SDG 2.1 what get by MBGC ?
(Mini Bio Gas Continuous)

Digester - MBGC toward SDGs/UN 2.1
(Target 2.1: By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round).

Summary

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Cries of Hunger:

Hunger is a complex, multifaceted problem with deep-seated roots in poverty, inequality, conflict, and environmental challenges. Hunger doesn't merely manifest as the growling stomachs of those affected; it also leads to impaired physical and cognitive development, weakened immune systems, and, tragically, death. For children, hunger is particularly devastating, as it hampers their ability to learn, grow, and escape the cycle of poverty. In recent decades, considerable progress has been made in addressing global hunger, but significant challenges persist. According to the Food and Agriculture

Organization (FAO), in 2019, approximately 9.9% of the global population—nearly 690 million people—experienced undernourishment. While this marked a decrease from previous years, it's clear that more must be done to eradicate hunger by 2030, as the international community has committed.

In a world where the contrasts between abundance and scarcity often take center stage, Sustainable Development Goal 2.1 (SDG 2.1) stands as a beacon of hope, calling for an end to hunger, the most fundamental and pressing challenge facing humanity. This goal is part of the United Nations' broader 2030 Agenda for Sustainable Development, which addresses critical global issues such as poverty, inequality, climate action, and peace. SDG 2.1, however, zeroes in on a challenge that has haunted human societies for millennia: ensuring that everyone has access to enough safe, nutritious food. SDG 2.1 is an integral component of the broader second Sustainable Development Goal, SDG 2, which aims to "End hunger, achieve food security and improved nutrition, and promote sustainable agriculture." However, SDG 2.1 hones in on the specific target of ending hunger, which is not only a moral imperative but a strategic necessity for a peaceful and prosperous world.

It is unconscionable that in a world with the knowledge, technology, and abundant resources to feed every person, millions still go to bed with empty stomachs. The access to food is a basic human right which forms the very essence of our shared humanity and its denial perpetuates grave injustice. The leading motivation for eradication hunger is deeply rooted in humanitarian principles. The insistent prevalence of hunger stands as a harsh reminder of collective failure to protect the most vulnerable among us. As conscious inhabitants of this planet, we are duty-bound to address this pressing issue and ensure that no one sleeps with the gnawing ache of an empty stomach. Ending hunger isn't solely a matter of charity; it is an ethical imperative that underscores our commitment to a more just and equitable world.

Malnutrition is a direct consequence of food scarcity which leaves individuals more vulnerable to host debilitating diseases. It stunts growth, particularly in children, depriving them of their physical and cognitive potential. Moreover, it inflicts lifelong health complications, leaving a lasting imprint on the individuals. The aftermath of hunger echoes throughout entire communities, entwine them in a web of poverty and deteriorating health. In many cases, it becomes a vicious cycle, where hunger and ill health feed off one another, making it extremely challenging for individuals and communities to break free from the shackles of deprivation. Prioritizing access to adequate and nutritious food is not only an essential component of promoting health and well-being but also a crucial step towards breaking the cycle of poverty and disease. It is our moral duty to address hunger as a fundamental pillar of ensuring good health and well-being for all.

Apart from being a major humanitarian concern, hunger profoundly affects the economic prosperity of the communities. When individuals and communities suffer from malnutrition, their ability to contribute to economic growth and development is severely hampered. Malnourished individuals often struggle to perform well at work, reducing their overall productivity. This practice is particularly detrimental to countries seeking to achieve economic prosperity and sustainable development.

In addition to its direct impact on the workforce, hunger prevents children from learning and doing well in school. Poor nutrition can lead to mental retardation, which hinders their educational progress. As these children grow into adults, their declining education limits their future earning potential. This not only hinders their individual economic growth, but also reduces the country’s overall human capital, hindering its ability to grow economically.Stopping hunger is therefore not just a moral imperative; It is also a wise financial decision. By ensuring that everyone has access to adequate and nutritious food, countries can unlock the full potential of their workforce and invest in the human capital needed for sustainable economic prosperity.

Hunger is a force for human instability, with consequences far beyond an empty stomach. In many parts of the world, it can exacerbate existing conflicts and even create new ones. As individuals and communities struggle with food insecurity, competition for limited resources intensifies, often leading to conflict and violence. Fighting hunger is therefore not only a humanitarian issue, but also an important step towards peace and stability. Where hunger is prevalent, the pressure on access to food, water and arable land can be severe. Because these conflicts are based on scarcity of resources, they can perpetuate a cycle of violence and instability. Moreover, hunger can leave individuals and communities vulnerable to domination and violence by extremist groups, making it a powerful source of conflict. By prioritizing hunger prevention we contribute to a more peaceful and secure world. is an essential prerequisite for sustainability.

Sustainable Developmental Goal 2.1:

Before delving into the strategies and analyzes to achieve SDG 2.1, it is important to understand the current state of global hunger. According to the Food and Agriculture Organization of the United Nations (FAO), the number of undernourished people worldwide is on the rise, reaching almost 690 million by 2019. This is an alarming trend that needs to be addressed early In recent years, we have witnessed various global challenges such as climate change, conflict and economic crisis, which have further exacerbated the issue of hunger. Understanding the scope of the problem and the underlying causes is essential to finding effective solutions.

SDG 2.1, which aims to end hunger and promote sustainable agriculture, provides a multi-pronged approach towards food security, sustainable agriculture, and development goals external challenges and relies on several complementary strategies to achieve this ambitious goal:

1. **Ensuring safe, nutritious and adequate food for all:** At the heart of SDG 2.1 is the commitment to ensure that every person, regardless of their socio-economic status or location, has access to safe food , nutritional and appropriate. This approach addresses not only the quantity of food available, but also its quality, recognizing the importance of a balanced diet for good health.
2. **Promoting sustainable agriculture:** Sustainable agriculture is key to achieving SDG 2.1. These policies include actions that aim to reduce the impact of food production on the environment, promote biodiversity, and protect natural resources such as soil and water Sustainable agriculture recognizes that the health of the planet is closely linked to our food system.
3. **Investment in agricultural research and development:** Innovation in agriculture is essential to increase productivity, resilience and sustainability. By investing in agricultural research and development, we can develop more efficient agricultural practices, pest and disease

resistant crop varieties and strategies to adapt to a changing climate.

4. **Supporting Small-Scale Farmers and Agri-Businesses:** Small-scale farmers often play a vital role in food production, particularly in developing regions. Supporting these farmers through access to resources, training, and markets is an essential mechanism to achieve SDG 2.1. Additionally, promoting agri-businesses that connect small-scale producers to global markets can enhance economic opportunities for communities.
5. **Ensuring Resilience in the Face of Climate Change and Other Challenges:** Climate change, natural disasters, and other external challenges can disrupt food systems. Ensuring resilience in the face of these challenges is crucial. This mechanism involves building infrastructure, systems, and practices that can withstand and adapt to these threats without compromising food security.

By addressing these mechanisms, professionals and decision-makers can collaborate effectively to build a more secure and sustainable food system. This approach recognizes that ending hunger and promoting sustainable agriculture are not standalone goals but are intricately connected to broader global objectives of economic development, social equity, and environmental stewardship.

For ending hunger and promoting sustainable agriculture, it's crucial to recognize the substantial challenges that must be surmounted. These challenges span the socio-economic, environmental, and political spheres, and understanding them is the pivotal first step towards formulating effective strategies for success.

1. **Economic inequalities limiting access to food:** One of the most important barriers to hunger reduction is the severe income inequality that exists worldwide and although it is widely produced worldwide, this does not mean that everyone will have it. Many individuals, especially in low-income communities, simply can’t afford the food they need. This economic divide prevents

them from achieving the benefits of SDG 2.1 which seeks to ensure safe and nutritious food for all.

2. **Climate change and its impact on agricultural production:** Climate change poses serious threats to agricultural systems. Rising temperatures, unpredictable weather, and increased frequency of extreme events such as droughts and floods are already disrupting crop production and smallholder farmers, who often lack the resources to adapt, are affected if it shouldn't. These climate-related challenges not only impede progress towards any famine but also threaten the sustainability of agriculture.
3. **Conflict and Fragility Disturbing Food Systems:** Food systems are highly fragile in areas affected by conflict and instability. Weapons of mass destruction can destroy food production, distribution, and availability, leading to severe food shortages. The consequences of this crisis run through communities, particularly affecting women and children. Achieving SDG 2.1 in such conflict-affected

areas is a major challenge, underscoring the critical role of peace and stability in ensuring food security.

4. **Comprehensive structural change is needed:** Any kind of famine requires comprehensive structural change to transform the global food system. This is not only about producing more food but also ensuring equitable distribution, sustainable practices and products where smallholder farmers have access to resources. These policy changes must address complex issues such as trade agreements, access to land, agricultural subsidies, and food waste reduction. Implementing such policies in a way that promotes inclusive growth is a formidable challenge.
5. **Data collection and management:** Going beyond SDG 2.1, robust data collection and management is needed. Unfortunately, many projects, especially in low-income countries, face challenges with data collection procedures, which prevent accurate measurement of the impact of interventions.
6. **Socio-Cultural Factors:** Food choices can be influenced by dietary habits, cultural beliefs, and socio-economic

factors. Addressing these factors can be particularly challenging to promote nutrition and food security. This requires sensitive approaches that respect local customs and traditions.

7. **Food waste worldwide:** About one-third of all food produced for human consumption is lost or wasted. This is a fundamental challenge not only for food security but also for environmental sustainability. Reducing food waste is a multifaceted challenge that involves changes in production, distribution and consumption patterns.
8. **Rural-urban migration:** Rural-urban migration is changing the demographic landscape of many countries. As young people move from rural areas to urban areas in search of better economic opportunities, strategies to encourage youth participation in agriculture, which could affect the availability of agricultural labor and the viability of small-scale farming well.
9. **Gender inequality:** Gender inequality in access to resources, land and decision-making power is prevalent in many parts of the world. This disparity affects women's

capacity to work in agriculture, hindering efforts to achieve SDG 2.1. Promoting gender equality in agriculture is a complex and multifaceted challenge.

