ASTI Country Brief | May 2020

THAILAND

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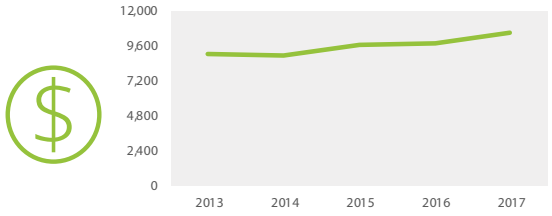
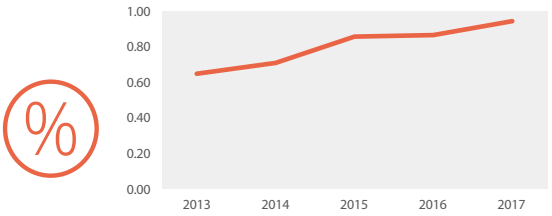
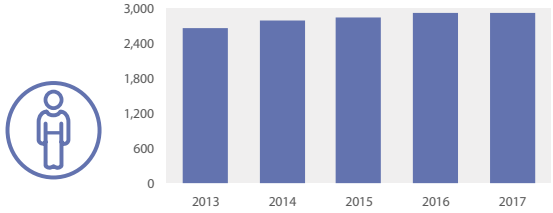
AGRICULTURAL RESEARCH SPENDING



SPENDING INTENSITY



AGRICULTURAL RESEARCHERS

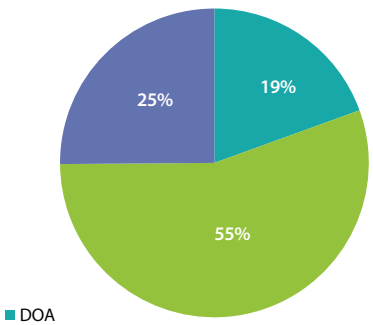


	THAILAND	INDONESIA	MALAYSIA	VIETNAM
Million baht (2011 constant prices)	10,480.2			
Million PPP dollars (2011 constant prices)	847.2	629.7	629.0	177.6
Agricultural research spending as a share of AgGDP	0.94%	0.17%	0.85%	0.20%
Full-time equivalents	2,911.4	4,289.5	1,543.4	4,250.1
Share of researchers with MSc and PhD degrees	50%	71%	72%	67%

Notes: Data in the table above are for 2017. Research conducted by the private for-profit sector is excluded from this country brief due to lack of available data. Information on access to further resources, data procedures and methodologies, and acronyms and definitions is provided on Page 8. See **www.asti.cgiar.org/thailand/directory** for an overview of Thailand's agricultural R&D agencies.

- Agricultural research investment in Thailand rose gradually during 2013–2017, largely driven by increased spending by the country's livestock, forestry, and rice departments.
- In 2017, Thailand invested 0.94 percent of its AgGDP in agricultural research, representing the highest share in Southeast Asia.
- Long-term civil service recruitment have skewed the age distribution of agricultural researchers employed at the government research agencies. As a result, the majority of PhD-qualified researchers at these agencies will reach retirement age within the next decade.

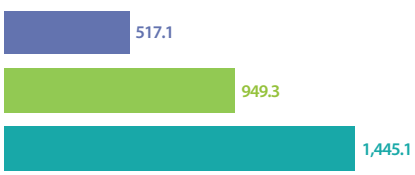
INSTITUTIONAL PROFILE, 2017



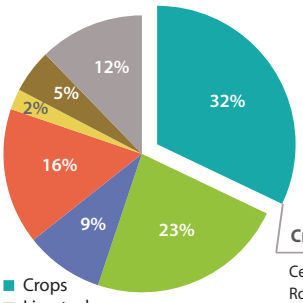
RESEARCHER PROFILE, 2017

By gender (%)

By qualification level (FTEs)



RESEARCH FOCUS, 2017



Crop categories

Cereals	9 %
Roots and tubers	4 %
Pulses	1 %
Oil-bearing crops	6 %
Horticultural crops	5 %
Other crops	6 %

KEY CHALLENGE

- Thailand's capacity to deliver effective agricultural research innovations is hindered by critical human resource challenges. Government research agencies lack sufficient PhD-qualified researchers, and recruitment restrictions since the 1990s have left many agencies with an aging pool of researchers, particularly at the PhD level. Given the official retirement age of 60 years, large-scale capacity loses are imminent in the coming years.

