ASTI Country Brief | December 2019

LAOS

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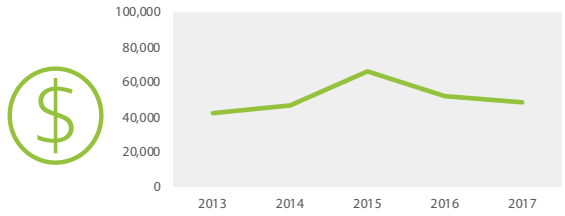
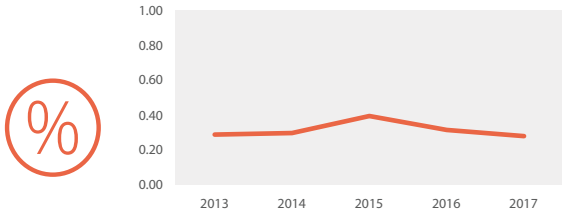
AGRICULTURAL RESEARCH SPENDING



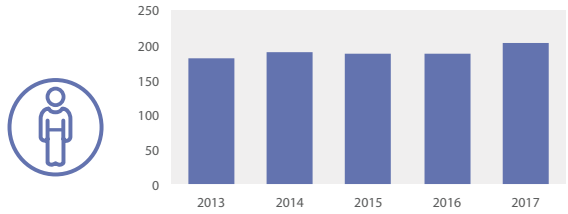
	LAOS	CAMBODIA	MYANMAR	THAILAND
Million kip (2011 constant prices)	47,638.3			
Million PPP dollars (2011 constant prices)	19.3	30.2	46.6	847.2

SPENDING INTENSITY



	LAOS	CAMBODIA	MYANMAR	THAILAND
Agricultural research spending as a share of AgGDP	0.26%	0.22%	0.06%	0.94%

AGRICULTURAL RESEARCHERS

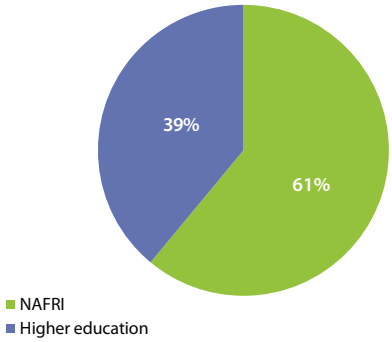


	LAOS	CAMBODIA	MYANMAR	THAILAND
Full-time equivalents	203.2	319.0	657.1	2,911.4
Share of researchers with MSc and PhD degrees	47%	45%	37%	50%

Notes: Data in the table above are for 2017. Information on access to further resources, data procedures and methodologies, and acronyms is provided on Page 8.
See **www.asti.cgiar.org/laos/directory** for an overview of Laos's agricultural R&D agencies.

- Agricultural R&D capacity in Laos has risen steadily over time, but R&D expenditures have exhibited an erratic trend in recent years. In 2017, the country invested only 0.26 percent of its AgGDP in agricultural research.
- Compared with most countries in Southeast Asia, Laos's funding for agricultural research in is highly donor-dependent. Australia, China, South Korea, Switzerland, and the Asian Development Bank are the principal donors supporting research projects and initiatives to build capacity and upgrade infrastructure.
- The country's research agencies lack the critical mass of highly qualified researchers and accompanying infrastructure needed to address the multidisciplinary challenges facing the agricultural sector. Many critical research areas remain overlooked.

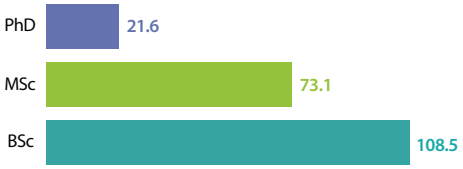
INSTITUTIONAL PROFILE, 2017



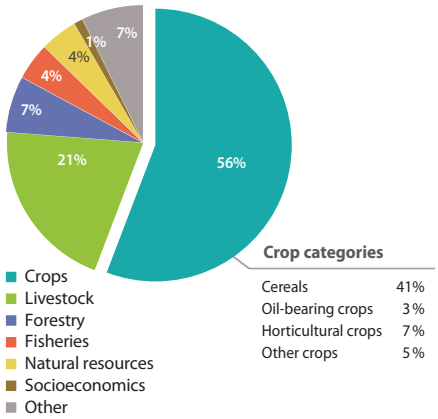
RESEARCHER PROFILE, 2017

By gender (%)

By qualification level (FTEs)



