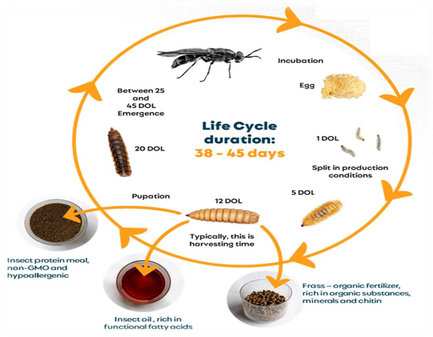
Tech-Driven Transformation in Insect Farming: The Future of Black Soldier Fly with Nasekomo and Fly Genetics

Marinela Farasheva [1], Cedric Pincent [1], Stefka Mavrodieva[2], Marco Tejeda[1,2], Lyubomir Nikovski[2], Marc Bolard[1,2]

1 Flygenetics AD, Saedinenie Str. 299, Lozen village, Sofia, Bulgaria

2 Nasekomo EAD, Saedinenie Str. 299, Lozen village, Sofia, Bulgaria

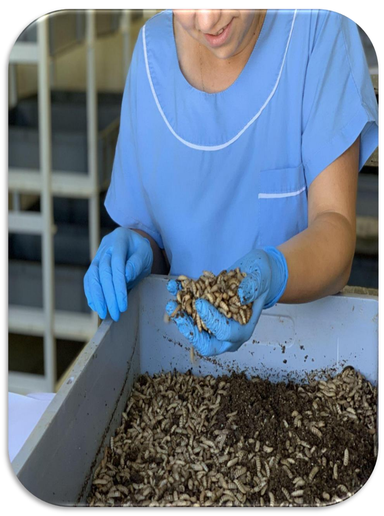
Introduction



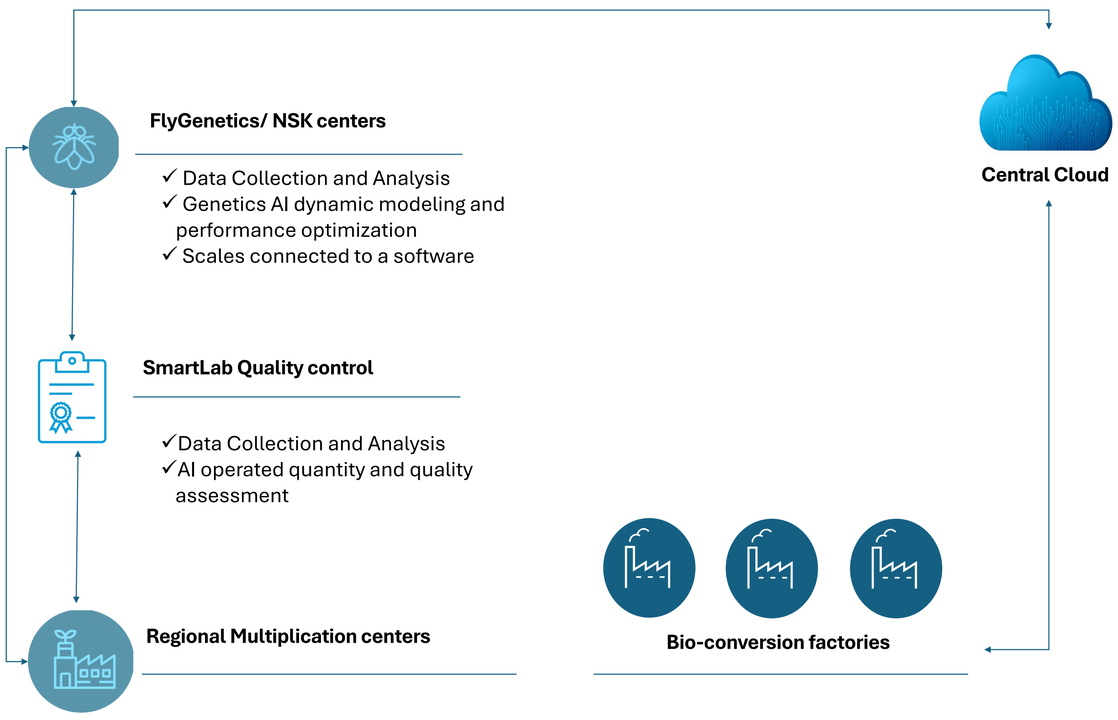
At Nasekomo, the Black Soldier Fly (BSF) lifecycle lies at the heart of our operations. A deep understanding of this biological cycle is essential for optimizing the transformation of undervalued agricultural biomass into high - quality insect proteins and fertilizers. Through the digitalization and automation of critical processes, we have successfully accelerated the BSF lifecycle - boosting productivity, enhancing system performance, and setting new standards in insect bioconversion.

The Challenges

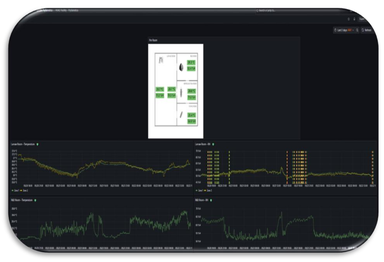
- **Modernizing the traditionally labor-intensive tasks** like counting, weighing, feeding and environmental monitoring through digital tools, enhancing precision and operational efficiency while supporting our workforce
- **Enhance Data Integrity:** Mitigate inaccuracies and inconsistencies stemming from human error and subjective larval assessments.
- **Improve Operational Efficiency:** Streamline time-consuming tasks and enable process optimization with real-time data.
- **Enable Scalability:** Facilitate effective operational growth beyond current manual system limitations.
- **Ensure Full Traceability:** Establish comprehensive batch tracking and accountability.

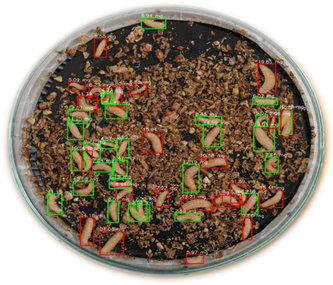


The Solution: Nasekomo's Digital Transformation



✓Industrial farming equipped with Technology designed for AI driven operations
✓ IoT integrated Production line, cyber secured
✓ Local Control room – SCADA real time monitoring, control and process optimizations integrated with AI
✓ Edge computing coupled with AI agent for data analysis and short-term process adaptations





Using Sensors for:

- **Environmental Monitoring:** All HVAC-equipped rooms feature sensors for continuous, real-time environmental data, accessed via a dedicated application.
- **Automation:**

- Real-time on-screen monitoring of robotic operations

- Automated logging of robot activity, with software compiling monthly/yearly performance statistics

- **Advanced Data Processing & Predictive Modeling**: We successfully developed a system for identifying and counting Black Soldier Fly larvae using a YOLOv8 Convolutional Neural Network (CNN) model. This model was meticulously trained, validated, and tested on a comprehensive, custom-built dataset comprising more than 2130 images of BSF larvae.
- **Enhanced Batch Traceability for Genetic Advancement**

- Significantly faster and error-free data entry

- Elimination of risks associated with batch mixing

- Precise performance data for individual batches, crucial for genetic evaluation

Conclusion

The power of this transformation is demonstrated by significant, measurable advancements, including a yield increase from 10.7% in 2023 to 15.17% in 2025 (a ~42% rise overall). By embracing AI-powered automation and comprehensive data strategies, we have substantially enhanced operational efficiency, data reliability, and unlocked new potentials for scalability and sustainable production of high-quality insect proteins and fertilizers.