renew
trash compactor

Acara Challenge 2011
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Executive Summary

Safe food and water are essential to life. In Indian communities such as Padli Gujar, accumulation of waste is posing a threat to the safety of food and water supplies. The renew waste compactor service provides an efficient and profitable way to collect accumulated waste in the communities, and provide income to community members.

The focus of renew is providing logistics for collection and transportation of waste from households to a large-scale recycling plant and providing employment to local lower class villagers. There are around 2600 households in the village, which generate around 3 kg of waste per week per household. The entire community will be broken down into groups of 100 households and each group will be serviced by 1 ragpicker whom we will employ. The compactor service will employ 26 persons total.

These people can be the local unemployed young villagers and the waste pickers whom are already working there. Their tasks will include manual labor, compactor repair, cleaning out compactors, and educating households on using compactor/service/etc. These 26 people will buy 1 compactor per person using micro financing loans. The renew waste compactor service utilizes a waste collector and compactor that our team has designed. Each employee will collect waste from 100 houses per person, separate it into bio-degradable and recyclables and put it into our renew compactor. Weekly collection will ensure that all 2600 households are covered by our renew service. We will hire a transport service (truck having capacity of 5000 kg) on weekly basis. Our 26 employees will put the compacted recyclable waste collected from their assigned households into the truck, which will then take the recyclable waste to the recycling plant.

Approximately 40% of the waste is degradable, which will be composted inside the village only. We have planned to use conventional composting and store the degradable waste at dumping sites in piles. We rotate the waste every other day manually by hired labor. Degradation is carried out with the presence of microbes like E.coli provided by supplementary addition of cow dung, scrap wood and fodder, and dry leaves (to decrease the moisture level to 40%). After a week, we obtain natural fertilizer (compost) and farmers mix this with chemical fertilizers available in market; the compost not only improves the productivity of crops but also lessens the ill effect of chemicals on soil (in the long run, chemical fertilizers decrease fertility of soil).

Rather than having each household take waste and recyclables to the large-scale facilities individually, or allow trash to accumulate in the streets, customers receive a waste collection service from which they receive a small profit. Our report contains detailed financial information that breaks down how we will obtain our monthly profit of 232,400 INR. We believe that our design allows for not only effective collection and organization of waste, but also efficient transportation to the large waste facility. Upon participation, community members will receive a waste collection service that will be both profitable and efficient.
Introduction

Waste in India is an unavoidable problem. Currently, total waste accumulation per day in India reaches amounts over 136,000 tons per day. Per capita waste generation is only about 500 grams per day, but due to the incredibly large population of the country, even small amounts per person manifest into large roadblocks towards development. The quantity of waste is not the only issue – both the current collection services available to the Indian population and household culture of waste generation are lacking sustainable control. Since most waste is not separated at the point of accumulation in the home, issues begin building up right away. This practice prevents valuable, recyclable waste from being reused in most cases.

The second point of concern falls on the funding and availability of collection and disposal services for the waste. Even if the waste is properly separated or accumulated where it is generated, the public services in place typically lack substantial funding and are ineffective. The result is awful consequences, which could have been avoided with simple technologies, and dangerous repercussions to those who live around the ever-accumulating waste. The undesirable constituents of the waste can leach into the soil and water in an area where waste is placed, and as a result many food-borne and water-borne illnesses will plague the local community. Water and food security are already serious enough problems without the adverse effects of waste accumulation. Thus, our group has thrown itself headfirst into the root of the problem, gained knowledge from the partner community, and seeks to solve the issues of this very real problem through efficient and creative planning.

Background Information

Waste management is a large problem in Padli Gujar as well as many other communities in India. Waste will collect in open areas and streets where no houses are located nearby, or in large dustbins placed by Municipal Corporations that are neglected. Currently, large-scale recycling plants reside in large cities like Delhi, Muzaffarnager, etc. Their objective is to collect trash from various vendors located in nearby villages and small cities and convert them into useable products like plastic bottles, paper envelopes, etc. Currently, vendors are only collecting plastic-related waste. They take this plastic and sell it to bigger vendors who then sell it further to a recycling plant. When selling the waste is not an option, trash is burned by local sweepers.

