

## Executive Summary of Exchange of Biodigester Experiences between Ecuador and Bolivia.

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### Objectives

RedBioLAC's latest initiative is to organize South-to-South exchanges where one or more experts with extensive biodigester experience travel to another country to provide emergent biodigester programs with more extensive hands-on training, technology transfer and business model development. For the first exchange, the Association of Agroecology Farmers of Intag (Asociación de Campesinos Agroecologicos de Intag – ACAI) requested expertise in strengthening their biodigester program. While ACAI has some experience installing biodigesters, the quality of installations is varied and ongoing monitoring and maintenance has been minimal. Therefore before scaling up their implementation, the goal of this exchange was to:

1. Improve the technology of the biodigesters being installed (materials and models)
2. Build the skills of ACAI members who are installing biodigesters
3. Improve processes of monitoring, maintenance and evaluation

### Activities

Biodigester expert, Jaime Marti spent three weeks (June 30-July 17, 2013) with different stakeholders in Ecuador, working to evaluate and improve the use and promotion of biodigesters through a mix of field visits, workshops and meetings.

First, in **Quito**, he met with Robinson Guachagmira of the Ecuadorian Coordinator of Agroecology (CEA), who accompanied him throughout the trip, with the Water Fund (FONAG) and EcoPar to review objectives of the trip to Intag.

From there, he went to the valley of **Intag** with members of CEA and ACAI to visit families using biodigesters, carry out a workshop with installers from the area, and visit the mid-scale biodigester project in **Cayambe**. With the support of CEDIR, he visited biodigester projects near **Cuenca** and shared his experiences with farmers in the association “Nuevo Amanecer” as well as students and professors of agronomy in the University of Cuenca.

With the Agroecology Network of **Loja**, he visited biodigesters in Catacocha and San Pedro de Vilcabamba, accompanied by local installers and students from the University of Loja. At this university, he delivered a workshop about biodigesters with the attendance of professors, students, installers and representatives of the provincial government. In the **Provincia del Oro**, he met up with RedBioLAC member and biodigester developer, Gerardo Parra and visited three systems. Finally, after meetings in Quito to evaluate the trip, he presented results in Cayambe, with the participation of CEA, Ecopar, and representatives from the “Bio-Corridors” program from various parts of the country.

In the various regions, 13 biodigesters were evaluated. The feedstock of the biodigesters ranged from treatment of waste from two to 60 livestock. Some biodigesters included a connection to a latrine to supplement the animal waste. The uses of the biodigesters were varied, some were used to cook, some to warm piglets and others boil hard grains for the livestock. Most of the farmers used the effluent as a natural fertilizer and were very pleased with the resulting agricultural production. Some systems were subsidized, while others were not, which will be discussed in the following section.

*“Each one of these places where we visited was strengthened with the exchange of experiences by sharing some important facts to consider in the moment of installing a biodigester. We also had discussions in which we were oriented to reinforce the technical skills of the biodigester installers, among other things: the right dilution of the organic material and water, the types of manure ... costs and materials used in the construction, siting on the farms ...and some basic doubts that needed clarification on the technical level.”*

– Robinson Guachagmira, Coordinadora Ecuatoriana de Agroecología (CEA)

It is also important to note that that the 7 biodigesters in Intag were part of the first RedBioLAC biodigesters, implemented by CARE in 2010 with counterpart from ACAI, and supported by Green Empowerment with funding from WISIONS. An additional 8 biodigesters were installed in Imbabura and 3 in Macas, totaling 18.

## Results and Commentary

### Why are the systems working with 100% subsidies?

In Intag, Cuenca and Loja it seems that the systems that had 100% subsidies were operational and in use. In comparison with fully subsidized projects in Bolivia and other countries, free systems imply low levels of appropriation. In Ecuador, the case is different because digesters are distributed through farmers associations, which provide follow-up and support. Furthermore, in many cases, the farmers associations are specifically oriented toward “agro-ecology” which guarantees a certain profile of farmer more open to adopting new and innovative technologies. Unlike Bolivia, all of the systems were connected to stables with cement floors, so that the biodigesters were filled during the routine washing of the corrals, which make the biodigesters very easy to use, load, and maintain a regular feedstock.

However, it was also observed that the five systems visited that did not receive subsidies were better protected (with walls and roofs) demonstrating that there was greater investment by the owner in the long-term viability of the system.

### Is the strategy scalable?

Currently, there is a group of experienced installers in Intag who have replicated the experience in Cuenca and transferred the technology to Loja. This dissemination has been through agro-ecological farmers (who have few pigs). This strategy has been working. This subsidized model has been working, however; it begs the question of what would happen without any subsidies provided to the farmers. To compare to an unsubsidized model, in the El Oro Province, where the strategy has a more market-orientation without subsidies, and is focused on farmers with greater economic capacity; this approach has been found to be more scalable. So, there is a gap; how to scale up adoption by the small farmers with little ability to invest in the systems and the technical assistance needed?

