



## Introduction

Grow Plastics produces products from the greenest material available, and uses less material than competitive products. Therefore, Grow Plastics has very low relative CO<sub>2</sub> emissions. This paper uses data published by the Plastics Foodservice Package Group (which favors polystyrene foam) and Natureworks and performs calculations in order to estimate the relative CO<sub>2</sub> impact of Grow Plastics' products.

A comparison was made between three products:

- A solid polystyrene cup
- A LDPE/Paper cup (viewed by many consumers as a "paper" cup, unaware it has a plastic coating)
- A Grow Plastics' 16 oz cup

## Sources of Information

In order to evaluate the CO<sub>2</sub> impact of Grow Plastics' products, a review of peer-reviewed life cycle analyses was performed. "LIFE CYCLE INVENTORY OF FOAM POLYSTYRENE, PAPER-BASED, AND PLA FOODSERVICE PRODUCTS" was selected as one source of information, because it is an article often referred to by petroleum-based plastic manufacturers<sup>1</sup>. The other source for information, from Natureworks website, was chosen because it is the most up to date<sup>2</sup>.

## Methodology

In the manufacture of plastic products, all waste scrap is recovered and re-used. Therefore, measuring product weight is a useful tool in terms of measuring environmental impact. Grow Plastics' process uses some energy for gas compression, but uses less energy in heating of products during shaping; these were assumed to be equal for this study. Figure ES-14 in "Plastic Foodservice..." shows that 10,000 PLA cups produce a net impact of 1419 lbs of CO<sub>2</sub>. In order to generate an apples-to-apples comparison for CO<sub>2</sub> impact based on material choice, the following calculations were performed:

Gram weight and Lbs CO<sub>2</sub>/10,000 cups were copied from "Plastic Foodservice...".

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<sup>1</sup> FRANKLIN ASSOCIATES, A DIVISION OF ERG. "LIFE CYCLE INVENTORY OF FOAM POLYSTYRENE, PAPER-BASED, AND PLA FOODSERVICE PRODUCTS." [Http://plasticfoodservicefacts.com/life-cycle-inventory-foodservice-products](http://plasticfoodservicefacts.com/life-cycle-inventory-foodservice-products). THE PLASTIC FOODSERVICE PACKAGING GROUP, 4 Feb. 2011. Web. 30 Dec. 2014. <<http://plasticfoodservicefacts.com/life-cycle-inventory-foodservice-products>>

<sup>2</sup> Natureworks. "Naturworks Ingeo Eco-Profile." *Natureworks Ingeo Eco-Profile*. Natureworks, 2014. Web. 30 Dec. 2014. <<http://www.natureworkslc.com/The-Ingeo-Journey/Eco-Profile-and-LCA/Eco-Profile>>.

The grams per cup was calculated by multiplying Lbs CO<sub>2</sub>/10,000 cups by (453 grams/lb)/10,000 cups to determine the grams CO<sub>2</sub> per cup

The grams of CO<sub>2</sub> produced per gram of plastic used was calculated by dividing the grams of CO<sub>2</sub>/cup by the weight of the cup, in grams.

Results are tabulated below:

	EPS	LDPE Paper Cup	Solid PLA Cup
Gram weight	8.80	19.80	35.00
Lbs CO <sub>2</sub> /10,000 cups	1309.00	1555.00	1419.00
Grams CO <sub>2</sub> /32 oz cup	59.30	70.44	64.28
Grams CO <sub>2</sub> /Gram Polymer	6.74	3.56	1.84

The Natureworks publication discloses kg CO<sub>2</sub>/kg of polymer. This number directly translates to grams of polymer used to grams of CO<sub>2</sub> generated. Results are tabulated below:

	GPPS	LDPE	Ingeo
Grams CO <sub>2</sub> /Gram Polymer	3.24	2.2	0.74

In order to determine product weight for equivalent products, a Grow Plastics and Solo cup were weighed. An LDPE paper cup was estimated to use 10 grams of material.



### CO<sub>2</sub> Factor

In order to determine relative CO<sub>2</sub> impact of the products, a CO<sub>2</sub> factor was created. This assigned Grow Plastics' products a value of 1, and multiplied the relative CO<sub>2</sub> impact for each product.

Plastic Foodservice Numbers	Cup Weight	Grams CO <sub>2</sub> /Grams Polymer	Total	CO <sub>2</sub> Factor
Grow Plastics -PFS #'s	6.13	1.84	11.28	1.00
Solo Cup - PFS #'s	13.49	6.74	90.92	8.06
LDPE/Paper Cup - PFS #'s	10.00	3.56	35.60	3.16

Natureworks Numbers	Cup Weight	Grams CO <sub>2</sub> /Grams Polymer	Total	CO <sub>2</sub> Factor
Grow Plastics - Natureworks #'s	6.13	0.74	4.54	1.00
Solo Cup - Natureworks #'s	13.49	3.24	43.71	9.64

**Grow Plastics cups produce approximately 1/3 the emissions of Paper cups, and 1/8<sup>th</sup> to 1/9<sup>th</sup> the CO<sub>2</sub> emissions of polystyrene cups.**

When competing with polystyrene foam, Grow Plastics products are of similar weight to polystyrene foam products. Ingeo PLA from Natureworks produces approximately 1/3 the CO<sub>2</sub> emissions per pound of material used. Therefore, Grow Plastics products have approximately 1/3 the CO<sub>2</sub> emissions when compared to polystyrene foam products.

Grow Plastics' products are plasticizer, styrene and BPA free. All products are recyclable and ASTM D6400 industrially compostable.

For more information, please contact [info@growplastics.com](mailto:info@growplastics.com)