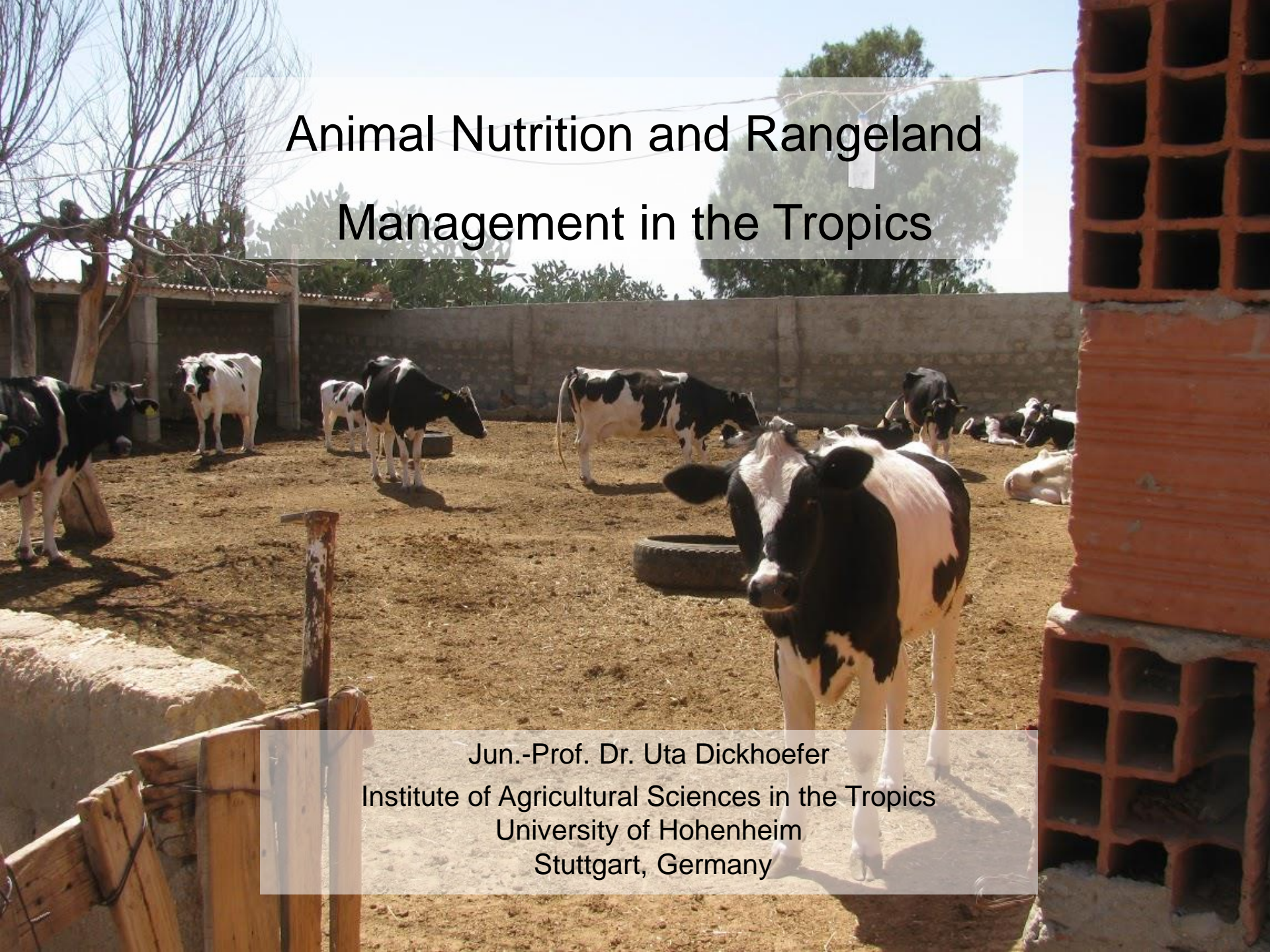


# Animal Nutrition and Rangeland Management in the Tropics

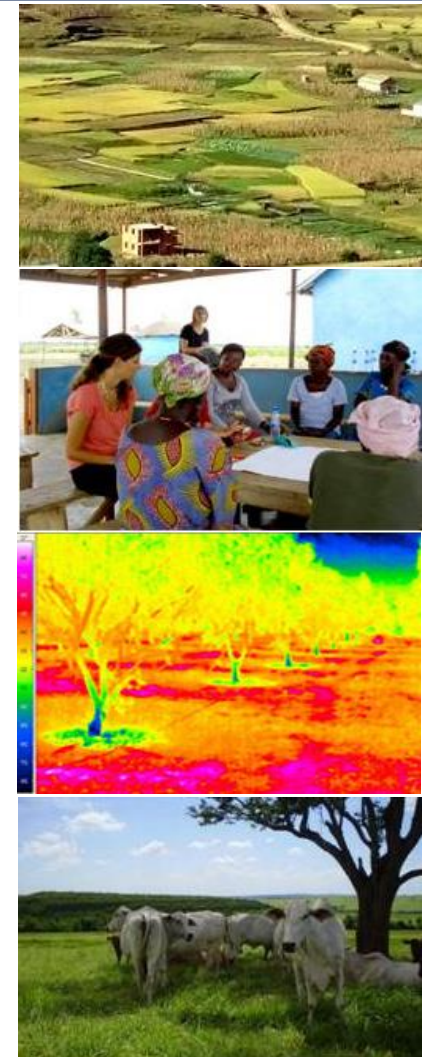


Jun.-Prof. Dr. Uta Dickhoefer  
