Master thesis topics APS 2021-2022

Dear students of APS,

This booklet comprises a compilation of possible master thesis subjects at the Animal Production Systems (APS) group. Now, in April 2021, we anticipate that these topics will be possible in the academic year 2021/2022, but I have to give a disclaimer here: there may be reasons that the topic is not possible. The APS staff will, however, do their utmost best to accommodate you in a master thesis research that is close to your interest.

Each Master thesis research starts with an intake meeting with me. You should make an appointment via the secretary of the APS group lia.verheijen@wur.nl. Lia will provide you an intake form to indicate your interests and to give some back ground information. At the intake meeting we will further discuss options.

I hope to meet you soon!

Kind regards

Simon Oosting,

Chairholder Animal Production Systems group

Which type fits best?

Key words: Circular Food Systems

To reduce the global impact of livestock production, there is the call for transitioning towards a circular food system. In such a system, land is primarily used to produce products for human consumption, while livestock is fed on waste streams and leftovers. This also means a big transition for livestock, i.e. from receiving high quality feed to maximize *milk/ meat/ egg* output, towards a feed with more fibers, wet, and human-inedible ingredients. Given this shift, the following question arises: "do we keep on breeding for the same high productive animals or do other animals traits become more important in a circular food system?" To find the answer, an existing computer model will be used to determine which traits impact the role of animals in a circular food system.

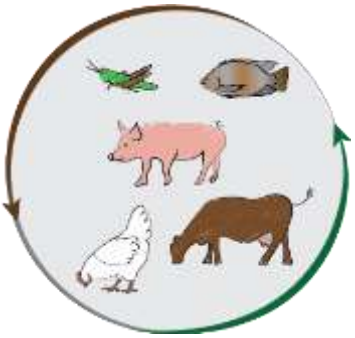
The aim of this thesis is to explore which animal traits are key for pigs to thrive in a circular food system.

Starting date: Available from May-June 2021 onwards

COVID-19 disclaimer: not applicable. A desk study will be performed for which a literature study and modelling are key activities.

What’s for dinner? Livestock diets in a circular food system.

Key words: Circular Food Systems



https://www.agric.wa.gov.au/sites/gateway/files/styles/page_featured_image/public/M15_8399%20Pig%20pellets.jpg?itok=zURFc8ZV

In a circular food system, land is primarily used to produce products for human consumption, while livestock is fed on waste streams and leftovers (e.g. rapeseed meal, soy hulls, sunflower meal). Using the APS circular food systems model, the amount of livestock production and feed consumption in a circular food system can be estimated. In this model, the diets of livestock are currently formulated based on i) the animals’ basic nutritional requirements and ii) the availability of low-opportunity cost biomass. The predicted diets, however, have yet to be evaluated on the extensive nutritional profile (e.g. amino acids, minerals, vitamins) an properties. Would you be interested in gaining knowledge on circular diet formulation for livestock?

The aim of this thesis is to evaluate the predicted livestock diets in a circular food system.

Starting date: Available from May-June 2021 onwards

COVID-19 disclaimer: not applicable. A desk study will be performed for which a literature study and modelling are key activities.

Feeding leftover diets to pigs, what is the environmental impact at animal level?

Key words: Circular Food Systems

In a circular food system, land is primarily used to produce products for human consumption, while livestock is fed on waste streams and leftovers (e.g. rapeseed meal, soy hulls, sunflower meal). By feeding leftovers, the environmental impact of feed production and thereby pig production can drastically decrease. However, what are the effects are at animal level? Will manure output and emissions be affected? How does that affect the environmental impact? To investigate how feeding leftover diets affect the environmental impact at animal level, a literature study and/ or life cycle assessment may be performed. Do you want to dive deeper into this topic?

The aim of this thesis is to evaluate at animal level the environmental impact of feeding pigs with leftover diets.

Starting date: Available from September 2021 onwards

COVID-19 disclaimer: not applicable. A desk study will be performed for which a literature study is a key activity.

Food competition induced by pet animals

Key words: Circular Food Systems

Photo by Alex Gruber on Unsplash

In a circular food system, land is primarily used to produce products for human consumption, while animals are fed on waste streams and leftovers. Although one might think that this only refers to animals kept as livestock, we also have to consider the feed consumption by our pet animals. As pet owners have an increasing interest in feeding premium diets containing food-grade ingredients they may (unintentionally) increase feed-food competition. Would you be interesting in studying pet food consumption, the trend of feeding human-edible ingredients and thereby feed-food competition?

The aim of this thesis is to evaluate the (human-edible) food consumption induced by pet animals

Starting date: Available from September 2021 onwards

COVID-19 disclaimer: not applicable. A desk study will be performed for which a literature study is a key activity.

Title: Livestock, circularity and environmental impacts in Kenya

APS key words: Livelihood, Environment, Circular Food Systems

Illustration

Description

Kenya has many smallholder mixed crop-livestock farms. Ruminants (dairy cattle, sheep and goats) can be found at such farms. Traditionally, such farms have a high degree of circularity, since crop residues and grazing on marginal lands are the major feed resources whereas manure is utilized for crop fertilization. With increasing intensification of livestock production at such farms, use of external inputs increases and the degree of circularity may decrease. This master thesis project has the objective to get insights into the degree of circularity at farm level and at regional chain level for different farming systems in the Kenyan Highlands and to explore options for improvement of circularity on food production potential, contribution to climate change and pollution, and land use. You will contribute to the data collection at different farming systems with livestock in Kenya and in the input and output value chains of the farming systems. You will use the data to describe and explain the present situation and to develop and explore options for improved circularity. Such improvement options will be presented in development scenarios which will be evaluated.

