IMAGO ENGINEERING

PROTEIN OF THE FUTURE

Protein from insects for animal feed

- Less pollution
- Less land
- Fewer resources
- Most cost-effective

ANTAH

ESG

ENVIRONMENT

Insect-based feed in aquaculture lessens the need for wild fish, conserving marine life, and turns chicken manure into safe biomass, reducing water pollution. This leads to healthier water environments and sustainable aquatic farming.

Insect recycling aids UN Goal 15, cutting waste and enriching soil, fostering biodiversity and ecosystem health by turning waste into useful biomass and soil enhancers.

SOCIAL

Protein from insects is the most promising source of food for humans and feed for animals.

High-quality nutrition and balanced product composition, as well as a technological process that reduces the harmful impact on the environment, significantly reduce the risk of disease

Insect protein in fish feed reduces water pollution and enhances farming sustainability by lowering chemical fertilizer use and improving soil moisture, aiding in water conservation.

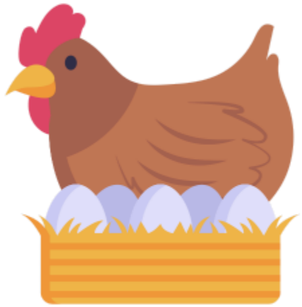
GOVERNANCE

Using insects to recycle organic waste cuts greenhouse emissions and supports climate mitigation by providing sustainable feed and improving soil health, enhancing carbon sequestration.

Insect recycling combines multiple fields to address environmental challenges, promoting global collaboration for sustainable development and climate action.

NEW INSECT TECHNOLOGY IN THE WORLD

And the first profitable one from the first plant



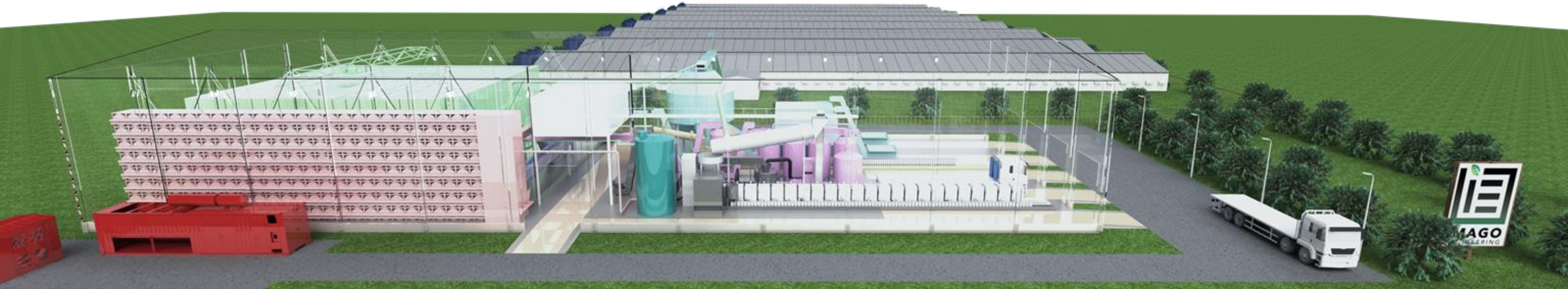
Poultry farm

Droppings →

Fully automated insect plant with bioreactor system

3 days →

Insect protein



TECHNOLOGY ADVANTAGES

SAFE

The technological process uses an insect - a house fly.

Selectively improved and pure population.

Housefly larva suppress pathogenic microflora in the droppings.

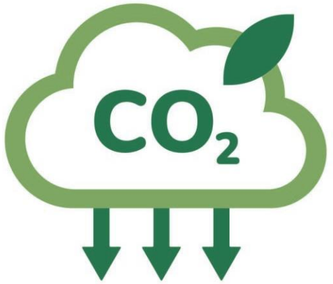
Additional thermal and chemical treatment ensures the elimination of pathogens.

GREEN TECHNOLOGY

Reduces land pollution.

Reduces huge greenhouse gas emissions from poultry industry.

Reduces unpleasant odors around the poultry farm.



ENCLOSED BIOREACTOR SYSTEM

The heart of the plant is a modular bioreactor system.

The closed system contains all unpleasant processes, preventing pollution.

Significantly increases the efficiency of biological processes.

Requires significantly less production space.

Requires less energy consumption.

Patented.

FULLY AUTOMATED MODULAR SYSTEM

Requires fewer staff members.

Allows for remote control of all technological processes.

Modular system allows to build and maintain plants quickly.

Easy adaptable to poultry farms of various sizes.

Optimization of bioreactor system operation and prediction of possible breakdowns using AI.

