



## Poster session



**LFL**  
Tier und Technik

### Influence of tail docking, housing conditions and stocking density on the appearance of cannibalism in weaning piglets

Abriel, M.<sup>1</sup>; Jais, C.<sup>1</sup>; Bernhardt, H.<sup>2</sup>; Reiter, K.<sup>1</sup>



**TUM**  
TECHNISCHE UNIVERSITÄT MÜNCHEN

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**Introduction**


The major part of the weaning and finishing pigs in Germany are kept in housing systems with slatted floors without litter, because of procedural, hygienic and economic reasons. These housing systems are characterized by a low-stimulus environment and few possibilities to explore or manipulate. Tail docking is the most effective method to reduce tail biting (EFSA, 2007; McGlone et al., 1990), but in the EU it is not allowed to be carried out routinely (Richtlinie 2001/93/EG). The first aim of the study was to estimate the risk of tail biting in conventional housing systems arising from leaving the tails undocked. Another major objective was to find practices to prevent tail biting and stop it in case of an outbreak.

**Materials and Methods**

Six trial runs were carried out in eight pens for weaning piglets, each with 10 m<sup>2</sup>. The pens had plastic flooring, a lying area with underfloor heating, four feeding places at pulp feeding automates, three drinker nipples and one plastic ball hanging from a chain as an enrichment object. The normal stocking density was 0,35 m<sup>2</sup> per animal.


**TRIAL RUNS 1 & 2:**

50% of the piglets (4 pens) were docked and the other 50% (4 pens) were left undocked. The pens were left in the original constitution.



**TRIAL RUNS 5 & 6:**



The enriched pens were tested with reduced (0,5 m<sup>2</sup> per animal) and normal stocking density (0,35 m<sup>2</sup> per animal).



**TRIAL RUNS 3 & 4:**

Focus was set on the influence of the housing conditions:


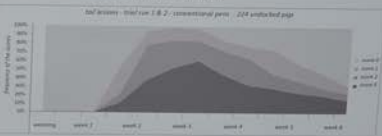
- All animals were left undocked and four of the eight pens were equipped with enrichment objects, organic materials and one additional open-water trough.
- Stocking density was reduced (0,5 m<sup>2</sup> per animal) in these pens.

**Results**

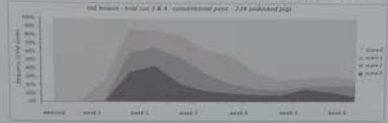
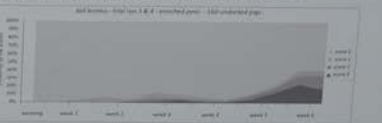
**1. Effect of non-docking (trial runs 1 & 2)**

In the first two trial runs, there was a significant difference (chi-square-test  $p < 0,001$ ) between the docked and the undocked piglets. While docked animals remained almost unharmed, nearly all undocked piglets had serious damages due to tail biting.

**2. Effect of housing conditions (trial runs 3 & 4)**

In the trial runs 3 and 4 also a significant difference between the treatments was observed (Chi-square test  $p < 0,001$ ). Strong tail biting in the conventional pens started again between the first and the second week after weaning. In contrast to the trial runs 1 and 2, countermeasures were started immediately by feeding the animals Alfalfa, whereupon the action calmed more quickly and the injuries were generally less severe.

**3. Effect of stocking density in the enriched pens (trial runs 5 & 6)**

The results of the last two trials are consistent with the results before. In the control-version pens, strong tail biting occurs again in the second week after weaning and in the enriched pens it started later and was less pronounced. In the enriched pens with higher stocking density, injuries with score 3 were little more frequent, however in total the difference was slight in comparison to the control-pens.

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**Abriel M.**

*Influence of tail docking, housing conditions and stocking density on the appearance of cannibalism in weaning piglets*



## Dairy Conflict and Resulting Association Structures

Economic and Emotional Effects of Market Liberalization

Jan Alpmann and Vera Bitsch

### Background

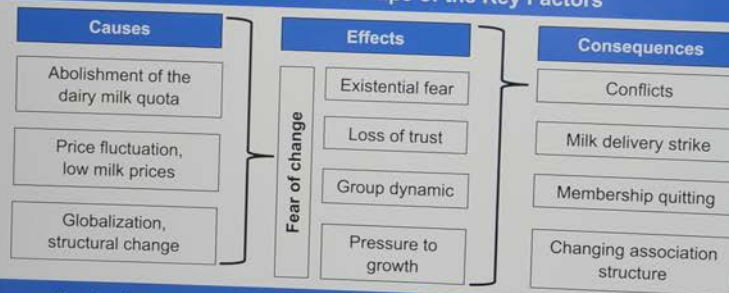
#### Dairy conflict

- Differentiation in the structure of farmer associations
- Increasing peer pressure, protests and milk delivery strike
- Abolition of the milk quota regime and fear of change
- Market liberalization -> increasing price fluctuation
- Small-scale dairy farm regions in southern Germany

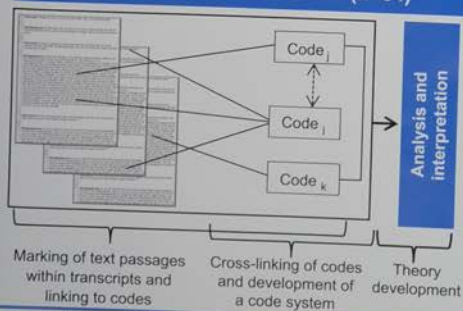
### Objectives

- Analyze the pattern of the conflict between the German Farmers' Association (DBV) and the Federal Dairy Farmers Associations (BDM)
- Identify economic and emotional key factors in the progression of the conflict
- Assess the process of change in farmer associations and potential impacts regarding long-term institutional differentiation

### Cause-Effect Relationships of the Key Factors



### Analysis of Interviews (n=34)



### Conclusions

- Changes in the Association Structure**
  - The German Farmers' Association (DBV) is losing its influence and its role as opinion leader, particularly regarding dairy farming and environmental issues
  - Alliance of different organizations has evolved including the BDM and BUND (Friends of the Earth in Germany) as important players
  - Overall, increasingly plural opinion formation with more players involved, as well as rising influence of consumer organizations



Alpmann J.

Dairy Conflict and resulting association structures: Economic and emotional effects of market liberalization

Studies on the decrease of spore potential of common bunt (*Tilletia caries*) and dwarf bunt (*T. controversa*) spores of wheat in soil considering different crop rotation systems in ecological farming

R. Bauer<sup>1</sup>, M. Sedlmeier<sup>1</sup>, B. Voit<sup>1</sup>, B. Killermann<sup>1</sup>, K.-J. Hülsbergen<sup>2</sup>

**Introduction**

Common bunt and dwarf bunt of wheat play an increasingly important role as dangerous plant diseases in ecological farming. High infection levels lead to an increase of the spore potential in soil. Based on the fact that spores of dwarf bunt and, to a certain degree common bunt, infect their host plants from soil, the intention of this project was to investigate a possible influence on the bunt spore potential in soil under crop rotation links commonly used in ecological farming. Brassica species setting free isothiocyanate after mulching are cultivated to examine a possible reduction of the spore viability. Additionally, the influence of stable manure on the number of bunt spores was tested.

**Materials and Methods**

**field experiments**

- split block design, three factors (1) crop rotation, (2) stable manure, (3) side crop mustard, four replications (Tab. 1), three years, at three sites in Bavaria (Obbach, Oberndorf, Wolfersdorf) with a high natural bunt spore potential in soil (Fig. 1)
- soil samples were collected yearly from each plot

**lab investigations**

- determination of the spore potential soil (10g) by spore extraction with several wet sieving and sedimentation steps (Fig. 2)
- counting the spores under the microscope (according ISTA)

**Results and Discussion**

**(1) Crop rotation**

- Obbach (*T. caries* site): significant effects for crop rotation variations, 3-years grass-clover and fallow (both without soil tillage): less decrease of spore potential
- Oberndorf (*T. caries* site): no significant effects of crop rotation variations, different soil types versus Obbach
- Wolfersdorf (*T. controversa* site): no significant effects of crop rotation variations

**(2) Stable manure**

- all three test sites show significantly higher decrease with stable manure

**(3) Side crop mustard**

- plots cultivated with mustard did not exhibit a significantly greater reduction of bunt spore numbers at any site



Fig. 1: crop rotation test field at Wolfersdorf in Upper Bavaria

Tab. 1: crop rotations tested

	2011/2012	2012/2013	2013/2014
1.	fallow	fallow	fallow
2.	grass-clover	grass-clover	grass-clover
3.	grass-clover	grass-clover	winter wheat
4.	grass-clover	winter wheat	rye
5.	winter rye	pea	winter wheat
6.	winter triscale	pea	winter wheat
7.	oat	winter rye	pea
8.	pea	winter wheat	winter rye



Fig. 2: left: bunt spores of *T. caries* and *T. controversa*; right: spore isolation from soil samples: first sedimentation step



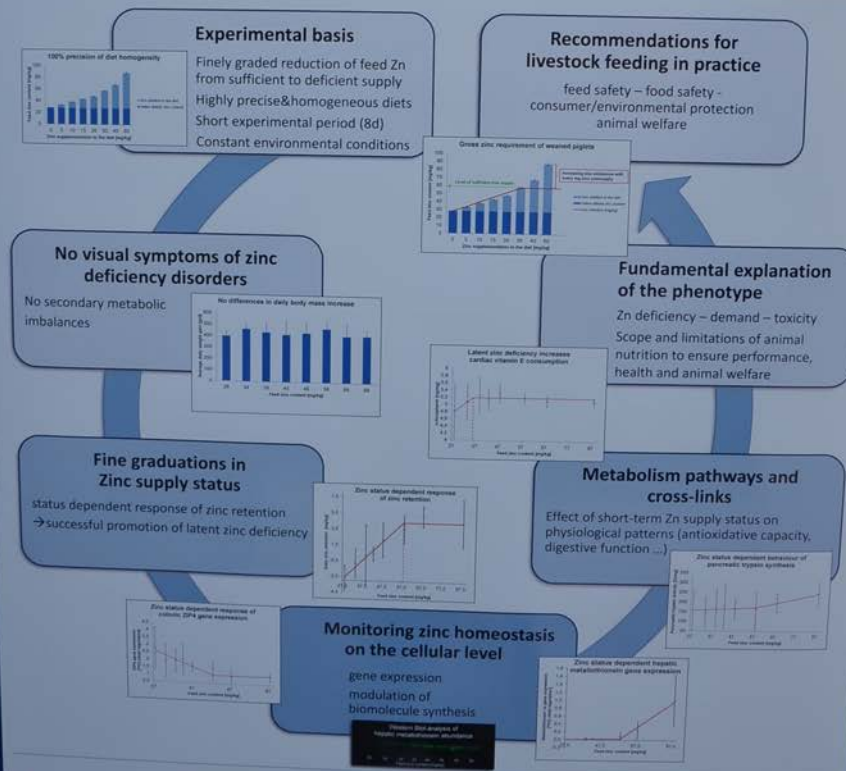
**Bauer R.**

*Studies on the decrease of spore potential of common bunt (Tilletia caries) and dwarf bunt (T. controversa) spores of wheat in soil considering different crop rotation systems in ecological farming*



## Short term experimental modelling of zinc status in weaned piglets

experimental model → metabolic response → phenotype



Daniel Brugger, M.Sc.; Prof. Dr. Wilhelm M. Windisch

Brugger D.