RESEARCH FOCUS, 2017



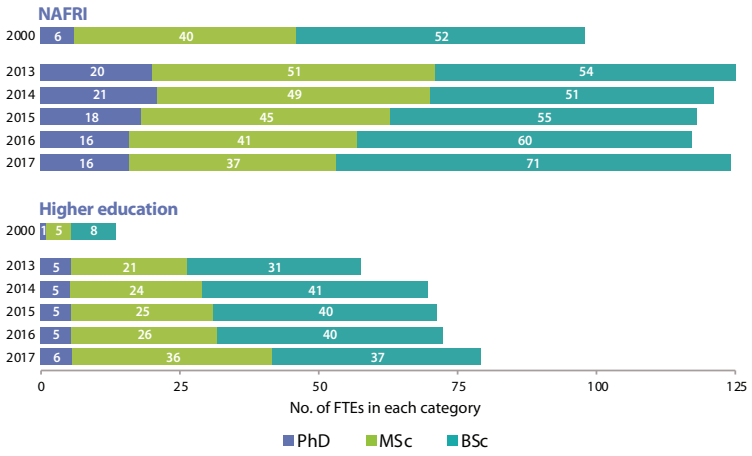
KEY CHALLENGE

- Laos lacks a critical mass of highly qualified and experienced agricultural researchers. As of 2017, just 11 percent of the country's researchers held PhD degrees, and many important research areas remained severely understaffed. The provision of postgraduate training programs at Laos's universities is limited. Most graduates from national universities only hold BSc degrees. Continuing education to the MSc or PhD level generally depends on donor funding, which is scarce.

POLICY IMPLICATIONS

- Accelerated training of young researchers to the MSc and PhD level is a critical first step toward ensuring Laos has an appropriate pool of qualified scientists at the national level. Local university programs in agricultural sciences need to be strengthened so that more scientists have the opportunity to pursue higher level degrees in-country. In recent years, foreign donors—particularly Australia and Japan—have funded a large share of the postgraduate training of the country's scientists outside Laos. Both financial and nonfinancial incentives are vital if these scientists are to be retained and motivated once they complete their training and return home.

Agricultural researchers by degree level, 2000 and 2013–2017



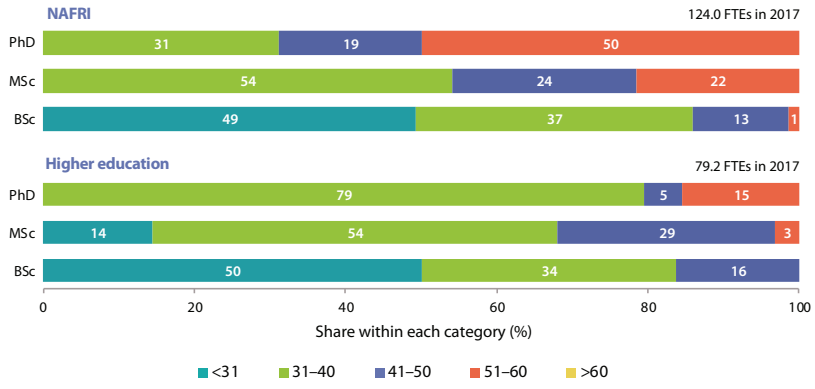
- Laos's total number of agricultural researchers has risen considerably since 2000, mostly driven by the establishment and expansion of several agriculture- and forestry-related faculties. However, most of the country's agricultural researchers only hold BSc and MSc degrees. In fact, the total number of PhD-qualified scientists has steadily fallen in recent years, mostly due to retirement and the promotion of researchers to (nonresearch) ministerial positions. In 2017, NAFRI employed just 16 scientists with PhD degrees, which is insufficient to address the multitude of challenges the country's agricultural sector is facing. Universities also lack a critical mass of PhD-qualified staff. Most faculties employ only a handful of professors, which confines the scope and overall quality of these faculties' graduate and research programs.

LIMITED CAPACITY TO IMPLEMENT THE AMBITIOUS ADS2025

Through its Agriculture Development Strategy to 2025 (ADS2025) the Government of Laos recognizes that the country has not reached its full development potential. The focus is firmly on increasing food crop production and improving nutrition. As such, the government has set precise targets across a range of food and cash crops, as well as multiple livestock categories. Targets per crop and livestock item incrementally increase toward 2020 and 2025. The critical role of agricultural research in reaching these targets is recognized in four main research areas: (1) seed science and technology, (2) biodiversity, (3) climate change adaptation, and (4) policy research.

Strengthening NAFRI's research capacity through overseas training of an additional 15 PhDs by 2025 is an important component of ADS2025, but it is unlikely that this target will be reached based on government funding constraints. For the time being, NAFRI's pool of permanent staff remains inadequate to implement the different research projects under ADS2025's four broad research areas. A large number of contract staff were appointed to address the most acute staff shortages. As a result, in 2018 about a quarter of NAFRI's researchers and support staff were working under contract, and most were under 35 years of age, were BSc- or MSc-degree qualified, and filled research assistance roles. Contract staff also earn lower salaries than permanent staff and are not entitled to pensions and other benefits. The main incentives for contract staff to accept employment at NAFRI are to gain experience and potentially become permanent staff members (which rarely occurs).