The vendors either collect the trash from streets for free, or purchase it from various households. The current rate for plastic waste from households is 10rs (Indian Rupees) per kilogram. Compare this to the current rate for plastic from vendors to bigger vendors: 12rs (Indian Rupees) per kilogram.

The distance from the nearest recycling plant to the village is approximately 2-3 hours by car, and there is no current recycling system in place in Padli Gujar. Currently, the solution for waste is either truck or tractor collection by the Municipal Court and burning it in areas away from residences. The main reason why there is no current waste or recycling collection system is because there is not enough tax money to support a waste management service. Our renew waste compactor service offers a product that will collect the accumulated waste, and keep it out of the food and water supply.
Trash Accumulated per Household per Week: 2 to 3 kg

**Waste Profile**

- Plastic Bottles: 15%
- Polythene Carry Bags: 30%
- Torn, Old Clothes: 10%
- Wrappers: 10%
- Animal Waste: 5%
- Papers: 5%
- Plants, Rotten Food, and Vegetables: 15%
- Used Commodities: 10%

**Value Proposition**

For villagers in rural India, the **renew** trash compactor and service provides an organized method of waste disposal that allows individuals and families to generate income while improving the environment and ensuring sustainable growth. In all, the compactor service will employ 29 community members with steady income from their work for the recycling and composting service. Due to the low cost of the compactor, the employees will see only a small capital cost to pay for the compactors they will use. The collection of recyclable and biodegradable waste will also result in immediate economic benefit to the families participating, and especially the community members employed by our service. The **renew** trash compactor and service will alleviate the issues of water and soil contamination from waste leaching.

**Business Description**

The **renew** system is a recyclable and biodegradable waste collection service based around efficient accumulation and storage of the waste. Thus, the first hurdle to overcome in creating a feasible product and business plan was the creation of low-cost, readily available, storage containment for household recyclables and waste. The storage product has multiple benefits to meet the team’s goals. The container will be large enough to allow for accumulation (and reduce transportation costs), and also dividable so that recyclables, which are money generating, can be kept separate from biodegradable waste that will be dealt with through composting. This waste is also money generating, but the two must be dealt with separately to have value. The container and compactor will be constructed of nickel-plated iron. This material was selected for simplicity, availability, and sturdiness. The 55-gallon drum container should also have a simple lid to prevent the prevalence of any odor associated with the waste.

The second component of the container is the compaction element and it is far more beneficial. The compactor device is as simple as possible with as few working parts as needed. The goal behind the simplicity of the compactor is to reduce cost and repairs needed, and deliver a simple product that any person can operate with little training. The compactor is manual, and thus needs no energy source other than low-strain human labor to work. The compactor utilizes a ratchet system between the lever arm, the toothed bar, and a slotted pole to drive the “hammer” component. The pole has a flat, semicircular hammer face attached to the bottom to evenly distribute the force of compaction from the ratchet mechanism on the waste.
Considering the length of the lever arm used to drive the hammer, very little work is required of the operator to efficiently and effectively compact the waste. The hammer face is a semicircle due to the separating metal sheet, which cannot be compressed. To simplify design, the hammer face remains semi-circular and the drum can simply be rotated to compact either half of the drum.

The compactor consists of:

1. Base
2. Two small beams for the stand
3. Horizontal beam to hold the hammer and lever
4. Pole and hammer face
5. Bracket to connect the pole to the stand
6. Lever arm
7. Thick bolts to connect lever to stand and lever to ratchet mechanism
8. Special bracket piece housing the ratchet system (spring loaded toothed bar)
9. Fasteners to hold these components together where necessary

Twenty-six employees from the community will be responsible for the compaction and collection of waste in these containers. Each employee will service around 100 households, which will cover the 2,600 families making up the community of Padli Gujar. The compactor will be necessary to ensure all waste – both recyclable and biodegradable – can be accumulated for an entire week, before it is handed to the two drivers assigned to transport the recyclable waste to and from the recycling plant in nearby Muzaffarnagar. Additionally, all biodegradable waste will be handed from the collectors to the drivers, who will take this waste to a specified composting operations area near the community. The composting operations will be overseen by one employee who will manually aerate the compost.