Starting date: between September 2021 and June 2022.

COVID-19 disclaimer: if travel restrictions due to COVID-19 are still in place, data collection in Kenya will not be possible, and the study will be based on already collected data.

Title: Black soldier fly larvae meal as novel protein source in dairy cow rations in Kenya

APS key words: Livelihood, Environment, Circular Food Systems

Description

In the livestock sector, there is a high demand for nutrient-rich feeds (concentrates) that increase the productivity of the animal (e.g. soya and maize). However, many of these feed sources do not belong in a circular food system, because they compete with direct human consumption of crops. Therefore, there is a demand for alternative feed ingredients. Insect farming is considered an alternative feed because of its contribution to the circular food system by converting bio-waste into high quality feed ingredients, its low land and water requirements, and its low carbon footprint. The black soldier fly larvae (BSFL; Hermetia illucens) is a promising species because, thanks to a rich gut microbiota, this larvae can grow on a wide range of organic waste streams including urban waste. This makes them ideal candidates to contribute to solving the current problem of organic waste streams in developing countries while producing a promising protein source that can be reused in the food system. Unlike in Europe, it is permitted in Kenya to feed insects to ruminants such as dairy cows. Via a feeding trail we will test the potential of BSFL meal as a substitute for soybean meal protein in a dairy cow ration. Milk, feed and manure samples will be collected and analyzed. The research will be conducted at the research facilities of Egerton University, Nakuru, Kenya.

Starting date: between September 2021 and January 2023.

COVID-19 disclaimer: if travel restrictions due to COVID-19 are still in place, data collection in Kenya will not be possible, and the study will be a literature review.

Title: Manure management at intensive livestock farms in Kenya

APS key words: Livelihood, Environment, Circular Food Systems

Description

One of the principles of circular food systems is safeguarding of natural resources. This means that the use of resources should not exceed their regenerative and absorptive capacity to ensure that the resource remains available. However, in Africa, the nutrient uptake of crops are often higher than the nutrients applied, leading to soil mining. Due to this inadequate fertilization (e.g. manure), the crop yields remains low. However, another practice commonly observed in Sub-Saharan Africa is the application of manure to fields close to the homestead. Access use of fertilizer has negative effects on the environment. It can cause eutrophication, soil acidification, greenhouse gas emissions, ammonia emissions, etc. To safeguard the natural resources (i.e. soil), the use of manure and other (in)organic fertilizers have to be properly managed. Another principle of circular food systems is recycling inevitable and unavoidable nutrients, and carbon in by-products back into the system. Animal manure is an example of such a by-product. In Sub-Saharan Africa, (liquid) manure is often not managed or applied, but gone for waste. In case the manure is used, the nutrient composition of manure at moment of land application has decreased due to poor management practices. Environmental conditions (e.g. temperature, humidity, rainfall, wind) influences the nutrient losses (e.g. emissions) during storage. In this study we will look at the manure management practices (i.e. capture, storage, treatment, and utilization) of intensive livestock farming systems in Kenya. Additionally, we will assess the effect of different manure storage methods on the nutrient losses between moment of manure collection and field application.

Starting date: between June 2021 and September 2021.

COVID-19 disclaimer: if travel restrictions due to COVID-19 are still in place, data collection in Kenya will not be possible, and the study will be based on already collected data.

Title: Sustainability certification in livestock production

APS key words: Integrated sustainability assessment, food system, farmers

Illustration

Description

Worldwide a large number of sustainability certification schemes have been developed to stimulate more sustainable production and consumption of food. Well-known examples include the Better Life (NL) label, Origin Green (Ireland) and GlobalG.A.P. (Global). While the consumption of certified products continues to increase, the effectiveness of certification, in other words does it stimulate more sustainable production practices, is unknown. Also the experiences of farmers with sustainability certification are hardly gathered. For instance, do these schemes really stimulate farmers to produce more sustainably? And what kind of investments do they need to make to comply to the certification schemes?

In this project you will explore what is known in literature regarding certification schemes, and gather insights from farming practice using interviews. Your task will be to review scientific literature and gather the experiences with, and effectiveness of, sustainability labels and certification schemes in the livestock sector, covering animal welfare, social and environmental issues. Through interviews with certifying organizations, auditors and farmers you will gather more insight into the experience and motivation in practice. In this project, you will focus on either dairy, pig or poultry production.

Starting date: between September 2021 and September 2022.

COVID-19 disclaimer: interviews might not be possible in person, but should be arranged online, depending on the situation

Title: Effects of light intensity on air quality in pig housing

APS key words: sustainability, pig husbandry & climate, animal behaviour

Illustration

Description

This thesis topic is part of the "Enlighted Pigs" project, which aims to integrate light with animal-friendly and sustainable farming.

The pig sector is facing several challenges in its ability to operate under socially acceptable circumstances, to produce in an environmentally friendly way and to remain economically viable. Within the realm of possible solutions for these sustainability challenges, the role of light has remained underexposed so far.

It is known, however, that light can be used to direct the behaviour of pigs, and this knowledge can help in developing smart light settings that improve the environmental sustainability of pig production. For example, lower light intensities might reduce the pigs' activity level, and applying a spatial gradient within the pen (in which the resting area is darker than the dunging area) can help to improve the use of each functional area. As a result, pen fouling may be reduced, air quality in the barn may improve and environmental emissions could be decreased.

