

# ESTIMATION OF CNCPS PROTEIN FRACTIONS FROM PROXIMATE NUTRIENT AND FIBER CONCENTRATION IN TROPICAL RUMINANT FORAGES

Salazar-Cubillas, Khaterine; Dickhoefer, Uta

Animal Nutrition and Rangeland Management in the Tropics and Subtropics, Institute of Agricultural Sciences in the Tropics (Hans-Ruthenberg-Institute), University of Hohenheim, Stuttgart, Germany.

## Objective

To evaluate whether crude protein (CP) fractions concentration in tropical forages can be accurately predicted from their proximate nutrient and fiber concentration.

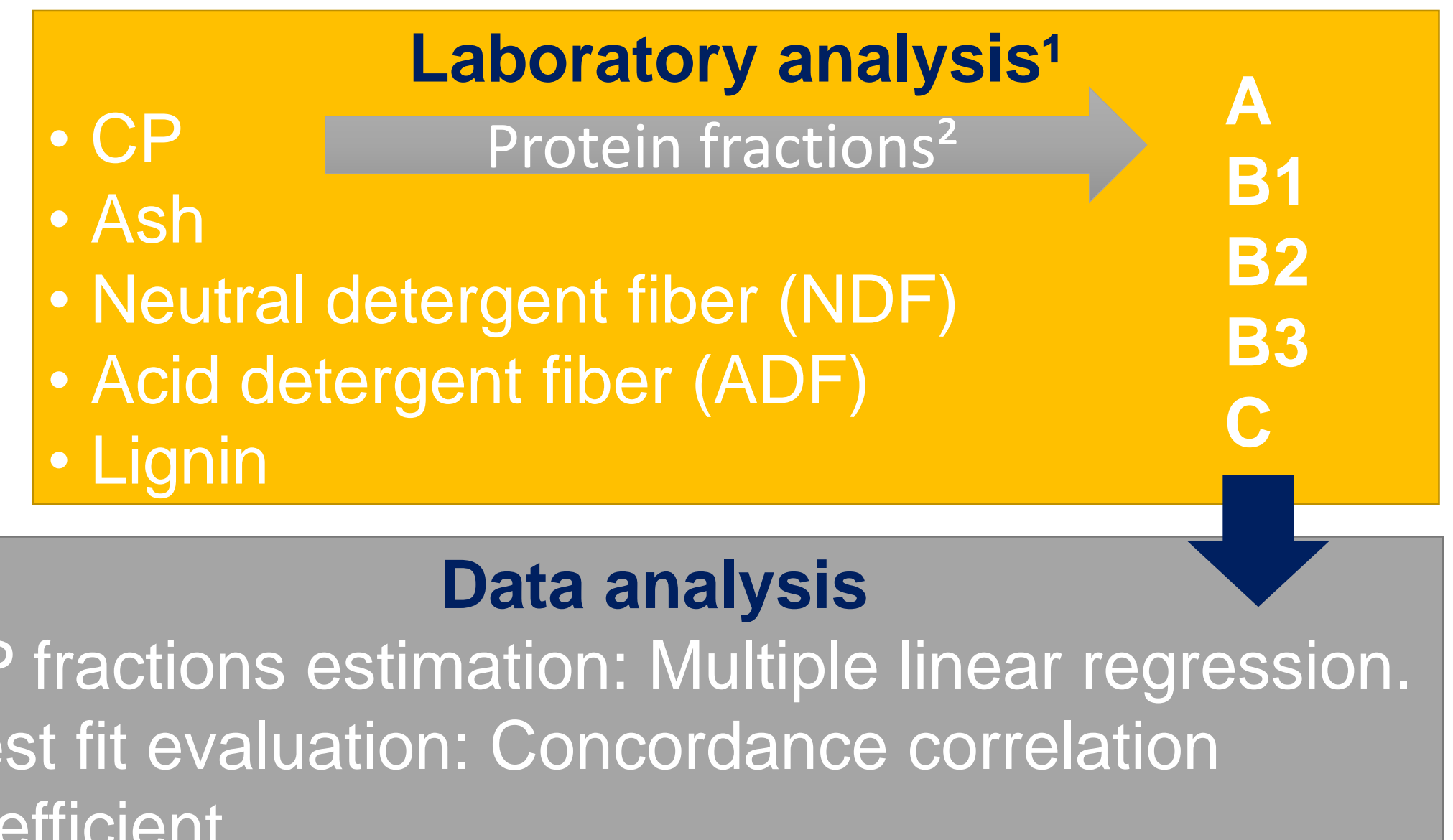
## Introduction

- Cornell Net Carbohydrate and Protein System (CNCPS) divides CP into five fractions.
- The CP fractions can be used to estimate rumen undegradable CP (UDCP<sup>3</sup>) and utilizable CP (uCP<sup>4</sup>).
- Concentration of CP fractions vary greatly across forage species.
- Analysis of CP fractions are cost- and labor-intensive.

