How Much Can We Charge?
Using Gravity Models to Predict Feedstock Availability and Tip Fees for Biogas Projects
Ecostrat White Paper Series
How Much Can We Charge?

Using Gravity Models to Predict Feedstock Availability and Tip Fees for Biogas Digestion Projects

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The Challenge

Clear understanding of the availability of feedstock and of the tip fees a new anaerobic digestion project can command is critical for developers and financiers. From a high level, it is possible to generate reliable estimates of feedstock generation in a region, but understanding what quantities of feedstock a project can expect to attract and the tip fees it can charge is a challenge.

There is, of course, no better data than verbal or written commitments (LOIs or MOUs) sourced directly from suppliers and haulers in the region—but that can be a time consuming and costly exercise, and may not be justified, especially for projects in earlier stages of development. Never mind the fact that in certain overheated markets, where suppliers have been approached multiple times, they can be (understandably) reticent to commit volumes or prices: “Call me when the project is up and running” is a typical response.

And therein lies the challenge: how do we develop data that enables critical decision making and strategic planning, especially for early-stage projects, in the absence of granular, on-the-ground feedback from committed sources? The answer is Gravity Modeling.

Using Gravity Modeling to get “Down to Earth” Results

Ecostrat is bringing to the organics recycling sector, and the biomass industry more broadly, Gravity Modeling as an effective analytical method to generate more accurate and refined analyses of feedstock availability and cost. By analyzing feedstock generation and markets, and modeling likely material flows in a region or supply basin, gravity modelling can help us validate many assumptions around feedstock availability under various pricing scenarios, including modeling the maximum tip fee a project could charge at the project’s gate and projected quantities of feedstock available at that tip fee (see chart below). Most importantly, it helps us do it without getting actual feedback directly from the suppliers themselves.

<table>
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<th>Tip Fee</th>
<th>Annual Quantity Available (MM gal)</th>
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<tbody>
<tr>
<td>$0.10-$0.12 per gal</td>
<td>5-8 MM</td>
</tr>
<tr>
<td>$0.13-$0.15 per gal</td>
<td>2-5 MM</td>
</tr>
<tr>
<td>$0.15-$0.18 per gal</td>
<td>1.5-2MM</td>
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The logic of the model is based on the fact that organic feedstock flow is by nature a geographical problem: in simple terms, feedstock generators (or haulers) prefer closer markets with the lowest tip fee. The total tip fee is a sum of tip fees charged at the feedstock market and transportation cost. Transportation cost is a function of distance. The amount of feedstock a biogas project will “attract” can be determined by feedstock generation from each potential supplier, the amount of feedstock supplied to any alternative markets, and several other hard and soft factors.

What goes into a Gravity Model

Hard Factors:
- Location of feedstock sources
- Estimated quantities and type of feedstock generated at each source.
- Locations of each market for feedstock.
- Type of feedstock accepted by each market.
- Intake capacity of each market.
- Minimum tip fee a market can tolerate.
- Transportation costs.

Soft Factors:
- Generator wants to de-risk its supply chain by supplying to more than one market.
- Markets may be limited to specific types of feedstock. For instance, some markets may not accept liquids.
- Markets may not be transparent. In many basins haulers control the market eating up much of a market’s margin by up-charging the generator.
- Tip fees may not be the only constraints considered by generators. For example, a generator may not wish to supply food waste to the animal feed market due to liability concerns.
- There may be long-term contracts in place, changing the dynamic of the feedstock flow. In such a case, a time-based projection of feedstock flow should be conducted.
- Local policies may regulate some of the feedstock flow.

GIS-based Analysis and Output

Geographic Information Systems (GIS) allow for solving problems in which distance and road infrastructure are significant variables. They provide analytical capabilities as well as means to illustrate results graphically. In case of Gravity Models, GIS analysis is used to determine the likelihood of feedstock availability at each tip fee level. GIS capabilities combine data on transportation cost, distance to competitors, assumptions about feedstock generation and tip fees, and apply probabilistic functions to determine these results. Once created, a GIS model can be run multiple times to test different assumptions.

Figure 1 shows an output of the Gravity Model applied to a high-level analysis, using Geographic Information Systems (GIS). In this case, different colors indicate probabilities that feedstock generated in those areas will be supplied to each Market.

“Gravity modelling can help us validate many assumptions around feedstock availability under various pricing scenarios”
What can we do with this information?

Gravity Modeling can help answer some of the most pressing questions biogas project developers and lenders have, like:

- Given current (and projected) feedstock flow, how much feedstock is available at each tip fee level?
- What tip fee could the market handle?
- Is it possible to starve a competitor out of feedstock through lowering the tip fee, thereby releasing more feedstock onto the market?
- Based on the current (and projected) markets for and generation of organic waste, what is the best location for a biogas project?