

# Responses of growing ruminants to variable diets in harsh conditions: a meta-analysis

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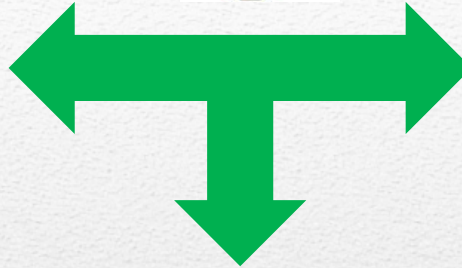


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Increase in human population==> Increase in animal protein demand (3.2 and 2.9%/year for milk and meat). *(Delgado et al, 1990)*

Livestock in a paradoxal situation especially in meeting growing demands for animal protein in tropical and warm countries and preserving the environment



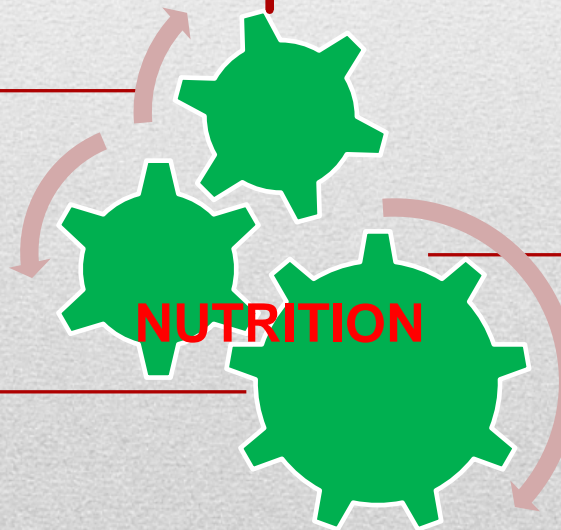
**PRODUCTIVITY**

## Animal performances

Intake, digestibility, growth, nitrogen balance...

## Nutrient requirements

Energy, protein...



