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Trilateral cooperation in agriculture

Achievements and lessons from AgriTT

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About the project

The Working in Partnership for Agricultural Technology Transfer (AgriTT) programme was a pioneering trilateral agriculture partnership between the governments of the UK, China, Uganda and Malawi, and the Forum on Agricultural Research in Africa. The AgriTT programme ran between 2012 and 2017, and was managed by Landell Mills Ltd (www.landell-mills.com).

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About this study

Investment in African agriculture remains well below average global levels and currently falls short of achieving the United Nation's 'Global Goals for Sustainable Development'. There is growing interest in the potential for trilateral development cooperation to promote learning and accelerate agricultural technology transfer. While the benefits of trilateral partnerships are often talked about in theoretical terms, there is very little empirical evidence exploring how they work in practice. This study aims to address this gap through a study of the Working in Partnership for Agricultural Technology Transfer (AgriTT) programme, which ran between 2012 and 2017. AgriTT was a pioneering trilateral agriculture partnership between the governments of the UK, China, and Uganda and Malawi, and the Forum on Agricultural Research in Africa. The programme worked through pilot projects, collaborative research and knowledge sharing activities. This study largely focuses on two pilot projects which aimed to transfer appropriate Chinese agricultural technologies (in cassava and tilapia) from production to processing and value adding in order to improve agricultural productivity and food security in Africa. This study involved fieldwork in China, Uganda and Malawi, interviews with over 120 project stakeholders, as well as consultation of primary and secondary sources. The report reviews the achievements and challenges of the pilot projects and finds that though the initial transaction costs of setting up appropriate management and finance systems is high in trilateral cooperation, there are potential opportunities for efficiency gains in longer-term, multi-phased projects. Furthermore, evidence presented on the benefits of this innovative partnership model, including joint learning and formation of horizontal relationships, makes a strong case for more investment in this area. The report concludes with recommendations for future trilateral cooperation and agriculture technology transfer in developing countries.

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Contents

About this study	1
Acknowledgements	2
Abbreviations and acronyms	4
Executive Summary	6
1. Overview: trilateral cooperation and AgriTT	10
1.1 The potential of trilateral cooperation in the context of China's agricultural aid in Africa	10
1.2 The AgriTT programme	11
2. Impacts of AgriTT	25
2.1 Assessment approach	25
2.2 Achieving successful transfer of Chinese technologies	27
2.3 Integrating technologies throughout value chains	35
2.4 Improving aid effectiveness through UK involvement	39
2.5 Sustaining long-lasting impacts	41
3. Challenges and responses	45
3.1 Managing coordination challenges and external constraints	45
3.2 Procuring appropriate technologies	54
3.3 Being realistic about project beneficiaries	56
4. Lessons for trilateral aid partnerships	63
4.1 How to engage	63
4.2 How long to engage	64
4.3 With whom to engage	65
4.4 How to ensure sustainability	66
4.5 Next Steps	67
References	68
Annex 1: Key partners and their roles in the AgriTT pilot projects	70
Annex 2: Key activities of AgriTT pilot projects	72
Annex 3: Interviewees	74
Annex 4: Questionnaire	78

Abbreviations and acronyms

AfrII	Africa Innovations Institute
AgriTT	Agricultural Technology Transfer: Working in Partnership to Accelerate Technology Transfer
ATDC	Agricultural Technology Demonstration Centre (under Chinese bilateral aid)
CAU	China Agriculture University
CATAS	Tropical Crops Genetic Resources Institute, Chinese Academy of Tropical Agricultural Sciences, Hainan
C:AVA	Cassava: Adding Value for Africa
DAC	Development Assistance Committee
DFID	Department for International Development (UK)
DPO	District Project Officer
DoF	Department of Fisheries (Malawi)
FAO	Food and Agriculture Organisation (UN)
FECC	Foreign Economic Cooperation Centre, Division of International Cooperation, Ministry of Agriculture (China)
FFRC	Freshwater Fisheries Research Center (Wuxi, China)
FOCAC	Forum on China-Africa Cooperation
HQCF	High quality cassava flour
LUANAR	Lilongwe University of Agriculture and Natural Resources (Malawi)
MAAIF	Ministry of Agriculture, Animal Industries and Fisheries (Uganda)
MAFS	Ministry of Agriculture and Food Security (Malawi)
M&E	Monitoring & Evaluation
MOA	Ministry of Agriculture (China)
MOFCOM	Ministry of Commerce (China)
MOU	Memorandum of Understanding
MU	Makerere University (Uganda)
NAC	National Aquaculture Centre, Domasi (Malawi)
NARO	National Agricultural Research Organisation (Uganda)
NASP	National Aquaculture Strategic Plan (Malawi)
NRI	Natural Resources Institute (UK)
OECD	Organisation for Economic Cooperation and Development
PKF	Private firm serving as managers for AgriTT budgets in Uganda
PMO	Programme Management Office and Officer (China and UK)
RCF	Research Challenge Fund
SC	Steering Committee
SPFS	FAO's Special Program for Food Security
SSC	South-South Cooperation

TA	Technical assistant/assistance
UIBE	University of International Business and Economics (China)
UNDP	United Nations Development Programme
WHO	World Health Organisation

Executive Summary

Boosting agriculture productivity is one of the most effective ways of addressing global poverty and food and nutrition security. China's agricultural transformation since the 1980s has created a wealth of experiences in technology development and deployment. Developing countries, particularly in Africa, have increasingly sought this experience from China—and Chinese actors have been eager to share. At the same time, the United Kingdom has long engaged in African agriculture, and has developed a strong understanding of how to develop enabling environments for policy and regulations that support sustainable agriculture and deliver effective aid.

Despite these efforts, investment in African agriculture remains well below average global levels, and current efforts fall short of achieving the United Nation's 'Global Goals for Sustainable Development'. Within this context, there is growing interest in the potential for trilateral development cooperation to promote learning and accelerate agricultural technology transfer. While the benefits of trilateral partnerships are often talked about in theoretical terms, there is very little empirical evidence exploring how they work in practice.

The Working in Partnership for Agricultural Technology Transfer (AgriTT) programme was established in 2012 to build on the complementary strengths of diverse development partners through three-way (trilateral) government-to-government partnerships involving the UK, China, and Uganda and Malawi. The programme's aim was to transfer appropriate Chinese agricultural technologies from production to processing and value adding in order to improve agricultural productivity and food security. It worked to achieve this through collaborative research, pilot programmes and knowledge-sharing activities.

AgriTT is one of the first experiences of trilateral aid engagement with China, and as such has attracted significant interest from global audiences. This report, "Trilateral cooperation in agriculture: achievements and lessons from AgriTT", reviews the achievements and challenges of the programme, which concluded in March 2017, and reflects on lessons for future trilateral cooperation and agriculture technology transfer in developing countries.

Piloting technology transfer right along the value chain

This study focuses in particular on the experiences, achievements and challenges of the two AgriTT pilot development projects, implemented in Uganda and Malawi from 2012–2016. Research was led by a UK-based researcher with input from Chinese researchers in the Ministry of Agriculture and China Agriculture University, and guidance from AgriTT project management. Findings are based on key informant interviews with 123 stakeholders, field observations in two pilot projects, and written project materials and input from AgriTT staff as well as broader literature on trilateral partnerships and Africa-Britain-China aid.

In Uganda, the pilot aimed to demonstrate the viability of cassava — a widespread staple food crop in that country — as an industrial food commodity with many uses, transferring appropriate Chinese technology and enhancing capacity along the value chain. The pilot focused on three main components of the cassava value chain: 1) applying Chinese agronomic practices in cassava production, including mechanised agriculture; 2) improving cassava processing to reduce waste and produce high-quality cassava flour; 3) developing value-added products and investments in cassava businesses.

The Malawi pilot project aimed to improve and expand aquaculture practices for tilapia (a native fish) and to decrease the cost of production by increasing efficiency and lowering the costs of inputs such as feed and fingerlings. The pilot focused on three main components for improving the tilapia value chain: 1) improving fingerling production and quality; 2) commercialising and improving feed; and 3) improving the 'on-growing' stage of tilapia farming once fish leave the hatchery.

Through these pilots, AgriTT aimed to bring together Chinese technology experience with the UK's understanding of effective aid delivery in an integrated, whole-value-chain approach to technology transfer. The assumption behind this value-chain approach was that technological innovation alone is not enough to impact poverty – technologies also must be linked with producers, markets and consumers, and encourage added-value services.

What has AgriTT achieved?

AgriTT was an ambitious project operating within a complex environment. While agricultural technology transfer is always a challenging process, requiring patience, flexibility and time, the challenges of the AgriTT pilots were particularly daunting given the ambitious project design, the limited timeframe, and the innovative nature of both the partnerships and the holistic value-chain approach. Despite this, informants reflected that the programme did largely play to the distinct strengths of the UK, China, and Uganda and Malawi, allowing it to transfer appropriate agriculture technology for key points in the value chain in uniquely effective ways.

AgriTT project achievements: some highlights

Uganda: Mechanised ridged planting and good agricultural practices with cassava planting equipment imported from China resulted in yields three times typical conventional yields. Farmers were trained in agronomy, crop management, processing and business management. Co-investment with Farm Uganda in a batch drier cassava drying and processing technology. Two entrepreneurs were selected and given incubation support to produce cassava-based snacks and biscuits.

Malawi: Tilapia farmers were trained in making deeper and larger ponds, using higher stocking rates and all-male fingerlings, improved feed and feeding regimes, careful pond management, predation control and record keeping. Extruded-feed production equipment from China was also introduced by the project. Yields for the package of aquaculture technologies and practices have been particularly promising, reaching as much as 6 tonnes per hectare, compared to previous yields of around 1.2 tonnes per hectare.

Successful project approaches included study tours to allow Ugandan and Malawian stakeholders to see Chinese technology for cassava production and processing and aquaculture in action. Technical assistants (TAs) provided technical input and trained farmer groups in the use of these technologies, working with farmers to adapt technologies to their local context. The pilots were supported by collaborative research by Ugandan, Malawian, Chinese and UK partners. This ensured that processing technologies identified for co-investment by the private sector were viable and appropriate.

The project's achievements included tangible impacts which could be measured in a log frame (see box above), as well as less visible but equally transformational impacts. These include development of strong networks amongst those involved, suggesting that mutual learning and exchange will continue among China, the UK and the two African countries. It has transformed the way in which cassava and tilapia are perceived in the pilot countries – opening up previously unrealised commercialisation possibilities. In this way, AgriTT has carved out a unique role for the private sector within an aid programme. Informants for this research also suggested that AgriTT has also significantly contributed to a change in the Chinese government's view of trilateral aid cooperation – from scepticism to a new willingness to deliver aid through other emerging trilateral partnerships.

What are the main lessons for trilateral cooperation?

Though the achievements of the AgriTT pilots are impressive, the key lessons of this study relate to the process of uptake and transfer of these technologies. While many researchers have speculated about the potential benefits of trilateral partnerships, AgriTT was among the first to actually test trilateral modalities with China — and thus to generate insights from practice.

One of the cornerstones of the trilateral partnership model is a reliance on “Southern” technology. This is underpinned by the assumption that such technologies are more appropriate to the needs of developing countries. By contrast, technical input from high-income countries such as the UK can be costly and their technologies not always suitable for conditions in developing countries. At the same time, experience shows that on the Chinese side, technologies that may be suitable are not always transferred effectively; and there is limited research on how to adapt China's experience to specific regions and countries. Thus, there is an assumed crucial role for third countries such as the UK to play in successfully transferring and adapting those technologies to the local context.

Though there was a sense that AgriTT provided only limited time and resources for this necessary co-innovation, informants in this study largely endorsed both the value of Chinese agriculture technology and the key role for the UK in supporting its transfer to Uganda and Malawi. Many stakeholders pointed to the Chinese technical assistance as a key highlight of the AgriTT pilots, and described experiences of collaborative co-innovation of technologies. This contrasts with studies of other Chinese agricultural aid projects in Africa, in which beneficiaries have tended to emphasise communication barriers and other management problems that hinder technology transfer. This study found that AgriTT employed Chinese technical assistance in a way that mainly avoided this common problem.

Stakeholders across both projects also emphasised the crucial role that third countries such as the UK play in transferring technology from China to low-income countries — and thus, the value of the trilateral partnership model. Both African and Chinese stakeholders appreciated the UK's contribution of rigorous research to the pilots, grounded feasibility studies, and focus on designing interventions based on clear market demand.

In addition, Chinese stakeholders emphasised how the UK partners enhanced their capabilities for more demand-driven, professionally-managed development work; they described becoming more adept at setting project priorities and more effectively navigating demands of the recipient country. Furthermore, this study presents initial evidence that this learning about trilateral modalities is already having a policy influence within China, garnering hard-won support from the Chinese government for trilateral-aid cooperation.

Through AgriTT's pioneering experience in trilateral partnership for agriculture technology transfer, there are a number of significant learning points regarding how to engage, with whom to engage, and how to ensure that the outcomes are sustainable. Based on these, a number of key recommendations for future trilateral cooperation and agriculture technology transfer can be made.

How to engage

- **Ensure strong management support and coordination** staff on the ground, with clear communication based on common ground, and strong steering structures delegating decision-making at different levels.
- **Use study tours** to the source country to allow beneficiaries to observe technologies in their socio-economic and geo-political contexts, and integrate that learning to develop supportive structures for adopting the technologies in their home countries.
- **Use technical assistance** experts judiciously. Short, targeted interventions that keep work focused and cost-effective are sometimes the best way to deploy TA; at other times longer-term postings that allow for extended collaboration may be more appropriate.
- **Recruit TAs who combine grounded field experience, good communication skills, and patience** with technical expertise.

How long to engage

- **Build flexibility into project timeframes**, as delays are a common part of agriculture technology transfer and activities need to be flexible around planting seasons and other constraints.
- **Set realistic targets**, and strike a balance between short timeframes which allow for focus and a continual push to show results, and room for setting up systems and accommodating for delays.
- **Design longer-term, multi-phase projects** to allow for finding the right partnership arrangements and more integrated learning and lower the costs associated with setting up systems from scratch.

Who to engage with

- **Consider carefully the most effective role for each partner, drawing out the comparative advantage of each.**
- **Create and nurture effective linkages with multiple actors** — including the private sector—that play to the comparative advantages of each.

- **Build in rigorous analysis and shared learning** to avoid purchases that may not be sensible investments.
- **Ensure that needs of project beneficiaries are well identified and remain uppermost.**

How to ensure sustainability

- **Explicitly incorporate co-learning and adaptation of technologies into project designs**, creating time and funds to support this essential process for ensuring long-lasting impacts.
- **Actively invest in collaborative research for technology transfer and foster knowledge sharing on lessons learnt.**
- **Develop new forms of evaluation** to capture the full value-added of trilateral cooperation that go further than the traditional linear rubric of log frames and development results to capture other benefits such as joint learning, trust and horizontal partnerships.

1. Overview: trilateral cooperation and AgriTT

Enhancing agricultural productivity is one of the most effective ways to alleviate rural poverty. This has been demonstrated by China's agricultural transformation since the 1980s. Other regions of the world, however, have not realised their agriculture potential, and there is considerable interest among governments, researchers and practitioners in Africa, China and elsewhere in the most effective mechanisms for agricultural technology transfer to low-income countries.

In particular, there has been considerable interest in recent years in the model of trilateral cooperation to improve aid effectiveness. Trilateral cooperation generally refers to a partnership between three categories of development actors: 1) donors (either bilateral or multilateral) that are members of the Organisation for Economic Co-operation and Development (OECD) Development Assistance Committee (DAC); 2) pivotal countries; and 3) beneficiary countries (Grimm, 2011). The OECD, United Nations Development Programme (UNDP), the World Bank, and others have produced a plethora of literature exploring the potential benefits of this model, including its ability to contribute to achieving the Sustainable Development Goals (SDGs). The literature also surveys existing projects, and projects trends in trilateral cooperation (UNDP, 2017; OECD, 2017; Special Unit for South-South Co-operation, n.d).

Proponents argue that trilateral partnerships have the potential to bring together the best of different development actors, maximising international solidarity among developing and emerging economies in overcoming shared obstacles, while improving the quality of aid management by drawing on DAC donor experience. They can also transcend any divides between different types of cooperation (UNDP, 2016; OECD, 2016a and 2016b). Indeed, those involved in trilateral cooperation repeatedly point to the value added of this model in terms of reciprocity among partners, integrated political and technical exchange, collaborative use of resources and the opportunity for co-learning and generating innovative solutions to development challenges (OECD, 2016b and 2016c; OECD, 2013). In addition, trilateral cooperation can achieve better value-for-money through access to less expensive financing, cheaper procurement of materials for more appropriate technology, and lower labour costs (UN ECOSOC, 2008). This was the goal of the five-year Agriculture Technology Transfer Programme (AgriTT) – to tap into the potential offered by trilateral partnerships as a way to overcome some of the challenges and inefficiencies of existing agricultural technology transfer approaches.

Established in 2012, AgriTT was an innovative trilateral partnership funded by the UK Department for International Development (DFID) along with the governments of China, Malawi and Uganda. Its aim was to promote accelerated agricultural technology transfer to developing countries in order to improve agricultural productivity and the food security of low-income households. It aimed to achieve this through collaborative research, pilot projects and by sharing knowledge. With a focus on the pilot projects, this study provides an overview of this experience, the achievements and challenges, and reflects on lessons for future trilateral cooperation and agriculture technology transfer to low-income countries.

1.1 The potential of trilateral cooperation in the context of China's agricultural aid in Africa

Chinese actors are increasingly engaging in African agriculture. During the high-level Forum on China-Africa Cooperation (FOCAC) in late 2015, Chinese President Xi Jinping pledged US\$60 billion in 'funding support' to African countries. In this announcement, agricultural modernisation was identified as one of ten 'priority areas'. Through these efforts, Chinese leaders aim to help African countries 'break the three development bottlenecks — backward infrastructure, talent shortage and inadequate funds — in order to accelerate industrialisation and agricultural modernisation, and realise independent and sustainable development.' (FOCAC, 2015).¹

This new pledge builds on an array of existing engagements. As of the end of 2016, there were 21 Chinese units from 19 provinces working in agricultural technology-demonstration centres in 23 African

¹ See also China Daily (1 November 2016) Agricultural ties grow stronger. Available at: http://english.agri.gov.cn/news/dqnf/201601/t20160111_164522.htm

countries, with a total of 30 such centres planned. In addition to direct agricultural technology demonstration, support is provided for agricultural vocational education for Africans, including agricultural education and training programmes for African stakeholders in both China and Africa.² At the same time, the Chinese government continues to encourage investment by Chinese firms in the African agricultural sector in order to develop 'China-Africa agricultural industrial chains' (MOFCOM, 2016).

Despite China's active engagement, experience suggests that technologies that have worked well in China may not always transfer easily to Africa; local contexts in African countries provide a continuous challenge to even simple technology-transfer models (Buckley et al., 2017). Furthermore, the effectiveness of Chinese aid has not been systematically assessed, and often relies on the ad-hoc resourcefulness of aid experts and staff on the ground, with mixed results (Xu et al., 2016; see also Bräutigam, 2015; Bräutigam and Zhang, 2013; Buckley et al., 2017; Gu et al., 2016).

Because of these challenges, there has been increasing interest in exploring trilateral cooperation among China and international development agencies, including DFID (DFID, 2016). While the proponents of trilateral cooperation argue that partners could complement each other's strengths and increase the effectiveness of aid, there is limited systematic analysis of trilateral cooperation experience. Monitoring and evaluation systems for existing trilateral initiatives tend to focus on the timely completion of projects and may not capture the wider development impacts and value-added of the trilateral model (OECD, 2016a; UN ECOSOC, 2008). Furthermore, existing research does not provide enough information on the details of implementation of the projects, and how this model can realise the potential benefits in practice. For example, one recent review of good practice in trilateral cooperation led by UNDP presented a wide range of trilateral cooperation projects globally, but presented only successes and outcomes of the initiatives, and did not explore issues of cost or management or details of partnership arrangements (UNDP, 2016).

Chinese leaders have been reluctant to embrace trilateral aid cooperation, however, government offices, state-owned enterprises and universities have recently begun to explore some initiatives, particularly with various UN bodies. For example, in agriculture, they have been engaging in and funding the UN Food and Agriculture Organisation's (FAO) South-South Cooperation (SSC) initiative within the Special Program for Food Security (SPFS). This initiative promotes the transfer of agricultural techniques at the grassroots level (FAO, 2015).

While the effects of this SSC initiative under SPFS have not been systematically reviewed, an evaluation of the programme conducted in 2001 suggested that this trilateral model 'potentially allows developing countries to forge long-term interaction at an operational level, and to share scarce technical expertise ... at much lower costs than those associated with regular technical assistance programmes.' And further, that 'It potentially allows recipient countries to access critically required additional expertise while simultaneously exploiting other ways and means of building up the capacities of their own staff and institutions' (DFID China, 2012). However, the evaluation also identified some weaknesses of the initiative, including a 'mismatch of expertise with needs, inadequate local resources to facilitate the technology transfer and poor communication skills.' There is need, therefore, for more evidence and practical experience with trilateral partnerships to explore whether — and how — the potential benefits can be realised in practice. This study aims to contribute to this learning.

1.2 The AgriTT programme

In 2012 the UK Department for International Development, along with Chinese partners, began exploring the opportunity to develop a partnership to engage in trilateral cooperation on agricultural aid in developing countries. The aim was two-fold: to explore with Chinese partners new ways to deliver aid, and to deliver better agriculture technology transfer by bringing together three partners with different strengths. In this way, AgriTT aimed to work through a trilateral cooperation model to enhance South-South cooperation (SSC) between China and African countries.

The original business case for AgriTT, prepared by DFID China office, described the assumption underpinning AgriTT that trilateral cooperation would 'allow the introduction of appropriate, economically sound and innovative technologies in a participatory manner to small-scale farmers'

² See, for example, Tugendhat and Alemu (2016).

(DFID China, 2012). This, it continued, would ‘potentially allow developing countries to forge long-term interaction at an operational level, and to share scarce technical expertise ... at much lower costs than those associated with regular [high-income country-led] technical assistance programmes’. Further, ‘lessons from emerging economies such as China could be more pertinent to developing countries because they are “a better reflection of the current geo-economic and political landscape facing developing countries”.’

