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Promoting of Environment Friendly Packaging Utilizing in the Egyptian Market "Study on Grocery Bags by Carrefour Egypt"

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Abstract
Packaging Waste is considered a huge problem in Egypt. The problem has been growing day by day with the eruption of political and economic issues in the past few years. Consumer awareness helps in decreasing the negative impact of packaging wastes as it promotes the selection of the environment friendly packaging. The solution will have to involve different parties. Companies and associations participation is required in solving packaging wastes problem.Biodegradable as well as reusable bags are examples of environment friendly packaging that helps in reducing packaging wastes accumulation. This paper is aimed to study a real life example from one of the leading markets in Egypt and elaborate on the effect of generalizing the solution including other parties. Another part of the study is concerned in the hypothetical effect of forcing environmental bags on the Egyptian market. Directing the average consumers towards utilization of friendly packaging by sneaking different smart alternatives of harmful bags and increasing the awareness can have more positive impact influencing packaging waste problem in Egypt.
Keywords: environment, grocery plastic bags, reusable woven P.P bags, biodegradable, Waste, Cairo, consumer awareness

1. Introduction

The accumulation of packaging wastes contributes to the bigger waste accumulation problem due to usage of various manufacturing materials as well as the different packaging types. Plastic bags used for grocery is one type of packaging that is used daily for single use. Plastic carrier bags are far more likely to be littered than multiple use bags, and they cause by far the biggest litter impact.(Bio Intelligence Service (2011)

Direction towards environment friendly alternative bags is a very important trend for green packaging sector. Plastic carrier bag concerns have been raised as they are now seen as a symbol of a modern ecological crisis due to concerns over waste management. (Musa, H. M.(2013)

Plastic bags are available in huge numbers and varieties across the world. It is estimated that around 500 billion plastic bags are used every year worldwide. (Legesse, A. (2011)

Five hundred followed by nine zeros. So many that over one million bags are being used every minute. (Gogte, M. (2009), (Abul Hasnat, Md. 2010)

The vast majority of plastic bags in circulation are high density polyethylene (HDPE) bags with handles. They are most commonly distributed by supermarkets and takeaway outlets. The bag is generally referred to as the 'single-use' plastic bag.(Australia, Clean Up. (2010)

Plastic shopping bags made from high density polyethylene (HDPE) first came into widespread use in 1982. (Morris, J.(2014)

Several researchers studied the eco-impact of plastic bags therefore more efforts are directed towards reducing the harmful impact of plastic waste bags on environment; air water and soil. The actions and strategies that can be made towards this issue have been studied.(Muthu, S. (2012) Ritch et al. (2009) indicates that, among the packaging concerns, the plastic bag use has become a focus of attention for government, business and community activists, which strive to find ways in which consumer behavior can be modified to reduce plastic bag use.(Avallone, I. (2012)

This paper aimed to investigate environment friendly alternatives for single use grocery bags made from high-density polyethylene (HDPE); HDPE that are used daily in the Egyptian market.

The following types of carrier bags were studied:

- A biodegradable plastic grocery bag, lightweight carrier.
- A heavier more durable bag, reusable bags made from woven polypropylene (PP).

This paper studied the consumer response towards usage of these bags aiming to reduce the negative impacts of conventional ones and increasing the green consumerism.

2. Conventional High-density polyethylene (HDPE) bags

This is the lightweight, plastic, carrier bag used in almost supermarkets and often provided free of charge. It is a

vest-shaped bag and has the advantage of being thin gauged and lightweight. It has been termed “disposable” and “single use". (C. Edwards, 2006)

Plastic bags are made from polyethylene, it is a form of plastic and it is non biodegradable: Polythene and/or plastic bags are widely used for transporting a range of small consumer goods. (Abul Hasnat, Md. 2010)

The main function of a carrier bag is to carry groceries and goods from the shop to the home. The bag therefore needs to be robust enough to hold a certain quantity of shopping, but at the same time provide a convenient option for the consumer to carry or transport the shopping home. (C. Edwards, 2006)

2-1 The Eco-impact of grocery HDPE bags

The environmental impact of all types of carrier bag is dominated by resource use and production stages. Transport, secondary packaging and end-of-life management generally have a minimal influence on their performance.(C. Edwards, 2006)

