

From climate change perception to bottom-up adaptation initiatives: a case study from banana producers of Upper Huallaga basin, Peru

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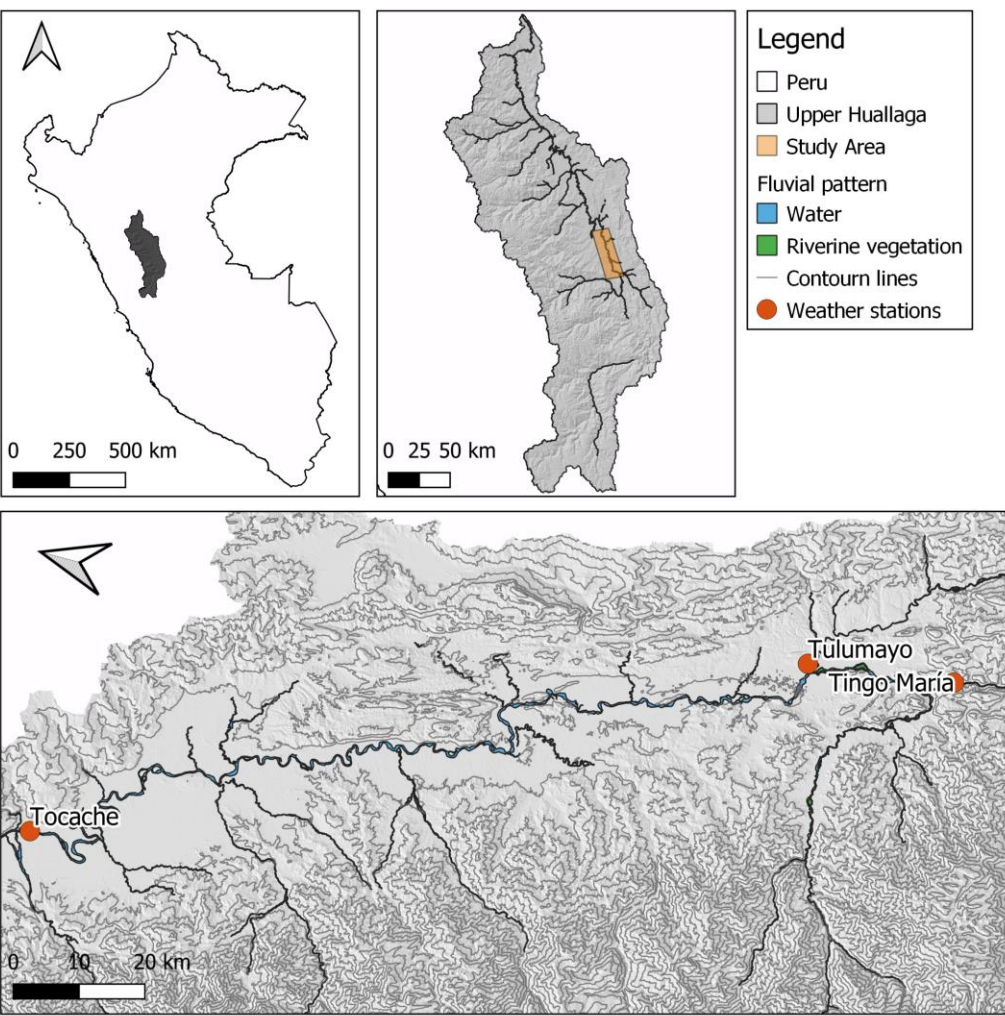
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Introduction and case study



The present study focuses on banana producers' perception of climate change in a tropical valley, and the initiatives that farmers adopt to cope with recent intense weather events. So far, climate conditions of the Upper Huallaga valley in Peru (76°2'56,69"W, 9°8'38.87"S) perfectly have met the needs of the banana plant (*Musa Musacae*) with 3500 mm of cumulative rainfall per year and average temperatures around 26°C. The agricultural system is mainly based on smallholder farms, characterised by low-tech and rainfed agriculture. However, over the past few years, local farmers have reported an increased frequency of extreme weather phenomena threatening their economic and food security. The research effort behind results presented here is part of the international cooperation project entitled "Upper Huallaga - Sustainable Development and Fight against Climate Change".

Research Questions

1. Do climate variables show any significant statistical trend during the last years?
2. Do local farmers perceive climate change as a possible reason for increased weather impacts?
3. Is there any correlation among the perception of climate change and the willingness to adopt adaptation strategies to cope with it?