POLICY IMPLICATIONS

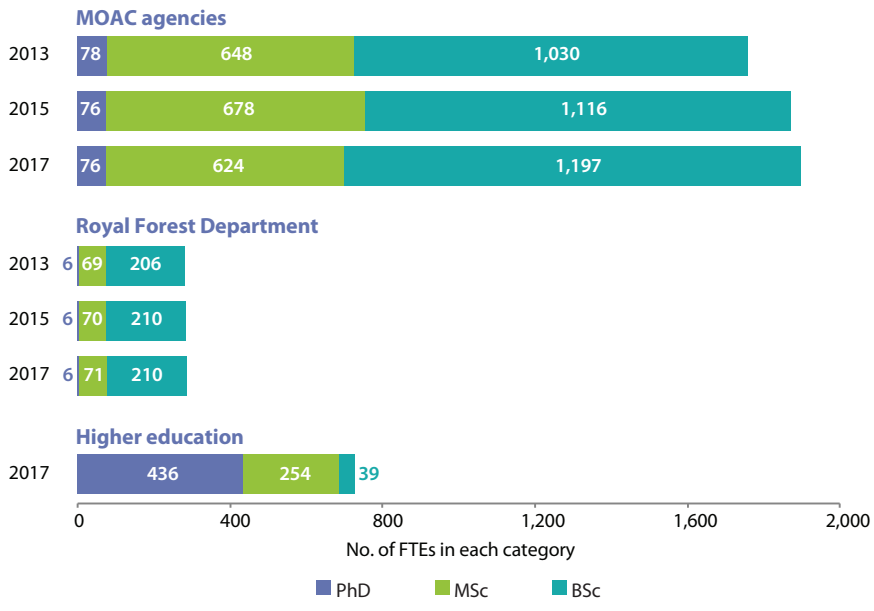
- In order to address the most pressing capacity gaps by 2021, the Thai government has launched a sizeable PhD scholarship scheme for MOAC's researchers through ARDA, its Agricultural Research Development Agency. It is critical, however, that such training opportunities are instituted on a more permanent basis, not just in response to crisis, as when an entire generation of scientist is due to retire. MOAC will need to systematically monitor anticipated skills and specialization gaps, and provide a timely and accurate response as training needs arise. It will also need to establish a solid incentive system to retain young scientists.

Agricultural researchers by degree level, 2017

	PhD	MSc	BSc	TOTAL
SECTOR/AGENCY		**(FTEs)**		
MOAC				
Department of Livestock Development	15.2	133.2	441.2	589.6
Department of Agriculture	44.0	342.4	181.2	567.6
Department of Fisheries	10.5	81.6	291.3	383.4
Rice Department	1.6	21.6	162.4	185.6
Queen Sirikit Department of Sericulture	0.3	16.5	71.4	88.2
Land Development Department	3.0	19.2	36.0	58.2
Office of Agriculture Economics	1.2	9.6	13.2	24.0
Subtotal	75.8	624.1	1,196.7	1,896.6
Other government				
Royal Forest Department	5.6	71.2	209.6	286.4
Higher education				
Kasetsart University (12)	185.9	76.3	13.9	276.1
Rajamangala University of Technology Lanna	30.0	53.1	1.8	84.9
Chiang Mai University	25.8	14.4	22.2	62.4
Khon Kaen University	24.0	3.9	0.0	27.9
Other higher education (29)	170.0	106.3	0.9	277.1
Subtotal	435.7	254.0	38.8	728.4
TOTAL	**517.1**	**949.3**	**1,445.1**	**2,911.4**

Note: Figures in parentheses indicate the number of agencies in each category.

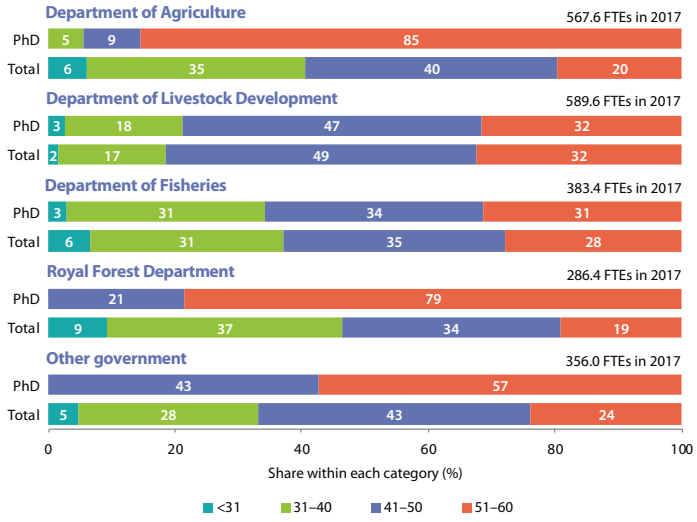
Agricultural researchers by degree level, 2013–2017



- Of the 2,911 FTEs involved in agricultural research in Thailand in 2017, 517 were PhD-qualified, and 949 were MSc-qualified. Researchers at the higher education agencies hold more advanced degrees, on average, than those at the government agencies. In 2017, 80 percent of agricultural researchers with PhD degrees were employed at one of the country's universities. Kasetsart University alone employs more than twice as many FTEs with PhD degrees than all the government agencies combined.

