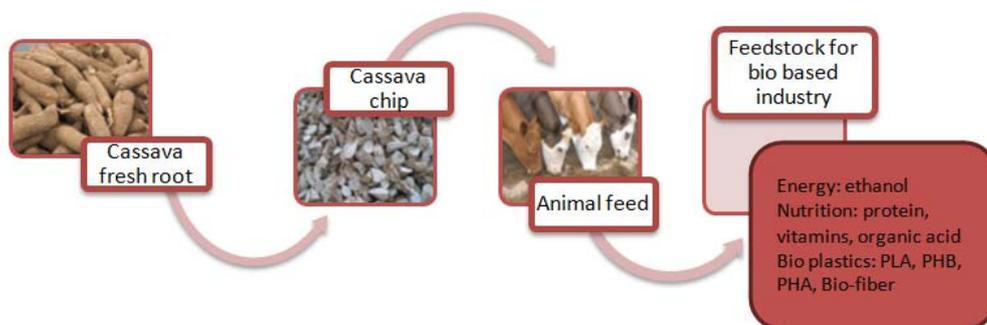


THAILAND: THE HUB OF BIO-PLASTICS

BIO-PLASTICS OVERVIEW

Bio-plastics, plastics derived from renewable biomass sources such as plant starches and vegetable fats, are a cutting edge biodegradable technology seen by many as a sustainable alternative to chemically produced plastics. The most widely known types of commercial bio-plastics include Polylactic acid (PLA), Polybutylene Succinate Adipate (PBSA), Polybutylene Adipate Terephthalate (PBAT), and Polyhydroxyalkanoates (PHAs). There is a growing demand for these biodegradable, environmentally friendly products as countries become increasingly environmentally conscious.

Cassava Value Chain



Source: The National Science and Technology Development Agency (NSTDA)

The global demand for bio-plastics is expected to more than triple to an approximately worth of US\$2.9 billion by the year 2015. Starch based resins and PLA are expected to more than double in demand by 2015 while PHA resins are expected to show the greatest increase in demand.

Thailand, a nation home to both a strong, thriving agricultural base and advanced technologies and research-driven resources, provides a competitive advantage to the bio-plastics industry. The combination of input supply and advanced manufacturing resources puts Thailand in a competitive and strategic position as a nation readying itself to become one of the global hubs for the emerging bio-plastics industry.

The bio-plastics industry is an enormous business opportunity in Thailand due to rich supply of biomass, supporting industries, active industry and government cooperation, supportive government policy, and the nation's strategic location. The Kingdom of Thailand also boasts a large agricultural base as the world's second biggest food exporter in Asia after China and is the world's largest exporter of cassava.

THAILAND: THE LAND OF BIO-PLASTICS OPPORTUNITIES

Thailand's agricultural and industrial resources truly position the nation as the regional hub in the bio-plastics industry, and the Thai government has taken active steps to incentivize investment into the flourishing, emerging industry. Thailand's strong agricultural sector, existing plastics industries and supporting governmental organizations make it an ideal location for bio-plastics investment.

Abundant supply of raw materials

Thailand has a flourishing agricultural sector in products such as rice, cassava, sugarcane and cellulose and is the world's biggest cassava exporter and second biggest sugar exporter. Thailand's large agricultural base, which can be used as biomass feedstock for bio-plastics, gives

those investing in the bio-plastics industry an enormous comparative advantage as a cost driver and offers biomass feedstock at competitive prices and enhanced price stability.

“Thailand is [one of] the major agricultural producing countries of the world. In 2012, the planted areas of cassava and sugarcane in Thailand are 1.26 million hectare (7.91 million rai) and 1.28 million hectare (8.01 million rai) and has the production of cassava and sugarcane around 26 million ton and 98 million ton, respectively.”

-Mr. Apichart Jongskul , Secretary General, Office of Agricultural Economics,
Ministry of Agriculture and Cooperatives -

Manufacturing raw biomass materials into bio-plastics is a profitable, value-added business opportunity that can diversify Thailand’s established plastics industry and advance Thailand’s goal to move its economy up the value chain and compete in world markets. In addition, bio-plastics can meet the growing demand for biodegradable products in environmentally conscious developed nations. Thailand is transforming itself into an advanced, knowledge-based economy and is moving its manufacturing products up the value chain.

