HANOI AGRICULTURAL UNIVERSITY
(HAU)

CENTRE FOR AGRICULTURAL RESEARCH
AND ECOLOGICAL STUDIES (CARES)

IMPACT OF UPSTREAM SOIL NUTRIENT LOSSES ON SOIL FERTILITY IN PADDY FIELDS

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1. Introduction

- In the Uplands of Northern Vietnam, swidden agriculture has come to constitute the most serious threat to the natural environment as human populations have increased well beyond the carrying capacity of traditional swiddening systems
- The central hypothesis of this research is that the farmers of Tat hamlet manage the swidden and wet rice field subsystems in ways that maintain soil nutrients in each subsystem.

Research Objectives

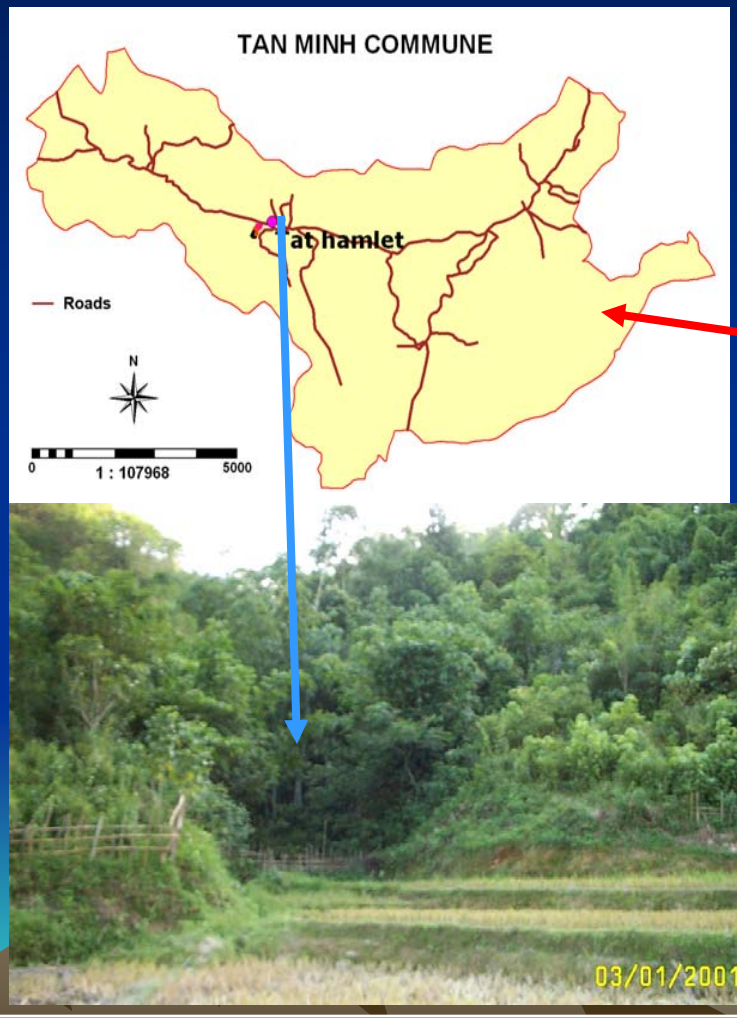
- The flow of water, soil, and nutrients from the swidden field to the paddy field
- The nutrient balance in the paddy field.

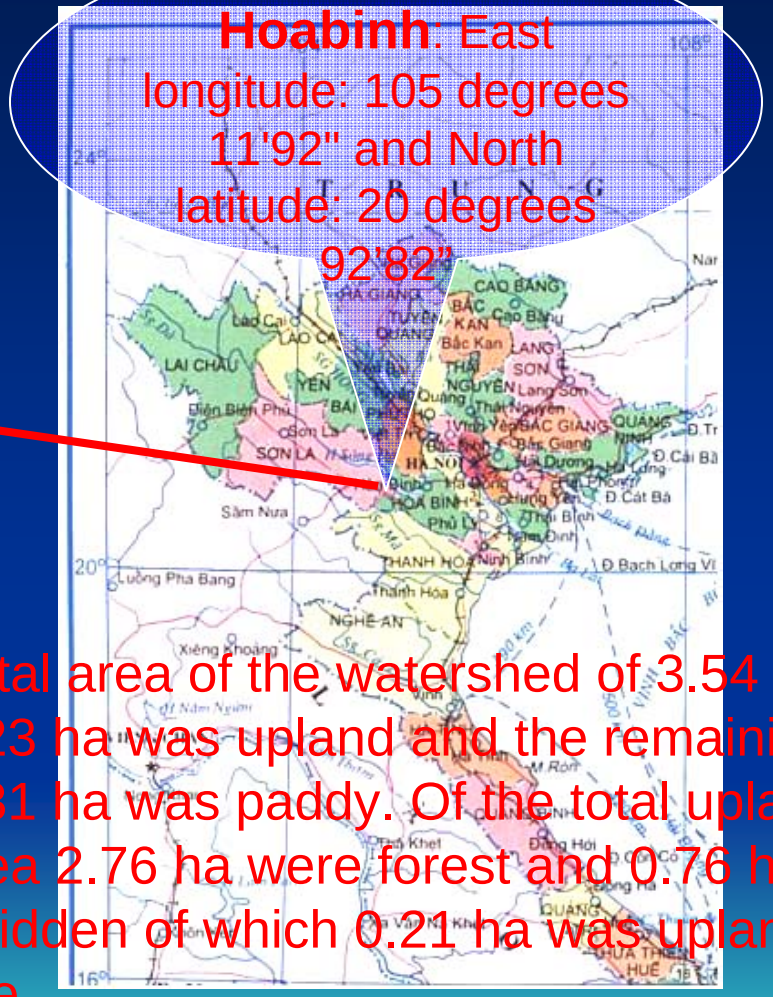
These measurements were necessary in order to:

- Identify the interactions between the upland and lowland areas with regard to water and nutrient flows
- Determine the nutrient balance of the overall system
- Quantify the nutrient contents in the various components of the water balance at the watershed

2. Materials and Methods

2.1.The study site





Total area of the watershed of 3.54 ha, 3.23 ha was upland and the remaining 0.31 ha was paddy. Of the total upland area 2.76 ha were forest and 0.76 ha swidden of which 0.21 ha was upland rice

2.2. Nutrient inputs from surface inflow from the upland to the paddy field

Nutrient concentration of the water flow from the upland to the paddy field on rainy days and dry days were determined separately. A water sample was set up at the end of the stream to collect part of the water from the upland field before it flowed into the paddy field

2.2. Nutrient inputs from surface inflow from the upland to the paddy field

The total amount of water flow from the upland to the paddy field was estimated as the sum of the total amount of water losses from the paddy field through evapotranspiration (ET), percolation (P) and discharge (Qout) by water balance (Mao Zhi 1992).

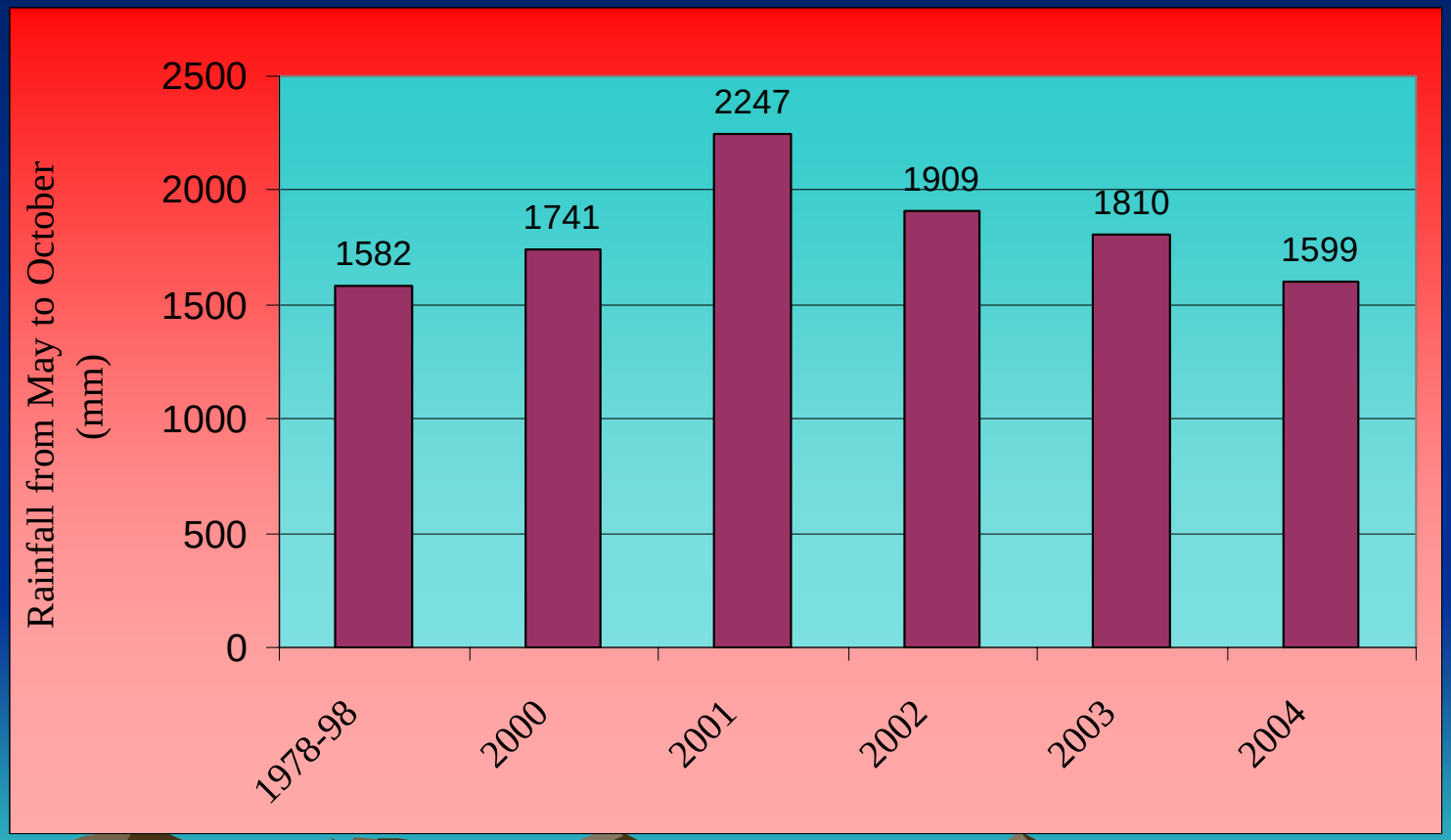
$$Q_{out} = 1838\,(L - 0.2H)H^{1.5}\,(l/s)$$

