Selective Learning: China, the CGIAR, and Global Agricultural Science in Flux*†

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Abstract This article analyses the interaction between China and the CGIAR (formerly the Consultative Group on International Agricultural Research) since the 1970s, exploring the formation of China's modern agricultural science capability and its approach towards learning. While China was previously regarded and treated as a recipient of international scientific expertise, it is now a more equal partner and contributor, with capacity to provide funds, support exchange programmes for scientists, and collaborate in building laboratories and joint research programmes. Some of these now extend beyond the CGIAR system and are creating new platforms for scientific collaboration and knowledge production in the South. By offering an illustration of China's 'selective learning' approach, emphasising self-reliance and pragmatism in its engagement with the CGIAR, this article feeds into broader debates on how China contributes to global development knowledge and learning.

Keywords China, CGIAR, international agricultural research, selective learning, South–South.

1 Introduction

There is a long history of interaction between China's agricultural science and technology systems and global development knowledge platforms such as the CGIAR (formerly the Consultative Group on International Agricultural Research). Yet, insufficient attention has been given to the history of these relations and how they have shaped China's own capability and identity in the field of agricultural science. This article traces the history of China–CGIAR relations over a period of 50 years and explores how these have evolved over time. While China was previously regarded and treated as a recipient of international expertise, it is now a partner and contributor to the CGIAR, with capacity to provide funds, support exchange programmes for

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scientists, and collaborate in building joint laboratories and research programmes involving other Southern partners. By documenting the changing relationship between China and the CGIAR, the article offers an illustration of China's 'selective learning', with its emphasis on self-reliance and pragmatic development. This feature of China's development cooperation is relevant to the international community, particularly its partners in the global South.

The article draws on a review of secondary literature and semi-structured interviews with key informants in China, conducted between 2019 and 2021. The team interviewed 28 agricultural scientists, policy researchers, and managers, among whom 15 individuals were working at CGIAR centres and their partners in China. Secondary literature comprised academic papers, reports, and archival material retrieved from the CGIAR webpage.

The article is organised into six sections. Section 2 provides a historical overview of the CGIAR system, after which Section 3 considers China's international engagements and outlines its 'selective learning' approach. Section 4 describes the historical trajectory of China's relations with the CGIAR system. Section 5 explores three modalities of interaction: germplasm exchanges, training of talent, and institutionalised platforms for collaboration. Section 6 concludes by discussing how China's selective learning is now part of development knowledge networks in the global South.

2 A brief historical overview of the CGIAR system

The CGIAR system was established in 1971, building on the experiences with international germplasm exchange, collaborative research, and training programmes involving American scientists and philanthropic organisations, such as the Rockefeller and Ford foundations. Byerlee and Dubin (2009) highlight the significance of the Inter-American Food Crop Improvement Program and the creation of four international agricultural research centres (IARCs) in the 1960s: the International Rice Research Institute (IRRI) in the Philippines, the International Maize and Wheat Improvement Center (CIMMYT) in Mexico, and the international institutes for tropical agriculture in Colombia (CIAT) and Nigeria (IITA).

The perceived success of these centres fuelled interest in scaling up. The World Bank played a leading role in establishing the CGIAR as a 'loose group of initially 17 member countries, international organizations and foundations for funding agricultural research' (Byerlee and Dubin 2009: 456).[4] Additional centres were created over the years and CGIAR membership expanded geographically. China officially joined in 1984, although connections between Chinese scientists and IARCs started earlier. Today, the CGIAR comprises 15 IARCs.

Since its establishment, the CGIAR has focused on supporting developing countries to adopt modern agriculture technology and roll out the Green Revolution (CGIAR 1971). The development of modern technology involved two core competences: international germplasm exchange and training. Germplasm enhancement was regarded as the 'backbone of the Centers [*sic*.] success and impact' and where the IARCs' comparative advantages laid (Anderson 1998: 9). Added together, CGIAR centres hold the largest collection of crop germplasm in the world (Dalrymple 2008). Furthermore, investment in training helped to develop an *esprit de corps* (Anderson 1998; Byerlee and Dubin 2009), a defining mark for a mission-oriented institution.

