KU LEUVEN

TRANSfarm

PILOT FACILITY

for circular bio-economy

TRANS farm
KU Leuven

INTRODUCTION

The transition to a circular and bio-based economy is essential due to our reliance on non-renewable resources and their geopolitical impacts. This shift requires changes in behavior and consumption patterns, and also faces challenges such as limited space, the need for housing and food, and regulatory hurdles.

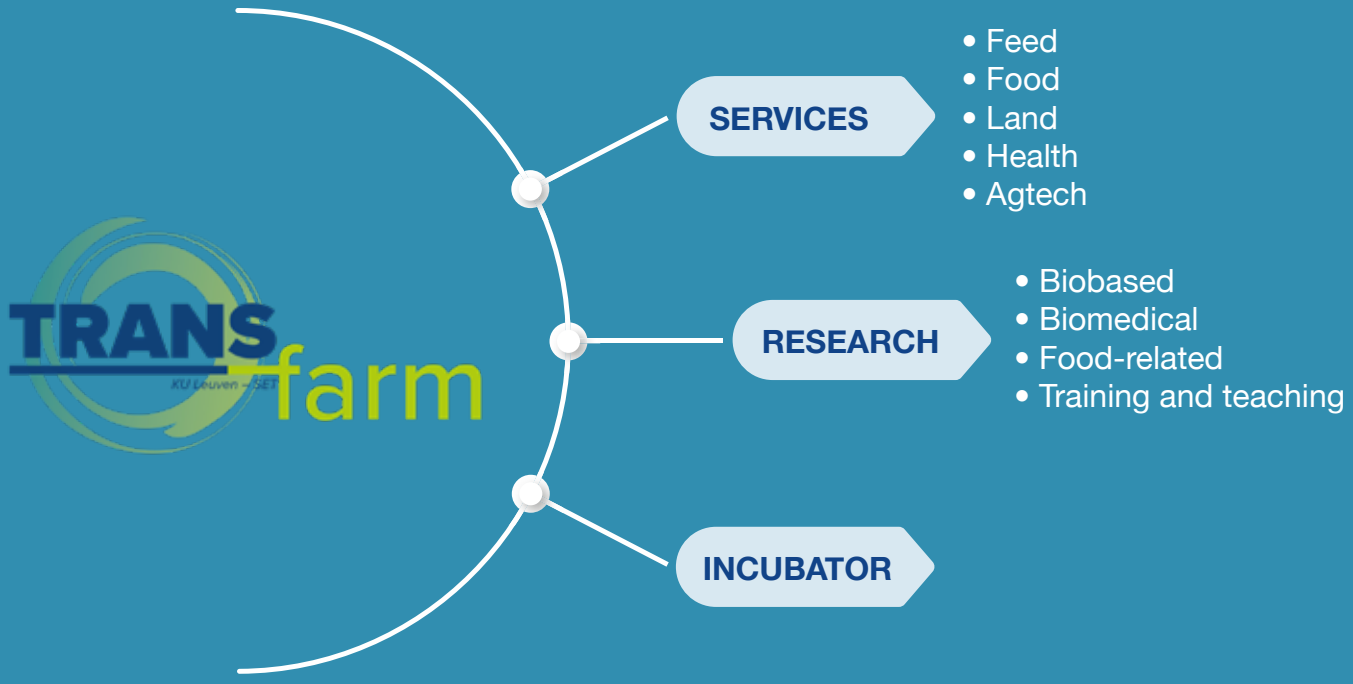
TRANSfarm addresses these issues by providing a unique environment where KU Leuven researchers and partners can scale up their lab expertise to a pilot scale, translating grams to tons and ml to m^3, and turning residues into valuable side streams.

TRANSfarm fosters interdisciplinary collaboration, transforming by-products into valuable resources and addressing challenges in a holistic manner. This pilot infrastructure not only advances technological innovation but also serves as a training ground for future specialists.

