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Leibniz Institute of Agricultural Development
in Transition Economies



2021

Kazakhstan

Uzbekistan

Altmark

Saxony-Anhalt

Ukraine

Mongolia

China

Russia

Germany

Rural areas

World

Halle (Saale)

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Leibniz Institute of Agricultural Development
in Transition Economies



Greetings by the Ambassador of the Federal Republic of Germany to Ukraine

Anka Feldhusen

Dear Readers,

The blue-yellow Ukrainian national flag is often associated with the blue sky above endless golden-yellow grain fields. After many trips to all parts of the country, I can vividly understand this interpretation: The image presents itself again and again in summer. It also fits the popular designation of Ukraine as the granary of Europe. From a historical perspective, Ukraine's agricultural sector is characterized by enforced Soviet planned economy, through a first, a partly disorderly privatization wave in the 1990s, to an agricultural sector that is now one of the country's economic growth engines. Ukraine is once again recognized as an important exporter of agricultural products in the world. With the exception of a drought-

related setback last year, grain and oilseed production has had record after record for many years. Agriculture contributes significantly to the country's economic output, accounting for 12 percent of GDP and over 40 percent of export earnings. 14 percent of all employees work in agriculture. It plays a decisive role in shaping rural structures and is thus an important factor in the development of rural areas. There is still great potential for growth that can contribute to a successful future for the country. At the same time, we currently see an agricultural structure with an enormous range. From mega-holdings to countless small household farms. Record harvests in crop production are offset by declines in food processing and animal








production. Above all, the opening of the agricultural land market is one of the central areas of reform after a decades-long moratorium. Ukraine's rapprochement with the European Union brings with it an additional need for reform in many agricultural-related areas. At the same time, however, it opens up economic prospects. Following the EU-Ukraine free trade agreement, there has already been a welcome increase in trade with the European Union. IAMO has accompanied the ongoing transition processes in Ukraine since the beginning. It not only provides science-based formats of policy analysis, but also successfully advises agricultural policy, administrative, business and scientific decision-makers. Increasingly,

the Institute is paying special attention to sustainable scientific capacity building in Eurasian transition economies, which spills over far into agricultural practice. This also applies to Ukraine. The German government supports this capacity building, among other things, through the projects of the Bilateral Cooperation Program of the Federal Ministry of Food and Agriculture. An outstanding example is the project 'German-Ukrainian Agricultural Policy Dialogue', which, in line with market and regulatory experience, provides advice to policy makers on the socially balanced and sustainable further development of the agricultural sector and rural areas as well as an effective processing industry

to increase the competitiveness of the Ukrainian agricultural sector. IAMO actively participates in these processes as a project partner. The Federal Republic of Germany has a great interest in a stable, democratic and economically prosperous Ukraine. The agricultural sector is of crucial importance for this. I would therefore like to thank IAMO for its great commitment and I am sure that its work in Ukraine will continue to fall on fertile ground!



Anka Feldhusen
Ambassador of the Federal Republic of
Germany to Ukraine

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IAMO—a portrait



Imprint



Foreword

The spread of the Coronavirus has presented IAMO with hitherto unforeseen challenges. The cessation of field research in our partner regions and the migration of many teaching, exchange and transfer activities to online formats are just two of these. Our international cooperation with partners in Central Asia, China, Ukraine and South-East Europe, which has intensified and become increasingly institutionalised over the past few years, has had to be reorganised. Even though there is no long-term substitute for direct contact in the field, it is a positive move that digitalisation at IAMO has been given a large boost which will have an impact far into the future.

One example here was the international academic **online conference on the topic of ‘Sustainable agricultural development and regional cooperation for integrative growth in Central Asia’** in October 2020, which was supposed to have taken place in Uzbekistan. The conference was organised by IAMO in conjunction with Tashkent State University of Economics (TSUE), the International Food Policy Research Institute (IFPRI) from Washington, the Samarkand branch of TSUE, Tashkent State Agrarian University (TSAU) and Tashkent Institute of Irrigation and Agricultural Mechanization Engineers (TIAME). The three-day online conference gave 120 registered participants from science, politics and NGOs a platform to discuss the opportunities for promoting food safety, sustainable agricultural development and regional cooperation in Central Asia.

Appropriately for its topic, ‘Digital transformation – towards sustainable food value chains in Eurasia’, the **IAMO Forum 2020 was held online** for the first time, with over 450 conference participants from science, business and politics. At four plenary sessions, 23 parallel sessions and a panel discussion, they debated the opportunities and challenges of digitalisation in the agricultural and food sector. The geographical focus of the Forum was on Europe, Central Asia and China.

In addition, IAMO, along with Martin Luther University Halle-Wittenberg and Anhalt University of Applied Sciences organised the **60th annual conference of the German Association of Agricultural Economists (GEWISOLA)**. This took place online from 23 to 25 September 2020 with 480 registered participants. The topic of the conference was ‘Challenges for rural development – perspectives from economics and social sciences’.

October 2020 saw the start of the second phase of the DFG research group **FORLand ‘Agricultural Land Markets–Efficiency and Regulation’**. From IAMO, Johanna Jauernig, Franziska Appel, Alfons Balmann, Marten Graubner and Daniel Müller are, over the next three years, researching market scepticism in relation to agricultural land markets, modelling farmers’ land market activity using artificial intelligence, and analysing the efficacy of the regulation of land markets. There will also be analyses of conflicting goals, created by the land market, in the geographical optimisation



of agricultural value creation, the preservation of biodiversity and the provision of societal functions. IAMO was awarded a total of 790,000 euros for the second phase of FORLand.

Direct transfer activity, putting research into practice, expanded further in 2020. For example, a pilot project on developing agricultural insurance in Mongolia began as part of the *bilateral cooperation programme of the German Ministry of Food and Agriculture (BMEL-BKP)*, which helps partner countries develop productive and resource-efficient agri-food sectors. Currently, insurance protection is being provided for 380 wheat farms, cultivating between 4 and 17 per cent of the land producing wheat in the various provinces. Ihtiyor Bobojonov and Lena Kuhn from IAMO are working on developing an index-based insurance product in cooperation with the Mongolian Ministry of Agriculture, local insurance companies and the national reinsurance firm Mongolian Re.

The work of young academics from our partner countries continues to benefit from capacity-building at IAMO, as is shown by the **appointment** of Lijuan Miao, who has been at IAMO since 2017 as an Alexander von Humboldt Scholar and Marie Skłodowska Curie Fellow, as Associate Professor at the School of Geographical Sciences at Nanjing University in China.

Although transfer activities in our partner countries, often connected with the development of the corresponding infrastructure, have substantially intensified,


this has not been at the expense of IAMO's academic publication activity. Quite the reverse, in fact. For example the number of refereed publications with **impact factor**, increased from an average of 46 in 2017–19 to 56 in 2020. This is clear proof that IAMO's strategy of boosting academic capacity-building in our target regions with projects that have a strong practical orientation, has also benefited the institute's research and publication activity as hoped.

It is down to our highly efficient administrative department, which has made flexible working conditions possible, that IAMO has been able to continue its successful work of the last few years even in the conditions of the COVID-19 pandemic. In a very short period of time the department has developed our digital infrastructure, allowing IAMO to fulfil its core tasks of knowledge transfer and as a communication platform. This is demonstrated by the aforementioned success of the large online events organised by the Institute. We offer special thanks, therefore, to our highly motivated and flexible colleagues in Administration and Central Services/Technical Support.

IAMO would also like to thank the Ministry of Economy, Science and Digitalisation of Saxony-Anhalt and the German Ministry of Food and Agriculture (BMEL) for their particular support and helpful encouragement. The same is true of the members of our Board of Trustees and Scientific Advisory Board, who we would also like to thank here.

The first two articles in this publication deal with the topic of land markets, a subject of much international discussion at the moment, as land is becoming a scarce and thus expensive resource. In Central Asia, the discrepancy between formal land-use rights and those practised by farmers is a major problem. The expectations of land market regulations and their actual effects are the subject of the second paper. The next two contributions discuss the future topic of agriculture and climate change. One focuses on the development of yield fluctuations with increasing climate change; the second looks at the impact of global warming on the income of Mongolian cattle breeders. The fifth article concentrates on the practical relevance of theoretical assumptions about expenditure planning and the implications for the design of incentive schemes for farmers in China. The sixth, also with a focus on China, examines the connection between access to supermarkets and their diversity of foodstuffs on the one hand, and food quality on the other. This is followed by an article on Russia's capacity to use growth in cereal production to increase exports. The eighth article looks at the effects of the bioeconomy on agrarian structure, focusing on the production of agricultural biomass, which is not used for food. The ninth paper explores the quality of life and life satisfaction in rural areas. Finally there is a report on the IAMO Forum 2020. ■



An aerial photograph showing a vast expanse of agricultural land, characterized by a dense grid of rectangular fields in various shades of brown, tan, and green. A large, irregular green area is highlighted in the upper right, with two white outlines: a circle on the left and a vertical rectangle on the right. In the lower left, a dark blue, irregularly shaped area is outlined in white, resembling a reservoir or a specific land plot. The sky is filled with white, fluffy clouds.

The reality of land rights in Kazakhstan and Uzbekistan

Zarema Akhmadiyeva
Thomas Herzfeld

The reality of land rights in Kazakhstan and Uzbekistan

Zarema Akhmadiyeva
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Introduction

After gaining independence in 1991, Central Asian countries have introduced a number of agricultural reforms to make a shift from command economies to market economies. Kazakhstan and Uzbekistan have followed a ‘conventional’ approach to land reforms that involves the transfer of agricultural land used previously by collective and state farms to individual farms and households (LERMAN and SEDIK 2018). Yet the two countries followed divergent paths towards the privatisation of agricultural land, leaving land users with unequal legal tenure environments. Country-specific legislative and policy failures have also resulted in a reduction of land rights’ effectiveness.

Kazakhstan granted land ownership to rural households first in 1991 and then to commercial farmers in 2003. About 99 per cent of the total agricultural land, however, is still used under long-term lease contracts due to bureaucratic obstacles. The overall regulatory environment in Kazakhstan remains weak, and most economic policies, therefore, are ineffective (WORLD BANK 2018). High uncertainty in law enforcement originating from the unpredictable judgment of local authorities undermines trust in formal institutions and deteriorates the investment climate for farmers (HANSON 2017).

The Uzbek government transferred land use rights to farmers only, reserving the individual right to land ownership. Over 80 per cent of agricultural land allocated to farmers is

under government-mandated cotton and wheat production.¹ Frequent reforms to optimise farm sizes—almost every year since 2006—undermine farmers’ management and investment incentives, increasing land tenure insecurity. In addition to these distorting government interventions, the strict control over the majority of agricultural activities in cotton and wheat production, such as input and output allocation and land management, does not leave room for effective land use. The highly centralised agricultural sector makes considerable profits for the state and a few elites and, therefore, the government imposes a strong law enforcement strategy.

Taking into account the current land tenure conditions and the regulatory environment in Kazakhstan and Uzbekistan, in this study we aim to analyse the real picture of farmers’ land rights in those two countries.

Land rights’ bundles and actual practices

Land laws and land policies exist to regulate agricultural land use by formally recognising or binding certain farmers’ actions with land. These actions make up a set of land rights, which can be grouped into several groups or bundles. Schlager and Ostrom (1992), for instance, distinguish between two groups of property rights: operational-level rights (which allow individuals to access property and withdraw its ‘products’) and collective-choice level rights (which grant authority to elaborate on operational-level rights).

