Choosing the Appropriate Site for the Organic Fertilizer and Biogas Production Project at the University of Anbar

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1- Introduction:

It is known that chemical fertilizers are expensive and may not be available. When it is fertilized, 20% of it is used by plants and the rest goes as pollutants to soil and groundwater.

Chemical fertilizers increase the productive quantity in the short term, but they negatively affect the long term in the soil and the yield of the crop, especially when the intensive farming method is followed, as it results in the following:

1) The increasing cumulative demolition of the nutritional balance in agricultural soils.
2) The agricultural soil is polluted and its natural, biological and chemical characteristics change, thus harming plants, animals, humans and the environment as a whole.
3) Phosphate fertilizers cause deposition of trace elements in the soil, making it difficult for plants to absorb them.
4) Groundwater pollution When these chemical fertilizers are washed, they become contaminated with nitrate ion, which pollutes irrigation water and then plant tissues, thus affecting animals and the environment and harming humans.

2- Organic Fertilizer:

Organic fertilizer, or compost, is the product of the biological biodegradation of organic matter, whether of plant or animal origin, by bacteria and some beneficial microorganisms under certain environmental conditions of warmth, humidity and good ventilation. There are two types of organic fertilizer according to the system and method of production (aerobic organic fertilizer and anaerobic organic fertilizer).

3- Components of Biogas and its Effects on Humans:

It is that gaseous mixture resulting from the fermentation of organic waste (plant, animal, and household industrial) under the surface of the water in isolation from the air. Anaerobic fermentation occurs as a result of a specialized group of bacteria

producing methane gas at a rate of between (70-50%) and the rest is a mixture of carbon dioxide, hydrogen sulfide and hydrogen. Figure (1) shows the lower and upper limits of biogas components and their effects on humans.

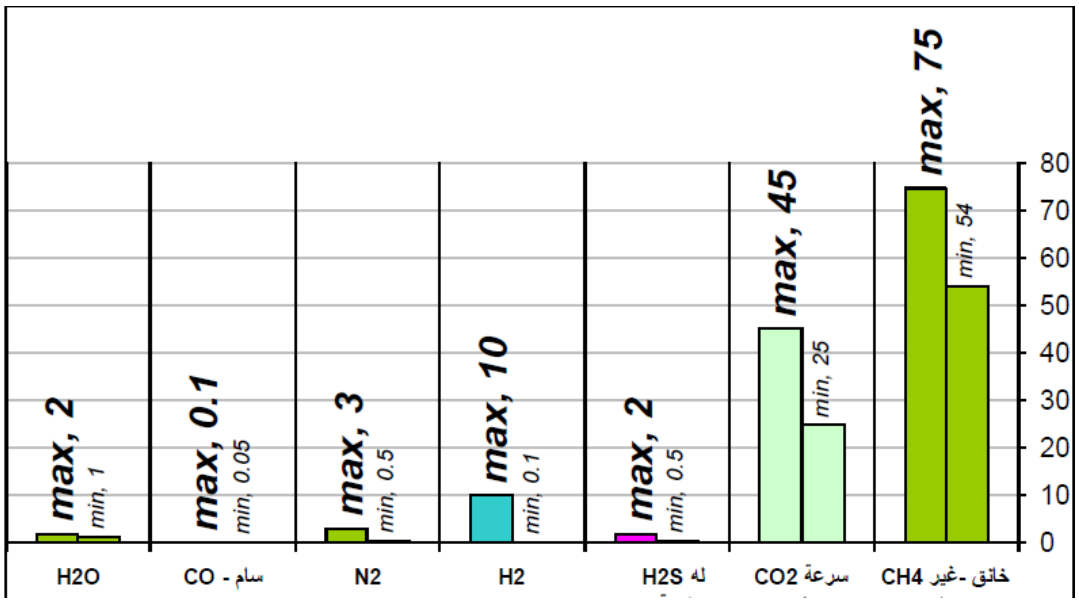

Figure (1): The Lower and Upper Limits of Biogas Components and their Effects on Humans.

The goal of the organic fertilizer and biogas production process is to get rid of waste and obtain high-quality products through which natural resources are preserved, such as fertile soil and clean water, while preserving biodiversity and the environment as a whole.

Organic fertilizer is of great importance to the plant by feeding the soil of this plant. It is considered the key to the success of any agricultural project, as it contains the spirit of life and development when it follows an optimal method for its production. We summarize and clarify that importance and benefit in the following:

1) It improves the properties of the soil and increases the moisture retention in it. When the organic matter decomposes in the compost, it leads to the formation of a complex of clay and waste, which helps in the porosity and aeration of the soils of mixed and clay lands. It also increases the cohesion of loose or sandy lands soils, which increases the possibility of preserving water, thus protecting it from loss through evaporation or seepage away from the root area of the plant. It also helps the possibility of washing salts when irrigating with saline water or planting in saline soils, as it has a role

in increasing the fertility of limestone soils.
2) It works to prevent soil erosion by erosion factors such as water and wind that strip the roots and erode the fertile surface layer rich in millions of beneficial microorganisms.
3) Provides the appropriate factors for seed germination and root growth and spread.
4) Build soil fertility cumulatively, in contrast to chemical fertilization, which works on the toxicity and demolition of the soil cumulatively.

