



Effects of Upland Immature Para Rubber Plantation on Erosion and Nutrient Losses in Northern Thailand



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Introduction

- Since 1989, rubber growing in Thailand has gradually shifted from the south to the north.
- Some original forests have been cleared for Para rubber cultivation.
- Para rubber monocultures can indirectly result in manifold negative biodiversity and environmental consequences.
- Intensive rubber plantation in upland areas is susceptible to erosion.



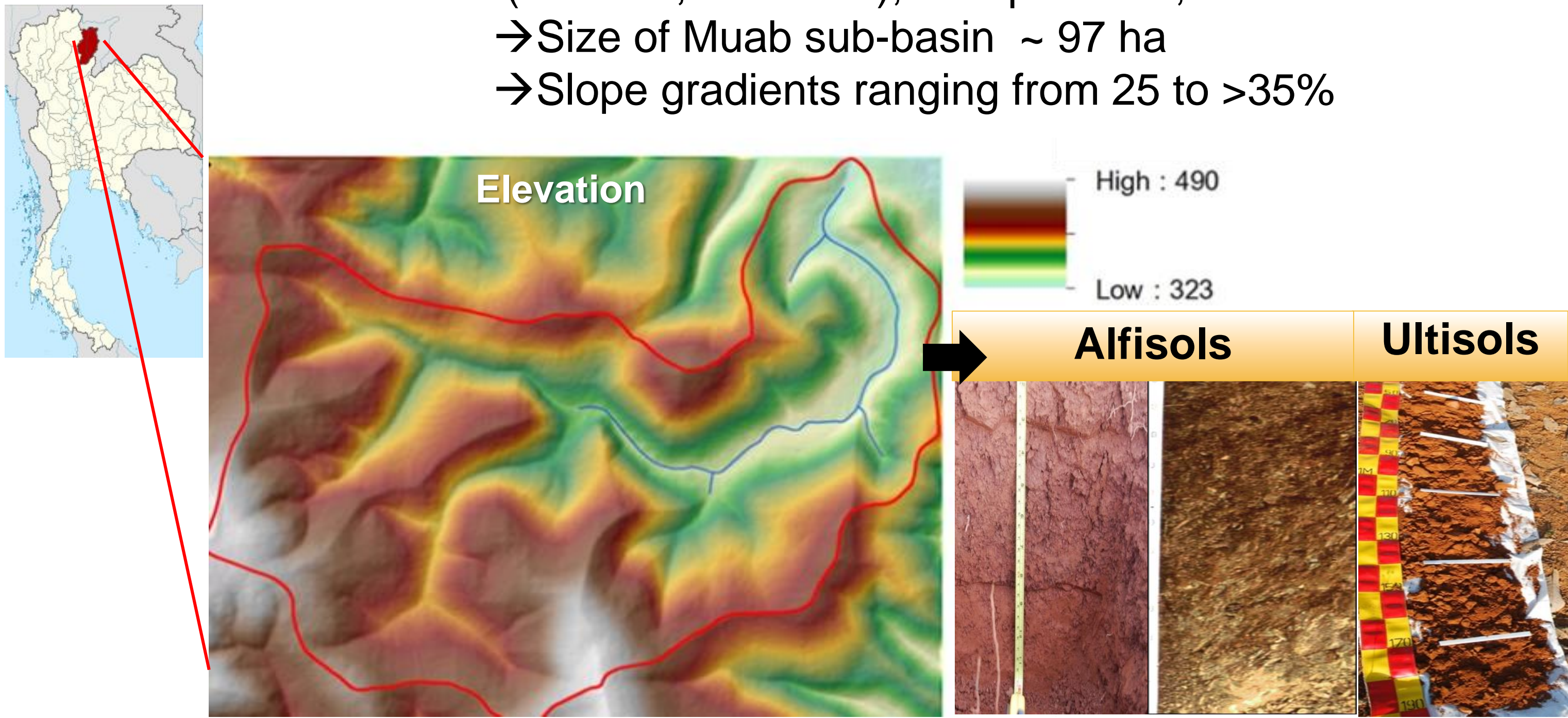
Objectives

- ❖ To assess erosion and soil nutrient losses in upland rubber plantation
- ❖ To assess the net present value (NPV) of soil nutrient losses by erosion

