

1 The Chiang Mai and Chiang Rai economy

This chapter analyses the regional economic context for the development of start-ups and scale-ups in the advanced agriculture and biotechnology sector and the food-for-the-future sector in the Chiang Mai and Chiang Rai regions in Thailand. It provides information on the regional industry sector specialisations, characteristics of the regional entrepreneurial ecosystem, including its anchor institutions such as universities, and the government support policies for SMEs and entrepreneurship in the regions. The chapter makes recommendations on strengthening approaches to the implementation of SME and entrepreneurship policy in the regions.

Introduction

The government's medium-term Thailand Industrial Development Strategy 4.0 targets ten “s-curve” industries with the aim of developing a more innovative and high value added economy, applying technology and innovation to increase the GDP growth rate and per capita income levels. The s-curve industries are: advanced agriculture¹ and biotechnology²; smart electronics; food-for-the-future; medical tourism; next-generation automotive; aviation and logistics; biofuels and biochemical; digital economy, automation and robotics; and medical services (Asawachintachit, 2018). The strategy targets functional foods, medical foods, food supplements and food innovation in driving forward the advanced agriculture and biotechnology s-curve and the food-for-the-future s-curve (NESDC, 2016a).

The government is investing nationally in basic and applied R&D in advanced agriculture and biotechnology and food-for-the-future as well as in training approximately 9 600 food scientists, researchers, and technicians and 126 600 food experts between 2018 and 2022 (BOI, 2018). It has also put in place a national cluster development policy for advanced agriculture and biotechnology and food-for-the-future.

These policies aim to support greater value added from Thailand's key agricultural production specialisations. Thailand is a major world producer of cassava (it is the 2nd largest producer in the world), palm oil (3rd), sugarcane (4th), tropical fruits (5th), rice (6th), and coconuts (9th) (FAOSTAT, 2017). It is also a leader in natural foods, herbs and spices for medicinal and health purposes.

The policy actions to support R&D and innovation in food need to be aligned with policy actions that support SMEs³ to exploit the technology developments, including through small firm start-ups and scale-ups. SMEs contribute 42% of Thailand's total GDP (NESDC, 2019) and will be key to extracting value from government R&D and skills investments.

There are strong opportunities for developing start-ups and scale-ups in agriculture and biotechnology and food-for-the-future in the Chiang Mai and Chiang Rai regions in the Northern region of Thailand, building on existing small firm networks and supply chains in these regions, connecting them together within the regions both vertically and horizontally, and connecting them with the underpinning national cluster (BOI, 2015). This chapter investigates the opportunities and the weak links that policy needs to address.

Chiang Rai is located in the northern continental highland, bordering Myanmar to the north and Laos to the east. It is approximately 805 km north of Bangkok and 416 metres above sea level. Chiang Mai is the second largest economy in Thailand and the largest province in the northern region. A statistical snapshot of the Chiang Mai and Chiang Rai regions is given in Table 1.1.

Table 1.1. Chiang Mai and Chiang Rai regions – statistical snapshot 2018 or latest year available

	Chiang Mai	Chiang Rai
Land area (square kilometres)	20 107	11 678
Agricultural land area (square kilometres)	2 937	4 431
Population	1 700 492	1 140 241
GDP (billion THB)	247	108
GDP (billion USD PPP)	19	8
GDP as share of Thailand	1.5%	0.7%
GDP per capita (THB)	145 280	94 319
GDP per capita (USD PPP)	11 420	7 410
GDP per capita as share of Thailand average	61%	40%
Employment	1 039 957	646 379
Registered employees ¹	153 132	48 739
Number of industrial establishments ¹	63	971

Number of newly registered companies ¹	2 668	1 119
Logistics	3 rd largest international airport in country	International airport, border trade
Special Economic Zones ²	Food Innopolis, Science Park, Space Krenovation Park	Maesai, Chaingsan, Chaingkhong
Main business specialisations	Tourism, food processing	Tourism, agriculture, border trade
Main crops	Rice, longan, lychee	Rice, corn, rubber, longhan

Notes: ¹ Data are for 2017

² Special Economic Zones (SEZ) provide a variety of benefits to SMEs and start-ups. They vary by location, by industry and by the government department that promotes the zone. Incentives might include income tax reduction, foreign worker allowances, waivers on duty and tax imports of machinery and technology, free trade zones and ability for a foreign entity to own land and a majority of shares in a company.

Source: Regional Investment and Economic Centre 1 Chiang Mai, Chiang Mai Provincial Business Development Office; Chiang Mai Provincial Comptroller General, Office of Commercial Affairs Chiang Rai (see www.cgd.go.th, www.chiangmai.nso.go.th).

Economic activities

SME activities

There are approximately 80 000 SMEs in Chiang Mai and 50 000 SMEs in Chiang Rai. The bulk of the enterprises are micro-enterprises with less than 6 persons engaged, and approximately 15-20% have between 21 and 200 persons engaged (Table 1.2).