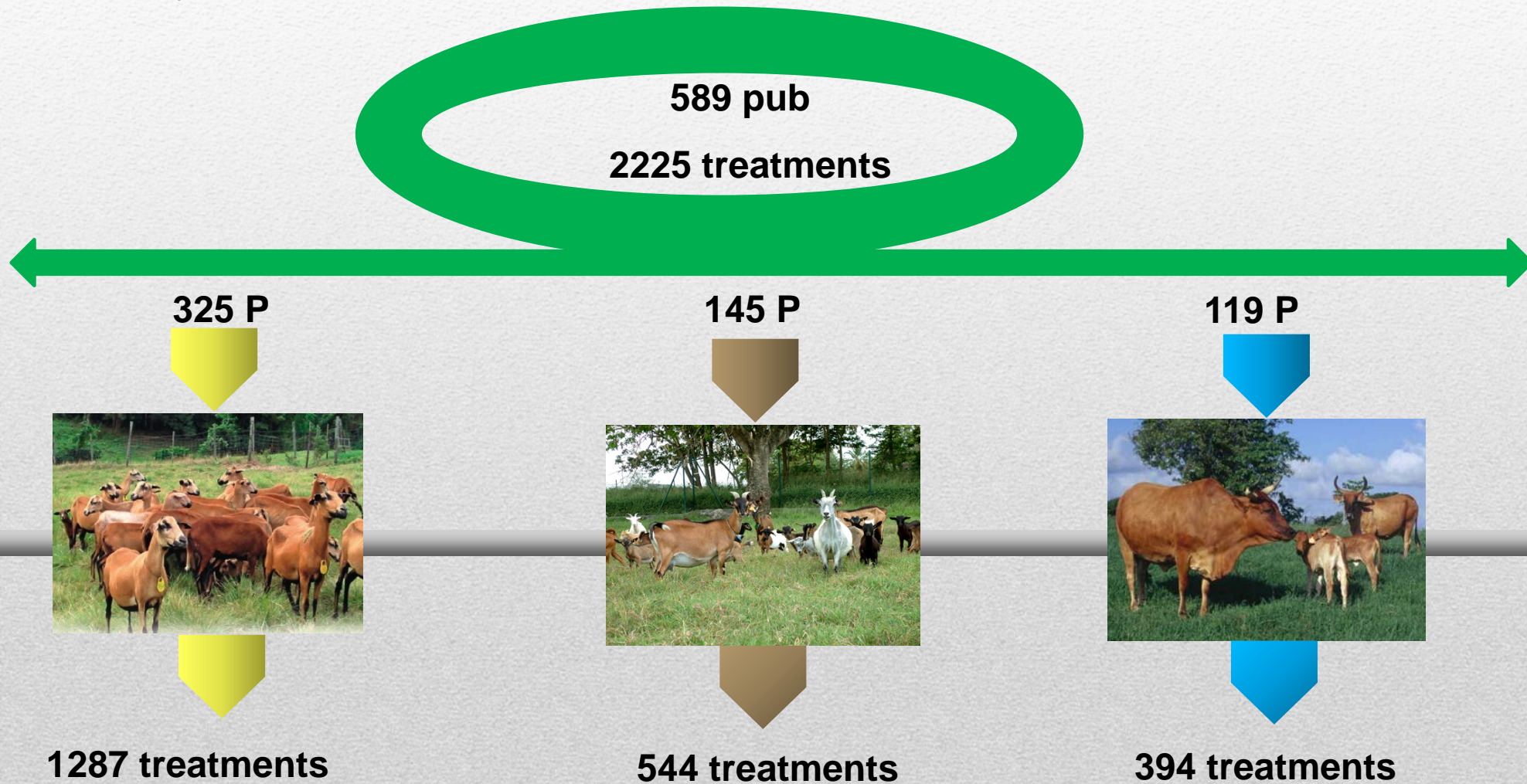
## Chemical Composition

Dry matter, crude protein, NDF, ADF...



# MATERIALS AND METHODS

**OBJECTIVE:** to predict animal responses to different nutritional factors (DMI vs NDF, DMI vs CP, ADG vs MEI, ADG vs DCPI) and their ability to use Nitrogen (UN, FN and RN) via a meta-analysis approach.



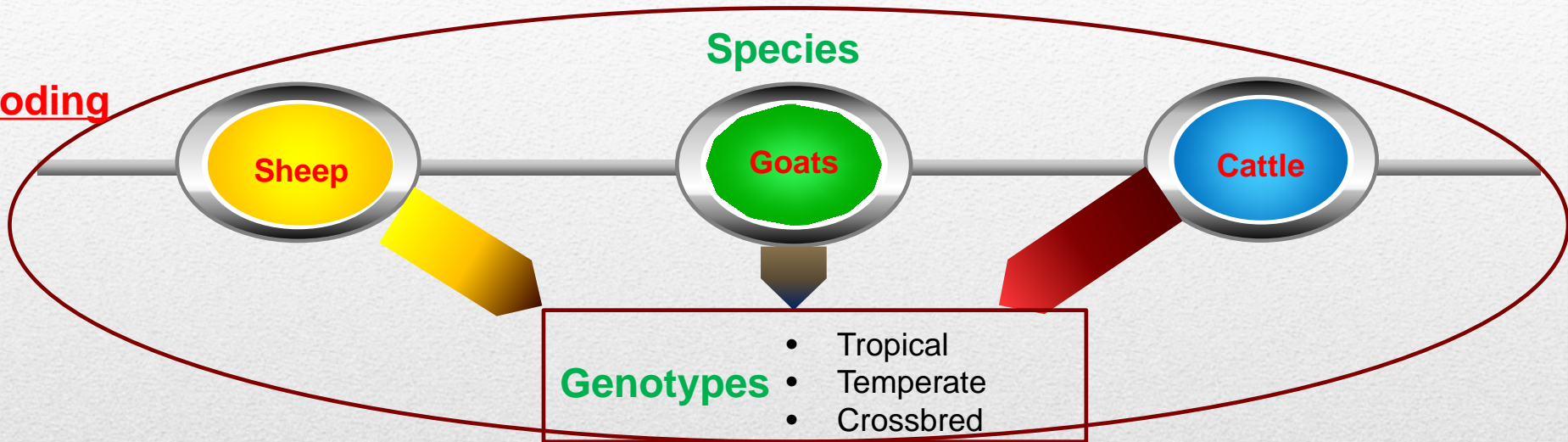
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# MATERIALS AND METHODS