This rationale for the role of China based on its own agriculture success is a strong theme within the literature and policy narratives on SSC globally (Buckley, 2013; see also Kaplinsky, 2013). For example, the Vice-President of the Alliance for a Green Revolution in Africa argued that ‘Africa should learn from China’s experience to drive technical change through policy and institutional support’ (DFID China, 2012). Likewise, the Chinese Ministry of Commerce (MOFCOM) website explains, ‘As a major farming country, China is in possession of some production and management experience and practical technologies in agricultural development that are suitable for African countries’ (MOFCOM, 2016). A scoping study commissioned by DFID found that stakeholders across Africa, Britain and China saw a clear need for increased collaborative research and development in African agriculture, pointing specifically to the need for agricultural technology collaboration to support Africa’s agricultural transformation (DFID, 2016).

As a novel trilateral partnership, AgriTT aimed to fill a gap in existing bilateral aid from both the UK and China. On the UK side, technologies are not always suitable for conditions in developing countries, and technical input from high-income countries can be costly. On the Chinese side, technologies may be suitable but are not always transferred effectively; and there is limited research on how to adapt China’s experience to specific regions and countries.

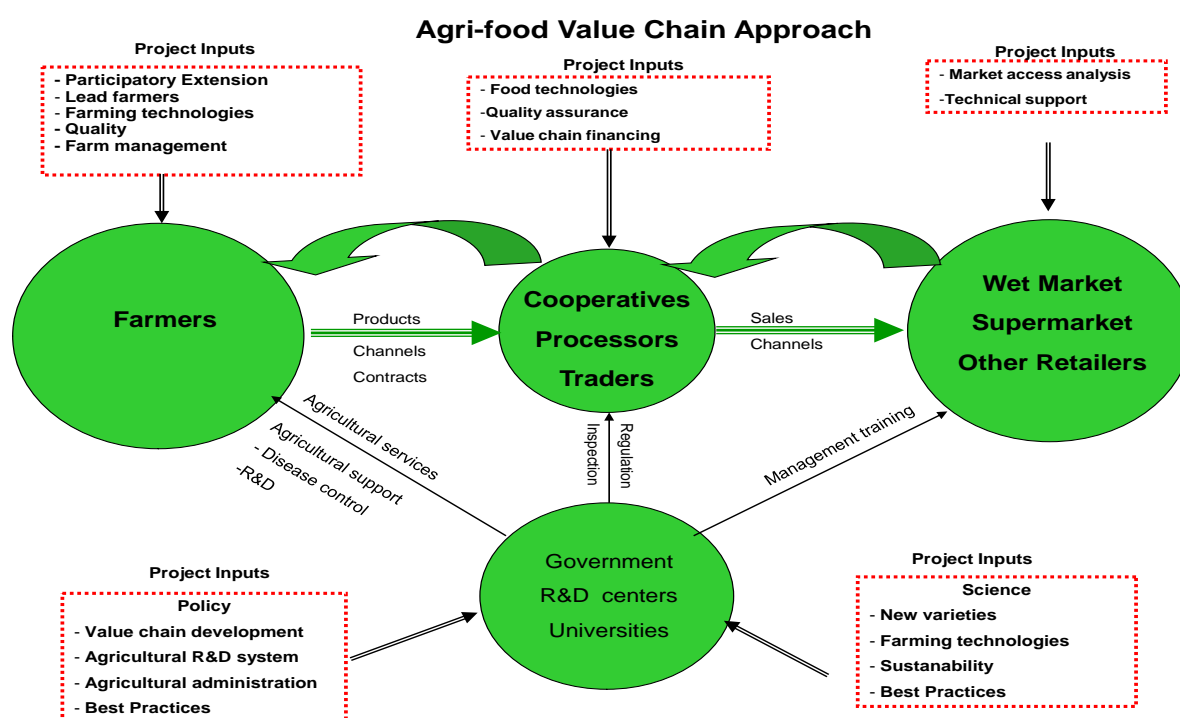
AgriTT also suggested the need for China and UK to work in partnership with African countries to explore ways to improve aid effectiveness together. As noted earlier, scholars and policy makers alike comment that China’s agriculture projects tend to focus heavily on technology transfer for production rather than on more integrated improvements to livelihoods and sustainability. Projects can often lack clear long-term objectives, and training can be ad-hoc, without strong integration into national policies (DFID China, 2012; Buckley, et al. 2017; FECC, 2016). They are also not monitored in ways that are publicly available.

The AgriTT project also proposed another unique dimension, which was to take a whole value-chain approach to technology transfer. Rather than simply focusing on technology for increasing agricultural productivity alone, it would focus on improvements along the entire value chain — linking producers, markets and consumers, and encouraging added-value services related to the new technologies. By so doing, ‘It addresses sustainability of food production. Even if farmers have improved skills to grow rice, they might not want to produce more if they do not have access to good harvesting and storage technologies, or good business-management skills’ (DFID China, 2012).

This focus was ideal for a trilateral partnership: in Chinese bilateral agricultural projects, the lack of clear long-term objectives linked to integrated livelihood improvements in a country can undermine the sustainable uptake of the technologies transferred. In contrast, the AgriTT business case argued, ‘how to develop the overall policy and regulatory enabling environment to support sustainable agriculture’ was a strong focus for UK agriculture aid, but it sometimes lacked access to appropriate technologies for developing countries. Thus AgriTT aimed to bring together Chinese technology experience with the UK’s understanding of sustainable livelihood development in an integrated, whole-value-chain approach to technology transfer in Africa.

The AgriTT business case further noted that this ‘holistic approach’ was already being gradually adopted by other development actors in developing countries. Private-sector actors were a particular target of this approach, as it was asserted that they ‘perform essential coordination work to link small farmers to markets and provide critical inputs such as seed, fertilizer, and feed to farmers. They also have technologies and management skills that can be transferred to farmers’ (DFID China, 2012). Figure 1 reproduces the agri-food value-chain approach presented in the original business case.

Figure 1. AgriTT agri-food value-chain approach



Source: DFID China (2012)

The AgriTT programme was formally established in 2012 as a three-year project to ‘facilitate the sharing of successful experience in agricultural development, especially from China, with developing countries in order to improve agricultural productivity and the food security of poor people.’¹³ To achieve this goal, the programme involved three main areas:

1. **Demonstration:** pilot projects in Uganda and Malawi disseminated sustainable agriculture knowledge, technology and management practices from China.
2. **Research:** a Research Challenge Fund provided two-year grants to support collaborative research among the three sides
3. **Communication:** activities to exchange knowledge through sharing lessons and promoting dialogue on agriculture technology transfer with decision makers, practitioners and others.

AgriTT set up formal partnerships with China’s Ministry of Agriculture (MOA) and Ministry of Commerce (MOFCOM); Uganda’s Ministry of Agriculture, Animal Industry and Fisheries (MAAIF); Malawi’s Department of Fisheries (DoF) in the Ministry of Agriculture, Irrigation and Water Development, and the Forum for Agricultural Research in Africa (FARA).

Implementation was managed by Landell Mills, a UK-based development consultancy firm, through a Programme Management Office based in China and the UK. There were just two AgriTT Programme Management Officers (PMOs), one in Beijing and one in the UK. They were responsible for the overall management of the programme, including managing the pilot projects remotely. Technical support for the Research Challenge Fund (RCF) was provided by a Technical Advisory Group composed of senior scientists and researchers. Annex 1 provides a summary description of all the partners and organisations involved.

The pilot projects and RCF were each governed by a Steering Committee consisting of members from the MoA and MOFCOM, DFID (Research and Evidence Division in London and DFID China), FARA, and key implementing partners in the pilot countries. The Steering Committee oversaw the programme through regular meetings and communication.

¹³ See the Landell Mills webpage, “About AgriTT”, <https://agritt.landellmillsprojects.com/about>

Because AgriTT aimed to bring governments together to explore ways to improve aid effectiveness, the programme required the lead partner in each pilot to be a government ministry. This had the advantage of ensuring that the pilot was integrated with the national strategy and it also provided stronger links for taking advantage of existing institutional mechanisms for scaling up. However, this arrangement also introduced some management challenges, discussed in Chapter 3.

1.2.1 Pilot projects in Uganda and Malawi

In the two pilot countries, a single commodity (cassava in Uganda and tilapia in Malawi) was chosen for its high potential to increase food security through improvements in technology along the value chain. The pilots were designed explicitly around demonstrating Chinese technologies – for cassava the focus was on Chinese mechanised production, processing and value addition linked with markets, while the Malawi tilapia pilot focused on developing markets and technologies for breeding and on-growing. This single commodity, value-chain approach set AgriTT apart from other agricultural aid in Africa, and was widely recognised among pilot project stakeholders as a unique strength of the programme.



AgriTT cassava demonstration field in Uganda⁴



Workers at NAC show tilapia growing in AgriTT demonstration pond in Malawi

⁴ All photos credit Lila Buckley unless otherwise noted.

Uganda: adding value to cassava

"Cassava is largely considered as a famine reserve. It is a very hardy crop, and people know how to grow it. There are actually lots of way to cook it, but we only have one way — we slice it and peel it and dry it. We dry it on bare ground, and then pound it by hand into flour. So there are a lot of stones and contamination in the food product. We need to send the message that there are limitless uses for cassava; that it can be a business, not just something you do on the side to fill your stomach." Cassava Desk Officer, MAAIF

In Uganda, while cassava is widespread as a food reserve crop, there is limited development along the value chain, and many of the local varieties succumb to cassava mosaic and cassava brown streak diseases, producing low-quality flour unsuitable for value-addition. In China, a strong market and quality research for cassava supports high yielding mechanised production and links farmers with industrial processing of cassava flour with many uses. The goal of the AgriTT pilot was to demonstrate the viability of cassava as an industrial food commodity in Uganda with many potential uses along the value chain. This was to be achieved by improving the quality and quantity of cassava production so as to increase market supply and make processing financially viable. The pilot focused on three main components of the cassava value chain: 1) applying Chinese agronomic practices in cassava *production*, including mechanised agriculture; 2) improving cassava *processing* to reduce waste and produce high-quality cassava flour; and 3) developing *value-added* products and incubating investments in cassava businesses.

For the first component, six demonstration sites and 37 'mother gardens' (nurseries to sustainably supply improved cassava) covering 145 hectares were established in four regions using an improved disease-resistant cassava variety, NASE-14, developed in Uganda by the National Agricultural Research Organisation (NARO). Mechanised planting equipment (including heavy furrow ploughs, rotary tillers, ridgers, wheeled planters and harvesters) was procured from China and transported to Kiryandongo district, and 93 technicians and farmers from 4 regions were trained by Chinese technical assistants (TAs) in Chinese agronomic practices for cassava.

Practices included preparing the land in ridges instead of planting in flat ground; using precise measurements for stem-cutting lengths; regulating planting distances, weeding and other field management approaches; as well as the use of machines for planting. For cassava processing, a business plan and co-investor were identified for procuring and installing batch drier technology, and Chinese chippers and processors were distributed to farmer groups. On the value-addition side, four kinds of cassava foods were developed, two of which — cassava high-energy biscuits and puffed cassava pops — were identified to be taken forward by investors.



Farmer in a cassava field planted with Chinese mechanised technology



Farmer shows large cassava tuber grown in AgriTT demonstration plot



Farmers show Chinese mechanised cassava planting equipment procured by AgriTT



Value-added cassava products developed through co-innovation between Chinese and Ugandan researchers

Malawi: introducing aquaculture for tilapia production

“Right now, people do aquaculture as a hobby; in the back of your house, you have a pond, you feed them when you want, not following any real methodology. It is not a business. The project has demonstrated the viability of aquaculture — that with proper fingerlings and proper feeding, you can really produce.” AgriTT Coordinator, Malawi

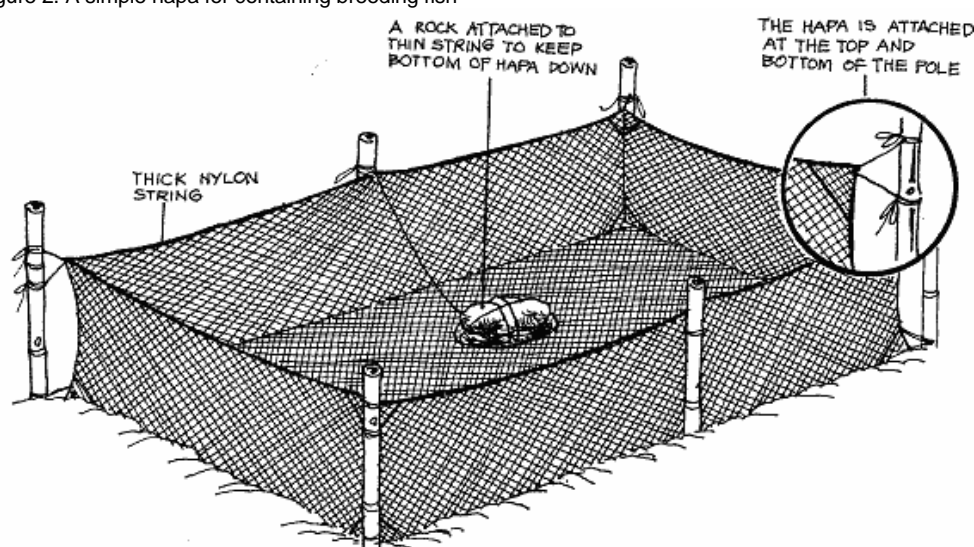
In Malawi, severe drought and overfishing have depleted wild fish sources. Tilapia, a freshwater fish native to Eastern Africa, is a preferred protein source in the country. However, demand surpasses supply. At the same time, aquaculture is a fledgling sector that promises to provide an important avenue for water harvesting and reducing vulnerability to drought. However, barriers include the high costs of inputs, limited support from government extension services, and lack of a developed market. China has one of the longest aquaculture traditions in the world, with extensive experience in optimal tilapia breeding, pond management, feeding and marketing.

The aim of the pilot was to draw on Chinese experience to improve and expand tilapia aquaculture practices in Malawi, and to decrease the cost of production by increasing efficiency and lowering the costs of inputs such as feed and fingerlings. The lead implementing partners were the Department of Fisheries (DoF) and Bunda College, Lilongwe University for Agriculture and Natural Resources (LUANAR). The pilot focused on three main components for improving the tilapia value chain: 1) improvement of fingerling production and quality; 2) commercialisation and improvement of feed; and 3) improvements to on-growing.

1) Improving fingerling production and quality

For this component, efforts focused on Chinese approaches to tilapia breeding and pond management, and increasing the number of fingerlings being produced in the government facilities of the National Aquaculture Centre (NAC) in Domasi and Kasinthula Agricultural Research Station, as well as in LUANAR. Infrastructure was renovated and expanded in all three facilities to support improved production of fingerlings; ponds were desilted and fenced and covered in plastic; and a greenhouse was constructed at NAC to make it possible to continue fingerling production in the cold season. Chinese TAs demonstrated practices for procuring breeders, using equipment (such as hapas; see Figure 2) for handling breeders and improving production of fry and fingerlings, and supporting nutrition for breeder fish.

Figure 2. A simple hapa for containing breeding fish



Source: Little *et al.* (n.d.)

2) Commercialising and improving feed

In this component, Chinese TAs worked with Malawian researchers and farmers to analyse and conduct experiments on existing feed formulations for starter, grower and finisher diets. Experiments were conducted to develop new formulations, including a focus on using local ingredients instead of

costly imported ingredients. Existing water tanks, filters and canals at LUANAR were renovated. Equipment was procured, and a feed facility was constructed to support production of new feed formulations at NAC.

3) Improving on-growing

For the third component, demonstrations were conducted in all partner facilities and 75 farmer demonstration households were engaged in on-growing production trials. The project realised an increase in survival rate of the fingerlings and an increase in on-growing growth rates. In addition, a training manual – a “Technical Manual for Tilapia Breeding” – was produced in collaboration with the Chinese TAs.

In addition to these activities within Uganda and Malawi, stakeholders from government, research bodies and farmers in both pilot countries participated in study tours to China, to learn more about the value chains for cassava and tilapia there. Annex 2 summarises key achievements within the planned activities of the pilot projects.



Hatchery facilities upgraded through the AgriTT pilot



Improved water tanks and ponds at LUANAR



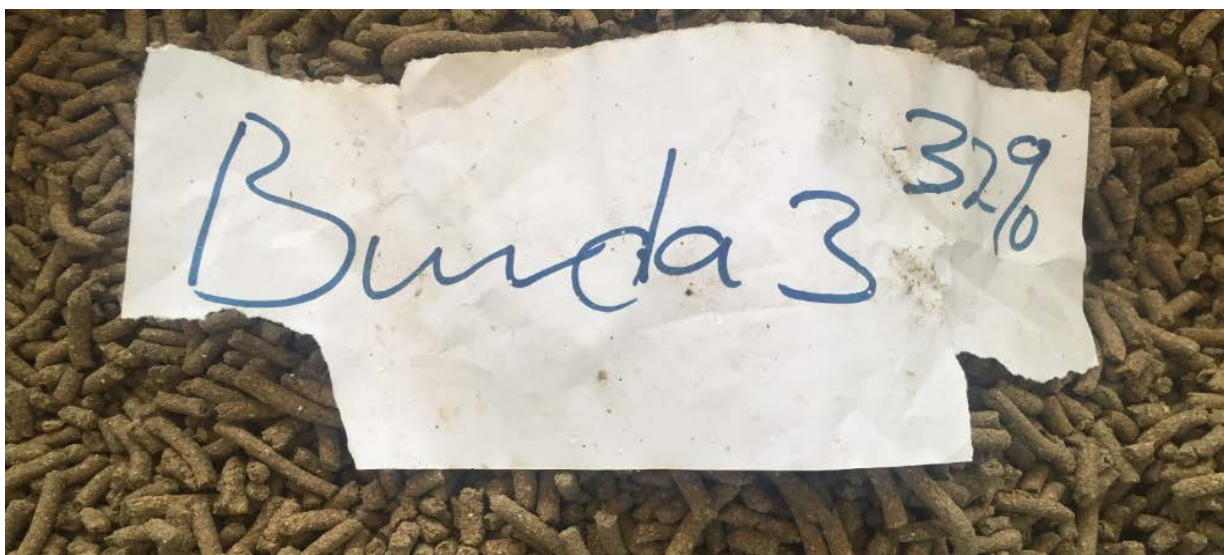
Pond based fingerling production at NAC



Workers at NAC wear Chinese waders procured by AgriTT



Deep large pond technology demonstration pond at NAC



One of many feed formulations developed for feed improvement experiments



Experimental hapas at Maldeco



A farmer shows his AgriTT demonstration pond with hapas



Farmer stands in fields irrigated with surplus water from the AgriTT demonstration pond (fenced on right)



Cooked tilapia

1.2.2 The Research Challenge Fund

While the focus of this study is on the pilot projects, it is important to note that AgriTT also included the Research Challenge Fund (RCF) and knowledge-exchange components simultaneously.

The RCF's overall objective was to support technology transfer through collaborative research with an applied focus. The fund was launched in May 2013 with a call for concept notes in three areas: 1) innovative agricultural technologies from China that can be developed and adapted for adoption in target developing countries; 2) effective value-chain development using proven innovations from China or elsewhere; and 3) innovation in knowledge-sharing and communication to enhance flows of information and knowledge. From a total of 126 concept notes received, 12 projects were selected in December 2013.

To ensure a trilateral character in the research, the RCF project teams were required to include one researcher from China, one from a developing country, and one from the UK. Researchers from other countries, or international organisations, could also join the team and even lead the research. Six projects were led by UK institutions, four by Chinese researchers, one by an African research institution, and one by an international institution.⁵ The time period for research was two years, from January 2014 until January 2016.

The RCF contributed new knowledge through collaborative research in all eleven projects, and in several projects the new knowledge was deemed outstanding in the final evaluation. This effort also contributed to building research capacity in developing countries, with at least 21 junior researchers playing an important role in the projects. Finally, the RCF contributed to the development of new partnerships that will continue beyond the life of the RCF itself, with at least three institutional memoranda of understanding signed by RCF partners for future collaboration (AgriTT, 2016).

1.2.3 Communication and knowledge exchange

AgriTT also aimed to establish a mechanism for exchanging information on technology-transfers and other experiences in developing countries, China and the UK. Two conferences on agricultural technology transfer were held, bringing together Chinese, African, UK and other international partners to share AgriTT's achievements and lessons, and to discuss strategic priorities for accelerating agricultural technology transfer to Africa. AgriTT also produced communication materials, including a video on African aquaculture, an AgriTT website, an AgriTT Briefing Series, and this present study. AgriTT experience was further disseminated through events, conferences and media communications such as the World Congress for Root Crops and Tubers, and through a knowledge-sharing session during African Agricultural Science Week. AgriTT also supported a study researching the perceptions of Chinese technicians posted to Africa under the FAO South-South Cooperation programme on the effectiveness of this mode of agricultural development assistance.



A Lead Specialist at FARA gives a presentation at a conference in China organised by AgriTT in 2015⁶

⁵ One of the twelve was terminated early due to slow progress in completion of milestones.

⁶ Photo credit: AgriTT

2. Impacts of AgriTT

“AgriTT has a key strength: It has brought science experts and businessmen to one single table to address a problem and identify opportunities. Normally, you just have a project going to the farmers and teaching them how to make pancakes, and then they leave. But AgriTT has started with the experts across science and business, then has brought in pilot technologies, which can now be taken to another level, to large-scale production.” Professor, Makerere University Kampala

AgriTT is the first experience of trilateral agricultural aid engagement involving a government-to-government partnership among the UK, China and African countries. As such, the AgriTT programme has attracted significant interest from a global audience. Interviewees in all countries and across stakeholder groups in this study repeatedly emphasized the innovative nature of this partnership. Many felt that the architecture of the programme effectively played on the distinct strengths of the UK, China and Uganda and Malawi, resulting in the challenges of agriculture technology transfer being addressed in uniquely effective ways. It has promoted an innovative, holistic value-chain approach to technology transfer, and enhanced African capacities through Chinese technical assistance. Perhaps most notably, AgriTT has garnered hard-won support by the Chinese government for trilateral aid cooperation.

