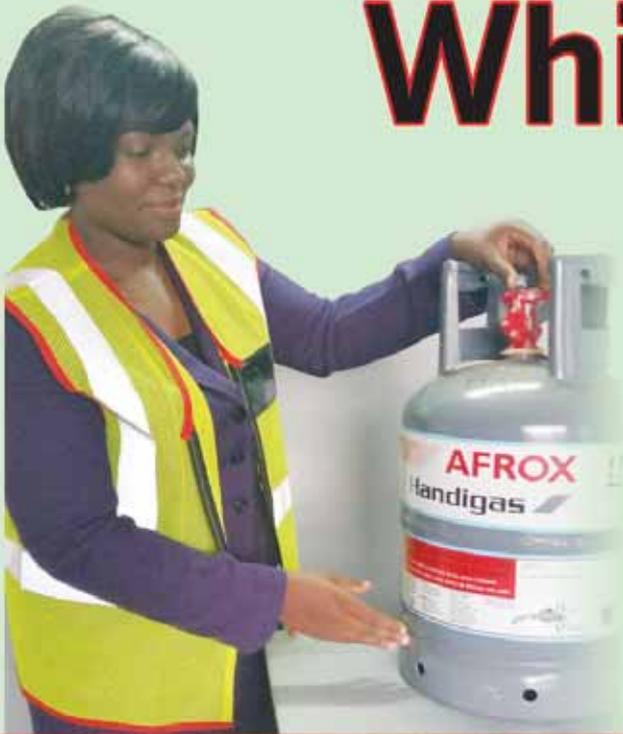




Malawi Energy Regulatory Authority

Regulating Energy for Sustainable Development

Whither Bio and Liquefied Petroleum Gas



A time to talk about alternative energy resources
— Page 2

Simplifying cooking, laundry with gas
— Page 4

We want biogas again
— Page 6

How to promote biogas in Malawi
— Page 8

A time to talk about alternative energy resources

Malawi Energy Regulatory Authority (MERA) is an energy sector-wide regulator with the mandate to regulate energy in Malawi in a fair, transparent, efficient and cost effective manner for the benefit of consumers and operators. MERA regulates electricity generation, transmission, distribution, importation and exportation; renewable energy technologies; and liquid fuels and gas.

Promoting energy efficiency and saving; facilitating increased access to energy supplies and promoting consumer awareness and education form part of our mandate. Just as the demand for energy keeps increasing, the need for consumer awareness and dialogue on alternate energy resources becomes more pronounced.

The national energy policy recognises that the full potential of the country's energy resources is far from being realised and that we need more creative measures to promote greater access to modern sources of energy, efficient conversion



Raphael Kamoto, MERA CEO

technologies and end use appliances.

Gas is as popular in other countries as is electricity here. How is Malawi fairing in terms of gas usage? Is gas viable enough to be part of Malawi's energy mix? To what extent has gas usage penetrated in other countries? How do other countries promote gas? These are some of the questions that this supplement seeks to answer.

We have a good starting point since we have liquefied petroleum gas (LPG) on the Malawi Market and biogas is no news

for some homes and institutions. Mining and gas exploration are not within MERA's domain. However, taking into account the current scenario, where the price factor is one of the main barriers to accessing gas, we can say that gas exploration could be part of the solution to the current energy deficit. Indeed, while waiting for the country's resources to be exploited, one needs to look across the neighbouring countries of Mozambique and Tanzania where natural gas is now commercially available. The

main uses of natural gas would include cooking, power generation, transportation and nitrogenous fertiliser production.

To allow for a large penetration of natural gas for cooking, its retail price has to be competitive with the cheapest alternatives, which are wood and charcoal.

Let us engage in a constructive debate. We look forward to your feedback and suggestions. Please write to mera@meramalawi.mw

Raphael Kamoto, MERA CEO

When gas brings smiles

LDYSON MTHAWANJI
STAFF REPORTER

Linda Manda of Area 43 in Lilongwe remembers a day she left work for home to take lunch but there was no food. This did not mean the home had run out of food but the chef did not cook because there was electricity blackout.



Linda Manda in her kitchen

She returned to work with an empty stomach. However, Manda did not waste her time complaining because it was already water under the bridge. Instead, she brainstormed what could be the possible solutions to this problem.

This is when she thought of starting using Liquefied Petroleum Gas (LPG). She says she learnt more about this gas while at Alliance One Tobacco Company.

"When I was working at Alliance One Tobacco, two colleagues of foreign origin were using gas at their homes. I did not have any interest in that. But when I faced persistent electricity blackouts, that was when I decided shifting to LPG. Since then, I have never looked back," says Manda.

She started using gas in November 2015 after Afrox Limited installed the gas system for her. She uses gas for cooking. Moving around her kitchen, one notices the cleanliness of kitchen utensils, especially pots and walls. Manda attributes this to use of gas. LPG provides an instant cooking flame as well as the correct amount of heat required and it does not form any soot nor blacken the pan bottoms or kitchen ceiling.