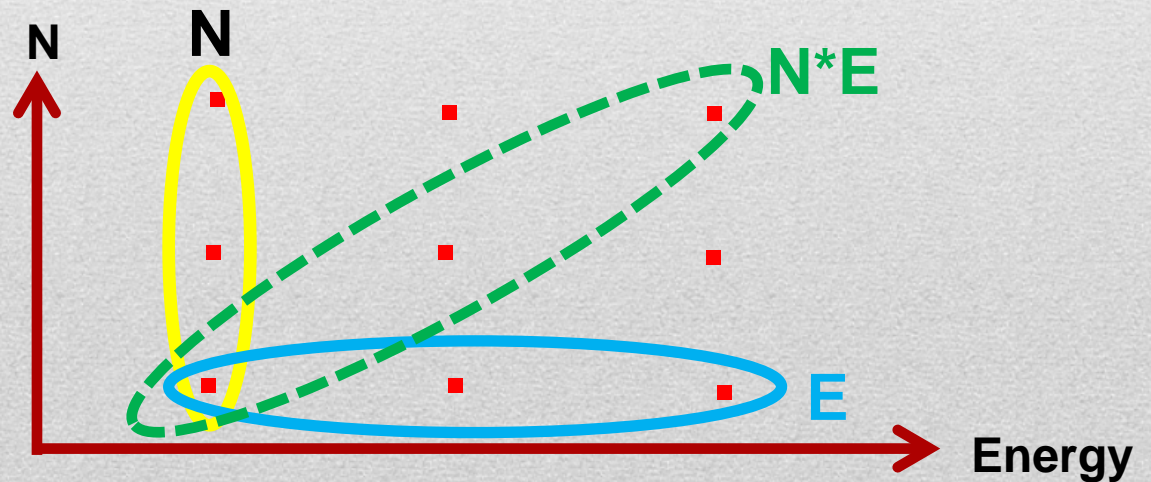
- ; Main studied variables : DMI, ADG, MEI, DCPI, FN, UN and RN.
- ; Modelling and Encoding of publications : Intra publication analysis with hierarchical models

## A priori encoding



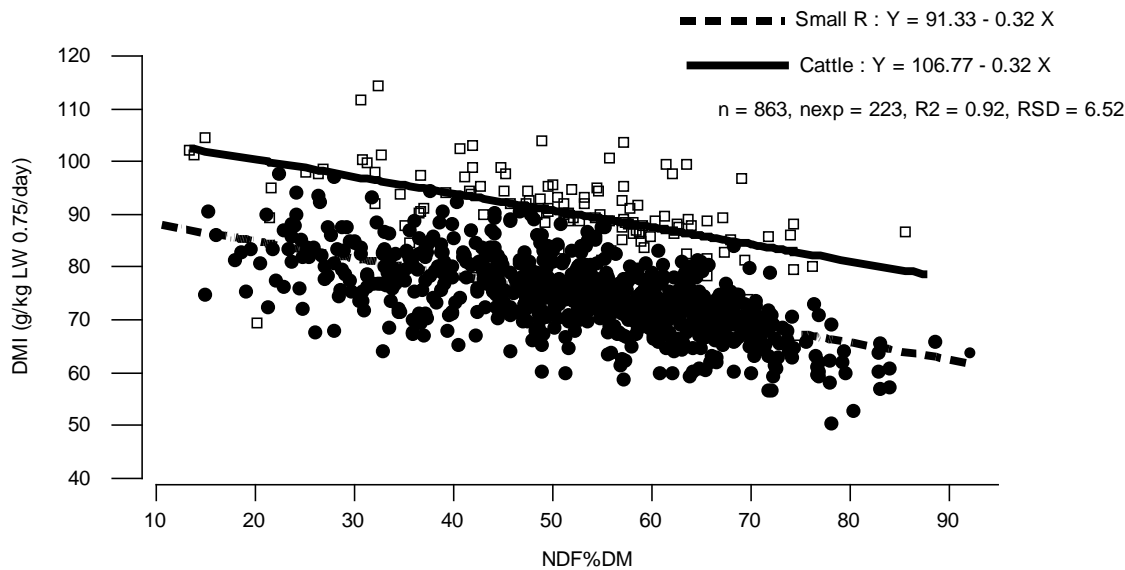
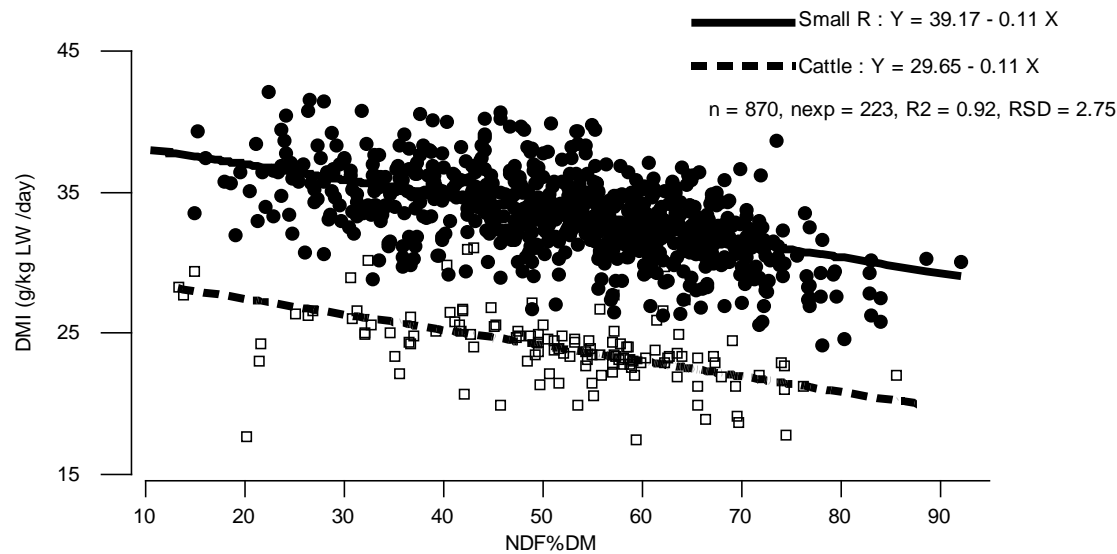
## An Operational encoding