Table 1.2. Number of establishments and persons engaged in Chiang Mai and Chiang Rai by size of establishment, 2017

Size of establishment (no. persons)	No. establishments	Chiang Mai		Chiang Rai		
		No. persons engaged	% persons engaged	No. establishments	No. persons engaged	% persons engaged
1-5	74,419	132,262	46.56	48,379	79,074	53.75
6-10	4,955	37,506	13.20	2,533	19,514	14.01
11-15	1,680	21,326	7.51	795	10,274	7.37
16-20	660	11,832	4.17	377	6,924	4.97
21-25	380	8,610	3.03	188	4,341	3.12
26-30	212	5,982	2.11	113	3,290	2.36
31-50	360	13,825	4.87	147	5,959	4.28
51-100	201	13,806	4.86	67	4,649	3.34
101-200	97	13,211	4.65	21	3,076	2.21
More than 200	59	25,700	9.05	5	2,225	1.60
Total	83,023	284,060	100.00	52,625	139,326	100.00

Source: The 2017 Business and Industrial census (Basic Information) Chiang Mai Provincial, National Statistical Office

In total there were some 14 788 manufacturing establishments in Chiang Mai (18% of all establishments) in 2017 and 7 950 in Chiang Rai (15% of all establishments) according to National Statistical Office data. An idea of the sectoral breakdown of these establishments can be gained from more limited data held by the Provincial Offices relating to a subset of the non-micro, i.e. larger, SMEs with minimum equipment and contacts with the Provincial offices. These data indicate that the

agriculture, food and beverage industries make up approximately 25% of all industrial enterprises in Chiang Mai and 41% in Chiang Rai (Table 1.3).

Table 1.3. Number of industrial establishments by type of industry, 2017

Type of industry	Chiang Mai	Chiang Rai
Agriculture	4	268
Food	11	130
Beverages	1	5
Textiles	2	1
Wearing apparel	1	3
Leather products	-	1
Wood and wood products	2	16
Furniture	2	43
Paper and paper product	-	11
Printing	-	-
Chemical	1	12
Petrochemical	2	8
Rubber	-	8
Plastic	2	15
Non-metallic	6	150
Metals	-	-
Metal products	1	33
Machinery and equipment	1	16
Electricity	-	7
Transport	10	87
Others	18	157
Total	63	971

Note: Industrial establishments are factories with at least 5 horsepower or the equivalent of 5 horsepower or having more than 7 employees using machinery

Source: Chiang Mai and Chiang Rai Provincial Offices

There were some 300 registered start-ups in Chiang Mai and Chiang Rai in 2017 (Table 1.4).

Table 1.4. Number of new registered enterprises, 2017

Type of industry	Chiang Mai	Chiang Rai
Agriculture, forestry and fishing	25	20
Mining and quarrying	3	4
Manufacturing	253	56
Electricity, gas, steam and air conditioning supply	4	3
Water supply: sewerage, waste management and remediation activities	2	1
Construction	304	298
Wholesale and retail trade; repair of motor vehicles and motor cycles	835	503
Transportation and storage	60	2
Accommodation and food service activities	277	26
Information and communication	73	48
Financial and insurance activities	40	9
Real estate activities	281	11
Professional, scientific and technical activities	212	46
Administrative and support service activities	133	37
Public administration and defence: compulsory social security	1	26
Education	28	
Human health and social work activities	39	6
Arts, entertainment and recreation	30	6
Other service activities	68	2
Other		17
Total	2 668	1 119

Note: There are four types of registration – Limited Company, Limited Partnership, Ordinary Partnership, and Public Limited Company

Source: Chiang Mai and Chiang Rai Offices of Commercial Affairs

Agriculture

Chiang Mai and Chiang Rai are highland regions rich in natural resources, with a temperate climate and good access to water. Their main regional crops include rice, fruit (longan, lychee), corn (animal feed), vegetables, herbs and spices, condiments and medicinal plants (OAE, 2019).

The government is supporting efforts to improve the agricultural value chain by focusing on technology and innovation in the following areas:

- Upstream – farming systems, seeding, water, soil and nutrient management, harvesting.
- Midstream – dehydrating, modifying food, packaging, increasing shelf life, food safety.
- Downstream – marketing, distribution.

Opportunities in healthy, functional and medicinal foods

There is a global trend towards healthier foods and foods with medicinal and functional purposes. For example, there is increasing demand for foods that support and improve brain function, digestion, eyesight, heart, blood, skin, bone and joint health as well as antibiotic, anti-aging and nutritional foods for athletes (Krungthai Bank, 2019). Processed and modified hygienic foods are also gaining popularity. These markets can substantially increase the value of the product from agricultural production. For example, the fermenting, cooking and processing of garlic can increase its sale price 50 to 100-fold per kilogram.

