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The role of bioplastics in the Circular Economy

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Content

What are bioplastics and why is it important for the circular economy?

Globally, what are the key benefits and challenges of bioplastics?

Why is Thailand positioned as a global leader for the bioeconomy?

Sustainability and environmental impact of plastics is the new burning platform

Consumer and society increasingly aware of sustainability issues

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Oceans | Environment and Natural Resource Security | ASEAN

Asia's plastic problem is choking the world's oceans. Here's how to fix it

NATIONAL GEOGRAPHIC

Tiny plastic pieces are spread throughout the deep sea

The finding adds to the growing body of evidence that microplastics permeate our oceans.

The New York Times

Dead Whale Found With 88 Pounds of Plastic Inside Body in the Philippines

Governments are urgently responding to the sustainability imperative

G20 AGREES TO TACKLE OCEAN PLASTIC WASTE

They will also share best practices, promote innovation and boost scientific monitoring and analytical methodologies.

BY REUTERS / JUNE 17, 2019 19:40

WORLD

Asian countries take a stand against the rich world's plastic waste

By SHASHANK BENGALI JUN 17, 2019 | 3:00 AM | MANILA

ADVERTISEMENT

European parliament votes to ban single-use plastics

Vote by MEPs paves way for law to come into force by 2021 across EU

As a result, circular economy of plastics becomes imperative, and bioplastics pay an important part

Biobased feedstock

Scope of the term "bioplastic"

What most people mean

Biodegradable

Non biodegradable

Bioplastics (Material substitution)

e.g. PLA, PHA, PBS, starch blends

Bioplastics (Drop in solution)

e.g. biobased PE, PET, PA, PTT

Bioplastics (Biodegradable only)

