GreenCape

OPPORTUNITY BRIEF

# Black Solider Fly Agriculture

## Waste to frass to fertiliser

# 1 Introduction

We have entered the decade of polycrises[1], where climate instability, ecosystem pressures, and geopolitical tensions are expected to exacerbate an already fragile agricultural supply chain. Such crises provide for an ideal opportunity for innovation and future proofing. One way to achieved this through the implementation of circular economy principles.

**A circular economy keeps products, components, and materials at their highest use and / or value for as long as possible. This includes the biological nutrients embedded in animal feed and human food. When food waste prevention and retention are not possible, beneficiation must be a priority. This is not only a societal and environmental imperative, but a strategic business decision to remain relevant and competitive, and in some cases legally compliant.**

One solution for unlocking the circular economy is the integration of Black Soldier Flies (BSF), *Hermetia illucens*, into supply chains. In natural ecosystems, insects play a number of pivotal roles. They function as pollinators, predators and as prey for a wide spectrum of organisms. Many insects, including the BSF, also act as waste processors/decomposers, and convert organic material into body mass and nutrient rich excrement called frass. In so doing, they keep nutrients cycling indefinitely.

Innovators are leveraging the insatiable appetite of the BSF larvae to convert various forms of organic waste into high-value products, including animal feed, pet food additives and soil amendments to support healthy thriving soils.

Whilst the broad opportunities for BSF are well documented[2], this opportunity brief introduces the role of BSF frass in fostering regenerative horticulture. More specifically, the brief introduces the reader to frass, its benefits, and the opportunities that exist, notably to keep organic waste out of landfills whilst also futureproofing the sector's reliance on functional soils.

## Key insights

- Innovators are using BSF larvae to convert organic waste into high-value products, including animal feed, pet food additives and soil amendments.
- Frass has many unique characteristics that synthetic fertilisers do not, and which stimulate the soil food web, which in turn feeds and protects plants.
- The frass of BSF can be used to create a high quality organic fertiliser that supports regenerative agriculture.
- The primary opportunity for frass production relates to organic waste producers / handlers seeking a landfill alternative disposal solution.

### This brief is written for:

- Horticultural related brands looking to future proof supply chains.
- BSF companies investigating frass as a formal product.

### This brief discusses:

- The role of BSF frass in future proofing horticulture.
- The opportunities for growth.
- Enablers and barriers of this growth.
- General industry insights.
- Regulatory landscape.

[1] WEF (2023) – https://www.weforum.org/reports/global-risks-report-2023

[2] See GreenCape (2023) – https://greencape.co.za/library/industry-brief-black-soldier-fly-agriculture-upcycling-cape-towns-organic-waste/

# 2 Background

People, cultures, and economies are highly dependent on plants for a wide range of goods: food, animal feed, medicines, textile fibres, cultural or ornamental expressions.

Demand for these horticultural products are expected to grow in the coming years as the world's population grows and the spending power of that population increases.

Nutrients are needed by plants to grow and thrive, notably: nitrogen (N), phosphorus (P) and potassium (K)[3]. Together they make up the NPK ratio. These nutrients are absorbed by the roots of plants and are subsequently used to support functions and structures[4].

In natural ecosystems, nutrients are supplied through interactions between gases, water; minerals, organic matter, and communities of plants, bacteria, fungus, viruses, and animals such as insects. These interactions, and the substances that are produced, form soil. When plants die and decompose, nutrients re-enter the soil and cycle indefinitely.

Humans have sought to manipulate natural ecosystems to ensure yield predictability and surplus. However, when crops are harvested and transported to markets, the nutrients locked in plants are removed from the system. This makes it difficult for natural ecosystems to replenish the nutrients in soil in time to meet the agricultural demands.

The 20th century saw huge progress in the production of human made synthetic fertilisers. The fertiliser industry transforms air, natural gas and mined ores into a number of mineral fertilisers, notably the NPK based fertilisers. These manufactured nutrients have been key in growing more plants on less land to feed an exploding global population.

As illustrated by **figure 1**, South Africa used ~2.36 million tonnes of fertiliser products in 2022, of which ~0.71 million tonnes were specifically NPK: ~0.42 million tonnes of nitrogen, ~0.12 million tonnes of phosphorus, and ~0.18 million tonnes of potassium. As illustrated by **figure 2**, just four crops made up over 77% of fertiliser used[5]: maize (57%), sugarcane (11%), vegetables (5%) and wheat (4%).

There is no doubt about the role synthetic fertilisers play in feeding and clothing billions of people across geographies.

However, when poorly managed, fertilisers can be a pollutant and negatively affect both terrestrial and aquatic ecosystems, exacerbate climate change, and can affect air quality and human health[6]. It is estimated that less than half of the nitrogen added to fields is absorbed by crops[7].

Synthetic fertiliser production is also highly concentrated in a handful of countries. South Africa imported an estimated R24 billion worth of fertiliser in 2022[8].

Furthermore, modern intensive agricultural tends to lack complex and diverse organisms that would otherwise be found in wild ecosystems, and have reduced biodiversity, soil health, and overall productivity. The continued use of synthetic fertilisers have shown to degrade soil quality over time, stripping the soil of its natural microbes and nutrients. This increases the demand and use for synthetic fertilisers which resulting a cycle of dependency.

Amidst these concerns, synthetic fertilisers will continue to play a pivotal role in ensuring food security, supporting cultural landscape and livelihoods, and the demand for horticultural products will remain strong.

Thus, horticulture faces three major incentives:

1) Minimise the ecological impact,

2) Maximising yields, and

3) Ensuring supply chain resilience.

This is driving the interest in more sustainable and novel fertilisers to displace conventional riskier sources. This includes a wide range of "Bio-fertiliser"[9], such as frass, the mixture of larvae faeces, exoskeleton sheds, and remaining undigested feed substrate.