*Intra-experience analysis* (1 point=1 treatment): Diet characteristics are the driving forces compared to *Inter-experience analysis* (1 point=1 experience) when the animal is the driving force.



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## □ Effect of Neutral detergent Fiber (NDF) on Dry Matter Intake (DMI)



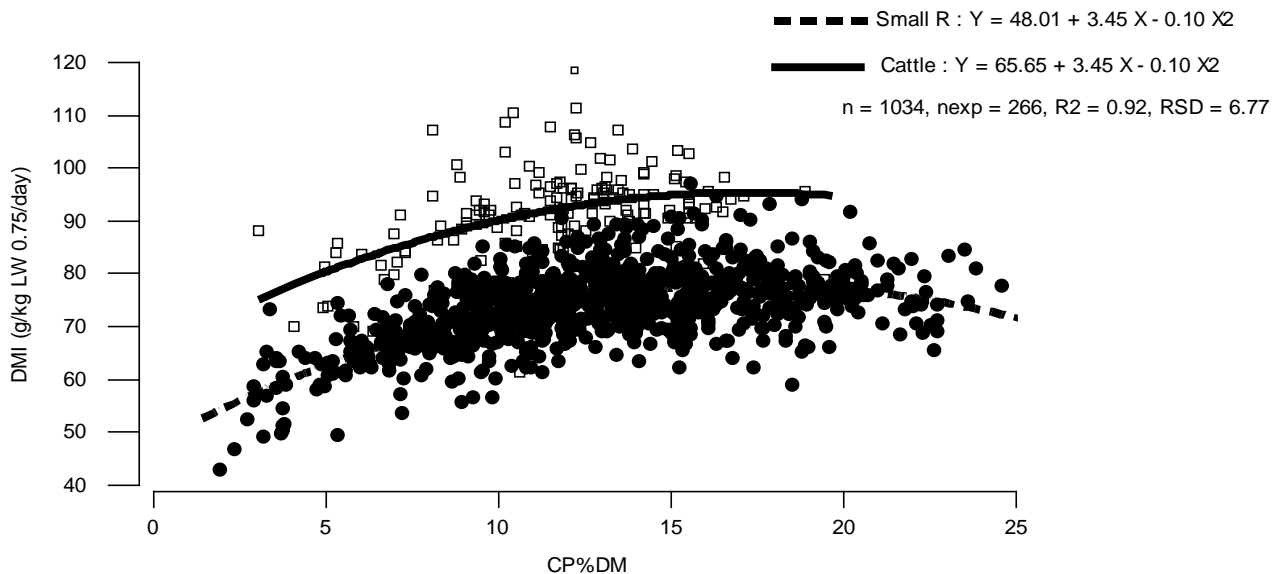
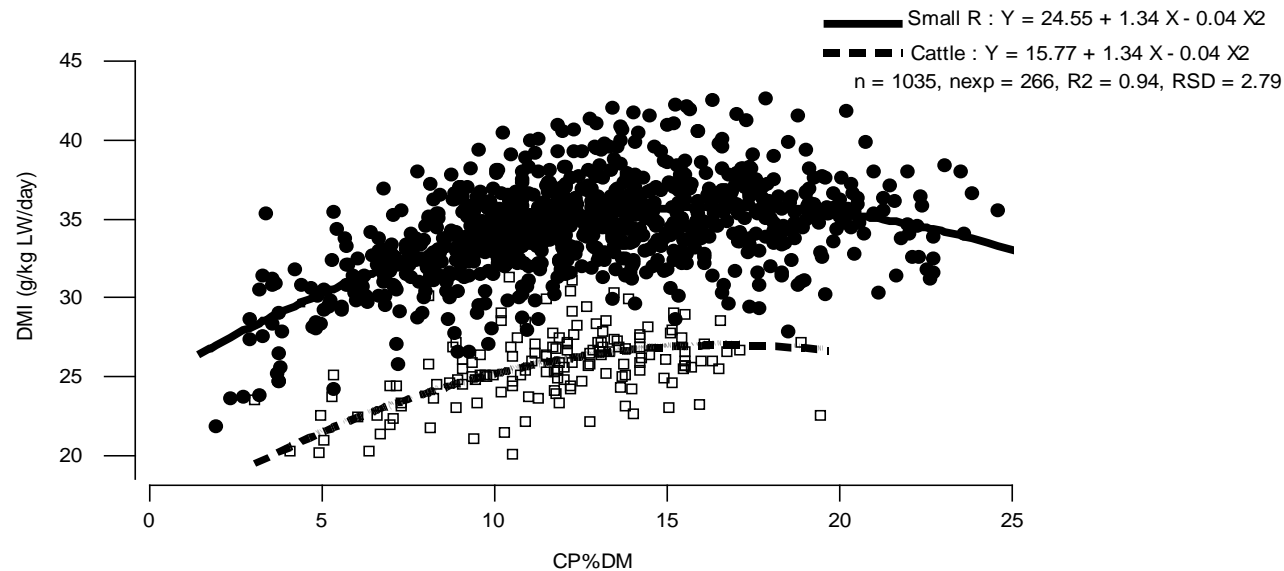
- NDF affect negatively DMI.  
(*Van Soet, 1994; Meyer et al, 2010, Assoumaya et al, 2007*).