e.g. PBAT, PCL

Conventional plastics

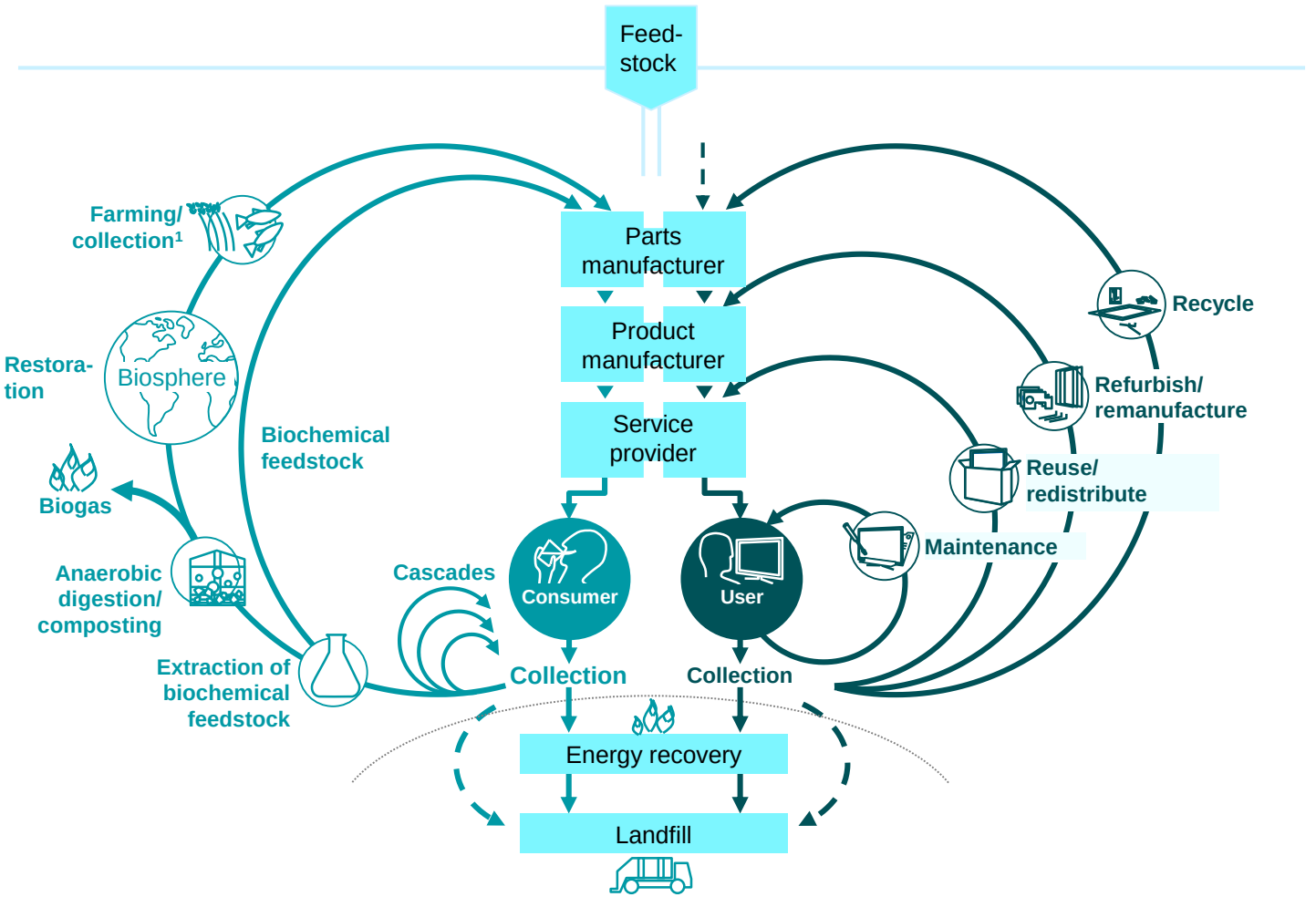
e.g. PE, PP, PET

Fossil-based feedstock

SOURCE: European bioplastics; Ellen MacArthur Foundation, McKinsey

As a result, circular economy of plastics becomes imperative, and bioplastics pay an important part

Biological loop:
Biodegradable plastics enabled to be composted and returned to earth



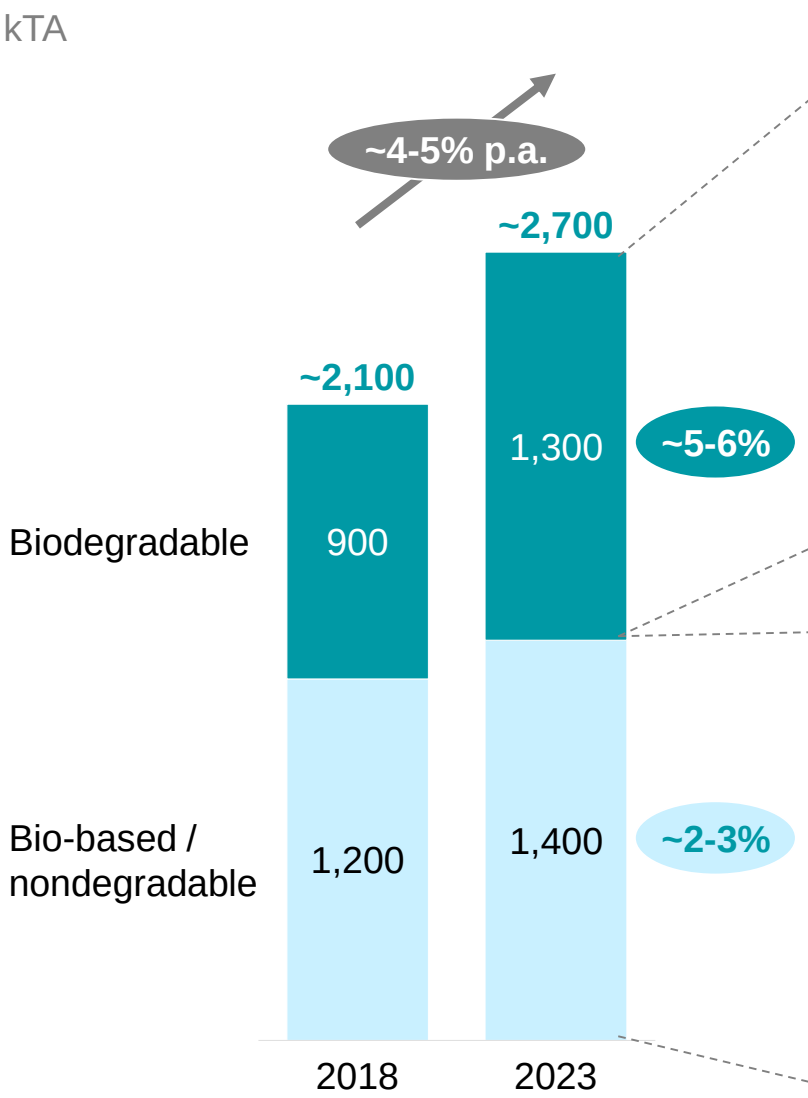
Technical loop:
Plastics with bio-based feedstock must be recycled back to be circular