Agricultural researchers by age bracket and degree level, 2017



- Laos's pool of agricultural researchers is one of the youngest in the world: more than 70 percent are under 40 years old. The recently established agricultural faculties at Champasack, Savanakhet, and Souphanouvong universities are predominantly staffed by BSc- and MSc-qualified researchers aged in their twenties or thirties. The average age of NAFRI researchers is higher, particularly for those with PhD degrees. As of 2017, 8 of the 16 PhD-qualified researchers employed at NAFRI were over 50 years old and nearing the official retirement age of 55 years for women and 60 years for men. Without adequate succession strategies and training/mentoring, significant knowledge gaps will emerge.

Researchers employed at NAFRI and the higher education agencies by discipline and degree qualification, 2017

	NAFRI		HIGHER EDUCATION SECTOR	
	FTEs		FTEs	
DISCIPLINE	MSc	PhD	MSc	PhD
Plant breeding/genetics (including biotechnology)	–	1.0	0.7	–
Plant pathology	1.0	–	1.4	–
Plant physiology	–	–	0.4	–
Botany	–	–	0.3	0.2
Seed science and technology	4.0	2.0	0.7	–
Other crop sciences	12.0	4.0	2.1	–
Animal breeding/genetics	–	–	–	–
Animal husbandry	–	1.0	2.0	0.6
Animal nutrition	–	1.0	2.0	1.1
Dairy science	–	–	–	–
Poultry science	–	–	0.9	–
Veterinary medicine	–	–	1.7	0.2
Zoology/livestock entomology	–	–	–	–
Other animal and livestock sciences	7.0	2.0	2.2	0.2
Forestry and agroforestry	5.0	1.0	10.0	1.9
Fisheries and aquatic resources	5.0	2.0	1.8	0.3
Soil sciences	–	–	0.8	–
Natural resources management	–	–	–	2.0
Water and irrigation management	–	–	–	–
Ecology	–	–	–	0.2
Biodiversity conservation	–	–	0.3	0.2
Food sciences and nutrition	–	–	0.4	1.7
Socioeconomics (including agricultural economics)	–	–	–	1.5
Extension and education	–	–	–	1.4
Other	3.0	2.0	2.1	0.4
Total	**37.0**	**16.0**	**36.1**	**5.6**

Laos lacks a critical mass of PhD-qualified researchers in a large number of important areas, including plant and animal breeding, plant pathology, agronomy, veterinary medicine, soil science, water management, and socioeconomic research. Large-scale training of MSc-qualified researchers to the PhD level is essential to ensure the quality of future research outputs. In addition, incentives need to be established to motivate and retain these newly trained scientists over time.

CAPACITY STRENGTHENING INITIATIVES

NUOL is the only university in Laos that offers MSc-degree (and very limited PhD-degree) training in agricultural science and forestry. The University lacks adequate expertise in many key areas, including plant and livestock breeding and pathology. As a result, many of the country's scientists go abroad to obtain postgraduate training, usually after securing a scholarship from a foreign donor. ACIAR (Australia) and JICA (Japan) have been the most important of these donors, providing scholarships on a competitive basis.

- ACIAR has been a reliable funder of MSc and PhD training in Australia for Lao agricultural scientists over time. Since 2014, five NAFRI researchers have been trained to the PhD level at Australian universities.
- Japan provides staff at NAFRI, NUOL, and ministerial departments with funding for three-year, PhD-level courses in agricultural and environmental sciences online through Nagoya University. The scientists travel to Japan once or twice per year to interact with their supervisors, but the work is primarily conducted remotely in Laos.
- NAFRI and NUOL participate in the Sida–funded Mekong Agriculture Research Network together with Hue University in Vietnam and the Royal University of Agriculture in Cambodia. Led by Uppsala University in Sweden, the network supports postgraduate training in the region (mostly in Vietnam). As of October 2018, two NAFRI researchers, one from the Department of Livestock and Fisheries, three from Souphanouvong University, one from Savannakhet University, and two from Champasak University were benefiting from this program.
- Various other donors, including South Korea's Asian Food and Agriculture Cooperation Initiative provide short-term training courses. NAFRI also sends its staff on short-term statistics, proposal-writing, and project-management courses.

Training plan for NAFRI and the higher education sector by discipline, degree level, gender, and location, 2018–2020

	BY GENDER			
BY DISCIPLINE	Male	Female	Total	BY LOCATION
PhD-level				
Environmental studies	4	0	4	Japan and Laos
Organic agriculture	1	0	1	Japan and Laos
Nutrition-sensitive agriculture	0	1	1	The Netherlands and Laos
Livestock breeding	0	1	1	Thailand
Fish nutrition	0	1	1	Vietnam and Laos
Animal nutrition	1	0	1	Vietnam and Laos
Natural resource management	1	0	1	Japan
Agricultural economics	0	1	1	Australia
MSc-level				
Rice breeding	1	0	1	Thailand
Maize breeding	2	0	2	China
Soybean breeding	0	1	1	China
Rubber science	0	1	1	China
Horticulture	2	0	2	China
Entomology	1	0	1	China
Crop science	1	1	2	Laos
Forestry	2	0	2	Vietnam
Fodder science	1	0	1	China
Global food and agricultural business	1	0	1	Australia
Financial management	0	2	2	China
Total	**18**	**9**	**27**	

