



Digitalising rural MSMEs:

Thailand's agriculture
and tourism sectors

June 2022



The GSMA is a global organisation unifying the mobile ecosystem to discover, develop and deliver innovation foundational to positive business environments and societal change. Our vision is to unlock the full power of connectivity so that people, industry and society thrive. Representing mobile operators and organisations across the mobile ecosystem and adjacent industries, the GSMA delivers for its members across three broad pillars: Connectivity for Good, Industry Services and Solutions, and Outreach. This activity includes advancing policy, tackling today's biggest societal challenges, underpinning the technology and interoperability that make mobile work, and providing the world's largest platform to convene the mobile ecosystem at the MWC and M360 series of events.

We invite you to find out more at gsma.com

Follow the GSMA on Twitter: [@GSMA](https://twitter.com/GSMA)



This initiative has been funded by UK Aid from the UK Government and is supported by the GSMA and its members. The views expressed do not necessarily reflect the UK Government's official policies.

Authors:

Sone Osakwe (GSMA Mobile for Development) and Nigham Shahid (GSMA Mobile for Development), David Leal Ayala (IfM), Ajjaree Kwan Limpamont (Thammasat Business School) and Pichawadee Kittipanya-ngam (Thammasat Business School).

Contributors:

Abbie Phatty-Jobe (GSMA Mobile for Development), Daniele Tricarico (GSMA Mobile for Development), and Clara Aranda (GSMA Mobile for Development).

Acknowledgments:

This report draws on research conducted for the GSMA by IfM Engage (University of Cambridge) and Thammasat Business School. We would like to thank the many experts and stakeholders who shared their insights with us. Please see the full list of organisations consulted at the end of this report.

Central Insights Unit

The Central Insights Unit (CIU) sits at the core of The GSMA Mobile for Development (M4D) and produces in-depth research on the role and impact of mobile and digital technologies in progressing sustainable and inclusive development. The CIU engages with public and private sector practitioners to generate unique insights and analysis on emerging innovations in technology for development. Through our insights, we support international donors to build expertise and capacity as they seek to implement digitisation initiatives in low-and-middle income countries through partnerships within the digital ecosystem.

Contact us: centralinsights@gsma.com

Follow us on Twitter: [@GSMAM4D](https://twitter.com/GSMAM4D)

Contents

Acronyms and abbreviations	2
List of figures, tables and boxes	3
Executive summary	4
<hr/>	
1 Introduction	8
1.1 Project objectives and methodology	11
<hr/>	
2 Digital transformation and MSMEs in Thailand	12
2.1 Current state of digitalisation	13
2.2 MSMEs in Thailand: overarching challenges of technology adoption	14
<hr/>	
3 Digitalisation of smallholder agriculture in Thailand	15
3.1 Overview of the agriculture sector	16
3.2 Key challenges affecting resilience and productivity	17
3.3 Digital solutions for smallholder farmers	19
3.4 Current level of digitalisation and adoption challenges facing smallholder farmers	20
3.5 Digitalising agribusinesses: Thailand's policy direction	24
<hr/>	
4 Digitalisation of rural MSMEs in Thailand's tourism sector	26
4.1 Overview of the tourism sector and policy direction	27
4.2 Key challenges affecting resilience and productivity	30
4.3 Digital solutions for rural tourism MSMEs	33
4.4 Current level of digitalisation of rural tourism MSMEs	36
4.5 The role of frontier technology in digitalising the tourism sector	40
<hr/>	
5 Policy priorities and recommendations from local and international experience	43
5.1 Addressing the challenges and opportunities of digitalisation for smallholder farmers in Thailand	44
5.2 Addressing the challenges and opportunities of digitalisation for rural tourism MSMEs in Thailand	49
<hr/>	
Appendix 1: Stakeholders consulted	55
Appendix 2: Examples of digital agriculture solutions in Thailand	56
Appendix 3: Examples of digital solutions for tourism MSMEs in Thailand	58
Glossary of terms	60



Acronyms and abbreviations

AI	Artificial intelligence	MaaS	Mobility as a Service
API	Application programming interface	MICE	Meetings, incentives, conferences, exhibitions
AR	Augmented reality	ML	Machine learning
ASEAN	Association of Southeast Asian Nations	MNO	Mobile network operator
BAAC	Bank for Agriculture and Agricultural Cooperatives	MOAC	Ministry of Agriculture and Cooperatives
CBT	Community-based tourism	MSME	Micro, small and medium-sized enterprise
CRM	Customer relationship management	NECTEC	National Electronics and Computer Technology Center
CRS	Computerised reservation system	NGO	Non-governmental organisation
DEPA	Digital Economy Promotion Agency	NIA	National Innovation Agency
DGA	Digital Government Development Agency	OSMEP	The Office of SMEs Promotion
DMO	Destination Management Organisation	OTA	Online travel agency
ERP	Enterprise resource planning	OTOP	One tambon one product
FAARMis	Food and Agriculture Revolution Model Information System	PA	Precision agriculture
GPS	Global Positioning System	PMS	Property management system
ICT	Information and communication technology	PPP	Public-private partnership
IT	Information technology	SME	Small and medium-sized enterprise
KTB	Krung Thai Bank	SMS	Short message service
		UAV	Unmanned aerial vehicle

List of figures, tables and boxes

List of figures:

- Figure 1:** Share of agriculture sector employment to total employment in Thailand
- Figure 2:** Contribution of agriculture to the GDP of Thailand (percentage share)
- Figure 3:** Cross-cutting challenges facing Thai farmers along a typical supply chain
- Figure 4:** Examples of digital solutions for smallholder farmers
- Figure 5:** Contribution of tourism to the GDP of Thailand (percentage share)
- Figure 6:** Share of tourism sector employment to total employment in Thailand
- Figure 7:** Impact of the COVID-19 pandemic on room occupancy, by region
- Figure 8:** Key challenges affecting the sustainability of rural tourism accommodation businesses
- Figure 9:** Community-based tourism management in Thailand

List of tables:

- Table 1:** Recommendations to fast-track the adoption of digital technology in rural agriculture
- Table 2:** Recommendations to fast-track the adoption of digital technology in rural tourism
- Table 3:** MSME-level adoption barriers
- Table 4:** Agritech provider barriers
- Table 5:** Ecosystem level challenges
- Table 6:** Number of tourism accommodation businesses in Thailand, by size
- Table 7:** Share of tourism-related businesses using ICT
- Table 8:** Digital technology usage by urban accommodation businesses in primary and secondary cities
- Table 9:** The role of advanced digital technologies in the tourism industry
- Table 10:** Policy actions required to fast-track digitalisation for smallholder farmers
- Table 11:** Stakeholder mapping for fast-tracking digital adoption for smallholder farmers
- Table 12:** Policy actions required to fast-track the adoption of digital technology in rural tourism
- Table 13:** Stakeholder mapping for fast-tracking digital adoption in tourism

List of boxes:

- Box 1:** Impacts of COVID-19 on tourism in Thailand and the government's pandemic support initiatives
- Box 2:** Apptivo: an innovative CRM tool
- Box 3:** Winding Tree: blockchain-enabled OTA
- Box 4:** Mobile operator Telefonica is leading the way in smart tourism
- Box 5:** Expanding tourism from primary cities to rural areas: The Discover England Fund
- Box 6:** Case study: Restructuring agricultural extension services for greater impact
- Box 7:** Case study: Community-based exhibitions and digital pilot farms
- Box 8:** Case study: An integrated agricultural data-sharing platform
- Box 9:** Case Study: A national data warehouse for tourism operators
- Box 10:** Case Study: Integrating data from cities using open APIs for Smart Tourism development



Executive summary

Thailand faces the dual challenge of swiftly navigating the disruptions caused by COVID-19 while also enabling sustainable and inclusive development. To enable inclusive development, Thailand must focus on building resilience and enhancing the productivity of micro, small and medium enterprises (MSMEs), which form the backbone of its economy. Mobile, digital and frontier technologies have a key role to play in this process.



99.5%

of all businesses in the economy are MSMEs



35.3%

of the country's GDP is generated by MSMEs



~70%

of private sector employment is generated by MSMEs

Despite industrialisation, **agriculture and tourism** remain vital sectors of the economy, particularly in rural regions.



33%

of the population work in the **agriculture sector**

8% of GDP is generated by the agriculture sector



11%

of total employment is in the **tourism sector**

2019 (pre-COVID-19)

18% of GDP is generated by the tourism sector

(pre-COVID-19)

Supporting the resilience, growth and profitability of MSMEs and rural communities is therefore critical to meeting Thailand's strategic objective of sustainable and inclusive development. This report explores the role of mobile and frontier technologies in supporting the development, success and resilience

of rural MSMEs in Thailand's agriculture and tourism sectors. The adoption of digital technologies can help increase efficiency, improve product/service quality and increase business opportunities, leading to greater productivity, competitiveness and well-being.



Agriculture sector

Smallholder agriculture remains a critical source of livelihood for Thailand's rural population. The agriculture sector accounts for more than two-thirds of rural employment in the country. However, due to inefficiencies and low productivity, the sector contributes less than a tenth of national output. Most Thai farmers operate as smallholders and four out of 10 are categorised as poor. The COVID-19 pandemic had a major impact on farmers, with about 10 million requiring government relief aid to manage declining incomes.

Farmers operating in Thailand's agriculture sector experience several constraints that make it difficult to thrive and build resilience. These challenges include small farm size and lack of land ownership, limited networks and access to information to guide efficient farm management operations, an ageing workforce, rising production costs, lack of access to water/irrigation resources, increased frequency of extreme weather events and rising debt profiles, among others.

Mobile and frontier technologies can help to address these pain points. In Thailand, enabling infrastructure for digital uptake (e.g. mobile phone and smartphone ownership, broadband network coverage) has steadily expanded over time. As a result, new agricultural technology (agritech) solutions are emerging in the country, supported by the government.

However, evidence shows that most smallholder farmers remain at a basic level of digitalisation and have yet to adopt digital agriculture solutions. Based on a survey by Thailand's National Statistical Office, only 23 per cent of farmers use some form

of ICT-related tools in their operations. The reasons for low digital adoption can be understood in terms of firm-level adoption barriers, agritech provider barriers and ecosystem challenges.

Smallholders struggle with the cost/benefit of investing in new digital agriculture solutions given the scale of their activities.¹ There is also a lack of trust in technology and a lack of digital skills. Providers of agritech solutions cannot reach this fragmented market on their own, which puts their solutions out of sight and out of reach of farmers. They also do not have sufficient information and data on farmers to tailor products to the diverse needs of different types of farmers operating in different contexts (e.g. type of crop grown, geographical location, weather impacts). While the government provides public extension support services to farmers, the reach and impact is not enough to accelerate digital adoption. Another structural issue is the lack of an integrated data platform that can be used by various players within the value chain.

The Ministry of Agriculture and Cooperatives (MOAC) recognises the importance of digital transformation for the sector and is driving policy strategies that use agricultural technologies and innovation to improve production quality, quantity and competitiveness. However, there are additional interventions that need to be prioritised to fast-track technology adoption. Implementing such interventions requires multi-stakeholder collaborations, highlighted in Table 1.

¹ Examples of digital agriculture solutions include: e-commerce platforms that support access to online trading of agricultural produce to enable farmers to reach new markets; smart farming tools to track/monitor key parameters and analyse field data; mobile-enabled information and advisory services for farmers; weather and climate forecasting channels; and digital financial products, among others.



Table 1

Recommendations to fast-track the adoption of digital technology in rural agriculture

MSME-level support	Agritech provider support	Ecosystem level intervention
<ul style="list-style-type: none"> • Provide digital training and education to build the capacity of farmers and help them become more open and willing to try new digital innovations. • Use digital remote participatory advisory services with built-in feedback loops between content providers and end-users. • Leverage community networks and farmer institutions that can share the costs and make digital technologies more affordable for their members. 	<ul style="list-style-type: none"> • Expand support beyond just funding the supply of innovative digital technologies. Additional support can include physical demonstrations and exhibitions of existing technologies to raise awareness, highlight trends and showcase the benefits of these solutions and how to implement same. • Research and development partnerships are needed to support start-ups in developing relevant solutions for farmers. 	<ul style="list-style-type: none"> • Restructure the agricultural extension system to incorporate public-private partnerships (PPPs) that expand the reach and impact of this support. • Invest in a National Agricultural Data Aggregation Platform that everyone involved in agriculture can access, share and use real-time agricultural data.



Tourism sector

Tourism is a key driver of Thailand's economy, but has suffered immensely from the COVID-19 pandemic. The share of GDP generated from tourism fell from 18 per cent in 2019 to just over six per cent in 2020, and there is a huge oversupply of tourism businesses not generating sufficient revenue.

The decline in international tourism during the pandemic has made community-based tourism (CBT) in rural areas a national priority, as part of a wider strategy of expanding tourism markets and products across the country. Under the CBT model, a rural community or village collaborates to host tourists and enable them to participate in the community's daily life and culture. While demand for CBT is currently low, it is expected to normalise in the next few years, and there is an opportunity to digitalise rural MSMEs that provide tourists with accommodation to become more productive and resilient to future financial shocks.

The use of mobile and digital tools by rural tourism businesses is low, due to several accessibility and adoption challenges. Currently, only half of all accommodation, food and beverage businesses in Thailand report using the internet, less than one in seven businesses has a web presence and less than 20 per cent conduct business purchases and sales online. Rural MSMEs in the tourism sector face several key barriers to the adoption of digital tools, including low levels of awareness and digital literacy, a perception that technology is high cost and low value, and a lack of access to quality affordable digital infrastructure in rural areas.

