



BLACK SOLDIER FLY AGRICULTURE

Major pain points affecting large
centralised commodity producing
Black Soldier Fly operations in
South Africa

INDUSTRY BRIEF





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The modern food and feed supply chain is under growing pressure from a set of complex, global, and interconnected challengesⁱ. Chief amongst these are climate instability, geopolitical tensions and vulnerable infrastructure that support the transport of goods and services. These complexities are further compounded by significant levels of food loss or waste, which represent both lost opportunities and liabilities. To mitigate these challenges, new technologies are being investigated to strengthen the resilience and competitiveness of the food supply chain.

One such solution is Black Soldier Fly (BSF) agriculture, a sector championed as an attractive solution to the instability. However, the struggles to bridge the gap between its potential as a high-value organic waste upcycling technology and industrial scaling represent a harsh reality. This is illustrated by the struggles and collapses of international pioneers like AgroNutris, ENORM and FlyBlast, and other insect leaders like Ynsect and Aspire Food Group. While BSF, mealworm and crickets have different struggles, it does signal a challenge in making insect protein commercially viable.

In South Africa, these pressures are exacerbated by a set of local challenges. This brief provides a non-exhaustive list of ten critical pain points experienced by South Africa's largest centralised BSF operations: AgriProtein (closed in 2021), Inseco (closed in 2024), and Maltento. By documenting these struggles, the aim is to provide future pioneers with the insights necessary to avoid the pitfalls of their predecessors. While these insights do not guarantee success, they provide opportunities to mitigate risk and optimise efficiency.

This brief is written for:

- BSF developers looking to scale production
- Investors interested in BSF investments

This brief discusses:

- Major pain points experienced by South Africa's major large scale BSF developments

i WEF (2026). Global Risks Report 2026. Online: www.weforum.org/publications/global-risks-report-2026/

1 THE DUAL THESIS TRAP

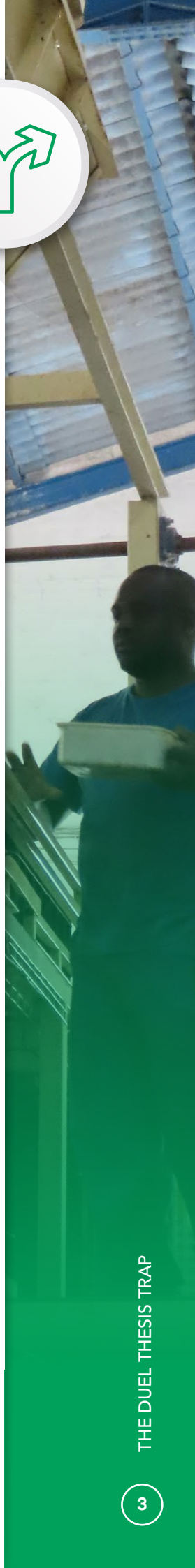


Developers should choose a primary value proposition from the outset. Attempting to bridge the waste-product proposition often results in a compromise product that fails to meet the standards of off-takers.

The BSF sector has long been marketed on a dual value proposition: divert organic waste from landfill while producing a sustainable, high-quality protein alternative to traditional ecologically destructive feed ingredients. In industrial markets where regulatory trust is paramount, maintaining a “license to operate” makes it difficult to function as both a high-volume waste processor and a legally compliant feed ingredient manufacturer. Attempting to bridge this gap typically results in a compromised product that does not satisfy either the waste generator or the end-buyer.

Waste-centric: the waste that solutions are trying to solve for are streams that are destined for landfill, and which are a liability to the waste generator. For large operations, this requires having to process high volumes of diverse and potentially contaminated organics. This results in a compromised and unpredictable nutrient profile, which affects the output reliability.

Product-centric: Products are developed for regulated markets, like animal feed and fertilisers. To meet these strict demands predictable, consistent, safe and quality inputs are non-negotiable. This is to ensure the output products fit within the parameters they have been registered against.





2 THE COMMODITY DISPLACEMENT TRAP

Developers should consider diversifying their product portfolio beyond bulk protein and focus on high-margin functional additives that meet the broader needs of the market. By doing so, producers can justify premium pricing and avoid the thin margins of the highly competitive and subsidised commodity market.

Transitioning from a production-centric to a market-driven model is essential for long-term viability. BSF developers must look beyond sustainability “novelty” and solve specific market problems, distinguishing short-term fads from structural demand. Despite their environmental credentials, BSF products must ultimately compete on price and performance:

In the B2B sector, commercial farmers prioritise the cost-to-performance ratio over purely ecological benefits. Similarly, B2C sector, notably the pet food consumers, may be willing to pay a “green premium” for sustainable food, but only up to a point.

