



Sustainable Sloping Land & Watershed Management 2006
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Hillslope sediment trapping of natural or cultivated riparian vegetation of Northern Laos

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Changes of land use in sloping land



- In Northern Laos, recent intensification of the land use led to increased sediment delivery to water bodies



Changes of land use in riparian land



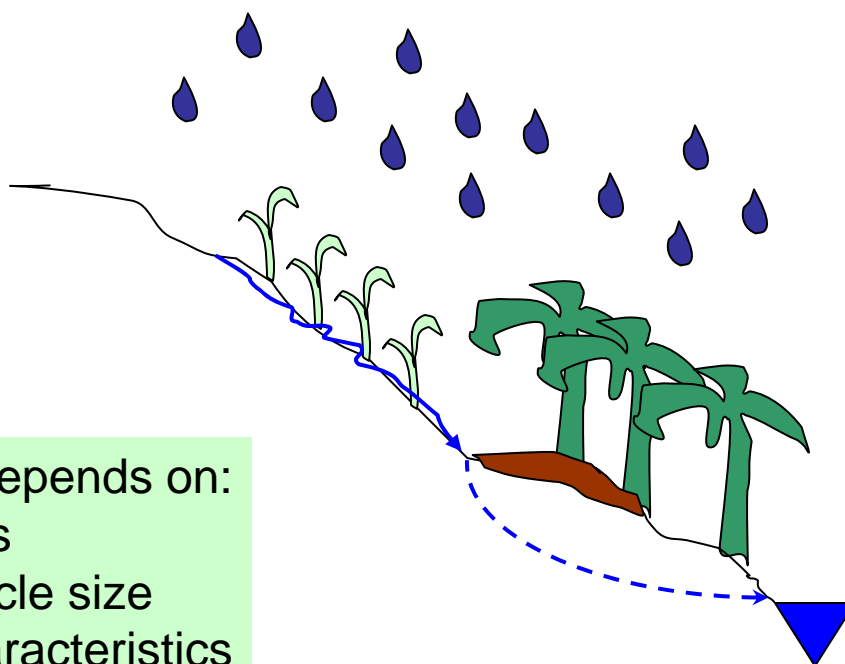
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Research questions

- what are the impacts of these changes on ecological functions of riparian land?
- what management of riparian areas can counteract the off-site impacts of increased erosion on the hillslopes?

Sediment retention in riparian land



effectiveness depends on:

- inflow amounts
- sediment particle size
- vegetation characteristics
- topographic setting

Aims of this study

- to assess water and sediment trapping efficiencies of riparian vegetation types of Northern Laos
- to assess the potential effect of cultivation of riparian land on these efficiencies

Study area: Houay Pano catchment



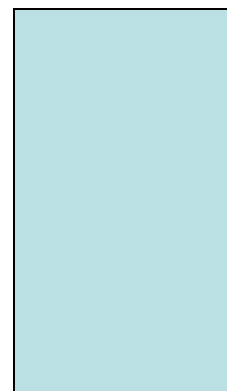
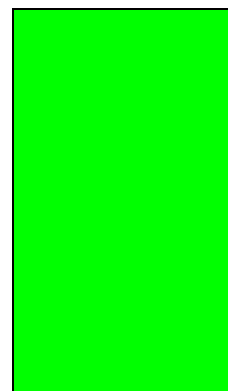
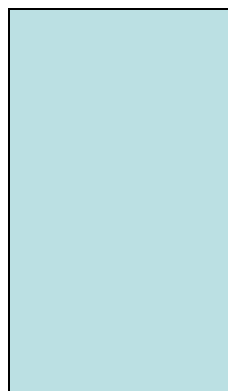
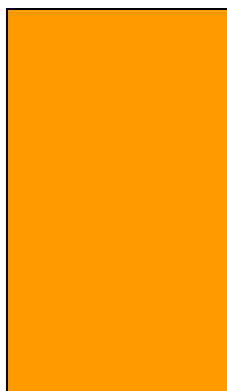
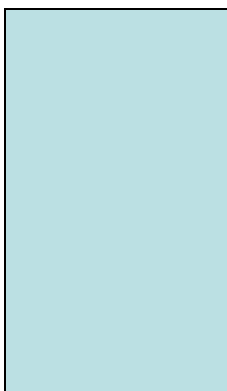
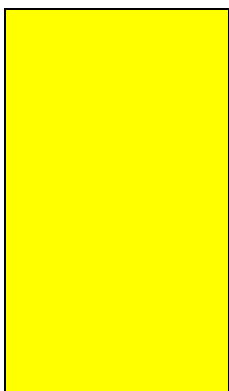
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Monitoring of event runoff and sediment

