African Biodigester Component

Biodigester enterprise inventory - Kenya

SEE – Clean Cooking
African Biodigester Component

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This publication presents an updated inventory of the biodigesters enterprises active in Kenya. This report was developed by Ashington Ngigi and Reimund Hoffmann, independent energy consultants for the African Biodigester Component in Kenya under the overall supervision of Florent Eveillé, African Biodigester Component manager in Kenya and Walter Kipruto, Senior Energy Adviser.

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Funded by the Dutch Ministry of Foreign Affairs (DGIS), the Danish International Development Agency (DANIDA) and the European Union (EU), the African Biogas Component (ABC) in Kenya aims at facilitating a shift of the biodigester market from its pioneering to the expansion phase where 20,017 small and 250 medium-sized biodigesters will be constructed/installed. This will be achieved by means of a well-balanced mix of demand-side, supply side, financing and enabling environment interventions, geared at boosting demand and supporting small scale and medium scale biodigester companies in acquiring more clients. The component is implemented by a consortium between GIZ and SNV (the Netherlands Development Organisation) in cooperation with the Africa Bioenergy Partnership Limited (ABPL - ex-Kenya Biogas Programme).

Contents

Executive summary

There are currently about 90 companies active in the biodigester industry in Kenya. 41 of these enterprises participated in this survey. The analysis of their answers shows the following findings:

- Most of the Biodigester companies in Kenya are officially registered, but they are rather small and have a limited outreach. Only the ones selling and installing prefabricated systems are larger and have genuine marketing strategies. Most of the others, mostly in the fixed dome market segment expressed the need for appropriate marketing tools and strategy and their interest to expand their businesses beyond its current status.

- The total number of staff per enterprise is rather low: 5 do not have any staff (except the owner), 17 employ up to 5 permanent staff, 2 between 6 and 10, 6 between 11 and 20 and 3 between 21 and 50 and only 2 companies have more than 50 staff. The total numbers add up to 532, mainly men - 368 (69%) - and 164 (31%) women.

- The total number of digesters sold and constructed so far ranges from 20 to 5,000+ per company. Eight companies have constructed less than 50 biodigesters, 1 between 51 and 100, 6 between 101 and 200, 13 between 201 and 500 and 8 account for more than 500. The total number is almost 20,000 units, 10,707 fixed dome (54%) and 9,174 prefabricated (46%) biodigesters.

- The total current number of sales and installations ranges from 1 to 1,700 per year. Five companies sell currently below 10 plants per year, 8 between 11 and 20, 14 between 21 and 50, 8 more than 50. The total number amounts up to approximately 3,450 units of which 1,217 are fixed dome (35%) and 2,233 are prefabricated digesters (65%). Introduced in Kenya in 2018, prefabricated biodigesters now constitute the fastest growing biodigester market segment.

- The participating enterprises expect to sell or construct in the next four years between 48 and even up to 40,000 biodigesters. Seven companies are planning to install up to 100, 11 between 101 and 200, 7 between 201 and 500, and 7 want to increase their figures by more than 500 units, even between 12,000 and 40,000.

- Participating companies generally operate, in the Mount Kenya area, followed by the Rift Valley. Another regional concentration can be found in the Western part of the country (Kakamega, Siaya, Busia). Prefabricated biodigesters are sold country wide whereas fixed dome biodigesters enterprises need to send a team of masons in the area to build several biodigesters. They mostly work through referrals of their clients in the area.

- The participating enterprises made a set of recommendations for the project during the interviews. It is suggested that the Ministry of Energy build up and maintain a database of trained / certified biodigester masons in each county. The project should explore options to engage demand aggregators (cooperatives and SACCOS) and provide Result-Based Incentives to them. The biodigester enterprises would appreciate support to develop bankable business proposals to present to commercial banks, especially for larger units (medium scale / commercial segment of more than 50 m^3). Finally, developing specific end-users financing mechanisms for biodigester would be highly appreciated by the enterprises.

Brief history of Biogas extension in Kenya

In the 1980's, the German Development Cooperation (GDC) started the first Biogas extension project in Kenya as part of the Special Energy Program (SEP) under the Ministry of Energy (MoE) and in cooperation with the Kenya Industrial Estates (KIE). In this cooperation, the floating drum type was promoted with a metal gas holder and a cement pit for the digester. The main objective of the SEP intervention was to train masons in the construction of digester pits and welders/metal workers in the fabrication of quality gas holders. The MoE created one position for Biogas in its department for renewable energy, and one of these Biogas plants was installed at all rural energy centres and agricultural training centres (former Farmers Training Centres). The majority of these digesters wer built at small mixed farms with dairy around Mount Kenya. Unfortunately, the demand of this digester type remained very low due to inadequate awareness on operation and maintenance, high costs (brickwork and metal drum) and corrosion susceptibility of the drums.

Having constructed about 400 Biogas Units, the SEP came to an end in the early 1990's. Some of the artisans continued with constructions, but at a very low level. During the same period, several masons had been trained on the construction of fixed dome digesters (CAMARTEC) by the SEP sister project in Arusha/Tanzania and were also active in Kenya. These masons build CAMARTEC digesters, but also in small numbers.

In 2006 the agricultural GTZ program "Promotion of Private Sector Development in Agriculture - PSDA" incorporated the component "Resource Friendly Technologies" in its portfolio, under which the use of Biogas and Improved Cookstoves Stoves (ICS) were promoted. Whereas ICS interventions were fully funded by Energising Development (EnDev), GTZ managed to secure a co-funding for Biogas by the EU Energy Facility. PSDA embarked fully on the fixed dome plant like the CAMARTEC type with some slight alterations and called it AKUT type. The approach was to train a good number of artisans, mainly masons and plumbers, to construct digesters and install quality piping systems and accessories. Technicians and engineers were trained in planning and siting of the digesters and supervision of the artisans. Contractors received also training on entrepreneurship. During this period, PSDA introduced a Matching Fund of about 30% the cost of the digester. The fund paid upon successful completion of a digester, subsidized the cost of the smaller digesters (12 to 16m^3), increased demand, enhanced awareness and due to close follow up by the project team, this ensured traceability and assisted in adherence to all the quality parameters. At the end of PSDA's Biogas activities in 2011, about 810 functioning Biogas plants ranging from 12 to 248 m^3 had been installed and 300 artisans and technicians had been trained. Some of the current Biogas enterprises still offer the three types of fixed dome biodigesters (CAMARTEC, AKUT and KENBIM).

Following a global conference in Nairobi, organised by the Dutch funded "Biogas for Better Life: An African Initiative", the initiative started the African Biogas Partnership Program (ABPP), of which Kenya was part from 2010. The Dutch government commissioned HIVOS with the Kenya National Domestic Biogas Program (KENDBIP). They identified the Kenya National Federation of Agricultural Producers (KENFAP) for implementation. KENDBIP promoted fixed-dome digesters ranging from 6 m^3 to 16 m^3. The design (KENBIM) was based on the AKUT type with slight modifications to reduce material costs. There was also a subsidy element following the PSDA approach.

HIVOS and SNV took over for the second phase, now called Kenya Biogas Program (KBP); which ended in 2019. Like PSDA, KENDBIP and KBP also embarked on fixed-dome digesters and came up with a slightly different design (KENBIM), but focussed on smaller digester volumes of 6, 8 and 10m^3. This second phase also attracted prefabricated biodigester companies in 2018. The program discontinued with the subsidies but continued with the training of artisans to become Biogas Construction Entrepreneurs (BCE) and recorded 147 of these at the end of the project.

The total number of constructed Biogas units came up to approximately 19,500 units. Some of the project staff formed in 2020 a social enterprise called Africa Bioenergy Programs Limited (ABPL). The major source of ABPL revenues is the implementation of a voluntary carbon credit program (gold standard). These revenues are reinvested in operation and maintenance of existing biodigesters. ABPL continues monitoring the BCE performance and assume that about 40 of them are still active and registered.

Figure 1 - Fixed dome domestic biodigesters have been adopted in small farms with dairy cows in stables – © GIZ

Survey results

Based on existing data from previous projects and an ABC workshop, a total number of 75 companies were contacted. 49 of these stated that they are still active in the Biogas business. After intensive follow up, 41 companies answered the questionnaire (see Annex 1). In-depth interviews were conducted with 5 companies from different categories, i.e., market leader, provider of mixed services, focus on fixed dome technology, without permanent work force.