By connecting stakeholders, entrepreneurs, and experts, TRANSfarm accelerates the development and evaluation of cutting-edge technologies, driving forward the circular bio economy. Discover the innovative projects already thriving at TRANSfarm today.

Welcome.

FACILITATES SCIENTIFIC RESEARCH ON A PILOT SCALE



TRANSfarm: Where lab expertise transforms into practical solutions.
Part of the Group Science & Technology of KU Leuven.

SERVICES: ANIMAL PRODUCTION MODELS

The recognized and certified **TRANSfarm facilities** provide research services to KU Leuven and external partners. Zootechnical trials are performed under conditions similar to those in commercial farming, allowing to adjust for specific health and safety, climate control or supplementation requirements in our high tech brand animal facilities.

• POULTRY

We facilitate all kinds of **poultry experiments** on different species, such as broilers, laying hens, turkeys, ducks, etc. We offer feed and drinking water trials under normal or challenging conditions.

- **Broilers**: 4 identical compartments with 60 floor pens of 1.3 m^2, each holding 18 animals.
- **Layers**: 30 cages of 2 m^2 with laying nests.

Our broiler trials are standard performed with Ross-308 day old chicks from Belgabroed, but setting up trials with other breeds, such as Cobb or slow growing breeds are also a possibility.

• PIGLETS

We facilitate all kinds of pig production experiments at different stages of their cycle.

- **Weaning piglets**: 2 fixed setups with 28 pens of 12 post weaning piglets.

We offer feed and drinking water experiments under normal or challenging conditions. In a standard setup we house the piglets from weaning until 6 weeks post weaning. The genetics of the piglets is TN70 or DANIC and PIC408.

• FLEXIBLE SETUP

We have flexibility to set up **customer made experiments**, with other species, such as rescue decks to evaluate milk replacers in newly born piglets, or to evaluate maternal immunity in farrowing units for gestating/lactating sows and many more.

INFRASTRUCTURE - TRIAL FACILITIES

• BIOSAFETY-LEVEL-2

The entire animal facility on TRANSfarm is **BSL-2 certified**, allowing to work with pathogen, viral and parasitic challenges. Research with mycotoxins is also possible. Animal models, such as heat stress, weaning diarrhea, coccidiose vaccination, etc. belong also to the expertise of our team.

For challenge trials, ethical dossiers are provided. All trials fulfill the ethical requirements as set by the government and by KU Leuven.

• AUTOMATIC FEED SYSTEM

The piglet units are equipped with an automated feeding system to enable the customized daily portion being administered to each pen. The different feed formulas can be send from 8 silos to different pens in the different units automatically. Feed portions are weighed and registered automatically.

• DRINKING WATER SUPPLEMENTATION

Each broiler unit contains 3 tanks and each piglet unit contains 2 tanks to test different drinking water treatments. These tanks are providing water to alternating pens to randomize the drinking lines over the barn. They are equipped with an automatic stirring system to homogenize the solution and allow to record daily water consumption per drinking line.

Drinkwater solutions can be either provided to the animals during the entire trial period or for a shorter period upon request. Water samples can be analyzed for water quality or bacteriology.

INFRASTRUCTURE - TRIAL FACILITIES

• CLIMATE CONTROL

Climate control in the piglet and poultry units is **fully automated**. NH3, CO2, air pressure, temperature and relative humidity are monitored by sensors to steer the fully automated HVAC system to obtain optimal climate conditions.

The TRANSfarm site strives to be energy neutral with a **low carbon footprint**. Our electricity is produced by 750 PV-panels, redundant heat pumps provide permanent heating and cooling throughout the facility. Each animal unit has its independent modular ISO 16890 airfiltered climate system. Air is washed by a biological air scrubber to reduce ammonia and other emissions striving up to 0%.

• HATCH ON FARM OR HEAT STRESS EXPERIMENTS

The temperature and relative humidity in the barns can be controlled securely to allow for on farm hatching or heat stress during the experiment. A good distribution over the entire unit is achieved by fans to ensure **equal climate conditions in the different pens**.

