COMBATING PERIOD POVERTY IN WEST BENGAL, INDIA USING COMPOSTABLE JUTE PADS

SPECIFIC AIMS:

Menstruation is a reality in the world around us, and even today, menstrual products are treated as luxuries rather than necessities. A study in Obstetrics & Gynecology demonstrated that 64% of women reported ever having difficulty affording menstrual products, such as pads, tampons, or reusable products like menstrual cups.[16] The concept of period poverty is something menstruators around the world have gone through for a long time, but it is a critical problem in need of imminent solutions. Period poverty is defined as “inadequate access to menstrual hygiene tools and education, including but not limited to sanitary products, washing facilities and waste management”.[2]

Merely 36% of India's 355 million menstruating female population use sanitary towels for protection, and an estimated 70% of all reproductive health issues are caused by poor menstrual hygiene.[7] According to Feminism India, those who cannot afford menstrual products resort to unsafe alternatives such as “rags, hay, sand and ash,” which can lead to infections. Period poverty is a continuing issue in India due to the cultural stigma surrounding menstruation. In India, research has indicated that 71% of girls do not have “knowledge of menstruation before their first period.” This lack of knowledge and stigma surrounding menstruation has led to one out of every five female students dropping out of school once menstruation begins. In addition, more than 40% of female students in India choose not to attend school during their menstrual cycle due to the inability to access menstrual products to properly manage their menstruation coupled with the social stigma menstruating girls face at schools.[3]

Period poverty is a major factor of gender inequality in West Bengal, India. Economic vulnerability, lack of awareness, and poor hygiene standards have all led to rampant period poverty. Lack of menstruation education has led to an increase in illnesses and deaths among people who menstruate. Due to lack of access to menstrual hygiene products, UTIs and other treatable infections often result in fatalities[33]. Approximately 70% of all reproductive diseases in India are caused by poor menstrual hygiene[17]. As a result of a lack of education and readily available resources, over 23% of Indian girls drop out of school when they start menstruating. Over 77% of people who menstruate in India use old cloths, which are often reused, and 88% of people who menstruate sometimes resort to using ashes, dried leaves, husk sand, and newspapers to absorb menstrual blood. These poor hygiene practices increase the risk of infection.[18]

The goal of this proposal is to create an initial, scalable, prototype of a compostable jute menstrual pad and then test and revise the design of the pad through the human-centered design (HCD) process. We will interview users across age groups, from menstruators who have just experienced menarche to people who are going into menopause. The pads will be compostable both to help farmers easily and cheaply access a natural fertilizer, but also to allow for discrete and hygienic disposal of pads after use.[33] After refining the product, we will create easily-operable machines to produce these pads and provide these machines to an Indian non-governmental organization (NGO) that already distributes menstrual products. Our long-term goal is to implement the production of affordable, hygienic, biodegradable menstrual pads in West Bengal made from materials local to the area, specifically jute, such that they are accessible to impoverished menstruators and can be composted to fertilize local crops.

Aim 1: Introduce pre-manufactured menstrual pads into target regions and quantify comfort and usability before local manufacturing.

Our working hypothesis is that a human-centered design approach during the first phase of our proposed process will allow the team to make adjustments to the product design and manufacturing process before moving on to phase 2, where the actual machines and pads will be distributed.

Aim 2: Distribute machinery to create jute sanitary pads and mechanisms to give them to village women in Jalpaiguri, West Bengal.

Develop a machine and give machines to Goonj, an NGO that already provides pads to women, that will provide three machines to three villages so that local women can create their own pads.

