FoodieCity Investment Fund

Greener city by recycling restaurant food waste into resources

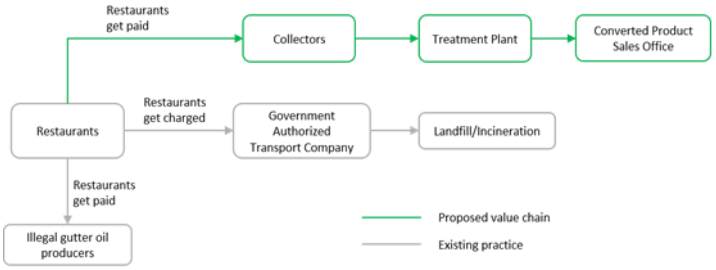
Challenge:

The rapid economic growth in China in the last decades has brought about the rising affluence of city dwellers and the increasing consumption of goods and services. Food waste has become one of the challenges resulting from this economic development.

- It is estimated that China produced 97 million tons of food waste in 2016[1]. Top tier cities with the most developed catering industries are the biggest contributors, such as Beijing, Shanghai, and Guangzhou, and Chongqing.
- The current daily food waste treatment capacity is as low as 5.5% of total food waste. The development of the treatment industry lags far behind the target set in the 12th Five Year Plan despite government subsidies and regulation.
- Most of the food waste ends up in landfill or incineration as a convenient treatment which leads to land salinization and air pollution.
- Some illegal recycling companies solicit food waste from restaurants and process it further into "gutter oil" which is to be used for cooking in low-end markets and producing fake fodder for pig farms, causing heightened concern over food safety and health. Restaurants are incentivized to do so as they get paid by these illegal companies, in contrast to getting charged if they dispose food waste to government authorized waste disposal companies.

Opportunities:

- Compared to the fragmented, small amounts of kitchen waste from households, food waste from restaurants comes in larger quantities due to Chinese over-order culture and is thus exposed to a higher risk of being misused. Therefore, our focus is on collecting and treating food waste from restaurants.
- Alternative treatment methods are available to transform food waste into valuable resources. For instance, waste oil can be treated into biodiesel through chemical reactions; anaerobic digestion can break down food waste and generate biogas; aerobic composting processes food waste into fertilizer of agricultural value. Economic return is achieved at a certain operational scale which relies on a stable supply of food waste with a relatively consistent quality (something which can be obtained relatively readily from restaurants).
- The market demand for biodiesel is promising, with strong support from the government. In its 13th Five Year Plan, the State Council announced ambitious goals to produce 5 million tons of ethanol and 2 million tons of biodiesel by 2020[2].
- The Chinese government is cracking down on the gutter oil industry through raids on illegal waste transportation at night and the regular inspection of pig farms to ensure no fake fodder is produced. Stricter regulation means that it is harder to dispose of food waste through illegal means. Restaurant owners are therefore looking elsewhere to dispose of waste making it easier to secure a ready supply of food waste in large quantities for further treatment.



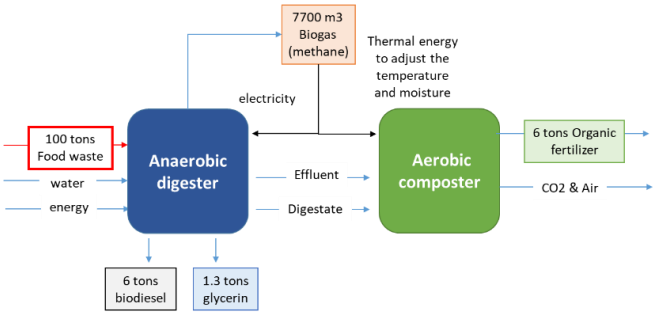
Solution:

Waste disposal plant with capacity of 200 ton/day with integrated digestion (for energy production) and composting technology to maximize the product output. Financial incentives provided to partner restaurants and institutions to secure the quantity and quality of food waste.

Technology applied: Aerobic composting + Anaerobic digestion to increase the useful product and reduce the excess waste.

The integrated system has the following advantages:

- Reduction or elimination of digester effluent treatment. Due to the combined processing technique, end-waste products are minimized.
- Electricity cost saving by direct onsite use of biogas energy
- Conservation of effluent nutrients to increase the value of fertilizer
- Increase in overall plant capacity by producing a portfolio of products and reduction in total footprint by reducing the intermediary process
- During start-up and shutdown periods of the AD system, food waste can be diverted to the composting system



Initial investments of RMB60mn including the purchase and installation of machines, acquisition of land-use rights, building the plants, hiring workers, the design fee, expense for environmental evaluation, etc.

Break-even analysis

Revenue: every 100 tons of food waste could produce 7700m3 biogas which is sufficient for the plant's electricity consumption and thermal consumption. 6 tons of biodiesel could be produced with price fluctuation with the price of gasoline, the average price of which ranges from RMB5000-RMB6000 per ton. Besides, 6 tons of organic fertilizer could be produced with an average price of RMB1000 per ton.