The biggest problem with plastic bags is that they do not readily break down in the environment, with estimates for the time it takes them to decompose ranging from 20 to 1000 years. (Gogte, M. (2009) Plastics made from petrochemicals are not a product of nature and cannot be broken down by natural processes. Therefore, despite how small the pieces of plastic may become, they are not and cannot be biodegradable.(Gautam, (2009)

Plastic bags persist in the environment for up to 1000 years, representing a significant waste impact. The combination of long life and high levels of consumption mean that plastic bags can place pressure on landfill capacity.(Australia, Clean Up. (2010)

The incredible slow rate of decay of plastic bags also means that each bag we use contributes to the problem, because the bags simply accumulate. (Gogte, M. (2009)

Accumulation of plastic bags wastes causes environmental pollution that can be manifested in number of ways. (Legesse, A. (2011)

- The lightweight of the plastic bag allow it easily to escape from rubbish bins, to move around the natural environment causing a variety of problems.
- Polythene has harmful effect on soil, water and air. International Rice Research Institute (IRRI) found that polythene bags prevent the soil of sunlight exposure; this prevention destroys the beneficial bacteria causing loss of soil fertility. (Abul Hasnat, Md. 2010)
- They are not durable enough to stand up to numerous trips to the store so often: The best that citizens can do is reuse them. (Wagner, J.,(2013)
- Burning plastic bags emits toxic gases that harm the atmosphere and increase the level of VOCs in the air; heavy metals and the toxic organic compounds and polyaromatic hydrocarbons [PAHs]) can be produced that pollutes air and negatively affect health.(Abul Hasnat, Md. 2010)
- Plastic bags can be re-cycled although only about one in every 200 ever found their way to a re-cycling unit. (Gogte, M. (2009)

Data from the U.S. Environmental Protection Agency shows that in 2010, the nation discarded 690,000 tons of HDPE bags. Of those, approximately 30,000 tons were recovered (i.e., recycled), meaning that a total of 660,000 tons were finally discarded—mostly into landfill. (Morris, J.(2014)

Egypt produces annually about 16.2 million tons of waste; plastic amount is about 6% of this waste, this is around 970 thousand tons of plastic waste per year in (2005/2006).this ratio increases every year with the increasing population. Only 30% of this amount are recycled, 5% (49 thousand tons) are reused, while the rest (65% of waste) are not collected, they are either buried or burned polluting the surrounding environment, this waste percentage increase each year by the increasing population(National Study (2008)

The Red Sea (Hurghada) is the first plastic bag free governorate in Egypt having introduced a ban in 2009. The ban has also created employment opportunities for women manufacturing cloth bags to substitute the plastic bags. This has occurred under a partnership with Egyptian Resorts Company, Barclays Bank and vocational training centers. (Australia, Clean Up. (2010)

3. Environmentally friendly alternative bags

Many researches are endorsing one type of environment friendly alternative bag as the most sustainable option, typically the PP Green Bag, paper bag or biodegradable plastic bag. (Australia, Clean Up. (2010)

Similarly, there is a standard developed by ISO (EN 13432) specifically for packaging, which assesses packaging compostability based on characterization, biodegradation, disintegration, and quality of compost or ecotoxicity.(Vaverková, M. (2012)

A number of large retailers all over the world have started providing consumers with plastic bag alternatives. (Australia, Clean Up. (2010)

To support the usage of biodegradable plastic bags, more efforts had to be made.

In Egypt Carrefour market started to introduce these kinds of bags in the Egyptian market; the

biodegradable grocery plastic bag and woven pp reusable bag. This initiative taken by a huge market in Egypt is a positive change in the environment awareness and is important to track and study. The application includes environment friendly bags either biodegradable or reusable.

3.1 Biodegradable plastic bags

Biodegradable polymer bags are either made of plant-based materials such as starch or bio-synthesized materials. These polymers have been produced since 1990 (Müller, C. (2012)). From an environmentally friendly point of view, the production of biodegradable plastics is important as it reduces the accumulation of plastic waste in the environment (Vaverková, M. (2012)) Introducing so-called "environment friendly plastic bags" which are biodegradable or reusable is considered a new to the Egyptian market.

3.1.1 what is biodegradable plastic bag?