Materials and Methods

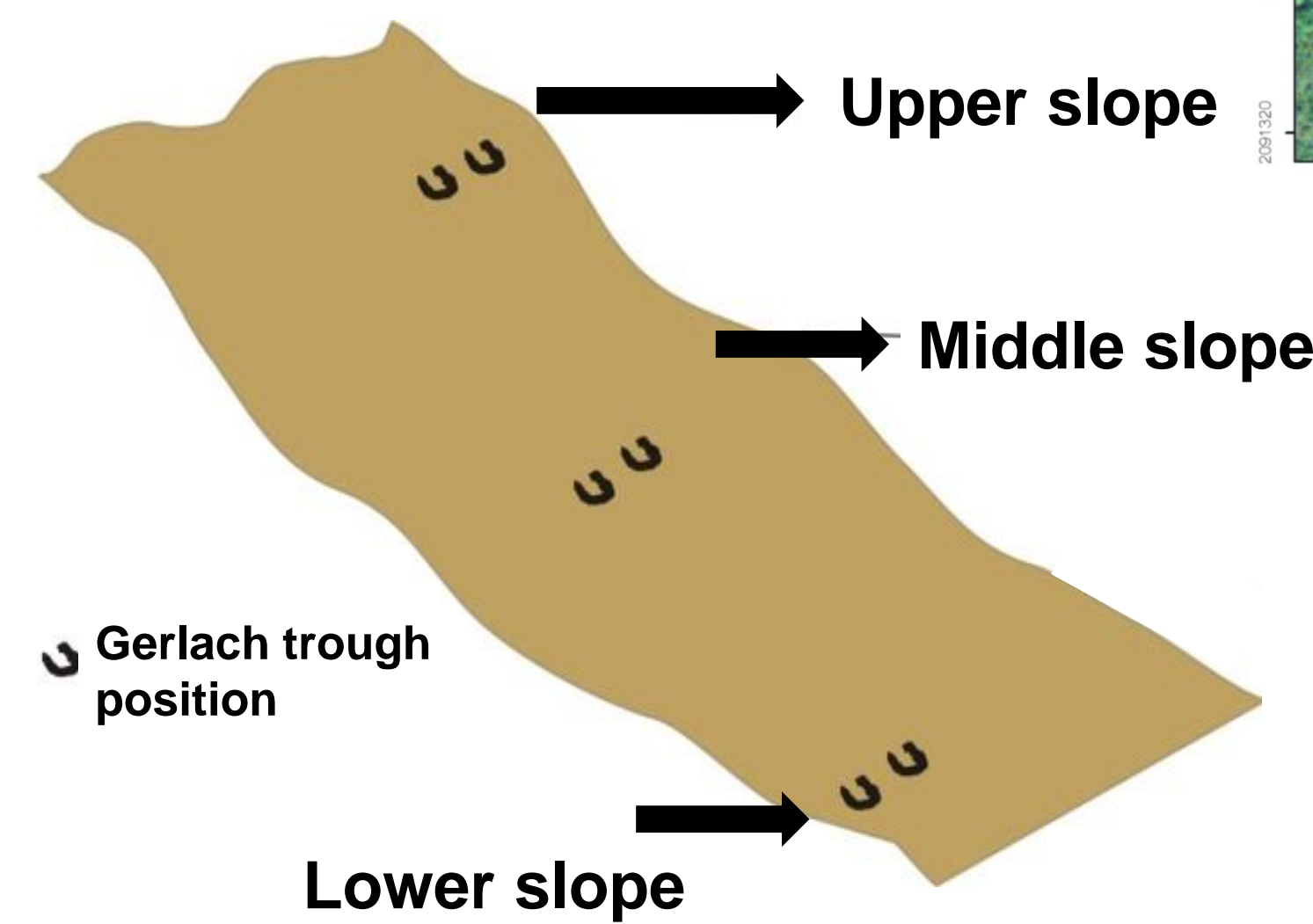
Site description

- Muab sub-basin of the Nan watershed (18°54'N, 100°54'E), Nan province, Thailand
- Size of Muab sub-basin ~ 97 ha
- Slope gradients ranging from 25 to >35%

