

Summary

Theoretical approach and methods

In this work, dry forest massifs and the people living in the immediate vicinity are defined as a socio-ecological system. The social and ecological components of the system as well as their negative interactions are identified and analysed. For the analysis, two study sites were selected in northwest-Madagascar. These differ in regards to their ethnic composition and the distance of the settlements to the forest massifs. For data collection, methods of empirical social research as well as natural sciences are utilised. Analysis of the socio-economic components applied methods of Participatory Rural Appraisal (PRA), household interviews as well as interviews with key-informants and observation. Additionally, four households were investigated in detail as case studies. For the analysis of the ecological system, inventories (timber, non-timber-forest-products) were conducted in secondary forests of different age groups and quasi-primary forests. Furthermore, the contribution of woody plants and lianas to the livestock sustaining capacity of open secondary forest formations was estimated by investigating the biomass of palatable leaves. Remote sensing data was used to analyse the dynamics of forest cover change in the study sites.

Results

Rice is the most important staple food in the study region. It is grown in different cycles. Rice yields are low due to irrigation problems. Households were categorized into groups according to their rice cultivation system, since household-impact on forest resources was expected to be dependent on the annual quantity of rice available.

Periods of rice shortage appear during both, the rainy and dry seasons. However, in the study site of Tsilakanina, rice shortage occurs only during rainy season due to a higher average size of arable rice lands. During these periods, alternative agricultural crops such as corn and cassava serve as staple food. In the study site of Mariarano, these crops are grown after slashing and burning dry forest. The number of households that cultivate these alternative crops is increasing due to unstable and diminishing rice yields. Another form of food supplements are forest and savanna products (wild yam and flour from palm trunks). Wild yam is preferably harvested in open secondary forests where it is found more frequently due to its light-demanding nature.

Cattle raising is of high importance in the study region. Cattle serve as both, draft animals and emergency nutrition reserves in times of crisis; and for the ethnic group, Sakalava, whom are common to the study region, cattle breeding also possesses a high cultural importance.

At the end of dry season, when the grassy vegetation has dried out, cattle are also driven into dry forests. During this period, especially young secondary forest stands provide fresh leafy biomass of woody plants and lianas at a height above ground that is accessible for cows.

The types of non-farm activities differ in both study sites. In Mariarano, 30% to 50% of household income is obtained from forest utilization such as charcoal production, wood processing, harvesting of bamboos and extraction of honey. In Tsilakanina, however, commercial utilization of dry forest hardly takes place.

Here, 20% to 40% of the household income originates from the sale of rice.

The horizontal structure of secondary forests in the study region is very dense. Stem number exceeds 30.000 stems per hectare. Although some tree species show characteristics of pioneer plants, there is a general lack of species adapted to early succession stages. Consequently, the

secondary forests consist almost exclusively of coppice from species typical for the understorey of primary forests. The absence of a diverse, competitive flora contributes to the ecological fragility of the dry forest ecosystem. In secondary forests, the utilizable volume of wood products is limited to poles of small dimension. The forests' potential to meet the demand for higher-value timber increases with increasing age. The growing stock of timber species highly appreciated for utilization is low in both, old secondary forests and primary forests.

Between 1994 and 1999, the annual rate of forest destruction in the study areas amounted to 3% and 7%, respectively. Degradation was caused by a combination of forest utilization practices accumulating dry biomass and vegetation fires. Fire-based land management practices exercise a strong human impact on vegetation.

Additionally, forest regeneration is strongly impaired by grazing livestock.

Recommendations for forest management

Strategies for sustainable management of dry secondary forests require an integrative, holistic approach. Improved agricultural productivity is an important prerequisite to reduce the pressure on forest resources. Land use planning is required for regulating and coordinating resource utilization, as well as for establishing an efficient fire management system. The core element of management strategies for secondary forests is the generative regeneration, since it counteracts the decreasing vitality inherent to coppice.