In the field of agricultural science and technology, the CGIAR established itself as the leading source for global public goods (Dalrymple 2008) through training and 'open source collaboration' in the form of germplasm exchange and knowledge sharing (Byerlee and Dubin 2009). The centralisation of 'fundamental research' and germplasm collections in IARCs was seen as key to ensuring efficiencies through economies of scale and scope in knowledge production (Byerlee and Lynam 2020).

Though global in scope, links to developing countries' research systems provided the ground where technologies could be tested and ultimately applied. Yet, because of their stance as autonomous non-governmental entities, the CGIAR centres presumably avoided national 'political and bureaucratic interference in science' (*ibid*.: 2).

Throughout the 1990s, the creation of additional centres broadened the scope and geographical presence of the CGIAR. New centres for water, fish, forestry, and agroforestry were established and natural resource management became more prominent. But while the system widened and became more complex, funding did not follow suit, reflecting a broader decline of agricultural official development assistance (Eicher 2004).

Nominal funding to the CGIAR declined in real terms during the 1990s, becoming also restricted or earmarked (World Bank 2003). The increase in restricted funding is thought to have transformed 'the CGIAR's authorizing environment from being science-driven to being donor-driven, and a shift in the System from producing global and regional public goods toward providing national and local services' (*ibid*.: 3). The reduced focus on enhancing crop productivity, seen as the system's core competence and comparative advantage, was questioned (*ibid*.).

Concerns over the CGIAR's mission crisis, financial sustainability, and global versus national focus, provide the backdrop in which China's engagement unfolds.

3 China's international engagements and 'selective learning'

Since the turn of the century, China's internationalisation intensified as part of a 'going out' strategy, which encouraged Chinese enterprises to do business abroad (Alden 2007; Wang 2016). Trade and foreign direct investment with other developing nations have seen unprecedented expansion (Tang 2020). This is illustrated by the Belt and Road Initiative (BRI), a transport and communications infrastructure development programme of global scale, launched in 2013 to help developing nations grow while improving China's access to resources and markets within a 'win–win' framework. Although there have been concerns about the BRI's impact on developing countries' debt and environmental sustainability (Teo *et al*. 2019; Were 2018), China's White Paper on international cooperation sees it as a 'major platform for international development cooperation' and the 'significant public goods China offers to the whole world' (SCIO 2021: 7).

Technology trade and scientific and technical cooperation have long been important elements of China's South–South relations (Brautigam 1998). These include placements for Chinese experts in developing countries, through bilateral cooperation or via organisations such as UNDP or the Food and Agriculture Organization of the United Nations (FAO). Furthermore, the 2006 Forum on China–Africa Cooperation (FOCAC) launched Agricultural Technology Demonstration Centres (ATDCs) (Brautigam and Tang 2009), offering a hybrid of aid and business through public–private partnerships combining state provision of public goods with private management for financial sustainability (Tang *et al*. 2015; Xu *et al*. 2016).

So, what defines China's development cooperation? Debates often frame the Chinese model as the 'Beijing Consensus', in opposition to the 'Washington Consensus' associated with neoliberal development policies spearheaded by the Bretton Woods institutions (Ramo 2004).[5] This framing has been challenged as a foreign creation that inaccurately represents differences between models and for 'overstating how far China diverges from standard economic theory' (Kennedy 2010: 475). The Beijing Consensus thesis has also been criticised for misleadingly suggesting the existence of a singular China model. Tang (2020) argues that China's international engagements have shown that there is no generalisable model but that solutions are adjusted to contexts in a pragmatic manner. Tang defines this approach as 'co-evolutionary pragmatism', departing from the market–state binary to emphasise distinct pathways towards the goal of economic development. Taking development as a learning process (Lin and Wang 2008), developing countries need to set their own priorities. During the learning process, improvisation and innovation are needed to explore solutions adapted to local realities in a pragmatic manner, rather than following orthodox recipes. The development process is therefore not linear but a winding pathway.