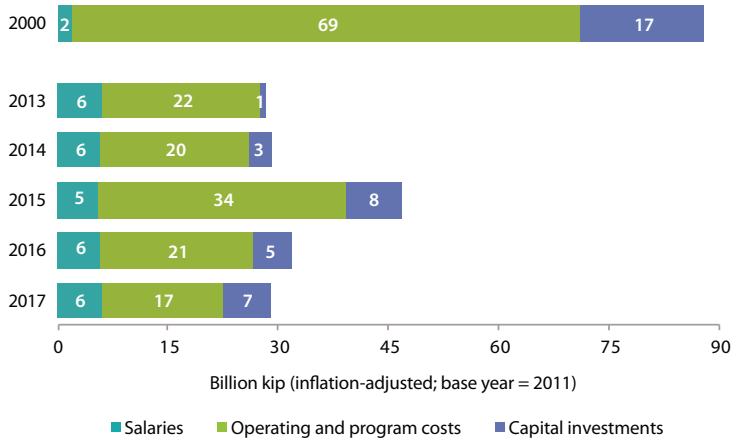
KEY CHALLENGE

- The pattern of agricultural R&D investment in Laos has been volatile in recent years, largely driven by yearly fluctuations in donor funding. Although ADS2025 and NSEDP8 prioritize raising agricultural productivity, Laos continues to underinvest in agricultural research. In 2017, the country invested just 0.27 percent of its AgGDP in agricultural R&D, which is clearly insufficient to address the numerous challenges facing the agricultural sector.

POLICY IMPLICATIONS

- If agricultural research in Laos is to become more effective, higher levels of funding must be secured. Overreliance on volatile donor and development bank funding needs to be counterbalanced with alternative financing mechanisms. The private-sector funding potential remains largely untapped in Laos. Success in securing private funding requires a more enabling policy environment, including tax incentives, protection of intellectual property rights, and inflows of foreign technologies.

NAFRI's expenditures by cost category, 2000 and 2013–2017

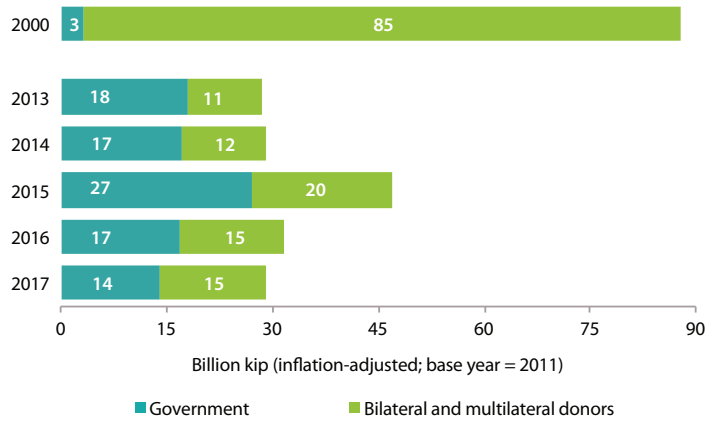


- NAFRI's research spending has exhibited considerable yearly fluctuations. In the years immediately following NAFRI's establishment in 1999, donor funding to support operations and new research infrastructure was strong. In subsequent years, however, NAFRI's operating and capital spending gradually declined.

  During 2013–2017, salaries accounted for less than one-fifth of NAFRI's total spending, reflecting a combination of extremely low scientist salary levels and the fact that payments to contract staff are drawn from NAFRI's operating budget.

  Operating and capital spending fluctuated significantly over time. The 2015 peak in spending reflects a one-off payment for the multiplication of rice seedlings for drought-stricken farmers in Laos's northern provinces. Capital costs were also high that year due to the purchase of research equipment (including transplanters, harvesters, driers, and seed selection machines) funded by Sida and ACIAR.

NAFRI's funding sources, 2000 and 2013–2017



- During the years immediately following its establishment, NAFRI was extremely dependent on bilateral support from Sweden and Switzerland, as well as funding from the International Rice Research Institute, ACIAR, and others. Although total levels have declined over time, NAFRI still remains highly dependent on donor funding. During 2013–2017, donors accounted for 44 percent of NAFRI's funding, with the government providing the remainder. Government funding is mostly channeled through the Ministry of Agriculture and Forestry, although the Ministry of Science and Technology also funds some of NAFRI's research projects.

AGRICULTURAL EXTENSION SYSTEM

- An important factor impeding the impact of agricultural research investment in Laos is the inadequate agricultural extension system. The Department of Technical Extension and Agriculture Processing has insufficient capacity in terms of the number of extension workers and their skill levels, and its linkages with other branches of the country's agricultural innovation system, such as research and education, are relatively weak. Another issue is the number of different ministries directly involved in assisting farmers, and the limited cooperation and coordination among them. Agricultural research does not operate in isolation. The drivers of agricultural transformation are multidimensional and interrelated. A more holistic approach to agricultural innovation—comprising research, extension, education, and policy—is vital, as are an effective institutional framework, governing mechanisms, and political environment to stimulate cooperation among the multitude of actors.

