



HEMIX™

**Bio-materials made from
Waste Plants and Trees**

< Hemicellulose Ltd. >

1. About us

*The **world's first** company
Patent holder that developed and
manufactured
Biomass resin using "Hemicellulose"*



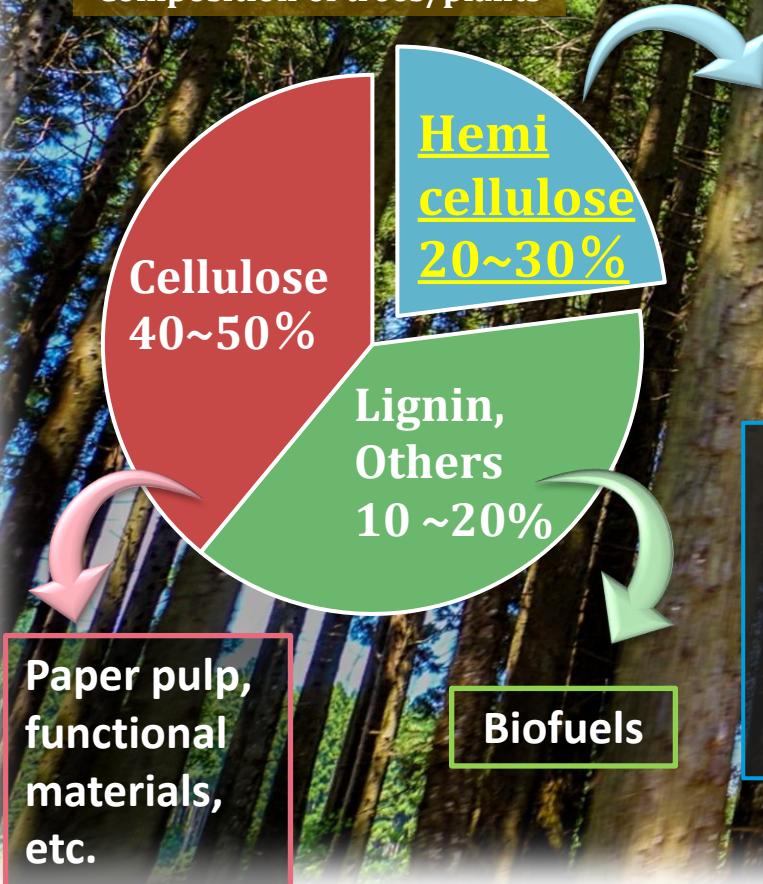
Company Name	Hemicellulose Ltd.
Business	Natural sugar-derived materials product development (Bio Plastic, Adhesive, Cosmetics, Food)
Established	April 2009 (Separated in July 2023)
Capital	40 million JPY
Shareholder	Jin Nasukawa, CEO & Founder (100%)

2. What is Hemicellulose ?



There is significant volume of **Hemicellulose (50 billion tons)** taken from trees and plants, after being separated from cellulose and lignin, almost all of which were incinerated, generating CO2 emissions.

Composition of trees/plants



Making functional bioplastics from wasted raw materials is the best way to utilize Hemicellulose to its highest value potential.

Hemicellulose offers **excellent soil/marine biodegradability** and **excellent moldability with high MFR** (melt flow rate), suitable material to replace petroleum-based materials such as PP, PE, PET etc.

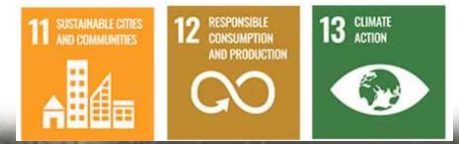




The problem we would like to solve is
Global Warming.

We follow the roadmap
“to keep the global temperature rise
to below 1.5 °C” **with Hemicellulose.**

3-2. Social issues and Our Solutions



Also, **Food loss and waste**

is a major contributor to CO₂ emissions, accounting for 8–10% of the world's annual greenhouse gas emissions.

Food and beverage companies are now looking for the way to utilize the food loss and waste generated from their plants to meet their SDGs goal.

As Hemicellulose is found every food loss and waste, food and beverage companies can **upcycle their wastes to valuable and meaningful products** such as their packages and PR goods etc. by using our technology to make bioplastics from their food loss and waste.

Drives **8-10%** of global
greenhouse gas emissions



Keep **agriculture and forestry** in the global south **sustainable**.

In plant-producing regions in Africa and South America, illegal logging (for the purpose of sale) and burning (for the purpose of cultivating farmland and pastureland) of plants are on the rise due to scarce income loss and inability to achieve economic independence.