[3] Other important nutrients are calcium, magnesium and sulphur, as well as iron, manganese, zinc, copper, boron and molybdenum.

[4] Plants take up nutrients directly if near their roots, but they most often rely on mycorrhizal fungi that have colonised the root tissue and bring nutrients to the plant in exchange for resources.

[5] A detailed NPK usage by commodity can be found at – https://www.fertasa.co.za/wp-content/uploads/2021/03/Fertilizer-Usage-2020-and-2021-RSA.pdf

[6] WRI (2019) – https://research.wri.org/sites/default/files/2019-07/WRR_Food_Full_Report_0.pdf

[7] Govindasamy et al. (2023) – https://www.frontiersin.org/articles/10.3389/fpls.2023.1121073/full#:~:text=Nitrogen%20(N)%20is%20an%20essential,pathways%20to%20the%20surrounding%20environment

[8] Quantec (2023)

[9] Biofertilisers are biological products containing living microorganisms that, when applied to seed, plant surfaces, or soil, promote growth.

## Fertiliser stats

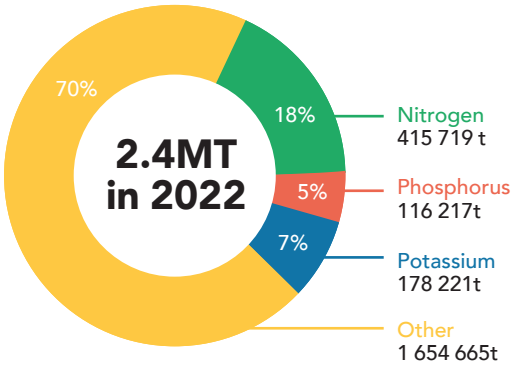



Figure 1: Total fertiliser consumed in SA by NPK for 2022
Source: Fertasa (2023)

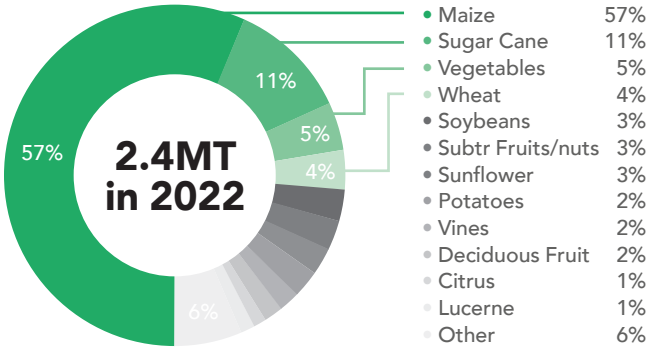



Figure 2: Total fertiliser consumed in SA by crop type for 2022
Source: Fertasa (2023)

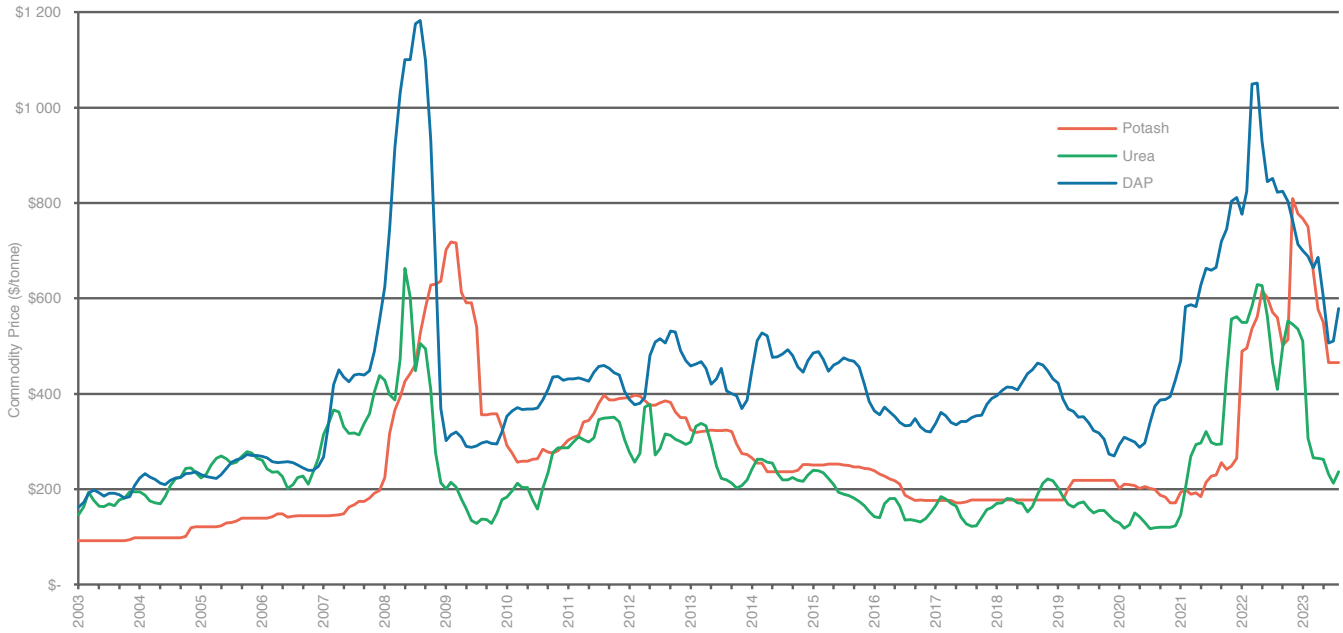
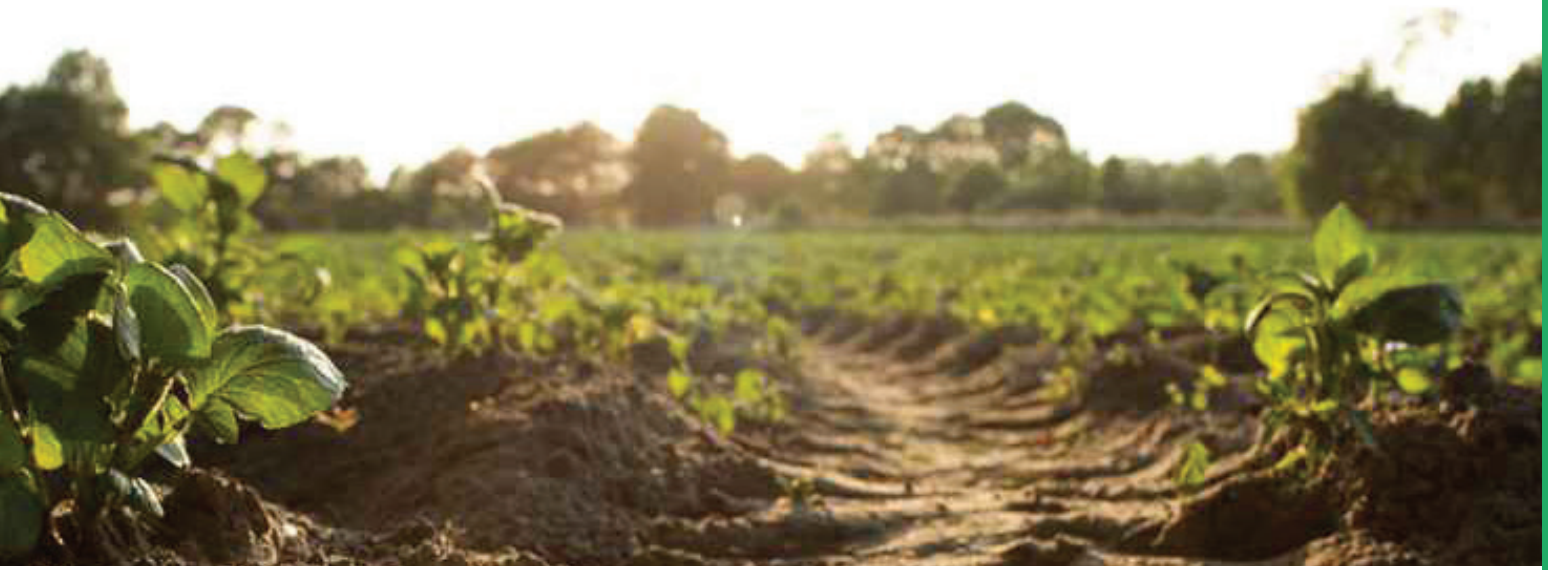