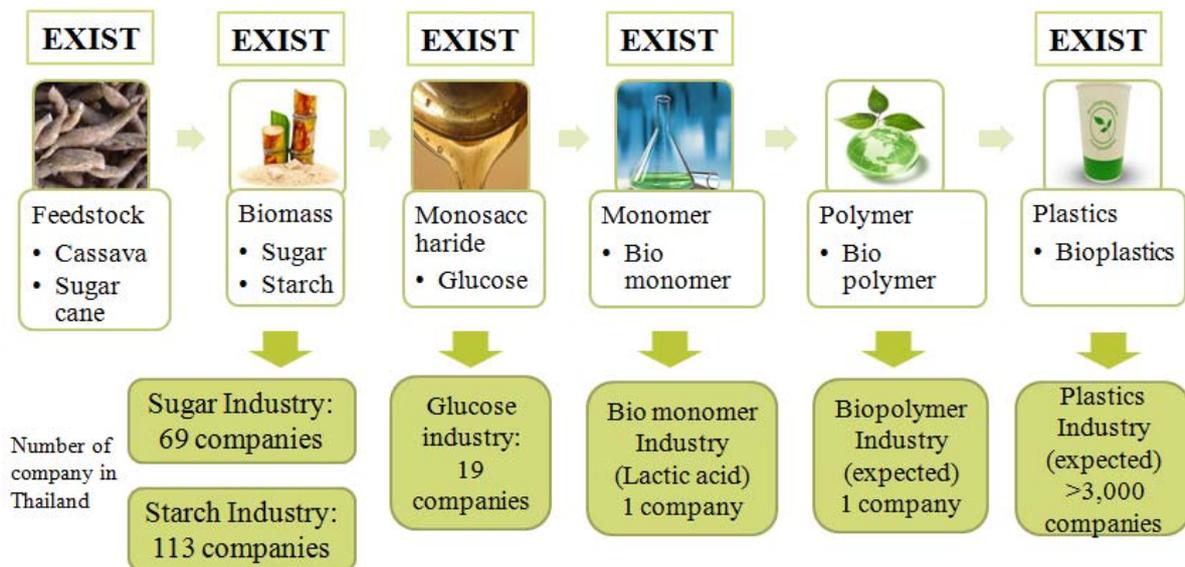
Existing complete value chain industries

Thailand offers existing complete value chain industries to the bio-plastics industry. Thailand has already established itself with a reputation as a strong competitor in the plastics industry and has established the resources and infrastructure necessary to be a global leader. According to International Trade Center, Thailand was ASEAN’s second leading exporter of plastics products after Singapore and was ranked 20th in the world in 2012.

Currently, Thailand has more than 3,000 companies in the domestic plastics industry. Thailand’s large presence in plastics manufacturing ensures that there are established industries in every

stage of the bio-plastics value chain process, ranging from biomass processing to bio-monomer and biopolymer industries. Thailand boasts incredible potential in its established value chain for plastics, from basic intermediates to midstream technologies such as compounding and downstream industries such as molding. In addition to such capabilities, a lactic acid plant was established in 2007 to produce lactic acid, the main raw material to produce PLA. This ensures that these established plastics industries can be used effectively to manufacture biomass into high-value-added bio-plastics.

Existing Supporting Industries in Thailand



Source: The National Innovation Agency (NIA)

Strong supportive government policies

The Thai government has taken an active role in promoting the bio-plastics industry with the goal to make Thailand the regional ASEAN hub for bio-plastics. The government appointed the National Innovation Agency (NIA) to create a national roadmap for the development of the bio-plastics industry as a new wave industry. In addition, the government also offers many incentives to support investment in the bio-plastics industry.