Testing such hypotheses could be an aim of your thesis project. The experimental setup of the Enlighted Pigs project is still under development and your exact topic will be further specified based on your personal interests and the possibilities at the start of the thesis. Practical work and data analysis can include air quality measurements (e.g. NH_3, dust), behaviour observations and pen fouling scores.

Starting date: September 2021

COVID-19 disclaimer: if there are restrictions concerning the number of visitors entering the farm due to COVID-19, on-farm data collection might not be possible.

title: **Dairy farming in the Alblasserwaard (NL): towards a biodiversity-friendly farming in peat soils**

APS key words: farming systems; dairy; environment; biodiversity; document analysis

Description:

Biodiversity in the Netherlands is declining, especially those species associated with agricultural areas (e.g. meadow birds, butterflies and mammals). The decline is happening despite of the great efforts from conservation organizations, farmers and farmer organizations, and the mobilization of resources (e.g. subsidies or regulations) dedicated to halt biodiversity loss. The Dutch Research Agenda has recently launched the programme "Living labs for the restoration of rural biodiversity" with the aim to gain insight into the practical possibilities to restore biodiversity.

The research will be linked to the Living Lab 'Alblasserwaard', situated on peat soils (Netherlands). The project involves investigating which management practices in dairy farming in pet soil areas are acknowledged to harm biodiversity and which can strengthen biodiversity. Ideally, you will also think how a change towards a biodiversity friendly farming systems could be enabled.

Starting date: available

Title: The role of livestock in the new EU Biodiversity strategy 2030

APS key words: farming systems; environment; biodiversity; policy; document analysis

Description:

The loss of biodiversity is of great concern. Ambitious targets have been set worldwide to halt biodiversity loss. The EU adopted the EU Biodiversity strategy 2020 to halt the loss of biodiversity by 2020 by, for instance, achieving a "more sustainable agriculture". The results, however, have not achieved the expected outcomes. Recently, the EU launched a public consultation (to experts and society) to draw and launch the new Biodiversity Strategy 2030.

What was expected from agriculture, and particularly from livestock, in the Biodiversity strategy 2020? What was the "feedback" posted in relation to agriculture and livestock? How much has the Biodiversity strategy changed compared to 2020? What is the "new role" for livestock? How much of the feedback has actually been up-taken?

In this thesis you will analyze the feedback received by the EU (it is public). Which stakeholders provided feedback? What are the main claims and recommendations? Or what are the implications for agriculture and livestock?

Starting date: available

Title: What should we conserve and how? Stakeholder views on biodiversity conservation in dairy production.

APS key words: Biodiversity, Ecosystem services, Livelihood, Environment

Illustration

Description

There is much attention for biodiversity conservation in agriculture. However, biodiversity is a broad concept, and there are many different views on biodiversity conservation. You will interview farmers and/or other stakeholders and perform supplementary literature study to unravel these different views. Which aspects of biodiversity are considered important, and why? What could farmers do to conserve or manage biodiversity? Which type of support is needed? The focus will be on dairy production; either in the Massif Central uplands of France (good command of French required; financial support for conducting the research to be discussed) or the coastal lowlands of the Netherlands (good command of Dutch required). The interviews will be conducted digitally or in person, depending on travel restrictions and project planning.

Starting date: immediately available.

Small ruminants in circular food systems

APS key words: Environment, Circular Food Systems

Description

Ruminants are an import source of nutritious animal-sourced food in circular food systems due to their ability to upcycle grassland resources. Current circular food system modeling focusses on dairy cattle and beef cattle production but what about sheep or goats? Your thesis will involve adding a small ruminant production system to the CiFoS-NL model. The CiFoS-NL model is a circular food system model of the Netherlands which optimises crop and livestock production to meet the nutritional requirements of the Dutch populations while minimising GHG emissions and land-use. Firstly, you will be tasked with quantifying the nutrient requirements, milk and meat yields and herd structure of an average small ruminant production system in the Netherlands. Secondly, running your newly created small ruminant system in the CiFoS-NL model and assessing the impact on GHG emissions, land use, and human nutrient supply. (BvSCvM)

Starting date: End of October 2021*

*Starting earlier is possible in consultation

Title: Restoring nutrient cycles in the Chinese dairy sector by recoupling animal and crop production

APS key words: Dairy, Crop Production, Food Systems, Modelling, Environmental Impacts, Nutrients

Description

Milk production in China has greatly increased over the last few years. This has led to intensification and specialization of dairy farms in many regions of China, an increased reliance on the import of feed, and decoupling of previously linked crop and dairy production. Dairy farmers face difficulties to return their animal manure to fields, and the efficiency of resource use is low. As a result, significant amounts of valuable elements, such as nitrogen (N) and phosphorus (P), are lost to the environment, causing environmental issues like eutrophication and global warming. In this master thesis, you will explore options for sustainable development of dairy farming systems in China. Data collection to quantify farm productivity and environmental performance of both crop and dairy production systems, improving nutrient cycling through optimizing the use of local resources, and exploring options to efficiently recouple dairy and crop production are among the topics you could work on. The study area is Henan province but thesis work can also be restricted to a desk study in the Netherlands using already collected data. (YWCvM)

Starting date: any moment

COVID-19 disclaimer: if travel restrictions due to COVID-19 are still in place, data collection in China will not be possible, and the study will be based on already collected data.