Both sides of the loop are necessary for "bioplastics" to be circular

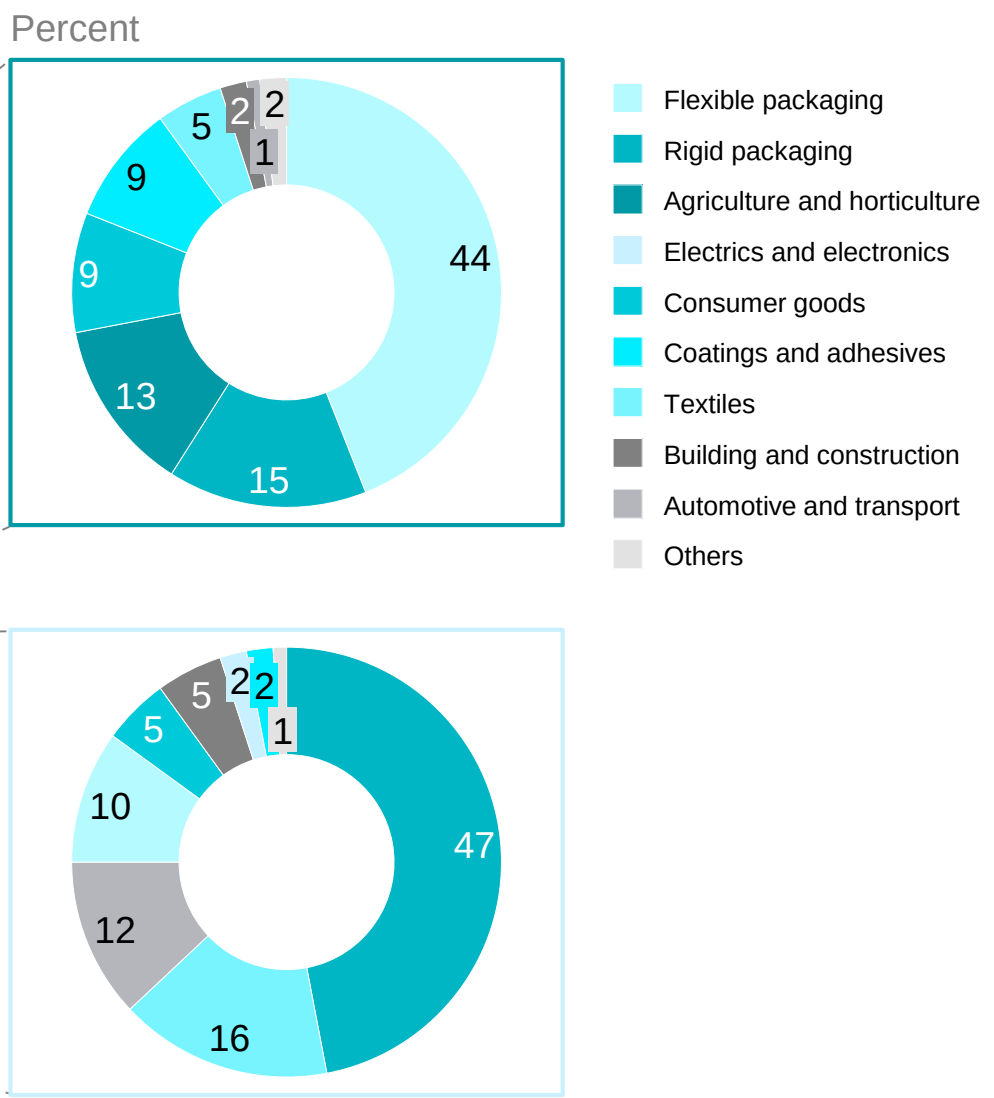
SOURCE: European bioplastics; Ellen MacArthur Foundation, McKinsey