Our notion of 'selective learning' captures the emphasis on development ownership and pragmatic development. These two ideas originate from China's own trajectory and its own process of learning from the international community and are now embedded in China's development policy and discourse. The emphasis on ownership links to the diplomacy of non-interference and Southern self-reliance that originated at the 1955 Bandung Conference on South–South solidarity (Ndlovu-Gatsheni and Tafira 2018). China is also sensitive to external interference due to its prior experience of dependence from Western powers in the nineteenth century. It thus avoids imposing on other countries what it does not want for itself.[6]

While the extent to which these principles hold in practice has been debated (Aidoo and Hess 2015; Okolo 2015; Po and Sims 2021; Verhoeven 2014), China's White Paper on international cooperation emphasises 'respecting each other as equals' as a guiding principle (SCIO 2021: 7). Also, the principle of 'providing the means for independent development' conveys similar meaning and highlights self-reliance through learning via joint work and capacity-building activities such as the training of talent and technicians 'to empower them to tap their own potential for diversified, independent and sustainable development' (*ibid*.: 8).

China's pragmatic development means working with partners to advance economic development with no pre-established blueprint and 'regardless of whether its [partner] political regime is authoritarian or democratic' (Aidoo and Hess 2015: 110). In this, China is seen as differing from Western development approaches that often seek to reform socio-political systems in partner countries (Gu, Li and Zhang, this *IDS Bulletin*). Tang argues that 'China was able to develop by promoting market economy and international trade while maintaining a sociopolitical system different from the West' and this experience informs its approach when engaging with other Southern nations. Hence, the pathway can be varied provided it leads to the ultimate goal: 'It doesn't matter whether the cat is black or white, as long as it catches mice' (Tang 2020: 7, citing Deng Xiaoping).

The combination of development ownership/self-reliance and pragmatic development, or 'selective learning', is an approach that has defined China's own domestic development process (and how it learned from other countries) and now informs its international engagements with other countries and institutions. Xu and Li talk about a 'closing-gap experience sharing' approach in China–Africa relations, which entails promoting 'heuristic learning under equal relationship between peers and shaping a new image of African development' (2020: 117).[7]

4 Half a century of China's engagement with the CGIAR in two stages

In China, the CGIAR is regarded as an international reference for agricultural science and technology. Chinese officials and scientists often refer to it as the 'World Academy of Agricultural Sciences', the international equivalent of the Chinese Academy of Agricultural Sciences (CAAS), the prestigious science institution that formally hosted CGIAR centres in the country.

The interaction between China and the CGIAR started in the 1970s, although this was only formalised in 1984 when China became a member. China currently holds Memoranda of Understanding (MoUs) with 13 CGIAR centres, and seven of these currently have registered offices in China.

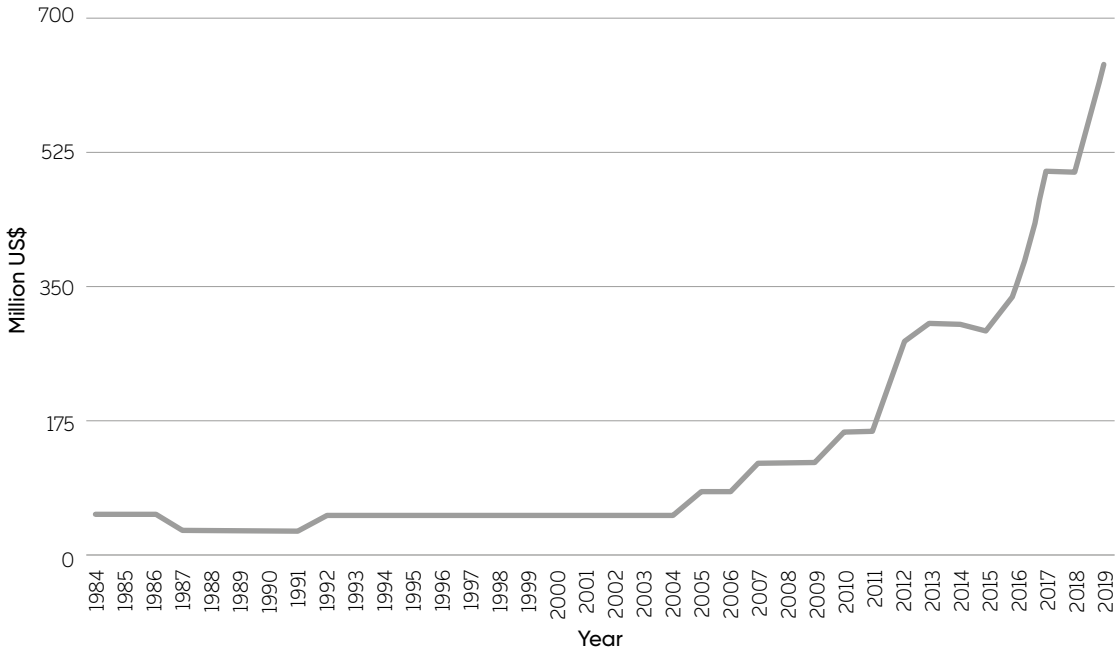
Over this past half century, China's interaction with the CGIAR has undergone two main stages. The first stage corresponds to the period between the 1970s and 1990s, when China was primarily a recipient of international agricultural science resources and expertise. The CGIAR provided significant contributions to China, particularly for non-staple crop research. These contributions intensified during China's market-oriented reforms, from the early 1980s. The second stage started in the new century, particularly after 2007–08, when the CGIAR initiated structural reforms and China increased its financial contributions. In this current stage, China has become more active and assertive by setting up a coordination office, establishing joint laboratories, and initiating joint programmes (Cabral, Pandey and Xu 2021). The following sections outline this trajectory.

