International Journal of Economy, Energy and Environment
2023; 8(3): 42-45
http://www.sciencepublishinggroup.com/j/ijeee
doi: 10.11648/j.ijeee.20230803.12
ISSN: 2575-5013 (Print); ISSN: 2575-5021 (Online)

A Review Article: Economic Advantages of Biogas Production in Afghanistan

Hakim Andishmand

Research Department, National Statistics and Information Authority, Kabul, Afghanistan

Email address:
h.andishmand666@gmail.com

To cite this article:
Hakim Andishmand. A Review Article: Economic Advantages of Biogas Production in Afghanistan. *International Journal of Economy, Energy and Environment*. Vol. 8, No. 3, 2023, pp. 42-45. doi: 10.11648/j.ijeee.20230803.12

Received: May 29, 2023; **Accepted**: June 16, 2023; **Published**: July 6, 2023

Abstract: Biogas production will be a well-established technology and valorization of organic residues throughout the whole province of Afghanistan. As it is the end product of a biologically mediated process, named anaerobic digestion, the different microorganisms follow diverse metabolic pathways to decompose the organic matter. The wide process will be applied to provide heat and power in households. The purpose of this study was to find out the benefits of biogas production in Afghanistan. So, the existence of abundant waste materials resources of biogas can rapidly grow the production of biogas in Afghanistan and create new achievements as the main biogas plant. As large advanced bioenergy companies. The huge authentic potential of Afghanistan with the resource of biogas makes the highest opportunity to produce this energy, as it is widely used as household energy. For instance, for supplying the required power for lighting, warming, and cooking foods in villages far from the gas network, generating income, and reducing the cost of transmission from cities to villages, ability to set up simple and low-cost biogas production units in rural, preventing the production of greenhouse gases from the waste disposal site; reducing the use of fossil fuels, and creating employment in the rural sector is the benefit.

Keywords: Biogas, Flammable Gases, Waste Materials, Economics Advantages

1. Introduction

Biogas is a renewable energy source that can be produced from organic waste such as animal manure, crop residues, food waste, or sewage. The energy crisis is one of the main problems of all the countries in the world, particularly developing countries [12, 18]. Still, a huge part of the world's population lives in villages, so the necessity and importance of rural development and its role are significant in the development of countries [17, 19].

One of the important aspects of development is the use of renewable energy sources such as solar energy, wind energy, geothermal, and biogas, instead of using fossil energies [10].

The negative impact of non-renewable energy sources such as gas and petroleum has caused environmental pollution and the demolition of human societies. On the other hand, the growth of industries and the hike in fossil fuels consumption, along with the growing population, will exceed the price of renewable energy and eventually, the world will face an energy crisis. [11].

The Afghanistan electric power sector crosses inadequate electricity to residences decades of instability and conflicts have caused third-one of the country's 32 million people to live below the poverty line, while 70% of the population has no access to electricity, the average per-capita electricity was between 100 and 150 kW-hours (kWh) per person per year, it demonstrated the lowest ranking of worldwide, according to United Nations Development Program [9]. Afghanistan's shortage of electrical energy sources caused almost all to rely on imports at huge consumer costs. As the Da Afghanistan Breshna Sherkat (DABS) reported [2]. Roughly 81% of power is imported from neighboring counties-Uzbekistan provides 35.2%, Tajikistan 30.5%, Iran 20.9%, and Turkmenistan 13.4% [4]. And the cost of imported energy resources is increasing day by day, of the 519 MW of domestic capacity, 51% is thermal (diesel and furnace oil) which generated a cost of 0.25-0.35 $ per Kilowatt hour, which is almost 4-5 times expensive than imported energy. 49% of the remaining hydropower energy, a seasonal resource with a capacity factor of less than 40%. While, no new hydropower, gas, or coal generation has been attentive.

Therefore, this article attempts to know what biogas is.

And what economic advantages could be discussed in biogas production throughout Afghanistan.

2. What Is the Biogas

Biogas is composed of flammable gases produced by the decomposition and fermentation of human and animal waste materials; Agriculture and industry arise, which is known as Go Bar Gas in India, Marsh Gas in China, Bihar Gas in Germany, and biological energy in Persian. Biogas is produced by the anaerobic decomposition of organic and biological materials by living microorganisms, or the group of gases produced from the decomposition and fermentation of animal, human, vegetable, and industrial wastes, which are formed as a result of the lack of oxygen and the activity of anaerobic bacteria, especially methanogens, in a fermentation chamber is called biogas. Biomass or biogas is a term in the field of energy that is used to describe a series of products obtained from photosynthesis [5].

Biomass sources contain combinations of organic materials with large chain molecules, which through the process of digestion (burying in the ground, in special tanks, or released in nature) the aforementioned molecules are converted into simpler molecules, the final result of this flammable gas process is called biogas. It also refers to Mardab gas biogas, which has two main components, one is methane and the other is carbon dioxide along with impure fractions such as H_2S, water vapor, and N_2, which is majorly composed of methane (40-65% v/v) and CO_2 (35-55% v/v) with minute amounts of hydrogen sulfide (H_2S) (0.1-3% v/v), moisture, and other trace contaminants depending upon the feedstock as demonstrated in Table 1 [7].

