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Baseline Study:

German-Chinese Bilateral Cooperation in Agricultural Sciences

By Dr. Rita Merkle

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Implemented by



In partnership with



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List of Abbreviations

A&F University	Northwest Agriculture and Forestry University
ATB	Leibniz-Institute for Agricultural Engineering and Bioeconomy
BfR	Federal Institute for Risk Assessment
BLE	Federal Office of Agriculture and Food
BMBF	Federal Ministry of Education and Research
BMEL	German Federal Ministry of Food and Agriculture
CAAS	Chinese Academy of Agricultural Sciences
CAS	Chinese Academy of Sciences
CAU	China Agricultural University
CSC	China Scholarship Council
DAAD	German Academic Exchange Service
DBFZ	German Biomass Research Center
DCZ	Sino-German Agricultural Centre (Deutsch-Chinesisches Agrarzentrum)
DFG	German Research Foundation
EU	European Union
FLI	Friedrich-Löffler Institute
IAMO	Leibniz Institute of Agricultural Development in Transition Economies
IPCC	International Panel on Climate Change
JKI	Julius Kühn Institute
KIT	Karlsruhe Institute for Technology
MARA	Ministry of Agriculture and Rural Affairs of the People's Republic of China
MRI	Max-Rubner Institute
NSFC	National Natural Science Foundation of China
RWTH Aachen	Rheinisch-Westfälische Technische Hochschule Aachen
S&T Platform	Science and Technology Platform
TUM	Technical University of Munich
ZALF	Leibniz Center for Landscape Research

1. Introduction

1.1 Study background

The present study was drawn up on behalf of the Sino-German Agricultural Centre (DCZ). The DCZ is a joint initiative of the German Federal Ministry of Food and Agriculture (BMEL) and the Ministry of Agriculture and Rural Affairs of the People's Republic of China (MARA). It was established in March 2015 as a central contact and information office and for the purpose of coordinating the bilateral cooperation between Germany and China in the agricultural and food sector.

China is an important partner for Germany in this sector, both economically as well as politically, and the BMEL has a great interest in accompanying China in its transformation process. The DCZ's activities are intended to build a bridge between stakeholders from the public and private sector and the scientific community of both countries. Thus, the DCZ fosters a mutually fruitful dialogue on agricultural issues of common interest and strengthens the cooperation between the two countries. This cooperation is reflected in three project components: Agricultural Policy Dialogue, Agri-Food Business Dialogue and Scientific Dialogue (or Science and Technology Platform). The latter one makes scientific expertise part of the professional exchange and acts as a coordinator of the Sino-German cooperation in agricultural research.

1.2 German scientific agricultural research landscape and funding programmes

In Germany, agricultural research institutes have various profiles. While some are focusing on fundamental research others are stronger connected to applied research, some of them producing scientific knowledge for the economic sector, others make their knowledge available as policy advice.

Their budgets consist of basic funding and are topped up by third-party funds for being able to plan and implement larger research projects. Agricultural research establishments might be supported by the industry or by the public sector. In this study the focus lies on those funded by the public.

Basic funding either comes from the federal government or the federal State (Länder) governments or jointly from both. For example, universities and universities of applied sciences are financed by the respective Länder government, the BMEL affiliated Federal Research Institutes receive their basic funding from the federal government. Moreover, there are six Leibniz Institutes of the Leibniz Association which are jointly financed by the BMEL and the hosting Länder governments.

Furthermore, for undertaking bigger research projects, all research institutes raise a considerable amount of their total budget themselves in the form of third-party funds. Key sources of third-party financing are the various funds available from the European Union, federal and state governments, foundations, and private enterprises. On the national level, agricultural research funded by third-party funds will be mainly granted by the Federal Ministry of Education and Research (BMBF), the Federal Ministry of Food and Agriculture (BMEL) and the German Research Foundation (DFG).

1.3 Objective and scope of the study

The study comprises quantitative and qualitative aspects of German-Chinese bilateral cooperation in agricultural sciences. It serves a dual purpose: a) to provide an inventory of existing bilateral research projects in agricultural sciences and b) to bring forward specific recommendations regarding the role

of the Science and Technology Platform (S&T Platform) in enhancing this scientific bilateral cooperation.

So far, there is no comprehensive inventory of ongoing German agricultural research projects with Chinese partners available¹. This baseline study fills the gap and establishes a first comprehensive inventory of German-Chinese cooperation in agricultural sciences.

It includes projects conducted by publicly funded research institutes, namely the BMEL affiliated Federal Research and Leibniz Institutes, some non-BMEL affiliated Leibniz Institutes, universities, and universities of applied sciences. However, it excludes other publicly funded institutions, namely some federal state facilities such as the federal state offices or the federal laboratories for agricultural research conducting practice-based and regional policy-oriented research. Also, non-university institutions, namely the Fraunhofer Institutes, the Helmholtz Institutes and the Max-Planck Institutes are not taken into consideration.

In a follow-up study, Chinese agricultural research establishments will be approached to complete this study.

2. Methodology

2.1 Quantitative data

The list of ongoing cooperation projects is based on three sources. Most data stems from a survey conducted in February and March 2020. These data were complemented with two other sources of data. All DFG-funded projects are listed on the internet, accessible via the DFG Gepris search engine². Thus, additional 15 projects were identified, three of which were also mentioned in the survey. And finally, DCZ already conducted a first investigation on German-Chinese bilateral research cooperation in agricultural sciences in July 2018. However, it only approached BMEL affiliated institutes, twelve in all. Since not all of them updated their project data in 2020, the 2018 data of three of these institutes were integrated in the project list.

2.2 Scoping phase for the 2020 survey

In a scoping phase, potential addressees and dissemination channels for the survey at the relevant agricultural research institutes were identified. The search of contact persons at universities and universities of applied sciences was internet-based, and the site of AGRARstudieren.de has been extremely helpful for this task. The search of contact persons at the BMEL affiliated institutes and the other Leibniz institutes was supported directly by the BMEL and the Leibniz Association.

¹ The DFG publishes a « Funding Atlas», the DFG-Förderatlas, but it only includes projects funded by them.

² Accessed on March 24, there were 22 projects listed for “Agricultural sciences, forest sciences and veterinary science”, of which 15 belonged to agricultural sciences. Online at: https://gepris.dfg.de/gepris/OCTOPUS?task=doSearchExtended&context=projekt&keywords_criterion=&nurProjekteMitAB=false&findButton=Finden&person=&location=&fachlicheZuordnung=207&pemu=%23&zk_transferprojekt=false&teilprojekte=false&teilprojekte=true&bewilligungsStatus=running&beginOfFunding=&gefoerdertIn=&oldContinentId=5&continentId=5&oldSubContinentId=52&subContinentId=52&oldCountryId=CHN&countryKey=CHN&einrichtungsart=-1

Simultaneously, preliminary interviews were conducted with key stakeholders from BMEL, Federal Office of Agriculture and Food (BLE), BMBF, DFG, Leibniz-Institutes, universities, and universities of applied sciences. The interviews should contribute to an increased understanding of frame elements of the German-Chinese bilateral research cooperation and allow a finetuning of the questionnaire set-up.

Altogether, 12 BMEL affiliated Federal Research and Leibniz Institutes (15 contact points), 5 other Leibniz Institutes (6 contact points), 11 universities of applied sciences (12 contact points) and 10 universities (17 contact points) were thus identified (see Annex 1: Identified German research institutes).

2.3 Set-up of the questionnaire

The survey was supposed to meet the double purpose of the study. Therefore, the questionnaire was set up of two sections. The first section collected baseline data on on-going cooperation projects, for example the name of the project, the Chinese cooperation partner, the cooperation type, and the funding of the project. In a second section, qualitative aspects of the bilateral cooperation were explored. It included questions on opportunities and bottlenecks of the cooperation and the expectations the respondents have regarding the role of DCZ in this bilateral research cooperation (See Annex 2: Questionnaire, in German).

2.4 Data collection

Starting on 6 February 2020, the questionnaire including a covering letter was sent digitally to the identified contact points which are not affiliated with BMEL. To make sure that these contact points were correct, all the contact persons of these institutions were approached by phone five days later. As a result of some faulty email address identification, a second series of requests was sent to the corrected addresses. BMEL sent a first request to the twelve research institutes which are affiliated to it.

Four weeks later, on 4 March, a reminder to all the contact points that had not participated so far, was launched via email. And finally, a last reminder was sent to some institutions on March 19 announcing the closure of the survey at the end of March.

The respondents were given the possibility to return the completed questionnaire either by email or to fill it out online. For this purpose, the online tool Framafoms was used.

In all, 26 persons from 21 different research institutes have participated in the survey (See Annex 3: Institutions having participated in the 2020 survey). The response rates are variable, with a response rate of only 18% for universities of applied sciences (see Figure 1). However, the return quota for the other institutions can be described as good, even remarkably high. The response rate for the BMEL affiliated research institutes was 92%, while it was 60% for universities and 40% for the other Leibniz institutes which are not affiliated to the BMEL.