"Amid these frequent electricity blackouts, one could use charcoal or firewood, but they are not good because the smoke taints pots and you don't enjoy cooking because of the smoke. Nowadays, we talk of sustainable development hence it is not good to use firewood or charcoal because they contribute to deforestation which aggravates climate change. Using gas is one way of discouraging deforestation in the country," she says. Manda, who now works with Standard Bank as deputy head, corporate and investment banking-client coverage, says use of gas for cooking and a solar energy for the geyser has reduced her electricity bills with 20 percent. Currently, she just uses Escom's electricity for lighting and for the fridge.

Manda's houseboy, Charles Dzimbiri, says gas is good not

only because it is clean but also it reduces criticisms from bosses in the home.

Says Dzimbili: "I enjoy my job as a cook because I use gas here. Even when there is electricity blackout, I still cook and my boss always finds food when she is back from her work."



Linda Manda showing the gas cylinder outside the house

"LPG is one of the premier contributors to the success of a good recipe and delicious meal. Its efficient flame provides me with instant heat and, therefore, makes cooking easy, enjoyable and clean. LPG does not leave any residue, does not taint the food and helps to prolong the cooking equipment's life span."

Dzimbili adds that gas is faster and easy to control when he is cooking. He says he used gas for the first time in 2009 when he was working at a lodge at Area 9 in Lilongwe. According to Dzimbili, if all households can start using gas for cooking, maids and houseboys can enjoy their job

and efficiently and effectively serve their bosses.

However, Manda says there is need for local suppliers to stock gas stoves to encourage more Malawians access them and shift from electricity, charcoal and firewood to gas.

Manda says, "Accessing gas



Manda's houseboy, Charles Dzimbili, cooking using gas

stoves is a challenge. But I hope soon most local suppliers of cooking appliances will start stocking them."

Current energy practices in many households in Malawi are often polluting and damaging to the surrounding environment. Huge emissions savings are possible

through small changes, and fundamental reform of the energy environment in households can unlock a range of additional environmental benefits.

If different stakeholders can bring sustainable energy initiatives to the rural masses,

it can deliver benefits to households and rural institutions. The sustainable energy such as gas can enhance safety especially for women and girls in rural areas who travel long distances in search of firewood.

Stella Chisale from Nkhwangwa Village, Traditional Authority (T/A) Malili in Lilongwe says she spends five hours every week in the bush to collect firewood. If people like Chisale were using gas in their homes, they could save time and concentrate on other beneficial tasks. Interestingly, for the rural masses, they can use biogas which has proved too easy to make.

Afrox will be increasing its selling points

People have different perceptions about use of Liquefied Petroleum Gas (LPG). In this interview, Dyson Mthawanji talks to Afrox Limited Regional Manager for Central and Northern regions, Grace Khangamwa who explains more about the gas. Excerpts:

Tell us more about the gas you sell

A brand name for marketing our Liquid Petroleum Gas (LPG) is Handigas. It is a mixture of propane and butane (60:40 ratio), and is measured in kilogrammes (kgs). This gas works both indoors and outdoors. This means our gas can be used in the home for cooking, laundry, and also outside the home by providing heat when it is cold. The gas is sold in cylinders of different sizes. These are 6kg, 9kg, 14kg, 19kg and 45kg.

On commercial use, this gas is used for cooking in restaurants and



Grace Khangamwa - Afrox will increase its selling points.

hotels, water heating in hotels and lodges, for example, at Waterlands in Salima. Others such as Rafik Foundation in Mzuzu use it for cooking, laundry and drying. The gas is also used as an

outdoor heater. One of our clients who use it for outdoor heating is Blantyre Sports Club.

In agricultural sector, the LPG is used for heating chicken brooders. One

of our clients who use it for that is Kamponji Estate. Still in agriculture, other people use it for greenhouses, crop drying and food processing. The gas is also used for oxy-LPG cutting and brazing, firing of ovens and furnaces, heating of road surfacing bitumen, and fuel for forklifts.

Many Malawians are used to firewood and charcoal for cooking. What is the advantage of using LPG?

There are a lot of advantages. This gas is convenient. It is simple to store, transport and handle. It does not taint food and pots; it does not produce black carbon and is efficient with very little heat waste.

How can one access this gas?

Handigas is available in our outlets in all regions and it is also stocked in a number of Puma service stations.

What are some of the safety tips for LPG?

Always keep a window slightly open when using gas indoors. Fresh air is needed for gas to burn correctly.

When lighting, always light the match and then open the gas supply.

Regularly check that the appliance, fittings and seals are in good condition.

Reject any cylinder that is not in good condition and never put a gas cylinder on a stove and keep it away from surfaces that can become hot. When you are transporting the gas, carry it in upright position.

What are some of the challenges in the gas industry?

One of the challenges is the perceived high initial equipment and gas costs in the face of some handy alternatives such as charcoal burners and

fuel wood. (Again), lack of general knowledge about the product among many Malawians is also a challenge which the gas industry is facing.

What should be done to promote gas?

Government through the relevant ministry should encourage joint massive sensitisation campaigns. They should start with urban areas such as Blantyre, Zomba, Mzuzu and Lilongwe.

Government should also introduce the use of gas in public institutions such as secondary schools.