DONOR FUNDING

- ACIAR supports a large number of research projects in Laos—either directly or through LARF (see below)—focusing on crops, forestry, livestock, fisheries, postharvest issues, and natural resource management. Training and capacity strengthening also play an important role in many of the projects that ACIAR supports. The main beneficiaries of ACIAR support are NAFRI and NUOL.
- TABI is a long-term program under the Ministry of Agriculture and Forestry supported by the Swiss Agency for Development Cooperation. The goal of the program is to raise the status of agrobiodiversity and integrate it as a key component in Laos's development policies and practice. TABI is active in the Luang Prabang, Huaphan, and Xiengkhouang provinces and funds a large number of small research projects focusing on crop, forestry, and fisheries issues. The research is performed by staff from NAFRI, the universities, and national/provincial government entities.
- The Chinese government has provided funding for the construction of a new laboratory for NAFRI's Rice Research Center, as well as a new offices and laboratories for the Rubber Research Center and funding for MSc training of NAFRI staff in China's Guangxi province.
- Since 2009, the Strengthening Higher Education Project, funded by grants and loans from the Asian Development Bank and counterpart funding from the Lao government, has been focused on reforming the higher education sector by enhancing the capacity of universities to deliver higher quality programs and services. The project has also supported a number of small agricultural research projects at Champasack University, as well as upgrades to infrastructure at the National University of Laos and Savanakhet University.
- The government of South Korea supports small research projects of US$3,000– 10,000 that focus on issues related to livestock, rice, maize, horticulture, and peanuts.
- For more than three decades, Sweden has been by far the largest donor to Laos's agricultural sector. It was also one of NAFRI's principal donors during the years immediately following the institute's 1999 establishment. However, in 2007, the Swedish government decided to phase out bilateral aid to Laos as part of a policy to focus its bilateral development cooperation on a smaller number of countries. Most Swedish-funded projects, including Research Cooperation for Livestock Based Sustainable Farming Systems in the Lower Mekong Basin and the Upland Research and Capacity Development Program, were completed by 2012.

COMPETITIVE FUNDING MECHANISMS

- LARF is a competitive research fund initiated by NAFRI in 2006 with the assistance of ACIAR. Over time, other donors have contributed to LARF, including the government of Sweden through the Upland Research and Capacity Development Program. LARF aims to enhance the research management capacity of Lao organizations, strengthen the capabilities of researchers to undertake and report independent research, improve research linkages and collaboration among agencies, and enhance access to external funding by research agencies. LARF-funded research activities are coordinated through NAFRI to help ensure consistency with the government's agricultural development research agenda. The third phase of LARF (2015–2018) had a total budget of AU$450,000. Each year, the Fund awards grants to 10 projects submitted by NAFRI and university-based scientists in the range of AU$10,000–30,000 each. Two Australian universities (Charles Sturt University and the University of Queensland) play an active role in reviewing the proposals (ACIAR 2017). Discussions on a new phase of LARF are currently ongoing. In the meantime, NAFRI is encouraging its scientists to submit project proposals to the National Research Fund. The Lao government has recently agreed to allocate 1 percent of its investment budget to this National Research Fund.

Number of journal articles published by Lao agricultural researchers, 2013–2017

TYPE OF PUBLICATION	2013	2014	2015	2016	2017
International journals	5	2	6	14	11
Asian journals	9	2	9	8	7
Lao journals	21	21	34	43	50
Total	**35**	**25**	**49**	**65**	**68**
Peer-reviewed publications per FTE researcher per year	0.21	0.14	0.29	0.38	0.37

Note: Data exclude the Faculty of Forestry of NUOL, for which data were not available.

The number of journal articles published by agricultural researchers employed by NAFRI and the universities rose steadily during 2013–2017, as did the average number of publications per researcher. Nevertheless, the publication record of Lao researchers remains low by international standards. University-based scientists have a better publication record in international journals than their NAFRI colleagues. NAFRI researchers mostly publish in the Lao Agricultural Journal, which publishes two volumes per year, each comprising eight articles.

KEY CHALLENGE

- Laos's agricultural research system is heavily focused on rice. Close to 60 percent of crop researchers' time is dedicated to rice research, and the bulk of new crop varieties released by NAFRI are improved rice varieties. As a result, a large number of other economically important commodities remain severely neglected.