Resilience in dairy cows

Cow data before calving can be an indicator for illness after calving. Several possibilities have been developed in an ongoing project. One of the investigated indicators for resilience were methane measurements, taken in adapted concentrates feeders.

Methods have been developed to determine methane peaks in the outgoing breath of dairy cows. The characteristics of these methane peaks (number of peaks, interval length, height) might be an indicator for health problems, but this is not yet clear.

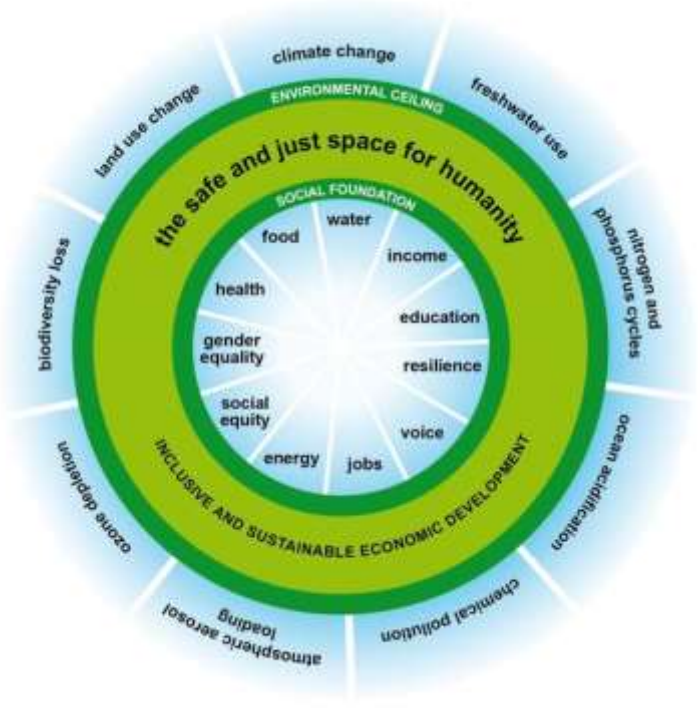
You can help to explore these relations!

- Type of work: data analysis, modelling, literature review
- Societal relevance: improving resilience of dairy cattle
- Start: at present
- Subject will be refined taking the interests of the student into account and at moment of start.
- See also: https://www.wur.nl/en/article/Increasing-resilience-of-farm-animals.htm

Title: Defining a social foundation for livestock production systems

APS key words: Doughnut economics, circularity, human and animal needs

Illustration



(Raworth, 2012)

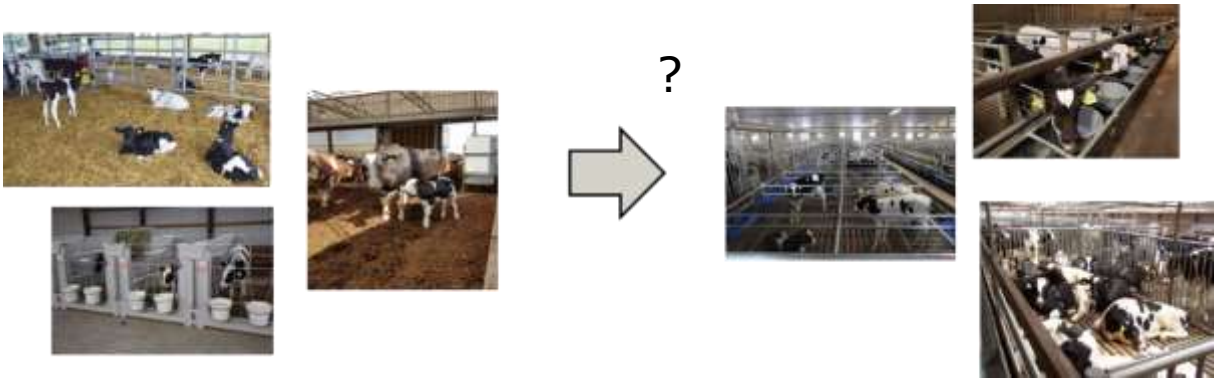
Description

Circular agriculture is a widely discussed issue. Circular agriculture can be seen as a way to produce within the environmental ceiling of our planet (picture). Nevertheless, when we discuss circularity, it mainly refers to environmental issues, while we also want to ensure a social foundation in which the needs of people and animals are taken care of. Over the past few years, the concept of Doughnut Economics, as developed by Kate Raworth, is getting more and more attention. How can we translate this concept to the food system, or more specifically, to livestock systems? What indicators would we have to include to study the social foundation? Not only the work of Raworth, but also many other institutes are increasingly studying approaches towards a broader perspective on our welfare. How do these approaches relate to each other, and to social sustainability in general? Your task is to develop an overview of current approaches that aim to give insight into the social foundation (and wellbeing) including indicators for both human and animal needs within the context of livestock production systems. These insights will be valuable for current research projects in which we aim to define the safe and just operating space for our food system, and in specific regions, such as the North of the Netherlands (CAN-DO-IT project). (EO)

Starting date: between September 2021 and September 2022.