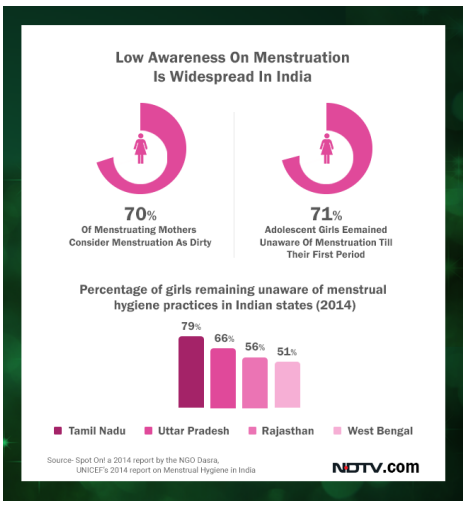
2. SIGNIFICANCE

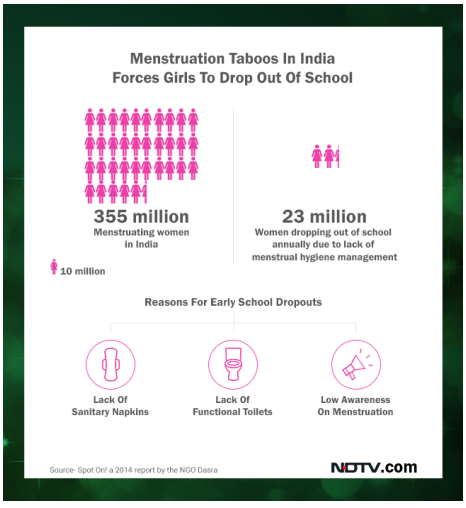
2.1 Period poverty is a widespread issue worldwide impacting a significant amount of the global population and requires urgent attention.

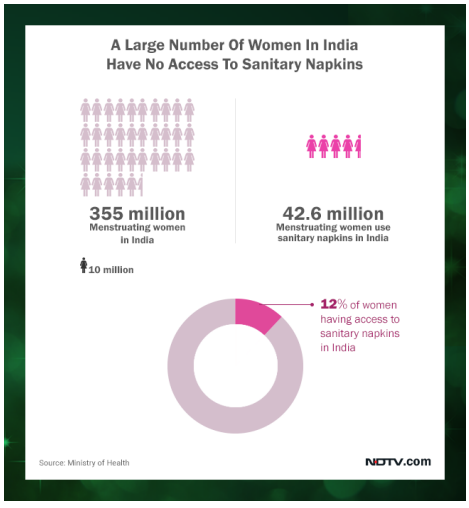
The American Medical Women's Association defines period poverty as the inadequate access to menstrual hygiene tools and education, including but not limited to sanitary products, washing facilities, and waste management.[1] While the term period poverty is relatively new in medical literature, menstrual hygiene management has been discussed for decades in the context of the gender gap in education for youth living in low- and middle-income countries.[2] The lack of access to menstrual resources impacts menstruators' health worldwide, and potentially leads to severe disorders and the risk of death. 23 million girls in India drop out of school each year when they begin their period, those who remain in school might miss up to 5 days of school each month during their period. Hence, there is an urgent need for a three-pronged human-centered solution to this problem in the highlighted zone of West Bengal, India, centered on *access, awareness and affordability*.

2.2 The lack of awareness and education around menstruation in India has led to significant period poverty in the region.

One out of five female students in India drops out of school due to menarche, or the onset of menstruation. Coupled with the total lack of education towards menstrual health and hygiene in school or society, this leads to increased potential of risk towards diseases or infections that period poverty or lack of access to menstrual products brings to women. In the context of the gender gap in education for youth in India, it is essential to bring about a significant change in the way menstrual health is addressed in educational and social spaces in the specific state of West Bengal. A study has found that 71% of girls in India report having no knowledge of menstruation before their first period. This unpreparedness leads to shock, fear, frustration at the situation and anxiety, and that often results in school dropouts.[3]







2.3 The need to combat the lack of financial resources in West Bengal that restrict menstruators from obtaining or purchasing menstrual products.

In 2018, India declared tampons and sanitary napkins tax-free, but most sanitary pads cost between 5 to 12 rupees (8 cents to 20 cents) per pad, which is a luxury for the nearly 800 million people who live on less than $1.90 a day.[4] Despite the cut in taxation, menstrual products are still priced at high rates, with most women in low-income and middle-income areas unable to afford the products. Thus, there is significant need for the creation, development and support of a product that can be offered at subsidized rates or sponsored to menstruators in these regions.

2.4 It is important to eradicate the stigma surrounding menstruation in West Bengal, India by enabling schoolgoing menstruators to educate themselves on the concept and form their perspective on menstrual health and hygiene.

