

EFFECT OF CLIMATE CHANGE ON NUTRITIVE QUALITY OF PLANTS AND CROPS

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Objective of the internship

Objective : Study the effect of climate change on the quality of different forage plant species based on a database containing nutritive metrics, geographical locations, and climate information.

Most important nutritive metrics in the database :

- Dry matter digestibility (DMD)
- Crude Protein (CP)
- Acid detergent fiber (ADF)
- Neutral detergent fiber (NDF)
- Ash
- Energy

Future analysis...

- 1) Find general patterns in the data
- 2) Make projection based on future climate

...with two Machine Learning algorithms

- Random forest
- Gradient boosting

Art	Plant_type	Season	Country	plant_part	DMD	CP	ADF	NDF	Ash	GE
Abies balsamea	Tree	all seasons	United States	twig	48.20	8.800	NA	NA	NA	5.280
Abies balsamea	Tree	NA	United States	leaf	NA	4.000	NA	NA	2.00	2.600
Abies forrestii	Tree	spring-autumn	China	immature leaf	NA	17.890	16.02	44.34	3.04	NA
Abies grandis	Tree	NA	Canada	seed	NA	11.400	45.10	47.20	NA	NA
Acacia aneura	Tree	NA	NA	leaf	NA	15.800	39.60	51.10	4.90	NA
Acacia angustissima	Tree	NA	Ethiopia	leaf	46.60	28.500	13.90	32.00	NA	NA
Acacia angustissima	Tree	winter	Rwanda	leaf	NA	29.500	46.60	54.70	NA	NA

Countries involved in the study

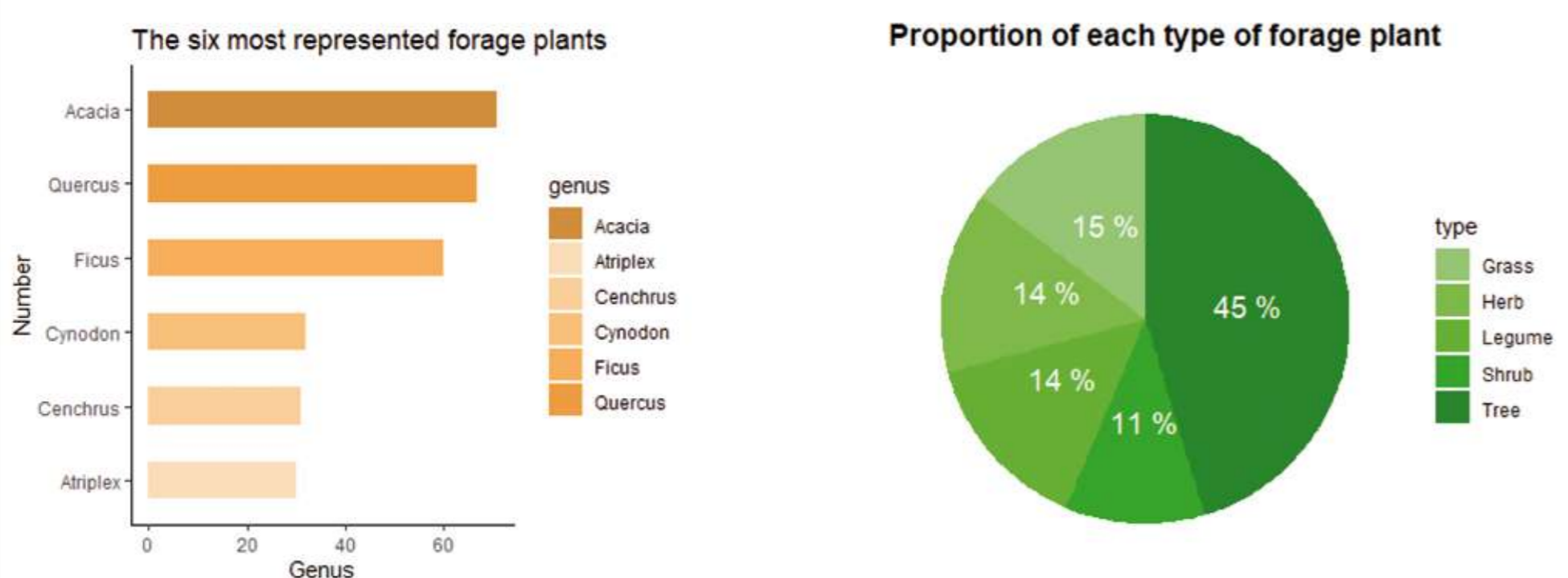
Countries of both hemispheres are presented in the study, such as United States, Ethiopia, India, South Africa, etc.

