

## **Feasibility of implementing a compost system in Santa Teresa, Costa Rica**

Econ Directed Research Paper, Fall 2015

Cora Swanson, [swansonc@dickinson.edu](mailto:swansonc@dickinson.edu) (*author*)

Group members: Katherine Oetheimer, Emma West, Jenna Powell, Abbie Milewski, Gabriel Núñez

Professor Mary Little (*Resource Person*)

**Key Words:** sustainable development, integrated waste management, Nicoya Peninsula, organic waste, mitigation, municipality, fertilizer

### **Abstract**

Costa Rica has a poorly functioning waste management system that is negatively impacting its environmental, social, and development goals. Composting can reduce the volume of waste going into landfills by half as well as have positive economic benefits, produce valuable fertilizer, and reduce greenhouse gas emissions. This paper focuses on the possibilities of implementing a composting program in Santa Teresa, Costa Rica, either through the municipality or through decentralized methods. Data was collected through surveys and interviews with the local restaurants, as well as an extensive literary review on the subject.. The results revealed a high level of interest among the community, and a multitude of benefits from composting, however, there is limited capacity to implement a composting project through the municipality and several obstacles to decentralized composting.

### **Introduction**

Costa Rica is one of the most developed of all the Latin American nations. It has one of the happiest and healthiest populations in the world, and has made impressive commitments for national sustainability (Breines 2014). It is a global leader for climate change combatment, with its reforestation initiatives, goal of carbon neutrality and progressive environmental laws. However, Costa Rica has a serious solid waste issue that is undermining its goals of environmental sustainability that demonstrates the government's inability to keep up with its rapid urbanization and economic growth. Only 15% of its solid waste is disposed of in 'sanitary landfills'(Ben- Haddej 2010). The rest is dumped illegally into the environment, buried, burned, goes to open or overfilled landfills, and less than 10% is recycled (Ben- Haddej 2010). A study found that approximately 90% of all the waste in Costa Rican Landfills could either be recycled or composted (Ben- Haddej 2010). This mismanagement leads to economic, health and environmental consequences.

This broken system can be seen in the small town Santa Teresa on the Nicoya Peninsula. It does not have the structural support from the municipality to properly handle its waste, that is exasperated by a thriving tourism industry (Almeyda 2010). Carolina Chavarria,

the executive director of the Nicoya Peninsula Waterkeepers Alliance, an organization dedicated to the conservation of all waterways in the community, noted that much of the problem of waste management is on structural level, citing a lack of capacity to handle waste within the municipality (Chavarria, personal communication, November 28, 2015). The waste from Santa Teresa goes to a dump site in Cobono despite the fact that it has reached its maximum capacity over a year ago (Chavarria, personal communication, November 28, 2015). It was condemned by the Ministry of Health in January of 2015, however, is turning a blind eye to the continued use because otherwise the waste would have to be sent to Puntarenas, which would be very costly until a new site in Cobono can be built in the next few years (Chavarria, personal communication, November 28, 2015).

Santa Teresa receives approximately 120,000 tourists per year, which is why the town produces more waste than the other districts within the municipality, according to Jose Pablo Delgado, Nicoya Waterkeepers waste management project manager (Delgado, personal communication, December 2, 2015). Waterkeepers have noted that development of Santa Teresa is happening faster than their ability to organize and impact changes.

In 2005 organic waste was responsible for 60% of all waste in Costa Rican landfills, and produces methane while it is decomposing, a potent greenhouse gas (Ben-Haddej 2010). Composting has multiple benefits including reducing pressure and environmental impacts of the landfill, reducing dangerous emissions, can be used as a potent fertilizer, provides additional jobs, and other economic gains (Taiwo). This paper analyzes the feasibility of composting on both a municipal level, and on a community and individual scale as a means of integrated waste management.