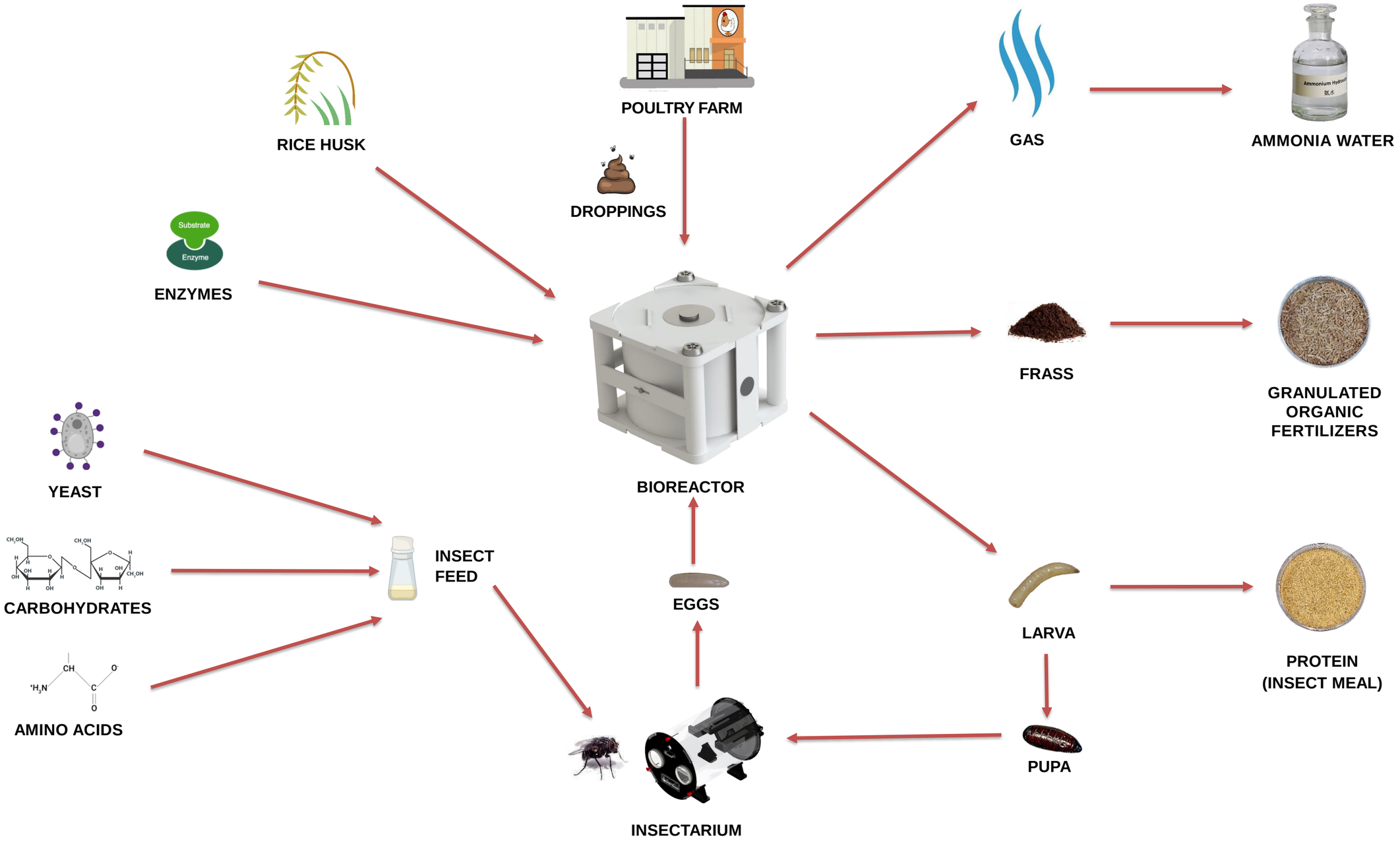
COST EFFECTIVE PRODUCTION

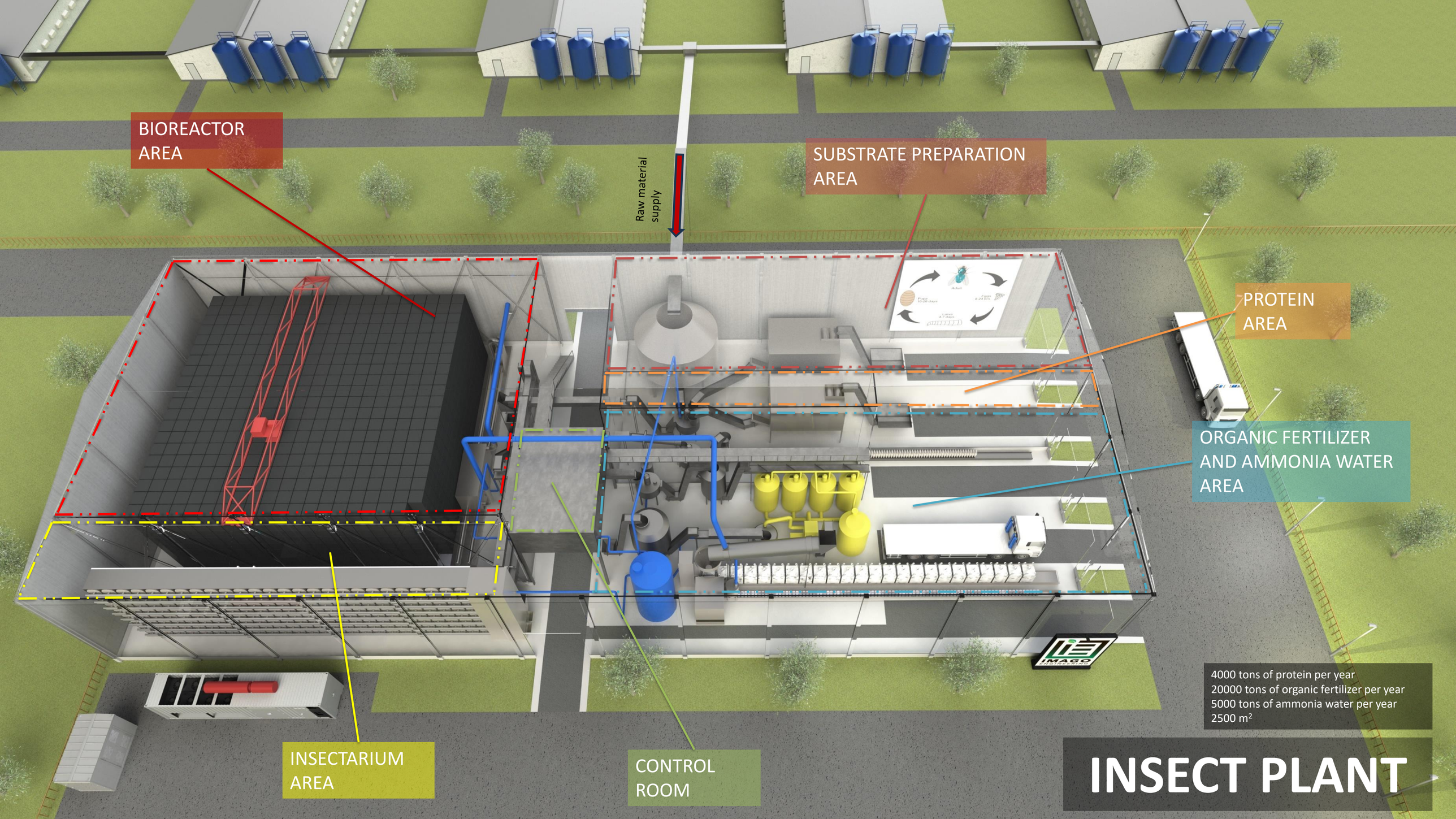
Free raw materials.

