

Biogas production with guinea pig manure



Photo: Jaime Cesar Gianella Malca

Mr Ulises Moreno explains the design of the biodigester.

Carmen Felipe-Morales and Ulises Moreno

Our small one-hectare ecological farm “Bioagricultura Casa Blanca” is located in the valley of the Lurin River in Pachacamac District, 35 km south of the capital Lima in Peru. Here we grow a wide variety of crops such as cassava, potato, sweet potato, beans, maize, vegetables, plantains, strawberries and several aromatic herbs. We also breed guinea pigs for meat production and to recycle nutrients within the farm. Ten years ago, in 1994, we decided to construct a biodigester of the Chinese model to make better use of the manure produced by our guinea pigs. We then had 600 animals and the guinea pig manure was either used directly as an organic fertilizer, or mixed with crop residues to make compost under aerobic conditions.

At present the number of guinea pigs varies between 900 -1000 animals, producing an estimated 3000 kg of manure per month, or 36 tons per year. The manure is recycled through the biodigester together with the crop residues of the farm. The process produces organic liquid (*biol*) and solid (*biosol*) fertilizer, as well as biogas.

The biodigester of “Bioagricultura Casa Blanca” has a capacity of 10 m³. The central chamber has 3 openings: a central opening which is opened only once a year to remove the solid *biosol* and to insert the annual starting load; an opening at the side through which a tube is inserted which reaches the bottom of the chamber and is used to add material; and finally a third opening through which liquid fertilizer or *biol* passes on to a side chamber where it is stored and can be taken out (see Photo).

Each year, a starting load of one ton of a pre-composted mixture of maize stubble and guinea pig manure is inserted through the central opening. The mixture has been pre-composted for three to four weeks and has a temperature of 50 - 55 °C. It is mixed with 200 litres of the contents of the rumen (stomach) of recently slaughtered cattle (it can be obtained from a local slaughterhouse and only needs to be used once a year). The rumen contains anaerobic microorganisms, which will start up the fermentation process that produces biogas, in particular methane. Water is then added so that about 8 m³ of the biodigester is filled, leaving 2 m³ free space for the storage of biogas in the upper part of the central chamber of the biodigester. The central opening is closed immediately with a lid that is heavy enough that it cannot be lifted by the

pressure of the biogas. It may be necessary to stack some additional stones on top of the lid to avoid this.

Once the biodigester starts to produce biogas (after 5 - 6 days in summer), the biogas can be used as fuel for cooking or lighting, using gas lamps. A regular petrol-fuelled electricity generator can also run on biogas (methane) and produce electricity, but the carburator has to be adapted for this fuel.

Once in operation, the biodigester has to be fed once a week with a mixture of one part guinea pig manure to three parts water. This guarantees us sufficient gas for the week.

The biodigester of “Bioagricultura Casa Blanca” has been working efficiently ever since its construction 10 years ago and thanks to the production of biogas we have been able to save significantly on the cost of electricity for our home. In addition, we have a constant supply of liquid fertilizer or *biol*, which is not only an excellent organic fertilizer for our crops but also a valuable catalyst to enhance crop growth and promote flowering, especially in fruit crops, thanks to the phytohormones it contains.

One year after introducing the starting load, the biodigester must be emptied and at this moment a third product is obtained: the solid fertilizer *biosol*, which is an excellent organic fertilizer for crop production.

In order to make the removal of *biosol* easier, we modified the original design so that the removal does not have to take place through the central opening, as this is very uncomfortable and complicated. Instead, we built a window at the side of the main chamber, which is closed with a lid of galvanized iron and fixed with screws. The window allows access to a room built alongside the biodigester from where the solid fertilizer can easily be extracted.

Because of the increasing interest in biodigesters we offer a practical course once a year, at the time of emptying and refilling the biodigester. During these courses, participants familiarize themselves in a very practical way with how to build a biodigester, how it works and how it is emptied and refilled.

One of the main attractions of the farm is certainly to observe the operation of the biodigester, as a tool for recycling all the residues produced on the farm.

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Photo: Anita Ingevall



One of the 1000 guinea pigs on the farm.