POLICY IMPLICATIONS

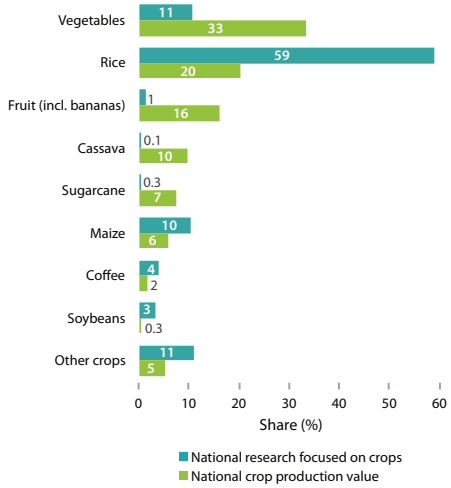
- A balanced research portfolio that allocates sufficient resources to food, fodder, and export commodities is of vital importance to address the agricultural sector's many challenges, including stagnating productivity of food crops (including rice), high regional disparities in malnutrition, and a rapidly growing plantation sector that needs to become more innovative and globally competitive. Both ADS2025 and NSEDP8 strongly emphasize growth in the production and export of nonrice crops. The development of a strategic research agenda accompanying these policy shifts is crucial.

Number of new varieties released and registered by NAFRI, 2018–2019

CROP	NUMBER OF VARIETIES	YEAR OF RELEASE
Rice	9	2018
Forage crops		
Guinea grass	1	2019
Congo grass	1	2019
Stylo	1	2019
TOTAL	**12**	

- Over the past 20 years, NAFRI has released 34 varieties of improved rice, but none have been formally registered. Since the 2018 establishment of the National Seed Policy, improved plant varieties must be registered. In 2018/19, NAFRI registered nine improved rice varieties with the Department of Agriculture, and three new forage crop varieties with the Department of Livestock and Fisheries.

Congruence between agricultural research and production value for selected crops, 2016/2017



Source: Data on crop production values are from http://faostat.fao.org.
Notes: Data on crop production values are for 2016; data on research focus are for 2017.

- Major incongruencies exist between the focus of crop researchers and the crops that generate the highest production value. Rice, for instance, accounted for just 20 percent of Laos's total value of crop production in 2016, yet nearly 60 percent of crop research was focused on rice. Similarly, comparatively more resources were allocated to coffee, maize, and soybean research than the production values of these crops alone would warrant. Vegetables, fruit, cassava, and sugarcane, on the other hand, appear to be extremely underresearched based on their production values.

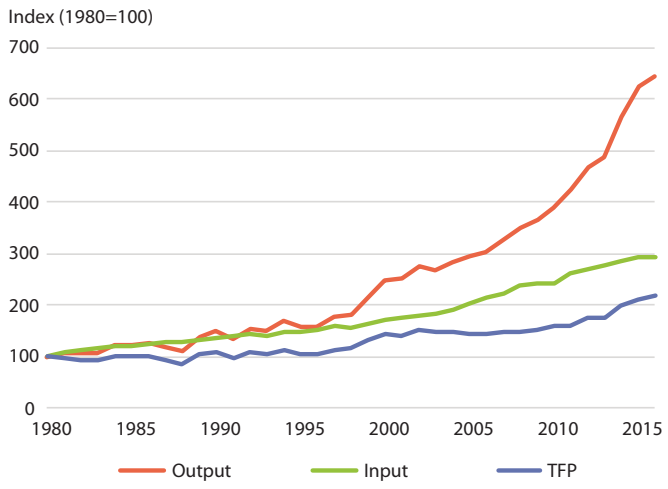
SLOW AGRICULTURAL PRODUCTIVITY GROWTH

- Increasing the efficiency of agricultural production—that is, getting more output from the same amount of resources—is critical for improving food security. 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 in roads and communications), and government policies and institutions that promote market development and competition, are major drivers as well.

During the 1980s, a period of tight government control and central planning, agricultural output in Laos stagnated. Large-scale reforms were passed in the late 1980s and early 1990s focused on reducing both domestic and international trade barriers, as well as restoring reciprocal trade with Thailand. The market was opened to the importation of fertilizer, tractors, and other technologies, and the demand for Laos's livestock and cash crops from neighboring countries grew. This combination of technology inflows, combined with an enabling policy environment, prompted the rapid acceleration of agricultural output and a gradual increase in TFP beginning in the second half of the 1990s.

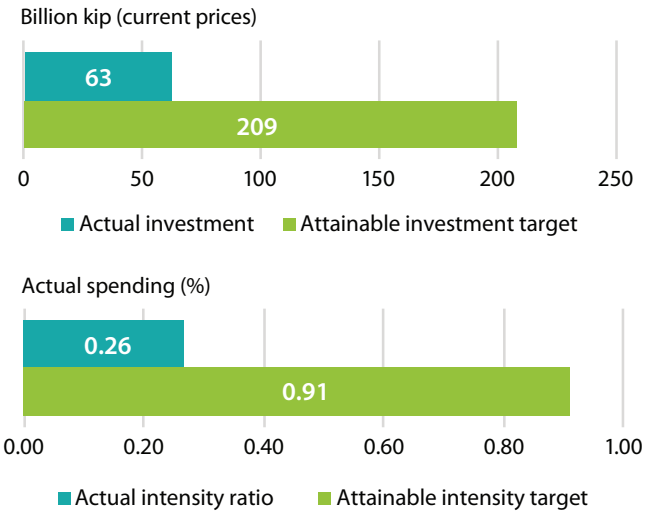
Over the next two decades TFP increased at an average yearly rate of 3.5 percent even though average yearly growth in R&D investment during 2000–2016 was negative (–1.3 percent). In this context, it is fair to say that TFP growth can largely be explained by improved efficiency in resource allocation as a result of policy reforms and knowledge spill-ins from neighboring countries. Future agricultural growth will increasingly depend on technical change, more intensive use of inputs, and further diversification of output.

