

## PART 1

# Thailand Bioindustry Landscape

## Thailand – Land of Investment Opportunities

Thailand is a key economy in South East Asia, with an estimated population of 66 million and a gross domestic product (GDP) of over 7,100 billion baht or US\$ 186 billion in 2005. Having weathered the Asian financial crisis in 1997, Thailand has undergone a remarkable economic transformation which propelled the economy from about minus 10% growth to almost 7% growth in 2003. Although economic performance has slowed down in 2004 and 2005 due in part to rising oil prices, the 2004 tsunami and the outbreak of avian flu, the economy has remained robust, with 2005 GDP growing at 4.7%.

In 2005, Thailand was rated the third most attractive FDI destination in Asia (behind India and China) by a UNCTAD survey. The kingdom is host to a growing number of MNCs operating out of Asia for a few reasons. Firstly, Thailand has a sizeable and growing economy with a substantial domestic market that represents significant opportunities for companies interested in tapping into local demands. Secondly, Thailand is committed to creating a business-friendly and low-cost operating environment that is conducive to foreign companies. Other key factors

contributing to Thailand's attractiveness as a preferred investment destination include its young and educated workforce, its geographical location and its excellent logistic infrastructure.

Thailand has already established itself as a global base for a number of industries such as the automotive, electronic and education sectors. For instance, world-class automotive players such as Honda and Toyota both have significant manufacturing and R&D operations in Thailand that cater to the global market. Similarly, Thailand is also the world's largest hard disk drive producer with most of the leading hard disk drive players such as Seagate, Western Digital and Fujitsu, tapping on the unique strengths of Thailand and investing in major manufacturing and development operations in the country. In the same way, biotechnology companies are discovering Thailand as a promising investment destination. The country, which is a hot spot in bio-diversity, has a large domestic and regional market, as well as a ready supply of competent scientific workers and scientists. Furthermore, it has developed dedicated infrastructure and has put in place, attractive schemes and incentives to support the industry.

## The Thailand BioIndustry – An Up and Coming Sector

Thailand regards biotechnology as an important industry sector that needs to be developed in order to strengthen its global competitiveness. The Thai government has recognized the tremendous value of biotechnology in enhancing economic productivity, especially in the agriculture and food sectors which are mainstays of the Thai economy. In particular, there is strong interest to use biotechnology for a variety of activities including processing food,



increasing value-add of products, improving the genetic stock of plants and livestock, developing diagnostics, enhancing aquaculture and developing biological control.

As early as the 1980s, initiatives such as the creation of the National Center for Genetic Engineering and Biotechnology (BIOTEC) were launched to promote the development of the local industry. More recently, the Thai government developed the National Biotechnology Policy Framework (2004-2009), which aims to bring about US\$125 million in R&D investments and the creation of more than 100 new biotech-related companies in the next few years. To meet these objectives, the government has provided significant resources to create an environment conducive for the growth of biotechnology industry including setting up a dedicated BioPark for R&D, creating training and business activities as well as establishing incentives and assistance programmes aimed at promoting the industry.

Key clusters within the bioindustry in Thailand include the Agri-biotech sector, the Medical sector and the Food sector.

#### ■ Agri-Biotech Sector

Thailand is a major agriculture exporter, with more than a third of its land being arable and about half of the country's labour force involved in agriculture. In 2005, the country's agriculture output contributes 8.7% to its GDP. Thus, the Thai government has long realized that biotechnology, applied to the country's agriculture base, can bring tremendous benefits to the economy and people.

With a large industrial base, in-depth experience and expertise in this area, Thailand possesses significant strengths in biotechnology within the agricultural sector and is already home to a number of international companies such as Bayer Cropscience, Monsanto and Syngenta. The country is now leveraging upon biotechnology advances to further develop the field and grow the industry. For example, marker assisted selective breeding has been used to develop disease resistant crops such as rice. Similarly, recombinant DNA techniques are used to produce more hardy transgenic plants including tomato, papaya and pepper. Biotechnology is also finding its way into other areas such disease (livestock and crops) diagnostics and agricultural product traceability.



