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An Economic Study of Bauo Gaz In Fayoum Governorate

Dr. Haitham Bayoumi Ali Hassan[1]; Dr. Abdu Omran Mohamed[1*]; Dr. Enaam Abdel Fattah Mohamed[1]; Dr. karima Awad Mohamed[1]
[1]Department of Agricultural Economy, National Research Centre Dokki, Giza, Egypt

A B S T R A C T
The problem is limited to the fragmentation of agricultural holdings and the lack of public wages in the villages, which led the farms to conduct the process of studying crops on the same cultivated area, and thus becomes an urgent need to get rid of the waste from the harvest and threshing process in the shortest possible time to prepare the land for the following crops.
And some agricultural waste represents one of the energy sources in the Egyptian countryside, where the annual production of field crop residues reached about 30 million tons, while the annual production quantities of animal waste are about 30 million other tons, and Egypt began implementing organic waste recycling systems by establishing biogas units for production Biogas from livestock manure.
The country has recently suffered from crises such as lack of electric power, environmental problems such as garbage accumulation in cities and villages alike, and the presence of plant and animal farm waste, some of which are a problem, in addition to crises of unavailability of gas pipelines, and other economic and environmental problems that do not There is plenty of room to mention it. The Egyptian state is trying to overcome these problems by various means.
Which led to thinking about using biogas technology, as it is inexpensive and environmentally friendly, to get rid of the waste of villages and cities, and produce alternative energy, safe fertilizer, and most importantly, a clean and safe environment, in addition to accessing clean agricultural products with a competitive capacity benefiting the Citizen health and the national economy .
The study targeted the economic evaluation of the Bioenergy project for sustainable rural development, and the identification of problems facing this project and proposals for solving it .
The study indicated the decrease of indicators of financial analysis for the biogas project, which indicates that the goal of adopting this technology is not in its economic form, but rather succeeded in achieving the environmental goal of it.

Keywords: *Organic agriculture - Animal and vegetable farm waste - Organic waste - Biogas technology - Clean agricultural products - Economic assessment - Sustainable rural development - Biogas units - Biofuels - Financial analysis*

Corresponding Author
Dr. Abdu Omran Mohamed
Department of Agricultural Economics, National Research Centre, Dokki, Giza, Egypt

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INTRODUCTION
In light of the above and within the framework of the results of the study and the indicators, some recommendations can be proposed, which would raise the economic efficiency of using this technology, namely.

1) To ensure the continuous flow of gas without interruption, it is proposed to make additional units operating next to the established unit that will be fed from the sewage house of the beneficiary's house or from his farm waste.
2) Establishing a technical follow-up unit to treat production problems.
3) Spreading environmental awareness among all local media, in a way that deepens the thought of a clean and safe environment for human life in its surroundings, including air, water, plants and living creatures.
4) The establishment of large biogas units at the village and city levels in order to achieve the following.
5) To save a lot of money wasted on creating small units that are not followed up and thus do not work.

Not neglecting the idea of establishing or operating the small unit as a result of the high prices of selling compost compared to the price of subsidized gas.
Solve garbage accumulation problems in cities and villages.
Solve village sanitation problems in drinking water and irrigation.
- Using household leftovers and food processing residues in a healthy and safe manner
Exploitation of septic tanks located in front of houses in some villages for continuous and inexpensive feeding for large units.
Eliminate floating plants in canals and drains.

Disposal of plant residues on farms and horticultural gardens.
Take advantage of the large production in providing electric power to meet the needs at the time of the power outage.
Take advantage of the large quantities of digested units to provide safe and inexpensive fertilizer or reclaim new agricultural lands.
Production of energy and fertilizer from inexpensive sources.

Introduction and research problem

The environment is the general homeland of man, and it is the framework in which a person practices his life and various activities. And thus affected by it and affected it. God Almighty has harnessed all the resources of the environment and humiliated him so that he can use them to satisfy his needs and desires, but the human being has been extravagant in using these resources and depleting them and polluting them in a way that led to the disruption of the environmental system and its imbalance, whether at the local or global level threatening the most dangerous consequences. The problem of environmental pollution appeared and became a danger to plants and animals and more dangerous to humans because it is at the top of the food chain [1].