An example of adding value to agricultural production using biotechnology in Thailand involves longan production. Thailand is the largest longan exporter in the world, exporting 72% of its production, and 38% of Thailand's total longan production is in Chiang Mai and Chiang Rai (see Box 1.1)

Box 1.1. Longan as a herbal medicine

Longan contains the following active, healthy ingredients: gallic acid, ellagic acid, tannic acid, GABA and corilagin. A number of uses of longan as a herbal medicine have recently been discovered in Chiang Mai and Chiang Rai, often with the support of the Northern Food Valley initiative:

- With the Natural Bev Co., Ltd., Chiang Mai University has researched the use of biotechnology to extract bioactive compounds from longan that assist in sleeping and have anti-aging properties.
- With funding from the Agricultural Research Development Agency (ARDA), research by Honorary Professor Ussani Winitkhetkamnuan, PhD, special lecturer at the Faculty of Medicine at Chiang Mai University, has discovered natural compounds in longan seeds that suppress cartilage enzyme degradation. This has led to the development of products to treat arthritis and chronic myositis conditions using longan seeds.
- A number of product innovations have been developed in Chiang Mai and Chiang Rai using the longan extract 'Longanoid'. These have received numerous awards throughout Asia.
- Research aimed at extracting compounds from longan seeds is ongoing at Chiang Mai University and Rangsit University.
- Mae Fah Luang University and Khon Kaen University are conducting research on combining longan seeds with other herbs to develop medicinal products.

Source: For more information: www.longanoid.com

A second example of adding value to local agricultural production involves the tea industry. A group of SMEs called the Tea Gallery Group in Chiang Mai is fermenting tea known as kombucha, which acts as a laxative and improves digestion and liver functions by removing toxins from the body. Research shows benefits for reducing cholesterol, blood pressure, inflammation, migraines and fatigue.

A number of business start-ups in Chiang Mai and Chiang Rai have developed by using biotechnology to produce higher value, healthy foods. Examples are:

- Sleep Well, which produces beverages that aid sleep using vanilla and honey;
- Tofusun, which produces milk from soybeans fortified with melatonin to aid sleep;
- Morinaga, which produces a candy with lactic acid bacteria to prevent the common cold; and
- Juiceinnov8, which produces fruit juice with reduced natural sugars to help prevent diabetes.

There is potential for further development of start-ups and scale ups based on new biotechnology-based products in Chiang Mai and Chiang Rai in the food and cosmetics sectors.

Anchor institutions

There are several anchor institutions in Chiang Mai and Chiang Rai that can play key roles in supporting the flow of technical knowledge to regional start-ups and scale-ups in advanced agriculture and biotechnology and food-for-the-future. The main anchor institutions are universities, science parks, research institutes and business incubators supported by public policy.

Universities

The universities in Chiang Mai and Chiang Rai support the entrepreneurial ecosystem in several ways. They supply skilled graduates in agriculture, food science, biotechnology, herbal medicine and cosmetics. They also support start-ups and scale-ups through R&D services, laboratory testing, business development support and nurturing start-up ideas. The universities work with start-ups and scale-ups in areas such as Technology Business Incubation, collaborative research, intellectual property and innovative design, and offering workshops and seminars on new technologies.

Chiang Mai University

Chiang Mai University is a public research university with approximately 35 000 students and a strong emphasis on engineering, science, agriculture, and medicine. As well as specialisations in aviation and 5G technology it includes activities for business co-operation in advanced agriculture and biotechnology and food-for-the-future.

Among other support, the Faculty of Agro Industry provides education, access to alumni, and seminars on agricultural and packaging design for local businesses and business clusters, the Agricultural Technology Service Centre holds seminars and workshops for local businesses and the Food Innovation and Packaging Centre provides research and food innovation development, including services for product testing and analysis, innovative packaging design and consulting support.

In addition, the Science and Technology Park (STeP) connects the University and the private sector on technology and innovation in the areas of agriculture, food, medicine, biotechnology, IT software, digital content, energy and materials (www.step.cmu.ac.th).

Mae Jo University

Mae Jo University is Thailand's oldest agricultural institution with approximately 15 000 students. Originally established as the Northern Agricultural Teachers Training School under the Ministry of Education, Mae Jo received university status in 1996. It includes a business incubator with a range of services (www.mjubi.mju.ac.th). The incubator offers business education for faculty members, researchers, students, alumni and local business owners. It provides business consulting services to entrepreneurs in business processes, innovation, production, marketing, management and accounting. It also collaborates with firms on research, proof of technology, development and commercialisation. It also manages intellectual property belonging to the University.

