

FINANCIAL INSTITUTION TRAINING MANUAL FOR DOMESTIC BIODIGESTER TECHNOLOGY

Picture courtesy of HomeBiogas

Module 1: Introduction to bioenergy and biodigesters

Co-financed By

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Ministry of Foreign Affairs of Denmark DANIDA International Development Cooperation

Co-ordinated By

Netherlands Enterprise Agency

In Partnership With

endev

Lead Implementer - Kenya

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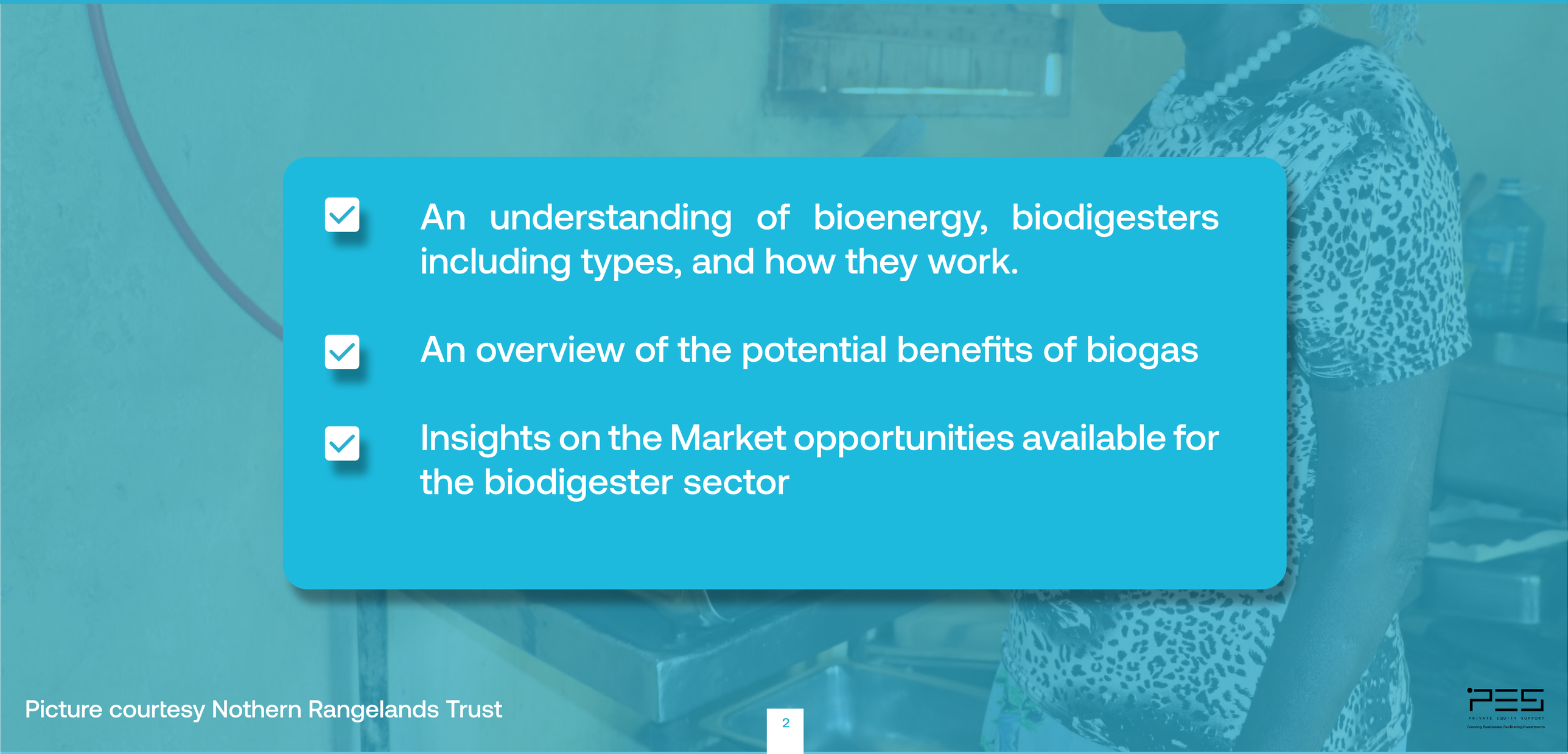
SNV