If we can license our technology to local compounder to produce bioplastics from local waste (e.g. cacao husks), and sell them to developed countries (e.g. Chocolate consumers), we can **return profits to local farmers and help them achieve economic independence.**



4. Key members



Mr. Jin Nasukawa (Founder & CEO)

- Worked for Trading company, Management Consulting firms and start own business from 2009.
- Created a hybrid service with “Management consulting”, “Global business development” and “Bio material products”.



Ms. Yoko Kamo (Head of R&D)

- Ph.D. (Agriculture) from the Faculty of Agriculture, Kyushu University.
- Worked for R&D at chemical and paper manufacturing company.
- Now leading R&D all activities.



Mr. Takeshi Nishiwaki, (Sales & Marketing Officer)

- Served as CEO for Oita CELEENA, Cellulose material venture company
- Now worked for Sales and Marketing.



Mr. Yuhei Maeda, (Intellectual Property Officer)

- Served as General Manager of TORAY Textile Research Institute.
- Now supervising R&D and intellectual property.



Mr. Shinichi Yamamoto, (Manufacture & QC Officer)

- Served as Manager of the ASAHI KASEI and the Plant manager of photosensitive materials plant.
- Now supervising material manufacturing, quality control, and quality assurance.



Mr. Yoshitaka Tsutsumi, (Chief Engineer)

- Engaged in in TOSO polymer-related R&D, manufacturing, sales etc.
- Now in charge of developing biodegradable polymers and compliance with laws and regulations for chemical substances.

5. All-in-one Development Process

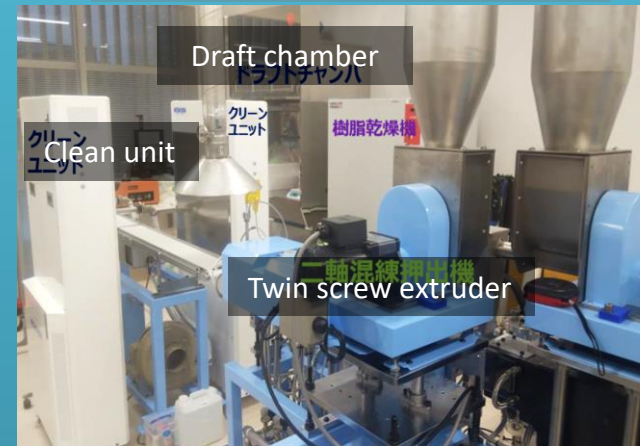
- ◆ Involved in **ALL the following processes** from raw natural material to the end-products made.
- ◆ There is **NO other companies in the world** controlling the connected processes (1 through 4).

1.
Extract
Hemicellulose,
Cellulose, Lignin

2.
Derivatize
Saccharide

3.
Compound
(material
making)

4.
End-products
Manufacturing



6. Our Original Agri-Tech

Our agri-tech is a **DB platform** for designing biomaterials using waste plants based on their **sugar composition**.

Already established **know-how on 7 major plants** that are produced **globally**, especially for **food and beverage industries**.





This is only our Agri-Tech in the world, can be expand our activities globally



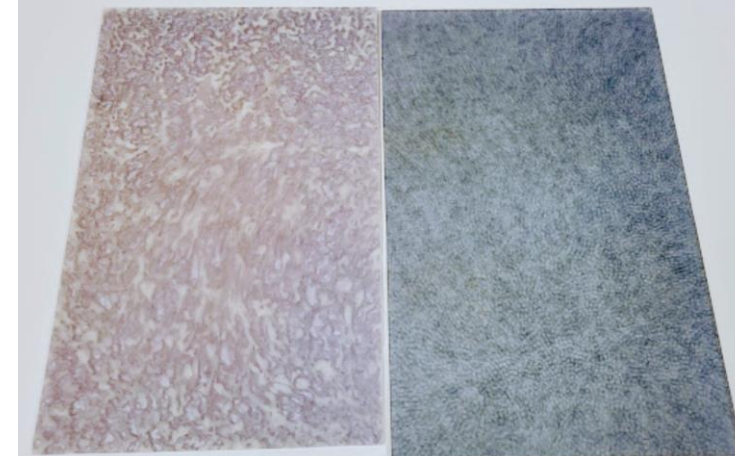
7. HEMIX™ pellets Line-up

- ◆ HEMIX™ is a brand name of **materials, products and solutions** created using our hemicellulose (natural sugar) know-how and technology.
- ◆ Making **Functional bioplastic pellets** is the first step towards “**Creative circularity**”.