ET and P were measured with lysimeters

A weir system was set up at three positions on the paddy bunds (7 weirs at each position, totaling 21 weirs

3. Results

3.1. Water discharge from watershed + Rainfall



3. Results

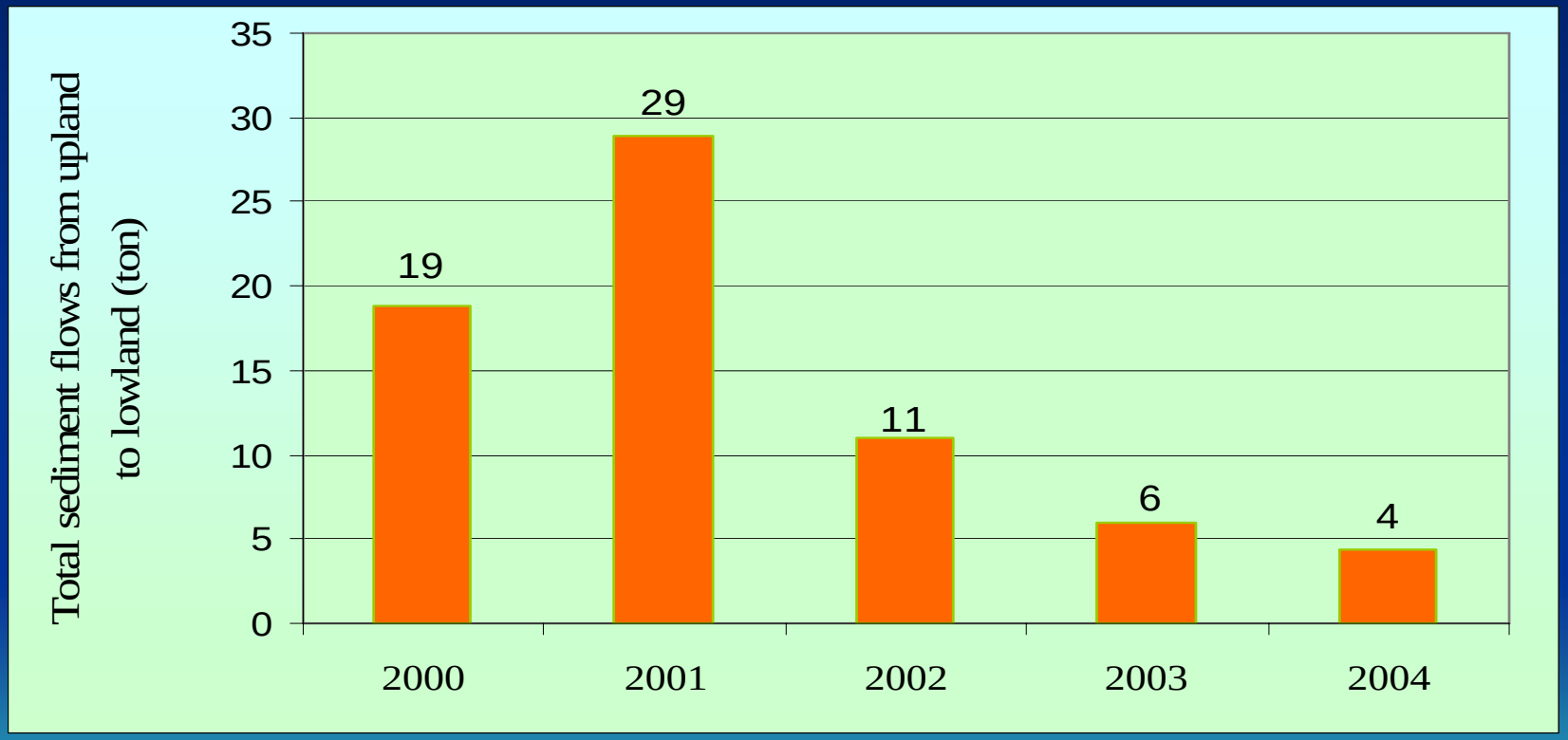
+ *Water discharge from watershed*