  In 2017, the MOAC agencies employed only 76 FTE agricultural researchers with PhD degrees, which is extremely low compared with countries of a similar size and level of economic development. The country's Rice Department, which focuses on Thailand's most important food crop, only employed 2 FTEs with PhD degrees in 2017. This situation resulted from large-scale staff retirement and institutional restructuring, combined with the aforementioned civil service hiring freeze.

Agricultural researchers by age bracket, 2017



As of 2017, 85 and 79 percent of the PhD-qualified researchers employed at DOA and RFD, respectively, were in their 50s and approaching the mandatory civil-servant retirement age of 60 years. Researchers qualified to the BSc- and MSc-degree levels were considerably younger, as were DLD and DOF researchers. It is important that young MSc-qualified researchers be given the opportunity to upgrade their qualifications if the government departments are to maintain an appropriately trained pool of agricultural scientists into the future.

MOAC'S RESPONSE TO IMMINENT LOSSES OF RESEARCH CAPACITY

ARDA is MOAC's main research coordination and funding body. The agency is also responsible for allocating training scholarships to staff across MOAC's departments. Under the Chalermprakiat scheme, ARDA has awarded 70 full-time PhD scholarships for MOAC researchers at Thai universities for the 2017–2021 period at a total cost of 109 million baht (roughly 1.5 million baht per scientist). The impending arrival of 70 newly trained PhD-qualified scientists will be a welcome and timely addition to MOAC's research capacity, given that, as of 2017, 50 of the 71 researchers with PhD degrees employed at MOAC's research departments were older than 50 (and approaching the mandatory retirement age of 60).

In addition to formal degree-level training, ARDA also provides short-term grants (typically of between three-months to one-year's duration) for research and training overseas, attendance at international conferences, and participation in various training courses. Some argue that the responsibility for funding postgraduate training of agricultural scientists should be shifted from ARDA to the Civil Servant Commission (CSC), a statutory board responsible for advising the government on policies and strategies regarding public-sector human resource management. Regardless, closer coordination and consultation between CSC and ARDA to identify training needs, priority disciplines, and trainee quotas would be beneficial.

MEASURES TO ATTRACT AND RETAIN YOUNG SCIENTISTS

CSC oversees the recruitment of all government employees, including agricultural researchers at the various government departments. The commission approves staff positions; advises the government on remuneration, allowances, and benefits; provides government scholarships for training; and monitors and evaluates the implementation of human resource management (including promotions and salary adjustments) across government ministries and departments.

A nationwide civil service hiring freeze was instituted from the late 1990s until the mid-2010s for the purpose of "right-sizing" the government workforce. Only short-term contract-based staff could be hired during this period. Although the restrictions were lifted in 2015, their impact remains in terms of the skewed age distribution of agricultural research staff, lack of well-qualified scientists, and impending loss of senior researchers to retirement.

Attracting young researchers to replace retirees is a challenge, however. Young graduates are more likely to seek employment in the higher education and private sectors, where salary levels are higher and bureaucracy less prevalent. And even though the government R&D agencies provide significant training opportunities to graduates, many leave once they have completed their training.

CSC recently developed a plan to address this situation by recruiting young graduates at the lowest salary scale but offering opportunities for fast performance-based promotion. This approach is expected to improve staff retention and motivation in the coming years.

KEY CHALLENGE

- Thailand invests a higher share of its AgGDP in agricultural R&D than any other country in the region. Nonetheless, budget shortages still affect the long-term continuity of many of the country's research programs. Moreover, the agricultural sector continues to be challenged by production inefficiencies, declines in productivity, natural resource depletion, and water scarcity, emphasizing the need for higher levels of sustained agricultural R&D investment.