Fast processing in just 3 days.

Eliminates the cost of delivering basic raw materials.

TECHNOLOGICAL PROCESS




BIOREACTOR AREA
Raw material supply
SUBSTRATE PREPARATION AREA
PROTEIN AREA
ORGANIC FERTILIZER AND AMMONIA WATER AREA
INSECTARIUM AREA
CONTROL ROOM
IMAGO
4000 tons of protein per year
20000 tons of organic fertilizer per year
5000 tons of ammonia water per year
2500 m²
INSECT PLANT

BUSINESS MODEL

Sources of income	Key points	Price	Production capacity of one plant	Customers
Protein	Price More cost-effective than other insect technologies	$2000/ton (Production cost: $944.4/ton)	3 900 tons/year	Animal feed producers Aquaculture Poultry farms Pig farms
Organic Fertilizer	Quality Organic fertilizers from insects have higher market value	$200/ton (Production cost: $94.4/ton)	20 000 tons/year	Palm oil producers Lawn manufacturers Land reclamation projects
Ammonia Water	Price and environmental friendliness Significantly lower greenhouse gas emissions during production.	$400/ton (Production cost: $188.9/ton)	4500 tons/year	Palm oil producers Open field agricultural
License	Profitability Superior to competing technologies for processing chicken droppings	$20/processed ton of droppings	55 000 tons/year	Poultry farms

Partners - involved in building a network of plants (own and licenses)

- Contractors for the manufacture of equipment
- Construction Contractors
- Installation Contractors
- Financial Partner
  For providing loans to poultry farms