4.1 Stage one: China as recipient of expertise and resources

In the early 1970s, a Chinese delegation participated in a FAO-hosted conference in Manila where the President of the Philippines showcased seeds developed by IRRI. Germplasm exchanges between China and the CGIAR began to sprout. With the inspiration of hybrid practices and its benefits, the three-line indica hybrid rice was completed in 1973 by Yuan Longping and his team,[8] and the hybrid rice production system was formally established. Productivity for hybrid rice was 10 per cent higher than for conventional rice, resulting in a qualitative leap for China's rice industry. The introduction of wheat, potato, corn, and other crop varieties greatly increased the average output of food crops and set the foundations for the breeding of China's main crops.

Scientific cooperation started off from personal connections established during those early visits. A delegation from the CAAS visited CIMMYT for the first time in 1974 and an IRRI delegation travelled to China in 1976. In 1977, IRRI and the Chinese Ministry of Agriculture signed an MoU and the CAAS and IRRI jointly convened a biennial meeting for germplasm exchange. Institutional cooperation comprised crop improvement, biotechnology, integrated pest management, natural resource

Figure 1 China's annual contributions to the CGIAR, 1984–2019



Source Authors' own, based on information provided by a CGIAR respondent in an interview, Beijing, 2020.

management, rice field environmental monitoring, farming systems, information exchanges, and training. In 1982, IRRI and the CAAS launched a collaborative research and training programme. In 1983, a Chinese delegation participated in the CGIAR annual meeting and China became a member the following year.

During this first period, collaborations between CGIAR centres and China comprised germplasm resource exchange and training Chinese scientists. Through these collaborations, the Chinese government encouraged the modernisation of domestic research systems and gradually transformed sporadic exchanges into institutionalised platforms for cooperation.

4.2 Stage two: China as partner and contributor

In the second stage, China's engagement with the CGIAR changed from being a recipient to becoming a more active partner and contributor. This coincides with a significant increase in China's financial contributions, particularly from 2007 (see Figure 1), in a context of sustained economic growth (Vincelette *et al.* 2010).

China gradually developed closer and broader cooperation with the CGIAR, mainly through: (1) the establishment of a joint laboratory system with the CAAS; and (2) the launch of a joint agricultural science and technology programme with the National Natural Science Foundation of China (NSFC)[9] (Han, Yan and Wang 2018).

Several CGIAR centres set up offices in China (CAAS 2017). Also, the NSFC and CIMMYT signed a cooperation agreement in 1999 and, between 2001 and 2007, NSFC–CGIAR research projects increased from seven to 17 (Han *et al*. 2018).