Long-term growth in agricultural input, output, and productivity, 1980–2015



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

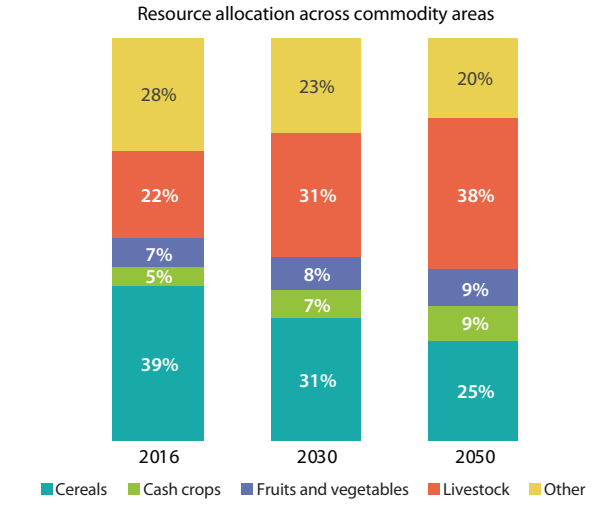
Actual research spending and attainable targets, 2017

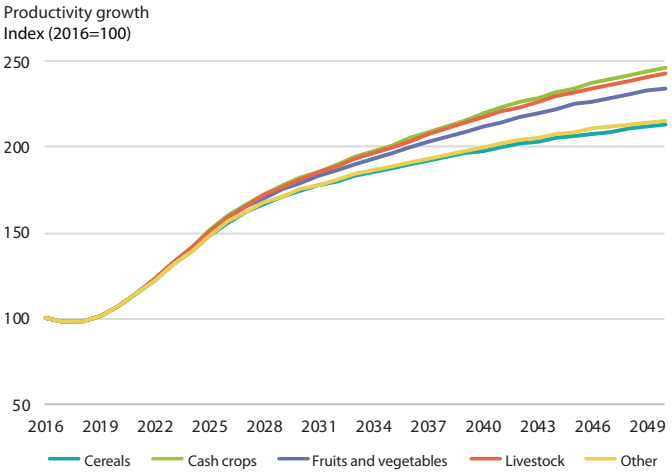


Sources: Calculated by authors based on ASTI (2019) and Nin-Pratt (2016).

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 for select commodity groups based on attainable rates of research investment, 2016–2050





Sources: Calculated by authors based on ASTI (2019), 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.

PRODUCTIVITY RESPONSE TO HIGHER AND SMARTER RESEARCH INVESTMENTS

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 multifactor 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 based on its particular input mix.

ASTI's weighted indicator of research intensity demonstrates that Laos is indeed underinvesting in agricultural research. Based on the structural characteristics of its economy and agricultural sector, its attainable investment target is 0.91 percent, more than three times higher than the country's actual investment ratio of 0.26 percent. To have met the higher target in 2017, Laos would need to have invested 208 billion kip, instead of the 63 billion kip it actually invested (both in current prices). In other words, the gap between the country's actual investment in agricultural research and its estimated attainable investment was 146 billion kip in 2017 alone. That leads to the questions, first, of what Laos's agricultural productivity could have been had these higher, accumulated investments been made over time, and second, of what future productivity levels could be if Laos increased its investments to attainable levels moving forward.

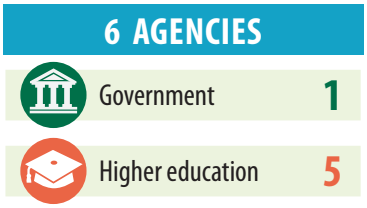
To answer these questions, ASTI ran long-term projections of the impact of historical agricultural research investment on the country's agricultural output and productivity, and of the higher rates of investment needed to close the gap. The projections indicate that closing the gap by 2030 would require Laos to increase its investment in agricultural research to a rate of 8.8 percent per year, which is ambitious, but not impossible. After 2030, the rate of investment growth could gradually decline to 3.0 percent by 2040, and remain constant thereafter. Under this scenario, the average rate of investment growth for the entire 2016–2050 period would be around 6 percent per year. If Laos were to follow this scenario, by 2050 its TFP would be more than double the level recorded in 2016.