As a pioneering trilateral effort, however, AgriTT presented many practical and logistical hurdles. Understanding the challenges, how they came about, how they differed in the two pilot locations, and how they were addressed and have affected the implementation process is the aim of this report.

This report is the outcome of an assessment study to explore the following key questions:

- What aspects of the pilot projects have gone particularly well, including key achievements? This is explored in this chapter.
- What challenges arose during implementation, and how were these addressed? This is discussed in Chapter 3.
- What improvements could be made in similar initiatives in the future? This is the focus of Chapter 4.

This report contributes to the knowledge sharing component of the AgriTT programme and aims to facilitate learning among AgriTT partners about the process of technology uptake in the pilots in both Uganda and Malawi, and key issues related to the transfer. In addition, the study aims to fill the gap in analysis of trilateral cooperation experiences mentioned in Chapter 1. It is hoped that this will contribute to informing wider stakeholders about the pros and cons of trilateral value-chain approaches to technology transfer, and support informed decision making for policy and practice in agriculture-technology transfer in future.

2.1 Assessment approach

The research was led by Senior Researcher Lila Buckley of the International Institute for Environment and Development (IIED). She was responsible for research design, fieldwork implementation in China, Uganda and Malawi, and final analysis and report write-up. Three other Chinese researchers, from the Foreign Economic Cooperation Centre (FECC) in the Division of International Cooperation of the Chinese Ministry of Agriculture and from China Agriculture University (CAU), also contributed research and reviewed the paper. From FECC, Dr Yin Yanfei participated in some of the fieldwork in Uganda and worked with colleague Dr Chen Ruijian to produce a background report (FECC, 2016). This compared lessons from AgriTT with other approaches to agriculture technology transfer, including South-South cooperation (SSC) and Agricultural Technology Demonstration Centres (ATDC). Finally, from the China Agriculture University (CAU), Professor Tang Lixia contributed a background report exploring Chinese stakeholder perceptions on AgriTT achievements and lessons, and supported reflections on the Malawi fieldwork.



Lila Buckley and Yin Yanfei interviewing farmers in Uganda



Local farmer and Chinese TAs show Lila Buckley an AgriTT pond in Malawi

Key informant interviews and field observations provided the main input for this study. Lila Buckley conducted research in China (two weeks), central and southern Malawi (two weeks) and Uganda (three weeks) between August and November 2016. The AgriTT Programme Management Office (PMO) provided support with logistics, while FECC accompanied part of the fieldwork in Uganda and CAU conducted some independent interviews in China.

During fieldwork, interviews were conducted with 123 key stakeholders in AgriTT (69 in Uganda; 25 in Malawi; 26 in China; and 3 in UK). These included key government partners such as DFID and the partner ministries in China, Uganda and Malawi; the contractor and Programme Management Officers (PMOs) in China and the UK; coordinators of the country pilots; Chinese technical experts from the Uganda and Malawi pilots; cassava and tilapia experts in China (Guangxi, Wuxi and Hainan); management partners in FECC; implementing partners in Uganda and Malawi; beneficiaries in Uganda and Malawi; and select key researchers involved in the AgriTT Research Challenge Fund (Annex 3 contains a full list of interviewees).

Interviews were conducted in English and Chinese, with some translation into local dialects for some farmer groups in Malawi and Uganda. All translations from Chinese into English are the author's own. Interviews were recorded whenever possible to increase accuracy of notation, but due to poor sound quality in some field conditions, coupled with possible inaccuracies in translation, quotes throughout this report should be considered approximate.

In addition to interviews and field observation, this report is informed by review of project documents and other relevant written materials, including: evidence on technology adaptation, adoption and innovation by key beneficiaries; monitoring data from quarterly reporting of pilots; key activity reports such as the Research Challenge Fund's (RCF) final report, Project Completion Reports and PMO Quarterly Reports; and data collected by technical assistance experts and implementing partners testing key technologies.

There are inherent limitations in research that involves rapid fieldwork and single-session open-ended interviews. While the research questionnaire (see Annex 4) comprehensively explored achievements and lessons learnt from the project, interviewees did not have opportunity to review and reflect on the questions before the interviews were conducted. Insights presented here cannot therefore be as deep as the actual lived experience of stakeholders interviewed, or perhaps as deep as they might have been upon further reflection. Furthermore, field observations were brief and time-bound, resulting in a narrow view of the 'reality' on the ground in the pilot project sites. A few key stakeholders and key site locations were missed entirely due to travel and time limitations. For example, beneficiaries were more geographically spread out and field time was shorter in Malawi, limiting the number of interviews and sites visited and therefore the depth of understanding of the Malawi pilot compared to that of Uganda. Finally, the timing of the research in mid-2016 may have been too premature to allow sufficient reflection on key lessons learned.

The researchers worked to mitigate these limitations by involving a team of known partners with a proven track record in this field. The lead researcher worked closely with AgriTT staff on the ground in Uganda, Malawi and China to coordinate logistics and facilitate introductions to key stakeholders. She also reached out to key stakeholders missed during fieldwork through video and phone interviews. Furthermore, she maintained strong communication with the AgriTT PMO throughout the research, to strengthen analysis, update key data, and ensure the accuracy and usefulness of the final report. An early draft of the report was also circulated for review among key informants to substantiate its accuracy.

Nevertheless, the findings of this study should be interpreted in the context of the limitations mentioned above.

2.2 Achieving successful transfer of Chinese technologies

The key objective of AgriTT was to take a value-chain approach to the uptake of Chinese technologies in agriculture. There have been clear achievements in both pilot countries (see Annex 2 for a more detailed list):

- In Uganda, Chinese TAs provided technical input on: cassava agronomy, planting, processing, and value-addition, and trained farmer groups from four project districts. Eight demonstration gardens were established using mechanised planting with Chinese equipment never previously been demonstrated in Uganda. Chinese chippers and processors were also distributed to farmer groups. Thirty-seven farmer groups received business management training and established 37 "mother garden" nurseries to sustainably supply improved cassava. Harvesting completed at the first two demonstration gardens produced yields three times typical conventional yields. The pilot produced collaborative research by Ugandan, Chinese and UK partners, including a Pilot Baseline Survey, a

cassava industrialisation feasibility study and strategic plan, scoping of appropriate technology for processing of cassava, and business cases for co-investment. Several prototype cassava food products were co-developed by Chinese and Ugandan researchers, among which two were identified for development in partnership with two entrepreneurs, who were given incubation support. A co-investor was also identified for procurement and installation of batch drier technology for cassava processing. Finally, Ugandan delegates participated in two study tours to China.

- In Malawi, TAs provided technical input and demonstration on: fingerling (hatchery management, pond multiplication, all-male fingerling production, including novel hybridisation of two indigenous tilapia species to produce all-males fingerlings, and fingerling transfer) and on-growing (deeper and larger ponds, higher stocking rates, all-male fingerlings, improved feeding regimes, improved feed, careful pond management including predation control and record keeping). Twenty-five grow-out farmers tested these production technologies. Infrastructure at NAC, Kasinthula, four satellite stations, and LUANAR was substantially rehabilitated and improved, including building new facilities including ponds, water filters and greenhouses, and Chinese extruded-feed production equipment was procured. Yields for the large-pond technology have reached as much as 6 tonnes per hectare, compared to previous yields of around 1.2 tonnes per hectare. The pilot produced collaborative research by Malawian, Chinese and UK partners, including a Pilot Baseline Survey, three production guidelines (on hatchery management, multiplication in ponds, and production of grow-out fish), amino acid profiling of key fish diets and ingredients, and development of a software tool for adjusting diets. Experiments were conducted on replacing imported ingredients and improving commercial diets, including trials on use of on-farm resource based diets. A virtual panel of Chinese technical assistance experts was established to provide guidance, and Chinese partners also shared improved feed formulations with Malawian partners. Finally, a study tour to China for Malawian researchers, managers and fish farmers was carried out.

This chapter assesses some of the key achievements from the point of view of project stakeholders.

2.2.1 Demonstrating technologies

Scoping for the two pilot countries focused on a key commodity for each—cassava in Uganda and tilapia in Malawi. Both are widely consumed in each country and both provide substantial opportunities for improvements along the value chain. In addition, it was identified that China has appropriate technologies and experiences to contribute to these improvements.

In Uganda, cassava agronomy, planting and processing are done largely by hand leading to heavy labour costs and low-quality cassava chips or flour, with high rates of waste due to rapid deterioration during drying. In addition, processed cassava is largely unavailable during the wet season due to drying constraints. These supply issues mean that there is very little development of value-addition for cassava-based products in Uganda. China's mechanised technologies were identified as providing opportunities to reduce labour costs, improve the production rates and the quality and shelf-life of cassava chips, and produce a stable supply of high quality cassava flour (HQCF), which could then be used in a range of value-addition products.

In Malawi, tilapia is a protein of choice among consumers throughout the country, mostly coming from dwindling wild-caught stocks. Though aquaculture is emerging, undeveloped approaches for managing fingerling and on-growing, high cost of commercial feed, poor transportation links, among other factors, present challenges to fish farmers and the development of the sector. It was identified that Chinese technologies (such as hatchery management, pond multiplication, all-male fingerling production, including novel hybridisation of two indigenous tilapia species to produce all-males fingerlings, fingerling transfer, deeper and larger ponds, higher stocking rates, all-male fingerlings, improved feeding regimes, improved feed, careful pond management including predation control and record keeping) could contribute to overcoming existing barriers. In addition, collaboration with Chinese TAs on improving fish feed was identified as an opportunity to lower the costs of production. In both countries, Chinese technologies were identified as particularly appropriate for each country given their widespread application in China and the relatively low cost of equipment and expertise.

Stakeholders interviewed for this study substantiated the assumption that Chinese technology for cassava and tilapia production was uniquely suited to Uganda and Malawi's needs. For example, the Director of Crop Resources at MAAIF explained that it is logical to use Chinese technology to develop

cassava in Uganda because 'Chinese technologies are not very far from the technological needs of Uganda.' An entrepreneur in cassava value-addition at Makerere University Kampala reflected, 'The crop we are dealing with is grown and processed in China, and [the Chinese] relate to the crop the way we relate to the crop here. Therefore, when they are telling us to do something, it is because they have done it before.'

"We feel that the Chinese technologies are nearest to what we need — that they are most appropriate for our conditions. Reading about China and talking with the Chinese, we see that we share the same experience. Many people look to developed countries for their advanced technologies, but when you travel to China you can see intermediate technology that is appropriate to our needs. They have cutting-edge starch technologies such as for making ethanol from cassava, but they also have intermediate technologies; they also eat cassava fried, boiled, and with sorghum/maize. And the Chinese are eager to collaborate too; they say 'We also grow cassava, and we can see what we can contribute here.'" Cassava Desk Officer, MAAIF

"The fish we are dealing with in Malawi is tilapia. There is no need to reinvent the wheel. China has been working with tilapia for a long time. They have been doing a lot of research, and if we just tap what they know, and adapt them to our needs, we can see a lot of improvements." Deputy Director of Fisheries at DoF

"The Chinese are innovative, and they have been in aquaculture for a long time. Most aquaculture around the world is from China. They are the best source of technology that we can easily learn from, adapt and move on. So it was a good idea to partner with Africa, Britain and China on the transfer of these technologies." Aquaculture nutrition specialist, LUNAR

The farm manager at the District Fisheries Office also emphasised the adaptability of Chinese technologies to Malawi's needs, in contrast to those of other countries:

"I went to Japan to breed and learn from how they work. I saw that their technology is extremely advanced — they use expensive materials and sophisticated manufacturing. We cannot even adapt it to our needs in Malawi. In China, their technology is not very sophisticated, so their technology is very easy to adapt to Malawi using just our local materials. If there is need for any modification of Chinese technologies, only very little modifications are needed."

The cassava desk officer at MAAIF explained how the Chinese guidance on correct spacing, gap filling and weed control for cassava production was initially met with resistance by the local farmers, but that this was transformed once they saw the techniques demonstrated:

"The Chinese were of the view that they should plant cassava in ridges to get higher yields, but the machines were not yet in place, so they were doing the demonstration manually. Farmers resisted because they were used to planting on flat ground, and felt that the extra effort was not worth it. The Chinese TAs did trainings and vigorous supervision in the mother gardens, keeping the farmers on their toes. In the end, they did demonstrate the value of their technique, and the ridge planting did well. The farmers there saw that the crop grew better on ridges than flat ground."

Indeed, farmers and extension workers in Uganda were full of praise for the effectiveness of the technologies introduced:

"Despite differences in skin colour, they worked right along with us; there was no difference. They used simple explanations; they were interactive and cooperative. They taught us how to space the plants; they worked right in the fields with us, and showed us how to fill gaps when some did not germinate. We learned that you can use a shorter stem and still get good results, resulting in more cuttings out of one stalk; we learned the value of planting cassava in ridges to benefit growth of the roots. Everything that the Chinese TAs introduced to us worked well." Farmer, Buliisa Kagera Women's Group

"We have changed our methods because we see that the Chinese methods really work. For example, we used to have problems with white ants destroying the upper stems of the cuttings. The Chinese showed us that we can bury them so that the stem is not disturbed. We also learned that turning the grass into the soil enriches the soil and improves yield." Farmer, Buliisa Nyasiabi Farmer Group

“They showed us exactly the size of cutting to plant, allowing us to use less cassava and get bigger results. We learned to differentiate good, healthy cassava from that which is diseased. If AgriTT had not come, I would not have known this. I would have just left them in the field, and they would have infected the other plants.” Secretary, Buliisa Nyasiabi Farmer Group

“We had never seen planting done with a machine. Ridging was a completely new thing for us. With ridging, we have been taught that production is faster. It has only been two months since we planted, but we already see roots. This is a sign of a good yield. We can really believe what we have been taught.” Farmer, Kiziranfumbi Demonstration Garden Farmer Group

In Malawi too, those involved in fisheries were impressed with how many new and effective ideas the Chinese were able to share and demonstrate. In Box 1, an aquaculture technician at LUANAR described his experience of collaborating with the Chinese and the process of learning that resulted in long-lasting improvements to their aquaculture approaches.

Box 1: The lasting effectiveness of Chinese aquaculture

An aquaculture technician at LUANAR detailed his learning from Chinese TA:

We have experienced so many improvements based on the Chinese approaches. The Chinese have gone, but we are continuing the practices because they really work. When the Chinese came, I explained my approach to breeding. Then we made a plan together. We went together to collect the stocks. The way the TA handled them was different from how we had handled them. We had been using oxygen, but they also added salt to help the fish produce a protective mucus. We had far fewer fish die in transport than previously, so we are now continuing this practice.

There are many other practices too: Previously we were just choosing fish randomly, not selecting the parents from the babies. We would breed them all together in one single pond. The Chinese TAs made us aware that we should not mix the generations. So now we know exactly what we are breeding, and what generation it is. We used to stock fewer numbers in our ponds, but they advised that the higher the competition, the better the survival of the fish. We are now putting in higher stocking densities because we see how it makes each individual fish thrive harder to survive.

Before, for breeding, we were stocking one male to two females. They advised a 1:1 ratio, which creates higher competition, and they survive better. We did a control trial of this approach, and it proved that this advice was effective. It really showed that 1:1 does much better. Previously, we exposed the fish for breeding for longer periods, and only gave them short, one-month periods of rest. The Chinese suggested that you have better results if you keep them separate longer for rest, and then breed together for shorter periods.

In addition to all of these small, detailed changes, our entire focus in how we manage the operation has shifted from the hatchery to the ponds. Previously, we thought that using the hatchery would give better results. But the Chinese said we should breed directly in the ponds. They observed that our efforts in the hatchery were a lot of work, but the outcomes were not so satisfactory. We were collecting the fry once a week from the ponds because we thought that it would be better to allow the young fish to stay with their parents for a longer period because we would not be disturbing them. But the Chinese said ‘No, it is the opposite; you need to remove them regularly.’

They also explained that we don’t need to go into the pond directly, that we can just take them out with nets from outside. They said we shouldn’t disturb the pond and make the water muddy. It is also good because the hatchery used heaters, which required generators to be running, and this was a real challenge. I would have to go in the middle of the night to turn them on. Now we are able to hatch in the ponds directly, without the heaters. So we are doing exactly what the Chinese taught us, and we are seeing good results.

The principal fisheries extension officer in DoF confirmed the impacts of the Chinese technologies in Malawi:

“The technologies we have learned from China have helped us increase the number of fingerlings we can produce, the survival of fry (which used to be less than 70% of hatched eggs at NAC, and now is close to 90%), improved management of the facilities, and tremendous increase in fish production: overall fish production used to be 1.5 tons/hectare/year, but now, with the technologies that we have learned from our Chinese counterparts, the productivity has gone up to 6 tons/hectare. This has been realised both in the field station and in farmers’ ponds. We are confident that we now have technology that has improved production more than four times what we used to have.”

2.2.2 The power of exchange visits

Exchange visits are popular activities for Chinese aid programmes, but aid analysts are often dismissive, suggesting that they do not provide long-term impact or value beyond basic relationship building. AgriTT’s experience shows that they can play a crucial role in ensuring the technologies transferred suit local socio-economic realities.

Eight delegates from the Uganda Pilot Development Project participated in a study tour to China in April 2015. Key recommendations were developed as a result of the study tour, and equipment identified by the delegates for procurement by the pilot. In addition, a study tour to China for 12 Malawian researchers, managers and fish farmers was carried out in July 2015.

The study tours stood out as particularly valuable to project partners, particularly for the opportunity to witness the technologies in the Chinese context. These exchanges with China gave beneficiaries the chance to think about the entire value chains for cassava and tilapia, and to understand key points of support and success in the Chinese system. Many stakeholders highlighted this as a key achievement of AgriTT:

“I visited small farmers in China and saw that farmers don’t work in isolation; they work in small groups. When it comes to bringing the fish to the market, they bring it in cooperatives. The farmers had been in the field for a long time, and had mastered what they were doing. They minimise wastage of food.” Deputy Director of DoF

“We visited research institutes, government institutions and farmers. We learnt about the system and the management of the entire value chain. Not everyone is producing fingerlings—there are companies that produce those, and give them to farmers who produce the fry. Then they give these to other farmers for grow-out. There are elements of quality control that are introduced in this way. We think this is a good model.” Aquaculture nutrition specialist, LUANAR

The Deputy Director of DoF further explained that this learning is being integrated back into how the tilapia sector is being developed in Malawi. Many other stakeholders shared similar reflections on how seeing the value chains in context provided powerful reflections on how to improve systems back home:

“When I went to China and saw the stunning success of the fish farmers, I said, ‘Why are we failing in Malawi?’ I got my answers from seeing what was happening in China.” Farm manager, Kasinthula District Fisheries Office

“In China, the government and private sector work together. The private sector told us how they changed some of the policies, and how government helped them to get to where they are through feed subsidies, new fish species, and support for processing.” Fish farmer, Aglupenu Investments

In Uganda too, people were impressed with the policy support and integrated value chain for cassava that they observed during their exchange to China:

“When we looked at the factories in China, and their crop production practices, we saw they are not that different from what we have here. But there, the farmers have a ready available market, and therefore an incentive to grow the crop. What we saw is that the farmers were delivering the cassava directly to the factory. Not even one person comes between the factory and the farmer.” Entrepreneur in cassava value-addition at Makerere University Kampala

“You can see that the Chinese engineers and professors move to the local level, setting up factories near the farmers. So those farmers were in touch with the research and with the processing. They knew where their tubers were going. If there was any problem, they could address it right away. I hope that this lesson could somehow have a bearing on what we do here in Uganda.” DPO in Hoima

Stakeholders in both Uganda and Malawi were eager to exchange with the Chinese and learn everything they could from them. The Head of the Aquaculture and Fisheries Department at LUANAR suggested that the exchange visit to China was one of the biggest achievements of AgriTT:

“The trip was very fruitful. There we saw that if ponds are larger, the fish grow better. Farmers who were on the trip really appreciated this technology. We have tested this in NAC and with farmers, and are now making our ponds according to the new deeper and larger specifications.”

The success of the exchange visits, which were a relatively small part of the AgriTT pilot projects, highlights the importance of embedding technology transfer within their socioeconomic and political contexts. If not taken into account, the differences between countries can hinder smooth technology transfer. Many Chinese partners, emphasised the importance of considering these contextual issues in the beneficiary country as well:

“We need to carefully consider the local circumstances when we look at technology transfer. There are times when even the best technology in China is not suitable for transfer to Africa because there isn’t a local market for it.” Deputy Director, Guangxi Academy of Agricultural Sciences

2.2.3 The added value of cross-cultural appreciation

AgriTT stakeholders were largely convinced of the technological effectiveness of the technologies transferred through the pilot projects. They also learned from and appreciated the Chinese approach to work, and found some room for co-innovation despite some constraints. AgriTT beneficiaries also appreciated the softer technologies that the Chinese brought, including their management practices, and their flexibility in adapting the technologies to the local situation. As the director at the National Aquaculture Centre reflected:

“The project managed to reduce the costs of tilapia production due to the Chinese management approaches. Their management practices are very good, and those are lacking in our country. Most of our farmers feed their fish once a week, and we get fingerlings from any farmer; we don’t care about the quality. But in China, they know where their fingerlings are from, and quality is very important. They are very specific about their management, and they know exactly where they are getting each of their inputs from.”

Likewise, the lead professor for a RCF project at Makerere University Kampala reflected on the value of the Chinese taking a research-based approach to their agriculture work:

“In Uganda, there is no consistency or science behind why we do what we do. It is basically, however you are trained, this is how you do it. In China, they have a solution for every problem, and scientific research and evidence to back it up.”

Among those who interacted directly with the Chinese TAs in Uganda and Malawi, there was an appreciation of a seemingly ‘uniquely Chinese’ approach to technology transfer, characterised by flexibility, open communication, and dedication to getting things done. According to the AgriTT Project Advisor for Uganda:

“One of the most important things that the Chinese transferred was their attitude.... The work attitude the TAs bring is really appreciated by farmers here. This is as important as the technology.”