The twenty-six employees will purchase and own their compactors. Our business believes this ownership will encourage the employees to work hard to regain their capital expenditure and give them reason to keep the compactor and container in working order. The two drivers will be employed by the business, but will provide their own truck for transportation, and will pay for gas or any other costs associated with transportation. The twenty-six collectors will be responsible for the security of their compactor and container. There will be one employee responsible for the oversight of composting operations.

Market Information

Community Demographics

In September 2011, renew partners from the India Institute of Technology in Roorkee, Delhi went to multiple villages including Padli Gujar observing and researching the way waste was accumulated and dealt with. Padli Gujar has around 2600 households, which generate around 3 kg of waste per week per household. According to the locals, there are only two forms of service that clean waste in these villages. These include rag pickers who later sell waste for money and the local Municipal Corporation who collect the waste in trucks or tractors and burn it outside of residential villages. Because of this, waste is neglected and builds up causing many problems for the people and the environment, including contaminated water and waste borne diseases.

Community Perceived Need

When renew partners from the India Institute of Technology asked the people of Padli Gujar what their
1. It will generate profit because of the money accumulated from selling waste
2. Educates the people of Padli Gujar about waste
3. Creates new jobs
4. Brings the community together to achieve a common goal
5. Results in a safer and cleaner environment
6. Will provide villagers with a sustained income and great opportunities for expansion while maintaining low operating costs

Customer Segments

renew will provide services for three customer segments: the 29 employed and paid members, the people who live in Padli Gujar, and the recycling companies in Delhi. The 29 employees with benefit from a new source of reliable income. The people of Padli Gujar will be provided with a cleaner environment and the recycling companies will be receiving a new source of resources from our employees.

Marketing Plan

Because the success of our project relies on consumer buy-in and participation, it is essential that we develop a successful method of marketing our product and service offerings. We need to engage residents of the village, educate them on the benefits associated with the renew trash compactor, and convince them to utilize the product. Beyond that, we need to make sure that the waste is collected in an organized, timely manner. Our target consumers are accustomed to life without recycling and small mistakes could ruin our brand equity and the consumers' willingness to participate in the program. Below is a schedule of marketing and educational initiatives aimed at improving awareness and recruiting new participants.
First 6 Months:

During the first six months of implementation, we will focus on recruiting participants and educating them on proper methods of waste disposal, how to use the renew trash compactor, and how to collect their earnings. We will focus on a small group of people and use their feedback to improve and alter our offerings. Signs will be posted throughout the village encouraging individuals and households to get involved.

Second 6 Months:

We will focus on both individuals and households and work to increase our return on investment. We will begin to divide different households into 26 separate segments and work to create a collection schedule. We will rely on word-of-mouth advertising to promote our cause.

Year Two:

Ideally, a majority of the households in the village will be serviced by our employees within a two year time frame. The service will be fully functional and our product and service offerings will, undoubtedly, evolve.

Year Three:

After two years of operation, we will take what we have learned and apply it to surrounding villages and communities. Hopefully, our initial success and impact on the village will provide us with the tools necessary to serve a large number of people.

Competitive Analysis

There are no other services in place in Padli Gujar. Waste disposal is left to the individual and, in most cases, they are uneducated as to how to properly dispose of recyclable or other inorganic waste. Our company will not have any major competitors during the product launch phase. However, it is our hope that the success of our business model encourages others to provide a similar service offering.

