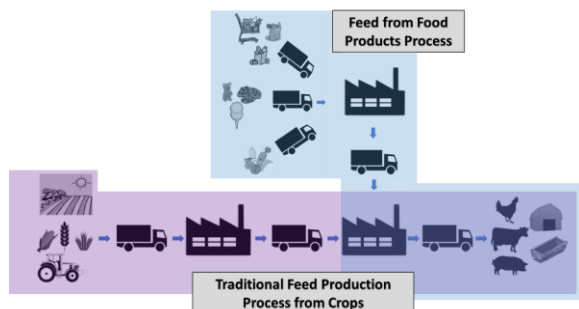


## Techno-Environmental Analysis of Generating Animal Feed from Wasted Food Products

This study investigates the technological and environmental parameters related to producing animal feed from wasted food products.

### Background

Research was conducted to investigate the technological and environmental parameters related to producing animal feed from wasted food products (FFP) instead of growing and manufacturing feed through traditional means. The general production process for both FFP and traditional feed manufacturing is shown below.

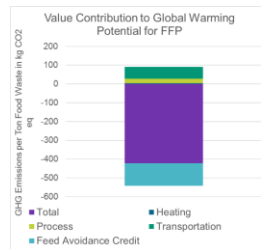


### Research Overview

An analysis was performed to understand both the global and local (New York) factors affecting food waste diversion to feed. In the case of New York, the State has great potential resources for FFP, however, it is currently lacking in both visibility and a motivating factor to incentivize industry growth.

Published literature was analyzed to understand deployment of FFP operations in other global regions, including Japan, Korea, and Europe. Food waste resources available in New York State were then characterized and quantified, and a life cycle assessment (LCA) was performed on an existing FFP operation to evaluate the net impact on greenhouse (GHG) gas emissions. It was determined that the net GHG benefit was -422 kg CO<sub>2</sub> eq. per ton of food waste processed, with by far the largest contribution (82%) associated with avoiding production of conventional animal feed, as shown in the figure below.

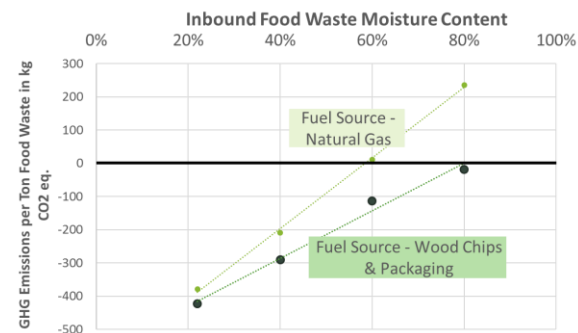
<sup>1</sup>United States Department of Agriculture (USDA), USDA National Nutrient Database for Standards Reference, <https://ndb.nal.usda.gov/>



Type	GHG Emissions Contribution (kg CO <sub>2</sub> eq. per ton food waste)	Percent Contribution
Total	-422	100%
Heating	4	1%
Process	28	4%
Transportation	87	13%
Feed Avoidance Credit	-542	82%

### Impacts

The greater GHG benefit realized with the subject New York State FFP operation relevant to prior studies was largely attributed to the much lower feedstock moisture content in the New York State case. The “break-even” moisture content, i.e. the point at which emissions from FFP operation exactly match the credit from conventional feed avoidance, is strongly dependent on the type of heating fuel used for feedstock drying. For the subject New York State FFP facility using wood chips and scrap food packaging for heating, the break-even moisture content was about 80%. Heating instead with natural gas dropped this critical moisture content to approximately 60%; as shown in the figure below. By changing the fossil fuel based heat source, the window of acceptable feedstocks is reduced. For reference, bread has moisture content in the mid-30% range, semi-soft cheeses such as feta or mozzarella range have moisture levels between 50% and 60%, and raw potatoes are in the mid-80% range. With relatively dry feedstock, the range of GHG emissions for FFP operations is favorable compared to other food waste utilization pathways, including direct feeding to animals, composting, and anaerobic digestion.



Funding provided by the Environmental Protection Fund as administered by the New York State Department of Environmental Conservation. © 2017 Rochester Institute of Technology. Any opinions, results, findings, and/or interpretations of data contained herein are the responsibility of Rochester Institute of Technology and its NYS Pollution Prevention Institute and do not represent the opinions, interpretation or policy of the State.