The concept of periods and menstruation is surrounded with stigmas and mythical beliefs that hinder menstruators from reaching full understanding and acceptance of the processes their systems are going through. Menstruators are told they are “impure”, are often aggressively shamed, and can be excluded from family dining, work, and other activities while they are on their periods. The lack of education extends to school too, where menstruating girls tend to take 6 days off a month for menstruation through shame and fear of discovery. Stigmas and norms related to menstruation can reinforce discriminatory practices. Menstruation-related barriers to school, work, health services, and public activities also perpetuate gender inequalities.[5]

2.5 Period poverty has significant medical implications that are potentially life-threatening.

Period poverty is also a major cause of increased illness and possible deaths among menstruators. With minimum access to menstrual products, lack of medical care, and poor menstrual hygiene, diseases like UTIs and other infections often end up being fatal. Furthermore, malnutrition, which even in 2021 is a serious issue in India, often impacts the health of menstruators severely.[3] It is also important to note that in the lack of access to safe menstrual products, menstruators unable to afford them end up resorting to unsafe alternatives such as “rags, hay, sand and ash,” which can lead to infections. There are also many girls in the world who do not have access to clean water, making it difficult for them to hygienically manage their period. UNICEF has also established that period poverty can negatively affect mental health, with women who suffer from period poverty being more likely to report moderate to severe depression. Additionally, girls who cannot afford period products may try to prolong their periods by skipping meals or taking medication. This can lead to anemia and other health problems, as well as a negative attitude toward food.[6]

3. INNOVATION

3.1 To address period poverty in West Bengal, biodegradable jute pads may be manufactured locally and distributed in schools.

Pads will be produced by the Indian menstrual health nonprofit, Goonj, in West Bengal using manufacturing machines. The pads will be composed of locally grown jute fiber. These pads will then be distributed to surrounding villages through their schools. Each school will establish a common pickup area, such as a closet, shelf, or storage container. This pickup location will contain the disposable pads in covert packaging, such as an unmarked paper bag. Students will be able to take period products for themselves, as well as bringing home products for other menstruators in their families. Schools that choose to do so will participate in a composting program, wherein the used menstrual pads may be composted to fertilize soil. This option may also be used by family households to support family agriculture and/or kitchen gardens.

3.2 Pads are the optimal sanitary product for distribution due to social conditions of West Bengal.

Some period products conflict with cultural virginity standards that exist in India. Many families instruct their daughters not to use products that require vaginal insertion before marriage.[25] In the Kanjarbhat community, marriages must be validated through a “white bedsheet” test, in which a newly married couple has intercourse on a white bedsheet. Afterwards, the husband must show that there is a bloodstain on the sheet, the result of a broken hymen, to prove the wife’s virginity.[26] This cultural expectation (although the white bedsheet test is specific to the Kanjarbhat) leads women to serious reservations about vaginal insertion products such as tampons and cups. According to Malini Parmar, an Indian menstrual product entrepreneur, “mothers in urban, upper middle class households are less worried about their daughters losing their virginity and more about the discomfiture cups or tampons might cause because they involve vaginal insertion.”[25] Pads, on the other hand, are more universally culturally acceptable because they do not require vaginal insertion.

Additionally, tampons and cups are more difficult to teach and to use than pads. Only a small percentage of Indian women use tampons or cups, approximately 2% in Chennai.[27] As a consequence, most young menstruators would be unable to rely on their mothers to teach them and assist them where necessary as they learn to use the products, eliminating a significant contact point in most menstruators' education. The other major method of menstrual education is through school programs. A detailed explanation of vaginal insertion products, as would be required from a school program would violate many of the same aforementioned taboos. Comparatively, pads are easy to use and easy to teach. Approximately 97.6% of women in Chennai have experience using sanitary pads, meaning mothers would be more capable of teaching their children to use pads. Pads also require less explanation and are an easier adjustment for new menstruators (a significant portion of the audience for this solution, as distribution is centered around schools) because they do not require vaginal insertion.

3.3 Producing disposable pads from jute fiber is economically beneficial and allows the pads to be composted.

With 70 jute mills, India is the world's largest producer of jute. 60 of those mills are located in the state of West Bengal.[30] Locating this project in the center of the world's jute production results in more affordable products as transportation costs are minimal. This helps `to address the issue of menstrual pads being unaffordable. Manufacturing pads from jute is also economically beneficial because it supports the local economy by giving business to jute producers, therefore stabilizing jobs for the same working class people in West Bengal the pad program is designed to help.

