

Assessment of Crop Destruction by Wild Boar (*Sus scrofa* Linnaeus, 1758) and Approaches to Mitigation in Rainadevi Chhahara, Palpa

Pit Bahadur Nepali¹, Pooja Pokharel, Hira Bahar Rana, Narayan Baral, Amrita Saru

Tribhuvan Multiple Campus, Palpa

¹Corresponding author, pitsnepal@gmail.com

Abstract

Wild boar (*Sus scrofa* Linnaeus, 1758) is considered a major challenge to agricultural products for socio-economic loss. The study was conducted between June 2024 and April 2025. This study measured the level of crop destruction by wild boar, the cause, and local mitigation approaches in Rainadevi Chhahara Rural Municipality, Palpa. Data collection involved field observations, household surveys, interviews, and structured questionnaires in affected areas. Results showed maize, paddy, wheat, and potatoes were the most damaged crops, with maize suffering the greatest losses. Key factors influencing crop damage included proximity to forests, wild boar population density, seasonal crop availability (especially high in summer and autumn), and nighttime conditions. Mitigation strategies include crop guarding, group guarding, chasing with dogs, the use of noise and light, and physical barriers, where personal and group crop guarding methods were most effective. Integrated, community-based mitigation strategies supported by local communities and conservation organisations are essential for reducing crop losses and promoting sustainable coexistence between farmers and wild boars in the region.

Keywords: Conflict; Community perception; Crop damage; Economic loss, Food security

Introduction

Wild boar exhibits the widest range of distribution and habitat behavior among mammalian herbivores, inhabiting human surrounding areas in diverse places including semi-arid tropical forests and open grasslands (Massei & Genov, 2004; Karami & Tavakoli, 2022). These species search for biological needs outside their normal habitats, producing significant conflict. As a result, there are negative consequences for both humans and wildlife (Attia et al., 2018). The conflicts are a global concern determined by elements like topography, land-use patterns, human activities, and the biological features of wildlife species (WWF, 2006) and also depend on number of individual populations. The primary crop that wild boars consume is maize, but they also eat other cultivated plants including wheat, barley, and paddy, potatoes, especially in the interim between harvesting and seeding. This availability drives seasonal dietary variations. Several crop varieties are impacted due to the nocturnal feeding habit of wild boars (Herrero et

al., 2006; Keuling *et al.*, 2010; Lindblom, 2011; Pant *et al.*, 2023). In addition, increase human activities in forest for various purpose as well as conversion of forests into agricultural and settlement lands, is leading to rising incidence of human-wild life conflict.

Wild boar is the major agricultural pest that damages crops and produces heavy economic losses for local farmers in Nepal. Dhakal (2012), Pandey *et al.* (2016), Khanal& Singh (2019), Pant *et al.* (2023), and other researchers measure the significant damage to crops in different regions of Nepal. According to Magar *et al.* (2024), damage to potatoes and paddy caused significant economic losses in national parks and hunting areas. Summer and early autumn were the seasons with the highest frequency of damage in Sardinia. Agricultural areas situated near forested zones and those carrying more permanent crops faced more vulnerability. (Lombardini *et al.*, 2017).

Identifying the behavioral factors that shape the species response to hunting is crucial for designing effective, evidence-driven control programs (Colomer *et al.*, 2021).

The increasing number of wild boars have reinforced human–wild boar conflicts and caused substantial economic damage, creating a serious concern for policymakers and conservation practitioners worldwide (Milda *et al.*, 2023). Despite the behavior of wild boar is not greatly affected by human presence or activities, adaptability allows them to exploit available resources while avoiding regions of human disturbance (Meinecke *et al.*, 2018). Understanding the level of conflict both on agricultural fields and in the character of the surrounding forest is vital for creating and adopting more effective methods of management. Applying appropriate mitigation strategies utilizing linear or nonlinear associations with various landscape, agricultural, and forest factors is essential to the success of wild boar management; integrated preventative and control measures are better than single-method approaches (Zhang *et al.*, 2024).

The primary goal of this research is to quantify the factors driving conflict by conducting field surveys across agricultural landscapes, identifying high-risk locations, and implementing comprehensive mitigation strategies to minimise wild boar impacts. Additionally, this study provides beneficial suggestions for managing wild boar and supports ideas for creating local strategies to prevent and manage their spread.