This stage is also marked by a problem-focused approach, reflecting China's pragmatic and more targeted engagement with international research, which resulted in cooperation between CGIAR centres and local academies of agricultural sciences to address challenges in China. For example, in 2004, CIAT, the International Food Policy Research Institute (IFPRI), and the CAAS jointly developed the 'China Crop Nutrition Fortification Project' to promote the cultivation of high-β-carotene sweet potatoes and high-zinc wheat in Sichuan, Chongqing City, and other regions: varieties such as 'Zhongmai 175' and high-speed rice 'Zhongguangxiang No. 1' sought to address nutritional deficiencies in poor areas. In 2008, following a devastating earthquake in Sichuan province, the International Potato Center (CIP), the CAAS, the Sichuan Academy of Agricultural Sciences, the Heilongjiang Academy of Agricultural Sciences, and other scientific institutions implemented the 'Sichuan Potato Post-Disaster Aid Project'. This introduced and promoted new varieties, such as virus-free seed potatoes,[10] and new technologies, such as mist culture,[11] which enabled the Sichuan potato industry to recover.

With the backdrop of the CGIAR reform, the establishment of the China–CIP Center for Asia and the Pacific (CCCAP) in 2008 illustrates a transition towards a more high-level, coordinated, and outward-looking mode of engagement by Chinese institutions. After the CGIAR reform was completed in 2011, the NSFC co-funded research with five CGIAR centres. In 2012, the NSFC and the CGIAR signed a framework agreement that now covers all 15 CGIAR centres and focuses on cooperation with the CGIAR's core research areas in a coordinated fashion, in line with the One CGIAR initiative.[12]

Over this second period, Chinese scientists became involved in CGIAR governance. Three Chinese senior scientists have served as members of the CGIAR Executive Council, and 15 have taken on the role of director of CGIAR centres.[13]

5 China–CGIAR cooperation and new South–South platforms

To further illustrate the evolving China–CGIAR interaction, we consider three modalities of cooperation: germplasm exchanges, training of talent, and institutionalised platforms for collaboration. We discuss the consolidation of selective learning, where Chinese scientists emerge as partners standing on equal footing with their international peers at CGIAR centres, and where these platforms increasingly serve as mechanisms for transfer of expertise from China to other countries in the global South.

5.1 Germplasm exchange

Germplasm exchange marks the beginning of China–CGIAR relations and constitutes a pillar of China's modern agricultural science system. Following the early visit of the Chinese delegation to the Philippines, IRRI provided rice genetic resources to China, several of which have been actively promoted in China.[14] At present, 90 per cent of hybrid rice in China uses IRRI's restoring genes (International Cooperation Bureau of CAAS 2008). Besides rice, China obtained germplasm resources from various CGIAR centres for crops, which laid the foundations for breeding China's main crops, such as high-lysine corn, hybrid sorghum, peanuts, and high-quality wheat (*ibid*.).

China has also provided germplasm resources to CGIAR centres (*ibid*.). Between 1981 and 2000, China donated 7,778 copies of Chinese rice landraces and 35 copies of wild rice to the IRRI bank. The China National Rice Research Institute (CNRRI) and 12 provincial Academies of Agricultural Sciences have also participated in the International Network for Genetic Evaluation of Rice (INGER) and, over the past 20 years, Chinese scientists have been involved in evaluating more than 18,000 rice germplasms around the world.

5.2 Training of talent

The CGIAR has contributed to the formation of Chinese scientists. Since the 1980s, many Chinese scientists were trained at CGIAR centres, and later became the backbone of agricultural scientific research, teaching, and management. Some scholars have not only made contributions to agricultural science and technology, but have also worked on the development of agricultural policy in China and abroad through international cooperation.

Taking IRRI as an example, this CGIAR centre signed an MoU with the Chinese Ministry of Agriculture in 1977 and began collaborating with the CAAS from 1982 on research and training. Between 1984 and 2008, IRRI supported the participation of 700 Chinese scientists in international conferences, seminars, and training (International Cooperation Bureau of CAAS 2008). It also provided postgraduate training to 105 Chinese students, and non-degree training to 225. In addition, IRRI scientists conducted more than 500 visits to China and engaged in collaborative research and teaching activities in China. Renowned Chinese rice scientists, such as Yuan Longping, Xie Huaan, and He Cheng Jian, spent time working at IRRI at different points in their careers.

