

Biorigin

(42.ORigIN)

Introduction

Climate change has caused serious problems in agriculture, with the UK experiencing a decline of around 20% in crop yields due to extreme heat and drought [1]. Plastic mulch is widely used to improve productivity, increasing yields by about 28.7% [2]. However, this solution creates a new problem: agriculture consumes about 12.5 million tons of plastic annually [3]. In addition, with conventional plastic mulch, small-scale farmers face the labor-intensive tasks of collecting it after use and planting seeds.

Target

To deal with this problem, we propose a new product “Biorigin-Sheet”. Its target customers are small-scale farmers in Japan who use plastic mulch.

Service/Product

We propose “Biorigin-Sheet”, a biodegradable dual-layer mulch sheet made partly from discarded crops sourced from farmers. The sheet consists of two layers with different decomposition speeds. The lower layer decomposes in about two weeks, while the upper layer lasts for several months, providing protection against heat and heavy rainfall. Seeds can be embedded between the layers, allowing natural planting as the lower layer decomposes, reducing manual labor. Unlike regular plastic mulch, this sheet does not need to be removed. It breaks down naturally in the soil, so farmers do not have to pay for disposal. It also reduces plastic waste by making use of discarded crops. Our product is environmentally sustainable because of this. As it breaks down, it can add nutrients to the soil. “Biorigin-Sheet” is a low-cost solution that helps small-scale farmers deal with climate change. From the customer’s perspective, this product reduces labor, costs, and simplifies farming.

Competitive Advantage

“Biorigin-Sheet” reduces labor and disposal costs because it does not need to be removed after use. Consequently, our plan is socially sustainable. It is more affordable than other biodegradable mulch because it uses discarded crops as raw materials.

Marketing

We will start with a pilot program in local farms in Japan. We will provide “Biorigin-Sheet” at a low price and collect data on labor, cost, and crop results. This helps farmers clearly see benefits. The production cost is \$87.5 per roll (one roll dimensions: 1m (W) x 200m (D)), and the selling price is \$93, making it affordable for small-scale farmers.

Finance

“Biorigin-Sheet” will be sold at \$93 per unit in the first two years and \$97 from the third year. The production cost is \$87.5, generating a profit of between \$5.50 and \$9.50 per unit. In the first two years, we target 1,000 farmers with an estimated sales volume of 5,000 units, generating approximately \$465,000 in revenue. As sales increase, production costs are expected to decrease, improving overall profitability.

TABLE OF COSTS AND PROFITS(DOLLARS)					
INITIAL COSTS					
Factors	Quantity	Cost per Unit	Total Cost		
Land	1	\$187,500	\$187,500		
Construction Cost	1	\$62,500	\$62,500		
Blown Film Machine	12	\$50,000	\$600,000		
Belt Conveyor	6	\$10,000	\$60,000		
Multi-hole Drilling Machine	6	\$940	\$5,640		
Automatic Needle Seeder	6	\$1,250	\$7,500		
Tank	3	\$31,250	\$93,750		
Roll Baler	6	\$6,250	\$37,500		
INITIAL COSTS			\$1,064,390		
FIXED COSTS					
Item	Quantity	Cost per Unit	Total Cost		
Personnel Cost	8	\$37,500	\$300,000		
Fire Insurance	1	\$1,250	\$1,250		
Utility Expense	1	\$37,500	\$37,500		
FIXED COSTS			\$338,750		
VARIABLE COSTS					
Year	2027	2028	2029	2030	2031
Factor	-	-	-	-	-
Materials	\$8,750,000	\$9,625,000	\$9,625,000	\$131,250,000	\$13,125,000
Transportation Cost	\$437,500	\$437,500	\$437,500	\$437,500	\$437,500
TOTAL	\$9,187,500	\$10,062,500	\$10,062,500	\$133,562,500	\$13,562,500
CASH FLOW(red is deficit)					
Year	2027	2028	2029	2030	2031
Sold Products	\$9,300,000	\$10,230,000	\$10,670,000	\$14,550,000	\$14,550,000
Total Cost	\$10,580,640	\$11,681,890	\$11,859,140	\$15,084,390	\$14,435,640
Profit in the Year	\$0	\$0	\$0	\$0	\$114,360
Overall Company Balance	(\$1,280,640)	(\$1,451,890)	(\$1,183,140)	(\$534,390)	\$114,360

References

[1] <https://www.theguardian.com/environment/2025/dec/04/record-heat-drought-2025-cost-uk-arable-farmers-estimated-800m-climate-crisis-grain-harvest>

[2] <https://www.nature.com/articles/s41467-026-68798-2>

[3] <https://www.fao.org/climate-change/thematic-areas/plastics-in-agriculture/en>

Financial References

[4] https://www.e-stat.go.jp/stat-search/database?page=1&layout=dataset&toukei=00500604&tstat=000001021281&result_page=1&metadata=1&data=1

[5] https://www.e-stat.go.jp/stat-search/database?page=1&layout=normal&toukei=00500604&tstat=000001021281&survey=%E8%BE%B2%E4%BD%9C%E7%89%A9&result_page=1&metadata=1&data=1

[6] https://www.e-stat.go.jp/stat-search/database?page=1&layout=normal&toukei=00500604&tstat=000001021281&survey=%E8%BE%B2%E4%BD%9C%E7%89%A9&result_page=1&metadata=1&data=1

[7] https://www.e-stat.go.jp/stat-search/database?page=1&layout=normal&toukei=00500604&tstat=000001021281&survey=%E8%BE%B2%E4%BD%9C%E7%89%A9&result_page=1&metadata=1&data=1

[8] <https://www.monotaro.com/k/store/%E3%83%97%E3%83%AC%E3%82%B9%E6%A9%9F/?srsltid=AfmBOooXRfealEC9ubaMz4JbXLPaphMFB5qwB8DKbdkvPgG41J9c0Va>

[9] https://www.e-stat.go.jp/stat-search/database?page=1&layout=normal&toukei=00500604&tstat=000001021281&survey=%E8%BE%B2%E4%BD%9C%E7%89%A9&result_page=1&metadata=1&data=1

[10] https://www.e-stat.go.jp/stat-search/database?page=1&layout=normal&toukei=00500604&tstat=000001021281&survey=%E8%BE%B2%E4%BD%9C%E7%89%A9&result_page=1&metadata=1&data=1

[11] https://www.e-stat.go.jp/stat-search/database?page=1&layout=normal&toukei=00500604&tstat=000001021281&survey=%E8%BE%B2%E4%BD%9C%E7%89%A9&result_page=1&metadata=1&data=1

[12] <https://www.monotaro.com/k/store/%E3%83%97%E3%83%AC%E3%82%B9%E6%A9%9F/?srsltid=AfmBOooXRfealEC9ubaMz4JbXLPaphMFB5qwB8DKbdkvPgG41J9c0Va>

Illustration