Materials and Methods

Study area

Rainadevi Chhahara Rural Municipality, Palpa, located at the latitude of 27°52'32.68'' N, 83°24'54.69'' E and has a highest elevation of 5061 feet, characterized by a forest hills, agricultural lands, cold climate with many water sources. Mujhung, Chahara, Somadi, Sidheshowr, and Bhuwan Pokhari village were chosen for study. (CBS, 2021; Rainadevi Chhahara Rural Municipality, 2022). The region comprises tracts of natural land that have remained undisturbed by human activities. The major sources of livelihood for the indigenous inhabitants are crop agriculture and livestock rearing. Generally major food crops are paddy, wheat, millet, maize, etc.; oil products are mustard, etc. vegetable products are potato, cauliflower, cabbage,

pumpkin, tomato, garlic, ginger, and onion; and fruit products are orange, pear, guava, etc., which are cultivated for commercial and household purposes. This region has many wildlife inhabited by wild boar.

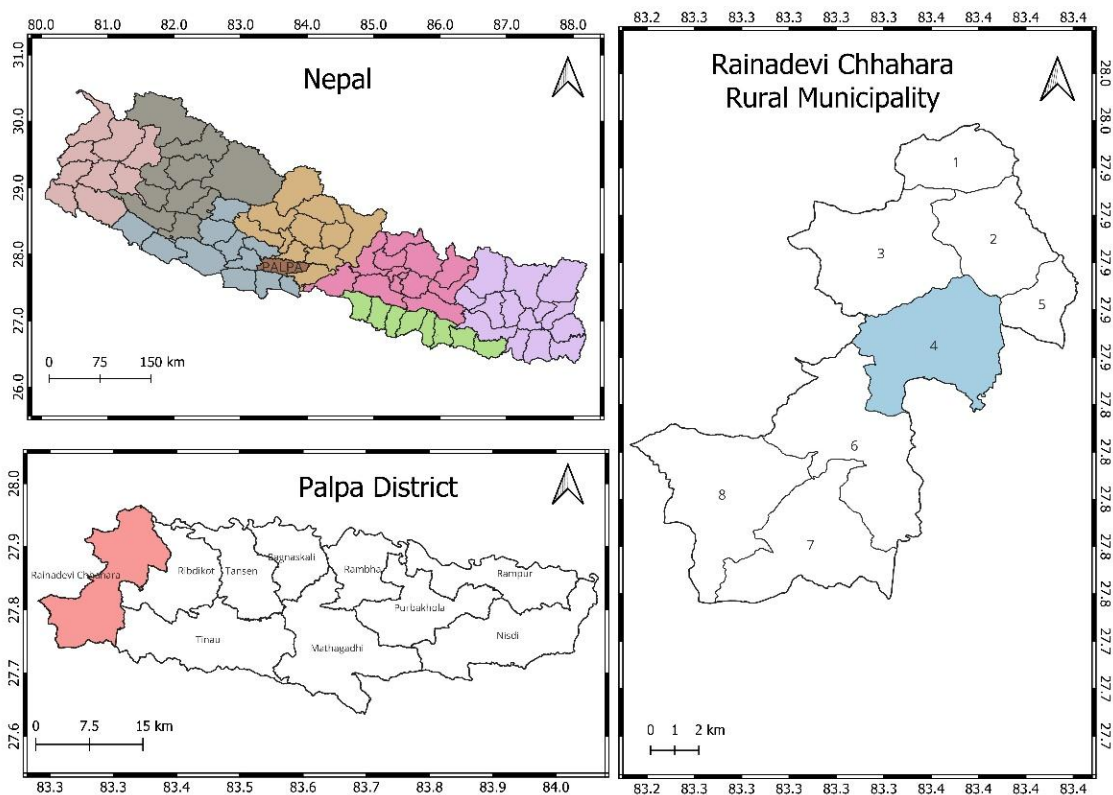


Figure 1: Map showing the study area in Rainadevi chhahara rural municipality

Data collection

Both direct observations and indirect evidence, such as tracks and damage signs, were used in field assessments at the study location to detect wild boar activities in order to confirm the information. The investigation was conducted between June 2024 and April 2025. Household surveys, interviews, and structured questionnaires were used to collect data on crop losses in affected areas. Additionally, additional data was obtained from the Department of Environment's (DOE) local office. To provide comprehensive and spatially representative coverage, a random sample of peasant households was chosen from five major villages. The survey was chosen in order to examine the relation between farmers' agricultural practices and wild boar damage. Settlement size, distance from forest margins, number of agricultural workers, and land-use patterns. Interviews were conducted in regions where wild boar activity occurs often. In addition, basic socio-demographic information (such as age, gender, household size, and education) was gathered. Detailed data were also recorded on livelihoods, income sources, land