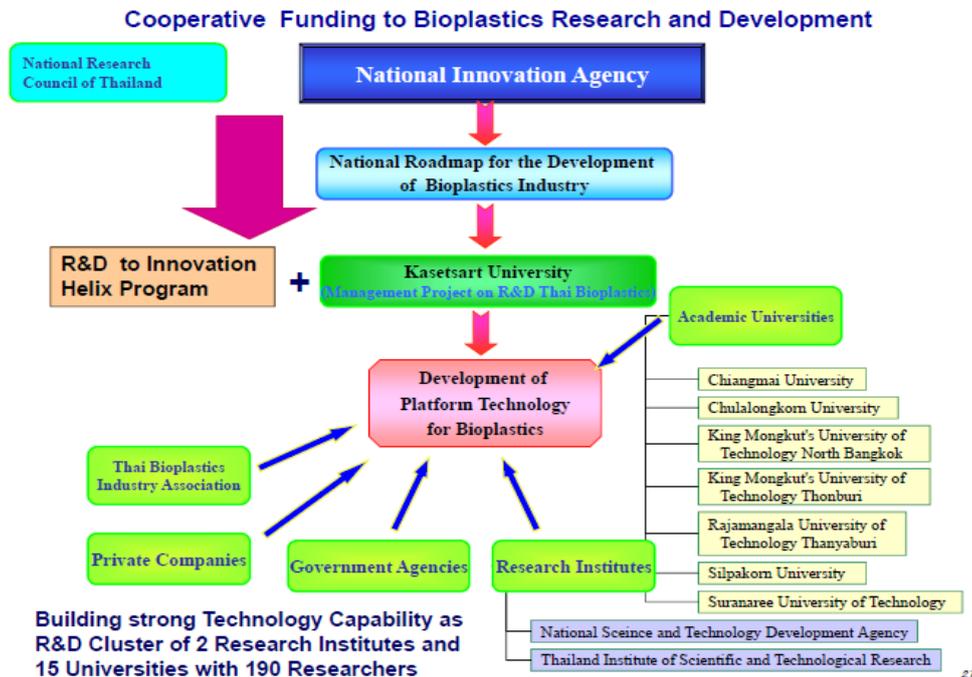
GOVERNMENT STRATEGIES ON BIO-PLASTICS

The Thai government has a strong network in both domestic technical and industrial alliances as well as international agreements that support the bio-plastics industry. Domestically, the National Innovation Alliance (NIA) holds relationships with organizations and leading Thai universities to foster technical advancements and innovation in bio-plastics technology. The Thai government also has a strong industry-wide network comprised of institutions such as the Thai Bio-plastics Industry Association (TBIA) to further develop the bio-plastics industry.

“As Thailand is paving the way to be the bio-plastics hub for Asia Pacific, the question that Thai producers have to consider is whether they are ready for this prestigious task or not. The Thai government has a clear mission to support this strategy by working thru their representative, the National Innovation Agency (NIA) to implement the supporting programs such as a pilot plant concept and the establishment of the Thai Bioplastics Industry Association (TBIA).”

- Dr. Pisuth Lertvilai, Deputy Managing Director, Multibax (Thailand) Public Company Limited-

Strong Networking to Support Bio-plastics Industry



Source: The National Innovation Agency (NIA)

The Thai Bio-plastics Industry Association (TBIA) currently has a memorandum of understanding (MOU) with global institutions to cooperate in developing harmonized certification and identification programs and scientifically based tests and specifications for bio-plastics products. The MOU also promotes further cooperation in areas such as technology development, capacity building, joint ventures, and market development to further the global development of the bio-plastics industry.

The Thai government cooperated with the involved parties to create the roadmap to support investment in the bio-plastics industry in Thailand. The National Innovation Agency (NIA) will be the key coordinator to convert the roadmap into practical methods. According to the

framework of the roadmap, the Thai Government will support the construction of a bio-plastics resin pilot plant.

In addition, there are more supplementary measures to accelerate the bio-plastics industry development, as follows:

- Permitting use of raw materials from starch and sugar at export prices
- Offering tax incentives for research and development
- Adopting compostable plastics standards that are certified at international levels
- Reducing import duties for bio-plastics resins that cannot be manufactured in Thailand
- Promoting and supporting the use and development of bio-plastics products to be launched in the market.