Yet the relationships of farmers with their land is determined by land tenure settings that include not only legally defined land rights but also customary rules, such

¹ The state-ordered quota system was abolished with the Presidential Decree on March 6th, 2020.



as commonly accepted practices and unwritten norms in use. These actual practices may match or mismatch with land rights, and differ from farmer to farmer.

The reasons for mismatches are ...

that traditional practices might be stronger than formal rules or, if the country goes through structural changes, farmers need to adapt to new social, political, economic, and technical arrangements by taking risk-reducing actions.

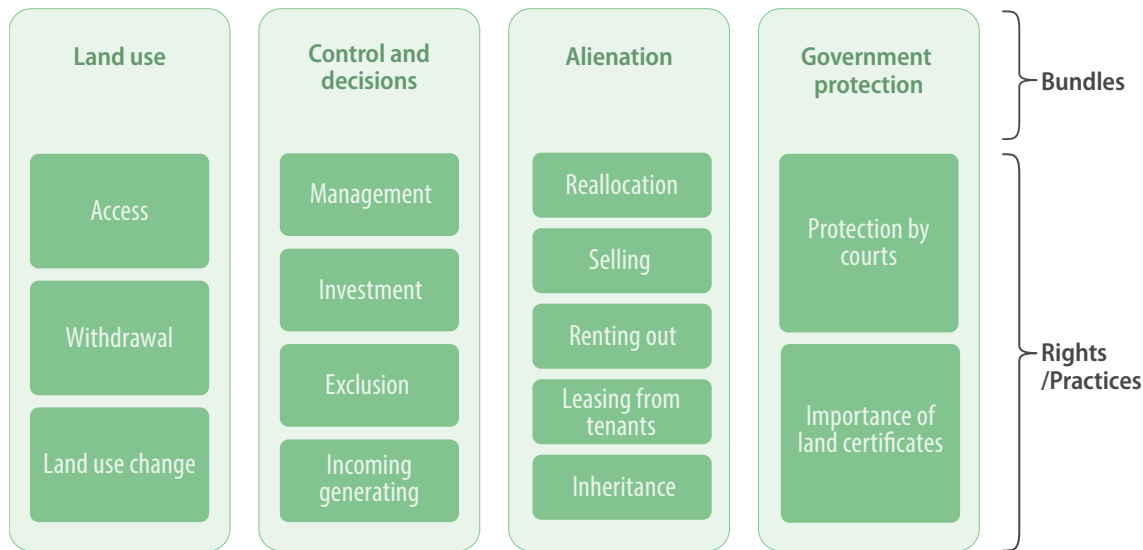
Combinations of legal rights and actual practices define how secure the tenure environment for farmers is and how much to invest in farming. Actual farming practices that are fully supported by the relevant land right bear fewer risks for farmers, increasing future returns to land. In the case of a partial or full mismatch, the situation for farmers differs depending on whether the mismatch is in favour of land rights or actual practices. When land rights are more prominent than actual practices, farmers might have low awareness about their legal privileges or be restricted from the full potential of tenure rights. When actual practices dominate land rights, farmers violate limitations and prohibitions in land law and disregard the authority of regulatory institutions. Both types of mismatches may increase the perceived tenure insecurity of farmers, distorting their production incentives

(BROEGAARD 2005).

Klümper et al. (2018) reconsidered the aforementioned classification of land rights and used them to investigate the extent to which actual practices of households in Tajikistan match or mismatch with land rights. They identify



Figure 1: Operationalisation of land rights and land-use practices



three main bundles of land rights: land use rights, control and decision-making rights, and alienation rights. We adopt the approach of Klümper et al. (2018) in this study to analyse the extent to which farmers in Kazakhstan and Uzbekistan can use their land rights and how effective the current tenure settings are.

Figure 1 demonstrates the list of bundles and the respective land rights that we analysed. Following studies that attempted to reconsider the bundles of rights, we split the right to lease into two: the right to rent out and the right to lease from land tenants (farmers who lease state land and are not allowed to sublease). The purpose of this segregation is to mirror whether land tenants violate legal restrictions in land use. Moreover, we added the

bundle of government protection, which comprises the protection of land rights by courts and the legal validity of land certificates. The rationale behind this adjustment is that some scholars claim that tenure security and government protection might be a full-fledged independent land right (PLACE 2009, MA et al. 2017). By government protection, we imply the right to protection in courts when farmers have disputes with other farmers, foreign investors, or local authorities. The assessment of certificate validity is introduced because the purpose of certificates is to confirm the possession of land rights. Land certificates should give security to the holder by default, but the perception of validity can differ completely from that which is originally conceived.



Table 1: The evaluation scale of legal land rights and actual farming practices

Scale	1	2	3	4	5
Legal right	No rights	—	Limited rights	—	Full rights
Actual practice	Never hold	Rarely hold	Occasionally hold	Frequently hold	Always hold

The evaluation method of land rights and actual practices is presented in **Table 1**. We analysed the national land codes of Kazakhstan and Uzbekistan to evaluate land rights on a 3-point ascending scale, where 1 stands for the absence of rights, 3 for rights with limitations, and 5 for full rights. Each relevant actual practice was assigned a score from 1 to 5, where 1 stands for 'never holds the practice' and 5 for 'always holds the practice'. Questions to assess farmers' actual practices were formulated as: 'To what extent are you free to access, withdraw from land, etc.?' Subtracting the value of actual practices from the value of land rights, we found differences in our study.

The real situation of land rights in Kazakhstan and Uzbekistan

The information on actual practices was collected via a farm survey conducted in March and April 2019 in the provinces of Turkistan (southern Kazakhstan) and Samar-kand (eastern Uzbekistan). The survey was financed by The Volkswagen Foundation, BMBF, and IAMO. **Figure 2** shows the three districts in southern Kazakhstan and the three districts in eastern Uzbekistan chosen for selecting respondents. **The sample was comprised of 460 Uzbek farmers and 503 Kazakh farmers, most of whom were cotton and wheat producers.** We divided respondents

Figure 2: The survey locations in the Kazakhstan and Uzbekistan districts



into three groups in accordance with their tenure settings: Kazakh farmers who own agricultural land, Kazakh farmers who lease state land, and Uzbek farmers who also lease state land.

Estimated discrepancies between the land rights and actual practices are summarised in **Figure 3**, which demonstrates the percentages of positive discrepancies, indicating the underuse of rights, and the negative discrepancies, indicating the violation of legal restrictions. 'No' discrepancies confirm the full use of rights. The assessments of legal land rights are presented as follows: FR—full rights, LR—limited rights, NR—no rights.

Our assessment shows that Kazakh land laws are more liberal compared to those of Uzbekistan, with almost all rights being granted to Kazakh landowners. The only exceptions relate to land use changes being partly restricted and leasing from land tenants, which is forbidden. Kazakh and Uzbek land tenants face a number of restrictions within the bundle of alienation rights, i.e. they are not allowed to sell, rent out, or lease land from land tenants. In addition, Uzbek farmers have limitations in the bundle of decision-making rights, as they are obliged to obtain permission from authorities before making land management and investment changes.

When looking at farmers' practices with respect to the rights they should fully enjoy, it is clear that, in reality, not all farmers fully utilise their land rights. In cases where they fully enjoy their full legal rights, fewer Kazakh landowners report that they don't use the respective rights compared to Kazakh land tenants. Uzbek farmers mainly underuse the fully granted legal rights. The right to protection by courts produces a similar pattern among

Kazakh and Uzbek farmers, with the vast majority complaining about insufficient protection and showing low trust in state authorities.

About half of Kazakh land tenants perceive no or limited rights to inherit land.

Big discrepancies in the right to withdrawal and participate in income-generating activities among Uzbek farmers indicate that farmers cannot use these legally enabled privileges. The reason for this is that most of the Uzbek respondents are cotton and grain producers, who are exposed to strict limitations and frequent government interventions in land use.

Almost all formally limited and completely restricted land rights are being violated by farmers in all three groups. Significant amounts of negative discrepancies among Kazakh farmers indicate that they do not take legal restrictions seriously, confirming that law enforcement in the surveyed region is weak. Widespread violations of restrictions in the bundle of alienation rights by Kazakh land tenants, on the other hand, indicate that farmers try to find a way to effectively allocate land resources that is limited by law. Uzbek farmers are more compliant with the law than Kazakh farmers, despite having more restricted land rights. Most of them uphold prohibitions in the bundle of alienation rights, yet the large share of negative discrepancies for land investments shows that the limitation is often being violated.

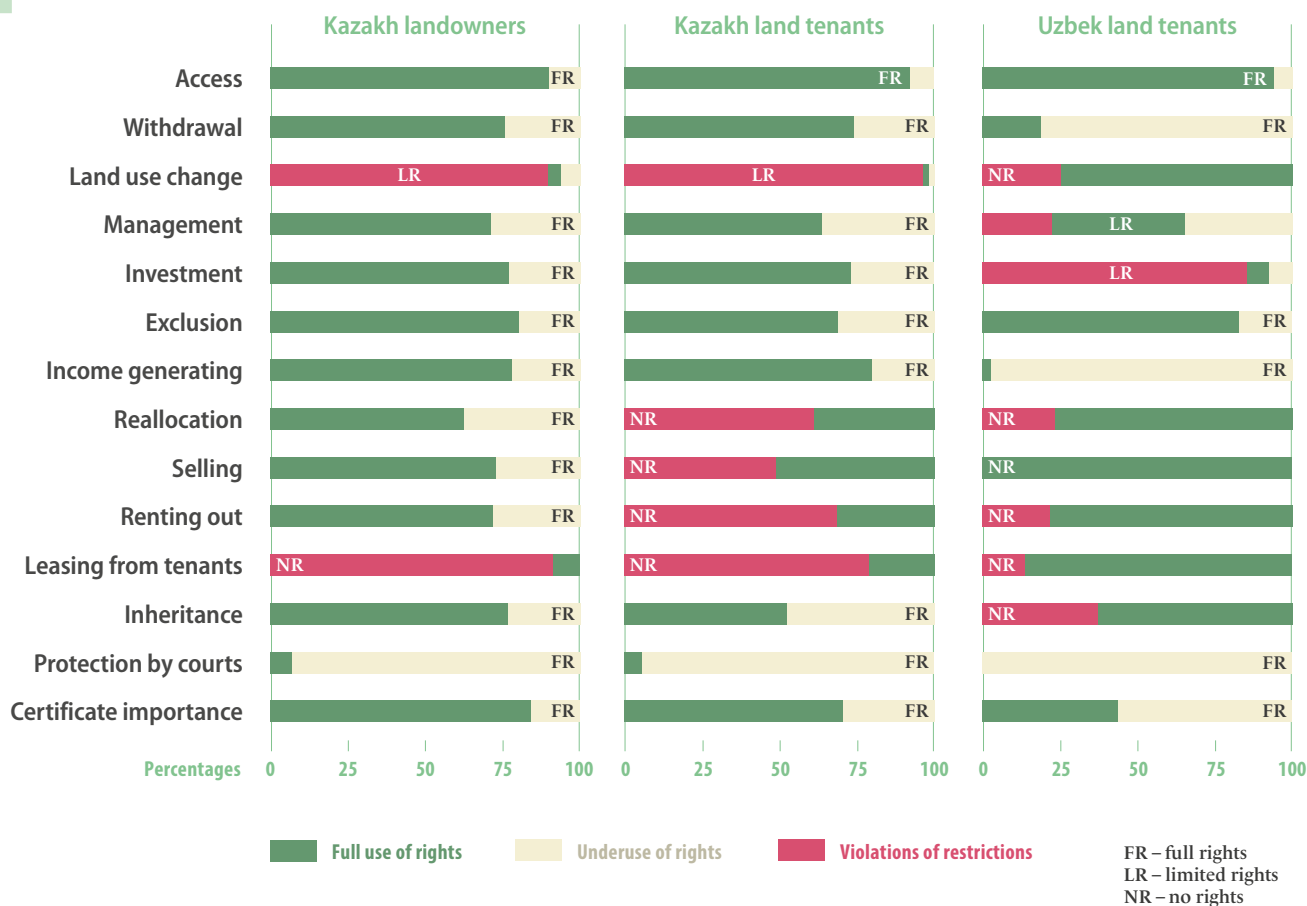


Conclusion

The legislative basis for agricultural land use in Kazakhstan and Uzbekistan is still undergoing a process of formation. To speed up this process, it is essential to evaluate the effectiveness of farmers' current land rights. Our findings reveal the reality of land rights for farmers in southern Kazakhstan and eastern Uzbekistan, most of

whom are cotton producers. The analysis of estimated discrepancies shows that Kazakh farmers have a higher propensity to violate limitations in land rights in comparison to Uzbek farmers. Inconsistency between land code and specific decrees in Uzbekistan has led to a substantial underuse of land rights that play a significant role in increasing farmers' incentives (the right to withdrawal, the right

Figure 3: Percentages of discrepancies between legal rights and actual practices



to land management, and the right to generate income from land). The major reason for such results is that cotton and wheat producers are exposed to strict limitations and government interventions. For Kazakhstan specifically, insufficient law enforcement causes extensive violations of legal restrictions in land transactions among farmers who lease state land.