Addressing these challenges will require a concerted effort by governments, international organizations, NGOs and local communities. This will require innovation, investment in research and technology, and a commitment to a sustainable and equitable food system. By understanding these challenges and working together to overcome them, we can move closer to realizing the vision of a world without hunger.

Mini Bio Gas Continuous (MBGC):

In the quest for sustainable resource management and waste reduction, the innovative known as MBGC (Mini Bio Gas Continuous) " Digester" represents a significant breakthrough. This device holds the key to open the most difficult doors for us towards our journey to achieve Sustainable Development Goal 2.1. With its unique and sustainable mechanism this device has proved its worth.

Decomposition refers to the breakdown or disintegration of complex organic matter into simpler and more elemental components. The efficient decomposition of these matrices holds the key to effective resource recovery, sustainable waste management, and environmental preservation. In The Digester, decomposition involves the transformation of organic matrices, such as organic waste and biological matter, into valuable resources, primarily methane, carbon dioxide, NPK (nitrogen, phosphorus, and potassium) salts of various titres, and clarified water. This process of decomposition is driven by a series of biological reactions facilitated by specific bacteria and occurs in a controlled environment within the device. To appreciate the importance of "The Digester," we first delve into the challenges inherent in organic matrix decomposition and the pressing need for innovative solutions.

Anaerobic digestion is the fundamental process underlying the production of so-called biogas. It involves the degradation of organic material by microorganisms in anaerobic conditions, i.e., in total absence of oxygen. It is a process similar to composting, which, however, occurs aerobically, in the presence of oxygen. The biogas production cycle represents an integrated system of renewable energy production, resource utilization, organic waste treatment, and nutrient recycling and redistribution. It inherently generates agricultural and environmental benefits, as listed below:

- Production of renewable energy.
- Inexpensive and environmentally friendly waste recycling.

- Reduced greenhouse gas emissions.
- Pathogen reduction through sanitation services.

The microorganisms that carry out anaerobic digestion can be classified based on their tolerance to oxygen:

- Obligate anaerobes, the group that cannot tolerate normal concentrations of oxygen (O2).
- Facultative anaerobes, the group of microorganisms that would thrive in the presence of oxygen but can tolerate its absence.
- Microaerophiles, organisms capable of using oxygen but only in reduced concentrations.
- Aerotolerant organisms, the last type of organism that cannot use oxygen for their metabolism but can still grow in its presence.

Due to their varying oxygen tolerance, these different types of anaerobic microorganisms are located at different depths in the sludge during digestion. Obligate anaerobes hide at the bottom to avoid contact with O2 molecules, while facultative anaerobes, as well as aerotolerant organisms, are distributed throughout the mixture, primarily accumulating on the surface. Microaerophiles position themselves at an ideal depth to receive only a non-toxic amount of oxygen for their survival.

From a microbiological perspective, the anaerobic degradation of organic matter into methane and certain by-products is a complex, multistage process of metabolic interactions performed by well-organized microbial communities. Consequently, various microorganisms coexist in anaerobic digesters. Even when a single type of substrate is used, their concentrated activity is necessary for the proper conversion of matter. The anaerobic digestion process causes a series of transformations in the organic material, resulting in processed material and a variety of gases, namely, the digestate and biogas, respectively.

The process of anaerobic digestion consists of four phases:

1. **Hydrolytic Phase**: The first phase involves the liquefaction of the substrate. More complex organic compounds are attacked by bacteria-containing enzymes and are then broken down into simpler organic compounds. In this phase, hydrolysis occurs as substances are dissolved in the presence of water. Hydrolysis and the fermentation by microorganisms are the primary reasons for the breakdown of polymers and monomers, producing mainly acetate, hydrogen, and a wide variety of volatile fatty acids such as propionate and butyrate. Microorganisms of hydrolytic origin secrete hydrolytic enzymes, such as cellulases, cellobiases, xylanases, amylases, lipases, and proteases. A complex group of microorganisms participates in hydrolysis and the fermentation of organic material.

2. **Acidogenesis Phase** In the second phase, commonly referred to as the acid phase, the products obtained from the hydrolysis in the previous phase (including water, ammonia, and acidic substances) are attacked by bacteria, ultimately leading to the formation of fatty acids. The

behavior of the various components depends on the concentration of the elementary substances in our compound: the lower the concentration, the more acetate is formed. During this process, approximately 20% of the total acetic acids are produced. The accumulation of hydrogen can inhibit the metabolism of acetogenic bacteria. Therefore, it is crucial to maintain a low level of hydrogen for successful acetogenesis and the preservation of hydrogen-producing bacteria. Many of these bacteria are strictly anaerobic, such as Bacteroides, Clostridia and Bifidobacteria. Additionally, facultative anaerobic bacteria like Streptococci and Enterobacteriaceae also participate.

3. **Acetogenesis Phase**: The third phase, the acetogenic phase, involves a new group of bacteria capable of attacking organic and alcoholic acids to produce acetic acids, carbon monoxide, and finally water. The products obtained from this transformation are crucial because they serve as substrates for methanogenic microorganisms. In this phase, an increase in water percentage hampers the

formation of acetogenic bacteria, affecting the production of substrates for methanogenic microorganisms. Methanogens recognize the importance of bacterial life and use the hydrogen present in water to produce methane, creating favorable conditions for their survival and establishing a symbiotic relationship between the two types of organisms.

4. **Methanogenesis Phase**: The fourth and final phase is the methanogenic phase, characterized by the highest methane production. Microorganisms formed in the previous phases transform the compound products into methane, carbon monoxide, and a mixture of other gases. The formation of these elements can essentially occur in two ways: through the methanogenesis of hydrogenotrophic bacteria or through anaerobic acetate splitting. Much of the methane produced comes from the latter of these two transformations. Methane can be considered the ultimate product of the cycle and is non-reactive within the process. These bacteria are strictly anaerobic and require a lower redox potential for growth compared to most other

anaerobic bacteria. Additionally, only a few species of bacteria are capable of converting acetates into CH4 and CO2, for example, Methanosarcina barkeri, Methanococcus mazei, and Methanotrix soehngen, while all anaerobic bacteria can degrade hydrogen to produce methane. In essence, the decomposition process in this context transforms complex organic matrices into more valuable and manageable components, which can have various applications, including renewable energy production (methane), nutrient-rich fertilizers (NPK salts), and reduced environmental impact (carbon dioxide capture). The ultimate goal of decomposition in this device is resource recovery, waste reduction, and contributing to sustainable agriculture and environmental preservation.

Effect of Temperature:

The temperature affects the "regime" of digestion: in general, as the temperature increases, the processing time decreases. When the temperature is maintained at around 35°C throughout the digestion process, it is called mesophilic digestion, and the retention time ranges from 14 to 30 days. When the temperature is maintained at approximately 55°C, it is thermophilic digestion, and the retention time is between 14 and 16 days. The bacteria characterizing this regime have a relatively high growth rate. With very simple systems, it is possible to work in a psychrophilic regime, maintaining the temperature between 10-15°C. In this case, the retention time in the system will necessarily exceed 30 days.

Influence of pH:

pH is defined as the decimal logarithm of the concentration of hydrogen ions H+. It represents an important characteristic as it affects the equilibrium between many chemical species. The optimal growth of groups of microorganisms involved in anaerobic degradation is closely related to pH, which strongly impacts enzyme activity in microorganisms, a prerequisite for anaerobic digestion. The activity reaches its maximum when the pH value is also optimal, meaning in a specific range of values, which vary depending on the type of microorganisms involved. For methanogenic microorganisms, this range is quite narrow, varying from 8.5 to 5. It is broader for acidogenic microorganisms, ranging from 4 to 8, and for acetogenic microorganisms, the optimal value hovers around 7.

The Mini Bio Gas Continuous (MBGC) known as the Digester is an integrated and compact system for the anaerobic digestion of organic matter. It is designed for small manufacturing companies in the agri-food sector and urban settlements of various sizes. Its main feature is an innovative hydraulic system with excellent effluent separation, resulting in only by-products to be directed to subsequent processes. The ultimate goal of this invention is to reduce waste from processing to nearly zero.

The MBGC invention consists of an insulated, box-shaped container divided into three distinct large volumes inside its lower part. These volumes determine the path of the liquid phase. To organize the three macro-volumes, two partitions are used, each with a height equal to two-thirds of the total height. The second partition covers the entire length of the box, while the first extends almost the entire length of the structure, leaving a vertical gap only a few tens of centimeters wide, through which sludge can pass. This creates natural passage for sludge from the first two volumes. To connect the second and third volumes, a perforated pipe of appropriate diameter is used, with the end closed, such that the sum of the areas of the various holes equals the section's area. The third volume is further divided into three parts by two new partitions perpendicular to the previous ones, covering the entire width of the third volume. These partitions are spaced at an appropriate distance, allowing different types of salts to deposit in three different stages. These salts will then be pumped away from the corners, where salt accumulation is expected to be higher.

The three macro-volumes relate to each other in a precise ratio, determined by the initial substrate volume. [$V1 = 2x$; $V2 = 6x$; $V3 = 8x$], where V1, V2, and V3 represent the three macro-volumes, and x is the volume of the substrate prepared at the beginning of the process. [Figure: Top view with the three main volumes highlighted in different colors]

As previously mentioned, the MBGC operates in two different phases: a liquid phase located in the lower part of the invention, divided into volumes, and a gas phase that occupies the upper area of the container. In the upper part of the box, for the gaseous operation of the structure, two layers of honeycomb are positioned. This particular solution uses the different weights and sizes of gaseous molecules to filter them.

The correct operation of the machine requires that the percentage of total solids in the substrate is approximately 10%. This implies that the incoming substrate needs to be mixed with an ideal amount of water to achieve the desired result. For this reason, the system needs to be initially filled with water throughout its volume to ensure proper functioning through the circulation initiated by drawing water from the end of the system.

