

## Trends analysis of the climate data from 2009 to 2019.

### Introduction

### Methodology

The data on the climatic variables Minimum temperature, Maximum temperature, Relative humidity and Precipitation for the three districts namely Dang, Gulmi and Mustang from the year 2009 to 2019 was obtained from Department of Hydrology and Meteorology, Ministry of Energy, Water Resources and Irrigation.

The obtained data was analyzed using the Generalized Additive Mixed Model (GAMM) in the R software program. The year was used as the dependent variables whereas the minimum temperature, maximum temperature, precipitation and relative humidity were used as the fixed effect and season was used as the random effect.

### Results

Trends analysis for the Mustang climate data

The change of the relative humidity over the year was significant whereas the others variables were not significant.

Table: GAM results of the climate data from the year 2009 to 2019, Mustang district.

R-sq.(adj)	0.0908			
	edf	Ref.edf	F	p-value
Intercept	2014	0.2196	9172	<2e-16 ***
Minimum temperature	10	10	1.477	0.1608
Maximum temperature	10	10	1.883	0.0572
Rainfall	10	10	0.578	0.8282
Relative humidity	10	10	4.471	3.26e-05 ***

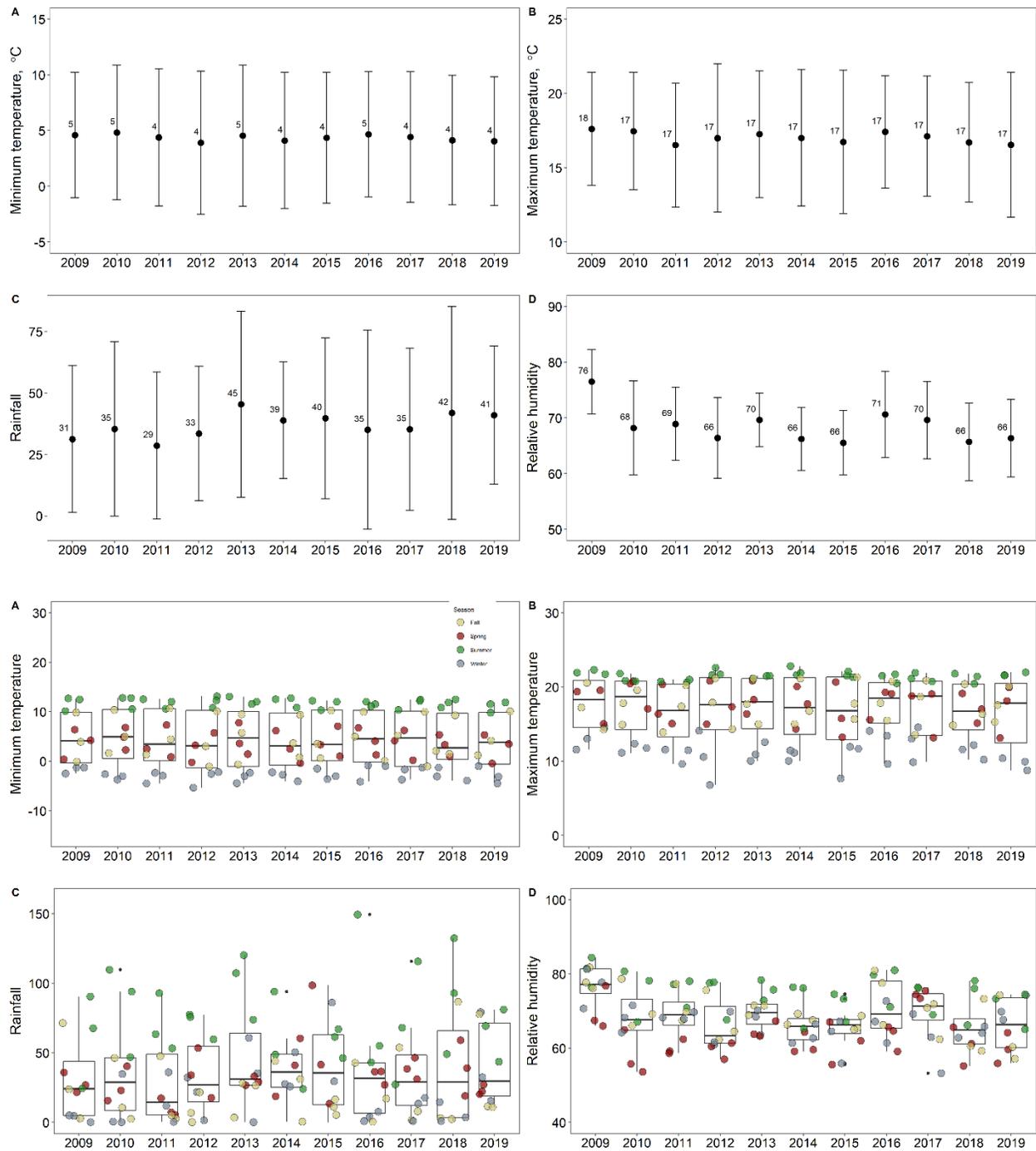


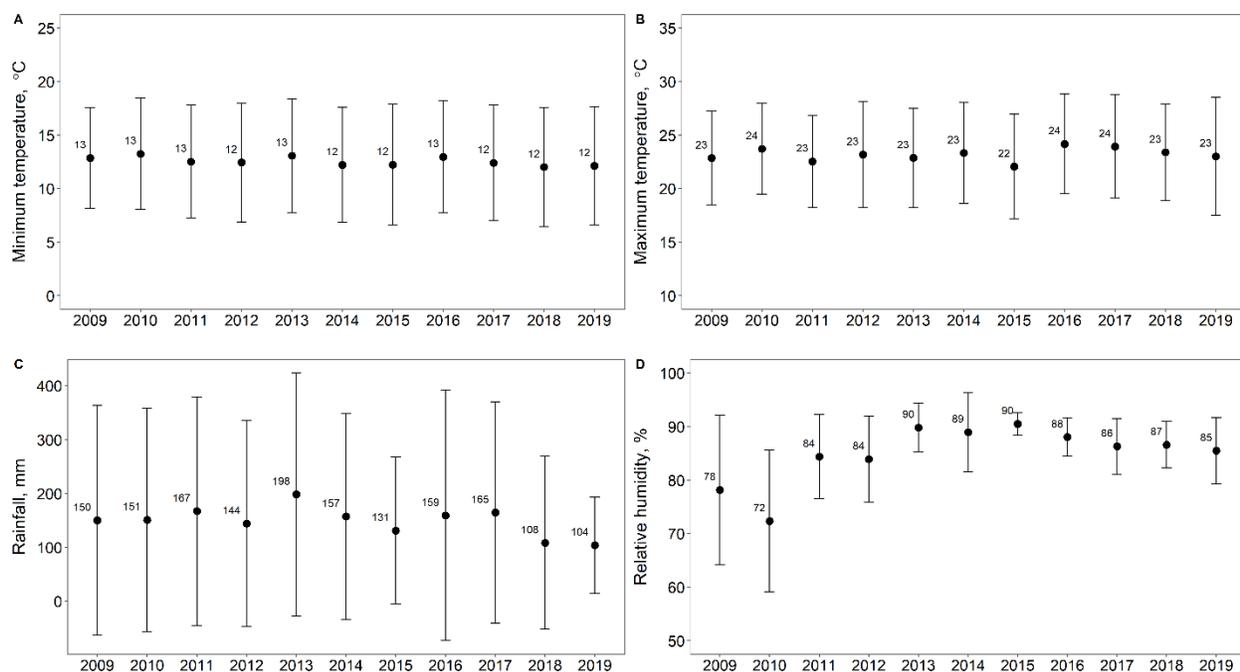
Figure1: Showing the trends of the climate data from the year 2009 to 2019, Mustang district.