Echoing this, the AgriTT Coordinator in Malawi suggested that the greatest value-addition from AgriTT ‘isn’t really new technologies, but the rhythm of work of the Chinese.’ He observed that through these interactions, ‘the Malawians have learnt to be more on their feet and work harder.’

Indeed, farmers and extension staff in both countries were full of praise for the Chinese attitude and work ethic:

“We used to say, is it broken? But Pingping would just tell us to keep going, to have faith that it would work. The Chinese don’t have time to waste. They have a spirit about work; they don’t stop to rest or eat. They even eat their meals in the fields!” Benjamin, Vice-chairperson, Amorisa Village farmer group

“In all these gardens, I have worked with the Chinese, morning until night. They were not harsh — they would listen; when the farmers would not understand, they would have patience and explain. And one thing I learned from them was commitment. I came to understand that if you can endure working hard, you can finish much more quickly.” District project officer in Buliisa District

“We can really trust them. They mean business. We love them.” Imone, Buliisa Nyasiabi Farmer Group

“They have a way of making impossible things possible.” Buliisa District Farmer

One farmer in Kiziranfumbi echoed these statements: ‘The Chinese are very good people. They are hardworking, cooperative and friendly. We had no conflicts. They work morning until evening, and gave us a good example. As members, we are all working together in the spirit of the Chinese TAs as a group.’ Pointing to the group leader, he said ‘He is now our TA, our teacher. He has the knowledge and the skills.’ When asked if this was true, the group leader said, ‘Yes, I have the knowledge and the skills now to play this role.’

The AgriTT pilots also provided opportunities for the collaborative co-innovation of some technologies. During field visits in Kiryandongo, farmers were eager to point out where the Chinese equipment had needed reinforcing to handle the heavy local soils. They described running into issues in the field with pieces breaking, and working with the Chinese to fix the problems.

In fact, the Agriculture and Natural Resource Advisor for DFID China suggested that adaptation and co-innovation was expected within the design of the project — that ‘the Chinese are very good at using available means to solve practical problems.’ Many stakeholders reflected the sense that this was true. For example, the DPO in Kiryandongo reflected, ‘What I liked from the Chinese was that they were coming in with their high-tech technologies, but their starting point was the tools that we had, and they were good at improvising and achieving what they would have done with the high-tech equipment in China, using our tools here.’



Chinese cassava planting equipment altered to better suit conditions in Uganda

The lead professor on the value-addition work at Makerere University Kampala described the process of developing the cassava products:

“You cannot easily put cassava flour into biscuit batter — it doesn’t work.... The Chinese said ‘Hey, you have something here, and we think we can add value to what you are doing.’ We worked together to modify it, this way and that way. In this way we were able to quickly experiment and soften the texture. The TA we worked with had the right mix of unique skills. She worked more in the lab, and didn’t talk much, but at the end of the day she would bring things out to test, and then we would argue about what to do, and eventually agree. When we went to her lab in China, we saw that the products they have are totally different from what we have here. That shows that we have really co-produced products together.”

In the Malawi pilot, the focus within the feed component was on co-innovation, and there were good concepts in place: breaking a monopoly on feed production through facilitating the government’s own feed production; experimenting with ‘local’ resources available through extensive experiments on different feed formulas. Though these concepts did not have much time to be field-tested before the end of the project, the approach was appreciated by stakeholders and is likely to be carried forward into future work.

Interviewees shared positive experiences of co-innovations with the Chinese in Malawi. The NAC director explained, ‘The technologies we are developing together. They come with their ideas, and we discuss, and find a middle point. That flexibility was good. We could come to an agreement and forge ahead.’ The farm manager at the Kasinthula District Fisheries Office described his experience working with the Chinese (See Box 2). In contrast to his previous experience working with Japanese technical assistants, he appreciated the hands-on nature and adaptability of the Chinese approach — not just solving problems, but bringing him and other fish farmers into the process together.

Box 2: Starting with what we have

When they demonstrate, you can see and understand. For example, they wanted to make graders for fish.⁷ At NAC, the graders were introduced by the Japanese, but they were very big, and made from plastic, so not suitable for our needs — and also very expensive. We were separating [the fish] visually, using our hands, but the TA came up with a grader made of local material (bamboo and rope) and he wanted us to develop it.

We failed to understand, so what he did was to draw it and show us pictures from China, and then make it himself. And from there we could understand exactly what it was that they wanted us to do, and we could follow that. We saw it, and we took it. So through demonstration we are able to understand. Once we had the graders, we saw that with a grader you can handle a lot of fish within a short period, and with less damage to the fish. Now we have trained the farmers so that they can do it on their own. Some of them have started adopting that technology.

I worked with the Japanese for six years. The Japanese were more serious in terms of relations. They take every small thing very seriously. The Chinese were not as expert, but they came [with an attitude] as if they didn’t know anything. But when we were talking, you could see that they know something. The Japanese were experts, coming here and doing everything on their own, and you just watch. With the Chinese, you discuss, negotiate, and then do things together.

With the Chinese, it is very easy to get the technology. With the Japanese, it took us some time to learn and understand what they were trying to do. The Japanese came, saw our fish, and said fingerlings should be 50–100 grams. Here we say 3–15 grams are fingerlings; our experience is that when a fish reaches 50 grams, it starts breeding, so it cannot be a fingerling — it is a breeder. When the Chinese came, they said, show us your fingerlings. We showed them, and they said, ‘In China, these would be too small.’ But then they asked, can we see your breeders? And they saw that our breeders are very small, and so they saw that it was okay. For the Japanese, it became very hard to achieve what they wanted; it took a lot more time.



Chinese bamboo graders⁷

2.3 Integrating technologies throughout value chains

As discussed in Chapter 1, the aim of AgriTT was not just to transfer Chinese technologies for food security, but to integrate them all along the value chain, supporting the transfer of skills and capacity from production to market. In Uganda, as mentioned above, most cassava is eaten at the local level, or sold wholesale as chips, which have been cut by hand and sun-dried on the ground—often with high rates of spoilage. The aim of AgriTT's approach was to produce higher quality flour through improved variety selection as well as mechanised production and processing, and then support development of pilot value-added cassava food products, including incubating investors to take these products forward beyond the life of the pilot project. In Malawi, as mentioned above, fish farming is nascent and there was room for improvement all along the value chain—in improving survival rates of fry and grow-out fish, as well as reducing the cost of feed and support for investors to develop and market alternative feeds. In both cases, beneficiaries were asked to provide co-investment in the form of in-kind contributions of land and labour, management of the fields and ponds, including weeding, fencing and pest control, and in some cases, sharing costs of fuel and other inputs.

This integrated value-chain approach was widely appreciated in stakeholder interviews as a standout element in AgriTT's design, and a unique factor in its achievements:

"I've thought a lot about China-Africa aid — there are so many development projects, but not much success. The impacts don't last. I think that AgriTT will be relatively successful because the farmers have been able to change their mindset, to accept the value of the technologies. This project

⁷ Chinese bamboo graders allow fry to pass through while retaining the larger fish.

considered the entire value chain, and this is really unique. I think, in this aspect, introducing this approach, this has been a real achievement.” Vice-director of CATAS in Hainan

In choosing the right technologies required along the value chain — including the equipment for the mechanised production, processing and value-addition in Uganda, and feed mills and aquaculture equipment in Malawi — a long period of assessment and consultation was needed. Added to this were several other elements requiring extra time: the production of machines, freight, payment of taxes, customs clearance and the logistics of installation.

For the processing component, the PMO explains, ‘there were no shortcuts for identifying a technically robust and economically viable option with a suitable co-investor.’ Indeed, the Gates-funded and NRI-managed Cassava: Adding Value for Africa (C:AVA) project had been running since 2010, and the processing technology (flash driers) it had identified only arrived in Uganda in 2016, showing that identifying an appropriate technology and then making it operational tends to take a long time. In Box 3, the PMO details the lengthy process of negotiating and researching that was required to find suitable equipment for cassava processing.

Things went more smoothly for the third component—the value-addition equipment—but here too AgriTT ensured that there was careful review by Ugandan and Chinese partners (Chinese scoping in Uganda and carefully reviewing domestic suppliers, and Ugandans reviewing them in China). And as with the other components, the equipment was only chosen after the products for incubation had been developed by the Chinese TA with the Ugandan partner, and the entrepreneurs had been successfully identified.

Box 3: Procuring suitable cassava-processing equipment for Uganda

Procuring suitable technologies can involve lengthy processes of negotiating and researching, as is highlighted in the case of finding suitable equipment for cassava processing in Uganda. As detailed by the PMO,

While cassava processing is mechanised in China and a range of equipment is available, cassava there is used primarily for industrial purposes, so the equipment is not food-grade stainless steel as is required in Uganda. Furthermore, Chinese technology is generally at too large a scale for Uganda— even the smallest viable size in China is still too big for Uganda’s needs. There was therefore no off-the-peg cassava-processing equipment from China immediately available to the project in 2014.

The main Chinese technical advisor on processing argued that the only technically robust choice was a large-scale processing plant investment option that would deliver high-quality cassava flour and starch. This would require private-sector investment, with possibly a small percentage of project co-funding. Indeed, in many conversations with DFID and FECC, it was accepted that the best the project could do was to organize study tours and expose potential investors to technologies and business opportunities. It would therefore not be possible to move all three components (production, processing and value-addition) forward in a synchronized way.

However, we continued to explore alternatives, and on the April 2015 study tour, an FECC-identified equipment supplier showed the Ugandan partners a bin cassava drier, which they were immediately very interested in. The Steering Committee had required – with good reason – that for processing procurement we had to have some co-investment and business plans to show that any investment could be replicated because it rested on sound business assumptions. Eventually, it became clear around September 2015, after a hiatus of several months, that funds would be available for the processing component, so AfrII [Africa Innovations Institute] organised investors to develop business plans.

We had the business plans reviewed, and [discovered] a lot of problems with the financial viability, and the assumptions about costings and markets. One of the key problems was the fuel source. Technical review showed that the machines as they were then designed would be too costly to operate, or environmentally unsustainable if they used wood. We therefore looked into adaptations such as attaching a briquette burner to burn compacted crop waste. More technical reviews were needed, and many questions remained, which could not ultimately be addressed. The bin drier just did not make good business sense. We were right not to rush into buying it.

In April 2016, Chinese partners introduced a completely new technology, the batch drier, only recently adapted for cassava. We organised an inspection in China, and a review of the economic case. A Chinese team made further technical adaptations, and by July the Ugandans had identified suitable co-investors and we were able to place an order. It was installed on-site in December, at the end of the project. The co-investor completed their facility construction on time, confirming the wisdom of working with a serious, business-like partner.

Despite its late arrival, we have good evidence that the batch drier is a promising technology. It was much better to push ahead late rather than cancel the plan. The project has invested around one-third [of the cost] and the private investor two-thirds, so they have strong incentives to make it work. AfrII will continue to provide support, as they attach great importance to finding a viable technology to address the wet-season drying constraint that limits availability of processed cassava for key parts of the year.

The length of time required of the value-chain approach and co-investment model contributed to frustrations and delays (see next chapter), and meant it scored badly against the log frame in early annual reviews for this component. Nonetheless, this innovative approach has set AgriTT apart and produced valuable learning. It has revealed the crucial importance of careful scrutiny into what makes a technology suitable for transfer (such as the engineering, the financials, the markets, the sustainability, etc.). And, especially where co-investors are involved, it has underscored the necessity of painstaking

analysis and shared learning to ensure that a technology will be successfully demonstrated, reduce investment risk, and avoid purchases that may not be sensible investments.

These lessons had the power to change some stakeholders' perceptions of the technologies they needed, and indeed the larger picture of the role of trilateral cooperation. For example, the Chief Executive Officer at AfrII recalls his early insistence that AgriTT buy the bin drier (and his initial frustration when this was refused):

"I was biased with demanding a bin drier. I saw it in China, and was convinced it was what we needed. We almost brought it over. But NRI helped me to change this mindset.⁸ They made me realise that it was not a suitable technology. It would have been a disaster to bring it all the way here and then realise that it was not of the right materials and specifications that we need. We kept insisting that it would work, but they went deep into the analysis, and this is how we were able to see that it would not work. You do need an independent party to be able to tell you these things, to tell you when you have gotten it wrong." Chief Executive Officer, Africa Innovations Institute

Focusing on transferring technologies along the entire length of the value chain for a single commodity was an innovative approach which demanded careful analysis. In this way, AgriTT stands apart from other projects on cassava technology innovation that did not aim to demonstrate the feasibility of industrial production. While the approach may have slowed progress down against planned project activities, it has potentially long-lasting and powerful, if relatively invisible, implications that could fundamentally change the way a commodity is perceived at every level of society. Many stakeholders in Uganda emphasized the revolutionary power of viewing cassava not just as a food but as a business opportunity:

"Through AgriTT, I have come to see that cassava is not just a food to be boiled and eaten. It can also be a source of revenue for farmers, an input product for industry, a promising focus for research, and an avenue for development of emerging entrepreneurs." Buliisa District Production Officer

Farmers saw machines applied to their land for the first time, and through the initial material benefits already realised, some were shifting their understanding of the value of cassava over other crops such as maize, while others were willing to pay for continued access to the equipment:

"Instead of focussing on low-value maize, I see the value of shifting to focus on cassava. I can really see that with cassava, I now have money to purchase rice and sugar." Farmer, Amorisa Village

"Our standard of living has improved, and we see the potential for it to get even better." Vice-chairperson, Amorisa Village

A shift in mindset was evident at the government level too, with the local districts embracing mechanised production:

"People are now able to appreciate that we can in fact use mechanised equipment to produce cassava. This was not obvious to us before. But now we have seen that it can work, especially if you are interested in commercial production. A fifty-hectare farm takes a lot of time to plant [by hand], but with the equipment you just need a few days and you are done." District Project Officer, Kiryandongo District

"At the district, we have come to learn that cassava can be harvested, peeled, dried and processed in the very same day. We didn't know this before." Team Leader, Buliisa District Government

Several stakeholders felt that this impact will be carried forward beyond the life of the project:

"I want to see cassava becoming a very important crop, not only for direct consumption but for multipurpose use, so that we can add value to it. If we can achieve this, more farmers would get involved in producing cassava, and they could run it as a business. Our farmers can produce it as long as it is marketable." District Agriculture Officer, Hoima District Local Government Office

"If I were to rate AgriTT on scale of 1–10, I would give it an 8. Before AgriTT, we were not even thinking about value addition for cassava. Yes, we are faced with resource constraints, but at least we now have a vision, a situation in which we shall have cassava-processing facilities. And because of that, as a

⁸ While this partner interacted primarily with NRI in this instance, the suitability-testing for the bin drier was initiated by the UK management, who brought in NRI along with other technical experts to review and help reach a robust position on the suitability of this technology.

department, we are mapping out areas in the district that would be more favourable for larger-scale production, and developing a strategy for efficient production of cassava to create a critical mass.” District Project Officer, Kiryandongo District

The private sector also followed the developments of the project. The Director of Crop Resources at MAAIF felt that the private sector interest in AgriTT’s value-added work was ‘clear’ and suggested that they were also watching what was happening in the harvesting and production components of the pilot.

“The private sector wants to see you pilot the technologies, and bring them to market. If you do that, they will follow you like moths follow light. There is now increasing demand for farms to become commercial, to increase productivity.” Entrepreneur in cassava biscuits, Makerere University Kampala

“When the equipment arrives, we will be able to produce at scale and take it to market. These will target a high-value, higher-end market than existing cassava products. Thereby we will have enhanced the value chain.” Professor, Makerere University Kampala

Thus, AgriTT provided stakeholders with broader lessons for scaling-up the agriculture sector and bringing the private sector in, looking at improving the whole value chain of a given commodity:

“We see a process we can go through, identifying the main actors, and giving them a role to play in the development of the value chain.” Director of Crop Resources at MAAIF

For farmers in both pilots, there was also early evidence of willingness to engage in cost-sharing to take the technologies forward:

“Based on our experience, if you bring the machines again, we will use the same methods and we will pay half of the cost of the fuel to prepare the land.” Farmer, Buliisa Kagera Women’s Group

“After AgriTT ends, I will continue to buy feed. I used to use maize husk and farm waste to feed the fish, but I have seen through this project that the fish grow much better with the purchased feed. It is more expensive and difficult for smaller farmers to afford, but those who can afford it will purchase feed once they see how much more effective it is. We will also continue to make our ponds deeper than we used to.” Fish farmer, Zomba

An advisor in DFID China explained that ‘The main priority of the project has been to open people’s minds. Then it is up to them whether or not they take it forward.’ This objective, though difficult to measure, appears to have been achieved to some degree.

From this perspective, AgriTT is valued (and should be valued externally) not just for its log frame achievements in directly improving various elements of production and processing, but also for the exposure to a value-chain-based industrial mindset, and to the systems and markets that support this, through interactions with Chinese TAs and visits to China.

2.4 Improving aid effectiveness through UK involvement

“There are certain elements which the UK is good at. For example, the UK partner was very strong in research, playing a supporting role through rigour in interrogation and reflection on what is being exchanged, and mechanisms for doing so. This has strengthened the delivery of the project.” The Director of Crop Resources, MAAIF

AgriTT had an explicit aim: to explore the potential of trilateral partnerships to improve aid effectiveness. If the involvement of Chinese technical assistance has been a highlight achievement of AgriTT, why not simply do this bilaterally? What is the added value of involving the UK? Farmers and lower-level extension staff in the pilot countries were themselves unclear on the UK’s added value. Many saw the UK as merely a source of funds; in their view the real value of the project was the Chinese engagement described in the previous section.

Over half of the interviewees, however, disagreed. Researchers and policy makers within Uganda and Malawi, as well as a majority of Chinese stakeholders, emphasised the crucial role that third countries such as the UK play in transferring technology from China to low-income countries. This section explores these perspectives, and suggests that providing ‘proof of concept’ for trilateral cooperation was a key achievement of AgriTT.

2.4.1 Rigour, experience and research support

Exploring the potential role of the UK in so-called ‘South-South’ cooperation was central to the design of AgriTT. In the original AgriTT Business Case, DFID emphasised the comparative advantages of China and the UK and highlighted that there has been limited study on how to adapt China’s experience to specific regions and countries (DFID China, 2012). By supporting need-driven, targeted and integrated technology transfer combined with research collaboration, the project aimed to help to build evidence for the adaptability and effectiveness of Chinese technology transfer.

While Chinese projects often receive criticism by local stakeholders in Africa who feel excluded from involvement or don’t have a clear understanding of what they are trying to achieve, AgriTT was different. As DFID China advisor explained, ‘All the ideas for the interventions originate from the African country. The Chinese are just there to help them deliver their targets. This is a different delivery mechanism.’

Similarly, the Business Development Specialist for AfrII emphasised the ‘key role’ that the UK consulting firm Landell Mills played in ‘making linkages’ between China and Africa. The Director of Crop Resources at MAAIF also appreciated that, thanks to UK management, despite the short time frame for AgriTT, ‘it was very focused, with specific outputs, which have been delivered.’ The Uganda AgriTT Project Advisor also appreciated how the UK partners brought strengths in ‘economic analysis, institutional analysis, and legal aspects’ of development work. One key aspect of this management was tight financial control. The supervisor at PKF Accountants and Business Advisors, the private firm managing the AgriTT budgets in Uganda, explained that the stringent process for releasing funds gave him confidence.

In Malawi, the funds were managed in a similarly stringent manner, externally to the main implementing partner, DoF. The department explained the need for this approach and the value of third party involvement:

“Our accounting system is poor, and mismanages the funds. In the end, we can’t report on the activities we are meant to do. So having another organisation managing and ensuring that the funds get where they need to go — that is the best for us. This way we are assured the money will be used for the intended purpose. No one is going to channel the funds to another activity that was not in the project activities.” Principal fisheries extension officer, Malawi DoF

Interviewees in this study emphasised the role of UK partners in providing analytical rigour to the design of the project, systematic management of the implementation, and continual brokering of relationships through networks and expertise, both in China and Africa. For example, the UK-based research institute NRI contributed to the pilot interventions being developed based on clear market demand and grounded feasibility studies:

“You may find that some countries are not able to support a successful bilateral technology transfer. That is where you look for a third party such as NRI to come in and support the implementation. They have deep experience in African agriculture, and some in China, so they were able to provide technical backstopping. You never know what is available until someone who knows the situation can look for it in depth. You need counterparts in the other country to achieve this.” Chief executive officer, Africa Innovations Institute

In the RCF as well, Chinese researchers expressed appreciation for the opportunity to learn from NRI’s working practices and their active, professional and responsive involvement.

2.4.2 Capacity building in effective project management

In the AgriTT pilots, UK actors played an indispensable role, facilitating strong and targeted links between key actors in research, government, experts and farmers. Stakeholders have particularly appreciated the focus on demand-driven implementation backed by rigorous research. Chinese partners especially emphasised what they learned about project management, such as how to set goals, the importance of evaluations, and selecting personnel.

Chinese partners described becoming more adept at setting project priorities and more effectively navigating demands by the recipient country. One professor at UIBE, for example, reflected that there were many good technologies in China that could be utilised in African countries, but ‘being able to be

grown is not the same thing as being appropriate for those countries.’ He said that without the UK involvement – which started with research before making policy recommendations, they would lack the information to make good judgements about what technologies are really needed. UK managers were appreciated for negotiating project goals and ensuring that the demands from African countries were realistic.

2.5 Sustaining long-lasting impacts

“If you look at a log frame and outputs promised at the beginning, and want to see a range of shiny impacts at the end of AgriTT, that might be a challenge. But if you see this as part of a long-term story about building relationships, putting a platform in place, and something that contributes to transformative technology that is tested out in an iterative way, then I see that as valuable. That is a significant achievement.” AgriTT PMO

In addition to the direct project impacts and learning on trilateral cooperation, AgriTT also aimed to provide a platform for ongoing mutual learning and exchange on agricultural technology transfer among China, Africa and the UK. Overall, there is a sense among project stakeholders that important roots have been put down – though their ability to grow in the long term will be hampered by AgriTT closing at the point that it did.