The diluted substrate, with a wet index of around 10%, starts its cycle by traveling through the first, smaller volume. During this phase, the substrate undergoes the hydrolytic and acetogenic phases. Thanks to the vertical gap in the final phase of the partition, the substrate enters the second volume. In the second volume, the substrate goes through the remaining two stages of anaerobic digestion: the acidogenic and methanogenic phases. In this second volume, the substrate starts to stratify according to the weight of its molecules. The upper part is occupied by more oily and lighter molecules, the bottom part by more proteinaceous and heavier molecules, while the central part consists of water and non-processable salts. The MBGC system takes advantage of the tendency of the "fluid" to stratify. At the end of the digestion path, near the bottom of the second volume, the three components it's composed of are separated. The oleic and proteinaceous components re-enter the system at the beginning through two different pumps so that they can participate in digestion again. One pump is located at the bottom, created by a step to maximize the gravimetric division of the compound. A gravimetric division works on a simple principle: the heaviest phase of the fluid tends to reach the bottom at certain velocity conditions, while the lighter phases tend to occupy higher parts of the fluid until they reach the free surface. The second pump is located at the bottom of the tank near the second partition, which allows for greater extraction of the proteinaceous part as the fluid flows toward the third volume. The part no longer processed by digestion, remaining at mid-level, can proceed into the third volume. The third and largest volume is not subject to anaerobic digestion. All the material that reaches this stage is considered processed and consists only of ash (various salts) and water. The compound, being in a closed circuit, tends to continue toward the bottom of the tank.

Gas Phase:

The gas phase of the MBGC is located in the upper part of the structure, especially above the first two volumes. Due to anaerobic digestion, a gas mixture called biogas is formed. This gas mixture consists mostly of methane and carbon dioxide, both of which have significant uses. To optimize the gas separation process, two layers of honeycomb are used, placed above the first two volumes. Honeycombs operate on a straightforward principle: their structure, composed of many adjacent honeycomb cells, isolates gas molecules so that external influences do not impose motion on them. The molecule retains its dimensions and weight to move within this vertical conduit. By sizing the honeycomb cell diameter, it is possible to create channels through which only specific molecules can pass. The specific gravity of methane (0.66 Kg/m^3) is lower than that of air (1.18453 Kg/m^3) and lower than that of CO2 (1.68 Kg/m^3). Therefore, using two layers of honeycomb, preferential channels can be created for gas movement. The lower honeycomb, constructed from metal and possibly assisted by a cooling device, plays a vital role in condensing the moisture that biogas carries after anaerobic digestion. The condensed water falls back into the first two tanks, activating a recirculation system of moisture in the gaseous system. After this step, methane can be further filtered by the second honeycomb. Finally, methane can be extracted through two extraction points at different elevations to serve our purpose. The gas extraction structures consist of long pipes closed at one end and perforated, characterized by a one-inch section with side holes of overall smaller section than the transverse one (to impose inflow uniformity). Gas can be extracted from the bottom via an aspirator. The two pipes are positioned on opposite sides to match the molecular characteristics they need to contact, one above the honeycombs, and the other just above the sludge's free surface in the opposite corner.

In several parts of the structure, during the recycling phase at the end of the second volume and throughout the duration of the third volume, gravitational separation of the fluid is employed. At the end of the second volume, it is used to separate the oleic and proteinaceous parts from the one ideal for continuing the cycle, allowing for their recycling. In the third volume, through two partitions, gravitational separation is used to divide the fluid into three different types of NPK salts.

In the MBGC,”sludge" with varying composition and varying humidity enters. The first consideration is the humidity of the incoming compound. It is necessary that the Wet Index (WET) is 0.1, while the incoming WET can fluctuate between 50% and 10%. To recognize the humidity, you can consider the volume of the compound. Given the knowledge of the incoming matrix and associated statistical analyses, you can estimate the approximate WET of your compound. If it doesn't meet the parameters, you'll need to add water at the end of the cycle to adjust it.

After anaerobic digestion is completed, the fluid ideally has three distinct phases: a more proteinaceous phase at the bottom, a more oleic phase at the top, and the ideal phase to continue the cycle, primarily composed of "ash" (i.e., salts) and water, in the center. The latter part continues in a pipe with necessary holes, positioned at the right height (approximately halfway up the partition). The closed-ended pipe covers the distance between the second partition and the wall of the third tank. To ensure proper and continuous fluid flow, without preferential pathways, there must be a precise relationship between the holes distributed on the pipe and its inner diameter. The flow that continues in the third tank is essentially composed of salts and water. At the same time, the oleic and proteinaceous parts of the sludge will be recycled through two depth pumps, one at the bottom and the other in a separator near the surface. The flow that continues its path in the third tank will be split into its components during the processes of the third volume, thus obtaining three different types of NPK salts and water.

It is essential to highlight that, thanks to the continuous plant setup, the process at its conclusion yields results that do not impede or slow down the structure's operation for extraction. The choice of the quantity of salts to be extracted, as well as the frequency of this task, remains the operator's decision, aided by appropriate tools.

The Digester consists of a relatively small number of components: a purpose-built prefabricated structure divided into three volumes, a series of honeycombs to be placed in appropriate areas, a limited number of pumps, and a limited number of pipelines. Furthermore, the compact dimensions of the enclosure, approximately 10 meters in length and two meters in width, make the transportation of the structure relatively straightforward. Additionally, the use of vibrated concrete as the primary building material keeps the costs of the structure reasonable. The MBGC operates under a depression regime and is completely sealed, preventing gas from escaping. The electricity consumption relative to electricity production ranges from 1% for MBGC to 50.4% for the FORSU plant, making MBGC particularly efficient in this regard.

The Digester comes with some features that are to unique to it and makes it stand out of the crowd. These features prove to make it an essential intervention in our strategies for achieving SDG 2.1.

1. Low operating costs and a relatively low daily biomass requirement.

2. The incoming biomass can have a variable wet index (WET) due to initial mixing.

3. Compact size allows for stable and easily controllable biological processes, leading to lower management costs.

4. The compact design and low material requirements make the MBGC adaptable to various settings.

5. Continuous processing eliminates loading pauses found in conventional biogas plants.

6. The MBGC's unique feature lies in its ability to obtain three different types of NPK salts and clarified water through the gravitational separation of the final volume, which can be reused in the cycle or extracted for other purposes.

Several structural components, such as the basin's design, separation baffles, vertical pipes for gas separation, submerged pumps, and a lighting system to prevent hydrogen sulfide (H2S) formation, are integral to the device's operation. These components ensure that the organic decomposition process is optimized for efficiency, safety, and resource recovery.

The "Digester" device is designed to handle a variety of organic matrices efficiently, making it adaptable to different contexts, from agricultural settings to waste management facilities. By effectively converting organic waste into biogas and nutrient-rich byproducts, it addresses both environmental and energy sustainability goals while contributing to SDG 2.1 by promoting sustainable agriculture and food security.

In the first phase, the tools involved in the system include the storage tank for slurry, the induced collection of any pumpable co-products, a sanitation system when necessary, a storage system, and a system for feeding solid substrates.

Furthermore, the subsequent production phases involve:

- Biogas production in the digester; during this second phase, the main unit involved is the digester tank.
- Digestate storage for potential use as a fertilizer.
- Biogas production.
- Biogas treatment and/or utilization.

In the later phases, important tools involved in production include the gasometer, the cogeneration unit, and, if necessary, a biogas upgrading unit to produce biomethane. A gasometer (gas holder) is a structure designed to store various types of gas for different purposes. The volume of the structure follows the quantity of stored gas, controlled by the pressure exerted by a movable cap on top. A typical large gasometer structure can have an approximate total volume of 50,000 cubic meters, with a corresponding diameter of 60 meters.

Biogas can be used for electricity production in a combined heat and power (CHP) gas engine, where the engine's exhaust heat is efficiently utilized to maintain the ideal temperature of the digester. Electric efficiencies of up to 43% can be achieved using a CHP gas engine. Microgas turbines yield lower electric efficiency (25-31%), but they have good part-load efficiency and longer maintenance intervals. Fuel cells have higher electrical efficiency but require purer gas to function because the catalyst for converting methane into hydrogen and the catalyst within the fuel cell are sensitive to impurities. When compressed to appropriate values, biogas can also be used as a fuel for various types of vehicles. It is essential to note that biogas must be dehumidified and desulfurized to eliminate potential damage to the units that use it. Biogas obtained from specific crops often has a high level of H2S, ranging from 100 to 3000 ppm. The appropriate level for usage is around 250 ppm. The desulfurization process is based on the oxidation of H2S by "Sulfobacteroxydans" bacteria, which must be present to convert H2S into simple sulfur or similar acids.

Methanogenic digestate provides nutrients for plant growth and can be used to protect soils against erosion. Anaerobic digestion also significantly reduces odor impact, with measurements showing that odors can be reduced by up to 80%. Anaerobic digestion also deactivates various species of seeds, fungi, parasites, viruses, and bacteria such as Salmonella, Escherichia coli, and Listeria. This makes the use of digestate potentially safe.

In a world where sustainable resource management is of paramount importance, "The Digester" stands as a beacon of innovation and hope. It is a long and difficult journey ahead of us with multiple hurdles in our way. Implementing the Digester in our tread towards the final goal could give us the boost that we could not get even after trying for all these years. This device helps us in so many ways. Some of them are:

1. **Food Waste Reduction:** One of the most critical aspects of SDG 2.1 is ensuring access to sufficient food for all. Food waste is a significant issue worldwide, contributing to hunger and malnutrition. The anaerobic digestion process described can be a valuable tool in addressing this problem. The device can process organic waste, including food waste, and convert it into valuable resources like methane, carbon dioxide, and NPK salts. This process not only reduces the volume of organic waste but also recovers energy from it. Professionals and decision-makers in the food industry, agriculture, and waste management sectors can use this device to manage food waste efficiently. Instead of disposing of food waste in landfills, which contributes to greenhouse gas emissions, the waste can be processed through anaerobic digestion. This not only reduces waste but also produces energy and valuable by-products that can be used for various purposes.