Institute of Agricultural Sciences in the Tropics  
University of Hohenheim  
Stuttgart, Germany

## Hohenheim Tropics

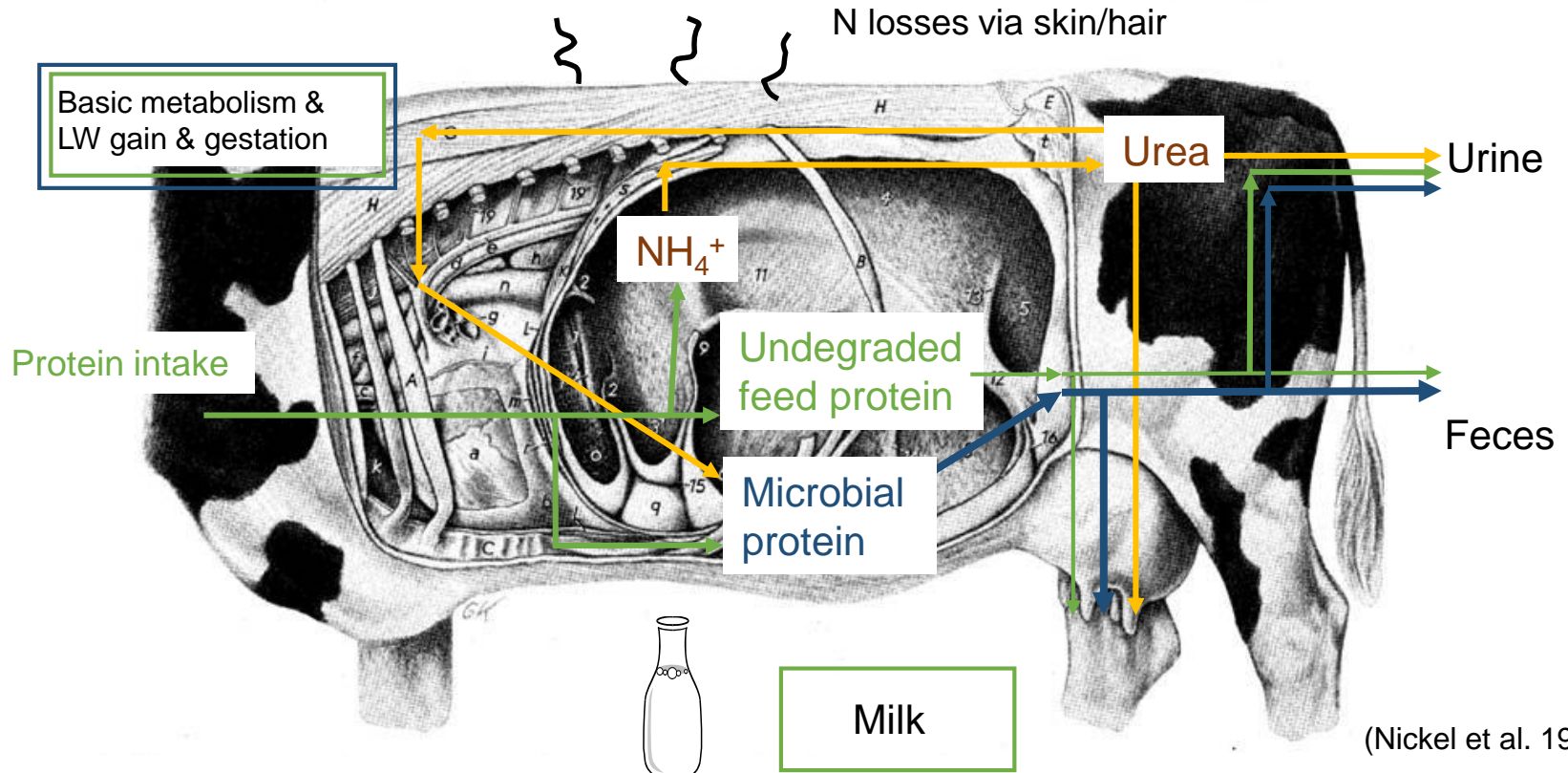
[tropen.uni-hohenheim.de](http://tropen.uni-hohenheim.de)