General information

Gender and age of the owners/managers

Biodigester installation is still very much a male-dominated sector. Out of the 41 interviewed enterprises, there are only 5 women owners against 34 men (two enterprises have one man and one woman each as CEOs). One company did not disclose ownership. Age ranges from 23 to 62 years, 13 persons are under 40 years of age, whereas 9 are between 41 and 50, 8 between 51 and 60 and 1 over 60 years old. 12 did not disclose their age. These figures show that biodigester enterprises are mainly run by middle-aged men even if the largest biodigester enterprise in Kenya is managed by a woman.

Type of company

Of the companies interviewed, almost all the 41 companies are formal, only 5 are of informal character. 17 are “Registered Limited Companies”, 8 “Private Limited Companies” and 4 indicated “Sole proprietorship”. No information was given by 8 participants. 11 enterprises operate on their own and 24 in rented premises. Four companies did not reply to this question.

Location / County

The highest number of enterprises (14) are based in Nairobi, 7 in Kiambu, 4 each in Nandi, and Nyeri, 3 in Meru, and one each in Kericho, Embu, Kakamega, Nakuru, Nyamira, Eldoret and Laikipia County. Most of them, however, operate in quite a few counties, some, especially the ones in Nairobi, even country wide. There is quite a discrepancy between the companies' legal locations and their areas of operation.

Exposure to IT/electronic media

All 41 companies own a smartphone and use this for more than just making phone calls. Only 12 companies have their own websites, 28 of them are active in various social media accounts and 27 of them are active on Facebook, which is also mentioned as the main marketing tool.

Workforce

The total number of staff per enterprise is rather low: 12 do not have any permanent staff, meaning that the owner him/herself is the main workforce, 17 employ (with or without contract) up to 5 permanent staff, 2 between 6 and 10, 6 between 11 and 20 and 3 between 21 and 50. Only 2 companies employ more than 50 staff out of which, the leading biodigester company in the country has 156 employees.

The total number of permanent staff with and without contract adds up to 615 of which only 62% have a contract. 441 men work in the sector. They constitute 72% of the workforce. In Admin/finance and support functions they represent 52% of the staff, 80% in the skilled functions and 77% of unskilled functions. The total number of temporary staff working days per year is 1,087 which is equivalent to roughly 5 full time equivalent staff. The proportion of male temporary staff is 78%, 86% in skilled and 66% in unskilled functions.

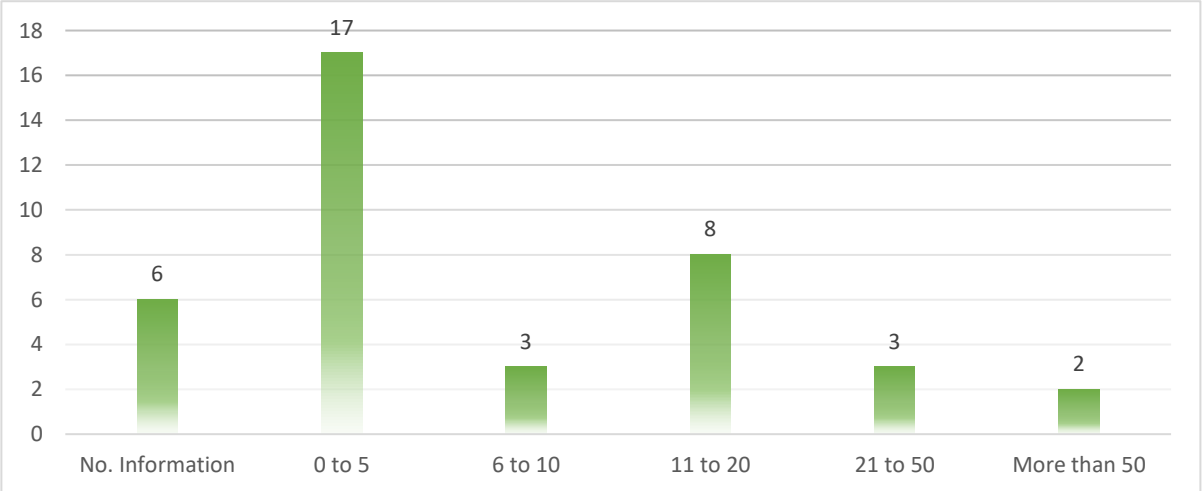

Figure 2 - Number of companies clustered per number of staff

The following tables give a detailed listing of staff in the companies:

Table 1 - Number of permanent full-time staff with and without employment contracts

	With contract		Without contract		Total
	Male	Female	Male	Female	
Admin/finance and support	54	55	27	19	155
Trained technical	151	46	52	6	255
Untrained technical	69	9	88	39	205
Total	274	110	167	64	615

Table 2 - Number of temporary staff days per year

	Male	Female
Trained	537	84
Untrained	307	159
Total	844	243

In the filled questionnaires, there is hardly any information on the number of days per year, when temporary staff was engaged. Whereas the installers of prefabricated digesters work mostly with permanent staff, the construction of fixed-dome plants is mainly done by trained masons and their untrained helpers on contract or without contract. The latter category was not disclosed by companies. It takes between 6 (6 m^3) and 60 (124 m^3) days to construct one biodigester depending on the size with an average of 40 days. This includes installation of piping. In addition to the staff reported above, one of the companies has a network of about 100 independent sales agents that work on commissions.

Thirty-two enterprises, all 26 of those with full time permanent workforce, had to reduce the number of staff because of the economic slowdown following the measures to combat Covid19. The pandemic had no influence on the workforce of 8 companies. Out of these are 3 selling prefabricated digesters and 4 with no other workforce than the owner. For one company, biogas contributes very little (5% only) to the overall turnover.

Only six companies mentioned the lack of technical and/or managerial skills for further expansion of their biodigester activities. It means that most companies have sufficient access to skilled masons, either on their paylist or in their vicinity.

Figure 3 - Prefabricated biodigester – © RVO

Biogas exposure

Services offered / Type of digester

Many enterprises (15) offer exclusively services for construction of fixed-dome plants, only 1 exclusively of the floating drum type. 6 focus on sales and installation of prefabricated digesters only, 10 deal with fixed-dome, floating drum and prefabricated types. This includes piping and installation of appliances. 11 companies fabricate or sell Biogas accessories, and 1 is engaged in repair and maintenance. 3 enterprises mention, that they offer training services for the construction of fixed dome plants. 2 companies did not reply to this question.

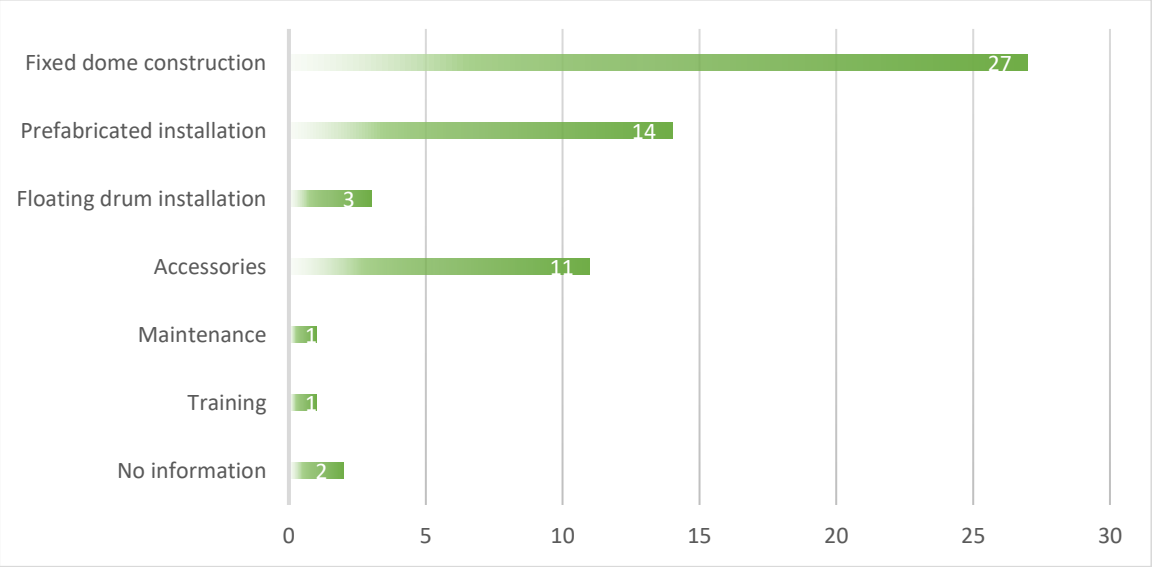

Figure 4 - Number of companies per type of service offered

Enterprise creation timeline

The vast majority (25) of enterprises started their activities between 2001 and 2010, all of them under the GIZ PSDA project. 12 started after 2011 (most of them under KBP), three companies started before 2001, respectively in 1999, 1988 and 1979. One enterprise did not reply to this question.

