert the local scenarios. So, 7-10 people were collected in a common place and crosschecked the information to clarify information collected through household survey. This discussion was also supportive to remove the confusion aroused during the household survey. From the discussions, we came to know that people have different views towards within family also. People, executive members of conservation institution, have positive response towards rhino where as their family members have different views. This prevails that people even within same family have different thinking towards the rhino conservation. So, we realized that awareness based program is not enough in the locality.



Consultation: Based on the analysis of local responses specifically youth (students), we consulted expert to organize outreach program by focusing those youth who are unaware (less aware) about importance of rhino and possible techniques to minimize the conflicts. Similarly, we have also shared our planning and output with experts.

In zest, we followed this matrix for appraising food availability, rhino distribution, habitat suitability and existing threats in the project site.

Target	Requirement	Method	Analysis	Output
Food availability assessment	Vegetation status; Tree, shrubs herbs of preferred species	Field survey: inventory	Important Value Index (IVI)	Vegetation availability rank
Rhino distribution prediction & habitat suitability analysis	Presence data with environmental variables	-Secondary data sources: Satellite imageries Shape files -Field survey: Sign recording	ArcMap 10.5 MAXENT Model	Distribution prediction Suitability map
Threat appraisal	Natural/anthropogenic disturbances	Field survey: Recording	SPSS	Frequency & percentage

4.3 Community Outreach

Being inhabitant of the Chitwan district and working in rhino conservation issue for long time, we have known that people of both bufferzone and outside the protected are less aware about the importance of rhino presence and possible benefits due to increase in rhino population. So, we have proposed some community outreach activities as instant action. However we were going to assess people understanding/perception towards rhino conservation. We had organized following activities with the aim of creating better understanding for local participation in rhino conservation.

School Teaching: We know the youth are the future manager of natural resources because management and conservation responsibility will be handed over to them sooner or later. So we conducted school teaching program in those schools where those less aware students (children of less aware people) study. We also provided the "Rhino Conservation Educational Toolkit" to the library of those schools. We shared why rhino is important for us? What kind of opportunities can we get in the presence of the rhino? and How can we get benefits due to rhino? During the school teaching program, we urged



teachers to take part in teaching so that they could deliver same knowledge to other students in future.

Education Toolkit Production and Distribution: In the support of Asian Rhino Project, we had published "Rhino Conservation Educational Toolkit" in 2012 and distributed to local schools, conservationists, bufferzone user committee offices, bufferzone user committee offices, conservation teachers. That toolkit has played significant role in disseminating concrete knowledge about rhino. I have been receiving good feedbacks of toolkit form readers and demand of toolkit from local levels also reflects its importance. Due to limited copies (numbers), we were unable to distribute the book throughout the school of bufferzone in sufficient number. In the current context, the necessity of toolkits is becoming high with the increasing of rhino population and their distribution in new areas. Similarly, time wise many things in toolkit have to be updated / amended. So, we republished rhino conservation toolkit with updated information and more coverage for distribution in the proposed sites. This time we distributed toolkits in other protected areas (sites); Bardia National Park, Shukla Phanta National Park and Parsa National Park where rhinos are found in recent years. The toolkit was published on the authorship of Mr. Suman Bhattarai and Ms. Deepa Paudel, Assistant Professors, who have been teaching conservation subjects in the Institute of Forestry, Nepal.



Education/Teaching Material Preparation: We utilized project finding for teaching the wildlife conservation subjects in the Institute of Forestry which is the pioneer academic institute of forestry, wildlife conservation and protected area management. So, the project is becoming good medium for academic enhancement and human



resource development of conservation sectors. Similarly, we prepared tutoring material entitled "Rhino! Our Recognition, Our Pride" to educate students and communities.

Poster: We had produced poster to spread positive message among the local people in local areas. The rhino is gratitude of Nepal and it has played immense role to introduce Nepal among conservation stakeholders throughout world. So, we produced poster having message "Rhino! Our Recognition, Our Pride" and distribute in different program to raise affirmative vibe on local people regarding rhino conservation.



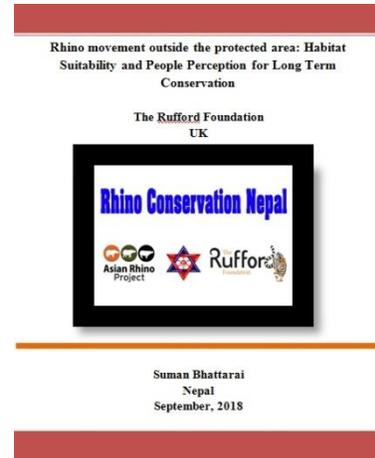
Calendar Publication Support: World has been celebrating "World Rhino day" since 2010 but many conservation stakeholders in Nepal are still unknown about this day. However September 22nd, 2018 was 9th World Rhino Day. We have been also continuously celebrating this day from the year of 2011 by organizing the different activities. To disseminate information of this day and request for celebration, we support conservation institution named Society for Wildlife Research and Conservation- SOWREC to publish calendar indicating September 22nd as World Rhino Day with some photo plates.



World Rhino Day Celebration: From 2011, we have been celebrating **World Rhino Day** continuously. During this project period, we also celebrated 8th and 9th World Rhino Day in Sep 22nd 2017 and Sep 22nd 2018. In 2017, we published the "Rhino Conservation Education Toolkit" 2nd whereas Rhino Sketch Competition on the theme of "Rhino! Our Recognition, Our Pride" was organized in 2018.