The Ministry of Tourism and Sports in Thailand is determined to use digital tools to support rural tourism businesses and community-based tourism, and several initiatives are already underway. To fast-track the adoption of technology by small rural accommodation businesses catering to tourists, the following policy actions need to be prioritised:

Table 2

Recommendations to fast-track the adoption of digital technology in rural tourism

MSME-level support	Technology solutions provider support	Ecosystem level intervention
<p>Provide digital training in basic social media marketing tools to enable wider, cost-effective access to tourism markets.</p>	<p>Assess the impact of, endorse and invest in technology providers that are having a demonstrable impact.</p>	<p>Invest in enhancing the breadth and capability of the tourism open data platform to better understand tourist behaviour and preferences and deliver services accordingly.</p>
<p>Assess and demonstrate the value of listing with online travel agents (OTAs) and using computerised reservation systems (CRS) and channel managers for better service delivery and market access.</p>	<p>Due to the challenge of acquiring individual customers, technology providers build business-to-business models instead, building solutions for corporates. Incentivise investment in business to consumer solutions tailored to micro-enterprises.</p>	<p>Invest in public-private partnerships to understand tourist preferences, trends and movement via Big Data, to promote local tourism strategically.</p>
<p>Provide entrepreneurship training in the use of digital tools for business operations to help reduce labour costs and make businesses more efficient, especially in the use of property management systems (PMS).</p>	<p>Encourage universities and tourism tech. startups to collaborate to stimulate innovation and build more tailored solutions for rural end users.</p>	<p>Showcase community-based tourism regions and products systematically on official websites and offer further information on travel routes, geotagged locations, ticketing services and an e-wallet to make travelling across Thailand easier.</p> <p>Create a map of key tourism regions and market these systematically via TAT, and explore marketing opportunities offered by VR technology.</p>
<p>Designate Destination Management Organisations (DMOs) and community leaders to organise and train the community, to generate content for online media and build an online presence for the community as a whole.</p>		<p>Make information on public transport and routes more accessible to tourists as well as on fair pricing by private transport providers.</p>
<p>Encourage the adoption of digital wallets, activity on which can then be utilized to build credit risk scores and offer credit to accommodation businesses during the low season.</p>		<p>Improve network infrastructure to connect rural communities easily and affordably.</p>



01

Introduction



As the second-largest economy in ASEAN, Thailand aspires to advance from upper-middle income to high-income country status by 2037, as outlined in the 20-year National Strategy (2018–2037). With the recently introduced *Thailand 4.0* vision, Thailand aims to move towards a value-based, innovation-driven economy and away from the production of commodities and low-value-added manufacturing. *Thailand 4.0* aims to promote technology,

creativity and innovation in focused industries, and increasingly in the service industry. This ambition follows from Thailand 3.0, which focused on complex industries and attracting foreign investment and enabled Thailand to become a production hub for exports.² The productivity, sustainability and growth of MSMEs, which are the backbone of Thailand's economy, is therefore a critical element of *Thailand 4.0*'s success.

Key Facts: MSMEs

MSMEs represent
99.5%



of all
enterprises
in Thailand

MSMEs account for
69.5%



of private-sector
employment in
the country

MSMEs contribute
35.3%



to national
output

Source: OSMEP³

COVID-19 impacts on MSMEs

~62%



received less
income during
the COVID-19
pandemic

~50%



experienced
losses due to
sunk costs

**More
than 1/3**



risked
shutting
down

Source: Statista⁴

² OECD. (2021). [OECD Investment Policy Reviews: Thailand](#).

³ Office of SMEs Promotion - OSMEP. (2020). [MSME Profile](#).

⁴ Statista. (2021). [Impact of the COVID-19 pandemic on small and medium enterprises](#).



MSMEs in Thailand were severely affected by the COVID-19 pandemic, suffering operational losses and reduced income, and many were at risk of shutting down. A key challenge for MSMEs was the inability to conduct business online. The Thai Central Bank calculated that 63 per cent of jobs in Thailand could not be performed remotely, particularly in informal MSMEs, which generate approximately 55 per cent of the country's employment.

Despite the industrialisation of the country in recent decades, agriculture and tourism remain key sectors of the economy, especially as it relates to providing livelihoods for entrepreneurs in rural communities.

However, the agriculture sector suffers from low productivity.⁵ In addition, farming households in the country have low resilience and response capacity to unexpected shocks; the majority of smallholder farmers reported negative impacts on sales and over a third struggled to pay back debts during the COVID-19 pandemic.⁶ The tourism sector has taken a much more disproportionate hit from the COVID-19 pandemic with over a million and a half tourism jobs lost in 2020 and a significant reduction in tourism activities.⁷ Between March 2019 and March 2020, the number of international tourists in Thailand decreased by 76.40 per cent.⁸

Key Facts



Agriculture

Contribution to GDP



8%

Employment



33%

Covid-19 impacts reported by farming households



64.6%

reported a decrease in agricultural product sales



31.7%

reported an inability to pay back debts

5 UN Thailand. (2 December 2020). [Thai Agricultural Sector; From Problems to Solutions.](#)

6 Statista. (2021). [Impacts of the COVID-19 pandemic on farming households in Thailand from March to May 2021.](#)

7 Reuters. (29 March 2021). ["Thailand loses 1.45 million tourism jobs from pandemic; tourism group."](#)

8 Statista. (2021). [Impact of COVID-19 on the number of international visitors in Thailand between March 2019 and March 2020 \(in 1,000s\), by region of origin.](#)

Key Facts



Tourism

Pre-COVID-19

Contribution to GDP



18.21%

Employment



11%

Post-COVID-19

Contribution to GDP



6.78%

Employment



1.65m

Loss of jobs

Building the resilience of MSMEs in Thailand (particularly those operating in the agriculture and tourism sectors) to become better prepared in the event of future financial shocks, will be fundamental to Thailand's post-pandemic recovery and future development. In the *ASEAN SME Transformation Study 2021*, both rural and urban SMEs surveyed recognised that the digitalisation of their business

could allow them to tap into the digital economy and increase their resilience to unforeseen events. Although more businesses are already implementing and benefitting from digital transformation initiatives in Thailand, many MSMEs are experiencing challenges, such as a lack of expertise and skills required for digitalisation and a nascent digital culture.

1.1 Project objectives and methodology

The purpose of this research is to understand the role of mobile and frontier technologies in supporting the development, success and resilience of rural MSMEs in Thailand's agriculture and tourism⁹ sectors, with a focus on accommodation businesses in the latter sector.

Specifically, the research seeks to identify:

- How digital technology can help improve productivity and increase opportunities for rural MSMEs in the agricultural and tourism sectors;
- The key barriers that need to be addressed to support the adoption of digital technology in these sectors;
- The policy instruments that can be used to overcome these barriers; and
- How Thailand can build an enabling ecosystem by using mobile and frontier technologies to improve the performance of rural MSMEs.

The research was conducted between December 2021 and March 2022 and involved both desk-based research and interviews with more than 30 stakeholders from industry and government. The full list of stakeholders can be found in Appendix 1.

⁹ For the tourism sector, the focus is on micro and small rural accommodation businesses that cater to tourists.



02

Digital transformation and MSMEs in Thailand



2.1 Current state of digitalisation

Thailand's ambitions for digitalisation and the adoption of frontier technologies to shift from an upper-middle to a high-income, prosperous country – sustainably and equitably – are articulated in key policy documents, such as *Thailand 4.0* and the *National Strategy (2018–2037)*. One of the aims of the 20-year strategy is to enhance Thailand's competitiveness through infrastructure development, including better transport, logistics, science, technology and advanced digital systems.¹⁰ The Eastern Economic Corridor, a government-led project encouraging innovation and Smart City initiatives is part of this effort. The sectoral transformation agenda articulated in *Thailand 4.0* also identifies digital and frontier technologies as key enablers of prosperity, “smart” and sustainable development in Thailand.¹¹ The *Thailand Digital Economy and Society Development Plan* similarly identifies Thailand's transformation into a high-income country via digital transformation in a range of socio-economic activities,¹² and in 2017 the Digital Economy Promotion Agency (DEPA) was established to promote and support the development of digital industry and innovation.

Enablers for the transformation to a digital economy include enabling regulations, quality digital infrastructure, access to and use of mobile devices, digital literacy and digital talent, as well as investment. Thailand's existing digital infrastructure provides good access across the country, although there are bottlenecks in remote areas. While Thailand currently ranks 56th in the world for mobile broadband speeds, fixed broadband speeds in Thailand are impressive and it ranks 4th globally.¹³ In addition, Thailand was one of the first markets in Asia-Pacific to launch commercial 5G services.¹⁴ Smartphone use in Thailand as a percentage of total connections is expected to increase from 81 per cent to 89 per cent by 2025.¹⁵ However, according to the Digital Quality of Life Index, while Thailand ranks well on internet quality, it lags behind Singapore and Malaysia on indicators such as e-security, e-government and affordability.¹⁶

¹⁰ [Thailand's National Strategy \(2018–2037\)](#).

¹¹ [Thailand 4.0 Vision](#).

¹² [Thailand Digital Economy and Society Development Plan](#).

¹³ Internet speed data from the [Speedtest Global Index](#).

¹⁴ GSMA. (2021). [The Mobile Economy: Asia Pacific 2021](#).

¹⁵ *Ibid.*

¹⁶ Statista. (2021). [“Digital Quality of Life Index in the Asia-Pacific region, by country”](#).



2.2 MSMEs in Thailand: overarching challenges of technology adoption

Thailand's five-year MSME policies are devised by the Office of SMEs Promotion (OSMEP). According to OSMEP, Thailand has more than three million enterprises, 99.5 per cent of which are MSMEs. Less than two per cent of MSMEs are medium-sized, while the remaining are micro (over 2.5 million employing less than 5 people) and small (under half a million, employing fewer than 50 people). In 2019, according to official statistics from OSMEP, MSMEs in Thailand employed about two-thirds of the population and generated over 35 per cent of GDP.¹⁷

While there is little disaggregated data on the types of rural MSMEs operating in Thailand, small enterprises in tourism and agriculture are a key feature of rural Thailand and an important source of income. COVID-19 has highlighted the necessity for rural enterprises to build resilience through digitalisation.

The digitalisation of rural MSMEs globally is more challenging than for urban MSMEs. This is due to differences in:

- **Digital infrastructure:** with more heavy usage in urban areas, building network infrastructure in rural areas tends not to be commercially viable and needs to be incentivised.

- **Awareness, digital literacy and exposure to digital tools:** urban populations tend to be much more aware of, and heavily exposed to, the various uses of digital technologies and are savvier in using them than rural populations, who may lack the same awareness, digital literacy and exposure.
- **Scale:** rural SMEs may feel digitalisation has limited value because of the small scale of their operations and the (perceived) high cost of technology adoption.

Thailand's fourth SME Promotion Plan (2017–2021) focuses on improving MSME productivity through technology and innovation, and the Digital Thailand Plan also aims to strengthen the economy by equipping MSMEs with digital technology to make them more competitive internationally. As part of this effort, the government has prioritised internet access, establishing a free Wi-Fi zone in all villages and providing training in digital skills. However, despite these enabling and supporting policies, rural MSMEs in Thailand are not leveraging technology sufficiently to improve productivity, sustainability and resilience.

¹⁷ OSMEP. (2020). [MSME Profile](#).

03

Digitalisation of smallholder agriculture in Thailand



3.1 Overview of the agriculture sector

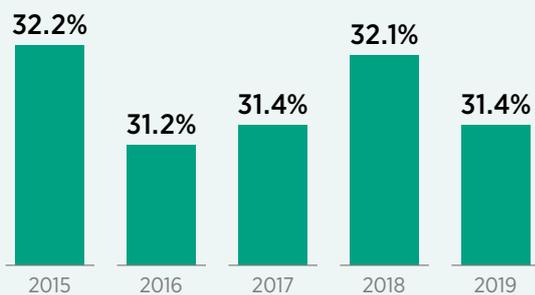
Given Thailand's tropical climate and abundance of biodiversity, agriculture has been a mainstay of the economy. Thailand is recognised as a global leader in various agricultural exports, such as rice, cassava products and sugar.¹⁸ Nationally, the sector accounts for a third of total employment (Figure 1) and remains a critical source of livelihood for Thailand's rural population, more than two-thirds of whom are engaged in agricultural activities.^{19, 20}

While the agriculture sector is one of the most labour-intensive in Thailand, it is also the lowest performing, contributing less than 10 per cent of GDP (Figure 2).²¹ This indicates the need for greater efficiency and productivity. Although Thailand's food exports are ranked high globally, this has not

translated into profits for rural entrepreneurs. This implies that the quality of jobs generated by the sector remains low.²² In addition, most farmers in Thailand are smallholders with very limited farmland available for cultivation per household.²³

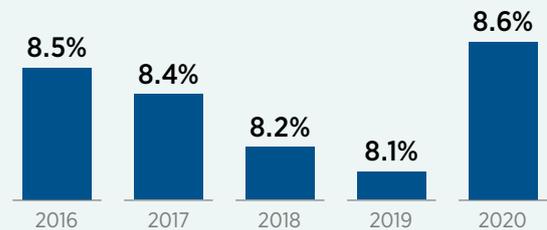
Low incomes combined with small-scale agricultural activities have meant many Thai farmers were not sufficiently resilient in the wake of an unforeseen event such as COVID-19. Ten million farmers received urgent relief packages to cope with income shortfalls, and²⁴ debt profiles in the sector increased by more than 25 per cent during the pandemic.²⁵ In the following section we discuss some of the factors that keep entrepreneurs in the sector from thriving.

Figure 1
Share of agriculture sector employment to total employment in Thailand



Source: World Bank

Figure 2
Contribution of agriculture to the GDP of Thailand



Source: World Bank

40%



of farmers live below the national poverty threshold (annual income of less than THB 32,000 / USD 905 per head of household).



Average annual income of farmers
THB 57,032
(USD 1,613)



Half of the farmers in the country have access to less than **10 rai (~1.6 hectares)** of farmland to cultivate.

Source: Thailand's Farmer Register 2017

18 Thailand Board of Investment. (2017). Food Industry BOI Report.

19 World Bank. (2019). *World Development Indicators for Thailand*.

20 Townsend, R.M. (2018). *Townsend Thai Project Household Annual Resurvey, 2017 (Rural)*.

21 Statista. (2020). "Thailand: Share of economic sectors in GDP".

22 Attavanich, W. et al. (2019). *Microscopic view of Thailand's agriculture through the lens of farmer registration and census data*.

23 Ibid.

24 Kenan Foundation Asia. (2020). "Thai farmers to get 5,000-Baht monthly relief grant".

25 Kittiyopas, D. (2020). "Impact of Covid-19 on Agriculture in the Asia-Pacific and the Role of Mechanization: Thailand Perspective". CSAM Webinar.