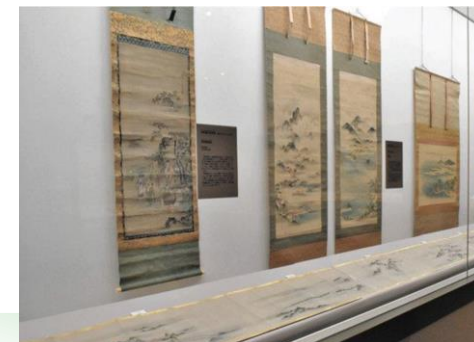
Type		Ingredients	Performance / Characteristics	Examples	
1	HEMIX™ 100% Plant-derived	<p>① Hemicellulose original High-function material</p> <p>② Natural-highbred material (Cellulose, Hemicellulose, Lignin, Starch, Algae, Trees, Plants, Shells etc.)</p>	<ul style="list-style-type: none">• 100% biodegradability & best environmental effect• High physical properties (Strength, Heat resistance, Transparency, Molding processability)	 <i>Hemicellulose 100%</i>	 <i>Cacao husk-derived</i>
2	HEMIX™ Plant + Petroleum-derived	<p>Biomass +</p> <p>PP, PE, ABS, PMMA, PS , PC, PC-ABS,PET,PA,PVA,POM,PVC, TPE (Elastomer), etc.</p>	<ul style="list-style-type: none">• Physical properties Customize (Can increase physical properties of which functions are close to those of conventional plastics.	 <i>PP +HC</i>	 <i>PS + HC</i>

8-1. HEMIX™ Products - 100% plant-derived-

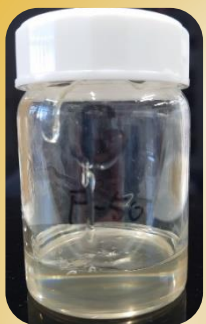


8-2. Adhesive and Hot melt

- ◆ Our 100% natural “Adhesive and Hot melt” get strong demand by Art museum, to prevent collapse/change for 100 years term



Biomass Adhesive



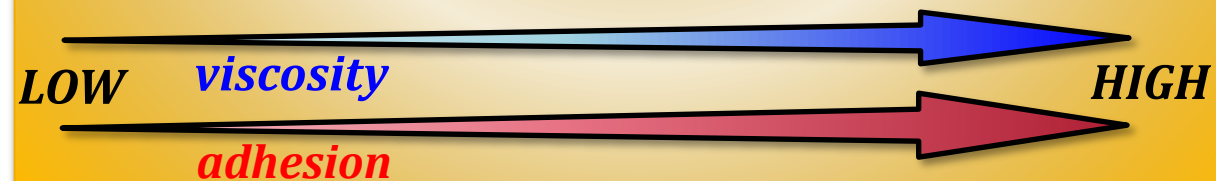
Version 1



Version 2



Version 3



Biomass Hot melt



Heated



Cooled



Version 1



- Once the two sheets peeled off, the adhesive becomes non-stickable.
- To re-bond them, heat the adhesive until melted and stickable.