The database contains 2009 observations and 49 variables.



Name, type and part of the forage plant

Three columns of the database characterize the forage plant studied : its species name, its plant type and the part of it that has been analyzed such as leaf, stem, fruit, flower, seed, etc.



Initial analysis

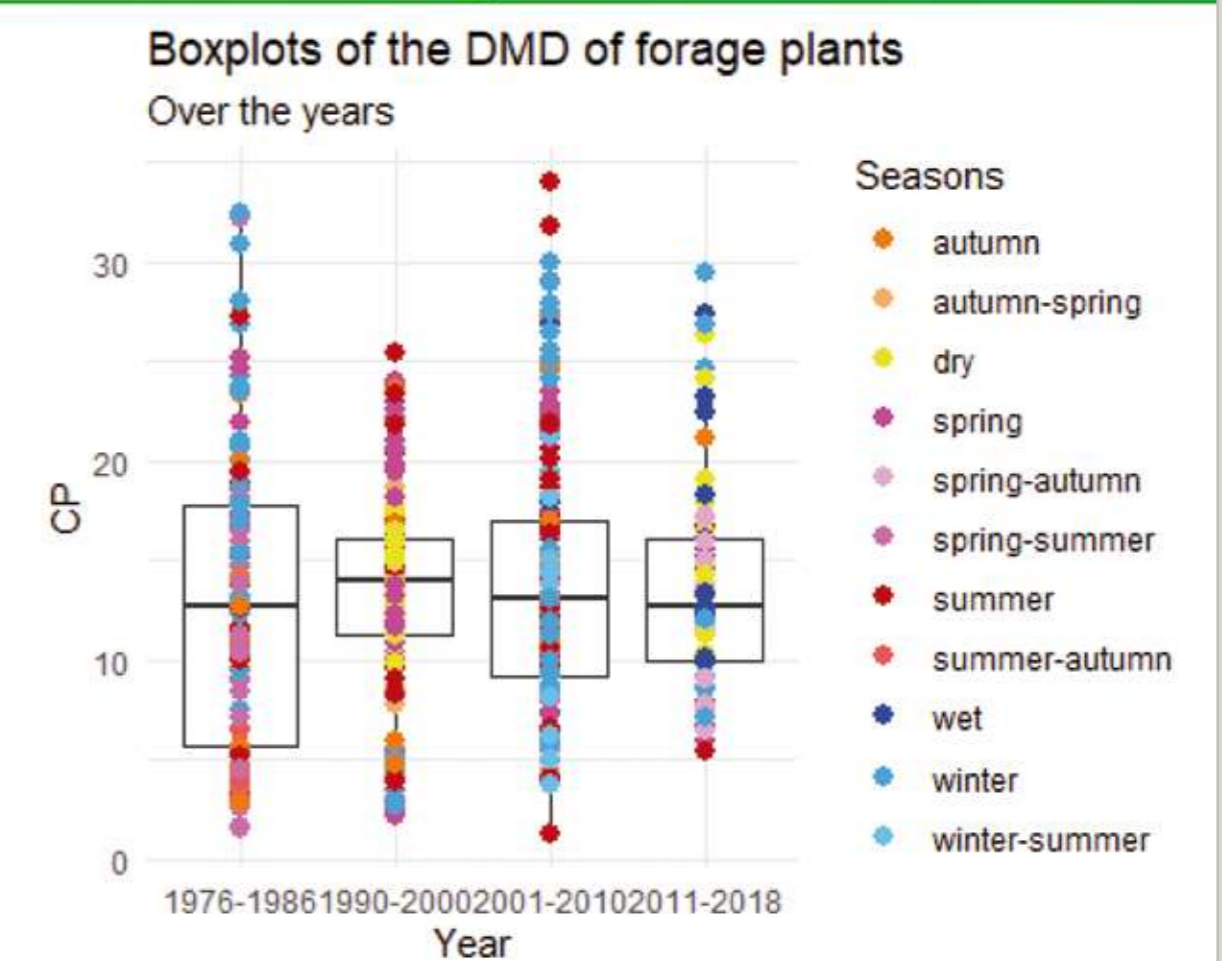
Crud protein (CP) over the years

As time goes by, is there less protein in forage plants because of climate change ?