Table 1: Yearly water discharge from the experimental watershed

Year	Discharge (1000 m^3 Water)
2000	104
2001	119
2002	32
2003	19
2004	18

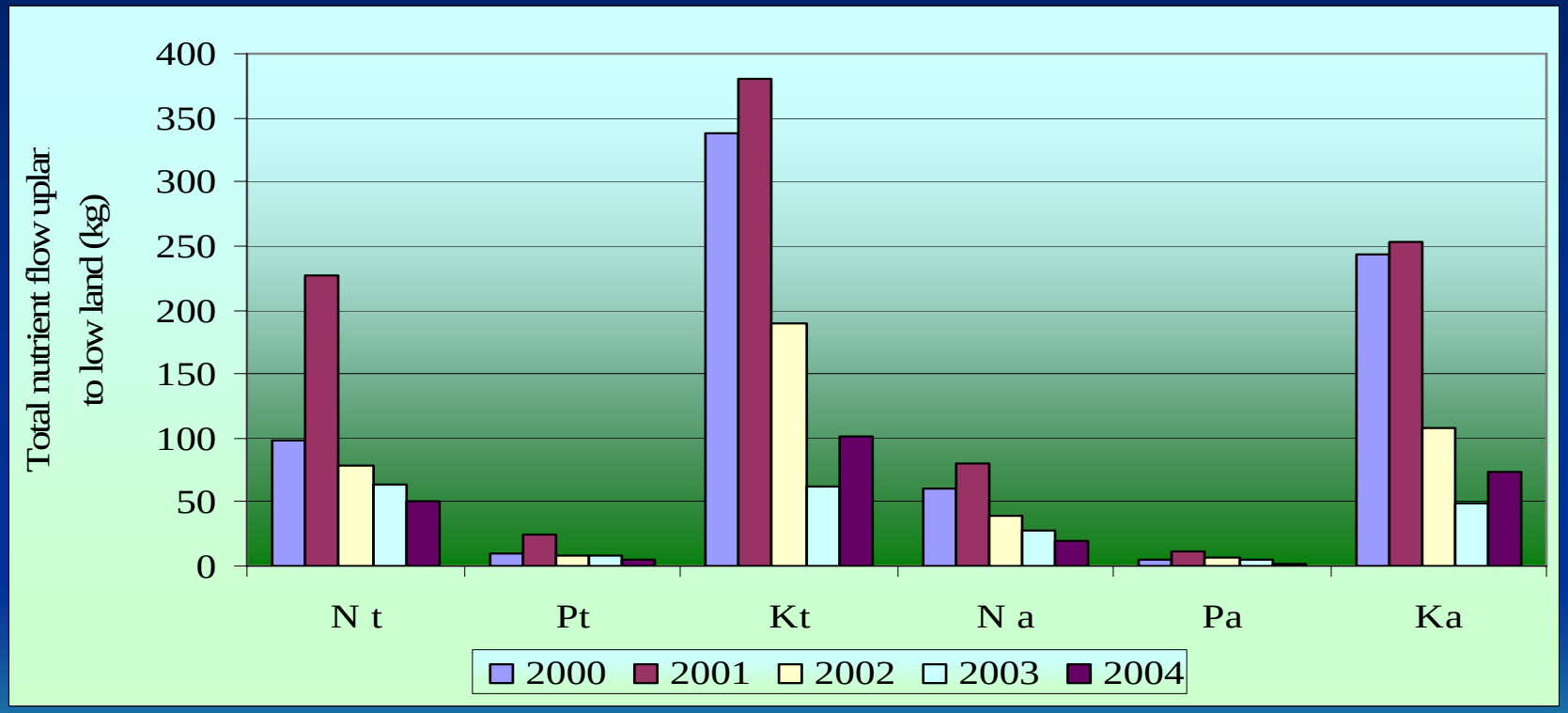
3.2. Nutrient flows from the upland to the paddy field

Sediment



Yearly total fine sediment flow from upland to lowland areas measured at the outlet of the watershed.