Short term experimental modelling of zinc status in weaned piglets

on A  
4.00 Uhr



## Enzymes as enhancers for digestion in ruminants

Mirko Deml

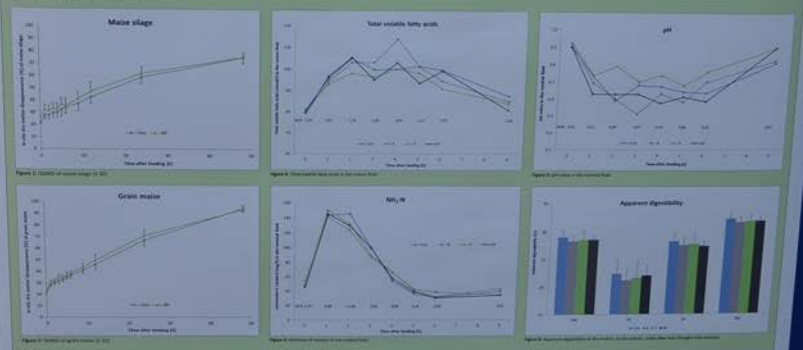
### Introduction

The efficiency of rumen fermentation is dependent on and limited by the chemical properties of the feed (e. g. plant cell wall digestibility, chemical composition of the grain). Feed additives may improve feed utilization in ruminants. For example, exogenous enzymes are administered to ruminant diets trusting that the supplementation increases ruminal catalytic capacity. This may result in an enhanced nutrient utilization and may lead to an increased animal performance and a resource-efficient animal nutrition.

### Methods

- 8 non-lactating, rumen-fistulated Holstein cows
- 7.0 kg feed intake (49 % maize silage, 15 % grass silage, 20 % grain maize, 6 % soybean meal, 10 % hay)
- 4 treatments: control (Con), addition of amylase (A), addition of Protease (P), addition of amylase and protease (AP)
- Each cow received all treatments (double 4 x 4 Latin square in 4 periods)
- Measurements/Calculations:
  - *In situ* dry matter disappearance (ISDMD) of the TMR and each single component at 1, 2, 3, 4, 5, 6, 9, 12, 24, and 48 h of incubation
  - Effective rumen dry matter degradability (EDMD)
  - Rumen physiological parameters in the rumen fluid
  - Total tract digestibility

### Preliminary results



### Further questions

- Which groups of nutrients (crude protein, starch, fiber fractions) are responsible for the increased ISDMD of maize?
- Does a higher ISDMD of maize lead to an increased production of microbial protein in the rumen?

Deml M.  
*Enzymes as enhancers for digestion in ruminants*

# Nitrogen fluxes of agricultural farming systems

## Analysis in an area with high livestock density

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### Problem

In the districts Hohenthann, Pfeffenhausen and Rottenburg a.d. Laaber, a big increase in livestock density took place in the past 10 years. In particular pig farming was expanded, accompanied by an increase in the nitrogen content in groundwater. Therefore a research project was started to analyse nitrogen fluxes and potential nitrogen leaching from farms in this region. As a second step, mitigation strategies will be developed and evaluated.



### Methods

- Analysis was conducted with the REPRO model (1)
- Nitrogen balances were calculated on the level of the whole farm, crop types and fields
- Input parameters are displayed in figure 1
- Up to now 5 farms have been analysed (tab. 1)

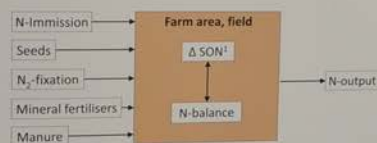


Fig. 1: Parameters used for calculation of nitrogen balances.  
 † Soil organic nitrogen stock.

Farm	Farm type	Farm size (ha)	Stocking density (GV/ha)	Analysed years
MS 1	Fattening pigs	62	6,0	2013
MS 2	Fattening pigs + Biogas	69	2,2	2011 – 2013
MV 1	Dairy Cows	98	1,8	2012 – 2013
MF 1	Arable	92	0	2011 – 2013
MF 2	Arable, slurry application	75	0	2011 – 2013

Tab. 1: Key figures of examined farms

### Conclusion

With actual N surpluses of the analysed farms there is a high risk of exceeding the critical level of 50 mg NO<sub>3</sub> / L percolate water. In order to reach the target of 0-50 kg N surplus (2), the farms need to reduce their fertilization levels. This implies more efficient use of slurry nitrogen, as well as a reduction in mineral fertilization. Lower N-balances can then be achieved without any or with only a minor reduction in yields.

Literature  
 (1) Kustermann, B., Christen, O., Hülsbergen, K.-J. (2010) Modelling nitrogen cycles of farming systems as basis of site- and farm-specific nitrogen management. Agriculture, Ecosystems & Environment 135, pp. 70-80  
 (2) DLG (2013) Nachhaltiger Ackerbau – DLG Merkblatt 369

### Results

Figure 2 shows the on-farm nitrogen cycle of farm MS 2. In all studied farms N surpluses ranged from 71 to 163 kg N/ha.

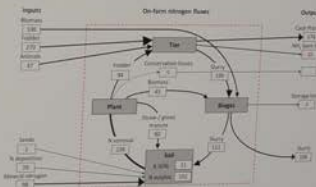


Fig. 2: Nitrogen cycle of farm MS 2.

N balances of specific crops in farm MS 2 are shown in table 2. As in most farm types the surpluses of all displayed crops are high. Problems are especially barley, rape and grain maize (preceeding cover crop included) because of low N removal and high fertilisation.

	Winter-wheat	Winter-barley	Grain-maize	Cover crop	
Yield	dt/ha	83	66	95	21
N removal	kg N/ha	153	112	143	0
N input (total)	kg N/ha	244	277	216	72
N input (total)	kg N/ha	20	20	20	0
Immission	kg N/ha	3	3	0	1
Seeds	kg N/ha	111	124	85	0
Mineral fertiliser	kg N/ha	110	130	111	71
Slurry	kg N/ha	13	13	20	47
Δ N Soil	kg N/ha	77	149	53	24
N surplus (with Δ SON)	kg N/ha	91	165	73	71
N surplus (without Δ SON)	kg N/ha	91	165	73	71

Tab. 2: Nitrogen balances of the most important crops in farm MS 2

Tab. 2: Nitrogen balances of the most important crops in farm MS 2 as basis of site- and farm-specific nitrogen management.





## Heuristical approach for system modelling of SMEs in hortibusiness

Andreas Gabriel and Vera Bitsch

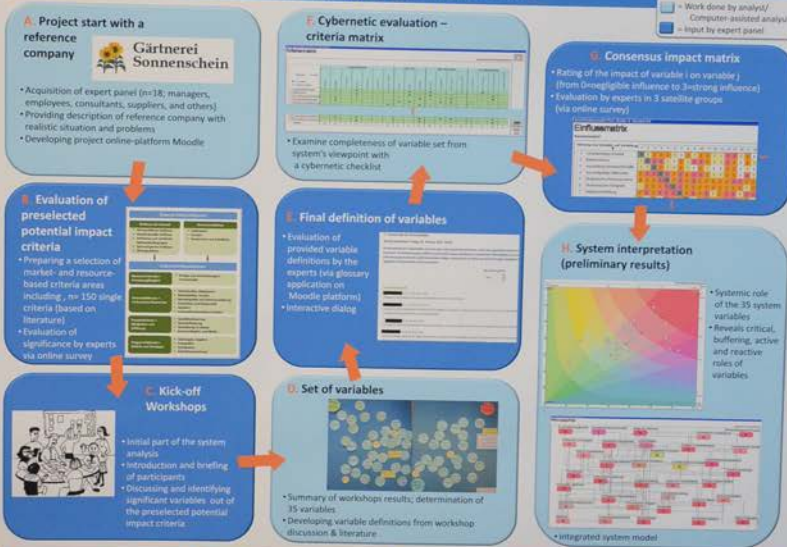
### Background & Goal

- Mostly small family-run companies with special tasks and features, e.g., tradition, human resources, low formal organization
- Complex challenges and threatened existence
- Goals of system analysis
  - Identifying the roles of key factors (system elements) that affect and are affected in the system "Hortibusiness SME"
  - Modeling and understanding the integrated system

### Methodology: Vester Sensitivity Model®

- Origin: biological & ecological issues (1970/80s)
- Integrative and heuristic approach
- Functions based on system theory:
  - Includes system thinking
  - Pattern recognition
  - Feedback loops in place of linear correlations
  - Fuzzy set theory, heuristics
- Combination of qualitative and quantitative data

### Process up to the system model



### Discussion & Conclusion

- Approach for visualizing and understanding complex relationships in enterprises
- First results during the process for hortibiz SMEs:
  - system strongly affected by human resources, their sentiments and SME's orientation (F.)
  - high degree of ability of internal regulation (F.)
  - tasks of management & organization as critical factors (H.)
- Further steps: Generating scenarios and simulations

### Literature

- Brexendorf, J. (2012) Komplexität in Kooperationen – eine empirisch basierte Analyse unter der Anwendung des Sensitivitätsmodells. PhD-Thesis. University of St. Gallen (CH).
- Huang, S.-L., Yeh, C.-T., Budd, W.W., Chen, L.-L. (2009) A Sensitivity Model approach to analyze urban development in Taiwan based on sustainability indicators. *Environ. Imp. Assess. Rev.* 29 (2009); pp. 116-125.
- Vester, F. (1988) The bio-cybernetic approach as a basis for planning our environment. *Syst. Pract.* 1(4); pp. 399-413.
- Vester F., Hesler, A. (1982) *The Sensitivity Model*. Frankfurt/Main: Umland-V.

