How erosion contributes to the dispersal of weed seeds

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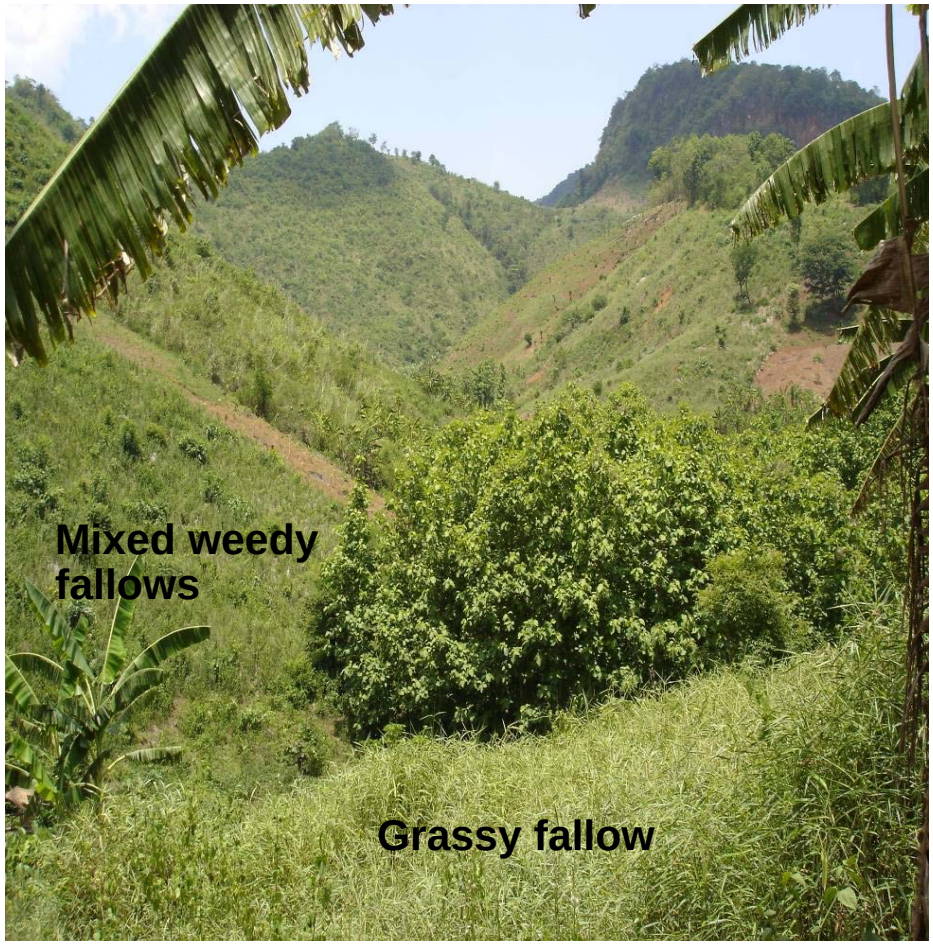