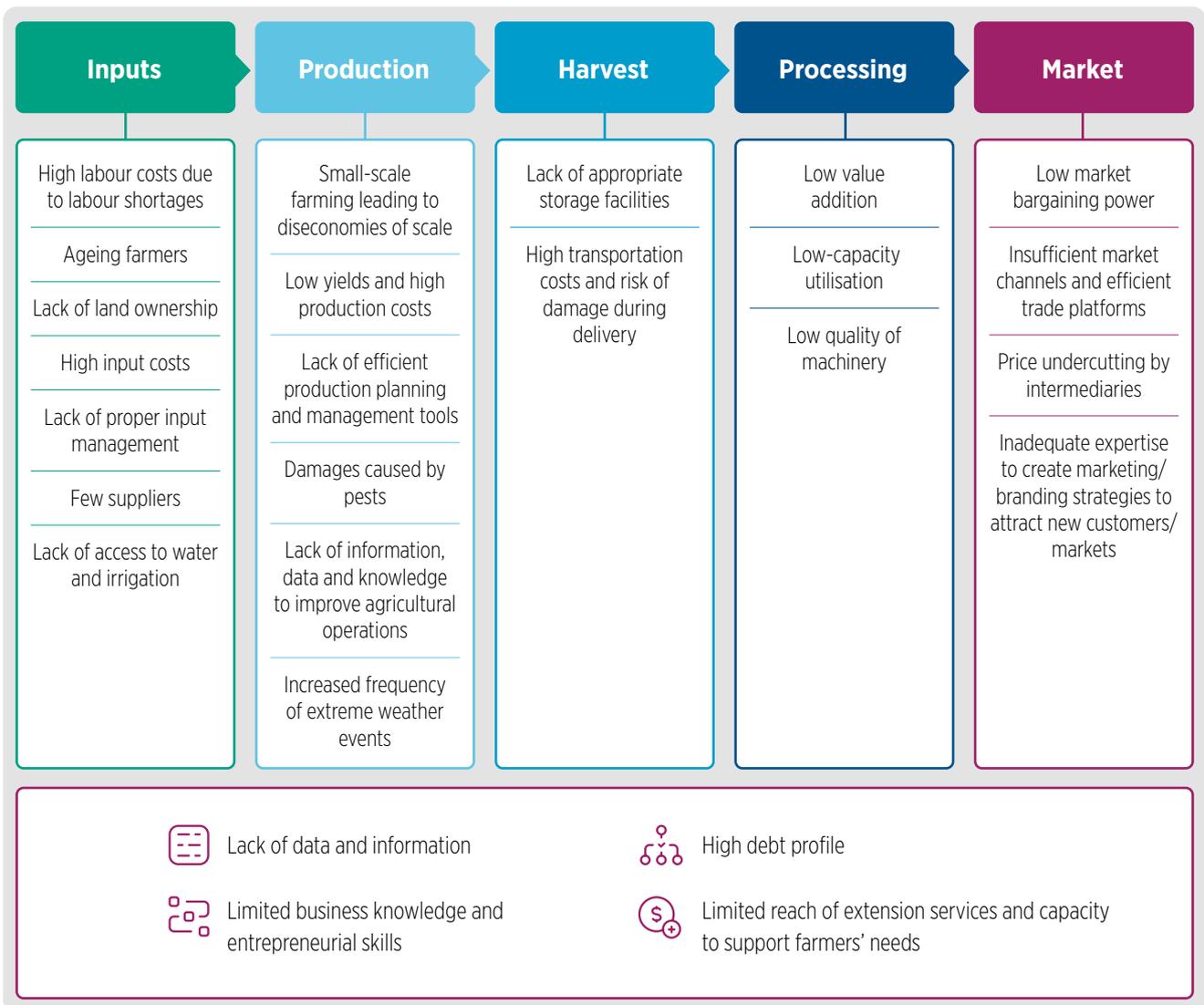


3.2 Key challenges affecting resilience and productivity

Entrepreneurs operating in Thailand's agricultural sector experience several constraints (see Figure 3) ranging from small farm size and lack of land ownership; limited networking and access to information to guide farm management operations;

an ageing workforce; rising production costs; lack of access to water/irrigation resources; increased frequency of extreme weather events; and rising debt, among others.

Figure 3
Cross-cutting challenges facing Thai farmers along a typical supply chain



Source: Interviews and literature.^{26, 27, 28, 29, 30}

26 Attavanich, W. et al. (2019). Farms, Farmers and Farming: A Perspective through Data and Behavioural Insights. PIER Discussion Paper, Puey Ungphakorn Institute for Economic Research.
 27 Kwanmuang, K. et al. (2020). Small-Scale Farmers under Thailand's Smart Farming System. FFTC Agricultural Policy Platform (FFTC-AP).
 28 Ratanavararak, L. et al. (2019). Digital Technology in Improving Thai Farmers' Quality of Life.
 29 Ministry of Science & Technology, Ministry of Digital Economy & Society and Huawei. (2017). *Insights on Digitalisation of Thailand Industry White Paper. Digital Roadmap for Aging Society, Agriculture and Tourism*.
 30 Analysis extracted from: Arthey, T. et al. (2018). Cassava Production and Processing in Thailand. A value chain analysis commissioned by FAO.



For example, due to a lack of reliable data to guide production planning, Thai farmers are often unable to determine the most appropriate crop(s) to plant, to select the most efficient production technique and the right input quantity and quality, to monitor crop growth or to forecast yield. Inadequate information on market trends and other value chain actors also makes it difficult for farmers to build networks and access markets. Farmers in rural communities in Thailand struggle to reach consumers or new markets on their own, forcing them to rely on intermediaries who can erode their profits. Where farm-related data is available, the skills to analyse important indicators, such as water resources or pest diagnosis, is lacking. Although the government provides extension support services, it is difficult for agents to reach the large number of small farmers in

villages. The required skills and capacity to support the diverse needs of these farmers is also lacking.

Input shortages related to labour and land are yet another concern. For labour, this is partly due to competing demand from more productive sectors such as services and manufacturing, and an ageing workforce (the average age of a Thai rice farmer is 56 years).³¹ In terms of access to land, about 40 per cent of farm households do not own the land they cultivate. As contractors, this means they cannot reap total farm yields or earnings, and they also have limited opportunities to enhance productivity.

However, mobile and frontier technologies have potential to address these challenges, both at the enterprise and system levels.

³¹ Analysis extracted from: Pongsrihadulchai, A. (2018). Thailand's rice industry and current policies towards high-value rice products. FFTC Agricultural Policy Platform (FFTC-AP).



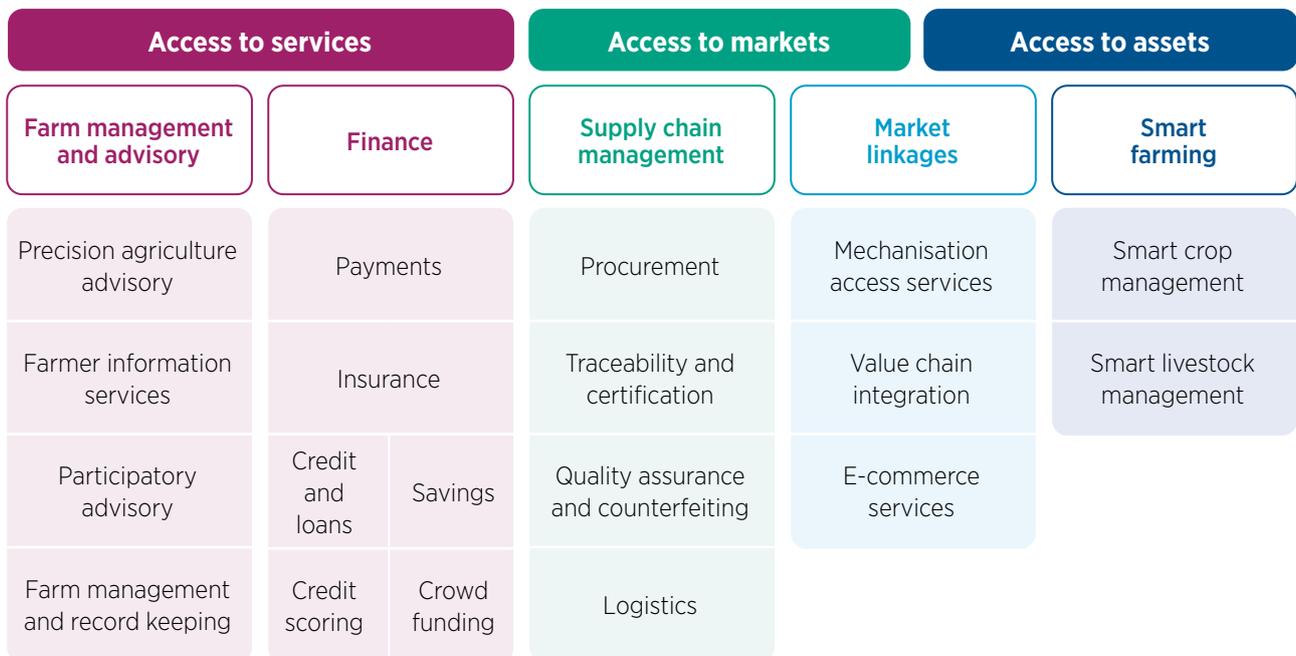
3.3 Digital solutions for smallholder farmers

Digital solutions are important to the development of the sector and provide many opportunities for smallholder farmers, including better resource efficiency and access to new and more profitable markets (Figure 4). There is evidence that adapting farm operations through the use of digital technologies has a direct positive impact on farmer earnings. In India, for example, when farmers had access to useful advisory services and information on their mobile phones, their incomes increased by USD 100 per year, with an estimated cost-benefit ratio of 10 times.³²

Some relevant agriculture-related digital solutions for farmers include:

- Mobile apps that expand the reach of extension services to farmers in rural communities.
- E-commerce platforms that allow farmers to sell their products directly.
- Platforms that connect farmers with affordable farm equipment rentals.
- Farmer data that is collected through IoT to support government advisory services and understand farmers' needs.
- Multi-stakeholder information systems and database platforms that facilitate knowledge sharing and exchange, networking, integration and access to innovation.
- The use of AI, including drones, robots and AI assistants, for precision agriculture and smart farming techniques. This technology can improve yields by identifying precise requirements for crop growth or remotely accessing farm equipment or monitoring key parameters.
- Data from sensors and satellite imagery, combined with big data and digital footprints, that can help financial service providers better assess the risk profile of farmers and improve their ability to access appropriate financing.

Figure 4
Examples of digital solutions for smallholder farmers



Source: GSMA AgriTech programme

32 Ratanavararak, L. et al. (2019). Digital Technology in Improving Thai Farmer's Quality of Life. PIER Abridged.



3.4 Current level of digitalisation and adoption challenges facing smallholder farmers

Enabling infrastructure for digital uptake (e.g. mobile phone and smartphone ownership, broadband network coverage) has been steadily expanding in Thailand and new agritech solutions are emerging, supported by a significant government effort.³³ A DEPA study identified more than 100 local digital agriculture solutions currently available through mobile apps.³⁴ However, most agritech start-ups struggle to reach their intended users – smallholder farmers – resulting in very few downloads and active users.³⁵ This implies there are systemic issues stalling wider adoption and deployment of these solutions.

Also, while the supply of technologies is growing, a review of the digital tools and platforms identified by DEPA indicates there are still supply-side gaps. Few solutions exist to support agricultural processing activities (e.g. automation and robotics), distribution services (e.g. product marketplaces) and support functions (e.g. farm management and advisory services, digital payments and credit scoring tools).

Evidence suggests that most smallholder farmers in Thailand remain at a basic level of digitalisation. Adoption of digital technology for business operations is low. A survey carried out by Thailand's National Statistical Office on the use of ICT-related tools by agricultural households shows

that only 23 per cent of farmers use some form of ICT-related tools in their operations. For the agricultural businesses that do, the primary tool is the smartphone, which is used to share information via social media channels with farmer groups. The fraction of Thai farmers who have adopted digital agriculture solutions tend to be those who engage in formal value chains and grow high-value crops like flowers, vegetables, fruits and organic food. These farmers see the benefits of digital technology across the agricultural cycle, from production and harvesting to taking crops to market. However, most Thai farmers typically cultivate staple crops and are less likely to see the benefits of digital agriculture solutions.

Although there is a wide gap in digital adoption among smallholder farmers in Thailand, mobile and digital technologies provide an opportunity to deliver additional farm support services that, in the right environment, can improve outcomes for them. However, it is important to understand what is impeding digital adoption by smallholder farmers. From interviews with smallholder farmers, technology suppliers and government officials, as well as a review of supporting literature, we have identified the following key barriers to digital technology adoption in Thailand.

³³ See Appendix 2 for examples of digital agriculture services and tools available in Thailand.

³⁴ DEPA. (2020). Agriculture Landscape in Thailand.

³⁵ Rattanawararak, L. et al. (2019). [Digital technology and improving the quality of life of Thai farmers: What? Why? and How?](#)

Table 3

MSME-level adoption barriers**Trust and behavioural issues:**

- Thai farmers are conservative and averse to risks and uncertainties. This significantly hinders them from trying new technologies and causes them to stick with traditional farming methods.³⁶
- Farmers require proof or tangible evidence of successful cases before deciding to adopt certain technologies.³⁷
- Many Thai farmers are part-time farmers who have other sources of income, and some only grow agricultural produce to qualify to receive government incentives. These farmers lack the motivation to be innovative and competitive.
- Farmers are reluctant to believe change agents, as there have been instances where distrust was warranted. Pilot farms or the endorsement of village heads can be more effective ways to build trust.

Digital competence:

- Digital literacy among Thai farmers is low. Technology adoption tends to decline significantly as the age of the head of a farmer household increases. This is due to less access to digital knowledge.³⁸
- Thai farmers have a strong preference for extremely simplified digital solutions.

Finances:

- Limited resources available to invest in new technologies and processes, and uncertain economic benefits to justify the investment required.³⁹
- Smallholder farmers consider investment in new technology solutions or services not worthwhile because of the high cost and small farm size.
- Some farmers lack access to additional credit or financial loans as they already have a high amount of outstanding debt.

Information gap:

- Farmers often do not have a clear understanding of the value technologies can add and the benefits are too vague, leading to low adoption.

Solutions not fit for purpose:

- Some technology suppliers do not consider the uniqueness and diversity of farmers' needs, which creates limited scope to adapt products and solutions.

³⁶ Attavanich, W. et al. (2019). Op. Cit.; Srivetbodee, S. and Igel, B. (2021). Op. Cit.; Wongsim, M. et al. (2018). Op. Cit.

³⁷ Poapongsakorn, N. et al. (2020). Op. Cit.

³⁸ Kwanmuang, K. et al., (2020). Op. Cit.; Ratanavararak, L. et al. (2019). Op. Cit.

³⁹ Kwanmuang, K. et al. (2020). Small-Scale Farmers under Thailand's Smart Farming System. FFTC Agricultural Policy Platform (FFTC-AP); Poapongsakorn, N. et al. (2020). Farming 4.0 Policy.



Table 4

Agritech provider barriers

Visibility:

Online marketing of digital technologies has not proven effective. Suppliers often need to do in-person marketing, showcases and events to meet and talk to farmers. This kind of marketing strategy is expensive, requires significant staff for one-on-one conversations and is time-consuming. Since agritech providers do not have this capacity, their solutions remain obscure.

