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SYNGENTA FOUNDATION
FOR SUSTAINABLE
AGRICULTURE



**REORIENTING PUBLIC AGRICULTURE R&D
FOR ACHIEVING SUSTAINABLE,
NUTRITIOUS AND CLIMATE RESILIENT
FOOD SYSTEMS IN CHINA**

**POLICY
BRIEF**

syngenta foundation
for sustainable
agriculture



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KEY MESSAGES AND RECOMMENDATIONS

CONTEXT

Agricultural transformation will require innovation, driven by the needs of farmers, consumers and the environment. Research has an important role to play in supporting the innovation process. Investments in agri-food system research will have to be scaled up and target poverty, nutrition and sustainability issues. But how should public agriculture and food R&D be reoriented and supported?

This policy brief comes from a report that aims to shed light on the past and current focus of the public agriculture R&D agenda in China and show major shifts and trends in public and private research spending. The study provides recommendations on how to reorient the future R&D agenda to address major gaps and integrate nutrition, sustainability and climate resilience needs. It also lays out necessary steps and actions for making the shift.

KEY MESSAGES

- China has the world's highest level of public R&D funding and the most R&D personnel. However, the country's R&D system is almost entirely driven by public R&D institutes with very limited private sector initiatives. R&D investment and innovation capacity need to be stepped up.
- China's R&D system is geared towards increased food production, with very limited attention to protecting natural resources and the environment, or to nutrition, health and yield aspects.
- R&D investment in China focuses largely on the three major staple grains (rice, corn and wheat) and on meat products. There is insufficient investment in more nutritional produce, such as non-staple grains, fruits and vegetables.

RECOMMENDATIONS

Repurposing public support for agriculture offers a significant opportunity to revitalize research systems in China and create the enabling conditions to leverage private sector R&D. More specifically, the report advises the Chinese government to:

- **Increase funding to agri R&D:** The ratio of China's agricultural R&D expenditure to agricultural GDP increased from 0.14% in 2002 to 0.46% in 2018. However, this is still far behind the global average of one percent and the two percent in developed countries. The government should gradually increase R&D spending to at least one percent of the national agri-GDP.
- **Diversify its R&D agenda and spending:** R&D should be directed to the new trends in international agri-food science and technology. Instead of focusing public support solely on increased production, expenditure should gradually increase to reach the four development goals: higher yields and efficiency, nutrition and health, environmental sustainability and climate adaptation.
- **Focus R&D on more nutritious crops:** R&D spending should target both staple grains and more nutritious non-staple grains, as well as fruits and vegetables. Stable supply of major staple crops and meat is currently the core objective of China's food security policy. However, as people have recently begun to over-consume these foodstuffs, R&D should be redirected to also include more nutritious non-staple grains, fruit, and vegetables. The aim should be to improve their production and reduce prices.
- **Create a more enabling environment for private sector R&D:** While ensuring government investment in agri-food R&D, China should also introduce a more diversified agri-food R&D strategy and encourage more private investment in the sector. The country's overall innovation system can be strengthened by providing incentives for private sector innovation, and by enabling private technology transfer through PPPs, as well as financial support and tax incentives, especially for agri-tech startups. The private sector, in turn, can stimulate more rapid access to new technologies for farmers.

SUMMARY

China's agricultural research system is largely driven by public sector R&D, with relatively low R&D investment coming from the private sector.

- China's agricultural research system is largely dominated by the public sector, with the government playing an important role. In 2019, 89% of R&D funding for public agricultural research institutes came from the government.
- The central and local governments are responsible for formulating, implementing, and managing agriculture R&D policies and strategies; building research institutes and improving infrastructure; and allocating funding for agricultural research. The National Science and Technology Leading Group is involved in formulating national R&D strategies and plans and oversees national science projects. It coordinates R&D initiatives among ministries and local authorities, including the Ministry of Science and Technology. The Ministry pioneered a nationally unified R&D information system and developed a mechanism for allocating, evaluating and monitoring research funding
- Non-governmental stakeholders invest comparatively little in R&D. Their interests lie in protecting intellectual property and investing in R&D activities with a high return on investment. Examples include food processing, agrochemicals, machinery, hybrid seeds and genetically modified crops.