2.5.1 Connections between partners and a platform for collaboration

While there was regret across the board that AgriTT was coming to a ‘premature’ close, stakeholders point to a range of specific achievements that will outlast the project. These include connections between partners for ongoing testing and adaptation of the technologies, as well as their uptake by enterprises and other stakeholders. It is clear that AgriTT has provided a strong platform for ongoing collaboration despite its short timeframe and other constraints (detailed in the next chapter).

For example, the cassava production demonstrations in Kiryandongo, Uganda, provide a potential hub for ongoing learning and exchange on Chinese technology for mechanised production. Technical support to cassava value-addition entrepreneurs may provide a market pull-factor for the continued production of high-quality cassava flour. And the training of Malawian fish farmers in Chinese aquaculture management techniques and the improvements to vital fish breeding and on-growing equipment in key government and research institutes offers a way forward for the development of a vibrant aquaculture sector in Malawi.

At least four MOUs for further collaboration have already been signed between RCF partner institutions. Countless stakeholders emphasised the importance of the platform for learning and exchange among Britain, China, and Africa and beyond that was developed under AgriTT.

“AgriTT has provided Uganda with a platform for a long-term relationship on cassava value-chain development. We have established a strong platform for exchange. We are only a call away from our Chinese counterparts. The link between myself and those individuals is now personal.” Director of crop resources, MAAIF

“If we have any technical questions, we have a channel to ask them now through our contacts in China.” Principal fisheries extension officer, DoF

“It took time to figure out our common goals and ways of working together, to know each other better. And these relationships are ongoing. If there are opportunities to work together in the future, we will. We all find we can learn something from each other.” Senior research fellow, IFPRI

One link that seems especially strong is the one forged between Chinese fish-feed scientists in Guangxi and their counterparts in Malawi. In LUANAR, they are trying to develop better, cost-effective fish feed but lack equipment to analyse the amino acid profile of the various proteins that they want to test. This information would help them to formulate the feeds based on what the fish require. Because the Chinese have this machine in their facilities in China, the team have begun sending their materials to China for analysis.

In addition to international connections, several stakeholders suggested that AgriTT also played a crucial role in supporting internal networking among farmers and various institutions in the pilot countries. For example:

“One of the strengths of AgriTT was that it brought AfrII and MAAIF together in a collaborative working relationship. This approach differed from most projects that work with only one or the other. ... They each emphasise very different approaches—i.e., a business mindset versus government policy and support. But through working through these tensions, there has been some cross-fertilisation, and the strengths of each have come to the fore.” AgriTT project advisor, Uganda

Particularly noteworthy are links that were made with the private sector:

“This project has strengthened our link with Maldeco.⁹ It is something very unique for a private company to provide us ponds to conduct research. AgriTT has helped us link strongly with them. In the past, Maldeco wasn’t open to us doing research with them, but now we are able to do the research on their own site, and they sponsor it. They are one of our partners in the Centre of Excellence, and they are hosting our PhD students.” Head, Aquaculture and Fisheries Department, LUANAR

“The site visit gave us additional opportunities to be in contact with manufacturers in China, so we can get in touch with them easily now. This should facilitate entrepreneurs making purchases and procuring necessary equipment from China.” Professor, Makerere University Kampala

Experience gained in bridging the information gap between Chinese cassava technology and Ugandan investors could also provide a platform for ongoing exchange:

“Before AgriTT, people would just go through Alibaba.com, identify a machine, bring it here, and try it, but it always failed. Many of those machines are white elephants. In Kiryandongo there is a rice farm where they put in huge combines and huge tractors, covering half of the field. They are just there, not being operated. What investors need is a one-stop centre [where they] could get all the information they need, including linkages with China, and then be assisted to implement a plan for the support team to gradually pull out. We were not designed to play this role within AgriTT, but investors are starting to demand this of us. We see that this is needed, and this is a role that we now have the ability to play. Thanks to connections made in AgriTT, we can now advise on any machine anywhere — what to look at, what to ask, etc. And also to advise investors.” Chief Executive Officer, Africa Innovations Institute

The business-development specialist at AfrII is already starting to provide research services to investors interested in Chinese equipment:

“The key, real achievement out of all of this is being able to get information — about the technologies available in China, about our limitations here, and about areas where there is a need to adapt. A lot of people just import blindly, but we have had the opportunity to be partners in the research in this area. Machinery coming from China will be an ongoing, continuous process of scoping, identifying and adapting. We are playing this role. I don’t see anyone else doing this in cassava. This is coming through experience gained in AgriTT.”

Others are seeking follow-on funding as well, including a professor at Makerere University in Uganda who is developing a proposal targeting the Chinese government to commercialise cassava to develop biscuits, snacks and starch.

2.5.2 Government capacity

The direct involvement of government distinguishes AgriTT from many other aid projects in Uganda and Malawi, which often bypass government, leading to duplicated efforts or even working against government policy and planning. The Chinese Ministry of Agriculture played a vital role as a project partner in helping the project to access high quality technical expertise from the Chinese cassava and tilapia systems, and helped the project to engage key personnel in China working on technology transfer with Africa. Government partners in both Uganda and Malawi felt that their involvement provided strong avenues for the sustainability of the efforts — the capacity to carry forward the approaches, and motivation to seek further funding to fill gaps in support. Interviews showed strong links between government policy and practices going forward in the pilot countries:

“This is the first project we’ve had where the international partner worked directly with our government. This strengthens our working relationship as a development partner; because we are involved, we

⁹ Maldeco Fisheries Ltd. is the leading private-sector commercial aquaculture producer in Malawi, and was involved in the AgriTT pilot (see Annex 3).

really know what it has done and how the farmers have benefitted. We can appreciate it, and so we can scale it up.” Extension director, MAAIF

“The good thing is that the local government was involved. So we as government will continue to scale-up and introduce methods in more areas.” District agriculture officer, Hoima District Local Government Office

“What we are doing is aligned with the national policies. This project came at a good time. There may have been some failures and challenges, but we hope that they can be learned from and then scaled up.” Senior lecturer, LUANAR

MAAIF in Uganda has already applied for World Bank funding to carry forward work that started under the AgriTT pilot. Likewise, LUANAR has received recognition as a leading fishery research station in Malawi, with promises of funding from the World Bank. Staff at MAAIF and LUANAR reflected on the crucial contribution that AgriTT made to achieve this WB recognition:

“When I started looking at the World Bank project, I realised it was looking at production, value-addition and marketing. Thanks to AgriTT, we have already identified and adopted the technologies, so we don’t have to waste any time on innovation and adaption of the technologies now. We can just go directly into scaling up from AgriTT. It simplifies my work.” Director of Crop Resources, MAAIF

“This project helped us to identify a lot of gaps. Due to the delays, we didn’t achieve everything but, having identified the gaps, we are able to [use this knowledge for] other projects... We were able to put these elements into this project because we had identified that need through our experience in AgriTT.” Aquaculture and Fisheries Department head, LUANAR

2.5.3 Changing mindsets about aid in China

While it is still premature to assess the full impact of AgriTT, several stakeholders suggested that AgriTT has indeed proven trilateral aid to be an important instrument in the aid toolbox. What is more, there is initial evidence that this learning about trilateral modalities is having a direct policy influence within China:

“AgriTT has largely achieved what it set out to do — to engage the Chinese in discussions about aid to Africa, to explore ways to work with other donors in aid in Africa. When we started the project, the Chinese were very inward-looking, focused on technology-demonstration centres, and not on broader issues of linking those to the market of the country. This project has helped the Chinese aid sector see that the value-chain approach is needed in Africa—just as it is needed in China. They were initially very sceptical. This project has provided them with living examples of how this can work. It is quite successful from this perspective.” Senior Research Fellow, IFPRI China

“The PMO has been able to convince the Chinese government of the value of our work. They were initially really sceptical. They wanted to scrap the project entirely in the early phase of delays. But the people managing this project had a unique ability to listen to expert input and move things forward. They have been very responsible, and communication has been smooth, so we have been able to overcome our challenges in the end. This is really hard to come by. They are very hard-working. DFID China has also played a huge role: They have been able to get us out of conflicts. Their capacity to coordinate is number one.” Vice-director of CATAS in Hainan

According to the Director of the Center for International Development and Innovation Studies at UIBE, AgriTT has had a really significant influence on the Chinese government, which was initially against trilateral projects. He explained that despite the small scale of the AgriTT project, its political influence has been huge, opening up the government mindset to new ways of delivering aid beyond bilateral co-operation. The Chinese Government has even begun to explore trilateral projects involving the US. A representative of the China Ministry of Agriculture also explained that, prior to AgriTT, the Chinese government had been sceptical of trilateral engagement, preferring to focus on bilateral engagements with African countries. Now, viewing AgriTT as a success, they have begun discussions of trilateral partnership with other countries:

“MOA sees AgriTT as a pioneering channel for collaboration on agriculture aid. The pilots have opened up doors for us to collaborate in new ways to the extent that trilateral modalities are gaining acceptance in China. This is thanks largely to AgriTT. We have seen that China has the technology that is suitable

for Africa. And the UK has the modalities for achieving better impact, for making aid more effective. AgriTT has been an exploration of this notion in practice, and we are satisfied with the initial results.

There were delays at first, but once things were underway we understand that the countries have positive views and experiences. Through this collaboration, we have been able to appreciate the deep connections that the UK has in Africa. We've also learned from their approach to training capabilities, managing projects, and the small details we wouldn't see from the outside, such as the value of having a dedicated office for managing the programme, with dedicated personnel in country. These insights will have lasting impact on our projects. Our only regret is that it is ending prematurely. The project has been too short to be able to ensure sustainability."

Looking beyond stakeholder perceptions, we can also see how pledges by the Chinese government at the 2015 FOCAC (Forum on China-Africa Cooperation) include high-level goals that are closely aligned with AgriTT's approach. For example, they include new notions of a value-addition approach, and plans to set up a collaborative research hub with African researchers not previously seen (Box 4). According to the Agriculture and Natural Resource Advisor for DFID China, before AgriTT, collaborative research in this field did not exist, 'The fact that it is in the FOCAC pledge shows that the value of this approach has been accepted, and that the Chinese government is willing to explore collaboration with other, non-UN organisations for the very first time'.

Box 4: Official Chinese government pledges supporting African agriculture modernisation

1. **Encourage Chinese enterprises to engage** in large-scale farming, animal husbandry and grain storage and processing in Africa to create more local jobs and increase farmers' income.
2. Carry out agricultural development projects in 100 African villages to 'impart and spread Chinese agricultural expertise suitable to local conditions and needs.'
3. Send thirty teams of agricultural experts to Africa for 'agricultural planning, academic exchange, experiments and demonstration, and technical and teaching guidance,' with the aim of building agriculture-development capacity in Africa.
4. Conduct **agriculture-research cooperation** by establishing a 'ten plus ten' cooperation mechanism that **pairs Chinese and African agricultural research institutes** researching seed breeding, poultry and livestock improvement, pest and disease prevention and treatment, and epidemic prevention and control. The aim is to enhance agricultural productivity and **value-addition in agro-production**.
5. Provide emergency food relief to regions experiencing severe drought and resulting 'food crisis' through emergency food aid and **cooperation with international organisations**.

Source: MOFCOM (2016)

As we will see in the next chapter, achieving these successes took a tremendous amount of effort, negotiation and compromise, and engendered a huge amount of learning on the part of all stakeholders. This learning would be deepened, and the successes strengthened, if the project could be extended in some form rather than ending at a time when all of the hard work has just started to pay off. As Makerere University Professor put it, 'AgriTT has been a noble model; I'm sure we will see similar projects popping up, but we need to not drop the gold that is already in our hands.'

3. Challenges and responses

“It seems straightforward, but in practice there are lots of challenges.” Reflections on AgriTT by the feed specialist TA from Guangxi Academy of Fishery Sciences

AgriTT has achieved meaningful and innovative impacts in a relatively short period of time. However, the programme has also run into challenges in implementation, particularly in the pilots. This section outlines some of the main challenges, and describes how they were addressed.

3.1 Managing coordination challenges and external constraints

Proponents of trilateral cooperation argue that these forms of partnerships can bring together the best of different actors to share knowledge and implement projects in support of common goals. While the magic of trilateral cooperation may lie in the opportunity it provides for each party to bring its main strengths to the table, fitting a diversity of roles into a cohesive whole does make managing trilateral cooperation particularly challenging.

AgriTT's approach entailed working across three different continents in four countries, involving multiple partners with different roles in each country. Although government departments were selected as the key implementing partners for the pilot projects, AgriTT also involved research organisations, NGOs, and the private sector for various components of the pilot projects. Each partner had its own goals and ways of working (some conflicting), areas of expertise (some overlapping), and assumptions (not always aligned). In such partnerships, crucial elements of good development cooperation such as communication, trust, transparency and common purpose do require more effort and coordination. This takes time to establish and get right. As discussed earlier, recognising the strengths and weaknesses of these different partnership types, and finding a way to fit them together, was a key achievement in the early phase of the pilot projects.

However, the ambitious task of working with many different partners across diverse geographies, together with external constraints within which the project had to operate (discussed below), was not well matched by the small management team working remotely from China and the UK. This was especially true given that the programme not only aimed to achieve meaningful technology transfer in innovative ways, but *also* had to set up entirely new relationships and systems for doing so.

In practice, due to the circumstances of the AgriTT pilots, securing official agreements and developing associated systems for project management took much longer than anticipated, and this contributed to perceptions of trilateral partnerships as inherently inefficient or costly. Indeed, many stakeholders pointed to ‘trilateral cooperation’ itself as a key source of challenges faced by the project, bemoaning the increased transaction costs of working with so many different partners:

“The challenge with tripartite arrangements is that it takes too long for decisions to be reached. We are from different backgrounds: China has its own system; Uganda has its system; the UK has its system. It takes a long time to reach very small decisions. The project was delayed by a whole year due to this.”
Professor, Makerere University Kampala

“The delays were mainly due to the trilateral nature of the cooperation. There were so many players who need to reach a consensus before any action could be taken. Reaching decisions on consensus takes a very, very long time. This project had a lot of contracts and partners involved, and it wasn't always clear how everyone's roles fit together.” Uganda AgriTT Project Advisor

“In trilateral cooperation, every party has its strengths. But because this kind of collaboration was new, there was a lot to learn. We didn't always collaborate very effectively, so we didn't always achieve the results we expected.” Chinese TA in aquaculture, Malawi

The AgriTT Business Case made some provisions to address the potential challenges of coordination by building in multi-stakeholder oversight through a Steering Committee, with room for regular review and ‘adjustments ... to improve efficiency,’ and by pointing to the necessity ‘in early stages of the programme, to secure official agreement with countries’ (DFID China, 2012). However, communication on this arrangement was not strong, and led to some feelings of exclusion by some partners.

“One key challenge for us was that the steering committee members were separate from the implementing partners. We submitted the reports, but they made the decisions. Anything that wasn’t in the project documents had to be approved by the steering committee. Anything that was not managed directly by us didn’t have room for input from us. The problem was the rigidity not of the people but of the systems. Given the contribution that the University made, we felt we should have had a higher profile in the project. But we did not have a seat in the steering committee, so we were excluded. It felt like, ‘I must answer to them, but I cannot influence the decision making’.” Professor, Makerere University Kampala

These feelings of exclusion were further enhanced by the fact that some implementing partners (such as NARO, MAAIF, LUANAR and DoF) were also members of the Steering Committee. This also created a possible conflict of interest since the governing role was combined with the implementing role. In this way, the process of decision-making by project management can affect the perceptions of inclusiveness and trust by partners.

Managing aid during aid suspension

The greatest challenge in coordination, however, came from the external constraint of aid suspensions in both Uganda and Malawi at the start of the pilot projects. This posed a particular challenge for AgriTT since it was working with government ministries as lead partners.

A financial management scandal in **Uganda** in 2012 prompted DFID to suspend all aid that went directly through government financial systems.¹⁰ Sweden, Norway, Ireland, Denmark and Germany also suspended budget support to the Government of Uganda.

Because of the aid suspension, DFID could not approve funds being passed into a central government account. Instead, it required Landell Mills to pass funds through a dedicated project account that could be carefully monitored. An interim solution was to pass money to MAAIF through NARO (Uganda’s National Agricultural Research Organisation). While this arrangement was necessary in the context of the aid suspension, the result was funds were slow to get to the district agricultural and production officers. This meant that the time-sensitive task of delivering cassava cuttings to the districts for the first planting season was delayed, essentially wasting the entire batch of cuttings and delaying the project by an entire planting season. Left in the lurch waiting for the cuttings, some of the districts obtained their own cuttings and proceeded with planting, while others planted other crops, creating unexpected costs and misaligned expectations for farmers and district staff.

This funding arrangement, coupled with the extension-system reform in Uganda, also meant that key district staff were not able to enthusiastically engage in supporting the Chinese TAs or the farmers. This left the Chinese TAs poorly coordinated and frustrated. MAAIF’s extension director explained how this was also a difficult experience from their perspective:

“When we did finally get extension officers, the procurement process was very, very long, so that the planting materials were brought out of season, and farmers had already planted other gardens. When the TAs arrived, people on the ground were expected to accompany the Chinese, but there were language barriers, and the work plan was not clear, and they did not have any support. The TAs were thrown into the village and became stranded. They didn’t know how to express themselves, and didn’t understand the communities, so it was a real challenge. The district had tried to put in a work plan for the district officers, but it was only on paper; the funds to help them implement it were not there. We lost a whole year this way. When they came to review [the project’s progress], there was almost nothing on the ground. The people came to see what we were doing, and there was nothing. It was a very bad experience.”

The PMO reflects, ‘Had we been able to pass funds to MAAIF directly at this point, implementation of this phase would very likely have been very different. In this way, the aid suspension and what followed from it contributed significantly to the planting season problems in 2014, which cast a long shadow over the Uganda pilot.’

Landell Mills were eventually given approval to make direct payments to MAAIF officials, up to a certain value and against agreed budgets. The project advisor was also allowed to make payments to district

¹⁰ See www.gov.uk/government/news/uganda-uk-suspends-aid-to-government.

staff using a mobile money system. This type of arrangement was frowned upon in 2014, but their eventual success indicates that with the passage of time the AgriTT PMO were able to make the case for a sensible change of the rules.



Advertisement for mobile money

In **Malawi**, DFID formally suspended aid to the country in November 2013 in response to the 'Cashgate' scandal involving fraudulent payments by central government officials. The suspension continues to this day. The PMO were told that no payments could be made to DoF (Malawi's Department of Fisheries), the main partner, without special approval of a dedicated mechanism that clearly reduced exposure to fiduciary risk. The mechanism the PMO ultimately devised had to be approved first by the DFID Malawi Head of Office, and then by the UK Secretary of State. It involved identifying partners to requisition payments for activities. Funding requests were then checked against project budgets and financial management guidelines by the project authorising officer, and then an accountant from LUANAR's account management office approved payment directly to the person responsible for the activity.

It was eventually approved, allowing the project to keep going. Without approval AgriTT in Malawi would likely not have been able to continue at all. The delay cost the project valuable time. The pilot finally started in March 2014, after several months of key project activities having been suspended. By that time, it was approaching the 2014 cold season, which meant that fish breeding could not begin in earnest until the autumn of 2014 when the Chinese TA arrived.

During the mid-term review, the PMO considered simplifying these procedures further, but the Director of Fisheries discouraged this, saying, 'We don't need any simplification of procedures, which will bring in financial risk. It's just a matter of planning.' However necessary from a fiduciary risk perspective, this 'planning' was not always forthcoming. As in Uganda, lack of coordination among key partners, and limited leverage by AgriTT PMO, sometimes translated into delays and frustrations in the field. As the NAC director explained,

"We have to request funds from another institution; we don't have our own funds here to manage. So that has created delays for our implementation. For example, we make plans to do a certain activity in the first week of the month, but we have to request funds, and only get them in the second or third week. We are dealing with live animals here. Some of the activities are really necessary in certain months. If you delay this, you just can't do them that season. This has a huge negative impact."
 Director, National Aquaculture Centre, Domasi

For Kasinthula District in Malawi, the challenges were particularly stark due to lack of coordination within the District of Fisheries. The farm manager explained that many of their experiments under the pilot had been affected by lack of funds or equipment, and not participating in the project meetings. 'This has affected our achievements. For example, when running our experiments, we stocked the nets with fish; but while we were waiting for the feed, which was delayed, the fish grew to the point that they started breeding, so we had to restock entirely in order to run the experiment.'

Robust financial and management systems

The management systems developed by AgriTT ultimately did allow the pilot projects to move forward. While not everyone appreciated the complex factors involved in these arrangements, many did realise the challenges involved and the need for rigour in financial management:

"In this project, we have quite a stringent process for approving fund dispersal. Even after we receive payment requests, we have extra checking mechanisms to make sure that all the paperwork is in place. We take all of this to the key partner in control of overseeing it; he has to sign the documents in order for us to proceed with the payments. The cheque is then prepared and taken back to the account signatories for signing. Only then can the funds move. We do not keep any petty cash whatsoever; all the money must sit in the bank. The beauty of this is that the funds are beautifully clear. Really, the control over funds is so strict that you cannot get a penny handed over; that authority must be in writing before we can process a payment. This contract has been good because all of the funds have been used as planned. We are comfortable with the structure that is up and running. But it can frustrate people and lead to delays. The request can come from the field, and it could be as urgent as needed yesterday — but the authorisation still has to come first." Supervisor, PKF

The PMO also reflected that by the end of the project the need for accountabilities and payment in arrears was 'well understood' by project stakeholders, and 'the arrangements for the most part work very smoothly.' The supervisor at PKF similarly suggested that, despite some resistance on accountabilities by partners in the early phases, this had changed by the end of the project. 'Working on the mindset of the people has been good. You tell them, "You have to show receipts." It may take some time, but they do get back to you.'

Internal coordination challenges

In addition to working through the challenges of the aid suspensions, there were also coordination challenges linked with working with government ministries as implementing partners. Firstly, the government extension systems in both Uganda and Malawi faced challenges of their own that hindered implementation. In Uganda, AgriTT occurred during a reform of the extension system, which had decreased their staffing and made it nearly impossible for MAAIF to fulfil its role in mobilising the farmers. Similarly, in Malawi, though AgriTT had the advantage of being aligned with the national fisheries policy, the country has only a fledgling aquaculture extension system, with very limited aquaculture extension workers in the districts, so capacity was limited to meet the needs of the AgriTT project plan.