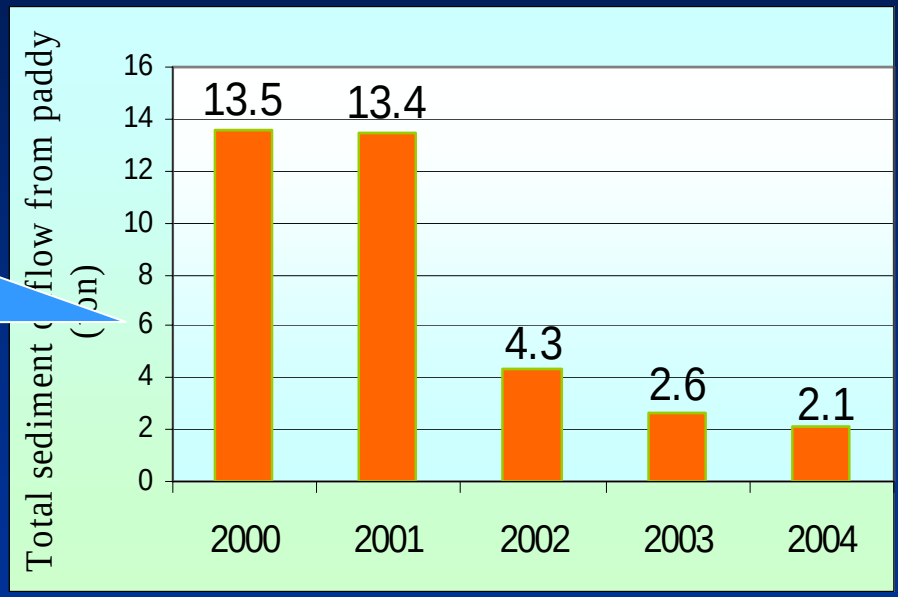
Nutrient flows from upland to lowland associated with sediment transport and in water dissolved nutrients showed a similar pattern

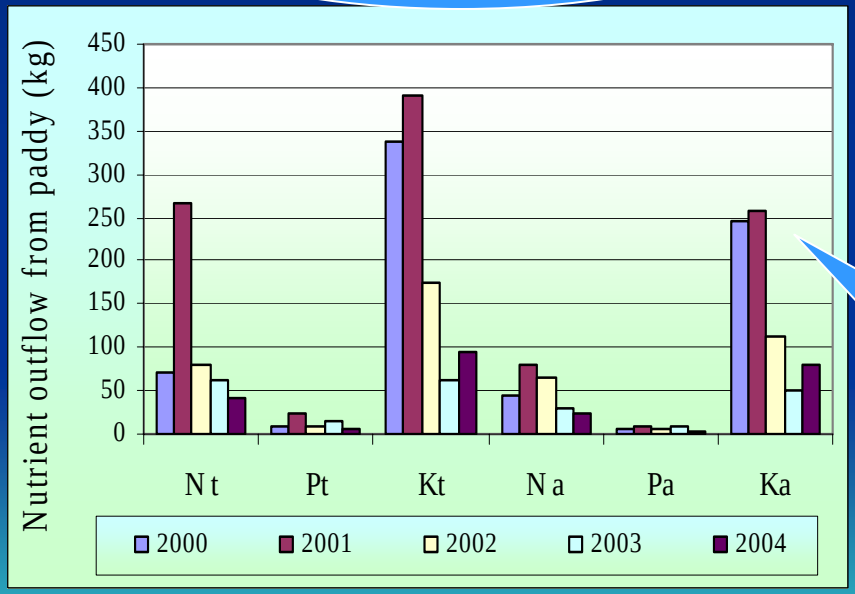


Yearly nutrient flows from upland swidden areas to lowland paddy fields (t=total. a= available)