Research and development:

When conducting pilot tests on their products, Thai agritech start-ups are only able to get data and feedback from a very limited number of users. There is, therefore, always a concern that some products are not fit for purpose as they do not consider the diversity of farmers' needs.

Finances:

- Difficulty in obtaining funding since non-government investors are more interested in immediate financial returns than social impact.
- For those who can access investment from government funds, disbursement of funds takes time, creating cash flow issues for service providers.⁴⁰
- Farmers often complain about the high cost of digital agriculture solutions and request that they be simplified, with only basic features and extra instructions. While adapting the solutions might help farmers, it is not always cost-effective for the supplier.
- Providing solutions to individual farmers engaged in small-scale activities is not always worthwhile from a cost perspective.

40 National Innovation Agency. (2021). [Thailand Agtech Startup Ecosystem Development White Paper](#).

There are also structural challenges that require government support or intervention.

Table 5

Ecosystem level challenges

Public extension services:

The Department of Agricultural Extension, under MOAC, is the main government branch responsible for supporting and promoting community enterprises. The department has regional offices in all 76 provinces. These offices assist in registering, providing technical advisory services, training programmes, financial support and other services to small and medium-sized community enterprises. However, the quality of public extension services is an issue in terms of low coverage of villages and digital knowledge capacity.

There is also a great deal of emphasis on 'ticking the box', for example, registering a high number of attendees in a training programme rather than focusing on the impact these programmes are having on farmers' operations.⁴¹

Infrastructure:

Essential public infrastructure is lacking, such as big data platforms for various actors in the value chain to access and use.

Tech ecosystem:

- Delay in issuing guidelines and regulations for new frontier technologies being introduced to the market.
- Inadequate support to deepen market penetration does not favour the growth and variety of available digital solutions.
- Limited public investments in research and development of innovative digital agriculture solutions.

For Thailand's agriculture sector to realise the potential of digital transformation, all these barriers to the adoption of digital technology need to be addressed.

⁴¹ Poapongsakorn, N. et al. (2020). Op. Cit.



3.5 Digitalising agribusinesses: Thailand's policy direction

The Thai government recognises the importance of digital technologies in the agriculture sector and is actively committed to its initiatives to encourage the adoption of technologies among farmers. MOAC, through its various departments, has the primary responsibility for charting the development strategy for the sector and aligning digital transformation initiatives to the broader national Thailand 4.0 digitalisation strategy.

As part of Thailand's 20-year Agricultural Development Plan (2017–2036), MOAC plans to transform traditional agriculture into Agriculture 4.0. To this end, a smart farming committee has been appointed and tasked with smart farming policy planning.⁴² A major objective that MOAC seeks to achieve is to use agricultural technologies and innovation to improve production quality and quantity and the competitiveness of the sector, as well as improve access to data infrastructure for production planning.⁴³ By supporting farmers in building more technologically enhanced production models, MOAC hopes that the average per capita income for farmers will rise to THB 390,000 / USD 11,028 per year, upon successful completion of the strategy. Some of the steps identified to achieve this goal include:

- Investing and collaborating on research to develop high-tech and innovative farming systems geared towards precision farming whereby production costs, resource use and marketing are guided by applying technology to control the use of water, fertiliser application, pest control, breeding, harvesting, etc.
- Improving the capacity of farmers to access and benefit from technologies, sustainable practices, marketing knowledge and the use of satellite technologies and other databases.
- Providing knowledge and access to technology at an affordable price through subsidies, as well as digital technologies to plan for demand-driven production.
- Developing agricultural data linkages to enable the free flow of real-time information on demand for agricultural products. This would allow farmers to plan their production using a demand-driven approach and would also guide MOAC in planning and decision-making.
- Supporting farmer institutions/organisations with advice on efficient e-commerce operations.

⁴² Ministry of Agriculture and Cooperatives. (2017). *Twenty year Agriculture and Cooperative Strategy*.

⁴³ *National Strategy (2018–2037)*.

MOAC collaborates with several other government agencies to implement their development vision for the sector. For instance, DEPA initiated a digital transformation fund and digital start-up fund for financing businesses interested in developing innovative prototype solutions (up to THB 1 million / USD 28,295 over three years) or strategic digital conceptual plans (up to THB 50,000 / USD 1,415). Some local agritechs have benefitted from these funds. DEPA has also set up a digital traceability system (TraceThai), using blockchain technology, to promote international standards used in agricultural businesses to boost transparency and confidence in the country's food exports.⁴⁴ The system supports the verification of quality certificates of producers and exporters and can trace each product back to the beginning of the supply chain.

Another notable initiative for the sector is the Food and Agriculture Revolution Model Information System (FAARMis) developed by the National Electronics and Computer Technology Center (NECTEC).⁴⁵ The purpose of the project is to create a digital database of farmers and their fields. The information collected will help to identify ideal crop zones, matching plants to the most suitable soil in each area for increased productivity and efficiency. The database will also become a prerequisite for farmer participation in government programmes, such as grants or subsidies.

In response to the ageing farming population, MOAC launched the “Young Smart Farmer” programme to attract young farmers to the sector and develop their technological competencies to enable them to become self-reliant entrepreneurs and local agricultural leaders in their regions. The programme has primarily provided non-monetary support and incentives, such as transferring knowledge and information to farmers, as well as developing formal and informal networks among young farmers.⁴⁶

A shortcoming of the regulatory environment is that existing policies have, over time, focused on short-term assistance, such as compensation for harvest expenses rather than funds for long-term investments.⁴⁷ This disincentivises farmers from adapting to key challenges through technology, knowing that they would be compensated, for example, in crop seasons with diseases or adverse weather. Inconsistent policymaking stemming from change in public office holders is another limiting factor. In addition, government interventions in the sector are heavily state-run, involving only modest partnerships with the private sector and leading to unsustainable deployment of digital agriculture initiatives in the country.

44 See: <https://tracethai.com>.

45 See: <https://faarmis.in.th/>

46 Jansuwan, P. and Zander, K.K. (2021). “Getting Young People to Farm: How Effective Is Thailand's Young Smart Farmer Programme?” *Sustainability*, 13(21), p. 11611.

47 Attavanich, W. et al. (2019). Op. Cit.



04

Digitalisation of rural MSMEs in Thailand's tourism sector

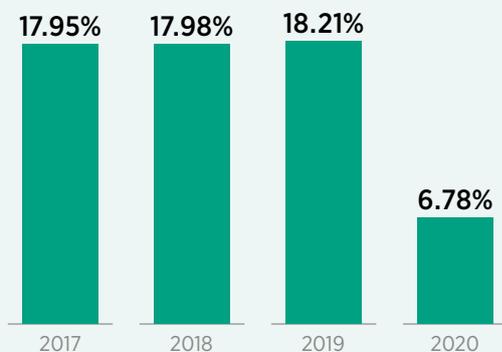


4.1 Overview of the tourism sector and policy direction

Tourism is one of Thailand's main economic activities. In 2019, Thailand's receipts from international tourism totalled USD 65 billion, the third highest in the world with just under 40 million international arrivals.⁴⁸ In the same year, the contribution of tourism to Thailand's Gross Domestic Production

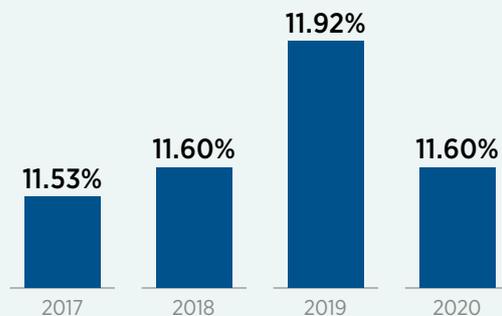
(GDP) was more than 18 per cent (Figure 5) while the sector employed almost 12 per cent of the total workforce (Figure 6).⁴⁹ Thailand ranked 31 out of 140 countries in the World Economic Forum's Travel and Tourism Competitiveness Report 2019, and 9th in the Asia-Pacific region.

Figure 5
Share of tourism contribution to GDP value in Thailand



Source: Statista, with data from the Ministry of Tourism and Sports (Thailand)

Figure 6
Share of tourism sector employment to total employment in Thailand



Source: Statista, with data from the Ministry of Tourism and Sports (Thailand)

COVID-19 had a significant impact on revenue from tourism, with only 6.78 per cent of GDP generated by the sector in 2020. More than half of this was generated by MSMEs, which employed 86.8 per cent of all tourism employees.⁵⁰

OSMEP classifies key businesses in the tourism industry into three categories,⁵¹ and within these, accommodation businesses are the focus of this research.

- Main businesses, including accommodation, restaurants and travel guides;
- Related businesses, including recreational activities and shops; and
- Supporting businesses, including transport, logistics and information services.

⁴⁸ World Tourism Organization. (2021). *Yearbook of Tourism Statistics*.

⁴⁹ Statista, with data from Ministry of Tourism and Sports (Thailand).

⁵⁰ OSMEP. (2021). *Analysis of MSMEs in Tourism Sector 2021 and Trends for 2022*.

⁵¹ OSMEP. (2012). *SME Development Plan in the Tourism Industry*.



Current policy directions in tourism

The Thai government has two policy directions in tourism, as articulated in the second *National Tourism Development Plan (2017–2021)* and *Thailand 4.0*. The first is linked to creating higher-value international tourism by expanding the customer base to include a much broader range of countries. The policy also aims to increase meetings, incentives, conferences and exhibitions (MICE) tourism, medical, wellness, culinary, eco and sports tourism and to target tourism offerings to the affluent international traveller.

The second policy direction is to increase both international and domestic tourism in Thailand's rural areas instead of in the heavily frequented primary cities, and encourage a CBT model whereby tourists can immerse themselves in the local life and culture of Thai villages. Agritourism and ecotourism are both parts of this drive. It is envisioned that rural communities can build a self-sufficient economy from their agricultural and cultural products sustainably and collectively, while revenues generated from tourism can be distributed more equitably between regions.

CBT has been used as an important tool for poverty elimination in rural communities in Thailand since the Asian financial crisis of 1997. CBT was initially actualised through the "One Tambon (sub-district) One Product" project, modelled on the "One Village, One Product" initiative launched in Oita prefecture in Japan. In 2008, the Ministry of Interior encouraged rural communities to put the "sufficiency economy" into practice, particularly in agriculture, by rolling out the sufficiency economy village role model project – a model that is still maintained⁵²

and which CBT supports. It is estimated that more than 3,000 Thai communities are participating in CBT.⁵³ More recently, Thailand has embraced a Bio-Circular-Green (BCG) economic model to ensure that tourism, among other key industries, is sustainable, environmentally friendly, innovative and technologically enabled.

The Government of Thailand recognises the importance of digitalisation for the tourism sector overall, but specifically for small and medium rural tourism enterprises if they are to be sustainable and contribute to revenue generation, employment and the self-sufficiency of the community. Thailand's *National Tourism Development Plan*, now in the draft stage for the third iteration (2023–2027), as well as *Thailand 4.0*, highlights the government's intention to use technology and innovation to meet their ambitions for the tourism sector⁵⁴ via five mechanisms: sustainable tourism management; development of infrastructure to support tourism; modern marketing; support for innovative tourism enterprises and start-ups; and effective private and public organisations managing the tourism supply chain. Notable digitalisation initiatives include the "Empowering Tech Tourism" project led by the Tourism Authority of Thailand (TAT), the government agency responsible for promoting tourism in Thailand, and the "Amazing Thailand, Amazing New Chapters"⁵⁵ initiative. Both aim to improve the productivity of tourism businesses through digital technologies. To incentivise digitalisation, DEPA has been providing subsidies to MSMEs, including those in tourism, to acquire digital technologies or digital payments for their businesses.⁵⁶

52 Shaokhrueamuang, A. (2014). *Sustainability of Rural Tourism in Thailand: A Comparative Analysis of Remote Area and Urban Fringe Area*.

53 See LocalAlike. (2021). *Survey on Community based Tourism Market in Thailand*. Commissioned by Japan International Cooperation Agency (JICA).

54 Siam Rath Online. (2021). *Thailand's Third National Tourism Development Plan, Guiding Thailand's Tourism Industry*. Siam Rath Newspaper, 2 September.

55 Public Relations Department. (2022). *Thailand's New Tourism Concept for 2022*. The Government Public Relations Department, 1 January 2022.

56 Digital Economy Promotion Agency. (n.d.). DEPA mini-Transformation Voucher.

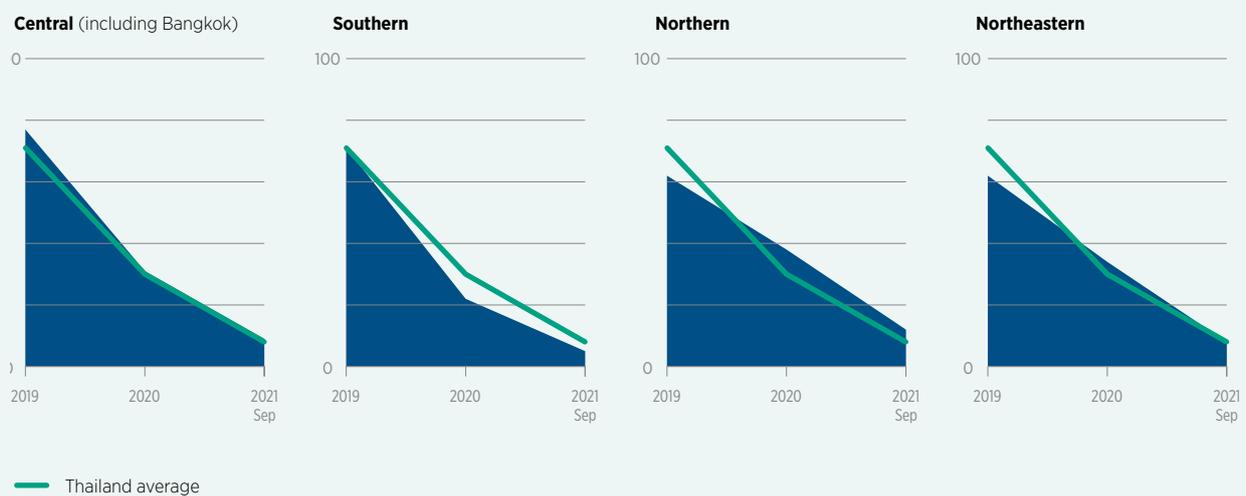
Box 1 Impacts of COVID-19 on tourism in Thailand and the government's pandemic support initiatives

As in most other countries, the COVID-19 pandemic caused a complete shutdown of international tourism in Thailand. The government was proactive in their support for tourism businesses, offering interest-free financing for struggling MSMEs and launching a “We Travel Together” campaign to encourage domestic tourism that provided accommodation, travel and food subsidies to domestic holidaymakers. Because most local tourists prefer to stay in hotels,^{57,58} the Ministry of Tourism and Sports launched a “Healthy Homestay and Safe Community-Based Tourism” initiative to help bring more income to villages through rural health and wellness-related services.