- Institute of Agricultural Sciences in the Tropics (Hans-Ruthenberg-Institute) is the largest in Germany or even Europe
- 10 core professors related to tropical agriculture:
  - Crop sciences
  - Animal sciences
  - Socio-economy
  - Agricultural technology
- Interdisciplinary research on:
  - Sustainable intensification
  - Migration & Agricultural Development
  - Farming Systems in the Digital Age
  - Food Security & Health



# Protein nutrition in tropical dairy cattle

- Rumen protein turnover as key determinant of N partitioning & use in ruminants
  - Microbial protein is the main source of essential amino acids to the host
  - Kinetics of feed protein degradation determine (urinary) N excretion



# Nitrogen partitioning and use efficiency (Peru)



Level of N intake from concentrates (LSMean, standard error of mean)

- No effect on milk yield and feed conversion efficiency

Variables	High CP (n=16)	Medium CP (n=18)	Low CP (n=18)	SEM
N intake (g/d)	412 <sup>a</sup>	373 <sup>b</sup>	301 <sup>c</sup>	19.6
RNB <sup>1</sup> (g/kg OM)	5.0 <sup>a</sup>	3.9 <sup>b</sup>	0.1 <sup>c</sup>	0.36
N excretion (g/d)				
Feces	97	95	95	4.9
Urine	238 <sup>a</sup>	201 <sup>b</sup>	133 <sup>c</sup>	8.3
Milk N (g/g N intake)	0.19 <sup>c</sup>	0.21 <sup>b</sup>	0.25 <sup>a</sup>	0.006

OM organic matter; RNB ruminal N balance.

<sup>1</sup>RNB = (N intake - Microbial N – Undegraded feed N) (in g/kg OM).

(Dickhoefer et al., submitted; J. Dairy Sci.)