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Gabriel A.

Heuristical approach for a system description of SMEs in hortibusiness



# Challenges in future phenotyping methods for maize breeding

Friederike Gnädinger

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## Introduction

With the use of phenotyping methods in the field like active and passive sensors and digital imaging, time consuming and tedious destructive measurements to detect plant traits can be replaced. This study was conducted to determine yield potential, abiotic stress adaption, disease resistance, plant architecture and quality parameter relevant in breeding processes with phenotyping methods. To gain deeper knowledge and understanding of important maize physiological traits phenotyping methods such as spectral reflectance and light interception measurements as well as digital imaging will be performed.

## Objectives

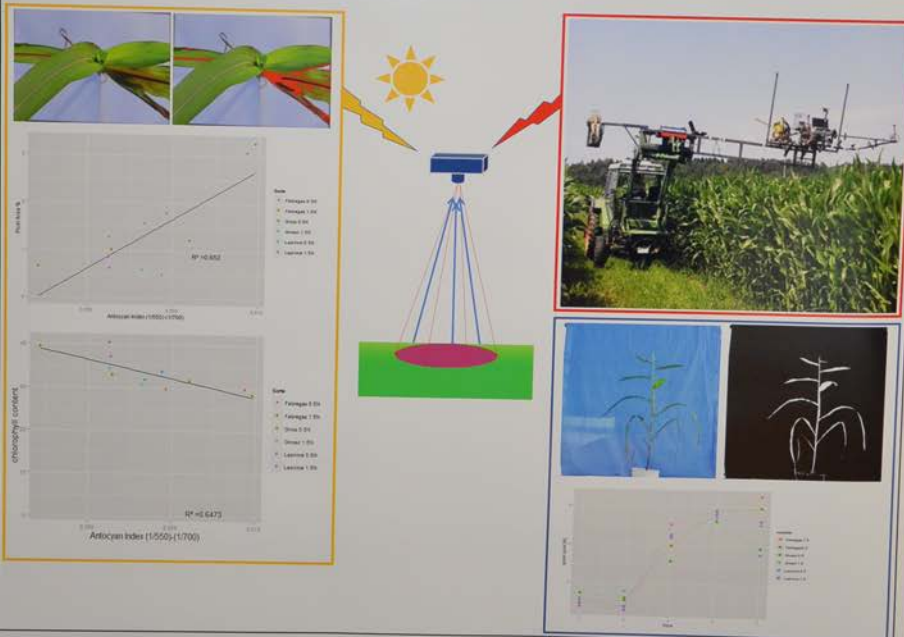
- 1) To detect phosphorous deficiency using the Anthocyanin Reflectance Index
- 2) To detect biomass production and yield potential using the NDVI Index
- 3) To capture plant growth under different N-level fertilization



## Material and Methods

Spectral readings of passive and active sensors (Ntech CropCircle ACS 470, Holland Scientific CropCircle ACS 470, YARA N-Sensor ALS, passive spectral spectrometer) were used to assess biomass, yield potential and light interception. Multi-camera digital images were shot and for light interception measurements the SunScan is used.

## Results



## Conclusions

Active and passive canopy sensors are frequently used instruments in Precision Agriculture and increasingly in plant phenotyping to detect plant characteristics through non-destructive measurements. Consequently all phenotyping approaches which have been tested successfully under greenhouse conditions during winter will be applied under field conditions in 2015.

Gnädinger F.

*Challenges in future phenotyping methods for maize breeding*



## On - Farm Energy Management

### Animal behavior in a fully automatically controlled dairy farm

Anja Gräff<sup>1</sup>, Renate Luise Dörfler<sup>1</sup>, Manfred Höld<sup>2</sup>, Jörn Stumpfenhausen<sup>2</sup>, Heinz Bernhard<sup>1</sup>

#### Objective

The dairy cattle farm of the future will be equipped with various kinds of mechanization and automation. The ideal would be for the farmer to be able to cover his energy needs by a self-sufficient, decentralized power supply of renewable energy. Important as these energetic-technical capabilities and features in a modern dairy farm are, the final decision when using automatic machinery depends on the animal itself and its behavior. As a result, all animal-physiological criteria, animal protection and animal welfare have to be taken into consideration.



#### Expected results of research

After having finished all experiments and having evaluated the test results, possible stress reactions should be shown by dairy cattle with a possible energy-conditioned failure of milking robots. The test results should give explanation whether variations or failures in the energy supply have effects on the cow behavior or whether postponements in the usual daily routine e.g. in the milking routine cause stress reactions to the milk cows.

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Gräff A.

*Animal behavior in a fully automatically controlled dairy farm*

## qPCR for bunt disease detection

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### LEADING SMUT/BUNT PATHOGENS IN EUROPE<sup>(1)</sup>

- *Tilletia caries* (DC) Tul. (Common bunt)
- *T. controversa* Kühn (Dwarf bunt)
- *Ustilago nuda* (Jens.) Rostr. (Loose smut)

Smut and bunt diseases of wheat and barley cause a large number of problems in crop production. In ecological seed multiplication and the official seed certification a good knowledge about these diseases, especially the infection about these diseases, is a crucial prerequisite. The maximum permitted infestation level for trade of untreated seed in Germany is 20 spores per kernel<sup>(2,3)</sup>. Cereal seeds are traded internationally and quarantine regulations exist in different countries. Therefore it is very important to have effective methods for detection and quantification of teliospores on cereal seeds as well as reliable species differentiation of the particular pathogens available to make up quick decisions for the export and import of cereal seeds.



Fig.1 sori and teliospores of *Tilletia caries* (left) and *Tilletia controversa* (right)

### Expected Advantages



Fig.2 microscope

present	Situation	future
<b>Microscopy method</b>		<b>qPCR based method</b>
very time consuming experienced analysers necessary -> cost intensive		faster selective, sensitive, reproducible -> less cost intensive (after development)



Fig.3 quantitative real-time PCR system

### How to start and how to move on

#### Specific DNA fragments needed



Fig.4 amplicons of ISSR primer ((GA)8)YT, M marker, 1-2 *T. caries* different origins, 3-4 *T. controversa* different origins

- qPCR 1) intercalating dye 2) fluorophor labeled probe 3) multiplex qPCR assay

### Acceptance as Official Seed Health Testing Method - ISTA (International Seed Testing Association)

#### References


- 1) Geelen, B. J. (1993). Common bunt and dwarf bunt. Bunt and smut diseases of wheat: concepts and methods of disease management, pp. 12-25.
- 2) Dreosler, M., et al. (2011) Samenreinheit und weitere Befreiungsgrenzen bei Getreide mit Zweifelsbrand (Fähig controversa) und Strohbrand (Tilletia caries). Beiträge zur 11. Wissenschaftstagung Ökologischer Anbau & Gesundheitsförderung im Rahmen der deutschen Anerkennung von Saatgut. Arbeitsgemeinschaft der Anerkennungsteiler für landwirtschaftliches Saat- und Pflanzgut in Deutschland, Anlage 5 Gesundheitsförderung, pp. 1-5.
- 3) AG-ARST (2014) Ökologische Gesundheitsförderung im Rahmen der deutschen Anerkennung von Saatgut. Arbeitsgemeinschaft der Anerkennungsteiler für landwirtschaftliches Saat- und Pflanzgut in Deutschland, Anlage 5 Gesundheitsförderung, pp. 1-5.



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<sup>2</sup> TUM, chair of Technische Mikrobiologie, Gregor-Mendel-Strasse 4, 85354 Freising, niessen@wzw.tum.de

## Grundler M.

Development of quantitative and qualitative test methods for detection of wheat and barley bunt diseases (*Tilletia* spp., *Ustilago nuda*) by means of Real-Time PCR assays



# Climate Change and Its Economic Impact on Ethiopian Farm Population

Lentlem T. Habtemariam  
Lehrstuhl für Produktions- und Ressourcenökonomie landwirtschaftlicher Betriebe

## 1. Introduction


- Climate change is anticipated to cause an overall negative impact on agriculture, with impact unevenly distributed across regions [1].
- Smallholder farmers in Sub-Saharan African countries are among the most vulnerable [2].
- Measuring the economic impact of climate change on subsistence farmers has not been adequately addressed.

## 2. Objective

- Assess the expected impact of climate and socio-economic changes on smallholder farmers.

## 4. Study Site

- Two selected districts from main crop producing zones representing different agro ecological and livelihood zones.



## 3. Significance

- To narrow the information gap on understanding the effects of climate change on smallholder farmers.
- To help policy makers formulate an informed policy and measures.

## 5. Materials and Methods

- Impact is assessed using the TOA MD (Trade Off Analysis for Multi-Dimensional impact) simulation model.
- The TOA-MD is parametrized with data from household survey, and projected yield & socio-economic changes for the 2030.
- Yield change is simulated by AquaCrop model.