In 2022, the US experienced a months-long tampon shortage due to supply chain issues sourcing cotton and rayon. Cotton and rayon were in high demand for use in medical devices, making tampons either too expensive or altogether impossible to find. The shortage disrupted the lives of many who were unable to obtain the period products they needed. The use of jute helps circumvent this potential issue by eliminating cotton, a product for which demand has exceeded supply for three straight years.[31]

Most mainstream pads and tampons are heavily composed of plastic elements such as rayon, making them nonbiodegradable and harmful to the environment.[28] Jute, on the other hand, naturally decomposes at a faster rate than other common fibers and so is well suited for composting.[29] Composting pads both reduces plastic waste and fertilizes soil, essential for the agricultural economy of West Bengal.

3.4 Distributing pads at no expense in schools maximizes access and incentivizes girls to stay in schools.

Menstrual products sold in stores frequently do not reach women who need them because the products are expensive. A menstrual pad can cost roughly three times as much as a meal in India, making the cost unreasonable for families of daily wage laborers.[32] Offering products for free at schools removes this cost barrier. Additionally, because menstruation is a heavily stigmatized topic in the region, discomfort publicly requesting or carrying menstrual products is another barrier to their distribution. Schools are protected environments in which a student could more comfortably take products. Covert packaging allows the students to carry products without exposing themselves to stigma. School distribution also addressed the issue of dropout rates. 23 million women in India drop out of school annually when they begin menstruating, primarily due to a lack of clean toilets and access to period products. Placing distribution in school incentivizes girls to stay in school to continue their access to period products.

4. APPROACH

Aim 1: Introduce pre-manufactured menstrual pads and manufacturing machines into target regions and quantify comfort and usability before local manufacturing.

Human-centered design is essential when creating products, so this process will be used to improve the jute pad and the jute pad manufacturing machine designs. The end-users, including school-aged children and older, adult menstruators will be sampled to test the pads. Workers that will be hired to create the jute

pads will be sampled to test the manufacturing machines. These inquiries will ensure that the pads are both user-friendly and cheaply producible. The working hypothesis is that the jute pads will be rated as easily usable by at least 80% of the randomly sampled end-users and can be manufactured easily by local Goonj workers.

Milestone 1.1: Perform inquiry study on end-users to quantify and qualify perceived usability and comfort of the pre-manufactured jute pads.

This inquiry will be conducted at 3 primary and 3 secondary schools that serve villages as well as 2 villages in Jalpaiguri, West Bengal in India. At each school, a random sample of 5 menstruators will be chosen to participate in the study. At each village, 10 married women who menstruate will be chosen to participate in the study. This makes for a total of 50 potential users being sampled. Each person will be instructed on how to use and dispose of the pads by composting them in their fields or their gardens. After using the pads for one menstrual cycle, the users will be asked about how long the pads last them, how comfortable they are, if they leak, and if they are difficult to use. In addition, they will be asked to provide an account of their days and how often they worry about, check, and change their pad. They will then be asked further about the ease of composting and if the packets for composting make it suitably discrete. The menstruators chosen at each location (school or village) will also have a group discussion, talking about how the pads can be improved and what they found satisfactory in the product. They will discuss how they would use these pads in their daily lives and any obstacles to actually using the product that they would have. All of the inquiry and discussion will be oral and the responses will be recorded and transcribed so that they can be analyzed. After feedback has been received, the responses will be sorted into different groups, such as positive and negative reviews about comfort, leaking, and discreteness. Using these comments, the design of the menstrual pads and the disposal packaging will be modified, preserving stated strengths and improving upon weaknesses.

Milestone 1.2: Perform an observational study to quantify the effects of composting used jute pads on jute plants and local home garden produce plants.

For this observational study, another group of menstruators will be sampled. A total of 8 menstruators will be asked to use jute pads during their menstrual cycles for a quarter of a year and give them to researchers after removing the pads. 2 menstruators will be from a primary school, two groups of 2 menstruators each will be from a secondary school, and the final 2 menstruators will be married women from a village. The pads from each menstruator will be composted using hot composting, with a separate compost bin for each menstruator and after 4 months[11], the compost will be used. The researchers will establish 20 plots in Jalpaiguri that are each 5 feet by 5 feet on which plants are grown. The *Corchorus capsularis*[8], or white jute, will be grown on 10 of these plots and local garden produce, specifically chilies, tomatoes, and eggplant[9], will be grown on the other 10 plots. All plants will be established in April as seedlings, with 25 jute plants per jute plot and 5 plants of each type of produce per produce plot (15 plants on each). These plants will all be seedlings purchased locally, in order to best imitate local growing conditions. 4 plots, 2 jute and 2 garden produce, will not be fertilized at all. For the other 16 plots, 1 of each type of plot (jute & produce) will be randomly assigned to each menstruator. These plots will be fertilized by the compost bin of the menstruator they are assigned to for a quarter year - April to July. The plants will be taken care of using methods used by people in Jalpaiguri villages, such as manual plowing and surface irrigation[10]. After the end of the quarter year, the fertilized plants' sizes and produce production will be compared to the unfertilized plants. Differences due to age or nutrition of the menstruators who provided fertilizer will also be compared. This study will enable the researchers to quantify the benefits of composting used jute pads.

