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Sino-German Agricultural Centre
(DCZ)
中德农业中心



Sino-German Agricultural and Food
Update
中德农业与食品通讯



No. 17 November 2021 - January 2022



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This newsletter is published under the responsibility of the Sino-German Agricultural Centre (DCZ), which is funded by the German Federal Ministry of Food and Agriculture (BMEL). All views and results, conclusions, proposals or recommendations stated therein are the property of the authors and do not necessarily reflect the opinion of the BMEL.

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Published by



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Sino-German Agricultural and Food Update

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Foreword

Dear partners and friends of the Sino-German Agricultural Centre,

We just entered 2022 and are already looking forward to the Chinese New Year which will be the Year of the Tiger. “Between the years” we bring a new edition of our newsletter to you with some hot issues in agricultural development.

Food security is of high concern at any time, and various measures are taken by the Chinese government to ensure the provision of what we are too often taking for granted: sufficient food in high-quality for the whole population.

In this regard, the development of **crop seeds** has been highly emphasized on several occasions as playing a “strategic role” for national food security and agricultural reform. An **amended Seed Law** which just passed the People’s Congress and will take effect in March aims at strengthening protections for new plant varieties and legal rights of breeders and variety owners. Among others, this is expected to support the enhancement of R&D efforts for high-quality seeds – and improved food security.

A **Food Saving Action Plan** proposes targeted measures to ensure grain supplies and food security and addresses the problem of Food Loss and Waste in production, storage, transport, processing and consumption.

A **three-year census of domestic crop**, livestock, and aquatic germplasm resources is on the way since March 2021 to ensure self-reliance on seed resources.

This edition addresses all of these topics and related news, most prominently in the cover story by Ms. Jelena Grosse-Bley of Humboldt University in Berlin: “Perspectives on crop seeds in the wake of China’s modern seed industry”.

You will also find a short summary of one of our policy briefs on “**Food loss and waste in China – status quo, policies and action**” by Dr. Huang Jiaqi, assistant professor at the Agricultural Information Institute of the Chinese Academy of Agricultural Sciences. A full version of this document can be downloaded on our website <https://www.dcz-china.org/dcz-publications.html> where you also find more studies and outputs of our Centre.

As always, I hope you find something of interest in this newsletter. Don’t hesitate to give us some feedback or suggestions.

With best wishes



Dr. Jürgen Ritter
Managing Director
Sino-German Agricultural Centre (DCZ)

Cover Story

Perspectives on crop seeds in the wake of China's modern seed industry

Jelena Grosse-Bley, Humboldt-Universität zu Berlin

Crop seeds: The microchips of agriculture

'Store grain in the soil, store grain in technology' the central government emphasized at the Economic Work Conference in December 2020, in a section dedicated to 'solving the seed and arable land question'. Just a few weeks prior, Tang Huajun, president of the Chinese Academy of Agricultural Sciences (CAAS), had dubbed seed breeding biotechnologies as a 'bottle-neck' technology and in doing so echoed broader discussions around critical technologies for which China relied on imports. Reliance on imported goods and technologies had received heightened attention in the context of trade conflicts with the US.

This high-level endorsement of the strategic role of crop seeds for national food security and agricultural reform culminated in the 2021 No. 1 Document. For the first time, this central government policy document included a dedicated section reforms concerning crop seeds. Seeds were now framed as the 'microchips' of agriculture, akin to semiconductors in their critical role of unlocking untapped potential in a whole computational system. The document specified a plan for China's modern seed industry that encapsulated a range of issues, from genetic resources to the commercialization of new crop varieties. It politically elevated points raised earlier, e.g. in the National Agricultural Modernization Plan (2016-2020) and sketched out in the Outline of the 14th Five-Year Plan (2021-2025). Momentum continued with the 'blueprint' for the seed industry published by the National Development and Reform Com-

mission (NDRC) and Ministry of Agriculture and Rural Affairs (MARA) later in 2021 and the latest amendment of the Seed Law, which is due to come into effect in March 2022.

The core of the newly invigorated reform of the seed industry seeks to address many issues that have long been concerns of domestic and international actors along China's seed supply chain from basic research into breeding technologies to successful promotion of new varieties. For example, researchers and proponents of a modernized seed industry have long pointed out problems with the protection of seed Intellectual Property Rights (IPR), both foreign and domestic, resulting in both a lack of incentives for companies to invest in research and development and lower quality seeds being fed into agricultural production.

Envisioning an 'emancipatory battle for a modern seed industry'

The central government has now set the direction for China's modern seed industry: Efforts should be led by domestic companies that link cutting edge biotechnological research across public and private institutions, translate the resultant breeding technologies into competitive new seed varieties, and provide seeds under Chinese intellectual property (IP) ownership to satisfy domestic demand. The goal is to overcome a perceived lack of research and development capabilities in China's seed industry, whose more than 5000 companies make it fragmented and small-scale. Instead, the government is seeking to foster internationally competitive Chinese seed companies backed by cutting-edge domestic research that benefit from more vigilant protection of IP and quality standards on the domestic market.

This high-level political endorsement of seed politics brings added weight to China's increasing emphasis on the importance of

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crops seeds to strengthen national food sovereignty. Commentators have termed these new developments ‘seed nationalism’, particular in the way ‘Chinese seeds’ are pitched against seeds sold under foreign IP by foreign companies, which is often framed with larger narratives of nation-state competition and trade.

Yet, officials have also been at pains to stress that the quantitative supply of seeds for domestic food production has at no point been at risk. Tang Renjian, minister of MARA, has noted that most seeds on the Chinese market are already produced domestically, with only a small fraction – especially vegetable seeds – relying on imports. Rather, the ‘emancipatory battle for the seed industry’, in Tang’s words, will be fought at the technological front in breeding.



力求突破

新华社发 徐骏 作

Caption: The running seed bag with ‘China seed industry’ on its belly is saying with a smile on its face: ‘Win the emancipatory battle, don’t get strangled.’ The red arrow carries the words ‘Strive to realize important breakthroughs.’

Source: http://www.news.cn/2021-03/09/c_1127191016.htm

China’s agrobiodiversity as ‘genetic wealth’

Genetic diversity of agricultural crops is considered a strategic resource key to the development of China’s seed industry. MARA expressed the urgency of engaging in not just understanding the extend of China’s agrobiodiversity but to also conduct ‘rescue-style collection and safekeeping’ in the face of many drivers of rapid agrobiodiversity loss. The ‘genetic wealth’ needed protection and serve as the raw material of potentially desirable genetic characteristics that could be utilized in developing new seed varieties.

China’s third agricultural genetic census was started in 2015, succeeding the first two in 1956-57 and 1979-83. In the end of 2021, the census and collection across the intended 2323 rural counties in 31 provinces was declared complete. Sun Haoqin, vice director of MARA’s Seed Industry Administration announced that the census had yielded 20.800 newly collected crop germplasm resources. As part of the new strategy to promote the collected germplasms and encourage their utilization by researchers and companies, MARA released the first annual batch of selected ‘10 outstanding resources for major crops’ with promising genetic traits from the census.

Germplasm collection and storage is facilitated by a new national agricultural germplasm bank, which started trial operations in September 2021 under the Crop Science Research Institute at the Chinese Academy of Agricultural Sciences. It has capacity for 1.5 million germplasm units - a capacity sufficient for the next 50 years equipped with the latest technologies to ensure a shelf life of up to 50 years. This collection effort extends other germplasm banks, such as Asia’s reportedly largest collection of plant and animal

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germplasm held by the Germplasm Bank of Wild Species at Kunming Institute of Botany. Furthermore, ex-situ conservation is complemented by in-situ conservation sites for life species in dedicated fields and zones across China, but is also pursued in less formalized initiatives in farming communities.