Projected climate data for 2025-2035 (for two RCPs)

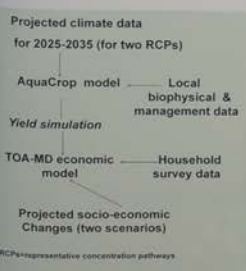
AquaCrop model — Local biophysical & management data

Yield simulation

TOA-MD economic model — Household survey data

Projected socio-economic Changes (two scenarios)

RCPs=representative concentration pathways

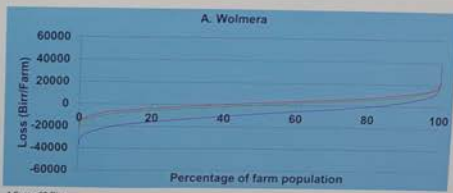


## 6. Preliminary Results

Table 1 Impacts of climate and socio-economic changes on farmers

Study areas	Changes	Poverty rate (less than US\$1.25/day)	Net loss (as a percent of mean net farm returns)
Wolmera	Climate change (CC)	95	1.3
	CC and SE-scenario 1	82	-54
	CC and SE-scenario 2	96	13
Dugda	Climate change (CC)	42	12
	CC and SE-scenario 1	38	-8
	CC and SE-scenario 2	43	14

SE-scenario 1=socio-economic scenario one (positive economic development)  
SE-scenario 2=socio-economic scenario two (low economic development)



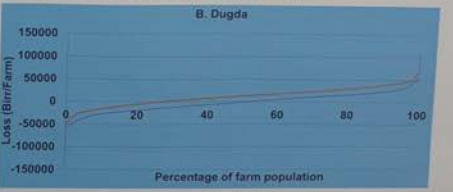


Fig 1. Economic impact of climate and socio-economic changes on (A) Wolmera and (B) Dugda farm population

## References

- [1] Calzadilla et al. 2013
- [2] Brown and Funk 2008

Contact: Habtemariam LT (M.Sc.), Technische Universität München, Lehrstuhl für Produktions- und Ressourcenökonomie landwirtschaftlicher Betriebe, Alte Akademie 14, 85350 Freising-Weihenstephan, Tel. 00151-171 40 40, eMail: lentlem.ltk@lgrg.tu-muenchen.de

**Habtemariam L.H.**

*Climate change and its impact on Thiopian Agriculture*

n A  
00 Uhr

# Effective vole control in the grassland of Bavaria

Barbara Hailer, IPS 2d



## Problems

- Loss of yield
- Wounded sod
  - Weeds
- Harvest contaminated with soil
  - Decrease of milk yield of cows
  - Wrong fermentation processes in the silage



## Evildoers



### Water vole (*Arvicola terrestris*)

120-190 mm  
80-210 g  
Black, grey-brown, sandy  
2 month  
21 days  
4-5 per year, each with 2-8 young voles

**Length**  
**Weight**  
**Colour**  
**Puberty**  
**Pregnancy**  
**Litter**

### Common vole (*Microtus arvalis*)

80-120 mm  
18-40 g  
Dark-grey, brown, never red-brown  
11 days  
20 days  
4-7 per year, each with 3-7 young voles



## Project aims

- Monitoring of the water vole, common vole and European mole (*Talpa europaea*) in the grassland of Bavaria
- Evaluation of available methods for vole control and identification of an applicable method for vole control with a reduction of rodenticides

## Material and Methods

- Questionnaire to gain grassland fields in all parts of Bavaria
- Monitoring of water voles estimating burrows of the individuals on 5000 m<sup>2</sup>
- Distribution of common voles is measured by activity studies
- Comparison of the different control options using plot trials

## Results and Conclusion

- In each district five to ten plots were selected for monitoring
- Monitoring and control experiments are taking place at the moment
- Data are right now not evaluated
- High number of returned questionnaire is not only a good source for selecting suitable plots, it also shows the importance of an effective solution for the control of voles

Administrative district	Questionnaire	Selected monitoring plots
Upper Bavaria	85	10
Upper Palatinate	32	7
Middle Franconia	21	6
Lower Bavaria	17	6
Swabia	12	6
Lower Franconia	12	5
Upper Franconia	5	



Barbara Hailer, Manfred Sohmén, Dr. Ulrich Benker  
Bavarian State Research Center for Agriculture,  
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Hailer B.

Effective vole control in the grassland of Bavaria



## Copper supplementation – Is there an influence on the ruminal microbiome?

Martin Hanauer

Chair of Animal Nutrition, Technische Universität München

### Background:

Next to its importance as essential trace element Cu has toxic effects. Particularly the antimicrobial effect on the intestinal flora along with growth promotion at fattening pigs has to be mattered. This effect appears in a range (20 ppm) which is situated in a legal range of ruminants (supply recommendation: 10 ppm; permitted maximum amount: 35 ppm) [1, 2, 3].

### Issues:

- 1) Does supplementation with Cu affect speed and extent of microbial fermentation of crude nutrients?
- 2) How does the pattern of ruminal microbiome change concerning different Cu doses and sources?
- 3) In what form "utilizable" Cu reaches the duodenum?



### Methods:

- Animal experiment with 8 non-lactating rumen fistulated cows fed a diet added with 2 different Cu sources at 3 levels (according to requirement [10 ppm] vs. maximum permitted dietary level [35 ppm] vs. excessive dose [50 ppm])
- Determination of in situ dry matter degradability and crude protein using the nylon bag technique [4] (Fig. 1)
- Characterization of the ruminal microbiome using RT-qPCR (Fig. 2)
- Measurement of fermentation endpoints (pH, volatile fatty acids, lactate, ammonia) (Fig. 3)
- Sampling of duodenal juice for determination of „utilizable“ copper

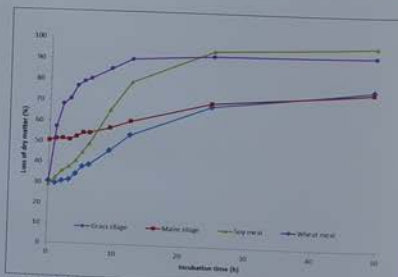
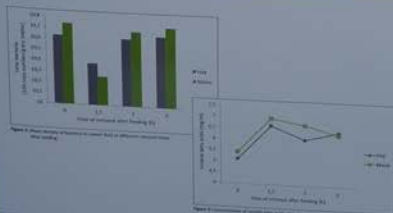


Figure 3: Example of a time profile of ruminal degradation of certain feedstuff

### Expectations:

- Effect of higher supply of Cu compared to supply recommendation (10 ppm) on the quantitative composition of the ruminal microbiome
- Negative influence of high Cu levels on digestive processes in rumen
- Either more or less negative impact on ruminal microflora and on provision of "utilizable" Cu in the duodenum due to varying solubility of different Cu compounds

[1] Armstrong TA, Cook DR, Ward MM, Williams CM, Spears JW (2004) Effect of dietary copper source (cupric citrate and cupric sulfate) and concentration on growth performance and fecal copper excretion in weaning pigs. *J Anim Sci*, 92, 1234-40.

[2] Commission Regulation (EC) No 1334/2003: Amending the conditions for authorization of a number of additives in feedingstuffs belonging to the group of trace elements.

[3] GE (2001) Empfehlungen zur Energie- und Nährstoffversorgung der Milchkühe und Aufzuchtstiere. In: (ed) Ausschuss für Bedarfnormen der Gesellschaft für Ernährungsphysiologie, Energie- und Nährstoffbedarf landwirtschaftlicher Nutztiere, Nr. 8. DLG-Verlag Frankfurt/AM.

[4] Ghosh, E. B., McDavall, J (1979). The estimation of protein degradability in the rumen from incubation measurements weighted according to rate of passage. *J Agric Sci*, 92, 499-503.

This animal experiment was reported to and approved by the district government of upper bavaria of the federal state of bavaria. (Az. 55.2/1-04-2332-79/14).

This study is funded by a H. Wilhelm-Schramm-Scholarship.

Hanauer M.

Copper supplementation – Is there an influence on the ruminal microbiome?

n A  
00 Uhr



# On - Farm Energie Management

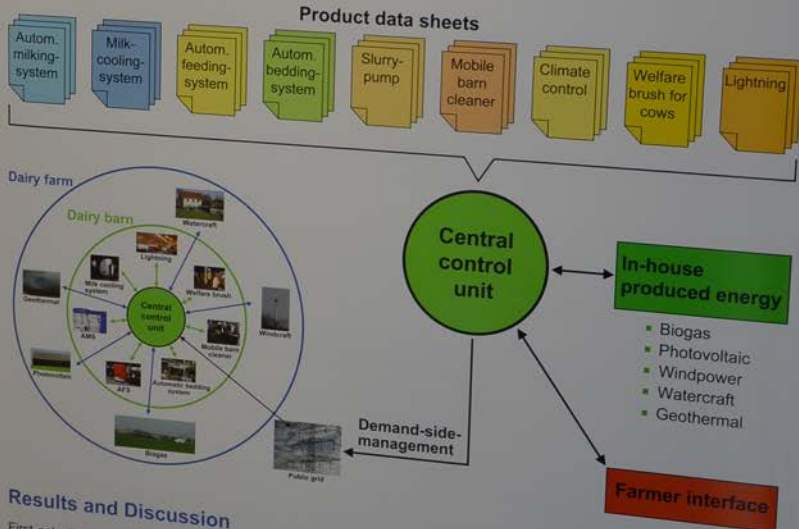
Elaborate the basics for implementation of an energy management system in a dairy barn

M. Höld, H. Bernhardt, J. Stumpfenhausen

## Introduction

Dairy Farmers often produce in addition to milk also electrical energy by using the sun or the wind. Since the year 2012, it is cheaper for the farmers using their own produced energy by photovoltaic before they buy electrical energy from the energy supplier. Therefore, it must be the highest aim to use much as possible of the own produced energy in the dairy barn. The machines in the high automated dairy barn, like the automatic milking system or the automatic feeding system, are often produced by several manufacturers. In cause of this, it is difficult to establish a communication between the machines. Find a way, how to distribute the energy to the right place at the right time within the dairy barn is the primary task. But the welfare of the cows must be guaranteed at the whole time, when we manage the energy distribution in the dairy barn.