Identification of risk factors of growth and mortality of veal calves based on data analysis

Keywords: Veal calves, growth, mortality, early rearing conditions, dairy farm of origin, data analysis, statistical methods



Male (and surplus female) dairy calves are transported at the age of approximately two weeks from the dairy farm of origin to a veal farm, to be raised for meat production. Upon arrival at the veal farm, calves frequently exhibit health problems, some of which are associated with a higher risk of mortality. The sometimes high disease and mortality rates in veal calves are likely related to the various challenges these animals are exposed to, including transport and mixing with other animals. In addition, early rearing conditions at the dairy farm of origin, related to housing, feeding and management, may influence the later risk of disease and mortality. In this project, we will use a large data with information on early rearing conditions of calves on a large number of dairy farms as well as performance data recorded on the veal farm and at slaughter – including growth, carcass weight and mortality rate – of calves originating from the same dairy farms. **Using advanced statistical methods, we will analyse the relationship between early rearing conditions at the dairy farm and later growth and mortality of calves at the veal farm.** In this way we will identify risk factors for veal calf performance and mortality. Based on this knowledge, dairy farmers may improve and adjust their rearing system for future veal calves, and improve the health and resilience of the animals.

Starting date: anytime from September 2021 onwards.

COVID-19 disclaimer: this project remains possible during lockdown.

Title: Effect of light intensity on the circadian rhythm of pigs

APS key words: animal welfare, pig husbandry, animal behavior, animal health

Illustration

Description

Light is a natural cue that regulates physiological processes and influences the behavioral rhythmicity of animals, such as pigs. Pigs usually show a recurring circadian rhythm, being more active at daytime and displaying more feeding behavior around light onset and offset. In literature, disrupted circadian rhythms have been associated with health issues in several animal species. Light intensity is an important light parameter that can affect circadian rhythmicity, however, the relation between light intensity and behavioral rhythmicity is not clear for pigs yet.

The aim of this study is to uncover the effect of different levels of light intensity on the circadian rhythm of (individual) pigs, through the rhythmicity of their active and inactive behaviors. Possibly the role of a stable circadian rhythm on the pigs' health status can also be investigated.

You will study the literature to select interesting behaviors and methods for analysis in this study. You will be involved in the collection of data from video recordings and on-farm health assessments. You will analyze the collected data, study behavioral rhythms and health of pigs and compare results between various light treatments.

Starting date: September 2021

COVID-19 disclaimer: if there are restrictions concerning the number of visitors entering the farm due to COVID-19, data collection on-farm about pigs health will not be possible.

Title: Effect of light intensity on pigs' social interactions

APS key words: animal welfare, pig husbandry, animal behavior, social interactions

Illustration

Description

Pigs use their vision to recognize and interact with conspecifics. Lighting conditions might influence pigs' ability to perceive their pen mates and therefore affect their social interactions. In literature it was shown that increased light intensity can improve social behavior by reducing aggression. It might also play a role in other behaviors, as shown for poultry, in which light intensity affected pecking behavior. The range of light intensity explored in literature is limited and further research is needed to uncover how light intensity influences social interactions in pigs.

The aim of this study is to unravel the effect of light intensity on the display of positive and negative social behaviors. Hereby, a social network analysis could help to understand the role of lighting conditions in group interactions.

You will study the literature to select interesting behaviors and methods for analysis in this study. Data on social interactions will be collected from video recordings. You might also take part in health assessments on the farm to strengthen your analysis of social interactions and social network in order to give more insights on the optimal lighting condition for pig welfare.

Starting date: September 2021

COVID-19 disclaimer: if there are restrictions concerning the number of visitors entering the farm due to COVID-19, data collection on-farm about pigs health will not be possible.

Title: How do social interactions influence pig feeding patterns?

APS keywords: Animal welfare, behaviour, sensor data

Illustration

Description

The use of electronic feeding stations to monitor the feed intake of individual growing-finishing pigs is becoming more common. These feeding stations have potential to continuously monitor pig production, health and welfare, in real time. The current use of feeding station data is, however, limited. Much variation in pig feeding patterns is present, which must be understood before feeding station data can be reliably interpreted. Previous studies have shown that dominance rank is a big contributor to this variation, as dominant and subordinate pigs show vastly different feeding patterns. The social network of pigs, however, consists of more than just dominance rank, with for example some pigs being involved in more social interactions (both positive and negative) than others. The aim of this project is to assess whether the position of a pig in the social network influences its feeding pattern. You will search the literature to develop a method with which social networks can be identified and quantified, will apply this method through video analysis, and will relate the identified social networks to the feeding patterns of individual pigs.

Starting date: Between July 2021 – August 2022

COVID-19 disclaimer: Visits to the pig farm may be possible depending on travel regulations.

Title: Can feeding station data be used to identify sick pigs?

APS keywords: Animal health, behaviour, sensor data

Illustration

Description

Rapid identification of sick growing-finishing pigs is required to provide adequate medical treatment of the disease, which can protect pig welfare and production. Disease is often accompanied by a reduction in feed intake, as has for example been reported during pneumonia. Nevertheless, other diseases, such as lameness, were reported not to reduce feed intake, but to solely alter the behaviours that underlie intake: feeding duration, frequency and rate. Electronic feeding stations can provide detailed information on the feeding behaviour of individual pigs, and this data can hence potentially be used to identify sick pigs in real time. The aim of this project is to develop a method that uses pig feeding station data to identify sick individuals. You will select promising feeding behaviours through literature research, will manually obtain health scores on farm, and will compare these health observations to the selected feeding behaviours.