The 'national team' of seed breeding bases

Research, breeding and production of new seed varieties need an institutional infrastructure with appropriate facilities. The current policies note the importance of the 'national team' of seed breeding bases for a modern seed industry. At the heart of this line-up are the three national bases in Gansu, Sichuan and Hainan, the latter having been termed the 'Silicon Valley' of seed breeding. The 'backbone' of the team is made up of 100 regional and 52 large county bases. According to official estimates, the 'national team' bases produce over 70% of the agricultural seeds used in China. MARA invited bases to come forward for assessment in October 2021, and a statement that the team had been 'basically set' was released later that month.

The development of breeding bases should be coupled and support the emergence of strong seed companies. To this end, MARA and the Ministry of Finance promised increased investments and financial rewards for the bases to improve their performance. They also put forward the '1+M+N' model to link up one seed variety (1) to be produced in one county breeding based (N) and one promising dragon head company (M).

Another complementing step to invigorate the domestic seed industry is the latest amendment of the Seed Law, which will come into effect on 1st March 2022 with an expanded scope and stricter protection of intellectual property for companies that bring new varieties to market. Long criticized copying, homogenization of varieties and

mislabeled seeds might now be addressed more vigorously by the authorities, as the development of the domestic seed industry is seen to be at stake.

Food security and agricultural modernization

China's central government has mainly understood food security as national self-sufficiency in grain – i.e. non-reliance on imports – by way of increasing yields and an extended storage system. A key challenge to ensuring food security, in the eyes of many researchers and policy makers, is balancing the land-use needs of urbanisation and industrialisation with that of agricultural production. China's limited per capita arable land and freshwater resources are often highlighted as particularly difficult constraints on its ability to meet the needs of its large, growing, and increasingly wealthy population. Alongside arable land and freshwater, crop seeds have now been added to this list of oft-cited national strategic resources that undergird national food security.

Past seed development successes in China, such as hybrid rice or Bt cotton, could be read as a promise to future improvement of crop seeds as 'microchips' of agriculture. This promise of increased quantity and quality of yields is different to arable land or agrochemical inputs, which are considered to have met their limits (or overstepped them) in further increasing yields. While land and water remain existentially important to agriculture, it is seeds now coming into the spotlight as a still unexhausted technological frontier waiting to be mastered in the name of future yields and other benefits.

Different modern approaches to plant breeding have a history of raising concerns and opposition. Commentators of the recent seed politics have emphasized, the strong endorsement of 'biological breeding' of new crop varieties is not to be equated with a

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renewed attempt of the central government to finally commercialize GMOs for domestic food production. The range of potential biotechnologies endorsed under the policy term 'biological breeding' could encompass anything from hybridization to latest gene editing technologies. But strong political support for the biotechnology sector and 'biological breeding' has made proponents of GMOs hopeful as to a new window of opportunity opening up for the commercialization of GM crop seeds for food production in China, especially for GM corn. This was amplified by commentary around a new draft regulation addressing GM biosecurity management in the seed industry, release by MARA in November 2021. But public GMO opposition in China had stopped commercial use of GM seeds for food production in the past, often just short of the final administrative permissions to release already certified varieties into the domestic seed market. Many eyes will be following the direction that the seed research and development efforts with new political significance will take.

Climate change impacts and projections further add pressures on agricultural production, amplifying debates round what agricultural systems to strengthen in order to sustainably ensure food security. Crop seeds are an important consideration in international research on agricultural adaptation to climate change. They also feature in China's National Climate Change Adaptation Strategy of 2013 (an update is currently being drafted), which notes the need for resilient seed varieties that can be used to cope and adapt to locally shifting climatic conditions. Current seed politics also shape how these seeds should be developed and who should decide about the technologies to be employed.

Agrobiodiversity

The dramatic loss and continued decline of biodiversity in agricultural crops have been a

key point made by the central government in explaining the need for quickly completing the 3rd census as well as the upgrade of its national genome and seed bank infrastructure. MARA highlighted 'increasingly fast industrialization and urbanization, climate and environmental change, and changes in agricultural [...] methods' as important drivers.' The modernization of the seed industry relies on resources harboured in socio-ecological diversity that has suffered strong collateral damage of other ongoing modernization efforts in agriculture and other parts of society.

Researchers and different advocates have long emphasized the role of local farmers in the creation and protection of agrobiodiversity. Experts involved with the Farmers' Seed Network (China), for example, propose a more differentiated approach to seed policy depending on local and regional conditions. One of the breeding modes they suggest is Participatory Plant Breeding and community seed banking in cooperation with local farmers to ensure ecological benefits as well as that seeds are being bred to directly benefit farmers beyond increasing yields. As mentioned above, ex situ conservation in germplasm and seed banks is complemented by in situ conservation in current seed industry policy. However, farmers are mostly absent from much of the official statements on modern seed industry reforms. The concrete mode of operation in the conservation zones, the distribution of financial and other benefits from company-led commercialization of new varieties remains to be seen. However, questions around distribution of benefits and a role of local farmers in seed politics beyond that of costumers of seed companies seem to be coming up against the strong policy support targeted at foster large market actors. As the new seed industry strategy is being integrated into wider agricultural reforms, the social and ecological effects of seed

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politics across heterogeneous practices on the ground will show over time.

Beyond the domestic context, it will be important to watch what the heterogeneous reverberations of seed politics from China entails. Already, China's party-state and other domestic actors are engaged in agricultural and food system issues beyond national borders. Chinese actors are providing agricultural extension services in other countries and participate in academic and policy debates on global food systems. They have become entangled in conflicts across borders around seed IP, but have also been subjected to unwarranted paranoia about 'seeds from China'. With the acquisition of Syngenta by ChemChina, Chinese companies participate actively in the consolidating trend on the global seed market, and initiatives taken by the FAO while headed by China shape global agricultural politics more broadly. In times of large socio-ecological transformation, agrobiodiversity loss and climate change, the agricultural paths advanced by China's party-state, but also other domestic actors, will be shaping factors for global food systems.



Caption: 2013 Hybrid rice stamp

Source: <http://www.chinesestamp.cn/9713.html>

Note from the author: Have you witnessed or participated in parts of the seed story in China? I warmly invite you to get in touch with me for an interview in the context of my ongoing research on seed politics in the PRC. Please reach out via grosseje@hu-berlin.de

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Good to Know

Politics and Law

Guiding document on carbon peak and neutrality

In late October 2021, prior to COP 26 in Glasgow, Chinese authorities unveiled a guiding document on the country's work to achieve carbon peaking and carbon neutrality goals, laying out key specific targets and measures for the coming decades. By 2030, China's CO₂ emissions will peak, stabilize and then decline, and by 2060, China will be carbon-neutral and have fully established a green, low-carbon and circular economy, it says, reiterating the country's previous pledge.

The document, jointly released by the Communist Party of China Central Committee and the State Council, outlines five major tasks, including creating a green, low-carbon and circular economy, improving energy efficiency, increasing the share of non-fossil energy consumption, lowering CO₂ emissions and boosting the carbon sink capacity of ecosystems. China aims to gradually increase the share of non-fossil energy consumption to around 20% by 2025, around 25% by 2030,

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and over 80% by 2060.