## Protein nutrition in tropical dairy cattle

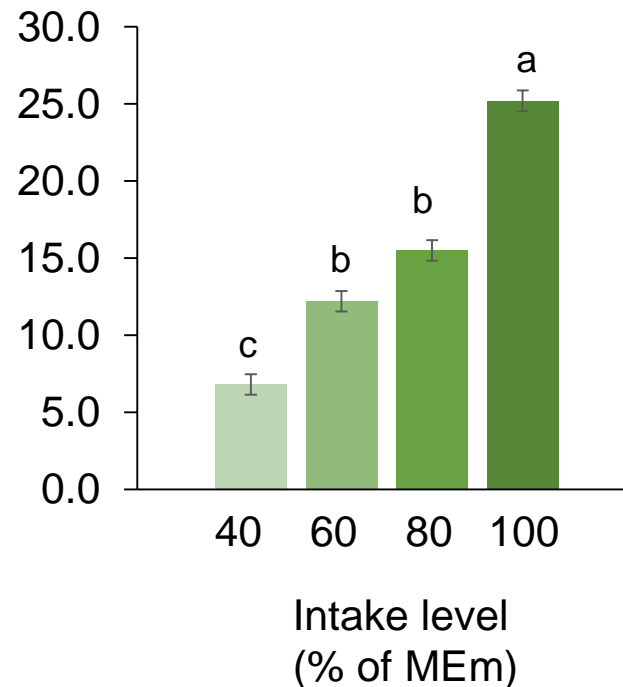
- Rumen protein turnover as key determinant of N partitioning & use in ruminants
  - Microbial protein is the main source of essential amino acids to the host
  - Kinetics of feed protein degradation determine (urinary) N excretion
- Enhanced N use efficiency by adequate (rumen-degradable) protein supply
  - Reduce feeding costs and increased profitability
  - Lower N emissions
  - Positive effects on animal health and performance
- Dietary & animal effects on rumen protein degradation & microbial growth
  - Feed intake, energy and protein source, synchrony in energy and N supply, .... etc.
  - Rumen volume, feeding/chewing behavior, microbial species composition, ... etc.

# Efficiency of rumen microbial protein synthesis (Kenya)

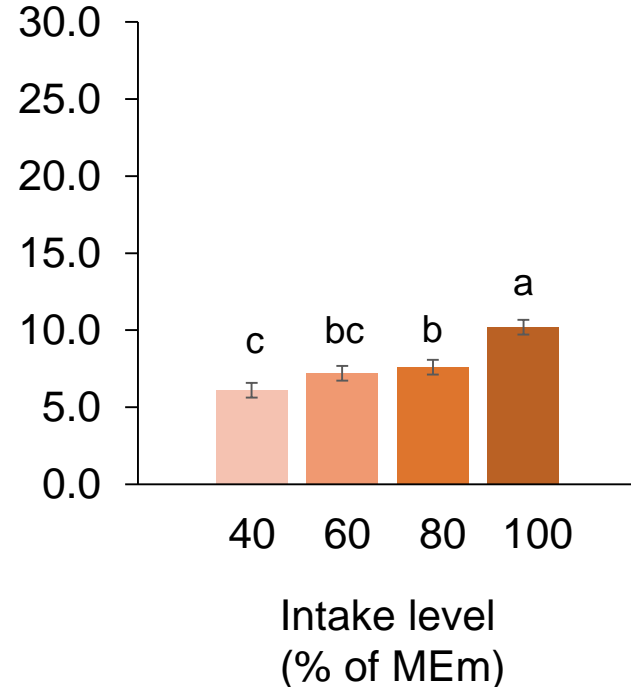


Effect of feed intake level (LSmean, standard error of mean; n=12)

Microbial N (g/d)



Microbial N (g/kg digestible OM)



MEM metabolizable energy requirements for maintenance; OM organic matter.

(Wassie, to be submitted)



## Research gaps & interests

- Contradictory findings on dietary effects on rumen protein turnover
- Few studies on inter-animal differences in protein metabolism
- Majority of (comprehensive) research from temperate feeding systems
- Low accuracy of research methods for tropical dairy systems
- Limited understanding of adaptations to nutritional stress in tropical dairy cattle

- **Dietary & animal effects on protein turnover & N use in tropical cows**
- **Methods to quantify rumen protein degradation & microbial protein supply**
- **Genotype x nutrition interactions in protein metabolism**

Thank you!

**DAAD**

Deutscher Akademischer Austausch Dienst  
German Academic Exchange Service



Federal Ministry  
for Economic Cooperation  
and Development