Article Publication: Based on the finding of the project, we are going to prepare article so that the scientific communities working with rhino conservation and natural resources management could be benefitted. Similarly, we have prepared article on "World Rhino Day; its background and Rationale" in local language to publish in local paper.



Reporting and Finding Dissemination: We are preparing a complete report to submit the supporting agencies and disseminate to concerned stakeholders. Findings will be share academic community by organizing presentation seminar. Article will be prepared for peer review

journal in order to share the findings with scientific community. We shared our project objective and activities with different stakeholders. In addition with sharing, we also interacted with postgraduate level students about research area that The Rufford Foundation



keeps in



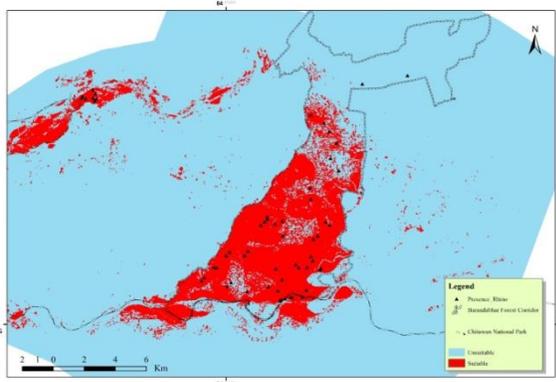
priority for funding. We took part in The Rufford Foundation workshop organized by Institute of Forestry, Hetauda Campus in Kathmandu Nepal. Similarly, the finding of habitat suitability, vegetation status and existing threats to rhino outside the protected area was shared in the Institute of Forestry, Pokhara Campus, Pokhara, Nepal. Now we are working for developing article based on out project findings. We will approach concerned institution to participate in their seminar and workshop in order to share our finding in global spectrum.

5. Result

To achieve set objectives, we organized reconnaissance survey, presence/absence survey, vegetation survey, direct observation, sharing meeting, key informant interview, questionnaire survey, focus group discussion, consultation, school teaching, poster, education toolkit production and distribution etc. Through these methods, we were able to bring the following findings. By synthesizing findings, we are preparing report, education/teaching material and articles.

5.1 Habitat Suitability

The Barandbhar Corridor Forest with other sites outside the protected area was found to be suitable for rhino but the dimension is very less with compare to Chitwan National Park. The probability of the occurrence of rhino was generated by MaxEnt model range between 0 – 1. Binary map was prepared using 10 percentile training presence Logistic threshold i.e.



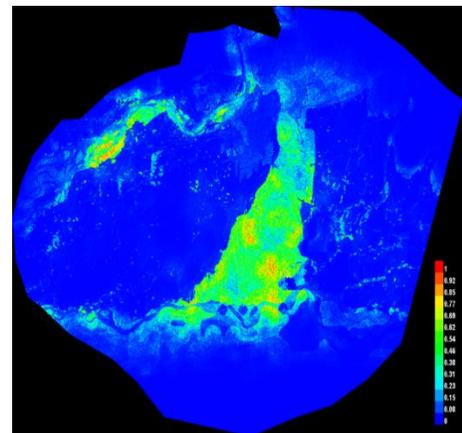
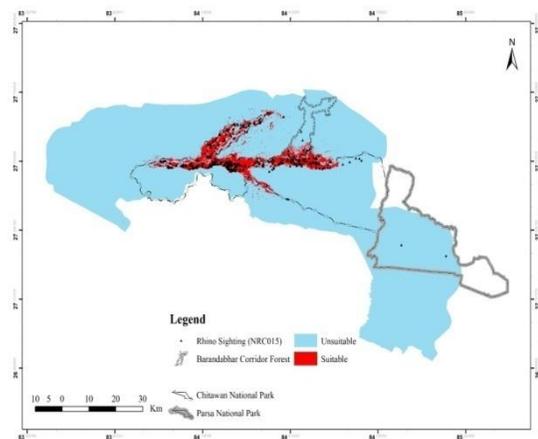
area
below

with 0.3211 probability is unsuitable. Out of total

area
(4720.75
Km².) of
the
landscape,

only 5.42 % (256.03 Km²) area was found to be suitable whereas 94.58 % (4464.72 Km²) was found to be unsuitable. Approximately, 75 % (53.32 Km²) Suitable area is occupied by CNP, Barandabhar Forest Corridor

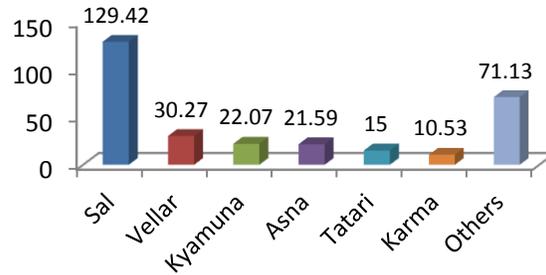
(BFC) occupies 7 % (18.89 Km²) of suitable area of the landscape. Mr. Sunjeep Pun has also done thesis on the habitat suitability for partial fulfillment MSc degree at Institute of Forestry, Pokhara Campus, Pokhara, Nepal. We are also preparing article on this case to publish in journal.



Rhino is mega herbivore and need large amount of feeding materials. So, vegetation type with their volume status is needed to be assessed.