## Trends analysis for the Gulmi climate data

The change of the minimum temperature, maximum temperature and relative humidity over the year was significant whereas the precipitation was not significant.

Table: GAM results of the climate data from the year 2009 to 2019, Gulmi district.

R-sq.(adj)	0.312			
	edf	Ref.edf	F	p-value
Intercept	2013.924	0.1893	10639	<2e-16 ***
Minimum temperature	10	10	3.69	0.00045 ***
Maximum temperature	10	10	5.251	7.2e-06 ***
Precipitation	10	10	0.841	0.59109
Relative humidity	10	10	6.478	1.4e-07 ***



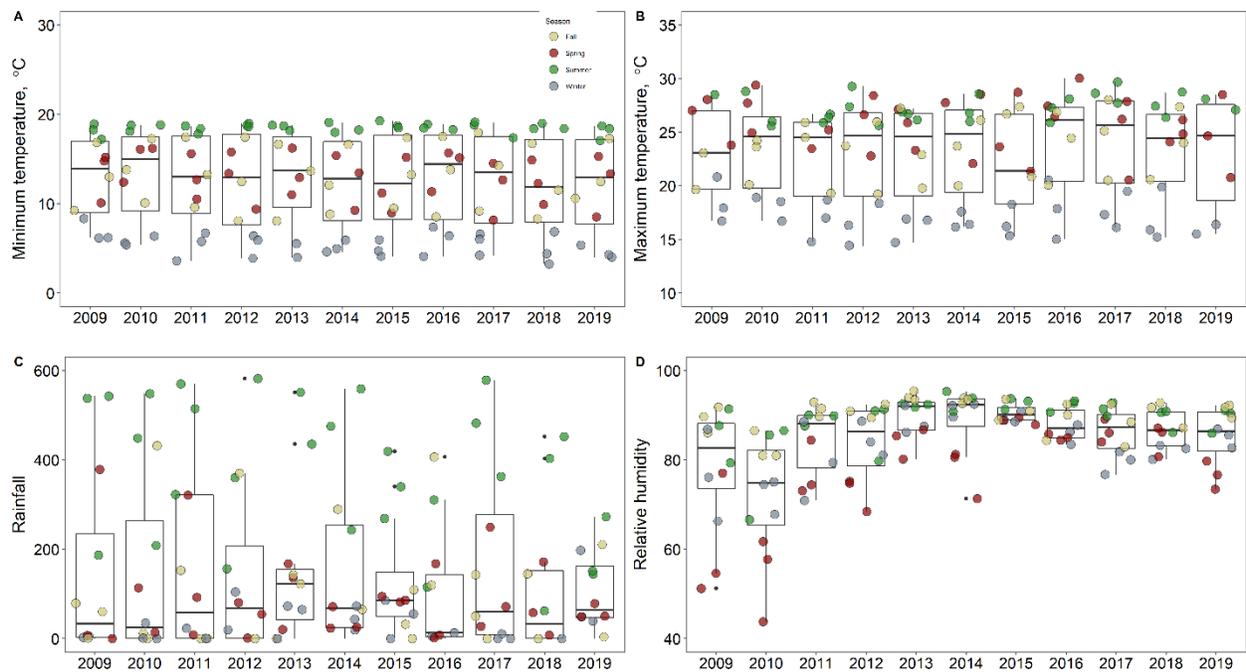


Figure2: Showing the trends of the climate data from the year 2009 to 2019, Gulmi district.

### Trends analysis for the Dang climate data

The change of the minimum temperature, maximum temperature, precipitation and relative humidity over the year was found significant.

Table: GAM results of the climate data from the year 2009 to 2019, Dang district.