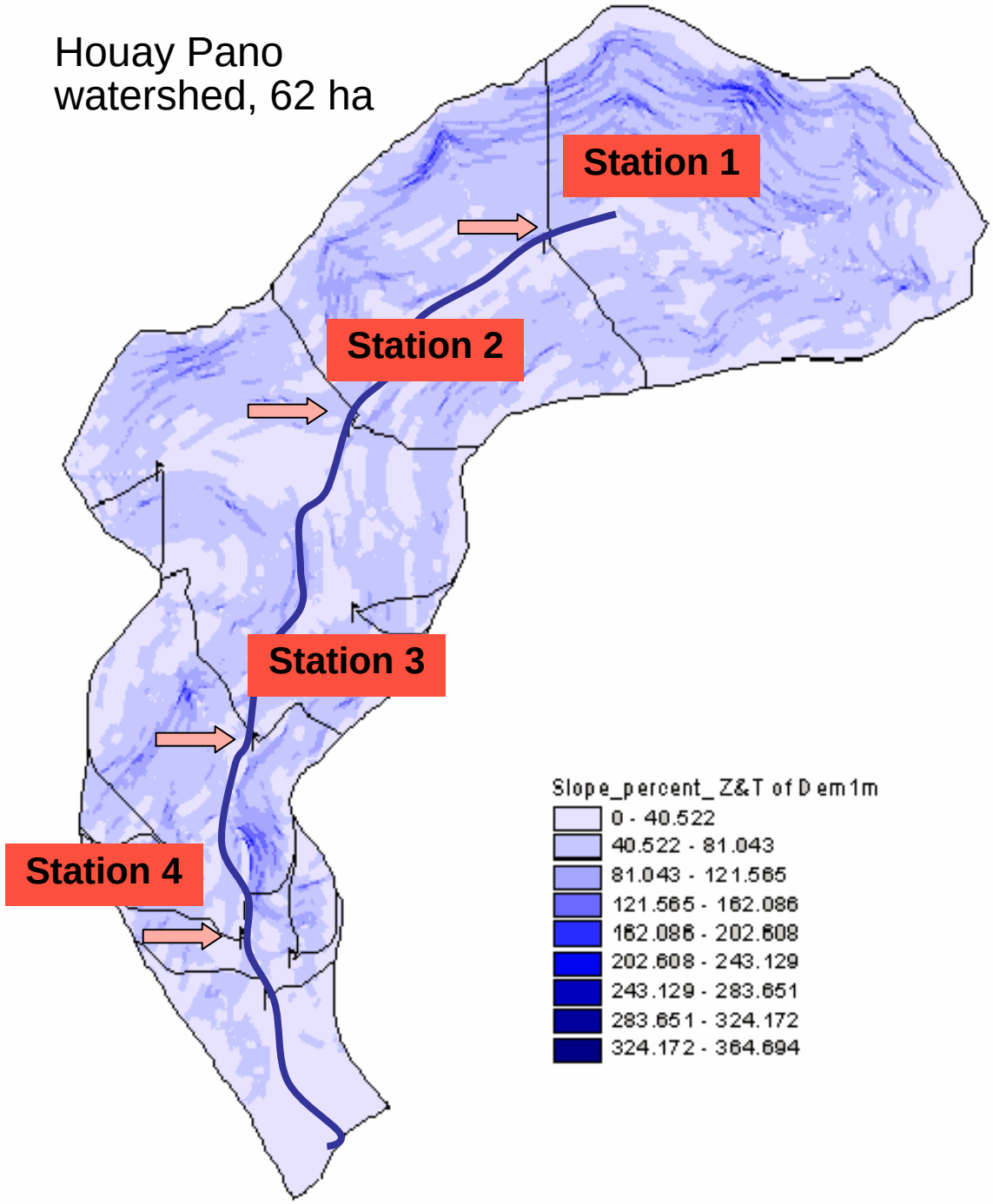
Typical cultivated uplands of Northern Laos

- Succession of short fallow periods => excessive weed growth
- Each plant producing huge quantities of seeds
- Transport of ripe seeds involves an external agent (wind, water, animals)
- Natural processes : runoff and erosion

- End of dry season => maximum seed deposits on surface
- First big rainstorm of the season on sloping land :

⇨ Produces runoff – weed seeds suspended in the water leave the watershed

⇨ Generates erosion – weed seeds embedded in sediments move down the slope



- Sampling in hydrological stations (weirs)
- Each station drains a well defined sub-catchment
- Houay Pano watershed is studies since 1998 by MSEC programme

