

## Attachment 2: Product Comparisons, Scoring by Criteria

Phase 1: research different products and compare according to our metrics. Each product is rated 1-5 based on qualitative research and in comparison to our current standard: the TS-24 from ImperialDade Plastics.

See full spreadsheet on google drive here: [https://docs.google.com/spreadsheets/d/1TxgwxbrcdJB5idzMjxhF7TAcJ3b\\_uXmNdmJCdIwxKM/edit?usp=sharing](https://docs.google.com/spreadsheets/d/1TxgwxbrcdJB5idzMjxhF7TAcJ3b_uXmNdmJCdIwxKM/edit?usp=sharing)

### MANUFACTURING IMPACTS

Criteria	Imperial TS-24	score	Good Natured Clear Clamshell	score	Ready Cycle Cardboard Clamshell	score	Grounded Clear Pouch	score	Biotre Brown Pouch	score
Material	PET		PLA		98% Kraft, 2% film top		<a href="#">Bioplastic: 25% starch, 5% PLA and 70% PBAT</a>		60% kraft paper & wood pulp 40% Polyethylene	
Renewable Feedstock 1 - nonrenewable resource 3 - slow or intensive renewable 5 - abundantly available	crude oil & natural gas	1	wheatstraw fiber	3	wood pulp	4	70% petrochemicals	2	Company continues Multiple: kraft paper	3
Manufacturing Energy Use 1 - intensive 5 - not intensive	intensive	1	still intensive*	1	difficult to say -- paper/cardboard is usually compared to multiuse plastics	3	lighter than clamshells	2	mixed materials, 60% paper	2
Manufacturing Water Consumption 1 - intensive, > xxx gal / unit 5 - not intensive, < xxx gal/ unit	**	1		1		1		1		1
Manufacturing Pollution 1 - large impact on env & human health 3 - some impact on env or human health 5 - no impact on env or human health	pretty bad across the board*	1	worse on SO4 / eutrophication*	1		2		1		2
Distance traveled	Impossible to know	n/a	Impossible to know	n/a	Impossible to know	n/a	Impossible to know	n/a	Impossible to know	n/a
Labor conditions	Impossible to know	n/a	Impossible to know	n/a	Impossible to know	n/a	Impossible to know	n/a	Impossible to know	n/a
Grade		20%		30%		50%		30%		40%

**Analysis:** A lot of assumptions had to be made about all of these environmental criteria. For the energy use, water consumption, and pollution production, information was not available for these specific products. Instead, we looked at Life Cycle Assessments (LCAs), a type of study to quantitatively compare the environmental impact of products and processes, for similar products like plastic bottles and cups. Overall, the LCAs show that producing the base materials for any of the packaging options requires a lot of heat (energy) and water, consumes chemicals, and produces harmful pollution. Further study would be needed to make more distinctive observations, which is beyond the scope of this project. Another barrier to accuracy is a lot of LCAs are using old data, and these new manufacturing technologies are likely to improve their efficiency overtime.

We had originally thought to consider travel distance and labor conditions for these base materials and manufacturing processes, but the supply chains are too obscure to find data that would break down along these material categories. We are listing travel and labor anyway as criteria, as a reminder to ourselves and readers that these factors exist and matter.

#### Sources:

\* Christian Moretti, Lorie Hamelin, Line Geest Jakobsen, Martin H Junginger, Maria Magnea Steingrimsdottir, Linda Høiby, Li Shen, *Cradle-to-grave life cycle assessment of single-use cups made from PLA, PP and PET, Resources, Conservation and Recycling*, 2021, <https://doi.org/10.1016/j.resconrec.2021.105508>.

### PRODUCT DISPOSAL

Criteria	Imperial TS-24	score	Good Natured Clear Clamshell	score	Ready Cycle Cardboard Clamshell	score	Grounded Clear Pouch	score	Biotre Brown Pouch	score
Reusable	some	3	somewhat	3	No	1	No	1	No	1
Recycleable 1 - No 3 - Only some recycling systems (i.e. mixed material, unusual material, unusual shape) 5 - In most recycling systems	PET is recycleable, but TS-24s are not bottle shaped	3	No	1	Yes, plastic portion is small enough to be filtered out in quality control	5	No	1	Many systems can't separate the plastic and paper layers	3
Biodegradable 1 - Long lasting (>>100 years) 3 - breaks down into microplastics 5 - breaks down completely on a molecular level within 10 years	No	1		4	small plastic component, but overall breaks down	5		5	plastic components break down into microplastics	3
Compostable 1 - No, not considered biodegradable 3 - Industrially compostable (ideal conditions) 5 - Home compostable	No	1	Industrial, certified	3	Home, made from Kraft	5	Home, Australian certification & we tested it	5	half is home compostable, half is not compostable at all	3
Subtotal		40%		55%		80%		60%		50%

**Analysis:** There is a clear winner in this section on the impacts of product disposal: the Ready Cycle clamshells are made almost entirely out of wood pulp cardboard, which breaks down well, quickly, and without harm in many settings. While the same is true of 60% of the Biotre pouch, this product got a lower score for the PET layer. The in Biotre would break down into smaller pieces faster than the Good Natured clamshells, but only because a thin layer would get torn into microplastics faster. Microplastics might not choke or trap wildlife like big pieces of plastic, but they are still a significant concern for pollution.