Within the same sector, biotechnology is playing an increasingly important role in the production of biofuels and materials from agricultural biomass. One specific example is the government's active support for projects related to the production of bioethanol from cassava, sugar cane and other agricultural materials, in an effort to augment the country's energy needs.

In the area of human resource development for the agri-biotech sector, Thailand is not only focusing on its own needs but also those of the region. It is establishing itself as a regional hub for training and development. For instance, the Asian Development Bank has sponsored training initiatives that are based in Thailand which reach out to participants from neighbouring countries. This aims to strengthen the agriculture capacity and advanced agricultural science and technology cooperation among nations in the region.

#### ■ Medical Sector

Thailand is poised to become the region's leading healthcare hub with over a million 'medical tourists' arriving each year seeking treatments including cosmetic surgery, dental work, hip and knee replacements and back surgery. Thai doctors and other medical staff study abroad, speak international languages and are among the best qualified in the region. Many private hospitals have translators to facilitate convenient communication with foreign visitors. The hospital facilities themselves offer spacious, luxurious accommodation and in some ways seem more like five-star hotels, with in-house

restaurants and food courts, spa and fitness facilities. Tourists from the United States, Europe and increasingly the Middle East are attracted to Thailand specifically because of its high-quality, attractively packaged and very affordable medical treatments. Furthermore, Thailand also offers medical treatments that are sometimes unavailable to these 'medical tourists' back in their home countries, for example stem cell therapies. In 2005 alone, medical tourism brought in more than half a billion dollars for the Thai economy.

With its superb medical healthcare infrastructure, well-trained medical personnel and a growing research base, the sector is poised to become a major clinical development center in the region. Thailand has established a number of initiatives to make this happen. For example, it has undertaken the Thai Pharmacogenomics Project with the aim of creating a comprehensive clinical database that will ultimately facilitate new drug discovery efforts with leading pharmaceutical companies and reduce healthcare costs.

Thailand is also at the forefront in the application of stem cell technology. There are already organizations in the country that offers commercial applications such as cord blood banking and stem cell therapies.

### ■ Food Sector

Thai food industry is the most dynamic and diverse in the world. The sector contributes significantly to the country's growth and prosperity. More than 11.72% of the country's total exports originate from the food sector, and the industry, together with the agriculture sector, employs almost 20 million people in 2003. There are about 10,000 food-related manufacturing operations in Thailand and 80% of the raw materials that go into production are harvested locally. Given the importance of the sector, it is not surprising that the industry is continuously looking to improve itself. This presents further opportunities for companies to improve upon existing production or add value to existing products through the use of technologies including biotechnology.

In general, the sector is moving towards higher value-added, functional foods and nutraceuticals. It is also developing a more robust value chain that incorporates higher standards, better safety and strong regulations. For



instance, Thailand's shrimp industry has managed to raise its productivity and stay ahead of other food exporting countries through the effective deployment of biotechnology. The industry has benefited from initiatives such as the Shrimp Genome Project and the Shrimp Traceability Project which have helped to improve the shrimp breeding and cultivation as well as raise the quality and safety standards of the industry respectively.

More details on opportunities in Thailand biotechnology industry can be found online at the BIOTEC website at <http://www.biotec.or.th/biotechnology-en/newsdetail.asp?id=1420>.

### The National Biotechnology Policy Framework – Providing Clear Directions

The National Biotechnology Policy Framework was formally established in 2003 with the aim of developing a competitive and self-sufficient Thai biotechnology industry.

The framework provides direction over a period of 6 years (2004-2009), with 6 specific goals for the development of the industry as follows:

#### ■ **Emergence and Development of New Bio-Business**

To encourage investment in R&D and establish biotechnology companies which can tap on new opportunities in both high value-added manufacturing (e.g. production of medical diagnostic kits and supplementary food) and services (e.g. molecular-level detection and analysis for medical care, public health, agriculture and biosafety).

#### ■ **Biotechnology Promotes Thailand as Kitchen of the World -**

To use biotechnology to enhance Thailand's competitiveness in the agriculture and food industries. The goal is to increase the export value of the country's raw and processed agricultural products.