SERVICE OFFER

We offer a standard package, which can be tailor made to fit your needs. The standard package includes the following services:

- A (**physical) kick-off meeting** is organized to define the detailed protocol before the start of the animal trial. For challenge trials, an ethical approval is obtained.
- During the trial, animals are **monitored daily**, which includes their general health state, and the daily temperature and relative humidity of the animal unit.
- The trial is performed under supervision of **a dedicated coordinator to meet QC/QA**, project manager and data/statistical and animal welfare expert. A specialized veterinarian is appointed as external supervisor. The trial executed by a **highly experienced team** consisting of research and animal technicians.
- **Client visit** during the ongoing trial.
- Zootechnical performance is measured by body weight and feed intake. **Three intermittent body weight measurements** are included in the standard package. All raw data are compiled in an excel sheet and shared once the data is processed and **statistical analysis** in R is performed.
- **Samples** can be **stored** for further analysis at the KU Leuven (-20°C or -80°C) or **shipped** to external labs.
- For broilers we have an **in house pilot scale slaughter line** or we collaborate with a small slaughterhouse to determine carcass dressing, breast muscle yield, wings, drumsticks, ... At slaughter, scoring of meat myopathies can be performed. Gut lesion coring can be performed to evaluate the efficacy of additives to reduce antibiotic therapies based on macroscopic scoring system for coccidiosis and bacterial enteritis of the small intestine.
- Zootechnical performance results and results from lab analysis are compiled in **a final report** at the end of the experiment.
- A **final (physical) meeting** is included to discuss and review the performed trial.

Various optional services are possible, such as blood or tissue sampling, footpath lesion scoring, litter scoring, gait scoring, slaughter and carcass yield, … and many others.

All kinds of tissues can be sampled, such as intestinal content for microbiome analysis, intestinal samples for gut morphology, immune organs and blood for immune parameters and many more. Blood samples can be taken and centrifuged to collect serum or plasma.

SERVICES: AQUATIC ANIMAL MODELS

• KILLIFISH MODEL: SMALLER, FASTER, CHEAPER

The killifish Nothobranchius furzeri is a small fish with a rapid lifecycle. The fish matures in less than 4 weeks and experiments spanning the life cycle only take 2-3 months. As a result, experiments on these small, rapid fish are shorter and less expensive than experiments on large, slow growing production species.

The model guaranties a faster turnover of experiments and important savings in maintenance costs and space requirements, while having access to a wealth of resources and valuable background information.

During the last 5 years, the fish has increasingly been used in scientific research and has become an established fish model in neurobiology, ageing and ecotoxicology. At TRANSfarm, we house **two strains of killifish**: an inbred lab strain (GRZ) and a natural strain containing more genetic variation.