► Zarema Akhmadiyeva and Thomas Herzfeld have also published their findings as a Policy Brief. IAMO Policy Brief No. 38 can be downloaded in English and Russian from the IAMO website. ◀



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Sources and credits

- Title** Satellite image ©NASA Earth Observatory images by Lauren Dauphin, using Landsat data from the U.S. Geological Survey
- On 1 May 2020, in strong rain and wind, the Sardoba reservoir in Uzbekistan (pictured below), which had been built to irrigate the dry steppe region, collapsed. Around 90,000 people had to be evacuated from the Uzbekistan–Kazakhstan border region. The satellite image from 8 May 2020 shows the flooded area (above), the destroyed residential and arable areas (middle) and the breach in the western reservoir wall.
- p. 11** Picture collage abandoned cropland with cows, photo © Nozilakhon Mukhamedova
- Fig. 1** Operationalisation of land rights and land-use practices © Own presentation
- Tab. 1** The evaluation scale of legal land rights and actual farming practices © Own presentation
- Fig. 2** The survey locations in the Kazakhstan and Uzbekistan districts © Own presentation compiled by the authors using the QGIS 2.18.9 software and the GADM database
- Fig. 3** Percentages of discrepancies between legal rights and actual practices © Own presentation



An aerial photograph showing a dense forest with trees in various shades of green and yellow, indicating autumn. Below the forest is a two-lane road with a white dashed line down the center. A small white car is visible on the road. Below the road is a green field with some yellow trees and a row of trees. The bottom part of the image shows a brown, plowed field with visible furrows. A large, stylized white outline of the number '7' is superimposed on the forest area.

Land market regulations: between expectations and effectiveness

Franziska Appel
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Land market regulations: between expectations and effectiveness

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Introduction

Agricultural land prices in Germany have been rising for about ten years, and many farmers are worried that they can no longer compete on the land market and will become unviable (LANGENBERG and THEUVSEN, 2016). There are also concerns that the price increases represent a failure of the market mechanism. Over the past few years, several German Länder, such as Lower Saxony (NASG 2017) and Saxony-Anhalt (LANDTAG VON SACHSEN-ANHALT 2020), have discussed draft legislation aimed at limiting the size of farms and introducing upper price limits for agricultural land. The academic literature includes a few studies on the objectives of land market regulations, but to date hardly any analyses exist studying the effectiveness of various land market regulations and whether they can fulfil the expectations placed on them. As part of the DFG project FORLand, we are researching this question using the agent-based simulation model AgriPoliS (FORLand 2017, HEINRICH et al. 2019).

The aims of land market regulations

The regulation of land markets is primarily aimed at limiting the increase of land prices in the interest of farmers, and to strengthen the competitiveness of family farms against non-agricultural investors. It should also restrict the local market power of large agricultural enterprises (DEUTSCHER BUNDESTAG 2018). These criteria are often linked to the goal of preventing a negative trend in the

agrarian structure (NASG 2017, LANDTAG SACHSEN-ANHALT 2020). By the terms of the Property Transactions Act and the Land Lease Contracts Act, however, sales and rental contracts can already now be rejected in Germany if the contract (i) leads to an 'unhealthy' distribution of land, (ii) divides land parcels into uneconomic sizes, or (iii) the sales or rental price is in an unreasonable relation to the value of, or return from, the land. While these regulations have traditionally been applied in a liberal, market-oriented way, current proposals are more restrictive and set harsher limits. Examples include the maximum size of a landholding or the extent to which prices can diverge from the average.



Early in 2021, a few months before the next state parliament election, again a legislative process for the law on agrarian structure in Saxony-Anhalt was stopped. (Photograph: debating chamber, Saxony-Anhalt state parliament, 2019)



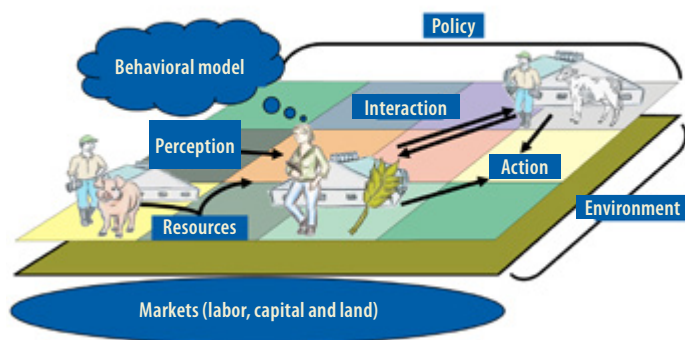
The simulation model AgriPoliS

The agent-based model can simulate the development of agricultural regions over time (e.g. HAPPE et al. 2006).

AgriPoliS is mainly used to analyse the effects of policy measures on structural change in agriculture.

Since 2003, the model has been used for many research projects at IAMO and elsewhere. AgriPoliS can be adjusted and calibrated to empirically gathered data for real regions, thereby leading to a better understanding of structural change in the past and future (SAHRBACHER et al. 2012). The model works on the assumption that individual agents in agriculture maximise their profits or household income through mixed-integer optimisation, and react to price or policy changes by leasing or renting land, changing their production system, or quitting agriculture. The individual agents interact on the land

Conceptual representation of the AgriPoliS model



market, which takes the form of a repeated auction where they compete with neighbouring farms for available land plots.

Our inquiry, which takes the region of the Altmark in Saxony-Anhalt as a case study, is examining the effects of price and size restrictions as outlined in the proposed legislation in Lower Saxony and Saxony-Anhalt. Specifically, we are simulating three regulation scenarios which are compared to a reference scenario (REF) that simulates the development of the region without land market regulations. In the regulation scenario 'price limit' (PL) the price of new rental contracts is restricted. Farms can offer a maximum of 10% above the average rental price of a comparable land plot in the region, differentiating between arable land and grassland. If several farms make the highest offer, lots are drawn to determine whose bid is accepted. The scenario 'size limit' (SL) restricts farm size to a maximum of agricultural land per holding which must not exceed five times the current average farm size in the region. The scenario 'price/size limit' (PSL) combines the two regulation scenarios above.

How do land market regulations work?

AgriPoliS simulates the development of the region over 20 years. For reasons of data availability, the simulation begins in 2016. After an initialisation phase, the regulation measures in the policy scenarios become active in 2020. The current policy measures of the Common Agricultural Policy (CAP) are assumed to be continued after 2020 as well. The analysis focuses on the period 2020 to 2035.

To analyse whether the price and size restrictions are effective and fulfil the expectations placed in them, we are



Figure 1: Development of rental prices

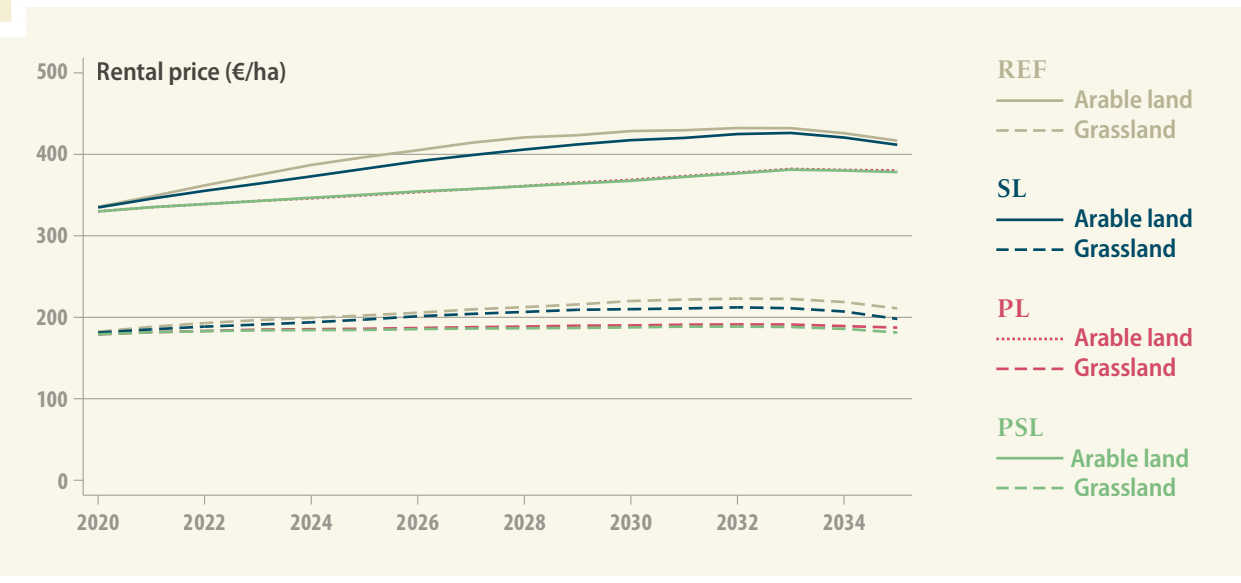


Figure 2: Farm size in hectares in 2035

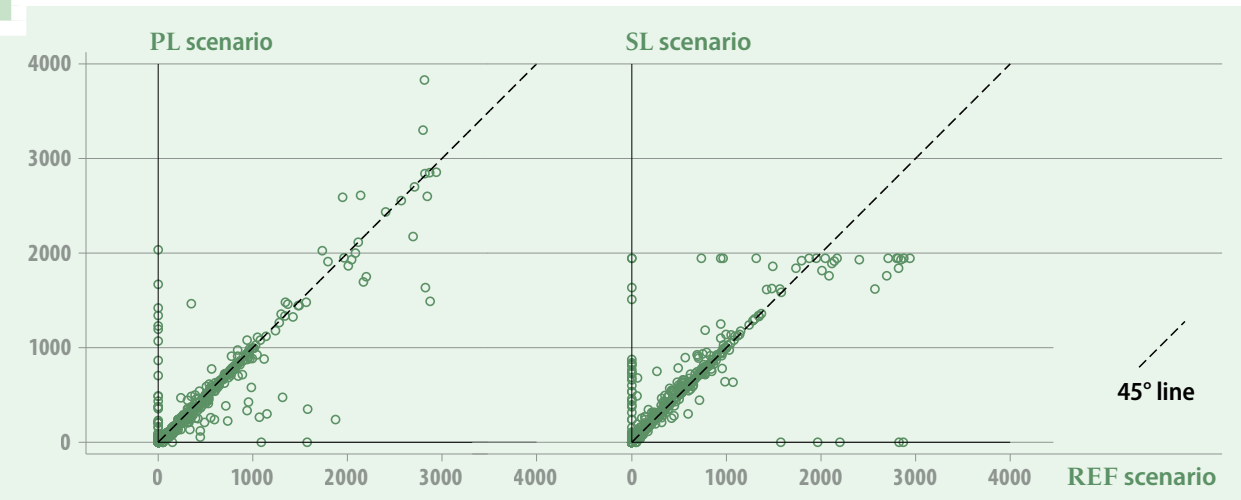


Table 1: Number of farms by year and scenario

Year	Scenario			
	REF	PL	SL	PSL
2016	928 (100%)	928 (100%)	928 (100%)	928 (100%)
2020	858 (92%)	858 (92%)	858 (92%)	858 (92%)
2025	762 (82%)	771 (83%)	773 (83%)	774 (83%)
2030	706 (76%)	723 (78%)	725 (78%)	726 (78%)
2035	629 (68%)	664 (72%)	662 (71%)	673 (73%)