2. **Energy Production:** Access to sufficient food isn't just about preventing hunger; it's also about ensuring a sustainable and resilient food system. Energy is a crucial component of modern agriculture and food production. The device's ability to produce methane can have a significant impact. Methane, a potent greenhouse gas, is produced during the anaerobic digestion process. Instead of releasing it into the atmosphere, the device captures and stores this methane for energy generation. Professionals and decision-makers in agriculture and rural development can use this technology to create decentralized energy solutions. This is particularly relevant in remote or off-grid areas where access to electricity is limited. By using the methane produced from organic waste, these communities can generate clean energy for food production and other needs.
3. **Soil Fertility:** To ensure access to nutritious food, it's essential to maintain fertile soils for agriculture. The NPK salts (nitrogen, phosphorus, and potassium) recovered by the device can play a critical role. The device separates

and recovers NPK salts from organic waste. These salts are essential nutrients for plant growth and soil fertility. Agricultural professionals and policymakers can utilize the recovered NPK salts to enrich soils and improve crop yields. This sustainable approach to soil fertility management reduces the need for chemical fertilizers, which can have negative environmental impacts. Additionally, the device contributes to circular agriculture by recycling nutrients and reducing the dependence on external inputs.

4. **Waste Management:** Efficient waste management is vital for achieving SDG 2.1. The device's role in waste reduction and resource recovery is noteworthy. The device efficiently processes organic waste, reducing its volume and recovering valuable resources, such as energy and NPK salts. Waste management professionals and policymakers can implement this technology to address the challenges of organic waste management. By diverting organic waste from landfills, it reduces the environmental impact of waste disposal. Decision-makers can promote

the adoption of anaerobic digestion technologies as part of comprehensive waste management strategies, leading to more sustainable and environmentally friendly practices.

5. **Environmental Impact Reduction:** Reducing the environmental impact of food production and waste management is integral to achieving SDG 2.1. The device's ability to capture and manage methane emissions is a key aspect. The device captures methane emissions, a potent greenhouse gas, and converts it into energy. Decision-makers and environmental professionals can use this technology to mitigate the environmental impact of organic waste decomposition. By capturing and utilizing methane, they reduce its release into the atmosphere, thus contributing to climate change mitigation. This is particularly important in the context of achieving SDG 13 (Climate Action).
6. **Economic Viability:** For any solution to be sustainable, it must also make economic sense. The device's ability to generate valuable by-products, including energy and NPK salts, enhances its economic viability. The device not only

reduces waste but also produces valuable resources, creating economic opportunities. Business professionals and entrepreneurs can explore the commercial potential of this technology. They can invest in and operate anaerobic digestion facilities to process organic waste and generate revenue from the sale of energy, NPK salts, and other by-products. Decision-makers can support and incentivize such initiatives as a means of promoting sustainable and economically viable waste management solutions.

Sustainable Development Goal 2.1 (SDG 2.1) is a global commitment to end hunger, ensure food security, improve nutrition, and promote sustainable agriculture by 2030. While this goal represents an urgent humanitarian imperative, it is a complex and multifaceted challenge. The world faces various obstacles in achieving SDG 2.1, including economic disparities, climate change, conflicts, and the need for comprehensive policy changes.

Case Studies for Anaerobic Decomposition Process:

Many counties and communities have opted for the process of decomposition to reduce their waste and increase productivity of their agriculture. In rural Kenya, the widespread implementation of biogas digesters has heralded a transformation in addressing food security challenges, aligning closely with the aspirations of SDG 2.1. This innovative technology offers a comprehensive solution to a myriad of interconnected issues, ranging from energy needs to waste management and, most crucially, food security.

One of the primary functions of biogas digesters in this context is the efficient processing of organic waste, which includes animal manure and agricultural residues. Through a controlled decomposition process, these digesters harness the potential of organic matter to produce biogas. This biogas serves as a versatile and renewable energy source, specifically tailored to meet the cooking and heating requirements of rural households. By providing an alternative to traditional fuels like firewood and charcoal, biogas effectively reduces the pressure on local forests, promoting conservation and mitigating environmental degradation.

However, the benefits of biogas digesters extend far beyond energy production. The byproduct of this digestion process is nutrient-rich slurry that emerges as a valuable resource for agriculture. This nutrient-rich material serves as an organic fertilizer, enriching the soil and enhancing its fertility. As a result, farmers can achieve higher agricultural productivity and crop yields, ultimately leading to an increase in food security for these communities.

The adoption of biogas digesters in rural Kenya signifies not only an improvement in energy access but also a holistic approach to sustainable agriculture and waste management. By diminishing reliance on polluting energy sources and simultaneously promoting eco-friendly agricultural practices, these communities are making significant strides towards achieving SDG 2.1's overarching goals. In doing so, they are fostering better livelihoods, conserving their environment, and substantially reducing the specter of hunger that has long haunted their populations.

Malawi's remarkable strides in addressing food insecurity and advancing toward the realization of SDG 2.1 exemplify the power of sustainable agricultural practices. This Southeast African nation, which has historically faced food shortages and relied on external food aid, has harnessed the potential of organic decomposition techniques to usher in a new era of food security. At the heart of Malawi's agricultural transformation lies the adoption of composting methods that prioritize the decomposition of organic materials. These materials encompass a spectrum of organic waste, including crop residues and other agricultural byproducts. By subjecting these materials to a controlled decomposition process, Malawian farmers are able to produce high-quality compost, rich in nutrients. The nutrient-rich compost, when integrated into agricultural practices, works as a natural fertilizer that significantly enhances soil fertility. As a result, crop yields are increased, and agricultural productivity is boosted. By enriching their farmlands through organic decomposition, Malawi's farmers have reduced their dependency on external food aid, contributing to the achievement of SDG 2.1's primary goal of eradicating hunger.

Crucially, the success in adopting organic decomposition practices in Malawi is not solely a grassroots effort. The government has played an instrumental role in advancing sustainable agriculture through policies and support systems that promote these techniques. By aligning its initiatives with the principles of SDG 2.1, Malawi's leadership has catalyzed a sustainable agricultural revolution, ensuring not only the well-being of its citizens but also the preservation of its environment. Malawi's journey from food insecurity to sustainable agriculture is a testament to the potential of organic decomposition in addressing hunger. By embracing these practices and receiving robust policy support, Malawi showcases the transformative power of sustainable farming methods in achieving the ambitious goals of SDG 2.1.

Nigeria, one of the most populous countries in Africa, has been grappling with significant food security challenges, particularly in densely populated urban centers like Lagos. However, innovative initiatives that focus on converting organic waste into a valuable resource have begun to make a substantial impact in addressing these issues. These waste-to-wealth programs, which heavily involve organic decomposition, represent a vital step towards achieving the ambitious goals of SDG 2.1.

In Lagos, where the population density is exceptionally high, organic waste materials, including food waste and agricultural residues, have long been viewed as a significant environmental challenge. The unmanaged accumulation of organic waste can lead to various problems, including pollution and health hazards.

However, Lagos has turned this challenge into an opportunity.

Controlled decomposition processes are employed to transform organic waste into compost. This compost is a nutrient-rich, organic fertilizer that significantly enhances soil fertility when applied to agricultural lands. Local farmers in Lagos, who have struggled with poor soil quality and low crop yields, now have access to this valuable resource. The utilization of compost in agricultural practices has led to visible improvements in crop yields and agricultural productivity. This increase in food production directly contributes to food security in Lagos and aligns with the core principles of SDG 2.1, which aims to eradicate hunger and promote sustainable agriculture. Furthermore, these initiatives foster an environmentally sustainable approach to waste management, as organic waste is converted into a resource rather than being discarded into landfills.

In conclusion, Nigeria's efforts in turning organic waste into compost through controlled decomposition are a significant stride towards realizing the objectives of SDG 2.1. These waste-to-wealth initiatives not only address waste management challenges but also directly impact food security by boosting agricultural productivity, ultimately improving the livelihoods of communities in Lagos and beyond.

In the rural areas of Burkina Faso, a country challenged by an arid climate and limited resources, a remarkable initiative has taken root to address the pressing issue of food security. With a deep commitment to sustainable farming practices, local communities have harnessed the power of organic decomposition techniques to transform their agricultural landscape. This initiative, grounded in practices like composting and agroforestry, revolves around the careful decomposition of organic materials, ushering in a new era of improved soil fertility.

Farmers in Burkina Faso have realized significant benefits from these sustainable farming practices. As organic matter decomposes and enriches the soil, the agricultural yields have surged, reducing the reliance on costly synthetic fertilizers and potentially harmful pesticides. This shift towards sustainable agriculture has brought about a tangible transformation in the region. No longer burdened by the uncertainty of external food aid, rural communities have witnessed substantial improvements in their food security. The nutrient-rich compost generated by these practices serves as a cost-effective and locally sourced soil conditioner, boosting agricultural productivity and paving the way for a more self-sustaining agricultural system.

This initiative underscores the deep alignment with the goals of Sustainable Development Goal 2.1 (SDG 2.1). At its core, SDG 2.1 strives to promote sustainable agriculture and ensure food security for regions where it is an urgent necessity. Burkina Faso's commitment to organic decomposition as a means of enhancing soil fertility and increasing crop yields serves as an exemplar of how local communities can significantly contribute to these vital objectives. By mitigating the need for external food aid and fostering sustainable agriculture, Burkina Faso's sustainable farming practices offer a beacon of hope and a tangible path towards achieving the goals of SDG 2.1 in a region where these aspirations are of paramount significance.

In the rugged terrain of Nepal, where subsistence farming is prevalent and food security remains a pressing concern, community-based farming initiatives have sprung forth as beacons of hope. These initiatives are deeply rooted in the principles of organic decomposition practices, representing a holistic approach to address the multifaceted challenges of food security. Rural communities in Nepal have championed the establishment of community-managed farms, where the spotlight shines on recycling organic waste and crop residues. Through techniques like composting and vermicomposting, these communities have unlocked the potential of organic decomposition to not only enrich the soil but also to reduce the staggering amount of agricultural waste.