As a result of the increase in the population, agricultural and industrial development, the improvement of the standard of living for human beings, the development of transportation and communication, in addition to the changing lifestyle and consumption, and the failure to follow appropriate methods in managing solid waste, all this was accompanied by the accumulation of millions of tons of waste and garbage in cities and villages , Which distorted the beauty of nature and disturbed the environmental balance. Waste was associated with human life from time immemorial, as it was limited to his excreta and the remains of his food, and he did not suffer from the problem of disposal, because he was living a life of movement and traveling leaving his waste that he was deserting, and because these wastes were organic materials, they were borne and composted Organic feeding the plant, the volume of individual consumption has increased significantly in recent years, and the most dangerous result has been the increase in the volume of waste resulting from this consumption and the use of new means of well-being[2].

The increased intensity of the use of the production elements and the accompanying horizontal and vertical expansion was reflected in the increase in the amount of agricultural waste for farmers and the accumulation of this waste annually without treatment, and that its misuse represents a serious environmental damage and waste of an important economic resource. Agricultural waste is estimated at about 35 million tons annually, of which about 23 million tons are plant wastes (about 7 million tons of feed are used, 4 million tons of organic fertilizers and 12 million tons are left without benefit) and animal waste is about 12 million tons annually [3].

(About 3 million tons are used as organic fertilizer, and about 9 million tons annually remain without benefit) That is, there are about 21 million tons of agricultural (plant and animal) wastes annually without benefit, and lead to pollution of the agricultural environment, it has become necessary to activate interest in recycling agricultural waste for crops that A large percentage of the waste is formed, and the most appropriate means for converting this waste into materials of economic value contribute to increasing the productivity of agricultural crops, providing energy and improving the environment, and increasing the rates of self-sufficiency [4].

The civilized progress of the human being and his interest in preserving the environment from pollution and rationalizing the use of chemical fertilizers and the search for alternative sources of depleted petroleum energy have led to a return to organic agriculture and the exploitation of natural resources to produce energy, food and feed to produce agricultural products with global competitiveness, and this is done by adopting advanced, clean and cheap technologies that achieve ambitious Farmers use secondary agricultural products in an economical and environmentally safe manner to achieve additional income from the agricultural area unit[5].

Problem of the study:

The problem is limited to the fragmentation of agricultural holdings and the lack of public wages in the villages, which led the farms to conduct the process of studying crops on the same cultivated area, and thus becomes an urgent need to get rid of the waste from the harvest and threshing process in the shortest possible time to prepare the land for the following crops. And the increase in the accumulation of agricultural waste and the process of getting rid of it by burning as it is the fastest and easiest means available to it, which causes many problems, the most important of which is wasting agricultural waste and not using it as an economic resource[6].

The country has recently suffered from crises such as lack of electric power, environmental problems such as garbage accumulation in cities and villages alike, and the presence of plant and animal farm waste, some of which are a problem, in addition to crises of unavailability of gas pipelines, and other economic and environmental problems that do not There is plenty of room to mention it. The state is trying to overcome these problems in several ways[7].

Which led to thinking about using biogas technology, as it is inexpensive and environmentally friendly, to get rid of the waste of villages and cities, and produce alternative energy, safe fertilizer, and most importantly, a clean and safe environment, in addition to accessing clean agricultural products with a competitive capacity benefiting the Citizen health and the national economy[8].

Some agricultural wastes represent one of the energy sources in the Egyptian countryside, where the annual production of field crop residues reached about 30 million tons, while the annual production quantities of animal wastes amount to another 30 million tons, and Egypt began implementing organic waste recycling systems by establishing biogas units for production Biogas from livestock manure, and a training center for agricultural waste recycling and biogas technology was established[9].