In 2019, non-fossil energy accounted for 15.3% of total energy consumption in China, 5.6 percentage points more than in 2012. By 2025, the country's CO₂ emissions per unit of GDP will be lowered by 18% from the 2020 level. By 2030, they will have dropped by more than 65% compared with the 2005 level.

By 2025, China's energy consumption per unit of GDP will be lowered by 13.5% from the 2020 level, the forest coverage rate will have reached 24.1%, and the forest stock volume will have risen to 18 billion m³. By 2030, China's total installed capacity of wind power and solar power will reach over 1,200 gigawatts, the forest coverage rate will have reached about 25%, and the forest stock volume will have reached 19 billion m³. By 2060, China aims to have fully established a clean, low-carbon, safe and efficient energy system, with energy efficiency reaching the advanced international level, according to the guideline.

Source: Xinhua

http://www.news.cn/english/2021-10/25/c_1310266060.htm

China issued Food Saving Action Plan

On 31 October 2021, China issued the *Food Saving Action Plan* to ensure grain supplies and food security. The plan was released by the General Offices of the Central Committee of the Communist Party of China and the State Council and emphasizes saving food through the entire value chain, including grain production, storage, transportation, processing and consumption. It aims to promote the implementation of the Anti-Food Waste Law of the People's Republic of China.

The Food Saving Action Plan focuses on multiple stages of the supply value chain and

carves out important ways to ensure national food security. Reducing food loss and waste will save land, water, fertilizers and pesticides, and thus protect the environment and reduce CO₂ emissions, supporting sustainability.

According to the plan, by 2025, China will define detailed measures for grain conservation and loss reduction for each part of the grain industry's value chain as well as establish a set of standards to save grains and monitor the system. It especially focuses on innovative measures to strengthen the value chain, food saving actions and S&T innovation.

Regarding food loss and waste in production, storage, transport, processing and consumption, the Food Saving Action Plan proposes targeted measures. It further refers to international cooperation on food conservation and loss reduction. It states that China wants to actively participate in international conferences such as the UN's Food System Summit and the Global Action to Reduce Food Waste and shares the experiences of food loss reduction with the international community. Bilateral and multilateral channels for joint research, technology demonstrations and personnel training on food conservation and loss reduction shall be promoted. It further stipulates that the institutionalization of the International Conference on Food Loss Reduction should be promoted.

(Li Yumei, DCZ)

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Action plan outlines measures to reduce waste. China Daily:

<https://www.chinadaily.com.cn/a/202111/03/WS6181e5b6a310cdd39bc72f99.html>

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Seed law revision expected to pave the way for GMO approval

The revision of the seed law which will take effect on 1 March 2022 is expected to improve the performance of China's seed production. Although China has made a huge effort to ensure food security, authorities are concerned about the fact that soybean and corn yields are 60% lower than those of the US and Chinese vegetable variety yields are 13% lower than foreign varieties. Government authorities therefore called for an urgent reform of the country's seed industry which at present is struggling with infringement of intellectual property that had hindered innovation in the sector. The amendment of the law will strengthen the protection of new plant varieties including the protection of harvested material. It further introduces the concept of "essentially derived varieties" (EDVs).

China is also planning to revise regulations concerning the approval of genetically modified (GM) crops. It currently does not permit planting of GM varieties of major feed or food crops though most of its cotton is GM. In November, draft rules have been published that lay out requirements for integrating a GM trait into conventional seed varieties, which has been seen as major step towards commercial production of GM corn. On 3 December, draft rules for outlining registration requirements for herbicides used on GM crops were published. The rules include guidelines on efficacy trials for herbicides and herbicide-tolerant corn and soybeans.

<https://www.dcz-china.org/nachrichten-agri-news-d-en/seed-law-amendment-has-been-adopted.html>

<https://www.reuters.com/article/china-gmo-regulations-idUSKBN2HZOD3>

Regulations on registration and administration of overseas manufacturers of imported food

According to the announcement of the Chinese General Administration of Customs of the People's Republic of China (GACC) Decree 248 (*Regulations on Registration and Administration of Overseas Manufacturers of Imported Food*) and Decree 249 (*Administrative Measures on Import and Export Food Safety*), as of 1 January 2022, overseas manufacturers of imported food will have to fill in their Chinese registration number under the Product Qualification of the customs declaration form. Import declaration without the Chinese registration number will not be accepted. GAC Decree 248 further mandates labeling of the facility registration number on the inner and outer package of foods exported to China. GAC Decree 249 also sets forth detailed labeling requirements for imported foods, e.g., special dietary foods, freshly frozen meat and aquatic products. The regulations will apply to foods exported to China that have been manufactured as of 1 January 2022.

<https://www.natlawreview.com/article/further-guidance-overseas-food-facility-registration-published-china-customs>

Measures for the administration of agricultural experimental zones with foreign cooperation

The Ministry of Agriculture and Rural Affairs (MARA) released "Measures for the Administration of Experimental Zones for Opening and Foreign Cooperation in Agriculture" on 30 September 2021. This document integrates broad policy goals from the No.1 Document with regard to foreign cooperation in agriculture. The most important details are summarized here:

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- Experimental zones for foreign cooperation in agriculture shall provide a platform for an opening and development policy, to promote the internationalization of the agriculture and support the “Belt & Road Initiative”.
- The Inter-ministerial Joint Conference on Foreign Cooperation in Agriculture will be responsible for establishing, coordinating and promoting as well as for selecting, evaluating and cancelling the experimental zones.
- Experimental zones for foreign cooperation in agriculture should meet the following criteria:
 - ◇ *Area* should be clearly defined and zoned. Core area should not exceed 100 km². Coastal and border as well as “belt-road” regions should be prioritized.
 - ◇ *Foreign trade*: Annual import and export volume should exceed 500 million Yuan or accumulated foreign outbound investment should reach 500 million Yuan or foreign inbound investment in agriculture should exceed 300 million USD.
- Approval: The Inter-ministerial Joint Conference will be responsible for handling the application for experimental zones for foreign cooperation in agriculture.
- Evaluation: Provincial agricultural departments should establish work mechanisms to carry out the projects. The Inter-ministerial Joint Conference should evaluate the work of each project. Being among the top 20 national projects should be prerequisite for the extension.

(Ahmatjan Rouzi, DCZ)

Source:

http://www.moa.gov.cn/govpublic/GJHZS/202109/t20210930_6378796.htm

Economy and Trade

Heavy rainfalls – rising vegetable prices

In October, heavy rainfalls in Central and Northern China left large areas of farmland inundated which resulted in a surge in vegetable prices. Vendors in Shanghai reported a two- to fourfold increase of prices for leafy green vegetables. Shandong province, China’s most important vegetable producer, reported the heaviest rainfalls in October in over three decades, almost 600% more than in the same period in 2020.

<https://www.sixthtone.com/news/1008791/after-heavy-rains%2C-chinese-consumers-now-face-high-vegetable-prices>

Few companies control China’s swine production

Recent statistics reveal that the industrialization of pig farming in China is still controlled by a few big companies.

In 1997, China’s agricultural census counted over 130 million rural households raising pigs. These small family holdings accounted for 95% of the swine inventory. Nowadays, a handful of companies dominate the sector. Their expansion accelerated in recent years after environmental regulations and the African Swine Fever epidemic forced hundreds of thousands of smaller farms to shut down. Subsidies to revive the sector favored big companies, and “pig concept” stocks attracted huge capital investment into industrialized pig farming.