While the insect sector remains fixated on displacing traditional protein commodities like soymeal and fishmeal it faces a persistent price-parity gap. Fishmeal remains, to some extent, cost-competitive, and to compete with soymeal is extremely difficult. In effect, soy is the global baseline that insect protein has yet to bridge. This is similar in the fertiliser space.

While sustainability is important to brands, price is still fundamental. As such, pivoting product offering from solely a protein or synthetic fertilizer replacement to functional additive offers a more pragmatic commercial path, at least in the short to medium term.

Recognising this, Maltento made a strategic decision to avoid the commodity trap and to rather focus on value add in high-margin and high-performance insect-based palatant. This diversified its offering, and offered the animal feed and pet food market a portfolio of flavour enhancers that price competed head-to-head with in liver-based market leaders, whilst also delivering a high-value proposition: hypoallergenic, clean-label, and fully traceable formulations that transcend simple protein.

Another example, is exemplified by BioMar, an aquaculture feed industry leaderⁱⁱ, that compromised on price not because of the sustainability credentials, though this was a considered, but due to the functional benefits of BSF that translated to efficient production.

ii BioMar, Innovafeed, and Auchan announced a partnership that intends to commercialise the use of BSF meal produced into feed for the Ecuadorian shrimp sector. Online: <https://innovafeed.com/en/biomar-innovafeed-and-auchan-announce-landmark-partnership-to-accelerate-the-commercialisation-of-insect-meal/>

3 THE FEEDSTOCK IMPERATIVE



Developers looking to focus on a product centric model, must not compromise on input control, and must put in place feedstock protocols and curated diets to ensure uncompromised substrates for strict markets.

The transition from pilot scale to a commercial production line requires a shift from biological experimentation to industrial discipline. In this context, consistency is the primary arbiter of viability; and predictability is the only way to manage operational risk and protect margins.

In large-scale operations, minor fluctuations in feedstock profiles can affect growth rates and subsequent harvest weights. This translates into downstream bottlenecks and inconsistent final products. This volatility prevents producers from meeting the strict standards of premium off-takers who prioritise reliability. Without stable, traceable inputs, a facility remains a chaotic biological system rather than a professional supplier.

Maltento applied the fundamental principle: predictable inputs yield predictable outputs. By prioritising the curation of larvae diet by a dedicated nutritionist, Maltento transformed a chaotic biological process into a standard production line. This commitment to stability was key to securing accreditations required for high-value export markets like the EU, successfully transitioning the company from a local supplier to a global player.



4 THE “FREE WASTE” TRAP

Developers looking to focus on a product centric model, must budget for feedstock as a primary procurement expense rather than a free or subsidised input.

A common strategic error in the BSF sector, and broader organic waste solutions, is the assumption that a business model can rely on “free” feedstock or revenue from gate fees. In reality, commercial operations producing regulated end-products requiring nutritional consistency and traceability, of which landfill-bound waste rarely possesses, must actually pay for organic waste depending on the quality and quantity. This shifts the perceived free waste input into an expensive overhead. This is for three main issues:

Intense competition: High-quality organic streams are not waste in the true sense; they are highly sought-after commodities. BSF developers must compete on price against established solutions, notably livestock feed markets (formal and informal) that already pay prices that are hard to compete against.

Logistics volatility: Even with “free” sources and strong supplier relationships, the cost of specialised third-party logistics remains a volatile variable. Not just from a cost of logistics perspective, but also from a certainty of arrival perspective, where logistics companies may divert in part or in full the “free” organics to an alternative paying competitor.

Scalability penalty: As facilities scale, the scarcity of premium feedstock often forces a BSF operation to pivot to sub-optimal streams. These low quality streams often require additional and costly pre-processing, for example de-packaging, contaminant removal, and moisture stabilisation.

5 BALANCING THE “ICK” FACTOR



Developers should consider adopting a “why” and not a “what” marketing strategy that does not focus on the origin of the ingredient, but rather emphasises the functionality of the ingredient, but in a way that the consumer does not feel like they are being tricked.

While the BSF sector celebrates and promotes the sustainability and health benefits of insect-based ingredients, a significant psychological demand risk remains. In the pet food and human nutrition sectors, consumers often associate insects, notably flies, with dirtiness and decay, a “contamination-by-association” that can override technical and sustainability credentials and cause risk averse brand owners to hesitate in integrating insect ingredients into products. To neutralise this instinctive consumer resistance, developers should consider adopting a marketing strategy:

Lead with “Why” and not “What”: Prioritise the performance credentials of insect-based ingredients rather than the origin of ingredient.

Refined terminology: Transition away from visceral descriptors like “maggot,” “larvae,” or “fly”. Using professional, food-grade terms such as “insect protein”, “novel protein,” or “invertebrate meal” is more likely to foster consumer acceptance.