## **Methods**

Data was collected in the town of Santa Teresa, Costa Rica between the hours of 9am and 5pm from November 29 through December 4. Data collection was conducted by two team of two people. Data was collected through surveys and interviews from either the manager or owner of each restaurant we visited. In total we collected surveys and interviews from 41 restaurants, and one grocery store with a small eatery attached. We collected data from the vast majority of the restaurants in town, with the exception of restaurants that were only open for dinner, or were unable to give an interview.

They were asked to rate how much organic waste they produced every day (almost none to a lot), asked to quantify it if possible, how they dispose of organic waste, if they do not compost, would they like to start, if there are challenges that prevents their business from composting and what they are, if they would be interested in doing a workshop to learn how to compost, if they would be interested in collection based composting program. They were also interviewed asking how easy it would be to separate their organic waste, if they would be willing to pay more for a program of collection of organic waste, and what is the maximum they would be willing to pay. The surveys and interviews were completed at the same time as a survey and interview on take out containers.

Data was analyzed using averages, and percentages of the restaurants that responded. We were not able to have answers for each question we asked, and so the restaurants that did

not respond were taken out of the number of total restaurants when calculating the average. The number of restaurants that did not respond to each question is noted in the results section.

## Results

All restaurants were asked to rank how much organic waste they produce in a day. Of the 40 restaurants that responded, 8% said they had almost none, 35% said little, 40% said some, and 18% said a lot. However, it was very challenging to actually quantify the volume, as many did not separate or keep track of how much organic waste they produced. Several restaurants noted that they produce twice as much organic waste in the high season for tourism than in the low season. The amount produced ranged from between a third of a bag a day to 6 garbage bags a day. Seven restaurants reported that they produce, “one large garbage bag” a day.

The challenges preventing restaurants from composting were numerous. Although 4 restaurants did not give a response to that question in the survey, of those that did 71% said they faced challenges, and 29% said they did not. Restaurants that faced no challenges were because they already dealt with their organic waste through composting, or using it as feed for animals, or felt like they had no need to compost because the municipality picks it up with the rest of their waste. Not all restaurants gave an explanation. Of the 27 restaurants that stated that they faced challenges, 10 did not specify what those challenges were. Of those that did specify 67% noted insufficient time and too much work, 26% were worried about smell and the animals it might attract, 56% had limited space, 19% had limited resources and felt it would cost too much, 41% said they didn’t know how, and 19% responded other. Three fifths of the restaurants that put other, explained saying there was no service in Santa Teresa that would compost for them. One restaurant felt they did not produce enough waste.

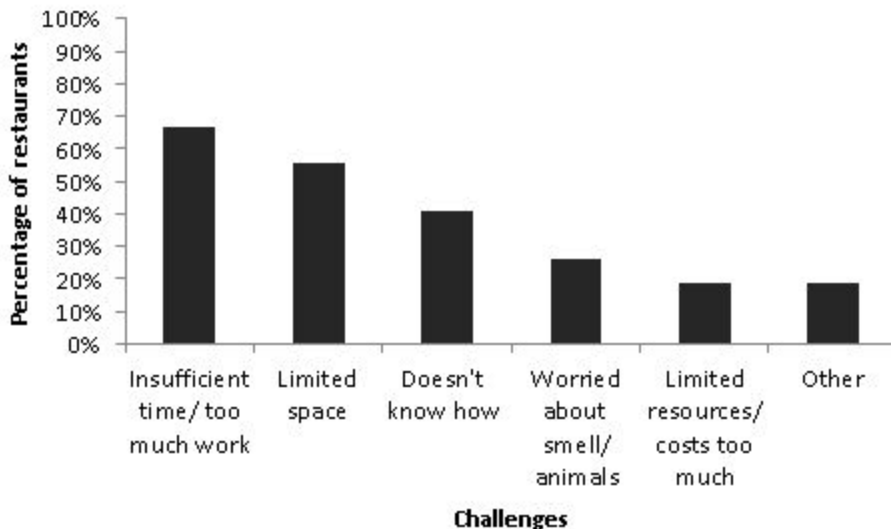


Figure 1: This graph depicts the percentage of restaurants that noted these as the main challenges that prevents them from composting. Data collected November 29 through December 4.