Access to finance - Kenya

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Learning outcomes



- An understanding of bioenergy, biodigesters including types, and how they work.
- An overview of the potential benefits of biogas
- Insights on the Market opportunities available for the biodigester sector

Picture courtesy Nothern Rangelands Trust

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Module overview

- Overview of Biodigesters and Bio energy
- Biogas benefits and Impacts
- Market Potential and Growth Trends
- Group Discussions

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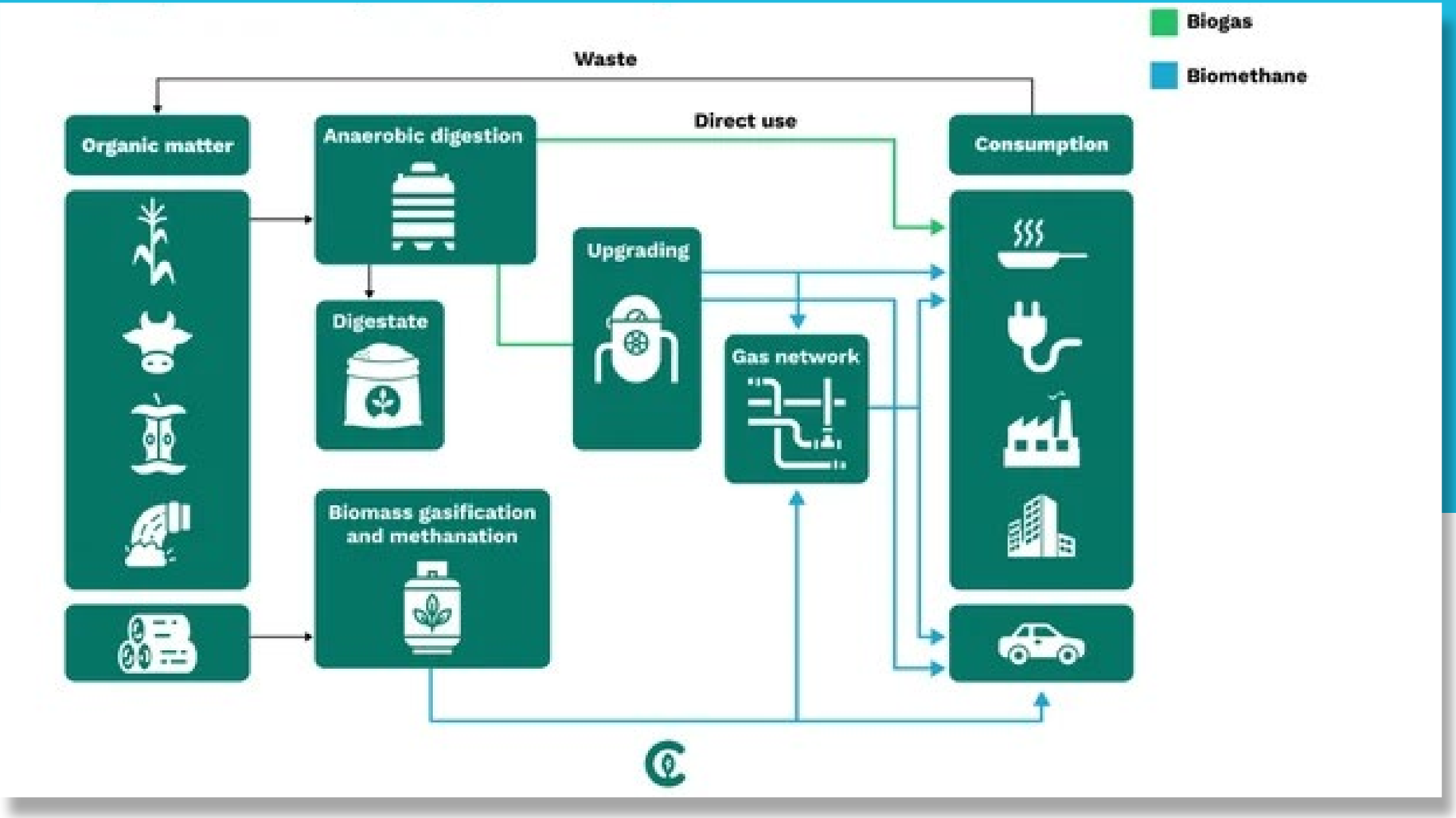
Overview of renewable energy, bioenergy and biodigesters