#### ■ **Thailand Represents Healthy Community and Healthcare Center of Asia -**

To utilize biotechnology to improve the medical healthcare of the nation and to establish Thailand as a lead hub for healthcare services in Asia.

#### ■ **Utilization of Biotechnology to Conserve the Environment and to Produce Clean Energy -**

To apply biotechnology to the conservation and management of the environment including energy production from waste, improvement of soil quality, recycling as well as the inspection, surveillance, treatment and rehabilitation of the environment.

#### ■ **Biotechnology as the Key Factor for Self-Sufficient Economy -**

To conserve and optimize the use of biological resources that are important to, or specific in, various local communities. The goal is to use biotechnology to extend the usefulness of traditional know-how, expand the diversity and value of local resources and resource-based products and to improve the quality of these products.

#### ■ **Development of Qualified Human Resource -**

To put in place infrastructure, resources and manpower development programmes to create a quality workforce that will support the growth of the industry.

More details on the NBPF can be found online at BIOTEC website at <http://www.biotec.or.th/biotechnology-en/policy.asp>.

### **Strong Infrastructure to Support the Developing Industry**

To support the development of the biotechnology industry, Thailand has been putting in place critical infrastructure necessary for industrial growth. The following section describes some of these in detail.

#### ■ **The Thailand Science Park**

Located at the northern outskirts of Bangkok, the Thailand Science Park represents the nation's first key infrastructure development to promote its science and technology research and development. The 80 acre park was completed in 2002 and is currently managed by the team from the Technology Management Center under the purview of the National Science and Technology Development Agency (NSTDA). The Park is currently undergoing Phase 2 expansion, while planning for Phase 3 development is already in progress.





The Park aims to be a fully integrated R&D hub to promote the translation of innovative public R&D to the private sector, as well as to provide training to advance the country's critical mass of R&D professionals. To show its resolve to make the Park the focus point of Thailand's science and technology activities, NSTDA houses its central administration and various centers of excellence here. These include:

- National Center for Genetic Engineering and Biotechnology (BIOTEC),
- National Electronics and Computer Technology Center (NECTEC),
- National Metal and Materials Technology Center (MTEC), and
- National Nanotechnology Center (NANOTEC)

In addition to these national centers, the Park provides ready built research, pilot plant and business incubation space for rental and long-term leasehold lands for companies to construct their own research facilities. The Park management also provides its tenants with one-stop services in the areas of technology and technical, financial, human resource, business and juristic support. Other benefits include access to government research grants, soft loans, joint investment by NSTDA and eligibility for Thailand Board of Investment's tax incentives (BOI Zone 3 incentives).

In the area of biotechnology, the abundance of state-of-the-art research activities in agriculture, food and medical biotech R&D have drawn an increasing number of companies to set up shop within the Park. The Park currently houses over 50 private companies, of which one third are active in biotechnology. Some of the notable companies include TÜV SÜD PSB (Thailand) Ltd., Betagro Group and the Shrimp Biotechnology Business Unit. Over the years, there is also a growing culture of scientific collaboration among BIOTEC, the universities in the vicinity and private companies located within the Park. BIOTEC also provides access to its many core resources to private tenants at the Park, such as the BioService Unit and DNA Technology Laboratory. An ecosystem of biotech activities is taking shape at the Thailand Science Park. More information about the Thailand Science Park may be found at [www.sciencepark.or.th](http://www.sciencepark.or.th).

With an aim of further developing the biotechnology sector, the National Biotechnology Policy Committee recently approved the expansion of the current biotech cluster infrastructure at the Thailand Science Park into a full-fledged BioPark. A sum of US\$16.5 million has been allocated to create an additional 40,000 sqm biotechnology lab space by 2009, some of which will be BSL-3 level bio-containment facilities for use by private companies and public institutions.

When completed, the BioPark will be Thailand's first biotech hub to promote the advancement of life sciences research and new bio-businesses.

### ■ The Industrial Estate Authority of Thailand

Established in 1972, the Industrial Estate Authority of Thailand (IEAT) under the Ministry of Industry is tasked to oversee the country's industrial development policies. In addition, the state enterprise implements guidelines and control measures to protect the country's environment against harmful industrial pollution.