Biodegradable bags take about three years to break down. This short period makes biodegradable bags rank high as an attractive solution to waste problem. It's also possible to get 'plastic' bags manufactured from corn. These bags break down very quickly and give off no more methane than any other corn product on landfill site.(Gogte, M. (2009)

Two basic classes of biodegradable plastics exist: Bioplastics, whose components are derived from renewable raw materials and plastics made from petrochemicals with biodegradable additives which enhance biodegradation. Both types of biodegradable polymer have attracted attention in the industry. Petroleum based biodegradable polymers may help to overcome the accumulation of nondegradable plastic waste. (Ebnesajjad, S. (2012)The latter is that kind introduced in the Egyptian market that depends on d2w biodegradable bags.

Important Definition

Biodegradable plastics are plastics that are capable of being decomposed by bacteria or other living organisms.(Gautam, (2009)) Biodegradability: Suitability for biological degradation, i.e. decomposition by living organisms or their enzymes down to mineralization such that the organic compounds are decomposed into substances like carbon dioxide, oxygen, and ammonia. (Federal Environment Agency (2013))

According to ASTM D6400-04 a biodegradable plastic is “a plastic that degrades because of the action of naturally occurring microorganisms such as bacteria, fungi, and algae”. (Vaverková, M. (2012)

(a) Compostable Plastic: A plastic that undergoes degradation by biological processes during composting to yield CO2, water, inorganic compounds and biomass at a rate consistent with other known compostable materials and leave no visible, distinguishable or toxic residue. (Gautam, (2009),(Vaverková, M. (2012)

(b) Photodegradable/ Oxodegradable Plastics:

Photodegradable/Oxodegradable plastics disintegrate into small pieces when exposed to sunlight (manufacturers add a sun-sensitive component to the plastic to trigger degradation).(European Bioplastic (2015)

3.1.2 Oxodegradable d2w plastic bag

Degradable polymer bags also consist of PE or PP, but contain additional substances like starch to stimulate degradation without the help of microorganisms. The decomposition begins with exposure to heat, UV-radiation or other stresses. Supposedly, such plastics even degrade underwater (d2w™, 2011).(Müller, C. (2012) Carrefour Egypt poses grocery biodegradable plastic bags with d_2w technology which is considered Oxodegradable; d_2w is brand for controlled-life plastic technology which is designed to control and shorten the life of normal plastic products and packaging. d_2w is a researched and tested additive formulation which is added to normal plastic at the extrusion or casting stage of manufacture. d_2w additive is included in the basic polymer resin during the manufacturing process. Then d_2w breaks the molecular chains so that at the end of its predetermined service life the plastic starts degrading in the presence of oxygen by a process of oxidation, which is accelerated by light, heat and stress. Finally bio-degradation is completed by micro-organisms.

Figure (1) d2w symbol

3-2 Woven polypropylene (PP) bags

Polypropylene plastic bags are durable as it is designed to be used several times instead of light weight grocery bags. Whatever type of bag is used, the key to reduce the negative impacts on the environment by reusing it as

many times as possible. (C. Edwards, 2006)

Carrefour Egypt introduced W.P.P bags in the Egyptian market sold for consumers with benefit of durability for reusing it several time. These reusable bags can even get exchanged after several usages with a new one, free of charge.

4. Research Methodology

A survey Study of environment friendly plastic bags in city of Cairo Egypt has been conducted the aim was to explore the response of consumers towards these kinds of bags and their effect for green consumerism; A meeting also was held to study the motive behind the introduction of these bags (biodegradable or reusable ones) to the market as an alternative for traditional plastic bags; The study included survey using questionnaire and meeting followed by analytical study.

- Exploratory study was carried out among different educated age group included; students home makers, employed professionals in Cairo city, a structured questionnaire was used for 320 consumers of plastic bags introduced by Carrefour Egypt.

The following table (1) indicates types of environmentally friendly plastic bags introduced in the Egyptian market.