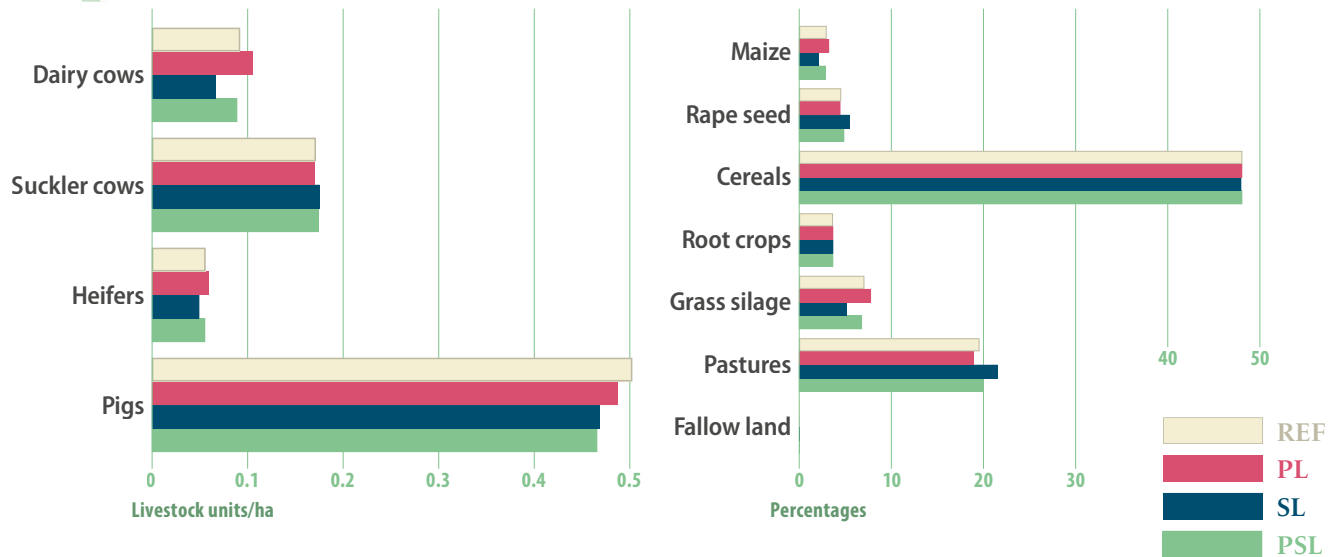
examining the effects of the regulations on rental prices, the number and size of farms, the production structure, added value, and efficiency.

Figure 1: Regarding the development of rental prices, we see that the price limit (PL) counters a further increase of rental prices compared to the reference scenario, whereas the price effect in the size limit scenario (SL) is small. In 2035, the rental prices for arable land in the PL scenario are around 9% (11% for grassland) below those in the reference scenario, whereas in the SL scenario the prices for arable land are only 1% lower and 6% lower for grassland. The combination of both instruments (PSL) leads to an even stronger reduction in land rental prices compared to the reference scenario (REF) in 2035 with 9% for arable and 14% for grassland. **Table 1:** The regulations slow down structural change. Whereas around 32% of farms will have quit agriculture by 2035 in the REF scenario, only 28% in the PL scenario will have ceased production. For the SL and PSL scenarios the figures are 29% and 27%, respectively. Consequently,

there is a quantifiable effect but the differences in the survival of farms tend to emerge only in the longer term. Aside from the development in the number of farms, land market regulations aim to prevent few very large agricultural enterprises from wielding market power. The scatterplots in **Figure 2** show the land under cultivation per farm in the PL and SL scenarios compared to the REF scenario in 2035. Farms on the 45° line cultivate the same area of land in the REF scenario and the corresponding regulation scenario. Farms below the 45° line are larger in the REF scenario, whereas farms above the 45° line in the PL or SL scenarios can increase their farmland. Points on the axes mark farms that cease production in one scenario but survive in the other. Some farms, which attain a medium to very large size in the REF scenario, are significantly smaller in the PL scenario because the price limit prevents them from being successful on the land market despite high shadow prices. For the SL scenario, the size limit becomes noticeable when it is around 2,000 hectares. Some farms that grow



Figure 3: Livestock and land use in 2035



larger than 2,000 hectares in the reference scenario cannot do this when a size limit is in place. Some other farms, however, which are smaller than 2,000 hectares in the reference scenario, grow to the upper size limit. Although many small farms benefit from the size limits, they rarely grow by more than 100 hectares.

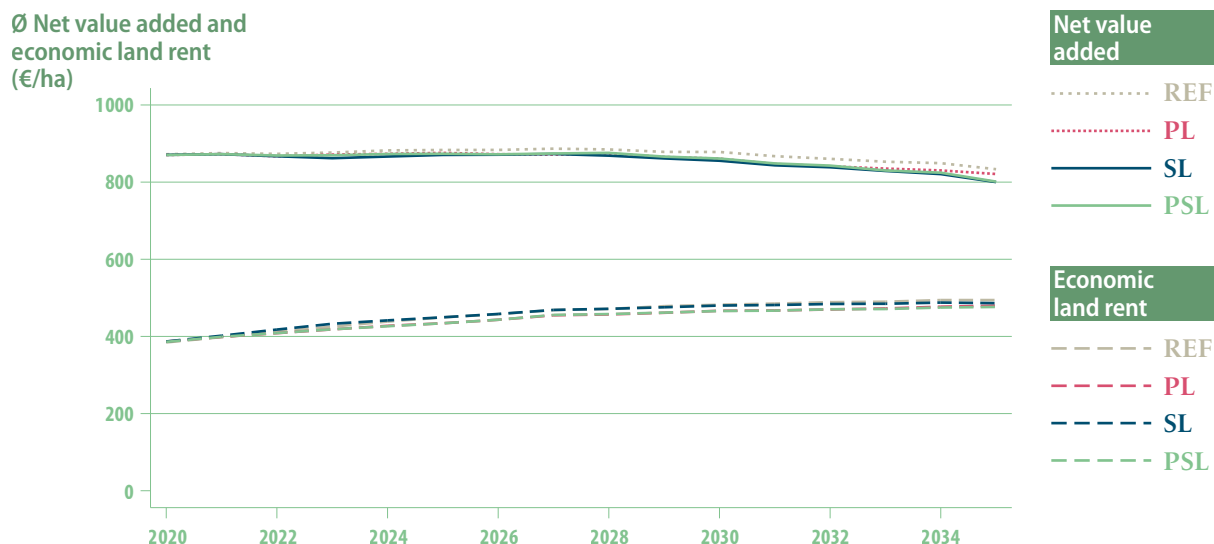
The land market regulations also have an effect on the production structure. In the PL scenario, we can detect a slight shift towards more intensive land use of arable land (maize) and grassland (grass silage). The farming of dairy cows sees a slight increase in this scenario too. Pig farming, by contrast, is reduced in comparison to the reference scenario. In the SL scenario, livestock production apart from suckler cows is reduced and land use is more

extensive. The latter effect can be explained by the reaction of very large farms that reduce their grassland rather than arable land. The combination of price and size limits has barely any effect on the structure of production and, apart from the number of pigs, is comparable to the reference scenario. The change in the production structure also leads to a decrease in the amount of agricultural labour.

Land market regulations have negative structural effects on economic land rents, which reflects the lower overall efficiency of the sector. The negative effects of price restrictions on economic land rents are a result of allocative inefficiencies that increase over time. This is because farms with very high shadow prices, or those which are



Figure 4: Development of net value added from agriculture and economic land rent



able to use the land particularly profitably, are not allowed to offer the corresponding high prices.

Conclusion

It has been shown that land market regulations slow down the rise in land rental prices. Structural change, in terms of the number of farms, is slowed too. As key objectives of land market regulations, both of these results make the measures appear effective. However, the effects are slight and they come with negative side-effects. Contrary to the aims of the land market regulations, they do not considerably support small family farms. Most farms that quit agriculture in the reference scenario cease production in the regulation scenarios too. By contrast, some medium to big farms can increase their profitability.

These are mostly pure arable farms, however, with comparatively little added value per hectare, and thus make a minor contribution to the development of the rural area. A central function of land markets – the efficient allocation of land – is reduced because the land is no longer acquired by those farms which are best at utilising it. Ultimately, a few slightly positive effects are balanced by a few slightly negative effects.

If we consider overall welfare in the sector as an indicator, we have to conclude that the negative effects outweigh the positive ones.

There is also the practicability of the measures, which cannot be accounted for in the analyses. The authorities will certainly be able to check sales and lease contracts for their compliance with the law, but this cannot prevent circumvention of the law, such as under-the-table payments. Such payments are common in other countries with strict land market regulation. Moreover, limits on farm size are probably easy to evade by dividing up farms early between family members or third parties (straw men), or if farming contracts come into play.

The land market regulations as set down in the proposed legislation cannot, in our opinion, improve the agrarian structure. Policy should rather be focused on maintaining or increasing the competitiveness of existing farms. Possible measures to achieve this include investment incentives, innovation support, and training opportunities. In the east of Germany, it is often the really big farms that generate a larger proportion of added value per area of land and also provide more jobs. Weakening these farms, which are an economic pillar of the Altmark, through land market regulations does not appear to be a sensible approach.

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Sources and credits

- Title** Autumn in Tangerhütte in the Altmark © Peter Kramer, Fotokombinat Altmark. www.fotokombinat-altmark.de
- The Altmark, a region in the north of Saxony-Anhalt, is one of Germany's oldest cultivated landscapes. Typical of the vegetation is the close interrelationship between arable land and woodland.
- p. 18** The debating chamber of Saxony-Anhalt state parliament during a parliamentary session © State parliament/Stefan Müller
- p. 19** Conceptual representation of the AgriPoliS model © AgriPoliS group
- Fig. 1** Development of rental prices © Own presentation
- Fig. 2** Farm size in hectares in 2035 © Own presentation
- Tab. 1** Number of farms by year and scenario © Own presentation
- Fig. 3** Livestock and land use in 2035 © Own presentation
- Fig. 4** Development of net value added from agriculture and economic land rent © Own presentation





5

How do weather extremes and climate trends influence wheat yields in Ukraine?