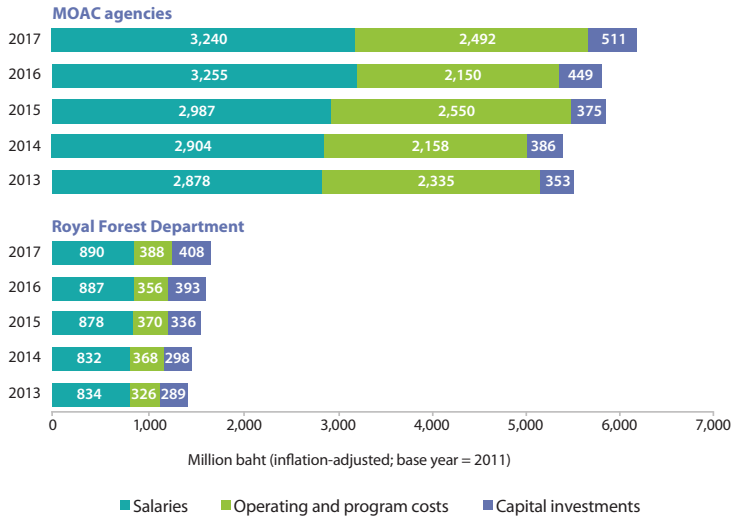
POLICY IMPLICATIONS

- In order to meet these challenges it is essential that investment be sustained at sufficient levels to support the human resource capacity and infrastructure needed to maintain a viable agricultural research system. In recognition of the important role of S&T in facilitating agricultural development, the Thai government has increased its agricultural R&D budget by an ambitious 5 percent per year, as is outlined in Thailand's Agriculture and Cooperatives Strategy (2017–2036).

Expenditures by government research agencies, 2017

RESEARCH AGENCY	Million baht (inflation-adjusted; constant 2011 prices)
MOAC	
Department of Livestock Development	2,781.0
Department of Agriculture	1,428.2
Department of Fisheries	774.7
Rice Department	814.5
Office of Agriculture Economics	172.9
Queen Sirikit Department of Sericulture	152.3
Land Development Department	119.1
Subtotal	6,242.8
Other government	
Royal Forest Department	1,686.4

Total expenditures by cost category, 2013–2017



- Agricultural research expenditures by Thai government agencies rose gradually during 2013–2017. Combined, the country's government agencies spent 7.9 billion baht in 2017 (in 2011 constant prices). The biggest spenders, in order of importance, were the Department of Livestock Development, the Royal Forest Department, and the Department of Agriculture. On average, MOAC's research departments allocated about half their spending to salaries, 40 percent to operating and R&D program costs, and the remainder to the purchase and rehabilitation of research infrastructure and equipment. At the Royal Forest Department, capital investments represented a higher share of spending (22 percent during 2013–2017) than at the MOAC agencies.

AGRICULTURAL RESEARCH FUNDING

- In Thailand, unlike in many of its neighboring countries, donors and development banks play a negligible role in funding agricultural R&D. The bulk of agricultural research funding is provided by the Thai government through a variety of channels.
- MOAC and the Ministry of Natural Resources and Environment submit yearly research proposals to the National Research Council of Thailand (NRCT) for the research departments under their command. NRCT assesses them prior to cabinet approval to ensure alignment with the country's development plans.
- NRCT and the Thailand Research Fund (TRF) also provide competitive research grants for key and emerging issues related to agriculture and value chains, respectively. Once again, for both funding channels, NRCT is charged with assessing and reviewing the proposals before funding is granted.
- ARDA also provides competitive grants for research activities primarily focused on developing outputs or technologies for commercialization.
- Public universities receive research funding through the Ministry of Education and from TRF and NRCT grants. They also generate funding from private and other sources. Kasetsart University receives 40 percent of its funding from the government and generates the remainder by offering services, for example, leasing land to private companies for research and providing satellite imaging.

A MORE PROMINENT ROLE FOR R&D ON THAILAND'S AGRICULTURAL POLICY AGENDA

Thailand's agricultural sector faces a number of important challenges, including shortages of labor and water, inappropriate use of farm inputs, depletion of natural resources, and large-scale indebtedness of smallholder farmers. Past measures taken by the national government to address these challenges were generally short term and ad hoc. To lay the foundation for longer term agricultural growth, MOAC developed a 20-year strategy (2017–2036), the first five years of which are documented in the Agriculture Development Plan (2017–2021).

The five main pillars of the new strategy are (1) strengthening farmers and farmer institutions, (2) increasing productivity and quality standards for agricultural commodities, (3) increasing agricultural competitiveness through technology and innovation, (4) achieving balanced and sustainable management of agricultural resources and the environment, and (5) developing a public administration system. Strengthening of the country's agricultural R&D system is embedded in pillars 2 and 3.

The overall aim is to achieve some ambitious growth targets by 2036, including

- 3 percent yearly growth of AgGDP,
- 2.5–3.5 percent yearly growth in the total value of agricultural exports, and
- 5 percent yearly growth in MOAC's agricultural R&D investment.

Important investments will be made to strengthen researcher capacity; involve farming communities in determining the focus of research undertaken; increase research in the area of biotechnology; promote postharvest research; stimulate private involvement in R&D; and forge research partnerships with other Association of Southeast Asian Nations countries in the areas of rice, rubber, and oil palm (MOAC 2017).