Figure 1 : Response rates to the 2020 survey

Catgory		Number of identified research institutes	No. of research insitutes having participated	Response rate (in %)	
BMEL affiliated research institutes	Federal Research BMEL	6	5	83	92
	Leibniz Insitutes BMEL	6	6	100	
Other Leibniz Institutes		5	2		40
University		10	6		60
University of applied sc.		11	2		18

2.5 Limits of the methodology

All in all, this provides a very satisfactory basis for the analysis of the qualitative section. However, the baseline of ongoing bilateral research projects is only a first comprehensive inventory of German-Chinese cooperation in agricultural sciences and needs to be completed in the future with data from the missing establishments.

In the case of universities and universities of applied sciences, it might be possible that an institute did not mention all its ongoing projects in bilateral cooperation with Chinese partners. In general, the agricultural faculties of these institutes do not have a designated person in charge of research cooperation, in contrast to the BMEL affiliated Federal Research and Leibniz Institutes. Thus, the identified contact person might not necessarily be up-to-date on all ongoing projects within its agricultural faculty.

Another weak point to mention is that only universities and universities of applied sciences which are listed on the above-mentioned website for agricultural studies in Germany were approached in this survey. The author is aware that other research institutes, for example non-agricultural university faculties or non-university research institutes such as the Karlsruhe Institute of Technology (KIT) or the Jülich Research Center (Forschungszentrum Jülich), both belonging to the Helmholtz Institutes, also have bilateral research agreements and projects with Chinese partners on agricultural issues, but these institutes had not been approached in the 2020 survey and data available only stems from the DFG search engine.

And finally, the project list may be affected by reporting bias since some institutions listed capacity building activities as “projects” whereas other might only have mentioned major research projects with third-party funding.

3. Quantitative survey - analysis and interpretation

3.1 General overview of ongoing projects

In all, 122 projects are listed, of which 81 projects were specified in the 2020 survey, 12 further projects were identified on the DFG search engine for DFG-funded projects, and 29 projects stem from the 2018 survey.

They cover a broad range of research topics: from food safety, plant protection, plant breeding, bioenergy, precision agriculture, land use management, nutrient management, livestock production and aquaculture, right through to forest management, agricultural politics, genetics etc.

The complete list is attached in Annex 4 (List of ongoing cooperation projects).

3.2 Profile of German key actors in research cooperation with Chinese partners

THREE MAIN CATEGORIES OF KEY ACTORS

In Germany, research cooperation with Chinese partners is conducted by three categories of actors, namely BMEL affiliated research institutes, universities, and other research institutes, such as Leibniz Institutes which are not affiliated to BMEL and other non-university research institutes. The Leibniz Institutes were all addressed in the survey, whereas the other non-university research institutes were not within the scope of the 2020 survey.

- BMEL affiliated research institutes are leaders in bilateral agricultural cooperation with China

BMEL affiliated Federal Research Institutes' projects account for more than half of the listed projects. And together with the projects of the six Leibniz Institutes affiliated with BMEL, they make up 81% of all listed projects (see Figure 2). They include the 29 projects of the 2018 survey of two BMEL Federal Research Institutes and one BMEL affiliated Leibniz Institute. Thus, all BMEL affiliated institutes are listed and hence, it can be assumed, that this also covers most of their ongoing bilateral projects with Chinese partners.

Figure 2: Number of listed projects by category of research institute

Catgory	Number of listed projects	as % of total listed projects	Average number of bilateral projects
Federal Research BMEL	63	52%	10,5
Leibniz Institutes BMEL	35	29%	5,8
Other Leibniz Institutes	1	1%	0,5
University*	20	16%	2,8
University of applied sc.	0	0%	0,0
Other research institutes	3	2%	1,5

*Universities alone conduct 20 projects; 8 other projects are jointly conducted with other institutes. They are counted in the other respective categories, namely six of them in the category "Federal Research BMEL" and two in "Other research institutes".

- Most universities have ongoing cooperation projects, although not always conducted by agricultural faculties

In all, 28 university projects are listed, conducted by ten different universities, including the two conducted in cooperation with the KIT and the Jülich Research Center, and six projects conducted jointly by the DBFZ German Biomass Research Center and the University of Rostock.

Six universities participated in the 2020 survey, but not all of them stated to have ongoing projects with China. As mentioned in the chapter on the limits of the methodology, at the Technical University of Munich (TUM), School of Life Sciences, for example, although contacted via two different contact points, the listed project was identified on the DFG Gepris portal. This search engine allowed both, to

fill the gaps of the responses, but also to identify projects of universities that were reluctant to answer. Moreover, it allowed to identify some bilateral research projects on agricultural issues conducted by non-agricultural university faculties, such as the faculties of natural sciences and the faculty of economics of Hannover University or the RWTH Aachen University.

- Universities of applied agricultural sciences have hardly any bilateral research projects with Chinese partners

The two universities of applied sciences which answered the survey do not have any bilateral research projects with Chinese partners. Another university of applied sciences contacted during the scoping phase does not have any bilateral projects with China neither. This suggests that either the contacted person did not have all the necessary information, since, as mentioned above, agricultural faculties of universities generally do not have a designated person in charge of research cooperation, or these universities only have very few, if any, of such bilateral cooperation with China and they therefore were reluctant to answer the survey³.

- Other research institutes also have some ongoing projects with Chinese partners

The two other Leibniz Institutes which answered the 2020 survey do not have any ongoing projects at present with China. The project listed in the table was identified via the DFG Gepris search engine. The information of three projects of the category “other research institutes” also stems from this search engine. Two of them are conducted by the Karlsruhe Institute of Technology (KIT), and the other one by the Jülich Research Center (Forschungszentrum Jülich), whereas two of them are furthermore in cooperation with universities (for details, see Annex 4). For this category of respondents, the reliability of the data is probably the lowest since they were not directly approached in the survey.

3.3 Profile of Chinese cooperation partners

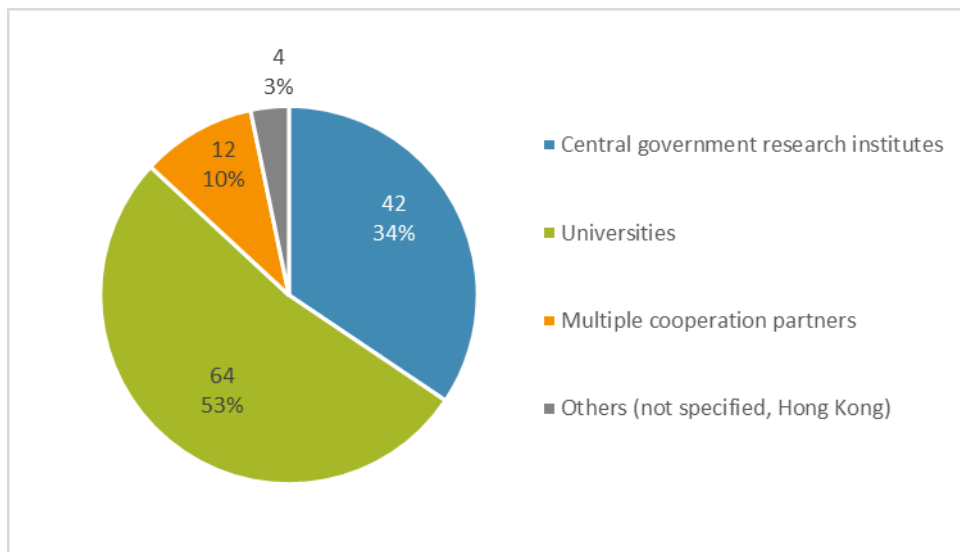
A WIDE VARIETY OF CHINESE PROJECT PARTNERS

German research institutes maintain bilateral scientific relations in the field of agriculture with a wide range of Chinese partners.

About half of the listed projects are in cooperation with partners from Chinese universities, one third are in cooperation with research institutes of the national government level and 10% are conducted with two or more Chinese partners.

³ As explained in the chapter on methodology, institutions were contacted up to four times during data collection. The first reminder via email coincided with the winter semester break at universities and the second reminder with the Covid-19 lockdown. This might also partly explain the low response rate.

Figure 3: Chinese project partners (in number of projects, and in % of total 122 projects)



- Cooperation with research organisations attached to central or provincial government institutions

German research institutes cooperate with three categories of research organisations directly attached to the central government or ministries. First, the Chinese Academy of Agricultural Sciences (CAAS), a national research organisation under the Ministry of Agriculture and Rural Affairs (MARA), either with one of the academy institutes on central level or provincial Academies of Agricultural Sciences (see Figure 4). Second, they also cooperate with the central government think tanks of the Chinese Academy of Sciences (CAS), on the national as well as on the provincial levels, including different CAS institutes, such as the Institute of Atmospheric Physics, the Institute of Geographic Science and Natural Resources Research, the Institute of Applied Ecology, the Institute of Subtropical Agriculture or the Center of China Agricultural Policy. And third, they cooperate with a variety of other national level research institutes such as the Academy of State Administration of Grain, the Chinese Academy of Fishery Sciences under MARA, the Chinese Academy of Agricultural Engineering under MARA, the Chinese Academy of Forestry under the National Forestry Administration or the Development Research Center of the State Council.