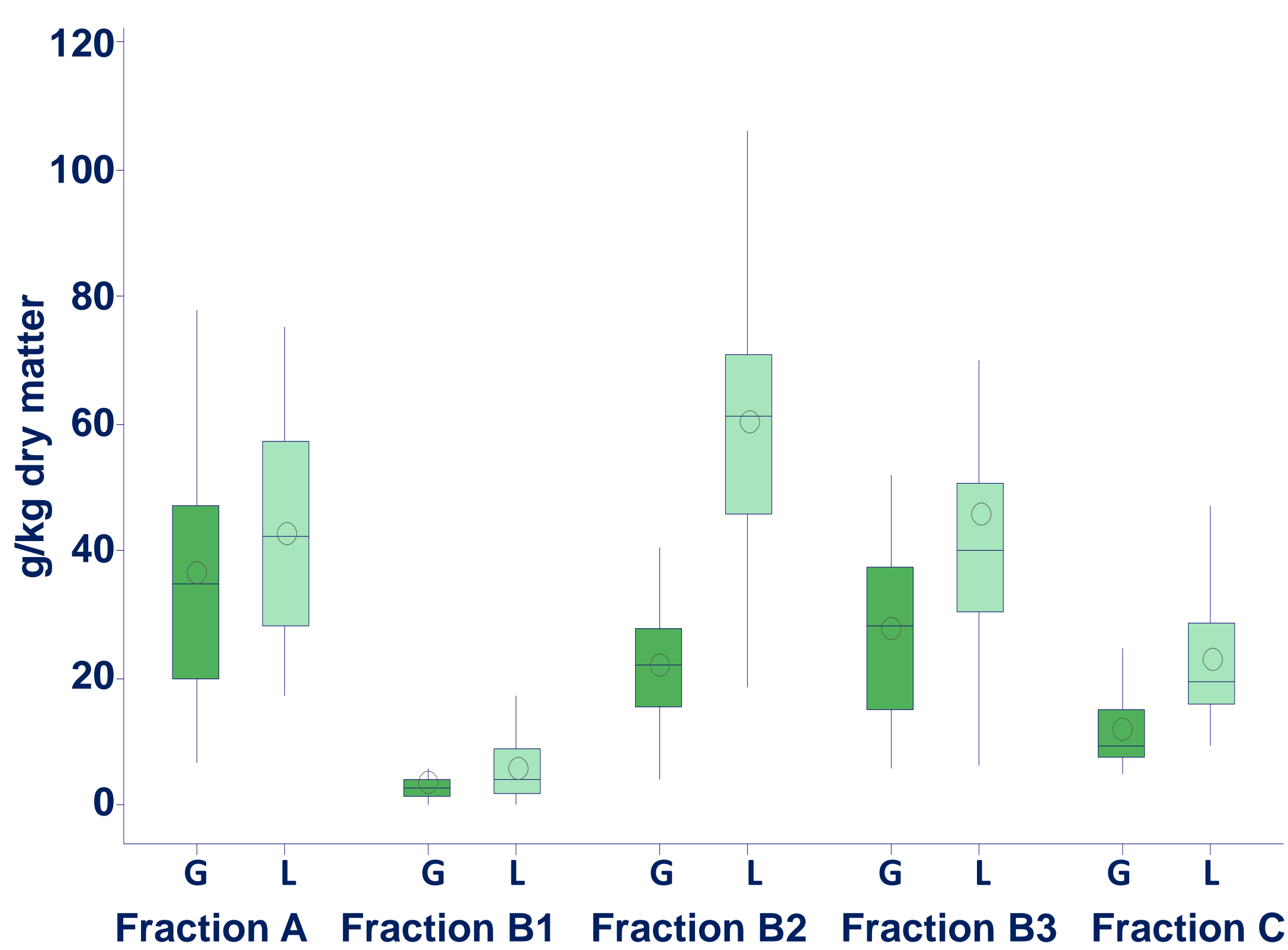
## Materials and Methods

**Samples (n=60)**  
37 forage grasses  
23 forage legumes

**Best fit evaluation**  
• The UDCP estimated by Kirchhof<sup>3</sup>.  
• The uCP estimated by Zhao and Cao<sup>4</sup>.