Furthermore, government should consider introducing some incentives such as easing taxes and levies in order to make gas more affordable.

The adoption and promotion of the use of LPG as an alternative energy source to charcoal and firewood may (also) arrest the problem of deforestation.

Simplifying cooking, laundry with gas

DYSON MTHAWANJI
STAFF REPORTER

It is not easy to wash and dry more than 100 clothes. But this is possible and easy at Rafik Foundation in Mzuzu. Thanks to the use of Liquefied Petroleum Gas (LPG).

The foundation, which keeps and provides primary and secondary education to orphans from Northern Region districts, uses LPG for laundry and cooking.

The foundation was opened in 2005 and has been using gas throughout its existence. According to the foundation's kitchen manager, Martin Chiteyere Zimba, the foundation is not looking back on the use of LPG because the gas has more advantages than firewood, charcoal and electricity.

Explains Zimba: "Whatever the weather, students' clothes can dry safely, hygienically and efficiently, thanks to the LPG-fired drier. It offers faster drying compared to conventional electric appliances because

it has greater volume of dry, absorbent air passing through the clothes. It cleans perfectly and provides moisture by reducing the amount of static energy whilst preserving the colours of the garments."

"Use of firewood is bad as it contributes to deforestation which has contributed to climate change whose effects have left Malawians in many problems such as hunger. Using gas for cooking for over 200 students has proven to be very practical for us especially because electricity in this country is not reliable.

"Imagine, when there is a blackout, it means we will not be able to cook for the students. And think of how many tonnes of firewood we could have used since 2009 to date."

Reforestation has become an undeniably relevant and popular topic. But as Zimba explains, tree planting should be accompanied with prevention of cutting more trees for firewood and charcoal.

"While we encourage people to plant more trees, we should also remember to reduce our



Inside the laundry room at Rafik Foundation: Laundry Supervisor, Mercy Mhango (L) says the LPG fired drier is very efficient.

dependence on firewood. We must encourage more people and, especially institutions, to stop using firewood and charcoal. If more people start using gas, our forests will be conserved and we will overcome effects of climate change," says Zimba.

Lumbadzi based farmer, Napoleon Dzombe, who runs Madalitso Food plant which produces Likuni Phala, also uses LPG for his factory. The Likuni Phala the factory produces is distributed to 100 000 households every month. The company which started in 2004 chose LPG because

of unreliability of electricity supply.

"With LPG, everything goes smoothly. Gas is faster and cheaper because we are not inconvenienced. We produce this flour without power interruption," he says.

The factory roasts 12 tons of maize and soya beans. The machine was bought from United States of America (USA) and was designed mainly for gas.

Many people and institutions prefer LPG because it also possesses more energy than firewood and charcoal. The



Martin Chiteyere Zimba switching on the LPG at Rafik Foundation in Mzuzu



Napoleon Dzombe uses LPG to roast soy beans for Likuni Phala

specific calorific value of LPG is 46.1 MJ/kg. In comparison, wood has an energy content of 16 MJ/kg. Charcoal has an energy content of 29 MJ/kg.

Apart from AFROX, other companies that supply LPG in Malawi are Industrial Oxygen Company Limited and Delta Gas.

Safety Tips for using gas

- Always keep a window slightly open when using gas indoors. Fresh air is needed for gas to burn correctly
- When lighting, always light the match and then open the gas supply
- Regularly check that the appliance, fittings and seals are in good condition
- Reject any cylinder that is not in good condition
- Never put a gas cylinder on a stove and keep it away from surfaces that can become hot.
- Transport in upright position
- In the event of gas leakage, i.e. where the odour is stronger than normal, it is advisable to:
 1. Open all doors and windows fully to allow leaked gas go out and fresh air come into the house.
 2. Switch off the cylinder regulator, and make sure that the safety cap is put on.
 3. Do not switch on or off any electrical equipment inside the house neither light matches nor lighters as these may act as source of ignition hence potential of fire.
 4. The cylinder should be taken to an open area.
 5. Contact emergency services.

The Guest

Malawians are becoming interested in using Liquefied Petroleum Gas (LPG) amid scarcity of firewood, charcoal and electricity. In this interview, **DYSON MTHAWANJI** talks to **DR LEO ZULU**, an Associate Professor at Michigan State University (U.S.). Through the USAID/Malawi-funded Protecting Ecosystems and Restoring Forests in Malawi (PERFORM) project, Dr. Zulu has been supporting the Departments of Forestry, Energy, and other government departments to develop a National Charcoal Strategy. Excerpts:

Malawi needs holistic and sustainable energy solutions



Dr Leo Zulu

Some people have the perception that using LPG is dangerous. What are your views on this?

We can say that all household cooking fuels (firewood, charcoal, electricity, kerosene, LPG, etc.) are associated with some safety risk, and it is important that appropriate safety measures are promoted and enforced in the use of any household cooking fuel.

Can LPG replace reliance on charcoal and firewood?

Given the degree of reliance on firewood and charcoal, and the economic situation in the country, there is no fuel—LPG or otherwise—that can replace reliance on firewood and charcoal in the near- to medium-term. More than **90 percent** of Malawians use biomass energy (firewood or charcoal) to meet their basic household energy needs.