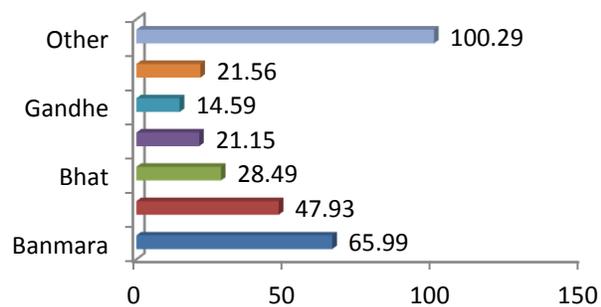
We did vegetation survey and stratifying three categories; tree, shrubs and herbs. In case of tree, we found Sal (*Shorea robusta*) as the most dominant species having highest Important Value Index (IVI) figure 129.42. Similarly, Vellar (*Trewia nudiflora*), also called rhino apple, was recorded as second dominant species with value of 30.27 whereas Kyamuno/Kyamuna (*Cleistocalys operculatus* Roxb.) and Asna (*Terminalia tomentosa*) have 22.07 and 21.59 respectively. Sal is not the preferred species of rhino whereas Veller fruit is one of its preferable foods among the tree species.

Tree IVI



Similarly, Banmara (*Chromolaena odorata*) was recorded as the most dominant shrub species whose IVI was found 65.99 where Galeni (*Sambucus hookeri*) had IVI 47.93 and Bhati (*Clerodendrum viscosum*) 28.49 followed to Banamara. *Chromolaena odorata* is invasive species. This species is also known as notorious (forest killer) species

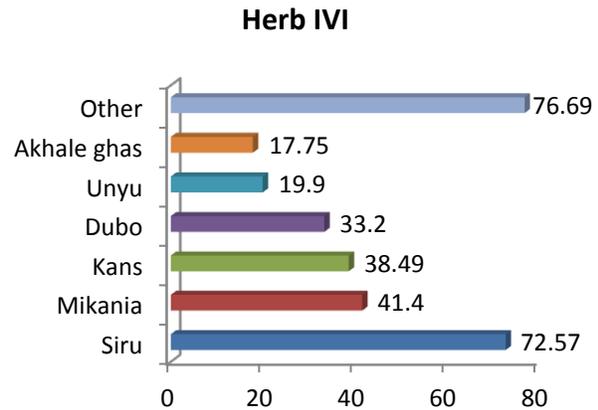
Shrub IVI



because it depresses other species regeneration and growth. It covers the ground fully and does not allow light to ground level for the germination of other plants. The management of this species is prime concern if we want to better habitat for the rhino in the forest. Other shrub species having the higher IVI value are also not palatable species so grassland management should be another major concern in the area.

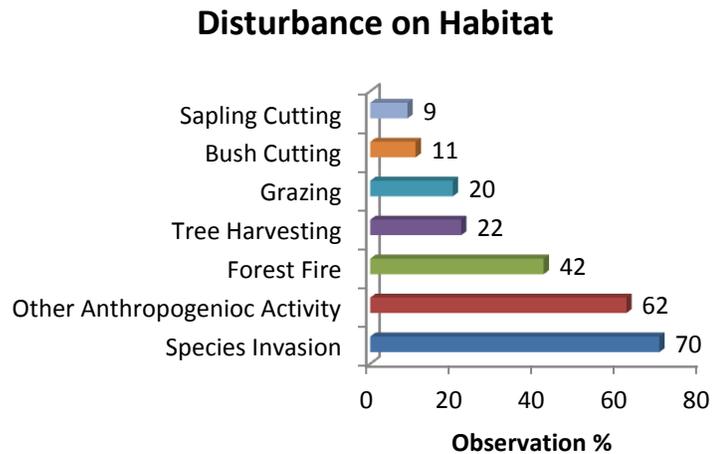
Rhino prefers grassland and mostly feeds grass so we also studied the status of the grass/herb species. Siru (*Imperata cylindrica*) was recorded as the most dominant species which bears highest IVI figure 72.57. Though rhino preferred many herbs are observed in the habitat, the Siru

is followed by Mikania (*Mikania micrantha*) with second highest IVI figure 41.40. Mikania is the most invaded and immense threat creature plants species in the study areas whose proliferation rate is also huge with compare to other. This climber species grows very fast and totally covers other plant from which plant cannot get light form the sun and ultimately dies. From the results we can conclude that rhino habitat is also invaded with many non-palatable species whose management is essential.



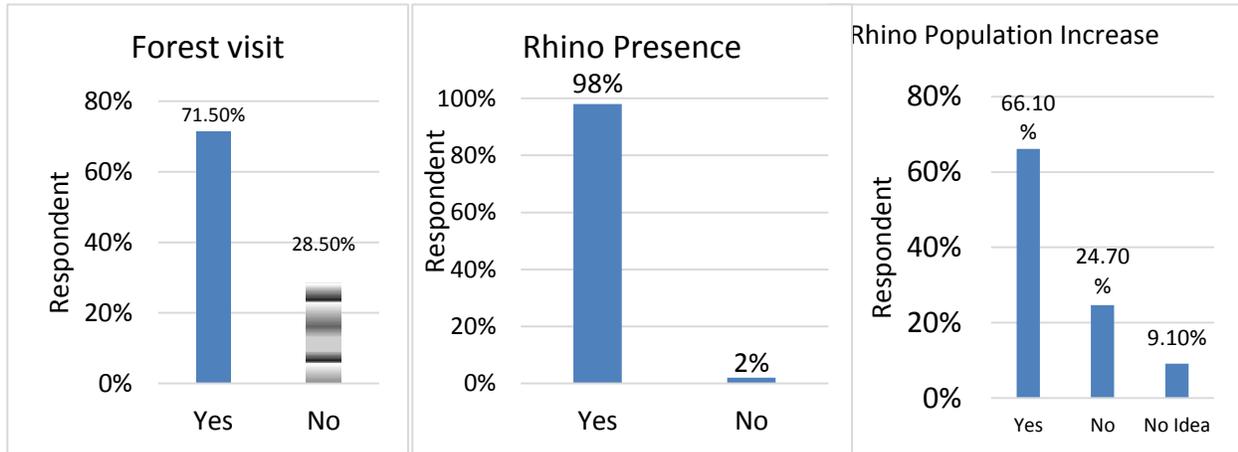
While conducting presence/ absence and vegetation survey, we observed different types interruption in laid sample plots which has been creating disturbance in habitat. Out of 200 laid plots, we noticed invasion of invasive species in 70% plots followed by other anthropogenic activities (noise and foot trail) in 62% plots. Similarly, we observed incidence of forest in 42 % plots, tree harvesting in 22% plots, bush cutting in 11% plots and sapling cutting in 9 % plots.