## Results

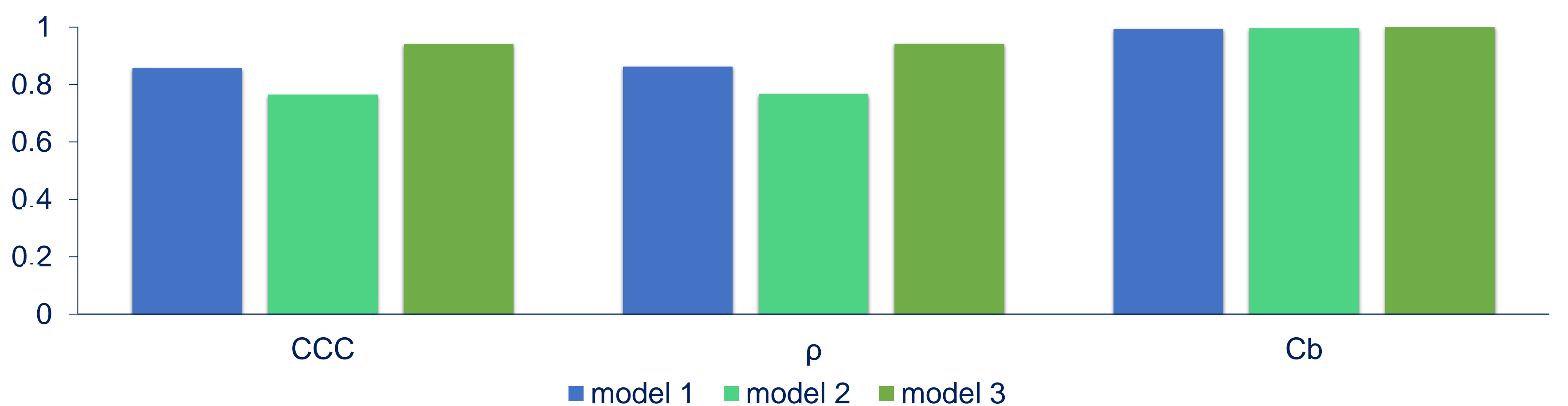


**Figure 1.** Protein fractions concentration: A, B1, B2, B3, and C (mean (O) ± standard deviation) of forage grasses and forage legumes (G, grasses; L, legumes).