Crude protein content in forage plant doesn't seem to change over the years.

Does climate affect crude protein content of forage plants?

Wet and cold climate have the biggest values of CP. So cold countries seem to be more interesting in terms of nutritional quality.

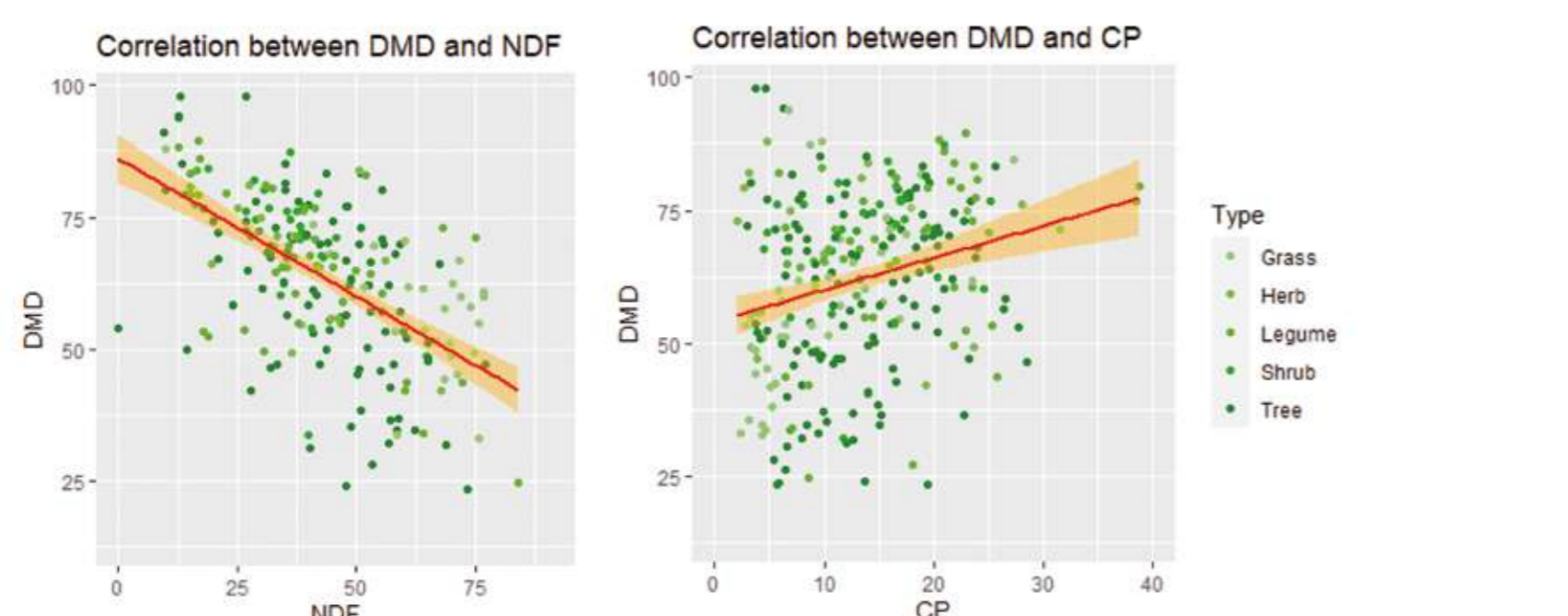


Initial analysis

Relation between Dry matter digestibility (DMD) and Crud protein (CP)