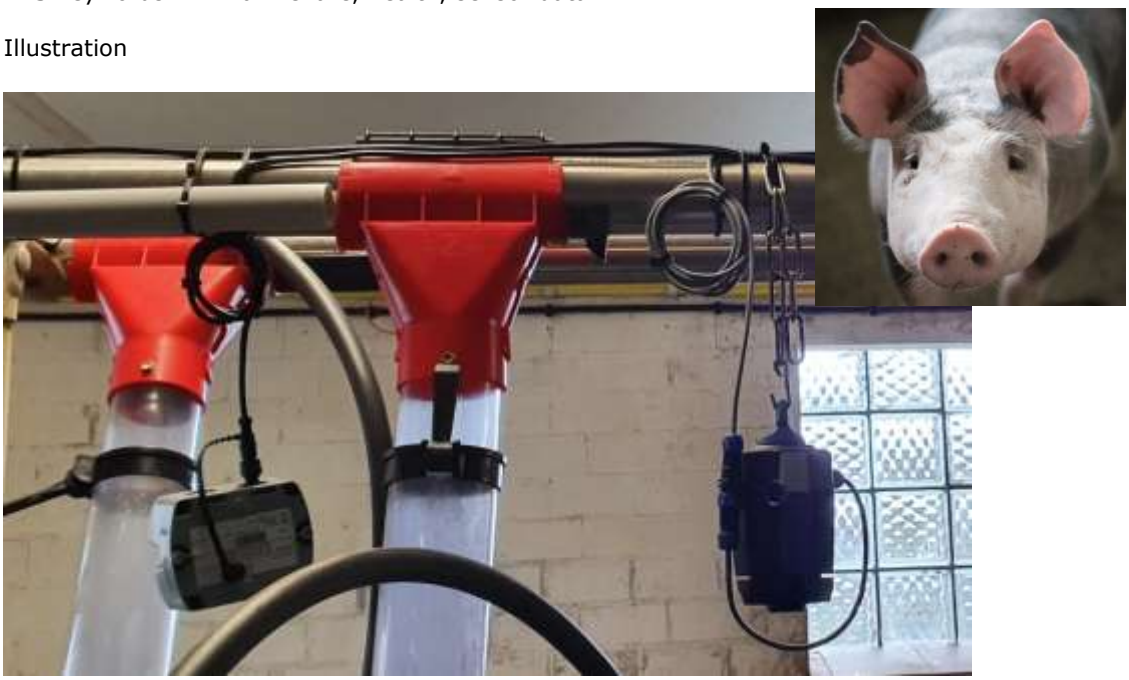
Starting date: Between July 2021 – September 2022 & Between March 2022 – August 2022

COVID-19 disclaimer: Only students that live in the Netherlands or Germany during the thesis can perform health observations at the pig farm. If travel regulations become stricter and the farm cannot be visited, already collected data is available.

Title: The impact of climate on pig health, welfare and production

APS keywords: Animal welfare, health, sensor data

Illustration



Description

At present, modern technological developments, including real-time climate monitoring systems, are increasingly used on pig farms. These systems generate farm data, such as ambient temperature, relative humidity, NH3 and CO2 concentrations, that can support on-farm management decisions. The barn climate has a major impact on the production, health and welfare of growing-finishing pigs. For example, experimental studies have reported that high ammonia concentrations can induce lung lesions and that extreme ambient temperatures influence feed intake and growth. How variations in the barn climate, e.g. daily fluctuations, influence pigs is, however, less clear. The aim of this project is to explore how climatic variations impact on pig production, health and welfare. You will explore automatically-collected climate data and will manually collect data on pig production, health and welfare on-farm and from video. Finally, you will compare the climate data to the manually-collected data to explore how climate influences pig production, health and welfare.

Starting date: Between July 2021 – September 2022 & Between March 2022 – August 2022

COVID-19 disclaimer: Only students that live in the Netherlands or Germany during the thesis can perform observations at the pig farm. If travel regulations become stricter and the farm cannot be visited, collected data is available.

Early detection of disease in veal calves via sensor technology

Keywords: Animal welfare, animal health, veal calves, sensors, accelerometers, automated milk feeders, 3D cameras

Young calves have a high morbidity and mortality rate and detection of health issues at individual level and at an early stage of disease is limited due to increasing farm and group sizes. Sensor technology combined with intelligent algorithms can support farmers in identifying sick calves early on and this can enable prompt treatment, in turn minimising medicine use and spread of disease. Many sensors exit which can collect behavioural and physiological data on calves, but the question is: **which (combination of) sensor(s) can best support the early detection of health issues in calves?** This project combines 3D cameras and regular cameras with automated milk dispensers and manual health checks to record the growth, activity and feeding patterns of veal calves.

The student(s) will visit the veal farm twice per week (a car is an advantage) to collect clinical health scores, and receive the data collected by the sensors. Multiple students can join at the same time or at different times.(LW)

Starting date: anytime from July 2021 onwards.

COVID-19 disclaimer: this project remains possible during lockdown.

Physiological markers of negative and positive welfare in dairy cows

Keywords: Dairy cattle, animal welfare, physiology, HPA axis, acute stress, dysregulation

When faced with repeated negative events, animals can experience chronic-stress. At the physiological level, chronic-stress manifests itself as maladaptive physiological responses to acute stress. There are two possible ways that chronic-stress dysregulates normal physiological responses to acute stress: 1) with a hypersensitive physiological response, whereby the response is heightened and exaggerated, or 2) with a blunted physiological response, whereby the response does not react so strongly to acute stress anymore. The (mal)adaptive physiological responses of animals to acute-stress can hence be used as a general indicator of animal welfare – as it reflects repeated stress in an animal. In our experiment, 48 dairy cows were exposed to either repeated negative or positive events for a period of 6 weeks. Cows were also exposed to an acute-stress, i.e. a hoof-trimming procedure, both before and after the induction of the positive and negative treatments. Blood samples were collected both on a weekly basis to measure albumin, NEFA, total protein, BHBA, haptoglobin and cortisol; and during the acute-stress procedures to measure magnesium, NEFA and cortisol.

