Impact of local people on Plant diversity in Ben En national Park, Vietnam

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Abstract: Hundreds of millions of people worldwide currently derive a significant portion of their subsistence needs and income from gathering plant and animal products. Moreover, those people who are most economically dependent on these resources tend to be the poorest members of the community. Sustainable harvesting is therefore not only essential for conservation of the biodiversity in the world, but also for the livelihoods of many rural peoples. In this study we will focus on the question under which conditions Timber and Non Timber Forest Product harvesting can be used as a viable way to conserve tropical forests, i.e. without over exploiting plant resources. Based on the outcome of this study we will provide recommendations for sustainable harvesting that minimize the impact on forest vegetation structure, composition and diversity. The study will be carried out in Ben En National Park, Thanh Hoa province, Vietnam. The diversity of plants and animals at Ben En National Park remains high, about 737 plant species, 64 mammal species, 194 bird species, 28 amphibian species, 58 fish species, and a high diversity of Lepidoptera. More than 18,000 people live in the buffer and core zones of the national park, and continue to exert an influence on the natural environment. Illegal logging by both local people and people from outside the national park continues. The Park thus forms a typical example of the many tropical forest areas that face increasing pressure of human exploitation.

Keywords: Sustainable development, Timber and Non timber forest products, harvesting, conservation.

I. Introduction:

Sustainable harvesting is therefore not only essential for conservation of the plant species, but also for the livelihoods of many rural peoples. Indeed, promotion of the commercial extraction of NTFP as a conservation strategy is based on the argument that forest conservation must be able to offer economic incentives to local rural people in order to counter the threat of destructive land uses such as logging, shifting-cultivation, and cattle ranching. This strategy has gained wide acceptance as a conservation paradigm (Nepstad & Schwartzman 1992; Panayotou & Ashton 1992; Plotkin & Famolare 1992), and the social, economic and political conditions necessary for sustainable extraction of NTFP have been debated widely (Parks, Barbier & Burgess 1998; Kline, Alig & Johnson 2000; Shackleton 2001; Amacher 2002).

However, the growing commercial trade of natural products, in particular medicinal plant and woodcrafts, has resulted in increasing exploitation from wild plant populations (Kuipers 1997; Lange 1998) and this has generated concern about overexploitation (Rebelo & Holmes 1988; Vásquez &Gentry 1989; Cunningham 1993; Clay 1997; Rawat 1997; Tiwari 2000). For instance, of the 1543 medicinal plant species traded in Germany, 93–98% is harvested from wild populations (Lange & Schippmann 1997). Similarly, more than 95% of the 400 plant species used in the production of medicine by the Indian herbal industry are harvested from wild populations (Uniyal, Uniyal & Jain 2000). It is estimated that between 4000 and 6000 non-timber plant species are of commercial importance world-wide (Iqbal 1993; SCBD 2001).

In this study we will focus on the question under which conditions Timber and Non Timber Forest Product harvesting can be used as a viable way to conserve tropical forests, i.e. without over exploiting plant resources. To do this we will (1) make a survey of how local people use the forest, (2) map forest access roads, paths and river systems, and enter them in a Geographic Information System (GIS) database and (3) relate these data to (i) vegetation structure, (ii) plant species composition, (iii) plant diversity, and (iv) specific inventories for a small selection of the most important forest resources

throughout the forest. Based on the outcome of this study we will provide recommendations for sustainable harvesting that minimize the impact on forest vegetation structure, composition and diversity.

The study will be carried out in Ben En National Park, Thanh Hoa province, Nhu Thanh and Nhu Xuan districts, which is one of 16 national parks in Vietnam (Map 1). The core zone of the national park covers 16,634 ha, while the buffer zone covers around 12,000 ha. (Tordoff et al. 2000). The diversity of plants and animals at Ben En National Park remains high, about 737 plant species, 64 mammal species, 194 bird species, 28 amphibian species, 58 fish species, and a high diversity of Lepidoptera. (Tordoff et al. 2000). More than 18,000 people live in the buffer and core zones of the national park, and continue to exert an influence on the natural environment. Illegal logging by both local people and people from outside the national park continues. (Tordoff et al. 2000). The Park thus forms a typical example of the many tropical forest areas that face increasing pressure of human exploitation.

II. Research area:

Field world will be conducted in Ben En National Park, situated in Nhu Thanh and Nhu Xuan districts of the Thanh Hoa province in Vietnam. The core zone of the national park covers 16,634 ha, while the buffer zone covers around 12,000 ha. The geology of the national park is characterized by sedimentary rocks, mudstone, limestone and alluvial soils. About 18,000 people live in the buffer and core zones of the national park and continue to exert an influence on the natural environment. Extraction of NTFP and illegal logging by both local people and people from outside the national park is common. (Tordoff et al. 2000).