PRIVATE-SECTOR AGRICULTURAL R&D

The private sector plays an important role in agricultural R&D in Thailand, but lack of publicly available data precludes detailed analysis. Private R&D investment is mainly concentrated around fast-growing industries, such as livestock, seed, and food processing. The largest private actors are Charoen Phokphand Foods (CP Group) and Betagro, which are agro-industrial and food conglomerates involved in food processing, the production of livestock feed, and the distribution of meat products. Their livestock-related research mostly focuses on improving feed efficiency for poultry and swine. Both companies also play an important role in research related to food packaging, food safety traceability, and the development of innovative food products. Other major companies involved in R&D related to food processing include Malee Group, Thai Beverage Company, and Universal Food Company. In 2016, to increase the global competitiveness of Thailand's food industry, 35 government, higher education, and private sector entities established Food Innopolis, a network through which innovators pool their R&D resources to achieve greater efficiency and impact toward shared goals.

The seed sector is another important area of private R&D investment by both local and foreign companies. The Thai seed market is fragmented, with various small and medium-sized companies and a few big players. About 20 percent of Thai seed companies operate R&D units. Rice is the dominant focus of private investment, but hybrid maize, legumes, forage crops, and horticultural crops are also important. The main seed companies operating in Thailand are CP Group and Chia Tai, alongside multinationals like Monsanto, Pacific Seeds, Pioneer Hi Bred, Syngenta, and East–West Seed.

Various tax and nontax incentives are in place to promote private R&D investment. These include corporate tax exemption measures, a waiver on import duties for machinery and raw materials, and permission for foreign companies to own agricultural land for the purpose of conducting R&D. The government also encourages private investment in agricultural research by focusing its own resources on activities that complement rather than compete with the private sector. Food Innopolis is a good example of this strategy.

Number of peer-reviewed publications by government research agencies, 2013–2017

PUBLICATION TYPE	2013	2014	2015	2016	2017
International journals	3	3	4	5	6
Asian journals	13	12	12	14	13
Thai journals	102	112	113	114	115
Books	60	54	52	64	65
Book chapters	2	1	1	1	1
Total	**180**	**182**	**182**	**198**	**200**
Peer-reviewed publications per FTE researcher per year	0.09	0.08	0.08	0.09	0.09

The number peer-review publications produced by government-based agricultural researchers in Thailand gradually increased during 2013–2017. Nevertheless—at less than 0.1 peer-reviewed publication per FTE researcher per year— the publication record of the country's agricultural researchers is extremely low by international standards. A major impediment to publication in international journals is lack of proficiency in the English language. Although exact data were not available, the publication record of university-based agricultural researchers is considerably higher than that of researchers based at government R&D agencies.

KEY CHALLENGE

- Agricultural output and productivity in Thailand have shown positive growth since the turn of the millennium. The primary focus historically has been on rice, as is reflected in the high number of new rice varieties released and registered by DOA. Recent reforms, however, are encouraging a shift to other crops. Nevertheless, in the decade ahead, growth in crop productivity will be challenged by the decreasing land and water availability and the negative impacts of climate change.

POLICY OPTION

- Future acceleration of agricultural growth will be highly dependent on innovations that increase production efficiency, reduce the cost of agricultural processes and products, and facilitate access to new markets. A considerable increase in R&D investment is required to strengthen and streamline the innovation system. The priorities outlined in the national agricultural strategy and associated five-year plan are important steps in the right direction.

Number of new crop varieties released and registered, 2013–2017

COMMODITY	RELEASED	REGISTERED
Rice	15	23
Ornamental plants	9	196
Durian (hybrid)	6	11
Sugarcane	6	6
Beans	2	7
Spices	3	9
Citrus fruit	2	5
Oil palm (hybrid)	2	–
Potatoes	2	2
Sweetcorn (hybrid)	2	13
Cassava	1	3
Cotton	1	2
Okra	1	2
Sorghum	1	–
Other crops	–	104
Total	**53**	**383**

Source: DOA.

- The Rice Department and DOA are responsible for testing new crop varieties for at least two years before they are certified and released for production. DOA is also responsible for registering all varieties developed in Thailand. During 2013–2017, DOA released 38 new crop varieties developed through in-house research. These included new varieties of ornamentals, durian, sugarcane, and many of other crops. During that same period, the Rice Department released 15 new rice varieties. The majority of the new varieties registered by DOA were developed by private seed companies, not by the country's government or higher education agencies. During 2013–2017, private firms registered more than 300 new crop varieties, including horticultural crops, (hybrid) rice and maize, and fruit crops.