The outcomes of these community-based farming endeavors have been transformative. Crop yields have witnessed significant increases, introducing newfound diversity in food production. Beyond the scope of agriculture, these initiatives have positively impacted livelihoods in rural areas. Families, who once struggled to secure a consistent source of nutritious food, now have access to a more varied diet, which contributes significantly to the enhancement of food security. This initiative's exceptional ability to harmonize sustainable farming practices with the recycling of organic waste has direct implications for Sustainable Development Goal 2.1 (SDG 2.1). By empowering rural communities to produce more food sustainably and bolstering food security, Nepal's community-based farming initiatives epitomize the spirit of this pivotal goal.

Meanwhile, in the rural landscapes of Guatemala, a nation grappling with food security challenges, a parallel narrative of hope and progress unfolds. In this region, sustainable agriculture practices have taken center stage, prominently featuring the use of organic decomposition techniques. Small-scale farmers have championed this transformative shift, with a particular emphasis on practices such as composting and green manure. These techniques, rooted in the principles of organic decomposition, are instrumental in elevating soil quality and increasing crop yields, offering a holistic solution to the multifaceted challenges of food security.

The outcomes of this sustainable agricultural shift in Guatemala have been both tangible and profound. By embracing organic decomposition practices, small-scale farmers have not only boosted their agricultural productivity but also achieved remarkable improvements in food security. The surplus of crops produced as a result of sustainable agriculture can be channeled into local markets, enhancing both the income and access to nutritious food for these farmers. This initiative is a shining embodiment of Sustainable Development Goal 2.1 (SDG 2.1), which seeks to promote sustainable agriculture and enhance food security in regions where it is urgently needed.

These case studies from Nepal and Guatemala echo the resonance of organic decomposition practices in driving significant positive change. These practices not only enrich soil fertility and increase crop yields but also extend their beneficial impact to the food security and livelihoods of rural communities. Such initiatives exemplify the essence of SDG 2.1, embodying the commitment to sustainable agriculture and the elimination of hunger in regions where it is an immediate imperative.

China's commitment to sustainable resource management and environmental responsibility has led to the development of innovative approaches to waste reduction and resource optimization. Notably, several villages in the city of Xiamen have embraced a "zero-waste" philosophy that focuses on organic decomposition, recycling, and waste minimization. These initiatives are not only environmentally conscious but also contribute significantly to addressing the objectives of SDG 2.1. In these zero-waste communities, the emphasis on organic decomposition plays a pivotal role in achieving multiple sustainable development goals. Organic waste, comprising food scraps and agricultural residues, is processed through biogas digesters. This process yields valuable biogas, which serves as a clean and renewable energy source for cooking and heating. By relying on biogas, these communities reduce their dependency on fossil fuels and contribute to environmental sustainability.

However, the benefits do not end with renewable energy production. The remaining organic matter, after biogas extraction, is transformed into nutrient-rich compost. This compost is an invaluable resource for local farmers as it enhances soil fertility and improves crop yields. Consequently, the use of compost has a direct impact on agricultural productivity and food security. The holistic approach to waste management, energy generation, and agriculture in these zero-waste villages aligns harmoniously with the principles of SDG 2.1. By implementing these innovative practices, China is working towards ending hunger and promoting sustainable agriculture, exemplifying how environmental responsibility can be a driving force for positive change on a global scale. China's zero-waste communities in Xiamen provide an inspiring example of how sustainable resource management, particularly through organic decomposition, can significantly contribute to the objectives of SDG 2.1, fostering both environmental sustainability and food security.

In the United States, the adoption of sustainable farming practices, including the incorporation of organic decomposition techniques, has become increasingly vital in advancing the objectives of SDG 2.1. Numerous farms across the country have embraced eco-friendly practices, with a particular focus on composting and organic decomposition. These innovative approaches to waste management and agriculture have made significant contributions to promoting food security and sustainable farming, thereby aligning closely with the principles of SDG 2.1. By converting organic waste materials into nutrient-rich compost, American farmers are enhancing soil quality, fostering healthier crops, and ultimately increasing their agricultural yields. The resulting surplus of food production positively impacts food security by ensuring a more abundant and stable food supply.

Furthermore, the integration of decomposition techniques in waste management practices highlights the remarkable potential of these methods in addressing hunger-related challenges. Not only do they minimize waste and reduce the environmental footprint, but they also create a sustainable cycle of resource utilization. By reducing the need for synthetic fertilizers and chemical additives, organic decomposition practices contribute to cleaner, greener, and more sustainable agriculture.

In these case studies, the United States serves as an exemplar of how the application of organic decomposition techniques, whether through biogas digesters or composting, can play a pivotal role in eradicating hunger and fostering sustainable agriculture. These achievements demonstrate the profound impact of innovative, environmentally conscious approaches in aligning with the objectives of SDG 2.1. They underscore the potential of these techniques to revolutionize food production, waste management, and environmental sustainability on a global scale.

The case studies presented from diverse regions around the world echo a resounding message: the implementation of organic decomposition practices holds the key to unlocking sustainable agriculture and achieving the objectives of Sustainable Development Goal 2.1 (SDG 2.1). These studies, from rural areas of Kenya, Burkina Faso, Nepal, Guatemala, India, Nigeria, Malawi, and China, highlight the critical role of organic decomposition in addressing food security challenges, promoting sustainable agriculture, and reducing waste. The implementation of these practices has far-reaching impacts, ranging from increased crop yields and improved soil fertility to enhanced food security and better livelihoods for rural communities.

The significance of organic decomposition in these case studies extends beyond its role as a waste management solution. It is a powerful tool for enriching soil and increasing agricultural productivity while minimizing the environmental impact of agriculture. Composting and vermicomposting, as seen in Nepal, offer a sustainable way to recycle organic waste and improve soil quality. Organic decomposition can also reduce the need for synthetic fertilizers and pesticides, promoting ecologically friendly farming practices, as witnessed in Burkina Faso and Guatemala.

These case studies underscore the versatility and adaptability of organic decomposition techniques across different cultural, geographical, and economic contexts.

From the resource-constrained rural communities of Nepal to the sprawling city of Lagos in Nigeria, organic decomposition initiatives offer a ray of hope for addressing complex challenges. They empower local communities to take control of their food security and agricultural sustainability.

At the heart of these successes lies a shared philosophy: the need to shift towards sustainable, ecologically responsible farming practices. The benefits of these practices extend well beyond the scope of agriculture, touching on numerous aspects of life in these regions. In Guatemala, sustainable agriculture has led to increased income and improved access to nutritious food for small-scale farmers. In Malawi, composting has contributed to reducing dependence on external food aid, a significant step towards self-sufficiency.

As we move forward in our collective pursuit of SDG 2.1, the global community is presented with a powerful opportunity to make a significant impact on hunger eradication. The diverse case studies collectively convey a compelling narrative; organic decomposition techniques can be instrumental in ensuring that no one goes to bed hungry. The success stories from these regions are testaments to the potential of sustainable agriculture and waste reduction, and they emphasize the need for such initiatives to be more widely adopted.

While organic decomposition practices have shown great promise in various parts of the world, there is room for expansion. The need for more extensive implementation of these techniques, such as composting, green manure, and biogas digesters, cannot be overstated. One way to amplify the impact of organic decomposition is through innovative technologies like the "Digester" device.

The "Digester" device, with its intricate four-phase process, gravimetric separation capabilities, and recycling mechanisms, has the potential to revolutionize organic decomposition on a larger scale. It offers an efficient and sustainable solution to the challenges of managing organic waste while generating valuable resources like biogas and nutrient-rich compost. The device can be adapted to various contexts, from rural farms to urban settings, making it a versatile tool in the global quest to achieve SDG 2.1.

The case studies and the potential of the "Digester" collectively emphasize the importance of organic decomposition in advancing sustainable agriculture and addressing food security challenges. The experiences of communities across the world remind us that innovative approaches to farming and waste management can create a brighter, hunger-free future. The path forward lies in our ability to embrace and scale up these practices, embracing organic decomposition as a cornerstone in our global mission to achieve SDG 2.1.

One of the key challenges in achieving SDG 2.1 is addressing economic disparities that limit access to food. "The Digester" offers a unique solution in this regard. By decomposing organic matrices, it produces valuable resources like methane, NPK salts, and clarified water. These resources can have a significant impact on local economies, particularly in rural areas. Decomposition in "The Digester" creates economic opportunities through the production of biogas. Methane, a powerful renewable energy source, can be used for electricity, cooking and heating. By making renewable energy available, "The Digester" can help boost local economies and reduce energy-related costs for local residents. Mechanically obtained NPK salts are important components of fertilizers. By producing this NPK salt, "The Digester" facilitates sustainable agriculture by supplying farmers with locally sourced, nutrient-rich fertilizers This can increase crop yields and, in turn, the income of farmers has increased. The availability of renewable energy and locally sourced fertilizers reduces the costs associated with agricultural and household energy consumption. Lower spending benefits low-income communities, freeing them up for other priorities like education and health care.

Climate changes cause adverse effects on agricultural output of communities, imposing a significant challenge in achieving SDG 2.1. Digester addresses this challenge through its operation and resource recovery mechanism. During decomposition process, this device captures and separates carbon dioxide. While methane is collected for energy, the capture of carbon dioxide contributes to greenhouse gas reduction. This reduction in carbon dioxide emission supports global climate change mitigation efforts. This device promotes sustainable agriculture by providing locally sourced, organic fertilizers. These fertilizers are rich in NPK salts, improve quality and crop yields. By reducing the need for chemical fertilizers, which contribute to climate change, the device aligns with sustainable agriculture practices. Biogas production from "The Digester" represents a renewable energy source that can reduce reliance on fossil fuels. This not only mitigates climate change but also enhances energy security for communities.

Hunger most often destabilizes the force in societies by exacerbating conflicts and creating new ones to further deteriorate the peace among the people. By promoting sustainable agriculture and reducing food waste, "The Digester" enhances local food security. When communities have reliable access to food, tensions related to scarcity are reduced, contributing to peace and stability. The economic opportunities created by "The Digester" enhance economic resilience in communities. People with economic stability are less likely to engage in conflict over resources. The device supports resource-efficient agricultural practices. Through the production of nutrient-rich fertilizers and renewable energy, it helps communities manage their resources more effectively. Hence, trim down the risk of resource-related conflicts among the communities.