China's hybrid rice achievements encapsulate the efforts of generations of Chinese scientists and the significance of international collaborations with the CGIAR. In the mid-1970s, China was the first country to successfully cultivate hybrid rice under temperate conditions (Tang and Ding 2002). Between 1986 and 1996, 'Shanyou 63' was the main rice variety planted in China,

which covered a total of 52.7m ha in 1996 (Xie and Zheng 1996). Although the yields success of 'Shanyou 63' is seen as the result of several factors (including the use of agrochemicals), studies highlight the role played by scientific research on crop improvement and germplasm exchanges with IRRI (Cheng and Liao 1998; Xie and Zheng 1996).

These achievements contributed to a more confident engagement of Chinese scientists in international knowledge networks. As a result, Chinese institutions gradually adopted a more active stance in the construction of platforms for collaboration and reciprocal training. For example, the Asian Rice Biotechnology Network (ARBN) comprises IRRI, China, and four other countries. Also, Chinese scientists cooperated with IRRI to establish the International Rice Information System (IRIS), which provides germplasm parent and pedigree information. The extension of these knowledge networks builds on the gradual deepening of cooperation between China and the CGIAR and the growing contribution of Chinese scientists. Wang Ren, the first CGIAR Secretary-General of Chinese nationality, highlighted China's role in scientific cooperation:

> It is difficult for us to have the opportunity and conditions to express Chinese ideas and influence on major issues related to the development of international agriculture. The Chinese people should play a greater role on the world stage. (Duan 2008: 23–5)

But only recently has the capacity development of Chinese scientists become institutionalised. The CGIAR earmarks part of the donations from the Chinese government for training and capacity building. The CAAS and the CGIAR have implemented an exchange programme that places Chinese scientists with CGIAR centres on a regular basis.[15] This not only improves the CAAS's capacity but also promotes collaborative projects. In recognition of the CGIAR's contribution, the Chinese government issued 'Friendship Awards' to 11 CGIAR scientists and two centres between 1998 and 2001 (CIMMYT and IRRI).

The NSFC and the China Scholarship Council have also cooperated with the CGIAR on training. The China Scholarship Council signed an MoU with CIMMYT and IRRI for joint scholarships to sponsor Chinese scholars (about ten scientists annually). The CGIAR and the NSFC also hold an international cooperation agreement for joint research projects.

Training programmes have, therefore, become normalised, institutionalised, and widespread. There is also growing interest in creating opportunities for collaborative research between Chinese scientific institutions and IARCs.

5.3 Institutionalised platforms for international collaboration

China has become a more active contributor and partner of CGIAR centres since the turn of the century, as illustrated by the establishment of joint laboratories with CAAS institutes and collaborative research involving the NSFC. These are now leading to further collaborations with China's Southern partners (see Section 5.4).

Since 1999, the CGIAR and the CAAS have established a joint laboratory system to carry out collaborative research and technology extension. Ten joint laboratories were created with the eight research centres with offices in China (CAAS 2017).

The new mode of engagement entails collaborative research, as illustrated by the NSFC–CGIAR framework agreement. This emerged from the High-Level Forum on China–CGIAR cooperation hosted by the Ministry of Agriculture in Beijing in 1997. In 1999, the NSFC and CIMMYT signed a cooperation agreement for the first time, resulting in collaborative projects.[16] This led to further agreements involving IRRI and, later, the International Center for Biodiversity. After the CGIAR reform was completed in 2011, the NSFC jointly funded seven projects with five CGIAR centres. In 2012, the NSFC and the CGIAR reached a consensus on signing the NSFC–CGIAR framework agreement, which came into effect in 2013. Priority funding areas are jointly determined, and the review, approval, and management of projects is the responsibility of the Chinese side. Chinese scientists and technicians operate as project hosts and the CGIAR collaborates by jointly submitting project applications. The NSFC provides scientific research and personnel exchange funds for approved projects, whereas CGIAR centres provide financial support for the participation of CGIAR personnel and for training and learning (Han *et al*. 2018).

These spaces are part of an effort from China's research organisations to have a more institutionalised and coordinated interaction with the CGIAR. The opening of CGIAR offices in Beijing brought to light high transaction costs and coordination gaps between different centres, as well as their limited practical contributions to contemporary China's agricultural challenges.