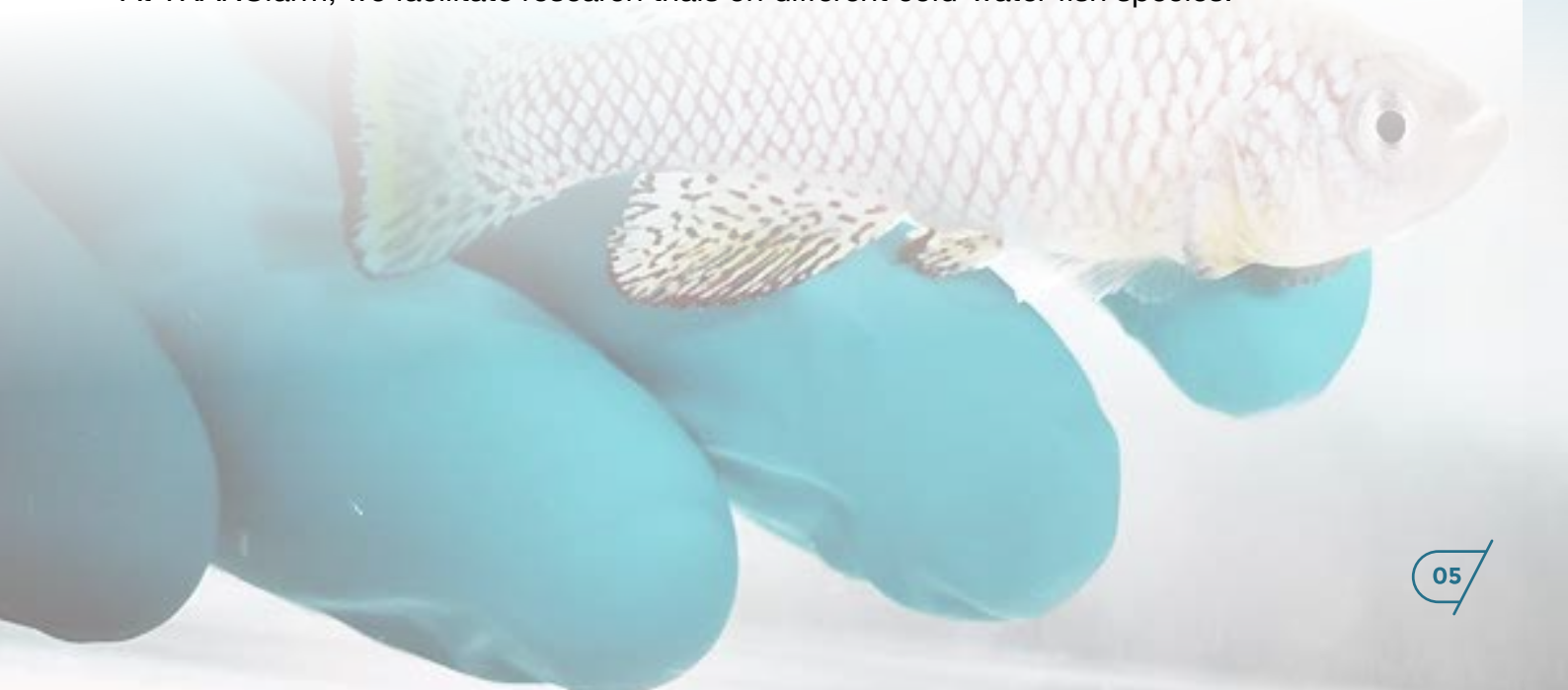
Our service platform aims to improve food and feed production towards a more circular and sustainable value chain.

• FRESH WATER AQUACULTURE IN RECIRCULATING AQUATIC SYSTEMS (RAS)

Land-based RAS have the potential to be more sustainable than traditional aquaculture systems, as they facilitate a reduced environmental impact, an improved water quality and better monitoring of the animals.

Fish are stocked in tanks within a controlled environment and water is subjected to mechanical, biological and UV filtration, after which it is recirculated back into the fish tanks. The system is therefore water conserving and discharges are into the environment are controlled.

At TRANSfarm, we facilitate research trials on different cold-water fish species.



INFRASTRUCTURE - TRIAL FACILITIES

• INFRASTRUCTURE

- The freshwater aquatic facilities are climate and light controlled.
- The Killifish facility is housed in a climatised chamber, in which 50-100 aquaria can be set up as stand alone (aquaria of 50 x 15 liter and 15 X 40 liter), as well as a recirculating system. The setup can house groups of 6-10 killifish per tank and has individual filtration for optimal replication and a temperature range of 16°C to 28°C.
- Three incubators simulate the dry period to allow the eggs to go into dormancy and develop at the desired time.
- The large facility contains ten independently filtered RAS of 5000 liter to house cold-water fish species, which can be configured modularly according to the research question. The tanks have an individual filtration and a temperature range of 12°C to 22°C.
- Smaller RAS setups of 600 liter are also available, with individual filtration and similar temperature range.

OFFER

We facilitate all kinds of aquatic feed and research trials on different species, in a **micro-diet setup** on tropical fish (Killifish) or for **upscale** in larger cold-water fish (trout and sturgeon).