R-sq.(adj)	0.282			
	edf	Ref.edf	F	p-value
Intercept	2014.112	0.2012	10009	<2e-16 ***
Minimum temperature	10	10	4.343	6.64e-05 ***
Maximum temperature	10	10	6.547	2.09e-07 ***
Precipitation	10	10	2.132	0.03018 *
Relative humidity	10	10	3.014	0.00267 **

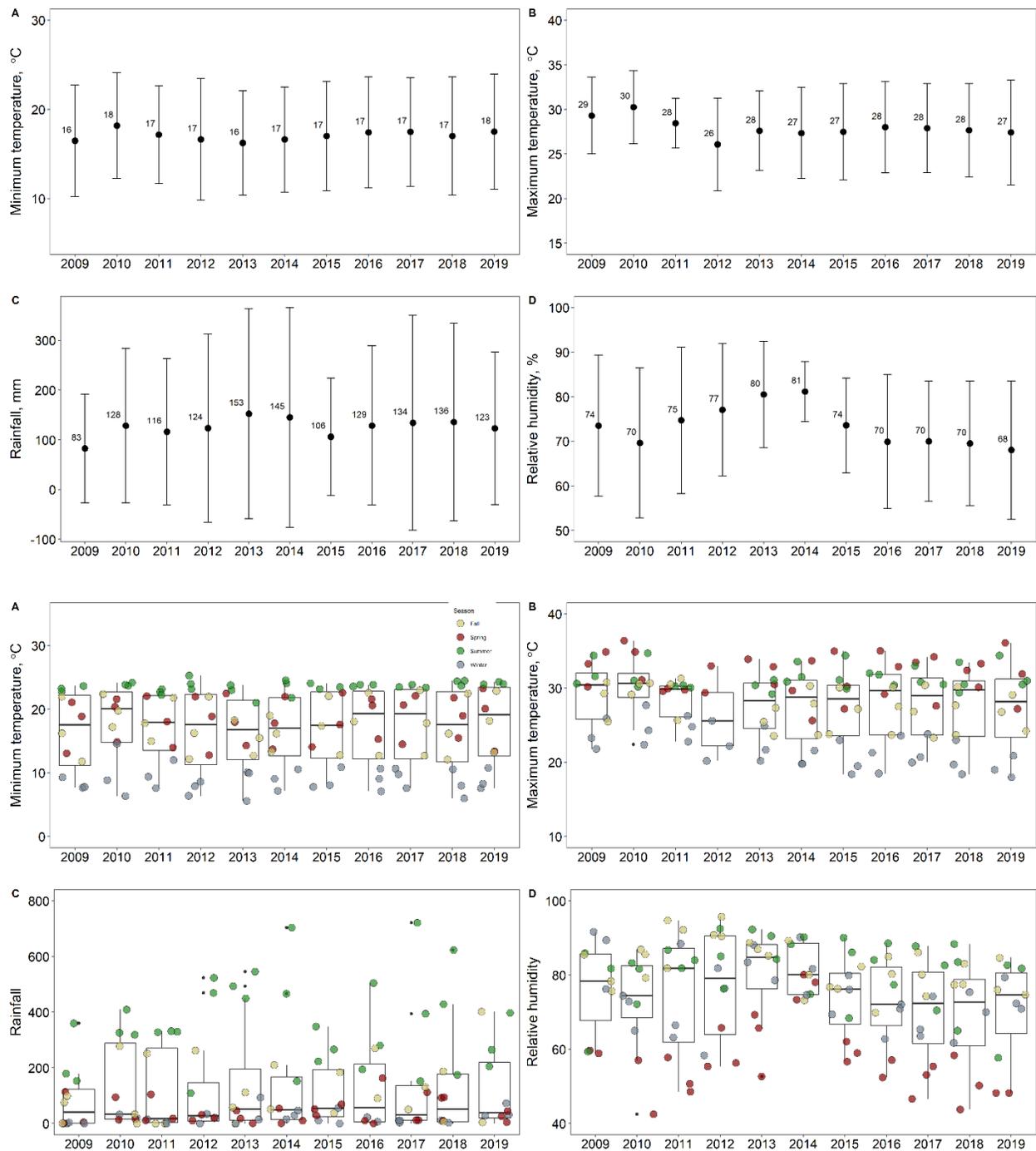


Figure3: Showing the trends of the climate data from the year 2009 to 2019, Dang district.