Mae Fah Luang University

Mae Fah Luang University was established in 1998 in Chiang Rai in two campuses at Doi Ngam and Mae Suay. The University has 13 000 students and is well regarded for its science, cosmetics and agriculture faculties (www.mfu.ac.th). The University includes a number of facilities that support R&D commercialisation in advanced agriculture and biotechnology and food-for-the-future:

- The *Tea and Coffee Institute* provides education, R&D and technology consulting services on tea and coffee products to promote the Thai tea industry to international markets. (<http://web2.mfu.ac.th/other/teainstitute/?lang=en>)
- The *Centre of Excellence in Natural Product Innovation* provides lab testing services for cosmetic ingredients, lab and testing equipment and conducts R&D on natural products. (<https://cenpi.mfu.ac.th/home-cenpi.html>)
- The *University Business Incubator* provides consulting services to SMEs and start-ups in the agriculture, health and cosmetics sectors (but does not offer physical co-location facilities). (<http://mfubi.mfu.ac.th>)

- The *University Intellectual Property Management and Innovation Department Office* serves as a centre for technology commercialisation and provides design innovation and intellectual property to the private sector. (<http://mfii.mfu.ac.th>)

Northern Science Park

The Northern Science Park (NSP) is one of three regional science parks in Thailand. It is supported by the Regional Science Park Programme launched by the Science Park Promotion Agency and the Thai Ministry of Science and Technology (MOST) in 2012.

The science park is operated by Chiang Mai University's Science and Technology Park (STeP), which acts as the headquarters of the Northern Science Park project. STeP aims to commercialise research from Chiang Mai University in industries in the region using the triple helix model concept, i.e. innovating through collaboration between the private, academic and government sectors. However, there are six other universities in the Northern region affiliated to NSP: Meajo University, Mae Fah Luang University, University of Phayao, Uttaradit Rajabhat University, Naresuan University and Pibulsongkram Rajabhat University. Since 2012, STeP is also the administrative office for Creative Chiang Mai, a network which seeks to create and support regional innovation ecosystems.

NSP and STeP play key roles in transferring R&D in regional universities to regional start-ups and scale-ups in the Northern Region, mainly focused on innovation in the value chains for agriculture and food, medical and biotechnology, IT software and digital content, and IoT and energy technology (CMU Corporate Relations and Alumni Center, 2018).

In May 2018, NSP opened a new 20 750 square metre building on 22 rai of land in the Mae-Hia campus of Chiang Mai University dedicated to acting as a 'Total Innovation Solution Centre' for SMEs. The site contains R&D laboratories, office space, meeting rooms, co-working spaces, and a 440-seat convention hall. Some 95% of the office units were occupied in August 2019.

There were 35 private sector companies in the NSP in 2019, in the following fields: IT software and digital content (59%), agriculture and food (15%), medical and bio-technology (13%), and energy technology and materials (13%)⁴. Among the companies are:

- Synapes (Thailand) Co., Ltd: A research-based company focusing on artificial intelligence (AI) technologies including cognitive computation, natural language understanding (NLU), machine learning, deep learning, and visual intelligence technologies.
- Horganice Co., Ltd.: A real estate management platform created by a graduate of Chiang Mai University. It manages approximately 3 000 apartments and has clients in all 77 provinces of Thailand.
- Siam Novas Co., Ltd.: A company working on immunology and reproductive research.
- Navis Plus Co., Ltd.: A herbal and natural product supplement manufacturer.
- BuddyGo Co., Ltd.: A digital car rental platform.
- Plastech Corporation: A successful start-up that was nurtured by R&D collaboration with the NSP. It has invented a prototype called the 'Micro PAW System' that uses plasma technology and micro-nano bubbles for dispersing pesticides in fruits and vegetables. It has drawn significant investor interest.

There are also eight public agencies located on the NSP, including the National Innovation Agency (NIA) and the Thailand Centre of Excellence for Life Science. Their main activities include R&D consultancy, technology transfer and public-private sector co-operation.

NSP also provides R&D and business incubator services with the goal of commercialising the research. This includes providing business matching, working space, wet and dry test laboratories, cleanroom laboratories, prototyping and an exhibition hall.

A second phase of the NSP was approved in 2019 with a budget of THB 385 million to develop 7 rai of land between 2020 and 2022. The goal is to further develop the medical, biotechnology, IT software, digital content and energy technology and materials sectors. It is expected to be able to host up to 155 start-ups with an economic value of THB 3.8 billion.

Between 2012 and 2019, NSP supported over 700 SMEs and worked with 140 start-ups, 40 of which are in Chiang Mai. It has been supporting start-ups at a rate of approximately 30 per year. For 2019, for example, its aim was to support at least 100 entrepreneurs with a target success rate of 25 successful start-ups. NSP estimates that the economic value created through these start-up firms is over THB 2 billion. Furthermore, during 8 months of 2019, NSP reports that it had 45 100 visitors from the private sector, universities and the government. It estimated that it had created 108 R&D jobs with private investment of THB 120 million and an economic value of THB 328 million in 2019, and forecasted that by 2024 it will employ 5 640, including 1 636 jobs in R&D, with economic value created of THB 546 million and 700 tech start-ups (Prachachat.net, 2019).