- The ranking between small Ruminant and cattle is inversed according to power of live weight.

(*Sauvant et al, 2006*).



## □ Effect of Crude Protein content (CP%DM) on Dry Matter Intake (DMI)



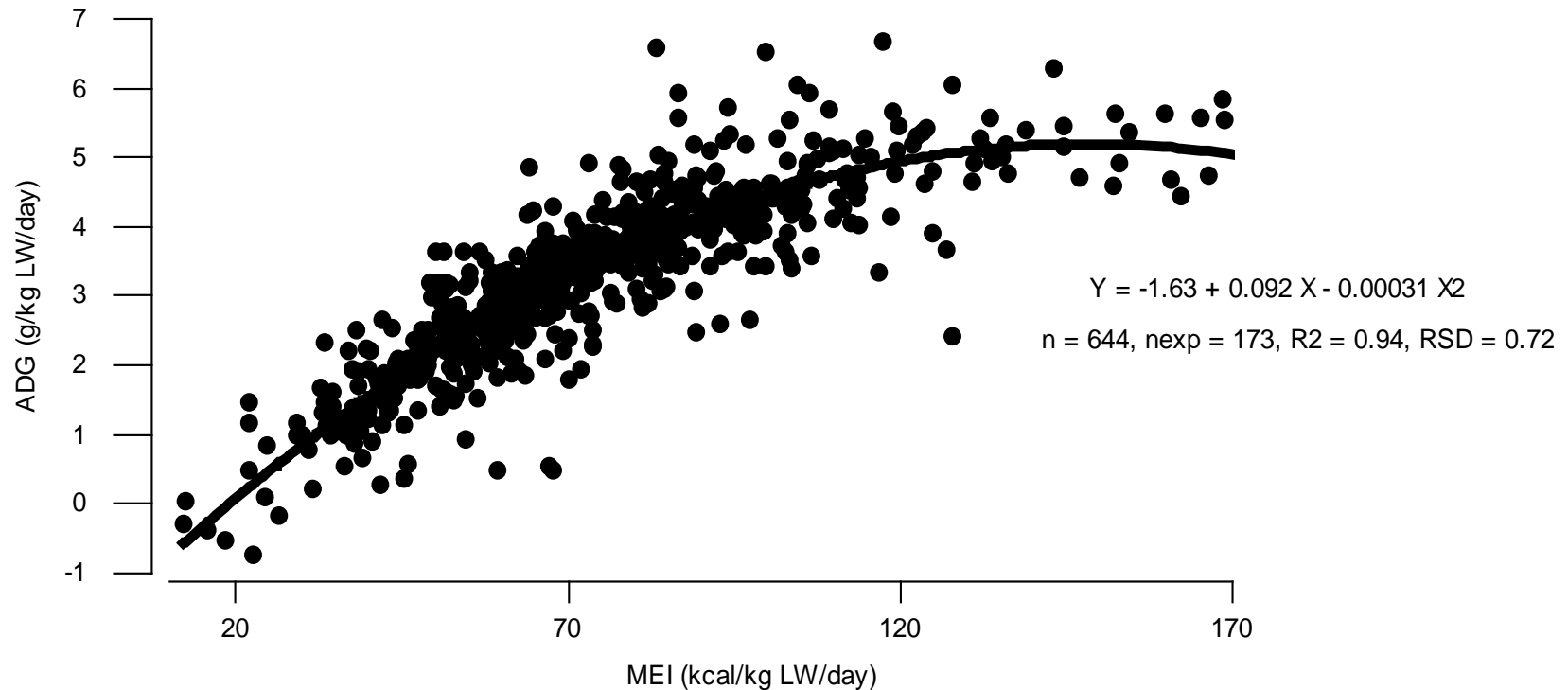
- CP affect quadratically DMI with a maximum obtained between 15 and 20% CP