Florian Schierhorn
Max Hofmann
Daniel Müller

How do weather extremes and climate trends influence wheat yields in Ukraine?

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Introduction

Ukrainian agriculture is already feeling the effects of climate change. In the future the challenges may be even greater. The problem cannot, however, be easily seen in the agricultural statistics, for the figures often show positive trends. For example, whereas around the turn of the millennium almost 30 million tonnes of cereals were harvested annually in Ukraine, the output is almost twice that today. This is primarily a consequence of the rise in per-hectare yields. Since the year 2000, yields of almost all important crops have increased substantially. Wheat yields have risen from 2.5 tonnes per hectare (t/ha) to more than 4 t/ha (**Figure 1**). Over recent years maize

yields have increased from 3 t/ha to sometimes considerably more than 5 t/ha, albeit with significant annual fluctuations. As a result of the rise in yields, Ukraine has become one of the leading global cereal exporters. From 2014–15 Ukraine was the third largest and in 2018 the fourth largest exporter of maize, and in 2016 the fifth largest exporter of wheat (FAOSTAT 2020). The growth in yields can be attributed to improvements in technology as well as greater use of inputs such as chemical fertilisers. This development is not the consequence of better weather conditions resulting from climate change.

It must be noted, however, that because of the country's continental position, climate change has proceeded at a faster rate in Ukraine over the past decades than in many maritime regions. Using freely available, high-resolution raster data (HARRIS et al. 2020) we calculated that the average annual temperature in Ukraine rose by 2.1°C between 1985 and 2018, while the global increase over this period was only 1.1°C. Average annual temperature, however, does not tell the whole story as far as agriculture is concerned. More relevant are the temperatures in spring and early summer—a key period for the growth of cereals and thus for yields. The average June temperature in Ukraine rose even further, by about 2.2°C between 1985 and 2018. In addition, historic climate data show that large parts of Ukraine, especially the important areas of cultivation to the south of Kiev, have experienced declining patterns of rainfall since 1980 (MÜLLER et al. 2016). Given these factors, an empirical study demonstrating that, without climate change, Ukraine would have achieved somewhat higher yields in recent years (RAY et al. 2019), comes as no surprise.

Figure 1: Yields in Ukraine, 1992–2018

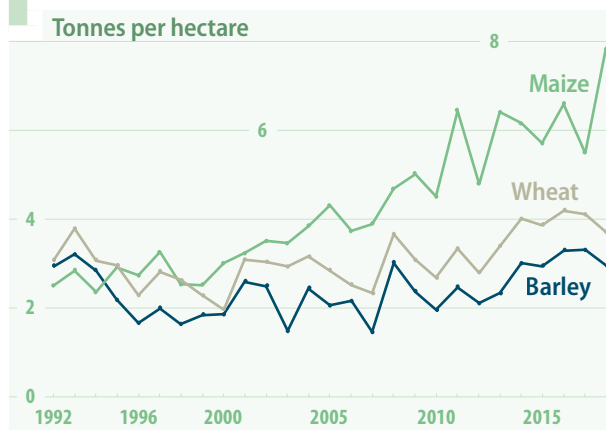


Table 1: The variation coefficient for yield, cropland, production, and export of the most important global producers of cereals from 2000 to 2018. The variation coefficient is a standardized measure of dispersion and high values (orange and red) show great variability.

	Yield			Cropland			Production			Export		
	Barley	Maize	Wheat	Barley	Maize	Wheat	Barley	Maize	Wheat	Barley	Maize	Wheat
Argentina	17.2	14.0	14.0	56.1	35.2	19.2	62.9	44.5	20.7	79.4	46.5	35.2
Australia	22.2	17.0	23.7	10.6	19.8	8.9	24.2	19.6	26.5	35.1	74.4	29.7
Canada	13.7	12.7	17.8	24.8	10.5	7.2	19.0	20.1	19.0	36.6	79.9	20.8
China	7.7	9.4	13.1	40.3	22.8	4.3	42.3	30.8	14.3	223.1	158.2	55.2
EU	8.1	11.0	7.4	6.7	5.9	3.0	6.3	10.3	9.0	46.0	70.2	37.0
India	14.0	18.4	9.6	7.7	11.8	6.7	13.4	28.5	15.1	168.7	100.9	115.9
Kazakhstan	19.3	14.4	18.6	21.5	22.0	8.1	32.8	35.2	23.1	72.7	114.2	32.4
Pakistan	3.6	30.1	7.5	21.7	13.6	4.5	21.7	41.5	11.2	N.A.	157.9	68.4
Russia	13.5	26.9	18.0	12.7	52.2	9.6	17.6	69.2	26.9	55.0	109.0	67.4
Turkey	14.1	31.4	11.0	4.4	9.3	6.3	15.7	36.0	8.2	140.8	113.7	58.8
Ukraine	22.7	27.6	22.8	21.6	46.5	16.5	19.7	65.2	31.5	43.0	91.8	70.0
United States	10.5	10.3	9.4	29.1	7.8	11.3	21.5	15.1	10.6	81.5	20.1	13.1

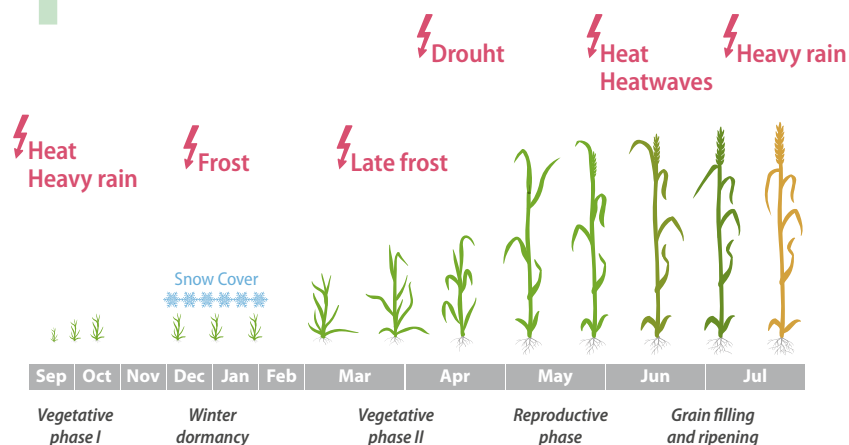
Ukraine is one of the countries with the highest yield variability

One of the biggest problems for Ukrainian agriculture is the high volatility of yields. Using the variation coefficient, **Table 1** shows the extent to which yields of the most important global producers of cereals varied between 2000 and 2018. We chose this period because, prior to 2000, yield variability in Ukraine was also linked to the turbulent processes of transition after the collapse of the Soviet Union. Yield variability in Ukraine between 2000 and 2018 for wheat, barley and maize were comparatively very high (**Table 1**). Wheat yields in Ukraine after 2000 varied even more than in Kazakhstan and only slightly less than in Australia, both countries which are

well known for substantial yield variability tied to climate volatility. In the EU and the USA, yield variability was far smaller than in Ukraine. Besides yields, the total area under cultivation in Ukraine was also subject to considerable annual variation and thus contributed to the marked rise and fall of annual production volumes, which was also reflected in volatile export volumes of cereals.

In short, Ukraine may be an important actor on global cereals markets, but also a relatively unreliable one as far as production and export volumes are concerned.

Figure 2: The development of winter wheat and potential extreme weather events that can negatively impact yield



This is especially relevant for countries like Egypt, which meet their demand for cereals predominantly through imports from eastern Europe.

Long-term climactic conditions and extreme weather events

The climatic and weather conditions during the entire growth phase influence crop development and thus yields. The literature distinguishes between long-term climatic conditions and extreme weather events. Long-term climatic conditions include average temperature, total precipitation and growing degree days. Growing degree days refer to the total of daily temperatures when the minimum tolerable temperature for a particular plant is exceeded and the maximum tolerable temperature is not surpassed. For its total growth phase, but also during individual phases of growth (e.g. flowering), an arable crop needs certain amounts of energy and water. High yields,

therefore, can only be achieved when certain values of growing degree days are met and sufficient volumes of water are available to the plant. By contrast, extreme weather events such as frost, extreme heat and drought have a short-term effect on plant growth, are unpredictable and rare, and can also significantly reduce the yield even if the average climatic conditions are optimal. Various extreme weather events influence plant growth in certain phases (Figure 2). Heat stress limits the plant's photosynthetic activity, can

reduce the ear fertility and upset the process of corn formation, which has a negative impact on yields (FAROOQ et al. 2011). It has been shown, for example, that temperatures above 34°C during the grain-filling phase of fructification can have substantial negative effects on the yield, especially if the heat persists for several successive days—a so-called heatwave—and no rainfall occurs. Heat and heatwaves at night can put a brake on plant growth too (SADOK and JAGADISH 2020). During winter dormancy, severe frost can damage winter crops, especially if there is no snow cover to insulate the young plants from the cold. Late frost in spring, after winter dormancy and when the plants have adapted to spring warmth, often have a negative impact on yields too. Downturns in yields can also result from heavy rain, especially when these wash chemical fertilisers and plant protection products from the field, damage part of the harvest and prevent the use of

harvesting machinery. The interplay of several factors impacting the yield can mean that their effect is intensified or weakened. The methodological challenge in a statistical analysis of yield-affecting climatic and weather conditions is to determine precisely the individual effects and functional relations of climate factors as well as understanding these functional relations.

Which extreme weather events influence yield variability in Ukraine?

We asked ourselves which climatic factors can explain the high yield variability in Ukraine. To answer this we focused on the effect of extreme weather events on yields, which is especially important for Ukraine because there is considerable evidence that extreme weather events such as heatwaves, heavy rain and frost have a substantial impact on the yields of cereals. The influence of such events on yields in Ukraine has not been systematically investigated before. We used daily climate data from 190 weather stations scattered across the entire country (**Figure 3**). From this data we calculated long-term climate variables (e.g. precipitation and growing degree days) as well as extreme weather variables—see **Table 2**—for each of the 25 Ukrainian provinces. We used annual yield data for winter wheat at the province level from 1985 to 2018 and removed from this the linear trend component of the yields to exclude other factors impacting yields such as developments in agricultural technology. In addition, all the variables were specifically calculated for the five most important growth phases of winter wheat—see **Figure 2**—to understand in which phase the various extreme weather events restrict plant growth. To quantify the influence of climate

and weather variables on the yield, we used Random Forests, a machine learning algorithm which uses many uncorrelated decision trees for regression. Random forests can estimate climate-related yield variability much more accurately than traditional regression methods (JEONG et al. 2016, LENG and HALL 2020). Because of regional differences in biophysical conditions, we estimated the model separately for the steppe region in the south-east and for the north-west of the country (**Figure 3**).