Favorable tax rate with 30% tax refundable the investment in the plant complies with the requirement of the government's support project list

capacity tons/day		50	60	100	200	annualized capcity of 200 tons/day
revenue	disposal treatment subsidy from government per ton	7,500	9,070	15,000	30,000	10,950,000
	sales of biodiesel	195,000	21,769	36,000	72,000	26,280,000
	sales of organic fertilizer	4,500	5,442	9,000	18,000	6,570,000
variable cost	subsidy to the restaurants per ton	7,500	9,070	15,000	30,000	10,950,000
	waste water treatment c	937	1,133	1,873	3,746	1,367,290
	other materials	2,500	3,023	5,000	10,000	3,650,000
fixed cost	depreciation cost	10,959	10,959	10,959	10,959	4,000,000
	maitenance cost	1,096	1,096	1,096	1,096	400,000
	administrative cost	9,000	9,000	9,000	9,000	3,285,000
	other cost	2,000	2,000	2,000	2,000	730,000
total cost		33,991	36,281	44,928	66,801	24,382,290
cost per ton		680	600	449	334	121,911
operating profit		173,009	0	15,072	53,199	19,417,710
tax @ 25% after 30% refund			0	2,638	9,310	3,398,099
net profit			0	12,435	43,889	16,019,611

Considering the variable cost related to the utilization of capacity and the fixed cost of running the plant, the break-even capacity is found at 52 tons/day, which is 26% of full capacity. That is approximately the food waste generated by 306 restaurants assuming waste of 170kg/day. Given seasonal fluctuations, the estimated food waste is discounted by 85%, indicating that cooperation with 360 restaurants is the minimum for break-even.

Monetary incentive for restaurants

To incentivize the restaurants to provide stable and qualified food disposal, contracts with the restaurants would be signed, agreeing an acquisition price of RMB150 per ton for food waste. The RMB150/ton expense will result in break-even production at 60 tons per day.

Partnerships

1. **Government**: franchise agreement as a food waste disposal plant from the government for 20 +1 years (including 1 year construction period)
2. **Commercial customers:** Sell the biodiesel to Sinopec and Petro China as the oil used by gas stations for commercial and passenger vehicles; Reach agreements with the agriculture department and farmers to sell the organic fertilizer to improve the soil quality by increasing the mineral components and beneficial bacteria.
3. **Financial Institution:** Beijing Guidance fund for energy conservation and environmental protection as cornerstone investor.

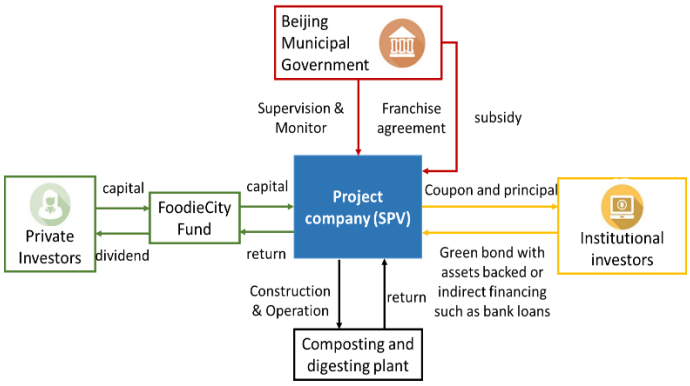
Social Impact

- Recycle 73,000 tons of restaurant waste, which may otherwise have gone into landfill, into 4380 tons of biodiesel, 4380 tons of organic fertilizer and 949 tons glycerin. The energy generated could also provide electricity to the plant and the neighborhood. The estimated economic value of the products is about RMB33mn per year.
- The mineral abundant fertilizer could increase the productivity of soil and increase the income of farmers. The estimated economic value is RMB1,000,000 per year and this helps to ensure China's food security.

- Food safety is improved by providing a solution which suppresses the illegal gutter oil. Gutter oil production should reduce from 3 million tons to 5000 tons. The project also helps to reduce the illegal pig fodder produced by food waste which poses a threat to millions of households.
- Provide a monetary incentive for the restaurants and canteens not only supports local businesses but enables them to do the right things and educates them in differentiating waste into different categories such as waste oil and other waste.
- Improve the image of city by collecting the restaurant waste daily to reduce the smell and pollution from the accumulated waste.

Capital Structure of Public-Private Partnership

Debt tranche:
Bank loan: 1 year RMB30mn project loan to support the construction period of the composting and digesting plant with the pledge of machinery. The estimated interest rate would be 8% p.a.
Green bond: once the construction for the plant is finished and it is operational, the project would be evaluated for the issuance of a green bond. The designed debt tranche shall consist of RMB30mn green bond with coupon rate of 5% in China. The bond would be collateralized with the right to the government subsidy for food disposal treatment of 200 tons/day for 5 years, (value of RMB54.75mn).