Methods

Validation of ground data and ERA5 data



(i) Selection of the available historical weather stations in the valley, (ii) Application of the Standard Normal Homogenization test (SNHT), and pairwise-SNHT, (iii) Comparison of the ground data with ERA5 data

Trend analysis of historical data



Statistical analysis of ground and re-analysis monthly data to assess potential climate trends through (i) Mann-Kendall test and (ii) Sen's slope test

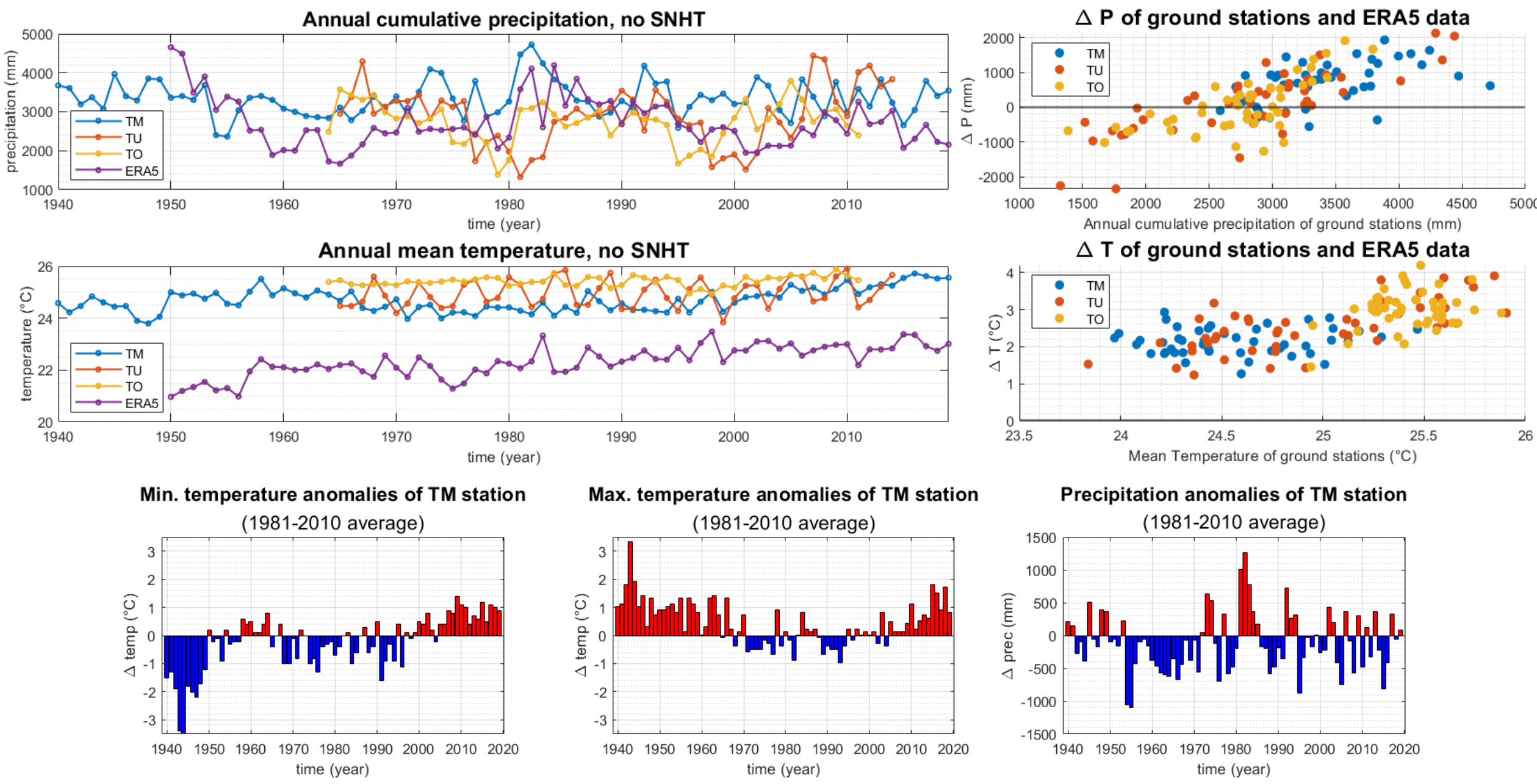
Survey among local farmers



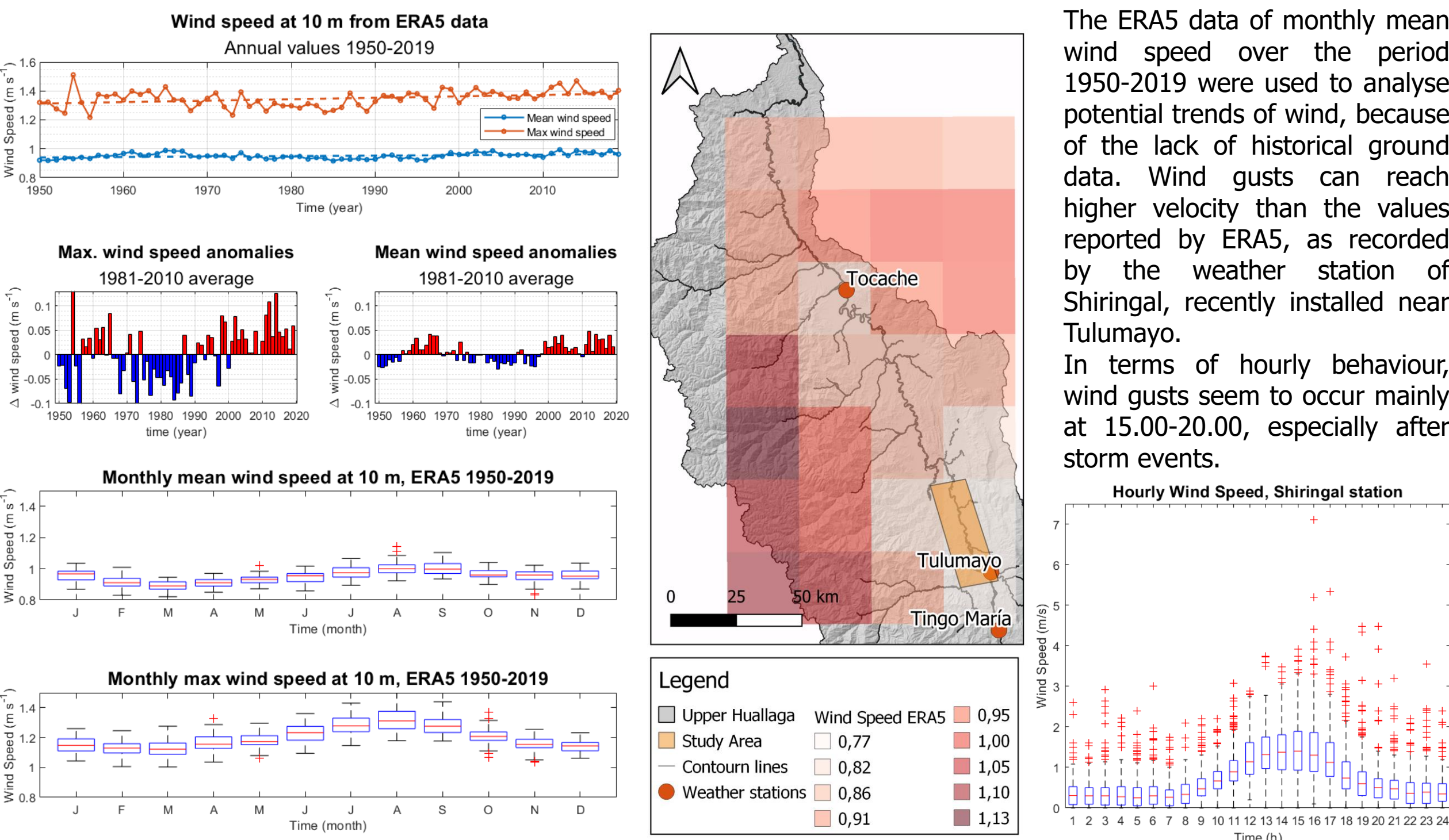
(i) Draft of the questions, (ii) Definition of the sample size, (iii) Random selection of the villages within a buffer of 3 km from the river and low terraces environment and (iv) survey