DEFINITIONS

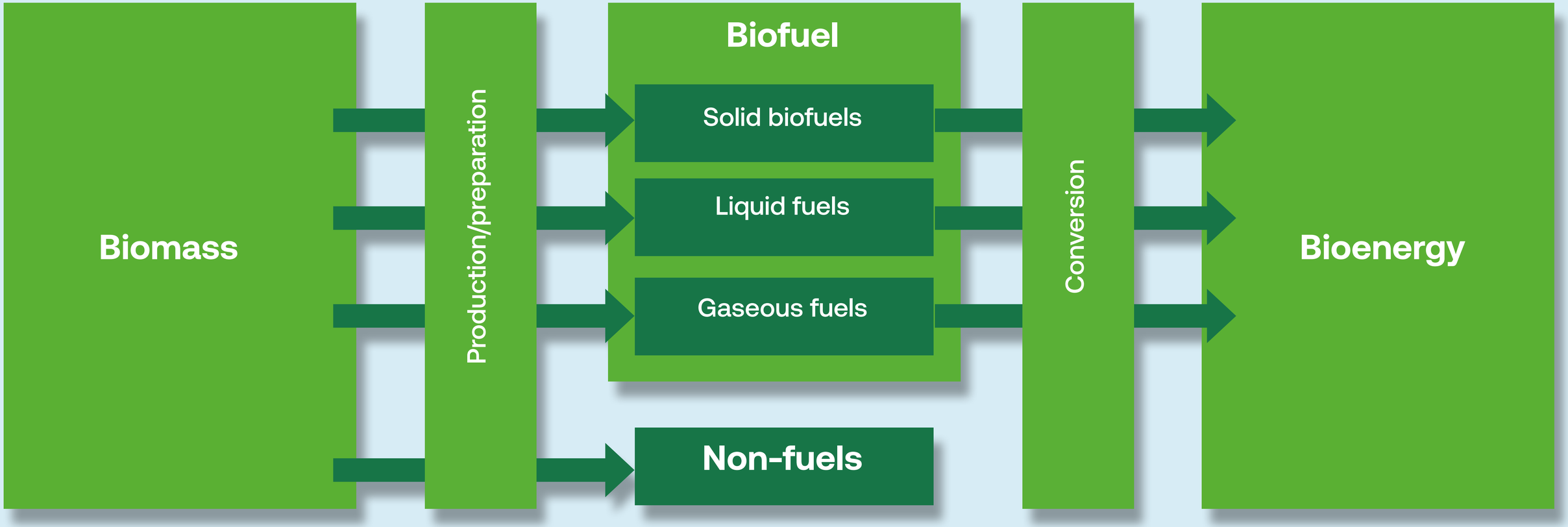
RENEWABLE ENERGY: Bioenergy, hydropower, ocean, solar and wind	**BIOENERGY:** Energy from living organic materials known as biomass	**BIOMASS:** Organic wastes - food or agricultural wastes, forests residues
BIOFUEL: Fuel that is derived from biomass or organic matter	**BIOGAS:** Produced thro organic matter in anaerobic digestion	**BIOSLURRY:** Biodigestate released from a bioreactor
BIOMETHANE: Cleaned biogas, consisting of almost 100% methane	**BIODIESEL:** Biodiesel is a vegetable oil or animal fat-based diesel fuel	**BIOETHANOL:** Ethanol is mainly produced using molasses feedstock

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Biogas production pathways and usages