- Cooperation with Chinese universities

The majority of research relations have been established with Chinese universities. About one fourth of the projects in partnership with universities are with universities based in Beijing. 33 of the projects are in partnership with Agricultural Universities, such as the China Agricultural University (CAU) (Beijing), the Northwest Agriculture and Forestry University (A&F University) (Yangling, Shaanxi) or the Nanjing Agricultural University. The other universities include, for example, the Beijing University of Chinese Medicine, the China University of Petroleum Beijing, the Hefei University or Nanjing University (see Annex 4: List of ongoing cooperation projects).

Category	Sub-category	Number of projects	
Academy of Agricultural Sciences	National (= CAAS)	12	18
	Provincial CAAS	6	
Academy of Sciences	National (= CAS)	6	13
	Regional AS	7	
Other national research institutes			11
Universities	in Beijing	16	63
	in other cities	47	
Multiple cooperation partners in China			11
Multiple cooperation partners, worldwide			2
Not specified			3
Hong Kong			1

Figure 4: Number of projects by sub-category of Chinese research institutes

➤ Multi-partner projects

Ten bilateral projects are conducted with several project partners in China and two projects also imply other international research institutes. They are generally conducted by BMEL affiliated research institutes, only in two of them the University of Hohenheim is implied.

3.4 Key features of German and Chinese project partners

TWO LEADING AGRICULTURAL PARTNER UNIVERSITIES IN CHINA

Among the Chinese agricultural universities, there are two leading universities, namely the CAU in Beijing and the A&F University, a national key university based in Yangling in Shaanxi Province.

CAU has ten ongoing projects with four different BMEL affiliated research institutes (four projects) and three German universities (5 projects with Hohenheim, Berlin and Hannover Universities). And one project is conducted with the KIT.

Nine projects are in cooperation with A&F University, of which eight are with BMEL affiliated research institutes and one with the University of Hohenheim.

THE CAAS AND ITS PROVINCIAL ACADEMIES EXCLUSIVELY IN COOPERATION WITH BMEL AFFILIATED RESEARCH INSTITUTES

The 18 projects in cooperation with the CAAS are all in partnership with BMEL affiliated research: three are in cooperation with two BMEL affiliated Leibniz Institutes, the 15 others with five Federal Research Institutes under the BMEL. The Julius Kühn Institute (JKI), the German Federal Research Centre for Cultivated Plants, alone accounts for seven of them, all co-funded by BMEL.

THE CAS IN COOPERATION WITH A VARIETY OF DIFFERENT GERMAN RESEARCH INSTITUTES

Nine universities and BMEL affiliated research institutes have 13 projects in cooperation with the institutes of the CAS and its provincial branches.

Four universities (Munich, Hannover, Göttingen and Bonn) have 5 ongoing projects with CAS institutes, all co-funded by DFG. Four of them are with provincial CAS institutes, the only project in cooperation with a national CAS institute is a partner project between the TUM and the KIT on the German side.

Five BMEL affiliated research institutes, three Federal Research Institutes and two Leibniz Institutes have eight ongoing projects with CAS institutes. They are either funded by BMEL funds, by DFG funds, by China Scholarship Council (CSC) grants for Chinese students or scientists coming to Germany or by own financing.

FEW GERMAN STAKEHOLDERS ABLE TO CONDUCT HUGE MULTI-CHINESE OR INTERNATIONAL PARTNERS' PROJECTS

Multi-partner projects mainly encompass two forms of cooperation, either they are research projects under the European Union (EU) Horizon 2020 programme, or they support activities such as capacity building of scientific staff or networking events such as common workshops of BMEL affiliated research institutes. In the case of multi-stakeholder research projects under the EU Horizon programme, they have a high need in project organisation and thus require enough capacity for ensuring an efficient organisation. In our survey we have only identified the university of Hohenheim and BMEL affiliated institutes involved in consortium projects under Horizon 2020.

PREDOMINANT ROLE OF HOHENHEIM UNIVERSITY AMONG GERMAN UNIVERSITIES

Three German universities are listed with five ongoing cooperation projects each, namely Hohenheim, Göttingen and Rostock Universities, thus being the three universities with most ongoing bilateral projects. However, a closer look reveals some differences in the scope of the respective projects.

Those of Göttingen University include three individual research projects and two projects financed by the Chinese side, one sending a Chinese guest scientist to Göttingen University and the other to finance a PhD student. The five projects of Rostock University are in partnership with the DBFZ, including capacity building activities such as training, education modules and conferences, and doctoral supervision. One project is more research oriented. And the five projects named by Hohenheim include two consortium projects co-funded by BMBF, one International Research Training Group project, one individual research project and one project financed by the Chinese partner to support mobility. Moreover, the Chinese partners of Hohenheim University are exclusively the leading Chinese agricultural universities, namely CAU and A&F University. Thus, Hohenheim University takes the lead among German agricultural universities in bilateral research cooperation with China (see Box 1⁴).

⁴ Source of information : https://www.uni-hohenheim.de/pressemitteilung?tx_ttnews%5Btt_news%5D=45130&cHash=4d93bd83eab52dc48cb165769633ca2b. Accessed on 24 April 2020.

Box 1: Pioneering role of Hohenheim University and China Agricultural University

In 1978, Germany and China signed a Scientific and Technological Cooperation Agreement between the two countries. China is now one of the most important international partners of Germany in the field of research and development. In agricultural sciences, what has started as early as 1979 as a kind of scientific set-up aid of some professors from Hohenheim University to the China Agricultural University in Beijing, based on their own initiative, has developed into a level playing field of bilateral cooperation at the turn of the millennium. From 1999 to 2003, they conducted together a research project on sustainable agriculture in the North China Plain which was co-financed by the BMBF and the National Natural Science Foundation of China. In 2004 then, the two universities started the first German-Chinese International Research Training Group for the joint training of graduate students. At present, they conduct an International Research Training Group on the "Adaptation of maize-based food-feed-energy systems to limited phosphate resources". Both universities are ranking number one in agricultural sciences in their countries.

3.5 Cooperation activities and framework

DIFFERENT FORMS OF COOPERATION ACTIVITIES CLOSELY RELATED TO CONTRACTUAL FRAMEWORKS AND FUNDING MODALITIES

The form and content of projects varies according to the framework conditions in Germany as well as in China. Broadly, four categories of cooperation activities can be distinguished:

1. Capacity building activities, such as conferences, summer schools, training, workshops or teaching
2. Joint publications
3. Support of mobility for scientists and graduate students
4. Joint research projects

In reality, these four categories cannot always be easily separated within a project, on the contrary, they generally overlap, and each project comprises various activities. For example, a visiting scientist generally carries out research and publishes articles. Or, a research project generally includes publications, travels, project related events and often performs sampling and analyses.

Cooperation activities are closely related to the contractual framework of the cooperation and its source of funding.

Again, four categories of contractual foundations can be distinguished:

1. Doctoral projects
2. Individual research projects without third-party funding
3. Research projects with third-party funding
4. Smaller agreements concerning mobility support and events

In the survey, the funding source has often remained unnamed which might have three reasons. Either there is no third-party funding and in this case the respondents just did not mention anything, or the respondents did not know the financial set-up of the projects or they simply did not want to answer.

Also, answers for the cooperation forms must be interpreted with some care, since “research projects” is an overly broad answer allowing much space for interpretation. A closer look at the funding sometimes gave some clearer ideas on the kind of actual cooperation activities taking place.

3.6 Key features of cooperation activities

ONE SPECIFIC JOINT DOCTORAL PROGRAMME IN AGRICULTURAL SCIENCES

Doctoral programmes are the focus of the International Research Training Group project of Hohenheim and China Agricultural University, including twelve complementary research groups with 35 German and Chinese doctoral candidates jointly working on various research questions⁵. This project is financed by a specific programme of DFG from the German side.

INDIVIDUAL DOCTORAL PROJECTS AND LONGER-TERM VISITING SCIENTIST PROGRAMMES: MOBILITY TAKES PRINCIPALLY PLACE TO GERMANY SUPPORTED BY CHINESE PARTNERS

Seven institutes, both BMEL affiliated institutes and universities, explicitly named projects in which the doctoral supervision of Chinese graduate students is the main activity. They are all financed by the CSC. No project was mentioned of German doctoral candidates doing their thesis in China.⁶

Chinese (post-doc) scientists doing research in Germany can also be financed by the CSC. Some German research institutes explicitly mentioned such projects focusing on the inclusion of guest scientists at their institution. However, Chinese visiting scientists might also be funded by the German side. This is the case for the Federal Institute for Risk Assessment (BfR) which has mentioned six ongoing projects financed with their own resources to invite Chinese scientists for three months up to one year to do research in Germany.

In all, this kind of activities might be underestimated in this study. It can be assumed that there are much more Chinese scholars doing research in Germany for some time than mentioned in the survey. In fact, and this will be discussed more in-depth in the qualitative analysis, longer-term mobility of scholars primarily occurs in the direction of Chinese scholars to Germany. One respondent explained that German doctoral students in agricultural sciences are still reluctant to stay for a longer period in China. And German researchers generally go to China for short-term activities.