Figure 3: International fertiliser prices from Jan 2003 to Aug 2023
Source: Quantec (2023)



# 3 Frass fertiliser

BSF are native to South America, but they have become widespread and virtually cosmopolitan, including within South Africa. Importantly, they are not regarded as an invasive species, pests or vectors of disease. This is because the mobile adult is shy and generally avoids human interactions. Furthermore, the adult does not have mouthparts and thus does not seek out food, such as food crops or food waste that may causes contaminations. The purpose of the adult form is to locate mates, copulate and lay eggs. It is only in larval form that BSF seek out food. The larvae have evolved to break down problematic microbes and emit odours that repel pests. Once the larvae have consumed enough nutrients, they pupate and prepare for metamorphosis into an adult fly.

BSF farmers leverage the insatiable appetite of BSF larvae to treat a wide spectrum of organic waste streams, and process the pre-pupae and excrement into high value products[10], including frass based fertilisers.

Frass has many unique characteristics that synthetic fertilisers do not, and which stimulate the soil food web, which in turn feeds and protects plants.

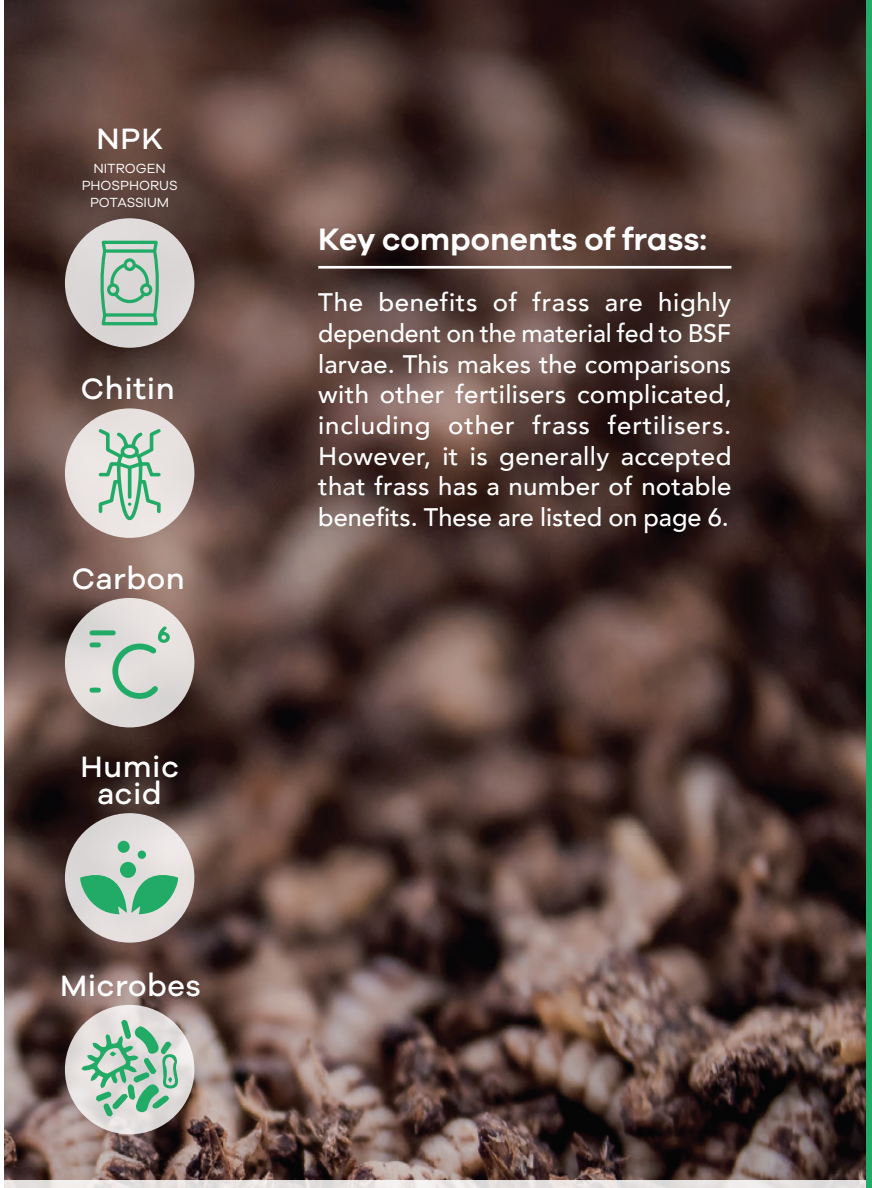
Further treatment of frass, such as through composting, is often necessary to obtain a stable/mature product. Thus, there are examples of frass products being processed further into client specific needs and requirements: granular, pelletized, encapsulated, and liquid, and can be used in deep placement or surface placement.