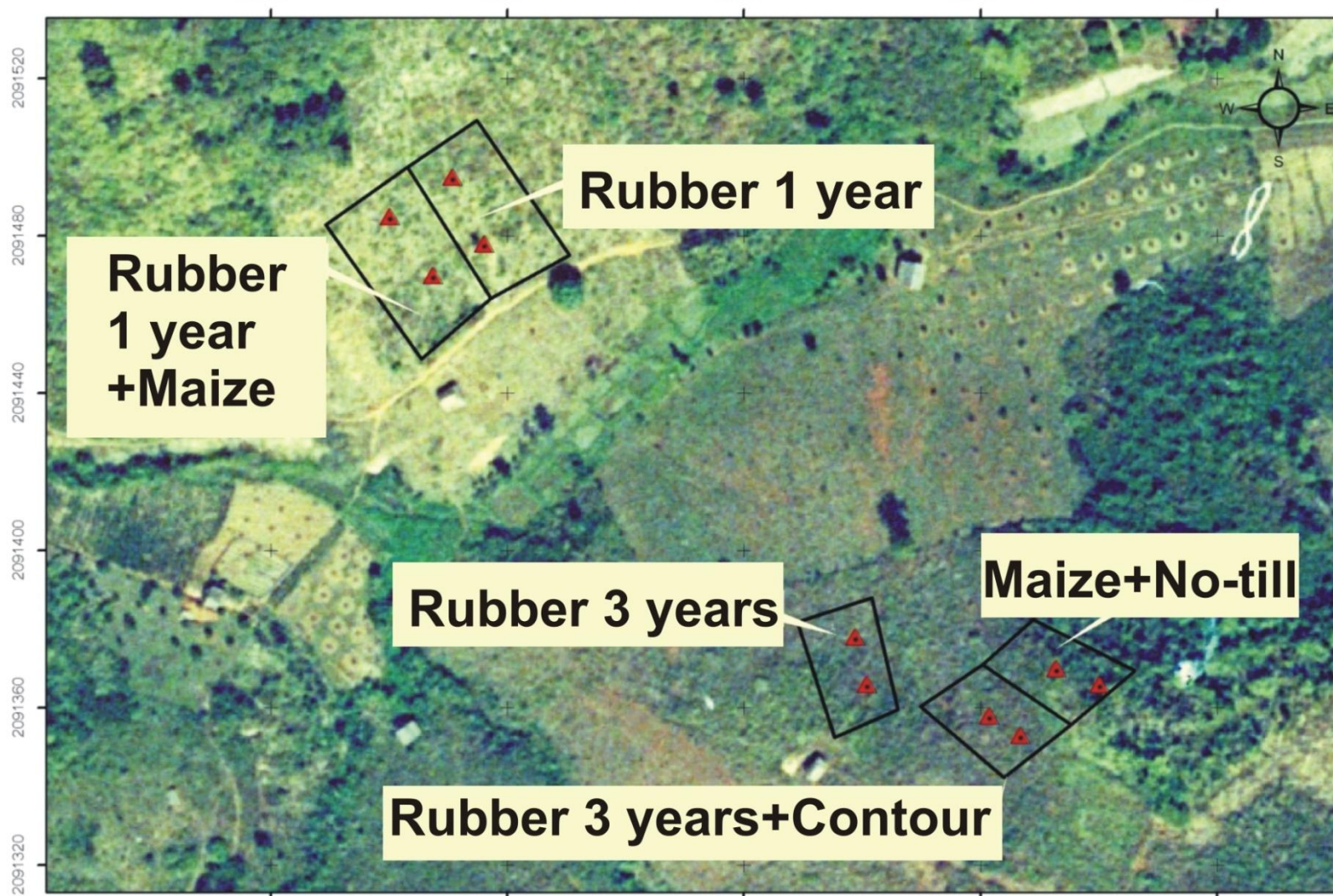


- Tropical savannah (AW) climate
- Annual rainfall: ~1,129 mm
- Temperature range 14- 38°C