Results: climate trend analysis

Temperature and precipitation: ground data and ERA5 data



Wind speed: ERA5 data



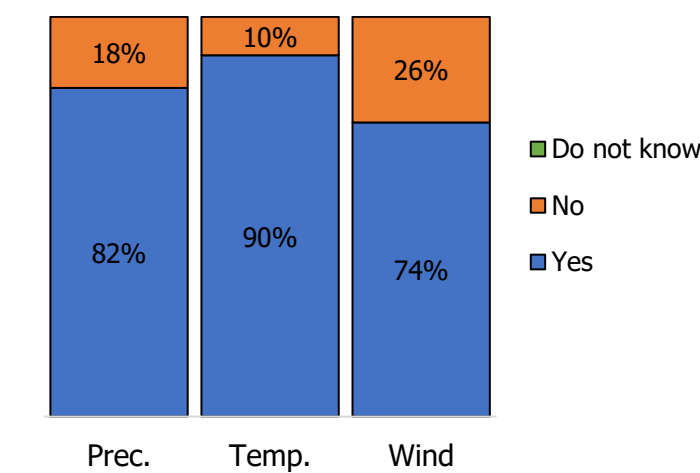
Trends analysis: Mann-Kendall and Sen's slope

		P-value	Tau MK	S MK	varS MK	S. slope	variation
T ave	TM station	2,20E-16	1,92E-01	8,32E+03	6,92E+05	7,28E-04	0,09 °C/decade
Prec	TM station	9,93E-01	1,93E-04	1,28E+02	0,00E+00	0,00E+00	0,00 mm/decade
Ws mean	ERA5	1,36E-05	1,00E-01	4,11E+03	4,67E+05	3,16E-05	0,003 ms ⁻¹ /decade
Ws max	ERA5	7,87E-03	5,73E-02	3,38E+03	6,95E+05	2,56E-05	0,01 ms ⁻¹ /decade

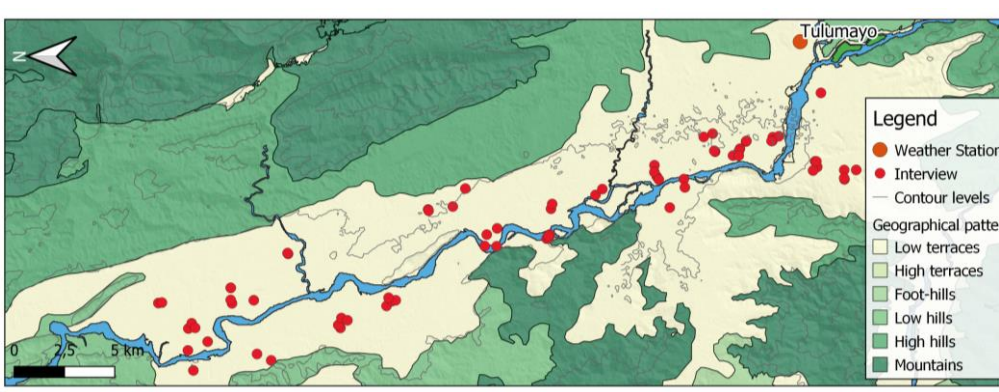
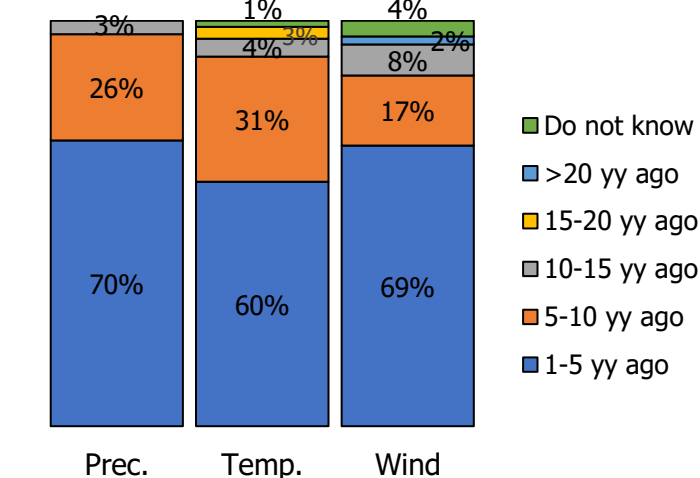
Results: survey on the climate change perception

We conducted, from March 2019 to February 2020, 73 interviews in 22 localities in the valley. Although the majority of the population perceives climate change, to date only a minority of respondents are implementing adaptation strategies. Among the minority, it is observed that the most widespread practices are those based on nature-based solutions, such as reforestation, which is carried out both to counteract wind gusts and rising temperatures.

