Biogas definition – proposal that can be improved by experts

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Biogas is produced when bioenergy[1] which is bound in Renewable Organic Material (ROM) is converted[2] during 'methane fermentation'[3] (Anaerobic Digestion) by methane producing bacteria in the absence of 'atmospheric oxygen'[4]. What remains is the biofertilizer[5]- for cultivation valuable product.
Biogas produced under controlled conditions is carbon neutral and consists mainly of 50-75% energy rich methane[6] (CH_4) and 25-50% carbon dioxide (CO_2) with small amounts of hydrogen sulfide (H_2S) and ammonia (NH_3). Traces of hydrogen (H_2), nitrogen (N_2), carbon monoxide (CO), hydrocarbons, halogenated hydrocarbons (eg hydrocarbons, fluorine-, chlorine-, bromine-, and iodine substituents), siloxanes, sulfur substances etc. are temporarily in the biogas.
The conversion to methane is carried out in several steps and as raw material can be used most renewable organic materials. Natural methane fermentation occurs for example, in human and animal digestive systems, marshes, rubbish dumps, septic tanks and in the Arctic tundra.
Efficiency[7] in biogas formation is mainly influenced by the amount of easily digestible compounds in raw material, water content, structure, temperature, pH …etc.
Biogas is similar in composition of natural gas with the difference that natural gas is the fossil gas while combusted contributes to the increase of CO_2 in the biosphere. In contrary the biogas is carbon neutral because that carbon dioxide from combustion of biogas comes from ROM and is again bound by photosynthesis in new plant biomass.

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[1] **Bioenergy** - solar energy that is biochemically bound in Renewable Organic Material (ROM) - all derived from now living organisms i.e. from plant and animal kingdom, unlike fossil organic materials such as coal and crude oil or synthetic organic materials such as plastics that can be produced from either renewable or fossil organic material.

[2] **Converted** - instead of "break down" because it is really continual transformations of energy

[3] **Methane Fermentation** - methanogenic bacteria produce methane. Methane-producing bacteria have two areas where the conversion is faster than at other temperatures; mesophilic process at about 37 º C and thermophilic conversion at about 55 º C.

[4] **Atmospheric oxygen** - oxygen in the air (O_2) is absent; NOTE: oxygen is bound in all organic material and in the water.

[5] **Biofertilizer** contains bioenergy that remains in the more slowly converted structures of ROM. Biofertilizer **positively affects soil fertility** / productivity and
* Is important for *carbon storage* that the elemental carbon is stored in the ground and sinks as part of the ROM of the biofertilizer becomes humus; part of humus is easy metabolisable but some have long-term beneficial effects on soil depending if its structure consists of sand, moraine, clay or mixture of these main types of soil
* *Raise the content of soil nutrients and water holding capacity*, thereby counteracts the drought and prevent rapid leaching of nutrients into groundwater, rivers, lakes and seas
* *Raises cation exchange capacity* (CEC) which means that more nutrients are available for plant roots
* *Improve the soil structure* so that the soil becomes more elastic, water and air can more easily penetrate and thereby support microbial processes, plant roots are easier to get around and get access to plant nutrients and elasticity may be ground to better resist compaction when using heavy tools
* *Affects positively soil heating*, one of the factors that increase the soil organisms and ultimately plant roots activity.

[6] **Energy-rich methane** that is biomethane - to mark where the energy is transformed from i.e. from biochemically bound sun's energy in renewable organic material.

[7] **The efficiency of biogas production** - depends on many factors that are connected to the substrate i.e. a mix of ROM to obtain
• *the right water content* - about 70%, which means that the aqueous ROM should be mixed with dry as dilution with water requires digesters of large volumes, while high solids anaerobic digestion optimize methane fermentation and can give 6 to 7 times higher production of biogas per volume of digester, which indicate that optimum water content can provide maximum benefit and lower costs for drainage, minor losses of plant nutrients, bio-fertilizer for better quality, lower transportation costs ... etc.
• *for microorganisms suitable structure* - decomposition is important because the conversion takes place only on the surfaces of the particles, the larger the surface the easier microorganisms to compounds and elements
• *proper nutrient balance* - a better nutritional balance indicate the need for the right moisture and texture because (i) the aqueous ROM is rich in nitrogen such as human and animal excreta, household, restaurant and shops food waste, slaughterhouse waste and fallen stock, while (ii) dry ROM is usually structure-bearing and rich in the element carbon such as straw, wood, bark, paper etc.

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