TEAM

Y.A.M. Tunku Naquiyuddin Ibni Tuanku Ja'afar

Executive Chairman

G. Mark Sooria Kumar

Deputy Director - Advisor

Linkedin

Leonid Nikishov

Chief Executive Officer

Linkedin

Vyacheslav Kaptenko

Chief Technology Officer

Linkedin

Maria Rasputina

Chief Marketing Officer

Linkedin

Manoj Menon

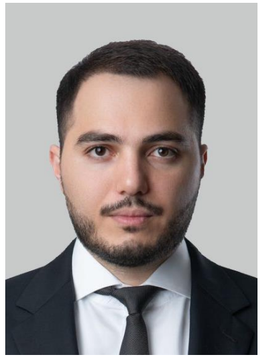
Chief Financial Officer

Linkedin

Ilya Kravchuk

Head of Market Expansion

Linkedin



Zakhar Shashkov

Chief Construction Officer

Linkedin

Mohamad Johan

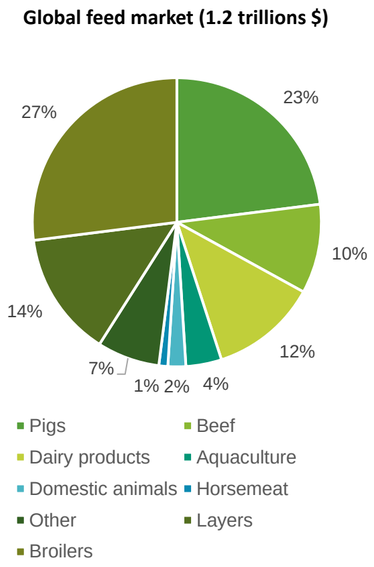
Regional Director - Malaysia

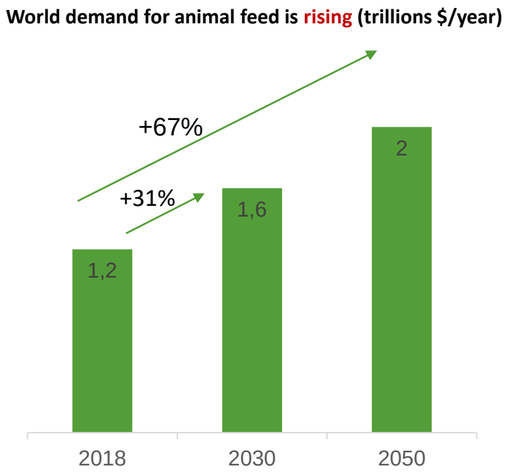
Linkedin

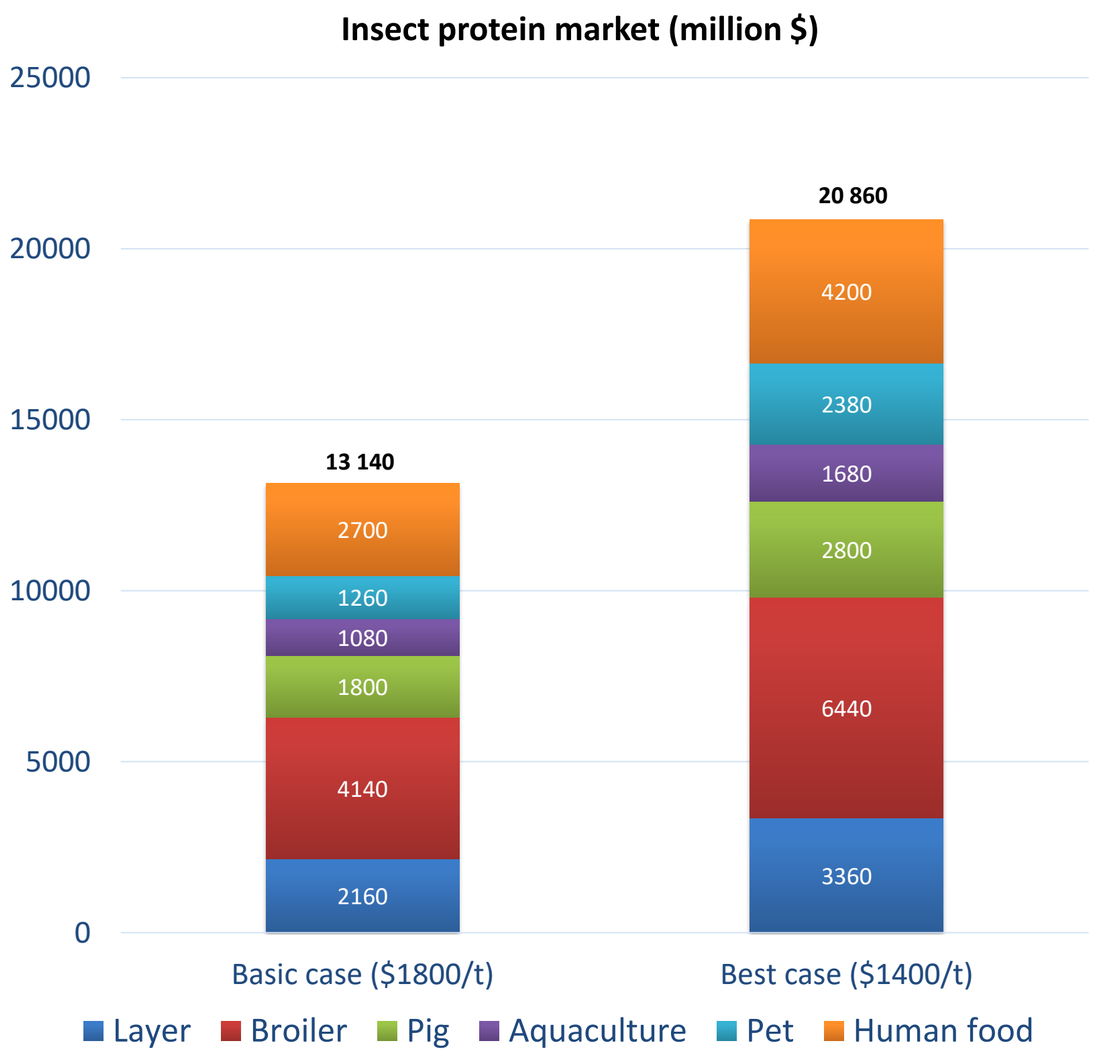
Teguh Rahayu

Entomologist

INSECT PROTEIN MARKET





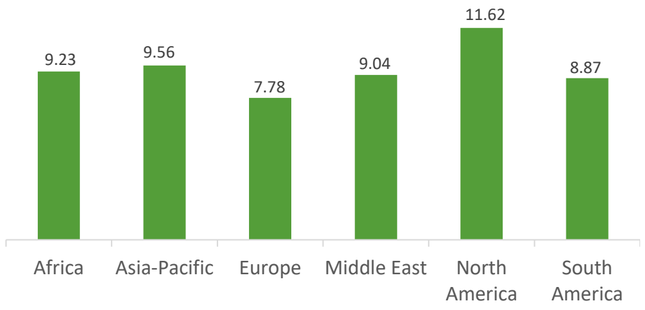


IMAGO Engineering target by 2030 – $87 million

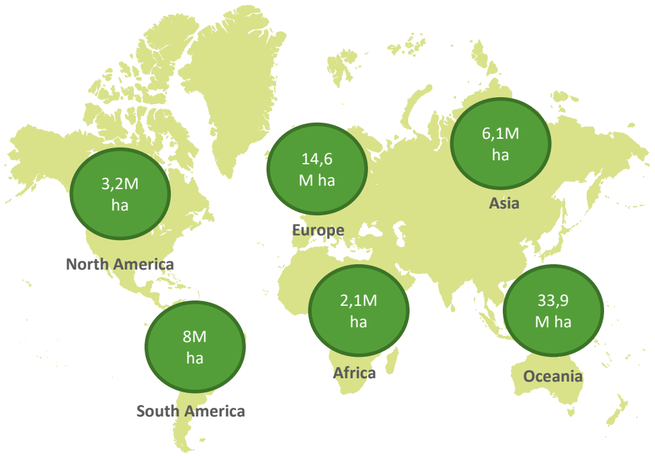
AgriTech. Alternative proteins – the trend towards meat, dairy and feed substitutes. Insects as feed. BRYAN GARNIER & Co Limited