Three factors underpin the large and growing reliance on charcoal in urban Malawi. The first factor is cost, whether real or perceived,—there is a belief that charcoal is a less expensive household cooking fuel compared to electricity. The second factor is availability and reliability since, with charcoal, there is no equivalent of power outages/load-shedding. And the third factor is preference whereby in some cases it (preference) has been indicated as a reason that urban households cook using charcoal. In the absence of viable and alternative household cooking fuels, Malawi’s urban population will not have other options than charcoal or firewood. Within this context, if LPG evolves as a cost-competitive and reliable alternative household cooking fuel, then there would be potential for LPG adoption to decrease consumption of charcoal which, over time, would result in decreased charcoal demand.

This said, there are known constraints to the wide spread adoption of LPG, and these include the cost of the gas canister, which, at present, must be fully borne by the consumer. As of late January 2016, the cost was between MK 23,000 for a 6-kilogramme canister to MWK 36,000 for a 14 or 19-kilogram canister.

Another constraint is upfront nature and relatively high cost of the gas canister sizes currently available in Malawi from the main supplier (MK 11,256 for the smallest, 6-kilogram canister; MK16, 840 and MK26, 264 for 14 and 19 kilogrammes respectively), and so on. Many urban residents purchase charcoal and firewood in small quantities as they go for as little as MK150 and MK400 which is way below the cost to refill the smallest gas canister.

Another problem is market fluctuations in cost and potential supply disruptions stemming from the nature of LPG as a globally traded commodity that must be imported into Malawi from afar.



The National Charcoal Strategy will align with government’s objectives of arresting deforestation and reducing dependence on firewood and charcoal

What are the experiences of other countries on use of LPG?

Over the recent past, a number of African countries have made strides in promoting LPG, including Senegal with 27 percent adoption, Ghana 13, Tanzania, Uganda, South Africa and Kenya which has a 21 and 40 percent adoption rate in Nairobi, alone according to Dalberg 2013.

Although the situation is different in each country, the literature shows that many countries share common barriers to adoption of LPG in Sub-Saharan Africa in the areas of low affordability, accessibility and availability, and awareness. Relatively, high initial costs of the cooking appliance and gas cylinder, along with the cost of the gas, undermine affordability, especially among low-income households. Limited availability, storage, distribution, and cylinder filling and retail capacity as well as import-related vulnerabilities often undermine accessibility.

Many countries also face poor awareness of LPG as a viable, clean, and affordable alternative fuel. In particular, information on and awareness of costs and benefits of using LPG for cooking relative to alternative energy sources is often lacking for potential users. Safety concerns as well as misconceptions are some of the challenges mentioned. Poor regulations, standards, and enforcement capacity are also problems in many developing countries.

Countries that have deliberate government efforts and incentives, including loans, tax and related fiscal incentives, subsidies, and instalment payment systems, have

generally achieved higher rates of LPG adoption. Countries with high urban populations (that facilitate LPG distribution and adoption speed) have also tended to have higher LPG adoption. In Kenya, for instance, local banks partnered with marketers to provide low-interest loans for initial costs, with mixed success. Senegal introduced cross-subsidies that used the cost of a larger (12.5 kg) LPG cylinder to subsidise the cost for small-scale users of 2.7 kg and 6 kg cylinders (Dalberg, 213).

However, conditions differ across countries and what succeeds in one country will not necessarily succeed in another. Therefore, experiences in other countries have to be treated critically in relation to conditions in Malawi.

How can the use of LPG be encouraged?

Increasing demand/consumption for LPG will require addressing the various constraints to broad based adoption of LPG. Effectively, addressing these constraints will likely require a concerted effort by the government working with the private sector to establish the policy and market incentives needed to promote LPG.

In addition to policy, legal and regulatory measures, interventions could include a mix of incentives, for example, related to taxes/duties and financing to offset the initial investment requirement for households to adopt and use LPG as an energy source for cooking. This would have to be accompanied by an aggressive publicity and awareness campaign on the use and benefits of LPG.

Are there other efforts to resolve the charcoal and general energy problem in Malawi?

It is important to emphasise that in the end, Malawi needs holistic and sustainable energy solutions in which the promotion of LPG is only one part of a broader strategy to reduce dependency on solid biomass fuels by diversifying the energy mix while recognising the continued importance of these biomass fuels in the short to medium term, arresting and reversing the problem of deforestation and its associated negative environmental and socio-economic problems.

To this end, since September 2015, the USAID/Malawi-funded Protecting Ecosystems and Restoring Forests in Malawi (Perform) project is supporting the Government of Malawi to develop a holistic, cross-sectoral National Charcoal Strategy. The strategy is being developed collaboratively by the departments of Forestry, Energy Affairs, Mines, Environmental Affairs, Economic Planning and Development (Ministry of Finance), and ministries of Gender, Children Disability and Community Development, and Natural Resources, Energy and Mining through a task force composed of representatives from these government agencies, and a consultant provided by Perform to facilitate the strategy development.