3.3. Nutrient losses through leaching and overflow in paddy fields

The sediments flowing out of the paddy field

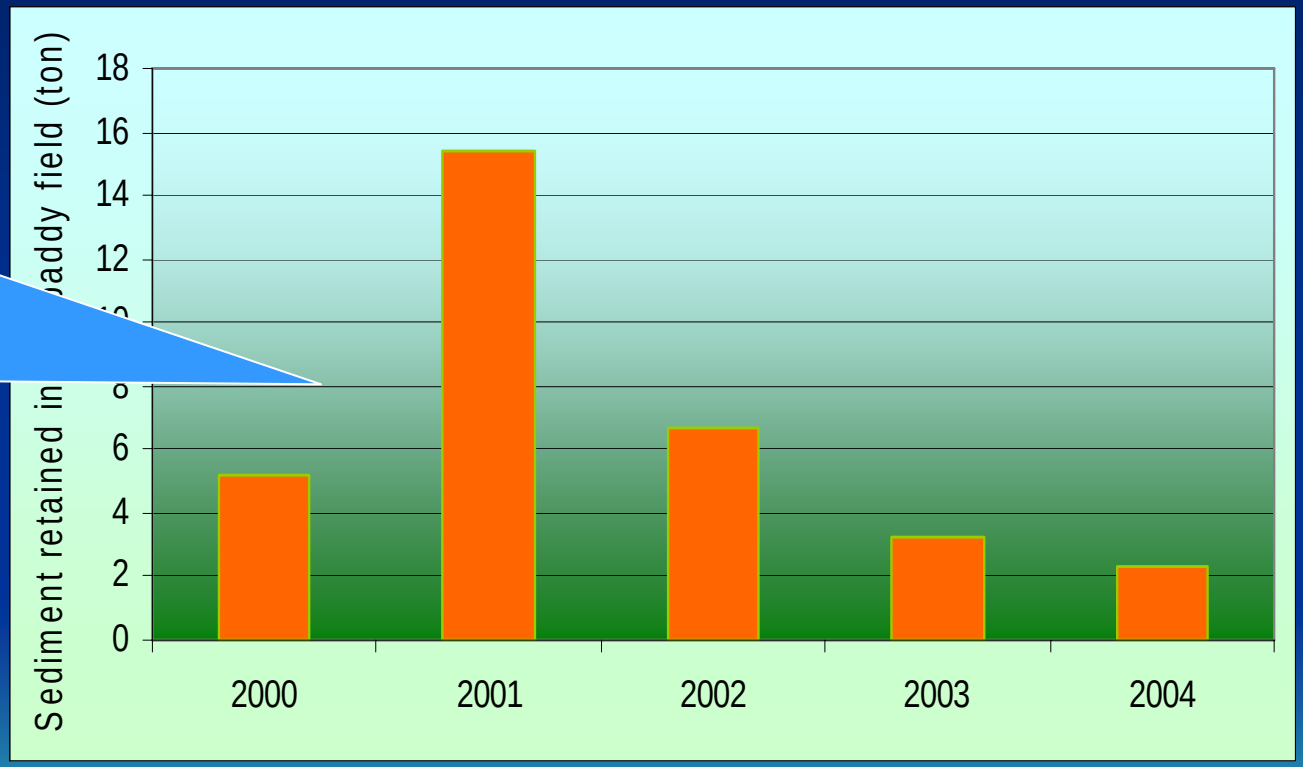




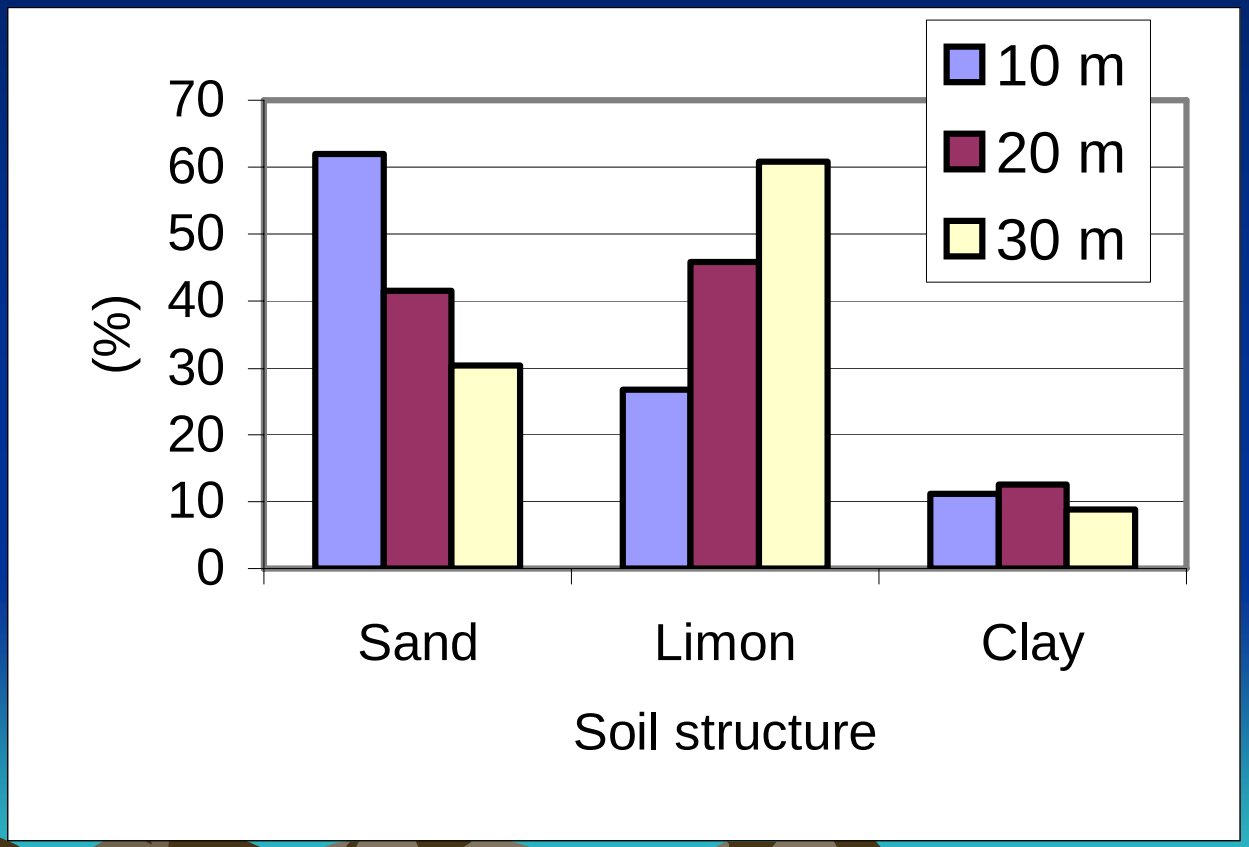
The highest nutrient losses associated with the overflow from the paddy fields were of potassium