- By using Gerlach troughs, i.e. 50-cm open troughs that intercept water runoff



Experiment set-up: 3 sites in 2 plots



Banana



Bamboo



Natural grass

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Experiment set-up (II): plot setting

- 3 Gerlachs in upper rim to intercept incoming runoff and
- 3 Gerlachs in lower rim to intercept outgoing runoff



Trapping efficiency

$$TE = \frac{X_{UP} - X_{DOWN}}{X_{UP}}$$

- X = water or sediment amount
- UP = average of three upper rim troughs (incoming flow)
- DOWN = average of three lower rim troughs (outgoing flow)
- Defined for water runoff, sediment load, and sediment concentration

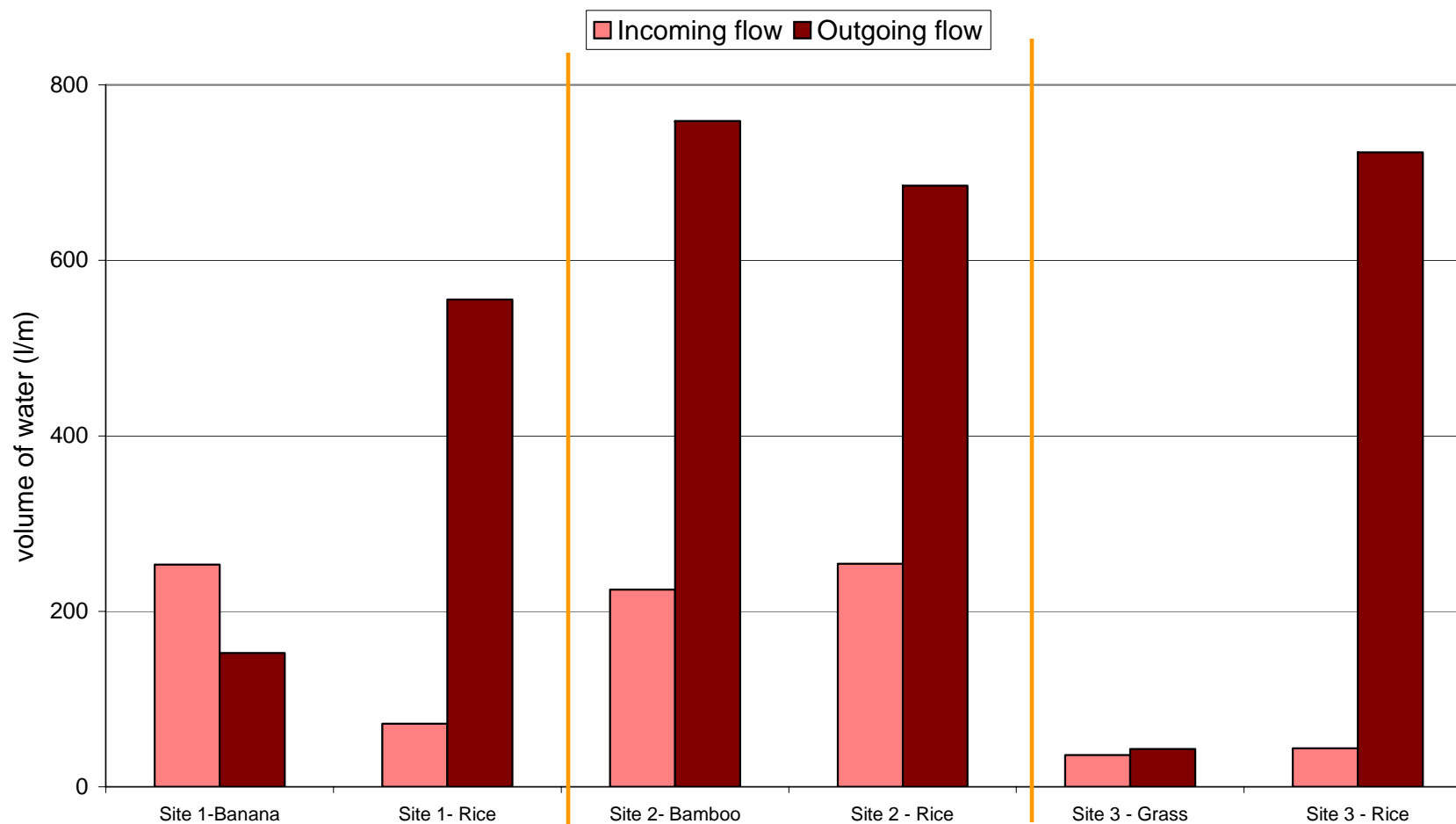
Results of 2006 season



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Runoff flows



Banana

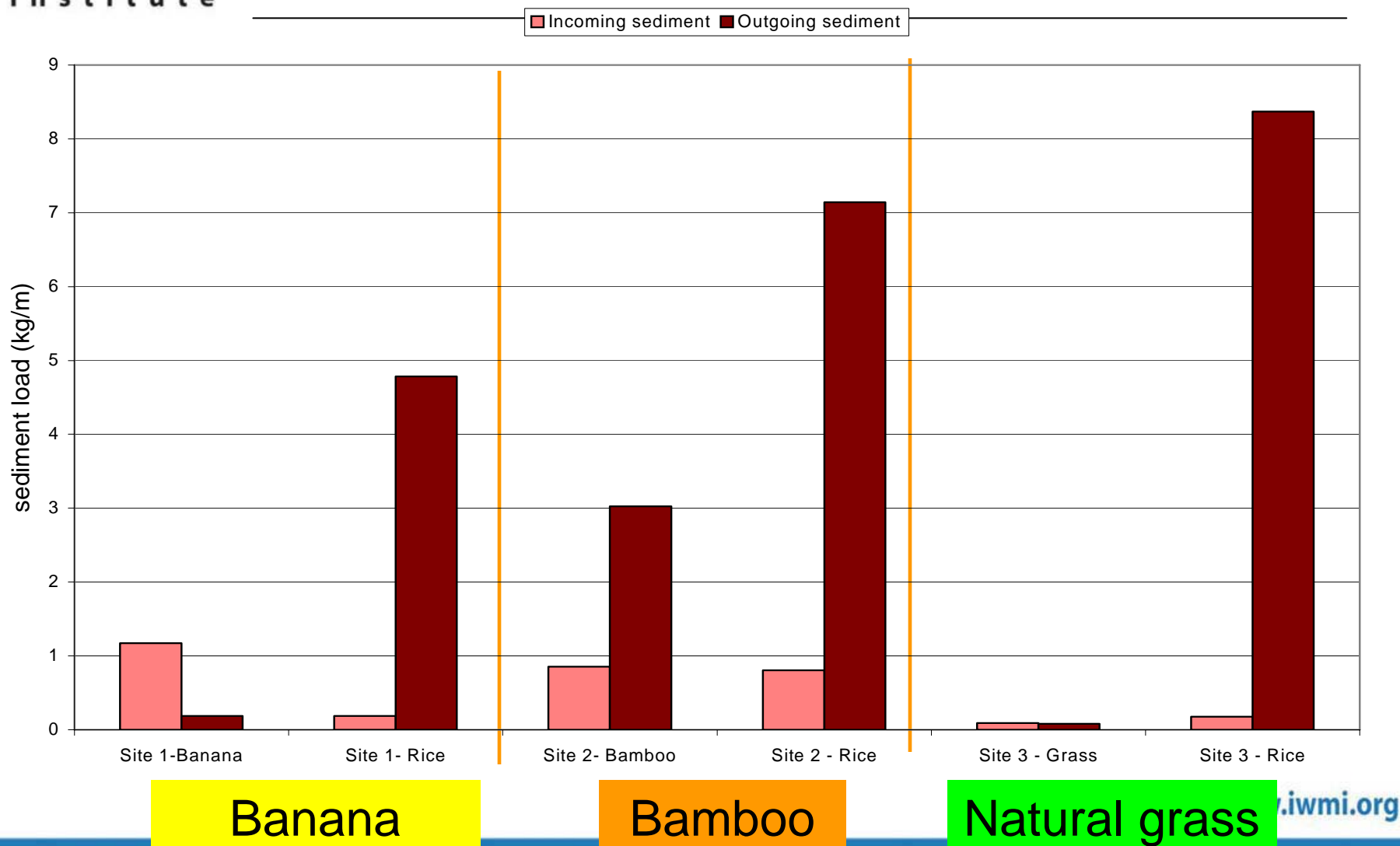
Bamboo

Natural grass

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Sediment load flows



Median runoff and sediment TEs

Site		Runoff	Sediment load
1	Banana	0.4	0.7
	Rice	-8.8	-25
2	Bamboo	-3	-4.5
	Rice	-1.7	-7.2
3	Natural grass	-0.3	0
	Rice	-22	-204