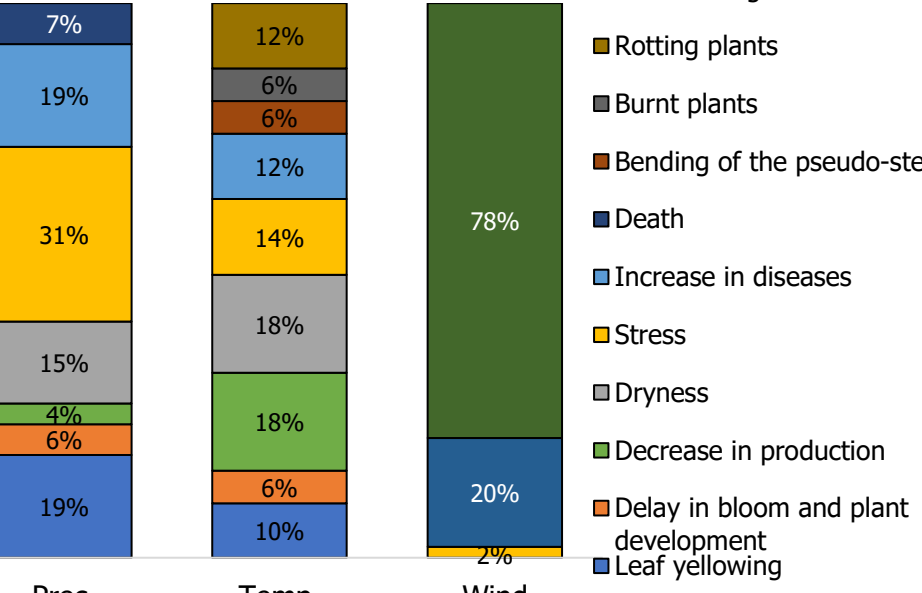
Change perception



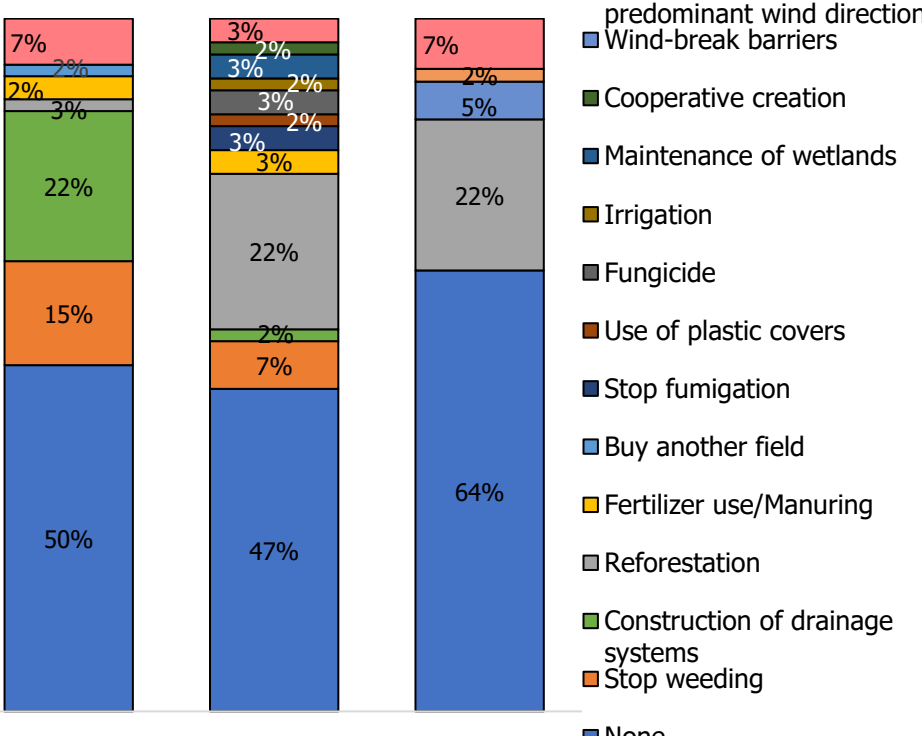
Starting point of CC



Impacts on Banana plants



Adaptation strategies



Conclusions

Our work quantified the occurrence of climate change in the Huallaga valley, Peru, assessing that temperatures increased at a rate of 0,1°C/decade, coherently with the local farmers perception. Whereas, precipitation has

not changed in the last years, contrary to farmers' perception. The majority of local farmers, 82%, perceives climate change, but only a 46% had already taken any initiatives to face with it.

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Acknowledgments

The authors want to acknowledge all the farmers who kindly participate to the survey and the Province of Trento for

supporting the "Alto Huallaga" cooperation project.