For the 7th China swine industry summit, a list of 108 companies with at least 10,000 sows was compiled. It counts 11.79 million heads, about a fourth of the 44.79-million-head national sow inventory reported by the China National Bureau of Statistics in 2021. The top -4 companies of the list account for 5.9 million sows, with the Muyuan Foods Group

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Top-4 swine-farming companies in China, October-November 2021		
Rank	Company	Sows (million heads)
1	Muyuan Foods Group	2.7
2	Wens Foodstuff	1.1
3	New Hope Liuhe	1.1
4	Zhengbang Technology	1.0

Source: Dim Sums blogspot 27.11.2021

with 2.7 million sows being the leading company, followed by Wens Foodstuff, New Hope Liuhe and Zhengbang Technology.

Science

Successful biosynthesis may help to solve protein bottlenecks in feed sector

Scientists of the Feed Research Institute of the Chinese Academy of Agricultural Sciences reported a major breakthrough in biosynthesis with the world's first successful synthesis of carbon monoxide to protein. With an expected capacity of 10,000 tons, the new technology could provide a solution to the dependence of imported feed protein and, at the same time, support China's greenhouse gas emission commitments. After years of joint research, the Feed Research Institute and the Beijing Shoulang Biotechnology Co. have made progress on core key technology, creating conditions for industrial scale. However, more research is needed before the new technology and cost-efficient mass production can be fully applied.

<https://www.globaltimes.cn/page/202111/1237778.shtml>

Generation of stable pig stem cells for gene-editing

Chinese scientists have generated stable pig stem cell lines that allow multiple gene-

editing.

Researchers from the China Agricultural University, Sichuan Agricultural University, Northeast Agricultural University and Beijing Institute of Genomics cultivated an in-vitro culture medium to maintain stable pluripotent stem cell lines from the pig epiblasts, the outermost layers of growing embryos according to a recent study published online in the journal Cell Research.

The study also found that those epiblast-derived stem cells could readily tolerate at least three rounds of successive gene editing and finally generated cloned live gene-edited piglets.

The findings may open new possibilities for biological research, regenerative biomedicine and animal husbandry.

Source: Xinhua http://www.news.cn/english/2021-12/03/c_1310350243.htm

Challenges posed by excessive mulch film usage in Chinese agriculture - DCZ experts attended GIZ seminar on mulch film management

In many Chinese regions, agricultural production is hardly possible without the utilization of mulch films as they increase soil temperature, suppress weeds and increase moisture retention. As a result, with 1.5 million tons per year, China is the largest consumer of mulch films in the world. Policy approaches

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and strategies for avoiding the resulting negative environmental impacts have been addressed in the “First Seminar on Mulch Film Management and Pollution Control”. The seminar was organized by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH and took place on 6 December 2021. DCZ experts Dr. Eva Sternfeld and Lea Siebert participated in the event on-site in Beijing.

The extensive use of mulch films in agriculture results in various environmental problems as they are often discharged on-site after only one planting season. The plastic pieces that remain in the soil are non-degradable and have negative impacts on soil characteristics as well as on crops of the next season, and hence, reduce yields. Due to the large quantities of mulch films made of polyethylene (PE) in China, plastic residues up to the size of microplastics threaten to become omnipresent in agricultural soils. In several presentations on the current status quo in China, experts illustrated the advantages of mulch film usage, such as a reduction of irrigation by 42% in cotton production and a reduction of the nitrate footprint. In response to the utilization of, e.g., 155 kg of films per ha in Gansu, both the recovery of used mulch films and the replacement with biodegradable films are promoted. Due to differences in raw material prices, bio-films are still more expensive than PE-films. Practitioners and researchers introduced several pilot projects

and subsidy schemes which are applied in China. So far, it was found that subsidies of 100 RMB/mu can have an effect on the farmer’s decision to buy bio-films instead of PE-films, even more effective if the recovery of used PE-films is made mandatory and enforced with a 100 RMB/mu fee in case external stakeholders need to be hired for the removal. International experience was introduced by several experts from Europe reporting, inter alia, on tracking and monitoring of the recovery rates of mulch films as well as sustainable alternatives to using any plastic films such as cover crops and straw. Although these approaches are much more sustainable from the recycling economy perspective, their application in Chinese conditions in arid areas still needs to be further researched.

(Lea Siebert, DCZ)

China’s 10 most significant advances in agricultural science in 2020

China has released the country’s 10 most significant advances in agricultural science in 2020 at a conference on November 19. They cover the molecular regulation mechanism of high-yield crops, mechanism of crop disease resistance and susceptibility of domestic livestock and poultry to SARS-CoV-2, among others. Chinese researchers identified a gene NGR5 and found rising NGR5 levels can increase rice tillering and yield without more nitrogen-rich fertilizer.

In another study, researchers investigated the susceptibility of ferrets and animals in close contact with humans to SARS-CoV-2. They found that SARS-CoV-2 replicates poorly in dogs, pigs, chickens, and ducks, but ferrets and cats are permissive to infection. A research team from the Shandong Agricultural University cloned Fhb7. This gene shows a stable large resistance effect on fusarium head blight, a disease caused by a fungus that

reduces wheat crop yield and introduces toxins into the harvest. The team revealed its resistance mechanisms and evolutionary history. The deployment of Fhb7 in commercial wheat cultivars could alleviate yield loss and food safety concerns.

Other selected advances include studies in intercropping, the simultaneous production of multiple crops on the same field, haplotype-resolved genome analyses of a heterozygous diploid potato, construction of high-quality graph-based soybean genome and causes of legumes' symbiosis with nitrogen-fixing rhizobia.

Source: Xinhua http://www.news.cn/english/2021-11/19/c_1310320569.htm

Agricultural germplasm resources census

China has undertaken a three-year census of domestic crop, livestock, poultry and aquatic germplasm resources since March as it seeks to ensure self-reliance on seed resources to secure national security. As of present, the census has covered crops in 2,323 Chinese counties and livestock and aquatic in over 95% of Chinese villages and counties.

A large number of new germplasm resources, including 20,800 crop germplasm resources, 18 livestock and poultry genetic resources and more than 30,000 aquaculture germplasm, were identified and preserved during the census. Separately, important progress has been made in building the national germplasm resource banks.

The national crop germplasm resource bank was finalized and put into trial operation in September. The preservation capacity ranks first in the world in both capacities and preservation time, with a designed capacity of 1.5 million copies and preservation time for 50 years. In addition, the national livestock and poultry germplasm resource bank

was approved in July and is expected to enter operation next year. The facility is designed to preserve 2,500 varieties of different species, and 33 million samples of semen, embryos, cells and other genetic materials, making it the most comprehensive facility of its kind once operational. The national marine fishery biological germplasm resource bank was officially put into operation in October.

Source: Global Times <https://www.globaltimes.cn/page/202111/1239674.shtml>

Agriculture and the Making of Sciences (1100–1700) Chinese European lecture series

This lecture series is a collaboration between the European Research Centre for Chinese Studies, the Institute for the History of Natural Sciences (Chinese Academy of Sciences) and the Max Planck Institute for the History of Science.