Secondly, the PMOs in Landell Mills – operating remotely from China and the UK – had limited leverage over these governments. A manager at Landell Mills recalled that when they arrived in Uganda to do the first planting, 'We found that some of the farmers didn't know what AgriTT was, and we had to spend a lot of time and effort doing the groundwork to move things forward, help them prepare the land, and build trust.' Several stakeholders also suggested that, within the context of the upheaval created by reform of the extension system, some of the farmers selected were not the most appropriate for the pilot.

Chinese travel restrictions

Likewise, in **China**, working with the Ministry of Agriculture's FECC provided the distinct advantage as a key Chinese government and implementing partner of gaining access to cassava and tilapia systems in China, and they provided a good channel of communication with MOA. However, there were disadvantages with this arrangement as well. Chinese government rules about overseas travel on official business changed shortly after AgriTT started its implementation phase, so that officials could no longer travel using private passports to avoid unnecessary bureaucracy; this became quite risky even

for those in research organisations or university partners. Approvals for any travel required permission from multiple agencies and took a long time to secure. FECC were subject to a quota that limited their overseas travel, which meant that they were only able to join visits to Africa for the scoping, final review, and annual Steering Committee missions, and then faced extremely tight restrictions on how many days they could stay. This limited the amount of on-the-ground supervision they could provide the TA during pilot implementation. This was mitigated somewhat by internet-based messaging apps which were used to maintain regular communication with the TA and support a sense of connection with the TA in field.

3.1.1 Response: scaling down and increased working on the ground

AgriTT chose to focus on government ministries as key implementers in the pilot projects. As discussed earlier, this allowed AgriTT pilots to be integrated into policy priorities of both beneficiary countries and also allowed for direct learning and capacity building. This parallels experience of other trilateral cooperation elsewhere. For example, in a recent survey of trilateral projects, OECD identified that a 'core motivation' by providers to engage in trilateral cooperation was to more effectively respond to beneficiary countries' demands (OECD, 2016). This points to the importance of strong ownership by the beneficiary and alignment with their national development strategy. However, in AgriTT's experience, aligning government priorities with implementation realities proved challenging. Coordination challenges in working with the government partner, coupled with the external policy constraints discussed above, presented major challenges to all or part of the pilot projects at various points, and each required a tremendous amount of negotiation and flexibility among all those involved as various components of the projects underwent adjustments. This section explores how AgriTT managed these challenges, what adjustments were made, and how stakeholders perceived the process.

Scaling down

In Uganda, the Chinese travel restrictions, coupled with the coordination challenges of bringing the cassava cuttings to the field, led to a scaling down of the project and a shift in how Chinese TAs were used.

By a year into the project, the first cassava planting season had been missed and there was severe waste of planting materials. There was discussion during the Steering Committee meeting of putting the first two components (cassava production and processing) on hold. There were also reductions in the budget due to adjustments to the DFID-China office. At the same time, the first Chinese TA had to leave prematurely, and MOA were reluctant to send further TA to Uganda for the production component.

Despite these issues, those involved in the pilot were keen to continue both the production and processing components. DFID did ultimately grant permission for them to proceed, but only on the condition that technical and economic justifications for procurement of equipment as well as a procurement timeline and an acceptable management model be made. Fulfilling this requirement took time to conduct evidence-based analysis and further negotiations among all partners.

By the time this approval came through, then, it was already mid-2015 and the October planting season was fast approaching. It was not certain that production, freight and customs clearance could take place in time. DFID therefore would not approve procurement of the mechanization equipment unless Landell Mills guaranteed to cover the cost in the event that the equipment arrived late. The PMO recalled, 'The company was so committed to delivery of the pilot that they were willing to take on this risk. Had they refused, which would have been quite reasonable, the Uganda pilot would effectively have ended.'

In this way, the Uganda pilot was ultimately scaled down significantly, from 40 'mother gardens' in the original plan to 8 demonstration gardens. This involved scaling down the pilot to focus on two 'closely managed' demonstrations in Kiryandongo focusing on mechanised planting. Some changes in the responsibilities of key partners and staff were also made, with a coordinator brought in to manage project activities on the ground rather than relying on the implementing partners to drive activities forward.

Adjusting technical assistance

On the Chinese side, the PMO were also able to work effectively with MOA to allay concerns and to ensure that if more TA were posted again there would be counterpart funds in place to ensure that the local partners were better placed to support the TA.

TA engagement was also scaled down. Instead of long-term TA engagement, Chinese TAs were sent for much shorter, focused stays (from a few days to a few months), at key points in the projects. The vice-director of Hainan CATAS, who was also on the Steering Committee for Uganda, reflected on the thinking behind this scaling down:

Many things came up that we hadn't considered in advance. Initially, we aimed to reach large numbers of farmers because we felt this would make our pilot more effective. But we didn't fully understand the limitations of the Ugandan government and partners. Our expectation was that everything would be in place across all the districts when the TAs arrived. But this was far too difficult. They were simply unable to coordinate across all the districts. It was far too ambitious a plan.

Managing disappointment

While these adjustments were necessary for the project to move forward at all, the Ugandan partners were not initially supportive of this approach. MAAIF preferred that all four districts be treated equally, with broad engagement across the farmer groups. They also wanted machinery in all four districts to meet the expectations that had been raised among farmers. Though they eventually agreed to the new plan, there was a strong feeling that DFID (or the PMO) were imposing unnecessary and unreasonable conditions, and that the Plan of Operation was not being followed as agreed. And there was also frustration among the original project farmers across the districts.

In the end, the equipment arrived before the deadline, and in time for the TA to carry out the demonstrations, which they did successfully. Thus, only with much negotiation on the part of the PMO, risk-taking on the part of Landell Mills, and compromises on the part of both DFID and MAAIF were the components able to move forward. Indeed, considering these challenges, it was an admirable achievement that the equipment for the TA demonstrations of mechanised production was in the field at all.

Likewise, while the scaling-down of how Chinese TAs were used in both countries allowed for maximum efficiency in resource use, it left both the Chinese TAs and the pilot-country partners frustrated since such limited interactions on the ground prevented them from taking full advantage of the opportunity for co-learning and exchange. The Chinese TA came to each site for only a few hours or at most days at a time. If questions emerged in the following days and weeks, both farmers and extension staff emphasised that they had limited communication channels between field visits, and a lack of guidance throughout the growing season. The PMO did recognise the gaps created by the adjusted plan, but they could not be addressed within the short timeframe of the project:

We tried to set up a virtual panel of Chinese experts that could be consulted, but it didn't really take off as a resource for Uganda. This could be a really good model for getting ongoing input in real time between the short stints. It didn't get off the ground because it was too much to manage, but this is something to consider for future.

Both the Chinese and the pilot project stakeholders expressed regret that the exchange of Chinese technology had been restricted.

"We only had the TAs for three months. One year would be better, to allow them to see the full-year cycle and be around for all the phases: site identification, and land preparation, planting, first weeding, second weeding, pruning, disease/pest management, growth characteristics monitoring, etc. These are all aspects that could benefit from technical expertise. They were not involved in site identification, so they just had to work within what we had, and that is how we ended up with one plot that was not up to standard. It was very intensive for those three months, but it covered just a short part of the full planting and growing process. Costs are also high for short visits because they stay in a hotel — if they stayed longer, they could have a house, and costs could be lowered." District Project Officer, Kiryandongo District

Those partners who received training from NAC wished that they could have had direct training from the Chinese TAs, or simply opportunities for back-and-forth exchange:

"I am a bit deflated because I am very eager to apply the techniques that I have learned, and I think I am doing everything right, but I am not succeeding. I believe that I'm following all the steps that I was trained to do, but still I only have an 80–85% success rate, and I don't understand why. Without more interaction with the Chinese TAs, I just don't have a way to figure out a solution. I think a better approach would be to work with the Chinese TAs directly on our farms. I believe in hands-on learning. The manual is useful, but you cannot question a manual." Farm manager, Aglupenu Investments

"I only received one-time training. This is not enough. I am trying to use what I learned, but there is no one to ask questions from, or to guide me, to tell me if what I am doing is right." Fish farmer and village head, Matambo village

"It takes time for us to understand each other. Even if you employ translators, it is still challenging. [The TA we worked with] needed to be comfortable, and we needed to try to understand her method of work, and we had to be patient. She eventually integrated into the system. Just when she was really getting comfortable, after six months, she had to go. This comes back to the rigidity of the system. It is really difficult to bring another new person." Professor, Makerere University Kampala

The Chinese also felt that their effectiveness had been limited due to the limited time for engaging with farmers:

"The TAs weren't given the opportunity to contribute to their full ability. First, you need to give them the opportunity to understand the environment in Malawi — the market, the feed situation, the available materials and the constraints. Then you need to allow them time to interact with farmers and adjust their techniques to the local needs." Fisheries economist, Wuxi Freshwater Fisheries Research Center

"AgriTT gave me ten days to do my training. This was not enough. You need more time for real dialogue, for two-way learning." Researcher, Guangxi University

"We haven't been able to spend as much time as we need with the farmers to do proper demonstration work — we can't just teach them once or twice and expect them to learn." Chinese aquaculture TA, NAC

Unfortunately, this scaling-down also disappointed many cassava farmers who were part of the original project design. Farmers in the Kiryandongo Farmer Group were particularly vocal about the challenges presented by their early involvement and unfulfilled expectations. The District Project Officer for the project felt that it had failed his district:

"At this point, the farmers have an awareness that there are possibilities for their cassava, but they have not yet seen this coming to fruition through the project. Most farmers see an opportunity, but so far have not yet seen the light of the opportunity. They know that it is possible, but have not yet seen any sign that that technology is coming soon. So for now the technology demonstration has not succeeded. They are mostly still focused on cassava for coarse flour, fresh eating, and brewing alcohol." District Project Officer, Kiryandongo District

Farmers in Kiryandongo even expressed feelings of being burdened by their involvement with AgriTT:

"The project has been very welcome, but it was a bit expensive for us. The materials came late, so the project failed to take off as expected." Farmer 2, Kiryandongo Demonstration Farm

"We are happy that you have come to help us here, to bring this knowledge to us. We have learnt how to plant cassava with machines. Now our cassava is mature here. That is why I beg you to help us transport and dry it. I am telling you I have mature cassava, and I beg you to help us in processing the flour." Margaret,¹¹ farmer, Kiryandongo Farmer Group

"The Chinese technology is good, but we have not benefited from it. The machines came late; the chip production has still not come. If these machines had come, it would have really helped us at least reach the level of bringing products to market. It would have really uplifted our standard of living." Farmer group chairperson, Kiryandongo Demonstration Farm

¹¹ Margaret requested to be quoted by name.

In one demonstration farm visited for this study, the farmer had failed to fence the property, and goats had completely destroyed the cuttings. He had also begun ploughing a section of the demonstration, preparing to plant something else. A field assistant suggested that these were acts of resistance to AgriTT's insistence that he provide his own protection:

"That farmer is planting something else that he is not telling us about. He has given up on cassava. The variety you are asking them to produce — there is no local market for it. It doesn't taste good. Sensitisation was not done well in this project. These farmers share information. When the project management team gives uneven support, giving full support to some gardens and requiring cost-sharing from others, they know about it. AgriTT brought a new technology, but it has failed to follow the necessary procedures for introducing a new technology. They forget they are dealing with human beings. In focusing on demonstration, they have sacrificed some individuals. This is not responsible."

Recognising the frustration of these farmers, the PMO explained that AgriTT pushed for procurement of a chipper as an additional processing measure in the year of the project's extension. The present study was conducted prior to the equipment for processing cassava chips going out to the districts with training in linking to markets. Further survey, following the integration of these elements, would be needed to provide conclusive reflections on the overall effects of the AgriTT pilot on these farmers.



Cassava eaten by goats in a demonstration garden that was not properly protected

Ambitious project design

Reflecting on the challenges and adjustments that were made, the PMOs suggest that, in hindsight, it is easy to see that the project was overly ambitious from the outset:

Agriculture technology transfer projects are inherently going to run into lots of dead ends. You have to 'feel the stones while crossing the river.' In practice, this can feel like taking one step forward and two steps back. Development is messy. It is easy to forget this. It requires building relationships and trust. It is naïve to think that you can work out the ingredients in a short timeframe. Upon reflection, the plan was probably overambitious. It isn't always obvious from the outside how much work goes into moving something forward even just a little bit. Development plans can't be drawn up in a month, with neat timelines. The real world isn't like that, particularly when you are dealing with government-to-government partnerships across three continents. It takes time to build trust. In hindsight, we probably assumed a level of capacity and logistics that was overambitious.

Many others involved in project implementation agreed. Because of the unrealistic original plans, scaling-down of the project was necessary to allow the Uganda pilot to continue. On one hand, these course-corrections were essential for ensuring that the pilots could move ahead. Capable institutions and personnel were put in place, and goals and activity plans sharpened to allow the pilots to move forward. As a DFID advisor put it, 'Landell Mills took actions, and these actions proved to be quite useful. After networking and understanding each other, the relationships among all partners, including those in the steering committee, have improved. The hard work has been really recognised.'

At the same time, DFID and AgriTT project management were appreciated for their flexibility and the space they provided for partners' suggestions for adjustments. For example, the principal fisheries extension officer at DoF explained how AgriTT had adapted the project's cost-sharing requirements based on their input:

“Initially, DFID wanted everything to be implemented on a cost-sharing basis. They would not provide free inputs or handouts of any kind. But we reasoned with DFID and the PMO to say, ‘Yes, we understand the sustainability logic to not provide all of the inputs to the farmers for free; but if we ask the farmer to buy fingerlings and also buy feed, it might delay the project too much. For them to get money to buy the [expensive Maldeco] feed and the fish would present too much of a burden.’ Our thinking was that the farmer should provide the labour and the physical ponds (making them larger and deeper, and putting up fencing), ensuring security, etc. But the original project design had not factored in the value of these things. We put in the value of these inputs and had a long discussion with DFID, and later they were able to accept that this approach makes sense, and accept the notion that the farmer did play their own part in a cost-sharing model.” Principal fisheries extension officer, DoF

Given the severity of the challenges, it is especially remarkable that many stakeholders felt that the adjustments allowed for real progress, meaningful impacts and trust-building among partners. As one Steering Committee member reflected:

We reduced the scale of the activities. This made them much easier to manage, and made it easier to see results. Our goal became very focused on how to do the demonstration well. The farmers were really eager to work with us. We did a lot of trainings, and they have all been very enthusiastic.

Thus, while adjustments are a necessary part of project management, the process can cause frustrations and loss of trust. AgriTT had particularly challenging adjustments to make given the aid suspensions and coordination challenges in working with the government as implementing partners. Unforeseen budget changes also sent mixed messages to partners and further undermined trust.

Clear management roles

Despite these challenges, the management of the AgriTT project was overall viewed positively by stakeholders. Indeed, even those who were critical emphasised that over time, trust was built. It is a particular achievement that stakeholders largely felt that the AgriTT systems were working well by the final year.

“We had a big learning curve. But we’ve now set our working ways, and we have succeeded. We had challenges in setting up the management structures and in getting the pilot design right. Those issues have been solved now. We have a good management structure, and we are operating at a more realistic scale. We’ve learned that you should start small, and do that well; then, little by little, you can expand. What we have learned is that it is impossible to set everything clearly from the beginning. You have to build room into the plan to learn and to make adjustments. This has been a real positive in AgriTT, the room to make adjustments.” Vice-director of Hainan CATAS

This also highlights the need for more time in such projects. Now that these systems and relationships are in place and recognised to be robust, a second phase of the project could have greater value.

AgriTT’s experience underscores the critical importance of having clearly defined roles of different partners, time and flexibility to establish good systems for management, and strong communication to support adjustments as needed. In this, AgriTT is not alone. A recent review by OECD of trilateral experience found that ‘Finding the right partnership arrangement in triangular co-operation requires time and resources, especially in the first stages of the project’ (OECD, 2016). Once management systems have been achieved, however, trilateral partnerships ‘allow for more efficient management of resources later on, which can compensate for higher initial transaction costs.’

Ideally, the Steering Committees should have had a clear ‘board of directors’ role, being responsible for setting the overall structure of the pilots, but not being involved in implementing. The implementing partners would have had more clarity over their level of decision making. In addition, the challenges would likely have been lessened with stronger coordination on the ground to support good communication and trust-building among partners, and support negotiations when frustrations arise.

While the trilateral partnership approach has meant added layers of complexity in AgriTT’s experience, by the end of the project, much of the early frustrations had dissipated, and stakeholders largely saw the established management systems as effective. If AgriTT had entered a further phase, it could have potentially demonstrated reduced transaction costs associated with the trilateral partnership model.

3.2 Procuring appropriate technologies

AgriTT could have taken shortcuts to quickly procure equipment and satisfy some stakeholders. But such shortcuts would have made it impossible to make sound business cases for the technologies transferred:

“If it were known at the beginning of the project what should be procured, then it would have been a simple matter for the PMO to organise purchase (following the procurement rules), freight and installation, and it would be reasonable to expect completion in a short timeframe. Indeed, this was the case for procurement of vehicles for the project, which were quite straightforward to procure.” AgriTT PMO

Thanks to the adjustments discussed in the previous section, AgriTT did achieve much of what it set out to do in agro-technology transfer along cassava and tilapia value chains. However, the early project delays coupled with the time-intensive process of researching, choosing, analysing, procuring and installing a wide range of technologies meant that the various components of this ‘holistic’ approach could not be fully integrated as planned. With these components managed separately, by different partners and with distinct budgets, and with some components encountering more challenges than others, the value-chain demonstration was fragmented in practice.

In Malawi, the feed component suffered the most. The principal fisheries extension officer of the DoF expressed frustration over the fact that the feed component of the project relied on work by LUANAR that was delayed: ‘The DoF were implementing the pilots, but we relied on feed that was supposed to come from LUANAR. Due to delays with equipment and internal challenges in LUANAR, this did not happen.’ The feed component only began making progress in the final extension year of the project, frustrating efforts to lower the costs of aquaculture and reduce entry barriers for fish-farming operations. Likewise, as mentioned earlier, while facilities for fingerling production were upgraded by the project, limited fisheries-extension staffing in Malawi hindered outreach to farmers. More time was needed to properly embed the technologies with farmers.

The delays also resulted in a broken value chain in Uganda: as mentioned above, farmers from the mother gardens were desperate to harvest what they’d grown but lacked avenues to process it into high-quality flour. The lack of high quality cassava flour from the project forced the value-addition investors engaged in the pilot to source high-quality flour from outside of the country. Given the failures of processing, stakeholders in Uganda suggested that AgriTT would potentially successfully prove the concept of industrial cassava to Ugandan leadership while simultaneously turning away those farmers involved in the demonstration project.

“In this project we worked with perfectionists who wanted things to be perfect before a decision could be made. This has been a pilot project, so if you have reached a good decision, my thinking is that you should try to see how it will work. If you don’t take risks, you will stay on the drawing board forever. That is what happened with this project. We were staying on the drawing board too much. You can overcome challenges, but delays can frustrate progress. This also relates to the pace at which you release funds to do an activity. If there is a work plan and then delays in releasing funds, this can make people half-hearted about the implementation, and you don’t get the attention to detail that you would have had otherwise.” Director of Extensions, MAAIF

Such frustration is completely understandable, particularly on the part of the farmers. But it is important to place these challenges in the context of the aid suspensions discussed above, and the fact that AgriTT management had to negotiate to keep the processing component funded at all.

It is equally important to note that risks were taken in the context that AgriTT was trying an innovative approach to development — demonstrating technologies within an entire value chain. As noted earlier, this required rigorous analysis in procurement decisions, to avoid purchasing equipment with no viable future in the country. For example, rigorous feasibility studies were needed to ensure the suitability of a given technology to the socio-economic context of the beneficiary communities. Stakeholders emphasised that even with a strong business case and relatively appropriate technologies, Chinese technologies still needed to be adapted to the local socio-economic realities, and this required time — time that was often lacking in AgriTT.

“We needed to have the technologies from China adapted in Malawi before they go to the farmers. But there has not been enough time to really adapt the technology. The infrastructure that we had to adopt the technology — most of the ponds here were smaller, not as deep as required for the technology. So they needed to be adjusted, some ponds combined together, deepened, etc. This was not factored in at the beginning, so it consumed some unforeseen resources.” Principal fisheries extension officer, DoF

A researcher at Guangxi University who was part of the initial scoping mission in Uganda reflected on the high costs of production for every aspect of the value-addition work in Uganda. During the interview she showed photos from her trip to Uganda of cassava drying on the ground. When she saw the cassava, she recalled,

“I was really upset. It was mixed in with dirt; it was moulding; and animals were walking over it. This showed me that the conditions of production in Uganda are really poor. The most basic food-safety awareness just isn’t there. So how are you supposed to produce a high-quality flour from that? Having high-quality cassava flour is the basic starting point before you take value-addition anywhere. I told the team that I could easily do value-addition work, but I can’t guarantee the flour quality. We developed good value-addition products, and this collaboration was successful. But the quality of the flour remains a major barrier that AgriTT has not overcome. Even if you do overcome it, we have found that there are expenses at every point along production. We were supposed to be developing marketing for the products, but we are finding that the packaging has to be printed outside of Uganda, so it is very costly. The target market is supermarkets, but current costings show our biscuits to be more costly and less tasty than those imported from China. The costs of production are just too high here.”