Our model findings show that wheat yield variability in Ukraine has been strongly affected by climatic factors in general and extreme weather events in particular. Put together, all extreme weather events account for about half of the yield variability between 1985 and 2018. The increase in explained variability is relatively small if long-term climate variables are considered in addition to ex-

Figure 3: Locations of the 190 weather stations (black dots) in the north-west and in the steppe region

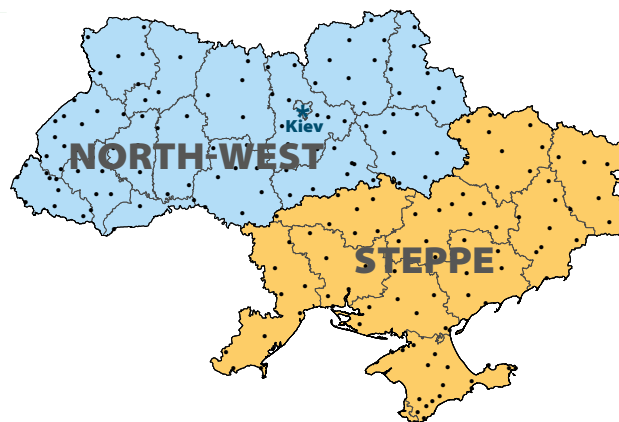


Table 2: Extreme weather variables calculated for each development phase for winter wheat using daily weather station data

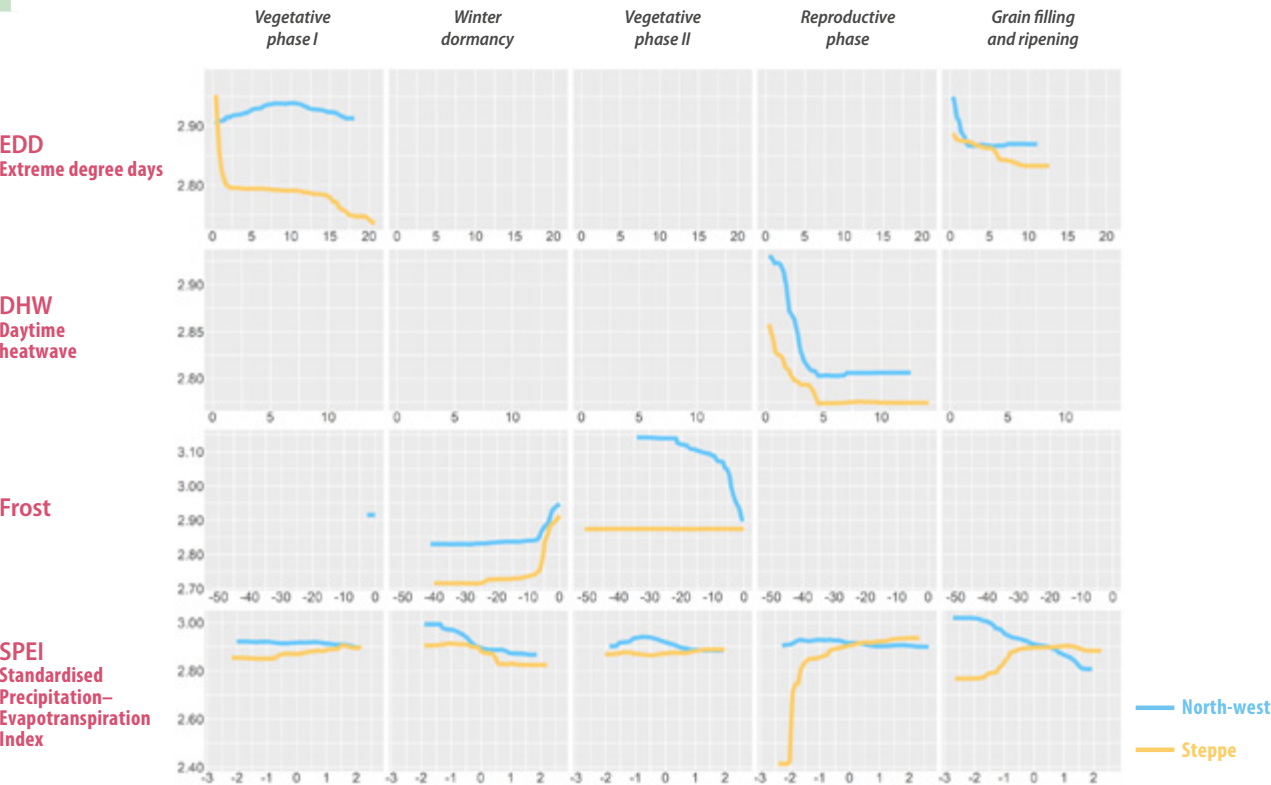
Name	Calculation
Extreme degree days (EDD)	Totalling the daytime temperatures above a specific value (e.g. 34°C in July)
Daytime heatwave (DHW)	Like EDD but only when the specific value is surpassed on at least three days in succession
Heatwave without precipitation	Like DHW but only when no rain falls during the heatwave
Night-time heatwave	Like DHW but with specific values for night (e.g. 20°C in July)
Frost	Totalling the daytime temperatures below 0°C
Late frost	Totalling the daytime temperatures below 0°C when preceded by a warmer phase of four days or more with at least 3°C
Heavy rain	Totalling the precipitation when the daily rainfall is greater than the long-term 90th percentile within a month

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treme weather events in the model. With the Random Forests method, functional relations between the independent variables and the dependent variable can be depicted. **Figure 4** shows the estimated functional relationship between extreme degree days and yield in the last few weeks before harvest, i.e. during grain filling and ripening. Here, the negative relationship is clearly evident. Heatwaves, both during the daytime and at night, also reduce the yield, especially when they occur during the reproductive phase. Our findings furthermore show that the wheat yield fell as a result of extreme frost events as

well, even though this effect was limited to the steppe region in the south-east (**Figure 4**). Although severe frosts occurred in the north-west of Ukraine too, the young plants there were regularly protected by a sufficiently thick layer of snow. Late frost, on the other hand, does not yet seem to have been a major problem for wheat. As far as the effect of precipitation is concerned, our findings show a regionally differentiated picture. In the steppe region, water stress during the reproductive phase and during grain filling and ripening was a major factor that reduced yields (**Figure 4, SPEI**). In the north-

Figure 4: Relationship between yield (y-axis) and various extreme weather variables (x-axis) for the five development phases of winter wheat for the north-west (blue) and the steppe (yellow)



west, however, water stress barely had a negative impact on yields, whereas heavy rain in the weeks before harvest led to decreases in yields (see also: FAO and ITPS 2015). This was probably due to the resultant waterlogging, which reduced the number of grains per plant and thus the yield as a whole.

In conclusion, our findings clearly show that various extreme weather events have had a substantial impact on wheat yield variability in Ukraine. In some cases this impact varies considerably between the north-west and the steppe, requiring measures tailored to the regions, such as the choice of crop varieties, to counter the big climat-

ic challenges. Our findings therefore provide a scientific basis to develop adaptation measures that reduce yield variability in the face of ongoing climate change.

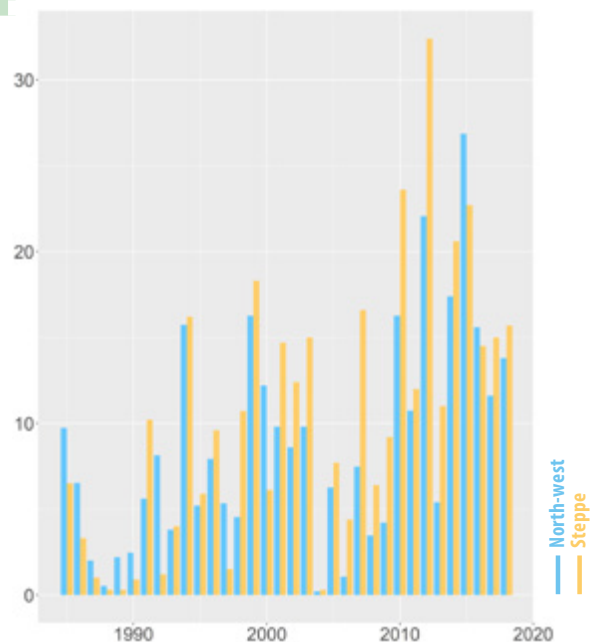
Measures to reduce yield variability

Water and frost stress in the south-eastern steppe as well as heat and heatwaves throughout Ukraine are the major causes of the severe yield variability. Heatwaves have increased considerably in Ukraine since 1985 (**Figure 5**), which suggests that their frequency and intensity will continue to grow. Measures that could counter climate-induced yield variability should therefore be investigated and developed further for Ukraine.

An important starting-point here is soil protection, for 40% of agriculturally used soils in Ukraine are already degraded and have lost a large proportion of their original organic matter (SCHIERHORN and MÜLLER 2020).

Implementing measures of conservation agriculture, such as no-till farming and extended crop rotation, can help to improve the soil structure and lead to an increase in humus content. In this way the soil temperature can be reduced and water can be stored more effectively in the ground, making it available to plants during periods of drought. According to the FAO, only a little more than 4% of cropland for cereals in Ukraine is farmed using conservation practices (EISENRING et al. 2019). Similar methods to those used in conservation agriculture are found in organic farming. Until now, only around 300 farms in the

Figure 5: Mean number of heatwave days per province in the steppe (yellow) and north-west (blue)





Ukraine, which cultivate less than 1% of farmland, follow the principles of organic agriculture (SCHIERHORN and MÜLLER 2020). Experts are anticipating a large increase in organic farming, however (EISENRING et al. 2019). Such increase may lead to the production of cereals that are more resilient to climate and weather fluctuations, even though the area of cropland needed for the same production volumes is higher in organic farming than in conventional farming, and the yields are correspondingly lower.

Much research is needed to identify how crop varieties can best help to improve both conventional and organic

farming. Plant breeding plays an important role in adapting agriculture to ever-more frequent extreme weather conditions and climate change. Research into frost, heat and drought-resistant cereal varieties, for example, promises good results for effective adaptation to climate change. Our research shows that the effect of hot, tropical nights on cereal yields needs to be studied further. At present, winter wheat is the dominant crop in Ukraine, but it is possible that climate change, especially warmer winters, will see summer crops being favoured. Overall, agricultural research with a focus on climate change is of great importance to Ukraine, for agriculture is one of the sectors that drives the country's economy. How Ukrainian agriculture adapts to climate change, however, is also of great international importance. ■

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Sources and credits

- Title** Radar image of central Ukraine, taken by Space Shuttle Endeavour in April 1994 © Courtesy NASA/JPL-Caltech
- The detail shows the data evaluation of a 35 x 35 km area in the intensively farmed region of central Ukraine. At the time the image was taken, most fields were uncultivated—these are dark brown and purple. Bright lines show field boundaries of hedges and trees. The larger yellow areas are riparian forest of the Dnieper (top left) and a small tributary (below).