SMALLER CAPACITY BUILDING ACTIVITIES AND JOINT PUBLICATIONS OFTEN FINANCED WITH OWN RESOURCES

When capacity building activities or publications are explicitly mentioned as key activities, which was the case for 19 projects, usually respondents either have not specified the funding source (10 cases) or they specified that the projects are financed with their own resources (9 cases). All these 19 projects are conducted by BMEL affiliated research institutes.

Often, these activities are mentioned in combination with other activities. Some respondents specified explicitly two or more cooperation activities within a single project. This might be research/exchange of scholars, research/workshops/joint publications, or research/infrastructure use/conferences/publications.

⁵ The research team also includes more than 30 scientists from China and Germany: For more information see: <https://amaize-p.uni-hohenheim.de/en>. Accessed: 29.04.2020.

⁶ It must be noted that BMEL and MARA agreed on the launch of a new exchange programme to support the mobility of German and Chinese PhD candidates and post-doc scholars to China and Germany.

JOINT RESEARCH PROJECTS ARE MOST OFTEN FINANCED WITH THIRD-PARTY FUNDS

Joint research projects are conducted by all categories of research institutes in Germany. At least 72 listed projects conduct joint research. In all, five sources of different funding were mentioned and for 13 projects funding schemes were not specified.

The five sources of funding are:

1. BMEL funding
2. BMBF funding
3. DFG funding
4. European Union funding
5. Financing from own funds

Almost all projects, if funding modalities are specified, are financed with third-party funds and only one project is financed with own funds.

BMEL SUPPORTS MOBILITY OF ITS AFFILIATED INSTITUTES

The BMEL supports mobility under its German-Chinese Research Cooperation Mobility Support programme. These funds are exclusively available for its affiliated research institutes. As the name implies, the fund basically supports mobility of German researchers doing research in China. In all, 26 projects specify to be funded by this programme. BMEL supports one other project via the 'Renewable Resources' funding programme in which Leibniz-Institute for Agricultural Engineering and Bioeconomy (ATB) and DBFZ are included.

BMBF FUNDS FOR UNIVERSITY OF HOHENHEIM

BMBF provides funds for three projects, two of them are consortium projects under the Client-II programme with several project partners both on the Chinese and on the German side. In agricultural sciences, the partners are the University of Hohenheim in Germany and the CAU in China. And the third project is a bilateral project between also those two universities.

DFG SUPPORTS UNIVERSITY PROJECTS AND A FEW BMEL AFFILIATED RESEARCH INSTITUTES

All in all, 20 projects are financed with funds of the DFG. DFG has a variety of funding opportunities, some open to all international collaborative projects, some are special funding opportunities for specific countries and regions, and some are opportunities to intensify international cooperation. In German-Chinese bilateral cooperation in agricultural sciences, four funding schemes are used covering all these three funding opportunities.

1. Individual research grants (open submission):

This is the scheme which is most often applied for. 13 out of the 20 projects with DFG funds are funded with this grant. It requires high scientific quality and originality and is open to all qualified researchers working at German research institutes⁷. Eight different universities have projects financed with this grant, the Leibniz Institute, which is not affiliated to BMEL has requested it, the KIT has two projects and the Thünen Institute in cooperation with Göttingen University has one project with it. Depending on the project, it enables researchers to carry

⁷ See online : https://www.dfg.de/en/research_funding/programmes/individual/research_grants/index.html. Accessed 29 April 2020.

out their project and the necessary project activities, such as travels, collecting samples or preparing publications.

2. Research Training Groups' scheme (open submission):

There is one project financed under this scheme, namely the project of Hohenheim University mentioned before. The fund requires the set-up of both, a research programme and a qualification programme. The latter one should include a visiting researcher programme. It offers posts and fellowships for doctoral researchers and postdocs and funds visiting researchers, research students, travel, workshops, small equipment, consumables, coordination and miscellaneous.⁸

3. DFG-NSFC (National Natural Science Foundation of China) Joint Calls for Joint Research Projects scheme:

Two projects are funded via this scheme, one of the JKI in cooperation with CAU and the other one is a project of the Leibniz Institute of Agricultural Development in Transition Economies (IAMO) in cooperation with Nanjing University of Information Science and Technology. Göttingen University has applied for two projects under this scheme, but the applications are not yet approved.

This scheme is a special funding opportunity with China, in place since 2008 and providing financing of both partners. It targets excellent scientists on both sides. The scientific evaluation of the joint proposal can be organised separately or jointly. In this latter case, both parties jointly agree on experts who will be recruited. The call is open to all researchers in Germany. The DFG finances the German partners, NSFC finances the Chinese partners.

4. Initiation of international collaboration scheme:

This scheme is funding one project which is jointly conducted by Max-Rubner Institute, the Federal Institute for Nutrition and Food (MRI) and the Köln Sport University on the German side with the Beijing University of Chinese Medicine as partner on the Chinese side. This scheme aims at intensifying international cooperation. It helps to establish collaborative relationships by funding trips abroad, guest visits or exploratory workshops⁹.

5. Cluster of Excellence scheme with a partner in Hong Kong (open submission):

One project is funded via this scheme. The Friedrich-Löffler Institute (FLI) is one of the eight European partner institutions of the Excellence initiative. International cooperating partners also participate, among others the University of Hong Kong.

Together with another project of FLI (see chapter below), these are the two projects listed with a cooperation partner in Hong Kong.

THE EUROPEAN UNION ALSO FINANCES SOME PROJECTS

⁸ See online :

https://www.dfg.de/en/research_funding/programmes/coordinated_programmes/research_training_groups/index.html. Accessed 29 April 2020.

⁹ See online :

https://www.dfg.de/en/research_funding/programmes/international_cooperation/initiation_international_collaboration/index.html. Accessed 29 April 2020.

Four projects get their third-party financing from the European Union. They are financed under the EU Horizon 2020 programme. Only BMEL affiliated research is involved in these projects: the JKI in one, the IAMO in one project where it has the lead and the FLI in two projects being lead coordinator in one of them. In this latter one, the consortium member in China is based at Hong Kong, the University of Hong Kong¹⁰.

RESEARCH PROJECTS WITHOUT THIRD-PARTY FUNDING ARE THE EXCEPTION

Three research projects are not financed via third-party funds. They are situated in a specific context: one project at the Leibniz Center for Landscape Research (ZALF) is a follow-up project of a doctoral thesis, another project at ATB is against the background of the implication in the International Panel on Climate Change (IPCC) of both, the Chinese partner and the researcher at ATB. And one project of the FLI is based on informal cooperation without any third-party funds at all.

OTHER CASES

In the case of the two BMEL Federal Research Institutes, namely the Thünen Institute and the DBFZ, funding sources for the projects are not mentioned, but it is specified that they are based on Basic Cooperation Agreements.

¹⁰ China has become a key international partner in research and innovation of the EU. Its participation is welcomed in Horizon 2020 and several topics are specifically flagged for targeted cooperation with China. These include food, agriculture, and water issues. See online: <https://ec.europa.eu/programmes/horizon2020/en/horizon-2020-whats-it-china>. Accessed 13 Mai 2020.

4. Qualitative survey – analysis and interpretation

4.1 Representative offices in China of German research organisations and institutions

DIVERSE REPRESENTATIVE OFFICES, BUT VERY FEW SERVING AS SPECIFIC CONTACT POINT FOR AGRICULTURAL SCIENCES

China has developed into an important strategic partner for Germany in research and development over the past four decades. Therefore, to support the German researchers in China, many research organisations and institutions have established representative or contact offices in China (see Figure 5).

Figure 5: German research organisations and institutions with a permanent office in China

German research organisation or institution	Office in China	Location	since ...	Remarks
German Academic Exchange Service (DAAD)	DAAD Regional Office Beijing	Beijing	1994	
Fraunhofer Society	Fraunhofer Representative Office Beijing	Beijing	1999	
German Research Foundation (DFG)	Sino-German Center for Research Promotion (CDZ)	Beijing	2000	
Helmholtz Association	Helmholtz Association Beijing Office	Beijing	2003	
German University Consortium for International Cooperations	Chinese-German University for Applied Sciences	Shanghai, Tongji University	2004	Applied agricultural sciences are not represented in the Consortium
Technical University of Munich	Representative Office China	Beijing	2006	Including agricultural sciences
Göttingen University	Göttingen University China Office	Nanjing, Nanjing University	2008	No focus on agricultural sciences, but MoU with Nanjing Agricultural University in agricultural sciences since 2010
Karlsruhe Institute for Technology	KIT China Branch Contact Office	Suzhou	2014	

Source: Stepan, Matthias; Frenzel, Andrea; Ives, Jaqueline & Hoffmann, Marie (2018), p.73 and own data¹¹.

DAAD was the pioneer setting up its office in China as early as 1994. DFG and the two big non-university research organisations, the Fraunhofer Society and the Helmholtz Association followed, before universities also established their contact offices in China.