Table (1) Types of environmentally friendly plastic bags in The Egyptian market

Plastic bag	representative	Plastic bag	Representative
Bio degradable plastic bag with d2w symbol.		Reusable woven polypropylene bag	

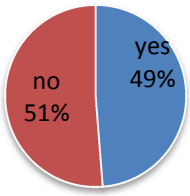
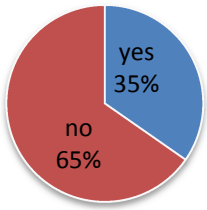
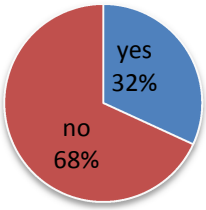
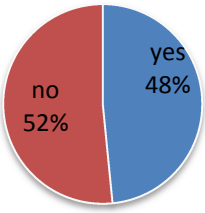
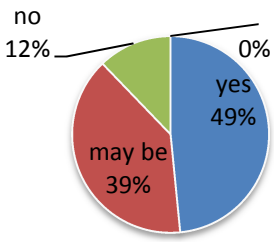
5. Results and Discussion

Meeting with Carrefour Egypt administration indicated that: Carrefour poses around 870 ton annually of biodegradable grocery plastic bags in the Egyptian market. This direction was adopted by Carrefour from environmental perspective and self-committed policy. This step had no arranged program with the environment authority.

5.1 Survey Results

The collected data from the questionnaire were presented in Table (2). The table shows consumers awareness about environmentally bags, results are described in details.

Table (2) Questionnaire collected data results

Awareness investigation	Result
1. Switching regular grocery plastic bags to biodegradable plastic bags were observed by (156, 48.75%) of the respondents.	
2. Biodegradable green symbol printed on the plastic bags were not recognized by most of respondents only by (111, 34.69%).	
1. Recognition of the benefits of biodegradable plastic bags were low (102, 31.88)	
1. Consumers Interests of buying reusable plastic bags were around fifty percent (155, 48.43%). Most of them buy it for non-environmental reasons	
2. From consumers point of view more information about environment friendly plastic bags will increase the acceptance of these kinds of bags and decrease the negative response (155, 48.43%) for yes and (126, 39.37%) uncertain and (39, 12.18%) negative of the respondents.	

5.2 Effect of Consumer awareness on green consumerism

Results of consumer awareness Investigation towards the introduction of environment friendly bags in Cairo city Egypt indicate that about 50% only of consumers noticed the switch to biodegradable plastic bags. This ratio decrease by 14% for the biodegradable symbol and decrease again by 3 % for the recognition of advantages and benefits of these bags. The researcher believes that insufficient awareness affect consumer acceptance for these environment friendly bags. However it's worth stating that all consumers use the biodegradable bags free of charge supplied by Carrefour to their customers; both aware and unaware consumers in the outer circle which represents green consumerism they are using environment friendly biodegradable grocery bags see figure (2),

table (3). The researcher uses the term green consumerism to describe consumers who use eco-friendly plastic bags even with no intention.

Sneaking environment friendly grocery plastic bags in the Egyptian market could constitute a considerable solution if it's generalized by more retailers, encouraged and arranged by environment ministry authority. On the other hand the survey studies the W.P.P reusable bags; the solution will be different as awareness plays more important role, consumers then will be involved as they have to make the decision of buying the reusable bags and using them frequently. Reusable bag use is limited among consumers that own these bags.