Risks & Assumptions

Replication of Service or Product

Considering the intentionally simple design and service provided by our business, renew believes that some entrepreneur may attempt to replicate the compactor container designed to accumulate recyclable and biodegradable waste. The risk of replication is a concern as it would take away from the profits of our business. Our business believes that through our community approach to the waste problem, a few replicators will not be able to make a significant impact on their own. The efficient, streamlined method by which our 26 employees will collect recyclable and compostable wastes will ensure the success of our business over imitators.

Lack of Community Interest

Since the community currently does not recycle or compost, for the most part, there may be a lack of interest in participation. Our business believes that although the additional income generated by each household is small compared to the income made by the employees collection services, this simple way to make additional money for a family will prove enough. The return on participation is a high considering participation takes little effort, and the employees deal with the waste from the household to the recycling or compost plant.
Lack of Recyclable or Biodegradable Waste (supply or demand)

If the amount of recyclable and biodegradable waste was overestimated, our business stands to make less money than expected. This assumption of waste supply could have easily been overstated. A lower amount of waste would mean that the compactor would not be a valuable portion of the service. Our business believes that, considering the massive amounts of waste currently lining streets in the community, there will be very little chance of not having enough waste available. Conversely, if there is a lack of need for manure or recyclables, our business would not be able to sustain itself. Fortunately, recyclable plastic is always in high demand, and agriculture accounts for a large majority of jobs in rural communities.

Potential Operational Issues

Willingness of Ragpickers

We will employ ragpickers in order to give them the option of having more controlled conditions, support from a stable organization, as well as a steady source of income.

Working Conditions and Safety Hazards

We want to incorporate an environment for the employees that is safe and healthy. We will achieve this by educating the employees before they start working in the field. We think it is incredibly important that each employee fully understands what materials they are working with. They will take classes on how to identify different types of waste, as well as how to handle them and organize them so that they can be disposed of properly.

We will require that the employees use equipment that will protect their bodies and prevent them from the risk of contracting waste borne diseases. This equipment will include gloves, facemasks, proper footwear, and a variety of full body suits.

We will also require that they use the proper products to protect them from the sun such as sunscreen and hats. We want them to expose as little skin as possible and to stay fully hydrated throughout the workday. Each employee will have a certain amount of water available to them depending on their workload for the day.

Employees will have a number of tools available for them to use in order to collect the waste and to make handling each material as safe as possible.

Each employee will be required to sign an employee terms, conditions, and rules document that will include protection for the employee in the company as well as anti-harassment regulations.

In Case of Injury

If an employee is injured on the job, assuming that we could not have prevented the incident by following safety procedures, the renew company will insurance for the employees and the compactors to help ensure a quick and complete recovery.

Cleaning and Maintaining Equipment

The renew team must ensure that all of the equipment is in incredible condition. We will teach the employees how to use them properly so they do not get damaged, as well as how to repair them if they lose functionality. The tools and equipment must be cleaned properly and on a regular basis. They will be cleaned with water and other cleaning supplies at the base building where all of the...
tools will be stored. This location will most likely be near the compost site.

Transportation

The trucks that will be used to transport waste will be employee owned and operated. Therefore, it is the employees’ responsibility to maintain quality vehicles and to pay close attention to our predetermined safety regulations. The company will have regular maintenance and sanitation checks on the trucks and equipment. Renew employees will pay for the gas that is used to bring all waste to the recycling and compost facilities.

Financial Analysis

The renew service is designed to require a small initial investment and to be financially sustainable for all those involved. The funding we receive from the Acara Institute will be used towards a multitude of different things. First, it will provide our team members with the opportunity to travel to India and begin implementing our concept. It will also help fund our participation in the Acara Summer Institute. Remaining funds will be used towards the purchase of educational materials, marketing collateral, insurance, land rental, and employee wages.

Many of these costs will occur upon arrival. Once we have created an initial network of employees (5 of the 29 total employees), and have established a relationship with the local recycling facility, we will embark on our journey towards becoming a fully functional, profit generating organization.