## Methods



## Results and Discussion

First calculations shows, that the PV-plant on the roof of the dairy barn produces more energy than the machines in the dairy barn use. When a dairy barn with an asymmetric shed roof was built, a PV-plant with round about 185 kW<sub>peak</sub> of electrical power can be installed. The energy produced from one installed kW<sub>peak</sub> in a year is round about 1100 kWh, when the dairy barn was built in Freising. For each cow an amount of energy of round about 1700 kWh will be produced. Additional, the energy from the biogas plant can be used in the dairy barn. A biogas motor with 75 kW of power can be used, when the biogas over 16 hours will be stored. The power of 67 kW can be used over a time of eight hours. The slurry of each cow provides an amount of energy of round about 1500 kWh.

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Lehrstuhl für Agrarsystemtechnik, Am Staudengarten 2, 85354 Freising

Höld M.

Elaborate the basics for implementation of an on-farm energy management system in a dairy barn



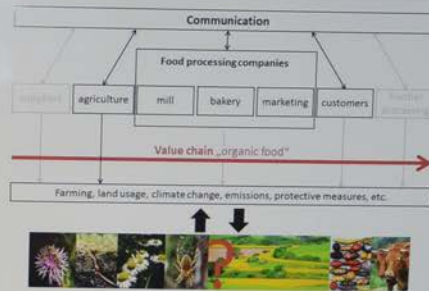
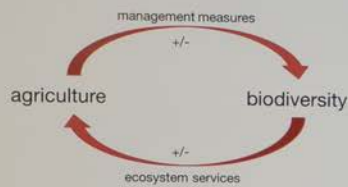
# Indicators of functional diversity for biodiversity management in value chains of organic food stuff

Köhler, Anna<sup>1</sup>; Wolfrum, Sebastian<sup>1</sup> und Hülshagen, Kurt-Jürgen<sup>1</sup>

<sup>1</sup>TU München, Chair for Organic Agriculture and Agronomy, 85354 Freising, anna.koehler@tum.de

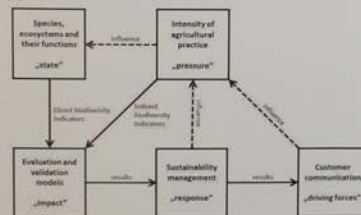
## Research issue

- Growing public awareness of biodiversity loss
- Agriculture as the main driver impacting biodiversity in value chains of food production



## Research approach and study design

### Schematic diagram of the research approach



### Direct biodiversity indicators



- Earthworm sampling with AITC and handsorting (1 sample date in spring)
- Bee sampling with UV-color bowls (3 sample dates in summer)
- Spider sampling with a leaf blower (3 sample dates in summer)
- Vegetation mapping (2 sample dates: spring/summer)

### Ecosystem services

- Pollination determination with phytometer experiment
- Biological pest control determination with aphid bait stripes, etc.

### Indirect biodiversity indicators



- Collection of management data
- Data analysis with the management system REPRO

## Objectives

- Development of simple and valid sets of methods and models to assess the effects of agriculture on functional biodiversity
- Integration in the biodiversity management of organic food production
- Definition of interfaces for efficient data exchange for the use of the results by the actors in the value chain

The project "Entwicklung von Instrumenten für das Biodiversitätsmanagement in Wertschöpfungsketten biologisch erzeugter Lebensmittel" is financed by Deutsche Bundesstiftung Umwelt (DBU)

Köhler A.S.

*Indicators of functional diversity for biodiversity management in value chains of organic food stuff*



# Cooperatives in the German Horticultural Sector

## Internal Governance Structure

Nevena Kokovic and Vera Bitsch

### Background

#### Market situation

- Increasing competition in agri-food markets induce need for cooperatives to develop new market strategies (Bijman, 2012)
- Traditional cooperatives have insufficient capital acquisition for growth strategies (Cook, 1993)

#### Research on cooperative governance

- Cooperative performance impacted by its governance (Bijman et al., 2013)
- Traditionally governed cooperatives lack in market orientation (Kopelove, 2013)
- Professional management enhances market orientation (Bijman and Hanisch, 2012)

#### Cooperatives in German horticulture

- Around 80 active cooperatives
- 23,300 members and 5,120 employees
- Turnover 3,4 billion Euro in 2013
- Focus on marketing functions (GRF, 2015)
- In fruits and vegetables, about 40% market share (Köhl, 2012)

### Objectives

Analyze the extent to which farmer-members engage in decision-making functions in cooperatives

Explore links between governance models (traditional, extended-traditional, managerial) and cooperatives' characteristics

### Material and Methods

- Website of the German Raiffeisen Federation provided cooperatives' contact information
- Information on main activities, products, number of members and employees, turnover, governance structure and an assessment of their economic performance collected through short, structured telephone or email questionnaire

### Results

- Traditionally governed cooperatives** (farmer-members are decision-makers) assess their **economic situation from tense to good**. Variation in assessment can be due to differences in cooperatives' strategies (successful when applying cost-leadership, while abortive in case of differentiation strategy) (Köhl, 1999)
- Cooperatives that delegate their decision-making to non-farmer management (**extended-traditional and managerial model**) assess their economic situation as good

Activities of cooperatives	Number of cooperatives	Membership	Turnover (Mill. €)	Board Model		
		Range	Range	Traditional	Extended-traditional	Managerial
Primary fruit processing	9	32 - 1450	0.1 - 2.5	7	2	0
Ornamental plants sale	4	9 - 93	3 - 3.1	2	2	0
Fruit and/or vegetables sale	10	18 - 1600	11.5 - 130	3	6	1
Fruit, vegetables, and ornamentals plants sale	1	3000	2000	0	0	1

### Conclusions

- Traditional organizational principles still important among cooperatives in the sample
- Cooperatives operating close to the end consumers delegate decision-making to non-farmer management, indicating better market orientation
- Future research will target performance analysis of different governance models; performance analysis will include financial analysis and members' satisfaction with their cooperative

### References

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Bijman, J., G. Hendriks and A. van Oijen. (2013). Accommodation Two Worlds in One Organization: Changing Board Models in Agricultural Cooperatives. Managerial and Decision Economics 34 (3-4), 304-317.

Cook, M.L. (1993). Cooperatives and Group Action. In D.L. Padberg (Ed.), Fruit and Agricultural Marketing Conference (FAMC 93) Uge. 154-169. Texas: A&M University.

German Raiffeisen Federation (GRF) (2015). Number and membership of cooperatives in the horticulture. Retrieved 18.02.2015, from <http://www.raiffeisen.de/pressenachrichten-und-haben/>

Stapanian, C. (2013). Public policy support for agricultural cooperatives: an organizational economic approach. *Annals of Public and Cooperative Economics* 84 (3), 242-252.

Köhl, W. (2012). Support for Farmers' Cooperatives, Country Report Germany. Wageningen: Wageningen UR.

Nelson, J. (1999). Cooperative Organizational Models as Reflections of the Business Environment. *LEA* 43(6), 443-470.

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Kokovic N.

Cooperatives in the German Horticultural Sector: Internal Governance Structure





## How do different husbandry situations affect the feed intake behaviour of weaned piglets and growers?

Peter Loibl, Chair of Animal Nutrition

### Intention of the study

The feed-intake-behaviour of livestock animals is directly influenced by the environment, e.g. most management tasks and diverse husbandry problems. Therefore the individual animal's feed intake behaviour could be a precise real-time-indicator for animal welfare.



### Materials and Methods

Several feeding trials will be conducted using automatic single space feeders. Thereby the feed intake profile of the individual animal will be assessed in high resolution.

Additionally environmental and husbandry associated factors (e.g. barn climate, temporary feed deprivation) are modulated and correlated to possible changes in feed-intake behaviour.

Saliva samples are taken to determine the stress status of indicator animals via analysis of the stress hormone cortisol.

### Current status

At the moment the chemical and statistical analyses are conducted in context to the first trials.

Furthermore, we are establishing statistical and database related methodology for the handling of large datasets in order to efficiently analyse the effects of environment and stressors on the key figures of feed-intake-behaviour.

### Practical application:

Using feed-intake-behaviour as an early warning system for alterations in animal wellbeing.

**Loibl P.**

*Influence of stressful situations on feed intake behavior in fattening pigs*

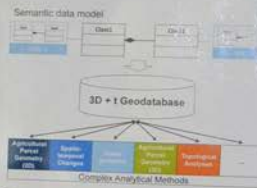
# LandModel: A Semantic 3D + t Data Model for Applications in Agricultural Sciences

Thomas Machl, Andreas Donaubaueer und Thomas H. Kolbe

## Core Concept: Coupling of Semantic Data Model and Complex Analytical Methods

With its research on „3D-Spatio-Temporal Semantic Data Modelling of Agricultural Landscape“, the Geoinformatics group at TUM focusses on the development of a monitoring system for a profound and comprehensive analysis of agricultural landscape. The core of this system is a semantic spatio-temporal data model representing agricultural landscape as a system of changing and interacting entities in three dimensional space. Due to the clear definition of all relevant object classes, attributes, associations, the explicit modeling of spatio-temporal changes at the level of single entities, the conformity with standards of the ISO 19100 series, and the possibility of an application-specific extension, the data model acts as a formally described and machine-interpretable, and interdisciplinary integration platform for the development of complex analytical methods.

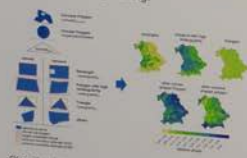
Based on the semantic data model, various tools have been developed, analyzing different aspects of agricultural landscape. Currently the land analytics toolkit includes tools for a parametric description of the shape of agricultural parcels, tools for estimating tracks in field, tools for the estimation of transport processes as well as tools for the detection of spatio-temporal changes of agricultural parcels. All information gained throughout the analysis processes is used for semantic enrichment of corresponding entities in the 3D + t geodatabase and is therefore available for further analysis at the level of single entities. As special emphasis is put on the scalability of the tools, large areas can be analyzed on a large scale (e.g. all agricultural parcels in the entire territory of Bavaria).