The most important dangers that agricultural, plant and animal residues may cause if they are not reused include:
1) Wasting money and time and occupying space.
2) A suitable place and environment for the breeding and reproduction of pests, insects, reptiles and rodents.
3) Emission of unpleasant odors resulting from rotting and decomposition of these wastes.
4) The spread of diseases and epidemics due to the seriousness of these wastes and the lack of environmental awareness.
5) Burning agricultural residues, dumping them in ponds, swamps and valleys, or accumulating them on the farm, resulting in serious environmental pollution of air, soil and groundwater.

4- Components of Production Units:

Digester gas production units consist of four basic parts, regardless of their shape or type:
1) The main tank (the reactor): It is the main part of the unit, in which the wastes are placed and the fermentation process takes place.
2) Gas collection tank: It is the part in which the gases resulting from the fermentation process are collected.
3) The entrance and exit holes for waste: through which the fermenter is fed and the waste that has been fermented is withdrawn.
4) Other works: they are as needed, such as the stirrer, heating, and gas intake pipes.

5- Project Specifications and Components:

6- Choosing the Right place for the Organic Fertilizer and Biogas Unit at the University of Anbar:

The following considerations should be taken into account:
1) Low-level land should be avoided to avoid water gathering in it during

rains. In addition to avoiding the high level of the ground water, because this leads to a reduction in the efficiency of the decomposition process inside the reactor.
2) Choosing an area of flat, compact land, preferably of concrete with tendencies, that ends with drains through which the leaking of the filtrate is collected and returned back to the reactor. As well as ensuring that the fertilizer does not mix with the rocks and soil of the ground, in addition to the ease of movement of equipment during the service operations of the fertilizer.
3) The site of organic fertilizer and biogas production should be close to the source of waste generation.
4) The water source should be close to the project site.
5) The project site should be shaded (under trees, for example, or under a canopy) so that it protects the production units from vertical sunlight, especially in the summer, which works on the evaporation of nutrients. As well as to avoid washing operations for those elements when it rains. The compost production unit must be open sides to ensure the arrival of the beneficial side sunlight and the entry of air from all directions due to its importance during the period of aerobic decomposition processes.

6-1 Site Selection:

1-Ranking the Candidate Sites for the Project:

A-First Ranking:

The study team excluded the sites that could not achieve the necessary requirements for the project. The areas located in the valleys and low-lying areas were excluded from the geological point of view, and the areas with human density and faculties from the environmental point of view.

- **Criterion of Site Area:**
  The study team determined the criteria and conditions for a site area of more than (300 square meters) on the basis of previous experiences. The following points were taken into consideration: the requirements of the organic fertilizer and biogas production units (number / 5) of the category ( ) and the design card ( ), project accessories such as warehouses..etc. Also, an appropriate distance must be provided between the project boundaries and other buildings, about (20-30 meters).
- **Criteria Environmental Consideration:**
  It is important to verify that these candidate sites do not fall within human-density areas such as university and college

housing. In addition to taking into account the direction of the prevailing winds to ensure that the citizens are not affected by the odors that may be emitted from the project.

- **Criteria Planning Consideration**:
  These sites should not be within the areas on which future projects are planned.
- **Criteria Consideration Transportation:**
  These candidate sites must be located at an appropriate distance from the waste generation points and the beneficiaries of biogas. The Figure (2) shows the excluded and candidate sites.

Figure (2): shows the excluded low (red color) and excluded sites close to housing, windward colleges (blue color), and candidate sites (green color).

2- Evaluation Results and Additional Site Reconnaissance:

The study team identified four candidate sites 1, 2, 3 and 4 as the most prominent candidate sites, and the results are shown in Table 1.

Among the candidate sites (4), two (3 and 4) were excluded from the sites because the area of the area is very small and far from the waste generation points. The two sites (1 and 2) were evaluated in terms of efficiency, such as the distance of the site from the waste generation points, the beneficiary, and the availability of transportation methods.

The results of the evaluation and analysis show that sites 1 and 2 are

more likely to be the appropriate sites for implementing the project, and the study team prefers site No. 1 over site No. 2.

Table (1): Detailed Evaluation Results for the Four Candidate Sites

4	3	2	1	Evaluation Standard	
Relatively far from waste generation points and the potential beneficiary	**Relatively far from waste generation points and the potential beneficiary**	**Near waste generation points and the potential beneficiary**	**Near waste generation points and the potential beneficiary**	**Site**	
Acceptable	**Excellent**	**Excellent**	**Excellent**	**Area**	
Less Than 30 m	More than 30 m	More than 30 m	More than 30 m	**Close to Human Populations**	**Environmental considerations**
The possibility is very low	The possibility is low	The possibility is very low	The possibility is very low	**Humans Affected by Unpleasant Odors**	
Excellent	**Excellent**	**Excellent**	**Excellent**	**Position relative to prevailing winds**	
Water Delivery Required	**Available**	**Available**	**Available**	**Roads and Water**	**Infrast ructure**
1	2	1	1	**Area**	**Degree**
2	2	1	1	**Environment al considerations**	
2	2	1	1	**Infrastructur e**	
2	2	1	1	**Final Rank**	

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