“We recommended that they didn’t need to produce such high-tech products. They could just promote cassava-flour chapattis. This would make a big difference for food security. Anyone would be able to make these, and eat them, and benefit from them. But the partners weren’t interested in chapattis — they wanted biscuits. The problem is that the impact is very small for these. Making a few biscuits isn’t going to solve any problems. They don’t have a market mindset. Even in the university, they don’t have a basic mindset for value-chain development. It isn’t any good to talk theories; you have to be able to demonstrate concepts.” Technical Assistant in Uganda from Guangxi University



Cassava drying on the ground¹²

¹² Photo credit: Simon Lim

The Director of Crop Resources at MAAIF suggested that, despite the achievements made through AgriTT's value-chain approach, more work is needed to make direct links between the private sectors in China and Uganda:

“AgriTT was a bit too narrowly focused on technologies. It is not just about technologies; it should be about advancing business connections. We identify the technologies, but the manufacturers of the machines in China don't know where they are going because they haven't been linked to manufacturers here in Uganda. We need to link and explore getting into partnership for a win-win for all. The technologies would be more affordable this way. We have done this with the Japanese; we brought the Japanese rice de-stoners. Initially we imported machines from Japan, but realised that the housing was not appropriate for Uganda. So, together with local manufacturers, they produced a steel element, and they continue to import the internal compartment. The focus should be on technology innovation in collaboration with private-sector partners in China. In the SSC SPFS project, for example, we brought private-sector actors from China and Uganda together (post-harvest, mechanisation, seed, etc.). This resulted in eighteen MOUs being signed in one single meeting. In AgriTT, there should have been a link between the private sectors in China [and Africa to determine] suitability of use in Uganda. Without established trade between China and Uganda, things can fizzle out at the end of the project. The Chinese manufacturers should have been linked to the testing in the field throughout the project.”

Such socioeconomic factors were identified in the project design phase of AgriTT, and tackling technology transfer within this context is at the core of the value-chain approach discussed earlier. Indeed, these complaints are a testament to the value of this approach to stakeholders. However, the constraints of the pilot hindered effectiveness in this area, lacking ample time and a more explicit focus on co-innovation and market links.

3.2.1 Response: extending the project timeframe

These early struggles led to a re-adjustment of planned activities, a sharpening of goals, and ultimately to an extension of both pilot projects for an additional year. The AgriTT Extension Plan made the case for this fourth year, reflecting that “setting up effective project management and fund management systems involving UK, Chinese and African partners in the two pilot countries has taken time to get right.”¹³

Given the unpredictable nature of agriculture development work, the external policy context, and the time-consuming process of technology transfer, AgriTT was unrealistically ambitious in trying to achieve rapid technology transfer in two countries in only three short years, with a small management team and limited in-country coordination. Add to that the innovative nature of relationships and systems that needed to be developed, and the external constraints that presented in the form of aid suspension and Chinese travel restrictions, and it seems a wonder that any achievements were possible at all.

“The fear we have is that AgriTT gave itself very little time. We would have loved AgriTT to remain actively involved in the promoting of cassava production and all those other components for a longer time. What AgriTT has achieved is that it has introduced the concept of mechanised production and the working methods of AgriTT. But now, at the point of adoption, when we are beginning to take them on but are not yet there, the project is ending.” District project officer, Kiryandongo District

Thus the extension was a crucial aspect to AgriTT's achievements, but these would have been more impactful had more time been planned from the beginning, for a multi-phased project that would allow for better integration of the value chain, active co-innovation and adaptation of the technologies transferred, and stronger outreach and support for private sector actors.

3.3 Being realistic about project beneficiaries

The question of target beneficiaries and the appropriateness of the technologies for the poorest farmers arose in both pilot projects. AgriTT was clear about its focus: increasing food security through value chain developments. Focusing on value chains, however, in reality meant working with mid-scale, more commercially-oriented farmers—those who had the means to invest and creating stronger supply chains for various agriculture inputs that could in turn benefit smallholders. Such an approach is in line

¹³ AgriTT Extension Plan

with Chinese agriculture development experience as well. However, most food security government policy and aid programmes tend to focus on smallholders as a basic starting point for interventions, and these were the groups targeted in the initial project documents. In both Uganda and Malawi, however, the poorest farmers were not the most appropriate target beneficiary group for the AgriTT value-chain approach.

Although in both pilot countries there was widespread acceptance of the project's core assumption that Chinese technologies are well-suited to technology transfer, some stakeholders felt that China's technology was still too advanced to be applicable to Uganda and Malawi's needs. In Uganda, as mentioned earlier, the question was whether mechanised equipment is appropriate for cassava production and processing. Though mechanisation was part of the original pilot design, and was requested by the Ugandan partner, not everyone was convinced that the relatively advanced Chinese technology was appropriate for Ugandan farmers, or that it would attract investors and promise sustainable uptake. As the Buliisa District Production Officer explained, 'The technologies are good, but individual farmers, being poor, can't afford to buy or lease them unless there is a subsidised price. Our farmers are still peasant-level.'

In Malawi too there were concerns about whether the intensive tilapia-producing technologies were appropriate for some poor farmers engaged in the project:

"AgriTT has targeted higher-level farmers who probably have the means to take things forward."
Professor, LUANAR

"The Chinese technology focuses on making fish bigger. But some people feel that smaller fish are good for the market because that's what people can afford. If you sell a large fish it is not good because only the man in the family will eat it. It is better to sell smaller fish." Director, NAC

This study was only able to have limited interaction with the fish farmers in Malawi, as they are spread across the north and the south of the country, requiring long travelling distances not feasible in this research. However, all farmers visited seemed to be struggling to fully apply the technologies introduced in the project. It was even challenging for one farmer who was the head of his village:

"The ponds I have are small. It took seven months to deepen them, because I was doing all of the labour myself. I now want to combine them into one larger pond to get even better results, but I haven't managed to raise the funds to do this work yet. It is my wish to integrate fish farming with horticulture, but my pond is spring-fed, and with climate change I may have to use up my water from my pond to save my crops. If I can get bigger ponds, I think I would have enough water to do both."

"I have built a fence around the pond, but I still have problems with predators. Birds still come, and otters can come through my fence because it is just made from local materials. What fish I do keep, I have trouble accessing markets for selling them. My fish are actually ready to be taken out of the pond right now, but I don't have anywhere to sell the fish. If I could work with a group of fish farmers to sell wholesale, then we would be able to access markets together." Fish farmer and village head, Matambo village

However, it is clear that investing in these resources remained a challenge for some project stakeholders. During a visit to a farm in Zomba, the Chinese TAs pointed out areas where the farmer was failing to apply their technology:

"The management of this pond is not good. They have put in a fence to protect against animals and theft, but it is made of straw, and it is not strong enough. The water is also not deep enough, so this pond has a problem with frogs. I've explained to the farmer that the water needs to be deeper so that the fish can eat the frog's eggs. But we haven't been able to convince him. Farmers will not accept what you tell them unless they see it with their own eyes, and we haven't had the means to demonstrate well in this project." Chinese aquaculture TA, NAC

The TA suggested that the root cause of the problem was competition between farm and aquaculture demands, with some of the farmers they worked with using pond water to water their fields to the point that they had completely drained them. On the Malawian side, too, there was scepticism that the Chinese technologies were appropriate for sustainable uptake by farmers.

"At NAC, they will tell you about the larger, deeper ponds, the stocking rate, etc. They will show you that they have increased aeration in the fishpond, that they are putting feed in feeding trays to reduce

waste, etc. They will show you fishponds with concrete banks instead of earth, so there is less seepage of water. They will describe the breeding system, and tell you ways of managing the fingerling production to make sure that you reduce the mortality rate of the fry and fingerlings. They will tell you about using soymilk for feeding the fry. But at what level can these be transferred to the farm? We have developed manuals, and we want them to be translated to local languages so the field extension workers can use them with the farmers. But how much farmers can really adopt these practices is a big question.” AgriTT Coordinator, LUANAR

“People here work hard, but they aren’t very attentive to detail. If a fishpond is not well-managed, our technologies are useless. You need meticulous management to see good results. If you demonstrate good results to farmers, they will be convinced. I don’t think we’ve had the opportunity to demonstrate and convince people.” Chinese aquaculture TA, NAC

This debate highlights the importance of targeting the right beneficiaries during the project design. The value chain approach in AgriTT probably meant that the best target were mid-level farmers (Box 5). This could have been more clearly articulated to all partners, particularly government who are more accustomed to working with smallholders. A longer pilot project would have allowed for more work on addressing the marketing constraints faced by smallholder farmers.

Box 5. Climate change compounds the problems faced by resource-poor farmers

Southern Africa is currently experiencing the worst droughts in decades, and at the time of fieldwork for this study Malawi had declared a state of emergency over the drought, with dire headlines claiming that ‘Drought-ravaged Malawi faces largest humanitarian emergency in its history’ (Hamel, 2016). At the time of this writing, the World Food Programme claimed that 6.7 million people in Malawi currently need ‘urgent food or cash support to tide them over to the next harvest’ (WFP, 2017).

In principle, the deep-pond technology used in China and promoted by AgriTT potentially provides an important avenue for water harvesting and reducing vulnerability to drought. Certainly China also struggles with water shortages and droughts and can share valuable experience with water management under resource scarce conditions. However, given the current severe drought conditions, many stakeholders cited the lack of available water to fill the ponds and keep them filled as a key obstacle in implementing the demonstrations. The Director of NAC reflected, ‘Climate change is really affecting us. Water availability and temperatures are a real issue. Temperatures had already reduced the breeding season from August to May, and now it is later than that.... Water availability is also a challenge. The river we are getting water from is reduced. We have trouble filling our ponds.’ These issues of water availability and temperature can be addressed through, for example, proper lining of deep ponds and use of greenhouses. But these are only accessible to those with the means.



Farmer's AgriTT demonstration pond filled with water



Dried-up pond neighbouring AgriTT demonstrations

3.3.1 Response: carefully selected beneficiaries and technical assistants

Some of these concerns, such as the viability of mechanisation or the environmental impact of the pond technology, were core questions explored by AgriTT. In the case of the Uganda pilot, as discussed earlier, a sound business case was developed to ensure that the technology would be taken forward, and there was evidence that at least some farmers were ready to engage on a cost-sharing basis. The DFID Agriculture and Natural Resource Advisor recalled her early scepticism about mechanisation in Uganda, and her subsequent change of heart:

“After the initial scoping mission, both Uganda and China were pushing for the project to include mechanised production. I didn’t think that Uganda had reached a level to be ready for mechanisation. But because this was a trilateral project, we changed our thinking and included mechanisation. Considering the fact that farmers are willing to pay for fuel in our pilot, this indicates that they are possibly ready for this as a first step. I can see now that there is big room for development of mechanisation. AgriTT has proven this to some extent.” Agriculture and Natural Resource Advisor at DFID China

Despite some struggles of smallholders, in Malawi, the deep-pond technology as a tool for water harvesting and reducing vulnerability to drought is gaining acceptance. Indeed, it is being explored for inclusion in Malawi’s national climate-resilience strategy. Following the final tour in Malawi at the end of 2016, the PMO reflected:

“Chinese deep-pond technology is being taken up by Malawian climate change-resilience institutions, and may be included in a new WB climate change-resilience programme. It’s seen as helping to store water, and making water available for small-scale irrigation in drought conditions. This goes against the view that aquaculture might not be a good choice given climate change-driven water scarcity. Doubtless, pond siting is case-specific, and needs careful assessment, but it’s potentially a very important legacy of AgriTT, and an example of a technology being transferred with potential for future scale-out.”



A relatively well-resourced farmer shows an AgriTT demonstration pond with manager’s house in background

The mid-level farmers are also likely to be better placed to take advantage of these new technology within the context of extreme drought. The farm visited in this study that was best poised to use the technology promoted by AgriTT was a well-resourced farmer with an immaculately clean hatchery, vast

fields, large imported farm vehicles, deep wells with submersible pumps, diversified farm activities including goats, pigs, citrus orchards, vegetable production and maize, and stories of travels in Thailand and China to purchase equipment for his fisheries. It is perhaps these dynamic farmers who are best placed to create the demand to improve fingerling and feed supply chains, which could in turn benefit smallholders and improve food security overall.

Thus AgriTT's experience has been that, with appropriate targeting of beneficiaries, Chinese technology is both appropriate and adaptable to local needs in parts of Africa, and further, it shows potential for increasing food security and resilience. As the farm manager in the Kasinthula District Fisheries Office reflected, "The Malawi government policy is to focus on the poor — but there are too many handouts. You need to teach a person to fish, not give them fish."



Chinese equipment welded and reinforced by pilot demonstration workers

In addition to the right target group to receive the technologies, the quality of interaction in technical assistance also affected stakeholder perception of the sustainability of Chinese technologies. In some cases, all that was required was certain adjustments. Much of the equipment procured for cassava planting, for example, needed reinforcing or replacing to handle the heavy Ugandan soils and rock-filled fields. This points to the need to support maintenance as well as co-innovation of equipment as an inherent part of technology transfer. However, there was often a lack of adequate time for this in the AgriTT pilots.

Thus the AgriTT experience highlights the importance of selecting the appropriate group for technology transfers as well as the appropriate means of delivery.

The Chinese stakeholders and AgriTT PMO also reflected that some of the successes in transferring Chinese technologies came from learning in the pilots about how to use technical assistance most effectively. Through trial and error, AgriTT found that sending TAs to the field for a short diagnostic phase, and then back to the field for active implementation when the project was ready for inputs, was an effective way to keep work focused and cost-effective. For example, after the early trouble with coordinating the TAs in the field in Uganda, the Director of Extension at MAAIF explained that the district-level staff had found effective ways of working with them. 'Now the new TAs are working well,' he reflected. 'The extension workers have learnt, and they can put these activities into their normal activities.'

There was also learning related to monitoring and coordinating the TAs' work:

"In the second round, we had a much more targeted approach to selecting the TAs. We were particularly focused on getting people who had experience working outside, in the fields, alongside farmers. They of course had to master the technologies but, more importantly, I emphasised that they needed to be good communicators. You have to befriend farmers — otherwise they will not be able to support you. I told the TAs that they needed to be extremely patient in character. I told them that they should explain to farmers, be very clear about the goals for each action, and then show them. I told them they should not talk too loudly, otherwise the farmers might think that they are angry. In the end we found just the right person. He had strong Africa experience, and he is a very patient person." Vice-director of Hainan CATAS

This learning could have been deepened further had FECC been able to travel to the field for longer periods. Though FECC monitored and interacted with TAs through weekly reports, social media and regular phone calls and meetings, more interaction in the field alongside the African stakeholders would have supported FECC to gain a better understanding of what the TAs were doing, and what would be needed in terms of support from the Chinese side. It would also be deepened with a second phase of the project. As the PMO reflected,

“The challenges of finding TAs who have great technical skills, Africa experience, and good communication skills are often underestimated. We would do so many things so much better if there were a phase two of the project. We would know about TA selection, objectives, roles and systems, not starting things until it was all in place. It is a shame to run something, learn from it, and then move on.”

Stakeholders suggested that future technology-transfer projects should allow more time and resources for the necessary back-and-forth of technology adaptation, and pair African and Chinese technicians to actively work together to adapt technologies and techniques to the local environment, and constructively feed that information back to China.

4. Lessons for trilateral aid partnerships

This report has explored achievements and lessons for trilateral cooperation in agriculture technology transfer from AgriTT's experience.

The key objective of AgriTT was to promote the uptake of improved Chinese technologies in agriculture. In this, there have been clear achievements:

In Uganda, Chinese TAs provided technical input on a range of cassava agronomy best-practice; mechanised planting was demonstrated across multiple districts, improving yields three-fold; Chinese chippers and processors were distributed to farmer groups and a co-investor was also identified for cassava processing equipment, backed by a business case; nurseries were set up to sustainably supply improved cassava; and cassava food products were co-developed in partnership with two entrepreneurs.

In Malawi, a virtual panel of Chinese technical assistance experts was established to provide guidance and TAs provided technical input and demonstration on fingerling and on-growing production, with on-growing technologies tested by farmers; infrastructure was substantially rehabilitated and improved in key government and research institutions and field stations; Chinese large-pond technology improved yields five-fold; training manuals and a software tool for adjusting diets were developed; and experiments were conducted on replacing imported ingredients and improving commercial diets.

Collaborative research was produced in both pilots and study tours to China allowed Malawians and Ugandans to observe these Chinese technologies in context. Furthermore, there is great enthusiasm on the part of project stakeholders in both countries, and evidence of strong relationships that will be ongoing.

Despite some challenges within the value chain approach and co-investment model, AgriTT has created unique spaces for learning. In particular, the model of trilateral engagement explored by AgriTT has garnered support among project stakeholders—including Chinese leadership who were previously sceptical of its benefits. The value chain approach has shown the potential to change the way a commodity is perceived, shaping a notion of farming as a business opportunity with multiple possibilities for livelihood improvement. The pilot suggested a shift in government mindset too, both in terms of the industrial potential of agrarian futures as well as their relationship to the private sector.

Though the achievements of the AgriTT pilots are impressive, the key lessons of this study relate to the process of uptake and transfer of these technologies. While many researchers have speculated about the potential benefits of trilateral partnerships, AgriTT was among the first to test trilateral modalities with China and generate these insights from practice. The pilots demonstrated the valuable role that third parties such as the UK can play, such as in providing analytical rigour, systematic management, and continual brokering of relationships through networks and expertise both in China and Africa. Chinese partners have especially appreciated learning on project management, such as how to set goals, the importance of evaluations, and selecting personnel. It is widely acknowledged that coordination and communication were complex, and it took time to establish management and financial systems, but once systems were in place and up and running, the strengths of the trilateral model and the value of an integrated value-chain approach shone through clearly.

There are a number of significant learning points regarding how to engage, and how long; with whom to engage; and how to ensure that the outcomes are sustainable. Based on these, a number of key recommendations for future trilateral cooperation and agriculture technology transfer can be made.

4.1 How to engage

The question of 'how to engage' with agriculture technology transfer is at the heart of the design of this innovative programme.

One important aspect of AgriTT's approach was enabling stakeholders from the pilot countries to visit China through study tours. These gave beneficiaries the chance to think about, and see in action, the entire value chain for cassava and tilapia, and understand key points of support and success in the Chinese system.

Trial and error in the pilot countries raised valuable lessons about the kind of Chinese technical assistants (TAs) that are best suited for this work, and how to use them effectively. While longer-term, collaborative working relationships are valuable for co-innovation and learning, this default approach may not be necessary in all cases. AgriTT found that sending TAs to the field for a short diagnostic phase, and then back to the field for active implementation when the project was ready for inputs was an effective way to keep work focused and cost-effective. Chinese stakeholders in AgriTT emphasised the importance of TAs having grounded field experience, good communications skills and patience – and not only technical expertise.

The experience has shown that identifying appropriate technology and making it operational takes a long time. Furthermore, agriculture technology transfer is incredibly time-sensitive, as planting seasons cannot wait for equipment to clear customs. As a technology-transfer project, AgriTT was procurement-heavy by nature. But in an integrated value-chain enhancement project, those technologies required rigorous analysis and a sound business case. There are key insights from this experience about how to avoid purchasing equipment with no viable future in a country.

AgriTT shows us that pilot projects for agriculture technology need strong management support and coordination staff on the ground to improve communication and handle issues quickly as they arise. While adjustments are a necessary part of project management, the process can cause frustration and loss of trust, and this needs to be managed carefully by all sides, including by the funder.

Recommendations

- **Ensure strong management support and coordination staff on the ground.**
- **Use study tours to the source country to allow** beneficiaries to observe technologies in their socio-economic and geo-political contexts, and integrate that learning to develop supportive structures for adopting the technologies in their home countries.
- **Use technical assistance experts in shorter, targeted interventions to keep work focused and cost-effective** when longer-term, collaborative working relationships are not possible.
- **Recruit TAs who possess technical expertise alongside grounded field experience, good communication skills, and patience.**
- Back technology transfer with **rigorous analysis and a sound business case.**

4.2 How long to engage

Some of the greatest frustrations and inefficiencies arose during the project because a sense of how *long* to engage, and at *what scale* appears to have been missing.

The short duration of the pilot projects — three years, plus one year of extension — allowed for great focus and a continual push to show results. Stakeholders in China and Africa appreciated the achievements made within such a short timeframe. However, tension between the need to establish credibility and show quick results in the pilots was not easily balanced with the time-consuming process of developing appropriate systems and processes for successful trilateral cooperation. In practice, it took much longer than anticipated to form formal partnerships and set up management and financial systems, and delays in planned activities caused a great deal of frustration.

The AgriTT experience reminds us that it takes time to build trust — and this is not something that fits neatly into a log frame or project work plan. Projects, particularly trilateral ones or those with multiple partners in different countries, need to plan for this critical aspect.

There is also a need to build time for delays into project design, as they are an inevitable part of the process. AgriTT would have benefited from a planned window for setting up systems and relationships in the early phase of the project, and a longer timeframe overall to allow for inevitable delays inherent in implementing agriculture development projects in complex environments. By the end of the project, with systems in place and running well, it could have been run for a second phase with much greater efficiency.

Research suggests that trilateral model could enable developing countries ‘to access critically required additional expertise ... at much lower costs than those associated with regular technical assistance programmes’ (DFID, 2013). While AgriTT cannot be said to have shown lower costs, over time and with learning and relationship-building, costs can be lowered and effectiveness increased. Indeed, AgriTT’s additional year did show much higher efficiency with established robust systems for management and communication.

Recommendations

- Build time for **delays into project design**, as they are an inevitable part of agriculture technology transfer.
- Set **realistic targets**, and strike a balance between short timeframes which allow for focus and a continual push to show results, and room for setting up systems and accommodating for delays.
- **Design longer-term, multi-phase projects** to allow for more integrated learning and lower the costs associated with setting up systems from scratch.

4.3 With whom to engage

Successful technology transfer is not just about technology. Technology is only the beginning. With its desire to ensure effective aid, AgriTT targeted governments as key implementing partners. Its focus on the entire value chain meant it also involved farmer associations, extension and research institutes, policymakers and the private sector. Stakeholders were particularly impressed with the strong farmer-private sector-government links they observed among fish and cassava farmers in China. While the value-chain approach and co-investment model contributed to frustrating delays, and resulted in a poor score in the log frame for this component in early annual reviews, this innovative approach set AgriTT apart and produced valuable learning. Where co-investors are involved, the necessity of painstaking analysis and shared learning to ensure that a technology will be successfully demonstrated, reduce investment risk, and avoid purchases that may not be sensible investments is underscored. This can result in more focused, sustainable technology transfer.