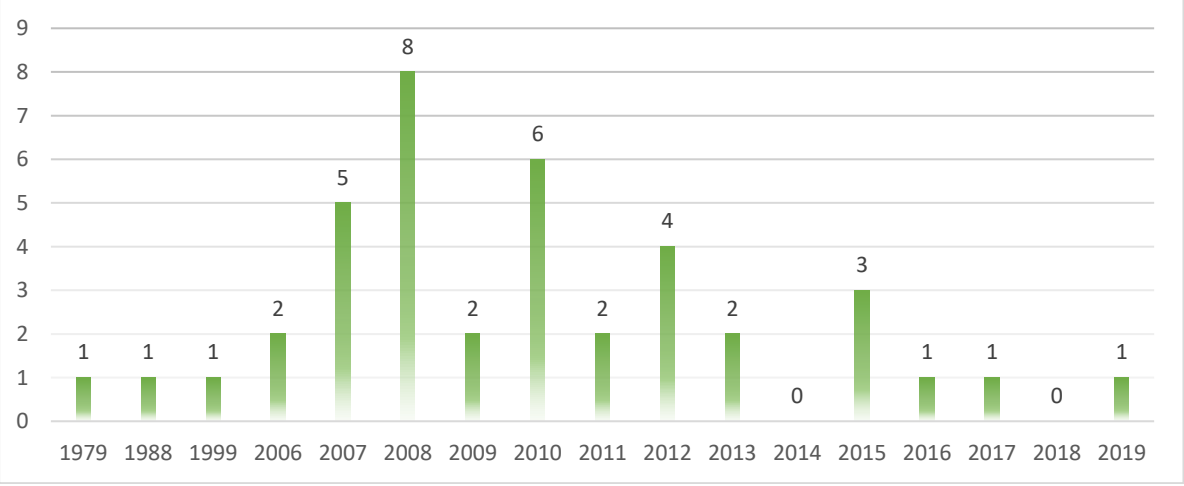

Figure 5 - Number of enterprises created per year. NB years prior to 2006 are not all represented

Biogas training

Thirty eight out of the 41 companies have received trainings in Biogas construction and installation: 19 by GIZ PSDA, 18 by KBP and 12 by others such as KCIC and KNDP.

Companies trained by GIZ PSDA, have proven their capability to construct quality digesters even with larger volumes and specific requirements due to non-standard substrates like waste from abattoirs and agricultural processing. Two enterprises engage in training of farmers and masons.

To construct a fixed dome digester an ordinary mason needs special training, which is currently neither part of any vocational curriculum nor training institute in Kenya. Entrepreneurs see the need to train more masons following the PSDA approach (whereas the KBP programme invested in capacity building measures to transition masons into entrepreneurs) with theoretical lessons and practical construction training. **It is recommended that the Ministry of Energy build up and maintain a database of trained biodigester masons in each county.**

Past, current and expected sales and installations of digesters

Among the 41 companies, three types of biodigesters are represented: fixed dome, prefabricated and floating drum according to the figure 6 below.

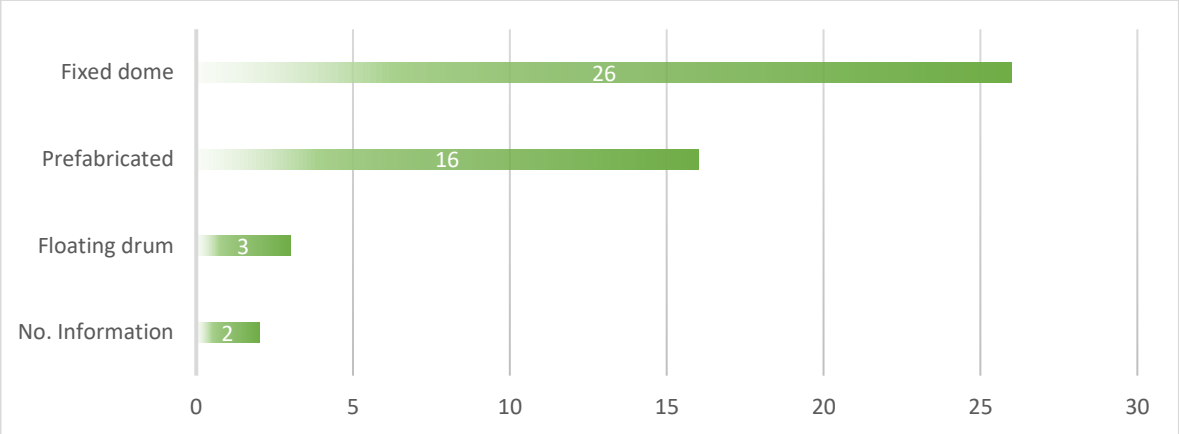

Figure 6 - Number of enterprises per type of biodigester installed

The current number of annual sales and installations ranges from 1 to 1,700 per year. 5 companies sell currently below 10 plants per year, 8 between 11 and 20, 14 between 21 and 50. However, 8 enterprises have annual sales of more than 50 with the lion's share lying with one company. The total number of annual sales and installations amounts up to approximately 3,350 units, 1,217 fixed dome and 2,233 prefabricated digesters.

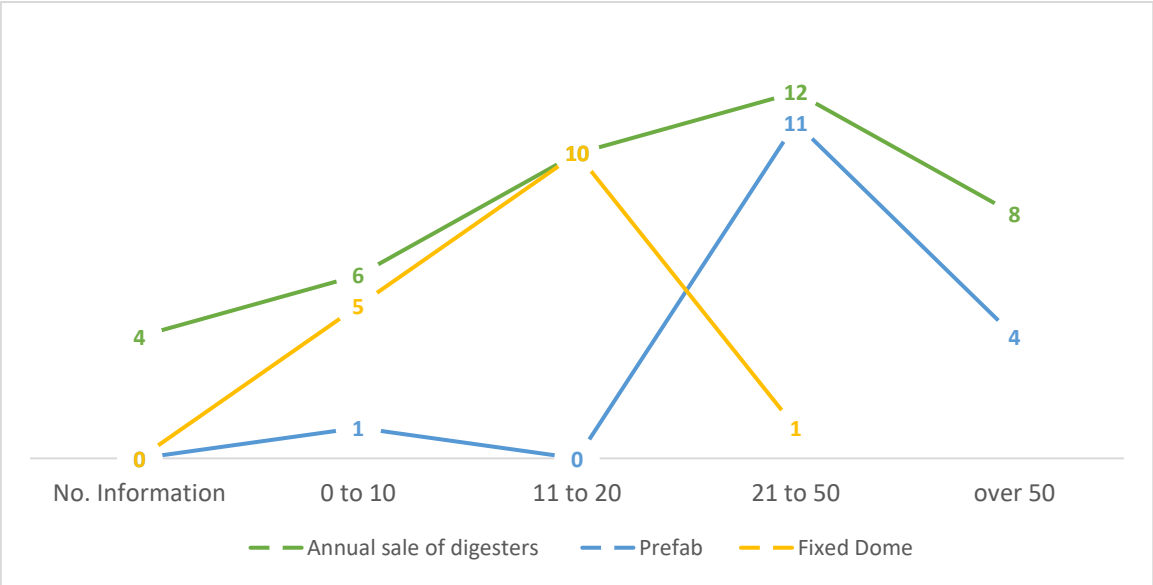

Figure 7 - Number of enterprises per average yearly sales

The total number of digesters sold and constructed so far ranges from 20 to more than 5,000 per company. Eight enterprises state that their total number is below 50, 1 between 51 and 100, 6 between 101 and 200, 13 between 201 and 500 and 8 account for more than 500. The total number of sold or constructed digesters by the interviewed companies is so far almost 20,000 units, 10,707 fixed dome and 9,174 prefabricated digesters.