In 2019, domestic tourists made 167 million trips in Thailand.⁵⁹ While domestic tourism is higher than international tourism, revenue generated from it is much lower. Therefore, Thailand needs to see a revival in international tourism for the sector to recover to pre-pandemic levels.⁶⁰ To restore some continuity to international tourism, the Thai government introduced a “Phuket Sandbox” in July 2021 whereby fully vaccinated international tourists could stay in Phuket in designated hotels for two weeks before travelling elsewhere in Thailand without having to quarantine.

In spite of these proactive measures, COVID-19 continues to impact the sector. Hotel occupancy during the pandemic has been poor due to the oversupply of accommodation businesses and low demand (Figure 7).

Figure 7
Impact of the COVID-19 pandemic on room occupancy, by region



Source: McKinsey. (2021). Reimagining travel: Thailand tourism after the COVID-19 pandemic.

57 Ibid.

58 Ibid.

59 Daengnoy, J. and Kamp, C. (21 November 2020). *Thailand: Emerging Stronger and Better. Perspectives on Domestic Tourism in Thailand*. Tourism Watch.

60 Ibid.



4.2 Key challenges affecting resilience and productivity

Tourism is a difficult sector to digitalise, in part because of the variety of businesses involved. Accommodation businesses in Thailand are quite diverse, ranging from rental rooms in residences to homestays and farmstays, lodges, guest houses, rental condominiums, hotels and resorts of varying quality and size.

According to the 2020 Accommodation Survey conducted by the Ministry of Digital Economy and Society, over 85 per cent of all accommodation businesses employ 1–15 people and are therefore micro and small businesses (Table 6).⁶¹ Larger accommodation businesses with 51–200 employees are primarily urban and a majority are located in Bangkok.

Table 6

Number of tourism accommodation businesses in Thailand (by size)

Number of total accommodation businesses	Percentage	Size of business (by employees)
24,269	100%	
20,979	86.4%	1–15 people
1108	4.6%	16–25 people
301	1.2%	26–30 people
688	2.8%	31–50 people
993	4.1%	51–200 people
200	0.8%	200+ people

Source: 2020 Accommodation Survey conducted by the Ministry of Digital Economy and Society

International travellers tend to visit primary cities, which leads to unequal revenue generation from tourism by region, as well as environmental degradation in heavily frequented localities. Eighty

per cent of foreign tourists visit only first-tier provinces such as Bangkok, Phuket, Chonburi, Surat Thani and Chiang Mai, and international travel peaks between September and March.⁶²

⁶¹ Thailand's Office of SME Promotion (OSMEP) does not distinguish microenterprises from small enterprises by definition or disaggregate statistics for micro versus small enterprises. Therefore, a microenterprise in the context of this research employs the more global definition of less than five employees.

⁶² Bank of Thailand and Visa. (2021). [Revitalising Thailand's tourism sector; in search of enablers for future sustainability](#).

A review of the literature and consultation with experts including government officials and technology solution providers, as well as with rural MSMEs, highlighted some of the most widely shared challenges of rural accommodation businesses of various sizes:

Market access

Market access is one of the greatest challenges faced by rural MSMEs. International tourists prefer urban areas or primary cities and their fringes, and the northern and central regions of the country are less frequented. Rural accommodation businesses lack the awareness and tools to market themselves effectively, and struggle for brand visibility against more well-established hotel chains. A lack of foreign language skills also presents a challenge in attracting international tourists.

Locally owned homestays and guest houses compete with accommodation businesses owned by urban investors that may have better marketing and outcompete them.⁶³ Similarly, tourists may consume standardised supermarket products rather than food, beverages and crafts produced by the community, limiting revenue generation from tourism.

Operational challenges

Rural accommodation businesses generally attract less skilled workers. There is limited career progression and, therefore, high employee turnover. Business operations, such as room reservations, inventory management, housekeeping, bookkeeping, sales and marketing and employee management, are managed manually, leading to inefficiencies, errors and lack of systematic data collection.

For a segment of rural accommodation businesses, it is their secondary source of income, with agriculture as the primary source. This limits the time and resources owners have available to invest in their businesses.

Digital Infrastructure challenges⁶⁴

Availability of and access to the internet is much poorer in rural communities than in urban locations. Despite heavy investments by the government in infrastructure, stakeholders have reported that merchants in rural areas may have to pay to access the internet and this acts as a barrier to internet adoption and use.

Transportation challenges

Tourists' access to rural areas can also be challenging, as public transport schedules and booking portals operate in isolation and often with information that is only available in Thai. Lack of transparent pricing from private transport providers is an additional barrier. Inconvenient transport solutions make it difficult for tourists to explore remote locations.

Financing and profitability challenges

MSME entrepreneurs face challenges accessing credit, especially short-term working capital, which is exacerbated by the seasonal nature of tourism. While Thailand sees high levels of international visitors from October to February and domestic tourism peaks in April, other months are quiet, and working capital is needed to keep the business going.

In addition, Thailand's safety and security ranking needs to be improved,⁶⁵ as does the enforcement of laws regulating tourism businesses. Monitoring of standards of accommodation businesses is also needed. The restrictions placed on international visitors by the government due to the COVID-19 pandemic (although Thailand expects to be completely open to foreign tourists soon) and the travel restrictions imposed on Chinese visitors by their government have compounded these challenges in the short term.

⁶³ Rattanasuwongchai, N. et al. (n.d.). Op. Cit.

⁶⁴ Sources: Interviews with rural MSMEs, technology providers and government officials in Thailand. Various literature sources: Thailand's Ministry of Sciences & Technology, Ministry of Digital Economy & Society and Huawei. (2017). Insights on Digitalisation of Thailand Industry White Paper. Digital Roadmap for Aging Society, Agriculture and Tourism; OSMEP. (2018). Digital Technology for Tourism Service and Related Businesses; Krungsri Research (2021). Business & Industry Trends 2021-2023: Hotel Business; Euromonitor. (2021). Travel in Thailand; Bangkok Biz News. (10 September 2021). "Restaurateurs Operating Businesses on 'Fear'".

⁶⁵ Thailand ranked 111th out of 140 countries for safety and security in the World Economic Forum's Travel and Tourism Competitiveness Index 2019.



Figure 8

Key challenges affecting the sustainability of rural tourism accommodation businesses



Market access

- ➔ Limited international tourism in rural areas as tourists prefer primary cities.
- ➔ Small rural accommodation businesses are out-competed by hotel chains on marketing and visibility.



Business operations

- ➔ Business processes such as reservations, accommodation management, accounting and procurement are manual, labour intensive, and inefficient.



Labour and skills

- ➔ Rural accommodation MSMEs attract low-skilled labour due to limited career progression.
- ➔ Seasonality impacts employment.
- ➔ Language limitations adversely impact international tourism to rural areas.



Infrastructure

- ➔ For rural access, good transport infrastructure, public transport system and road safety are needed.
- ➔ Network infrastructure is lacking in some rural communities.



Financing and profitability

- ➔ The seasonal nature of tourism makes working capital to sustain the business a challenge.
- ➔ Where profits from the businesses are at a subsistence level, there is little incentive to invest in business solutions.

Source: GSMA Mobile for Development

4.3 Digital solutions for rural tourism MSMEs

Digital tools bring significant benefits to rural tourism businesses, including access to a wider range of customers and suppliers, greater efficiency, lower costs and higher profits. Different types of digital tools offer solutions for rural accommodation businesses.

Basic tools

- ➔ Email and email marketing software;
- ➔ Office software;
- ➔ Social media;
- ➔ Website;
- ➔ Digital banking;
- ➔ Online data storage;
- ➔ Computerised reservation system (CRS) or online travel agents (OTAs); and
- ➔ Online procurement and e-commerce.

Intermediate tools

- ➔ Customer relationship managers (CRM);
- ➔ Mobile apps;
- ➔ Data analytics;
- ➔ Online interaction with suppliers and clients;
- ➔ Channel managers;
- ➔ Enterprise resource management (ERM); and
- ➔ Property management systems (PMS).

Market access and customer engagement

In interviews, local stakeholders perceived the greatest value of digitalisation for rural tourism MSMEs was its ability to enable wider market access by improving online brand visibility and online bookings. For MSMEs, social media platforms are the simplest and most easily adopted solution for market access and customer engagement, followed by a dedicated business website. The ability to use email for communication with potential customers is also an important tool in encouraging business.

More sophisticated digital solutions to improve marketing and market access, one of the biggest challenges faced by rural SMEs, include computerised reservation systems, such as online booking and review platforms (popular examples include Expedia and Agoda). These booking platforms make MSMEs more visible to an international audience and assist with backend services, such as room bookings, recording customer requests and processing payments.⁶⁶ Particularly

relevant to rural communities are niche travel booking platforms in Thailand that specifically promote rural and community-based tourism, such as LocalAlike and TakeMeTour, to international tourists.⁶⁷

Part of the revenue generated by CBT is from the sale of handmade local cultural products to tourists. Since visitor numbers have declined during the pandemic, communities that can offer their products for sale online may still be able to generate revenue from sales compared to those that do not engage in e-commerce. When COVID-19 hit, the social enterprise LocalAlike enabled communities affected by a drop in tourism to sell their products online. The sale of local rural products had such unprecedented success that LocalAlike announced the intention to set up an e-commerce business in addition to their travel agent services facilitating community-based travel.⁶⁸

66 Yiamjanya, S. (2016). "Endogenous and Exogenous Factors for e-Marketing Technology and Innovation in Homestay Establishments: A Case Study of Samut Songkhram Province, Thailand". *Journal of Economics, Business and Management*, 4(1), pp. 40–46; SCB 10X. (2021). "TravelTech Big Trends Returning Post-Covid 19".

67 Ditta-Apichai, M., Kattiyapornpong, U. and Gretzel, U. (2020). "Platform-mediated tourism micro-entrepreneurship: implications for community-based tourism in Thailand". *Journal of Hospitality and Tourism Technology*, 11(2), pp. 223–240.

68 Weforum. (2020). How Thailand's social enterprises are helping locals survive COVID-19.



Business operations

Managing operations manually for rural accommodation businesses that offer more than a few rooms is time consuming and laborious. A property management system (PMS) is a web-based tool that helps to streamline hospitality operations, including housekeeping, emailing guests, accepting online bookings and handling payments.

While PMS offer bookings through their online engine, to expand their reach businesses need to list their services on multiple channels or online booking sites, the most common of which are Expedia, Agoda and Booking.com. A channel manager is a tool that automatically updates all channels an accommodation is listed on when a room is booked, eliminating the risk of double bookings. Interviewees report that PMS and channel managers, which in Thailand include technology start-ups such as HMS Thailand and Ace Marketing Solutions, are increasingly affordable, costing about THB 7,000 / USD 198 per month on average for a 30-room accommodation.

PMS and channel managers may be integrated with other systems, such as customer relationship management (CRM) systems. Notable CRMs in Thailand are Buzzebees, Readyplanet and Gofive. They may also be integrated with ERP software, examples of which in Thailand include Zort, Humanica, Trizeri and Rhbus. These integrated systems enable efficient operations and customer management.

Finally, accommodation businesses can utilise data analytics from data collected by property management systems to better understand their business and customers to make process improvements.⁶⁹ Data from PMS can improve occupancy forecasting, help set prices, identify the most profitable channels, optimise procurement of supplies and identify the most relevant market for services.

Box 2 Apptivo: an innovative and affordable CRM tool

Apptivo is a Bangkok-based company offering CRM software to help companies manage their customer relationships from a single cloud suite, customisable for tourism businesses. For travel agents and accommodation businesses offering more than a few listings, it can manage lead generation, email marketing, bookings and payment tracking and advanced reporting. Their leanest subscription for small businesses costs \$8 per month, making it an affordable solution.

69 Campiranon, K. (2019). "Examining the Competitiveness of Smart Tourism in Thailand by Using the Diamond Model". *Suthiparithat Journal of Business Innovation (SJBI)*, 33(107), pp. 39-50.

Digital payments

Digital payments, including contactless payment systems such as PromptPay or digital payments via apps such as WeChat and AliPay, have experienced an uptick since the COVID-19 pandemic.⁷⁰ The government has launched multiple campaigns to boost digital payments in the tourism sector by linking support payments to digital cash transfers, making financial transactions efficient, safe and convenient.⁷¹

For example, Pao Tang is an app that offers an e-wallet, which the Thai government uses to deliver digital payments to the population. It currently has more than 30 million users, making it the largest digital financial services application in the country. Since COVID-19, the Thai government has been providing support to MSMEs in the tourism industry, including accommodation, food and transportation businesses, by subsidising the payments that domestic tourists make through the wallet, between 40 per cent and 60 per cent of the total cost. By providing subsidies only through the wallet, the government has incentivised rapid registration and use of the wallet for transactions.

However, a 2021 Bank of Thailand survey of consumer payment preferences found that the majority of Thai consumers, especially older ones, prefer to use cash due to its higher acceptance by food and beverage vendors, small merchants in markets and local shops. The research, assessed in early 2021 and published in December 2021,⁷² concluded that higher uptake of e-payment solutions by market vendors and merchants is likely to encourage a shift to digital payments.

Recently the Vietnamese government, in collaboration with telecom group Viettel Money, launched a mobile app for traders at wet markets, which sell perishable food items in urban Da Nang, to increase uptake of digital payments.⁷³ A similar targeted strategy to reach and digitalise payments in rural markets in Thailand may encourage the uptake of digital payments.

In addition, Thailand's tax collection rate is low. It is estimated that only 3 million out of approximately 70 million people pay taxes. MSMEs may be reluctant to register and make claims on the Pao Tang app, as they would no longer be able to operate in the shadow economy.

In addition to these solutions, the adoption of online tools and applications that translate between Thai and local and international languages could enable MSMEs to better communicate with tourists and lead to increased customer satisfaction.

The viability of these digital solutions depends on the location and scale of the business. While micro-businesses such as homestays or one- and two-room lodges benefit from an online presence and digital marketing solutions, technologies tailored to manage business operations may be better utilised by more heavily frequented and larger operations that lie on the urban fringes of popular tourist cities such as Bangkok, Phuket and Pattaya.

⁷⁰ Bank of Thailand. (2021). Op. Cit.

⁷¹ Public Relations Department. (2021). "Subsidy campaigns resume for hotel bookings, domestic trips".