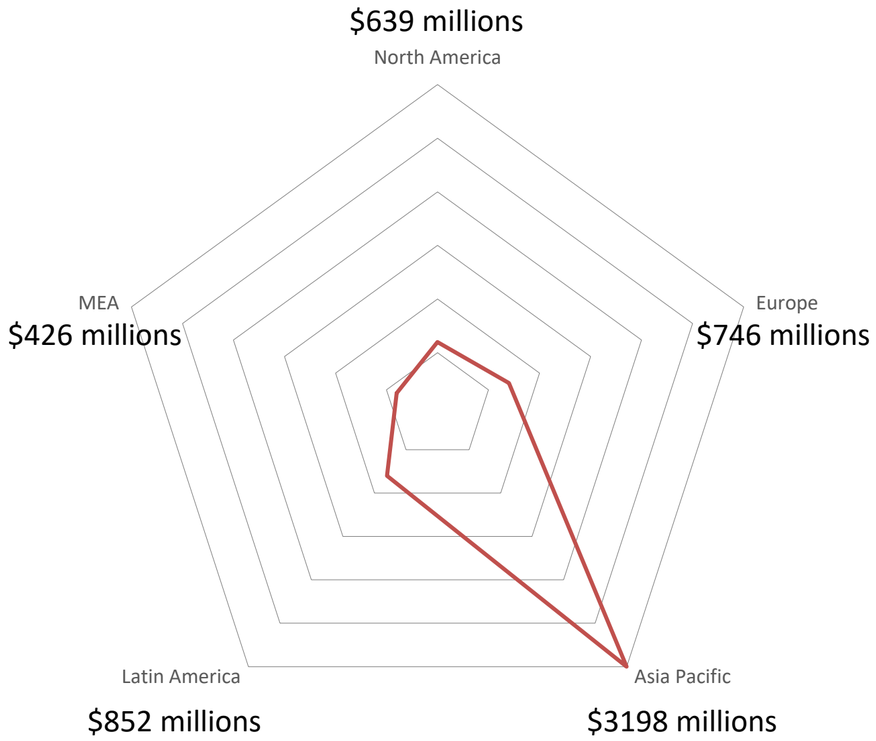
ORGANIC FERTILIZER MARKET

Organic fertilizer market, CAGR, by region, 2023-2029



Land used for organic farming



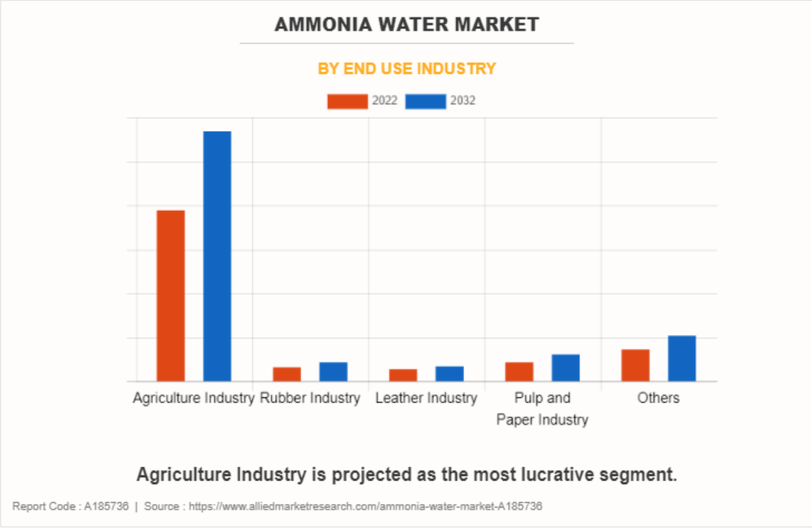


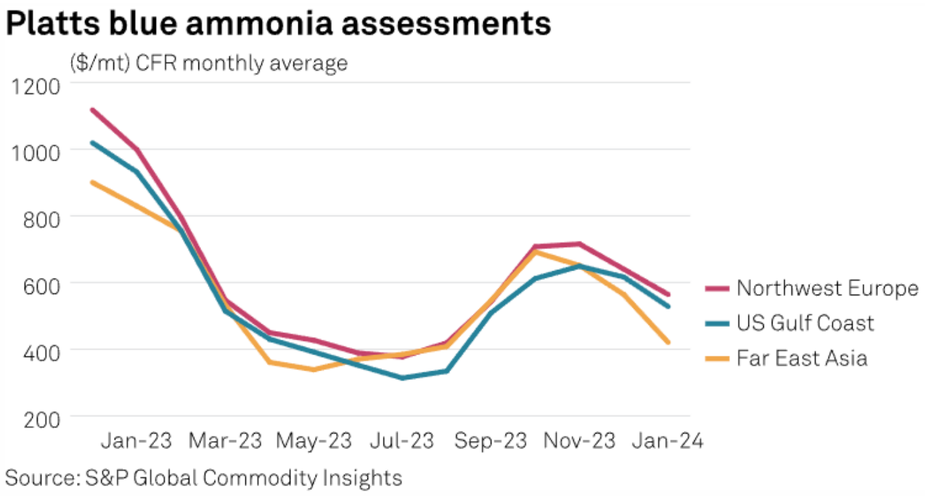
IMAGO Engineering target by 2030 – $24 million

Average price in Asia-Pacific - $234 per ton

Fertilizer Market Size, By Form (Dry, Liquid), By Product (Organic, Inorganic), By Application (Agriculture, Horticulture, Gardening), Industry Analysis Report, Regional Outlook, Growth Potential, Covid-19 Impact Analysis & Forecast, 2022 – 2030
AgriTech. Alternative proteins – the trend towards meat, dairy and feed substitutes. Insects as feed. BRYAN GARNIER & Co Limited
Organic Fertilizers Market Size and Share Analysis by Source (Plant, Animal), Form (Solid, Liquid), Crop Type (Cereals & Grains, Oilseeds & Pulses, Fruits & Vegetables), Application (Broadcasting, Fertigation, Foliar Application) – Global Industry Demand Forecast to 2030
https://www.psmarketresearch.com/market-analysis/organic-fertilizers-market-report
https://www.alibaba.com/product-detail/2022-High-quality-neutral-earthworm-protein_1600578023674.html?spm=a2700.galleryofferlist.normal_offer.d_title.6c3b563eP6H8rW
Organic Fertilizer Market SIZE & SHARE ANALYSIS - GROWTH TRENDS & FORECASTS UP TO 2029 Source: https://www.mordorintelligence.com/industry-reports/global-organic-fertilizer-market
https://www.alibaba.com/trade/search?spm=a2700.galleryofferlist.0.0.68842fb1hUICJL&fsb=y&IndexArea=product_en&categoryId=11502&keywords=organic+fertilizer&tab=all&&page=2

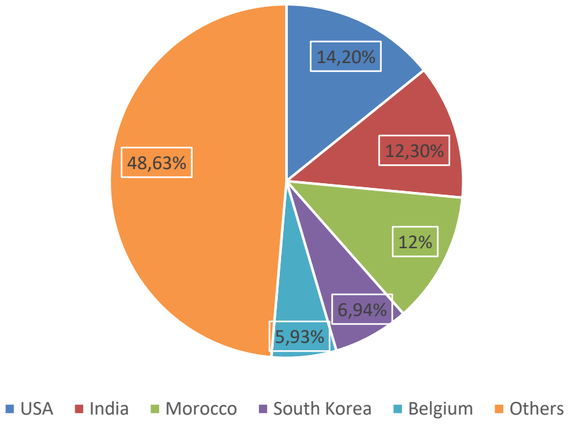
AMMONIA WATER MARKET





Market size:
2022 – $28,2 billion
2032 - $40,5 billion
CAGR – 3,8% (2023-2032)