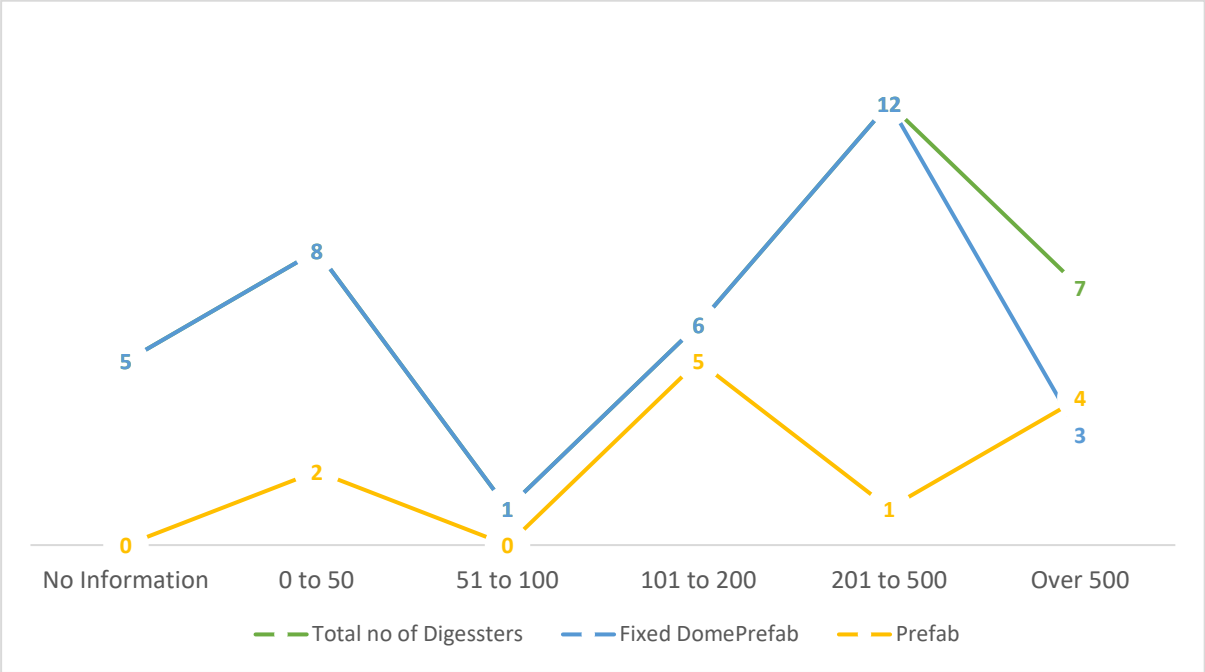

Figure 8 - Number of enterprises per historical sales

The participating enterprises expect to sell or construct in the next four years between 48 and even up to 40,000 Biogas plants. 7 of those gave a modest forecast of up to 100, 11 between 101 and 200, 7 between 201 and 500, and 7 want to increase their figures by more than 500 units, one between 12,000 and 40,000. 5 companies did not give information on this question.

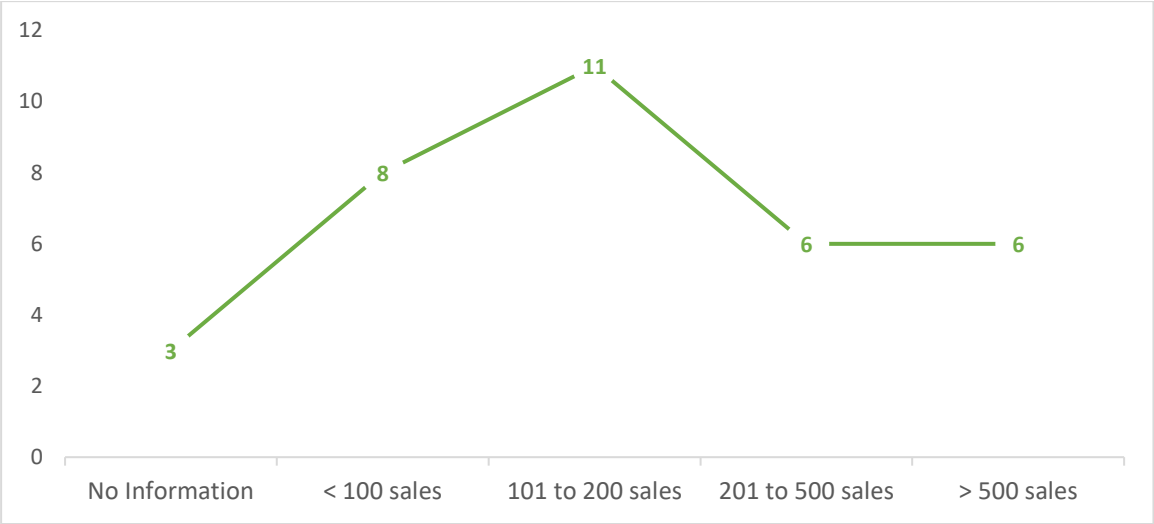

Figure 9 - Number of enterprises per projected yearly sales in the next four years

If the medium size companies would be able to reach their targets by selling or constructing between 100 and 500 digesters during the next 4 years, there would be between 15,000 and 18,000 additional Biogas plants in Kenya. The companies selling prefabricated digesters have set ambitious goals and plan to sell from 1,400 (1) to 6,000 (1), to 15,000 (1) and even between 17,000 and 40,000 systems (1). They report, however, that the total number of digesters constructed or sold up to now are 1,550 (1), 300 (1) and less than 6,000 (1).

Measures to assure quality

23 companies underlined the importance of having well-trained masons and close supervision during construction time, 12 have a warranty (mostly one-year) on the digesters, and 15 have contracts for after sales service. 4 interviewees use social media to advise and keep in contact with their clients.

Market barriers for up-scaling of the individual business

The participating enterprises mentioned a multitude of barriers to up-scale their businesses:

- 21 own financial limitations
- 11 low consumer awareness on the technology
- 9 costs of the digesters
- 6 limited resources for marketing
- 4 limited capacities of the company
- 3 logistics
- 1 impact of Covid19
- 1 import logistics
- 1 failed biodigesters
- 1 inflation
- 1 lack of subsidy
- 1 taxation
- 1 competition from prefabricated plants
- 1 water scarcity in semi- and arid areas

The answers show that many companies do not have the financial means to expand their business activities on their own, which is also a reason why they do not see themselves in the position to run awareness or marketing campaigns.

Engagement of financial intermediaries

Eighteen companies had so far not engaged with financial intermediaries, 3 gave no information; the other 19 had engagements with:

- 17 different SACCOs
- 5 Kenya Women Finance Trust
- 5 Commercial Banks e.g., Equity Bank
- 1 NGO
- 1 Agricultural Finance Corporation
- 1 Fortune Micro-finance

SACCOs, most of them for dairy farmers, are by far the most popular financial intermediaries for the provision of credits to Biogas users. **The biodigester enterprises would appreciate support to develop bankable business proposals to present to commercial banks, especially for larger units (medium scale / commercial segment of more than 50 m^3).**

Figure 10 – Large biodigesters requires technical and project development skills – © GIZ

Engagement with demand aggregators

Only 6 companies had not engaged with aggregators (marketing hubs, cooperatives, SACCOs or farmer groups), 5 gave no information, but 30 had engaged with:

- 15 dairy SACCOs and cooperatives
- 4 other cooperatives
- 1 Kenya Agricultural and Livestock Research Organisation (KALRO)
- 1 agricultural project (IFAD)

Most of the biogas entrepreneurs have realised that aggregators, especially dairy cooperatives, can play an important role to reach potential clients, since these are in regular contact with dairy farmers. **The project should explore options to engage such aggregators, maybe even open an opportunity to have access to or manage Result-Based Finance.** In counties with low demand for biodigesters, enterprises have difficulties to have enough clients to develop their business. This is specially the case for fixed dome biodigester enterprises. These enterprises would need an intermediary which would aggregate the demand for them.

Drop in sales due to measure to combat Covid 19

Forty participating companies experienced a detectable drop in sales because of the Covid19 impacts; 2 even stopped their operations and have not resumed yet. Most enterprises are, however, optimistic that business will get back to normal once the economy has recovered from the impacts of the pandemic. 1 enterprise did not reply to the question.

Mode of pricing

The prefabricated biodigesters are sold at fixed prices according to the size and location. Price information can be found in Annex 3.

Most of the companies constructing fixed-dome digesters (19) submit a list of material depending on the size of digester to the client for purchase of the same. With this system the client benefits from lower prices as he knows better the local raw material market than the mason. For labour, supervision and warranty they add between 25% and 35% on the material costs. 5 companies sell their fixed-dome digesters at a fixed price according to the digester size, 3 others ask for a fixed price per cubic meter plus logistics. A table with the average price for fixed-dome digesters can also be found in Annex 3.

Two companies have established a price list for after-sales services. The price of accessories depends very much on the quality and the wholesale or import prices.

County coverage

The 39 participating companies cover a total of 33 out of 47 counties, two even state that they are active country wide. The following table gives an overview how many enterprises are active in the respective counties.