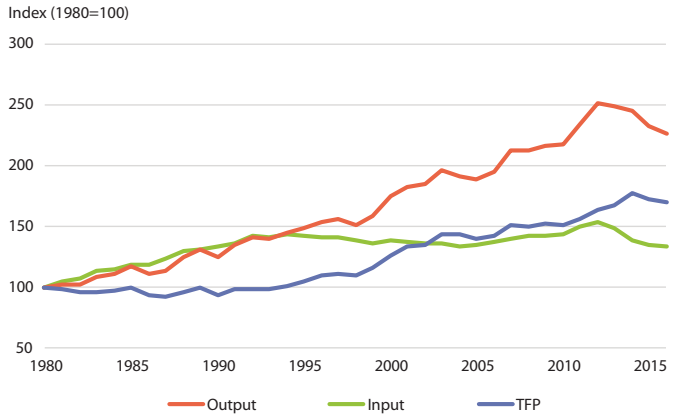
AGRICULTURAL PRODUCTIVITY GROWTH

- Increasing the productivity of agricultural production—that is, getting more output from the same amount of resources—is critical for sustaining agricultural growth in Thailand. Total factor productivity (TFP) is an indicator of how efficiently agricultural land, labor, capital, and other inputs (seed, fertilizer, and so on) are used to produce a country's agricultural outputs (crops and livestock). TFP is calculated as the ratio of total agricultural outputs to total production inputs, so when more output is produced from a constant amount of resources, TFP increases. R&D activities producing new technologies and innovations are a crucial factor driving TFP, but technological spillovers from abroad, higher numbers of skilled workers, investments that favor the development of input and output markets (such as roads and communications), and government policies and institutions that promote market development and competition, are major drivers as well.

As part of the economic transformation of Thailand's economy since the 1980s, the agricultural sector evolved from a fragmented production system focused on rice subsistence to a highly diversified, specialized, and competitive sector. Between 1980 and 1995, growth in agricultural output was largely driven by the use of increased inputs, such as mechanization and the use of high-yielding varieties and fertilizer. Large-scale investments and the use of modern inputs facilitated rapid TFP growth from the mid-1990s until 2010. Major changes in demand also prompted shifts in the mix of products produced, leading to fast growth in oil crops, horticultural crops, poultry, and swine. TFP growth averaged 2.6 percent per year during 1995–2010 and was the main driver of output growth. After 2010, Thailand focused on increasing value-added and diversifying and commercializing agricultural production, causing a further shift away from rice production.

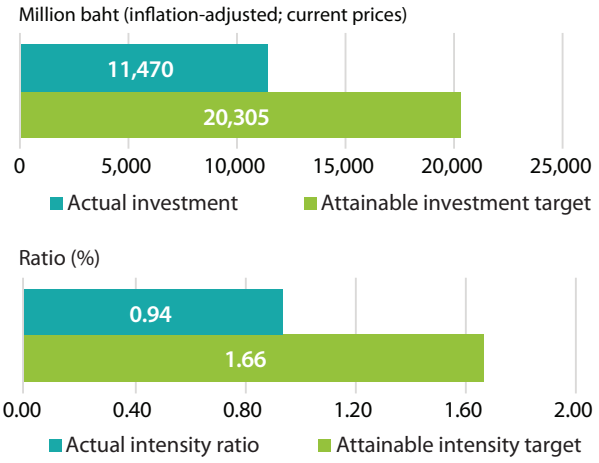
Increased cultivated area, capital investment, and productivity growth have led to the transformation of Thailand's agricultural sector. The increased productivity was achieved in part through collaborative research with foreign research agencies targeting such crops as rice, maize, and cassava. The slowing of output growth in recent years has highlighted the need for new strategies to accelerate productivity, enhance efficiency, and build resilience, especially in response to the negative impacts of climate change.

Long-term growth in agricultural input, output, and productivity, 1980–2016



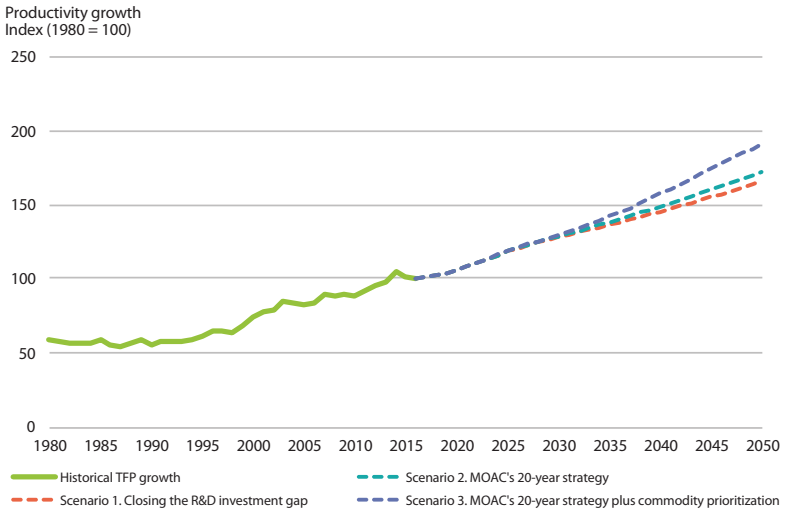
Source: Calculated by authors based on USDA-ERS (2019).