> *In the early days, CGIAR centres played a key role in introducing new technologies and training scientists, yet now their comparative advantages have been greatly reduced in China's context. They increasingly focus on meetings, delivering presentations and writing papers. It looks fancy, yet the work effectiveness and outcomes are limited. It has become increasingly bureaucratic and over-burdened.* (Interview with staff member at CGIAR centre, Beijing, 2020)

Joint laboratories and framework agreements reflect the efforts to make these interactions more strategic and effective for China, and learning more selective from international organisations.

5.4 New South–South connections and knowledge platforms

International research collaborations have provided fertile ground for Chinese research systems to mature. Chinese experts are now engaging in South–South scientific cooperation, building new knowledge platforms based on their experiences with the CGIAR.

One example of new platforms is the CCCAP, which is expected to push forward joint research and extension on potatoes in China and the Asia-Pacific region (Lu and Xiu 2014). Furthermore, the CGIAR–CAAS joint laboratories provide not only a space for the continuation of training Chinese talent, but are also becoming channels for China to offer training and develop other collaborations and knowledge networks with Southern partners. China is also establishing additional international joint research centres and overseas bases, drawing on other international industry–university research networks. In June 2019, the Chinese Ministry of Science and Technology approved the first batch of 14 Belt and Road joint laboratories, including six in agricultural research.

China has extended the joint research model to China–Africa cooperation, assisting the construction of the Sino–Africa Joint Research Center (SAJOREC) and establishing a '10+10' cooperation mechanism for China–Africa agricultural science.[17] Since its establishment in 2013, SAJOREC has proposed more than 45 joint research projects across a range of themes, including biodiversity, pathogenic microorganism detection, remote sensing, and natural resource management (SAJOREC n.d.). It has also provided scholarships for African students to study in China and training for scientists and senior technicians from across Africa (*ibid*.).

China has also set up a national research plan and special projects dedicated to supporting international scientific and technological cooperation. The aim is to enhance capacity to facilitate global innovation, meeting the global goals while promoting the participation of Chinese businesses in international cooperation.

6 Conclusion

This article has reviewed the interaction between China and the CGIAR over the past 50 years and identified two stages in this relationship. The first stage features China largely as a recipient of resources and expertise, particularly in the context of market-oriented reforms (in China) and greater international exposure. During this formative stage, the interaction comprised germplasm exchanges, cultivation of new crop varieties in China, and training and mentoring of Chinese scientists. The second stage has unfolded in a context of China's economic ascendency and intensified contributions to global development (Alden 2007; Carmody 2013). During this stage, there has been a gradual assertion of Chinese scientists and scientific institutions within

the CGIAR (at a time of stagnant CGIAR funding), as well as in other international spaces through new Southern platforms for collaboration. China's more active and strategic engagement with the CGIAR fits a trend towards increasingly earmarked CGIAR funding. This is also happening alongside intensifying South–South cooperation activities (Mawdsley 2012; Scoones *et al.* 2016).

Over this period, we can trace the formation and practice of China's 'selective learning' in agricultural science, followed by its extension to other countries through South–South cooperation. Selective learning is defined by emphases in ownership (or self-reliance) and pragmatic development that have long guided China's own trajectory (Tang 2020). The approach emerged from interacting with international organisations, such as the CGIAR centres. In the first stage, China's selective learning entailed an emphasis on the training of talent (who would later lead research projects and institutions) and focused on germplasm exchanges, on the basis of which China gradually developed its national agricultural research system. In the second stage, when China began to actively 'go out', the principle of selective learning meant being more entrepreneurial and proactive in research collaborations, aligning these with China's own challenges, and building on accumulated competences and knowledge. China's pursuit of development ownership is visible in the push for more problem-driven cooperation, in line with the country's needs. Pragmatic development is reflected, in turn, in the joint laboratories with CGIAR centres and collaborative projects that are geared towards an exploration of multiple pathways to economic development, and which establish new knowledge spaces involving multiple players, including diplomats, bureaucrats, and businesses, for scientific and technological innovation. The White Paper on international cooperation states that science and technology are the 'primary productive forces' and a key element in supporting endogenous growth by developing countries (SCIO 2021: 40). These global science and technology initiatives are being extended to include Southern knowledge networks and spaces, diversifying the existing international development regime and knowledge pool.

