1. Introduction
Continuous maize cropping (without fallow) and deforestation in
Further improvement of the sediment modeling could be done by distinguishing different texture classes
Research area: Chieng Khoi, Son La, NW Vietnam. Subtropical climate, unimodal rainfall distribution, steep slopes
Development of a standalone paddy module that simulates water and sediment flow and can be connected to the LUCIA model[8]. Test the module based on field measurements.

2. Model Concept
The model runs on a daily time step, uniform paddy size (pixel)
Water flow in the cascade follows elevation instead of local drain direction (+ no spatially routed distribution inside the paddy cascade)
Inflow added to the water volume of the previous day before results in potential water volume. Water infiltrating in bund and in topsoil, as well as evaporotranspiration (ET) and percolation are subtracted. Bund infiltration is first used to saturate the bund. The remaining water flows partly into ground water (bund percolation), partly to the neighboring field (cross flow). When the water level reaches the height of the connection to the next paddy, outflow starts. This outflow is limited by the connection capacity. The connection capacity is reached, when the connection volume between the paddies is not enough to transport the water to the next paddy. When water level reaches bund height, overflow starts. Outflow and overflow are used as inflow for the next lower paddy (Figure 1):
Water volume = water volume + rain + inflow - bund infiltration - topsoil infiltration - ET - outflow (overflow)
Inflowing water from the uplands transports sediments into the paddies. Particles in the water remaining in the paddy are assumed to settle during 24 hours. Calculation of erosion inside paddies uses the rose equation[8].

3. Methods
Water base flow rates measurements with water clocks in paddy fields
Turbidity measurements as proxy for sediment loads in paddy waters with portable sensors (NEP160 and NEP 260, McVan Instruments)

4. Results and discussion
Water flow
Potentialization to an inflow of 49 m³ day⁻¹ (as measured) resulted in an outflow of around 20 m³ day⁻¹ (Figure 3) during normal base flow (measured: 24.4 m³ day⁻¹)
Rainfall led to an increase of outflow (Figure 3): high rainfall events caused an increase of the water level due to exceeding of the connection capacity (Figure 4)
Sediment concentrations:
Measured turbidity during base flow was too low for significant differences between inflow and outflow turbidity
Turbidity measured in the outflow during a rain event decreased along paddies and was 10% of inflowing sediment concentration
Modeled turbidity decreased to 15% of the inflow concentration (Figure 5)

5. Conclusion and Outlook
Modeled filling and drying of the cascade was in a realistic timeframe
Modeled percolation, cross flow and bund percolation (data not shown) were in the range of measurements by other authors[1,2]
To calibrate the turbidity change correctly, more measurements, especially during rain events have to be taken
For a better validation of the model also more flow measurements during rain events and in other cascades should be carried out
Further improvement of the sediment modeling could be done by distinguishing different texture classes
Coupling to LUCIA is pending.

References