The student will receive these data and analyse them to establish how the repeated exposure to positive and negative events impact baseline levels of physiological markers in dairy cows; and whether the repeated exposure to positive and negative events in dairy cows alter individual physiological responses to ulterior stressor. In addition, the student will conduct a literature review to study the different biomarkers included in this study. (LW)

Starting date: as soon as possible

COVID-19 disclaimer: this project remains possible during lockdown.

Grazing behaviour of sheep on solar farms (in California)

Keywords: solar farms, grazing, sheep, welfare, biodiversity

There is an opportunity for students to study grazing behaviour of sheep in San Luis Obispo, California, in collaboration with California Polytechnic State University. Grazing sheep can be used to keep vegetation low at a low cost on solar farms, while the solar panels may provide protection from extreme weather to the sheep, in a win-win context. The sheep are fitted with HOBO data loggers that record grazing and other behaviours. Cal Poly has a flock of approximately 80 ewes available for the project. The student would have to fly to California for this project to collect the data and do most of the work over there. Cal Poly can help with finding housing in San Luis Obispo. Borrowing or renting a car or bicycle is highly recommended for the project to get around. (LW)

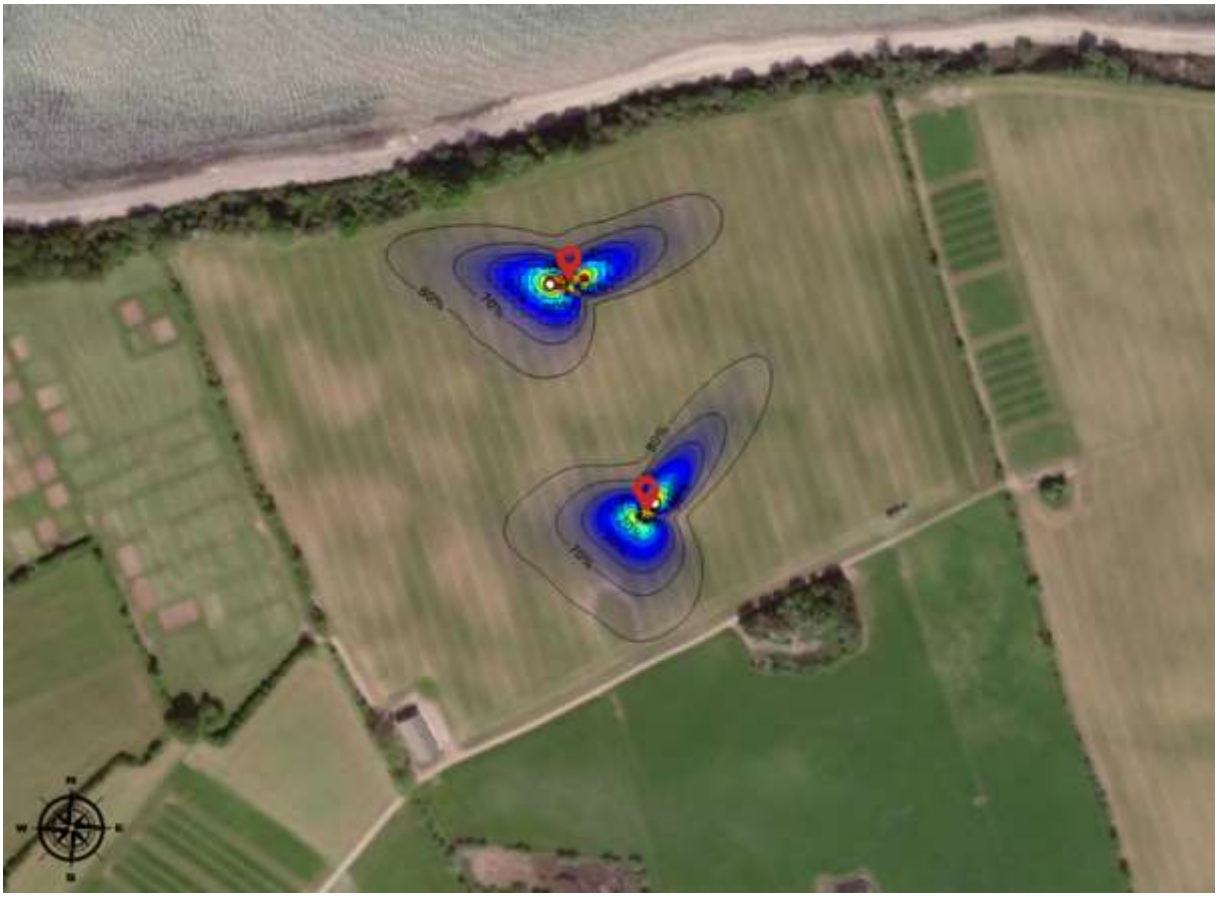
Starting date: Project dates will have to be discussed with Dr. Zachary McFarlane and Beth Reynolds from Cal Poly.

COVID-19 disclaimer: This project is not possible during lockdown.