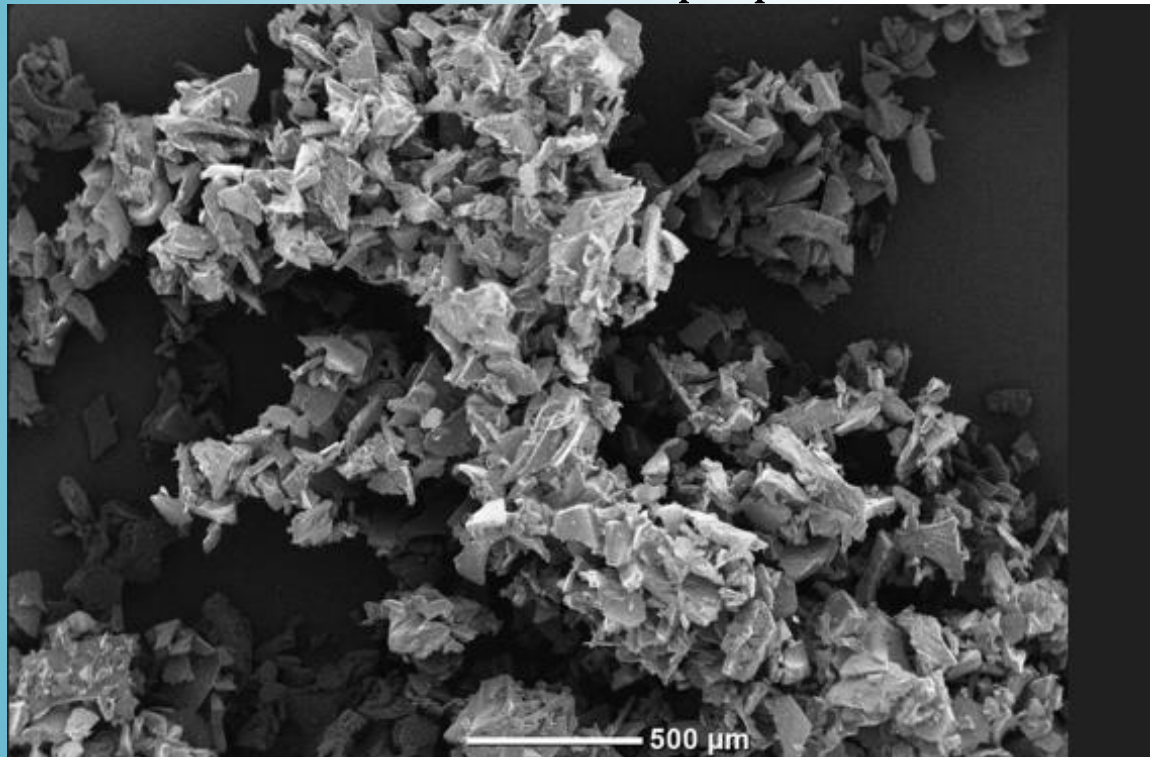
8-3. Cosmetics Material

- Has completed “**Scrubs and Foundations**” from Hemicellulose
- Evaluation will be conducted by a European cosmetics manufacturer.
- Also developing “**Food applications for spherical Hemicellulose**”.