The main importers (2022)

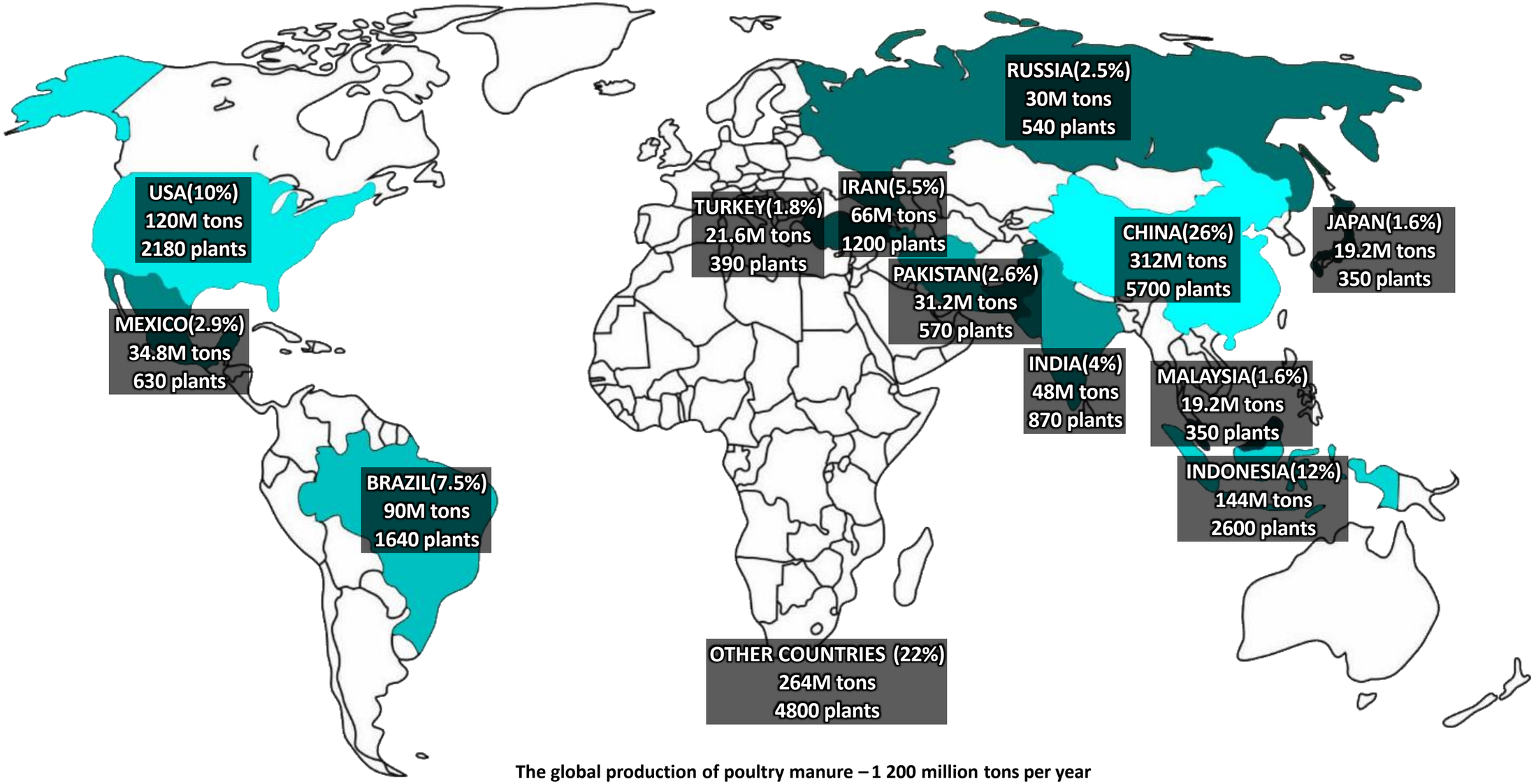


IMAGO Engineering target by 2030 – $20 million

[1]https://www.alliedmarketresearch.com/ammonia-water-market-A35560
[2]https://www.businessresearchinsights.com/market-reports/industrial-grade-aqua-ammonia-market-110793
[3]https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/energy-transition/022824-asia-pacific-blue-ammonia-prices-extend-discount-to-europe-us

LICENSE MARKET

Top 12 countries producers of chicken droppings



The global production of poultry manure – 1 200 million tons per year
Imago's target by 2030 – 0.57 million tons (0.078%)
Potential number of standard plants (for 1 000 000 chicken poultry farm) in the world – 21 820

BENEFITS FOR A POULTRY FARM

Complete solution to the problem of chicken droppings processing

- No need to store a portion of the droppings in the fields. The processing time takes 3 days, making it possible to process the entire volume of waste. Reduced land and air pollution.

Significantly more efficient waste recycling business

- Additional products and more valuable organic fertilizer, significantly shorter processing times make the project economically attractive.

Increasing the value of organic fertilizer

- Organic fertilizer obtained through insect processing has advantages, which are described further.

Retaining customers for organic fertilizer

- Not only retaining but also expanding the customer base due to a higher quality product and the possibility of reducing the price, thanks to more efficient technology.

Freeing up significant spaces

- Processing with this technology only requires 4 days, unlike composting which takes weeks with an accelerated method and months with standard technology. Consequently, significantly smaller areas are needed. The space thus freed up can be used to expand the main production.

Obtaining additional, more valuable products

- From the same volume of chicken droppings, one can obtain up to 6% of a much more expensive product - protein. Why lose valuable components?

Reducing the number of insects on a poultry farm

- The process of standard composting always has additional problems, such as insects from the surrounding environment. The Imago technology involves closed bioreactors. The production site does not attract insects from the surrounding environment.

Improving the health of birds

- In the case of switching to daily droppings collection, this will reduce the spread of pathogenic microflora.

Absence of operational problems associated with composting

- Most of the processes in the plant's operation are automated and additionally remotely monitored by Imago Engineering, to minimize potential problems.