Classifications of bioenergy



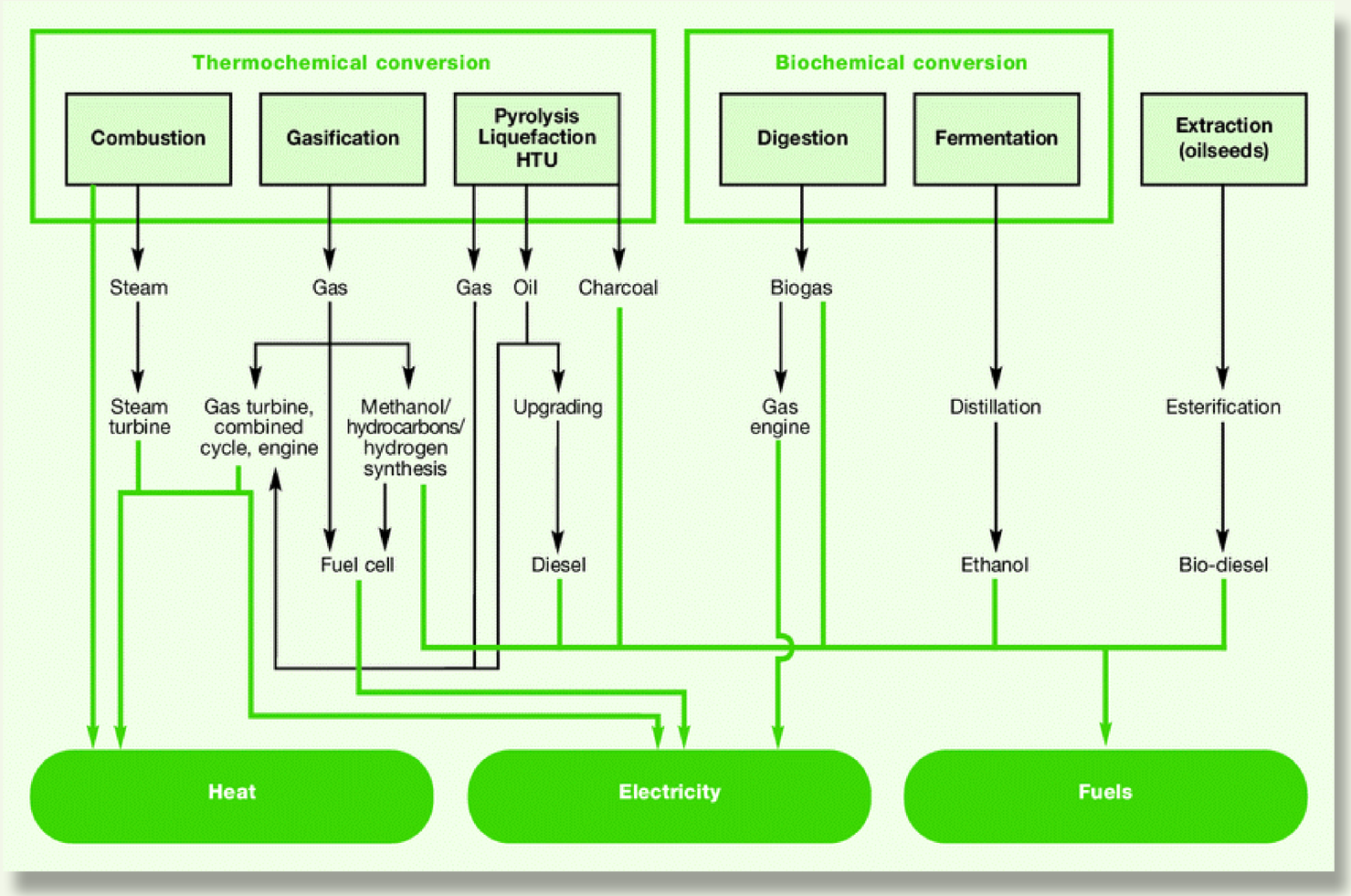
1. Solid fuels (chips, pellets, briquettes, charcoal, logs),
2. Liquid fuels (methanol, ethanol, butanol, and biodiesels),
3. Gaseous fuels (synthesis gas [syngas], biogas, and hydrogen);

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Production/conversion methods

Methods of conversion can be:

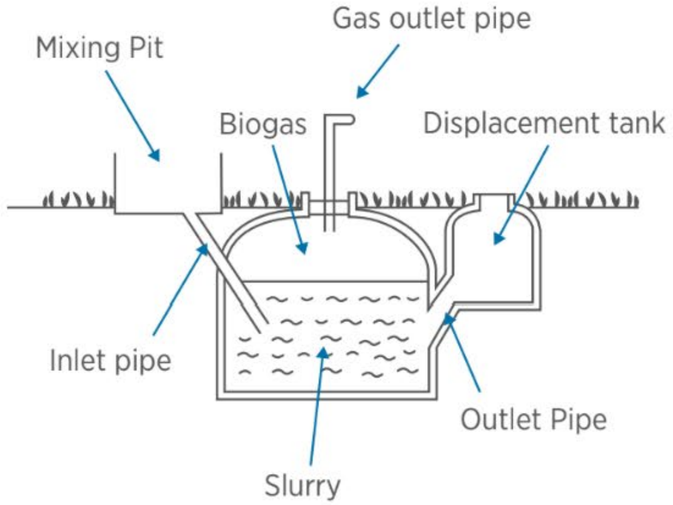
- ☑ Thermal - burning in oxygen
- ☑ Biological - anaerobic digestion or fermentation
- ☑ Chemical - production of biodiesel from vegetable oil