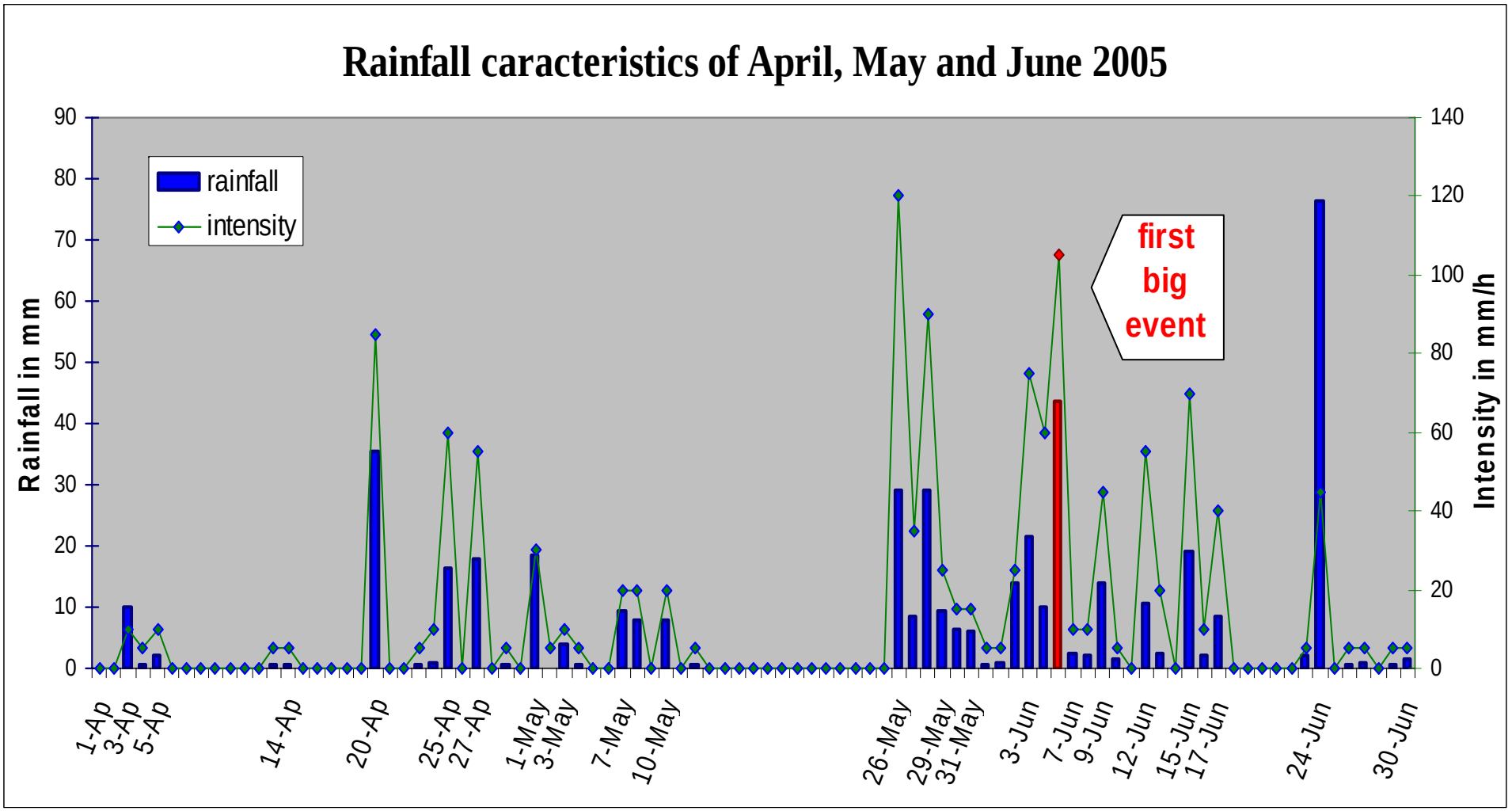
Stations 1, 2, 3, 4 in the stream – permanent flow