GOOD

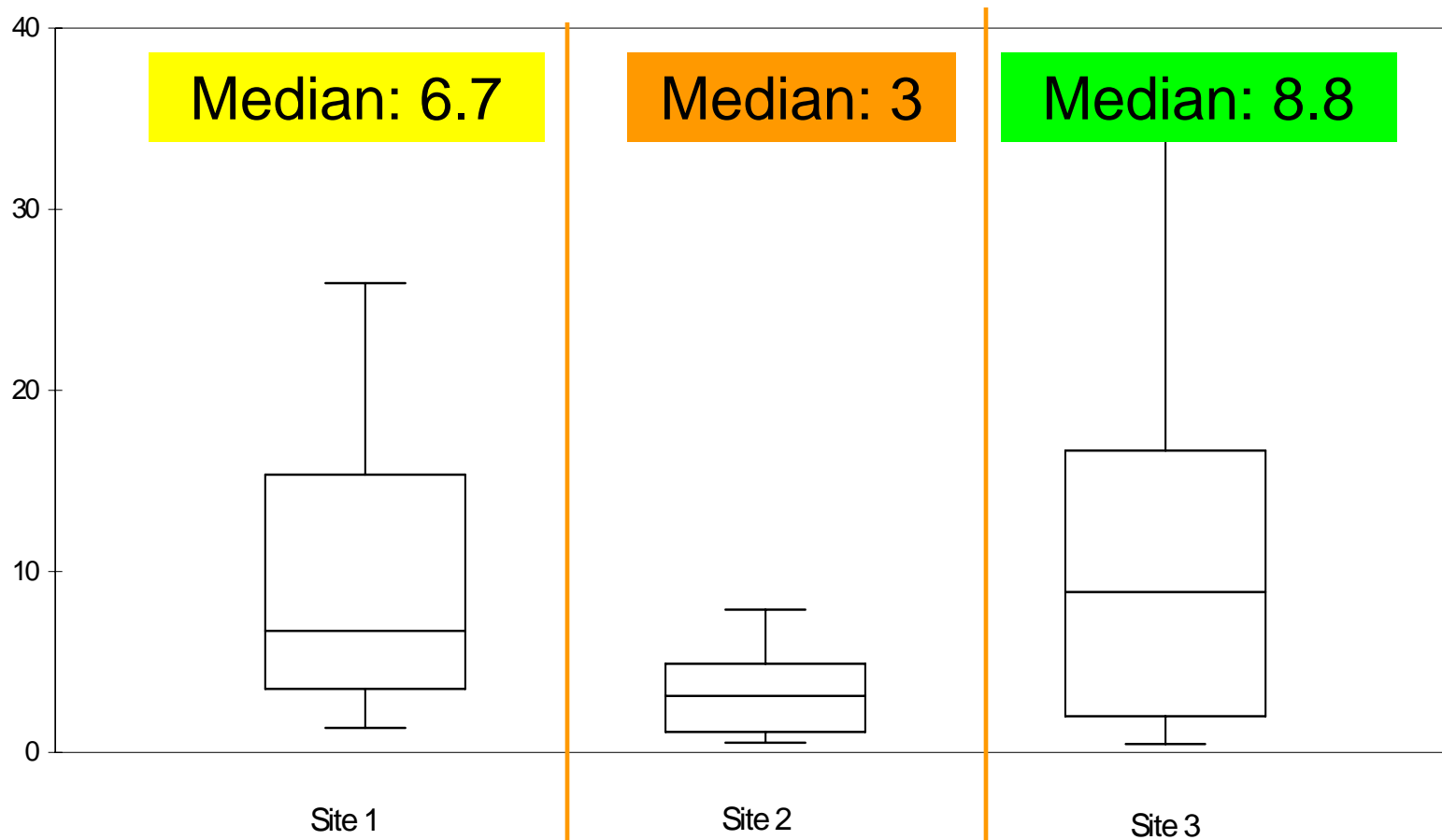
BAD

Median sediment concentration TE

Site		Sediment concentration TE
1	Banana	0.5
	Rice	-2.9
2	Bamboo	-0.5
	Rice	-0.7
3	Natural grass	-0.1
	Rice	-6.6



Out-flow sediment concentration rice / no rice



Banana

Bamboo

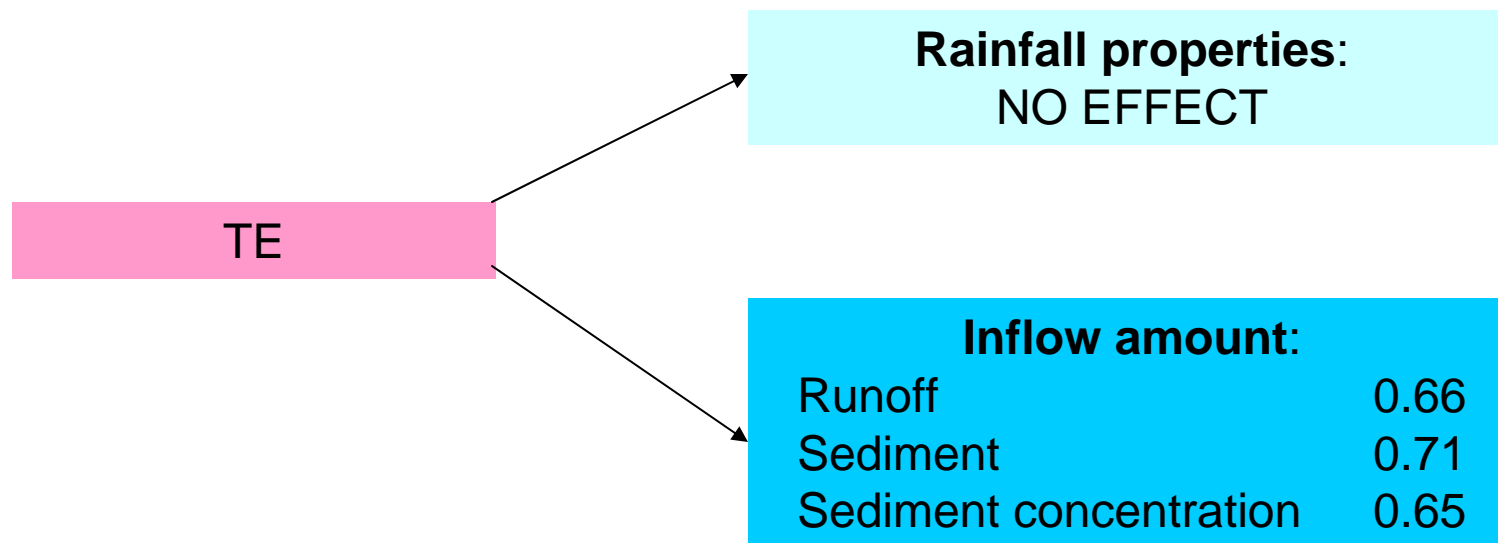
Natural grass

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Rice plots runoff (and sediment load) TE



Correlations of trapping efficiencies (rice plots)



Conclusions (I)

- Trapping efficiencies were generally low: clay material and low concentration in inflow?
- In agreement with other (few) studies in tropical countries and in open field conditions

management of riparian land should be complementary but not substitutive of sloping land management



Conclusions (II)

- Banana and natural grass were sinks of water and sediment;
- Bamboo and rice were sources of water of water and sediment;
- Cultivation of riparian land led to a 3- to 9-fold increase of sediment concentration of runoff directly delivered to the streams

cultivation of riparian land with annual crops
largely deteriorate water quality



Thank you for your attention



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