3.4. Impact of upland water discharge on nutrient status of the paddy fields

The amount of sediment retained in the paddy field

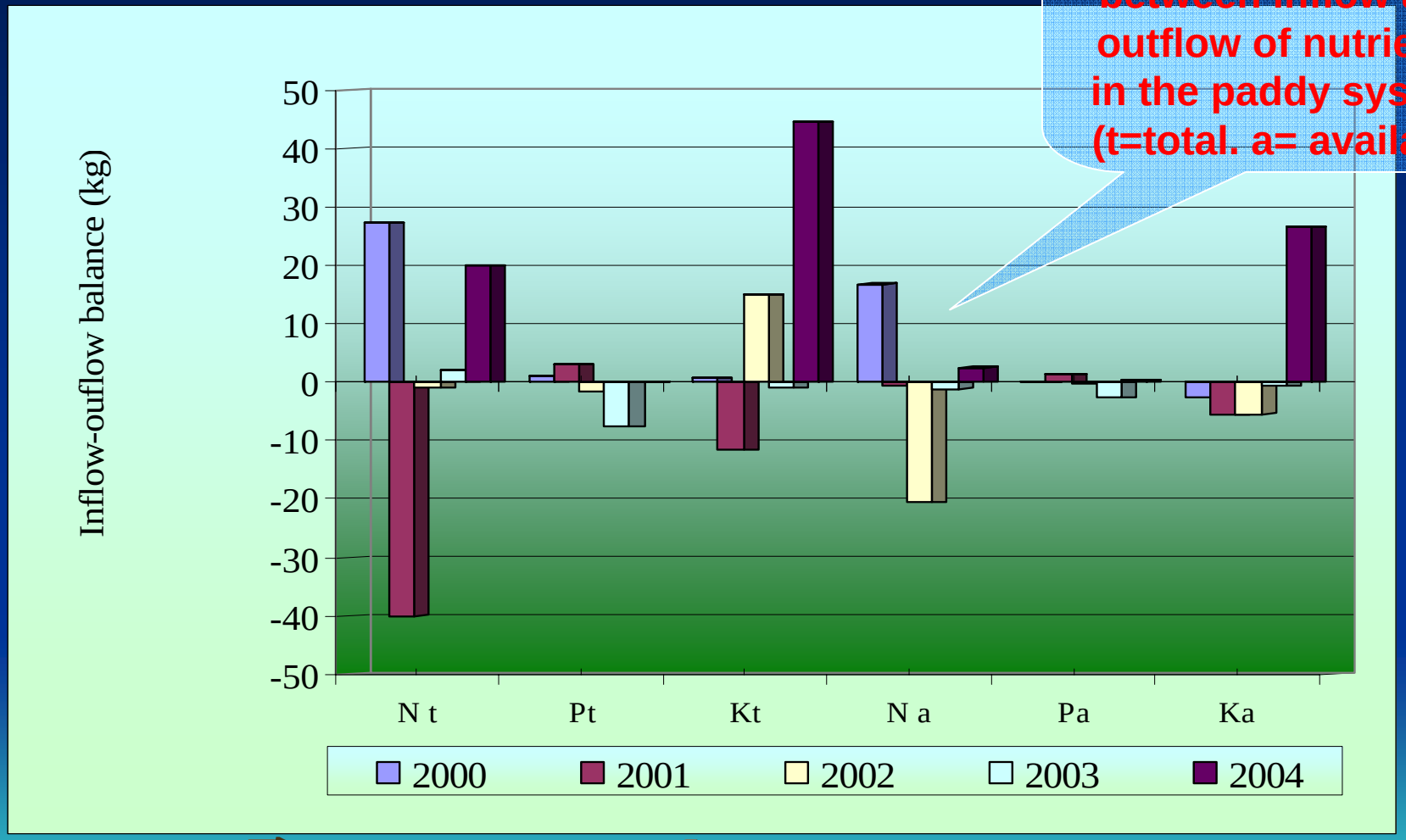


Soil texture in the paddy fields near the discharge inlet was altered. Three plots in the paddy field were established 10, 20 and 30 m from the foothill