Restaurants disposed of their organic waste in several different ways, sometimes using more than one method. All of the restaurants responded, 75% of which used municipal collection, 14% used private collection, 11% said they disposed of it on their property, or throwing it in the forest, or burying it under trees, and 21% disposed of waste by giving it to animals (most commonly pigs and iguanas, although some also fed chickens and dogs). Nine restaurants, 21%, said that they already composted. However, this is very unlikely due to the fact that there was a large misconception in the community that burying organic waste, or throwing in the forest is the same as composting. We interviewed three restaurants, that were a part of high-end hotels, that could actually verify they composted.

On the survey we asked if the restaurant would like to compost if they did not already, 10 restaurants did not respond. This is likely because of the 9 restaurants that felt they were already composting. Of those that did respond, 90% said they would would like to, one restaurant said they had no interest, and 2 responded maybe. When asked if they would want to take a class to teach them how to compost, two-thirds were interested, 13% had no interest, 10% might be interested and 4 did not respond.

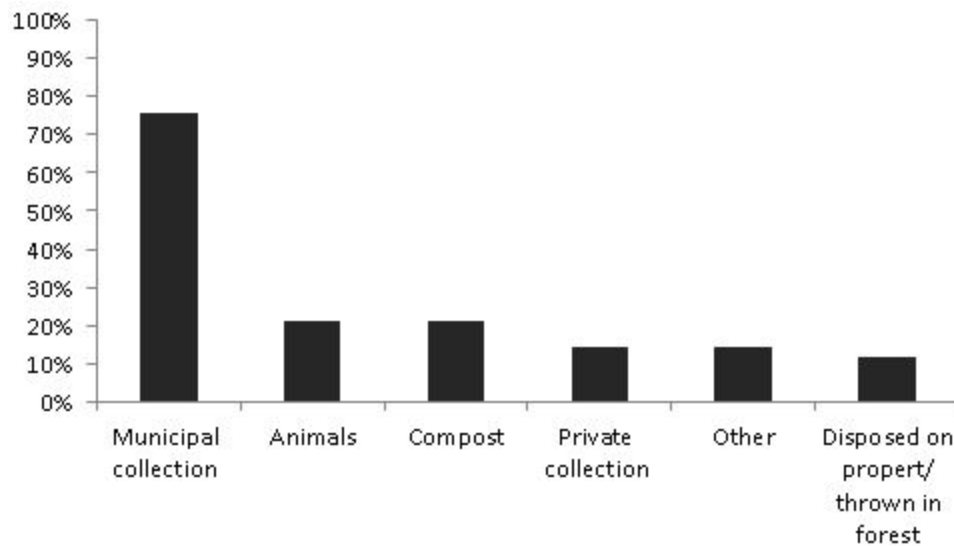


Figure 2: Comparison of methods of organic waste disposal among restaurants in Santa Teresa. Data collected November 29 through December 4.

All but 2 restaurants responded to the question on interest in participation in a community based collection program of organic waste for compost. 85% expressed interest, 10% restaurants had no interest, and 5% said that they might be interested. They were then asked if they would be willing to pay more for this type of program about half said they would be willing to pay more (47%), 38% said they would be unwilling, and 17% said that they might be but it depends, and 6 restaurants did not respond. It was very challenging to collect data on the amount restaurants were willing to pay for such a program through interview questions. We do not have any response from 14 restaurants, in addition to the 8 restaurants that said they wouldn't be willing to pay for anything. Almost every restaurant, when asked what the maximum they would be willing to pay answered it depends initially. When pressed, suggesting 1 mil per

bag and asking if they would be willing to pay more less than that, 71% remained unsure, 24% agreed that 1 million colones was a fair price, and 5% would pay under a million.