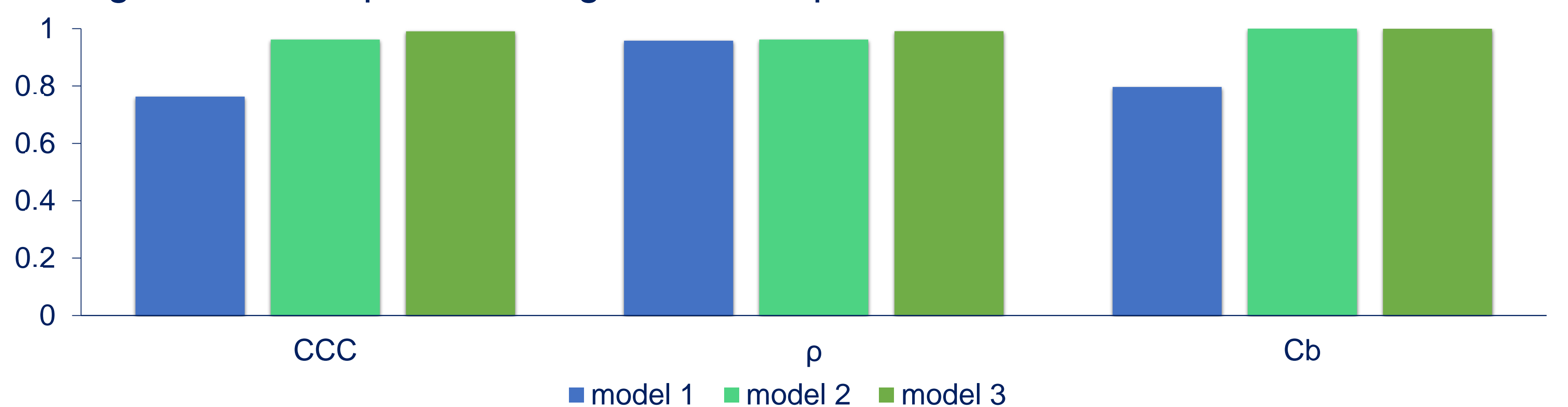
**Table 1.** Regression parameters of crude protein fractions concentration A, B1, B2, B3, and C.

N°	Crude protein fractions equations	R <sup>2</sup>	RMSE
1	A = -0.01 + 0.37 x CP + 0.12 x Ash - 117.50 x (Lig/ADF)	65.1	10.9
2	B1 = 1.35 + 0.02 x CP	10.1	3.3
3	B2 = 82.4 + 0.21 x CP - 0.13 x Ash - 0.11 x NDF	77.5	10.9
4	B3 = 0.41 + 0.38 x CP + 0.14 x Lig - 0.15 x Ash	71.6	7.5
5	B3 = -165.60 + 0.38 x NDF - 175.50 x (Lig/CP) + 474.90 x (Lig/ADF)	76.0	12.4
6	C = 4.63 + 0.30 x Lignin - 11.20 x (Lignin/CP)	58.8	6.3