The flow of money is as follows. Households will receive 3 Rupees per kilogram of waste collected. They will give their organic and nonorganic materials to our employees who will, in turn, compact them into a more manageable load and transport them to our facility. They will be given a higher rate of return for each kilogram of waste collected. The margin of difference becomes their individual wages. Our drivers will then transport the waste to the local recycling facility. The money we receive in return will be used for operational expenses, rental fees, insurance, marketing and promotions, and wages for the compost coordinator, drivers, etc.

To avoid high upfront costs, we will ask our employees to provide and pay for some, if not all, of their equipment. Waste collectors will purchase the renew trash compactors and it is up to them to maintain and clean the device. Drivers will use their own vehicles and pay for any fuel, maintenance, or other associated fees.

According to our detailed financial analysis, our business will become profitable within the first year of operation. The revenues associated with both compostable and recyclable waste will provide our employees with a steady source of income. We expect the renew service to grow within the village of Padli Gujar and, eventually, throughout villages in rural India.

This concept is financially sustainable and, therefore, will benefit all those involved for a very long period of time. It is simple, yet refined and will undoubtedly impact the issue of waste management in and around our targeted area.

For a more detailed financial analysis, please reference our Pilot Phase Financial Worksheet, located in the appendices.
Social Benefit

Our team has designed and developed the renew trash compactor service in line with the mission of the Acara Challenge: “to develop sustainable business solutions that address global societal challenges.” Our product and service model offer a great benefit to communities. renew’s value proposition offers a solution to waste management problems in both urban and rural communities. renew’s goal to provide efficient and profitable waste collection services has the potential to diminish the threat that waste poses to water and food security. Our team believes that a possible result from our renew trash compactor service is the influence it may have on government decision-makers to increase waste collection and beautification projects in communities. The renew trash compactor service intends to greatly impact the communities we serve. Upon completion of renew, the communities will be receiving an adequate waste collection service that is profitable to the households and that generates jobs for community members. The team that has worked together to create the renew trash compactor service has developed a new approach to solving the waste contamination issue affecting the food and water supplies in Indian communities.

Pilot Phase Outline

The renew trash compactor initiative will require a huge amount of planning, research, implementation, and various methods of continuous improvement. Below is an outline of the steps that will need to take place in order for our business to exist and, eventually, to flourish.

Assuming our group has the opportunity to implement our ideas, we will immediately begin the next phase of research and planning. One or more of our group members will travel to India to establish connections, make observations, and to ensure the success of the overall project. We will contact materials suppliers in India and determine how much of each element will need to be purchased. The individual compactors do not cost much to build, but creating the first batch of them will require materials, a monetary investment, and a skilled manufacturer. We will also need to develop a training program for our employees. Ragpickers will need to be screened, hired, and educated on our processes. It is important that we find employees who identify with our cause and who will represent our company to the best of their ability. Without a positive public image, it will be impossible to convince villagers to buy in.

We will also need to hire drivers, a compost coordinator, and a supervisor. This individual will oversee the business once we have returned home to Cincinnati. They will be our main source of information and the person responsible for implementing change and keeping everything in order.

During our time in India, we will finalize the training/educational element of our business. We will locally source materials to create informational pamphlets, banners, vehicle decals, etc. We will attempt to host at least one training session in the village before we depart for the United States. Because our long-term success depends on the amount of impact we are able to generate, it is essential that we are well prepared and open to suggestions and feedback.

Once the compactors have been created and dispersed among our employees, the marketing materials have been distributed, and the training sessions complete, we
will return to Cincinnati where we will continue to oversee the program. We will meet with the program supervisor once a week (or perhaps more often) to ensure that everything is under control. We will collect feedback on the functionality and frequency of use for each compactor. We will also measure how popular the service becomes throughout the village of Padli Gujar. If the villagers remain unconvinced that this is the solution to their living conditions, we will refocus our efforts and continue the training and recruitment process. If, on the other hand, villagers are willing to commit to this safe and simple method of waste disposal, we will begin to expand our program to more households, more villages, and more regions in India.