Milestone 1.3: Perform a manufacturing study to quantify usability and durability of jute pads made with the manufacturing machine and the usability of the machine.

The manufacturers of the pads, local female workers hired by the non-governmental organization Goonj to create pads, will be recruited to test the pad manufacturing machines. The machine will be hand-operated and will function by compressing jute fibers into a pad. The machines will also be able to make a separate,

much thinner, packaging material by compressing jute fibers. A random sample of 10 workers will be taken in order to test the machine. The workers will first of all be taught how to use the machines by a researcher giving a demonstration. After this, each subject will be asked to use the machine to create 20 pads and packages, and the time it takes them to make each product will be recorded. The quality of each pad and each package made with machines will also be recorded, along with any deterioration in quality. After using the machine, each person will be questioned about their experience using the machine. They will be asked to use a 5-point Likert scale to rate statements such as “The machine is easy to use” and “I can make pads quickly with this machine”. A group discussion will also be conducted on the machine, where the participants will be asked to talk about ways to make the machine easier to use, faster, or more accessible. Using the worker’s feedback, the design of the machine will be modified. The machine will also be tested for consistency by having 200 pads made with the machine (each worker makes 20). The pads will all be tested for quality by ensuring they can all hold the same amount of liquid (at least 5 milliliters) and can withstand being bent, twisted, and crushed by hand, to simulate how they would be moved when worn by a menstruator. If there is inconsistency or flaws in some of the pads, the machine will be re-designed to account for these defects.

Aim 2: Distribute machinery to create jute sanitary pads and mechanisms to give them to village women in Jalpaiguri, West Bengal.

Following Milestone 1.3, machines that have been modified following worker feedback and production output will then be distributed accordingly throughout West Bengal. Due to the small population size of the majority of villages within West Bengal, (20,763 villages out of 37,955 have less than 1,000 people[12]), machines may be shared by neighboring villages to save on production costs. Machines can be redistributed accordingly if we receive feedback from Goonj stating that the current distribution makes it difficult for menstruators to receive menstrual products. To begin, we will only distribute three machines to test distribution strategies before rolling them out all over West Bengal. In addition to distributing menstrual products, we will focus on providing menstrual education in schools in an attempt to destigmatize menstruation.

Milestone 2.1: Distributing menstrual machines throughout a small number of West Bengali villages

The exact number of villages impacted by this milestone will not be determined until meeting with Goonj to determine the number of villages we would be able to reach with three machines. To ensure that menstrual products are readily available to menstruators, the number of villages that share a machine will be limited. Factors in determining the number of villages will include the relationships between neighboring villages, the number of menstruators in each village, and the distance between each village. As we intend to employ local villagers to manufacture the menstrual pads, it is vital that the villages that we choose to share machinery have a good relationship with each other. Otherwise, we would only be introducing unnecessary conflict into the area. The number of menstruators in each village is also an important factor to consider, as that will impact how many people are relying on the supplies produced. In addition, the proximity of the villages must also be near enough so that people from both villages can easily reach the production site.

Milestone 2.2: Distribution of menstrual products within village schools

We will partner with village schools to aid with the distribution of menstrual pads. These products will not only be available throughout the school day for children but children will be encouraged to take the menstrual pads home with them to share with menstruators in their families who are not attending school. This method of distribution is similar to programs started by teachers and school nurses within the United States, who, in an effort to combat period poverty and a lack of access to menstrual products, provide menstrual products to students by leaving them in student restrooms or easily accessible by students in classrooms or the nurse’s office, where they can take the products no questions asked. We will also work with the schools to demonstrate the composting aspect of the menstrual pads to students. To encourage composting with our menstrual pads, we will encourage schools to start composting bins if they do not already have them. This will help reduce the stigma around used menstrual products and allow students to be a part of the process.