*(Roffler, 1986; Assoumaya et al, 2007).*

- The ranking between small Ruminant and cattle is inversed according to power of live weight.

*(Sauvant et al, 2006).*

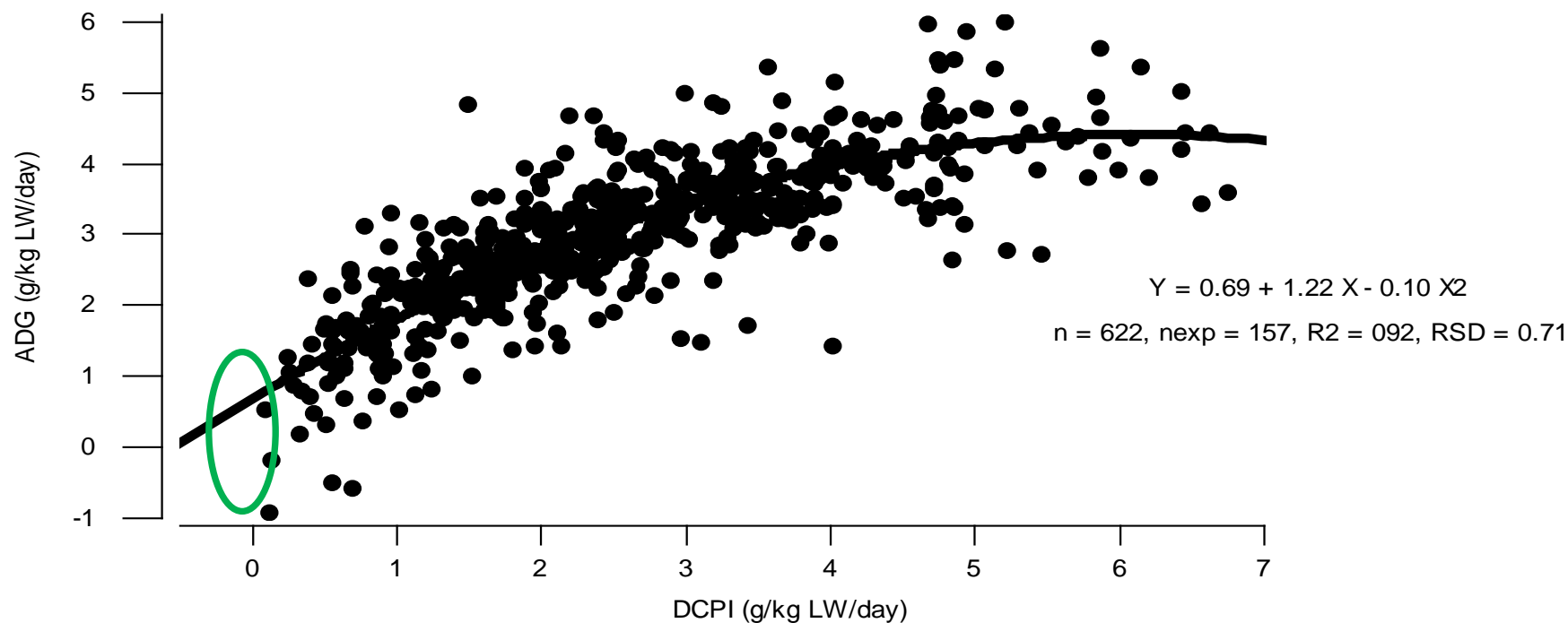
## ✓ Effect of metabolizable energy intake on ADG