THAILAND'S NATIONAL BIO-PLASTICS ROADMAP

Over the past decade, the Thai Government has taken an active role in developing the bio-plastics industry to support Thailand to become a regional and worldwide leader in industrial growth and innovation. The Ministry of Science and Technology was appointed to lead the project with the support of the Ministry of Industry and Board of Investment (BOI). The working committee appointed the National Innovation Agency (NIA) to create a national roadmap for the development of the bio-plastics industry as a “New Wave Industry”.

Thailand's National Bio-plastics Roadmap – Phase 1 (2008-2012)

The National Bio-plastics Roadmap, a five year plan spanning 2008-2012, was approved by the Thai cabinet on July 22, 2008. The resolution approved a budget of US\$60 million. The roadmap, which aims to make Thailand the regional leader in the bio-plastics industry, comprised four main strategies, and is expected to stimulate growth in the Thai bio-plastics industry of US\$183 million. The roadmap consists of four main strategies including;

1. Preparing a sufficient supply of biomass feedstock so that the supply of raw materials for the bio-plastics industry does not interfere with the food supply.
2. Focusing on accelerating technology development, cooperation and focuses on both the adoption of international technologies and domestic innovation.
3. Investing in bio-plastics industries and businesses.
4. Establishing supporting infrastructure.

The NIA expects that these four strategies will support the Thai bio-plastics industry and drive innovation and growth through advances in technology, business and environmental capabilities.

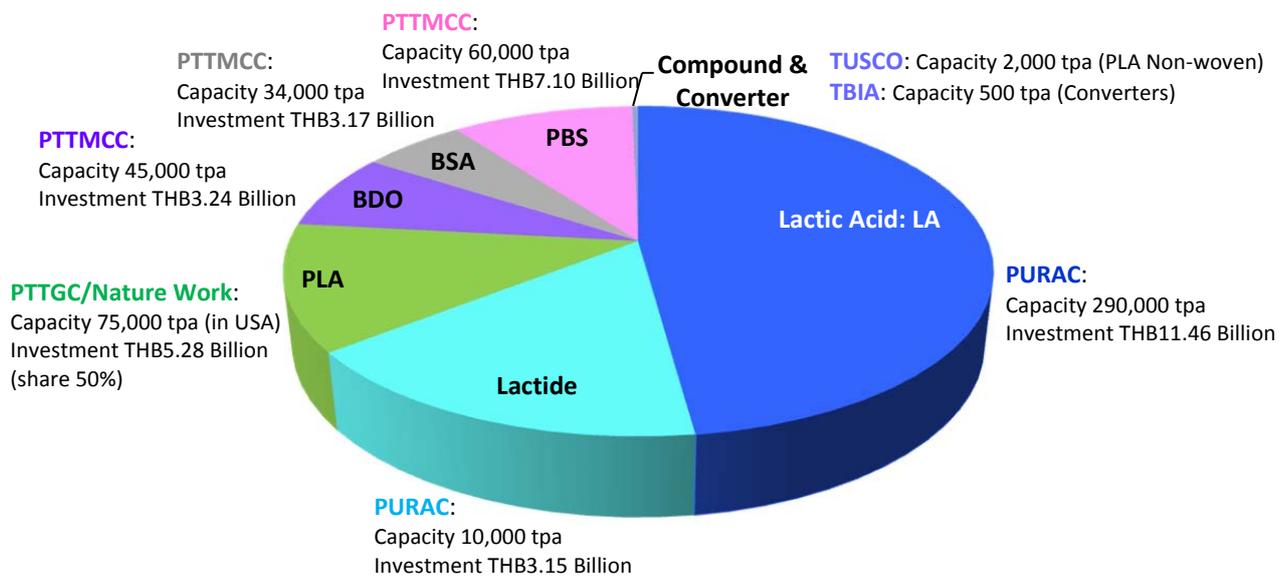
Thailand's National Bio-plastics Roadmap – Phase 2 (2011-2015)

Thailand's National Bio-plastics Roadmap has been continued to Phase 2 (2011-2015), demonstrating the success of Phase 1 and the Thai government's commitment to making the nation the regional leader in the bio-plastics industry. The government has committed substantial funds, including a US\$10 million grant for the construction of a public-private (30:70) bio-plastics resin pilot plant. The second phase of the National Bio-plastics Roadmap aims to work on areas such as improved market promotion and environmental management, research and development, biomass supply chain and business and investment incentives and privileges.