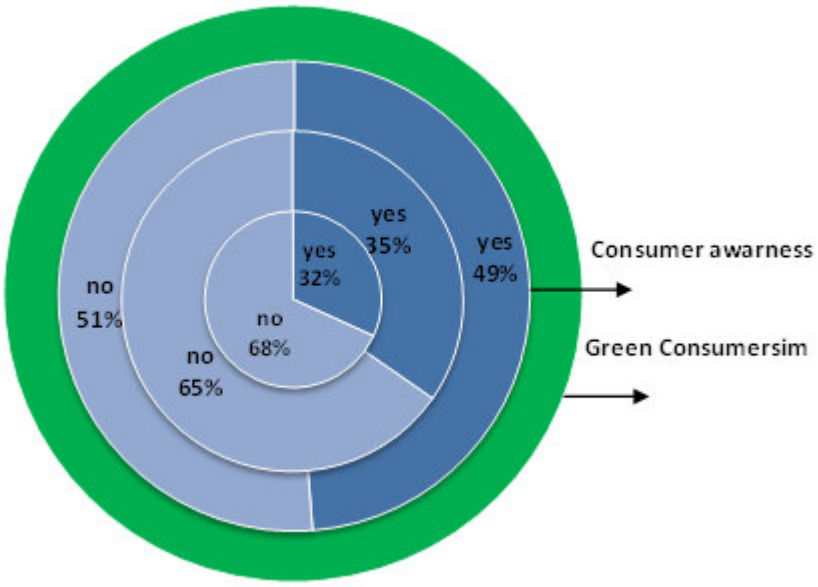


Figure (2) Consumer awareness of biodegradable plastic bags & green consumerism

Distribution of responsibility

Promoting the usage of environment friendly packaging as well as grocery bags had to be arranged by the main authority represented in environment ministry besides the commitment of retailers and consumers. The commitment of consumers can be raised by adopting an effective campaign to raise awareness and subsequently commitment of different associations. The researcher described these parties involved in the following figure

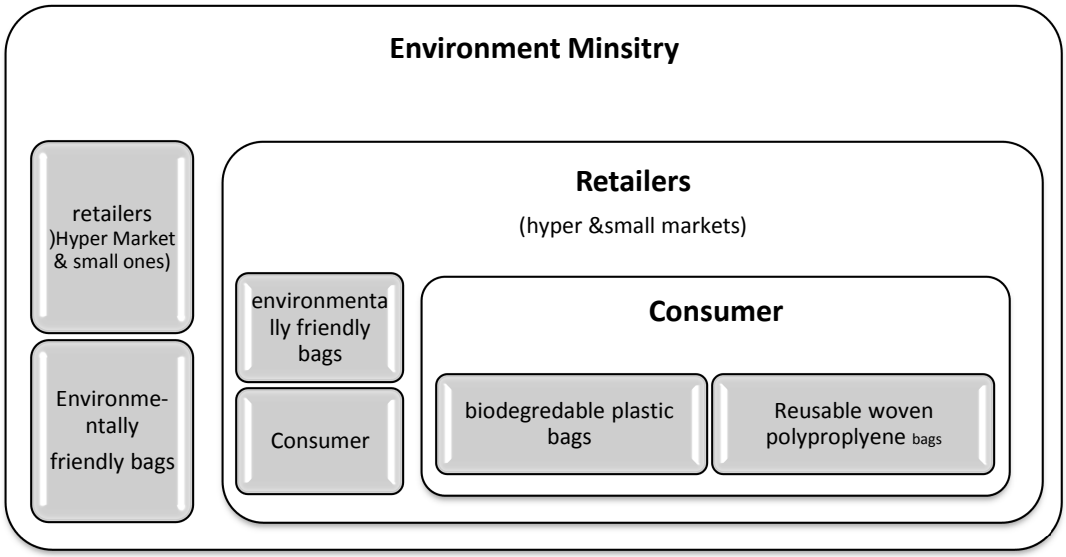


Figure (3)The responsipilty of different parties for environmentally friendly bags

Studying the effect of different parties' responsibility towards environment friendly bags on green consumerism are described by researcher in the table (3)

Table (3) the effect of different responsible parties on green consumerism matrix

Partners Environmentally Friendly bags	Environment Authority	Commercial stores		Consumer		Green consumerism
		Hyper Markets	Small Retailers	Aware	Not aware	
Biodegradable Plastic bags	●	●	●	●	○	●●○○
	-	●	-	●	○	●○
Reusable W.P.P bags	●	●	●	●	-	●●
		●	-	●	-	●

With no doubt different parties awareness of environment friendly bags usage in Egypt (biodegradable and reusable plastic bags); from environment ministry as the main authority and commercial stores either hyper markets or small retailers to consumer will increase the green consumerism. For grocery bags that distributed.

6. Conclusion

- Consumer awareness in Cairo Egypt towards environment friendly packaging as well as grocery bags is still low; this issue needs to be concerned.
- Consumers' awareness may increase the usage of reusable woven pp bag, more effort and advertising campaigns should be adopted to encourage usage of these bags in the Egyptian market.
- Reusing plastic bags can control waste accumulation problem for some time; generalizing the use of biodegradable plastic bag could constitute the first step in the solution plan of packaging wastes problem.
- Sneaking a solution could somehow help in reducing the eco impact of daily usage of plastic grocery bags despite lack of consumer awareness.
- The researchers suggest adopting policies and programs to increase awareness and adopting programs to encourage plastic carrier bag recycling; an effective campaign strategy to encourage usage of environment friendly bags should be driven by environmental organizations and under the umbrella of environment ministry.
- Plastic bags waste accumulation problem should be taken more seriously. The problem is increasing day by day especially after revolution; alternatives of eco-bags should be used.