From the figure, we can clearly say that rhino habitat outside the protected area has both natural (species invasion) and anthropogenic pressures. Among these pressures, invasion of non preferred species, human movement and fire are seemed to be serious. However grazing and harvesting of forest products are also noticed during the survey. Therefore we highlight management of invasion species and reduce in human intervention are primary actions to create the area in favour of rhino.



5.2 Community Perception

Forest visiting trend and rhino observation rate: We questioned that at what frequency do you visit forest and how many of them observed the rhino and how often? The intension of questioning these questions is to know the pressure to forest, presence of rhino and disturbance to rhino.

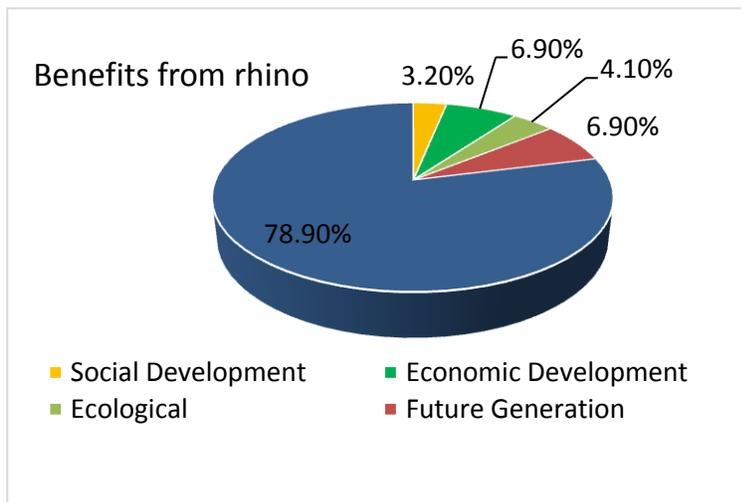
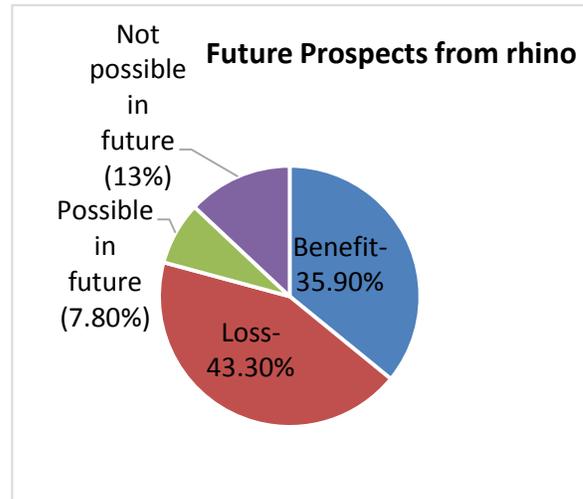


From the figures we can clearly see that, majority of the respondents (71.50%) go to the forest whereas a little more than one fourth of the respondents (28.50%) do not go. Among those going to the forest, some go on daily basis while most of others for a few times per week. They visits forest mostly for fodder and forage collection. A great majority of the people (98%) responded positive to the presence of rhino in their area while only a few (2%) responded otherwise.

Among the respondents, more than 66% of them experienced an increase in the number of the rhinos. At the same time less than 25% of them responded that they have not experienced an increase. Among those around 25% further mentioned that there are similar numbers of rhinos in their area as in the past whereas some experienced that the number has rather declined. Meanwhile less than 10% of people have no idea about the number of rhinos.

Response on benefits from rhino and its aspects: We asked people; how are you taking the increased population of rhino in their localities?

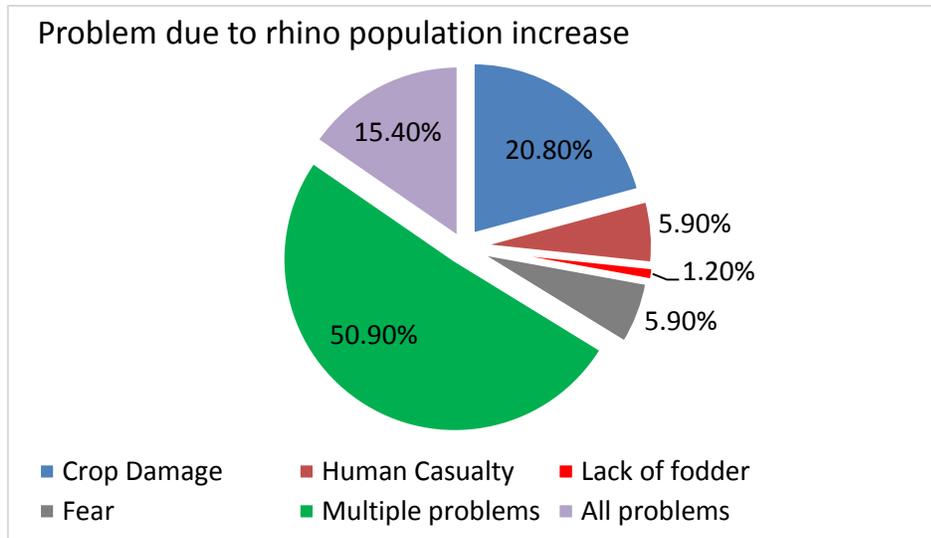
The chart clearly illustrates that around 43% of the respondents have experienced loss due to increase in the number of rhinos. Meanwhile almost 36% of them said to have experienced benefits from this increase. 13% of the respondents are not concerned at all by the experiences brought on by the rhino increase whereas around 8% believed that this increase will have some possible benefits in the future. This means some people have believe that they can get benefits from rhino presence in future however currently they are not experiencing benefits from rhino.