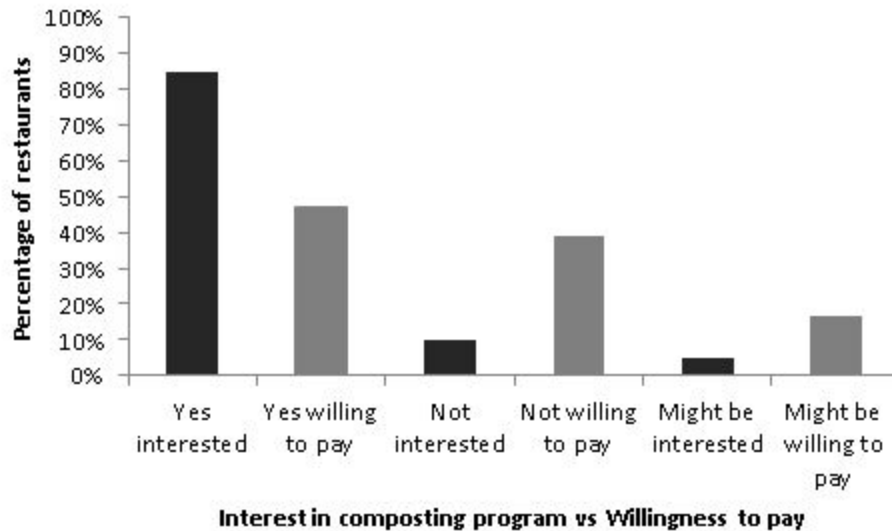


Figure 3. Comparison of restaurants that were interested in participating in a composting service to restaurants that were willing to pay more for a composting service. Data collected November 29 through December 4.

### Municipality composting

Composting on the municipal level is becoming more common across the world, and is seen as an important component of reducing our collective environmental footprint. City wide municipalities, as well as state-wide legislation in the United States, including Vermont, Massachusetts, New York City and San Francisco, are now requiring composting (Peterson). However, there is potentially even more benefit in less developed countries, with struggling waste management programs, such as Costa Rica. Troschinetz notes that, “composting is being considered in many parts of the world (especially in the tourist and agricultural sectors) as a method to reduce waste destined for the landfill” (Troschinetz ).

Part of this recent popularity, is that governments have the most to gain through implementing a compost program. This is particularly evident when analyzing the economic benefits, as they are responsible for the costs of municipality collection and disposal, as well as the environmental and health consequences of poor management. Jose Pablo Delgado stated that around 80% of the volume currently in the Cobono dump could either be recycled or composted (Jose Pablo Delgado, personal communication November 28, 2015). Yet, due to the fact that Cobono is at capacity, a new landfill is being constructed, an expensive investment (Jose Pablo Delgado, personal communication November 28, 2015). Composting could divert between 50-60% of waste, thus expanding the lifespan of the landfill and reducing long term capital investment. This alone could make economically viable to start composting. Additionally, because compost is a beneficial product, the municipality has the opportunity to make money on selling it back to the people and farmers.

People are already paying for the municipality collection service as part of their property tax, meaning they are less incentivised to pay extra for a separate composting service. There is evidence of this in the results we collected. While, 85% of restaurants were interested, and an additional 10% might be interested in participating in a composting program, only 47% of restaurants were willing to pay for it, and an additional 16% said it would depend entirely on the cost. Two thirds of all restaurants use the municipality as their main means of organic waste disposal. Many establishments expressed that they felt the municipality should already be doing this, and that was why they were unwilling to pay more for an outside program.