A consortium of 26 German universities of applied sciences set up an office at Tongji University in Shanghai in 2004. They created the Chinese-German University for Applied Sciences which provides four-year double undergraduate programmes in four disciplines. As it was mentioned by a respondent, agricultural sciences are not represented there.

¹¹ The Free University of Berlin (FUB) also has a liaison office in Beijing. It has existed since 2007 and is incorporated into the local office of the DAAD. FUB maintains partnerships with different universities in China, among which Nanjing Agricultural University.

For agricultural sciences, there are only two specific contact points in China, set up by two universities and thus targeted for scholars of these universities. The TUM was the first German university which has established a specific office in China as a contact and information point in order to support research projects and study programmes between partners in China and at the university. This was in 2006. It serves as a contact point for all faculties, agricultural sciences included.

Two years later, in 2008, Göttingen University followed by setting up an office in Nanjing, located at Nanjing University, as a continuation of a more than thirty years partnership between the two universities. One outcome of this presence is a Memorandum of Understanding between the Nanjing Agricultural University and the faculty of Agricultural Sciences of Göttingen University which was signed in 2010.

The KIT which belongs to the Helmholtz Association, represented in China since 2003, has established its own contact office in Suzhou in order to further intensify their engagement in China and develop their strategic partnership project. Two projects in the ongoing project list are conducted by KIT.

The Leibniz Association is not represented in China so far. And Hohenheim University, ranking first in agricultural sciences in Germany and pioneer in bilateral cooperation in agricultural sciences with China, is not represented in China neither.

BMBF has three regional project offices in Asia, one of them in China for the “Clean Water” project under the Client-II programme. It opened in 2012 and is located at the Tongji University in Shanghai. It also supports the BMBF project “PIRAT systems”, listed in the attached project list which also deals with water management and fertilizer recycled from sewage sludge (Struvit).

4.2 Key priorities in cooperation

Priorities in research cooperation are first of all determined by the research priorities of the institute or the involved persons. In the case of the Federal Research Institutes under the BMEL, respondents specified, that the research topics first arise from their political mandate. The concrete cooperation issues are then a result of common research interests and considered important by both, the German and Chinese partners. For example, of uttermost common interest in plant research is the field of virus diagnostics. Or, food and feed safety is of common priority research interest, which is underlined by several institutes working on these topics, such as the MRI, the BfR and the IAMO.

Two informants also noted that political priorities and public interest have an impact on research topics. For example, food safety is an important issue in Germany and therefore, the topic is also fostered politically in German-Chinese research cooperation. However, it is underlined by some informants, that this political influence on research topics is much greater in China than in Germany.

Three respondents underlined that the topics of cooperation are above all an outcome of long-term existing contacts with Chinese partners.

4.3 Opportunities in bilateral cooperation

Bilateral cooperation with Chinese partners offers a large variety of opportunities for German researchers. They can be summarised in four broad areas:

1. Cooperation with highly qualified Chinese researchers (7 nominations)

2. Unique diversity of the natural environment and agricultural cultivation systems in China (4 nominations)
3. Unique Chinese research environment (7 nominations)
4. Maintain and further develop high innovativeness and shape strategic research (4 nominations)

COOPERATION WITH HIGHLY QUALIFIED CHINESE RESEARCHERS, PARTIALLY SUPPORTED BY FUNDING PROGRAMMES

Chinese research institutions often have enormous human and financial resources and have well-equipped infrastructure at their disposal. In terms of human resources, scientific exchange produces win-win outcomes for all participants. Several respondents underline the high quality of Chinese scientists in general, of which many are top researchers in their field. Different funding programmes facilitate a research cooperation at a high level, such as the DFG-NSFC scheme. The CSC grants for doctoral students are said to be an excellent opportunity to hire excellent young scientists. Moreover, it provides financing for four years. However, it seems that mainly BMEL affiliated research institutes hire Chinese students that have CSC grants. Among universities, there is Göttingen University which takes advantage of this fund and Hohenheim University has the specific DFG-funded Research training group schemes, especially targeted on young scientists, doctoral researchers and postdocs. Another advantage to get engaged with young Chinese scientists is the fact that they have more time to invest in research and to write proposals than Chinese professors who are often charged with many different tasks.

However, it is underlined by some informants that cooperation with Chinese partners especially with top scientists, requires many years of building a trusting relationship. And to achieve the best success when hiring Chinese doctoral students, the importance of exploration activities is stressed. Topics must be well defined and pre-selected.

UNIQUE DIVERSITY OF THE NATURAL ENVIRONMENT AND AGRICULTURAL CULTIVATION SYSTEMS IN CHINA

The high diversity of the country offers many other opportunities for German researchers, which they do not have in Germany. China not only has a high diversity of environmental and natural resources, but also in terms of agricultural cultivation systems and cultivation intensities.

China is one of the world's mega-diversity countries having exceptionally high plant biodiversity. It hosts, mostly or partially, four of the world's 36 global biodiversity hotspots¹². This offers a unique opportunity for German researchers to have access to plants and plant-based foods which they could not find in Germany. The high climatic diversity is also interesting for German researchers especially when studying agroecological systems and biogeochemistry topics.

Agricultural systems are also remarkably diverse compared to Germany. China is characterised by highly different agricultural management systems, ranging from small family farm holders to extraordinarily big agricultural cooperatives and private company led farm enterprises. The degree of mechanization is also highly different in these different systems.

¹² See: Myers N, Mittermeier RA, Mittermeier CG, da Fonseca GA, Kent J. (2000) Biodiversity hotspots for conservation priorities. *Nature* 403(6772): 853–858.

In this context, it is also mentioned that Chinese agricultural policies are an interesting research topic for German scientists working on rural development questions, since the Chinese government is conducting numerous pilot projects in those quite different agricultural regions.

UNIQUE CHINESE RESEARCH ENVIRONMENT

Several characteristics of the Chinese research context offer unique opportunities for German researchers. Although research approaches of Chinese partners might sometimes be quite different from their German counterparts, this also offers opportunities for the bilateral cooperation. Thus, research in China is more application-oriented which, as it is mentioned, helps to open the horizon of own theoretical-oriented approaches. Also, this has allowed Chinese research to gain a considerable collection of empirical know-how, which is less available in Germany.

Of high interest especially in agricultural sciences is the fact that long-term field experiments are much easier to conduct in China. Thus, a cooperation project serves as open “laboratory” for field experiments not possible in Germany. Moreover, the availability of many different scientific devices in laboratory analysis in Chinese research institutes offers an additional opportunity for cooperation. Also, it is mentioned, that high laboratory animal capacities are feasible in China, which would not be possible in Germany.

MAINTAIN AND FURTHER DEVELOP HIGH INNOVATIVENESS AND SHAPE STRATEGIC RESEARCH

It is not only important to learn from the unique Chinese experiences and take advantage of the more flexible and unique research environment, but, as two respondents indicated, Germany should continue to provide ideas for a further intensification of the partnership between the two countries. It is seen as crucial to generate ideas also on issues like climate change or digitisation in relation to agricultural sciences. Only in doing so, Germany could secure its innovation strength. Moreover, in the case of climate change, global challenges of common interest are addressed together.

Some respondents underlined the importance of doing research with Chinese partners in order to shape strategic research, for example to address challenges in different value chains for which China also seeks solutions, at present or in future. Or to assure food and feed security along global commodity chains, for example in order to backtrack commodity chains in case of abnormal events or to track the authenticity of food and feed.

POLITICAL SUPPORT HELPS TO INCREASE COOPERATION OPPORTUNITIES

The research cooperation is facilitated by different circumstances and mechanisms. It is underlined that the challenges to the public service missions of agriculture are comparable in both countries, and the need for regulation by the government is considered similar. This basic common understanding facilitates research cooperation. It has already been mentioned that public funding schemes help to promote a high quality of scientific exchange. Moreover, the mobility support programme of the BMEL for its affiliated institutes or the mobility support of DFG via its Sino-German Center for Research Promotion in Beijing primarily offer an opportunity to do short-term travels to China in order to collect data, initiate or intensify cooperation or conduct any other short-term activities in China.

4.4 Bottlenecks and crucial points in agricultural research cooperation

The opportunities of bilateral research cooperation with China in agricultural sciences are enormous, but cooperation is not always going as smoothly as it is expected even though there is a basic mutual interest in research cooperation. Four respondents have not encountered difficulties in their cooperation projects, all the others encounter challenges. Crucial points in research cooperation can also be summarised in four broad categories:

1. Incomplete reciprocity (6 nominations)
2. Lack of financing (7 nominations)
3. Language barriers (4 nominations)
4. Other miscellaneous obstacles

PERCEIVED ONE-DIRECTINAL EXCHANGE

A major issue in cooperation is linked to the question of data exchange. The exchange of data is perceived as difficult, and respondents even notice that it has become even more and more difficult recently.

