

Summary

Entrance Year : 2016

United Graduate School of Agricultural Sciences

Course : Science of Bioresource Production

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Title	Human-elephant conflict in the traditional dry zone village settlements of Sri Lanka: A study on farm household resilience and adaptation
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Key word (**Human-elephant conflict**) (**resilience**) (**adaptation**)

Chapter 1: Human–wildlife conflict (HWC) is a detrimental issue for many agrarian communities in Asia and Africa, where agriculture and livestock are often the staples of household economies. Conservation priorities for certain endangered species that raid crops or prey on livestock make some forms of HWC challenging to mitigate. The human-elephant conflict (HEC) in the dry zone of Sri Lanka is such a wicked problem that it has been detrimental to both wild elephants and farming communities in the region. Despite the increasing threat of elephants to farm livelihoods and human lives, elephants play an important role in the country’s ecosystem, culture, religion, and national economy, and elephant conservation therefore remains a priority in Sri Lanka.

When lethal measures are not permissible for controlling problematic wildlife such as endangered elephants, other measures are essential. They are needed to strengthen the capacity of vulnerable people to absorb and compensate for the damage caused by wildlife and to adopt non-invasive preventive policies that will protect their livelihoods with little or no disturbance of the wildlife. The formulation of such measures requires comprehensive insights into the human perspective on HEC, but knowledge on this matter is lacking. Filling this knowledge gap is important, so this research has attempted to examine the human dimensions of the HEC by means of four interrelated field studies. The research was focused on traditional dry zone villages, which are the dominant form of settlements in the region and where human–elephant interactions have been occurring for a long time.

Chapter 2: The first study, with reference to Kuttikulama, a traditional dry zone village, attempted to gain insight into the historical trajectory of interactions between humans and wild elephants in this area of Sri Lanka. This study examined the role of agricultural land use dynamics in the depletion of elephants’ habitat and the intensity of the HEC. Data were collected through focus group discussions, key informant interviews, and a cross-sectional survey. The focus group discussions were mainly held with village elders, who were over 70 years of age and could remember past events in the village that they had experienced or heard about from their parents and grandparents. Although the number varied in different sessions, a total of 18 village elders participated in the discussions. The cross-sectional survey was conducted with a randomly selected sample of 143 adult respondents in Kuttikulama, who represented different households. The study could reveal that agricultural land use patterns in traditional dry zone villages, which have been influenced by land regularization policies, the widespread adoption

of agro-wells in the early 1970s, and the popularization of corn as a crop in the early 1990s, as well as the interaction of land use with population dynamics, have changed in major ways over the last few decades. Such changes included the transition from a shifting-cultivation mode of farming to a fixed sequential mode of farming, the expansion of the per capita cropping area, and the disappearance of communality in agricultural land use patterns. The changes were found to have significantly contributed to a drastic depletion of elephant habitats and a shift in human–elephant interactions from relatively harmonious ones to contentious ones. Further, as revealed by this study, the severity and probability of elephant crop raiding in Kuttikulama was significantly greater for farms in which cropping encroached on the elephants’ habitats. Choosing to encroach on the elephants’ habitats in order to grow crops was found, in at least some cases, to be a reasoned decision made by an individual household to take good advantage of a number of perceived socioeconomic benefits. The choice to adopt cropping systems with less exposure to and disturbance of elephants, such as cash cropping in home gardens, depended mainly on the household’s ability to secure a stable non-cropping source of income.

Chapter 3: The concept of resilience measures the extent to which various social systems, from individuals to societies, strive to maintain their normal functions amidst (single or multiple) stressors. Thus, household resilience explains the capability of households in traditional dry zone settlements, which are exposed to not only the adversity of HEC but also many other environmental stressors (most notably drought and limited access to potable water), to maintain and develop their livelihoods and standard of living in the face of such stressors. Therefore, household resilience can be considered an indicator of a rural household’s tolerance of environmental stressors that can result from the availability (or lack of it) of internal and external resources for the household. Study Two, presented in Chapter 3, attempted to empirically explore the effects of social and human capital on household resilience in traditional dry zone settlements in the face of HEC and other significant environmental stressors. Because resilience is conceptualized as an abstract socio-cognitive process, this study considered a broader context of environmental perturbation than just HEC. Data were obtained from the same sample as in Study One. Using structural equation modelling, Study Two developed and validated a causal model that conceptualized the relationship between different dimensions of social and human capital and household resilience. Both endogenous and exogenous variables in the model were measured using subjective assessment scales. The findings indicated that the bridging social capital, bonding social capital, and economic activeness dimension of human capital significantly predicted household resilience to environmental perturbations. The findings of this study have policy implications for the assessment and building of resilience in agricultural communities affected by HEC and other significant environmental stressors.

Chapter 4: The first study revealed that collective farming and land use patterns contributed to the preservation of elephant habitats and the minimization of encounters between elephants and human inhabitants in ancient traditional dry zone villages. Although collectivity in farming and land use patterns has been greatly reduced from earlier times, the second study revealed that community- and neighbourhood-level social capital remained the most significant factor influencing the resilience of traditional dry zone farm households in the context of environmental perturbation. As observed in the