The goal of the strategy is to provide a framework for the Government of Malawi to address the linked problems of increased deforestation and growing demand for household cooking fuel, with defined and prioritised short, medium and long-term actions. Specifically, the National Charcoal Strategy will align with government’s objectives of arresting and reversing deforestation and forest degradation; and reducing dependence on solid biomass fuels (mainly firewood and charcoal).

Ultimately, the promotion of clean cooking fuels within the broader context of the pillars of the charcoal strategy being developed, will not only enhance the sustainable supply of cleaner energy and associated energy services but also save lives from adverse health effects of using solid biomass fuels, improve livelihoods, empower women who are the primary users of cooking energy, and protect the environment, including mitigating effects of climate change.



Phwezi School head teacher, Zondiwe Nkhata, showing the biogas digester at the school campus



Zondiwe Nkhata (left)...use of firewood contributes to deforestation

DYSON MTHAWANJI
STAFF REPORTER

"We want biogas again"

Once upon a time, Phwezi Girls Secondary School in Rumphi was using biogas to cook food for its students. The biogas was made from excreta from hostels' toilets and leftover foods.

Head teacher Zondiwe Nkhata says the school used this gas from 1996 to 2008 and it was one way of conserving forests in the district.

It was developed in partnership with the German State of Baden-Württemberg. However, the system has not been in use since 2008 due to lack of maintenance.

Nkhata explains that the pipes got corroded which affected the functioning of the digester and the floating dome. He adds that the school still wants the biogas because it has many advantages over use of firewood.

"When we were using

biogas, the cooking process was so fast that the cooks could prepare food for the students in good time. For example, cooking beans would take only half the time required when using firewood" says Nkhata.

Biogas is made when landfills decay, especially when the waste material becomes wet and receive little sunlight. As a result, a lot of methane and nitrous oxide is produced and released into the atmosphere. When biogas is produced, it is an energy source like no other. Its use as fuel happens because it reacts with oxygen and releases energy, which is clean in nature.

The heart of any biogas system or production arrangement is known as a 'digester'. A digester is a

sealed and airtight tank or container usually made of concrete or plastic that behaves like the stomach of a human being. It collects waste and digests it with the help of billions of bacteria. For biogas to be produced, this digestion must happen in the absence of oxygen (scientifically known as 'anaerobic digestion'). The valuable by-product of this digestion process is methane which is the cooking gas that users so desperately need.

The methane gas that is produced usually rises and builds up at the top of the digester. A gas pipe is attached to the top of the digester to carry the produced gas back into the house where it is used as fuel for cooking and heating.

Another interesting part of a biogas plant is the outlet or

collection pipe for the solid and liquid residue that is left behind after the digestion process.

This residue, which is also known as slurry, is commonly referred to as a 'biofertilizer' because it is very rich in nitrogen and phosphorus which makes it good manure for the garden or small farm. It is acknowledged that effluent fertiliser retains its fertility residual effect in the soil for about three years compared to that of chemical fertilisers which is about one year.

In the case of Phwezi Girls Secondary School, staff members were using the manure for their maize and vegetable fields.

In many African countries, organisations are using biogas to change the communities. In Uganda, the Social Innovation

Academy (Sina) under the NGO Jangu has successfully constructed a biogas latrine system. It serves as a toilet and produces biogas for cooking and manure for agricultural fertilisation.

Jangu is promoting the idea of "upcycling", whereby waste is only waste if you waste it! All waste is collected and serves a purpose. The human and animal waste creates gas for cooking and lighting. With this, no charcoal or firewood is needed and deforestation is decreased.

MERA's Fuels and Gas specialist, Allan Minofu, says the government of Malawi needs to make a policy concerning the use of biogas for energy generation, cleaner environment and poverty reduction. "The government and concerned stakeholders can collaborate directly with

institutions such as Biogas Institute of the Ministry of Agriculture (Bioma) of China, to further learn from the Chinese Biogas Technology," says Minofu.

Studies show that China has a lot of natural resources and when it was realised that their environment was much polluted due to anthropogenic activities, the government took the very necessary steps to combat pollution. They resorted to the use of renewable energy for cleaner production. After 2000, the Chinese government took the development of rural biogas as the grand objective of solving the problem of rural energy shortage and control of the pollution of environment. For effective implementation of such project, the central government subsidised for household participation.

Biogas: A technology with cross-cutting opportunities

COLLEN ZALENGERA, PhD
Mzuzu UNIVERSITY

Mzuzu University (Mzuni) has installed more than 20 biogas plants in Mzimba and Mchinji districts.

Based on the work in the two districts, a number of benefits are seen from the technology and this article describes these benefits.

Firstly, the biogas construction has great ability to create Jobs in Malawi. For example, local bricklayers in villages in which the Mzuni project has been implemented can now trade in construction of biogas digesters. The brick layers who were trained in Mchinji are able to offer their services in Zambia. Moreover, local welders in Mzuzu fabricate locally designed biogas



Kamuzunguzeni Zgambo... I use biogas to cook any food

burners; and local plumbers are involved in the installation of the associated pipe work.