“Data-sharing seems not be encouraged by (high-level) Chinese authorities, for example, if the server is located in Germany. As a consequence, systematic reviews, among others, could not have been done.” (Survey respondent)

Official, bidirectional exchange of information, data and samples remains difficult. Reasons for this are the complex structures in research and monitoring units in China with different, sometimes overlapping responsibilities, but also the acute epizootic disease situation within the context of the unfolding African Swine Fever crisis. Since 2018, ASF has further aggravated the problems and led to priority changes. (Survey respondent)

In general, informants state that it is not easy to understand the reasons behind these difficulties.

It is, however, not apparent whether these difficulties are due to lacking property rights (lack of own sample collections) or to politically motivated reasons. (Survey respondent)

Bottlenecks: Official approvals for the export of samples (for example soil and plants) and sometimes also the import of technical instruments (long, complex, and non-transparent bureaucratic procedures). (Survey respondent)

Another bottleneck for German researchers lies in the expectation of Chinese partners that the German side should manage the implementation of the high-tech research. For some it is difficult to find well-organised Chinese research groups that are able and willing to collaborate as equals in research.

“High-tech research is often confused with the mere possession of expensive analytical devices and it is overlooked that the quality of the research depends not on highly modern devices, but on strictly organised overall processes, routine processes included.” (Survey respondent)

FINANCING MODALITIES HAMPER EFFICIENT COOPERATION

Another major issue in cooperation is related to financing. There are only very few public funding schemes which allow financing of both partners at the same time. As mentioned before, this is the

case of the DFG-NSFC scheme. However, whereas the German side accepts English proposals, NSFC asks for proposals in Chinese. This implies an enormous organisational effort.

Otherwise, most of the other third-party funding schemes available for German researchers and research institutes are only open for the German side and the Chinese partner must provide the financing of their part. This has turned out to be problematic for some projects with BMEL funded mobility support, for instance. Travels of German scientists to China took place, but Chinese project partners then did not come to Germany or cancelled their already planned travel belatedly.

Delegations from Chinese colleagues have sometimes not been conducted in the past, without giving specific reasons (sometimes short notice cancellation of already planned travels). This impedes scientific exchange and sometimes a successful project initiation. (Survey respondent)

It is underlined that the predictability of visits of Chinese scientists in Germany becomes increasingly challenging, since the necessary financial means are, according to the Chinese partners, not planned or not provided in time. For example, the approval of study tours especially for researchers from non-university Chinese institutions is often very slow.

Calls for proposals of Horizon 2020 apply the same conditions and financial rules for Chinese participants as their peers from other emerging economies and industrialised countries. This means that they need to cover their participation costs in Horizon 2020 projects with their own funds. According to a respondent, this makes it more difficult to integrate Chinese partners in such projects since these initiatives demand high financial inputs.

LANGUAGE BARRIERS ALSO HAMPER EFFICIENT COOPERATION

Language barriers are yet another major obstacle for an efficient cooperation. Although English is usually the common language in bilateral projects, it is mentioned, that only some Chinese colleagues have a good working knowledge of English. To mitigate these difficulties to some extent, Chinese doctoral students or even a Chinese person in the coordination staff can be helpful.

A VARIETY OF MISCELLANEOUS OTHER OBSTACLES

A variety of other obstacles are mentioned that also impede efficient cooperation. In general, as one person noticed, a lack of openness and caution in providing expert input are recurrent challenges in cooperation with Chinese partners.

As mentioned before, longer-term mobility of scholars primarily occurs in the direction of Chinese scholars to Germany. This is true for both, young scientists and senior researchers. It is still exceptional for German graduate students in agricultural sciences to stay for a longer period than six months in China. And senior researchers travel to China only for short-term activities in general. This is regretted by some respondents who think that a long-term reciprocal exchange would benefit capacity building.

Concerning administrative issues, there are two obstacles. First, filling in joint proposals demands a considerable time budget. In China, there is normally no financing for this task. This is also why it seems a good practice for some respondents, as mentioned before, to have Chinese doctoral students in the project who can take on this task. Second, practical administrative tasks, such as visa procedures for Chinese scholars in Germany, are also an obstacle which was especially mentioned in the survey.

4.5 Role of Science and Technology Platform of DCZ

GENERAL OVERVIEW

The expected support of the S&T platform is partly reflecting the obstacles the respondents encounter in cooperation with Chinese partners, but other issues were also brought to light. Respondents suggested many ideas as to what the S&T platform of DCZ should do and which role it should play. They can be summarised in three broad categories, two of which relate to its general function as information and networking platform and the third to its function on the concrete project level. The last one cannot easily be separated from the function as an information platform but underlines the particular need of concrete information and support on the project cooperation level.

In general, the big majority of respondents raised more than one point where they would appreciate assistance. Networking support and help for research project initiation and implementation are most often mentioned:

1. Networking support: 16 nominations
2. Help for project initiation and implementation: 15 nominations
3. Help for general information procurement and provision: 8 nominations

Although networking support ranks first, help for project initiation and implementation is required by more respondents. Whereas nine informants expressed their need for networking, by sometimes mentioning up to three different aspects, 12 respondents stated that they would require help for project initiation and implementation.

In the following, further details on the expressed needs and expectations of the respondents are illustrated.

NETWORKING PLATFORM

Respondents from both, BMEL affiliated research institutes and universities, mentioned different aspects of contact and networking needs, and sometimes one respondent stated two or even three different aspects of networking needs.

- Important support is required is for the identification and establishment of contacts with Chinese, but also with German stakeholders from science, politics and industry, adapted, if necessary, to the specific needs of the German research institute (6 nominations)
- DCZ should act as mediator between research institutions and relevant public authorities and regulators and even of private enterprises which are involved in agricultural production systems and value chains (5 nominations)

To establish contacts with universities is easy, but as soon as something becomes political, 'political contacts' are needed in China. DCZ should accompany German research institutions in that. DCZ should enhance its role of facilitator between research and politics. [Survey Respondent]

- Support or co-organisation of common Sino-German events, meetings, or expert exchanges, during all phases of a project. Support could include the invitation of German partners (3 nominations)

- Organisation of expert exchanges among German experts, for example on thematically sensible topics, such as Intellectual Property Rights (IPR), but also to promote networking and visibility among German researchers (2 nominations)

PROJECT COORDINATION PLATFORM

On the concrete research cooperation level, 12 respondents express an urgent need for support. This is true for all categories of research institutions. This might concern administrative issues, but also financial questions and issues concerning the project content. The different needs include:

- Concrete practical information on how to initiate a project. For example, explaining logistic challenges and organisational aspects, third-party financing possibilities or crucial points in cooperation with China such as the importance of political contacts in certain cases, to mention just some points (5 nominations)
- Support in administrative project management: provide assistance concerning visa issues for Chinese graduate students and scientists, provide guidance for the financial set-up, logistical advice etc. (4 nominations)

Support of research projects in submitting applications for visas, travel permit for critical regions, import and export of material etc. [Survey respondent]

Providing advice on China-related research topics in the areas of food and agriculture, possibly logistical and organisational advice of research projects. [Survey respondent]

- Develop an advisory structure for doctoral students (2 nominations)
 - Support of concrete research projects, for example as multiplier or through brokering of contacts with external partners, development of an advisory structure for doctoral students etc. [Survey respondent]*
- Promotion of an optimum research cooperation environment, based on “real bilateral arrangements”, which comprise knowledge transfer in both ways (1 nomination)
- Support the set-up of cooperation contracts (1 nomination)
- Support the set-up of research groups which, in terms of planning security, are reliable (1 nomination)
- Finding external project partners (1 nomination)
- Increased coordination and increased institutional support of existing cooperation projects in agricultural sciences (1 nomination)

INFORMATION PLATFORM

Information needs and information provision on various aspects and issues are stressed by six respondents. The consulted experts would like that DCZ functions as information point for information which is difficult to obtain individually. Different points mentioned include:

- Information on research topics in Germany which could be of interest for Chinese research institutes and related to that, information of the German agricultural research landscape for

Chinese stakeholders in order to raise the visibility of German stakeholders for Chinese partners (4 nominations)

- Information on ongoing Chinese research projects in agricultural sciences in China (1 nomination)
- Information on the complex Chinese research landscape: A Who is who on agricultural sciences including stakeholders from science and politics (2 nominations)
- During project initiation, collecting expert opinions and expert reports on selected themes (1 nomination)