Secondly, we asked people who are agreed as rhinos are beneficial to them as, what are the benefits that are being made through rhinos? The chart displays people have derived benefits from the rhino like; social development, economic development, ecological and possibilities for future generation.

More than 75% of the people claimed to have multiple benefits from the rhino. Only 21.10% people have seen individual benefits. Meanwhile 6.90% of them believed that it will have possible benefits for the future generation. Similarly 4.10% mentioned its ecological benefits, another 6.90% mentioned the economic development it has incurred and lastly 3.20% stated its role in the social development.

Response on Problem due to Increased Rhino population: On our question, what could be the problems that you have expected with the increased population of rhino in your locality? The respondents have their different views with respect to the potential negative consequences. The

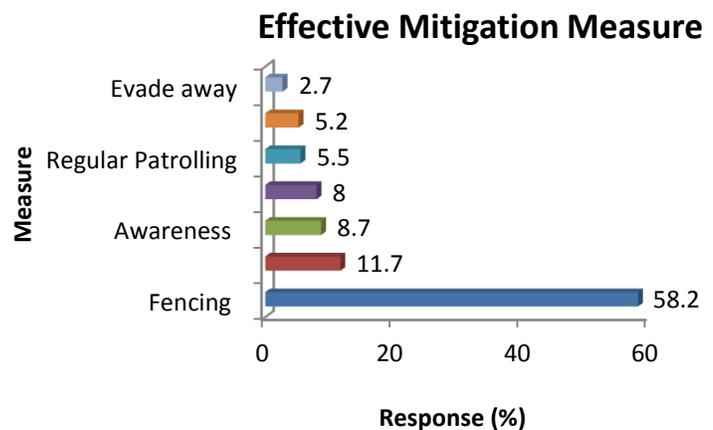


adjacent figure displays different problems incurred as a result of increase in the number of rhino. About 21% of the people claimed crop damage to be the major problem due to rhino increase while only 5.90% claimed

that human casualty was the major problem. Similarly, only 1.20% of the people responded lack of fodder as a major problem whereas fear was reported as another main problem by 5.90% of the people. Meanwhile, about 51% of the people reported that multiple problems were incurred by the increase in rhino with crop damage and human casualty the most serious among the multiple problems. Less than 16% of them claimed all the problems as a serious issue in their area.

Response on Effective Mitigation Measure: With the same time, we also asked people what will be effective measure to mitigate

to expected potential problem? The bar graph shows different mitigation measures that the respondents reported to be suitable for dealing with the problems due to increase in rhino. Majority of them (58.2%) reported proper wired fencing as the most suitable mitigation measure.



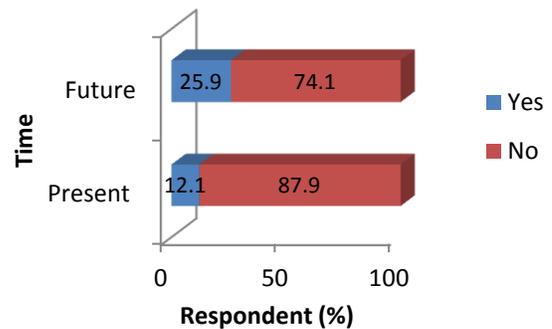
They also highlighted electric fencing with regular working mechanism i.e. effective in the electrical load shedding. 11.7% said restricting the entry to forest as a suitable mitigation

followed by creating awareness among the people and digging pit around the area accounting for around 8%. About 5% of the people claimed regular patrolling and high security to be the most suitable mitigation measure. Lastly, only a few (2.7%) believed that evading away the rhinos was the most appropriate mitigation.

Response towards the human rhino conflict: We also wanted to know the existing situation of human rhino conflict and expected situation with increase in rhino population in the locality. Among the people surveyed, 33% of them had suffered loss from the rhino while 67% denied to have incurred any loss. Crop damage and human casual population were the major losses they suffered. Similarly, less than 50% of them reported rhino causing loss in their neighborhood whereas more than 50% reported that there were no losses in their neighborhood.

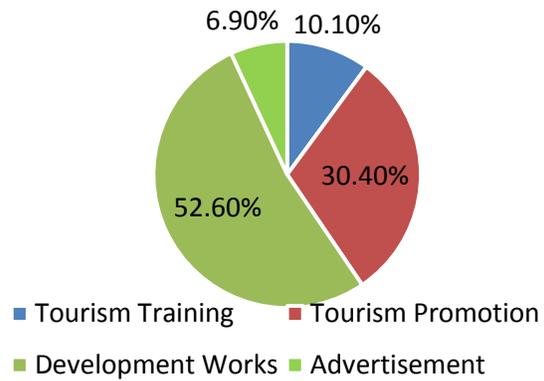
In addition, we were interested to know the human casualty and wounded cases because these are the most emotional issue of dissatisfaction to wildlife conservation. The bar graph shows that about 12% of the people agreed that the increase in number of rhino has affected their life at present whereas majority of them (around 88%) disagreed with it. Likewise, about 26% of the respondents believed that the increase in number of rhino will affect their life in the future while about 74% believed otherwise.