IEAT has developed more than 30 Industrial Estates across the country, either on its own or jointly with private developers. These estates are generally equipped with many of the essential infrastructure needed for a successful industrial operation. As such, many biotech companies have chosen to locate themselves within such estates to enjoy the many privileges and incentives offered by IEAT. For example, the agency provides a one-stop service to grant licenses and permits necessary for operation initiation. It

also allows foreign investors to purchase the land they occupy within certain estates. Additional information on the various IEAT Industrial Estates and the privilege schemes available may be found at [www.ieat.go.th](http://www.ieat.go.th).

Other than these industrial estates, private developers also offer ready spaces or leasehold lands at various Industrial Parks to potential investors. However, tenants in such Industrial Parks are not eligible for IEAT incentives. In addition, they do not have access to IEAT's business licenses and permits facilitation services.

### ■ Investment Zones

Thailand's Board of Investment (BOI), through the enactment of the Investment Promotion Act, divides the country into several economic zones based on the regions' infrastructure availability and the local citizens' income levels. These zones serve as a guide for the agency to direct different investment opportunities to the various regions and to provide added incentives to promote investment into the lesser developed provinces.



Different tax and duty incentives and privileges are offered by BOI at each of the zone. Details on these incentives may be found at the BOI website at [www.boi.go.th/english/about/boi\\_privileges\\_by\\_location.asp](http://www.boi.go.th/english/about/boi_privileges_by_location.asp).

## Public R&D – Focusing on Thailand's Strengths

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Much of the biotechnology R&D activities in Thailand are concentrated in public research institutes and university research centers. These organizations conduct a range of research from publicly-funded upstream R&D to commercially-driven collaborations with companies. With Thailand's long history and experience in agriculture, aquaculture and food production, strong biotechnology expertise can be found in areas including tropical disease, immunology, food science and technology, fermentation and certain areas of plant biotechnology. Furthermore, given the country's rich biodiversity, Thailand has established large germbanks and natural products libraries for use in agriculture research and screening for bioactive compounds.

One of the leading biotechnology research institutes in Thailand is the BIOTEC Central Research Unit, which was established in 1996. It is the largest in-house research unit under BIOTEC and NSTDA and conducts basic and applied research as well as provides technical services to the industry.

## Private R&D Activities – Commercially Driven and Close to Market

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Although biotechnology R&D activities are concentrated mostly in public institutions, private sector R&D activities are also growing. Increasingly, companies are working closely with public R&D institutes and the universities to develop new products and innovations. Some of the established local firms in the agriculture and food industries collaborate with the local institutions in areas such as agricultural biotechnology. One example is the Betagro Science Center, initiated and funded by Betagro Group (one of Thailand's largest agricultural and animal husbandry companies), which is the nation's latest private advanced agro-based R&D institute. The institute focuses on food safety - detecting

bacterial, viral or chemical contamination in products; this includes the detection of emerging animal diseases, such as the Avian flu.

In addition, Thailand is gradually being considered by global firms as a base for R&D activities. It has attracted a number of foreign investors that have established R&D activities and research collaborations with local R&D organizations. Leading international companies such as Shiseido and Novartis currently work closely with NSTDA research centers. For example, in 2005, Novartis established a three-year partnership with BIOTEC aimed at developing new medicines based on natural products found in Thailand.

## Human Resource Development – A Critical Component

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Thailand recognizes that it must have a good pool of scientists, doctors and other biotechnology professionals to support the nation's developing biotechnology industry. At present, there are a total of 24 public and private universities that offer a program in biotechnology. Of these, 14 offer the program at post-graduate level i.e. Masters or PhD.

In addition, there are joint research centers between BIOTEC and leading local universities that provide research programs which contributes to human resource development. The Center of Excellence for Shrimp Molecular Biology and Biotechnology at Mahidol University and the Rice Gene Discovery Research Unit at Kasetsart University are examples of such successful collaborations. Besides the universities and joint research centers, a new breed of problem-based learning institutes have also been set up. These institutes focus on R&D training that addresses the specific needs of the private sector. The Chemical Engineering Practice School (ChEPS) and Food Engineering Practice School (FEPS) which were developed in collaboration with King Mongkut's University of Technology Thonburi (KMUTT), are successful examples which have produced graduates with skills and knowledge sought after by the industry.