5. Lessons learned and recommendations

5.1 Lessons learned of the quantitative survey

1. The list of ongoing cooperation projects, 122 in all, represents a first comprehensive inventory system of German research institutions having bilateral cooperation projects with Chinese partners. The list is not complete and needs to be improved, but it provides an approximative idea on key actors and their engagement with China.
2. The reliability of project data is very high for BMEL affiliated research, average for universities and probably very low for other research institutes, which were not targeted in the 2020 survey.
3. Cooperation projects are conducted by a modest number of key stakeholders in Germany against a wide variety of stakeholders on the Chinese side. Also, in Germany, BMEL affiliated research institutes are most implicated in bilateral cooperation (in 79% of all listed projects) whereas in China partners are mainly based at universities (in 52% of all listed projects).
4. Among universities, there are two leading universities in China, namely China Agricultural University (CAU) in Beijing and A&F University in Yangling. In Germany, University of Hohenheim has a predominant role among German universities engaged in agricultural research cooperation with China. CAU and Hohenheim University are pioneers in bilateral cooperation in agricultural sciences.
5. Bilateral projects with the CAAS are all in partnership with BMEL affiliated research institutes whereas bilateral projects with the CAS have partners from universities and from BMEL affiliated research involved. Huge multi-Chinese partner projects or projects with several international partners were only conducted by Hohenheim University and BMEL affiliated research institutes in the past.
6. Cooperation activities are diverse, both thematically and in terms of academic depth, ranging from capacity building activities (conferences, training, teaching etc.), joint publications, support of mobility to full-scale joint research projects. However, activities often overlap within a project. They are closely related to the contractual framework and the funding sources. Smaller capacity building activities and joint publications are often financed with own resources, whereas joint research projects are almost all financed with third-party funds. Long-term mobility of young scientists and senior scholars takes principally place to Germany and is generally supported by the Chinese side.
7. More than half of the projects listed are joint research projects (59%). They are financed with national level third-party funds (BMEL; BMBF and DFG) or by the EU. Only one funding scheme allows financing for both partners (DFG-NSFC scheme), the other funding schemes are generally

only open for German researchers, the Chinese partners must raise their own funds. BMEL funds are only open for BMEL affiliated research institutes and European funds are only requested by BMEL affiliated research institutes.

5.2 Lessons learned of the qualitative survey

1. German research in general is well represented in China by higher education research organisations and non-university research establishments. For agricultural sciences, however, there are only two universities having their representative offices in China which also serve as contact points for their agricultural faculties, namely the TUM and Göttingen University. Universities of applied sciences are represented in China, but they focus on four other disciplines.
2. Key priorities in cooperation are first of all a result of common research interests determined by the research priorities of the institutes and the persons involved. Hence, they cover an overly broad range of topics. They also reflect recent events and similar interests of research, politics and the public. The priorities of Chinese partners seem to be strongly influenced by politics.
3. Bilateral cooperation with Chinese partners offers a large variety of opportunities for German researchers. It allows research with often highly qualified Chinese researchers creating win-win situations for both. But China also offers unique basic conditions and a unique research environment which is more flexible than in Germany: high biodiversity, several different climate zones, highly diversified agricultural production and management systems on one side meet huge empirical know-how, more flexible testing regulations, the possibility of long-term field experiments and well equipped laboratories on the other side.
4. Another opportunity for bilateral cooperation for German researchers is related to factors which characterize German research. Germany has a remarkably high innovation strength which, by generating ideas on issues like climate change or digitisation and agriculture could secure this competitive advantage in research. And it helps simultaneously to shape strategic research in China on innovative issues.
5. The efficiency of cooperation projects, though, might be hampered by different obstacles, some of them inherent in any international project collaboration and some of them exacerbated or specific in cooperation projects with China. Specifically China-related bottlenecks are the perceived one-directional exchange of data, insufficient knowledge and visibility of the Chinese research landscape, lack of specific funding schemes providing financing for both sides, language barriers, lack of openness and caution in providing expert input from the Chinese partners, administrative issues concerning the editing of joint proposals and visa questions.

5.3 Recommendations for the Science and Technology platform of DCZ

The survey could highlight lessons on which the following recommendations are elaborated for enhancing the role of DCZ in Sino-German cooperation in agricultural research. The S&T platform can prove its worth vis-à-vis the public sector and the scientific community of both countries in fostering its role in three different ways: firstly, as an information and dissemination platform, secondly, as a networking platform and thirdly, as a project coordination platform.

Recommendations are made for these three key intervention areas. They sometimes converge. And they are meant to be a catalogue of various options which are not ranked according to their importance or their feasibility within this or a future project term.

1. Fostering S&T platform's role as an information and dissemination platform

➤ Enhance the S&T platform's external communication and visibility

As a prerequisite of all the other recommendations, the S&T platform should enhance its visibility and foster its external communication. To place more emphasis on its “new” role as a platform in the three identified areas, it should be transmitted to the outside world by means of an effective external presentation. For this, the homepage should be updated in a way to highlight the role of the S&T platform. For example, a specific link to this project component could be created, with subfolders providing for example access to a “cooperation wiki” recommended below, podcasts etc.

➤ Create an information database (a cooperation-wiki) with all necessary information on project cooperation with Chinese partners

The database should provide two kind of information. First, a Who is Who on the complex Chinese research landscape including stakeholders from science and from politics. Secondly, concrete practical information on how to initiate and conduct a cooperation project explaining different aspects of project initiation and management (organisational set-ups, financing possibilities, crucial points to be aware of, logistic challenges, legal questions etc.).

The database should be accessible online and a specific link “cooperation-wiki”, hosted on the DCZ homepage, could be created with all the necessary sub-folders. Furthermore, a basic factsheet can be published in a comprehensive form in paper format.

➤ Provide a detailed compilation of Chinese research institutes conducting research on agricultural issues

German research institutes have a limited visibility of agricultural sciences in China. They would appreciate to be informed on all the research institutes doing research in agricultural sciences and their specific research topics. This could be based on the Who is Who of the cooperation-wiki being an extension of it, but with a focus and more detailed information on science. A further focus should be put on bilateral cooperation projects of these institutes with German partners, which are not yet integrated in this survey.

➤ Publish a factsheet on the German agricultural research landscape for Chinese stakeholders

A comprehensive description providing basic facts on German research institutes working on agricultural issues would increase the visibility of German stakeholders for potential Chinese cooperation partners and could foster bilateral cooperation. The factsheet should also comprise one section specifically targeted for young Chinese scientists. Again, dissemination should be in paper format, but more importantly, a link on the DCZ homepage should provide access to the factsheet online.

2. Fostering S&T platform's role as a networking platform

➤ Serve as contact provider of relevant Chinese contacts for the German scientific community researching on agricultural issues

German agricultural sciences are underrepresented in China. Only two universities have their own representative offices in China. To initiate bilateral cooperation and assure smooth

project implementation, contacts and networks are of utmost importance. This is especially true for contacts on the political level where DCZ has developed an outstanding network. Moreover, contact provision of private enterprises which are involved in agricultural production systems should also be included. The provision of these services should be open for the whole German scientific community researching on agricultural issues. Again, this role of contact provider should be communicated on the homepage with practical instructions for interested German research institutions.

➤ **Foster its role as a mediator between science and politics**

Based on their contacts, DCZ should act as mediator between German researchers and Chinese public authorities and regulators, and even private Chinese enterprises being key stakeholders in agricultural production systems and value chains. German research institutes often cannot stem this task on their own but need to be accompanied by higher authorities such as the DCZ which is a common initiative between BMEL and MARA. Again, the provision of these services should be open for the whole German scientific community researching on agricultural issues. Concretely, external communication on this role on the homepage is recommended with the proposal to accompany the German research institutions for this task. Furthermore, S&T platform could invite more German stakeholders from research to the Sino-German Agricultural Week and create specific workshops for them.

➤ **Serve as a network hub and support or co-organise common Sino-German events and expert exchanges**

DCZ should further extend their already widely acknowledged role in organising high-level Sino-German conferences such as the Sino-German Agricultural Week on which, as mentioned before, stakeholders from German research should be increasingly invited. It is recommendable to also support or co-organise smaller events focusing on bilateral cooperation in agricultural sciences, on specific topics such as agriculture and digitisation, agriculture and climate change or circular economy in agriculture. These topics are of great mutual interest and at the same time these events could strengthen Germany's role as generator of ideas.

➤ **Organise expert exchanges among German researchers working with Chinese partners**

Besides the need of focused networking events with Chinese equals, German researchers would also gain in getting to know each other better. Ad-hoc workshops could be organised which could be rather open at the beginning and in follow-up events focus on topics and needs expressed by the stakeholders.

3. Fostering S&T platform's role as project coordination platform

➤ **Support the set-up of concrete cooperation projects**

To create highly effective and sustainable projects, a well-thought set-up is decisive. The S&T platform could support several very practical aspects of project set-up: the set-up of cooperation contracts, the handling of administrative questions related to visa procurement, the financial set-up and the set-up of reliable research groups allowing the necessary planning security. Concretely, templates for cooperation contracts or visa invitations could be made

available on the homepage, contacts of best practice examples could be provided on demand etc.

➤ **Support the smooth implementation of ongoing projects**

Ongoing projects sometimes need advice and the S&T platform should underline and further enhance its role as facilitator for ongoing projects. Several described action fields already contribute to this, but the S&T platform should stress this role as contact point in the relevant communication tools. The recommended link to the S&T platform project component is one dissemination channel, another is the already mentioned basic factsheet containing information on how to initiate and conduct a cooperation project.