Human Rhino Conflict (Chance)



Response on potentiality of generating benefits from increased rhino population: Among the total people questioned, about 73% of the people claimed that benefits can be taken from the increase in number of rhino while about 27% of them claimed that no benefits can be taken from this increase in number of rhinos. But the claimed possible benefits only can be made available with assuring following activities; tourism promotion activities, training, advertisement and development works.

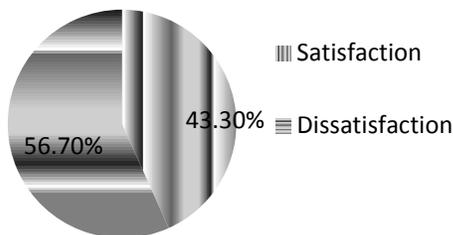
Needs to derive benefits from rhino



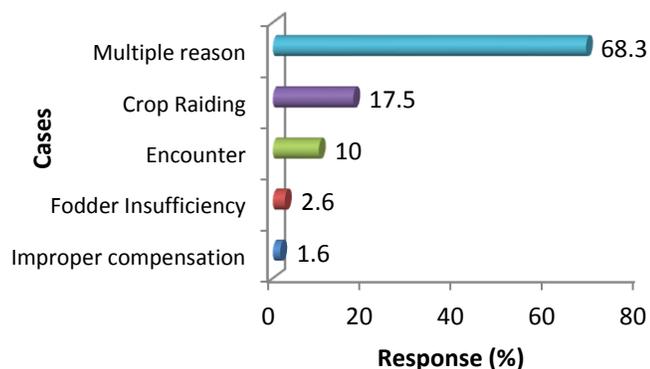
The figure illustrates the things needed to be assured to gain more benefits from rhino in days to come. More than 50% of the respondents believe that different development works such as roads, building, hotels, other infrastructures and facilities are the most necessary for deriving benefits from rhino. Likewise about 30% of them claim that the promotion of tourism in the area is most needed for getting benefits. Lastly, around 10% claim different trainings related to tourism such as guide, hospitality, etc. is needed whereas only 6.90% of the people believe advertisement is the most necessary requirement for deriving benefits of rhino. They have also realized that the rhino conservation and maintained its population is primary task to obtain these benefits for long term. Among those people surveyed, a vast majority of them (93%) claimed that it is necessary to conserve rhino whereas only 7% disagreed with it.

Response on potentiality of generating benefits from increased rhino population: We asked

Satisfaction to Rhino Population Increase



Reason for Dissatisfaction



people are you happy with the increasing number of globally important species in your locality. In response, people gave their views as show in the following figure.

The figures above illustrate the people who are satisfied and dissatisfied with the increase in rhino as well as the reasons for their dissatisfaction. More than 50% of the respondents reported to be dissatisfied with the increase in number of rhino whereas about 43% of them were satisfied with it. Among those dissatisfied with the increase in number of rhino, majority of them (68.30%) claimed there were multiple reasons for their dissatisfaction such as crop loss, human casualty, lack of fodder and improper amount of compensation. Only a few of them claimed individual reasons for their dissatisfaction. Almost all of the people dissatisfied were either farmers or those living close to the forest.

Focus Group Discussion: This discussion was also supportive to remove the confusion aroused during the household survey. From the discussions, we came to know that people have different views towards rhinos within family also. People, executive members of conservation institution, have positive response towards rhino where as their family members have different views. This prevails that people even within same family have different thinking towards rhino conservation. So, awareness based program is not enough in locality.

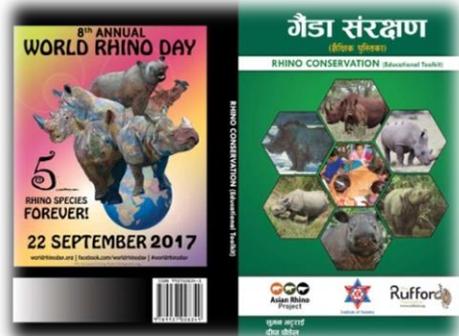
5.3 Community Outreach Activity

Following activities were carried out whose details have been presented below.

School Teaching: Most of the students whom we taught were aware about the rhinos and the surrounding forests are rhino habitat. But they were not about the importance of the rhino, how many rhinos are in Nepal and major threats toward this globally threatened species. They were also unknown to the population trend (status) and habitat situation of rhino. With the school teaching program, many students had got opportunity to know about the rhino and their possible role to conserve rhino and sustain its population in their locality.



Education Toolkit Production and Distribution: One education activity can influence certain number of students who can take part in the activities whereas a single publication can influence many people for long time. If we keep single book in a school library, it will be source of knowledge to thousands of students for many years. These publications can be also resources material to many conservation stakeholders and teachers who are interested to conduct rhino conservation program with the completion of project. We republished "**Rhino Conservation Educational Toolkit**" with updated information and more coverage for distribution in the proposed sites. Besides Chitwan, we distributed toolkits in other protected areas (sites); Bardia National Park, Shukla Phanta National Park and Parsha National Park where rhinos are found in recent years. So, this educational toolkit could impact throughout Nepal where rhinos are found. We distributed toolkits to conservation institutions, bufferzone user committee, community forest user groups, school, academic institution. We provided toolkit to teachers with request to utilize it as teaching material.