Transparency balance: While marketing should lead with the benefits, the marketing must remain transparent and not seem to hide the fact that insects are being used. Not only for regulatory reasons, but also misleading consumers may lead to reputational damage. The goal should be to frame the ingredient accurately.



6 GRID ELECTRICITY SUPPLY RISK

Developers must integrate resilient electricity supply to mitigate the persistent risk of energy insecurity projected over the short to medium term. This is especially important for future projects as load shedding is still a major risk in South Africa with load shedding events expected as early as 2028/29ⁱⁱⁱ.

Manufacturing products reliant on biological growth cycles at scale without reliable power is extremely complex, as these cycles cannot be simply “paused” during a shutdown.

In highly mechanised operations, electrical grid instability, as seen in South Africa’s past and likely ongoing energy crisis, disrupts critical thermal regulation and mechanised systems. This can lead to a number of issues that can negatively affect operations:

Metabolic risk: Precise thermal regulation is fundamental to larval feed conversion and neonate inoculation pipelines. Intermittent power failure induces metabolic stasis, which translates to deviations from growth curves, devastating biomass loss, which ripples through the production line.

Cost of switching: Relying on backup generators introduces more than just high and unpredictable fuel overheads. The frequent switching between grid and backup generator power creates power-quality fluctuations that can damage sensitive machinery, negatively affecting immediate production and increasing long-term maintenance overheads.

Asbestos barrier: While solar PV is an attractive long-term solution, many older industrial sites still feature asbestos-cement roofing. The high cost of replacement and structural reinforcement can make these solar projects unfeasible, especially when landlords lack the incentive to fund upgrades for tenant energy savings.

ⁱⁱⁱ SAETA (2026). Policy to power: Ten actions to deliver green, accessible and secure electricity. Online: www.saeta.org.za/Policy%20to%20power%20-%20Ten%20actions%20to%20deliver%20green-%20accessible%20and%20secure%20electricity%20-%202017Feb26%20Fin.pdf

7 EXPENSIVE GRID ELECTRICITY



Developers should consider mitigating the rising costs of electricity by integrating solar PV into their energy mix. It is further suggested that multiple ESCOs are consulted to secure competitive, performance-backed agreements that safeguard long-term margins.

Large-scale centralised BSF facilities are energy-intensive, requiring constant power for critical mechanical processes, most notably for temperature control. In South Africa, the viability of this margin-sensitive sector is increasingly threatened by a grid that is not only unreliable, but increasingly expensive, with costs consistently outpacing inflation over the last 15 years.

While diesel generators provide a temporary stopgap for supply insecurity, rising fuel costs and geopolitical volatility make the cost of diesel generator reliance financially unsustainable in the long-term.

Consequently, the industry leaders had pivoted toward solar PV to secure price stability and operational predictability. While these companies had different reasons for delaying their solar PV installation, they had two primary models to choose between:

Direct ownership: a capital-heavy approach where the facility procures and maintains its own infrastructure. While this offers long-term independence, it requires a massive upfront investment (CAPEX) and leaves the facility responsible for all technical risks and ongoing maintenance. Furthermore, in older industrial sites, the high cost of asbestos-cement roof remediation becomes an additional, often prohibitive, upfront expense.

Electricity-as-a-service: a more pragmatic, OPEX-focused alternative, the electricity-as-a-service (EaaS) requires facilities partnering and procuring electricity from an Energy Service Company (ESCO), at an agreed rate. This shifts the electricity costs to a predictable monthly OPEX line item. The ESCO assumes the risk for installation and uptime, as their revenue is tied directly to the system's performance. Critically, this model allows developers to spread the cost of "dead expenses", like asbestos removal, by baking them into the monthly energy tariff over several years. This makes solar integration far more palatable for landlords and enables facilities to upgrade their infrastructure without depleting their capital reserves.

An unforeseen hurdle to solar PV adoption is an unsympathetic or capital strapped landlord. If the BSF developer does not own the building, securing landlord approval or funding for these structural assets becomes a barrier to entry, especially for direct ownership model where the landlord will most likely have to fit the CAPEX. A EaaS model is more palatable to landlords as the tariff spread enables facilities to upgrade infrastructure without depleting capital reserves, but also to reclaim from monthly rental.



8 COSTS OF DRYING

Developers must future-proof their business models by secure low-cost industrial waste heat or innovate moisture-positive products that eliminate the need for drying altogether.

The BSF larvae's waxy, hydrocarbon-rich cuticle acts as an evolutionary adaption to seal in moisture. The shell becomes thicker and more heat-resistant during pupation to support its future non-feeding adult fly stage. This layer functions as a physical insulator that resists evaporation, forcing standard drying techniques to work harder to extract water from the insect's core to get from a 70% moisture larval body to 5% moisture shelf-stable meal, which in turn runs the risk of destroying protein and fats.