The use of frass as a horticultural input is consistent with the principles of circularity - closing the loop of BSF farming by cycling nutrients and organic matter back into soil.

Compared to synthetic fertilisers, frass based fertilisers are regarded as a more sustainable alternative, especially where regenerative agriculture, resilience and competitiveness are prioritized.

BSF farming and frass production can be undertaken at various scales from large CAPEX intense industrial scale centralised facilities with controlled environment technologies and automation, to cheaper labour intense decentralised containerised operations.

Table 1 illustrates the NPK and carbon values achieved by a number of international frass products, of which are highly dependent on feedstocks and further treatments.




## Key components of frass:

The benefits of frass are highly dependent on the material fed to BSF larvae. This makes the comparisons with other fertilisers complicated, including other frass fertilisers. However, it is generally accepted that frass has a number of notable benefits. These are listed on page 6.

**Table 1: Frass product analysis from the scientific literature and commercially available products**
**Source: Demster *et. al* (2022) and company websites**

| BRAND/STUDY | N | P | K | CARBON |
|---|---|---|---|---|
| | W/W% | | | % |
| Bardee | 3.5 | 1.9 | 2.1 | - |
| Beesigamukama *et al.* (2020) | 2.1 | 1.16 | 0.17 | - |
| EntoFood | 3 | 2.5 | 0.5 | 22% |
| Enviro Flight | 3 | 2 | 1 | - |
| Gärttling and Schulz (2019) | 3.4 | 2.9 | 3.5 | - |
| InnovaFeed | 3 | 4 | 3 | >75% |
| Nutrition Technologies | 3 | 2.8 | 1.6 | - |
| The Critter Depot | 5 | 3 | 2 | - |
| Fly Lab | 3.2 | 2.9 | 1 | 20% |
| Nutrition Technologies | 3 | 2.8 | 1.6 | - |
| Protix | 3 | 3 | 3 | - |
| Hexafly | 3 | 2 | 1 | - |
| Protenga | 4.7 | 2.5 | 1.2 | 32% |

[10] BSF farming also process larvae to such as dried grubs, protein meals, oils, and more niche products like palatnats, functional feed, and chitin.

## Elements of frass:

**Nutrients:** Frass contains a wide array of macro-nutrients (NPK) and micro-nutrients, of which concentrations are similar to that of animal manures.[11,12,13.]

**Carbon:** Frass is largely made of carbon based substances, notably undigested biomass. When applied to soil, this carbon acts as an energy source for soil microbes.

**Microbes:** Frass contains and supports a diverse and dense community of beneficial microbes that directly and indirectly build and maintain resilient soils, cycle nutrients between soil and plants, and act as bio-stimulants[14].

**Chitin:** Frass contains chitin, a naturally occurring biopolymer that makes up the major constituent of the exoskeleton of insects, and which has bio-stimulant properties. Chitin in fertilisers has shown to stimulate growth of beneficial bacteria and mycorrhizal fungi, whilst supressing plant pathogens, induce plant defences against certain insects, and in general have a positive effect on soil and plant health[15].

**Humic acid:** When further processed and allowed to mature, frass based fertilisers can contain humic acid, a final break-down constituent of decay of plant and animal materials. Humic acid increases the cation exchange capacity (CEC) of soils, allowing soils to hold onto key micronutrient for more efficiency plant uptake and growth, whilst also reducing nutrient leaching.

**Produced locally:** Frass is a product of the BSF farm process. BSF are fed a wide range of organic material, notably organic waste. This means that the horticultural sector can leverage frass based fertilisers within the urban landscape, thus ensuring hyperlocal production of fertilisers, thus reducing need for imported fertilisers.

## Benefits of frass:

**Enhance growth:** Frass is rich in macro-nutrients (NPK), micro-nutrients, humic acid, microbes, and chitin. In combination, these elements enhance plant growth[16], including seeds, fruits and flowers.

**Promotes healthy soil:** Frass has shown to harbour a diverse and dense mix of microbes, but that also directly and indirectly support soil microbes.

**Increases stress tolerance:** Frass contains microbes and compounds that increase the tolerance against stresses, such as drought, flooding, and salinity.

**Boosts plant defences:** The chitin in frass activates plant defence responses against a wide range of threats, notably future threats.