Secondly, the biogas construction will lead to improved well-being. With biogas technology, there is no need for regular blowing over fire. Once the fire is lit, the biogas

flame burns freely until it is put off by the user when cooking is completed. The user can cook in a smokeless environment and therefore avoid the respiratory ailments which could result from the inhalation of smoke. Additionally, biogas gives an assurance that food will be well

cooked, and there is no need to worry about how and when the firewood will be dried.

Thirdly, getting manure and biogas as two usable products. Although animal dung can be used as organic manure in its raw form, biogas technology still gives the organic manure as a by-product after the gas has been produced, hence, ensuring more value from the dung.

Fourthly, a biogas digester can produce biogas from a range of waste such as vegetable wastes, potato peels, and food wastes. Therefore, biogas technology can act as a waste management system which also ensures productive utilisation of what would cost money to dispose of.

Apparently, the size of biogas digesters constructed so far can provide for a family of four at a minimum, dependent on

cooking practices. Studies have shown that a family of four cooking three meals a day requires about 6 kg of firewood per day to meet its cooking energy needs. Therefore, it can be said that for every biogas plant constructed and utilised; two tonnes of wood are saved every year.

The biogas plant can also reduce effects of climate change. Any amount of firewood saved by a biogas digester can contribute to improved forest cover which is a carbon sink, hence, providing a mitigation measure against greenhouse effects.

Peace of mind is another advantage of biogas. The user has the control. It can be noted that electrical load shedding is done when energy is needed

most, that is, cooking time because that is usually the peak time. At that time, there is no need to worry about where to get plastic papers or a drop of paraffin to help you prepare a charcoal or firewood stove, no need to worry about the carbon monoxide poisoning from charcoal, no need to worry about getting hands dirty and if it is rainy season, no need to worry about where to put the charcoal stove for safe initial burning.

Instead of everyone getting connected to the constrained grid power, biogas technology can also offset the grid electricity power demand and, therefore, leave room for the grid power to be utilised for industrial purposes.



Zgambo (right) and his wife Chimwemwe Shaba



Teresa Nthani taking care of her cattle from which she gets dung to feed the biogas digester

Striving to make biogas

DYSON MTHAWANJI
STAFF REPORTER

Kamuzunguzeni Zgambo, aged 50, has no cattle. However, this did not stop him from making biogas. Every morning, he goes to his friends in the village who have cattle to collect three buckets of dung to feed his biogas plant.

Interestingly, he is the only one having a biogas plant in the whole Kamuzunguzeni Village, Traditional Authority (T/A) Mtwalo in Mzimba. Fellow villagers admire him because, together with his wife, Chimwemwe Shaba, they no longer collect firewood for cooking. They are able to cook food for themselves and their four children using biogas.

"My family is now living a happy life because of the biogas plant. In the past, my wife spent more time searching for firewood in the near-by forests. But now, we are able to cook without sweating for firewood," says Zgambo.

Shaba concurs with her husband and adds that she is able to cook without problems even when it is raining. "Before we started using gas, I could leave early in the morning to the forest and return at sunset without firewood. The surrounding forests here have no trees like in the past. Therefore, biogas has rescued us," says Shaba.

The Zgambo's story is similar to that of 57-year-old Teresa Nthani of Mbugo Village, Traditional Authority (T/A) Zulu in Mchinji who uses dung productively by turning it into biogas for cooking at her home.

Nthani no longer uses firewood but biogas for everything she cooks. She also uses manure from the biogas system for her maize and vegetable gardens. Her biogas plant was constructed in 2015 by Mzuzu University (Mzuni) which has installed more than 20 biogas plants

in Mchinji and Mzimba districts.

Unlike the Zgambo's, the Nthani's have cattle. To make the biogas, Nthani feeds the digester with two buckets of dung every day from 10 her cattle. To construct the biogas, Mzuni used 32 bags of cement.

A small-scale biogas production plant in the backyard can last for up to 20 years and will require little maintenance during its life time.

Biogas in Malawi started as early as 1970s. Its use has been limited to household, for lighting and cooking. Most of the biogas plants built are of the fixed dome type ranging from 2 m³ up to about 12 m³. Most household plants use animal manure as their feedstock.

Magomero Training Centre trained some community development officers in the construction of different biogas technologies. The team had hands on training in constructing fixed dome plants which included two plants; one at Bua (Lilongwe -Mchinji road) and another in Mchinji. These plants were fed using pig manure. Several other plants were built with support from various development partners.

Considering that most of the past plants failed due to lack of technical support and back up services and due to lack of commitment by owners, Mzuni, through its Test and Training Centre for Renewable Energy Technologies (TCRET) embarked on the Choma-Chigwere Biogas Project with support from the David Livingstone Fund through the British High Commission in Malawi. The target was to have 12 biogas plants and trained local builders within the catchment area of Choma and Chigwere Bulking Groups in Mzuzu and Nkhata Bay.

Following the Choma-Chigwere biogas project, TCRET started another biogas project in Bua Bulking Group in Mchinji. This was with support from the Scottish Government under the Malawi

Renewable Energy Acceleration Project. Nine local builders have since been trained in the construction of fixed dome plants. Ten biogas plants have been constructed and one rehabilitated.