Fig. 1 Yields of maize, wheat, and barley in Ukraine, 1992–2018 © Own presentation. Data: UKRSTAT, 2019. Agriculture of Ukraine: Statistical yearbook, State Statistics Service of Ukraine, Kiev <http://www.ukrstat.gov.ua> [05.07.2021]

Tab. 1 The variation coefficient for yield, cropland, production and export of the most important global producers of cereals from 2000 to 2018 © Own calculations using data from USDA (2020)

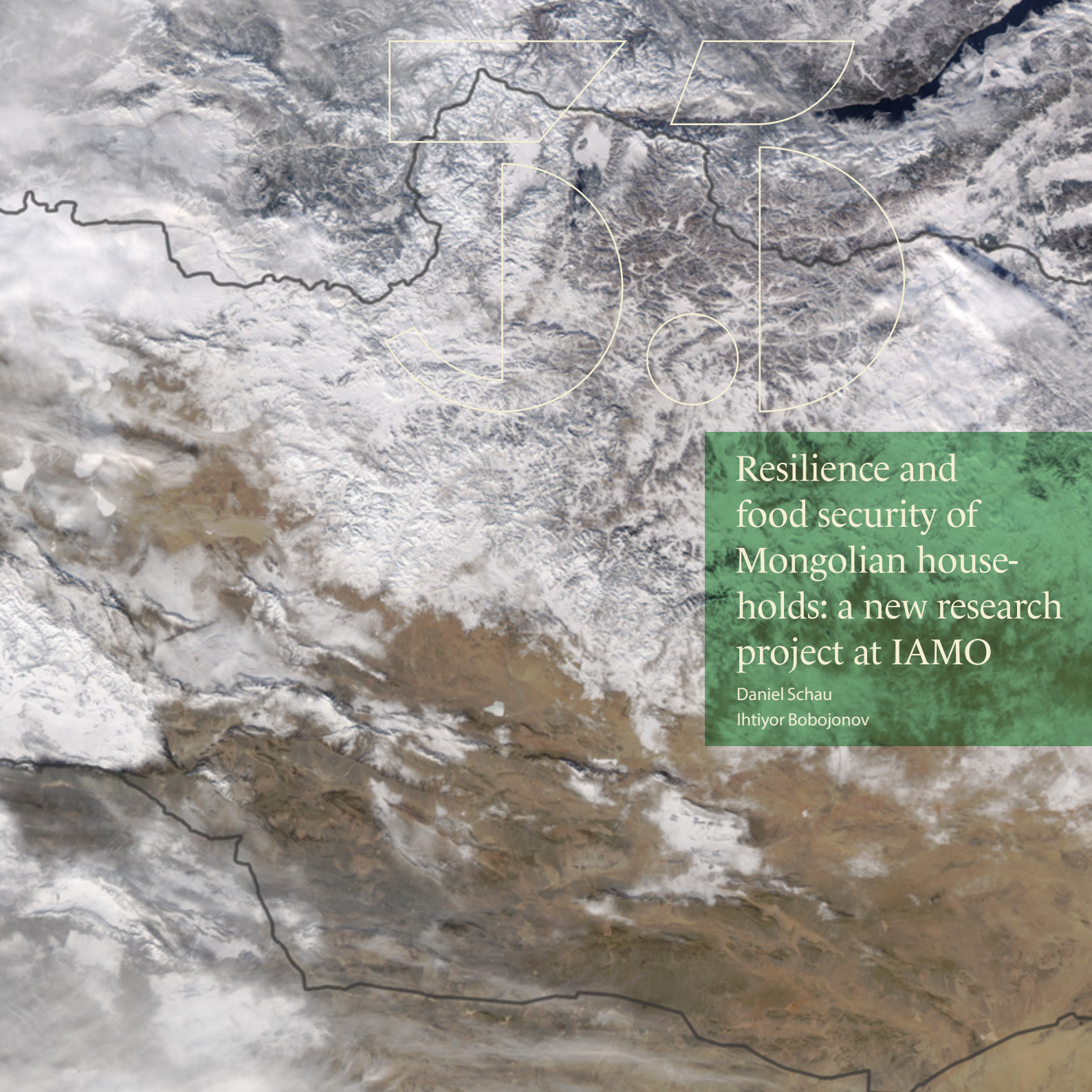
Fig. 2 The development of winter wheat and potential extreme weather events that can negatively impact yield © Own presentation under using graphic wheat © ilyakalinin – stock.adobe.com and graphic snowflake © Sapann-Design – de.freepik.com

Fig. 3 Locations of the 190 weather stations in the north-west and in the steppe region of Ukraine © Own presentation

Tab. 2 Extreme weather variables calculated for each development phase for winter wheat using daily weather station data © Own presentation

Fig. 4 Relationship between yield and various extreme weather variables for the five development phases of winter wheat for the north-west and the steppe © Own presentation

Fig. 5 Mean number of heatwave days per province © Own presentation

A satellite map of Mongolia is the background. A thick black line outlines the country's border. Overlaid on the map are several yellow geometric shapes: a rectangle in the north, a circle in the center, a small circle in the east, and a large semi-circle on the right side. These shapes appear to be highlighting specific regions of interest.

Resilience and food security of Mongolian house- holds: a new research project at IAMO

Daniel Schau
Ihtiyor Bobojonov

Resilience and food security of Mongolian households: a new research project at IAMO

Daniel Schau
Ihtiyor Bobojonov

Introduction

With a total area of 1,566,600 square kilometres, Mongolia is more than four times the size of Germany. The country's agricultural land consists almost entirely of pasture with a limited share of cropland. Animal husbandry is an important sector of the Mongolian economy; its products are used for domestic consumption (meat and dairy products), as well as for the export of leather, sheepskins, cashmere, wool and other related processed products. Under extreme weather conditions, Mongolian pastoral nomads have practiced extensive livestock farming for centuries. Devastating weather events such as harsh winters and summer droughts have been familiar to Mongolian pastoral nomads since time immemorial. But there are clear signs that the frequency and magnitude of these natural disasters are currently increasing due to global climate change. '*Dzud*' is the Mongolian term for an exceptionally harsh winter preceded by a summer drought (July–September) (RAO et al. 2015). In normal years, cattle build up the necessary weight, strength, and fat reserves in summer to survive the harsh winter and spring. However, under *dzud*, livestock must enter the winter already undernourished. The animals also fall victim to the extremely low temperatures because there is not enough hay available as winter fodder after a drought. Additional to risks associated with a *dzud*, increasing frequency of droughts also pose a threat to livestock. Their negative impact on livelihoods increases the longer they

last and the larger the area affected. Successful livestock production requires secure access to water and fodder in particular. The drying up of water sources and the decline in fodder resources have a major impact on extensive Mongolian livestock production, especially vital milk production, and ultimately on herders' livelihoods.

Temperate pasture regions are some of the most endangered ecosystems on earth.

The interplay of climate degradation, land overuse, and unsustainable changes in the agricultural institutions that regulate grazing threaten Mongolia's pastoral economy. Of particular concern are the potential ecological impacts of changing grazing practices—especially the declining use of remote grazing reserves as pastoralists become less mobile (FERNÁNDEZ-GIMÉNEZ et al. 2018). There is evidence of a reduction in economic performance as a result of economic individualisation and fragmentation of cultural landscapes during the transformation of the economy.

Social resilience based on traditional pastoral communities tends to be lost. Traditional pastoral communities that have been sustainable for centuries have already eroded in the central part of Mongolia (CHULUUN et al. 2017). Environmental challenges, labour shortages, and a lack of government support threaten the future of mobile pastoralism in Mongolia. Younger pastoralists and those without enough livestock to sustain their livelihoods are increasingly migrating to urban centres to find other sources of income. There is already a preponderance

Because Mongolian herder families are having to give up their traditional nomadic way of life, tent cities are growing, especially on the edges of cities like Ulaanbaatar, Erdenet and Darkhan.



of older men and women and there is almost no future generation to continue herding practices. It should be noted here that the use of the terms 'herder' and 'herder household' is no longer completely accurate, as most households are pluriactive in how they earn their livelihoods (THRIFT 2015).

However, there are pastoralist households that despite dzud, pasture privatisation, degrading rangelands, and deteriorating water access, manage successfully and cope with shocks better than others. This raises the question of the reasons for their adaptability. There are survey-based studies that qualitatively examine the determinants of adaptive capacity (e.g. FERNÁNDEZ-GIMÉNEZ et al. 2018, FERNANDEZ-GIMENEZ et al. 2012, CHULUUN et al. 2017, THRIFT 2015). Findings from this research state, among other things, that households with a large livestock population recover faster from a disaster and that livestock mobility and storage of fodder and hay are the most important strategies to limit livestock losses. Knowledge sharing, access to information, linkage to social capital, and proactive herders' behaviour improve adaptive capacity. The main barriers to successful adaptation to weather shocks are low levels of mutual aid, knowledge deficits, and limited development and implementation of formal guidelines to regulate pasture use and management, as well as limited herder mobility. The increase in livestock numbers and limited mobility lead to overgrazing and degradation of pastures, especially near roads and villages. Mobile pastoralism, on the other hand, represents a highly resilient resource use strategy that involves continuous adaptation to environmental change and uncertainty through mobility patterns, diverse and extensive resource use,

and flexible social organisation (THRIFT 2015). This mobility is increasingly constrained by property rights over land and wild mining.

Conceptual framework

The ability to adapt has a decisive influence on the resilience of an economy. The fact that resilience to shocks is not a directly measurable variable makes it difficult to conduct quantitative research on resilience. However, households, firms, and countries are increasingly exposed to climatic, economic, and social risks. Resilience is therefore increasingly becoming a focus of scientific research. The concept of resilience is applied in various fields, such as ecology, psychology, and epidemiology, and increasingly in the social sciences and especially in the analysis of complex systems. This is particularly the case in developing countries, where agriculture, agroforestry, and fisheries are the livelihoods of many communities.

The use of the resilience concept in development research is relatively new and only recently has there been a comprehensive theoretical framework for defining and measuring resilience. One example is **the newly developed FAO Resilience Capacity Index (RCI)**, which is based in the first step on a factor analysis followed by structural equation modelling. Then probit models are estimated to test whether resilience has a positive impact on food security and improves the ability to recover from a shock. The Resilience Measurement Technical Working Group (RM-TWG), an expert group established in 2013 by FAO, IFPRI, and WFP (World Food Program), agreed upon an internationally accepted definition of resilience as the ability of negative stressors and shocks not to have long-last-

ing negative consequences for development. Thus, resilience is an outcome-based concept with a statement on or measurement of poverty, food security, and other welfare indicators. Resilience needs to be analysed in relation to the experience of specific shocks and associated risks. Unlike similar concepts, such as vulnerability, resilience focuses on long-term impacts on the outcome variable. Resilience explicitly requires the actor's ability to adapt and transform to offset the negative effects of shocks and stressors. In the scope of this study, we use the resilience index for measuring the food security of Mongolian households after a shock (*dzud*).

The Resilience Capacity Index (RCI) pioneered by Ciani and Romano (2011) combines direct and indirect measures of resilience to predict the development of food security. The aim of our research project, which is still in its initial stages, is to obtain information on the resilience of Mongolian herder households and their expected levels of food security with particular focus on the FAO's Resilience Capacity Index (RCI) and by using the Resilience Index Measurement Analysis (RIMA) approach (2016). Our study is based on a survey carried out in Mongolia from 2012–13 to 2014–15.