The toolkit was published on the authorship of Mr. Suman Bhattarai and Ms. Deepa Paudel, Assistant Professors, who have been teaching conservation subjects in Institute of Forestry, Nepal. This publication has played crucial role in building career of authors.

Poster: The rhino has been playing crucial role to introduce Nepal among conservation stakeholders throughout world. With this sentiment, we produced poster having message "Rhino! Our Recognition, Our Pride" and distribute in different program. Produced poster became meaningful to spread affirmative vibe on local people regarding rhino conservation.



Calendar Publication Support: World has been celebrating "World Rhino day" since 2010 but many conservation stakeholders in Nepal are still unknown about this day. However September 22nd, 2018 was 9th World Rhino Day. Through the calendar, many stakeholders got chance to be aware about this day and some of them had celebrated this with conservation related activities. We mentioned September 22nd as World Rhino Day with some photo plates in calendar. The calendar has 3 month details within single page. People, who had this calendar, could notice the day 3 month before.



World Rhino Day Celebration: We celebrated 8th and 9th World Rhino Day in Sep 22nd 2017 and Sep 22nd 2018 during this project period. In 2017, we published the "Rhino Conservation Education Toolkit" 2nd edition whereas Rhino Sketch Competition on the theme of "Rhino! Our Recognition, Our Pride" was organized in 2018. published rhino conservation educational toolkit became milestone to educate students, local communities, teachers and many more individuals interested in rhino and conservation education.



The

Similarly, in the collaboration with SAFE-Nepal we organized rhino sketch drawing competition in the theme of "Rhino! Our



Recognition, Our Pride" on 9th World Rhino Day, September 22nd, 2018. Altogether 20 individuals took part in the competition and drew sketches with different views and meaning. The drawn sketches were kept for exhibition in order to disseminate conservation importance in broad spectrum. All contestants were recognized through certificate and educational toolkit for participation and top 4 were rewarded with prizes, certificate and

educational toolkit. We will keep these sketches in exhibition program and festivals in coming days also. We can provide this sketch to other institution/individuals if they want to utilize for awareness creation and education. The competition was organized among the conservation of Bachelor level studying forestry and biodiversity conservation but half number of contestants had drawn sketch of two horned rhino (African). This reflects that many people in Nepal are still unknown which is the Greater One Horned Rhino (*Rhinoceros unicornis*).

Education/Teaching Material Preparation: Based on concept of this project along with outside the protected area activities, we prepared the teaching material and utilized for teaching and train conservation related students. In coming days also, the project finding will be the great experience for teaching the wildlife



conservation subjects in the Institute of Forestry and other colleges concerned with forestry, wildlife conservation and protected area management. So, the project is becoming good medium for academic enhance and human resource development to conservation sectors.

Article Publication: Based on the finding of the project, we are going to prepare article so that the scientific communities working with rhino conservation and natural resources management. Similarly, we will prepare the article in local language to publish in local paper so that the finding of project can be shared with local people.

Reporting and Finding Dissemination: We have prepared a complete report to submit the supporting agencies and disseminate to concerned stakeholders. Findings will be share academic community by organizing presentation seminar. Similarly, article will be prepared for peer review journal in order to share the findings with scientific community.



T-shirt Production: We had produced t-shirt for team member and other key person while involving project activities. It is designed as extension material for disseminating rhino conservation information with supporting agencies logos. The message; "Rhino! Our recognition, Our Pride", was printed in t-shirt which made project member and people feel proud being part of rhino conservation project.



6. Project Performance Evaluation

Every effective project will have short and long term output/impacts. This is a research cum community outreach project whose visible impact cannot be predicted within short period. But the performance of project activities can be measured. We measured success based on local participants' number, change in students' knowledge (by questioning before and after the school teaching), responses of local communities and other stakeholders (experts, institutions). Schedule wise deliverables; completion of projects' activities, reporting, publication are the major basis of performance measurement. According to the feedback of the students, local stakeholders, academicians, conservationists, representative of conservation institutions, schools, we could comfortably say project was able to make meaningful contribution. Despite time schedule change due to some circumstances, we could complete all project activities in satisfactory manner.

Report, articles, citation to these reports/articles, development of future projects/action based on the finding of the projects also prevail the success in future. The performance of project member in rhino conservation and related issue can be taken as impact of the project in human resource development. The sustaining of rhino population with the active involvement of local community will be taken as outcome of the projects in long run.

7. Expected Conservation Impact

Though rhino poaching is being reduced, rhino population is still in critical stage due to poaching, public perception, habitat shrinkage and less secured habitat. Habitat restoration and protection action for restoring and sustaining rhino population is worldwide understanding. Recent rhino count has found population increase not only in core area but also in Bufferzone of national park and outside the protected areas. This has raised issue of sustainability of this increased population outside the protected areas because of public pressure on resource utilization and local participation in conservation. In Nepal, participatory approach has also worked as backbone for bringing current positive results in rhino population however, increased population brings not only positive but also negative aspects which are directly influenced on the coexistence of people and rhino. Chances of human-rhino conflict; crop raiding, encounters, human casualty, become high which creates hostility. So the project has assessed habitat condition, public sentiment, awareness level and local willingness to contribute for sustaining increased population in one hand and organize community education and awareness programs on the other. We covered different group of people; occupation, age, education level in project activities so people feel ownership towards the project. This has assured meaningful impacts on maintaining the area as secure habitat in coming days. The finding of study will work as backstopping to prepare effective rhino conservation action by covering outside of the protected area in future. We will also design the conservation program based on the findings of this study which will bring visible impact.