Actual research spending and attainable targets, 2017



Source: Calculated by authors based on ASTI (2020) and Nin-Pratt (2016).
Notes: Traditionally, agricultural research intensity ratios compare investment and AgGDP levels to determine whether countries may be underinvesting. ASTI's Intensity Index incorporates additional factors that account for the size and nature of a nation's economy and hence facilitate more accurate cross-country comparisons. For more information, see https://astinews.ifpri.info/2017/07/01/a-new-look-at-research-investment-goals-for-ssa/.

Agricultural productivity projections under different R&D investment allocation scenarios, 2016–2050



Sources: Calculated by authors based on ASTI (2020), USDA-ERS (2018), Nin-Pratt (2016), FAO (2018), and World Bank (2018).
Note: For more information on the methodology behind these projections, see https://www.asti.cgiar.org/knowledge-stocks and https://www.asti.cgiar.org/tfp-projections.

THE IMPACT OF HIGHER AND SMARTER RESEARCH INVESTMENTS ON AGRICULTURAL PRODUCTIVITY

- Conventional recommendations of agricultural research intensity levels, such as the 1 percent target set by the United Nations, assume that national investments should be proportional to the size of the agricultural sector. In reality, a country's capacity to invest in agricultural research depends on a range of variables, including the size of the economy, a country's income level, the level of diversification of agricultural production, and the availability of relevant technology spillovers from other countries. In efforts to address these nuances, ASTI developed a multi-factor indicator of research intensity that comprises a range of weighted criteria (for further details, see Nin-Pratt 2016). Under this approach, countries with the same mix of inputs are expected to require similar minimum levels of research investment, and investment below that level can be interpreted as an indicator that the country is potentially underinvesting.

  ASTI's weighted indicator of research intensity reveals that Thailand is indeed underinvesting in agricultural research. Based on the structural characteristics of the Thai economy and agricultural sector, the country's attainable investment target is estimated to be 1.66 percent of AgGDP, about 75 higher than its actual 2017 investment ratio of 0.94 percent. To have met this 1.66 percent target in 2017, Thailand would need to have invested 20.3 billion baht in agricultural R&D instead of the 11.5 billion baht it actually invested (both in current prices). In other words, the gap between the actual and estimated attainable agricultural research investment was 8.8 billion baht in 2017. If Thailand realizes its stated goal of increasing agricultural R&D spending by 5.0 percent per year to 2036, it will succeed in closing the research investment gap by 2028.

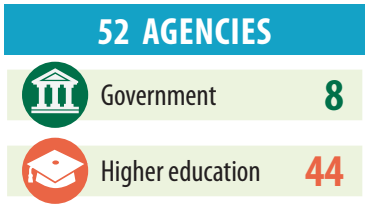
  In addition to considering the optimal level of investment in agricultural research, it is important to analyze the optimal distribution of that investment across commodities. The government's development plans focus on increasing diversification, competitiveness, exports, and value-added. With that in mind, should Thailand maintain its historical allocation of R&D investment or could further TFP gains be made by prioritizing investment in certain sectors over others?

  In an effort to answer these questions, ASTI modeled three investment scenarios to determine their likely impact on future TFP growth. Under the first scenario, investments are increased proportionally across all commodities by 4.2 percent per year in order to close the aforementioned investment gap by 2030. Under the second scenario, investments are increased proportionally across all commodities at 5.0 percent per year, in line with MOAC's 20-year strategy. The third scenario maintains the same 5 percent per year average investment growth as under the MOAC strategy (Scenario 2), but instead of allocating the increased investment equally across all commodities, it prioritizes cereals, cassava, and fruit and vegetables (increasing R&D investment by 10 percent per year to 2030) over other commodities (for which R&D investment increases by 3.5 percent per year to 2030). Note that under all three scenarios, R&D investment growth from 2030 to 2050 remains constant at 3.5 percent per year for all commodities.

  Projections indicate that prioritizing investment in cereals, cassava, and fruits and vegetables (i.e. Scenario 3) would result in an increase in agricultural productivity of 92 percent during the 2016–2050 period (which translates to 1.9 percent per year). This is significantly higher than the projected 73 percent increase under the second scenario (which translates to 1.6 percent per year). When investment priority is given to other commodities (livestock, fish, oil crops, sugar, rubber), productivity gains would not be significantly higher than under Scenario 2. These results indicate the strongly positive impact of increased agricultural research funding overall, and the additional potential to maximize this impact by prioritizing a combination of staple (cereal and cassava) and high-value (fruit and vegetable) crops.