**Introduces carbon to soil:** Frass boosts soil organic carbon content, which in turn stimulates beneficial micro-organisms.

**Soil structure:** Frass promotes the growth of mycorrhizal fungi, that bind soil particles and in turn improves soil structure and erosion prevention.

**Increases water holding capacity:** The increase soil carbon of frass infused soil increases the water holding capacity of soil.

**Suitable for all soil types:** Frass often has a neutral pH, is low in salt, and high in humic acid, which benefit all soil types.

**Co-application:** Frass can be used in conjunction with synthetic fertilisers, and have shown to have better outcomes than sole synthetic fertiliser application[17].

**Slow release:** Mature frass has high CEC, meaning it ensures soils are able to hold onto nutrients for longer to facilitate the slow release and uptake of nutrients and in turn ensure efficient fertiliser application and ultimately input costs.

[11] Wageningen (2023) – https://edepot.wur.nl/587213
[12] Basri et, al (2022) – https://www.mdpi.com/2304-8158/11/17/2664
[13] IPIFF (2021) – https://ipiff.org/wp-content/uploads/2021/11/Nov-29-2021-IPIFF-fact-sheet-on-insect-frass-final.pdf
[14] A biostimulant is an organism or derived substance from a natural organism that is used for the improvement of plant growth.
[15] Wageningen (2023) – https://edepot.wur.nl/587213
[16] In some cases, poor plant growth has been documented with the use of frass, but this attributed to poorly processed and unstable frass.
[17] Roman et al. (2023) – https://www.maxapress.com/data/article/tihort/preview/pdf/TIH-2023-0008.pdf

# 4 The opportunity

A number of niche applications for frass are being investigated. However, **the primary opportunity being driven is to provide organic waste producers / handlers with a landfill alternative disposal solution**[18], whilst also supplying the market with organic fertilisers and bio-stimulant for horticultural activities.

The short-to-medium term opportunity lies in providing the market in full and/or in part replacement of synthetic fertilisers, whilst in the medium-to-long term, there is are niche opportunities in the form of bio stimulants.

Of the ~22.8 million tonnes of food for human consumption produced and/or imported in South Africa in 2021, ~10.3 million tonnes (45.4%) was never consumed, and wasted.

**Figure 4** tables where along the value chain this food loss and waste takes place for various commodity types. It also illustrates the potential frass (wet) that could be produced. This is based on a conversion rate from input into frass is between 20 – 30%[19]. Applied to the total of ~10.3 million tonnes of organic waste generated in South Africa, a range of between 2.1 – 3.1 million tonnes of frass (wet) could be produced. The feedstock type and how the frass is treated further will determine the end product and subsequently value potential.

It is extremely difficult to get a realistic value potential if converted into a frass product. This is due to the various inputs and product configurations. However, if an optimistic range of R1 500 – R4 000 per tonne of frass (wet)[20] were applied, then the total potential could be between R3.1 – R12.4 billion per year of frass (wet).

Additional value could be added to the frass product to increase the value proposition. However, this is highly dependent on the frass producer and the specific end market. The above opportunity is a highly optimistic estimation, and does not take into account the regional variations and activities.

Almost two thirds of food loss and waste was produced at points along the value chain largely associated with the urban landscape: processing and manufacturing; retail, wholesale and distribution; household and consumption[21].

And almost half of the loss and waste takes place at the production stage. A stage synonymous with large, homogenous, consistent, and relatively clean waste streams.

Furthermore, much of production takes place within the urban landscape, thus producers are reliant of outsourced disposal solutions. This makes disposal an overhead and costly liability. BSF farmers are well should consider focusing attention on the production stage great opportunities for revenue stacking.

As such the likely frass opportunity is targeted at urban, notably metropolitan areas, of which South Africa has eight[22].

**Figure 4** illustrates where along the value chain this food loss and waste takes place, the potential frass to be produced, and also broad considerations for frass producers to consider when targeting the supply chain.

[18] See GreenCape (2023) – https://greencape.co.za/library/industry-brief-black-soldier-fly-agriculture-upcycling-cape-towns-organic-waste/