Hitherto, historians of science tend to examine pre-modern agriculture in extra-European traditions from the perspective of modern agronomy retrospectively, often within a single ethno-linguistic context. In this set of seminars, speakers aim at reversing this approach by exploring how agricultural practices informed the emergent discrete scholarly categories and epistemic genres in disparate cultural and literary traditions. Presenters focus on particular traditions of knowledge in their own terms, both in their cultural context and as emerging languages of authority, while being mindful of the cross-cultural and longue durée interplay between different fields and traditions of knowledge. They examine how everyday agricultural practices and material actions shaped these categories in particular and knowledge cultures in general to address some key questions.

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How were diverse forms of knowledge that did not conveniently fit into the discrete scholarly categories and epistemic agendas of their respective times negotiated, (re-) articulated and denounced?

What are the practices and strategies of claiming authority?

What are the resources, networks and institutions behind the emergence of new categories?

The first online event was organized on 25 October 2021 on the topic of “Botanical Knowledge on Food Plants in Middle and Late Imperial China”. The second event took place on 16 December on the topic of “Water Benefits”.

For upcoming events please check their website: <https://ercs.hypotheses.org/>

DCZ Activities

Workshop on cooperation in the seed sector

On 21 October, the DCZ hosted a hybrid workshop on Sino-German cooperation in the seed sector. The event was attended by several representatives from both government and industry associations of the seed sector from China and Germany (PVP Office, CNSTA, CNSA, BSA, BDP and GAA).

Purpose of the meeting was to identify fields of mutual interest in the light of the state of the art of research and existing collaboration. The workshop was also a follow-up of a seed workshop in 2019. However, as DCZ managing director Jürgen Ritter emphasized, in the meantime, the seed topic gained significant importance in China, underlined by several policy documents like the 2021 Document No.1 and the Seed Revitalization Action Plan as well as by the launch of the Nanfan Breed-



Photo: DCZ

ing Research Center. Hu Yan’an from the Foreign Economic Cooperation Center (FECC), the Chinese partner of the DCZ, also referred to the national strategic priority of increasing China’s competitiveness in the seed sector and expressed his hope to continue the practical cooperation between both countries in the spirit of openness and transparency.

In the first session of the workshop, the representatives from both countries’ government offices responsible for plant varieties introduced their departments and their respective country’s seed strategy. Zhang Ximing, Division Director in the Plant Variety Protection (PVP) Office under the Ministry of Agriculture and Rural Affairs (MARA) presented the administrative system for approving new varieties. As of 2020, the list of officially approved titles in China comprises over 16,508 varieties. Also, there were 43 approved applications received from German companies. Besides the current revisions of the Chinese seed law and regulations on the protection of new varieties of plants, the PVP is also working on how to safeguard variety rights and fighting infringements of protected varieties while collaborating with several countries. Friedhilde Trautwein, Head of Section, National and International Variety and Seed Affairs and Coordination Centre for the Ministry of Food and Agriculture in the

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Bundessortenamt (BSA), also named securing plant breeders' rights for certain plant varieties as one of the BSA main tasks. Furthermore, the BSA is involved in approving varieties for Germany, which is the prerequisite for market access. However, as in the EU, breeders can also apply for Community Plant Variety Rights at EU level instead of national country level admission, applications in Germany are decreasing. In Germany, 3,457 varieties are currently listed. Due to the German federal system, the BSA is not responsible for seed certification. Instead, this is done by the seed certification agencies in the individual German federal states.

In the second session of the workshop, stakeholders from the respective country's seed industry associations which represent the interests of seed trading and breeding businesses presented their organizations. Tian Weihong, Secretary General of the Chinese National Seed Trade Association (CNSTA) gave an overview of the CNSTA. It has 170 companies as members, over 50% of them are active in import and/or export. It also organizes conferences, exhibitions and missions to foreign partners. She emphasized the importance of innovation in seed breeding and international cooperation in germplasm as well as the protection of intellectual property. China currently aims to decrease its import ratio, which is in seeds still higher than exports. Currently, the authorization process for approval of new varieties is being streamlined and allows online approval. Moreover, it was pointed out that the new (upcoming) Seed Law will also include a section on "essentially derived varieties" (EDV) which will help fighting the exploitation of minor mutations of protected varieties by others than the holder of the initial variety rights. From the German seed industry, Dieter Rückert presented the German Plant Breeders' Association (BDP) which currently has 130 members – mainly plant breeders and family

businesses, but also large, multinational seed trading companies. He described that the most relevant regulatory issues for BDP and its members are the topics of protection of intellectual property and seed legislation. In Germany, the government invests in seed breeding R&D of research institutions, however, property rights are only protected in private companies. The BDP hopes that in the future, all countries can comply with international seed legislation, such as the OECD Seed System, International Seed Testing Association (ISTA) and International Plant Protection Convention (IPPC), as this would allow free international circulation of seeds while ensuring a fair competition between seed companies. Both sides expressed interest in future Sino-German collaboration and the DCZ will draft a proposal with concrete activities shortly.

(Lea Siebert, DCZ)

DCZ participated in kick-off meeting of DITAC

On November 10, DCZ science advisor Dr. Eva Sternfeld participated in the online kick-off meeting of the joint research project DITAC (Digital Transformation of China's Agriculture – Resources, Trade and Food Security). The project is funded by the German Ministry of Education and Research (BMBF) and coordinated by the China Research Group of IAMO. The main goal of DITAC is to analyze and assess digitalization processes in China's agri-food sector with regard to their effects on production, use of resources and trade.

In China, the DCZ is one of the project partners. Other partners are the China Agriculture University (CAU), the Institute of Agriculture Economics and Development of CAAS (IAED-CAAS) and the Macro Agriculture Research Institute of Huazhong Agriculture University. For the project, the DCZ will design a

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communication strategy and knowledge transfer.

The project will also lay foundations for the establishment of an international competence center “Digital innovations in transition economies” at IAMO.

More: <https://www.iamo.de/en/research/projects/details/ditac-1/>

DCZ organized Sino-German workshop on new research in manure and digestate treatment

In Germany as well as in China, the environmentally friendly and climate-friendly utilization of solid manure and manure is a major challenge. In 2021, the DCZ S&T platform in cooperation with the CAAS Institute for Environment and Sustainable Development in Agriculture (IEDA) carried out a virtual study tour on the “Sustainable and environmentally friendly utilization of manure from animal husbandry”. The DCZ together with Prof. Dr. Walter Stinner (German Biomass Research Center, DBFZ) and Prof. Dong Hongmin (CAAS) developed the concept for the virtual event. Target groups were Chinese universities, research institutes and government institutions whose representatives gained an insight into the state of research, political regulation and practical implementation in Germany.

Topic of the first module of the virtual study tour were “Environmental and administrative aspects”. It was held as a hybrid event on 7 and 8 April 2021 and organized together with IEDA and the Sino-German Animal Husbandry Breeding Project. The module attracted 30 participants on-site in Beijing and 100 participants online in China and Germany. A compendium compiled by the DCZ expert Helmut Döhler (Döhler Agrar) on relevant German laws on this topic was made available to the participants in Chinese.

On 22 November 2021, the virtual study tour continued with the online workshop on “New research in manure and digestate treatment and utilization”. The workshop was organized by the DCZ in cooperation with IEDA and simultaneously translated into English and Chinese. Due to the large network of IEDA and the National Alliance for Innovation in Agricultural Waste, a significant number of participants could be reached. At peak times, 175 devices were connected.

While the first part of the event focused on the treatment of manure and digestate from biogas plants, the second part focused on fertilizer production from manure and digestate.