• Feed trials: sustainable and cost-effective feed alternatives to improve circularity and sustainability. We want to test unexplored food ingredients from food processing side streams to assess their safety and quality.

• Research trials exploring the effects of stressors or changes in management strategies: to improve production by studying factors that negatively impact fish welfare and optimizing welfare monitoring).

• The impact of compounds is examined, by measuring growth and perfomance. Behavior, as an indicator for modest toxicity, and preferences can be screened.

• Additional analysis can be performed like cortisol measurements as stress indicator, endocrine and intestinal functions, amino acids and nucleotide profiles in the blood, thus allowing to evaluate the nutritional value, antinutritional factors and safety of the tested compounds.

• The trial is performed by a highly experienced team of animal research technicians, under supervision of experimental biologist as aquatic coordinator.

• All research trials apply to the rules of the Ethical Committee for animal research of KU Leuven.

FOOD-RELATED SERVICES AND RESEARCH: VEGLAY

• TRANSFARM'S FOOD HUB, THE FUTURE OF SUSTAINABLE NUTRITION

Within the **TRANSfarm's Veglay project**, we are developing new processes and products so that everyone can enjoy sustainable and healthy food. TRANSfarm works with protein-rich raw materials, often plant-based, and moves away from the heavy processing steps currently used in the industry. We preserve the strength of our raw materials and make the process much more accessible for everyone. This way, also the farmers can get involved in the process.

Our goals are to develop new, sustainable ways to use the **available protein sources** in our food chain, to valorise and involve the local agriculture and use local resources to newly develop food forms with enhanced functionalization and minimal processing of the ingredients.

With "taste" being a high priority, we have been working for the last 4 years on the development of 3 major product lines, which are based on soybean, fava, yellow pea and common bean:

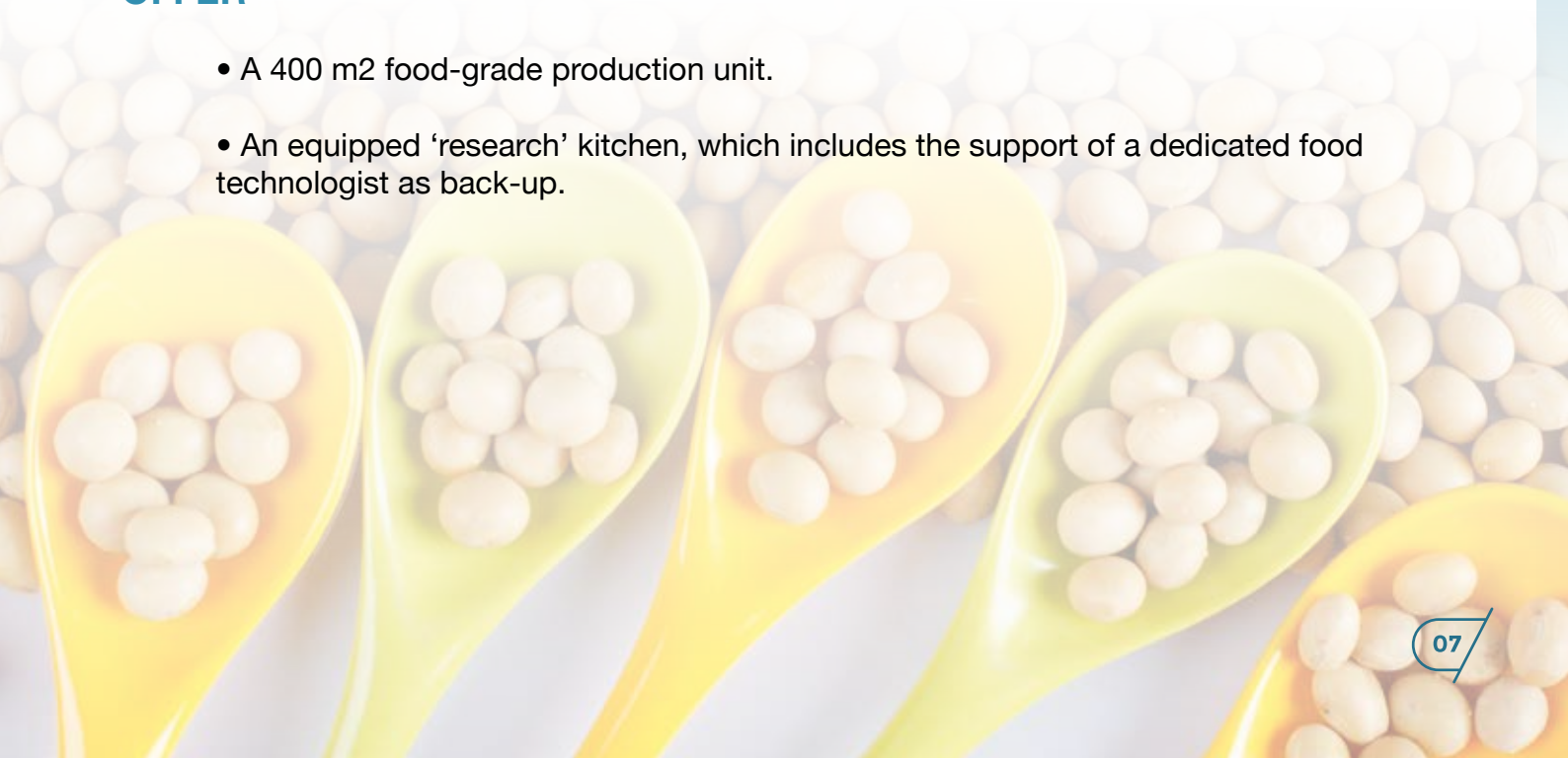
- Clean label vegan food (from non-dairy products like milk, ice cream, protein snack and yoghurt, to cheese and warm and cold sauces, up to pea burgers and soups) ready to eat and as an instant easy mix.
- Our products use the whole pulse – no side streams.
- Our food products are minimally processed: treatments are kept simple, we only do mild refinery to protect the existing functionalities of the pulse proteins.