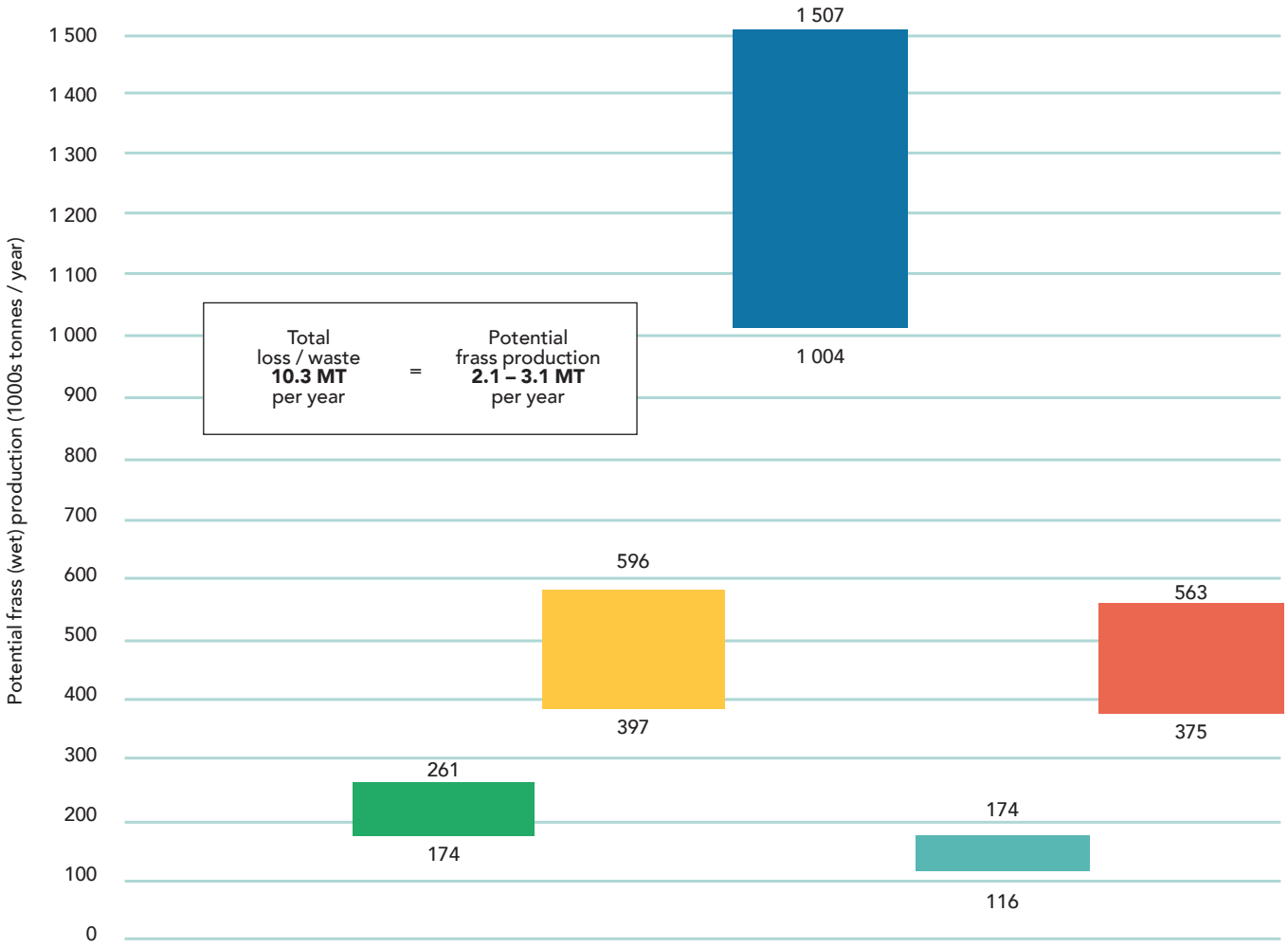
[19] Highly dependent on feedstocks

[20] Based on industry engagements

[21] A detailed breakdown of value chain wastage by commodity type can be found at CSIR (2021) – https://wasteroadmap.co.za/wp-content/uploads/2021/06/17-CSIR-Final_Briefing-Note_Food-waste.pdf

[22] Buffalo City, City of Cape Town, Ekurhuleni Metropolitan Municipality, City of eThekwini, City of Johannesburg, Mangaung Municipality, Nelson Mandela Bay Metropolitan Municipality and City of Tshwane.

## Potential frass production by South Africa's food value chain




| | Primary Production | Post-harvest handle / Storage | Production / Manufacture | Retail / Wholesale / Distribution | Household / Consumers |
|---|---|---|---|---|---|
| **Loss / waste by commodity (1000's tonnes)** | | | | | |
| Cereals | 103 | 589 | 3494 | 122 | 864 |
| Fruit & vegetables | 336 | 621 | 381 | 132 | 463 |
| Milk | 27 | 323 | 783 | 54 | 215 |
| Meat | 216 | 175 | 0 | 223 | 296 |
| Roots & tubers | 182 | 160 | 133 | 31 | 20 |
| Oilseed & pulses | 3 | 116 | 111 | 1 | 12 |
| Fish & seafood | 3 | 2 | 120 | 17 | 5 |
| **General feedstock considerations** | | | | | |
| Location | Rural | Urban / peri-urban | Urban | Urban | Urban |
| Number of sources | Very few | Very few | Few | Few / many | Many |
| Feedstock type | Agricultural | Agri / industrial | Industrial / Comm | Commercial | Hospi / household |
| Contamination levels | Low | Low | Low – med | Med – high | High |
| Quality control | High | High | High | Med / low | Low |
| Feedstock supply | Seasonal | Seasonal | Consistent | Consistent | Consistent |
| Homogeneity | High | High | High | Med | Low |
| Disposal burden | Low | Med | High | High | Med – low |
| Contract type | SLA | SLA | SLA | SLA | Tender |

Figure 4: Potential frass production along South Africa's food value chains
Source: CSIR (2021), and industry engagements

## Drivers

The need to localise and diversify South Africa's fertiliser dependency is driven by a number of key drivers, most notably:

### Supply security

South Africa is a net importer of fertiliser. In 2021, South Africa exported ~0.77 million tonnes of fertiliser, whilst imported ~2.6 million tonnes[23]. This net import of ~1.8 million tonnes makes up 83% of the total 2.2 million tonnes consumed in 2021. Furthermore, of the R24 billion worth of imported fertiliser, R17 billion was purchased from just five countries (Saudi Arabia, Russia, Qatar, Oman, and China)[24]. This is a major risk in the event of supply challenges, such as geopolitical tensions.

### Price volatility of synthetic fertilisers

Supply chain constraints affect prices. Coupled with a weakening Rand, unstable energy supply and rising fuel prices, farmers ability to weather price volatility illustrated by **figure 3** are proving difficult. Although the price of fertiliser is falling from historic highs, geopolitical stress continue to pose a risk.

### Consumer demand for organic products

The global, and to some extent local, demand for organic food is on the rise, especially in South Africa's major export markets, such as the US and EU. Local suppliers are under pressure to develop more sustainable products and as such are seeking organic based inputs to replace synthetic fertilisers.

### Demand for water smart agriculture

There is a growing recognition of the importance of integrating water smart practices in agriculture, notably in drought prone parts of South Africa.

### Regenerative agriculture demand

Brands are under pressure from shareholders and consumers to produce sustainable products. Notable demand is growing in foreign markets such as the EU, UK, and the US, with major brands like PepsiCo, Walmart, Nestle, and General Mills making sizable investments and requirements in regenerative practices, including the use of organic fertilisers[25].