The dry matter digestibility (DMD) is weakly correlated to the Crude protein (CP) content and the fibre (NDF) content.

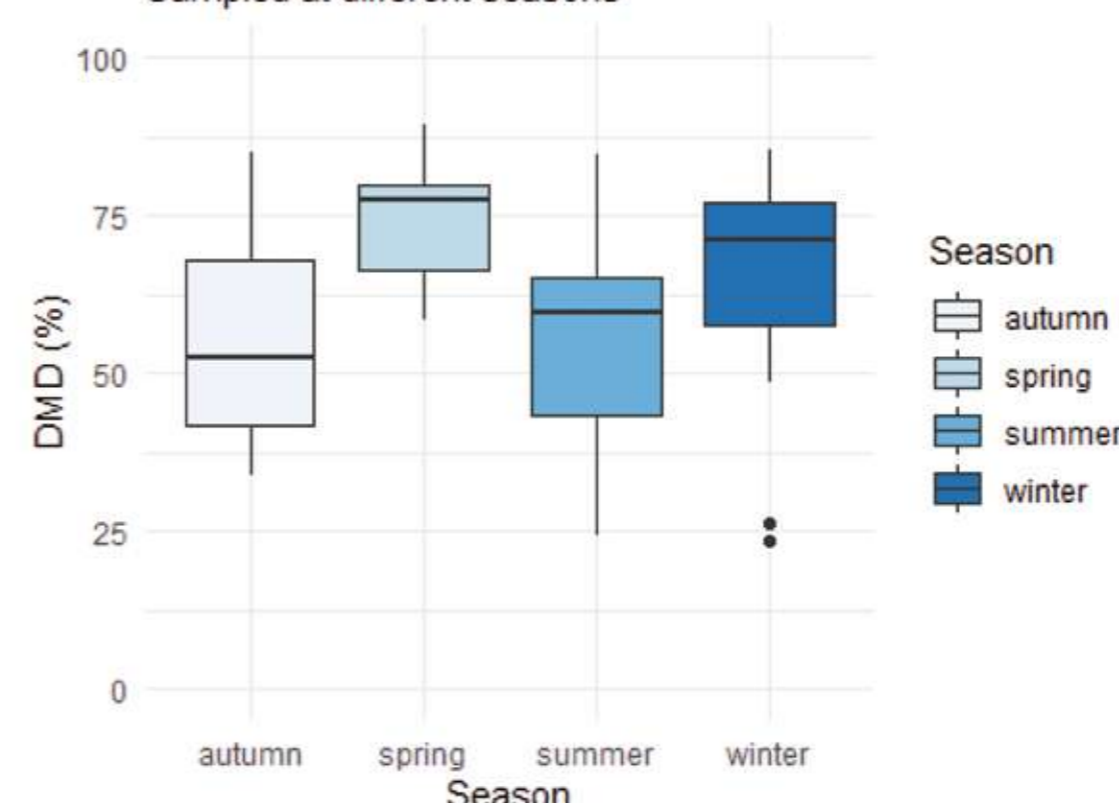
The slope of the regression line indicated a positive correlation between CP content and DMD, and a negative correlation between NDF content and DMD.



Initial analysis

Dry matter digestibility (DMD) throughout the seasons

Boxplots of the dry matter digestibility of plants sampled at different seasons



Dry matter digestibility (DMD) is higher in spring and winter, like Crude protein (CP).

The forage plants harvested in summer are less digestible than the ones collected in winter.