In the past years we IP-protected these developments in the food lab.

OFFER

• A 400 m2 food-grade production unit.

• An equipped 'research' kitchen, which includes the support of a dedicated food technologist as back-up.



SERVICES: BIOTECH

TRANSfarm has longstanding experience with preclinial translational research in different disciplines: vaccinology, gastroenterology, orthopedics, dermatology, host-pathogen interactions, immunology and more. We offer our expertise and facilities to biomedical companies and research groups from KU Leuven and externals.

• PRECLINICAL ANIMAL MODELS

TRANSfarm covers a broad range of preclinical large animal models, such as swine (piglets, mini-pigs), sheep, poultry (broilers, turkeys, ducks), rabbits, etc.

• TRANSFARM'S SPECIALIZED RESEARCH INFRASTRUCTURE

- 8 research units at Biosafety Level 2 (BSL-2)
- Each equipped with a fully automated climate control, with continuous monitoring of temperature, NH3, CO2, air humidity, light intensity.
- Fully equipped state-of-the art surgery room
- Standard lab infrastructure
- Medical imaging (ultrasound - X-ray)

OFFER

• Services for translational biomedical research groups as well as contract-based research for companies can be facilitated at TRANSfarm.

• For each trial, a dedicated protocol is discussed and defined during a starting up meeting. The trial is custom-made, and taloired to the research questions.

• An ethical dossier is provided. All research trials apply to the rules of the Ethical Committee for animal research of KU Leuven.

• The execution of the trial is performed by a team of scientists, veterinarians and animal caretakers with an extensive track record in laboratory animal science, to provide a range of services and to ensure high quality trials.