CAAS was able to invite two renowned keynote speakers from the Chinese Academy of Sciences (CAS) for the workshop: Prof. Ma Lin (Institute of Genetics and Developmental Biology) and Prof. Yin Yulong (Institute of Subtropical Agriculture). In the opening lecture, Prof. Ma Lin gave an interesting overview of the results of decoupling livestock and agricultural production in China and urged for a better understanding of nutrient recycling. In the final lecture, Prof. Yin Yulong presented strategies for achieving climate neutrality through various manure treatment technologies which can also be adapted to regional differences in China. The DCZ had engaged eight German experts, who gave an insight into the state of the art of German research. Dr. Jochen Mellmann from the Leibniz Institute of Agricultural Engineering and Bioeconomics (ATB) presented the results of a recently completed research project on drying of digestate. Dr. Ulrich Kreidenweis (also ATB) presented studies by the Institute on the climate-friendly treatment of chicken manure in biogas plants. Sascha Hermus from the 3N Kompetenzzentrum (Lower Saxony Network for Renewable Resources and Bioeconomy) presented technologies for the use of manure in biogas plants. Helmut Döhler

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discussed the challenges arising from the use of liquid manure leading to high nitrate pollution in regions of Germany with intensive animal husbandry, in addition to major logistical challenges and high transport costs. In the second part of his presentation, Döhler discussed future strategies and presented a stable system for pig farming developed by his company, in which both animal welfare and climate protection are taken into account. Johannes Koslowski from the Competence Network Water Berlin (KWB) presented a pilot plant that filters out ammonium from digestate. The last three German contributions by Prof. Dr. Walter Stinner (Deutsches Biomasse Forschungszentrum DBFZ), Johanna Wiechen (DBFZ and TU Berlin) and Dr. Joachim Clemens (SoepenberG Gmbh) discussed the possibilities for struvite extraction from manure and digestate and the potential possibilities of this technology in fertilizer production. Struvite is a water-containing phosphate mineral extracted from wastewater and manure. According to Dr. Clemens, it remains to be seen whether this technology will prevail in China, as it is one of the few countries in the world that has its own phosphate rocks. In field trials conducted by Dr. Clemens with China Agriculture University and Humboldt University, very promising fertilizing results were achieved with struvite.

(Dr. Eva Sternfeld, Lea Siebert)

Presentations of the workshop are available for download at

<https://www.dcz-china.org/animal-manure-treatment-and-utilization-module-2.html>



7th Sino-German Agricultural Week held as an online event

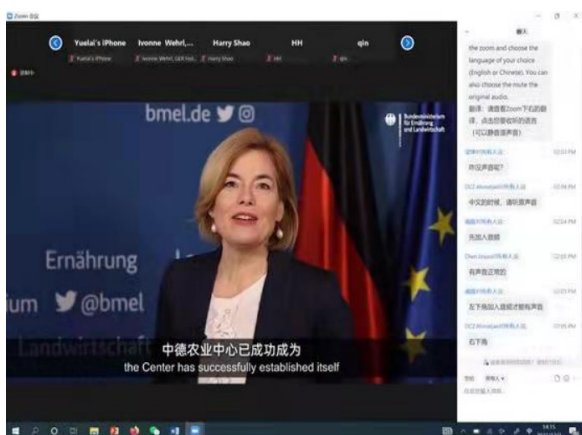
The 7th Sino-German Agricultural Week (DCAW) was held from 1 to 2 December 2021 in Beijing. As the COVID-19 situation is still continuing, it was organized as an online event with only staff and moderators present in the premises of the Foreign Economic Cooperation Center (FECC) in Beijing. The DCAW was jointly supported by MARA and BMEL and organized by the DCZ.

The two-day event consisted of two sessions:

- 1) Workshop on Sino-German Agricultural Cooperation and Rural Revitalization
- 2) Workshop on Sino-German Digital Agriculture Solutions

High-level representatives from politics, science and agribusiness of both countries participated in this event and contributed online or with recorded video messages. Representatives from various companies showcased their solutions to agricultural digital modernization and their contribution to the

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Photos: DCZ

revitalization of rural areas.

Workshop on Sino-German Agricultural Cooperation and Rural Revitalization

Zhang Lubiao, Director General of the Foreign Economic Cooperation Centre (FECC), chaired the opening session of the event and welcomed the online audience. Ma Youxiang, Vice Minister of MARA, delivered a recorded opening speech in which he emphasized the increasing importance of smart farming in China and its possible contribution to a green development of the agriculture sector. Julia Klöckner, acting Minister of BMEL, delivered a pre-recorded opening address in which she elaborated on the wide range of BMEL-supported projects to foster rural development in Germany.

She also praised the ongoing Sino-German collaboration and was hopeful that the successful cooperation in the field of animal husbandry will be continued as well. The workshop on Sino-German Agricultural Cooperation and Rural Revitalization saw a wide range of presentations with many examples for successful rural revitalization in several Chinese provinces as well as the progress made in the development of digital villages in China. In a keynote speech, Liu Qi, Special Researcher in the Counsellor's Office of the State Council and former Deputy Secretary General of Anhui Province, put rural revitalization as a key strategy to achieve national rejuvenation into a historical context and included it into the five engines driving China's economic development, along with the household contract responsibility system, the resumption of college entrance exams, opening-up and the private economy. Dr. Michael Klaus, Representative of the Hanns-Seidel Foundation, emphasized the need for cross-sectoral approaches to align rural development with the attainment of the Sustainable Development Goals. Prof. Wen Tiejun underlined that rural areas have always been important and analyzed it from the perspective of rural construction: rural revitalization could lay the foundation for national ecological transformation. Prof. Sun Qingzhong of the China Agricultural University introduced practical cases of "rural community

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university” and protection of agricultural cultural heritage which could provide an impetus for rural revitalization. Dr. Tobias Federwisch of the German Federal Office of Agriculture and Food introduced the role of the “Federal Rural Development Scheme” in the task of revitalizing rural areas in Germany and highlighted the trend towards co-working and digitization. In the good practices session, examples from the provinces of Zhejiang, Guangdong and Jiangsu were elaborated, and Patrick Paziener, a German expert and alumni of the programme shared his experiences in the Sino-German Agricultural Exchange Programme. Rita Chen of BAYER Crop Science informed the participants on “new opportunities for agricultural transformation”. The increasing market of trade in farmers’ property rights and its implications for the modernization of the Chinese agriculture sector was presented by Zhang Kai, General Manager of the Tianjin Rural Assets and Equity Exchange. The first day of the DCAW was finalized with closing remarks by the outgoing Director General of the International Cooperation Department of BMEL, Friedrich Wacker, who reflected on the establishment and development of the Sino-German Agricultural Centre in 2015 to which he contributed to a significant extent.

Workshop on Sino-German Digital Agriculture Solutions

The Director General of the Department of Market and Informatization, Chinese Ministry of Agriculture and Rural Affairs (MARA), Chen Yong, and Prof. Dr. Engel Hessel, Director General, Rural Development and Digital Innovation, BMEL, represented the two ministries in their opening speeches to the workshop on Sino-German digital agriculture solutions on the second day of the DCAW. Chen Yong pointed out that the digitization of the Chinese society has already made much progress with a 90% coverage of the 4G mobile phone technology across all rural areas in China.