Table 1. *Composition of Biogas.*

Constituent	Concentration (v/v)	Combustibility
Methane	40-65%	Combustible
Carbon-di-oxide	35-55%	Non-combustible
Moisture	1-5%	Non-combustible
Nitrogen	0-5%	Non-combustible
Hydrogen	Traces	Combustible
Hydrogen sulfide	0.1-3%	Combustible
Oxygen	<2%	Non-combustible
Trace Gases	<2%	
Ammonia	0-500 ppm	

The calorific value of biogas is estimated from 15 to 25 megajoules per cubic meter (40 to 70% of the calorific value of natural gas). For instance, if one cubic foot of methane gas is burned it produces 252 kilocalories (3.1052 kilojoules) of thermal energy, compared to other fuel materials [8]. Furthermore, if it converts into electricity by biogas-burning engines, 1.5 to 2.2-kilowatt hours of electricity can be generated from each cubic meter. It is also estimated that 3-kilowatt hours of electricity can be obtained from each cubic meter of natural gas [8, 7, 6].

In developing countries, biogas is commonly used as a source of energy for household activities including cooking and lighting. However, developed countries give more focus to using it for large-scale farm-based and commercial industrial biogas production and its application in transport, electricity, and synthetic industry [7].

3. Fuels Consumption in Afghanistan

As reported by the National Statistics and Information Authority (NSIA) [3]. As the proportion of the population with primary reliance on clean fuels and technology for cooking demonstrate 31.1%, the proportion of the population that primarily relies on clean fuels and heating technology is 6.5%. and the proportion of the population that primarily relies on clean fuels and technology for lighting is about 97.8%. Development and access to facilities in Afghanistan are available through the use of local resources capable of producing energy.

Energy is a basic need for the continuity of economic development, social welfare, and improving the quality of life and security of society; Therefore, renewable energy is a correspondent alternative according to the tendency of amusement fossil energy and having the advantage of free energy, no need fossil fuels during the operation of the system of these energies, very long life, easy access and no environmental pollution [18].

Moving towards the use of renewable energies, especially in Afghanistan, where most of the population includes rural areas, is an important step in the direction of accelerating the development of villages, where the energy required by the rural population mainly includes thermal energy, especially for cooking and hot water supply, heating, and energy for subsistence production activities such as drying products, handicrafts, general lighting, conversion industries, and the like, due to the dispersion of rural areas, the lack of use of the sanitary system for wastewater disposal, and environmental pollution, the use of technology to produce biogas energy will have some advantages [14].

Biogas has great potential to contribute to rural development and poverty reduction in Afghanistan, where about 75% of the population lives in rural areas and depends on agriculture and livestock for their livelihoods. However, only a small fraction of this potential has been tapped so far. According to a report by UNDP, about 1.5 million households in Afghanistan could benefit from biogas systems, but only about 2,000 biogas plants have been installed as of 2018.

4. Advantages of Using Biogas in Afghanistan

The crucial advantages of using biogas according to some empirical analysis that corresponds to the situation in Afghanistan, the following are:

1. Afghanistan can produce biogas energy, through its enormous animal, vegetable, and industrial wastes resource.
2. Afghanistan can generate income through the sale of energy, organic fertilizer, and water that can be used in

agriculture;

3. By conducting a proper plan of producing biogas Afghanistan can sewage treatment and thus reduce long-term costs for removing water and soil pollution;
4. As the major parts productivity of Afghanistan depends on the agricultural sector the producing can improve soil texture and increase agricultural soil fertility by using organic fertilizer produced by the biogas unit;
5. The production of biogas can decline the use of chemical fertilizers;
6. By producing biogas in Afghanistan can be supplying the required energy to rural far from the gas network;
7. Reducing costs related to expensive infrastructure for gas transmission from cities to rural;
8. Ability to set up simple and low-cost biogas production units on small scales [15];
9. Preventing the production and release of millions of tons of carbon dioxide and greenhouse gases from the waste disposal site [13];
10. reducing the use of fossil fuels;
11. reduction of harmful insects and disease carriers and as a result improving the health of society [15];
12. Creating employment in the rural sector [16].

In addition, due to the presence of fertilizers in treated wastewater, its use for agricultural irrigationand saving fresh water consumption can also be a rich source for plants and strengthening fields [20, 17]. Also, due to the abundant nutritional substances in treated wastewater, it is suitable for the growth of aquatic animals and fish [4] argued that to prevent the import of natural gas in Luxembourg, biogas can be used as substitute energy [2] has also stated that biogas can be used as car fuel.