Table 3 - Counties of operation of the interviewed companies

# enterprises	County	# enterprises	County
19	Kiambu	7	Siaya
17	Nyeri	6	Bomet, Laikipia, Bungoma, Kirinyaga
14	Muranga	5	Taita Taveta
12	Nakuru	4	Kilifi, Tharaka-Nithi, Nairobi, Transnzoia
10	Nyandarua, Kericho, Meru	3	Narok, Makueni, Nyamira, Machakos, Kisii, Nandi
9	Kajiado, Kakamega	2	Mombasa, Turkana, Baringo, Garissa, Migori
8	Uasin Gishu, Busia, Embu	1	Nandi, Elgeyo Marakwet

The by far highest number of counties, in which the participating companies operate, is in the Mt. Kenya area (Kiambu, Nyeri, Muranga, Nyandarua, Meru, Embu), followed by the Rift Valley (Nakuru, Kajiado, Uasin Gishu, Kericho, Laikipia). Another regional concentration can be found in the Western part of the country (Kakamega, Siaya, Busia). Two companies each operate in the ASAL (semi- and arid land) counties of Baringo, Garissa and Turkana. Remarkable is the fact, that only 4 companies are active in Nairobi, the county with the highest number of inhabitants, and 2 in Mombasa, the second largest city in Kenya.

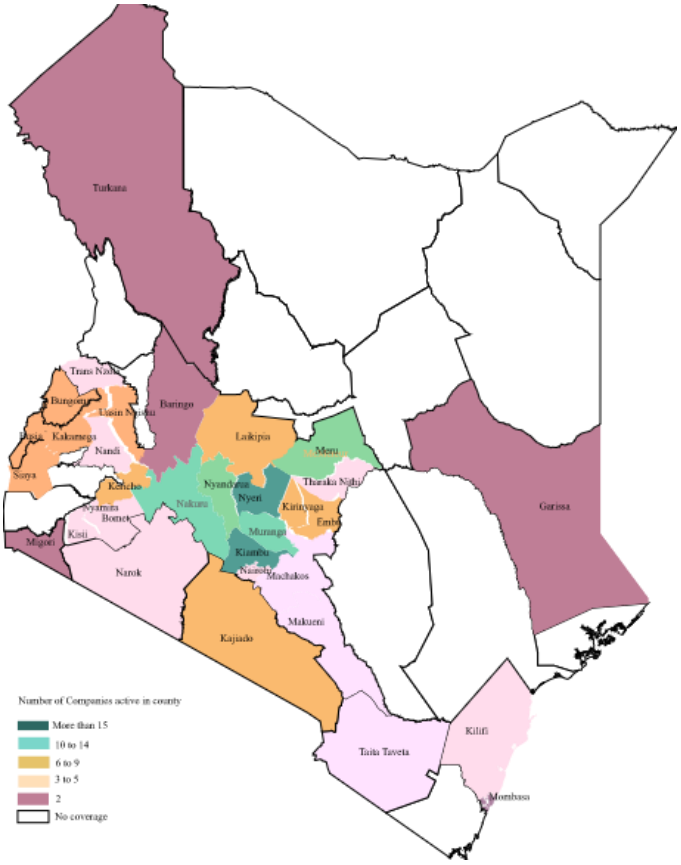

Figure 11 - Counties of operation of the interviewed companies

The following table gives an overview of the 3 best and 3 worst performing counties in terms of sales according to the participants.

Enterprises	3 best performing counties	Enterprises	3 worst performing counties
10	Muranga		
8	Kiambu		
7	Nyeri, Uasin Gishu		
6	Meru		
5	-	5	Machakos
4	Nakuru, Nandi, Kirinyaga	4	Laikipia,
3	Nyandarua, Embu, Kajiado	3	Embu, Kisii, Nakuru, Wajir,
2	Laikipia, Busia, Siaya, Tharaka-Nithi	2	Kericho, Marsabit, Mombasa, Meru
1	Bomet, Kisii, Bungoma, Migori, Kericho, Makueni, Nyamira, Narok, Mombasa, Nairobi, Elgeyo Marakwet	1	Kitui, Muranga, Makueni, Samburu, Bungoma, Garissa, Mandera, Kiambu, Siaya, Nairobi, Kakamega, Kisumu, Bomet, Nyeri

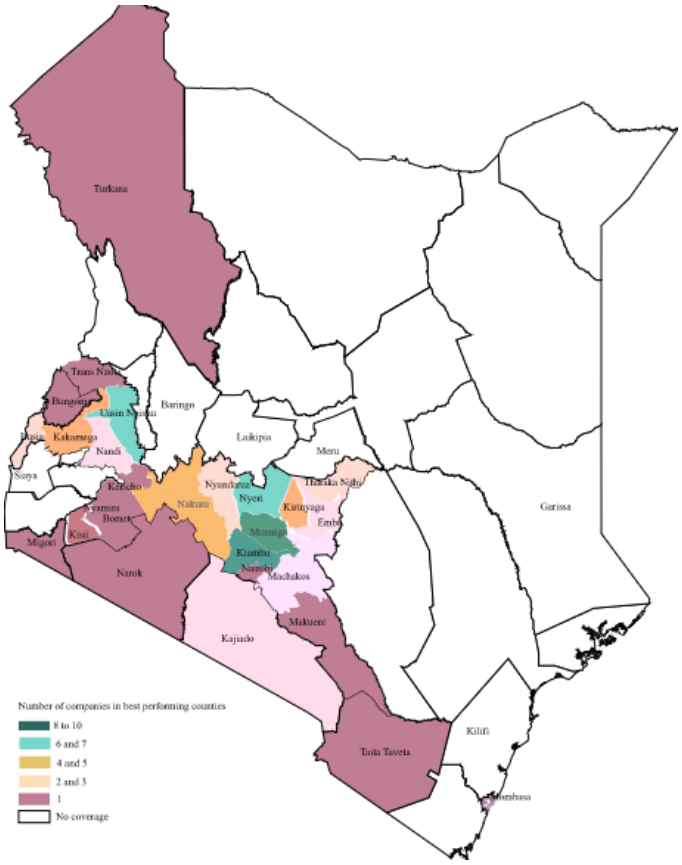

Figure 12 - Counties rated as best performing by the interviewed companies

Counties in the Mount Kenya region (Muranga, Nyeri, Kiambu, Meru and Embu) are rated best when it comes to sales performance, followed, once again, by those in the Rift Valley (Uasin Gishu, Nakuru, Nandi and Kajiado).

Figure 13 - Biogas user in Kiambu county, Kenya - © GIZ

The Rift valley counties top the list of worst performing counties (Laikipia, Nakuru). From the Mt. Kenya area only Embu (3x), Meru (2x), Muranga (1x) and Kiambu (1x), and Eastern Machakos, were mentioned as bad performers.

These figures indicate clearly that the Mt. Kenya region is the one with by far the biggest potential for scaling up of biodigester market.

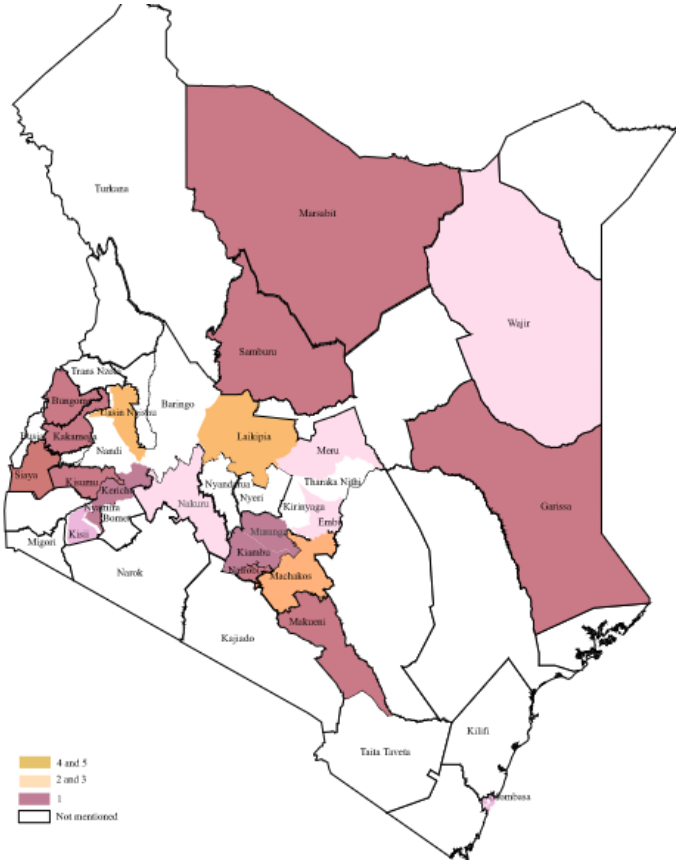

Figure 14 - Figure 12 - Counties rated as worst performing by the interviewed companies

Marketing activities

Social media is the by far most popular marketing tool among the enterprises: 21 of them use it, but most of them not in a structured or strategic way. Thirteen participate in exhibitions, field and market days, 11 use printed material like flyers or brochures, 5 believe in the word of mouth, 4 organize exhibitions as part of community events, 2 each mentioned seminar and 1 car branding as well as national and local TV/radio as opportunities for marketing.