Waste management is a major issue in India; one that cannot be avoided any longer. Because there are not many services like the Renew Trash Compactor, it is important that we focus on the development of the program early on.

Funding Request & Next Steps

The renew trash compactor service has an incredible amount of potential. Up front costs are relatively high, but according to our break-even analysis, we will recover our initial investments within the first year of operation. During this time, we will establish an infrastructure and a system for the safe and educated removal of waste.

Based on our research, product development, financial and market analysis, and the social need for our service, we are requesting funding from the Acara Institute. We truly believe that the renew trash compactor will benefit not only Padli Guhar, but all of rural India.
Appendix

renew
trash compactor
Demographic of Village, Recycling Plants, and Waste

After research and conversations with our team members in India we were able to collect the information we needed to approach the problem and find a practical and applicable solution. This included the demographic of the village, information on nearby recycling plants and their process, and the actual waste in the village as well as how it is currently dealt with.

**Main Occupations:** Manual Labor and Agriculture  
**Population:** 24,000  
**Population of Men:** 11,000  
**Population of Women:** 13,000  
**Literacy Rate:** 70% (10th Standard Pass)  
**Average House:** Made of Concrete, Cement, and Brick. Typically containing 2-3 rooms.  
**Typical Transportation:** Bicycles and public transport (buses and trains)  
**Work Commute Distance:** Agricultural workers travel to farms outside of village and laborers travel to nearby cities 1-2 hours away.  
**Common Illness/Diseases:** Waste and water borne diseases  
**Locations for Purchasing Food and Water:** Food inside village or in Roorkee, Water is collected at boring systems  
**Villagers Largest Issues:** Waste and lack of drinking water  
**Government Structure:** Elected ‘Pradhan’ Leader and committee  
**Location of Recycling Plants:** Large Cities like Delhi, Muzaffarnager, etc.  
**Recycling Plants Objective:** Collect trash from various vendors located in nearby villages and small cities and convert them into useable products like plastic bottles, paper envelopes, etc. Currently vendors are only collecting plastic related waste. They take this plastic and sell it to bigger vendors who then sell it further to a recycling plant. At times, trash is burned by local sweepers.  
**Where do Vendors Find Waste?** They collect the trash from streets for free or purchase it.  
**Current Rate for Plastic Waste from Households:** 10rs (Indian Rupees) per kilogram  
**Current Rate for Plastic from Vendors to Bigger Vendors:** 12rs (Indian Rupees) per kilogram
Demographic Information (continued)

Distance from Nearest Recycling Plant to Village: 2-3 hour drive
Current Recycling Service Available: None
Current Solution for Trash: Municipal Court collects trash in truck or tractor and burns it in areas away from residential area.

Group Responsible for Trash Collection Service: Municipal Corporation
Cause for No Current Recycling Service: Municipal Corporation uses tax collections to pay for cleaning service but because of the poor people there is not enough money to support a cleaning service.

Locations of Collected Trash: Open areas and streets where no houses are located nearby or in large dustbins placed by Municipal Corporations that are neglected.

Waste Accumulation Location: After built up waste is displaced by local people or government body or consumed by stray animals.

Trash Accumulated per Household per Week: 2-3kg

Waste Profile:
- Plastic bottle – 15%
- Torn old clothes – 10%
- Animal waste – 5%
- Plants/rotten food/vegetables – 15%
- Polythene carry bag – 30%
- Wrappers – 10%
- Papers – 5%
- Used and thrown commodities – 10%

Raw Materials:
- Plastic
- Clothes
- Plants/rotten food/vegetables
- Paper
- Animal/human waste
- Rubber

Source of Waste:
- Packaging
- Used and crushed plastic bottles
- Wastes thrown from Households/small factories – clothes, slippers, shoes, plastic, crockery
Problem Scope

The information gathered from visits to the villages and interviews with the villagers indicated that the greatest problem in the area is waste disposal. This relates to the “Food and Agriculture” theme of this year’s challenge because the waste in the village poses a huge threat to the agricultural fields and water supply. With adequate disposal of waste, the agriculture and water will be safer from contamination. The scope of the problem can be focused into two areas: (1) Containment of waste at a household level and (2) Collection of waste at a community wide level.