Bioplastic capacity and demand small, but growing

Global production capacities of bioplastics



Bioplastic use by application, 2018



- **Total capacity of bioplastics represent < 1%** of global plastics production (~330 MMTA)
- **Flexible and rigid packaging applications drive ~60% demand**
  - PLA and PHA dominate biodegradables
  - Bio-based PET, PE, and Nylon represent ~80% of the resins
- Packaging, consumer electronics, and agriculture drive short term growth

SOURCE: European Bioplastics, Nova institute (2018); IHS CEH (2018); Industry Experts Market Report (2018); McKinsey

Many favorable developments for bioplastics, though some challenges remain

		Factors driving adoption	Some challenges remain
1	**Economics**	▪ Consumers willing to pay 15-20% premium for sustainable product	▪ Bioplastics are still 3-10x more expensive – selective choice in application needed to be competitive
2	**Regulations**	▪ Increasing awareness, plans, and pledges – Cascading bans on single use plastics globally	▪ Adoption still relies on a market-driven structure – No direct mandates on usage of bioplastics, nor other incentives (e.g., subsidies) to promote sector compared to biofuels and bioenergy
3	**End User**	▪ Many companies commit to utilizing biodegradable or recycled products due to the sustainability challenge	▪ In some cases, there may not be enough supply to meet these commitments
4	**Environmental**	▪ Less carbon footprint ▪ Most have renewable feedstocks	▪ Waste collection stream needs to be managed for some bioplastics
5	**Technical**	▪ Many improved / superior properties for bioplastics (e.g., enhanced breathability, increased material strengths, reduced thickness)	▪ Some limitations (e.g., high temperatures for food applications) although improving

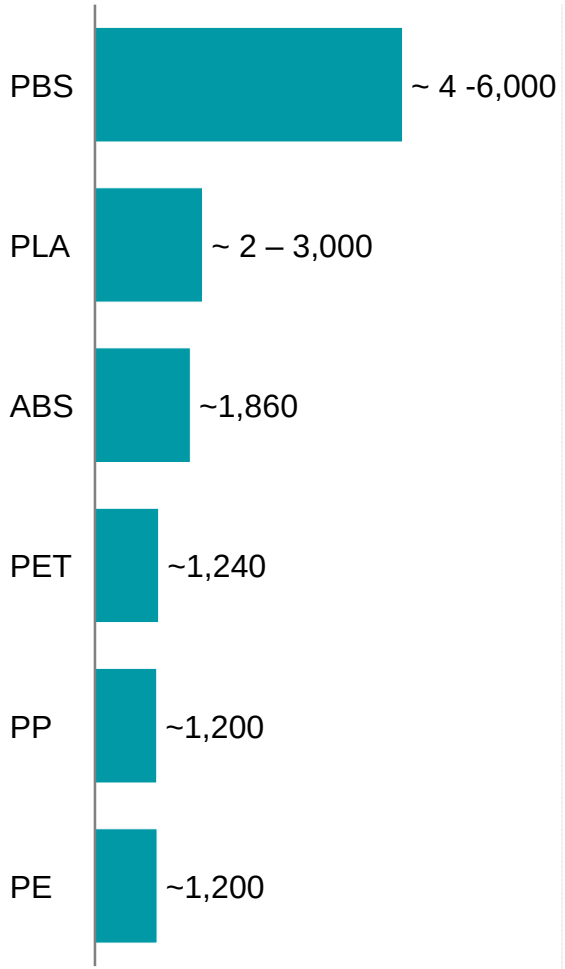
SOURCE: IHS, European Bioplastics Association, Industry expert interviews, Press Search team analysis