Types of biodigesters

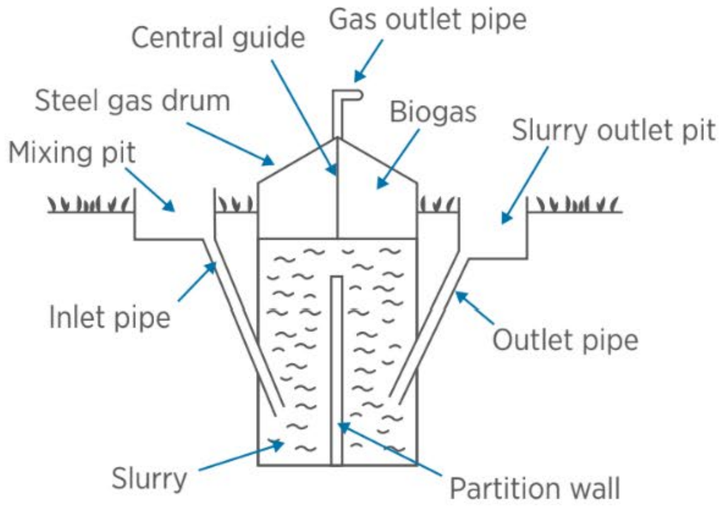
Fixed dome plant





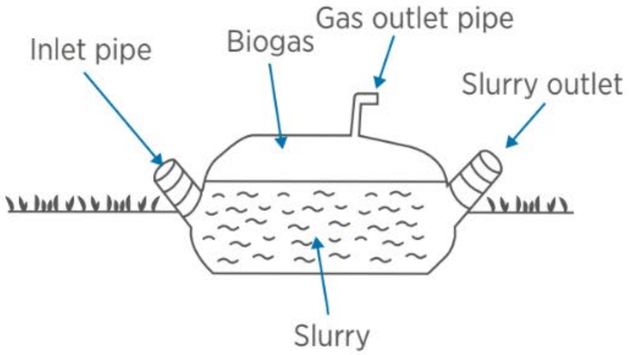
Floating drum plant





Flexi/Balloon/ Prefab





Source: IRENA, 2016b



Picture courtesy of BIO-NET

Biogas benefits and impacts

Indicator	Cost	Benefit
Financial	Cost of bio-digester, including all materials, labor, and installation.	Cooking fuel saving.
	Cost of rainwater harvesting system.	Chemical fertilizer saving.
	Cost of biogas utilizing equipment (gas burner, etc.).	Mitigation of health care costs associated with air pollution.
	Repair and maintenance cost of the system.	
Economic	Cost of extra time used in the adoption of bio-digester use.	Time-saving due to biogas and rainwater harvesting (no longer collecting and using more efficient cooking practices).
		Increased personal well-being because of using clean-burning energy (reduced respiratory and eye ailments related to poor indoor air quality).