ownership, crop types, extent of crop damage by wild boars, area of loss, timing of attacks, recent trends in human–wildlife conflict, and the mitigation measures used along with their effectiveness. Along with responding to the 125 household survey, 150 structured questionnaires were taken from various respondents, and 50 female and 100 male farmers were interviewed about the effects of wild boar.

Data analysis

Both analytical and descriptive methods were used to analyze the data collected. Excel, PAST, and R tools were used for data processing and analysis (R Core Team 2023). The associations between gender, age, education level, occupation, and public opinion of wild boar conservation were examined using percentages, frequencies, and Pearson's chi-square tests. A comprehensive regression model was created in addition to a one-way ANOVA to assess variations in crop losses.

Crops loss (kg per household) = total crop loss in kg / total number of affected households

Result and Discussion

Table 1:

Age group, Gender and Education of Respondents

Age	Male	Female	Illiterates	Below SEE	Higher level
20-35	23	18	0	14	25
36-50	14	21	2	19	14
51-65	19	16	8	21	8
66 above	8	6	8	5	1
Total	64	61	18	59	48
%	51.2%	48.8%	14.4%	47.2%	38.4%

A total of 125 farmers were interviewed, and 150 structured questionnaires were collected from wild boar–affected areas. Educational status, age categories, and gender were considered as key factors influencing wild boar damage patterns and the use of mitigation strategies. Farmers aged 20–35 and 36–50 were the most actively involved in agriculture and therefore had higher exposure to wild boar encounters, whereas older individuals (66+) were less involved in farming activities. It indicated that adult people participated in agricultural farming. Both males and females participated more or less equally in agricultural work. Both genders share agricultural responsibilities, a trend commonly observed in subsistence farming communities where tasks like guarding fields, harvesting, and crop maintenance are jointly carried out (Acharya *et al.*, 2016). Most respondents with education levels below SEE were the group primarily involved in farming and most frequently affected by wild boar conflict. In agricultural fields, maize was the most impacted crop, although barley was less affected.

Chi-square tests were measured between age groups and categories (gender + education grouping) that are independent. The p-value, i.e., $p \approx 0.0000051$ indicated the distribution of

male/female and education levels varies significantly across age groups. Age categories represent the most economically active workforce in rural agriculture, meaning they spend more time in the fields and are thus more likely to detect or experience wild boar damage (Ogra & Badola, 2008;. Karanth *et al.*, 2012).

Table 2:

Cultivated crops and damage pattern in different habitat

crops	Households	Damage	Habitats					
			Forest edge	moist	dry	watery	Sandy	vegetation cover
Maize	81	severe	71	9	7	18	12	6
Wheat	27	Mild	45	18	14	31	2	2
Potatoes	51	high	12	7	29	0	41	1
Paddy	21	high	17	12	0	47	12	0
Barley	7	low	0	4	2	2	0	0
Vegetable	59	high	0	7	12	0	18	1

The association between crops damage and habitat types was found that Chi-square value (χ^2):280.75, Degrees of freedom (df):25 and p-value (4.27×10^{-45}). Different levels of food availability, shelter, and movement routes are formed by the many habitat types, which include the forest edge, moist areas, dry areas, aquatic habitat, sandy habitat, and vegetation-covered places. The results reveal that crop damage caused by wild boars varies depending on the kind of habitat. A wide variety of cultivated plants were severely damaged by wild boars. Several people reported cases of wild boars attacking crops. Tuber crops and vegetables were among the most seriously impacted (Milda, *et al.*, 2023). Higher levels of severe damage were observed in areas like the forest edge and moist or wet conditions. This is probably because these areas provide adequate of food resources, serve as important access points and extensive cover, which facilitates scavenging. Crop loss also varies with habitat characteristics, as shown by the observation that some crops, including potatoes and vegetables, were more commonly attacked in specific habitat conditions, such as dry or sandy locations (Piekarczyk *et al.*, 2021; Eshtiaghi *et al.*, 2024; Magar *et al.*, 2024). Similarly, Boitani *et al.* (1994), Cappa *et al.* (2019), and Schley& Roper (2003) reported that forest edges and moist areas were highly desirable habitats because they provide dense cover, increased soil moisture, and an abundance of food resources like potatoes, paddy, and maize, suggesting a strong relationship between crop susceptibility and habitat type.