It is not only the quantity of agricultural R&D investment, but also the quality that is important. ADS2025 and NSEDP8 set forth Laos's goal of diversifying agricultural production and increasing exports. It is therefore advisable that the country invests proportionally less in research into cereals and more in high-value commodities, such as fruit and vegetables, cash crops, and livestock. ASTI carried out detailed analysis of the optimal allocation of research resources across commodities, and the effects on the country's future TFP growth based on the investment growth scenario described above. Results indicate that productivity for livestock, fruit and vegetables, and cash crops has the potential to be 2.3–2.4 times higher in 2050 than in 2016, and cereal productivity could double during the same period. For this to occur, research investment in livestock, fruit and vegetables, and cash crops needs to increase at average yearly rates of 7.6, 6.7, and 8.0 percent, respectively, and investment in all other commodities needs to grow by 6.0 percent per year. Total TFP growth would remain the same whether investment growth were distributed evenly across commodities or targeted high-value commodities, but the prioritization of high-value commodities has the added benefits of diversifying agricultural production and increasing the profitability and global competitiveness of Laos's agricultural sector.

OVERVIEW OF LAOS'S AGRICULTURAL RESEARCH AGENCIES

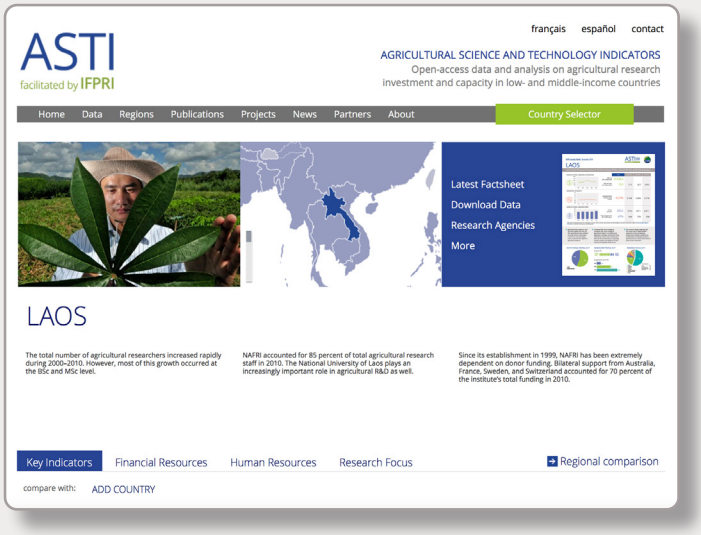
Six agencies undertake agricultural R&D in Laos. NAFRI (124 agricultural FTEs in 2017) is by far the largest, as well as being the only government agency. The institute conducts research related to crops, livestock, forestry, fisheries, natural resources, climate change resilience, postharvest issues, and agricultural economics. It also assists the national government in formulating agricultural policy. NAFRI is headquartered just outside the capital, Vientiane, and operates 15 research centers (11 in or around Vientiane, and 4 in the provinces). In 2018, NAFRI underwent institutional reform to further decentralize its research and improve its responsiveness to the needs of farmers in the country's more remote areas.

The composition of Laos' agricultural research has undergone important shifts over time, with the higher education sector playing an increasingly prominent role. The number of university-based FTE researchers grew nearly six-fold during 2000–2017, although very few recruits were PhD-qualified. The bulk of the research conducted by Lao universities is basic and supports education. Vientiane-based NUOL is by far the largest higher education agency involved in agricultural research. Its Faculty of Agriculture employed 21 FTE researchers in 2017, mostly focusing on livestock, crop production, and socioeconomic issues. NUOL's Faculty of Forestry employed an estimated 18 FTEs in 2017. The Faculties of Agriculture of Champasack, Souphanouvong, and Savanakhet universities are smaller, employing 12, 17, and 12 agricultural FTEs in 2017, respectively. Of the research conducted, Champasack University focuses heavily on livestock, Souphanouvong University focuses on crops, and Savanakhet University focuses on a combination of crop, livestock, and forestry issues. No private companies were identified as conducting agricultural research in Laos.



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

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



ACRONYMS USED IN THIS COUNTRY BRIEF

ACIAR	Australian Centre for International Agricultural Research
ADS2025	Agriculture Development Strategy to 2025
AgGDP	agricultural gross domestic product
FTE(s)	full-time equivalent(s)
JICA	Japan International Cooperation Agency
LARF	Lao Agricultural Research Fund
NAFRI	National Agricultural and Forestry Research Institute
NSEDP8	The Eighth Five-Year National Socioeconomic Development Plan (2016–2020)
NUOL	National University of Laos
PPP(s)	purchasing power parity (exchange rates)
R&D	research and experimental development
Sida	Swedish International Development Cooperation Agency
TABI	The Agro-Biodiversity Initiative
TFP	total factor productivity

ABOUT ASTI, IFPRI, APAARI, AND NAFRI

Working through collaborative alliances with numerous national and regional R&D agencies and international institutions, **Agricultural Science and Technology Indicators (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 **National Agriculture and Forestry Research Institute (NAFRI)** is Laos's principal agricultural research agency. It operates under the Ministry of Agriculture and Forestry and carries out research related to crops, livestock, forestry, and fisheries.

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