Milestone 2.3: Implementing menstrual education within village schools to reduce menstrual stigma

In addition to a lack of menstrual products, the stigma surrounding menstruation also negatively impacts school-age youth. Menstruation is often seen as something shameful, and due to a lack of menstrual education, many people believe that those who are actively menstruating are somehow unclean. This leads to many menstruators feeling like they should not be out in public while menstruating, and many school-age children miss school as a result. This can lead to them missing between 10-20% of school days per year, which causes many to drop out of school altogether. When young menstruators drop out of school, they face higher child marriage and teen pregnancy rates. In many areas where menstruation is taught about as a part of a school's sexual education program, boys are left out of the discussion. This leads to continuing stigma and misconceptions regarding menstruation[14]. To get ahead of this stigma, we will work with village schools to implement comprehensive menstrual education starting at the primary school level. This will hopefully introduce young children to menstruation before they experience menarche, which will lead them to have a more positive reaction towards menarche rather than one of fear and shame[14]. In addition, introducing schoolchildren to menstruation before they experience it will allow them to be knowledgeable about the products available to them, and the school will be able to make their free menstrual pads known to the students. While primary school may seem like a very early time to start preparing children for menarche, the average age of menarche has fallen dramatically in recent years, with the low side of the average age for menarche being ten years old[15].

Milestone 2.4: Quantifying the success of our initiative

To quantify the success of this program, we will keep track of menstrual pad distribution. This will allow us to see how many pads are being used and will allow us to adjust distribution if necessary if we are constantly running short on products or if we can cut back on production. Since interviewing people who menstruate and asking them if they use our products may come off as invasive outside of a product testing setting, this will be the best way to quantify how many of our menstrual pads are being used. To track the success of our educational programming, we will track how school attendance fluctuates over the course of a few months before and following the implementation of the programming. This will allow us to observe any differences our programming made in the attendance of people who menstruate. The school compost bins will also allow the schools to see how useful providing menstrual pads to the students are, along with monitoring supply levels in school menstrual pad distribution.

Milestone 2.5: Future Endeavors

After this proposal is complete, our next steps are to implement this program in more areas. Our focus is to first expand our distribution throughout the rest of West Bengal before expanding distribution across India. Following India, we hope to eventually help create a world where everyone has access to menstrual products and menstrual education.

BUDGET

#	ITEM	AMOUNT	COST	TIME USED
1	Initial jute pads	1,000	$20	1 month - MS 1.1
2	Modified pads	640	$13	4 months - MS 1.2
3	Plant seedlings	400	$800	4 months - MS 1.2
4	Composting Equipment	for 8 bins	$800	8 months - MS 1.2
5	Farming Equipment	-	$400	4 months - MS 1.2
6	Farming Land	100 square feet	$2,800	4 months - MS 1.2
7	Initial machine	1	$10,000	2 weeks - MS 1.3
8	Modify machine + final 3	3	$30,000	Beyond grant - MS 2.1
9	School composting	3-6	max - $600	Beyond grant - MS 2.2
10	Researcher Pay	3 full time, 3 temps	$198,000	1 year
		TOTAL COST:	$243,433	

BUDGET JUSTIFICATION

1. Jute fabric costs $1/yard[20], and it is estimated that approximately 50 pads could be made with 1 yard of fabric. Hence, using the cost of jute fabric to estimate the cost of the raw jute that will be used to make pads, 20 yards, or $20 would have to be spent for materials for 1000 pads.
2. Using the same reasoning as above, $13 is needed for the materials for 640 pads.
3. Seedlings are usually ₹200/seedling[21] or $2.43, so 400 seedlings would be $972.
4. Low-cost composting methods using a bin usually cost $100, so for 8 bins it would be $800[11].
5. Setting up irrigation, watering plants, plowing, pest extermination, etc. is both labor and cost intensive[22]. Integrated Pest Management will cost $100, drip irrigation will cost $200, water will cost $50, and further equipment (for plowing) will cost $50[23].
6. Land will cost $2,400 at ₹20 per square foot[24].
7. Manual, industrial-scale, pad machines are usually around $10,000 in India[19].
8. 3 machines would be 3 times the cost for item #6.
9. As discussed for item #4, composting bins cost $100 to set up, and a maximum of 6 schools (6 villages) would be served.
10. 3 full time workers in Fulton County would need a minimum of $42,000 each for a year[13] and 3 additional temporary workers will be needed for the 8 months of milestone 1.2.

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