1 Bioplastics are still 3-10x more expensive – selective choice in application needed to be competitive

SIMPLIFIED

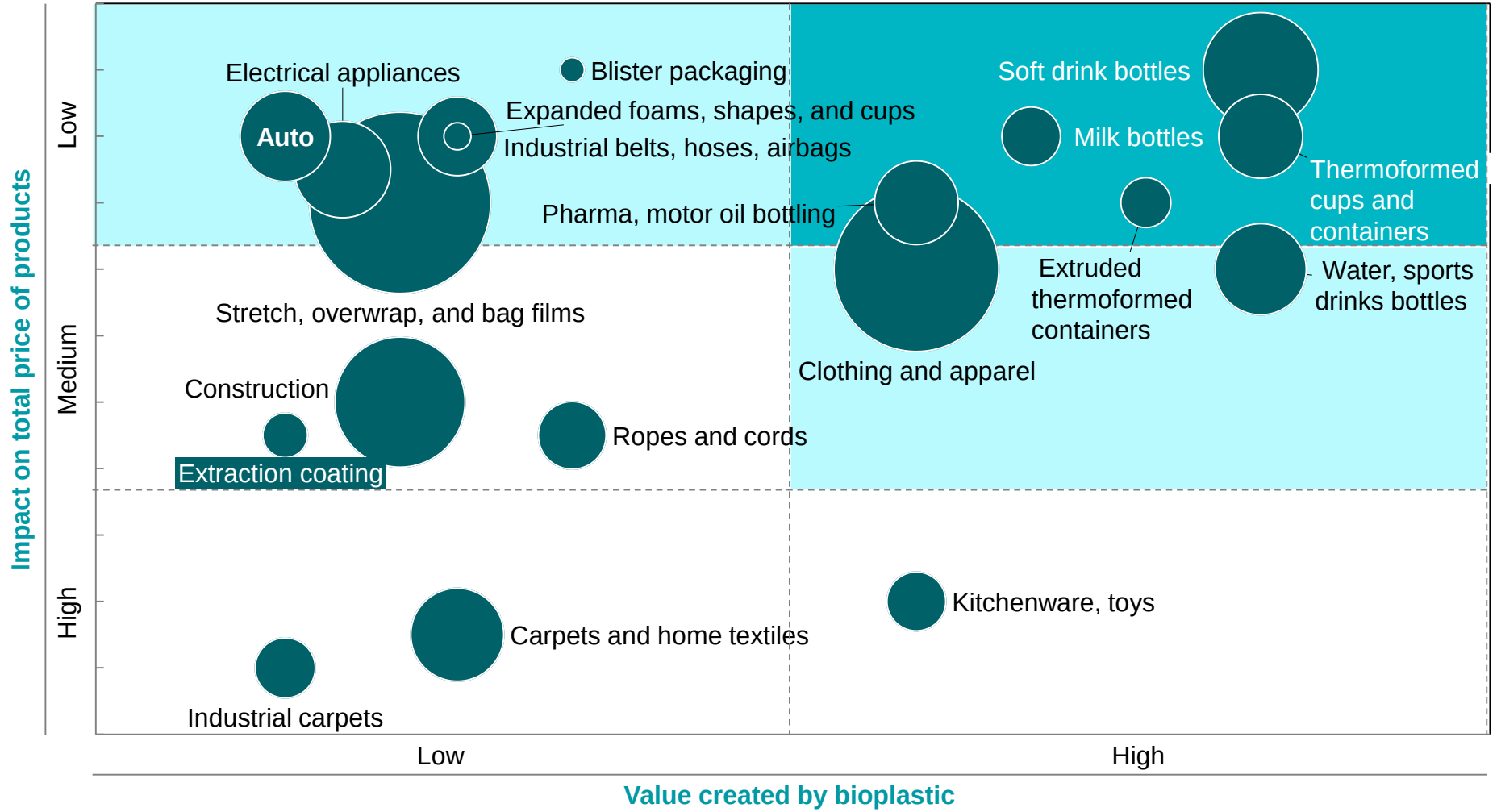
GREEN PE EXAMPLE

Estimated price, 2018
USD/tonne



Cost impact and value created by biopolymers in packaging and textile applications
Bubble size corresponds to estimated market size

Potential for premium and penetration
High Medium Low



SOURCE: SRI; IHS Markit; Expert Interviews; McKinsey analysis

2 Most policies relevant to plastic use and waste are bans or usage limits

[x] Number of cases in sample | >= 4 cases | 1 – 3 cases | No case found

Rrecently cascading policies show a united front to combat plastic waste

- **75% of packaging waste recycling** and **ban on landfilling** of separately collected waste by 2030
- **Extended Producer Responsibility** schemes[1]