COMPARISON OF PROCESSING TECHNOLOGIES

Technology	Description	Pros	Cons	Best for	Average Processing Time	Products	Average Cost per Ton of wastes	Energy Consumption kWh per Ton	Space Requirements m^2 for 0,4M chicken poultry farm	Potential revenue per ton of wastes
Traditional Composting	Natural breakdown of organic matter through microbial activity. Slower process, with lower temperature and less control over the process.	Low cost, simple.	Slow process, odor issues, pests' issues, less efficient nutrient recycling.	Small-scale or backyard operations, areas where simplicity is preferred.	90-180 days	Compost	$10-30	Minimal (primarily manual labour)	9 000 – 18 000	$30-50
Biofuel production (Anaerobic digestion)	A biological process where microorganisms(anaerobic) break down organic materials in the absence of oxygen, producing biogas and fertilizer.	Biofuel for electricity generation.	Dangerous, due to explosiveness; Increases CO2 emissions.	For farms that need an additional source of energy.	20-30 days	Biogas Fertilizer	$20-100	100-400	6 000-9 000	$50-110
Pyrolysis	A thermal decomposition process that occurs in the absence of oxygen, converting organic materials into bio-oil, syngas, and biochar.	Can process a wide range of organic wastes; Small production area	Requires high temperatures, leading to high energy consumption; The process needs to be carefully managed to avoid the production of harmful emissions.	For small poultry farms	1 day	Bio-oil Syngas Biochar	$100-250	1500-3000	600-700	$130-290
Accelerated Composting with Forced Air	Like traditional composting but enhanced with forced air to increase microbial activity. Faster decomposition, more control over the process.	Faster than traditional composting, better odor control, more efficient.	More complex setup, requires energy for aeration, higher initial costs.	Medium to large-scale operations requiring faster processing and more control.	25-60 days	High-quality compost	$40-60	200-250	3 000 – 6 000	$50-70
Black Soldier Fly	Processing with a common fly in the production of protein from insects - Black Soldier Fly (Hermetia illucens)	Faster waste processing. Additional products.	Requires management of fly populations, limited to certain climates.	Better for processing food waste than chicken droppings	16-21 days	Protein Oil Organic Fertilizer	$140-180	250-300	5 000 – 6 500	$130 - $150
Housefly (IMAGO Technology)	Similar technology to Black Soldier Fly, but a more suitable insect species for processing chicken manure	Recycling in a closed bioreactor system. The shortest processing time technology. Full automated control of the technological process. No harmful emissions.	Requires control and management of housefly populations. Additional technological measures to ensure product purity.	Best for processing chicken manure. This is the main type of insect that can be found on any poultry farm.	3-4 days	Protein Organic Fertilizer Ammonia Water (Planned: Chitin Liquid Organic Fertilizer)	$141	260	2 500	$257 (Planned: $300 - $350)

STAGES OF SAFETY

Poultry farm

The poultry farm implements biosecurity measures to warn about potential pathogens in raw materials.

Bioreactor

1st stage

Temperature treatment of manure
>70°C
With the help of safe aerobic bacteria, it significantly reduces the number of pathogenic microflora.
However, spores of some species can survive.

2nd stage

Larva processing
The larvae use microorganisms as a food source. They also release allomones that inhibit the spread of competitors, such as microorganisms, reducing the risk and pathogens.

Control

Frass analysis
Viability PCR to strengthen the next treatment in case of pathogen detection.

Larva washing

With ozone water
Cleaning from surface contaminants.

Larva processing

Temperature treatment
Hight temperature and fast heat-up to prevent bacteria from turning into spores.
Cleaning from possible internal contaminants.

Protein processing

X-ray treatment
Up to 3 kGy for the destruction of possible cysts.

Biopreservation

With the help of safe and useful lactobacilli to suppress possible new pathogens from the environment and extend the shelf life of the product.

Control

Protein laboratory analysis
To confirm the quality of the final product

Go-to-Market

	Protein	Organic Fertilizer	Ammonia water	Licenses
Initial region	Asia Pacific	Asia Pacific	Asia	Asia Pacific Africa South America
Strategy	Sell of a small batch for testing. Pursue a wholesale contract based on the test results.	We tap into thy existing market for organic fertilizers from poultry farms by offering a higher quality organic insect fertilizer, thereby adding value. Additional wholesale sales to palm plantations.	Wholesales to palm plantations. Certification as blue ammonia	Replacing inefficient chicken droppings processing technologies. We supply the technology, equipment, and financing, requiring clients only to commit to adopting this superior technology.
Competitors	Fishmeal The price is rising BSF protein The price is too high Soy protein Low digestibility	Compost Low quality Vermicompost High price BSF Organic Fertilizer High price	Grey ammonia Causes additional environmental damage	Composting The processing is too long Biofuel Causes additional environmental damage Pyrolysis It requires a huge amount of power. Only for small poultry farms.

SIGNED OFFTAKE CONTRACTS

CONTRACTS	2026	2027	2028	2029	2030	2031
Company 1 Protein 33 000 tons Vietnam, Thailand	1 500 tons $2 per kg	1 500 tons Plant price (more than $2,2) – 10% discount	1 500 tons Plant price (more than $2,2) – 10% discount	4 321 tons Plant price (more than $2,2) – 10% discount	16 235 tons Plant price (more than $2,2) – 10% discount	7 944 tons Plant price (more than $2,2) – 10% discount
Company 2 Protein 8 000 tons Indonesia	98 tons $2 per kg	994 tons $2 per kg	1 241 tons $2 per kg	5 667 tons $2 per kg	-	-
Company 3 Protein 15 000 tons Europe	1000 tons €4,17 per kg	4000 tons €4,17 per kg	7000 tons €4,17 per kg	3000 tons €4,17 per kg	-	-
Company 4 Fertilizers 50 000 tons Malaysia	11 911 tons $200 per ton	29 779 tons $200 per ton	8 310 tons $200 per ton	-	-	-

ACHIEVEMENTS

The pilot production, equipped with its own research laboratory, aims to create a full cycle of the technological process. This process will produce feed protein and organic fertilizers through waste-free processing of fresh poultry droppings.