Hydrological station

Waterlevel recorder

Watersampler

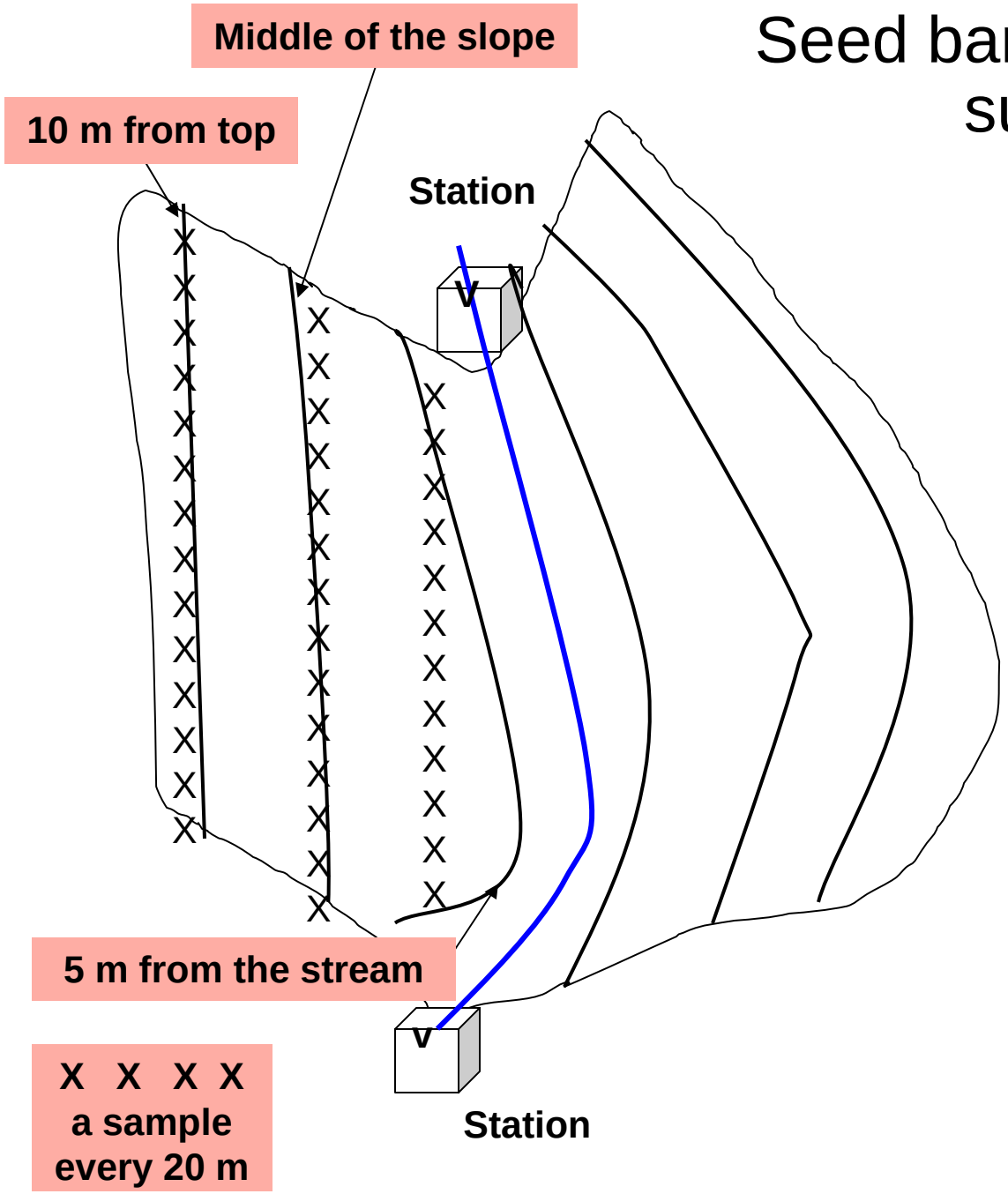
Sediment trap



44 mm et 105 mm/hr max

1. Suspended material in the water bottles
2. Sediments in the tank, the next day

Seed bank sampling in every sub catchment



- In the dry season, before any rain
- Soil samples 0-2 cm including litter

- Seeds in sediments:

Sub catch 1 => station 1

Sub catch 2 => station 2

etc.

- Seeds suspended:

Sub catch 1 => station 1

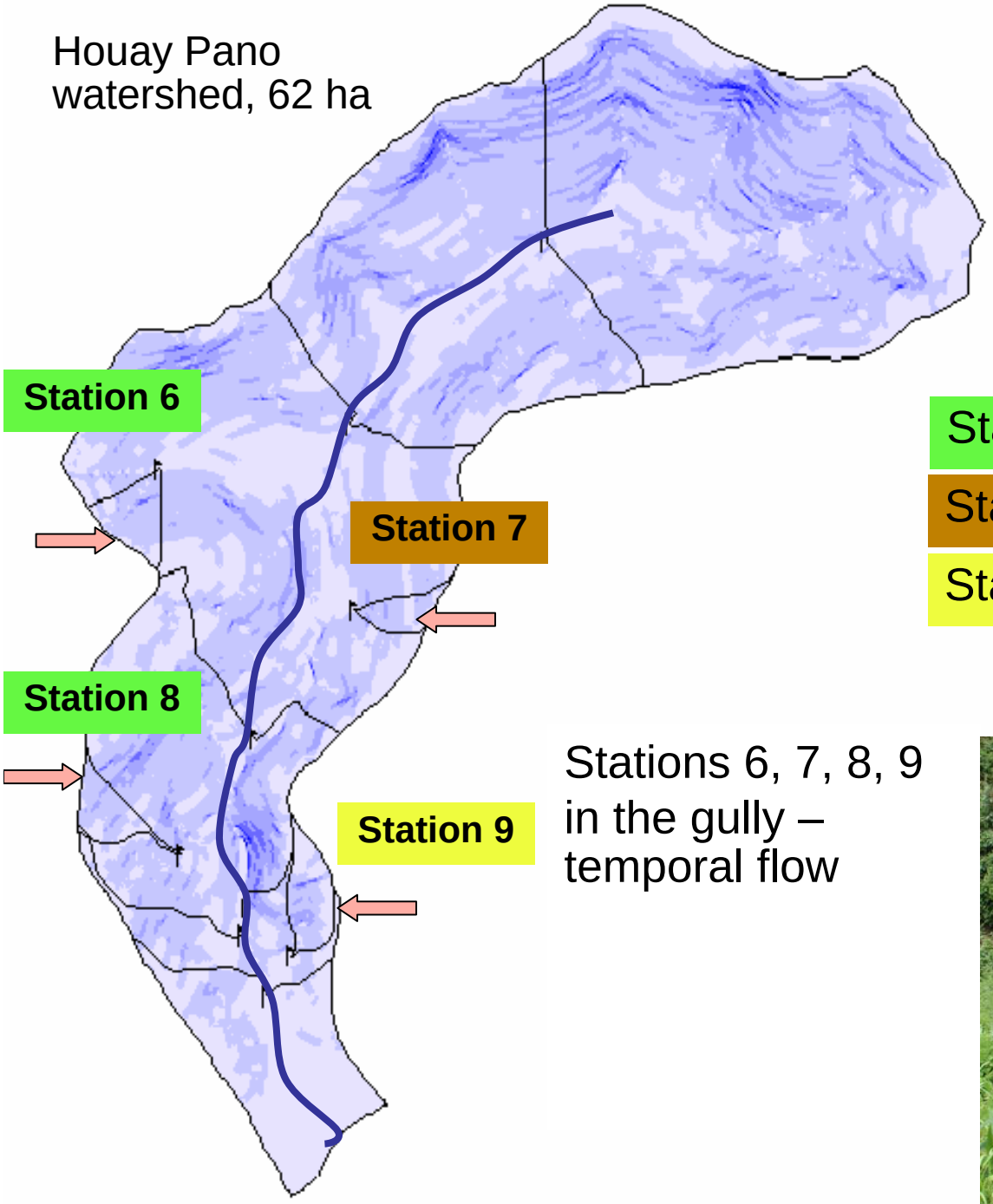
Sub catch 2 => station 1,2

Sub catch 3 => station 1,2,3

Sub catch 4 => station 1,2,3,4

Seedling emergene method

Houay Pano