1. Containment of waste at a household level

This section of the problem scope encompasses how waste will be contained. Our group had to consider many things when developing this aspect of our product. For instance:

- How will the waste receptacle be designed?
  - Size, shape, dimensions, capacity
  - Material
  - Aesthetics
- How will the receptacle be maintained, cleaned, and emptied?
- What is the function of the receptacle?
  - Storing
  - Compacting
- What mechanics/moving parts are involved with the receptacle?
- Who owns the receptacle?
  - Do families buy the receptacle?
  - Or, is it owned by a larger program?
- How will the waste be organized within the receptacle?

Product Description & Design

The importance of the compactor is manifold. First, the system serves to store the waste and recyclables accumulated as efficiently as possible. The straightforwardness of the compactor’s operational use, coupled with its energy free design, makes this product easily accessible and immediately implementable. Second, the compactor and container prevent a significant portion of the waste found on the streets. The slow response time of the Municipal Corporation can then be accommodated by a reduced supply of waste to the two dumpsters in the village. The absence of this waste will eventually increase soil and water quality, as no leachate from the waste will infiltrate the land or water sources. The third benefit of this system is efficiency in transportation on the supply end. Those employed to transport the recyclables and waste to and from the recycling plant will take less, more valuable trips. The drums, filled with compacted material, can be further consolidated from house to house, ensuring the maximum amount of profitable recyclables will be transported.
Product Design (continued)
Product Design (continued)
Inspirational Design Target

In order to gain perspective and insight into our target consumer, our team developed an inspirational design target (IDT). We used our IDT to inspire the product, elements of the service, a visual identity, and our marketing plan. Below is a description of our target consumer and a visual representation of her lifestyle.

Shefali

Shefali is the mother of two children and a loyal wife. She lives in the village and earns an income doing agricultural work. She and her husband sell crops and milk from their livestock. Shefali purchases sachets and other packaged goods on a semi-regular basis and does not have an organized method of waste disposal. She is unaware of the detrimental effects that of waste and would love the opportunity to earn extra income.
Online Resources

When researching our problem, we came across several websites that encouraged us. These websites show some successful models of trash collection in India. Our model of trash storage and collection will be different, but it was still encouraging to see that this project is a definite possibility.

Background on India’s Ragpickers

These articles provided us with insight into the current waste disposal system in India. In India, there are people known as “ragpickers” who make a living by recycling waste. This way of life is very common in urban areas, and it is typical for children to be ragpickers. These article classify three different types of ragpickers: those who go door to door, collecting and disposing of waste from individual homes, street children who collect waste left in the road, and whole families who make their living by sifting through urban dumps to reclaim garbage. The various types of ragpickers collect recyclable materials such as glass, metal and plastic. The recyclables are then sold to scrap dealers, who process the waste and sell it on, either to be recycled or to be used directly in industry. A salary of $1 a day is normal for a ragpicker; since it is an unregulated industry, there is only an expected monthly donation of 10 rupees, or 25 cents. India does not have a municipal waste management policy and no program of recycling, which means that the work that the ragpickers do is extremely valuable. As of now, there is no governmental support or protection of the ragpickers.

Waste Collection Ventures
http://www.wasteventures.org/

Waste Ventures is an organization, based out of India, that nurtures solid waste management companies owned and operated by waste pickers. Waste Ventures provides smaller solid waste management companies a blueprint to recycle, compost, and earn carbon credits from waste collected in addition to organizational assistance in devising a profitable business that can attract commercial investment. In this manner, Waste Ventures is transforming the way garbage is handled all over the developing world into a more environmentally and socially friendly process based on market mechanisms.
Team Bios

Below is a list of our team members, professors, and mentors.