⁷² See: [Occasional Paper: Consumer payments diary survey project](#).

⁷³ Dharmaraj, S. (14 April 2022). "Da Nang, Vietnam Wet Markets Go Cashless". OpenGovAsia.



4.4 Current level of digitalisation of rural tourism MSMEs

One of the challenges of accurately assessing the digitalisation of rural MSMEs and CBT is a lack of statistics, particularly disaggregated by urban and rural. While disaggregated statistics on the use of digital tools by rural tourism accommodation businesses are not available, the Establishment Survey on the Use of Information

and Communication Technology (2021), conducted by the National Statistical Office, provides some insights into the use of basic digital tools by tourism-related businesses (Table 7). Although almost half of accommodation, food and beverage service businesses report using the internet, web presence and e-commerce are quite low.

Table 7
Share of tourism-related businesses using ICT

	Number of establishments	Use of computer	Use of the internet	With a web presence	Purchase via the internet	Sales via the internet
Accommodation, food and beverage service activities	353,919	35%	49.4%	13.3%	14.3%	21.3%

Source: 2021 Establishment Survey on the Use of Information and Communication Technology, National Statistical Office, Ministry of Digital Economy and Society.

By comparison, a survey of accommodation businesses in primary and secondary tourist cities conducted by the Ministry of Tourism and Sports in 2018 suggests that most urban accommodation

businesses use digital tools for business management, customer services and marketing (Table 8).

Table 8

Digital technology usage by urban accommodation businesses in primary and secondary cities

	Technology usage	Primary tourist cities (%)	Secondary tourist cities (%)
Business management	Business communications	95.9	81.1
	Accounting and finance	95.1	80.6
	Purchasing	93.9	65.8
Customer services	Email	96.7	78.2
	Facebook	93.5	86.1
	Line Messaging	60.4	50.2
	Reservations (OTA)	95	77.7
	Reservations (own website)	93	70.4
Use of customer database	For service improvement	95.7	70.1

Source: Ministry of Tourism and Sports (2018). The Secretariat of The House of Representatives.

The difference in the survey findings suggests that most rural SMEs are not using digital tools. Data published by [DataReportal](#) on internet access and use in Thailand suggests that 54.5 million people out of a population of more than 70 million are internet users, and internet penetration in Thailand is just over 75 per cent.⁷⁴ The use of popular social media sites is also high. Statistics by Meta and Google advertising resources indicate that Facebook had 50.05 million users in Thailand in early 2022

(although this statistic needs to be interpreted with caution as some users may be double-counted) and YouTube had more than 48 million Thai users in early 2022.⁷⁵ In addition, the roll-out of the government's digital payments system, PromptPay, has seen unprecedented success and has more than 62 million registered users.

However, stakeholder consultations indicate that the following act as barriers to digitalisation:

Barriers to the adoption of basic digital solutions

Reported barriers to the adoption of digital tools include:

- Lack of access to digital infrastructure or its cost;
- Lack of digital literacy and skills;
- Concerns about being defrauded online;
- The perception that technology incurs a high capital cost; and
- An unclear value proposition. For rural MSMEs, there is a lack of awareness or demonstrable evidence from peers that digital solutions increase profits, provide convenience and are worth the resources and investment.⁷⁶

⁷⁴ DataReportal. (2022). [Digital 2022: Thailand](#).

⁷⁵ Ibid.

⁷⁶ Sources: Interviews with rural MSMEs, technology providers and government officials in Thailand. Various literature sources: Ministry of Science & Technology, Ministry of Digital Economy & Society and Huawei. (2017). *Insights on Digitalisation of Thailand Industry White Paper*. Digital Roadmap for Aging Society, Agriculture and Tourism; OSMEP. (2018). *Digital Technology for Tourism Service and Related Businesses*; Krungsri Research. (2021). *Business & Industry Trends 2021–2023: Hotel Business*; Euromonitor. (2021). "Travel in Thailand"; Bangkok Biz News. (10 September 2021). "Restaurateurs Operating Businesses on 'Fear'".

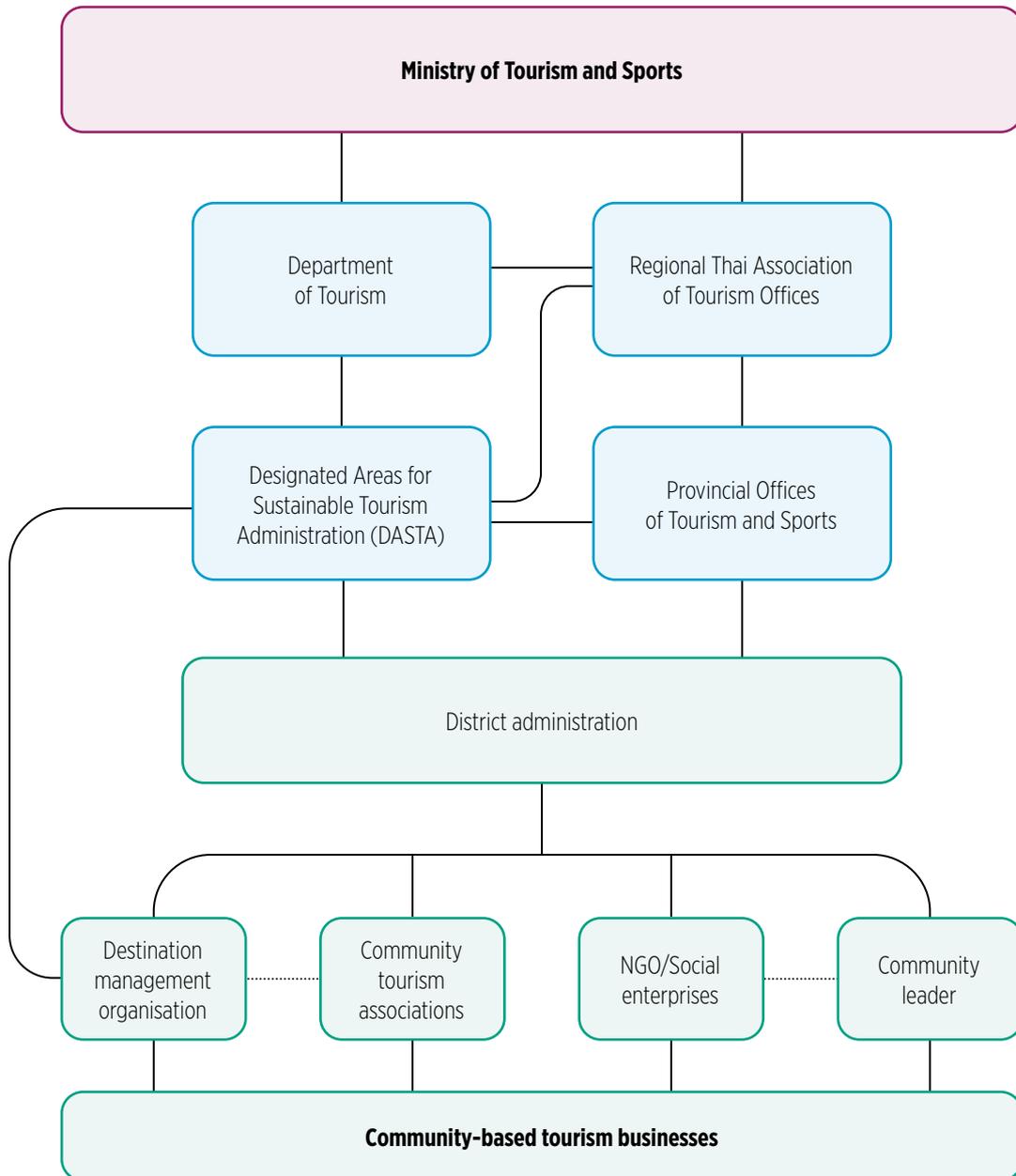
Targeting digital tools to different types of tourism businesses and contexts

Community-based tourism

The digitalisation of rural tourism accommodation SMEs requires a strategy tailored to the context

and size of these businesses and the tourism management model.

Figure 9
Community-based tourism management in Thailand



While intermediate digital tools that improve business operations may be less beneficial for an individual microenterprise due to its small scale, they are likely to benefit communities practicing CBT as a collective.

For CBT to be successful, the entire community must participate and collaborate to make the destination appealing to tourists, offer quality cultural products and experiences and invest in the community. Digital tools facilitating CBT are nascent and there is significant room for innovation. For example, piloting

a digital CBT project that connects a community via an application to offer tourism services collectively could yield interesting innovations and results.

Given that tourism is one of the country's key economic sectors, a structured curriculum on promoting tourism online and simple ICT tools for tourism management could be delivered in rural communities as standard practice and made available through online channels accessible for free. Such an initiative could be transformative in making rural community-based tourism more competitive.

SMEs on urban fringes

For larger businesses such as hotels and resorts, the use of intermediate tools needs to be actively promoted. Online computerised reservation systems and travel agents are the most popular tool to increase market engagement and bookings. The commission they charge on each booking and fierce competition can drive profits down, although these charges could be viewed as an alternative to marketing costs incurred through other channels. An interview with the company GoWabi, an online booking platform, suggests that rural SMEs are reluctant to register because of the commission fees. Research from other contexts, such as India, suggests that homestays that have registered on online platforms have seen a notable increase in bookings and profits.⁷⁷

As a starting point, the Ministry of Tourism should commission research to understand the impact of CRMs and OTAs on the profits and sustainability of rural accommodation businesses and strengthen the business case for adoption.

According to data from [Traxn](#), Thailand has 132 start-ups that are MSMEs themselves, offering solutions to businesses working in the tourism sector. While these include food delivery and e-commerce platforms, several are online travel agents and booking platforms, PMS and channel managers. Understanding their impact on rural tourism MSMEs and the challenges of reaching rural businesses is a first step in collaborating with, and offering support and incentives to, impactful start-ups to accelerate the role of the private sector in digitalising last-mile businesses in the tourism industry.

Box 3 Winding Tree: blockchain-enabled OTA

Major travel service aggregators such as Expedia and Priceline dominate airfare bookings, charging a commission on each booking. Blockchain-based start-up Winding Tree is a private company founded in 2017 in Switzerland and uses blockchain technology to enable a fairer and more competitive travel distribution market.⁷⁸ The company seeks to connect travellers directly with service providers like airlines, hotels and tour guides with their LIF token. The aim is to minimise fees for travellers while reducing costs for service providers. LIF is Winding Tree's platform cryptocurrency.

The company's clever use of smart contracts and the ERC827 protocol delivers better savings for every stakeholder in the travel and tourism industry. Winding Tree's non-profit status ensures there are no intermediaries adding unnecessary fees to the booking process.

⁷⁷ Mukhopadhyay, D. and Babu, S. "The Digital Platforms and Homestay Business: A Study in Indian Context". Ascension Centre for Research & Analytics.

⁷⁸ Winding Tree website.



4.5 The role of frontier technology in digitalising the tourism sector

Because rural tourism businesses in Thailand are primarily micro and small businesses, they do not have the scale to adopt advanced digital solutions. However, since tourism is a key driver of growth in Thailand, the digitalisation of the sector would

increase competitiveness, attract a larger global market and improve the tourist experience, all of which can indirectly improve rural tourism businesses.

Table 9

The role of advanced digital technologies in the tourism industry

Technology	Application
AI and mobile technology, including chatbots for the hospitality industry	<ul style="list-style-type: none"> → AI chatbots allow customers to ask questions or find information easily via the platform. → AI technologies overlaid with the internet and mobile technologies could significantly improve the efficiency of the search experience for travel accommodation. There has already been widespread adoption of AI technologies to power “chatbots” on social media platforms, as well as instant messaging apps. This can help companies to meet consumer demand for faster response times and enable 24/7 access.
Big data analytics for predictive analytics and greater insights on customer segments	<ul style="list-style-type: none"> → A data analytics platform for the hospitality industry. → Big data provides a range of benefits in the tourism industry, including being able to use predictive analytics on occupancy and greater insights on customer segments.
Facial recognition and biometric data for personalisation of services, security, data analysis and payments	<ul style="list-style-type: none"> → Facial recognition technology is a form of biometric AI, which can identify an individual or verify their identity based on facial features. This technology can be used to personalise services, improve security, support data analysis and offer payments without a human contact point, which reduces the risk of the spread of bacteria.
Blockchain technology for accessing and storing important information easily and reliably	<ul style="list-style-type: none"> → Blockchain technology refers to a list of public records, also known as a public ledger, where transactions between parties are listed or stored. Blockchain can make accessing and storing important information easier and more reliable (e.g. payment information, passport details, baggage information) because the responsibility for storing it is shared across the whole network.
Augmented reality (AR) to create a new experience for customers and enhance marketing	<ul style="list-style-type: none"> → AR technology is the use of technology to create virtual media that combines reality and the virtual world to present exciting new tourist attractions, fun through animation, 3D images or others, including simulating a virtual tour guide to attract more tourists, creating a new experience for customers and helping a business with marketing to increase sales.

Source: [Policy Links](#).



Larger tourism businesses are already employing some of these technologies in their businesses, such as AI-enabled chatbots for customer service and advanced data analytics to better understand their business.

Thailand's Ministry of Tourism has also been partnering with private companies such as online travel agencies and booking systems including Expedia and Airbnb, which generate a vast amount of data that the government is using to better understand consumer preferences and trends.

However, government-driven initiatives to collect big data on tourism effectively and invest in technology that can transform the sector need more investment and capacity. The Thai government announced their intention to build a tourism open data platform in 2018, with the aim to offer an open API so that developers can integrate information on tourism activities, routes and merchants from TAT

in their apps and websites. Executing this ambition would make Thailand's tourism industry extremely competitive, but not much progress has been reported on the initiative.

The Thai government has also launched the "Tourism Smart Data, The Time Is Now" initiative as part of *Thailand 4.0* to drive data-driven policymaking and enhance tourists' experiences. Phuket Smart City 2020 is the first pilot Smart City under *Thailand 4.0* and is a collaboration of DEPA, the Ministry of ICT, public entities, various private businesses and universities. As part of this initiative, the city offers more than 1,000 free Wi-Fi hotspots to tourists, has developed a CCTV vehicle licence plate recognition system and installed smart sensors for ocean surveillance and monitoring of weather and safety conditions for beach visitors.⁷⁹

⁷⁹ ADB. (2021). [Big Data for better tourism policy, management and sustainability](#).



While these pilots and the open data platform drive are promising, a more coordinated and consistent effort is needed, as is investment in frontier technology and big data to integrate data responsibly from a variety of public sources to understand tourist preferences and behaviour and to tailor services accordingly. In addition, public-private data-sharing partnerships with OTAs and mobile network operators (MNOs) can further strengthen understanding of tourists' needs.