Research institutes

Northern Herb Innovation Park (N-HIP) is located in the NSP. N-HIP is a collaboration with the Pharmaceutical Science faculty at STeP, Chiang Mai University, and the Department of Thai Traditional and Alternative Medicine (under the Ministry of Public Health). It includes the Herbal and Holistic Medicine Total Solution Centre, a research centre opened in March 2018 with the goal of developing the Thai herb industry, including cosmetics, health supplements, healthy beverages and natural medicine.

BIOTEC is a national agency under the National Science and Technology Development Agency (NSTDA) headquartered outside the region in Pathum Thani. It provides R&D and technical services in the agricultural, biomedical and environmental areas to firms throughout the country. One of its facilities is a Biomedical Technology Research Laboratory at Chiang Mai University. NSTDA also launched a national Bio Based Start-up Programme in 2018 to create and support biotechnology technology entrepreneurs.

BIOTEC, NSTDA, and the Department of Thai Traditional and Alternative Medicine have signed a Memorandum of Understanding to promote the medical Thai herb industry. Their goals are to grow the industry to annual revenue of THB 320 billion using R&D, engineering, science, technology and innovation to promote 13 Herbal Cities (recently expanded to 14 provinces). The pilot project will transform raw herbal ingredients into high-quality herbal supplements. Chiang Rai will be the hub for the Northern Region.

Box 1.2. Narah Industry Co. Ltd, Chiang Mai

NARAH is an R&D-based start-up located in Chiang Mai manufacturing Thai herb products. It won the Gold Medal and three special prizes for innovation excellence at the 2017 International Invention and Design Competition held in Hong Kong. NARAH produces a line of herbal teas that aid human health. The products have proven effective in the control of diabetes by lowering blood sugar levels and cholesterol, quickly, safely and effectively.

Source: More information: <http://en.narahherb.com/>

Business incubators

Each of the universities in Chiang Mai and Chiang Rai has a University Business Incubator supported by the Office of Small and Medium Enterprise Promotion (OSMEP) assisting technology-based start-ups by providing R&D, technology transfer, shared infrastructure and other services. Furthermore, in 2018, three government agencies – the NSTDA, the Office of the Higher Education Commission (OHEC) and the OSMEP – jointly signed a memorandum of understanding to establish the Thai Business Incubator and Science Park Association (THAI-BISPA). The Association serves as a focal point for collaboration, business networking, knowledge sharing, and capacity development across the 60 incubators located in science parks and universities across the country.

Policy support mechanisms

Office of Small and Medium Enterprise Promotion (OSMEP)

The Office of Small and Medium Enterprise Promotion (OSMEP) is a government agency under the Ministry of Industry (MOI) that leads the formulation of policies and strategies to promote SMEs across government and operates a range of programmes offering financial support, training, and consultancy to SMEs. Its main programmes are listed below.

Financial loan assistance programmes:

i. SME Development Loans

The government has allocated THB 20 billion to the OSMEP as a fund for long-term, low interest rate loans at 1% interest to support SMEs in the s-curve industries (future driving sectors of the Thai economy), including advanced agriculture and biotechnology and food-for-the-future. Loans are for a period of up to seven years and up to a value of THB 10 million for SMEs. Repayments are not required during an initial period.

ii. SME Transformation Loan

The government has allocated THB 15 billion to the OSMEP as a fund for long-term, low interest rate loans at 3% to SMEs. Loans are for a period of up to seven years and up to a value of THB 15 million. Repayments are not required during an initial period.

iii. SME Rescue Micro-Enterprise Loans

The government has allocated a fund of THB 2 billion to the OSMEP to support rescue loans of up to THB 1 million for small enterprises and up to THB 200 000 for micro, community and social enterprises. The loans are interest free, and repayments are not required during an initial period.

iv. SME Rescue Non-Performing Loans

The government has allocated THB 1 billion to the OSMEP as a fund to support loans of up to 1 million THB for up to seven years to small enterprises. The loans are interest free and repayments are not required during an initial period.

SME training and seminar programmes:

i. *Start-Up / Early Stage Group*

These training offers teach business principles to start-up/early-stage entrepreneurs to encourage sustainable business development. A diverse group typically attends the training, including students, people with no prior business experience, and those with existing businesses. The OSMEP encourages attendees to register as legal entities in order to widen their business opportunities.

ii. *The Strong and Regular Group*

These trainings emphasise increasing the capacity of existing SME and micro-enterprises to grow and realise their potential through innovation. The OSMEP exposes the group to new opportunities such as gaining access to new markets, partnering with foreign entities via e-commerce, introducing modern export practices, and providing access to state sector markets.

iii. *The Turn-around Group*

This training focuses on SMEs that have encountered difficulties in the course of their growth or are at the end of their business life cycle. The goal is to provide financial and business consulting support in order to develop a business improvement plan.

OSMEP One-Stop Service Centres:

The SME One-Stop Service Centres (OSS) offer information and consultancy support to SMEs and help them to navigate to a range of relevant public programmes.