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Annexes

Annex 1: Research institutes identified in the scoping phase

Annex 2 : Questionnaire (in German)

Annex 3: Institutions having participated in the 2020 survey

Annex 4: List of ongoing bilateral cooperation projects

Annex 1: Identified German research institutes

Catgory	Name of institutions	Acronym
Federal Research BMEL	Max-Rubner Institute (German Federal Research Institute for Nutrition and Food)	MRI
Federal Research BMEL	Julius Kühn Institute (German Federal Research Centre for Cultivated Plants)	JKI
Federal Research BMEL	Friedrich-Loeffler Institute Federal Research Institute for Animal Health	FLI
Federal Research BMEL	Thünen Institute (German Federal Research Institute for Rural Areas, Forestry and Fisheries)	TI
Federal Research BMEL	DBFZ German Biomass Research Center	DBFZ
Federal Research BMEL	Federal Institute for Risk Assessment	BfR
BMEL affiliated Leibniz Inst.	Leibniz Center for Landscape Research	ZALF
BMEL affiliated Leibniz Inst.	Leibniz Institute for Food Systems Biology	LSB
BMEL affiliated Leibniz Inst.	Leibniz Institute of Vegetable and Ornamental Crops	IGZ
BMEL affiliated Leibniz Inst.	Leibniz Instit. of Agricultural Developm. in Transition Economies	IAMO
BMEL affiliated Leibniz Inst.	Leibniz Institute for Farm Animal Biology	FBN
BMEL affiliated Leibniz Inst.	Leibniz-Institute for Agricultural Engineering and Bioeconomy	ATB
Lebniz Institute	Leibniz Institute for Plant genetics and Crop Plant research	IPK
Lebniz Institute	Leibniz Institute for Plant Biochemistry	IPB
Lebniz Institute	Leibniz Institute for Ecological Urban and Regional Developm.	IÖR
Lebniz Institute	Leibniz Institute of Freshwater Ecology and Inland Fishery	IGB
Lebniz Institute	Leibniz Institute for Natural Product Research and Infection Biology	HKI
University	Technical University of Munich, TUM School of Life Sciences	
University	University of Hohenheim	
University	Humboldt University of Berlin	
University	University of Göttingen	
University	University of Halle-Wittenberg	
University	University of Rostock	
University	University of Kassel	
University	University of Bonn	
University	University of Gießen	
University	University of Kiel	
University of applied sciences	Anhalt University of Applied Sciences	
University of applied sciences	Osnabrück University of Applied Sciences	
University of applied sciences	University of Appl. Sc. for Sustainable Developm. Eberswalde	
University of applied sciences	Bingen University of Applied Sciences	
University of applied sciences	Dresden University of Applied Sciences	
University of applied sciences	Weißenstephan-Triesdorf University of Applied Sciences	
University of applied sciences	Rhine-Waal University of Applied Sciences	
University of applied sciences	Neubrandenburg University of Applied Sciences	
University of applied sciences	Nürtingen-Geislingen University of Applied Sciences	
University of applied sciences	Kiel University of Applied Sciences	
University of applied sciences	Südwestfalen University of Applied Sciences	

Annex 2: Questionnaire (in German)



Studie zur bilateralen Zusammenarbeit in der Agrarwissenschaft mit China

Vielen Dank für Ihre Mithilfe und das Ausfüllen des vorliegenden Fragebogens. Zum einen dient die Studie zur Erfassung aller laufender Forschungskooperationen in der Agrarwissenschaft mit China und so einen Überblick über den aktuellen Stand und die Schwerpunkte dieser Zusammenarbeit zu liefern. Darüber hinaus soll es aber auch um Ihre Erfahrungen in der Zusammenarbeit gehen und die Identifizierung von Themen und Aspekten, bei denen sich die Science&Technology Platform des DCZ einbringen und deutschen Forschungseinrichtungen unterstützend zur Seite stehen könnte. Neben den mit dem BMEL affilierten Ressortforschungs- und Leibnizinstitutionen werden auch Universitäten, Fachhochschulen und andere Forschungseinrichtungen erfasst.

Alle Daten werden vertraulich behandelt und bei der Berichterstattung werden die Namen nicht genannt.

1. Zu Ihrer Person und Ihrer Institution

NACHNAME, Vorname	Institution, Dienststelle/Abteilung/Fakultät	Position

PLZ, Ort	email	Telefonnummer

2. Unsere Institution hat eine Repräsentanz/ständige Vertretung in China: ☐ Ja ☐ Nein
Wenn ja, wo? Und seit wann?

3. Laufende Forschungskooperationen mit China

☐ Wir haben gegenwärtig keine Forschungskooperationen in der Agrarwissenschaft mit China?

☐ Wir haben Forschungskooperationen in der Agrarwissenschaft mit China

Gegenwärtig haben wir ...x... Forschungskooperationen. *(Bitte die Anzahl angeben)*

4. Bestandsaufnahme

Nennen Sie bitte alle Vorhaben, und geben Sie bitte zu jedem Vorhaben, wenn möglich, folgende Informationen an:

4.1 Titel des Vorhabens/der Kooperation

- Laufzeit
- Chinesischer Kooperationspartner
- Vertragsbasis/Kooperationsrahmen (z.B. *Mobilitätsunterstützung deutsch-chin. Forschungsk Kooperation, BMEL/BLE deutsch-chinesisches Agrarförderprogramm, Doktorandenaustausch, NSFC-DFG Cooperation Group project, EU Horizon 2020 etc.*)
- Kooperationsart (z.B. *Doktorandenbetreuung, Forschungsvorhaben, Workshops und Trainings, Events, Mobilitätsförderung, gemeinsame Publikationen etc.*)
- Kategorie/Disziplin, Fachliche Zuordnung
- Funding : Eigenmittel, Drittmittel. Falls Drittmittel, welche?
- Beteiligte Personen Deutschland
- Beteiligte Personen China
- Handelt es sich um eine Fortschreibung oder ist es ein neues Projekt?
☐ Fortschreibung
☐ Neues Projekt

4.2 Nennen Sie nun bitte alle weiteren Forschungsk Kooperationen, die Sie in der Agrarwissenschaft mit China haben, unter Angabe der genannten 9 Punkte.

Schwerpunkte in der Forschungsk Kooperation

5. Gibt es Schwerpunkte in der Forschungsk Kooperation Ihres Institutes mit China?

☐ Ja ☐ Nein

Falls Ja, welche?

Und warum diese?

Chancen und Schwierigkeiten in der Zusammenarbeit

6. Welche Chancen sehen Sie in der deutsch-chinesischen Zusammenarbeit im Bereich Agrarwissenschaft? Was macht die Zusammenarbeit mit chinesischen Partnerinstitutionen für Ihre Institution interessant (auch im Vergleich mit der Zusammenarbeit mit anderen Ländern)?

7. Gibt es Schwierigkeiten in der Kooperation mit chinesischen Partnern und wenn ja, welche?

Rolle der Wissenschaftsplattform (S&T Plattform) des Deutsch-Chinesischen Agrarzentrums (DCZ) in Peking

8. Welche Erwartungen haben Sie Ihrerseits an die S&T Plattform? Was sollte sie Ihrer Meinung nach leisten?

Abschließende Fragen

9. Wollen Sie noch weitere Vorschläge oder Anmerkungen machen was die deutsch-chinesische Zusammenarbeit in der Agrarwissenschaft betrifft?
10. Wären Sie eventuell für ein vertiefendes Gespräch mit Frau Merkle bezüglich ihrer Erfahrungen bereit? ☐ Ja ☐ Nein

Annex 3: Institutions having participated in the 2020 survey

Category	Name of institutions	Acronym
Federal Research BMEL	Federal Institute for Risk Assessment	BfR
Federal Research BMEL	DBFZ German Biomass Research Center	DBFZ
Federal Research BMEL	Friedrich-Loeffler Institute Federal Research Institute for Animal	FLI
Federal Research BMEL	Julius Kühn Institute (German Federal Research Centre for Cultivated Plants)	JKI
Federal Research BMEL	Max-Rubner Institute (German Federal Research Institute for Nutrition and Food)	MRI
BMEL affiliated Leibniz Inst.	Leibniz-Institute for Agricultural Engineering and Bioeconomy	ATB
BMEL affiliated Leibniz Inst.	Leibniz Institute for Farm Animal Biology	FBN
BMEL affiliated Leibniz Inst.	Leibniz Instit. of Agricultural Developm. in Transition Economies	IAMO
BMEL affiliated Leibniz Inst.	Leibniz Institute of Vegetable and Ornamental Crops	IGZ
BMEL affiliated Leibniz Inst.	Leibniz Institute for Food Systems Biology	LSB
BMEL affiliated Leibniz Inst.	Leibniz Center for Landscape Research	ZALF
Leibniz Institute	Leibniz Institute for Natural Product Research and Infection Biology	HKI
Leibniz Institute	Leibniz Institute for Ecological Urban and Regional Developm.	IÖR
University	University of Freiburg	
University	University of Gießen	
University	University of Göttingen	
University	University of Hohenheim	
University	Technical University of Munich, TUM School of Life Sciences	
University	University of Rostock	
University of applied sciences	Bingen University of Applied Sciences	
University of applied sciences	Dresden University of Applied Sciences	

Annex 4: List of ongoing cooperation projects

(see excel table attached)