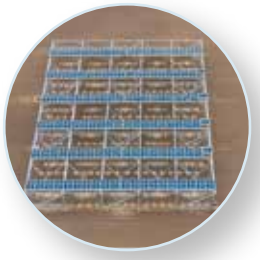
• Dedicated specialized analyses can be implemented according to your request. Various sampling is available, such as blood, tissue, etc. Analysis can be performed in house or send to external lab for further analysis.

• At the end of the trial, a final report is issued and discussed during a final meeting.

RESEARCH @ A GLANCE

The ongoing research at TRANSfarm covers different domains within the circular and sustainable bio-economy. Sustainable agriculture, protein shift, fossil-free farming, aquaculture and sustainable nutrition are active ongoing research topics.

• AGRIPV



An **agrivoltaics pilot site** is installed at TRANSfarm, which showcases the principle of dual land use. The concept combines crop cultivation and energy production on the same site to improve land efficiency and broadening agricultural activities.

At TRANSfarm, a **horizontal setup** is installed, at a height of 5 meters. The PV panels are placed in roof shapes. The setup is flexible, allowing to place the panels closer or further apart. This allows to balance the soil coverage, and thus the light level for the plant, against the energy yield per ha on a sea-son-by-season basis. TRANSfarm acquires data of several cropping seasons with standard growing conditions under normal agricultural conditions.

More info: www.hyperfarm.eu

• INNOVATIVE AIR SCRUBBER

A new type of air scrubber is developed by the KU Leuven research group of Prof. Johan Martens, which enables the recovery of ammonia and its transformation into ammonium nitrate, **a valuable N-fertilizer.** The idea is to produce in-situ nitric acid with a plasma reactor and to capture ammonia gas from the ventilation air of the pig barn at TRANSfarm, in a nitric acid solution.

The new plasma air scrubber concept with which ammonia emissions can be drastically reduced with the advantage of reduced water consumption, production of valorizable drain water in the form of fertilizer without use from externally supplied chemicals and maximum direct use of green energy from solar energy.

TRANSfarm is actively working together with the team of Prof. Johan Martens to demonstrate the newly developed air scrubber to the wide public.

Furthermore, current research focuses on new technologies and applications to reduce emissions, including odor.

INCUBATOR OF INNOVATION

TRANSfarm is an incubator for innovative companies, organisations, young start-ups and up-and-coming business, who are embedded in a dynamic and stimulating innovative environment, which facilitates **cross-pollination amongst disciplines and expertises**. Companies can further develop their technologies and scale up to higher levels.

Our current resident covers different domains within the circular and sustainable bio-economy.

• BIOCON - BIOREFINERY TECHNOLOGY

The BIOCON platform develops biorefinery technology to accelerate the transition towards a **sustainable circular bio-economy**.

BIOCON is coordinated by the research group of Prof. Sels. Their world leading lignin-first technology is applied for the production of highly functionalized aromatic products and processable carbohydrate pulps from biomass.

Biocon

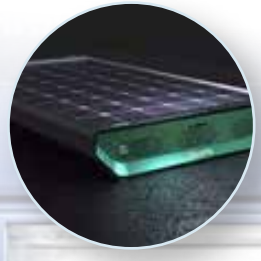
They offer exclusive infrastructure and expertise to evaluate various feedstocks such as wood, grass, agricultural residue, and post-consumer waste wood.

TRANSfarm is actively working together with the team of BIOCON in research projects that focus on the **use of agricultural biomass**, and their side streams, to process and valorize them as animal feed.

More info: www.kuleuven.be/biocon

• SOLHYD - HYDROGEN SOLAR PANEL TECHNOLOGY

Solhyd



At TRANSfarm, Solhyd produces hydrogen solar panels. Hydrogen panels are modules that use solar energy to produce hydrogen gas.

They resemble classical solar photovoltaics, but instead of an electric cable they are connected via gas tubes.

Just like solar panels, they can be used in many ways. Hydrogen panels can be installed on the roof of a building, but Solhyd is exploring many more potential applications. At the site of TRANSfarm, solar panels are placed on an agrivoltaics setup as innovative application.

More info: https://solhyd.eu