Aim of the study:

The study mainly aims to: "Study the economics of biogas technology in Fayoum Governorate", through several sub-goals represented in:

1. Economic evaluation of a project to implement biomass technology in Fayoum (the vital energy for sustainable rural development).
2. Learn about the problems facing this project and proposals to solve them

Research method and data sources

The study relied on descriptive and quantitative analysis methods for the primary data that could be collected through the personal interview of the study sample. A research questionnaire was designed to collect data from the sample. In addition to the secondary data obtained on the websites, references, research and reports related to the field of study.

The data used were obtained from the Ministry of Agriculture and Land Reclamation, Economic Affairs Sector, Central Administration for Agricultural Economics, General Authority for the Agricultural Budget Fund, Egyptian Center for Fertilizer Development, Central Agency for Public Mobilization and Statistics, Food and Agriculture Organization (FAO), Ministry of Economy and Foreign Trade, Ministry of Industry, some fertilizer companies. In addition to the questionnaire forms, they were designed to collect data related to the research from a field sample in Fayoum Governorate, and that was from a sample of 100 individuals chosen in the engineering medium way, for the cultivated area and the number of for those in Fayoum.

Description of the study sample:

The research sample was taken according to the method of stratified random sample from farms in Fayoum Governorate, in the center of Tameyah and Atsa centers from the governorate. The planted and the number of holders in the governorate, which is estimated at 4502 acres, 3211 acres for the agricultural season 2017-2018. The villages of Al-Rawda and Al-Mazatly, with an area estimated at 419, were chosen about 460 acres from the Tamiya Center. And the villages of the Prince facility and the Abdul Majeed facility, with an area estimated at 254, are approximately 242 acres from the Atsa center.

First: Agricultural waste management:

The environment is one of the most important issues that have occupied human beings since it was found on the surface of this earth because it is the environment in which it lives and from it gets its sources of life and its survival and continuity, so its pollution is the most dangerous thing that threatens this life and prevents the environment from being able to continue giving and regeneration to meet the demands of man. But at the end of the twentieth century, a person's influence on his environment reached phases of danger, as it exceeded in some cases the ability of natural ecosystems to tolerate these changes and cause environmental imbalances that threaten human life and survival on the surface of the Earth because the environment is the soul of natural balance and also concerned with the survival Life of the planet to preserve its diverse (renewable and non-renewable) resources automatically to ensure the continuity of all living and successive creatures in the future. Since the human being realized the extent of his misuse of the various elements of the universe around him, the call was made for Earth Day in 1970. Since then, the cries of environmental advocates have come out, and green parties have appeared in many countries, and many people form an environmental awareness and a real desire to stop the resource bleeding, A generation has emerged that knows new vocabulary such as: ecosystem, greenhouse effect, greenhouse effect, ozone hole, and waste recycling. Waste recycling is one of the pillars of the waste management process and must be raised awareness.

Biogas technology is considered one of the technologies used in waste management in the Egyptian village, in addition to producing compost fertilizers and producing unconventional fodder.

Second: Biogas production technology:

This technology achieves the production of clean, cheap and renewable energy, natural organic fertilizer rich in organic matter, major and minor fertilizer elements and plant hormones, free of visible microbes, weed seeds and nematodes, as well as securing villages from fire, raising the health level, and protecting the environment from pollution Figure No. (1)

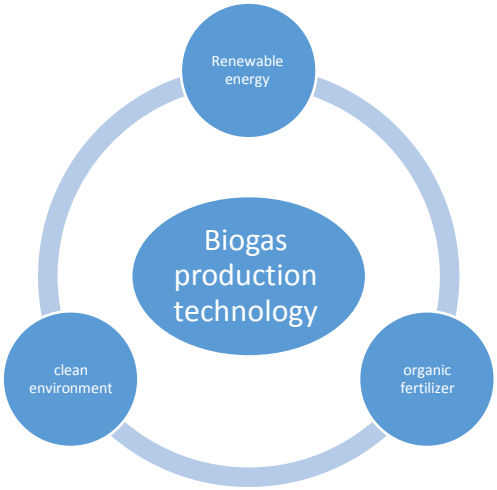

Figure: 1

Conditions for testing the biogas unit location:

1. Close to the cattle barn and the restroom for easy feeding.
2. Close to the field for easy compost transport.
3. That the place be exposed to the sun all day and not exposed to the wind.
4. It is far from the source of drinking water.
5. The area between the unit and the place of gas consumption should not exceed 75 m

Feeding with organic waste (plant waste is cut into small parts or grinded) daily or at intervals. The waste must be mixed with water and the solid matter percentage does not exceed 10% in the feed mixture. Plant waste can be fermented aerobically for 20 days before feeding the unit with it and can be used Detergent-free waste water in dilution inside the biogas unit.

Benefits of biogas:

1. Production of clean energy:

The biogas gas is non-toxic, clean, has no combustion exhaust and is used directly for cooking, lighting, heating, operating irrigation machines, and generating electricity.

2. Biogas fertilizer production.

Biogas fertilizer is produced in the form of an aqueous suspension that is used directly with irrigation water, or dried and packed in bags for spreading. The humidity in the fertilizer is 30%, the organic matter is 60%, the nitrogen is 1.9%, the phosphorus is 1.5%, the potassium is 0.6%, and the microelements are in appropriate quantities. And adding it to the soil increased the productivity of different crops. Also, this fertilizer is healthy and repellent to household insects, such as flies, mosquitoes and mice, because it does not have an attractive smell.

3. Protection of the environment from pollution resulting from the traditional treatment of waste from farms, factories, villages and cities as a result of burning.
4. Reducing the time that rural women use to prepare food and use it for other productive goals.
5. Maintaining public health as a result of not using the canon and rakia and not handling livestock by hands.

Third: Home Biogas Units:

During the recent years, many designs of biogas units have been developed in many countries of the world, such as construction, operating systems, gas storage and its uses, types of biogas fertilizer, its components and uses.

There are two main types of home biogas units that have been developed to suit local conditions and the experience gained for users of biogas technology:

The products of biodegradation of organic matter are a gaseous mixture and the solid and liquid residue. The gaseous mixture consists of:

50% - 70% methane
20%-25 % carbon dioxide
5%hydrogen, nitrogen, and hydrogen sulfide

Fourth: The Bioenergy Project for Sustainable Rural Development (case study / study sample):

It was implemented with partial funding from the Global Environment Facility in cooperation with the United Nations Development Program and the Ministry of State for Environmental Affairs, which will work to save energy use and protect the Egyptian environment through the implementation of project activities.

*The project activities aim to test the technical and economic feasibility of some vital energy technologies as one of the renewable energy sources and find a market for these technologies to help spread them in Egypt, including the implementation, operation, and maintenance of home biogas units on a large scale that includes all governorates of the Republic.

The project implemented 100 biogas production units in the villages of Awlad Elias, Assiut Governorate, and Al-Mazatly Village, Fayoum Governorate during the past year, during which the beneficiaries were delivered a gas cooker that was imported from India.

1-Selecting the study sample:

Considering that the study community is the beneficiaries of the project, about 50% of these 43 beneficiaries who have been reached are selected, and Table No. (1) shows the distribution of the vocabulary of the study sample in terms of project status.

It also shows from Table No. (2) the results of the study sample that there are 11 suspended projects, i.e. 25.6% of the total sample items, and 74.4% a working project

Table No. (1) Shows the technical specifications of the oven and its inclusions for the biogas units delivered to the project beneficiaries

shape	specifications	indication	Quantity
	1- 57 cm x 60 cm x 85 cm Dimensions 2-large flame 62 mm, 1 mid flame 50 mm, equipped with special gas flow hoods U shape oven with gas inlet from 30 to 50 mbar	burner with hob oven	1
	specifications	indication	Quantity
	-	variable regulator	1
	length 1 m + 2 IFES	1-rubber gas hose,	1

	1-PVC plastic trap with a diameter of 20 mm	trap	1
 	2-galvanized iron pipe, 10 cm length, 0.5 inch - single-sided	iron pipe	2
	1galvanized iron pipe, 30 cm length, 0.5 inch, single-sided It is welded with 8mm iron bars with a length of 7 cm 2Aves +	iron pipe	1
	HDPE hose HDPE plastic with a diameter of20mmand a thickness of at least 3mm1	rubberHDPE	1
	Spare additional 3 keys extra pullovers for biogas 4	spare parts	

Source: field research data.