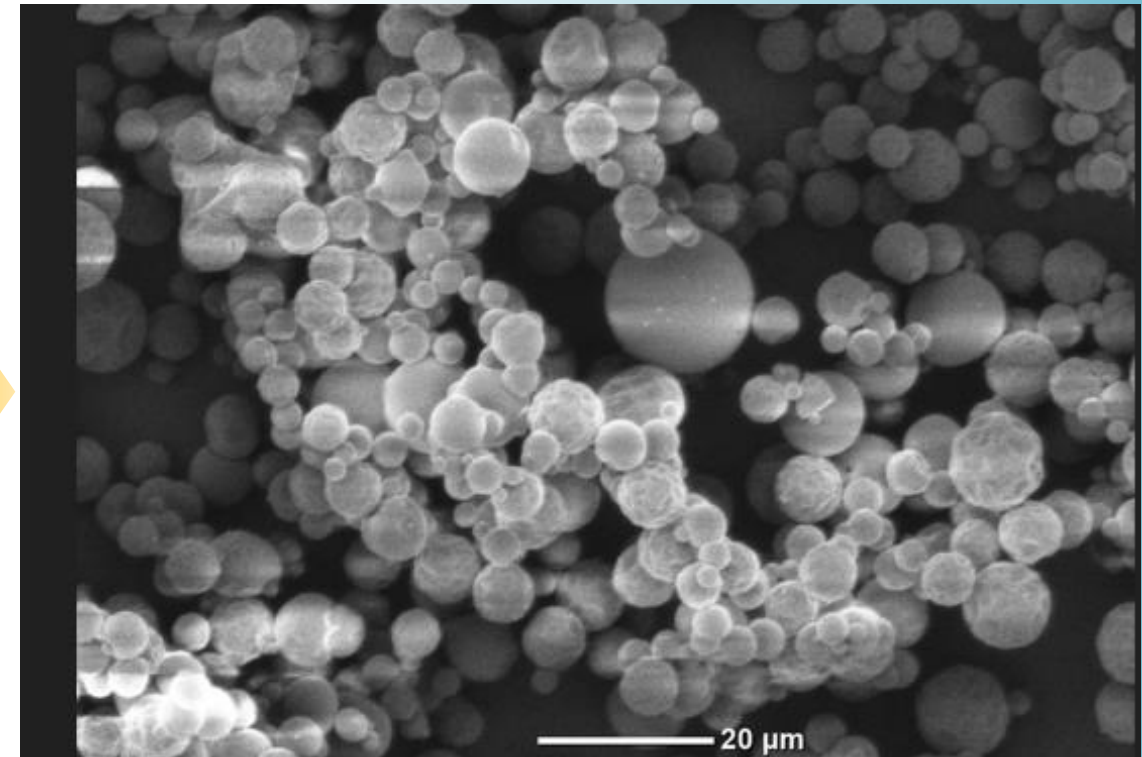
Before modified

Electron Microscopic photo



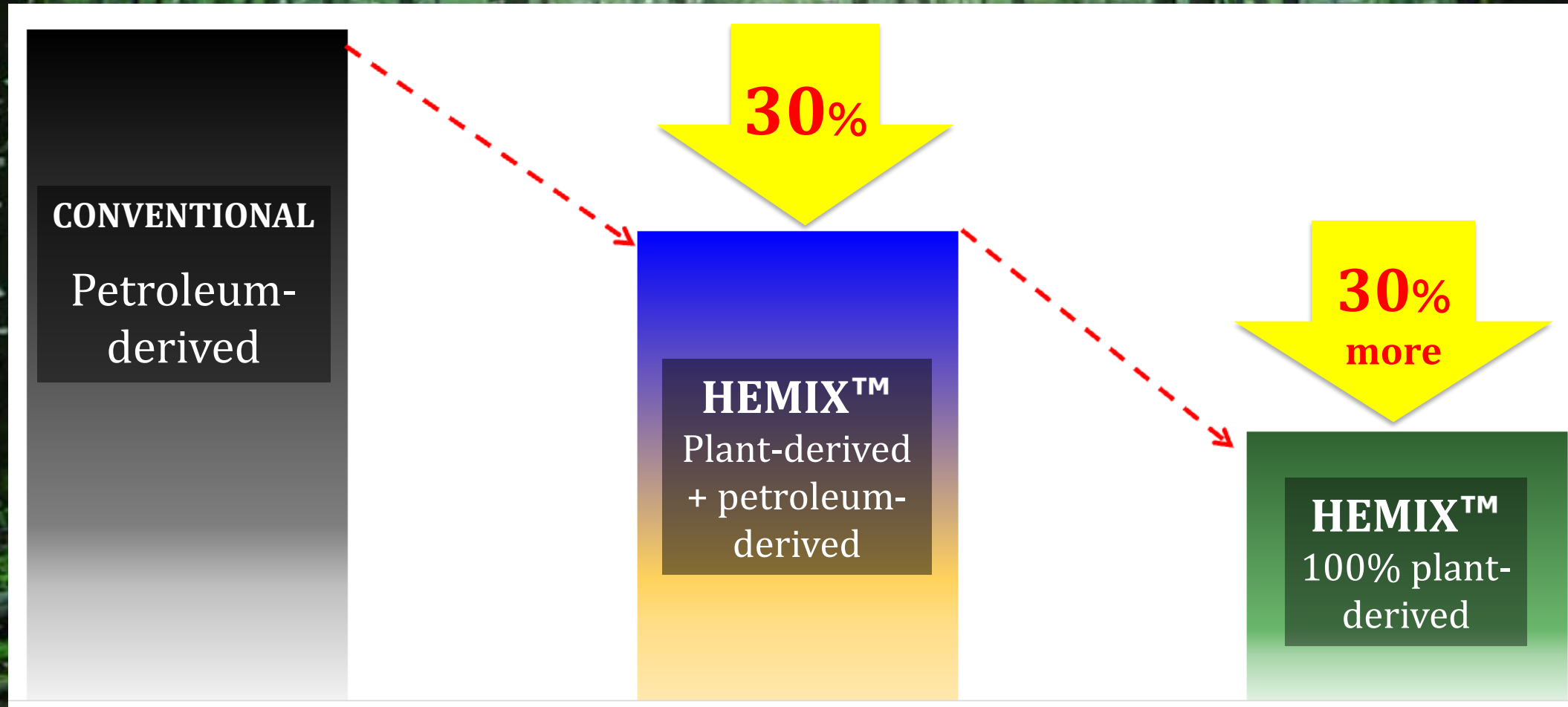