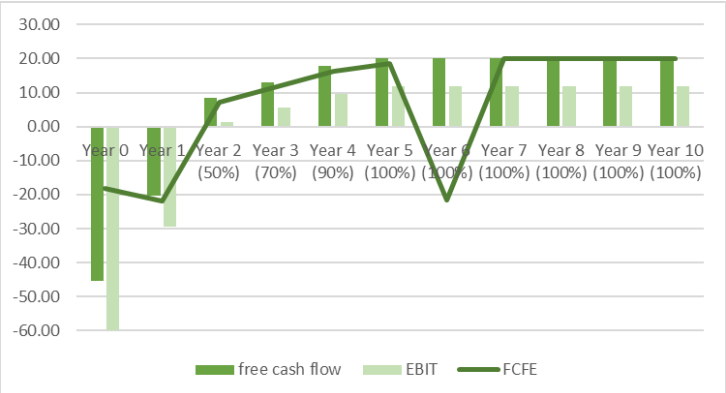


Equity tranche:
The equity investment is injected via the Foodiecity Fund's investment into the SPV of the project. The SPV will sign a franchise agreement and receive the subsidies from the government and the right to operate the plant. The SPV company is also responsible for debt service and the payment of a management fee to FoodieCity Investment Fund I.

Fund term sheet

Fund name	FoodieCity Investment Fund I
Fund Manager	FoodieCity Biotech Capital
Fund Size	RMB40mn
Fund Structure	Double Bottom Line Private Equity Fund
Minimum investment	RMB1mn
Tenor	10 years
Target Investors	Impact investors, Foundations, Institutions
Target IRR	20.46% (gross of management fee)
Fee structure	0.25% management fee + 10% carried (hurdle rate 8%)

Assumption: Withdraw the construction loan of RMB30mn @ 8% p.a. in year 0 and fully repay by the end of year 1. Issuance of RMB30mn green bond at 5% p.a. in year 1 which is due in year 6



Risk and mitigation

Type	Risk	Mitigation
Business Risk	Technological limitations to processing	This project features a cohesive design of different systems including automatic segregation systems, aerobic composters, anaerobic digesters, fertilizer dryers, waste water treatment plant, odor purification system etc.
	Environment pollution risk	The project will comply with the strictest environmental requirements and 3rd party environment evaluation report will be issued and renewed annually.
	Delay of the construction	The estimated construction period is 11 months which might be affected by extreme weather and discrepancy from the investigation report which could increase the cost, delaying the operation and extending the payback period.
	The quality and quantity of disposal might be below projected	The risk is mitigated by providing monetary compensation to the restaurant according to the quantity and quality of the waste and providing education for waste categorization and management.
Financial Risk	Price volatility of the final product	The risk of price change in biodiesel is mitigated by signing 5-10 year supply contracts to municipal bus transport and contracts with Petro China. For the fertilizer, the risk is mitigated by bidding for long term soil improvement projects with the government of provinces such as Gansu, Shanxi
	Delay in issuance of green bond	Project company (SPV) would apply for bridge loan from the bank with the collateral of the fixed assets or the land use rights.
Policy risk	Risk of government cancelling franchise agreement	Project company (SPV) will actively cooperate with the government's monitoring and update processes in accordance with new policies.
	Government subsidy risk	The financial return would be reduced to 18.54% of IRR but it is not materially affected by the government subsidy.

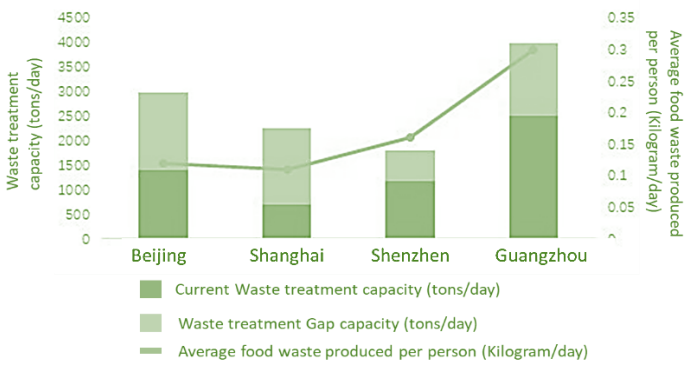
Sensitivity Analysis for the Fund Return

Factors	Variation	IRR (%)
Fixed assets investment	+10%	20.40%
	+5%	20.43%
	-5%	20.50%
	-10%	20.53%
Selling price of the product	+20%	22.22%
	+10%	21.33%
	-10%	19.62%
	-20%	18.81%
Operating costs	+10%	19.91%
	+5%	20.19%
	-5%	20.74%
	-10%	21.03%

Future Addressable Market

According to the research report[3] of restaurant food waste treatment capacity in 2017, there is an evident capacity gap in 1st tier city of Beijing, Shanghai, Shenzhen and Guangzhou. With economic development, the 2nd tier cities including Hangzhou, Suzhou, Nanjing are also supportive of food waste treatment projects. There are many opportunities to apply the successful experience to other potential markets.

Graph: Food Waste treatment capacity and gap in 2017



Source:
[1]https://www.qianzhan.com/analyst/detail/220/170512-c3aeabba.html
[2]https://gain.fas.usda.gov/Recent%20GAIN%20Publications/Biofuels%20Annual_Beijing_China%20-%20Peoples%20Republic%20of_1-18-2017.pdf
[3]https://baijiahao.baidu.com/s?id=1592310906501137672&wfr=spider&for=pc