Table No. (2): shows the distribution of the vocabulary of the study sample in terms of project status

%Project case	**number**	%
Factor	32	74.4
Stopped	11	25.6
Total	43	100

Source: field research data.

2-Financial analysis for the operation of the biogas production unit for a year:

The results of the financial analysis resulting from the field study, shown in the following table, show that the net return of the biogas project is about 292 pounds. The ratio of revenue to costs was 1.17%, meaning that the project covers its costs with an economic surplus.

It can be seen from Table No. (3): - The internal rate of return (IRR), which has a value of 3, indicates that the profitability of the project amounts to about 3 piasters per invested pound. The speed of capital recovery was about 3.3 years.

Table No. (3): Shows the internal rate of return for the biogas project

Statement	value in pounds
Total costs	1707
Total revnu	1999
Net retern	292
The benefit / cost ratio	1.17
The internal rate of return IRR	3
Capital recovery speed	3.3

Source: field research data.

The low indicators of the financial analysis of the biogas project indicate that the goal of adopting this technology is not in its economic form, but rather succeeded in achieving the environmental goal of it.

3-The opinions of the respondents on the project performanc

The results of the field research shown in Table No. (4) indicate that 39.5% of respondents believe that the use of biogas is a good alternative to energy, while only 4.7% of the study sample see it as an excellent alternative. There are 20.9% of respondents who see it as an acceptable alternative, and 16.3% of respondents see it as a very good alternative to energy.

At the same time, 18.6% of respondents see using biogas as an unacceptable alternative, and they recommend not using it.

Table No. (4): The opinions of the sample members on using biogas as an alternative to energy

Rating	number	%
Not acceptable	**8**	**18.6**
Acceptable	**9**	**20.9**
Good	**17**	**39.5**
Very good	**7**	**16.3**
Excellent	**2**	**4.7**
Total	**43**	**100**

Source: field research data.

It is clear from Table No. (5) field research data that there are 58.1% of respondents who believe that it is not possible to enlarge the size of the unit and distribute the product to neighboring individuals and villages instead of personal use, and 41.9% believe that this can happen.

Table No. (5): The opinions of the sample members on the possibility of enlarging the size of the unit and distributing the product to the neighboring individuals and villages instead of personal use.

Capability	number	%
can	**18**	**41.9**
Can't	**25**	**58.1**
Total	**43**	**100**

Source: field research data.

4-The problems facing the respondents and proposals to solve them

The results of the field study indicated in Table No. (6) indicate that the most important problems that were agreed upon by about 37.2% of the total sample population are the lack of technical follow-up, followed by that the project needs continuous technical follow-up due to the large number of malfunctions in the device by 30.2%, then each of it follows that Non-economic project, non-continuity of operation, and weak gas produced, especially in the winter, at 27.9% each.

Table No. (6): Shows the most important problems facing the respondents frecouncy problem relative importance

problemThe	frecouncy	%
Bad smell	9	20.9
Non-continuity of operation and weak gas produced, especially in the winter	12	27.9
It requires continuous technical follow up due to the frequent malfunctions of the device	13	30.2
Unavailability of technical follow-up	16	37.2
Uneconomic	12	27.9
Needs constantly feeding	9	20.9
Insufficient amount of waste to run the project and high purchase costs	3	7
Not to bear all costs for Project	3	7
Gas interruption due to blockages 4 vents	4	9.3
High maintenance costs of the machine	1	2.3
The gas room level is not adequate	3	7
Not fully reliable 4 9.3ل	4	9.3
Feed basin above ground 1 2.3	1	2.3
The device is primitive 1 2.3	1	2.3
No problems 4 9.3	4	9.3
Total	43	

Source: field research data.