Core concept: semantic data model acting as integration platform for complex analytical methods

## Parametric description of the shape of agricultural parcels from an ergonomic point of view

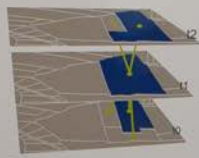
Shape and further geometric characteristics of agricultural parcels are main factors with respect to machinability, working time requirement, and arising costs for cultivating agricultural acreages. Due to missing comprehensive statistical information on existing agricultural field structures regarding shape and ergonomically relevant geometric properties, most ergonomic simulations are based on simplified assumptions and therefore the correlation with real world conditions is limited. In this context this research project focuses on the development of methods for a comprehensive classification, characterization, and statistical description of ergonomically relevant geometrical properties of existing agricultural parcels on a large scale. Results gained provide basic information for continuative research in the fields of ergonomic simulations and agricultural engineering.



Classification and parameterization of the shape of agricultural parcels using an indicator-based algorithm

## Detection and analysis of spatio-temporal changes in agricultural landscape

Agricultural landscape is a complex system of interacting and changing entities and sub-systems. Division or consolidation of agricultural parcels, land sealing, and rotation of crops are only few examples with respect to spatio-temporal changes in agricultural landscape. In this context the research project aims the development of a monitoring system for the continuous detection, documentation, and level of single entities (e.g. agricultural parcels). Major research issues are the development of methods for the comprehensive recognition of spatio-temporal changes as well as the representation of change at a conceptual level in the semantic data model.



Representing spatio-temporal changes using graph-based approaches

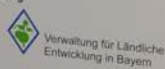
## Estimation of transportation flows and traffic load caused by agricultural transport processes

Agriculture is known as a „transportation industry against its will“ as transportation processes play an important role in daily business. Due to structural changes in agriculture and the expansion of the cultivation of renewable resources especially for energy production, these transportation processes changed and especially intensified during the last decades: transportation distances increased, flows of goods changed, machines became bigger, and machines like lorries are more frequently used. In many cases the existing road network is unable to meet the needs of changed requirements of agricultural transport. Against this background the transportation analytics toolkit focusses on the area-wide estimation of agricultural transportation processes, the detection of weaknesses in the road network, and methods for prioritizing the expansion of the transportation network.



Estimated catchment area, substrate composition, and biomass flow of a planned biogas plant

### Funding



Bayerisches Staatsministerium für Ernährung, Landwirtschaft und Forsten

### Project Support





## Analysis of Influencing Factors on Infield-Logistics

Michael Mederle, Heinz Bernhardt

### Abstract:

Agricultural logistics extremely increased in the last years. For process optimization several software tools have been developed to navigate vehicles to the fields. Regarding infield-logistics and navigation in the fields only first steps have been made. The main question is the systematics of doing the field work and the corresponding influencing factors. In contrast to road navigation infield-logistics is understood as area navigation. An endless number of tracks are selectable but only few are realistic. Common strategies of different farmers should be investigated and analyzed in terms of efficiency, process- and down-times.

### Example Scenarios:

Fig.1 shows a rectangular field. Scenario A represents tillage operations. Neither supply- nor removal-logistics is needed. Usually these operations are done in long tracks for minimizing turning times. Scenario B and C show the application of liquid manure. The field roads affect the infield-logistics because the operating vehicle has to leave the field periodically for refilling. Infield-logistics for slurry application also depends on factors like application amount, working width or tank volume. Scenario B differs from C regarding tramline distances. In B this distance is less, so the whole field length can be worked and no more turnings in the field are necessary.

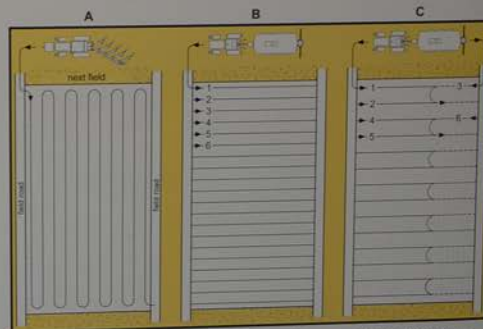


Fig. 1: Different infield-strategies depending on various operations

### Material and Methods:

The investigation consists of two different parts. First there will be an interrogation of farmers about the reasons and influences for their infield strategies in terms of an expert interview. Furthermore different driving lanes will be recorded by GNSS data loggers (Fig. 2) for analyzing the operations regarding efficiency, process- and down-times. The data acquisition will include all production steps from tillage to harvest. Additionally it will take place all over Germany to be able to represent different agricultural landscapes with different preconditions.

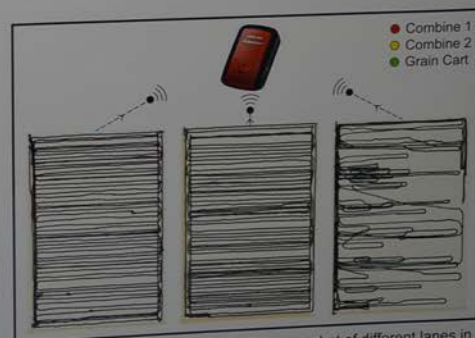


Fig. 2: GNSS data logger and QGIS screenshot of different lanes in grain harvest

### Expected results:

First results of the GNSS tracks analysis recorded in grain harvest show that there are static, not changeable influencing factors like field shape, field size or field entries. On the other hand there are dynamic reasons for infield strategies which are changeable, e.g. weather conditions, different varieties or various driver skills. These trends should be checked by the interrogation and further GNSS data recordings.



Mederle M.

Analysis of Influencing Factors on Infield-Logistic

## Cryogenic removal of carbon dioxide from variable CH<sub>4</sub>/CO<sub>2</sub> gas mixtures, Liquefied biomethane (LBM) from biogas for long-term energy storage

Department of Life Science Engineering, Agricultural Systems Engineering, GZW,  
UAS Landshut, Faculty mechanical engineering

### Abstract:

In the planned process biogas will be cleaned and subsequently transformed into liquid biomethane (LBM) and solid carbon dioxide (dry ice). Core pieces of this system are two heat exchangers connected in series with operating temperatures of about 200 and 120 Kelvin. Triggered by the low temperatures reached in the second heat-exchanger, the CO<sub>2</sub> flocculates. To minimize the physico-chemical adsorption of the heat exchanger for a continuous working process different surface coatings such as gold, silver, nano particles, ceramic will be compared.

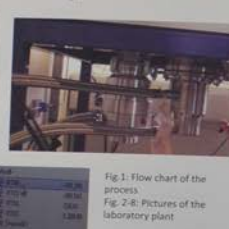
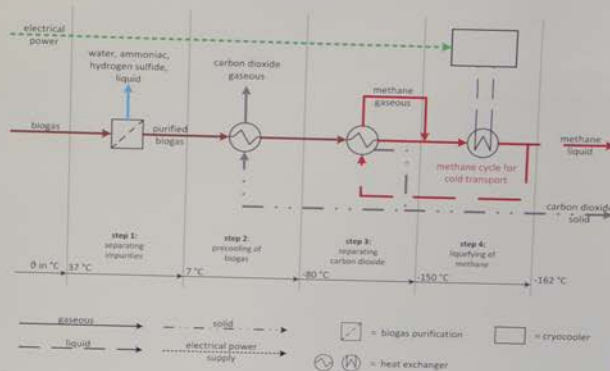


Fig. 1: Flow chart of the process.  
Fig. 2-6: Pictures of the laboratory plant

### Expected results:

It shall be demonstrated that it is possible to freeze out CO<sub>2</sub> continuously in a pressureless, cryogenic process. Parameters for the controlled freezing out of dry ice will be found. The solid carbon dioxide can be removed from the heat exchangers in form of snow.

### Research priorities

#### • Solid-density: Ice or snow!

- Factors: flow rate, CO<sub>2</sub>-content, test duration, temperature delta

$$\rho_{CO_2} = 1191 + 57,65w + 21,25\psi_{CO_2} + 3,40t - 13,67\Delta T_{DS} \quad [1]$$

- Manipulating the density



Fig. 10-13: CO<sub>2</sub>-snow formation on stainless steel

### Next steps:

- Surface behavior
  - Basic material copper or stainless steel
  - Different coatings
- Process development
  - Discharge of dry ice
  - Energy balancing



Fig. 9: heat exchanger tubes

### Challenges and difficulties

- For biogas unusually low temperatures down to -162 °C
- Very low odor threshold of H<sub>2</sub>S
- Intersection point of the vapor pressure curves of CO<sub>2</sub> and H<sub>2</sub>S
- Developing a two-phase heat exchanger -> gas - solid
- Control system to simulate methane cooling

### Contact

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Nachtmann K.

Development of a laboratory plant to produce liquefied biomethane and dry ice from biogas

# Indicators of soil functionality and its assessment in Cerrado - Brazil

Vanessa Oliveira

TUM LS Bodenkunde / HSWT Fakultät Wald und Forstwirtschaft.

## Introduction

Ever-more-pressing demands on the land are driving unprecedented land-use change (Bai et al, 2013). In turn, unsustainable land use is driving soil degradation and loss of soil functions of Cerrado in Brazil. Ecosystem services and soil functions are of great importance and have been frequently discussed; however, their parameters do not enter the discussion. Therefore, this paper reviews publications on soil functions and indicators in the Cerrado region of Brazil and discusses its assessment using multifunction parameters.

## Soil Indicators

Soil quality has no standards and therefore regulations have not been created as a way to measure its quality. Soil assessment is measured by indicators, which are attributes that measure or reflect the environmental status or sustainability condition of the ecosystem.