Around 140 million households use the Internet. Prof. Dr. Engel Hessel mentioned that the increased digitization in agriculture will offer more solutions to face challenges like the climate change and achieving food security at a global scale. She also called for a closer collaboration between the two countries in the field of digital innovations as both countries are already leading players in this topic. Prof. Roland Gerhards, University of Hohenheim, and Prof. Patrick Noack, University of Applied Sciences Weihenstephan-Triesdorf, introduced two of the 14 digital experimentation fields funded by the BMEL. Both projects are part of the 14 showcases of digital innovations at farm level in cooperation with federal research institutions, local universities and model farms. In a thought-provoking presentation, Dr. Zscheischler from the Center for Agricultural Landscape and Land Use Research (ZALF) raised questions about possible unintended side effects of the widespread use of digital technology and called for a thorough risk analyses before the adoption of any technology. Dr. Maximilian Deutsch of the Saxony State Ministry for Energy, Climate Protection, Environment and Agriculture outlined the experiences of digitalization in agriculture in the Federal State of Saxony. The opportunities and challenges in digitization in horticulture were the topic of the presentation by Dr. Manuela Zude-Sasse (ATB). The Chinese speakers informed about the latest developments in intelligent agricultural machinery, digital equipment as well as new experiences with cloud-based applications and fully integrated digital innovation in the production of tomatoes and waxberries. Zhao Chunjiang, acclaimed academician from the National Engineering Research Center for Information Technology in Agriculture, sees the current wave of digitization in agriculture as the 3rd Green Revolution and predicts that future machinery in agriculture will not grow in size any further, but the machines will become more adaptive. Dr. Sheng Yaohui,

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Deputy General Manager, Department of Agriculture and Rural Affairs of Huawei illustrated the growing involvement of modern tech companies in the agriculture sector in China. The company not only provides 5G to rural communities, but also develops artificial intelligence technologies for its use in animal husbandry (e.g., detection of individual pigs through face recognition) and devices which can provide real-time test results of soil samples while applying mineral fertilizers to crops. Finally, Dr. Lena Kuhn from the Leibniz Institute of Agricultural Development in Transition Economies (IAMO) informed the audience about her institute's latest research project about the digital transformation of China's agriculture – resources, trade and food security (DITAC). With an interdisciplinary approach the project will explore the potentials of China's digital agricultural sector and its possible implications to other transition economies.

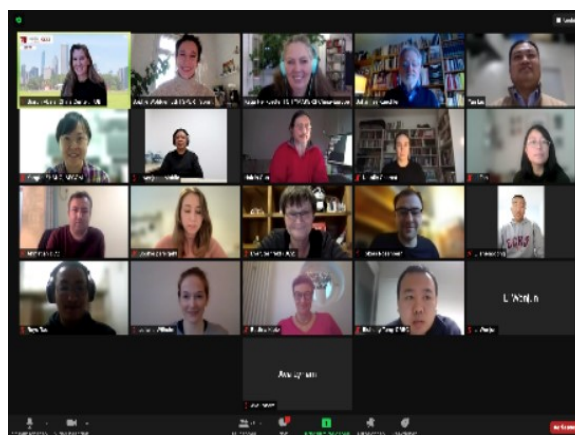
The two days of the DCAW were respectively moderated by Dr. Hu Xiangdong, Deputy Director of the Institute of Agricultural Economics and Development in the Chinese Academy of Agricultural Sciences (CAAS), and Prof. Wu Wenbin, Deputy Director of the Institute of Agricultural Resources and Regional Planning in CAAS.

For more information on the 14 experimentation fields funded by the BMEL see also the website on smart agriculture by the DCZ: <https://smart-agriculture.org/>
<https://www.dcz-china.org/7th-sino-german-agricultural-week-2021.html>

DCZ experts participated in international alumni seminar at TU Berlin

From 6 to 10 December, DCZ experts Dr. Eva Sternfeld and Dr. Ahmatjan Rouzi participated in the international alumni seminar “SPURT – Sustainable Processes of Urban-

Rural Transformations” at the Technical University Berlin. In their presentation, they introduced the “Sino-German Agricultural Center and its focus on smart agriculture”. Due to the COVID-19 pandemic, the seminar took place online.



DCZ Publications

Policy brief: Food loss and waste in China – status quo, policies and action

In this policy brief, Dr. Huang Jiaqi, assistant professor at the Agricultural Information Institute of CAAS, shows that the largest amount of food loss and waste (FLW) occurs at postharvest handling and storage stage. She also shows that fruit and vegetables take up the highest share of FLW. Recent new legislation such as the FLW action plan encourage immediate actions by governmental department, industry and media.

The policy can be downloaded from the DCZ website <https://www.dcz-china.org/dcz-publications.html>

Publications

China's future food demand and its implications for trade and environment

by Hao Zhao et al. *Nature Sustainability*
download available at <https://www.nature.com/articles/s41893-021-00784-6>

In the past two decades, the demand for food, especially for livestock products, has increased significantly in China. The import value of agricultural products has grown by 78% while domestic agricultural outputs increased by 36%. In particular, there was a strong rise in the import of soybean products, ruminant meat and dairy products. Due to the intensified production, much more fertilizer has been used. Currently, China's nitrogen fertilizer consumption accounts for one third of the global fertilizer consumption. Also, China's agricultural production contributes 13% to the global greenhouse gas emissions (GHG) and irrigation water use represents 13% of global withdrawals. Moreover, China's expanding imports increase environmental pressure in the exporting countries. For example, 43% of deforestation emissions due to soybean cultivation in Brazil can be attributed to China's soybean imports.

Taking the recent developments in account, a group of researchers from the Center for Agricultural Resources Research of the Chinese Academy of Sciences (CAS), Wageningen University and other Chinese and international research institutions assessed the global impacts of China's future food demand that can be expected under different scenarios for 2030 and 2050.

Impacts on global trade: The findings predict that China's food demand will more and more rely on imports. The authors calculate with a 6% increase in per capita calorie demand by 2050 in a business as usual (BAU)

scenario compared to 2020. In the BAU scenario, per capita demand for animal-sourced calories is projected to increase by 23%. However, it is projected that by 2040, the increase will level off because per capita is saturated and expected decrease of population. The projected increase in crop products will be mainly driven by demand for animal feed. The authors project that the increasing demand for crop products, pig and poultry products will be largely covered by increasing domestic production. However, they predict an increasing demand for imported ruminant meat, dairy products and soybean.

Environmental impacts: The authors forecast that in the BAU scenario, by 2050, China's growing demand for food will increase the need for virtual agricultural land (agricultural land in exporting countries) by 21 million ha and of agricultural land in China by 6 million ha. The rise of domestic GHG emissions mainly from increased livestock production is predicted to be compensated by the carbon sink from China's ambitious afforestation programs. However, it is projected that China will be responsible for 123 million tons of CO₂ equivalent of virtually imported GHG emissions, mainly due to imports of livestock products. Furthermore, it is predicted that increased domestic production will increase demand for nitrogen fertilizer use and irrigation water use. In addition, China's increased demand for imported animal products and animal feed will contribute to environmental challenges in exporting countries (mainly Brazil, US and Canada).

Strategies to alleviate the environmental impacts: A shift to a less meat-intensive and more diversified diet with a low environmental footprint including insects, seaweed and plant-based protein as well as campaigns to reduce food loss and waste can reduce the negative environmental impacts. However, for this to happen, consumers must accept a less meat-based diet and have to be aware of

the links between meat consumption and environmental sustainability.

