

**Water and element budget of slash and burn agriculture in the eastern Amazon:  
Methods and preliminary results**  
(ENV-25/8)

Dirk Hölscher, Tatiana A. de Sá, Maria Regina F. Möller & Manfred Denich

The element budget of ecosystems managed by slash and burn agriculture is determined by human activities such as clear cut, burn, fertilization and harvest. The element stock and input-output of such a system are measured to evaluate the ecosystem stability. In this paper the applied methods and first results of rainfall distribution and element input with precipitation are presented.

The case study is established in four different stages of land use represented by six study sites in small-holder farmland.

The sites are two year-old secondary vegetation, two sites in a seven year-old secondary vegetation with subsequent clearcut, crop burning and in one of them fertilization, a ten year-old secondary vegetation and a cassava plantation abandoned during the study period.

The water balance for one of the two year-old stands is calculated by meteorological methods (Table 1) and it is the basic information for the element fluxes related to waterflow. General weather observation data are also derived.

Tab. 1: Water fluxes considered in the study

Water flux	Method
Precipitation	Raingauges in open field
Throughfall	Raingauges below the canopy
Stemflow	Stemflow collectors
Stomatal conductance	Dynamic porometer
Evaporation	Meteorological fieldstation - Energy balance approach - Penman modell

The element budgets focuss on input and output fluxes of the ecosystem (Table 2). The rainwater is analyzed as well as the soil solution. In the case of fertilizer application or harvest of crop or fuelwood, the element flows are estimated.

Tab. 2: Element fluxes considered in the study

Element flux	Method
Deposition	Raingauges in open field and below the canopy, stemflow collectors
Fertilization	NPK
Harvest	Fuelwood, corn, cowpea, cassava
Burn	Stocks in vegetation - stocks in ash
Leaching	Lysimeters

The rainfall, with an annual mean of around 2400 mm, shows a distinct seasonality. In March 1992, 500 mm (FCAP Igarapé Açu, unpublished data) precipitation was measured while in November it was only 7 mm. From May 1992 to February 1993 an average of 81 % entered the floor-like throughfall in the two-year-old secondary vegetation during the open field rainfall. However, in the ten year-old secondary vegetation, which is dominated by the broad leaved banana like species *Phenakospermum guianense* (*Strelitziaceae*) and has a high amount of stemflow, the throughfall is reduced to 35 %. The spatial variation of throughfalling rainwater showed an average coefficient of variation of 55 % and 74 % per sampling date in two year- and ten year vegetation stands, respectively.

The pH as well as the concentrations of Na, K, Ca and Mg cations, in rainfall (throughfall), usually increases from open fields over two year to 10 year stands. The results for the month of July 1992 are listed (Table 3).

Tab. 3: Element fluxes with precipitation in open field (site of), throughfall for two year (site 2) and ten year-old secondary vegetation (site 5) in July 1992.

Site	pH	Na	K	Ca	Mg
		[kg/ha]			
of	5.1	0.7	0.1	0.1	0.0
2	5.6	0.7	0.8	0.2	0.1
5	6.0	0.6	0.6	0.3	0.2

Future work will be done to include the other listed fluxes (Tab. 2) and more chemical elements to calculate the element budget for slash and burn agriculture at the Igarapé Açu site.