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More benefits

Energy

- Heat generation
- Power generation
- Combined heat and power

Environment

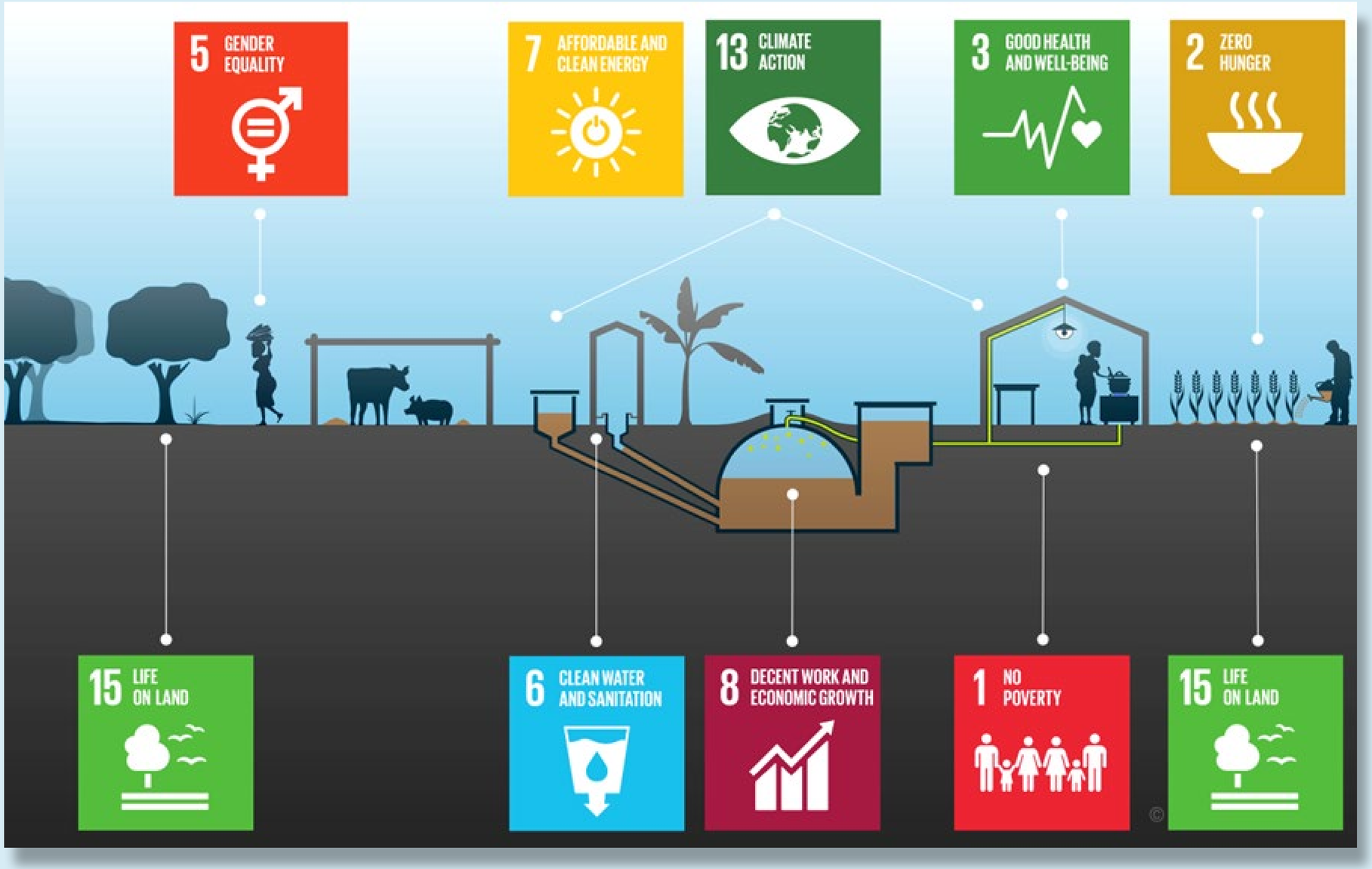
- Reduces soil and water pollution
- Reduces deforestation
- Reduces CH4 emissionsfrom untreated water

Food Security

- Produces organic fertilizer
- Bio slurry production

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Contribution to SDGs



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Market potential and growth trends

- Modern bioenergy: 55% of renewable energy and over 6% of global energy supply
- In 2017, 55.6 EJ of biomass was utilised for energy purposes – 86% (solid biofuels); 7% (liquid biofuel); 3% (Biogas), 3% (MW & I)
- Global biofuel production stands at 154 billion liters (IEA 2019)
- Feedstock for biogas and biomethane production is set to grow by 40% over the period to 2040
- Biogas is projected to provide a source of clean cooking fuel to an additional 200 million people by 2040, half of whom will be from Africa
- Biofuels provided 93% of global renewable energy, the remainder being renewable electricity— mainly solar