watershed, 62 ha

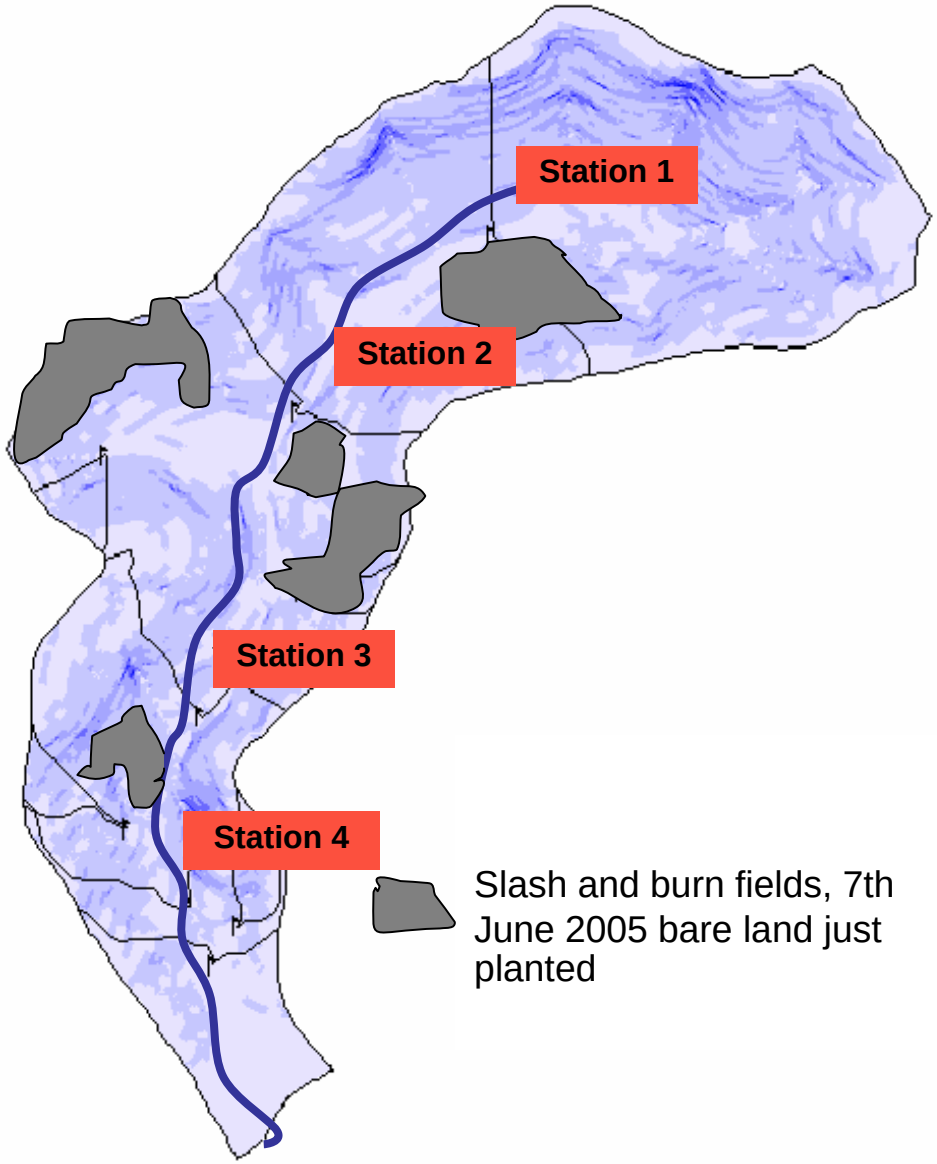


Sampling micro catchments used for testing soil and water conservation techniques along with conventional farming (2002-2007)