The need for comprehensive policy changes to achieve SDG 2.1 cannot be overstated. "The Digester" aligns with these policy changes by providing a practical and sustainable approach to food security. This device encourages the localization of resource production. By producing renewable energy and fertilizers locally, it supports policies that promote local self-reliance and sustainable resource management. The promotion of environmental sustainability is the major key role of Digester as it captures the carbon dioxide and reduces the reliance on chemical fertilizers, aligning with broader goal to reduce the environmental impact. This incorporation of renewable energy from the device supports policies aimed at transitioning to clean and sustainable energy sources. It can contribute to national energy strategies focused on reducing greenhouse gas emissions. A crucial policy change for achieving SDG 2.1 is reducing organic waste. "The Digester" directly addresses this by efficiently decomposing organic matrices, thereby reducing the waste that might otherwise contribute to environmental degradation.

"The Digester" is a groundbreaking innovation that offers a multifaceted approach to address the challenges of achieving SDG 2.1. By promoting local economic opportunities, mitigating climate change, enhancing food security, and aligning with comprehensive policy changes, this device represents a significant step toward ending hunger and promoting sustainable agriculture. It provides a model for how innovative technologies can contribute to achieving global goals and creating a more sustainable and hunger-free world.

Digester and its mechanism have the potential to be used in various regions and context to help achieve Sustainable Development Goal 2.1. It is well suited for rural areas that majorly rely on agriculture. Small scale farmers in these regions can benefit from the recycling of nutrients and the production of biogas for cooking, reducing their reliance on traditional practices which are often unsustainable. Agricultural cooperatives that bring together multiple farmers can invest in and operate a centralized digester facility. By pooling the resources and waste materials, these cooperatives can enhance their agricultural productivity and sustainability.

Food security remains a serious challenge in many developing countries, with millions of people facing hunger and malnutrition. Digesters are emerging as a practical and accessible technology that can go a long way in addressing this issue. It offers a multi-pronged approach to promoting sustainable agriculture, nutrient recycling and waste reduction in areas of high resource scarcity. By adopting this device, developing countries can use its innovative process to effectively break down organic matrices. This method not only effectively manages waste but uses these resources including biogas, NPK and salt and other nutrient-rich materials to increase agricultural productivity, ensuring sustainable food security constant and energetic.

Furthermore, the digester’s ability to reduce waste and recycle valuable nutrients aligns well with sustainable agriculture goals. It reduces environmental footprint and makes better use of available resources, contributing to sustainable and environmentally friendly agriculture. Essentially, the digester provides developing countries with a practical and cost-effective way to promote food security, reduce waste and promote sustainable agriculture, and thus creating a more nutrient-rich and sustainable approach.

Livestock farms, including the dairy and poultry industry, are known for producing large amounts of organic waste, particularly in manure. Digester provides a valuable solution for these farms, consuming two important take-ups addressing sustainability; waste management and energy production. First of all, it treats garbage and other organic waste materials efficiently. Doing so reduces the environmental impact associated with waste disposal. The decomposition mechanism of the digester degrades organic matter, reduces odor issues and the risk of water contamination, thereby creating a cleaner and healthier environment.

Additionally, the operation of the digester produces biogas, a renewable energy source composed primarily of methane. This biogas can be used to meet energy needs on site, which is particularly useful for off-grid or remote animal farms. By converting biomass into energy, these activities increase sustainability, reduce dependence on fossil fuels, and reduce carbon emissions. This dual waste efficiencies and sustainable energy consumption make the digester an essential tool for ranches seeking to balance seed production with environmental responsibility. This results in increase in productivity of these livestock farms, hence increasing the available source of food for the communities.

In general, areas affected by natural disasters such as floods or hurricanes tend to bear the brunt of food challenges that follow these catastrophic events as nature unleashes its wrath, destroying crops, destroying food webs and giving communities away residents struggle with food shortages. In such a dire situation, innovative solutions are needed to support the recovery process and contribute to the achievement of Sustainable Development Goal 2.1, which aims to end hunger and provide food for all awareness In this context, the digester appears as a versatile and valuable tool to manage these critical issues.

One of the most important challenges in disaster-affected areas is waste management, which directly affects food security. Violence caused by natural disasters creates a huge amount of organic waste including damaged crops, contaminated food, and other organic matter If not properly managed, this waste can cause environmental pollution environmental pollution and exacerbate food safety issues. The ability of the digester to efficiently handle the biological matrix is consistent with the overarching objectives of SDG 2.1 in providing viable solutions for waste management during the recovery phase.

Additionally, in these situations, the digester's resource recovery mechanisms have significant advantages. Natural waste decomposition produces biogas, which can be a clean and renewable energy source. This energy can be used for a variety of purposes such as cooking and heating, which is important in disaster-affected areas where traditional energy sources can be disrupted. The availability of biogas can exhaust scarce energy resources under the burden of these communities, has provided a lifeline for essential day-to-day operations and directly contributes to SDG 2.1.

Outside of areas prone to natural disasters, refugee camps and humanitarian centers often face unique challenges related to energy sources and waste management, affecting access to food In these areas, conventional energy consumption the function can be scarce or unreliable, and waste management can be terribly accurate. The digester, which has dual functions in waste management and renewable energy, is an important asset in refugee camps and humanitarian settings, furthering the objectives of SDG 2.1, ensuring that organic waste is treated well, reducing the risk of contamination and disease outbreaks. At the same time, biogas production meets energy needs, providing a cleaner and more sustainable alternative to conventional fuels. This not only improves living conditions in these camps, but also reduces the strain on already insufficient resources, helping to achieve the SDG 2.1 goal of ending hunger and food security.

Therefore, the use of the digester in disaster-affected areas and humanitarian situations directly supports the SDG 2.1 objectives. By simultaneously addressing waste management and energy needs, helps improve the overall well-being and resilience of communities facing food challenges in the aftermath of disasters or refugee relief situations, thereby advancing the global goal of ending hunger.

Deployment and Operation of MBGC in Underserved Communities:

In developing countries the initial investment required to acquire and set up a "digester" can be a formidable barrier for local communities and small farmers. This high upfront cost provides a look to purchase the machine itself, build the infrastructure needed to operate it, and maintain it on a regular basis. These financial requirements can put a huge strain on a limited budget, making technology seem out of reach for many. Furthermore, beyond the initial investment, concerns about ongoing operations and maintenance costs become more apparent. Efficient and continuous operation is necessary to maximize the usefulness of the "digester" machine. This requires not only financial but also technical expertise to ensure proper monitoring and maintenance of the system. The cost of maintenance can be especially difficult for communities and individuals with limited resources. Households and communities in many developing countries operate primarily on shoestring budgets for urgent needs such as food, health care, and education. With limited resources, allocating funds for sustainable technologies, including a "digester," can be a daunting prospect. The urgency of meeting these basic needs often overshadows the long-term sustainability goals behind them.

Operating and maintaining a "digester" requires specific technical skills and knowledge, which may not always be readily available in developing countries These technologies include construction and maintenance the machine, its operating procedures will be understood and troubleshooting potential problems will be adequately addressed . Access to finance is another important challenge in rural and underserved areas in developing countries. Often these communities lack access to affordable and easy financing options such as loans or microfinance, which can facilitate the adoption of advanced technologies such as "digesters" Financial institutions rarely or hesitate to invest in sustainable projects in these areas. New strategies and collaboration are needed in addressing these multifaceted challenges. This could include government support, partnerships with NGOs, knowledge sharing, capacity building, local initiatives to reduce costs To tap into these challenges and develop tailored solutions for developing countries specific needs and priorities may make the "digester" more available to those who need it the most.

A multi-pronged approach is needed to increase the availability of the "digester" technology in developing countries and meet the economic challenges associated with its adoption. Several approaches can be used effectively to increase affordability and make this sustainable technology accessible to a wider range of users. One important approach is grants and subsidies, where governments, international organizations, and nongovernmental organizations (NGOs) provide financial incentives to cover the cost of initial investment. These incentives can has significantly reduced the financial burden on farmers and communities interested in adopting "digester" technology. By providing financial support, governments and NGOs can play an important role in promoting sustainable agricultural practices and waste management. Microfinance and loans offered by local financial institutions can be tailored to the financial capacity of the users. These centers allow individuals and communities to invest in "Digester" technologies without requiring a significant upfront cost. Structured to suit users' specific financial situations, these financial services can empower heavy users. Partnerships between NGOs, international development agencies, private organizations and local governments are critical to implementing the "digester". These partnerships provide financial and technical support, and provide knowledge and resources that often constrain technologies that will be accepted by the mouth. By pooling resources and expertise, these collaborations make the "digester" more accessible in different areas.

Economies of scale can be implemented by using "digester" technology on a large scale, reducing unit costs.

Communities and farmers can consider setting up cooperatives or joint ventures to pool resources and share benefits. This collaborative approach spreads the financial burden and ensures that the technology is much more affordable for individual users. Other payment methods, such as pay-as-you-go or revenue sharing, offer flexibility for users. This budget allows users to pay based on energy income or output produced, making it accessible to users of different financial capacities. Government support through policies that encourage sustainable agriculture and waste management is crucial to facilitate access to finance and resources. These policies could promote the adoption of sustainable technologies such as "digesters" and provide financial incentives for users.

Local communities play a pivotal role in making the "Digester" technology operable, affordable, and sustainable. Their active participation and engagement are essential for the successful adoption and long-term viability of this sustainable solution. Recognizing local manufacturers or assemblers can reduce production costs and create local employment opportunities. By involving community members in the setup and day-to-day management, the need for external experts and costly contractors is reduced. This not only lowers the financial burden but also ensures that community members have a direct stake in the technology.

Locally sourced materials and labor not only help the local economy but also reduce the overall cost of the machine. Local manufacturing contributes to affordability and at the same time promotes economic growth. Capacity building and training programs are another valuable way to make technology more affordable. Providing local communities with the necessary knowledge and expertise to build, operate and maintain the "digesters" themselves reduces reliance on outside experts This reduces the cost of specialist advice and maintenance. Community involvement in the planning, implementation and use of "digester" devices is essential to reduce costs. This community-based approach reduces reliance on external consultants and contractors, resulting in cost savings while encouraging local ownership and participation.