Board of Investment (BOI)

The BOI aims to promote investment by Thai and overseas enterprises to enhance Thailand's competitiveness and sustainable growth (BOI, 2017). The incentives generally target specific industries in specific locations through policies for Special Economic Zones (SEZs), free trade zones, agro-processing clusters and industrial parks. Tax incentives in these areas include corporate tax reduction, duty and tax exemptions, and tax reductions on importing machinery and technology. In addition, the policy creates more facilitative regulations that enable foreign investors to own land in special economic zones and to have 100% shareholdings in local enterprises.

One of the key support instruments for the development of advanced agriculture and biotechnology and food-for-the-future in Chiang Mai and Chiang Rai is the Food Innopolis SEZ, discussed below. In addition, the BOI has designated Chiang Mai and Chiang Rai, together with Lampang and Lamphun, as a regional Agro-processing Industrial Cluster, one of five in Thailand. The initiative is designed to support agricultural processing activities in fruit, vegetables and herbal products, including measures for infrastructure, public utilities development, water, transportation, IP licensing, R&D, co-operation with local universities, product and packaging design and tax incentives. The tax incentives include a three to eight-year corporate income tax exemption with an additional five years in which there is a 50% reduction in corporate income tax and import duty waivers on machinery (Asawachintachit, 2018).

Food Valley

Thailand Food Valley was set up in 2014 to support SMEs in the advanced agriculture and food industries. It involves a collaboration between the Ministry of Agriculture and Cooperatives (MOAC),

Department of Industrial Work (DIW), Ministry of Science and Technology (MOST), Thai Chamber of Commerce (TCC) and Federation of Thai Industries (FTI). The initiative was modelled on the Food Valley ecosystem in the Netherlands. It aims to create sustainable and innovative start-up and scale-up businesses in co-operation with producers, growers, investors, research institutes and government. Information and consultancy are provided to member companies to improve the value chain, food quality, increase exports, and bring technology and innovation. Marketing and branding are also promoted with the “Thai Kitchen to the World” concept.

The Northern Region is the pilot location for the programme. There are two strands of the programme – Northern Food Valley 1 and Northern Food Valley 2:

- **Northern Food Valley 1**

Areas Covered: Chiang Mai, Mae Hong Sorn, Lumphun, Lumpang.

Command Centre: Chiang Mai.

There are about 400 members of Food Valley 1.

Sub sector in Food Valley 1: Chiang Mai, the City of Coffee.

- **Northern Food Valley 2**

Areas Covered: Chiang Rai, Prayoa, Phrae, Nan.

Command Centre: Chiang Rai.

Sub sector in Food Valley 2: Chiang Rai, the City of Tea .

The aim of Food Valley is to work in collaboration with STeP, Lanna Thai Coffee Development Centre, the Mae Jo Tea Institute and Mae Fah Luang University, to make the Northern region Thailand’s leading destination for premium tea and arabica coffee, establishing Chiang Mai as the City of Coffee and Chiang Rai as the City of Tea.

Food Innopolis

Food Innopolis (<http://foodinnopolis.or.th/en/about-us/>) is a national cluster-based initiative with sites in five regions of the country, each with different specific sector targets. It offers infrastructure, human capital and investment incentives for R&D and innovation in food technologies. It was launched in 2016 as a joint initiative of 35 public agencies, private sector companies and universities.

A key component of Food Innopolis is an SEZ, which offers food industry firms exemptions from income tax for three to eight years with a further five year period of 50% reduction in tax after the exempt period expires, and the possibility of permanent Thai residency status for foreign national industry experts and the ability for foreign enterprises to own land in the zone.

The initiative also involves investment in a range of infrastructures and research capacities and networks. At a national level, the initiative aims to establish a network involving 9 000 Food Factories, 150 Food Research Labs, 20 Pilot Plants, 3 000 researchers and 10 000 students across 70 universities.

Food Innopolis is developing projects with three universities in Chiang Mai and Chiang Rai, namely Chiang Mai University on Healthy and Functional Food, Mae Jo University on Organic Food and Mae Fah Luang University on Tea Innovation. It also works with Naresuan University on Herbal Innovation in Phitsanulok Province of Northern Thailand.

Food Innopolis is also expanding to work with three regional science parks in Thailand, including one in Northern Thailand. The branch at Northern Science Park in Chiang Mai will focus on rice, fruits, vegetables and organic products. In addition, Food Innopolis will work with the science park in Khon

Kaen focused on sugar, rice, and meat and poultry and the science park in Songkla on seafood and Halal food.

Local clusters

The Food Valley and Food Innopolis clusters are overarching initiatives that are inclusive of a number of sub-clusters that operate more locally: the longan cluster (Chiang Mai), functional foods cluster (Chiang Mai), coffee cluster (Chiang Mai), tea cluster (Chiang Rai) and cosmetics cluster (Chiang Mai), etc. Some of these local clusters are very nascent in their development processes and need to be better connected to the broader regional and national innovation systems.