For facilities focused on traditional protein meal, drying often represents a large share of OPEX, leaving profit margins highly vulnerable to volatile fuel prices. Furthermore, the high carbon intensity of fossil-fuel drying can attract carbon taxes and complicate entry into "green" premium markets. To mitigate these thermal costs, developers should consider three strategic pathways:

Thermal symbiosis: Co-locating facilities with heat-generating industries allows producers to capitalise on Waste Heat Recovery (WHR) or Combined Heat and Power (CHP) systems, drastically reducing the primary energy bill. This approach requires strategic site selection whereby a facility would need to be built where the heat is, which may complicate your proximity to feedstock or customers.

Alternative heating: While technologies like microwave drying can be more efficient, they shift the burden to the electrical grid, which as noted in Lesson 6 and Lesson 7, increases exposure to electricity supply instability and price increases unless backed by resilient onsite renewables.

Product innovation: An innovative approach is to re-engineer the end product to bypass drying entirely using the liquid / moisture as an advantage. Maltento successfully pivoted from dried commodities to a high-margin, liquid-based liquid palatant. By leveraging the larva's inherent moisture to facilitate fermentation, they transformed a liability into a strategic value-add, significantly lowering their energy footprint. Bardee applied a similar logic to BSF frass. Rather than investing in energy-intensive drying and stabilising the frass into a powder, they developed hydrofly, a stabilised liquid plant food. Innovating toward "moisture-positive" products allows developers to sidestep the most expensive phase of BSF processing. This approach not only lowers OPEX but also creates differentiated, high-performance products that stand out in a market crowded with bulk dried meals and fertilisers.

9 THE COMPLIANCE RUBIK'S CUBE



Developers should view regulation as a strategic advantage to be cleared early rather than a problem to be solved later to secure their “license to operate” and ensure their assets remain bankable.

Navigating the BSF value chain requires reframing regulatory compliance as an operational necessity and strategic advantage rather than a secondary administrative burden. Strict adherence is the primary safeguard for a facility’s “license to operate”.

South Africa possesses a mature but complex regulatory landscape that includes but not limited to: waste management, animal feed and pet food, fertilisers and biostimulants, air quality (notably linked to drying insect matter), and land use. These regulations are well documented in GreenCape’s [regulation brief](#)^{iv}.

Without regulatory alignment, a high-CAPEX facility risks becoming a stranded asset. While it is technically capable of producing product at scale, it is legally barred from trade. This triggers a loss of liquidity and creates a reputational risk that can collapse offtake agreements with premium export markets, notably the EU, where rigorous safety and traceability protocols are non-negotiable.

Regulatory lead times: strategic planning must synchronise licensing lead times with construction. Failing to do so can result in a stranded asset, where a developer is servicing debt and paying overheads on a facility that cannot legally produce or trade.

Product certification lead times: Further lead times must be allocated for product specific certifications. In the context of BSF, there are two broad paths to certify against:

Basic claims: certifying a product against basic nutritional profiles is a relatively easy and straightforward registration process. An example may be protein content for animal feed or NPK levels for frass products.

Novel claims: marketing novel products based on performance benefits requires specialist trials and empirical data to verify claims. This can be both expensive and may take unpredictably long. An example may be hypoallergenic properties, or frass products marketed as a biostimulant.

A compromise may be to initially register products under the basic claims to ensure some form of revenue, whilst collecting the needed data to register ideal products under the novel claims.

Consult from the outset: developers should engage experienced consultants and initiate early sound boarding sessions with the local, provincial, and national authorities. This ensures the regulatory burden, particularly for high-margin functional products, is integrated into the business model from the outset.

^{iv} GreenCape (2025). Regulatory Landscape of Black Soldier Fly Agriculture. Online: <https://greencape.co.za/library/a-regulatory-landscape-of-black-soldier-fly-agriculture/>



10 ACCESS TO CHEAP CAPITAL

Developers must identify strategic partners who prioritise long-term structural demand over short-term fads and who possess the technical depth to value the business based on operational discipline rather than novelty.

Raising capital for BSF ventures in South Africa has become difficult following the struggles of several high profile global insect pioneers. Venture capital (VC) firms in particular have become more cautious, often viewing the sector through the lens of past industry failures rather than future potential.

Specialisation premium: Generalist VCs often lack the patience for biological lead times and regulatory cycles. Smart patient investors with specific agtech or circularity expertise are fundamental to navigating early-stage BSF scaling.

Debt vs equity dilemma: high interest rates make traditional bank debt nearly impossible for novel biological models. Developers should focus on grants and blended finance to bridge the “valley of death” for commercial viability.

Unit economics: to rebuild confidence for investors, developers must shift away from the hype-based valuations to models that are driven by unit economics.



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