Annual costs between KES 20,000 and 600,000 for marketing activities were given.

Only two large companies have a marketing strategy. The smaller ones make use of social media, field days and community events organised by others. **The need for appropriate marketing tools and strategy was strongly expressed by the enterprises.**

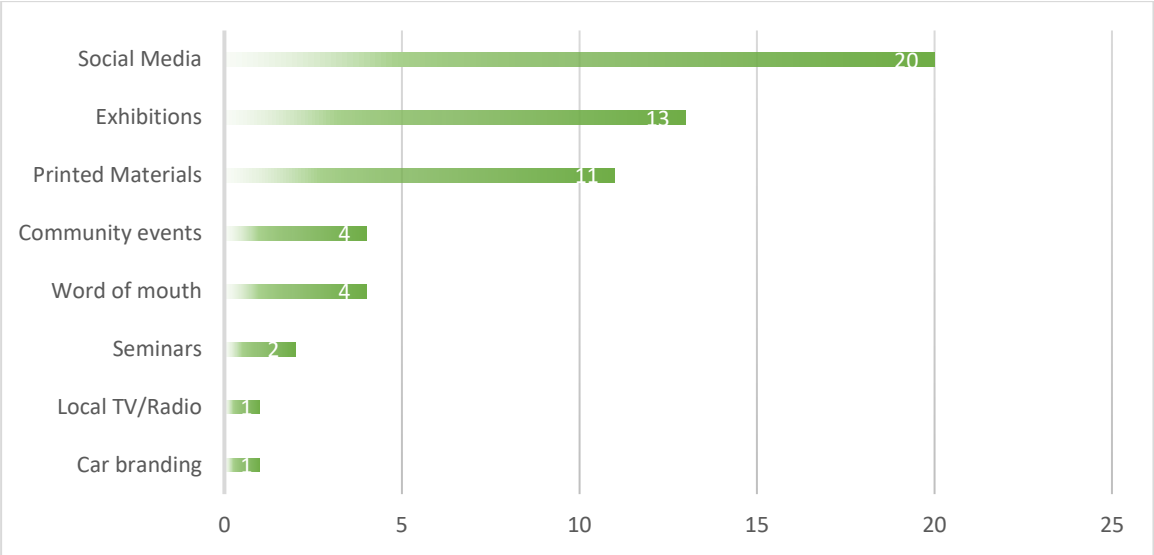

Figure 15 - Number of companies per type of marketing activity

Cooperation with other Biogas companies

Thirty-five enterprises cooperate in one way or another with their competitors, e.g., being members of a Biogas association, joint trainings, purchase of accessories or support in remote places, but there is no formal cooperation in the day-to-day business. Three companies stated that they do not cooperate with others, 3 did not reply to the question.

Figure 16 - A biodigester owner cooking on biogas – © RVO

Most of the positions in the Kenya Biogas Stakeholder Network (BIO-NET) National Board and National Executive Committee are filled by owners/CEOs of companies who participated in this survey. BIO-NET represents the sector in various governmental and private sector institutions.

Sales and finances

Annual turnover

Only 23 out of the 41 enterprises were ready to disclose information on their annual turnover. This ranges from KES 300,000 to KES 207,000,000 and even KES 2,700,000,000. Five out of the 23 companies report figures up to KES 1,000,000, 6 between KES 1,000,001 and KES 2,000,000, 6 between KES 2,000,001 and KES 10,000,000 and 6 above KES 10,000,000.

As already shown in previous chapters, most of the biodigester enterprises are rather small; about half report annual turnovers below KES 2,000,000, which means that they construct less than 70 digesters per year. The 17 companies, that did not give information on their turnover, also fall in this category; none expects to sell or construct more than 200 digesters in the next 4 years.

Biogas percentage in sales

27 enterprises replied to this topic; 14 did not. The Biogas percentage in sales ranges from 5% (1 company) to 100% (4 companies). In 3 companies the percentage is below 25%, in 8 between 26% and 50%, in 7 companies between 51% and 75%. 13 companies are mainly relying on Biogas with a percentage of more than 75%.

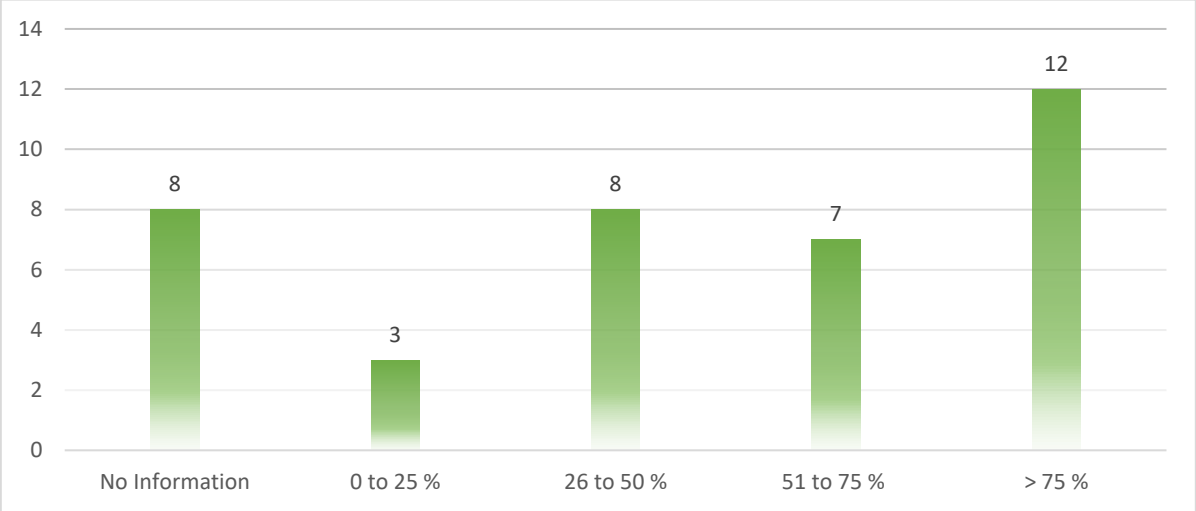

Figure 17 – Number of enterprises according to the percentage of biodigester sales in the total turnover

Out of the 27 responses, more than two third are mainly or even purely biodigester companies. Beside suppliers of prefabricated digesters, most of these contractors have a steady and reliable source of revenue.

Real annual growth in sales

Twelve companies did not give any information on this. Out of the other 29, a growth lower than 10% is reported by 14, 4 between 11% and 20%, and 11 companies enjoy annual growth of more than 21%. In general, also the growth rates are steady, but lower than 20% in most enterprises.

Bank account and accounting system

Forty companies have active bank accounts, 1 did not answer this question. Twenty-one companies engage an accountant, 11 of those on a full-time basis. 7 mentioned that they use QuickBooks, others (one each) and 1 each use ERP, ZOHO and ESRO as accounting software. Most companies do not have an in-house accountant but outsource accounting to service providers. Just about one quarter (10) use an accounting software.

Bank loans / credits

Eleven companies do have loans of KES 2 x 150,000, 2 x 200,000, 1 x 205,000, 2 x 500,000, 1 x 600,000, 1 x 900,000, 1 x even 30,000,000. One did not disclose the amount. 26 do not have a loan, 3 did not answer the question.

Three of the loans reported do not need collateral, three require a collateral; the respective values of the collateral are higher than the loan:

Table 4 - Value of collateral per provided loan

Loan amount KES	Value collateral KES
150,000	500,000
205,000	1,000,000
500,000	1,500,000

Seven companies state that they currently do not need a loan, 5 gave no information on this, 26 see the need for a credit. The amounts required and the intended uses are as follows:

Table 5 - Required loan value and intended use

Amount required KES	Intended use	Amount required KES	Intended use
200,000	No information (2)	2,000,000	Management structure and tools (1) No information (1)
400,000	No information (1)	2,200,000	No information (1)
500,000	Procurement of appliances (start-up 1)	3,000,000	No information /1), Expansion and employing marketing staff (1)
600,000	Biogas expansion	4,000,000	Accessories (1)
900,000	Workshop for appliances, awareness	4,300,000	No information (1)
1,000,000	Biogas expansion (1) No information (1)	5,000,000	Marketing, Purchase of tools and equipment, working capital, R&D (1)
1,500,000	No information (2x)	11,610,000	Market activation, working capital (1)
1,000,000	Biogas credit scheme (1) No information (1)	50,000,000	Biogas expansion, accessories

Only 5 companies had already a loan application rejected, 1 because of poor financial records and 2 because of the lack of collateral. Two companies did not disclose the reason.