Causes of conflict

This study showed that the crop cover and diversity of primary and secondary crops cultivated near forested areas had a major role in determining the HWPC. The risk of HWPC increased with an increased percent crop cover and diversity of primary and secondary crops cultivated. Similar to the observations of Schleyand Roper (2003) in Western Europe, wild boars

in our study area also were well-adapted to the changes in the crops and heavily relied on agricultural areas. We found that vegetables (including tubers), millets, maize and groundnut, were the most damaged crop by the wild boar in our study area, followed by paddy, banana, coconut, orchard, sugarcane and cotton. Similar observation was also reported by other studies (Tamil Nadu Forest Department, 2015; Senthilkumar *et al.*, 2020). Many global research reveals that wild boar have a strong preference for vegetables, particularly tubers such as potatoes and cereals like maize, resulting in crop destruction behaviors that increase human-wild boar conflict, especially in agricultural regions (Liu *et al.*, 2024).

Figure 2 shows that conflict between wild boars and crops is not uniform throughout season and time. Instead, it follows predictable seasonal and temporal patterns. In the summer, crops like maize and vegetables were impacted; in the spring, wheat and barley were impacted; and in the autumn, there was more conflict with potatoes and rice. In the same way, wild boar destructively harm crops at night (barley and maize), in the evening (wheat and paddy), in the morning (vegetables), and in the afternoon (potatoes). A similar observation was that the conflict between wild boars and crops varied by season and time of day, affecting different crops at different periods (Smith, 2024) and also high damage levels were most commonly observed during night and evening hours (Podgórski *et al.*, 2013; Nasiadka *et al.*, 2024).

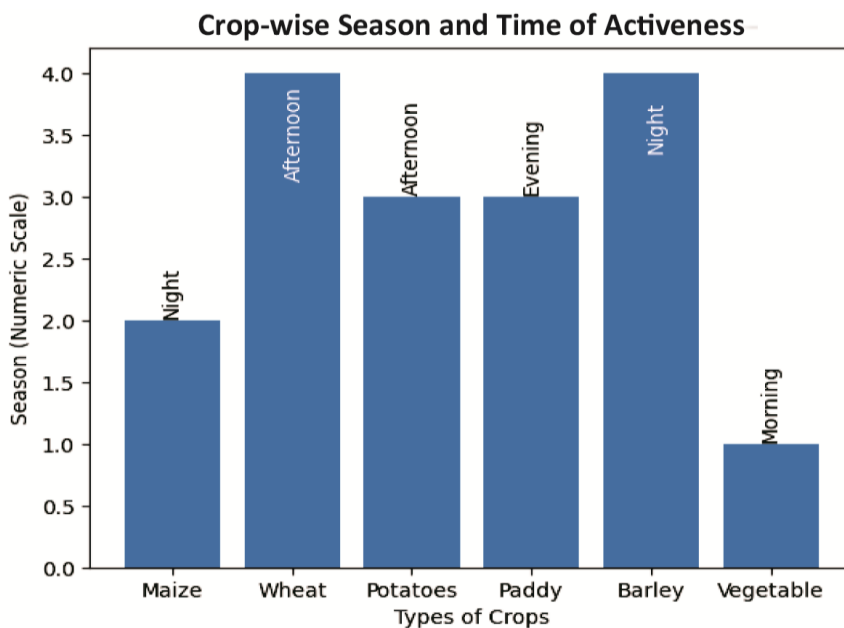


Figure 2. Seasonal and activeness of wild boar on crops

The occurrences of crop attacking are common in the study area from the beginning of crop planting to harvesting because they continuous threat to crops and prevalent across a wide range (Joshi *et al.*, 2022). Similarly, damage intensity across habitat proximity and crop types. Crops such as maize and wheat, located closer to forest edges (high forest factor values), experienced greater damage intensity, particularly during summer and spring seasons. In

contrast, crops grown farther from forest influence (barley and vegetables) showed low to moderate damage, despite the presence of wild boars (Schley & Roper, 2003). Damage events in agriculture are rare but can be very severe, often affecting large areas, particularly during the ripening and harvesting stages of crops. While these events occurred more frequently during these times, their severity per event is usually lower as feeding becomes spread across multiple fields (Nasiadka *et al.*, 2024).