## Brazilian Savanna Ecosystem - Cerrado

Second largest biome in Brazil (ca. of 25% of its total area)  
Great prominence in the national and global agricultural scenario  
Important reserve of biodiversity and food production potential



### Soil Degradation

- Erosion
- Nutrient depletion
- Compaction

### Soil Functions

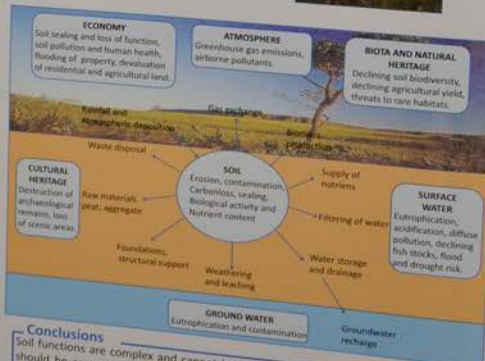
- Filtration
- Buffering
- Transformation
- Nutrient cycling
- Water retention

### Ecosystem Services

- Provisioning
  - Food
  - Fresh water
- Regulating
  - Air quality
  - Water quality
- Supporting
  - Soil formation
  - Nutrient cycling
  - Water cycling
- Cultural
  - Cultural
  - Social relations



Indicators of soil condition	Relationship to soil condition and function, rationale as a priority measurement
<b>Physical</b>	
Texture	Retention and transport of water and chemical; needed for many process models; estimate of degree of erosion and field variability of soil types
Depth of soil, topsoil and rooting	Estimate of productivity potential and erosion; normalizes landscape and geographic variation
Soil bulk density and infiltration	Indicators of compaction and potential for leaching, productivity, and erosivity; density needed to adjust soil analysis to field volume basis
Water holding capacity / water retention character	Related to water retention, transport, and mobility; available water matter can be calculated from soil bulk density, texture, and soil organic
<b>Chemical</b>	
Soil organic matter (total organic C and N)	Defines soil texture, stability, and erosion extent; use in process models and for site reclamation
pH	Defines biological and chemical activity thresholds; essential to process modeling
Electrical conductivity	Defines plant and microbial activity thresholds; soil structural stability, and infiltration of soluble water; presently lacking in most process models; can be a practical estimator of soil cation and plant available nutrients and potential for loss from soil; productivity and environment quality indicators
Extractable N, P, and K	
<b>Biological</b>	
Microbial biomass C and N	Microbial catalytic potential and repository for C and N; modeling soil sequestration of management effects on organic matter
Potentially mineralizable N (primarily microbial)	Soil productivity and N supplying potential; process modeling; surrogate indicator of microbial biomass N
Soil respiration, water content, and temperature	Measure of microbial activity (in some cases plants); process modeling; estimate of microbial biomass activity



## Conclusions

Soil functions are complex and cannot be measured in a single indicator, in turn, it should be assessed through several parameters which combined can give a good assessment of the soil. This paper is the first step of an ongoing PhD research, which aims at analysing the main studies regarding soil rehabilitation in Cerrado and then creating a rehabilitation guideline, that will give recommendations for soil regeneration.

Funded by:



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Oliveira V.C.

Soil functionality indicators and multifunction assessment of Cerrado – Brazil



## Online-Anbieter von Schnittblumen in Deutschland

Meike Rombach und Vera Bitsch

### I. Hintergrund



#### Schnittblumenkonsum in Deutschland

- Einzelhandelsumsatz in 2013: 3 Milliarden Euro
- Pro Kopfverbrauch: 14 Euro
- Absatzkanäle: Blumenfachhandel, LEH, Markt



#### Online Shopping

- Verbraucherakzeptanz in Deutschland
- Literatur auf Verbraucherwahrnehmung und Lebensmittel fokussiert



#### Blumenonlinehandel in Deutschland

- In der Forschung bisher weitgehend unberücksichtigt wengleich die Anzahl der Anbieter steigend

Quellen: AMI (2014), Ramus und Nielsen (2005)

### II. Zielstellung

#### Typisierung der Onlineschnittblumenanbieter in Deutschland

- Analyse der Interaktion zwischen den Anbietern
- Analyse der Interaktion zwischen Anbieter und Verbraucher

### III. Material und Methoden

25 Webseiten

Fachzeitschriften und Zeitungen

Tiefeninterviews mit Onlineanbietern

Qualitative Inhaltsanalyse

Quellen: Altheide und Schneider (2013), Schreier (2012)

### IV. Anbietertypen



#### Typ 1: Globaler Auftragsvermittler

- Auftragsvermittler zwischen lokalen Blumengeschäften in einem globalen Netzwerk
- Konzept: Qualität, Vertrauen und Service



#### Typ 2: Deutschlandweiter Standard

- Standardisierte Blumensträuße oder Schnittblumenabonnements
- Konkurrenz, Zusammenarbeit und Rufschädigung



#### Typ 3: Alleskönner

- In Deutschland: Blumensträuße und Abos
- Auftragsvermittler: Außerhalb Deutschland



#### Typ 4: Partner von Discountern

- Kooperiert mit Discountern
- Ausgewähltes Sortiment
- Produktidentität des Discounters



#### Typ 5: Partner von Onlinehändlern

- Kooperiert mit Onlinehändlern
- Ausgewähltes Sortiment
- Kundenkontakt durch Onlinehändler



#### Typ 6: Zusätzlicher Absatzkanal

- Blumenfachgeschäft oder Großmarkt
- Zusätzlicher Absatzkanal
- Sekundäre Geschäftstätigkeit

### V. Marktsituation

- Starker Wettbewerb unter den Anbietern
- Anbieter haben keinen Zugang zu statistischen Daten erforderlich
- Umfangreiche Branchenkenntnisse und Eigenrecherche
- Anbietern bleibt ihre Marktposition unklar
- Ergebnisse interessant für Marktforschung und Beratung

### VI. Ausblick

- Weitere Interviews mit Onlineschnittblumenanbietern erwünscht
- Einordnung der Onlineschnittblumenanbieter in die Wertschöpfungskette

### VI. Literatur

- Altheide, A.D. und C.I. Schneider. 2013. *Qualitative Media Analysis*. London, Sage.
- Agrarmarkt Informations-Gesellschaft mbH (AMI). 2014. *Top-10 Liste der Schnittblumen in Deutschland*. Abgerufen am 15. Januar 2015 von [http://www.g-net.de/download/presstedienst/2014/Top10\\_2012\\_2013.pdf](http://www.g-net.de/download/presstedienst/2014/Top10_2012_2013.pdf).
- Schreier, M. 2012. *Qualitative Content Analysis in Practice*. London, Sage.
- Ramus, K. und N.A. Nielsen. 2005. *Online grocery retailing: What do consumers think?* *Internet Research* 15 (3): 335 – 352.

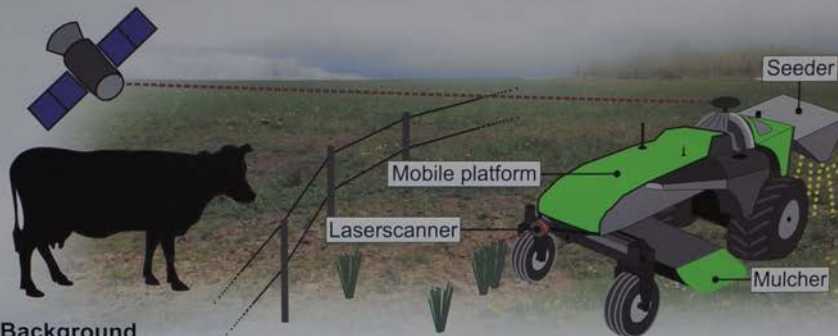
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Rombach M.

A typology of online flower shops on the German market



### Background

Pasture care is an important factor in pasture management. Quantity and quality losses of pasture forage are consequences of insufficient pasture care. An optimal pasture care includes selective mulching of weeds and seeding on areas without vegetation. Until now these operations have been done manually, extensive by machine or there was no pasture care at all. Selective improvement of pasture conditions after grazing increases the potential of pasturing.

### Objective

Autonomous mobile machine for selective pasture care:

- Ensuring stable and reliable movement under real pasture conditions
- Localization of pasture spots for maintenance operations
- Performance of maintenance tasks on pasture

### Material and Methods

- Design based on a evaluated and selected existing remote-controlled platform
- Evaluation and selection of sensors for localization of pasture spots for maintenance operations
- Equipping with selected sensors and actuators (mulcher and seeder)
- Development of the low level vehicle control
- Technical implementation of the interaction of sensors and actuators

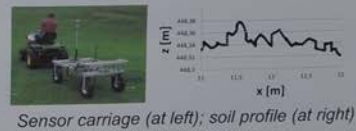
### Conclusion and Outlook

Next step is the technical implementation:

- Equipping the acquired platform with sensors
- Equipping with attachments
- Development of the low level control for autonomous operation
- Tests of sensors to detect pasture data for calibration and checking the reliability under pasture conditions.

### Results

- Analysis of constraints for the operating process
- Detection of soil profiles on pastures:



- Evaluation of mulcher types

Analysis of existing technique      Definition of requirements

Selection of technique:



Remote-controlled machine as a platform for the pasture robot (at left); flail mulcher (at right)

## Seiferth B.

*Development of a system for selective machining on pasture to automate pasture care by an autonomous mobile robot*

A  
Uhr



# INVESTIGATING THE GENETIC STRUCTURE AND DIVERSITY OF THE BARLEY PATHOGEN *RAMULARIA COLLO-CYGNI*

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## Introduction



The fungus *Ramularia collo-cygni* (*Rcc*) is now recognized as an important pathogen of barley. The fact that the fungus can grow symptomless in barley plants overwintering, coupled with its very slow growth in wheat, makes it difficult to detect. As a result, the epidemiology of this pathogen remains poorly understood.

In this study, we tried to have a first look at the genetic diversity of *Rcc*. Four putative housekeeping genes (HKG) were sequenced on different *Rcc* isolates and we performed classic population genetics analysis (Theta-W, Tajima's D) to uncover genetic variability and population structure. The whole *Rcc* genome as well as its RNA from 6 different conditions were also sequenced.

## 2. Genome analysis

- The finished assembled genome of *Rcc* is about 32 Mb and is currently to be found in 77 scaffolds.
- The RNAseq data generated 5-6000 transcripts (with the longest reading frame)
- The overall automated annotation enabled the prediction of about 9600 genes.