Erosion measurement



Experiment

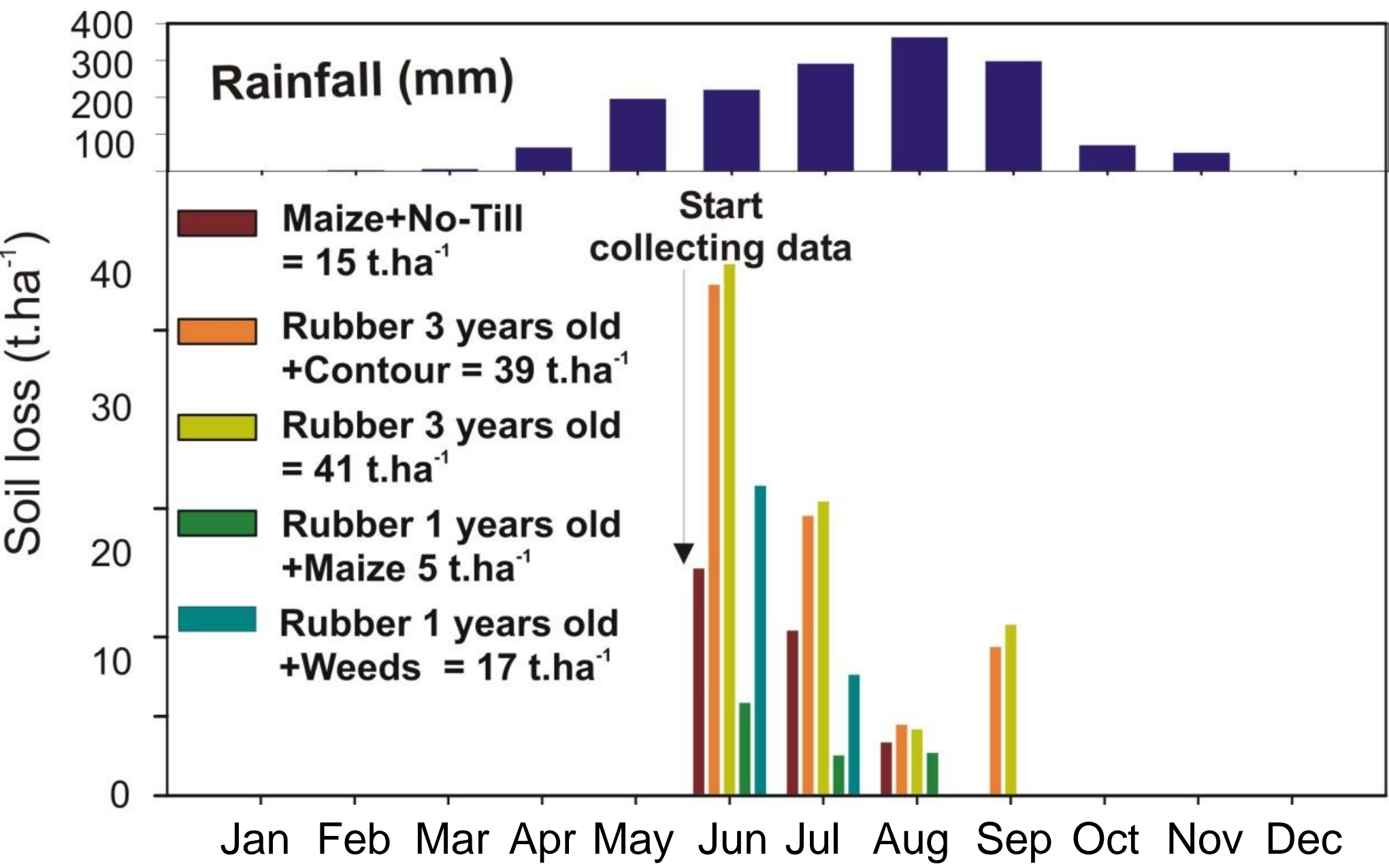


- Observation period: March to December 2014
- Soil loss and runoff were collected after every rainfall event.
- Samples were analysed for total N, P and K.
- **Water Budget:** using CropWat 8.0

Net present value (NPV)

- Quantifying costs and benefits for calculation of the NPV
- Project period: **20 years**