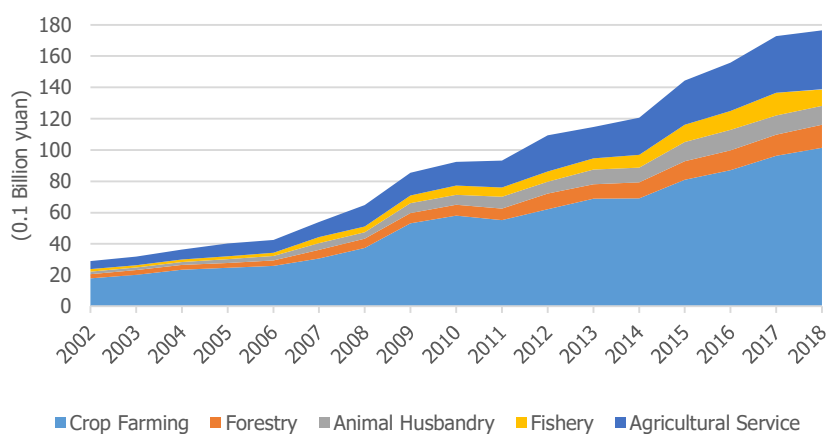
China's agricultural research system has the highest number of R&D personnel and largest amount of funding in the world. However, the intensity of agricultural R&D investment is low.

- The majority of agricultural researchers is employed by research institutes. In 2019, there were 1014 agricultural research institutes in China, one-third of all such institutes worldwide.
- The responsibilities of public agricultural R&D institutes vary according to their geographical reach. National institutes (7% of the total) focus on high-tech and general R&D. They are part of the Ministry of Agriculture and Rural Affairs. Provincial institutes (40%) mainly conduct applied research under local agroecological conditions. Prefectural institutes (53%) concentrate on extension. This includes experimental demonstrations, technology dissemination and processing.
- The agricultural research institutes receive both core and program-specific funding. This is split into basic research expenses, funding for R&D innovation, and for China's modern agricultural industrial technology system.
- The ratio of agricultural R&D expenditure to agricultural GDP increased from 0.14 in 2002 to 0.46 in 2018. However, this is still far behind the global average of 1% and the 2% in developed countries.

China's public agricultural research system is largely dominated by crop research.

- In 2019, 487 institutes engaged in crop research, 166 in forestry research, 68 in animal husbandry and 46 in fishery. 247 institutes ran research across agriculture, forestry and animal husbandry.
- Investment in basic agricultural research has risen considerably since 2002 (Figure 1) Crop research is still the main focus, but research funding for forestry, animal husbandry, fishery and agricultural services is on the rise.

Figure 1. China's agricultural R&D expenditure by subsector



SUMMARY

Public agricultural R&D in China is largely focused on productivity and less attention is put on sustainability, nutrition and climate aspects.

- The main focus of public R&D in China's agri-food system is on increased food production. Less attention is paid to the problems of natural resources, the environment, nutrition and human health arising from yield growth.
- Data from the China Agricultural University and the Chinese Academy of Agricultural Sciences show that colleges or institutes focusing on traditional crops and livestock and poultry products receive the most research funding and have the most personnel. Those focusing on natural resources and the environment have less funding and staff, even though the growth rate has increased significantly.
- Data from the Jiangsu Academy of Agricultural Sciences show that institutes related to natural resources and the environment, food quality and nutrition have relatively high inputs in terms of funding levels and the quantity and quality of researchers. The numbers of published papers and patents from those institutes are also higher, reflecting the importance and transformation of agricultural research related to natural resources, the environment, nutrition and health.

R&D investment in China's agri-food system focuses on the three major staple grains (rice, corn and wheat) and meat products, with relatively insufficient investment in agricultural products with more nutritional value such as non-staple grains, fruit and vegetables

- The ratio of research funding for staple grains / livestock and poultry / fruit / vegetables at China Agricultural University was 65/12/14/9 in 2016–2020. There was a clear focus on staple grains with little attention to more nutritious crops.
- The Modern Agricultural Industrial Technology System (MAITS) employs 100 scientist and have 94 testing stations for the four major non-staple grains. These numbers are well below those for the three major staple grains (140 scientists and 157 testing stations).

Take-Aways from the validation Workshop

China Agricultural University presented the results and recommendations at a high-level stakeholder meeting in February 2022 in Beijing. CAU staff were joined by experts and policy makers from the public and private sectors, as well as academia and development partners. Professor Si Wei chaired the discussion that generated key insights into the current challenges of China's agricultural R&D system and highlighted important opportunities for its future development. Special attention should be paid to interdisciplinary studies, innovation systems, system thinking and closer public-private collaboration.



SYNGENTA FOUNDATION FOR SUSTAINABLE AGRICULTURE

The Syngenta Foundation for Sustainable Agriculture (SFSA) is a non-profit organization that seeks to create value for resource-poor small farmers in developing countries through innovation in sustainable agriculture and the activation of value chains. The operational strategy of the SFSA focuses on smallholders, productivity and markets.

The results presented in this policy brief are extracted from a currently unpublished draft report by China Agricultural University (CAU). For inquiries, please contact the SFSA team.

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