Operating since 15th of June 2023

ACHIEVEMENTS

We are thrilled to announce the official signing of agreements to establish our first manufacturing plants in Malaysia with the support of the Malaysian Ministry of Agriculture and the Minister of Agriculture, Datuk Seri Haji Mohamad bin Sabu. This marks a significant step towards promoting sustainable agriculture through innovative technology. At the heart of our initiative lies a commitment to harnessing new technologies that not only benefit farmers economically but also address critical environmental challenges. This initiative underscores our dedication to green technologies that reduce carbon footprint and promote eco-friendly practices.

26th of June 2024

SUPPORT

Ministry of Health (Department of Food Security)

Bioeconomy Corporation

Department of Veterinary Services Malaysia

Nano Malaysia Berhard

UPM

Selasih Amam SDN. BHD.

Invest Selangor Berhard

PARTNERS

THE EUROPEAN CENTER FOR PEACE AND DEVELOPMENT UNIVERSITY FOR PEACE ESTABLISHED BY THE UNITED NATIONS

Partner for the implementation of our technology in the global market

SOLVEMEN ASIA

Venture building partner

FAO

Promoting solutions to food insecurity through insect protein

AFFIA

For the latest updates on the insect protein market

ANTAH GLOBAL VENTURES

Strategic partner, Exclusive representative (Malaysia)

MIDA

Local and international support

NATIONAL UNIVERSITY OF SINGAPORE

Internships for students

UN GLOBAL MARKETPLACE

To sell products and licenses to the Africa region

UN GLOBAL COMPACT

To promote the topic of insect protein as an important component of a future greener world

HELIOS NETWORK INTERNATIONAL SDN. BHD.

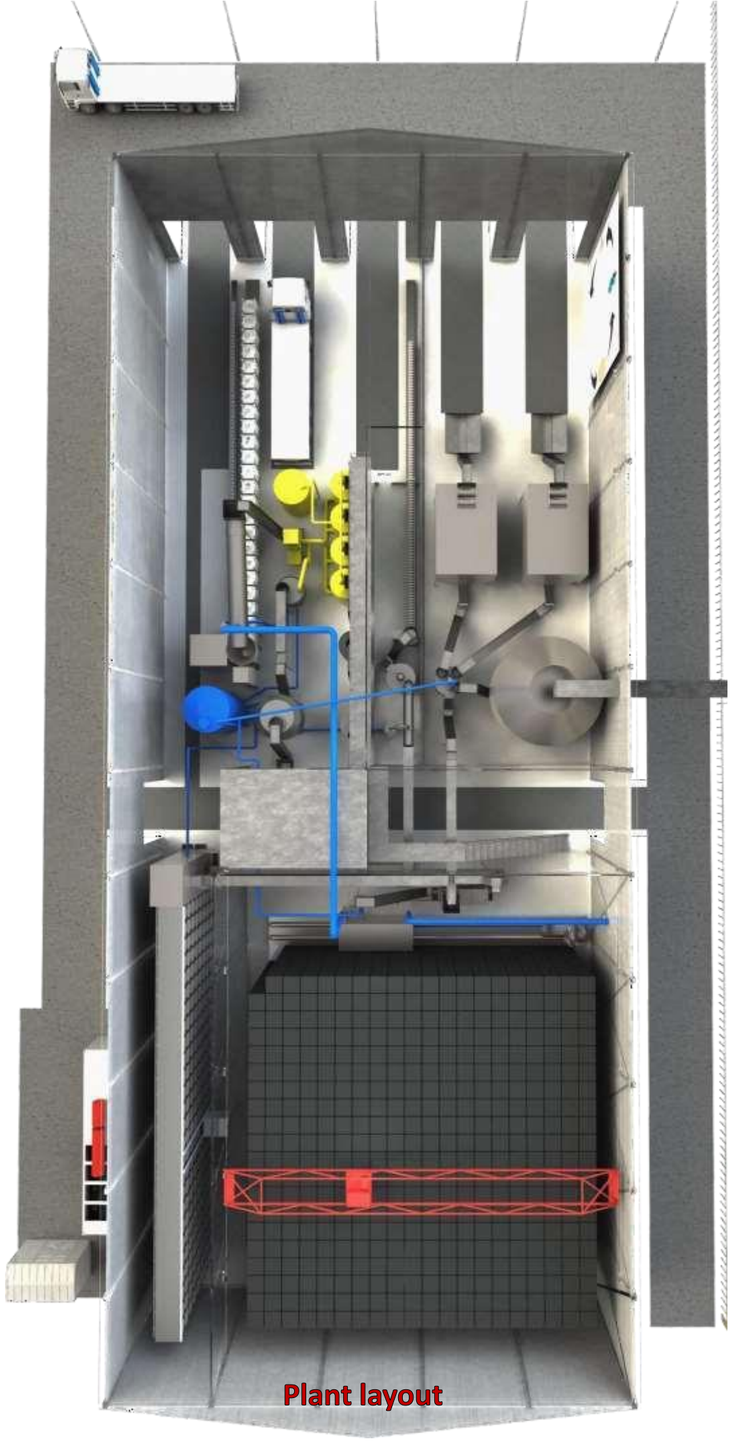
PR and Management partner (Malaysia)

INVEST SELANGOR

Government relations

UNIVERSITI PUTRA MALAYSIA

Partner for research and certification of our products (protein and fertilizer)



Plant layout

PROSPECTS

The business model does not include the potential upsides through:

- **Revenues for the recycling of organic waste**

(we did not take into consideration any revenues for the waste collection/processing)

- **Revenues from chitin and chitosan**

(both higher-value products that can be obtained with limited amounts of effort/additional capex)

- **Revenues from the transition to production of liquid humic fertilizers**

(higher value produce that can be obtained with limited effort or additional expenditure (capex))

- **Revenues from reducing greenhouse gas emissions**

(we reduce CO_2 output by significantly more than 0.17 tons from every ton of poultry droppings)

IMAGO ENGINEERING

Thanks!

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