## Barriers

However, there are a number of barriers to growth affecting, or likely to affect, the frass fertiliser market, at least in the short term:

### Scaling operations

It has been difficult for BSF farmers to scale farming operations at a large enough scale that meets the demand of large farmers that are willing to pay premium prices and sign into long term contracts.

### Market awareness

Although regenerative agriculture is gaining traction, and the use of organic fertilisers is on the rise in South Africa, this shift has been slow and has taken the organic fertiliser sector time to grow its reputation. This can be attributed to limited commercial product ranges and the adoption lag by farmers hesitant to shift to less known products with short track records. With frass being such a new product line, awareness and trust is low and would take time to develop.

### Registration delays

In order to sell frass as an agricultural input product, that product must be registered as such (Section 5). Due to COVID-19 related delays and capacity constraints, the Department of Agriculture Land Reform and Rural Development's (DALRRD) ability to process applications in a timely manner are extremely compromised, with turnaround times in excess of 18 months. This makes it difficult to develop a legally compliant product in a fast enough timeframe.

### Onerous special claims registration

Frass fertiliser products that make additional claims beyond NPK levels must go through a difficult Group 3 application process (Section 5), which is burdensome, and requires proof of claims, which are likely to incur additional costs and product development delays.

### Complex carbon credit accreditation

The viability of leveraging carbon sequestration as an incentive for farmers using carbon rich frass fertiliser is limited by amongst others: upfront costs linked to soil sampling and project registration, opportunity costs of shifting practices, the potential near-term reduction in crop yields, and the current market price of nature-based carbon credits.

[23] Fertasa (2023)
[24] Quantec (2023)
[25] Insight Ace (2023) – https://www.insightaceanalytic.com/report/regenerative-agriculture-market/1623#:~:text=The%20Global%20Regenerative%20Agriculture%20Market,forecast%20period%20for%202023%2D

## Insights from industry:

- It is imperative that frass fertiliser products are registered as such. Not only is this a mandatory requirement (Section 5), but it allows for a more competitive market price compared to unregistered products.
- Further treatment of frass is often needed to obtain a stable / mature product. Frass fertiliser developers could partnering with reputable composters.
- To ensure consistent product for both the client and for the registration parameters, it is important to have consistent inputs. This may be difficult when processing mixed urban organics. One consideration is to integrate and dilute inconsistent frass product into composting operations that are treating large volumes of consistent inputs, for example manures or greens.
- Frass product developers could engage potential clients / sectors to understand how they physically distributed fertilisers and only then invest in key equipment to process frass into the correct format.[26]
- When developing a frass product, engage the sector to understand what nutrients are needed for their crops, and then curate the product for the client's / sector's needs.
- Consider developing a frass product that is dry. This helps with preventing product rot, allows for easier and longer storage, and ensure a good reputation with clients.[27]
- Consider pricing frass products that it is cheaper or the same price as products clients are already familiar with, and only then once a reputation has been secured, consider raising the price when the client accepts benefits.
- Consider joining a reputable industry body that support your industry, and who have access to strong networks. There are two key representative bodies of fertiliser industry, South Africa hosts two key association that can assist the industry in navigate the regulatory challenges.

  Fertilizer Association of Southern Africa (FERTASA) aims at supporting and promoting the fertiliser industry, whilst the South African Bioproduct Organisation (SABO) represents the bio-product industry, and covers a wider range of products beyond fertilisers.
- Due to the organic nature of frass, some frass fertiliser producers are interested in capitalising on this quality and seek to sell frass as an organic input but also to sell into the certified organic supply chain. There are a number of reputable organic certification bodies in SA.

  Ceres is a South Africa based certification for organic farming and food processing, for organic textiles, for Good Agricultural and Good Manufacturing Practices in the food industry, and also certification according to several global agricultural sustainability standards.[28]

  EcoCert South Africa, is a subsidiary of the Ecocert group, and assist stakeholders in the implementation and promotion of sustainable practices through certification. Ecocert certifies according to over 150 programs, selected for their environmental and societal criteria.[29]

[26] For example, pelletised fertilisers are slow support release, and are easier to use with various farming equipment, and are a popular choice for plants that need controlled release of nutrients

[27] Clients may purchase x tonnes of frass fertiliser. If the frass fertiliser is wet and lose it may lose weight in transport due to evaporation resulting in lower tonnages than what the client purchased and thus causing conflict about.

[28] Certifications standards include EU Organic, USDA NOP, JAS, Bio Suisse, Naturland,

[29] Ecocert certifies a wide range standards as listed at https://www.ecocert.com/en-ZA/certifications-list

# 5 Regulatory landscape

Regulations plays a key role in shaping the commercialisation of horticultural products and their inputs. It is vital that regulations are adhered to protect humans and animals. Below are a number of regulations existing and future BSF business and investors should consider.

## Waste:

The management of waste in South Africa is regulated by the National Environmental Management Waste Act (Act 59 of 2008).

The Act provides a list (GN921 of 2013) of waste management activities that require a an activity to secure a waste management licence, and undertake an environmental impact assessments (EIA). To reduce the regulatory burden, some activities have been downgraded to norms and standards.

Annexure 3 of the norms and standards for the treatment of organic waste (GN1984 of 2022) sets requirements for organic waste treatment facilities, including BSF.

Companies looking to integrate composting activities into their business model must adhere to the requirement of the norms and standards for organic waste composting (GN561of 2021).

Companies looking to pre-process general organic waste must consider the norms and standards for the sorting, shredding, grinding, crushing, screening, chipping or baling of general waste (GN561 of 2021).

Some municipalities also have local waste management related bylaws that must be adhered to when operating within their jurisdiction, for example: The City of Cape Town[30] and the City of Johannesburg[31] both have integrated waste management bylaws that require businesses sorting or recycling waste must be accredited with the respective city waste departments.