"Currently, TCRET, in partnership with the Department of Agricultural Research (Dars) is constructing 60 biogas plants (20 in Mzimba, 20 in Mchinji and another 20 in Chipata, Zambia). The project "Crop and Livestock Integrated Project" is coordinated by Dars through Lunyangwa Research Centre working together with Mzuzu and Kasungu Agricultural Development Divisions (ADDs) in Malawi and Msekera in Zambia. The target is to train two local builders for each of the 12 extension planning areas (EPAs)," says Kondwani Thapasila Gondwe, a lecturer from Department of Energy Studies at Mzuni.

Gondwe adds that TCRET is now planning to have specialised training on biogas for construction companies so that the project can be done on a commercial level. "TCRET is currently trying to research on the different feed stock which would include food, industrial and human waste. It is also trying to test the different technologies under the local conditions," he says.

Other institutions that are working on biogas projects include the Malawi Environment and Endowment Trust (Meet) and Chancellor College. Meet is currently constructing two plants of 6 m³ in Nsanje and Chikwawa Districts. This is done with technical support from a Malawian NGO, "Sustainable Development Solutions".

The physics department at Chancellor College has been working on poly tubes for biogas technology with the aim of reducing the cost of constructing biogas plants. The technology has been tested in some villages in Zomba.

In other countries, district and city councils have taken a role in using

sewages to produce biogas which they sell to the community.

"MERA should powerfully hearten the collaboration between councils and other stakeholders on proper waste disposal measures which should include use of landfills and biogas digesters and management of wetlands," says Opper Walita, Head of Finance and Administration at Livingstonia Synod's Development Department.

Collen Zalengera (PhD), a lecturer at Mzuni says biogas can open a lot of opportunities for Malawians. Zalengera says local bricklayers in villages can now trade in construction of biogas digesters.

"The brick layers who were trained in Mchinji are able to offer their services in Zambia. Moreover, local welders in Mzuzu are used to fabricate locally designed biogas burners; and local plumbers are involved in the installation of the associated pipe work," says Zalengera.

Biogas is becoming reliable and sustainable source of energy in a number of African countries after realising that use of charcoal and firewood is contributing to deforestation and climate change.

For example, Kenya is ranked first out of nine African countries in the implementation of biogas programme after farmers embraced the energy generating technology, according to the Kenya National Farmers Federation. Chief executive John Mutunga is quoted as saying out of the nine countries, Kenya is leading with a production of 2 557 units followed by Uganda with 1 511 units.

About 300 farmers are taking up the technology every month and close to 6 000 have built biogas units in their farms in the recent years.

Other countries in the programme include Ethiopia, Rwanda, Tanzania, Burkina Faso, Senegal, Benin and Cameroun.

With a minimum of two cows,

a farmer can put up a plant which would generate all the gas required for domestic cooking and manure for crops.

Zgambo says lack of cattle is the main factor that puts off villagers in his area to engage in biogas making. "Many people admire my biogas plant. They wish they had their own plant but the challenge is lack of cattle to provide them with dung," says Zgambo.

It is interesting that people who have desire to run a biogas plant have no cattle while majority of those who have cattle are not aware that dung can be used to make biogas.

While Africa is still quite new to the concept of biogas, the Asians, especially in India, Bangladesh, Pakistan and Vietnam have been using biogas for more than 50 years. Over 2 million households in India use biogas as fuel for cooking and heating. In Bangladesh and Pakistan, the number is in the hundreds of thousands. By producing fuel from their own waste, many poor families in Asia have cut down the amount of money they spend on cooking fuel which can amount to thousands of dollars in a single year.

Today, there are several different techniques for producing biogas and several models and designs of biogas machines and plants now exist. Nevertheless, the concept remains simple and the same.

The Ministry of Agriculture, Irrigation and Water Development says Malawi's cattle population has jumped by 3.1 percent this year compared to last year. The Ministry says the cattle population is expected to surge from 1 398 376 to 1 440 706. This is good news. However, it also means Malawians are wasting potential biogas by throwing away dung. It is time to put dung to right use by making biogas.

How to promote biogas in Malawi

CHRISPIN GOGODA & COLLEN ZALENGERA PhD, MZUZU UNIVERSITY

Biogas technology for cooking and lighting is a proven technology and its application is evidence based. However, the rate of adoption is so slow in Malawi despite it not being a new technology. Addressing the challenges that retard the diffusion rate of biogas technology does not require rocket science.

There are steps which different stakeholders, including government, can take to enhance the diffusion and adoption rate of the technology.

One of the steps is to train local artisans in construction of fixed dome biogas digesters. Until late 2014, there were less than five trained artisan in the country who were competent in construction of fixed dome digesters. This made it difficult for the country to move forward with the insufficient human resource capable of developing the digesters. On the job training such as the



Local artisans building a fixed dome biogas digester in Mchinji. (Photo by Chrispin Gogoda)

one which Mzuzu University carried out in Mchinji, built capacity of nine more local artisans in the construction of 11 biogas plants under the Malawi Renewable Energy Acceleration Programme. The training only requires one to be a bricklayer although with intensive apprenticeship, people without a bricklaying background can successfully gain the skills in biogas digester construction as evidenced by one only lady in the nine trained artisans in Mchinji.