The BIOTEC and NSTDA has committed to 244 national and international scholarships/fellowships per year in order to strengthen and develop capabilities to cope with technology changes and future manpower demand.

In all, these programs help ensure a steady supply of quality manpower that will meet the raising demands and requirements of research institutes and new biotechnology companies setting up in Thailand.

Thailand is also building up biotechnology research capacities for the region. In 2001, Thailand, through BIOTEC, initiated the Human Resource Development Program in Biotechnology for Neighbouring Countries. The program which is funded by the ASEAN Foundation and the New Zealand UNESCO Commission has trained a steady stream of researchers from ASEAN countries and also provides a networking platform for ASEAN researchers.

## Support Schemes and Government Incentives – Promoting the Industry

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There are a variety of assistance schemes and incentives from government agencies to assist and attract biotechnology companies to set up presence in Thailand. The BOI is the main government agency offering privileges and incentives to investors. Companies that invest in biotechnology or biotechnology-related businesses in Thailand may receive tax or non-tax privileges if their projects receive approval from the BOI. Tax privileges comprise of corporate income tax exemption for up to 8 years, import duty reductions or exemptions on machinery and raw materials. Non-tax privileges include land ownership rights for foreign investors, permission to bring in foreign experts and technicians, and rapid processing of visa and work permit applications. Companies with R&D activities can also apply for 200% tax credit on R&D activities from the Thai Revenue Department.

Biotechnology investors may qualify for financial support packages from several other organizations. For example, the Technology Management Center (TMC) offers grants

and soft loans for R&D or to upgrade manufacturing processes for up to 75 percent of the project budget for technology development projects (not exceeding US\$750,000) at a competitive interest rate. Various other programs are available from the TMC including the Industrial Technology Assistance Program (to provide financial support to companies seeking external experts from Thailand and overseas) and the Support for Technology Acquisition and Mastery Program (to facilitate technology transfer).

The National Innovation Agency (NIA) under the Ministry of Science and Technology can also offer financial support and technical services for innovators seeking marketing assistance. NIA can award soft loans of up to US\$125,000 for marketing and feasibility studies. In addition, NIA can also enter into joint ventures (with less than 25% equity) with companies and other investment organizations if such arrangement can result in significant innovation.

## Moving Forward

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Thailand will continue to establish itself as a major biotechnology player in the region. With a clear focus that leverages upon the nation's advantages, Thailand will concentrate its efforts on key areas of biotechnology R&D. It will also continue to enhance its supporting infrastructure and boost the quality and quantity of its human resource. The establishment of the 40,000 sqm BioPark by 2009 which will accommodate Agro-business, life sciences research, an incubation center and a pilot plant, will enhance the country's competitiveness in the bioIndustry. Thailand's new Suvarnabhumi International Airport, which has the largest terminal building in the world (563,000 sqm) with a capacity to handle 45 million passengers and 3 million tonnes of cargo per year, will enhance the country's global logistic network. Finally, the setting up of a regional training center in biotechnology with the support from UNESCO, FAO and the Rockefeller Foundation will help develop strong research capabilities in the region to meet future demand for qualified manpower from industry. These and various developments are set to make Thailand a preferred location for foreign Biobusiness in Asia.

# Useful Addresses

## AGRICULTURAL RESEARCH DEVELOPMENT AGENCY (PUBLIC ORGANIZATION)

2003/61 Phaholyothin Rd  
Ladyao, Chatuchak  
Bangkok 10900  
Tel: (66) 2579 7435  
Fax: (66) 2579 7235  
Email: veerasuda@arda.or.th  
Website: www.arda.or.th

## BIOTECHNOLOGY ALLIANCE ASSOCIATION

Rm 308, 3/F, Kasetsart University Alumni Association  
Bldg. 50 Paholyothin Rd.  
Ladyao, Chatuchak  
Bangkok 10900  
Tel: (66) 2940 5264  
Website: www.thaibaa.org