There have been several case studies reinforcing the plausibility of economic sustainability of municipal composting programs. The Republic of Serbia saved 6.54 million euros by composting just 10% of the plant and animal waste by reducing the stress of landfills and dumps by diverting the organic waste (Popovic). The paper notes, "Such products [compost] can be sold on the market, and that confirms the social responsibility of a state towards the ecology, industry, retail sector, and population" (Popovic). The study conducted was based on the idea that development and use of resources should be sustainable and can have positive effect for the environment and economy, very similar to the development goals of Costa Rica.

Composting is a cost effective way to reduce greenhouse gas emissions, needed to reach Costa Rica's goal to become carbon neutral in just a few years. This should give additional financial incentive for the government to instate composting on a municipal level. A study that focused on Africa found that composting could lead to multiple co-benefits for the economy, environment, climate change and society. The paper cited composting as more efficient and cost effective than other forms of mitigation measures, as well as waste management initiatives. The main social benefits included increased number of jobs, reduction in health risks caused by poorly managed waste. This paper suggests that the Clean Development Mechanism could be used to finance the setup of a composting system on a municipality level. Although the CDM is no longer in use, there are other current funds dedicated to mitigation projects in developing nations. In fact, composting was a key component of Costa Rica's Nationally Appropriate Mitigation Actions (Androvetto). This signifies the government's recognition of composting as a key component to sustainable waste management.

While composting was recognized in Costa Rica's NAMA, the option has had little traction in actual policy. In 2010 Costa Rica passed a law on integrated waste management. According to the website that gives information on the law, "The project proposes a series of actions to "enhance" the waste, recovering their material, economic or energy value and also prevent their improper handling, impact on ecosystems through polluted water, soil, air and contributes to climate change" ([website](#)). This directly relates to processing organic waste into compost. However, the articles in the [law](#) do not directly mention the words compost, or composting, nor does it directly mention organic waste in any of the articles. However, it is briefly mentioned in the [manual](#) the government provides for municipalities to use when creating integrated waste management plans. It outlines the priorities, one of which is valuing waste that can be recycled or composted. Under the section, "Laying out the strategy" the manual has a suggested plan of action for the next 3-5 years that mentions compost.

Drawbacks of a large scale compost system are high initial investments due to systems that are usually mechanized. According to Calvo municipalities' capacities have numerous, "limitations in service and delivery" (calvo). The same report also noted that composting can be very challenging to manage on a large scale logistically. Even Costa Rica's NAMA does note that it would "require higher levels of investment and greater administrative capacity"(Manual). Unfortunately, there is very limited administrative capacity within the Santa Teresa municipality.

Although there are a multitude of benefits from a municipality based composting system, this is unlikely to occur in Santa Teresa. The municipality has proven its limited capacity to handle basic waste management, and likely does not have the ability to make the initial investment. They currently do not pick up recycling, which is often prioritized over composting programs, and has unreliable collection for regular waste. Due to the fact that the municipality will likely not have the capacity in the near future to incorporate composting collection and processing, the possibility of both private or individual composting should be considered.

### **Private and individual composting**

The benefits from composting can still be achieved without municipality involvement, through community based programs, initiatives by companies, individual scale composting, private company, or a public-private partnership. These are often on a smaller scale and have the advantage of increased flexibility, and able to deal with local and community needs. A study conducted in the 1990s suggested that "several small manual composting plants" would be better than "one single large mechanical compost plant" (**Decentralised composting**). This was largely do to the high investment costs. Decentralized composting has the same benefits in terms of creating organic fertilizer, reducing the volume waste in the landfill, creating jobs and reducing greenhouse gas emissions. Additionally, in a guide to community composting, Platt notes that, "In community composting programs, resources are recognized and managed as community assets" that would lead to high level of community awareness and involvement in waste management issues(Platt). There have been several recent studies that have called for composting through "non governmental recyclers" for all of the aforementioned benefits (harper). A recent article in the Tico Times promoted composting on an individual scale.