study village, however, social capital was reflected only through emergency and temporary adaptation measures against HEC and other environmental stressors. It is apparent that a long-lasting solution to the HEC problem involves conservation of the forests, which are the primary habitats for elephants in the region. There is a high demand for land by the still-increasing agricultural population in the dry zone, and, therefore, conserving forests (and thereby impeding agricultural expansion) would not be possible without increasing the productivity of the land already in use. Because social capital seems still to be strong in the traditional villages, it can be presumed that an economically viable collective farming and land use strategy could achieve this greater productivity. The literature shows that a sustainable measure for impeding agricultural expansion in capital-scarce economies is the transformation of cropping systems from land-intensive systems to high-value, labour-intensive systems in places where collective farming can enable such a transformation. Taking into account the above findings, facts, and scholarly recommendations and adhering to the theory that agricultural production is still the most feasible and important livelihood strategy in the rural sector, the next study attempted to investigate whether collective farming systems could survive in the current context of smallholder farming and minimize the need for large holdings to sustain farmers' livelihoods. In that vein, this study examined a collective reciprocal farming system in a traditional dry zone village called Mawathawewa, where the village households have been able to maintain better economic conditions (compared with the average household income for both rural and urban sectors in Sri Lanka) by growing chilli crops in labour-intensive conditions; much less land is needed for these crops than for land-intensive crops (i.e. corn). It was observed that the salient features of this collective reciprocal farming system, such as individual–individual reciprocity, operational autonomy, uniformity, and gender neutrality, have allowed it to adapt to and continue to survive in a commercial context of smallholder farming. Organized collective action in farming has contributed to the intensification of cropping in Mawathawewa. The increased land productivity and practical limitations of the collective farming system have considerably reduced the need and desire of the farmers to make use of larger land holdings to sustain their livelihoods. On the other hand, a policy intervention to control land-intensive crops (mostly corn) to suppress deforestation in Sri Lanka is less likely to affect a household's income in Mawathawewa than in an area where a household income is largely dependent on land-intensive cash crops.

Chapter 5: Adopting non-invasive collective measures against HEC and abandoning croplands often visited by elephants appeared to be critical strategies that suffering households must use to curtail HEC; they constitute a conservation-oriented approach. The inclination of a farm household to adopt such complex or costly measures can depend upon a number of socio-cognitive factors, which are deemed to be the most proximal determinants of human behaviour. The fourth study, which considered five traditional dry zone village settlements and drew from an extended protection motivation theory model, attempted to investigate the socio-cognitive factors that might predict farm household members' intentions to adopt two long-term measures against HEC. One intention reflected the inclination of farm households to adopt long-term, collective protection measures to reduce exposure and susceptibility to HEC whereas the other intention reflected the inclination of farm households to abandon farmlands critical to elephant crop depredation and switch to alternative livelihood strategies. This study also investigated the effect of objective socio-demographic factors and exposure level to HEC on adaptation

intentions, as well as the socio-cognitive predictors. The data were collected through a cross-sectional study of a sample of 222 randomly selected farm household representatives. Only adult household members who reported that they had actively engaged in farming activities and household decision making were included in the sample. Partial least squares structural equation modelling was used for data analysis. As the study revealed, farm households in the traditional villages had a lower-than-average propensity to adopt the proposed long-term measures in the near future. As path analysis showed, the coping appraisal (i.e., the perceived ability of the coping measures to prevent HEC and the household's efficacy in adopting them), the subjective norms (i.e., the perceived social influence reflected in descriptive and injunctive social norms), and the perceived lower cost of the adaptation measures were positively and directly related to farmers' intentions in adopting collective measures against HEC. In contrast, public efforts to adapt (i.e., reliance on government involvement) and maladaptation beliefs (i.e., fatalism and wishful thinking) were negatively and directly related to the farmers' intentions in adopting the collective measures. The risk appraisal (i.e., perceived probability and severity of HEC) had an indirect effect via maladaptation beliefs. As revealed by the other path analysis model, the coping appraisal was associated directly and positively with the respondents' intentions to abandon lands critically exposed to elephant crop raiding, whereas the perceived lower cost of the adaptation measures had a positive but indirect effect. Maladaptation beliefs were also directly and negatively associated with the farmers' intentions to abandon croplands in areas critical to wild elephant activities. In both models, coping appraisal could explain more of the variability in the farmers' intentions to adopt the long-term measures. The analysis of variance test with the post-hoc analysis test revealed that older farm household members, farm household members with little education, farm household members in households with single-income support, households entirely dependent on crop farming, households with lower income and households that are more frequently exposed to HEC were less likely to adopt or support household decisions to uptake the aforementioned adaptation measures. Regarding interventions to motivate and facilitate farm households to adopt sustainable measures against HEC, this study provided insight into areas that must be addressed to attain the expected outcomes.

Chapter 6: To effectively control HEC through an elephant conservation-oriented approach, the study highlighted the importance of enhancing the capabilities and inclinations of the farm households to withstand adversity caused by elephants, adopt damage prevention measures that were non-invasive to elephants, and minimize their encroachment on elephant habitats for livelihood activities. Given the historical background, cultural context, and prevailing socio-economic conditions, this research identified two distinctive assets that could potentially strengthen the above capabilities. Economic stability in farm households, particularly those strengthened by income sources other than crops, was one of the influential assets. The other asset, being external and particularly reflected through access to social safety networks and organized collective land use and farming systems, had the potential to strengthen the above capabilities while sustaining the crop-farming livelihoods. This research also identified the pervasive socio-cognitive factors and socio-demographic features that could determine the inclination of a farm household to adopt measures to curb HEC through a conservation-oriented approach. Overall, this research has implications for the government and other developmental agencies to determine how well the households in traditional dry zone villages can be facilitated and motivated to

face and reduce their exposure and susceptibility to wildlife activities with minimal threats to the survival of endangered wild elephants. Although the implications of this study are contextually relevant to the dry zone of Sri Lanka, the theoretical model developed to assess the effects of human and social capital on household resilience and the extended protection motivation theory model may be applied universally, with the necessary cross-cultural validation processes allowing for possible modifications.