As technology may require periodic maintenance and repairs, local communities can develop systems for these tasks. This may involve appointing community members responsible for maintenance, creating maintenance schedules, or even establishing local repair shops or services. This ensures the longevity of the technology without relying on costly external services. Training and capacity-building programs within the community can empower individuals with the necessary skills and knowledge to operate and maintain the "Digester." These programs can be facilitated by experts or organizations but should be designed to transfer knowledge to local community members. This not only ensures sustainable technology use but also provides community members with valuable skills that can be applied to other aspects of their lives.

When local communities take ownership of the "Digester" technology, they are more likely to protect and maintain it. Community-owned projects are often better sustained over the long term, as there is a collective sense of responsibility and shared benefits. This ownership extends to the financial sustainability of the technology, as communities are more willing to invest in maintenance and repairs when they have a direct stake in the outcomes. Communities can pool their resources and share the financial burden of adopting the "Digester" technology. By contributing collectively, individual households may find it more affordable to invest in the technology. This resource mobilization can take various forms, including savings groups, cooperatives, or community fundraising efforts.

Local communities can educate their members about the benefits of the "Digester" technology and how it aligns with sustainability goals. Creating awareness about the environmental and economic advantages of the technology can encourage more widespread adoption and a shared commitment to its sustainability. Communities can collectively advocate for supportive policies from local governments and authorities. These policies may include financial incentives, subsidies, or regulations that encourage the use of sustainable technologies like the "Digester." By voicing their needs and interests, communities can create an enabling environment for technology adoption. The social networks and relationships within local communities can play a crucial role in promoting technology adoption. Communities that are well-connected and have strong social capital often find it easier to share knowledge, resolve issues, and mobilize resources for common goals. This social capital can be harnessed to make the "Digester" technology more affordable and sustainable.

Local communities are essential stakeholders in making the "Digester" technology operable, affordable, and sustainable. Their active involvement in every stage of the technology's lifecycle, from construction and operation to maintenance and resource mobilization, is instrumental in realizing the potential of this sustainable solution. Through community-driven initiatives, the "Digester" can become a catalyst for improved food security and sustainable agriculture in diverse regions.

Sharing knowledge and learning from successful case studies and best practices can help reduce the learning curve associated with adopting new technologies. By exchanging knowledge across communities, regions, and countries, users can leverage the experience of others, save time, and make better use of "Digester" technology Knowledge sharing is possible has been a cost-effective way to improve the technology used and ensure affordability.

Conclusion:

The "Digester" device, with its innovative mechanisms for organic matrix decomposition and resource extraction, emerges as a powerful catalyst in addressing the challenges outlined within Sustainable Development Goal 2.1 (SDG 2.1). Focused on ending hunger and promoting sustainable agriculture, this goal is intrinsically tied to the very essence of human well-being and the foundation of thriving societies.

The need to end hunger goes beyond statistics; it speaks of the human imperative. In a world that prides itself on the knowledge, technology, and resources to feed every inhabitant, perpetuating hunger is morally unreasonable. This represents an injustice that ignores the principles of rights that people on it and does not provide individuals with a basic need, food. The demand to end hunger is an expression of deep moral responsibility, recognition that food must be controlled as a basic human right in order to promote justice and equality. This study further validates its impact on health and well-being. Hunger is not just an empty stomach; Damage to human health includes attacks. Malnourished individuals are left vulnerable to disease, often enduring lifelong health struggles, experiencing developmental disabilities that hinder their full potential. The effects of hunger extend beyond the human being completely; it permeates the entire community, trapping them in relentless poverty and poor health.

But SDG 2.1 extends beyond humanitarian goals; It is consistent with economic prosperity. Hunger is not just a moral crisis; It is also an impediment to economic growth. When an individual is malnourished, their ability to perform well at work suffers. Furthermore, hunger has a lasting impact on children, preventing them from learning well, thus limiting their future earning potential. By eradicating hunger, we embark on a moral mission and simultaneously choose an economic strategy. The quest for an end to hunger is also intertwined with the idea of peace and stability. Hunger is a destabilizing force in societies. It can inflame existing conflicts and spark new ones as individuals compete for dwindling resources. By eliminating hunger, we are paving the way for peace and stability, which are fundamental prerequisites for sustainable development. Furthermore, the mandate of SDG 2.1 is consistent with important environmental sustainability concerns. Ensuring adequate and nutritious food for all is closely linked to the sustainability of agri-food systems. Adopting sustainable food production and consumption is essential to conserving the planet's finite resources and reducing the growing impacts of climate change.

The Digester not only addresses the immediate problem of hunger but also focuses on long-term sustainability. It takes the challenge forward by enhancing food safety through efficient degradation of organic matrices. By doing so, it reduces the burden on traditional waste management systems, promotes sustainable agriculture and plays an important role in resource efficiency The importance of the SDG 2.1 framework is undeniable, with far-reaching implications for the well-being of humanity, economic growth, and the overall stability of our planet The "digester" machine contains innovations that can contribute significantly to this goal. Its mechanism for efficiently managing organic waste, generating renewable energy and increasing soil fertility are perfectly aligned with the core objectives of SDG 2.1.

In conclusion, the global community stands at a pivotal juncture where the imperatives of ending hunger and promoting sustainable agriculture are fundamental. The "Digester" device, with its ingenious mechanisms and innovative approach to organic matrix decomposition, signifies an auspicious leap towards this brighter future. In the pursuit of SDG 2.1, it not only addresses the moral imperative of ending hunger but also aligns with the objectives of enhanced health and well-being, economic prosperity, peace and stability, and environmental sustainability.

Moreover, the "Digester" embodies the much-needed synergy between technology and sustainability. Its potential to tackle challenges posed by economic disparities, climate change, conflicts, and policy transformations is invaluable. Through its affordability and sustainable operation, it presents a lifeline for communities and regions grappling with food security issues. By implementing the "Digester" more widely, we forge a path towards a world where hunger is but a distant memory, and sustainable agriculture thrives, enriching the lives of countless individuals worldwide.

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JWTeam

http://www.expotv1.com/ESCP_NUT_Team.pdf
*Offers extensive support on **Energy** and **Water Cycle,** verse **IP_S DGs /UN***

Bibliography/Conclusion

Any reference to people and things is purely coincidental, as well as creative/imaginative and aimed at the common good (both in fiction and non-fiction/disclosable texts).

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Digester from MBGC (source) :

Patent:

MBGC , **https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2016092582** (organic waste to biogas, for urban and periurban); view1, MBGC_Plan, Hello;

Italy: GRANT

http://www.expotv1.com/LIC/MISE_0001427413_MBGC.pdf, ...mean "INDUSTRY (useful), NEW (no make before), INVENTIVE (teach some things)"

Abstract/Description - Patent:

MBGC , https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2016092582

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Summary – Applications (to SDGs)

MBGC

https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2016092582

Biogas - generate high purity raw materials from organic matrices. MBGC is dedicated to the disposal and reconversion of organic waste , both from excrement (human and animal) and from manufacturing processes (agri-food industry), as well as in many agro-zootechnical activities. Very compact system that uses only renewable energy, with high energy recovery indices and production of high quality by-products (CH_4, CO_2, NPK_x , H_2O). Excellent solution for urban areas for contrast to the disposal of wastewater and containment of interventions on its infrastructures (sewerage transport networks and purifiers), acting in a distributive /pervasive manner where the problem arises. It offers significant contrast to the load Organic contributing to the performance on " **Water cycle** ".

Project: MBGC – Mini Bio Gas Continuous

Objective : Launch a pre- assembly and testing site (procedures and manuals) for the production of MBGC tanks

Target: Prefabricated (CLS) companies, hydromechanics , financial investors, operators in the BioGas / BioMethane sector

The project aims to activate a production site, from design to assembly (pro delivery and rapid assembly), with the development of production-oriented procedures agreed with the client (based on the products available for supply) and destinations of the outputs produced. The solutions rely on standard products from the water management and prefabricated market, assembled and tested with a view to optimize linear anaerobic digestion, with selective and corrective extraction. In collaboration with internal and external laboratories, it will act as remote support for the installations in charge (EPC - Engineering , Procurement and Construction).

Summary: This is a method for anaerobic digestion and a device for its implementation. Anaerobic digestion is a biological process that breaks down organic matter in the absence of oxygen, producing biogas, fertilizer and water. Biogas is a mixture of methane, carbon dioxide and other gases that can be used as a renewable energy source. The fertilizer is composed of nitrogen, phosphorus and potassium salts (NPKx salts) which can be used to enrich the soil or supplement supplies from specific industries. Water is the liquid fraction that can be reused or discharged after treatment.

A device to implement this method consists of a tank divided into different areas, where different phases of anaerobic digestion take place. The tank is equipped with bulkheads, pipes, pumps, heating means and gas separation means. The organic matter enters the tank through a vertical inlet pipe (in homogeneous diffusion mode) and undergoes the following phases:

1) Hydrolysis: organic matter is divided into smaller molecules by means of water and enzymes;

2) Acidogenesis : the hydrolyzed products are transformed into volatile fatty acids and other compounds by acidogenic bacteria .;

3) Acetogenesis : volatile fatty acids and other compounds are further transformed into acetic acid, hydrogen and carbon dioxide by acetogenic bacteria;

4) Methanogenesis : acetic acid, hydrogen and carbon dioxide are transformed into methane and carbon dioxide by methane genic bacteria;

The liquid mixture flows through the tank from one area to another, following a path defined by the bulkheads and pipes. Along the way, some pumps recycle some of the liquid mixture to optimize the process. In the last zone, the liquid mixture separates into different components by gravity:

a) Oleic phase: the lighter fraction which mainly contains fats and oils , is drained and brought back to the beginning;

b) Protein phase: the heavier fraction which mainly contains proteins and amino acids, not yet treated, is taken and brought to the beginning;

c) NPK salts: the solid fraction that precipitates at different levels according to their solubility and specific weight;

d) Clarified water: the clear fraction that remains after the separation of the other components is expelled by gravity and thermally pre-treated in the last part of the tank at half level;

The gases produced during the process (methane and carbon dioxide) rise towards the top of the tank, where they separate by density and start non-specific functions. Carbon dioxide, being heavier, remains in the lower part of the space above the liquid surface, while methane, being lighter, moves towards the upper part of the space. Gases are extracted through pipes with holes that are connected to gas storage or utilization systems. The device also includes a lighting and cooling system to prevent the formation of hydrogen sulfide, a toxic gas that can result in anaerobic digestion, damaging it. Lighting stimulates photosynthesis in some bacteria that consume hydrogen sulfide in the absence of oxygen. Cooling condenses water vapor in the gas phase and returns it to the liquid phase .