These technologies can also be used to enhance tourists' experiences, encouraging them to return. Consistent internet service in rural areas, geotagged

locations, online route mapping, mobility as a service (MaaS), smart sensors and devices in popular locations to understand and improve visitor experience can all help make Thailand an even more attractive tourist destination. With the roll-out of 5G, VR experiences capturing rural Thailand can be offered to tourists in real time, encouraging those visiting popular primary cities to visit less-frequented areas. This is particularly important as planning in-destination trips is a growing trend. Offering VR experiences of rural communities at highly frequented city destinations could be a way to help balance tourism.

Box 4 Mobile operator Telefonica is leading the way in smart tourism

Telefonica is facilitating smart tourism to drive the economic recovery of the sector, using technologies such as IoT, big data, AI, blockchain and virtual reality. For example, with the roll-out of 5G, Telefonica provides a simultaneous translation solution for more than 80 languages that is instant enough to allow users to maintain a conversation in different languages in real time. In partnership with the Santander City Council, Telefonica is enabling smart city developments using its own platform, integrating a range of data to improve planning and enhance the tourist experience.⁸⁰

Box 5 Expanding tourism from primary cities to rural areas: The Discover England Fund

To encourage tourism outside major cities, in 2015 the UK Government announced the £45 million Discover England Fund. The plan was to identify touring routes and work with a range of public and private partners to improve, showcase and market tourism experiences throughout the route.

Recognising the need to stay competitive, the Fund invested in the sector's digital expertise so that more businesses were online and visible, and trips could be booked easily online. Over five years, the Fund supported more than 51 projects and worked with online travel agencies and companies to promote England and its products. Seventy-six DMOs have participated in the programme and projects extend to every part of the country. Investment has been key in enabling partners to work together.

Although the COVID-19 pandemic has slowed impact, the initiative's pre-pandemic international marketing of Discover England Fund products generated a 22:1 return on investment.

Source: [Discover England Fund website](#)

⁸⁰ See the Telefonica [Smart Tourism Transformation Handbook](#) 2022.

05

Policy priorities and recommendations from local and international experience



5.1 Addressing the challenges and opportunities of digitalisation for smallholder farmers in Thailand

Policy responses in the short, medium and long term are needed to overcome the barriers that prevent rural MSMEs and communities in the agriculture sector from harnessing the benefits of mobile and frontier technologies. We have identified the following levels of support that can be prioritised to fast-track technology adoption:

Table 10

Policy actions required to fast-track digitalisation for smallholder farmers

MSME-level support

- Digital training and education to build the capacity of farmers and help them become more open and willing to try new digital innovations.
- Use digital remote participatory advisory services with built-in feedback loops between content providers and end-users.
- Leverage community networks and farmer institutions that can share the costs and make digital technologies more affordable for their members.

Agri-tech provider support

- Expand support beyond just funding the supply of innovative digital technologies. Additional support can include physical demonstrations and exhibitions of existing technologies to raise awareness, highlight trends and showcase the benefits of these solutions and how to implement same.
- Research and development partnerships are needed to support start-ups in developing relevant solutions for farmers.

Ecosystem level intervention

- Restructure the agricultural extension system to incorporate public-private partnerships (PPPs) that expand the reach and impact of this support.
- Invest in a National Agricultural Data Aggregation Platform that everyone involved in agriculture can access, share and use real-time agricultural data.

Valuable lessons can be drawn from local and international experiences to address these thematic priorities. Relevant case studies are provided below.

Box 6 Case study: Restructuring agricultural extension services for greater impact

Thematic objective

To extend the geographical reach of Thailand's agricultural extension service using digital tools, deployed via PPPs.

Change mechanism

Collaborate with the private sector to develop and implement a mobile app-enabled remote participatory advisory service featuring feedback loops between content providers and end users. This could increase the number of smallholder farmers receiving advice, as well as offer greater interactivity with the service and possibly a role for farmers to create or customise advisory content.

CASE STUDY

Kaset Go app: Developed by Total Access Communication Public Company Limited (DTAC) a major mobile operator in Thailand, in partnership with Yara Thailand. The Kaset Go app is an online community for farmers to exchange advice on a range of topics. It has a question and answer (Q&A) community where peer farmers and experts from across the country provide support by responding to queries from farmers.

Once a Q&A thread is verified by the experts, the app sorts all the responses in a large database and filed in a knowledge directory that farmers can access and filter responses by topic. It also has a section that uses infographics, videos and other formats to show trends and insights on agricultural data in an easy-to-understand way.

The app became available for mobile download in August 2020 and to date has almost 200,000 users. The developers are currently working on additional features, such as information on 44 additional crop types, weather warning data, pest and disease alerts and market price benchmarking. A longer-term plan is to include ancillary services, such as farm equipment rentals, agri-insurance and digital financial services.

Source: [DTAC](#)

CASE STUDY

Arifu: A Kenyan digital content and interactive learning platform that is personalised and free for learners. Arifu's chatbot allows both smartphone and feature phone users to learn via SMS, WhatsApp and Facebook Messenger.

For agribusinesses, the solution has digitised traditional in-person training and dissemination of product information, reducing the cost of delivery from \$20 to \$1 per farmer. Arifu has been used to engage more than 250,000 farmers over interactive SMS to improve agricultural practices. In the first pilot scheme, the solution helped farmers improve behaviours related to good agricultural practice, boosted farmers' average yield by 55 per cent and increased income per acre by \$187.

Source: [Arifu Insights](#)



Box 7 Case study: Community-based exhibitions and digital pilot farms

Thematic objective

Increase awareness to demonstrate the business value of emerging low-cost agritech solutions in Thailand.

Change mechanism

Collaborative demonstration of available private-sector digital agriculture solutions for farmers through a broad network of community-based digital road shows and pilot farms.

CASE STUDY

Thailand's smart farming technology exhibition project

MOAC, in collaboration with DEPA and the National Innovation Agency (NIA), developed a smart farming technology exhibition project involving 150 maize farmers in Nakhonsawan Province in 2019, and a similar scheme in Sukhothai Province with 65 farmers. The purpose was to use these pilot farms to exhibit several advanced digital technologies and support research. Some practical demonstrations included using drones to spray crop pests or unmanned aerial vehicles (UAV) to spray liquid supplements on crops. While it took only three minutes for the drone to spray the pilot farm, it would have taken farm labourers one hour to spray one rai. While the success of these demonstrations is unknown, there is scope for scaling them nationally so that farmers who are unaware of these technologies can see the benefits first-hand.

It is important to note that implementing these digital agriculture solutions would require more than conducting demonstrations or pilots. To deploy the solutions at scale and sustainably, farmers would need to be shown how to use and operate them.

Source: [FAQ](#)

Box 8 Case study: An integrated agricultural data-sharing platform

Thematic objective

Facilitate data-driven collaboration and innovation in agricultural development.

Change mechanism

A National Agricultural Data Aggregation Platform for everyone involved in agriculture to share and use agricultural data.

CASE STUDY

Japan's Agricultural Data Collaboration Platform (WAGRI): Developed by a consortium of industry, government and academia, WAGRI is a data platform that collects and organises agriculture-related data previously scattered across various databases and websites. The platform makes it possible to coordinate, share and provide organised data for everyone in the agriculture sector to gain access to all important available data, and to encourage private-sector innovation by providing an API that can be used by any company.

There are already several agricultural data sources available in Thailand that could be used to create a broader, integrated data platform. Examples include What2Grow, Agrimap Online and TraceThai, among others.

Source: [WAGRI website](#)

A multistakeholder collaboration is required to drive the digital transformation of rural farm operations. Table 10 provides a roadmap to improve the chances

of smallholder farmers using agritech solutions to build more sustainable and profitable businesses.

Table 11
Stakeholder mapping for fast-tracking digital adoption for smallholder farmers

Action	Lead partner	Supporting stakeholders	Expected outcome
 Digital training and education to help farmers become more open and willing to try new digital innovations.	MOAC	<ul style="list-style-type: none"> • PPP under the agricultural extension scheme. 	Improved digital competence to use innovative tools to transform farming activities.
 Restructure the agricultural extension system to incorporate PPPs for greater reach and impact.		<ul style="list-style-type: none"> • Department of Agricultural Extension • Agritech companies, especially those with digital advisory expertise. 	Farmers have adequate support from agents.
 Encourage digital uptake via community networks that can share technology costs and make it more affordable for farmer members.		<ul style="list-style-type: none"> • Community Enterprise Promotion Division (MOAC) • Community Organizations Development Institute • Local agricultural cooperatives and community enterprises • Agritech companies 	Digital solutions become more affordable when costs are shared.
 Extend support to providers of digital agriculture solutions, to showcase physical demonstrations and exhibitions of existing technologies, to highlight benefits and how to implement solutions.		<ul style="list-style-type: none"> • DEPA • NIA • Bank for Agriculture and Agricultural Cooperatives (BAAC) • Agritech start-ups • Start-up Thailand (association) 	Improved attitudes of local farmers towards adopting innovative digital solutions.
 Infrastructure investments in a National Agricultural Data Aggregation Platform that everyone involved in agriculture can access, share and use real-time agricultural data.		<ul style="list-style-type: none"> • Office of Agricultural Economics • National Agricultural Big Data Center (NABC) • Digital Government Development Agency (DGA) • Data Protection Commission • Open Government Data of Thailand • BAAC • Large private sector agriculture aggregators • Cooperatives 	Available information for planning, decision-making, networking, etc.



5.2 Addressing the challenges and opportunities of digitalisation for rural tourism MSMEs in Thailand

Our research yielded several recommendations for the government to support the digitalisation and productivity of rural accommodation businesses at the MSME, technology solution provider and ecosystem level that can enable them to build sustainability as tourism recovers to pre-pandemic levels.

Table 12

Policy actions required to fast-track the adoption of digital technology in rural tourism

MSME-level support	Technology solutions provider support	Ecosystem level intervention
<p>Provide digital training in basic social media marketing tools to enable wider, cost-effective access to tourism markets.</p>	<p>Assess the impact of, endorse and invest in technology providers that are having a demonstrable impact.</p>	<p>Invest in enhancing the breadth and capability of the tourism open data platform to better understand tourist behaviour and preferences and deliver services accordingly.</p>
<p>Assess and demonstrate the value of listing with online travel agents (OTAs) and using computerised reservation systems (CRS) and channel managers for better service delivery and market access.</p>	<p>Due to the challenge of acquiring individual customers, technology providers build business-to-business models instead, building solutions for corporates. Incentivise investment in business to consumer solutions tailored to micro-enterprises.</p>	<p>Invest in public-private partnerships to understand tourist preferences, trends and movement via Big Data, to promote local tourism strategically.</p>
<p>Provide entrepreneurship training in the use of digital tools for business operations to help reduce labour costs and make businesses more efficient, especially in the use of property management systems (PMS).</p>	<p>Encourage universities and tourism tech. startups to collaborate to stimulate innovation and build more tailored solutions for rural end users.</p>	<p>Showcase community-based tourism regions and products systematically on official websites and offer further information on travel routes, geotagged locations, ticketing services and an e-wallet to make travelling across Thailand easier.</p> <p>Create a map of key tourism regions and market these systematically via TAT, and explore marketing opportunities offered by VR technology.</p>
<p>Designate Destination Management Organisations (DMOs) and community leaders to organise and train the community, to generate content for online media and build an online presence for the community as a whole.</p>		<p>Make information on public transport and routes more accessible to tourists as well as on fair pricing by private transport providers.</p>
<p>Encourage further adoption of e-payments on digital wallets, activity on which can then be utilised to build credit risk scores and offer credit to accommodation businesses during the low season.</p>		<p>Improve network infrastructure to connect rural communities easily and affordably.</p>

A number of case studies from the international context provide valuable lessons for the adoption of digital tools for the tourism sector and tourism MSMEs.

Box 9 Case study: The Australian Tourism Data Warehouse (ATDW)

Thematic objective

Provide micro, small and medium enterprises with government support to increase their reach and digital marketing.

Change mechanism

A national data warehouse where tourism suppliers can apply to be listed and digitally marketed.

CASE STUDY

The Australian Tourism Data Warehouse (ATDW)

The Australian tourism data warehouse is a national marketplace for tourism suppliers. Tourism MSMEs apply to be listed, are vetted by the state tourism organisations and then listed on the national data warehouse. Licensed tourism operators can then pull the listings they would like on their own websites, multiplying the listed operator's online presence. The initiative is jointly managed by Tourism Australia and the state tourism organisations.

Source: Australian Data Tourism Warehouse [website](#)

Box 10 Case Study: SDK Smart Tourism API

Thematic objective

To provide innovative technology companies with tourism data from a range of sources that can be utilised to build targeted tourism products, making the sector globally competitive.

Change mechanism

A service development kit for cities and developers that aims at harmonising application programming interfaces (APIs) across cities.

CASE STUDY

CitySDK is a service development kit for cities and developers that aims to harmonise application programming interfaces (APIs) across cities. As each city provides its data in a different format, applications are not easily portable across cities. The CitySDK Tourism API addresses this problem, with targeted solutions for the tourism sector. The database provides start-ups with access to tourism information on participating cities through a single, interoperable API. Developers can use the data to develop targeted products and services for tourists.

Source: SDK [website](#)



Finally, to enable the adoption of digital tools by rural tourism MSMEs as well as support the overall digitalisation of the sector, a range of stakeholders need to work collaboratively (Table 13).