3.5. Nutrient balances in paddy fields

Net nutrient balance between inflow and outflow of nutrients in the paddy system (t=total. a= available

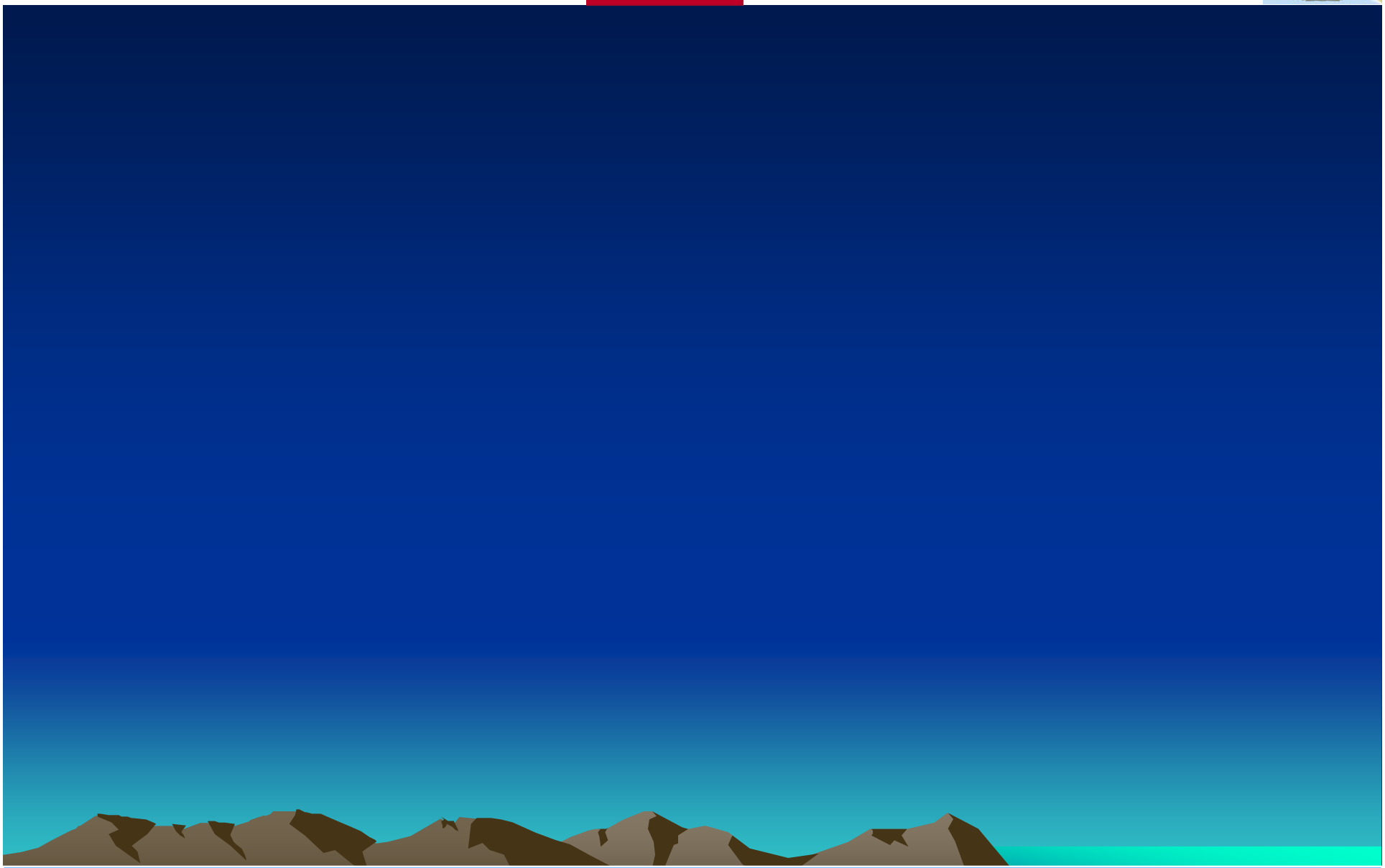


4. Conclusion and discussion

The nutrients eroded from swidden upland fields would help replenish soil fertility in the paddy fields, making the nutrient inputs more or less in balance with the outputs, thus maintaining the soil productivity of the paddy fields.

Nutrient losses through water outflows were also quite large, and appeared to offset the inflows of nutrients

Thank you for your attention



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