The trilateral approach added another vital dimension, allowing the UK to play a successful brokering role in the exchange of information and knowledge between relevant Chinese and African stakeholders. Rigour of research and careful scoping work contributed by the AgriTT PMO, NRI and other UK experts aided in procuring more appropriate technologies from China.

These multiple engagements have also thrown up some important lessons. Having a government ministry as the lead partner had some advantages, such as ensuring that AgriTT was coherent with national strategy and that institutional mechanisms exist for scaling up. However, there were also distinct challenges in terms of setting targets and leveraging coordination. The requirement to work with government departments as implementing partners is not integral to trilateral cooperation, and could be a point of reflection for future projects. Government departments could be involved, for example, in an overseeing role, with other organisations in the private sector or NGOs as implementers.

The final, and most important groups with which to work, are the target beneficiaries of a project. AgriTT has worked with farmers to help them see activities as a business opportunity—an achievement that stands out among aid efforts. At the same time, careful thinking is necessary about the target beneficiary for such an approach, as not all farmers are in a position to invest in a business. The lessons from this project are that there needs to be clarity on all sides about who these target beneficiaries are, to ensure that technologies being promoted are appropriate and accessible to them. It is also important to ensure that such exploratory projects do not have negative impacts on project beneficiaries, through delays and inability to deliver on initial objectives.

Recommendations

- **Consider carefully the most effective role for each partner, drawing out the comparative advantage of each.**
- **Create and nurture effective linkages with multiple actors** — including the private sector.
- **Build in painstaking analysis and shared learning** to avoid purchases that may not be sensible investments
- **Ensure that needs of project beneficiaries are well identified and remain uppermost.**

4.4 How to ensure sustainability

AgriTT was built on the assumption that supporting testing of technologies and innovations from China in a structured way, and integrating them along the value chain, has great potential for contributing to agricultural development. The AgriTT business case claimed that ‘Through this approach, food supply can be increased sustainably, and rural livelihoods will be improved through wealth creation.’

In international debates on triangular co-operation, trilateral cooperation is often promoted for its unique ability to create horizontal partnerships, foster learning and build trust among partners, strengthen networks and increase intercultural understanding. These aspects feature prominently in experiences of trilateral cooperation, however, they are rarely captured in analyses, such as evaluations. A recent survey of trilateral cooperation conducted by OECD found that ‘project documents focus mostly on achieving development objectives and impacts in the beneficiary countries, justifying the development intervention’ (OECD 2016). The UN similarly finds that the M&E systems of these projects ‘seem to be largely concerned with the timely completion of projects and less with longer-term perspectives on the sustainability or wider development impact of projects’ (UN ECOSOC, 2008). The dilemma with these measurements of success is that they do not fully capture the value-added of trilateral cooperation—those elements repeatedly cited by participants involved.

Likewise, AgriTT should be valued not just for its log-frame achievements related to elements of production and processing, but also for the chance it provided project beneficiaries to be exposed to a value chain-based industrial mindset, and to observe the systems and markets that support it.

Such an approach has possibly long-lasting and powerful, if less visible, potential to fundamentally change the way a commodity is perceived at every level of society. Indeed, the government showed a shift in mindset, particularly in Uganda, in terms of the industrial potential of its agrarian future, as well as government and other stakeholders’ relationship to the private sector.

The unique role carved out for the private sector in AgriTT also shows promise for long-lasting impacts, though the pilots would have benefited from more time to proactively engage and nurture the private sector to take forward certain technologies. Chinese technologies have great potential for contributing to agricultural development for Africa, but they require adaptation and co-innovation.

The elements of a platform for ongoing learning and exchange among Africa, China and the UK are emerging. Although they could have been strengthened through more time and opportunities for co-innovation and adaptation of the Chinese technologies, there is evidence that sufficient commitment exists for many of the relationships, communication channels and approaches learned to be taken forward.

When governments come together in new ways to experiment and improve aid effectiveness, the achievements go beyond project outputs. The AgriTT experience challenges us to consider questions of value-for-money outside of the traditional linear rubric of log frames and outputs. In fact, it could be said that the greatest achievements of AgriTT were its ability to convince project stakeholders of the value of both experimental trilateral and holistic value-chain approaches. AgriTT, and other trilateral projects, need to be evaluated not only on the timely completion of projects, but also on the longer-term perspectives of the sustainability of connections and the wider development impacts of promoting the trilateral approach across the governments involved.

Recommendations

- **Explicitly incorporate co-learning and adaptation of technologies into project designs,** creating time and funds to support this essential process for ensuring long-lasting impacts.
- **Actively invest in collaborative research for technology transfer and foster knowledge sharing on lessons learnt.**
- **Develop new forms of evaluation for experimental approaches such as trilateral aid** that go further than the traditional linear rubric of log frames and outputs.

4.5 Next Steps

Bold, innovative approaches are needed in today's complex aid environment. Trilateral approaches facilitate opportunities for exchange of information and knowledge that are not otherwise possible, and as such they provide strong potential to improve aid effectiveness, while also possibly increasing efficiency. More experimentation and practical experience is needed to continue to learn how to manage trilateral partnerships well and achieve sustainable agriculture technology transfer. AgriTT has made a strong contribution to this learning, and donors and practitioners should continue to invest in this area.

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Annex 1: Key partners and their roles in the AgriTT pilot projects

UK

- UK Department for International Development (**DFID**) provided funding (see also DFID China below).
- **Landell Mills**, a UK-based development consultancy firm, coordinated the overall project through Programme Management Offices based in China and the UK.
- **Triple Line**, Subcontractor managing the monitoring and evaluation of the programme
- **Natural Resources Institute**, contributed applied research and analysis on suitability and adaptability of technologies

China

- **DFID China**, the office of DFID responsible for implementing the AgriTT programme. DFID China's overall objective is to work with China to achieve shared objectives on development issues specific to third countries or regions.
- **The Ministry of Commerce** participated in programme governance through the Steering Committees.
- **The Foreign Economic Cooperation Centre**, in the Division of International Cooperation at the Ministry of Agriculture collaborated with DFID China to implement the AgriTT Programme. Provided in-kind support such as administration, office space, and subsidies to experts, and coordinated experts and technical assistants within:
 - Wuxi Freshwater Fisheries Research Center
 - CATAS, Hainan
 - Guangxi University
 - Guangxi Academy of Fishery Sciences
 - Guangxi Academy of Agricultural Sciences

Malawi

- **Department of Fisheries (DoF), Ministry of Agriculture and Food Security** was the lead implementing partner, representing the Government of Malawi and responsible for overall implementation by Malawian partners and management of Chinese TA.
- **The National Aquaculture Center (NAC) and Kasinthula research station** led fingerling research, production, community-level production, marketing and transport. They also provided support for testing and scaling up of new technologies introduced by Chinese technical assistance (TA) on on-growing.
- **Bunda College**, part of Lilongwe University of Agriculture and Natural Resources (**LUANAR**), shared project activities with the DoF, particularly carrying out experiments on formulations and substitution of feed ingredients, as well as coordinating work with MALDECO (see below) on producing formula feeds and production of floating feed.
- **Maldeco Fisheries Ltd.**, the leading private-sector commercial aquaculture producer in Malawi, participated in the production and marketing of fingerlings in the project and worked with innovative farmers providing feed, fingerlings, water and marketing for market-ready fish.
- **Farmers** in each of three regions of Malawi committed land and resources to testing the Chinese aquaculture technologies introduced through the project.

Uganda

- **The Ministry of Agriculture, Animal Industries and Fisheries (MAAIF)** was the lead implementing partner, responsible for communication in Uganda, management of Chinese TA, and providing policy guidance on cassava production and value-chain development.
- **District local governments (DLG)** provided extension agents, supported technology transfer provided by the Chinese TA, assisted with mobilising farmers and farmer groups in the target area, and procured planting materials.
- **Africa Innovations Institute (Afril)**, a Ugandan NGO, contributed to research and analysis and conducted training for farmer groups with the Chinese TA in primary processing, businesses entrepreneurship development and linking to markets.
- **The National Agricultural Research Organisation (NARO, NaCCRI and Bulindi ZARDI)** identified suitable cassava varieties for multiplication, coordinated their procurement, cutting and transportation to project farmers, followed up and monitored the seed-multiplication system, and worked with MAAIF to certify the planting materials.
- The Food Technology and Nutrition Department of **Makerere University (MU)** supported cassava-based food-product development alongside selected private-sector investors, supported by Chinese TA.
- **Private sector partners** were identified to produce high quality cassava flour and other profitable processed food products.
- **Farmers** throughout four districts committed land and resources to testing out the Chinese cassava technologies introduced through the project.
- **PKF Accountants and Business Advisors**, a private firm that helped manage AgriTT budgets in Uganda.

Annex 2: Key activities of AgriTT pilot projects

Uganda

- Five Chinese technical assistance experts were placed in country. These experts provided technical advice on cassava agronomy, crop management, weed management and ridged planting. The Chinese TA carried out training for representatives of farmer groups from four project districts (two farmers per group). The trainings covered agronomy, crop management and processing. Mechanised planting demonstrations were also held for each group.
- Eight demonstration gardens were established using mechanised ridged planting and good agricultural practices with cassava planting equipment imported from China. This equipment had never previously been demonstrated in Uganda. Two demonstration gardens were established in each of the four project districts. Harvesting was completed at the first two sites in Kiryandongo, where yields were 47 and 36 tonnes per hectare respectively, three times typical conventional yields.
- 37 mother garden nurseries with improved cassava were established.
- Trainings were conducted in business management for thirty-seven farmer groups.
- Cassava industrialisation feasibility study and strategic plan was completed, with inputs from Ugandan, Chinese and UK partners.
- Scoping was conducted of the most appropriate technology for processing of cassava, with development of business cases for co-investment. A co-investor was identified for procurement and installation of batch drier technology.
- Chinese chippers were distributed to farmer groups and processors.
- Three short-term Chinese technical assistance placements and one long-term Chinese technical assistant was placed in Makerere University, from which several prototype products were developed: biscuits, cassava pops, cassava juice, chapattis, penne pasta, and cassava breakfast-cereal flakes.
- Two cassava-based food products were identified for development in partnership with entrepreneurs.
- Two entrepreneurs were selected following consultancy and competitive process. They were given incubation support in production of cassava based snacks and biscuits.
- A Pilot Baseline Survey was conducted by Makerere University.
- The procurement of biscuit and extruded snack-product lines was installed at Makerere University to support the incubation of entrepreneurs.

Malawi

- Fingerling production: hatchery management and pond tilapia multiplication techniques was demonstrated; all-male fingerling production technique was demonstrated, including novel hybridisation of two indigenous tilapia species to produce all-males fingerlings; fingerlings were transferred to satellite stations; four satellite station ponds were rehabilitated.
- Substantial rehabilitation and improvement of infrastructure was realised, such as fencing of ponds to reduce predation, procurement of the generator, rehabilitation of the biofilter, construction of a greenhouse for cold season production in NAC, and construction of a hatchery and biofilter at Kasinthula.
- Feed production: extruded-feed production equipment procured from China was installed; Chinese partners shared improved feed formulations with Malawian partners; experiments were conducted on replacing imported ingredients and improving commercial diets; and trials on use of on-farm resource based diets were completed.
- Amino acid profiling of key diets and ingredients in Malawi was completed.

- A software tool was developed for adjusting tilapia diets to maintain a specific nutritional profile when ingredients are substituted.
- On-growing production: Chinese production technologies were demonstrated on station (a package including deeper and larger ponds, higher stocking rates, use of all-male fingerlings, improved feeding regimes, use of improved feed, careful pond management including predation control and record keeping). Yields for the large-pond technology have been particularly promising, reaching as much as 6 tonnes per hectare, compared to previous yields of around 1.2 tonnes per hectare. 25 grow-out farmers tested Chinese tilapia production technologies on farm. Three production guidelines were produced (on hatchery management, multiplication in ponds, and production of grow-out fish).
- A Pilot Baseline Survey and report were completed.

Annex 3: Interviewees

Position	Affiliation
Uganda	
Uganda AgriTT Project Advisor	Independent consultant
Cassava Desk Officer and AgriTT Coordinator	MAAIF
Director of Crop Resources	MAAIF
Director of Extension	MAAIF
Professor	Makerere University Kampala
Technical assistant, value addition	Makerere University Kampala
Entrepreneur in cassava biscuits	Makerere University Kampala
Entrepreneur in cassava pops	House of Rusa
Business development specialist	Africa Innovations Institute
Chief Executive Officer	Africa Innovations Institute
Executive Director	Food Rights Alliance
District Project Officer	Kiryandongo District
Sub county Supervisor, extension worker	Kiryandongo District
Farmer group chairperson	Kiryandongo Farmer Group
Farmer	Kiryandongo Farmer Group
Farmer	Kiryandongo Farmer Group
Farmer	Kiryandongo Farmer Group
Farmer	Kiryandongo Farmer Group
Farmer	Kiryandongo Farmer Group
Farmer	Kiryandongo Farmer Group
Farmer	Kiryandongo Farmer Group
Host farmer	Kiryandongo mother garden
Farmer Group Chairperson	Amorisa Village
Farmer	Amorisa Village
Farmer	Amorisa Village
Farmer	Amorisa Village
Farmer	Amorisa Village
Farmer	Amorisa Village
Driver and field assistant	AgriTT
District Project Officer	Buliisa District
Farmer	Buliisa Kagera Women's Group
Farmer	Buliisa Kagera Women's Group
Farmer	Buliisa Kagera Women's Group

Farmer	Buliisa Kagera Women's Group
Farmer	Buliisa Kagera Women's Group
Farmer, Demonstration garden 2	Buliisa Nyasiabi Farmer Group
Farmer, Demonstration garden 2	Buliisa Nyasiabi Farmer Group
Farmer, Demonstration garden 2	Buliisa Nyasiabi Farmer Group
Farmer, Demonstration garden 2	Buliisa Nyasiabi Farmer Group
Farmer, Demonstration garden 2	Buliisa Nyasiabi Farmer Group
Buliisa District Production Officer	Buliisa District Local Government
Team Leader	Buliisa District Local Government
Farmer	Kitonga Farmers Group A
Farmer	Kitonga Farmers Group A
Farmer	Kitonga Farmers Group A
Farmer	Kitonga Farmers Group A
District Agriculture Officer	Hoima District Local Government Office
District Production Officer	Hoima District Local Government Office
Group leader	Kiziranfumbi Farmer Group
Host farmer	Kiziranfumbi Farmer Group
Farmer	Kiziranfumbi Farmer Group
Farmer	Kiziranfumbi Farmer Group
Farmer	Kiziranfumbi Farmer Group
Farmer	Kigorobya Farmer Group
Farmer	Kigorobya Farmer Group
Farmer	Kigorobya Farmer Group
Farmer	Kigorobya Farmer Group
Farmer	Kigorobya Farmer Group
District Production Officer	Masindi District Local Government Office
Supervisor	PKF Accountants and Business advisors
Professor, Mushroom RCF project	Makerere University Kampala
SSC Uganda project leader	FAO SSC
Technical assistant	FAO SSC
Technical assistant	FAO SSC
Technical assistant	FAO SSC
Technical assistant	FAO SSC
Social economist	Uganda-China ATDC
Director	Uganda-China ATDC
Translator	Uganda-China ATDC

Malawi	
AgriTT Coordinator	LUANAR
AgriTT Coordinator	Independent consultant
Principle fisheries extension officer	DoF
Deputy Director of Fisheries	DoF
Aquaculture nutrition specialist	LUANAR
Senior Lecturer	LUANAR
Aquaculture technician	LUANAR
Farm Manager	Maldeco
Aquaculture TA	NAC
Aquaculture TA	NAC
Director	National Aquaculture Centre, Domasi
Researcher, breeding	National Aquaculture Centre, Domasi
Researcher, grow-out	National Aquaculture Centre, Domasi
Researcher, breeding and grow-out	National Aquaculture Centre, Domasi
Aquaculture farm worker	Zomba
Farm Manager	Kasinthula District Fisheries Office farm
Research assistant	Kasinthula District Fisheries Office farm
DFO	Kasinthula District Fisheries Office farm
Fisheries extension officer	Kasinthula District Fisheries Office farm
DFO	Lilongwe District Fisheries Officer
Farm manager	Aglupenu Investments
Fish farmer and village head	Matambo village
Head, Aquaculture and Fisheries Department	LUANAR
Malawi power and development	SMEC
Deputy Director of Agriculture Research Services	Bvumbwe Agriculture Research Station
China	
Senior Researcher	FECC, MOA
Researcher	FECC, MOA
Assistant	FECC, MOA
Director	FECC, MOA
Fisheries economist	Wuxi FFRC
Research Assistant	Wuxi FFRC
Vice Director	Hainan CATAS
Researcher	Hainan CATAS
Researcher	Guangxi University
Technical Assistant in Uganda	Guangxi University

Professor	Guangxi Academy of Fishery Sciences
Malawi TA, feed	Guangxi Academy of Fishery Sciences
Deputy Director, Cassava Breeder	Guangxi Academy of Agricultural Sciences
Director	FECC, MOA
Program Manager	FECC, MOA
Director	UIBE
Professor	UIBE
Professor	UIBE
Program Officer	Department of Int'l Cooperation, MOA
Head	DFID China
Agriculture & Natural Resource Adviser	DFID China
Project Scientist	CABI
Project Scientist	CABI
China Program Leader	IFPRI
Communications Assistant	IFPRI
Administrative Coordinator	IFPRI
UK	
Manager, Framework Division	Landell Mills
PMO	Landell Mills
PHD candidate	SOAS

Annex 4: Questionnaire

Questionnaire (Uganda and Malawi; questions modified and posed in Chinese for China)

NB: questions under each theme are a guide and will be modified or rephrased depending on the interviewee position

[Preamble: 5 minutes]

1. Introduce self

IIED researcher with background in agriculture and Chinese studies, and focused on China-Africa agriculture for past 8 years.

2. Explain objectives of research and interview

IIED has been asked by AgriTT and Landell Mills to carry out a review of achievements, lessons and challenges based on the experience of the AgriTT programme. The aims of this 'Achievement and Lesson-Learning Study' are:

- a) To facilitate learning among AgriTT partners about the process of technology uptake in the pilots in both Uganda and Malawi, and key issues related to the transfer
- b) To inform wider stakeholders about the pros and cons of these unique approaches to technology transfer
- c) To support informed decision-making on policy and practices related to Africa-Britain-China agriculture technology transfer in future

Check clear/invite questions.

3. Explain and agree basis of interview

- I will be taking notes of the conversation which will not be shared in raw form.
- Detailed analysis of the interviews will be included in an internal report available to AgriTT staff and partners.
- Final analysis of the interviews will be presented at an ABC event in China in January, and will be included in a publically available Discussion Paper jointly produced with IIED and AgriTT.
- I would like to make use of approximate quotations in my analysis – check whether happy for attribution. If not, please say when you would like your insights to be used only in such a way that you cannot be identified, and I will respect that.
- You can choose not to answer particular questions, or end the interview at any point.
- I anticipate that the interview will last around 45-maximum 60 minutes. Check that interviewee has that amount of time and adjust accordingly

4. Check whether interviewee has any questions and is happy to proceed

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5. Introduction and respondent background (5 mins)

- Please tell me about your role and responsibilities
- What do you do? What is your main area of work?
- Where? (geographically/organisationally)
- How long have you been in current job? Previous relevant experience?

6. Processes of implementation (30 mins)

- Were you involved in developing the concepts for the pilot projects (their objectives, strategies, and plans of operation)? Can you describe this process? Who else was involved? (The process of developing scope)
- What is the operational and management setup of the pilots? What are the financial management systems? How was this arranged and why? What steps were involved? (The process of design)
- Can you walk me through the implementation process of the pilots? What was your role?
- What is your perspective on this implementation experience?
- To what degree do you feel AgriTT has enabled a process of mutual learning between Uganda/Malawi, the UK and China on agricultural aid? Has this programme informed thinking of both sides on approaches to agricultural development?

7. Key achievements of AgriTT (10 mins)

Achievements of the program considered through multiple angles:

- Hard outputs of the pilots/initial impacts
- Lessons on the process, what can we learn about how trilateral agri tech transfers work? What are the crucial elements? What did NOT go well and what can we learn from that? What lessons/learning was gained on how to do agriculture aid?
- The notion of a platform for ongoing learning and exchange. Relationships and trust as an achievement in themselves.

Can you give examples of achievements of AgriTT in terms of:

- Effective demonstration of new technologies and practices
- Technology transfer (including specific technologies, and management practices).
- Innovations in value chains
- Capacity building (with beneficiaries and implementing partners)
- Establishment of partnerships that create a platform for ongoing technology transfer exchanges and other forms of knowledge sharing

In what ways are these achievements distinct from other forms of partnership or modes of agriculture technology transfer?

8. Sustainability of interventions (5 mins)

- Has a platform been built for ongoing testing and adaptation? Will this likely succeed?
- Has there been uptake of technologies by enterprises? How? Examples?
- Have technologies been piloted effectively? How high do you think their potential for adoption is?
- With continued support, what kinds of change/impact would you expect to see?

9. Concluding Questions (5 mins)

Are there other people you suggest I talk to during this process of research? Either specific individuals or organisations? Why?

Is there anything else you would like to add/questions I haven't asked that I should have asked?

Conclude by saying can email or call if anything else, and thanking interviewee.

Investment in African agriculture remains well below average global levels and currently falls short of achieving the United Nation's 'Global Goals for Sustainable Development'. Whilst there is growing interest in the potential for trilateral development cooperation to promote learning and accelerate agricultural technology transfer, there is very little empirical evidence exploring how such partnerships work in practice. This study aims to address this gap through a review of the Working in Partnership for Agricultural Technology Transfer (AgriTT) programme, which ran between 2012 and 2017. Focusing on two of the programme's pilot projects this report discusses the achievements and challenges encountered, and finds potential opportunities for efficiency gains in longer-term, multi-phased projects. Furthermore, evidence presented on the benefits of this innovative partnership model, including joint learning and formation of horizontal relationships, makes a strong case for more investment in this area.



Project Materials

Natural resource management

Keywords:

China-Africa, agricultural aid, aid effectiveness



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