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SOIL ASPECTS OF THE INDONESIAN BENCHMARK AREA OF THE GLOBAL PROJECT ON ALTERNATIVES TO SLASH AND BURN

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ABSTRACT

The global project on 'Alternatives to Slash and Burn' agriculture was initiated by a consortium of international and national research institutes to speed up intensification of the use of converted forest land, in order to help protect the remaining forest areas for their biodiversity values as well as role vis-a-vis greenhouse gas emissions. In the first phase of the project, benchmark areas were chosen and further characterized in Brazil, Cameroon and Indonesia. Data for the Indonesian benchmark areas on Sumatera are discussed here in the light of the hypothesis that 'Intensifying land use as alternative to slash-and-burn farming can help to reduce deforestation, conserve biodiversity, reduce net emission of greenhouse gasses and alleviate poverty'. We conclude that this hypothesis indicates only one of three necessary conditions. Apart from farmer-adaptable technologies, effective protection of the remaining forests is needed as well as a reduction of other driving forces of deforestation.

Benchmark areas were chosen in the lowland peneplain, piedmont and mountain zone of central Sumatra (in the provinces of Jambi and West Sumatra) and in Lampung. The latter represents higher population densities. Existing data were summarized for the purpose of the project and new data were collected on: vegetation, land use, soil type at family level, soil organic matter fractions, net flux of methane and a number of socio-economic indicators.

Traditional 'shifting cultivation' systems hardly exist any more in Sumatra, but slash-and-burn is widely used as technique for clearing forest land, mostly for planting tree crop based production systems (rubber, cinnamon). The past ten years have shown a significant amount of forest land converted to agricultural

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use in the two lowland peneplain benchmark areas, following after logging concessions. Soils on the peneplain are poor (oxi- and ultisols) and current intensive crop based production systems are not sustainable. In the piedmont zone outside the Kerinci Seblat National Park the lowland forest has been logged, but few migrants settled in the area, despite the better soil qualities (inceptisols) and a more stable rubber-based agroforestry system (still) characterizes the area. A new size-density fractionation scheme for soil organic matter revealed that the degradation of soil organic matter after forest conversion can be slowed down, but not halted, by the use of large amounts of organic inputs in the form of tree prunings. The tree component in such an 'alley cropping' system strongly competes with the crops, but yet is not enough to maintain the soil qualities of the original forest soil. Long term sustainability of land use is more likely under transformation to tree-based production systems.

Forest soils can be significant sinks for methane and thus partly compensate for the methane emissions in lowland rice production. After forest conversion, however, the methane sink strength is considerably reduced. An empirical correlation between methane sink strength and certain organic matter fractions deserves further testing. The net effect of forest on the methane balance may be their most important role in mitigating global warming due to emission of greenhouse gasses.

The discussion focusses on the need to combine intensification of land use at the field/household level with effective protection of remaining forest areas at the community level and reducing other driving forces of deforestation at the national level. Hypotheses for further research in phase 2 and 3 of the project are formulated.