8. Contribution to Associate Species and Habitat

The targeted site supports world's second largest population of this rhino. Besides rhino, it is habitat of several globally threatened species; tiger, elephants, gharial, sloth bear, bison, birds (Bengal florican) and many more globally threatened herbivores and carnivores. Many conservation issues of rhino; conflicts resolution, habitat management and community sensitization are interlinked with other species because they are the elements of a common ecosystem and their habitats overlap with each other. This means efforts for conserving rhino has eventually played significant role to many other globally important species and local environment. Even in school teaching and educational toolkit, we have covered the importance of

ecosystem and landscape based conservation which directly concerned with habitat, corridor and other associate species. Similarly, UNESCO has listed this area as world heritage site because of unique landscape ecology and biological diversity. So, conservation initiatives of rhino also contribute to secure value of heritage site too.

9. Involvement

In the leadership of grantee; Suman Bhattarai and assistance of different stakeholders, project was implemented successfully. Students, local resource person, academicians and local people were also hired in as per necessary for supporting in organizing outreach activities, social survey, vegetation survey and habitat suitability assessment. We run the project in the joint venture of local stakeholders who are working in the field of forestry, wildlife, natural resource management etc. in the target area. Local institutions forest user groups, youth clubs, schools, and other conservation institution of the local area were also involved. Students with related with conservation subjects, Mr. Sunjeep Pun, Mr. Prashanta Shrestha, Mr. Santosh Paudel, Anu Padel, Alisha Sharma, Ambika regmi, Barsha Tripathi and Pratikshya dahal were mobilized throughout the project for field based activities like; data collection, school teaching, data analysis, reporting and educational toolkit distribution. Similarly, academicians; Mr. Bishnu Prasad Devkota, Rajan Subedi, Bishnuhari Wagle etc. were also mobilized in the field visit activities.

Our all program are specifically focused on grass root level so we have given priority to local involvement in the project. While implementing the project, we had kept close coordination of local community and stakeholders. Our activities; school teaching, interaction and focus group discussion are specifically local community targeted program. Rhino conservation education toolkit production and dissemination in different pockets became milestone to educate local community because anyone can utilize this toolkit after the project completion. In questionnaire survey, we mobilized the local youth and students which provided depth knowledge to them as well about local issue. Conservation related students, who were involved throughout project duration were locals. The main objective of mobilizing local students is to teach them about the local situation and make them responsible for working in favour of rhinos in coming days too. In our assistance, Mr. Sanjeep Pun did his master's degree thesis and other students are trying to do their academic thesis in rhino related issue.

10. Conclusion

The study area including Barandabhar Corridor Forest is found to be suitable for the rhino but invasion of non preferred species is also excessive in the habitat. The concentration of rhino is mostly seen in small pockets of river bed which is followed by grassland and water body. To disperse this population and protect from threats, habitat management practices should be focused in less suitable areas as well. Habitat suitability analysis at localized level provides valid evidence to justify the area as suitable and unsuitable so specific site level study is needed in new area where rhino movement occurs. Proliferation of invasive plant species and human disturbances (trails, noise) are relatively most disturbance factor outside the area. Alternative uses of invasive species should be explored in order to reduce the invasion pressure in the area.

Local people have also realized that the rhino population and their movements were found increased in the locality. They were more susceptible to chance of increasing conflicts with the rising in rhino population in there periphery. Majority of the people agreed electric fencing with proper mechanized system would be the effective mitigation measure for reducing potential increasing conflicts. Communities who are the farmer and live close to forest are not positive to increased population. People believe rhino presence will be beneficial in future however currently they are not experiencing any benefits. Similarly, people of same family have also different understanding toward rhino, member who is involving in conservation work were seemed to be positive whereas other were not. The community outreach activities were fruitful to make better understanding specifically rhino among young generation, local people, students and academicians. Depth study with school teaching activities were recommended to attract attention of local people for rhino conservation. Similarly, farmer and people live close to forestland should be kept in priority while developing conservation plan and activities.

11. Way Forward

Continuity and monitoring after project completion are also vital part to strengthen achievement. We are honest on this issue so we have organized education and other community outreach activities after project completion in previous days. We conducted many activities when we didn't have any support from funding agencies. From 2011, we have been celebrating World Rhino Day continuously. After this project, we have planned to continue some activities in this area.

-Organize post project monitoring with some education activities.

-Utilize learning of this project in other areas where same issues are observed.

- Prepare article for publishing in national/international journal based on the finding of the project.



-Materialize branding of rhino for rhino and its habitat conservation. Many people are generating income by using name of rhino or making rhino as medium for



income generation so we want to assess their opinion/willingness in contributing particularly rhino conservation. During this project period also, we observed branding of rhino in local and surrounding area for many purposes. Many people are using rhino name for their business (hotel, guesthouse, departmental stores, security institution etc), as institution name (bank, clubs), keeping rhino picture/statue in their business room. We found some people making rhino statue for sale, printing rhino picture in t-shirt, hotel rooms and other products. So, we have planned to appraise willingness of those people who have been using the rhino as brand in their business to contribute for rhino conservation. If we can mainstream willingness of those people, that could be big source for rhino conservation program for long term.

12. Acknowledgement

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Logo Use: We have kept logo of The Rufford Foundation and Asian Rhino Project (ARP) in every item produced in the support of The Rufford Foundation and ARP, like; banner, certificate, t-shirts, posters, report, publication, teaching materials etc.

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Rhino!



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