Table 13

Stakeholder mapping for fast-tracking digital adoption in tourism

Action	Lead partner	Supporting stakeholders	Expected outcome
 Provide, entrepreneurship training, training in digital tools for business operations such as property management systems, and social media marketing training.	<ul style="list-style-type: none"> • Department of Tourism • Digital Economy Promotion Agency • Office of SMEs Promotion 	<ul style="list-style-type: none"> • Provincial tourism and sports offices • Tourism business associations • Non-government organisations • Start-ups & social enterprises supporting rural tourism • Thai Tourism Council • Designated Areas for Sustainable Tourism Administration • National Economic and Social Development Council • Education Institutes 	<p>Increased online content creation, enabling wider, cost-effective access to the tourism market.</p> <p>Creating content as a community will encourage CBT, leading to more self-sufficient village economies.</p> <p>More efficient and cost-effective business operations.</p>
 Assess and demonstrate the value of listing with online travel agents (OTAs), using computerised reservation systems (CRS) and channel managers.	<ul style="list-style-type: none"> • Ministry of Tourism 	<ul style="list-style-type: none"> • Thai Association of Tourism • Provincial tourism and sports offices • Tourism Technology start-ups. 	<p>Expanded market access and improved customer booking experience lead to more revenue and higher customer satisfaction.</p>
 Promote increasing adoption of e-payments by rural MSMEs and expand digital payments options so that international tourists without Thai Bank accounts can pay via digital channels with ease.	<ul style="list-style-type: none"> • Bank of Thailand • Krung Thai Bank 	<ul style="list-style-type: none"> • Data Protection Commission • Other State Banks 	<p>Businesses and customers, especially international tourists visiting rural areas, can transact conveniently and safely.</p> <p>The government has a better understanding of the financing needs of businesses, reliable risk assessments, and can provide more targeted support.</p>

	<p>Assess the impact of, endorse and invest in technology providers that are having a demonstrable impact.</p> <p>Build awareness of technology solutions for accommodation businesses that are delivering results.</p> <p>Incentivise investment in business to consumer solutions tailored to rural micro-enterprises.</p>	<ul style="list-style-type: none"> • Ministry of Tourism • Thai Tourism Council • Thai Association of Tourism • Designated Areas for Sustainable Tourism Admin 	<ul style="list-style-type: none"> • Provincial tourism and sports offices • Tourism technology start-ups • Thai Responsible Tourism Association • Tourism social enterprises (e.g., SATARANA/HiveSisters) 	<p>Better managed, more efficient rural MSMEs operating at lower cost and generating higher revenue.</p> <p>More digital solutions are available cost-effectively to rural businesses.</p>
	<p>Invest in enhancing the breadth and capability of the tourism open data platform to better understand tourists and deliver services accordingly.</p> <p>Invest in public-private partnerships to understand tourist preferences and trends.</p>	<ul style="list-style-type: none"> • Ministry of Tourism 	<ul style="list-style-type: none"> • Public sector institutions holding relevant data • Data analytics companies • Technology providers such as computerised reservation platforms and channel managers 	<p>A sophisticated tourism sector that provides optimised and tailored experiences to both domestic and international tourists.</p> <p>Evidence-based policy making in the tourism sector.</p> <p>The development of innovative private sector solutions such as applications that enhance tourism sector services.</p>
	<p>Showcase community-based tourism regions and products systematically on official websites and offer further information on travel routes, geotagged locations, ticketing services and an e-wallet to make travelling across Thailand easier.</p> <p>Explore marketing opportunities offered by VR technology.</p>	<ul style="list-style-type: none"> • Thai Association of Tourism 	<ul style="list-style-type: none"> • Provincial tourism and sports offices • Destination Management organisations 	<p>Tourists are compelled and find it convenient to visit rural communities.</p>
	<p>Incentivise rural connectivity infrastructure and enact enabling policies to make access more affordable.</p>	<ul style="list-style-type: none"> • Ministry of Digital Economy and Society 	<ul style="list-style-type: none"> • Telecoms operators 	<p>Wider availability and affordability of digital solutions, leading to increased adoption and use.</p>



Appendix 1:

Stakeholders consulted

Sector	Organisation	Focus
Agriculture	Siam Kubota Corporation	Tech firm
	Ricult	Tech firm
	Easy Rice	Tech firm
	Dee Mee Suk	Tech firm
	Gaorai	Tech firm
	TraceThai	Tech service
	Biomatlink	Tech firm
	FarmThailand	Tech firm
	Algaeba	Tech firm
	Taratera	Tech firm
	Rice farmer	End user
	Durian farmer	End user
	Sugar cane farmer	End user
	Varuna (PTTEP)	Private-sector support for agritech
Sector	Organisation	Focus
Tourism	Expedia	Tech firm
	Robinhood	Tech firm
	Eatlab	Tech firm
	Readme	Tech firm
	Wongnai	Tech firm
	GoWabi	Tech firm
	SCB/ Robinhood	Tech firm
	Krungthai Bank 'Pao Tang' app	Government digital wallet to connect MSMEs with consumers nationwide
	Thailand Travel Tech Start-up Association	Technology users' representative
	Malizon Residence	End user
	Green Hotel and Resort, Khon Kaen	End user
	Krua Thai	End user
	e-tourism frontiers	Global program digitalising tourism businesses in emerging markets
	Telefonica	Mobile operator

Sector	Organisation	Focus
Government	Community Enterprise Promotion Division	Government
	Office for SME Promotion (OSMEP)	Government
	Digital Government Development Agency (DGA)	Government
	Techsauce	Government
	National Innovation Agency (NIA)	Government
	Digital Economy Promotion Agency (DEPA)	Government
	Thai Tourism Authority	Government
	Puey Ungphakorn Institute for Economic Research	Government (think tank with the Bank of Thailand)

Total interviews: 37

Appendix 2:

Examples of digital agriculture solutions in Thailand

Stage	Operational challenges	Technology	Local agritech providers	Opportunity
Input			DJI	Drones used for irrigation and applications of fertilisers/pest control
	<ul style="list-style-type: none"> Farmers use off-the-shelf fertilisers that are not customised to soil conditions 	IoT, robotics, mobile apps, etc.	Ricult, RV Connex	Analysis of crop imagery data to monitor crop growth and forecast yield
	<ul style="list-style-type: none"> Limited water and irrigation 		GAP and Organic Zoning, Ling	Applications for agricultural land area analysis
	<ul style="list-style-type: none"> Increasing input costs 		FCS, Puen Kaset, Kamnuan Pui Sang Tad	Fertiliser calculation via mobile phone
		E-commerce platform	TALAD, Getztrac, Yam Ram Premium Club	Input market platform via mobile phone



Stage	Operational challenges	Technology	Local agritech providers	Opportunity
Production	<ul style="list-style-type: none"> • Inefficient use of resources leading to high production costs • Lack of production planning and management system 	Remote sensors for precision agriculture functions	Komomi	Network-connected IoT sensors and irrigation systems to monitor and wirelessly control/automate input provision
			Kubota	Autonomous agricultural machinery that uses GPS and remote control, eliminating the need for direct human control
			Ricult, FarmAI, Chaokaset, Farmbook	Apps for crop planning and/or planting calendar
			FarmPress	IoT sensors for on/off control of agricultural production process devices
			Kod Doo Roo Din, Kod Doo Roo Nam	Water resource analysis via mobile phone
			SPsmartplants	Smart agriculture operating system for greenhouses and indoor farming
Market	Lack of weather forecast knowledge	Data collection through satellite imagery; mobile apps	YaraFarmWeather	Use of historical weather data and latest satellite data to create forecast models and soil quality analysis available to farmers via mobile phone.
	Lack of knowledge of pest control hinders agricultural productivity		SuperFarm	Pest diagnosis via mobile phone image recognition
	Farmers are unable to reach consumers on their own. They also lack expertise to develop value-added products and a marketing strategy.	E-commerce platform	FreshKet, GetzTrac, Kaspy, Happy Grocer, GaoRai	Platform to connect farmers to the input market (input suppliers, agricultural contractors, etc.) and to consumers

Source: Data collected from interviews and DEPA's report on the agriculture landscape in Thailand.



Appendix 3:

Examples of digital solutions for tourism MSMEs in Thailand

Digitalisation level	Technology	General opportunities	Example local suppliers in Thailand
Basic	e-Commerce and online marketplaces	<ul style="list-style-type: none"> Expand customer acquisition and international reach Improve online brand visibility Improve service quality and increase visitor satisfaction 	<ul style="list-style-type: none"> Shopee Lazada GoWabi
	e-Payment	<ul style="list-style-type: none"> Improve service quality and increase visitor satisfaction Expand customer acquisition and international reach 	<ul style="list-style-type: none"> Contactless payment WeChat Pay AliPay
	Computerised reservation system (CRS)	<ul style="list-style-type: none"> Operational cost reduction Expand customer acquisition and international reach Improve online brand visibility 	<ul style="list-style-type: none"> Booking.com Agoda Klook Local-A-Like Take Me Tour GoWabi
	Online travel agencies (OTA)	<ul style="list-style-type: none"> Expand customer acquisition and international reach Improve online brand visibility 	<ul style="list-style-type: none"> Expedia
	Social media and websites	<ul style="list-style-type: none"> Expand customer acquisition and international reach Improve online brand visibility 	<ul style="list-style-type: none"> ReadMe Facebook Messaging apps (e.g. LINE) Google Maps Own websites



Digitalisation level	Technology	General opportunities	Example local suppliers in Thailand
Intermediate	Enterprise Resource Planning (ERP) software	<ul style="list-style-type: none"> Operational cost reduction 	<ul style="list-style-type: none"> Zort Humanica Trizeri Rhbus KINOF innovative Sundae Solutions GrowERP
	Customer Relationship Management (CRM) software	<ul style="list-style-type: none"> Operational cost reduction Improve service quality and increase visitor satisfaction 	<ul style="list-style-type: none"> Buzzebees Readyplanet Gofive
	Property management system (PMO)	<ul style="list-style-type: none"> Operational cost reduction Improve service quality and increase visitor satisfaction 	<ul style="list-style-type: none"> HMS Thailand Ace Marketing Solutions
	Channel manager software	<ul style="list-style-type: none"> Operational cost reduction Expand customer acquisition and international reach 	<ul style="list-style-type: none"> HMS Thailand Ace Marketing Solutions
Advanced	AI and mobile technology, including chatbots for hospitality industry.	<ul style="list-style-type: none"> Operational cost reduction Improve community-based tourism attractions 	<ul style="list-style-type: none"> OneDee AI Eatlab
	Facial recognition and biometric data for personalisation of services, security, data analysis, and payments.	<ul style="list-style-type: none"> Improve service quality and increase visitor satisfaction 	—
	Blockchain technology for accessing and storing important information in an easy reliable way.	<ul style="list-style-type: none"> Improve service quality and increase visitor satisfaction 	—
	Augmented reality (AR) to create a new experiences for customers and help marketing	<ul style="list-style-type: none"> Improve community-based tourism attractions Improve online brand visibility 	—

Glossary of terms

Concept	Definition
Micro, small and medium-sized enterprises (MSMEs)	<p>MSMEs in Thailand are defined according to the following characteristics:</p> <p>1) Microenterprises Manufacturing, trade and service sectors: annual revenue of not more than THB 1.8 million and not more than five employees.</p> <p>2) Small enterprises Manufacturing Annual revenue: more than THB 1.8 million, but not more than THB 100 million. Employment: more than 5 employees, but not more than 50 employees. Trade and service sectors Annual revenue: more than THB 1.8 million, but not more than THB 50 million. Employment: more than 5 employees, but not more than 30 employees.</p> <p>3) Medium enterprises Manufacturing Annual revenue: more than THB 100 million, but not more than THB 500 million. Employment: more than 50 employees, but not more than 200 employees. Trade and service sectors Annual revenue: more than THB 50 million, but not more than THB 300 million. Employment: more than 30 employees, but not more than 100 employees.</p>
Start-up	<ul style="list-style-type: none"> A startup, or start-up, is a company or project undertaken by an entrepreneur to seek, develop and validate a scalable business model.
Digital technology	<ul style="list-style-type: none"> Digital technologies are electronic tools, systems, devices and resources that generate, store or process data.
Digital platform	<ul style="list-style-type: none"> A computing platform or digital platform is an environment in which a piece of software is executed. It may be the hardware or the operating system, even a web browser and associated application programming interfaces (APIs), or other underlying software, as long as the program code is executed with it.
Digitalisation	<ul style="list-style-type: none"> Digitalisation is the process of converting information into a digital format. The result is the representation of an object, image, sound, document or signal obtained by generating a series of numbers that describe a discrete set of points or samples.
Digital transformation	<ul style="list-style-type: none"> Digital transformation is the adoption of digital technology by an organisation. Common goals for its implementation are to improve efficiency, value or innovation.
Mobile technology	<ul style="list-style-type: none"> Mobile technology is the technology used for cellular communication. It consists of portable two-way communication devices, computing devices and the networking technology that connects them.



Concept	Definition
Frontier technology	<ul style="list-style-type: none">• Frontier technologies are defined as potentially disruptive technologies that can address large-scale challenges or opportunities. Frontier technology is the next phase in the evolution of modern technology.
Precision agriculture	<ul style="list-style-type: none">• Precision agriculture (PA) is an approach to farm management that uses information technology (IT) to ensure that crops and soil receive exactly what they need for optimum health and productivity.
Smart City	<ul style="list-style-type: none">• A Smart City is a technologically modern urban area that uses different types of electronic methods, voice activation methods and sensors to collect specific data.
Agritech	<ul style="list-style-type: none">• Agricultural technology, or agritech, is the use of technology in agriculture, horticulture and aquaculture, with the aim of improving yield, efficiency and profitability. Agricultural technology can be products, services or applications derived from agriculture that improve various input/output processes.• Digital agriculture is a subset of agritech and refers specifically to the use of digital technologies in the agricultural sector.
Artificial intelligence	<ul style="list-style-type: none">• Artificial intelligence (AI) refers to the use of data to make decisions or perform certain tasks that are normally considered to require human knowledge, intelligence, learning and understanding.• Such tasks include visual perception, speech recognition and decision-making.
Big data	<ul style="list-style-type: none">• The large-scale deployment of cyber-physical systems, together with improvements in industrial networking, have led to the exponential growth of data volume and traffic.• These large data sets, whose size means that it is beyond the capability of typical database software tools to capture, store and analyse them, are commonly known as “big data”.
Blockchain	<ul style="list-style-type: none">• System for recording and sharing encrypted data across multiple data stores.
Internet of Things	<ul style="list-style-type: none">• The Internet of Things (IoT) refers to networks of physical objects (devices, vehicles, buildings, equipment, etc.) connected to the internet.• In the IoT, cyber-physical systems generate and capture data from the physical world and transmit it through the network infrastructure to be analysed and employed by distinct applications.
Machine learning	<ul style="list-style-type: none">• Machine learning is considered an enabler of AI. In its most basic form, machine learning refers to the use of algorithms to analyse data, learn from it and make decisions about specific tasks.• Rather than writing a specific set of software codes to instruct a machine to perform a particular task, machine-learning algorithms allow the machine to learn how to do it by training the system using large amounts of data or big data.
Robotics and automation technologies	<ul style="list-style-type: none">• A combination of mechatronic components, sensors and computer-based control functions. The complexity of a robot differs significantly from other machines in the greater degrees of freedom and the variety and scope of its behavioural forms.

[gsma.com](https://www.gsma.com)



For more information, please visit the
GSMA website at www.gsma.com



GSMA HEAD OFFICE

Floor 2
The Walbrook Building
25 Walbrook
London EC4N 8AF
United Kingdom
Tel: +44 (0)20 7356 0600
Fax: +44 (0)20 7356 0601