While links to prestigious and well-established knowledge networks such as the CGIAR centres continue to be highly prized spaces for the formation of Chinese talent and cutting-edge knowledge production, China is also enabling the construction of new platforms for collaborative scientific research and technological innovation together with other nations. While these build on the learnings of five decades of collaboration with the CGIAR, they bring on board Southern partners and connections, convened by Chinese scientists and research institutions in their own right.

It is too early to say whether these new initiatives will lead to a reconfiguration of global agricultural research systems

and knowledge networks. Further research should explore the extent to which China's heightened international engagement and domestic capability is transforming established systems and opening up new pathways for global agricultural science, including creating channels in the South for the circulation of ideas, and the exchange of people and germplasm resources.

Drawing implications for international cooperation relations, our analysis suggests that foreign assistance, if well selected and adapted to specific needs of recipient countries, can contribute to building their domestic capabilities and enable the choice of development trajectories that suit them. China as a South–South cooperation provider emphasises partner ownership and self-sufficiency through capacity development that can enable endogenous development trajectories. How China's 'selective learning' is interpreted by other Southern countries and whether it is taken up as a distinctive approach to development learning that they can apply on their own terms are questions that warrant further investigation.

Notes

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4 The first meeting of the CGIAR, held in May 1971, listed the following countries and organisations as members: Canada, Denmark, France, the Federal Republic of Germany, the Netherlands, Norway, Sweden, the United Kingdom, the United States, the African Development Bank, FAO, the Inter-American Development Bank, the International Bank for Reconstruction

and Development (the World Bank), the United Nations Development Programme (UNDP), Ford Foundation, the International Development Research Centre (IDRC), the Kellogg Foundation, and the Rockefeller Foundation (CGIAR 1971).

5 Ramo's notion of the Beijing Consensus centres on three presumably distinctive and central features of China's economic model: (1) innovation-based development; (2) economic success measured not by growth alone but by equitable distribution of wealth and environmental sustainability; and (3) self-determination *vis-à-vis* the United States' hegemony.

6 As Confucius put it: 'Do not impose on others what you yourself do not desire'.

7 Specifically, this approach comprises three elements: (1) drawing on experiences already practised; (2) mobilising actors that worked directly with those experiences to find solutions with local partners to tackle on-site development challenges; and (3) peer-to-peer experience sharing (Xu and Li 2020).

8 The successful completion of the 'three-line' hybrid rice was the result of years of research by a team of Chinese scientists led by Yuan Longping. The three-line matching system was announced as successful at the National Rice Scientific Research Conference in 1973.

9 The NSFC is the organisation responsible for coordinating funding to support basic research and foster scientific talent, and ultimately promote progress in science and technology for China's socioeconomic development. Since 2018, the NSFC sits under the Ministry of Science and Technology.

10 This refers to the virus-free or rarely virus-infected seed potato obtained after implementing a series of technical measures to remove the virus in the potato block. It has the advantages of early maturity, high yield, and good quality.

11 Mist culture is a new type of soil-less cultivation. It uses a spray device to atomise the nutrient solution into small droplets, which are directly applied to plant roots to provide water and nutrients.

12 One CGIAR is an internal initiative to promote greater integration across CGIAR centres in recognition of the interconnectedness of sustainable development challenges.

13 For example, Wang Ren was the Deputy Director General of IRRI in 2000–07 and Shenggen Fan was the Director General of IFPRI in 2009–19.

14 IR varieties from IRRI (such as IR24, IR26, IR30, IR50, IR64, IR9761-19-1) have become the most important restorer lines and parents of hybrid rice in China.

15 In 2019 alone, these included placements with CIMMYT, IFPRI, the International Livestock Research Institute (ILRI), World Agroforestry (ICRAF), and Biodiversity International (interview with staff member at a CGIAR centre, Beijing, 2020).

16 The NSFC Life Sciences Department subsidises about 35 projects on rice physiology, nutrition, pathology, genetics,

and other aspects every year, and actively promotes cooperation and exchanges with IRRI.

17 This refers to the 'Ten Major Cooperation Plans' of the Sixth Ministerial Conference of the Forum on China–Africa Cooperation held in Johannesburg in 2015. Based on current China–Africa agricultural cooperation projects, China and Africa will each select ten agricultural research institutions to establish a cooperation mechanism (MOFCOM 2015).

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