Only 9 (less than 20%) of the participating companies do have loans, half of these from commercial banks requiring collateral. Five had applied for loans but were not successful. On the other hand, almost three quarters see the need for loan with figures ranging from KES 200,000 to more than KES 50 million. Information on the intended uses for the loan is very shallow and needs further investigation. Working capital and marketing were mentioned by more than one company. It was not asked why not more companies applied for loan, but the lack of collateral seems to be the largest obstacle: only 11 companies own their premises, the others work from rented places.

Mode of payment

Twenty-one companies state that they demand pre-payment: 10 each for up to 50% and from 51 to 100%. Thirty-one companies ask for payments by instalments, ranging from 2 to 25 instalments: 9 for 2 payments, 16 for 3, 2 for 12 and 1 each for 6, 15, 24 and 25 instalments. Only 6 enterprises have access to micro-credit facilities. The percentages of such sales are 6%, 10%, 15%, 40% and 100%. Four business use lease-to-own models for 5%, 10% (2x), 20% and 25% of their customers. One company uses RBF support for 40%, another for 100% of their sales.

Five companies state that they use other forms of payments for 10%, 40%, 50%, 88% and 100% of their clients, mainly invoicing after finalization of construction or installation.

There is no preferred mode of payment. Most suppliers of prefabricated digesters ask for one-time payment, either pre-paid or after installation. One company has, however, options and different prices for a one-time payment, 12 instalments and even 24 instalments. The prices for 12 instalments are between approximatively 3% and 16% higher, the ones for 24 instalments between approximatively 16% and 26% higher because of the perceived risks for the company. Most of the smaller contractors for fixed-dome digesters want to be paid in 3 instalments: after signing the contract, after finalisation of construction and after the plant is fully functional or commissioned. **Credit options for biodigester clients would be highly appreciated by enterprises**.

Credit risk to end user

Twenty-one companies did not give any information on this topic. 10 assessed the risk below 10%, 2 between 10% and 20%, 1 between 26% and 50% and 5 higher than 50%.

These results indicate that the notion is not well understood or that the credit risk is not a serious obstacle for end users.

Marketing, last mile distribution and quality assurance costs per biogas plant as a proportion of the unit cost

The proportion of marketing costs ranges from 2 to 40% of the total cost of the biodigester. Thirteen companies estimate up to 5%, 8 between 6% and 10%, 9 between 11% and 20% and 5 more than 20%.

This information shows that the enterprises do not spend significant amounts of money on marketing.

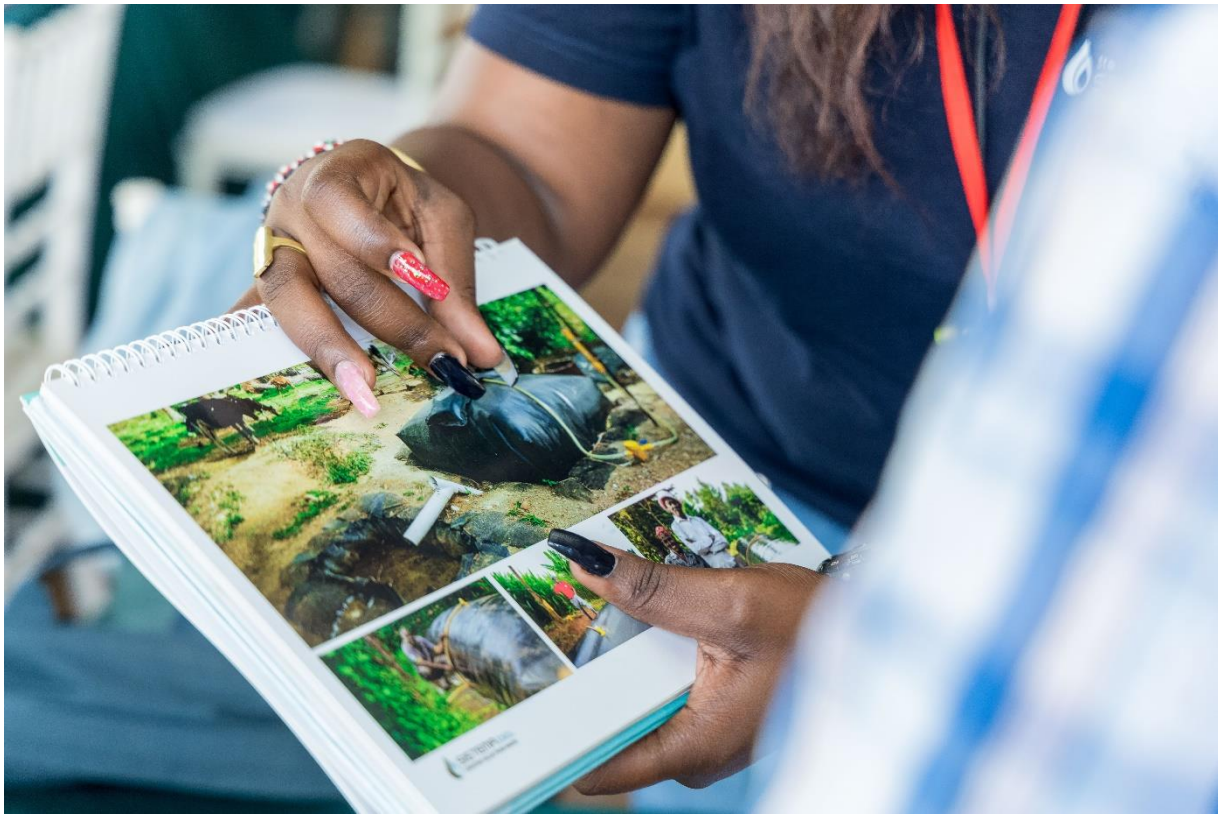

Figure 18 - Awareness raising activities conducted by enterprises – © GIZ

The proportion of last mile distribution cost of the total cost of the biodigester ranges from 2% to 80%. Seven companies each estimate up to 5% and between 6% and 10%, 5 between 11% and 20% and 11 more than 20% of the total cost of last mile distribution per sold biodigester. Ten companies did not reply to this question.

The highest proportion of last mile distribution costs is found in companies constructing fixed-dome digesters, i.e., the money they pay to the local masons and casual workers including transport for the masonry and plumbing work.

The proportion of after sales service cost of the total cost of the biodigester ranges from 1% to 70%. 8 companies estimate up to 5%, 17 between 6% and 10%, 2 between 11% and 20% and 8 more than 20%. Five companies did not answer this question.

The figures do not give a clear picture about the cost implications of quality assurance and after sales services. During the in-depth interviews it became, however, obvious that this can be a real cost factor when the clients are located far from the location of the contractors.

Critical number of Biogas plants to sustain marketing, distribution and after sales support costs per year

The critical number per year ranges from 8 to 3,600 plants because of the variety of the company sizes. 3 companies state up to 10, 6 between 11 and 20, 9 between 21 and 50, 8 between 51 and 100, and 10 more than 100. 5 companies did not reply to this question.

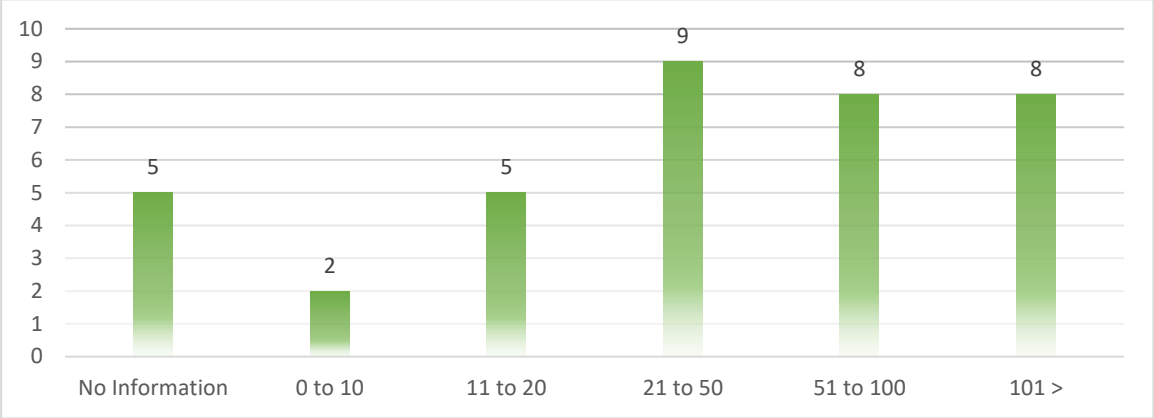

Figure 19 - Number of enterprises per critical yearly number of plants to sustain the business

All companies selling prefabricated digesters consider critical numbers of over 200 per year to sustain their marketing, distribution and after sales support costs. Eight of the contractors for fixed-dome digesters would need just up to 20 biodigesters, the majority between 21 and 100. These figures are, however, higher than their actual sales of digesters per annum.