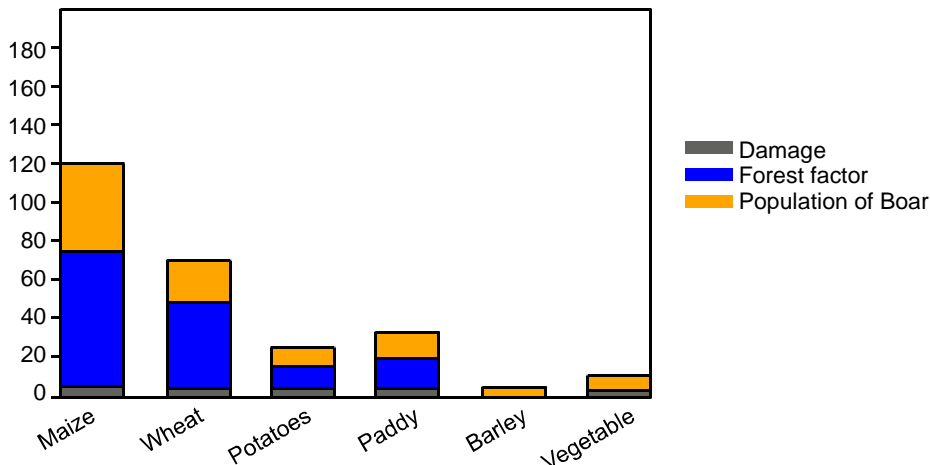


Figure 3. Cause of damage pattern on forest factors and population

The pattern of wild boar damage clearly showed a strong relationship between type of crop, boar population, and proximity to forest areas (forest factor). Damage is highest in maize and paddy, followed by potatoes, while wheat and barley experience relatively low to mild damage (Fig. 3). The maize fields coincide with the highest recorded boar population and the most severe damage, suggesting a direct positive relationship between population density and damage intensity. The forest factor is vital when it comes to estimating damage levels. Crops located near forest edges experience significantly higher damage than those farther away. It is due to forests provide cover, resting sites, and escape routes. The interaction between preferred crops, high boar population, and close proximity to forest explains most of the observed damage pattern. Even moderately preferred crops can suffer high damage when grown near forests with dense boar populations, whereas less preferred crops show lower damage when cultivated farther from forest edges (Barrios-Garcia & Ballari (2012). It suggests that during feeding seasons, wild boars attack on soft, high-energy crops; maize is especially exposed because of its growth structure and nutritional content. Similar feeding preferences for potatoes and paddy have been observed where the potential of conflict is increased by being close to forests (Aryal *et al.*, 2016; Thapa, 2010).