Also, China's livestock sector needs to become more sustainable in terms of productivity and feed efficiency, which has important impacts on agricultural land demand and GHG emissions footprint. Finally, China needs to look at the sustainability of imported agricultural products and play a role in promoting environmentally friendly production in exporting countries, e.g., by introducing certification schemes such as "zero deforestation" and "fair trade".

The Impact of COVID-19 on the Dietary Diversity of Children and Adolescents: Evidence from a Rural/Urban Panel Study

by Yi Cui, Wei Si, Qiran Zhao, Thomas Glau-ben, Xiaolong Feng in *China&World Economy*, Vol. 29, No.6, 2021, p. 53-72

In China, like elsewhere in the world, COVID-19-related lockdowns seriously impacted the daily life of citizens including their dietary. This paper is based on two surveys which have been conducted in 2019 prior the pandemic and in 2020. In the surveys, 2,201 primary school students and 1,341 junior high-school students in the Jining district, Ulanqab, Inner Mongolia Autonomous Region, were asked to complete a 24-hour dietary recall and provide some personal and family information. The results showed that COVID-19 influenced especially the dietary diversity of low- and middle-income households negatively. Those households had a lesser intake of protein-rich food as the pandemic reduced food availability and affordability for them. Furthermore, changes in dietary were also related to changing eating habits, e.g., a stress-related higher intake of sweets, and changing food choices, e.g., lesser consumption of frozen food including sea-

food as it is a suspected virus carrier.

Two articles on land consolidation

Consolidation of agricultural land contributes to agricultural sustainability in China

by Jiakun Duan, Chenchen Ren et al. in *Nature Food* 2, 1014-1022 (2021)

China's agricultural sector is dominated by smallholder farms, which mostly exhibit relatively low nutrient use efficiency, low agricultural income and substantial nonpoint source pollution. The authors assess the spatial feasibility and cost-effectiveness of agricultural land consolidation in China by integrating data from over 40,000 rural surveys, ecological modelling and geostatistical analysis. They found that 86% of Chinese croplands could be consolidated to establish a large-scale farming regime with an average field size greater than 16 ha. This would result in an increase in knowledge exchange and machinery use, respectively, contributing to a reduction in total nitrogen input, an increase in nitrogen use efficiency and a reduction in labor requirement, while doubling labor income.

<https://www.nature.com/articles/s43016-021-00415-5#Abs1>

Benefits of China's land consolidation

by Yuelai Lu, School of International Development, University of East Anglia, Norwich UK, in *Nature Food* 2, 926-927 (2021)

To merge small farms into fewer large ones is a key part of China's food security and rural revitalization strategy. Yet, the benefits of implementing large-scale farms vary under different land consolidation pathways. It is important to note that the formation of large-scale farming per se does not deliver the

green outcomes. An integrated farm management approach should be employed to take into account all aspects of the farm business plan, soil and water management, pollution control, and landscape and biodiversity conservation.

It is equally important to note that smallholder farms will exist in China for a long time into the future, to produce a large share of food and provide a safety net for millions of people living in rural areas. Facilitating and enabling smallholder farms to adopt improved practices for production, marketing and environment protection and, thus, to gain better livelihoods is still a vitally important part of China's agriculture modernization.

<https://www.nature.com/articles/s43016-021-00444-0>

Occurrence of crop pests and diseases has largely increased in China since 1970

Chenzhi Wang, Xuhui Wang, Zhenong Jin, Christoph Müller, Thomas A. M. Pugh, Anping Chen, Tao Wang, Ling Huang, Yuan Zhang, Laurent X. Z. Li & Shilong Piao in *Nature*, 9 December 2021

Based on a unique, previously unpublished historical dataset with more than 5,500 statistical records, ranging from 1970 to 2016, an international team including the Potsdam Institute for Climate Impact Research (PIK) compared long-term statistical records about pest and disease occurrence in China with potential climatic driving factors such as temperature, precipitation and humidity as well as factors from farming practices, including fertilizer application, irrigation and the use of pesticides. They found that, since the 1970s, the occurrence of crop pests and diseases in China has increased by a factor of four. Climate change is responsible for about 20% of the observed increase, with great variations

between different Chinese provinces, ranging from 2% to 79%.

When looking closer into the climatic driving factors, especially warmer night temperatures are likely to foster an increased chance for crop pests and diseases. The scientists projected how future climate change in China might influence crop pests and diseases until the end of this century. They found that in a scenario of high greenhouse gas emissions, the occurrence of crop pests and diseases would further increase. The scientists conclude that the occurrence, on top of the rise they found for the past half century, could potentially double. The results of this study show the urgent need to accurately account for the increasing risk of crop pests and diseases in mitigating the impacts of climate change on food production.

<https://www.sciencedaily.com/releases/2021/12/211209124223.htm>

<https://www.nature.com/articles/s43016-021-00428-0>

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Upcoming Events 2022

With the ongoing Corona crisis all dates of conferences and trade fairs tbc.

Date	Location	Event	Contact
January 2022			
24-28	online	GFFA Global Forum for Food and Agriculture – Sustainable Land Use: Food	www.gffa-berlin.de #GFFA
March 2022			
14-19	online	ITS Food 2022 Fourth International Training for Safer Food	Federal Office of Consumer Protection and Food Safety (BVL) More information https://www.bvl.bund.de/EN/Events/ITS-Food_2022/ITS-Food_node.html Deadline for applications: 31 January 2022
30-1	Beijing	China International Wisdom Agricultural Equipment Exhibition	Beijing National Agricultural Exhibition Center
April 2022			
19-21	Shenzhen	WEDA World Expo on Digital Agriculture	Shenzhen International Exhibition Center organized FECC of MARA
25-May 8	Kunming	UN Biodiversity Conference COP 15 of Convention on Biological Diversity (2nd)	
May 2022			
11-13	Shanghai	Biofach Shanghai	Shanghai World Expo Exhibition and Convention Center
June 2022			
28-30	Villmar, Germany	Organic Field Days (Ökofeldtage)	Hessische Staatsdomäne Gladbacher Hof www.oeko-feldtage.de

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About DCZ

The **Sino-German Agricultural Centre's** (DCZ) activities are bridging the interest between politics, academia and businesses between China and Germany in the spheres of agriculture and food.

As 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)** the DCZ was established in March 2015 as a central contact and information office to foster a dialogue between Germany and China in the agricultural and food sector. In April 2018, the project entered its 2nd phase.

In charge of project execution are the **IAK Agrar Consulting GmbH** (leadership) and the **Leibniz Institute of Agricultural Development in Transition Economies (IAMO)**. Operative project partners in China are the **Foreign Economic Cooperation Center (FECC)** and the **Chinese Academy of Agricultural Sciences (CAAS)**.

With its specific key issues, the DCZ intensifies the dialogue with and among relevant stakeholders of the agriculture and food sectors.

For more information and regular updates please check the dcz-website: www.dcz-china.org

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Imprint

This issue was compiled by the international DCZ team. For enquiries and subscription please send an email to info-dcz@iakleipzig.de

Any news about upcoming events and conferences to share? Please send your information to e.sternfeld@iakleipzig.de

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The Sino-German Agricultural Centre (DCZ) (project no.: CHN 18-01) is supported with funds from the Federal Ministry of Food and Agriculture (BMEL) via GFA Consulting Group GmbH and implemented by IAK Agrar Consulting GmbH as leading company in a consortium with Leibniz Institute for Agricultural Development in Transition Economies (IAMO).

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