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References

Abul Hasnat Md. Shamim. (2010) "Awareness of Urban and Rural People Regarding Polythene Ban in Rajshahi Division, Bangladesh" , 8 3,: 37-40.

Australia, Clean Up. "Report on actions to reduce circulation of single-use plastic bags around the world." *Clean Up Australia* (2010).. Retrieved from http://www.cleanup.org.au/PDF/au/cua_plastic_bag_usage_around_world_april_2010.pdf

Avallone, I. V, Giraldi, J. D. M. E., & de Oliveira, S. V. W. B. (2012). Conscious Consumption: a Study on Plastic Bags' Consumers in Brazil. *International Journal of Psychological Studies*, *4*(1), p122.

Bio Intelligence Service (2011), Assessment of impacts of options to reduce the use of single –use plastic carrier bags, Final Report prepared for the European Commission – DG Environment.

Chaffee, C., & Yaros, B. R. (2007). Life cycle assessment for three types of grocery bags—recyclable plastic; compostable, biodegradable plastic; and recycled, recyclable paper. *Final report, Boustead Consulting and Associates Ltd*.

d2w - controlled life plastic technology, http://www.d2wusa.com/files/TechnicalInformd2w.pdf accessed- February 2015.

Ebnesajjad, S. (Ed.). (2012). *Handbook of biopolymers and biodegradable plastics: properties, processing and applications*. William Andrew.

Edwards and J.M. Fry(2006). "Environment Agency. Report SC030148 Evidence: Life Cycle Assessment of Supermarket Carrier bags: A Review of the Bags Available in 2006. 1-120. 2006.

European Bioplastic, Factsheet.(January 2015) "What are bioplastic? Material types, terminology and labels – an introduction (Date 26.1-.2015)

Federal Environment Agency. Germany Report (2013) "Study of the Environmental Impacts of Packagings Made of Biodegradable Plastics",

http://www.umweltbundesamt.de/sites/default/files/medien/461/publikationen/4446.pdf (Accessed 3/1/2015)

Gautam, S.P. (2009). Biodegradable plastics-impact on environment. Report submitted by CPCB to Ministry of Environment & Forests Government of India

Gogte, M. (2009). Are plastic grocery bags sacking the environment?.*International Journal for Quality Research*, *3*(4), 363-375

Legesse Adane and Diriba Muleta. "Survey on the usage of plastic bags, their disposal and adverse impacts on environment: A case study in Jimma City, Southwestern Ethiopia." Journal of Toxicology and Environmental Health Sciences 3, no. 8 (2011): 234-248.

Morris, J., Christensen,L., (2014). "Evaluation of the Effects of California's Proposed Plastic bag ban", Reason Foundation Policy Brief 123.

Müller, C., Townsend, K., & Matschullat, J. (2012). Experimental degradation of polymer shopping bags (standard and degradable plastic, and biodegradable) in the gastrointestinal fluids of sea turtles. *Science of the Total Environment*,*416*, 464-467.

Musa, H. M., Hayes, C., Bradley, M. J., Clayson, A., & Gillibrand, G. (2013). Measures aimed at reducing plastic carrier bag use: A consumer behaviour focused study. *Natural Environment*, *1*(1), 17-23.

Muthu, Subramanian Senthilkannan, et al. (2012). "Eco-Impact of Plastic and Paper Shopping Bags." *Journal of Engineered Fabrics & Fibers (JEFF)* 7.1 (2012).

National Study (2008), Plastic Recycling Sector, Final Report- Plastic technology center& Industrial Organization center, Ministry of trade and industry technological center sector

Wagner, J.,(2013) The effects of plastic bags on environment, available online at: http://ar.scribd.com/doc/254090326/The-Effects-of-Plastic-Bags-on-Environment#scribd (accessed 12-2014)

Vaverková, M., Toman, F., Adamcová, D., & Kotovicová, J. (2012). Study of the biodegrability of degradable/biodegradable plastic material in a controlled composting environment. *Ecological Chemistry and Engineering S*, *19*(3), 347-358.