Station 6, 8	Improved fallow
Station 7	Slash and burn
Station 9	Mulch cropping

Stations 6, 7, 8, 9 in the gully – temporal flow

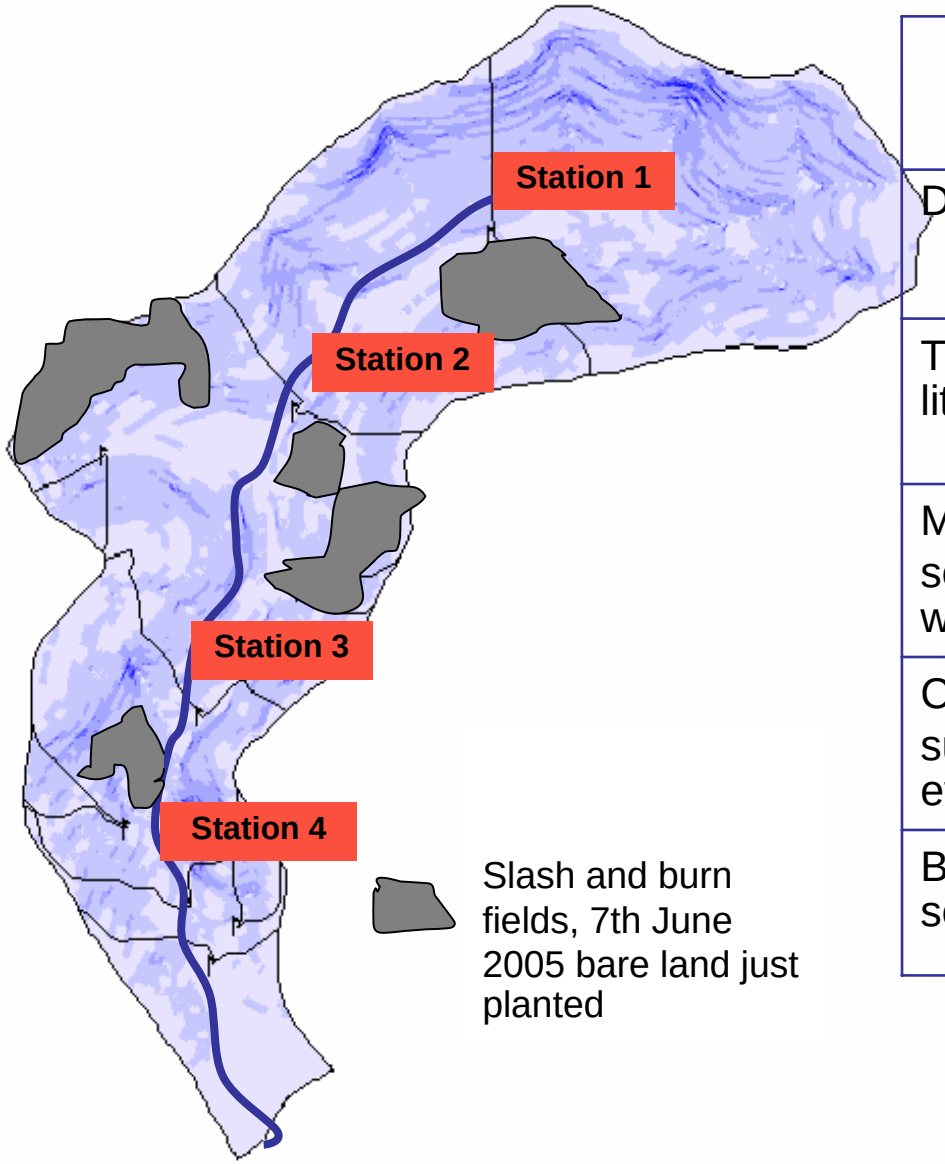
Results – land features



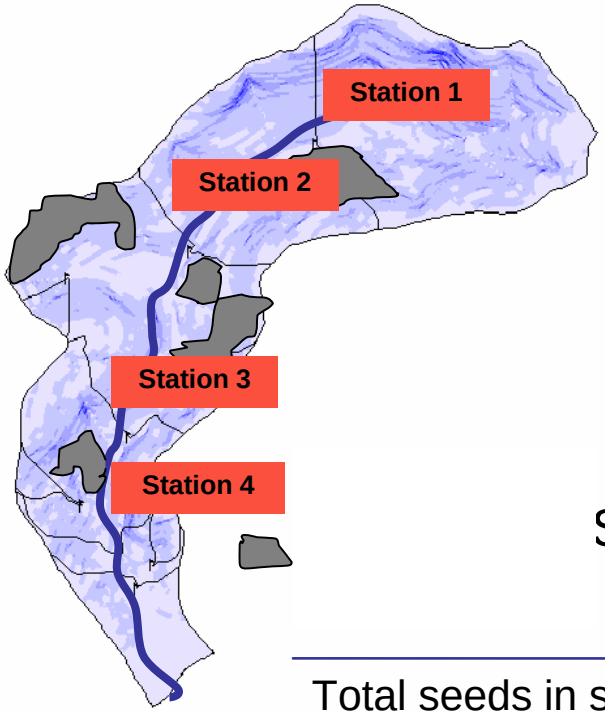
Slash and burn fields, 7th June 2005 bare land just planted

Stations in stream – permanent outflow				
	1	2	3	4
Sub catchment (ha)	21.5	14.1	20.6	8.4
Burnt and planted (ha)	1.7	2.4	4.5	0.7
Mean slope (%)	56%	57%	54%	54%
Land use	fields, fallow, teak, bananas, riparian			
Mean seed density /m^2	274	368	223	308