Government financial support programmes for SMEs

Industrial Technology Assistant Programme (ITAP) Grants

ITAP will finance 50% of consulting fees up to a maximum of THB 100 000 per SME for applications for food certification through Good Manufacturing Process, Hazard Analysis Critical Control Point, British Retail Consortium Global Standard for Food Safety, International Standards Organization ISO2200 and Food Safety System Certification FSSC22000 certifications.

It also offers grants to SMEs seeking to purchase an Enterprise Resource Planning (ERP) system to improve their supply chain management. Two programmes are available:

1. 50% of the cost of purchase of an ERP out-of-the-box plus consulting expenses up to a maximum of THB 150 000 per SME.
2. 50% of consulting expenses up to a maximum of THB 300 000 per SME for implementation of a customised ERP system according to company specifications.

ITAP will also finance 50% of R&D expenses up to THB 400 000 for SMEs in the food, medical, automotive, energy and environmental industries with a maximum registered capital of THB 200 million.

The Digital Economy Promotion Agency (DEPA) Voucher

DEPA will finance 50% of the cost up to a maximum of THB 10 000 for a mini-transformation voucher for micro-enterprises, farmers and SMEs. The vouchers can be used to buy software, IT systems and hardware. Some 2 200 vouchers will be available throughout the country on a first-come, first-served basis, with 200 vouchers allocated to the Northern region.

National Innovation Agency (NIA) innovative start-up funding

The NIA aims to promote Thailand as a global start-up investment destination, attracting global venture capital to the region and promoting deep tech start-ups using advanced technology like artificial intelligence in health, food, and agriculture. The NIA's Open Innovation scheme offers grants of up to THB 1.5 million and low interest rate loans to qualifying innovative start-ups. Together with smart visas, the programme aims to help position Thailand as a landing pad for global start-ups (Leesa-Nguansuk, 2019).

Digital Economy Promotion Agency (DEPA) start-up and SME transformation funding

DEPA in collaboration with the United Overseas Bank and the FinLab have established a Smart Business Transformation programme to assist Thai SMEs with technology integration (Boonnoon, 2018). The funds will be split evenly between a Start-up Fund and a DEPA Transformation Fund.

Amounts of THB 50 000, 1 million and 5 million are available through grants, angel funding or co-investment, depending on the size of the project.

National Science and Technology Development Agency (NSTDA) and National Electronics and Computer Technology Centre (NECTEC)

NSTDA and NECTEC provide financial support with a science, technology and digital focus. They operate two programmes for innovative entrepreneurship. The Young Entrepreneurs programme supports university students to create their own businesses and offer vouchers and grants to fund their business to those judged to have successful business plans. The Start-up Voucher Programme is a reimbursement scheme to enable business owners to receive vouchers worth up to THB 800 000 per project to develop a scale-up business (Business Incubation Center, 2018).

Government non-financial support programmes for SMEs

The Department of Business Development (DBD)

The DBD is a government agency under the supervision of the Thai Ministry of Commerce (MOC) with the primary responsibility for regulating and enforcing business legislation including the Foreign Business Act.

DBD holds seminar courses and workshops to educate entrepreneurs. Sample courses include *Starting a Business*, *Smart Business Solution for SMEs*, *E-Filing* and *Total Solution for SMEs* (DBD Academy, 2019a).

The DBD's Academy for e-Learning has six curricula and 27 subjects, with a certification process for each subject. Classes are provided free of charge on subjects such as starting a business, finance and accounting, beginner e-commerce and developing strategies for e-commerce (DBD Academy, 2019b).

Department of Intellectual Property

The Department of Intellectual Property provides services such as trademark, copyright and patent registration and protection (Department of Intellectual Property, 2019a). It also offers free seminars and an e-learning site on subjects such as the basics of intellectual property, licensing innovation for commercial use and the power of innovation (Department of Intellectual Property, 2019).

Department of International Trade Promotion (DITP)

The DITP is a government agency that promotes import-export activities through seminars, workshops and trade fairs. It operates an e-Commerce platform www.thaitrade.com to expand trade opportunities for Thai products and companies. It also offers online international trade courses at <https://nea.ditp.go.th/>. Some examples of its courses are *Startup 101* and *Upgrading Business Processes for International Trading*.

Department of Industrial Promotion (DIP)

The DIP provides a range of consultancy support to industrial businesses. It operates a Business Service Centre (BSC) which offers seminars and provides information to entrepreneurs, individuals and SMEs. It also operates a range of non-financial support programmes to support SME growth (Table 1.5).