***SDGs / UN_en* - *SDGs / UN_it* Full Strategy to**
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http://www.expotv1.com/ESCP_Hello.htm

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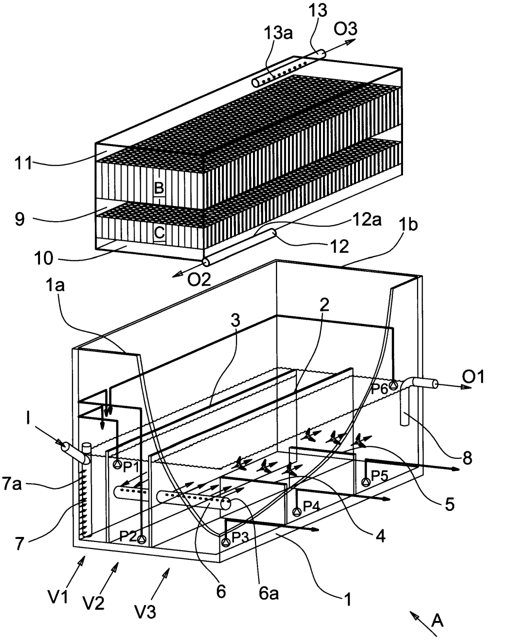
13
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Fig. 1

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(54) Title (EN): METHOD FOR ANAEROBIC DIGESTION AND DEVICE FOR IMPLEMENTING SAID METHOD

(54) Title (FR): PROCÉDÉ DE DIGESTION ANAÉROBIE ET DISPOSITIF POUR LA MISE EN ŒUVRE DUDIT PROCÉDÉ

(57) Abstract:

(EN): This invention relates to a method and to a device for the implementation of said method, to decompose and to selectively extract methane, carbon dioxide, NPK salts (nitrogen, phosphorus and potassium salts) of various titre and clarified water, from an organic matrix; said components will be the raw material for further industrial processes. The method is characterized in that it includes the following phases: • implementation of a hydrolytic phase, constituted by the fission action by means of the water, by hydration; • implementation of a acidogenesis phase generated by means of specific bacteria; •

implementation of a acetogenesis phase generated by means of specific bacteria; • implementation of a methanogenesis phase by means of specific bacteria, with a simultaneous gravimetric separation of a mainly oleic phase, lighter and of a predominantly protein phase, heavier; • gravimetric separation of solutions of said NPK salts of different titres • taking of clarified water. The device is characterized in that it comprises a basin (1) divided into various zones (V1), (V2), (V3), in each of which biological reactions occur, in accordance with the claimed method, said zones being all communicating and identified by suitable separation baffles, in particular: • a first baffle (2) extended from a first end (1a) of the basin to a second end (1b) of said basin (1), dividing it into two parts; • a second baffle (3), of height equal to said first baffle that divides one of said parts in a first zone (V1) and in a second zone (V2) extending from said first end (1a) of the basin (1) until it reaches the vicinity of said second end of the basin (1), so that said two zones (V1) and (V2) are communicating through an opening, of substantially vertical development, between the end of said second baffle (3) and the second end (1b) of the basin (1); • a plurality of baffles (4) and (5) transversely arranged to said first baffle (2) and inside a third zone (V3), delimited by said first baffle (2), said third zone (V3) being placed in communication with said second zone (V2) through a transfer pipe (6), positioned at about half height of said first baffle (2); • two blocks (B) and (C), placed in the upper part of said basin (1) and provided by taking means (12, 12a, 13, 13a), each of said blocks (B) and (C) including a plurality of vertical pipes and being fitted to carry out a gravimetric separation of the gases that are generated during the treatment of said mixture; said baffles (2) and (3) and said transfer pipe (6), by identifying a path crossed by the liquid mixture to be treated, that runs into the beginning of said first zone (1) where it is placed an inlet pipe (7) of the liquid mixture to be treated and comes out from various points of said third zone (V3).

(FR): La présente invention concerne un procédé et un dispositif pour la mise en œuvre dudit procédé, pour décomposer et extraire sélectivement du méthane, du dioxyde de carbone, des sels de NPK (sels d'azote, de phosphore et de potassium) de titres divers et de l'eau clarifiée, à partir d'une matrice organique; lesdits composants constituant la matière première pour d'autres procédés industriels. Le procédé est caractérisé en ce qu'il comprend les phases suivantes : mise en œuvre d'une phase hydrolytique, constituée par l'action de fission au moyen de l'eau, par hydratation; mise en œuvre d'une phase d'acidogénèse au moyen de bactéries spécifiques; mise en œuvre d'une phase d'acétogénèse au moyen de bactéries spécifiques; mise en œuvre d'une phase de méthanogénèse, au moyen de bactéries spécifiques, avec séparation gravimétrique simultanée d'une phase principalement oléique, plus légère, et d'une phase principalement protéique, plus lourde; séparation gravimétrique de solutions desdits sels de NPK de titres différents; prélèvement de l'eau clarifiée. Le dispositif se caractérise en ce qu'il comprend un bassin (1) divisé en différentes zones (V1) (V2), (V3), dans chacune desquelles ont lieu des réactions biologiques, conformément au procédé de l'invention, lesdites zones étant toutes communicantes et identifiées par des chicanes de séparation appropriées, en particulier : une première chicane (2) s'étendant d'une première extrémité (1a) du bassin jusqu'à une deuxième extrémité (1b) dudit bassin (1), le divisant en deux parties; une deuxième chicane (3), de hauteur égale à celles de ladite première chicane qui divise l'une desdites parties en une première zone (V1) et en une deuxième zone (V2) s'étendant entre ladite première extrémité (1a) du bassin (1) et le voisinage de ladite seconde extrémité du bassin (1), de sorte que lesdites deux zones (V1) et (V2) communiquent par une ouverture, de développement sensiblement vertical, entre l'extrémité de ladite deuxième chicane (3) et la seconde extrémité (1b) du bassin (1); une pluralité de chicanes (4) et (5) placées transversalement par rapport à ladite première chicane (2) et à l'intérieur d'une troisième zone (V3), délimitée par ladite première chicane (2), ladite troisième zone (V3) étant mise en communication avec ladite deuxième zone (V2) par un tuyau de transfert (6), placé à environ la moitié de la hauteur de ladite première chicane (2); deux blocs (B) et (C), placés dans la partie supérieure dudit bassin (1) et munis de moyens de prélèvement (12, 12a, 13, 13a), chacun desdits blocs (B) et (C) comprenant une pluralité de tuyaux verticaux et étant conçu pour effectuer une séparation gravimétrique des gaz qui se dégagent pendant le traitement dudit mélange; lesdites chicanes (2) et (3) et ledit tuyau de transfert (6) délimitant un trajet emprunté par le mélange liquide à traiter, qui s'étend du début de ladite première zone (1) dans laquelle est placé un tuyau d'entrée (7) du mélange liquide à traiter et sort par différents points de ladite troisième zone (V3).

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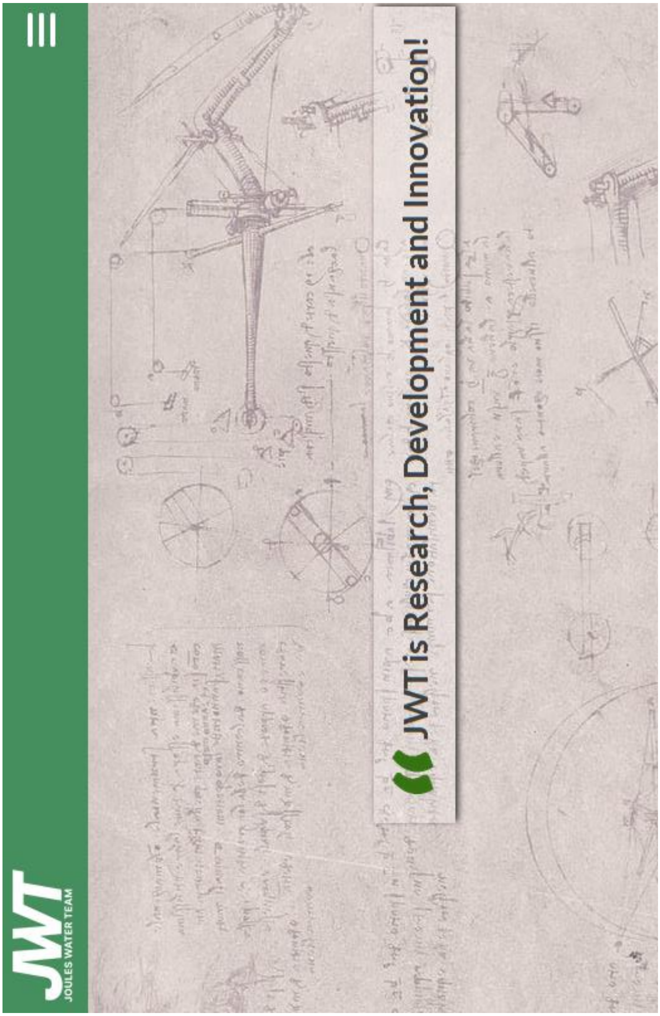
Declarations:

Declaration made as applicant's entitlement, as at the international filing date, to apply for and be granted a patent (Rules 4.17(ii) and 51bis.1(a)(ii)), in a case where the declaration under Rule 4.17(iv) is not appropriate

Declaration of inventorship (Rules 4.17(iv) and 51bis.1(a)(iv)) for the purposes of the designation of the United States of America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