After modified

Electron Microscopic photo

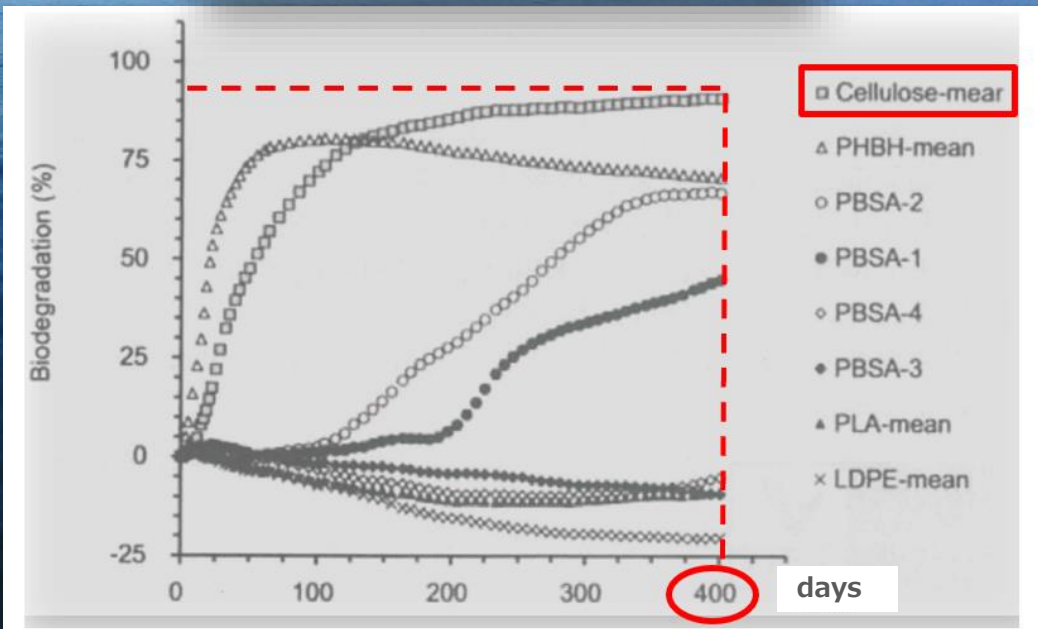
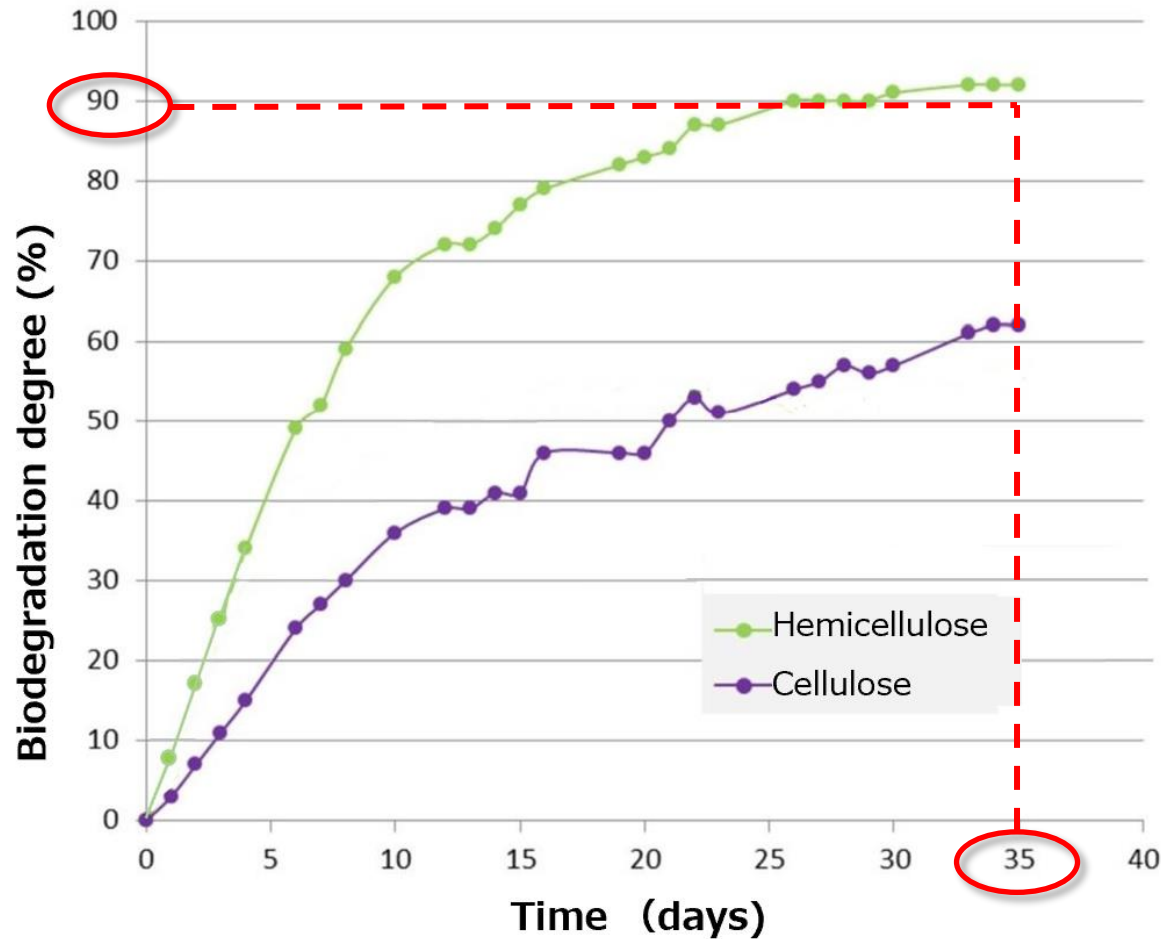