- MEI = 170 kcal==> Maximum ADG==> Satisfaction of energy requirement.
- None significant difference observed between species and genotypes intra-species.

*Tauqir et al (2011), Sayed N Abdel-baset (2009)*

## ✓ Effect of digestible crude protein intake on ADG

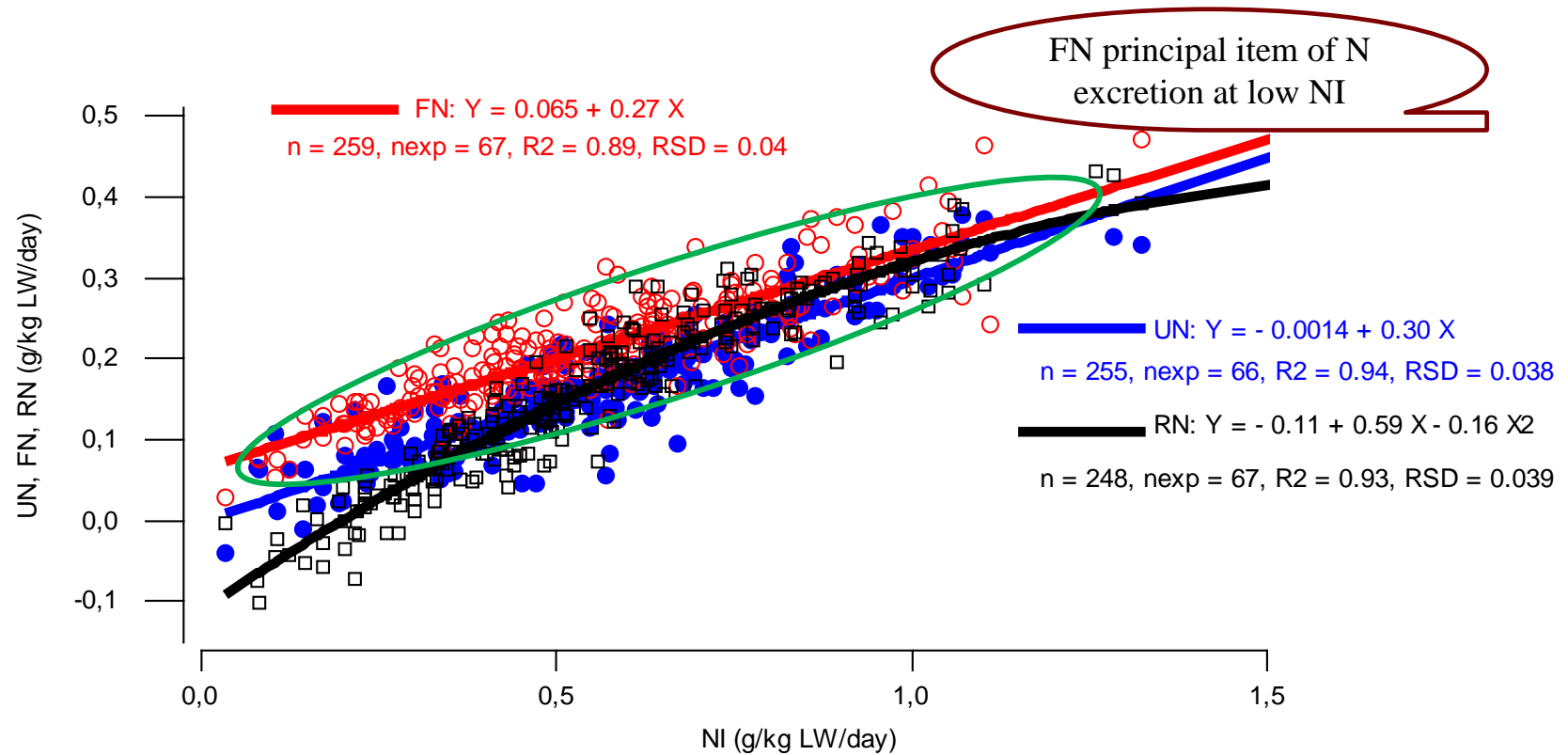


- DCPI = 0g ==> ADG = 0,69 g/kgLW==> Nitrogen recycling.
- None significant difference observed between species and genotypes intra-species.