## DEPARTMENT OF AGRICULTURE

3/F, The Center of Operation Training and Conveying  
Technology Bldg.  
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Bangkok 10900  
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Email: itc@doa.go.th  
Website: www.doa.go.th

## DEPARTMENT OF INTELLECTUAL PROPERTY

44/100 Nonthaburi 1 Rd.  
Muang  
Nonthaburi 11000  
Tel: (66) 2547 4632  
Website: www.ipthailand.org

## DEPARTMENT OF LIVESTOCK DEVELOPMENT

Payathai Rd.  
Bangkok 10400  
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Email: foreign@dld.go.th  
Website: www.dld.go.th

## DEPARTMENT OF MEDICAL SCIENCES

88/7 Tiwanon Rd.  
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Nonthaburi 11000  
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Website: www.dmssc.moph.go.th

## DEPARTMENT OF SCIENCE SERVICE

75/7 Rama VI Rd.  
Ratchathewi  
Bangkok 10400  
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Website: www.dss.go.th

## EXPORT-IMPORT BANK OF THAILAND

EXIM Bldg.  
1193 Paholyothin Rd.  
Phayathai  
Bangkok 10400  
Tel: (66) 2271 3700  
Fax: (66) 2271 3204  
Email: info@exim.go.th  
Website: www.exim.go.th

**FOOD AND DRUG ADMINISTRATION**

88/24 Tiwanon Rd.  
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Tel: (66) 2590 7000  
Website: [www.fda.moph.go.th](http://www.fda.moph.go.th)

**FOOD SCIENCE AND TECHNOLOGY ASSOCIATION OF THAILAND (FOSTAT)**

113 Thailand Science Park, Paholyothin Rd.  
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**INDUSTRIAL PARK CENTER, KING MONGKUT'S UNIVERSITY OF TECHNOLOGY THONBURI**

The 4th Chemical Engineering Bldg.  
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Website: [www.kmutt.ac.th/organization/Park/#Ind](http://www.kmutt.ac.th/organization/Park/#Ind)

**INSTITUTE FOR SMALL AND MEDIUM ENTERPRISE DEVELOPMENT (ISMED)**

99 Gym 1  
Thammasat University Rangsit  
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**MARINE BIOTECHNOLOGY RESEARCH UNIT, CHULALONGKORN UNIVERSITY**

254 Phayathai Rd. Pahatumwan  
Bangkok 10330  
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Website: [www.biotec.or.th/marine/](http://www.biotec.or.th/marine/)

**NATIONAL CENTER FOR GENETIC ENGINEERING AND BIOTECHNOLOGY (BIOTEC)**

113 Thailand Science Park, Paholyothin Rd.  
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Pathumthani 12120  
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**OFFICE OF SMALL AND MEDIUM ENTERPRISES PROMOTION (SMEs)**

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**OFFICE OF THE NATIONAL RESEARCH COUNCIL OF THAILAND**

196 Paholyothin Rd.  
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Tel: (66) 2561 2445  
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**PHARMACEUTICAL RESEARCH & MANUFACTURERS ASSOCIATION**

21/F, Paholyothin Place Bldg.  
408/51, Paholyothin Rd.  
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**PROTEIN SOCIETY OF THAILAND**

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Website: <http://cbag2.sc.mahidol.ac.th/protein>

**SERVICE CENTER FOR MEDICINAL PLANT INFORMATION**

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**SHRIMP BIOTECHNOLOGY BUSINESS UNIT (SBBU)**

BIOTEC Pilot Plant, Module 2  
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**TECHNOLOGY MANAGEMENT CENTER (TMC)**

111 Thailand Science Park, Paholyothin Rd.  
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**THAILAND BOARD OF INVESTMENT**

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**THAILAND CENTER OF EXCELLENCE FOR LIFE SCIENCES (TCELS)**

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Fax: (66) 2644 9538  
Website: www.tcels.or.th

**THAILAND SCIENCE PARK (TSP)**

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Website: www.sciencepark.or.th

**THE ASIA & PACIFIC SEED ASSOCIATION**

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