Drawbacks of "decentralized composting" is that citizens receive these indirectly, meaning they are less likely to see the benefits, raise awareness and are closer to the source. Harper notes that, "composters rarely reap any benefits from the savings in waste disposal" and "business persons do not see composting as a business venture" and thus are unlikely to remain in the long term. Other drawbacks are motivation, time and capacity to compost on an individual scale. These were also seen in the results from our study seen that the majority of the challenges restaurants faced were related to limited time, capacity, and space. Harper also notes that composting privately requires a market for the compost produced to make it economically sustainable, which is largely dependant on the good marketing and education. This would be important research for another study.

Howard notes that the most common pitfalls of a successful composting program are poor partnerships with governments, poor stakeholder partnerships, failure to account for a holistic approach, and financial sustainability.

## **Conclusion**

Composting is good. composting is important. While the maximum amount of benefits can more likely be acquired through a municipality based composting system, that is unlikely to occur in Santa Teresa due to a lack of general government incentive, and lack of organizational and structural capacity. There are still a multitude of benefits that can be achieved through smaller scale projects and composting should be encouraged at all levels of the waste stream. Ineffective and poor waste management in Costa Rica is a barrier to its environmental, economic, and social goals. Composting is an effective way to greatly reduce the pressure on the current landfills. According to Hoornweg, in a study analyzing the benefits and costs of composting in developing nations, “composting is a cornerstone of sustainable development” because of the multitude of benefits it produces.

## **References:**

Almeyda, A. M., Broadbent, E. N., Wyman, M. S. and Durham, W. H. (2010), Ecotourism impacts in the Nicoya Peninsula, Costa Rica. *Int. J. Tourism Res.*, 12: 803–819. doi: 10.1002/jtr.797

Androvetto, E. Costa Rica Ordinary Solid Waste NAMA: Executive Summary. 2015. Ministry of Health, Ministry of Environment and Energy.

Ben- Haddej D, A. Buchenan, A. Owen, and G. Shaken. 2010. Managing costa rica’s waste: Recommendations for a Municipal Solid Waste Management Plan. WorcesterPolytechnic Institute 1-40. (Not peer reviewed)

Breines, Juliana. 2014. Want to be happy? Move to Costa Rica. *Forbes*. Web. Accessed December 8, 2015, from <http://www.forbes.com/forbes/welcome/>

Calvo, C. 2014. Towards sustainable environmental sanitation in Costa Rica Dissertation, Doctor of Philosophy, University of Kansas School of Social Welfare.

Carolina Chavarria, executive director

Drescher, S., Zurbrugg C. 2006. Decentralised composting: lessons learned and future potentials for meeting the Millennium Development Goals. Collaborative Working Group on Solid Waste Management in Low- and Middle-Income Countries. Paper No. 72.

Economy of The Republic of Serbia Through Processing Less Hazardous Waste into Useful Products, The Case Of Compost. *Bulletin Of The University Of Agricultural Sciences & Veterinary Medicine Cluj-Napoca* 71(1): 305-306.



Harper, M, Pervez, A. Rouse J, Drescher S. Zurbrugg C. 2004. Sustainable composting: Case studies and guidelines for developing countries. Water, Engineering and Development Centre.

Hoornweg, D., L. Thomas, L. Otten. 1999. Composting and its applicability in developing countries. Urban Waste Management Working Paper Series. Published for the Urban Development Division. The World Bank. Washington DC

Jose Pablo Delgado, NW waste management project manager

Peterson, Christopher. Mandatory Compost Laws Update: New York City, San Francisco, Massachusetts, And Vermont. Agricultural Management Committee Newsletter 19.2 (2014): 3-4. Environment Complete.

Planificamos para l111a gestion responsable de los residuos solidos de nuestro canton. 2008 PMGIRS. Programa Competitividad y Medio Ambiente. (Manual).