- **June 2018** - Total ban on single use plastics by 2022
- **March 2019** – Reduction on single use plastics by 2030

- **June 2019 –** State of Vermont passed the nation's most comprehensive single-use plastic ban for 2020

- **June 2019**: Ban "harmful" single-use plastics by 2021

- **March 2019:** Ban 3 types of plastics by 2019, 4 single use applications by 2022

Sample of plastic packaging policies indicate that focus is on replacing/banning plastics, esp. in food service and bags

Sample of 82 plastic packaging policies/legislation in US, Europe and Asia

	Region				
	United States			Asia	
	California	Other states	Europe	China	Other Asia
1 Increase use of bio-based plastics			1		
2 Increase recyclability			2		
3 Increase recycled content	1		1		
4 Replace plastics with other materials	6	32	5		7
5 Increase recycling rates	3	8	2	3	
6 Reduce excessive packaging					3
7 Other		4	3	2	
Total	10	44	13	5	10

1 Includes legislation/policy that targets all packaging regardless of substrate

2 Includes cups, cutlery and tableware

SOURCE: Press search; McKinsey

3 Meeting sustainability targets set by companies still require a changes by the rest of the value chain

Companies targeting plastic content and sustainability…

Pledged to work towards using 100 percent reusable, recyclable or compostable packaging

amcor
ecover
evian
L'ORÉAL PROFESSIONNEL PARIS
MARKS & SPENCER
MARS
Unilever
Coca-Cola
PEPSICO
Walmart
WERNER & MERTZ

… but a lot of work still required to make targets into reality

SOURCE: Plastic News, Feb 2019; EMF

Thailand is positioned to advance the development of bioplastics

1 Access to Feedstock

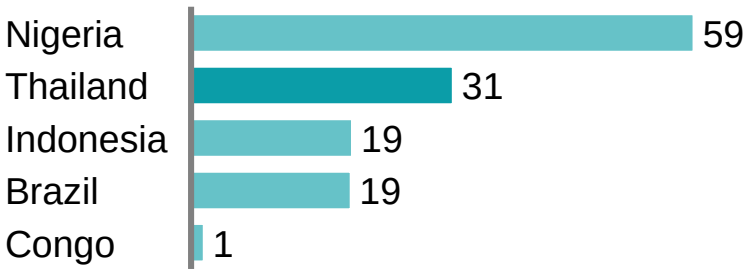
Top 5 global producer of key feedstock crops

- 31 MT of cassava
- 103 MT of sugarcane

Top 5 in terms of yield for both cassava and sugar cane

2017 top cassava production

Million tons



2 Well established infrastructure and associations

- Multiple bioplastic and bio-based chemicals producers already clustered
- Established chemical industry (~4500+ plastics producers / converters) with logistics access
- Network of industry association promoting consumer awareness
- Market early adopters of bioplastic applications in Asia