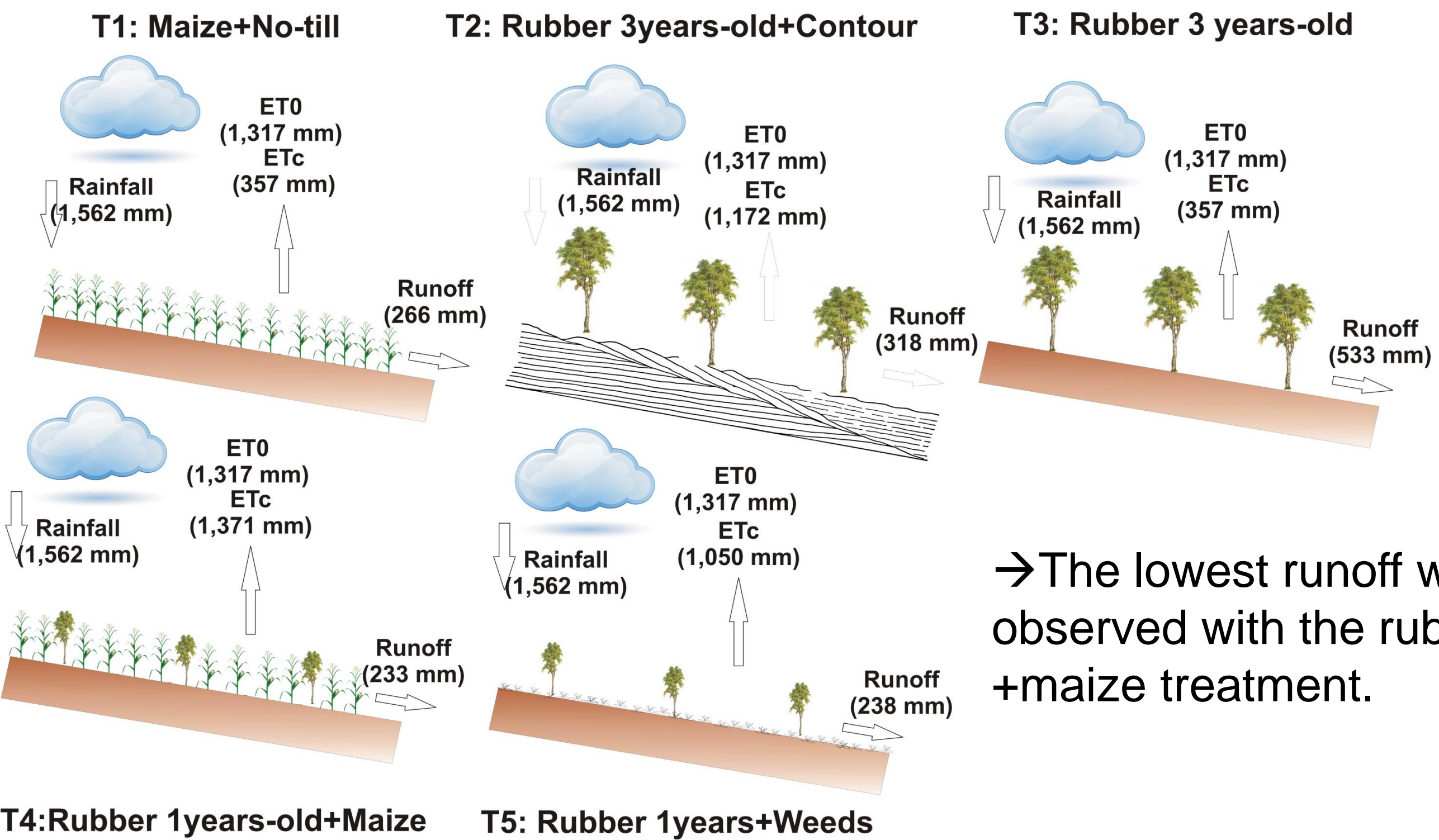
Result



Soil loss

- The result showed significant differences in soil losses among treatments.
- The lowest soil loss was observed with the rubber+maize treatment.

Water Budget



- The lowest runoff was observed with the rubber +maize treatment.

Nutrient losses by soil loss and runoff

Treatments	Total N	Avai P loss	Exchangeable K loss
	kg.ha ⁻¹		
<u>Nutrient losses by soil loss</u>			
Maize+No-till (T1)	111.77	0.29	15.18
Rubber 3 years-old + contour (T2)	313.96	0.36	43.88
Rubber 3 years- old (T3)	297.03	0.18	45.95
Rubber 1 years old +maize (T4)	27.47	0.05	6.76
Rubber 1 year old+Weeds (T5)	114.10	0.28	24.57
<i>F</i> -test	NS	NS	NS
<u>Nutrient losses by runoff</u>			
Maize+No-till (T1)	2.08	4.20	0.60
Rubber 3 years- old + contour (T2)	1.78	3.70	0.86
Rubber 3 years- old (T3)	3.41	9.11	1.25
Rubber 1 years old +maize (T4)	1.58	4.61	0.73
Rubber 1 year old+Weeds (T5)	1.52	3.45	1.12
<i>F</i> -test	NS	NS	NS

Net present value (NPV) of each cropping system

NPVs estimated for project period of 20 years		Discount rates					
Treatments	NPV (Baht / Rai)	0%	3%	5%	7.5% (Base case)	9%	12%
T1	NPV	38,705	29,559	25,241	21,319	19,193	16,137
	B/C Ratio	1.47	1.47	1.47	1.48	1.47	1.47
T2	NPV	91,617	49,036	31,110	16,407	9,698.53	5,339
	B/C Ratio	2.09	1.78	1.59	1.39	1.25	1.17
T3	NPV	92,373	50,471	32,916	17,294	11,003.10	1,951
	B/C Ratio	2.13	1.84	1.66	1.43	1.31	1.06
T4	NPV	121,167	77,635	58,866	42,456	35,529.85	25,412
	B/C Ratio	2.35	2.16	2.04	1.91	1.84	1.72
T5	NPV	115,290	68,634	51,401	34,522	27,471.91	17,104
	B/C Ratio	2.60	2.27	2.21	2.02	1.93	1.73

(Baht per rai; 1 Euro=39 Baht; 1 Rai = 0.16 ha.)

Conclusion

- Immature rubber intercropping with maize is suitable systems which can reduce erosion and also the losses of nutrients by erosion in the upland rubber plantation.

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