9-1. Environmental effect : CO₂ reduction

◆ Plant-derived HEMIX™ **can reduce CO₂ emissions by 30-60%** compared to petroleum-based plastic .



◆ HEMIX™ offers the **HIGHEST** level of soil/sea biodegradability among all bioplastics.



10. Physical Performance

Petroleum-based 100% vs Petroleum-based 90% + HC 10%
MFR/Productivity x 1.5~4.2 **Tensile Strength x 1.0 (Equal level)**

MFR (g/10min)

0 20 40 60

Tensile Strength (PMa)

0 20 40 60 80

Cellulose 100%

11.4

x 2.2

Cellulose 90% +HC 10%

25.1

Cellulose 100%

42.5

x 0.96

Cellulose 90% +HC 10%

41.2

PP 100%

10.6

x 4.2

PP90% + HC 10%

44.6

PP 100%

35.5

x 0.98

PP 90% + HC 10%

34.8

PS 100%

6.8

x 2.8

PS90% + HC 10%

19.2

PS 100%

48.5

x 0.98

PS 90% + HC 10%

47.6

PMMA 100%

10.7

x 1.5

PMMA90% + HC 10%

16.2

PMMA 100%

55.6

x 1.07

PMMA 90% + HC 10%

59.5

11. Comparison to Competitors



Hemicellulose Ltd.

QUICK

in decision making,
in developing lead-time



VARIETY

of woods/plants
Know-how



SMALL

Capital Investment



Other Bio material
companies

Take long time

in decision making,
in developing lead-time,
dependency on outsourcing

ONE (or a few) kind(s)



LARGE

Capital Investment



12. Project examples (Tagua nuts from Ecuador rain forest)




HEMIX
From the rainforest of Ecuador

Save the Rain Forest
Save Tagua
with **HEMIX™**



Supported by the embassy of Ecuador



In Ecuador,
Tagua nuts, used for clothing buttons,
Replaced by petroleum-derived plastics

→ **lost jobs, suffer from poverty**

Accelerates illegal logging, burning

→ **Severe air pollution ,CO2 emission**



Certificate 

Nr. FW_Cert_272317_2023.1

TRAFINO S.A.
Zona Manta Km.1 Via a San Juan, Manta
Ecuador

CONTRACTED PROCESSOR/EXPORTER: TAGUATECH S.A.
AVENIDA GALO PLAZA LASSO LOTE 1 Y DIEGO DE VASQUEZ, QUITO, ECUADOR

Ecocert Swiss AG hereby confirms that the above mentioned operation was inspected and certified according to the control procedures as outlined in the FairWild Standard Version 2 (August 2010) and that the below listed activities and products were found to be in compliance with the production rules defined in said Standard. It is the certificate holder who is responsible for permanent compliance with the applicable requirements.



Certified Activity **FairWild Collection**
Processing and Marketing of FairWild Products

Validity* **from date of issuance until 31.01.2025**

Quality & Product **FairWild**
Tagua (*Phytelphas Aequatorialis*) - seeds
Tagua powder
Tagua button blanks

Issue date: Kreuzlingen, 04.10.2023

Ecocert Swiss AG


This acknowledgment may not be used as a trade transaction certificate.
* This certificate is valid until issuance of the succeeding certificate provided that a valid contract is in place and that all activities of the operator are inspected annually and do not contravene the above regulations.