Map 1: Location of Ben En National Park in Vietnam.

III. Objective:

1. Project overall objective:

Determine the conditions under which sustainable Timber and Non Timber Forest Product harvesting can be used as a viable way to conserve tropical forests.

2. Specific objectives:

1. To provide an inventory of commercially important Timber and Non Timber Forest Products in Ben En National Park, Vietnam, and to evaluate their economic potential.
2. To determine the population structure and spatial distribution of important Timber and Non Timber Forest Products in Ben En National Park, Vietnam.
3. To determine the impact of Timber and Non Timber Forest Product harvesting on forest vegetation structure and biodiversity values.

IV. Research questions:

To determine the conditions under which sustainable Timber and Non Timber Forest Product harvesting can be used as a viable way to conserve tropical forests, we ask the following three main questions:

1. How many species of Timber and NTFP are used by the local people in Ben En National Park, and which of these are of most importance to them? Which are commercially traded?
2. How does Timber and NTFP harvesting affect the population structure and spatial distribution of the harvested plants?
3. How does Timber and NTFP harvesting affect general plant diversity and forest structure in Ben En National Park?

Question 1. *How many species of Timber and NTFP are used by local people in Ben En National Park, and which of them are of most importance to the households? Which are commercially traded?*

Household surveys and interviews will be carried out in 40 randomly selected households per village (three villages). Questions will be aimed at obtaining information on (1) how often, how long and where people go to the forest to collect plant products, (2) which products they collect, the way they collect them and why they collect them, (3) the importance of these products for their household income.

Additionally we will use the 'walk-in-the-wood' method to determine which products are harvested (for what purpose) in the forest surrounding the villages. These trips will also be used to collect voucher specimens which will be used to get reliable identifications of the harvested plants. Local names will also be noted during these surveys (Martin, 1995).

Market inventories will be used to determine the prices of the forest products that are for sale. These surveys will serve as an independent way to determine which products are harvested from the surrounding forest, and assess local uses of these forest products.

Question 2. *How does Timber and NTFP harvesting affect the population structure and spatial distribution of the harvested plants?*

For this purpose we will establish plots at three locations in the National Park (1 undisturbed and 2 disturbed sites) (Map 2). In each location we will establish 3 transects of 3 km length. Along these transects we will map (GPS-coordinates) (1) all visible human influences (paths, roads, camps, cut tree stumps, animal traps), (2) streams and rivers, (3) altitude above see level, (4) soil type (limestone or not), and (5) presence of swamps or floodplains. If cut tree stumps are encountered along the transects, we will try to determine the species they belonged to and fix their position in relation to the transect with the use of GPS-coordinates. All these measurements will be imported in a GIS-database which already contains a detailed map of the National Park.

Additionally on each transect we will establish 3 main plots 300 x 300 m at a 1.5 km interval, the total number of main plots of all transects combined is 27 (9 main plots per location). In each main plot we will establish 9 plots 10 x 10 m (Figure 1), resulting in ca. 243 plots for all transects combined, (81 plots per location). In these plots we will note the presence, number and cover and/or basal area of all (or at least a selection of the most important) harvested plant species. For each plot we will also note the altitude, slope, topographic position (valley, lower slope, mid slope, upper slope, ridge), GPS-coordinate, canopy openness, soil type (limestone or not), soil moisture (alluvial sites versus dry sites), and presence of human disturbances. The location of the plots will be imported in the GIS-database.

We will use the GIS-database to relate spatial distribution and population structure of the harvested plants to parameters related to accessibility such as (1) human population density, distance to villages, park boundaries, rivers, roads, forest

paths, forest edge; (2) number of forest paths within a plots 300 x 300 m (Figure 1); and (3) (a)biotic variables such as soil type, altitude, topography and drainage, slope, topographic position and light environment. This will enable us to determine whether these harvested plants show patterns that could indicate overexploitation, and the parameters that these overexploitations are related to (including the value of the harvested products). Furthermore, it will provide information on the population size and habitat preferences of the remaining harvestable crop. This information will make it possible to make recommendations concerning sustainable harvest levels.