Picture courtesy SNV

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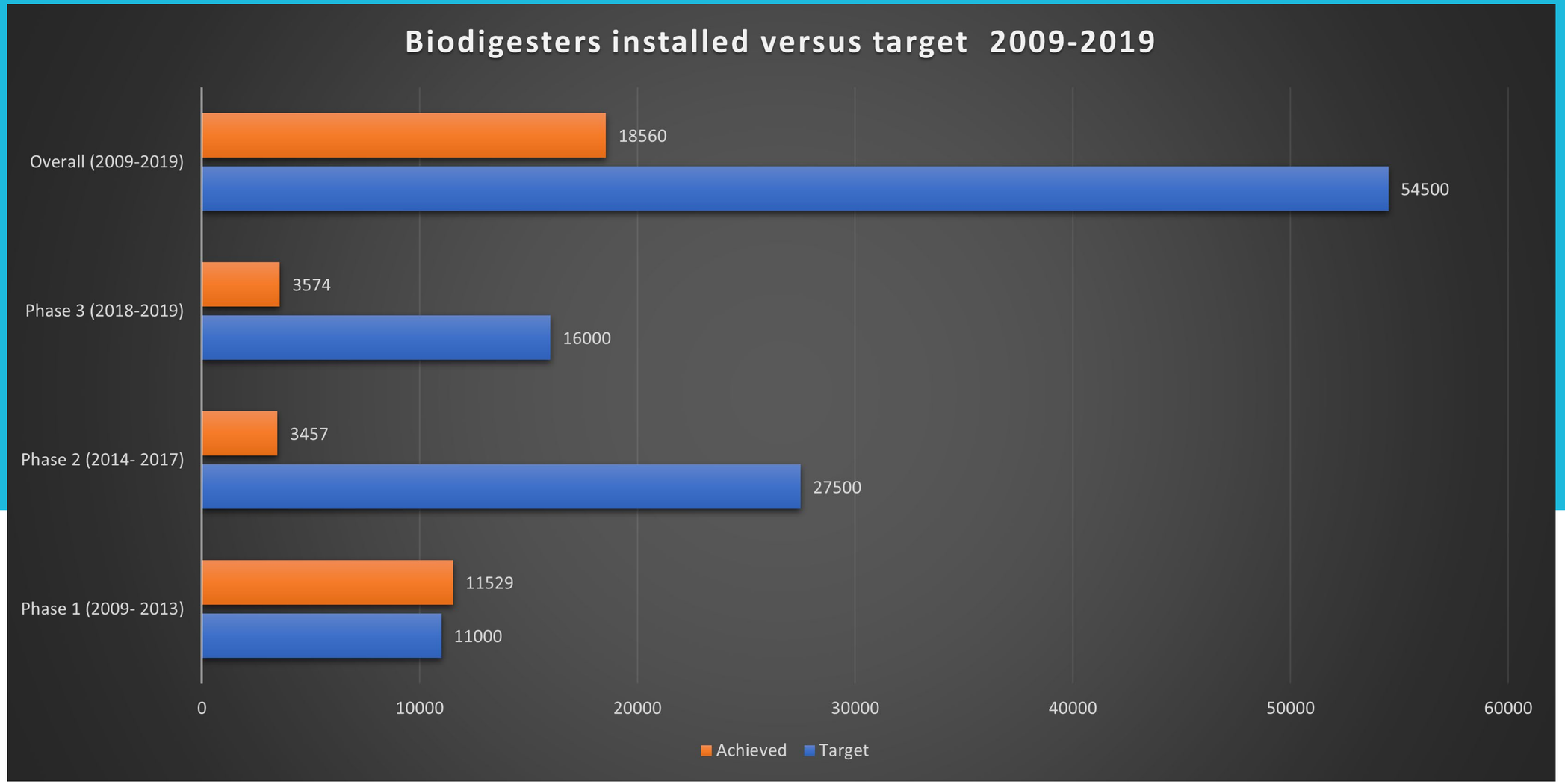
Biogas potential in Kenya

- About 60,000 installed to date
- The population of Kenya today is 55.5 million people.
- The dairy industry in Kenya contributes 14% of agricultural gross domestic product (GDP) and 3.5% of total GDP.
- Dairy farming by smallholders estimated at nearly 1.8 million farmers.
- A feasibility study on biogas established that it is possible to construct 6,500 biogas digesters annually in Kenya,
- The country has the potential to establish 1.5 million small scale and 105,000 medium-scale biodigesters.



Picture courtesy of BIO-NET

Biodigester installations up to 2019



Kenya Biogas Program

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Recap and practical exercises



Picture courtesy SNV

Pop Quiz

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NEXT: -

Module 2: Financial instruments and mechanisms

- Financial Products for Biodigester Sector
- Overview of available Financing Mechanisms
- Results-based Financing (RBF)
- Risk Assessment and Mitigation Strategies
- Investment Opportunities and Returns
- Project Planning and Financing

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