Table 1.5. DIP non-financial support for SME development in Thailand

Goal	Strategy
1.	23 Information and Communication Technology Centres (ICTs) provide central machinery, co-working space, consulting and advisory services for SMEs for product development.
2.	The SME Support and Rescue Centre (SSRC) acts as a help desk consultant and assists with problem solving and loan requests. It operates 270 centres serving SMEs at the provincial industrial offices of the DIP.
3.	Training to support SMEs to adjust business models, technology training and business mentoring.
4.	Collection of SME Big Data to analyse SMEs and create access channels to government services.
5.	The Big Brother Guarantee Success Solution connects SMEs with leading national and global companies. Mentor companies include: CP, Betagrow, Thai Union Frozen Foods, Central Grop, Tesco-Lotus, PTT, SCG, Denzo, Delta, Nissan, Honda and Toyota.
6.	Digital Value Chain to link SMEs into a digital B2B platform with Japan. The program is supported by the Japanese Ministry of Economy, Trade and Industry (METI).
7.	Strengthening SME financial literacy, including having a single set of accounts.
8.	Assisting SMEs with meeting standardised certification processes for products and services.
9.	Creative Industry Village. Developing community-based agricultural SME economies with the goal of increasing community income by 25%.

Source: <https://www.dip.go.th/th/category/2019-03-24-11-29-11/2019-03-22-10-34-15>; <http://www.smerescuecenter.com/>; https://www.dip.go.th/th/events_details/60y; https://www.dip.go.th/th/events_detail/53364.

Institute for Small and Medium Enterprises Development (ISMED)

ISMED is an institute that provides training seminars and consultancy services for start-ups and SMEs. Examples of its development projects are the Innovation HALAL Cluster Project, SME Regular Level Project and Beyond Beauty ASEAN Bangkok 2019.

The Thai government SME policy response to COVID-19

OECD (2021) summarises the policy measures the Thai government put in place in order to help SMEs to survive the COVID-19 crisis. Measures specifically targeting SMEs include low interest loans, reduction of withholding tax, tax deductions of salary expenses, rapid dissemination of VAT refunds, and rebates on social security payments.

Conclusions and policy recommendations

Many of the conditions that will be required for the development of the advanced agriculture and biotechnology and food-for-the-future sectors in Chiang Mai and Chiang Rai are already in place. They include agricultural production, growing international demand for new healthy functional and medicinal foods, and high-level R&D and knowledge transfer infrastructures. However, there are constraints in developing innovative start-ups and scale-ups to apply R&D results to agricultural production through new products aimed at international markets. This suggests the need for stronger support for start-ups and scale-ups in areas including support for technology adoption, R&D, and access to funding.

It is also important that the government closely monitors the progress of its key policy initiatives aimed at promoting start-ups and scale-ups in the regional innovation cluster. These include notably the Northern Science Park, Food Innopolis, the agri-clusters and business incubators initiatives. There needs to be continuity of support for these programmes and reinforced support where there is positive evaluation evidence of strong impact.

Box 1.3. Recommendations stemming from the regional economic and policy context

- Increase the focus of SME support programmes on existing and potential start-ups and scale-ups with innovation, growth and export potential.
 - Align Key Performance Indications (KPIs) across government organisations with SME growth and innovation objectives.
 - Reduce or eliminate the ‘check the box’ mentality for approving the participation of SMEs in public support programmes, focusing more on their potential to benefit.
 - Ensure continuity of policies to support start-ups and scale-ups in advanced agriculture and biotechnology and food-for-the-future in Chiang Mai and Chiang Rai and refine the policies based on evaluation evidence.
- Data analytics
 - Create a system to track the success and failure of start-ups, scale-ups and other SMEs that receive public support.
 - Obtain data on different types of SMEs (e.g. new firms, high-growth firms, technology-based firms etc.) covering issues such as number of employees, years in business, type of business, gross/net margins and capital investment. Use this information to guide the design of SME policy and the firms selected to benefit.

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Notes

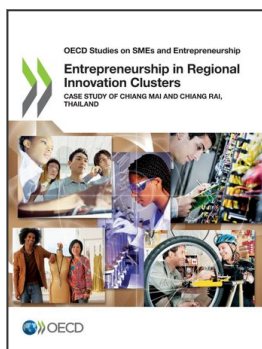
¹ Advanced agriculture, also referred to as agritech, is a broad term to describe technology that improves agricultural output or the efficiency of "every link in the value chain from field to fork" (Magnin, 2016). This includes every area where technology can impact the supply chain (i.e. optimising production methods, distribution, reducing waste and adapting digital payment systems). Precision farming, robotics, use of satellites or drones for soil and weather mapping and AI are all opportunities in advanced agriculture.

² Biotechnology refers to innovations exploiting biological processes for the production of products, including in food science (functional and healthy food), medicine and cosmetics.

³ The Table below sets out the definitions used to define SMEs in Thailand. Source: Department of Industrial Promotion (DIP), www.dip.go.th.

Sector	Criteria	Micro	Small	Medium
Manufacturing	Employees	1-5	6-50	51-200
	Revenue (million THB)	<1.8	1.8 – 100	100 – 500
Trade and Service	Employees	1-5	6-30	31-100
	Revenue (million THB)	<1.8	1.8 – 50	50 – 300

⁴ Information from the Customer Interface Officer at the Chiang Mai University Science and Technology Park (STeP CMU, 2019).



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