CURRENT BIO-PLASTICS INVESTMENT IN THAILAND

Thailand’s bio-plastics roadmap and a full range of incentives to encourage investment have attracted many bio-plastics firms such as PURAC [lactic acid and lactide], PTTGC/Nature Work [PLA], PTTMCC Biochem – a joint venture between PTT and Mitsubishi Chemical – [Bio-Butanediol (BDO), Bio-succinic (BSA) acid and PBS]. With Southeast Asia projected to become the world’s major bio-plastics manufacturing region in the next 10 years, Thailand is readying itself to be the regional hub of bio-plastics and continues to implement its roadmap, develop new innovative technology and build its infrastructure and industry.

Current Bio-plastics Investment in Thailand



Source: Thailand Board of Investment (BOI)

DEVELOPED NETWORK OF SUPPORTING ORGANIZATIONS

Government and private organizations supporting the growth and competitiveness of the bio-plastics industry in Thailand include:

- ***The National Innovation Agency (NIA)***: NIA is the core operational organization in facilitating innovation development in Thailand. Operating under Thailand's Ministry of Science and Technology, the NIA functions as a central unit and strives to coordinate and partner different organizations from various fields to promote innovation. The NIA has played an important role in promoting and supporting Thailand's National Roadmap for the Development of the Bio-plastics Industry.
- ***Thai Bio-plastics Industry Association (TBIA)***: TBIA was founded in 2007 with support from NIA and aims to be the center of information and knowledge in bio-plastics markets and technology. TBIA assists bio-plastics firms in reaching international standards through laboratory testing and certification, encourage networking between members, academics and certification international organization and cooperate with the government in the establishment of national policy that supports the development of the bio-plastics industry. TBIA consists of 50 members ranging from upstream to downstream industries and strives to promote coordination and cooperation between raw material suppliers, plastics resin manufacturers, molded plastics producers, traders, and customers.
- ***The Plastics Institute of Thailand (PITH)***: PITH, was established in 2010, is an organization under Thailand's Ministry of Industry with aims to support the development of bio-plastics sector by promoting coordination between public agencies and private firms. PITH supports research and development in bio-plastics, provides laboratory and testing centers, and assists government agencies to develop national policy.

BOI INVESTMENT INCENTIVES

As part of its policy to promote sustainable development, enhance the country's competitiveness in science and technology, encourage the improvement of manufacturing quality as well as reduce environmental impact, the Board of Investment offers special tax incentives in specific activities that support national development objectives.

Recognizing the importance of the bioplastics industry to the future of Thailand, the Board of Investment has classified two activities related to bioplastics (Manufacture of eco-friendly chemicals and Manufacture of eco-friendly products) as priority activities of special importance and benefit to the country.

As such, projects that locate anywhere in the country except for Bangkok and submit applications for investment promotion within December 31, 2013 are eligible for maximum tax incentives, including:

- Exemption of import duties on machinery
- 8-year exemption of corporate income tax with no cap
- 5-year 50% reduction of corporate income tax on net profit
- 10-year double deduction of transportation, electricity and water supply costs
- Deduction from net profit of 25% of investment in infrastructure installation and construction costs, in addition to normal capital depreciation

FOR FURTHER INFORMATION:

Thailand Board of Investment (BOI): www.boi.go.th

The National Innovation Agency (NIA): www.nia.or.th

The Thai Bio-plastics Industry Association (TBIA): www.tbia.or.th

The Plastics Institute of Thailand (PITH): www.thaiplastics.org

The National Science and Technology Development Agency (NSTDA): www.nstda.or.th