Results – 7th June rainfall event



Stations in stream – permanent outflow	1	2	3	4
Duration of flow	2H20	5H40	6H00	5H15
Total discharge litres	18240 0	514 500	707 300	818 600
Mean sediments in water bottles g/l	1.5	0.8	0.9	2.6
Cumulative suspended load evacuated kg	804	398	1498	4043
Bedload sediments kg	247	320	560	1100



Results – 7th June seed transport

Stations in stream – permanent outflow

	1	2	3	4
Total seeds in suspended load	740 000	2 080 000	780 000	970 000
Seeds per 10 litres runoff	17	5	11	12
Total seeds in bed load sediments	24 200	8600	15 700	43 500
Seeds in kg eroded soil	98	27	28	40
Total seed flow per ha	35 500	59 100	14 800	20 200

Results – land features

Conventional Slash and burn (micro catchment 7)

Micro catchments – temporal outflow

	6	7	8	9
Micro catchment (ha)	0.3	0.5	0.4	0.5
Burnt and planted (%)	0%	100%	0%	0%
Mean slope (%)	38%	54%	64%	40%
Land use	Impr. fallow	Rice field	Impr. fallow	Mulch sowing
Mean seed density /m^2	271	207	591	906

Results – 7th June rainfall event

Improved fallow (micro catchment 6, 8)

Micro catchments – temporal outflow				
	6 Impr. fallow	7 Rice field	8 Impr. fallow	9 Mulch sowing
Duration of flow	0H20	1H15	1H25	0H20
Total discharge litres	220	169 400	1680	2300
Mean sediments in water bottles g/l	0.09	3.68	0.07	0.13
Cumulative suspended load evacuated kg	0.02	109	0.11	0.3
Bedload sediments kg	3.5	960	1.2	3.5

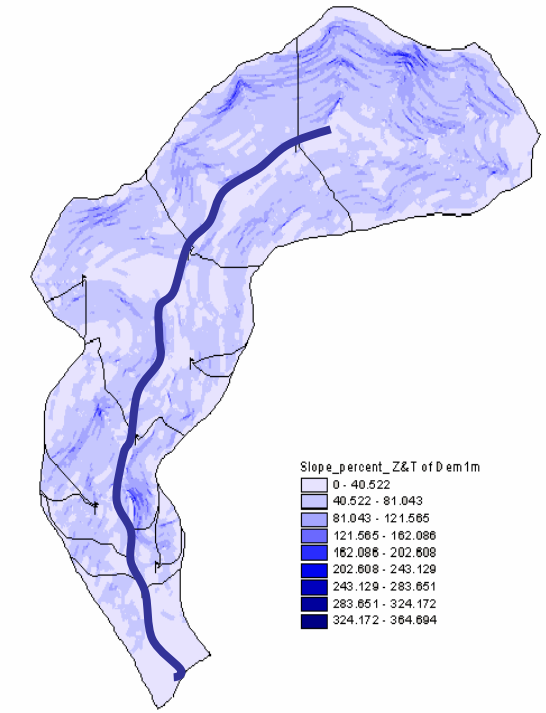
Results – 7th June seed transport

Mulch sowing (micro catchment 9)
- Ruzi grass cover before herbicide treatment -

Micro catchments – temporal outflow

	6 Impr. fallow	7 Rice field	8 Impr. fallow	9 Mulch sowing
Total seeds in suspended load	1423	2973	25	23
Seeds per 10 litres runoff	389	2	1	12
Total seeds in bed load sediments	7200	30 100	184	2700
Seeds in kg eroded soil	2048	31	153	766
Total seed flow per ha	26 800	61 500	540	5450

Some conclusions



- Runoff from the micro-catchments (fields and fallow) => few seeds
- Runoff in the main stream (fields, fallow, riverbank) => 10 times more seeds /10 l

✂ ➔ the vegetation next to the stream contributes most to the suspended seed transport

- Eroded soil from the micro-catchments => many seeds
- Eroded soil from the main catchments => 5 – 10 times less seeds per kg sediment

✂ ➔ does eroded soil from cultivated fields really reaches the stream? How about collapsing riverbanks?

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