Our thought process here is much simpler than those pursued in LCA studies, which consider factors such as energy recovery and nutritional contributions to compost. Those additional nuances are hugely important on a global scale, but our perspective is that of a small farm and what we can actively do regionally.

### FARM OPERATIONS

Criteria	Imperial TS-24	score	Good Natured Clear Clamshell	score	Ready Cycle Cardboard Clamshell	score	Grounded Clear Pouch	score	Biotre Brown Pouch	score
Cost per clamshell	\$0.41	4	\$0.50	3	\$0.40	4	\$0.47	1	\$0.63	2
cost with shipping <i>Not scored, entirely variable on quantity ordered, location, current freight costs, etc.</i>	\$0.41		\$0.50		\$0.63		unknown ships from Australia		\$0.79	
Ease of ordering	Fast, easy, great customer service	5	Great customer service & follow-up	5	Helpful website, responsive customer service, limited size options	4	Unrealistic minimum for small farms, customer service not very helpful	1	Unrealistic minimum for small farms	2
Ease of use	Stacks and nests well, can pack in multiple orientations, closure mechanism is clear	5	Easy fit. Nitpicking: does not stack well, closure is a little tricky	4	Edges don't seal. Difficult to close quickly	2	Different flow, but workable	3	Different flow, but workable	3
Storage space 1 - not viable 3 - can store enough for a few months 5 - compact, no problem	not bad, boxes are a little unwieldy	4	case size similar to TS-24	4	Bulky	2	Compact	5	Compact	5
Shelf Life 1 - five days or less 3 - one week 5 - two weeks	two weeks	5	two weeks	5	2 days max, completely non viable	1	10 days	4	10 days	4
<b>Subtotal</b>		<b>92%</b>		<b>84%</b>		<b>52%</b>		<b>56%</b>		<b>64%</b>

Analysis: These criteria eliminate Ready Cycle and Grounded as viable options for the micro operation at Brooklyn Grange. The Ready Cycle works for microgreens packed live (roots and soil still attached, we tested it) but not in for our operation with harvested greens. The vents dry out the micros within a day or two. Grounded is eliminated because we would not be able to work with this supplier, although it is otherwise effective. Of the remaining options, the Good Natured clamshell is an easy swap for the TS-24, just not quite as well designed.

### RETAILER EVALUTATION (THE MEAT HOOK)

Criteria	Imperial TS-24	score	Good Natured Clear Clamshell	score	Ready Cycle Cardboard Clamshell	score	Grounded Clear Pouch	score	Biotre Brown Pouch	score
Appearance	professional	4	condensation, same issue as TS24, would not buy wrong size for shelves	4	Very appealing, perfect size for the shelves	5	Liked that it was lined with a moisture pad. Display was a concern.	2	how to display well was a concern	2
Durability/Transportability		5		5		5	soft walls -> product damage	3	soft walls -> product damage	3
Marketing would customers buy a package like this? 1 - No, 3 - Maybe, 5 - Yes		5		5		5		5		5
Disposal Method 1 - no interest in composting this product 3 - retailer doesn't know how to compost it 5 - what to do is very straightforward	recycleable; container shape issues not common knowledge	4	unclear how	5		5	retailer thought it was recycleable, but it's not.	1		5
<b>Subtotal</b>		<b>90%</b>		<b>95%</b>		<b>100%</b>		<b>55%</b>		<b>75%</b>

Analysis: The Meat Hook was enthusiastic about all of the clamshell packaging options, but didn't think the pouches would display very well. The only drawback for the plastic clamshells was they mist up, so that the product isn't as visible as they ought to be in a clear package.

### CONSUMER EVALUTATION (FARMERS MARKET)

Criteria	Imperial TS-24	score	Good Natured Clear Clamshell	score	Ready Cycle Cardboard Clamshell	score	Grounded Clear Pouch	score	Biotre Brown Pouch	score
Durability/Transportability	Standard, very good	5	6 customers happy	4.3	no problem 1/1	4	mixed reviews	3.7	3/4 no issue	3.75
Shelf Life	Standard, very good	5	very good	4.5	"okay" 1/1	3	effusive comments	5	great!	5
Appearance: Preferred over TS-24?	Neutral, standard	3	Yes but not clear that it's compostable	3.8	No shelf life	2	Yes but not clear that it's compostable or recycleable	4	Compostable > Recycleable	4.25
Disposal Method	Clearly recycleable	4	customers with curbside compost are clear, others not so much	2.8	no problem 1/1	1	customers requested more info on packaging	3	plastic liner confusing	2.8
<b>Subtotal</b>		<b>85%</b>		<b>77%</b>		<b>50%</b>		<b>79%</b>		<b>79%</b>

Analysis: The biggest takeaways from surveying our market customers were that they were excited about a compostable package, and that direct communication about how the composting would work is imperative.