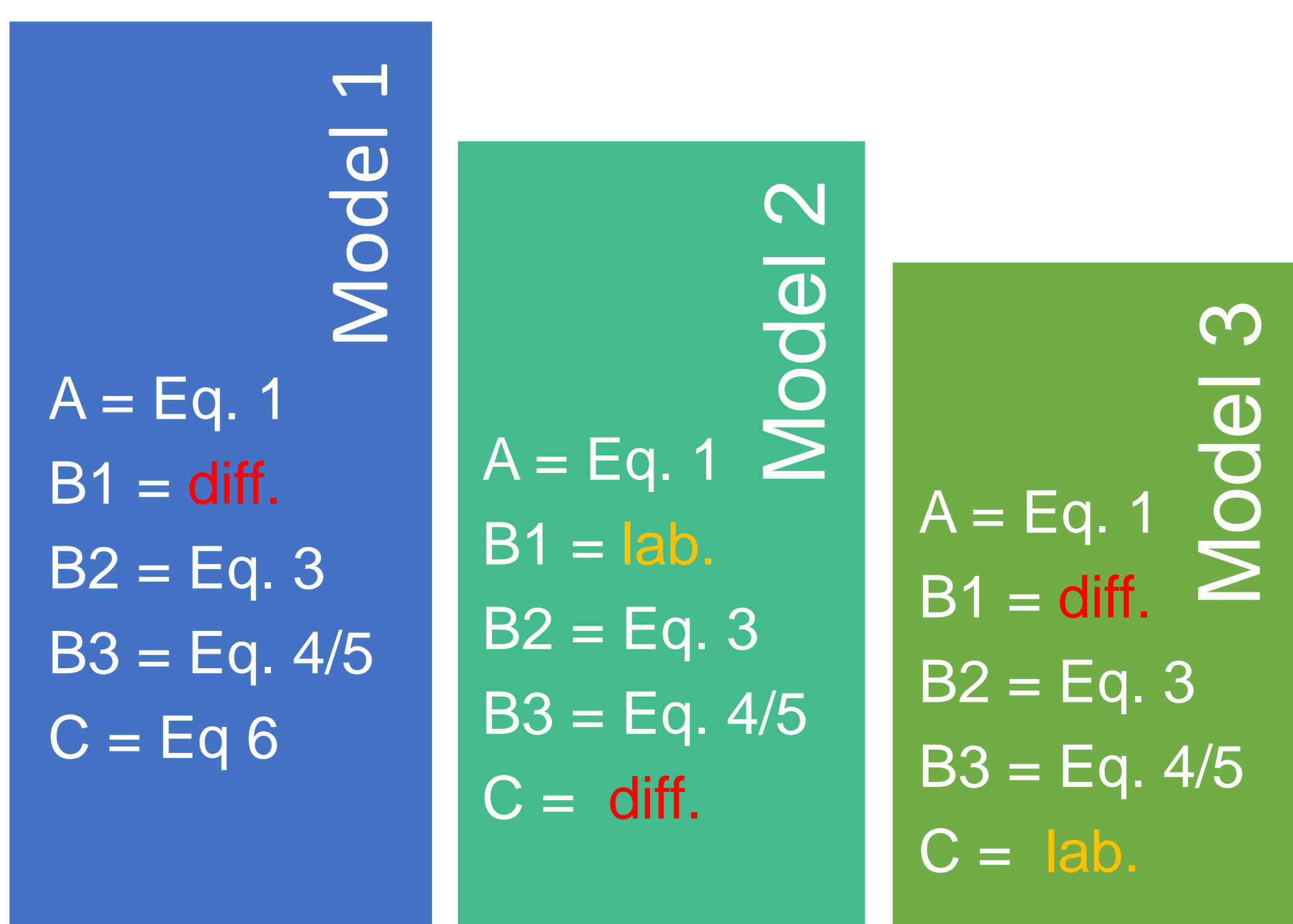
CP, crude protein; Lig, Lignin; NDF, neutral detergent fiber; ADF, acid detergent fiber; RMSE, root mean square error (g/kg dry matter)



**Figure 3.** Concordance correlation coefficient (CCC), Pearson coefficient (ρ) and bias correction factor (Cb) of model 1, 2 and 3 on the prediction of rumen undegraded crude protein using Kirchhof equation.



**Figure 4.** Concordance correlation coefficient (CCC), Pearson coefficient (ρ) and bias correction factor (Cb) of model 1, 2 and 3 on the prediction of utilizable crude protein using Zhao and Cao equation.



**Figure 2.** Derived models to estimate crude protein fractions concentration (Eq, equation from table 1; diff, obtained as the difference between crude protein and four protein fractions; lab, determined in the laboratory).

## Conclusion

Concentration of CP fractions A, B2, and B3 can be predicted from CP and fiber concentration in tropical forages; however, analysis of fractions B1 and/or C appears to be necessary.

<sup>1</sup>VDLUFA, Verband Deutscher Landwirtschaftlicher Untersuchungs- und Forschungsanstalten (2007). <sup>2</sup>Licitra G., Hernandez T.M., Van Soest P.J. 1996. Anim. Feed Sci. Technol. 57, 347-358. <sup>3</sup>Kirchhof, S. 2007. Christian-Albrechts-Universität. Kiel, Germany; <sup>4</sup>Zhao G. Y., Cao J. E. 2006. J. Anim. Physiol. Anim. Nutr. 88, 301-310.