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P,Nyhus., R.Tilson (2004). *Agroforestry, elephants, and tigers: balancing conservation theory and practice in human-dominated landscapes of Southeast Asia*. *Agriculture, Ecosystems and Environment*, 104: 87-97

Many large animals are in global decline because of different reasons due to a growing human population. People need to intensify their land use, they need more land for agriculture and deforestation is a big problem. The wild animal's habitat is getting smaller and smaller and many wild species are now living in small protected areas. (Internet 1)

The article *Agroforestry, elephants, and tigers: balancing conservation theory and practice in human-dominated landscapes of Southeast Asia*, by Nyhus and Tilson brings up the benefits from using agroforestry systems as a buffer zone but the article also addresses the problems. To use agroforestry systems as buffer zones may have an important role due to increased habitat for large mammals and wildlife corridors. This strategy can at the same time increase the human-wildlife conflict because people and animals are supposed to use the same area. Most of the human-animal conflict in Asia involves tigers (*Panthera tigris*) and elephants (*Elephas maximus*) and it has been showed that the conflict between human and wildlife has increased when the animals habitat are fragmented by humans. According to Nyhus and Tilson it is important to considered sustainable solutions for agroforestry, wildlife conservation and to find solutions to solve the conflict between them.

Agroforestry is a new name for a very old farming system and to get a picture of its concept I use the definition by ICRAF (World Agroforestry Centre). "Agroforestry is a collective name for land use systems and practices in which woody perennials are deliberately integrated with crops and/or animals on the same land management unit. The integration can be either in a spatial mixture or in a temporal sequence. There are normally both ecological and economic interactions between woody and non-woody components in agroforestry" (Internet1.)

In Sumatra is agroforestry very important for the farmers and between 20-60% of the cultivated land are agroforestry systems. The system generates income from cash crops but also from more specialised crops. In this area are rubber forest and agroforestry systems with fruit trees and other useful species common. One can also find agroforestry systems with cinnamon, coffee and timber trees. One of the ideas with agroforestry is that the smallholder should be able to generate income from different crops or species and during the whole year(Internet 2). The Ministry of Forestry is encouraging farmers to plant trees on production forest land and this is to create important buffer zones around protected areas.

This case study was carried out in Lampung Province, Sumatra, Indonesia and data showing the extent and distribution of conflicts have been collected since 1995. The outcome from this study can be used for development for both agroforestry systems and conservation of mega-vertebrates. The Sumatra Island is both a home for a great biological diversity and for 45 million people (in 1999). Deforestation is a major problem in this area and only 2/3 of the abundant forests remain and the lowland forests are just a memory. 1/5 of Sumatra's land area is protected. The protected area consists of small reserves and few larger reserves. The Lampung province has one of the fastest growing populations of the island. The tiger

population at Sumatra is today (1994) estimated to 500 and the elephants are estimated to between 2800 and 4800. Once you could find these two species in thousands all over the island but today they are restricted to a few isolated and protected areas. The decline of both tigers and elephants are severe and the increasingly isolated distribution is directly correlated with the high human pressure. These two species often share the same area and if one could develop sustainable conservation programs for these two animals you will at the same time protect species living in this area. Tigers are important predators that play an important role in maintaining biological diversity for example the pig and large ungulates. A study has showed that elephants play an important role as an agent for seed dispersal.

So, how does the conflict between these two animals and the people living in this area occur?

To find an answer to this question about tiger-human conflict did the researcher use a lot of reports, documents etc. for the last 20 years. The researcher categorised the information to; location of attacks, information about human and livestock victims. They found out that at least 4 people were killed per year between 1987 and 1997. They also found out that the tiger conflict was lower in undisturbed forests and higher in areas where tiger and people were overlapping each other. Likely will conflict occur in industrial forests, protected forests, and degraded forests and in agroforestry systems on the edges of protected areas where people and animal are sharing the same land and resources. People are attacked when they are collecting rubber, working in the fields, collecting timber etc. To illustrate this has the researcher compared to national parks. The first one is surrounded by production forests and buffer zones around the second one there is no buffer zone or significant areas that are suitable for wildlife. In 1997 was three people killed and three injured by tigers in a forest near the national park and in 1998 was a child attacked by a tiger sleeping a hut near recently cleared forest land adjacent to the park. This can be compared with the second national park with no buffer zones where only one man has been killed by tigers in twenty years. There are a lot of tigers in this area, it is estimated to be 4.3 tigers per 100 km² and there is 90.000 living in this area. The example shows that conflicts are likely to occur in areas where people and tiger are overlapping each other and where the animal's habitat is decreased. With this kind of information believes the authors that agroforestry systems can become "hot spots" for conflicts in the future.

For the elephant- human conflict it is much harder to find documented information but the conflict is a big problem for example crop-raiding. Crop raiding is most common in areas where secondary forest is grown near the village and less common in areas where wetland provides a buffer between forest and fields. The authors think that "hot spots" for conflict can be in the area close to the protected forest and unlike the tiger, agriculture land with high-proteins crops.

There is big need of combining agroforestry and wildlife conservation. Agroforestry is a very important land use system in Sumatra. The authors think that one of the biggest problems is to know how and who should be responsible for what. It is not only a question for wildlife conservation organisations. To solve this major problem there need to be an interaction between different actors like, authorities, farmers and wildlife conservations organisations. And we need more information; first we really need to know how many tigers and elephants there are and where they are living and how they are moving. Further on we need to create a dialogue between organisations working with conservation within the protected area with those managing agroforestry systems.

The author's conclusion is that agroforestry can be work as a good buffer zone with its great diversity and its economical benefits. But to do this we will need a leader who will address the issue of human-wildlife conflict. The best man for this is the agroforestry and agriculture community. They have to address the issue outside the traditional wildlife conservation areas. Just this type of area is one of the biggest threats to the survival of many large animals.

This problem is just not only a problem in Sumatra, it is a problem all over the world. All over the world are humans using animal's natural habitats. Humans and animals are moving closer to each other. And when humans and animals meet it is not always positive and it can end up in complicated conflict. I agree with the authors when they are talking about that it is a need of collaboration from different stakeholders and organisations. Both tigers and elephants are moving trough big areas and if we want the population of these animals to increase we need to give them their space. Agroforestry can very well be the solution, the system encourage both animals and humans to use the same land.

References

Internet 1. <http://www.peopleandwildlife.org> Visited 060501

Internet 2. . <http://www.worldagroforestry.org/> Visited 060501