There is also need for innovative financing

mechanisms for construction materials for fixed dome biogas digesters. Due to the high capital cost of fixed dome digesters, innovative financing mechanisms are required to enhance adoption of the technology by low income households. The huge cost for fixed dome digesters is on cement. Other materials such as sand and quarry can be locally sourced in most areas.

Another step which Malawi can take is to encourage all schools to use biogas as their primary source of energy for cooking and heating.

Institutional use of firewood for cooking can be replaced with biogas from human waste as was the case with Phwezi Girls Secondary School for close to 12 years.

Furthermore, the responsible stakeholders should promote use of plastic based biogas digesters. Plastic drum based digesters are significantly less costly than the fixed dome digesters and their promotion can enhance adoption and diffusion of the technology. However, innovative financing mechanism is still crucial, particularly for low-income households.

Many people are not yet aware of biogas technology hence stakeholders should increase awareness of biogas technology and its opportunities. People need to be civic educated on the use of different feed stocks for biogas production and how the feed stock and biogas are delinked as some think the gas is the same as the feed stock which make them think it is not clean and hence, not good for cooking.

Myths and Truths about Biogas Technology

CHRISPIN GOGODA
DEPARTMENT OF ENERGY STUDIES, MZUZU UNIVERSITY

One of the major challenges affecting the diffusion rate of biogas technology is the myths that many people attach to the technology despite not being evidence based. Below are the truths for the myths that surround the biogas technology.

MYTH	TRUTH
Biogas is dangerous	Biogas does not present major safety hazard as the system is fitted with redundant safety valves to ensure maximum safety for the user. And also users are trained on the utilisation of the system once installed.
Biogas is dirty	The biogas from the digester is mainly methane gas and carbon dioxide which have nothing to do with the nature of the feed stock. The cooking is not done using the feed stock but the burning of the gas.
Biogas digesters are expensive	This may only be true on the short term but in the long term, it is a cost-effective technology considering that the life span can range from 25-45 years for the fixed dome. Tonnes of trees would have been saved over the lifetime of biogas, significantly addressing the issues of deforestation and drudgery on women when collecting firewood. The digestate is also a good source of manure which helps to reduce the pressure on vulnerable households in getting fertiliser for farm application. Costing labour for firewood collection, the offset cost of inorganic fertiliser, the cost of firewood, and the inconveniences caused by electricity load shedding; biogas technology benefits significantly outweighs the costs.
The digestate is a health hazard	Due to the recommended duration (retention time), the feedstock stays in the oxygen-free (anaerobic) digester before it gets to the outlet; a higher percentage of pathogens are killed which makes biogas a waste treatment system.

Gas is the way to go



With Dyson Mthawanjji

Climate change, which has resulted into many problems, has become one of the most spoken words both in media and other circles.

It is a well-known fact that deforestation has contributed much to the climate change. Deforestation has come because majority of Malawians use firewood and charcoal

for cooking.

Although every year we hear of tree planting exercise, the number of trees which are cut obviously outnumber those being planted especially when we consider that many (planted trees) are not taken care of and may eventually die.

Many Malawians think that there is no solution to deforestation because every household wants firewood or charcoal to cook every day. However, this is just lack of knowledge on alternative sources of energy.

Liquefied Petroleum Gas (LPG) and biogas are part of the solution to deforestation. If more people and institutions start using either LPG or

biogas, we can reclaim our forests.

It is painful to see government institutions such as boarding secondary schools, hospitals and prisons using firewood for cooking, a practice which hugely contributes to deforestation. It can be great if these institutions championed the shift from firewood to gas.

Phwezi Girls Secondary School in Rumphi district set a good example when it used biogas for cooking from 1996 to 2008. During that period, the school did

Many Malawians think that there is no solution to deforestation because every household wants firewood or charcoal to cook every day

not use any firewood and this reduced the number of trees which were cut in surrounding hills. Of course, it is unfortunate that the school stopped using biogas due to lack of management of the biogas plant. As of now, the school fully relies on firewood.

Visiting some biogas users in Mzimba and Mchinji, it shows that they enjoy using them compared to firewood or charcoal.

However, many people who wish they had the biogas plant have no cattle from which to

collect dung to feed the biogas' digester.

On the other hand, there are some farmers who have enough cattle to run biogas plants but they don't have a biogas plant and continue relying on firewood. This shows that many Malawians have little information about biogas despite the concept being introduced in the 1970s.

Lack of coordination among institutions is manifest in most development initiatives. We need a more holistic approach to solving these problems. For example, in the articles, it comes out clearly that some of the solutions to energy challenges are interlinked with solutions to farming practices

and employment. This, therefore, requires that institutions should not confine themselves to only working with partners in the same sector.

Furthermore, in the promotion of alternative sources of energy, there is need for a framework of incentives. This can contribute to improved access to gas and making it more affordable.

Last but not least, a robust and coordinated awareness campaign on energy resources such as LPG and biogas is pivotal to increasing adoption of and, consequently, easing pressure on the national electricity grid as well as complementing efforts to overcome environmental degradation.