Benefitting from Biogas promotion projects

Ten companies have not benefitted from any Biogas promotion project. 9 have benefitted from GTZ/GIZ,10 from KBP and 6 from others like Caritas, Mau Forest Conservation, SNV and BEEF. 3 benefitted from a project but did not mention the name of the project or the implementing organisation.

Familiarity with Result-Based Finance

Twenty-four companies have heard of or are familiar with RBF, 13 have not. No information was given by 4 enterprises.

Trade and technology

Input of domestic or foreign origin

The percentage of input of domestic origin ranges from 0% to 100%. Twelve companies have no inputs of foreign origin. Seven companies use up to 20% domestic inputs, 2 between 21% and 40%, 1 between 41% and 65%, 3 between 65% and 80%, 2 between 81% and 99% and 2 even 100%. Eight companies did not reply to this question.

For most of the enterprises hardly any foreign input is required. For the construction of fixed-dome biogas plants domestic inputs like locally available building material are mainly required.

All seven companies with a percentage of more than 60% of foreign input sell and install prefabricated digesters. For the rest this share is almost neglectable, especially since imported biogas accessories are locally available.

Import and licenses, research and development

Only 8 companies gave information on import; the durations to obtain an import license were given with 4, 7 (2x), 14, 21, 30 (2x) and 45 days. Only 7 companies apply technology, which is licensed from a foreign company. Importation and licensing do not play a significant role in biodigester businesses.

Twenty-one companies state that they are active and invest in R&D activities, 11 say they do not, 9 did not reply to this question. More than half of the participating companies state that they have R&D activities and are interested to become part of respective initiatives.

Easiness to purchase required accessories

Five companies did not reply to this question. The largest number (21) find it easy to purchase accessories, 1 neither nor and 14 find it difficult.

Twelve companies find it difficult to have access to required accessories. One company has specialized in import and branding of biodigester appliances from China.

Training in use of digital platforms

One company did not answer this question, the other 40 expressed their interest in being trained in the use of digital platforms.

Figure 20 - Bioslurry is applied on crops to increase yields

Annex 1. List of contacted companies

#	Company name	#	Company name
1	Abiud Ltd	41	Dolphin contractors
2	Kentainers	42	Likunga Company Ltd.
3	Sistema	43	Mazao contractors
4	Bett Ernest	44	Simgas
5	Gimosong Entereprises	45	Biogas solutions
6	Akut East Africa Ltd	46	Biogas International
7	Fagaden Enterprises	47	Keilot Kenya
8	Sapudu constructions	48	Sky link innovators
9	Nickton Bio-Energy contactors	49	Ndungu Samuel
10	Rural & Urban Alternative	50	Githunguri Renewable resources
11	Igwemas Ltd.	51	Jamtu Contractors
12	Takamoto	52	Afrisol Energy Ltd.
13	Greesb Drive EA	53	Kiangombe modern hills contractors
14	Biogas construction and Energy Deve Ltd	54	Multi-purpose contractors.
15	Biogas construction and energy dev.	55	Njoroge Joshua
16	Pluro Industries	56	Nyariki Peter
17	Kenya Sunrise	57	Green Yard Ltd.
18	Intermuck Comm. Enterprises	58	Kobole building constructions
19	Mt. Kenya Renewable energy	59	Chogo biogas techniques
20	Redsan Enterprises	60	elico bioenergy construction
21	Kibicho Simon	61	Green link.
22	Sakaki	62	Otieno gases
23	Kichemu	63	Pessarac contractors
24	Felikam	64	Byestar International LTD
25	Marirmoi Investment	65	Nyongi contractors
26	Kibicho Simon	66	Woodroffe Enterprises ltd
27	Jasmark General Contractors	67	Biogas International
28	CIDES	68	Wahome Lucy
29	Madahana Aggrey	69	Hard Forks engineering
30	Scode Ltd	70	Home Biogas
31	Biotechno & Servixe	71	Ozone Renewable Energy and Construction
32	Domino biogas contractors.	72	Andcol Enterprises
33	Githimatu Biogas Contractors	73	Ndima Renewable Energy
34	Renewable Energy Engineeering Contractors	74	Lemesko biogas construction company limited
35	Rural Green Energy	75	Wahome Lucy
36	Frontiers Biogas contractors	76	Bio Esline Ltd
37	Perjo Biogas and building	77	Sunray biogas
38	Steve building and constructions	78	Peniamax Bio
39	Kensam	79	Chei constructions Co LTD
40	Mucirira Biogas Contractors	80	Home Biogas Venture Ltd.

Annex 2. Questionnaire

Name of company: _____

General information

Name, gender and age of owner	
Firm age	
Type of firm (formal or informal)	
If formal: legal status	
Physical address	
Premises owned or rented?	
Postal address	
Telephone number(s)	
Email address	
Website	
Social media account	
Do you own a smartphone and use it for other than phone calls?	

Workforce

Total number of staff			
Number of permanent full-time staff with employment contracts	a) Admin/finance and support b) Trained technical c) Untrained technical	male: male: male:	female: female: female:
Number of permanent full-time staff without employment contracts	d) Admin/finance and support e) Trained technical f) Untrained technical	male: male: male:	female: female: female:
Number of temporary staff; engaged for how days/year	a) Trained b) Untrained	male: male:	female: female:
Did you reduce your workforce due to the Covid19 pandemic?			
Where do you see the biggest gap or obstacle for expansion with regard to your workforce?			

Biogas exposure

Services provided (Construction of fixed dome biodigester, Installation of prefabricated biodigester, Sale of biogas accessories, Other)	
Year of first engagement with Biogas	
Type(s) of digester in your business	
Have you received training in Biogas construction or sales?	
If yes, when and by whom?	
How many Biogas units of which sizes do you currently construct or sell per annum?	
Total amount of Biogas units and sizes so far	
Expected installations in the next 4 years	
What are you measures to assure quality and after sales service	
What are the key market barriers that prevent you from scaling up the sales?	
Do you engage financial intermediaries e.g., MFIs, SACCOs? Which are the main ones?	
Do you engage aggregators of farmers (e.g., dairy cooperatives, Frigoken) who have access to potential biogas customers? Which ones?	
Did you experience a drop in sales due to the Covid19 pandemic?	
How do you do your pricing including logistics?	
Which counties do you cover with Biogas activities with which %?	
3 Best / 3 Worst performing counties (in terms of sales)	
What type of marketing activities do you apply and at which costs?	
Do you cooperate with other Biogas companies?	

Sales and Finances

Annual turnover	
% of Biogas in annual turnover	
Real annual sales growth (in %)	
Have you got a checking and/or savings bank account?	
Do you have an accountant (name) or use an accountability software (name)?	
Do you have a bank loan or line of credit? (if yes, can you disclose the amount?)	
Proportion of loans requiring collateral	
Value of collateral for the loan	
Would you currently need a loan? If yes, what amount and for which purpose?	
Has a loan application already been rejected? How much did you ask for and for which reason was this rejected?	
How do clients pay for their Biogas units?	a) Pre-paid (____%) b) Instalments (____%); number of instalments: _____ c) (micro)credit (____%) d) PAYGO (____%) e) RBF support (____%) f) Other form of payments (____%)
If providing credit to the end user, what is the portfolio at risk of default (%)	
% of marketing costs per biogas plant as a proportion of the unit cost	
% of last mile distribution costs per biogas plant as a proportion of the unit cost	
% of quality assurance and after sales support costs per biogas plant as a proportion of the unit cost	
What is the critical number of biogas plants to sustain marketing, distribution and after sales support costs per year?	
Have you or are you benefitting from Biogas promotion projects? Which ones?	
Are you familiar with RBF?	

Trade and Technology

Inputs of domestic origin (%)	
Inputs of foreign origin (%)	
Duration to obtain import license (in days)	
Technology applied is licensed from foreign companies	
Do you invest / spend money in R&D?	
How easy/difficult is it for you to purchase all required accessories?	
Are you ready to receive training using digital platforms?	

SEE – Clean Cooking

African Biodigester Component

Co-financed by:

Ministry of Foreign Affairs

Ministry of Foreign Affairs of Denmark
DANIDA International Development Cooperation

Coordinated by:

Netherlands Enterprise Agency

In partnership with:

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