13-1. Cacao Facts

健康にアイデアを

meiji



Cacao pod
1 0 0 0 g

Cacao beans
5 0 g

Cacao beans



Cacao nib



Germ



Chocolate

Cacao pulp



Cascara

(Cacao pod husk)



Scattered
in the field

Energizing
fermentation

Cacao husk



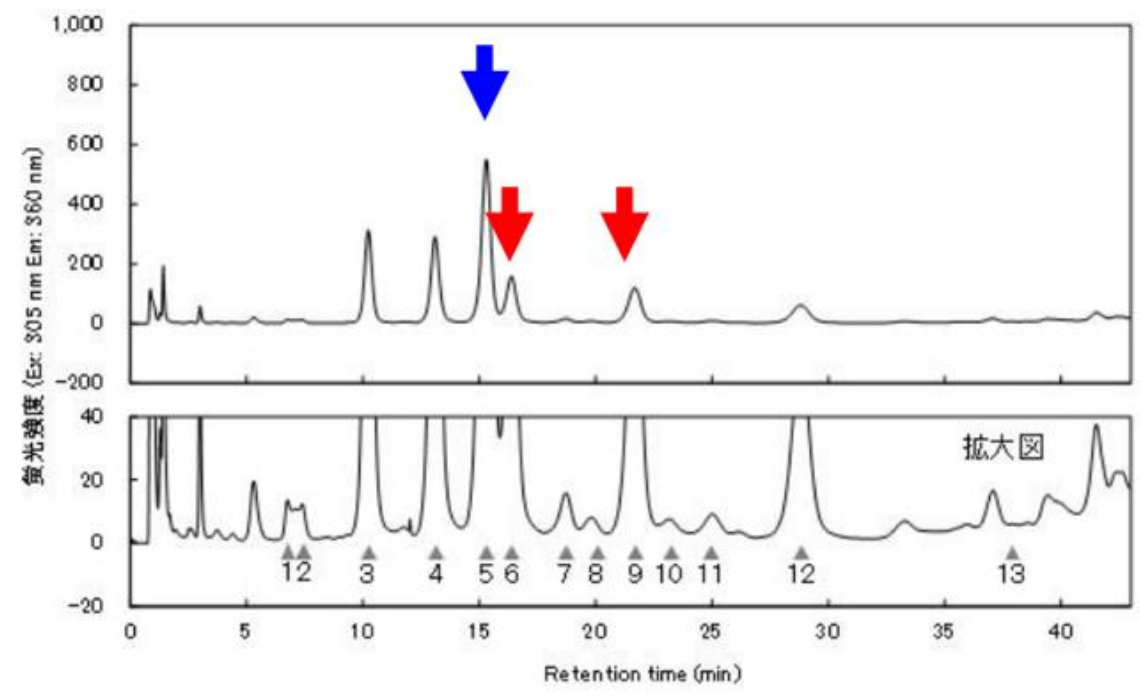
Not so good
quality...

Feed, Fertilizer, Fuel

Cascara
8 0 0 g

80% is underutilized → NEEDS UPCYCLE!!

13-2. Cacao husk/cascara Bioplastic



記号	成分名	保持時間(分)	pmol	サンプル 1 mL あたり	
				nmol	μg
1	Glucuronic acid	6.8	< 5.0	< 816.5	< 158.5
2	Galacturonic acid	7.4	< 20.0	< 3265.8	< 634.0
3	Galactose	10.2	17.0	2775.7	500.1
4	Mannose	13.1	19.3	3156.4	568.7
5	Glucose	15.3	34.8	5687.2	1024.6
6	Arabinose	16.4	11.4	1859.7	279.2
7	Ribose	18.7	1.4	232.6	34.9
8	N-acetyl-mannosamine	ND	ND	ND	ND
9	Xylose	21.7	12.4	2022.1	303.6
10	N-acetyl-glucosamine	23.2	< 1.0	< 163.3	< 36.1
11	Fucose	25.1	< 1.0	< 163.3	< 26.8
12	Rhamnose	28.8	10.1	1642.2	269.6
13	N-acetyl-galactosamine	ND	ND	ND	ND

13-3. Application of Cacao-Bioplastics

Cacao husk bioplastic



Cacao sheet



Inner tray



Inner tray



Chocolate case



Tray



SARASA Ballpoint pen



Cosmetics package



Yarn



Cloth



Straw



Plastic model



Miniature train



Miniature car



T-shirt



14. Global expansion of Bio materials made from Cacao Belt Countries

◆ Transfer “bio material technology” to Agri/Forest countries to realize “Local production” for Ecological & Economical.





Innovate for the Earth