### What biodigester technology is used?

All of the biodigesters are made of low-cost tubular plastic, and only vary in the sizing and shape of the inlets/outlets. The designs used are viable, but can be improved. In Intag, the same model of biodigesters introduced 10 years ago has not changed, which implies a certain stagnation of technological development. However, this exchange showed that there was a lot of interest in new models and technology.

*“With the suggestions of Jaime on the calculations for sizing biodigesters, I’m now being more efficient and taking advantage of the real volume of the liquid phase – aspects that improve the work in the field”*

– Gerrardo Parra, Biodigester installer

There are a number of ways to adapt and optimize the technology to different situations. In the Provincia del Oro, the technology is more optimized and adapted to each producer. Technical improvements and optimizations discussed include the inlets/outlets, size of pipes, placing of filter, and use of gas reservoirs. During the field visits and workshops, each technological improvement was detailed, along with instruction on how to calculate the appropriate size of biodigester.

### What is the Research and Development situation?

There has been a lack of technological development and innovation, with the exception of new ways of patching biodigesters. There is a lot of accumulated knowledge by the users and installers that could be shared through the networks of agro-ecology. There were also some common “myths”, such as biodigesters can only be used with pig manure, which Jaime was able to dispel. It would be good to link the users with universities for research and development.

## Conclusions and Next Steps

There is interesting and successful experiences with biodigesters in Ecuador, including the social strategies of implementation. This generates a base of credibility of the technology of great value. There are possible adaptations to the technology and program to reach more producers. While the market-based model in Provincia del Oro is more economically sustainable, it leaves out the small producer without capital to invest. What is clear is that a dialog and exchange of positive experiences in both lines of action can lead to strategies which allow a scaling up of the technology between small and medium producers in Ecuador.

*“With the presence of Jaime Marti in the Provincia de El Oro, we analyzed the importance of the social aspect of biodigesters, as he convinced me that it is essential to train and “empower” the beneficiaries of the systems since the management and care that they do depends on the success of having a functioning biodigester and at the same time the credibility of the work of the technician.”*

– Gerrardo Parra, Biodidigester installer

While using the community networks for dissemination, such as the agroecology associations, are strong, the technology used could be strengthened with the advances from other parts of the region and the world. The introduction of methods of design and sizing, optimization of materials and standardized models (introduced on this trip) can improve the knowledge of the installers and their ability to design systems optimized for different circumstances.

Until now, the government has not taken initiative in the implementation of biodigesters, their interest lies mostly with medium to large-scale uses. However, there is renewed interest in focusing on the biodigester not just for a source of energy, but linked to agricultural production by using the effluent as a natural fertilizer. The government could stimulate scale-up through quality standards, supporting implementation programs and generation of knowledge, promotion, and certification of installers.

There are professors within the universities with interest in these themes, so there is potential in creating linkages for research and investigation. There are many people from the universities, farmers associations and NGOs interested in forming a network, similar to other countries in the region.

One weakness, similar to other countries in Latin America, is the lack of a diversity of technologies available. In Ecuador, almost all of the biodigesters are of low-cost plastic. Diversifying the sector with, for example, geomembrane biodigesters or dome models, strengthens the sector by allowing farmers to choose.

Subsidies have been either 100% or 0%. The use of high subsidies can be a tool for rapid diffusion of the technology but with the risk of low adoption and effectiveness -- although in Ecuador the specific conditions of the agroecological producers have proven to lead to high adoption rates. The unequal rates of subsidies across the nation could lead to

confusion by the consumer, and an artificial inflation or deflation of the perceived value of biodigesters. A national network could debate these considerations and strengthen conditions for scale up such as costs of installation, quality control, training needs, system of guarantees.

To scale up the technology in a responsible form, it is necessary to consider the previous experience of other countries with national biodigester programs and adapt them to the Ecuadorian context. Important elements include quality control, certification of technologies and installers, technical assistance, promotion, research and development, fair and sustainable subsidies, access to micro-credit.

*“There is a meeting planned at the end of September with the CEA to look into the possibility of forming a network of biodigesters in Ecuador, led by CEA, with the goal of organizing ourselves”.*

– Diana Dominguez, ECOPAR, program of Bio-corridors

Finally, it is important to learn from the successful experience in Ecuador such as the viability of the subsidized systems installed through a strong alliance of farmers dedicated to sustainable farming, along with the other experience of a small enterprise installing systems for medium-scale farmers without subsidies. While other countries may be more advanced in terms of the technology, they may lack the social strategies witnessed in Ecuador. As such, the participation of the Ecuadorian stakeholders in RedBioLAC will be useful for the whole network.