Behavior and methane emissions of Jersey cattle grazing on a clover-grass pasture

APS key words: Grazing, Methane emissions, Eddy covariance

Illustration



Description

Methane emissions from dairy cattle is one of the largest contributors to agricultural greenhouse gas emissions in Germany and Europe. Using an intensive rotational grazing system with very low external inputs is a potential measure to reduce the methane intensity of milk produced. Since such a dairy production system aims at increasing circularity, other negative environmental impacts, such as nitrous oxide emissions and nutrient leaching, might be reduced as well. Within this master thesis, the interactions between cattle behavior, season of the year and measured methane emissions will be analyzed in detail. You will use data from eddy covariance systems measuring methane fluxes at a pasture in northern Germany and relate these to cattle positioning and activity obtained from frequently recorded photographs. One of the main tasks, therefore, will be to conduct image analyses leading to profiles of cattle movement during grazing. In addition, footprint analyses of eddy covariance measurements will be conducted to relate methane fluxes to cattle behavior. These analyses will give valuable results for cattle activity and its effects on methane emissions allowing conclusions for optimized pasture and grazing management to reduce the methane intensity of milk production. (FT)

Starting date: between June 2021 and April 2022.

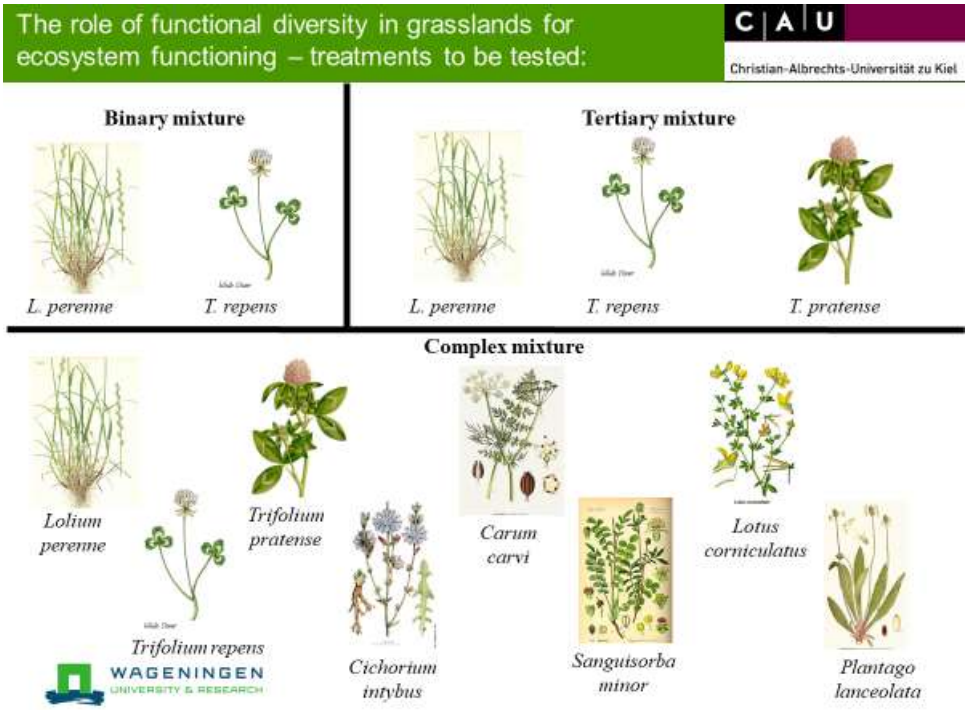
Supervisor: Dr. Arne Poyda / apoyda@gfo.uni-kiel.de

Impact of the species diversity on the diversity of soil microbes: a comparison of grassland leys and cereal monocropping

APS keywords: qPCR, biodiversity, soil health

Description:

Production systems have a strong impact on soil microbial communities. Particularly fertilization and tillage events, but also the presence of legume are factors that affect microbial abundance and diversity. Generally, grasslands have shown to provide higher microbial biomass. This can in turn effect nutrient cycling. However, little is known about how pasture diversity can additionally enhance microbial diversity and abundance.



Hence, an experiment is planned where soil samples from maize monocultures and pastures with a gradient in diversity will be taken and analyzed via qPCR for microbial diversity, as well as for microbial abundance. Dependent on the workload, the effect of sward age could also be analyzed, to determine the rate of change in microbial biomass after converting arable land to pasture and vice versa. These results will yield valuable insights into the benefits of pastures for soil health and nutrient cycling. (FT)

Starting date: between June 2021 and April 2022.

Supervisor: Dr. Carsten Malisch / cmalisch@gfo.uni-kiel.de

Growth in animal source food consumption: a contribution to food security?

APS keywords: food security, animal sourced food consumption, income diversity

The demand for animal source food (ASF) is increasing, caused by an increase in world population, urbanization and an increase in wealth. Currently, livestock provides 18% of the calories and 25% of the protein for human consumption. An increase in consumption of ASF can contribute both positively and negatively to nutrition and health. The goal of this research is to contribute to the debate on the place of ASF in sustainable food systems by assessing consumption patterns on a global scale.

Using databases available at the World Bank, FAO and others, the study will provide a disaggregated assessment or ASF consumption by type of products, income levels and country. It will discuss different types consumption and their relative contribution to food security by comparing current consumption levels to National Dietary Recommendations. Implications for future growth trends, and sustainability policies will also be discussed. The main contributions of this study are the global picture it will provide, and the use of detailed datasets to assess consumption for sub-national income groups. Results will be published in a peer-reviewed journal. (PG)