Mitigation strategies of wild boar

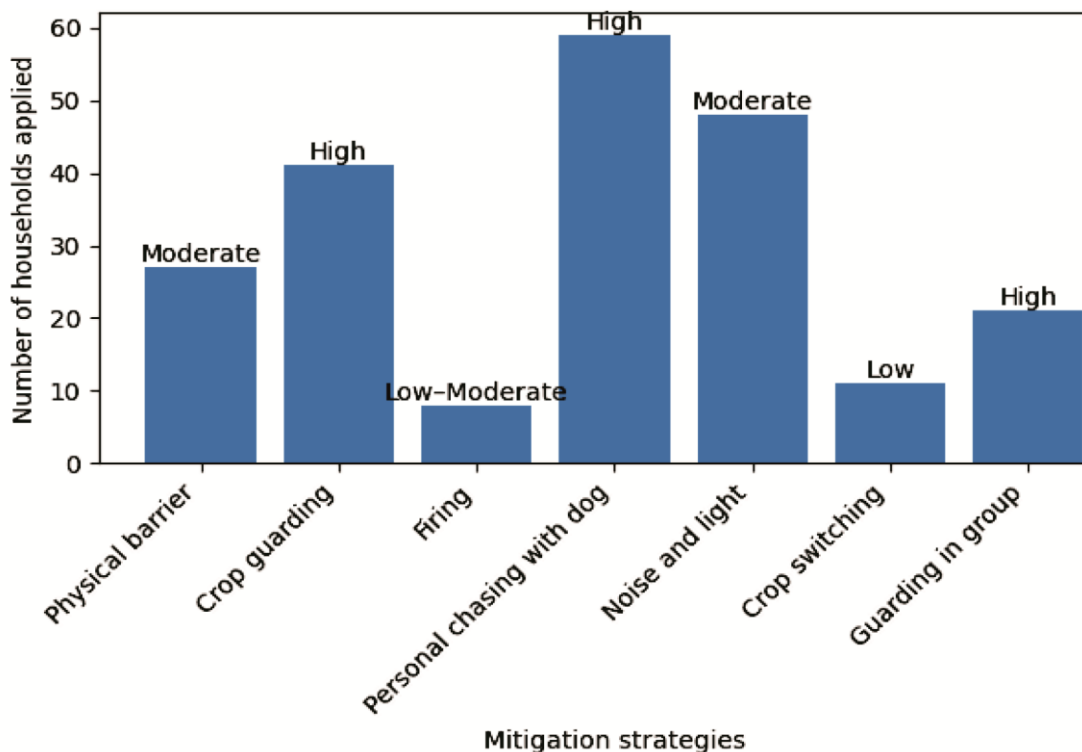


Figure 3. Mitigation strategies of wild boar

These pests produce serious problems for farmers of this area. There was no single method to protect crops from wild boar. Major strategies applied included physical barriers of stone, wire, and rope; crop guarding by individuals as well as in groups; chasing with dogs; producing sound and light; and crop switching near the forest.

To reduce crop damage, affected households implemented various mitigation strategies, which were evaluated on an effectiveness scale ranging from 1 (low) to 4 (high). The most effective measures (effectiveness = 4) were personal chasing with dogs (reported by 59 households), crop guarding (41 households), and group guarding (21 households). Moderately effective strategies (effectiveness = 3) included the use of noise and light deterrents (48 households) and physical barriers (27 households). In contrast, firing was rated as low to moderately effective (effectiveness = 2) and was adopted by only 8 households, while crop switching was perceived as the least effective strategy (effectiveness = 1), practiced by 11 households (Fig. 3). Wild boar conflict mitigation strategies vary in effectiveness depending on habitat type, crops, and boar behavior and also effective solution of conflict need scientific monitoring and integrated, community-based mitigating methods. Because group crop guarding increases human presence and discourages boars, it is very effective. Similar mitigation strategies also reported by Nyhus (2016). Other useful practices include making noise, using light, and constructing physical barriers. The omnivorous and adaptable nature of wild boars

makes crop rotation and firing less effective (Aryal *et al.*, 2016; Thapa, 2010). The degree of crop damage is inversely correlated with the distance from forest areas, suggesting that crop raiding decreases with increasing distance (Bhatta & Joshi, 2021). The community-based chasing and the use of dogs for personal chasing was most effective for control. Beside these, efficient management methods should be practiced throughout the entire crop cycle (Naik & Basavadarshan 2020).

Conclusion

In Rainadevi Chhahara, Palpa, the wild boar (*Sus scrofa*) seriously damages agricultural crops, creating incessant problem. They preferred high-energy crops like maize, paddy, wheat, and potatoes, and their effects vary depending on crop type, season, closeness to forest edges, and time of day. Due of their nocturnal activity, damage is more severe at night and in the evening. Seasonal trends also showed that crop destruction was highest in the summer and autumn. Crops grown farther away from forests suffered comparatively less damage as a result of increased wild boar populations exerting pressure on the severity of damage. Because there are fewer natural predators, improved habitat, changing farming methods, increase population and insufficient population control, contribute significantly to the severity of conflict.

The assessment of mitigation approaches reveals that no single strategy is sufficient to address the problem effectively.. Crop losses can be decreased more successfully via community-based crop guarding, human chasing (often with dogs), better fencing, population monitoring, and institutional support. Limited mitigation is provided by passive approaches like light, noise, and simple physical barriers. In order to achieve a balance between agricultural security and wildlife protection, farmers, local governments, and conservation organizations must work together.

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APPENDICES

APPENDIX I : Photo plates

