

## Narration for Presentation on Enduse of Treatment Products

### Slide 2

Hi, my name is Ani Vallabhaneni, and I'm one of the co-founders of Sanergy, a social enterprise based in Nairobi, Kenya. Today, I'm going to give you an overview of the work we do here at Sanergy and focus primarily on how we treat and convert waste into valuable end-products.

### Slide 3

Sanergy is working to tackle the sanitation crisis in urban slums – starting with Nairobi's informal settlements.

We launched our first toilet in November 2011, and we remain committed to making safe sanitation accessible and affordable for everyone, forever.

### Slide 4

As you've learned in this course, the provision of safe sanitation requires more than just a clean toilet. It also requires safe and professional removal and treatment of waste. In order to address the entire sanitation value chain – and in order to make our solution sustainable – we take an innovative **systems-based** approach to tackling the sanitation crisis in 5 parts: build, franchise, support, collect and treat, and convert and distribute.

**Build.** Using local materials and labor, we design and build high-quality, low-cost sanitation centers known as Fresh Life Toilets.

**Franchise.** We distribute them to the community through three different methods: a commercial model, a residential model, and a community model. The residents who run our toilets are called Fresh Life Operators.

**Support.** We provide a variety of support services to our Fresh Life Operators, helping them secure the materials and acquire the skills they need to start their business and ensure its success.

**Collect and treat.** On a regular basis, Sanergy's waste collection team collects the waste from each Fresh Life Toilet and safely transports it from the community to our central waste processing facility, where it is then properly treated.

**Covert and distribute.** Sanergy converts this waste into saleable end-products like organic fertilizer and insect-based animal feed, which we sell to farms.

### Slide 5

Our Fresh Life Toilets capture the waste in double sealed cartridges, for safe and easy waste collection. Our urine diverting squat plates automatically separate urine and feces into the 2 cartridges, reducing smell and improving our customers' experience.

Each Fresh Life Toilet can meet the needs of 100 visitors per day. When full, each cartridge weighs 30 kilograms.

### **Slide 6**

Fresh Life has three primary distribution models for our toilets:

Commercial toilets, which FLOs run as pay-per-use toilets for public customers.

School toilets, which provide hygienic sanitation to the most underserved populations

Residential toilets, providing secure 24-hour access to residents within the safety and comfort of their own plots.

### **Slide 7**

We work to create an environment that enables our Fresh Life Operators to thrive by helping them gain access to land, capital, training, and government support. Once they launch their business, field officers visit them on a regular basis to help them with the smooth functioning of their business and to ensure they are maintaining the standards of the Fresh Life network.

### **Slide 8**

We provide safe and professional waste collection services on a regular basis for every toilet in the Fresh Life network. To date, we have removed 8,200 tons of waste from the communities we serve.

### **Slide 9**

Once we remove the waste from the community, we convert it into a variety of valuable end-products, including organic fertilizer, insect-based animal feed, and biogas. We sell these end-products to Kenyan farmers, as a critical part of sustainable agriculture practices in East Africa.

### **Slide 10**

We co-compost human waste with other organic waste – primarily rice husks and maize cobs, using a technique called aerated thermophilic box composting, in order to convert the human waste we collect from the Fresh Life Toilets into organic fertilizer that improves Kenyan farmers' soil health and crop yields.

In our current process, we combine our toilet waste with rice husks and maize cobs and allow the waste to sit in compost boxes for 2-3 months. After that, they are transferred to windrows, where the fertilizer further matures for another 4-6 months.

We are currently experimenting with ways to improve our composting process, including adding in a step of mechanized mixing to accelerate composting, incorporating lime into the feedstock to kill pathogens earlier in the process, and testing new ways to improve the aeration of the compost.

### **Slide 11**

The final product is Evergrow fertilizer, which addresses a variety of critical needs Kenyan farmers face.

80% of Kenyans rely on agriculture for their livelihoods, but farmers are often stuck in a poverty trap due to declining agricultural productivity.

Without enough nutrients and organic material being restored into the soil, each harvest further depletes the land, and farmers are trapped in a downward spiral of declining soil fertility and decreasing yields.

The Kenyan Ministry of Agriculture has identified soil degradation as the number one issue surrounding Kenya's food security. As such, the Ministry of Agriculture has recommended that farmers use up to 10 tons of organic fertilizer per hectare to restore soil health.

However, regional farmers do not have ready access to organic fertilizers, as they are not produced domestically, and imports are prohibitively expensive.

### **Slide 12**

As you read in Chapter 10, fertilizer derived from human waste is used all over the world.

Because of our cartridge-based collection system, we can be sure that the waste used in Evergrow has never come in contact with other types of refuse and thus lacks the heavy metals and chemicals often found in industrial waste and that can make their way into biosolids derived from sewer waste.

In addition, every batch of Evergrow is tested by external labs for the presence of salmonella and E. coli, which are indicator organisms, representative of the bacteria present in a sample.

High in nutrients and pathogen-free, Evergrow is used by farmers on a variety of crops, including French beans, corn, tomatoes, flowers, and more. It consistently increases crop yields by at least 30%, while also restoring soil health.

### **Slide 13**

We also convert the waste into insect-based animal protein, using Black Soldier Flies, whose larvae eat a combination of human waste and kitchen waste.

Boiled and dried, BSF larvae make a high-performing protein additive for animal feed that is more sustainably produced than Omena, the current available alternative in the region.

#### Slide 14

The animal feed market is growing rapidly in Kenya, and there's high demand for quality protein inputs.

Feed millers are unsatisfied with the inconsistent supply and poor quality of Omena, and they are excited for a product that provides comparable results with more consistency in supply and quality.

We are currently in the process of proving the market for insect-based protein and working with partners around the globe to determine how best to scale our production.

#### Slide 15

We are also piloting the production of biogas from human waste. In the last year, we have made two significant discoveries:

First, we were pleasantly surprised to learn that after testing several organic wastes, fecal waste from our toilets could generate high-quality biogas with a high methane content. FLT fecal waste also performed well in terms of total volume of gas produced. Considering methane content, volume of gas produced, and availability of the feedstock from our own toilet network, we have demonstrated that fecal sludge is a viable feedstock for a large-scale anaerobic digestion system.

Second, use or disposal of the resulting effluent posed a major hurdle for us, as it does with most large-scale anaerobic digestion projects. The nutrient content of the effluent byproduct gives it potential for reuse, but the cost and difficulty of transporting the highly diluted liquid makes it challenging to actually harness its potential. In collaboration with researchers from the Swiss Federal Institute of Aquatic Science and Technology ([EAWAG](#)) who tested their [VUNA system](#) for urine valorization with us in 2014, we realized we could apply a similar process to further concentrate the effluent into a natural high-nitrogen fertilizer as potent as widely used chemical fertilizers like [calcium ammonium nitrate](#).

Based on these two discoveries, we are developing innovative pre- and post-treatment steps for our biogas process to ensure maximum efficiency and minimum waste.

#### Slide 16

And as I mentioned, in collaboration with EAWAG, we are looking for ways to develop liquid fertilizer from the urine we collect and from the effluent of our biogas production.

Liquid fertilizer is high in nitrogen which promotes plant growth and restores soil health.

### **Slide 17**

At Sanergy, treatment and reuse of end-products is critical to our mission of building healthy, prosperous communities by making hygienic sanitation accessible and affordable in urban slums. We are dedicated to finding the most effective and efficient uses for the human waste we remove and collect from the communities we serve.

If you have any additional questions about our work generating value from waste, please feel free to email me at [ani@saner.gy](mailto:ani@saner.gy), visit our website, or follow us on social media.