3 Regulatory support/ spurring demand

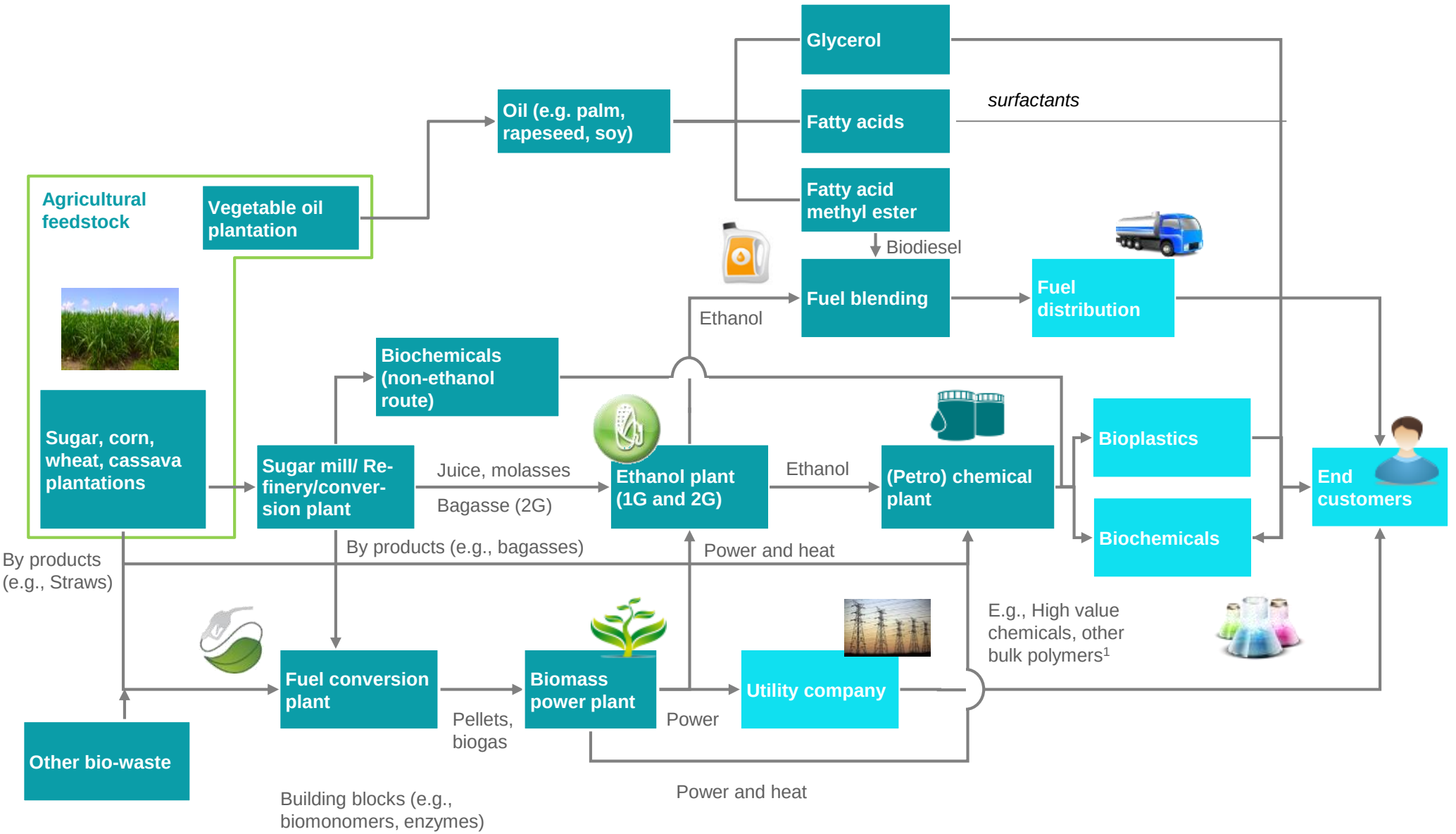
- Many recent policies including:
  - 20-Year Roadmap for Plastic Waste Management (2018-2037), banning 3 types of plastics in 2019 and 4 single use applications in 2022
  - BOI priority S-Curve sectors giving tax incentives for companies in biosector
  - Thailand 2018-2027 Bio Industry Development Plan approved by cabinet aiming for Thailand to be Bio Hub of ASEAN with in the year 2027

SOURCE: FAO, Thailand BOI, Press Search, McKinsey

Thailand has the vision and potential to organize an integrated Biohub

ILLUSTRATIVE

End products/services



BOI estimates expected contribution from the bioeconomy to the GDP to be 10% by 2037

Potential for all players in the value chain to mobilize the industry in Thailand

SOURCE: McKinsey; BOI; Press Search

In summary…

What are bioplastics and why is it important for the circular economy?

- Crucial lever to combat against plastic waste and promote sustainability
- Bio-based feedstock or biodegradable or both
- Both biological and technical loops paths in CE

Globally, what are the key benefits and challenges of bioplastics?

- Increasing consumer awareness increasing demand
- Enabling global policies help shift towards bioplastics
- Choice of application is key to remain competitive

Why is Thailand positioned as a global leader for the bioeconomy?

- Access to feedstock
- Established industry, infrastructure and supporting organizations
- Ambitious roadmap policy defined by the government