Table 2. Assembly results

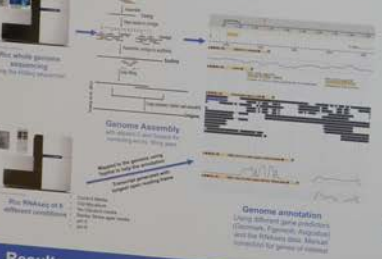
Assembly	Length	Assembly	Length	Assembly	Length
1	1,100,000	3	2,200,000	5	3,300,000
2	1,100,000	3	2,200,000	5	3,300,000
3	1,100,000	3	2,200,000	5	3,300,000
4	1,100,000	3	2,200,000	5	3,300,000
6	1,100,000	3	2,200,000	5	3,300,000
7	1,100,000	3	2,200,000	5	3,300,000
8	1,100,000	3	2,200,000	5	3,300,000
9	1,100,000	3	2,200,000	5	3,300,000
10	1,100,000	3	2,200,000	5	3,300,000

## Methods

### 1. Population genetics analysis



### 2. Whole genome and RNA sequencing



## Conclusion

- Population genetics analysis**
  - Analysis of the *Rcc* housekeeping gene sequence data indicated substantial genetic diversity between the isolates supporting the data of Hjortshøj et al. (2012).
  - Due to the high degree of conservation typically observed with housekeeping genes on account of their critical role in basic cell maintenance these genes were under strong purifying selection, as indicated by the strongly negative values of Tajima's D.
  - In addition, as *Rcc* has recently emerged as a newly important pathogen the negative Tajima's D value observed for the housekeeping genes could partly be explained by a population size expansion.
  - To evaluate the true genetic diversity of this fungus, full genomes sequencing of *Rcc* isolates from multiple geographic locations and non-barley hosts are underway. We hope by this approach to provide valuable insights into the genetic diversity of this organism and to address how this diversity has influenced the evolution of the fungus.
- Genome Analysis**
  - The complete annotation of the genome is still underway. Gene families are still to be identified and we hope that soon we will have a clear vision of *Rcc* genetic structure.
  - The analysis of the fungal RNA expression from the 6 different conditions is also in progress and we hope it will help to uncover putative gene of interest that might be involved in the pathogenicity of the fungicide resistances for example.

The project is making great progress in understanding the genetic structure and diversity of this important up rising pathogen as the basis for optimal sustainable control in Integrated Pest Management.

## Results

### 1. Population genetics analysis

Table 1. Estimation of gene diversity of four R. collo-cygni housekeeping genes

Strain	Seqs	Theta-W	Tajima's D	Number of Haps	Tajima's D	Tajima's D	Tajima's D	F <sub>ST</sub>	F <sub>ST</sub>	F <sub>ST</sub>	F <sub>ST</sub>
str1	14	0.017	0.149	13	0.006	0.017	0.006	0.006	0.006	0.006	0.006
str2	17	0.016	0.165	16	0.005	0.016	0.005	0.005	0.005	0.005	0.005
str3	15	0.016	0.165	14	0.005	0.016	0.005	0.005	0.005	0.005	0.005
str4	15	0.016	0.165	14	0.005	0.016	0.005	0.005	0.005	0.005	0.005
Mean		0.016	0.165	14	0.005	0.016	0.005	0.005	0.005	0.005	0.005

Abbreviations and symbols:  
 \*Nonparametric Mann-Whitney U-test (Mann-Whitney)  
 †Mann-Whitney U-test (Mann-Whitney)  
 ‡Mann-Whitney U-test (Mann-Whitney)

## References

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## Acknowledgements

We would like to thank Dr. U. Gueldener for the seed and assistance for the RNA-seq experiment and for sequencing. Grant funding by the Helmholtz Association (HZ) through the Helmholtz Institute for Plant Pathology (IP2) is gratefully acknowledged.

Sghyer H.

Investigating the genetic structure and diversity of the barley pathogen *Ramularia collo-cygni*



# Biocontrol of *Aphis gossypii* on Okra in Cameroon

Akanksha Singh\*, Sharon Zytynska, Rachid Hannah, Wolfgang Weisser

## Introduction

Okra is an economically important crop in Cameroon and *Aphis gossypii* (the cotton aphid) is one of its major pests. Ants are known to attend aphids for aphid honeydew and in return protect the aphids from predators.

However, the interaction between aphids and ants can vary from mutualistic to antagonistic depending on other biotic and abiotic factors, for example plant variety.

## Research Questions

- (1) Will ants protect aphids in our system?
- (2) Will the ant-aphid interaction vary across different okra varieties?
- (3) Does ant-aphid interaction vary amongst ant species?



Okra      *Aphis gossypii*      Ants on okra attending aphids

## Results

- (1) Aphid growth rate was reduced by aphid predators in open cages, even in ant presence ( $F_{1,99} = 32.44$ ,  $P < 0.001$ ; Figure 1). Hence, no protection by ants. Dominant ants recorded in the field were of *Pheidole* genus.
- (2) Ant-aphid interaction differed amongst okra varieties. Ants marginally reduced aphid growth rate on *Clemson* and *Kirikou* varieties; but significantly reduced it on *Caffeier* variety of okra. ( $F_{1,41} = 5.14$ ,  $P = 0.029$ ; Figure 2)
- (3) In the field experiment ants of genus *Pheidole* favoured okra pearl bodies over aphid honeydew ( $F_{1,108} = 18.36$ ,  $P = 0.001$ ; Figure 3)

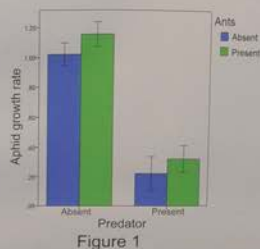


Figure 1

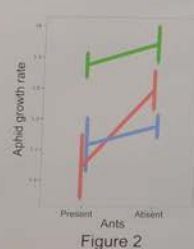


Figure 2

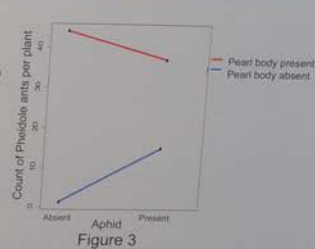


Figure 3

## Methods

- (1) Field study: 4 okra varieties were used and the presence and absence of ants and aphid predators was manipulated.
- (2) Screenhouse study: 3 varieties were used and ant presence was manipulated. Observations were made for ant-aphid interaction.
- (3) Field study: 5 okra varieties were used and observations were made to test for preference of ants over aphid honeydew or plant chemicals (pearl bodies)

## Conclusion

Our study suggests that there is possibility of breeding okra varieties which have pearl body composition that is favoured by ants. This might lead to aphid reduction by ants.



Experiment 1



Experiment 2



Experiment 3

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Biocontrol of *Aphis gossypii* on okra in Cameroon



## Characterization of the rumen microbiome with DNA-classification by qPCR at a different structure supply of beef bulls

Elisabeth Zißler, Chair of Animal Nutrition

### Background

The special ability of ruminants to break down non-edible, fiber-rich biomass and transform it into edible food is due to the complex microbial ecosystem of their rumen. However, only a fractional part of the ruminal microorganisms is already known. Previous studies have been limited to quantitative measurements of (bio)chemical endpoints (e.g. volatile fatty acids, methane) and ruminal degradation rate of the feed matrix. By using advanced molecular biology methods an accurate characterization is facilitated. Aim of the present study was to investigate the influence of different structural supply of beef cattle on the microbiome and the biochemical endpoints of rumen fermentation.

### Methods

**Animals:** 67 Simmental bulls (body live weight 800 kg)

**Diet:** *Pre-experimental phase:* animals were fed to a live body weight of 500 kg with a uniform structure value (SW) of 1,2. *Experimental phase:* animals were divided into three experimental groups with varying structure values: group 1 (SW 1,2 (control group)) was fed a total mixed ration (TMR) based on corn silage, concentrate (about 30% of dry matter (DM)) and straw; group 2 (SW 1,1) received a similar diet without straw; group 3 (SW 0,6) was supplied with a ration containing 70% concentrate and 30% corn silage in the DM without straw supplementation.

**Sampling:** 200ml of rumen fluid were taken from each animal after over night fasting

**Analysis:** Volatile fatty acids (acetate, propionate, butyrate) and pH were measured. qPCR was made for quantitative detection of density of total bacteria in the rumen fluid by 16S rRNA gene

### Results

	SW 1,2	SW 1,1	SW 0,6	p-value	SEM
pH	7,04 <sup>b</sup>	7,06 <sup>ab</sup>	7,15 <sup>a</sup>	0,040	0,03
acetate [mmol/l]	38,35	35,56	31,28	0,120	0,15
propionate [mmol/l]	8,08	7,50	6,51	0,199	0,05
butyrate [mmol/l]	4,58	4,05	3,77	0,142	0,03
total bacteria [log <sub>10</sub> /gTM]	9,76	9,87	9,89	0,399	0,08

Table: Mean pH and content of volatile fatty acids in rumen fluid (acetic acid, propionic acid and butyric acid [mmol/l]) and mean density of bacteria in the rumen (log<sub>10</sub> of gene copy number per gram of dry matter); values with different superscripts indicate significant difference

A numerical trend for a decrease of the amount of all measured volatile fatty acids (acetic acid, propionic acid, and butyric acid) in the experimental groups with a lower supply of structure was observed. Contrary to volatile fatty acids, the pH value in the rumen fluid significantly increased with decreasing SW. With decreasing structure the total density of bacterial DNA rose from 9,76 through 9,87 to 9,89 log<sub>10</sub> gene copies/g DM. These effects did not reach statistical significance.

### Conclusion

A different structure supplementation of beef bulls had an effect on the fermentation endpoints and the density of total bacteria in the rumen. Because the sampling was conducted 24 hours after the last feeding, the observed effects indicate an interaction between the ruminal microbiome and the host.

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Zißler E.

*Characterization of the rumen microbiome with DNA-classification by qPCR at a different structure supply of beef bulls*