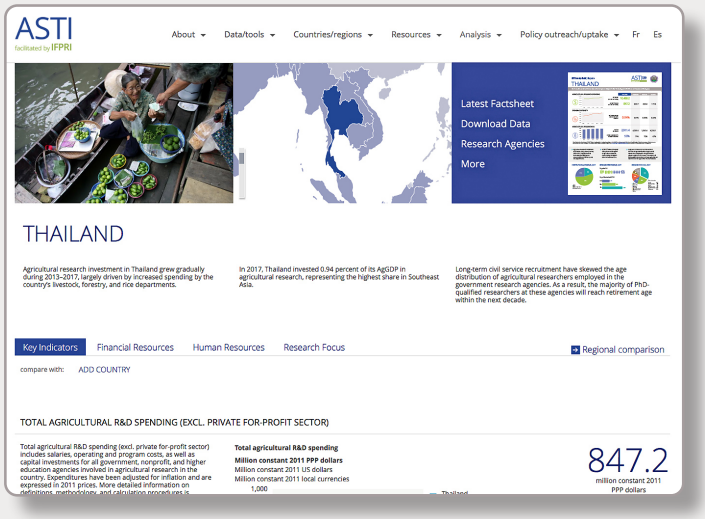
OVERVIEW OF THAILAND'S AGRICULTURAL RESEARCH AGENCIES

Fifty-two agencies conduct agricultural research in Thailand (excluding the private for-profit sector). About three-quarters of the country's FTE researchers are employed at its 8 government agricultural research agencies; the remaining one-quarter are employed across 44 higher education agencies. MOAC administers seven of the eight government agencies. DOA (568 FTEs in 2017) is the country's principal research institute for crops other than rice. Its research mainly focuses on the development of pest-resistant and high-yielding varieties, plant protection, and soil and fertilizer improvement. The Rice Department (186 FTEs) focuses exclusively on rice, while the Queen Sirikit Department of Sericulture's (88 FTEs) focuses on mulberries and silk. DLD is Thailand's main livestock research agency. Its 590 FTE researchers focus on beef cattle, dairy cows, buffalo, swine, and poultry. The Department of Fisheries (383 FTEs) focuses on fisheries research, the Land Development Department (58 FTEs) focuses on soil and natural resources research, and the Office of Agricultural Economics (24 FTEs) focuses on socioeconomic research. RFD (286 FTEs), which is administered by the Ministry of Natural Resources and Environment (rather than MOAC), focuses on research related to sylviculture, wood, forest products, and biodiversity. Kasetsart University is Thailand's main agricultural university. It operates campuses in four provinces and is a major training hub for students from across Asia. The 135-hectare Bangkhen campus in Bangkok is the largest by far, housing numerous faculties, research centers, and innovation laboratories. In 2017, Kasetsart University's four campuses together employed 276 FTE agricultural researchers concentrating on a wide range of issues related to crops, livestock, aquaculture, forestry, and agricultural product development. Other major entities in the agricultural higher education sector include Rajamangala University of Technology Lanna (85 FTEs) and Chiang Mai University (62 FTEs). The private sector plays a significant role in agricultural R&D in Thailand. The two main local R&D firms conducting private research are CP Group and Betagro. Detailed analysis of private-sector entities is excluded from the country brief due to lack of available data.



For a complete list of the agencies included in ASTI's dataset for Thailand, visit **www.asti.cgiar.org/thailand**.

For more information on ASTI's **data procedures and methodology**, *visit* **www.asti.cgiar.org/methodology**; *for more information on agricultural R&D in Thailand, visit* **www.asti.cgiar.org/thailand**.



ACRONYM LIST

AgGDP	agricultural gross domestic product
ARDA	Agricultural Research Development Agency
CP	Charoen Phokphand
CSC	Civil Service Commission
DLD	Department of Land Development
DOA	Department of Agriculture
DOF	Department of Fisheries
FTE(s)	full-time equivalent(s)
MOAC	Ministry of Agriculture and Cooperatives
NRCT	National Research Council of Thailand
PPP(s)	purchasing power parity (exchange rates)
R&D	research and experimental development
RFD	Royal Forest Department
S&T	science and technology
TFP	total factor productivity

ABOUT ASTI, IFPRI, APAARI, AND DOA

Working through collaborative alliances with numerous national and regional R&D agencies and international institutions, ASTI is a comprehensive and trusted source of information on agricultural R&D systems across the developing world. In the Indo–Pacific region, ASTI is facilitated by the **International Food Policy Research Institute (IFPRI)** and the **Asia-Pacific Association of Agricultural Research Institutions (APAARI)**. The Ministry of Agriculture and Cooperatives' **Department of Agriculture (DOA)** is Thailand's main research agency focused on crops other than rice.

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