*Haddad et al (2001), Shahzad et al, (2011)*



## ✓ Effect of Nitrogen intake (NI) on nitrogen balance



- UN and FN increased linearly with increasing NI: [Huhtanen et al. \(2008\)](#), [Kebreab et al. \(2010\)](#) ; [Weis et al. \(2009\)](#)
- Retained Nitrogen increased quadratically with increasing NI ([Zanton and Heinrichs., 2008](#))
- None significant difference observed between species and genotypes intra-species.

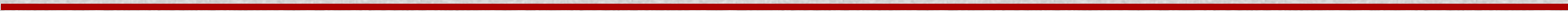
- 1. Dry matter intake** : Both covariables (NDF, CP) gives a good intra-experience predictions of DMI.
- 2. ADG** : The equation developed in the current study provide an approach for producers to quantify animal performance and to develop their own mitigation strategies to increase energy and protein efficiency with manipulation of dietary composition.
- 3. Nitrogen balance**==> affect environment.
  - Efficiency of N utilization is affected by dietary N intake.
  - Nitrogen intake is the a very accurate predictor of nitrogen partitioning.
  - Variation in UN is greater than FN.
  - Test the effect of energy , the interaction between nitrogen and energy and metabolizability in Nitrogen partitioning.





***THANKS FOR YOUR ATTENTION***

***We welcome your questions, suggestions and comments***



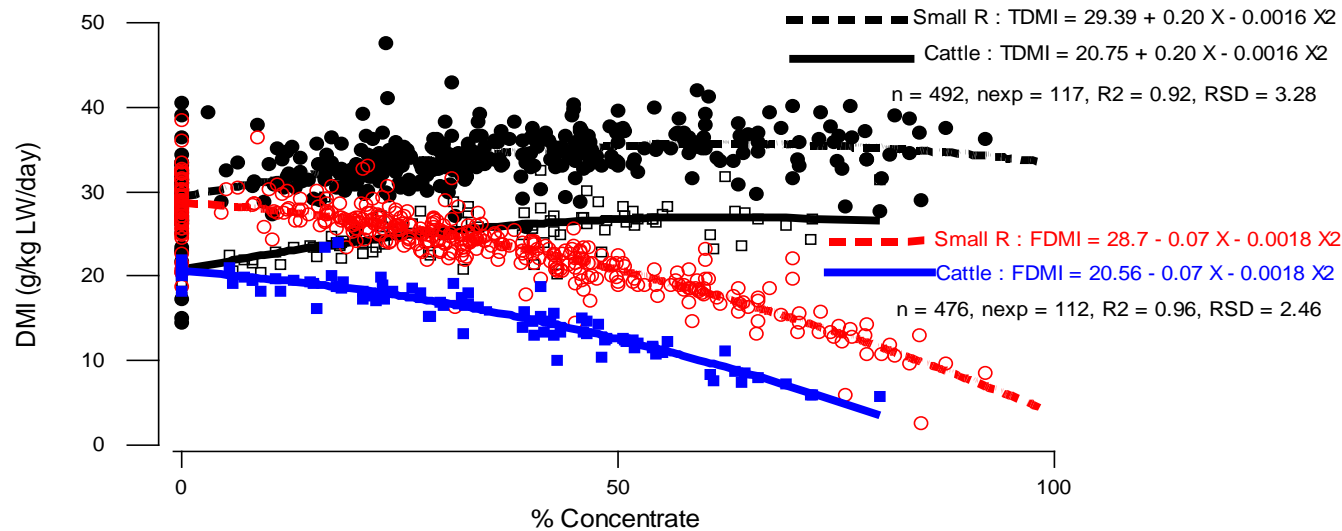


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## Effect of percentage of concentrate (%CC) on Dry Matter Intake (DMI)



- % CC affect quadratically total DMI with a maximum obtained between 60%.

- % CC affect quadratically and negatively forage DMI (substitution rate).

*(Roffler, 1986; Assoumaya et al, 2007).*

- The ranking between small Ruminant and cattle is inversed according to power of live weight.

*(Sauvant et al, 2006).*