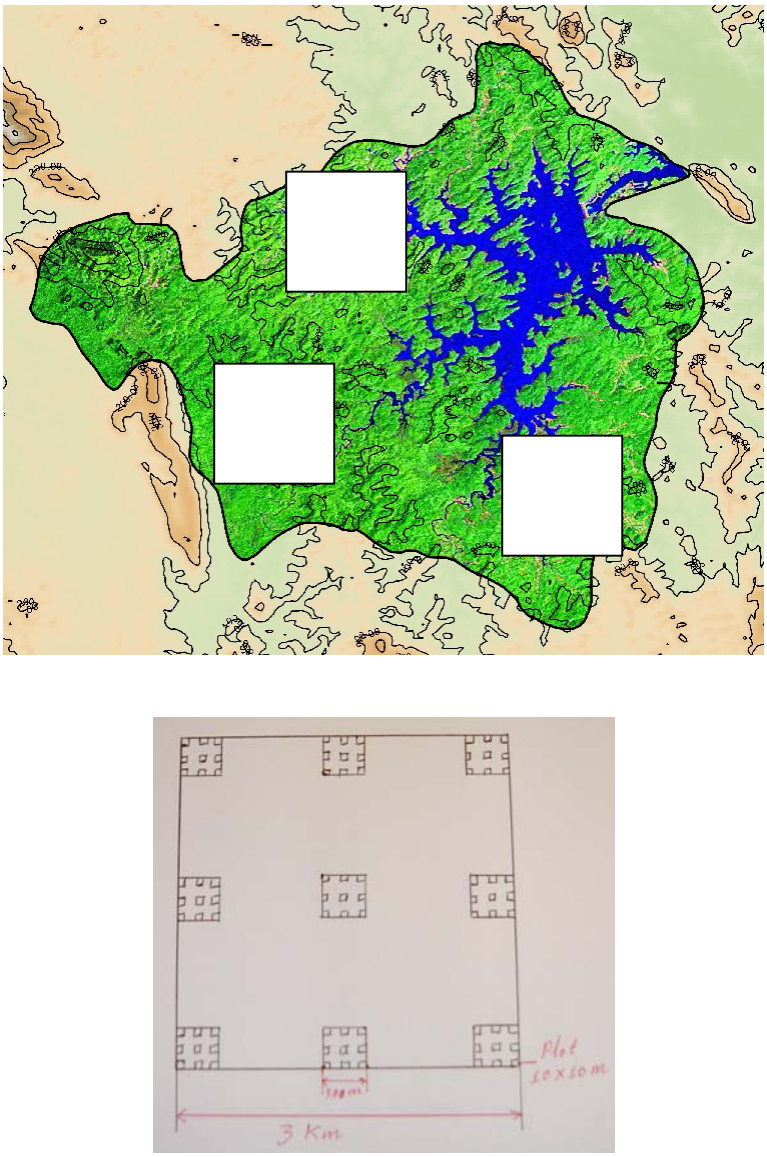

Figure 1: Figure of transects that will be established.

Question 3. *How does Timber and NTFP harvesting affect plant diversity and forest structure in Ben En National Park?*

In the 243 plots (10 x 10 m) described above we will make additional measurements to determine total plant diversity and forest structure. These measurements include both herbs and woody plants (lianas, palms, trees). All trees, Palms, rattan and lianas with a dbh ≥ 5 cm (palms, trees and lianas) will be identified; their diameter measured and height estimated in the complete 10 x 10 m plots. For trees and lianas with a H ≥ 1.3 m high, but dbh < 5 cm, we will use a 5 x 5 m subplot within each 10 x 10 m plot. Herb, seedling and liana species < 1.3 m high, the identity and cover will be sampled in a subplot of 2.5 x 2.5 m within each plot of 10 x 10 m. For each sampled plant we will collect a voucher

specimen, which can be used to determine their identity with certainty in a herbarium (Herbarium of Vietnam Forestry University, Vietnam National herbarium in Ha Noi, Leiden herbarium).

Like explained in the previous question, we will enter the plot data into the GIS-database and relate plant diversity, composition and forest structure parameters to both forest accessibility, human population density and (a)biotic variables. This methodology will give us a clear picture of the current impact of humans on forest diversity and structure and will enable us to do recommendations on harvesting levels or methods that do not alter the forest ecosystem in a negative way.

V. Expected output of the project:

1. Provide a list of commercially important Timber and Non Timber Forest Products in Ben En National Park, Vietnam, and describe their economic potential.
2. Detection of possible overexploitation, and the parameters that this overexploitation is related to (including the value of the harvested products).
3. Provide information on the population size and habitat preferences of the remaining harvestable crop.
4. Do recommendations concerning sustainable harvest levels and conservation efforts.

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