Ley para la Gestion Integral de Resduos No. 8839 del 13 de junio de 2010. Programa Competitividad y Medio Ambiente. [http://www.ifam.go.cr/docs/ley\\_comentada%20final.pdf](http://www.ifam.go.cr/docs/ley_comentada%20final.pdf)

Platt, B., J. McSweeney, and J. Davis. 2014. Growing local fertility: a guide to community composting. Agricultural and Food Engineering Working Document. A collaboration of Highfields Center for Composting and the Institute for Local Self-Reliance. Hardwick, Vermont.

Popovic, S., B. Martinovic, A. Majstorivic, M. Urginovic, and R. Garic. 2015. Development of

Marshall, R.E. and K. Farahbaksh. Systems approaches to integrated solid waste management in developing countries. 2013. Waste Management 33(4): 988-1003. Tico times

Schubert, F., Kandampully, J., Solnet, D., & Kralj, A. 2010. Exploring and predicting consumers' attitudes and behaviors of green restaurants. Tourism and Hospitality Research 10(4): 286–300.

Toris, C. Cost effective waste management through composting in Africa. 2012. SciTech Connect 32(12): 2518-2525.

Troschinetz, A. M., and J. R. Mihelcic. 2009. Sustainable recycling of municipal solid waste in developing countries. Waste Management 29(2): 915-923.

Taiwo, A. M. 2011. Composting as a sustainable waste management technique in developing countries. Journal of Environmental Science and Technology 4(2): 93-102.

It makes the most sense for the government to be the ones handling this as they stand the most to gain from implementing composting projects. “this kind of environmental degradation can also negatively impact the (sometimes fragile) economies of those countries that rely heavily on tourism (Henry et al., 2006).”

- waterkeepers had a workshop with minimal success- according to woman there is a lack of interest among the people
- harder to make change because such diverse demographics with so many foreigners as business owners, locals and people who have lived their whole life
- lack of awareness of what composting actual is
  - people think its just throwing it on the ground or burying it
- if give waste might get back some of the compost
- accordingN to waterkeepers it is “last on the list” in terms of priorities for campaigns on waste manamgent, although is definitely still on the adgenda
- waterkeepers
  - plans on collecting grease traps/ recycling from 30 restaurants in town
  - might be able to include collecting organic waste but not for a while into the program bc it would be overwhelming
  - need to find adequite space, someone to do it
  - not sure about the volume they would be recieving
- article in tico times promoting compost
  - <http://www.ticotimes.net/2014/05/24/why-we-compost>
- **why it would make sense to tackle this from a private perspective**
  - “Public awareness and attitudes towards waste can impact the entire SWM system, from household storage to separation, interest in waste reduction, recycling, demand for collection services, willingness to pay for SWM services, oBen- Haddej D, A. Buchenan, A. Owen, and G. Shaken. 2010. Managing costa rica’s waste: Recommendations for a Municipal Solid Waste Management Plan. Worcester Polytechnic Institute 1-40. (Not peer reviewed)
  - 
  - position to proposed locations of waste facilities, the amount of waste in the streets, and ultimately the success or failure of a SWM system”  
(Marshall).

## **010 Law for an Integrated Management of Residues**

**Percentages of restaurants that indicated using certain methods of waste disposal.**

**Percentages of restaurants that indicated certain challenges preventing composting**

**One limitation of this study was the length. Data was collected over the course of five days**

**during the transition from the low season to the high season. A longer period of data**

collection would have produced a more accurate representation of the overall population during both seasons. Another limitation was the selection process for study participants. Participants were not selected randomly, but by going door to door and to businesses. This could have resulted in biases based on which kind of people were at home and which homes were easily accessible. Residents in private condos, for instance, were not included in the sample even though they are an important demographic in the Santa Teresa community. Finally, although the surveys were translated in both Spanish and English, it is possible that our lack of fluency in Spanish prevented us from completely understanding further explanations from participants, or from completely explaining concepts to people we surveyed. Despite these limitations, however, this survey includes a large portion of the Santa Teresa community, and most of the restaurants in the town, and can be considered representative of most of the overall population.