Then comes the problems of bad smell and that the project needs to be constantly fed by 20.9% /, then comes both that it is unreliable and the gas sector as a result of clogging the openings by 9.3 each. Then All of the insufficient amount of waste comes to operate the project and the high costs of purchasing it, and that the gas room level is inappropriate, and all costs for the project are not borne by 7%, and finally all of the high costs of maintaining the device come, that the feeding basin is higher than the ground, and that the device is primitive by 2.3 %. Finally, 30.9% of respondents believe that there are no problems encountered.

As for the proposals, the results of the field study shown in Table No. (7) show that developing the installation of the biogas unit to store larger quantities of gas is one of the most important proposals, as it was recommended by about 48.8% of the sample individuals, followed directly by connecting the unit to electricity generators and not benefiting from the gas only. At 30.2%, followed by the need for technical follow-up at 16.3%.

Then followed by each of the possibility of adding other types of waste to increase the efficiency of the project, and holding educational seminars and training courses on biogas technology by 4.7% each, then followed by each of the

increase in the space for the biogas hole, the need to provide spare parts for the device, and the need to provide a project that provides full support To create a biogas unit at 2.3% each, The proposed freoouncy relative importance.

Table No. (7): - Shows the most important proposals for the field study

recommendations	frecouncy	%
Project provides full support for the construction of the biogas	1	2.3
Development of the unit's installation to store gas quantities	21	48.8
Educational seminars and training courses on biogas technology	2	4.7
Technical follow-up is required	7	16.3
Connecting the unit to electric generators, not using the gas stove only	13	30.2
The possibility of adding other types of waste to increase the efficiency of the project	2	4.7
Provide parts for the device	1	2.3
Increase the space for the biogas pit	1	2.3
Total	43	

Source: field research data.

Summary and recommendations:

The country has recently suffered from crises such as lack of electric power, environmental problems such as garbage accumulation in cities and villages alike, and the presence of plant and animal farm waste, some of which are a problem, in addition to crises of unavailability of gas pipelines, and other economic and environmental problems that do not There is plenty of room to mention it. The Egyptian state is trying to overcome these problems by various means.
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1) The study targeted the economic evaluation of the Bioenergy project for sustainable rural development, and the identification of problems facing this project and proposals for solving it.
2) The study indicated the decrease of indicators of financial analysis for the biogas project, which indicates that the goal of adopting this technology is not in its economic form, but rather succeeded in achieving the environmental goal of it.
3) In light of the above and within the framework of the results of the study and the indicators, some recommendations can be proposed, which would raise the economic efficiency of using this technology, namely.
4) To ensure continuous flow of gas without interruption, it is proposed to make additional units operating next to the established unit that will be fed from the sewage house of the beneficiary's house or from his farm waste.
5) Establishing a technical follow-up unit to treat production problems.
6) Spreading environmental awareness among all local media outlets that deepen the thought of a clean and safe environment for human life in its surroundings, including air, water, plants and living creatures.
7) The establishment of large biogas units at the village and city levels in order to achieve the following.
8) To save a lot of money wasted on creating small units that are not followed up and thus do not work.

Not neglecting the idea of establishing or operating the small unit as a result of the high prices of selling compost compared to the price of subsidized gas.
Solve garbage accumulation problems in cities and villages.-
Solve village sanitation problems in drinking water and irrigation.-
-Using household leftovers and food processing residues in a healthy and safe manner
-Exploitation of septic tanks located in front of houses in some villages for continuous and inexpensive feeding for large units.
Eliminate floating plants in canals and drains.-
Disposal of plant residues on farms and horticultural gardens.-

-Take advantage of the large production in providing electric power to meet the needs at the time of the power outage.
-Take advantage of the large quantities of digested units to provide safe and inexpensive fertilizer or reclaim new agricultural lands.
Production of energy and fertilizer from inexpensive sources.

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