University of Cincinnati

Mark Schutte, Civil Engineering
Morgen Schroeder, Civil Engineering
Carmen Osterman, Fine Arts
Autumn Utley, Marketing and International Business

IIT Roorkee

Akhil Jain, MBA
Ankur Kukal, MBA
Lavlesh Shukla, Civil Engineering
Ankush Agrawal, Industrial Engineering

Professors

Ratee Apana, UC
Rajan Kamath, UC

Mentors

Shawn Hanson, Microsoft
Map of Village
## Detailed Financial Analysis

### Summer Institute

<table>
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<tr>
<th>Activity</th>
<th>Expenses</th>
<th>Revenues</th>
<th>Matching Funding</th>
<th>Basis of Estimate</th>
<th>Comments</th>
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</table>

### Year 1 (after a pilot)

- **Expenses (1st month of Y1)**
  - Educational Materials: 250.00
  - Employee Wage: 700.00
  - Household Wage: 276.92
  - Waste Transportation: 250.00
  - Composter Costs*: 120.00
  - Rent of Land: 40.00
  - Insurance: 90.00
  - **Total:** 1,606.92

- **Expenses (2nd month of Y1)**
  - Educational Materials: 0.00
  - Employee Wage: 1,400.00
  - Household Wage: 600.00
  - Waste Transportation: 250.00
  - Composter Costs*: 840.00
  - Rent of Land: 40.00
  - Insurance: 160.00
  - **Total:** 2,450.00

- **Expenses (3rd month of Y1)**
  - Educational Materials: 0.00
  - Employee Wage: 2,200.00
  - Household Wage: 969.23
  - Waste Transportation: 250.00
  - Composter Costs*: 960.00
  - Rent of Land: 40.00
  - Insurance: 240.00
  - **Total:** 3,699.23

- **Expenses (4th month of Y1)**
  - Educational Materials: 250.00
  - Employee Wage: 2,700.00
  - Household Wage: 1,200.00
  - Waste Transportation: 250.00
  - Composter Costs*: 600.00
  - Rent of Land: 40.00
  - Insurance: 290.00
  - **Total:** 5,730.00

- **Expenses (Next 8 Months)**
  - Employee Wage: 21,600.00
  - Household Wage: 9,600.00
  - Waste Transportation: 2,000.00
  - Repair/Maint. Overhead*: 1,000.00
  - Rent of Land: 320.00
  - Insurance: 2,320.00
  - **Total:** 35,940.00

*Matching funding refers to any matching funding you may have received. Revenue is sales or revenue received for something your team is providing. Possible Funding includes airfare, lodging, food, local transport.
## Detailed Financial Analysis (continued)

<table>
<thead>
<tr>
<th>Financial Needs</th>
<th>Expenses (US Dollars)</th>
<th>Revenues (US Dollars)</th>
<th>Matching Funding</th>
<th>Basis of Estimate</th>
<th>Comments</th>
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<td>From Recycling</td>
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<td>Revenues (1st month of Y1)</td>
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<tr>
<td>From Recycling</td>
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<td>include all expenses; including salary or living expenses for you, etc.</td>
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<td>Revenues (Next 8 Months)</td>
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<td>-6,579.00</td>
<td>0.00</td>
<td>8,000.00</td>
<td>Based on inefficiency in the beginning</td>
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<tr>
<td>1st Month of Y1 Summary</td>
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<td>1,153.85</td>
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<td>No profit from compost</td>
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<td>2nd Month of Y1 Summary</td>
<td>-7,032.08</td>
<td>2,592.31</td>
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<td>No profit from compost</td>
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<tr>
<td>3rd Month of Y1 Summary</td>
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<td>No profit from compost</td>
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<td>4th Month of Y1 Summary</td>
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<td>Next 8 Months Summary</td>
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<td>Does not include $3000 from Acara Finalist winnings</td>
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