5. Conclusion

So, biogas is one of the close substitutes for fossiliferous fuels, to produce heat and calorific energy, a productive effect of agricultural fertilizers, maintaining the level of environmental health, and controlling morbidity. Beyond that, it is also an adequate solution for the disposal of solid waste in the environment of countrified. As Afghanistan has a huge authentic potential resource of biogas production which makes the highest opportunity to produce this energy, as it's widely used as household energy especially supplying the required energy to villages far from the gas network, generating income, sewage treatment that could decline the long-term costs of water and climate, improving soil texture, reducing the cost of transmission from cities to villages, ability to set up simple and low-cost biogas production units in rural, preventing the production of greenhouse gases from the waste disposal site; reducing the use of fossil fuels, and creating employment in the rural sector.

6. Suggestions

Some suggestions to facilitate entrepreneurship through biogas technology, especially in the villages of Afghanistan can be stated as follow:

1. Study and research and implementation of experimental plans for biogas production in Afghanistan villages;
2. Using the participation of local people in the implementation of biogas production projects;
3. Familiarizing villagers with the benefits of home biogas production projects;
4. Planning to buy biogas produced by villagers;
5. Providing some incentives to villagers to build biogas production units.
6. Granting appropriate loans from the government to villagers in the field of biogas, increasing economic motivation.

References

[1] Lau, C. S., Allen, D., Tsolakis, A., Golunski, S. E., and Wyszynski, M. L. (2012). Biogas upgrade to syngas through thermochemical recovery using exhaust gas reforming. Biomass and Bioenergy, 40: 86-95.

[2] Da Afghanistan Breshna Sherkat, 2016. Afghanistan Energy Information Center. Kabul, Afghanistan. ⟨http://aeic.af/⟩

[3] National Statistics and Information Authority. (2020). Income and Expenditure & Labor Force Surveys Report. Center Kabul, Afghanistan. (http://nsia.gov.af/). April. 2021.

[4] Jury, C., Benetto, E., Koster, D., Schmitt, B., and Welfring, J. (2010). Life cycle assessment of biogas production by monofermentation of energy crops and injection into the natural gas grid. Biomass and Bioenergy, 34 (1).

[5] McKendry, P. (2002). Energy production from biomass (part 1): overview of biomass. Bioresource Technology, 83: 37- 46.

[6] Mydin, M. A. O., Nik Abllah, N. F., Sani, N. Md., Ghazali, N., and Zahari, N. F. (2014). Generating Renewable Electricity from Food Waste. E3S Web of conferences, 3: 1012, 2014.

[7] Scurlock, I. M. O., and Hall, D. O. (1990). The contribution of Biomass to Global Energy Use. Short Communication Biomass, 21 (1): 19-29.

[8] Shin HS, Han SK, Lee Ch, Son YC. (1999). Performance of UASB reactor treating an acidified leachate from food waste. J Chinese Instit Environ Eng; 9 (4).

[9] United Nations Development Program, (2015). Rapid Assessment and Gap Analysis Report. Kabul, Afghanistan.

[10] Ahmadi, A. and Zargarzadeh, M. (2016). Using renewable energy to produce electricity. Publications of South Tehran Azad University.

[11] Ismaili Faraj, h. and Esmaili Nistani, S. (2012). Design and economic and technical study of the construction of a one-megawatt biogas power plant in the city sewage treatment plant. The first national conference of Iran Energy Association, Tehran.

[12] Bawafa, M. (2010). Evaluation of gasification technologies for distributed production of energy from biomass sources in remote areas. Proceedings of the second bioenergy conference, Tehran.

[13] Rosuli Kohi, M., Safai, B., Taleghani, G. and Shabani Kia, A. (2011). Technical and economic review of biogas technology in Iran. The second conference on optimization of fuel consumption in the construction sector, optimization organization, fuel consumption of the country, Tehran.

[14] Sartipipour, M. (2018). The role and place of renewable energies in rural development and construction. Geography Quarterly, 9 (31): 148-125.

[15] Sha'bani Kia, A. and Nazari, A Kia, A. and Nazari, A. (2012). Choosing the right place for biogas power plants in the country's energy supply in the fourth five-year plan. Proceedings of the third conference on optimizing fuel consumption in buildings. Iran Atomic Energy Organization, New Energy Development Center, Biogas Department. pp. 1207-14.

[16] Abdali, M. A., Pazaki, M., Fallah Nejad, M. and Sami Far, R. (2009). Investigating and classifying biomass sources in Iran and the world and investigating their diversity in rural areas of the country with an emphasis on normal solid waste and livestock waste. The fifth national waste management conference, Mashhad.

[17] Mismi, H. and Saeedi, S. (2013). Collecting and disposing of wastewater from small communities. Country Water and Wastewater Engineering Company, Tehran.

[18] Talai, A. (2010). Using renewable and local energy in rural areas with a sustainable design approach aligns with sustainable development goals. Proceedings of the second bioenergy conference, Tehran.

[19] Yamchi, H., Ghanizadeh, Q. and Ghahri, A. (2014) Feasibility study of using biogas and Its potential in rural and remote areas. Scientific Quarterly Promotional Way of Health, Safety and Environment, Tehran.

[20] Manzavi, M. T. (2007) Urban wastewater: wastewater treatment. The first volume, University of Tehran, Tehran.