## Fertiliser:

Fertilisers, composts and soil conditioners, as well as, biostimulants are regulated by the Fertilisers, Farm Feeds, Agricultural Remedies and Stock Remedies Act (Act 36 of 1947), more specifically, the Regulations Relating to Fertilisers (GN972 of 2017).

Companies seeking to label / sell fertiliser must register each product. There are three groups to register fertilisers as:

**Group 1:** fertilisers containing a total of ≥100g/kg of NPK or any combination thereof.

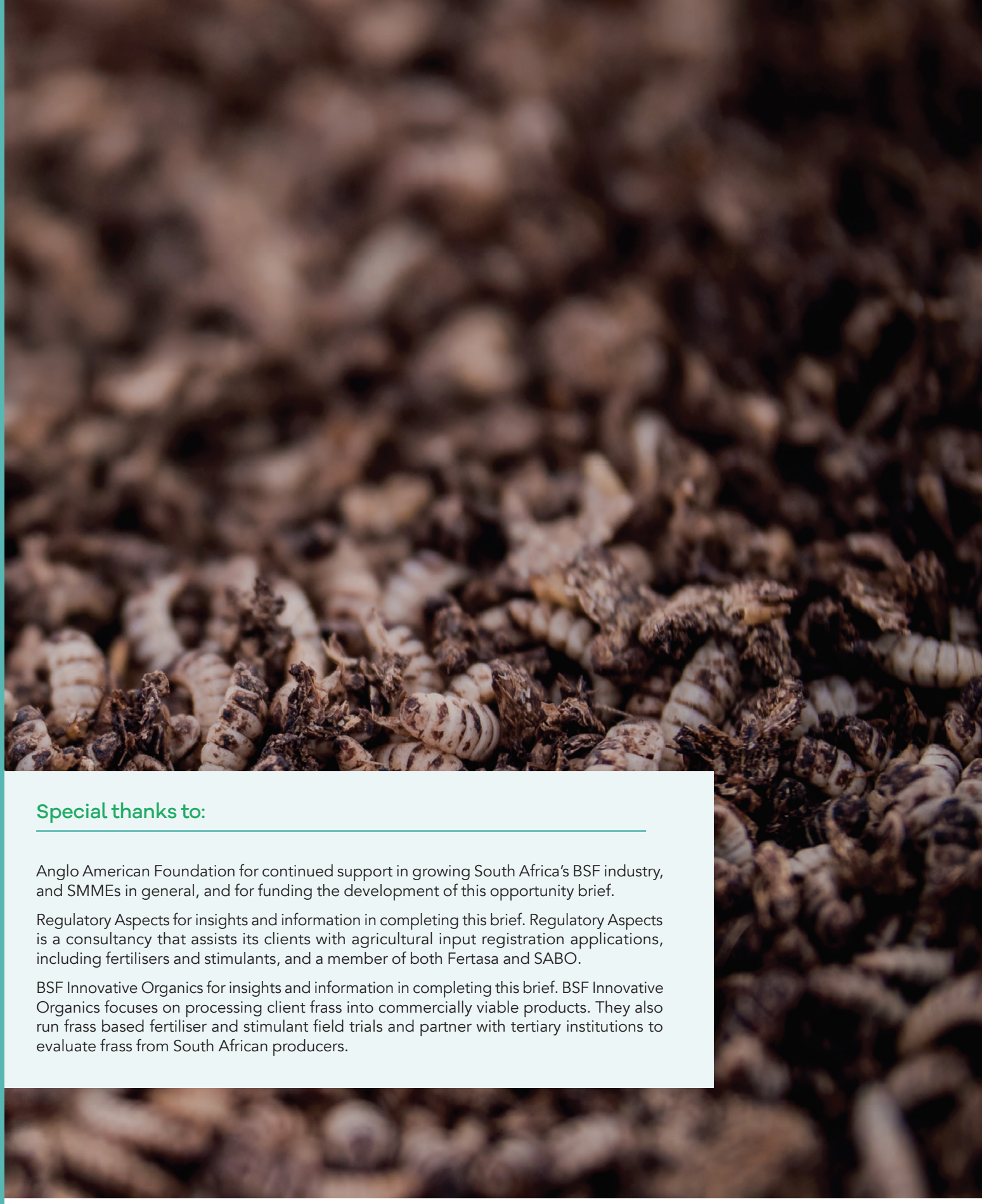
**Group 2:** fertilisers containing a total of <100g/kg of NPK; or any combination thereof; or any other recognised plant nutrient(s) in acceptable amounts as indicated.

**Group 3:** a fertiliser containing natural or synthetic substance(s) or organisms(s) that improve(s) or maintain(s) the physical, chemical or biological condition of the soil.

Frass products marketed for their nutrient (NPK) benefits only will likely fall within Group 2 group. Additional claims, such as biostimulant related benefits, will need to apply for Group 3 certification.

Group 2 applications are relatively shorter, generally cheaper[32], and easier to obtain than Group 3[33]. Group 3 applications are highly onerous and must be accompanied by various proofs, which incur additional costs related to testing.

[30] City of Cape Town IWMBylaw – https://openbylaws.org.za/akn/za-cpt/act/by-law/2009/integrated-waste-management/eng@2016-06-30
[31] City of Johanesburg IWMBylaw – https://openbylaws.org.za/akn/za-jhb/act/by-law/2021/waste-management/eng@2021-10-13
[32] About registering Group 2 fertiliser – www.gov.za/services/fertilizers-farm-feeds-agricultural-remedies/register-group-2-fertilizer#
[33] Guidelines for registration of Group 3 fertilizers can be found at – https://www.dalrrd.gov.za/index.php/core-business/agricultural-production/inspection-services/agriculture-inputs-control

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