Materials and methods

Data

Household-level data, collected through face-to-face interviews, form the basis of this study. The survey covers selected households in western Mongolia in the three *Aimags* (provinces) of Govi-Altai, Zavkhan (Dzavhan), and Uvs (see **Figure 1**). The survey was conducted by DIW Berlin together with NSOM (National Statistical Office of Mongolia) (KRAEHNERT et al. 2017). A sample of 1,768 house-

Figure 1: Study area with Aimags Uvs, Zavkhan, Govi-Altai; Mongolia

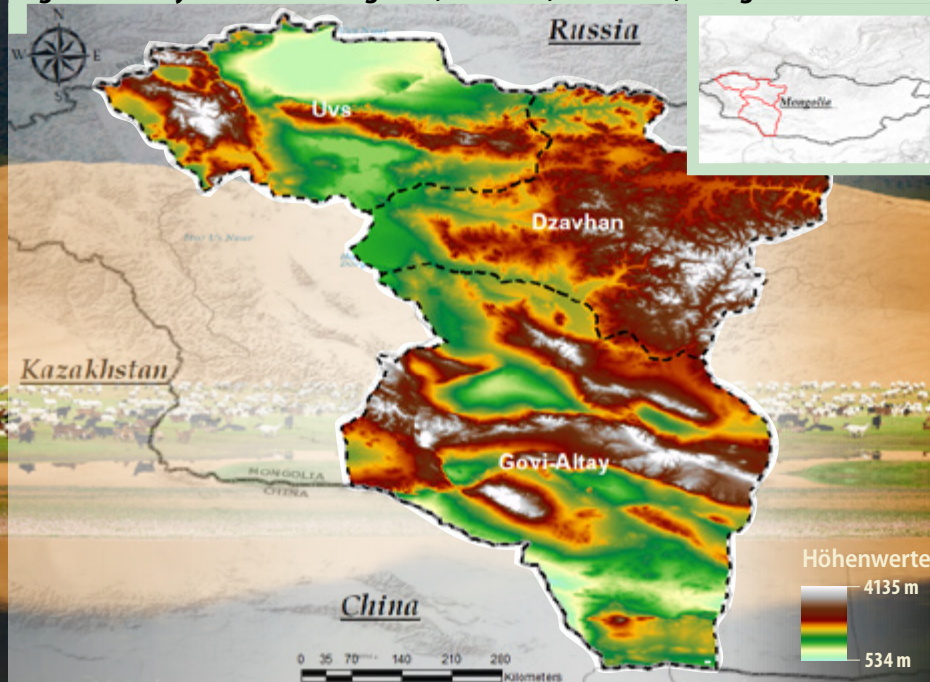


Table 1: The sample (number of household interviews)

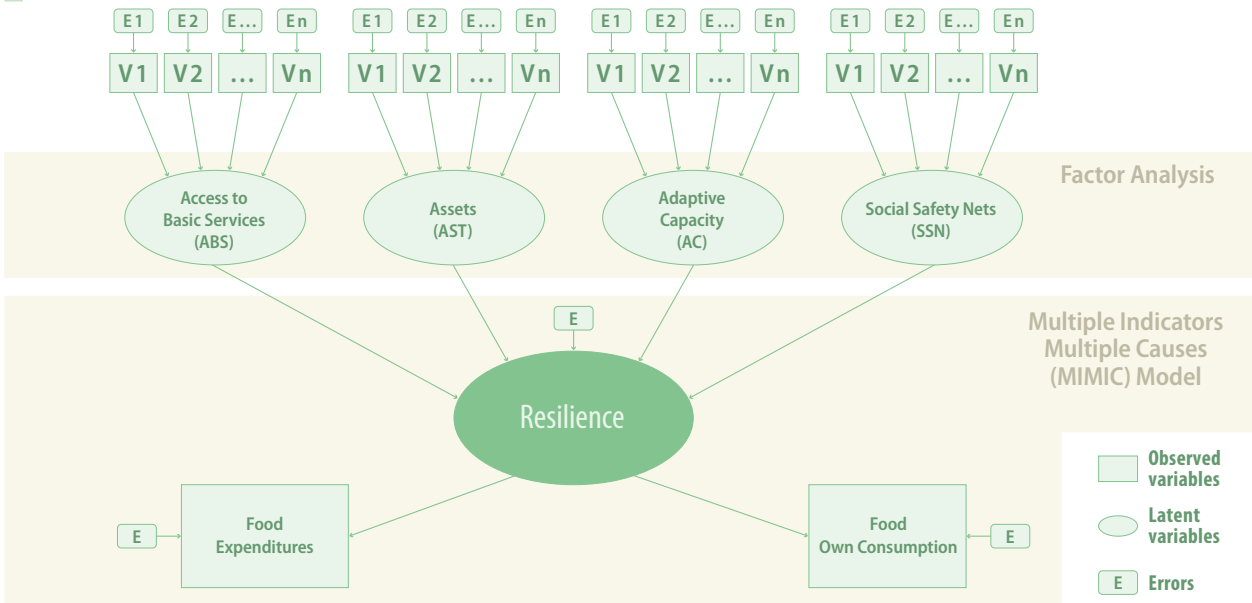
Provinces (Aimags)	Provincial capital	County town (Soums)	Rural area	total
Zavkhan	288	64	240	592
Govi-Altai	288	80	216	584
Uvs	296	80	216	592
total	872	224	672	1,768

Table 2: Descriptive analysis of the model variables for resilience estimation

Variable	Obs.	Mean	Std. Dev.	Min	Max
Female HH	1,768	0.11877	0.32361	0	1
Age of HH Head	1,768	44.15328	13.09612	11	87
HH Size	1,768	4.07296	1.52132	0	11
Dependency Ratio (Children ≤ 14 years + Senior ≥ 65 years)/HHMember 15–64 years	1,768	0.60829	0.61239	0	4
Farming Activity	1,767	0.18506	0.38846	0	1
Herding Activity	1,768	0.41459	0.49279	0	1
Dzud XP 2009	1,768	0.54808	0.49782	0	1
Highest Certificate of HH Head Master=1 ... Secondary=6 Basic=7 Primary=8 None=9	1,716	6.24767	1.88190	1	9
Total SFU SFU per type of animal is 5 SFU per camel, 7 SFU per horse, 6 SFU per cow or yak, and 0.9 SFU per goat	1,768	163.8	246.7	0	2484.4
Total Area of Land in ha	1,768	0.06468	0.44411	0	10



Figure 2: I) Creation of components (Access to Basic Services, Assets, Adaptive Capacity, Social Safety Nets) using factor analysis; II) MIMIC (SEM) modelling of resilience



holds were interviewed in western Mongolia. Interviews were conducted in provincial capitals (*Aimags*), district towns (*Soums*), and in rural areas (see **Table 1**). The survey lasted three years, from May 2012 to April 2015, and the data was collected in three waves. Each household has thus participated in surveys three times at intervals of exactly 12 months (KRAEHNERT et al. 2017).

Table 2 contains the descriptive analysis of the most important variables from the estimates. According to this, about 12 per cent of the household heads are women (Female HH). The average age of the household heads is

44 years old and a household consists of 4 members on average (Age of HH Head & HH Size). The dependency ratio is 0.6 or 60 per cent (the age-population ratio of those not in the labour force and those in the labour force). About 19 per cent of the households are engaged in arable farming with an average farmland of 0.06 hectares total area (Farming Activity) and 41 per cent are pastoralists (Herding Activity) with an average Sheep Forage Unit (SFU) of about 164 (Total SFU). Almost 55 per cent of the households experienced the 2009/2010 *dzud* (Dzud XP 2009).



Estimation of resilience

The two-step FAO-RIMA method was used to estimate the RCI (Resilience Capacity Index) at the household level (FAO 2016, **Figure 2**). In the first step, Factor Analysis was used to form components that explain to a very high degree the latent variable, resilience, which itself cannot be measured directly. These components can be summarised in four groups: Access to Basic Services (ABS), Assets (AST), Social Safety Nets (SSN), and Adaptive Capacity (AC). In our model, we additionally implemented the risk affinity of the household head, which potentially influences the household's adaptive capacity to shocks and thus individual resilience.

In the second step, a Multiple Indicators Multiple Causes (MIMIC) model was used. A MIMIC model explains the relationship between the components or observed variables and the latent variable (FAO 2016). We investigated the relationship between resilience and food security using a probit model. Food security, measured as food consumption, was extended in our study to include own-consumption of animal products.

Expected results

The expected results of this project, which was financed by The Volkswagen Foundation, are that certain factors contribute more to household resilience than others. In particular, Access to Basic Services is likely to play a prominent role. The demographic dependency ratio and education are also likely to be important determinants of Mongolian household resilience. Moreover, following the literature, diversity of income sources and herd composition are likely to promote resilience (e.g. CHULUUN et al. 2017, THRIFT 2015, FERNANDEZ-GIMENEZ et al. 2012).

The same is true for social safety nets. Moreover, strong household resilience is expected to reduce the loss of food security after a shock and accelerate recovery after a shock.

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Sources and credits

- Title** Blanket of snow over Mongolia. Satellite image from 9 January 2017. National border is marked. © NASA image by Jeff Schmaltz, using MODIS data from LANCE/EOSDIS Rapid Response
- In 2017, the year the data was collected, people in Mongolia had to battle an unusually cold and snowy winter for the second year in succession. The dimensions of such a dzud are shown by figures from 2009–10: then, 80 per cent of Mongolia was covered in knee-high snow. In Uvs aimag the extreme cold, which fell to -47°C at night, lasted almost 50 days. It is estimated that 4.5 million animals (around 10 per cent of the total livestock) died. (Sources: image description and Wikipedia)
- p. 37/43** Tent city on the edge of Ulaanbaatar, September 2018 © Taylor Weidman
- Fig. 1** Study area with Aimags Uvs, Zavkhan, Govi-Altai. Map © Shovkat Khodajev. Image in collage:
- p. 39** Sheep and horse herd at Khar Nuur lake, Aimag Zavkhan, Mongolia © Tuul and Bruno Morandi/Alamy Stock Photo
- Tab. 1** The sample (number of household interviews) © Own presentation according to survey data collection by DIW Berlin and NSOM
- Tab. 2** Descriptive analysis of the model variables for resilience estimation © Own calculation according to survey data collection by DIW Berlin and NSOM
- Fig. 2** Creation of components and MIMIC (SEM) modelling of resilience © Own presentation





Do Chinese vegetable farmers engage in mental budgeting for pest control?

Yangyi Zeng
Thomas Herzfeld

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Mental budgeting and its current application

In neoclassic economic theory, money is supposed to be fungible, which means money is substitutable for each category in terms of income or expenditure. However, through experiments about daily expenses, Thaler (1985) demonstrates that the assumption of fungibility is not supported, which led him to introduce the concept of mental accounting. A component of mental accounting, mental budgeting is aimed at simplifying the decision making processes into two perspectives, where rational trade-offs between competing uses of funds are easily identified and expenses are tracked as a result of self-control (THALER 1999). Unlike the assumption of classic rational choice, mental accounting theory holds that money is more fungible within a specific mental budget, but hardly to be fungible across different budgets.

Applying the concept of mental budgeting would have a profound impact on the understanding of farmers' decision making in allocating monetary resources for inputs. Furthermore, understanding how farmers mentally budget could lead to better predictions of the effects of agriculture policies and programs connected to monetary support or incentives. Our study is based on data collected using a field survey among 393 vegetable farmers in Sichuan, China, to better understand whether or not vegetable farmers show the existence of mental budgeting. As a first step, we analysed whether farmers assign agricultural inputs to different categories. Secondly,



Two students at Sichuan Agricultural University interview a farmer. Around 25 researchers took part in the study; in late 2018 they interviewed the target group in more than 50 villages.



a mental budgeting scale with respect to agricultural inputs and the corresponding categories was constructed using *Principal Component Analysis*.

The measurement of mental budgeting

Typicality of agricultural inputs

As a prerequisite of mental budgeting, it is assumed that a farmer would subdivide expenditure for agricultural inputs into different categories. A typicality refers to when similar inputs are grouped together. In the vegetable farmer survey, an identification method introduced by Heath and Soll (1996) was adapted, focusing on three categories of variable agricultural inputs: seeds, fertilisers, and pest control measures. These three kinds of inputs represent the main variable costs of vegetable production in China. Other possible items such as costs for infrastructure (e.g. irrigation infrastructure and post-harvest infrastructure), machinery, land rent, or labour are assumed to be fixed within one season.

Following the principles of categorisation (HENDERSON and PETERSON 1992), seeds, fertilisers, and pest control measures are assumed to represent easily distinguishable goods which may be categorised with minimal thought and effort due to prior experience. Obviously, it might be possible that some inputs have dual use, such as Bt cotton seeds, which could be classified as seeds and a pest control measure at the same time. In the literature, this is referred to as cross typicality. However, in our survey it was not seen as a problem among respondents. If farmers categorised a specific agricultural input into a certain category, the respective expenses for this input will be subsumed within this category.

More specifically, ten specific agricultural inputs were presented to farmers during the survey and they were asked to assign them to three predefined categories.

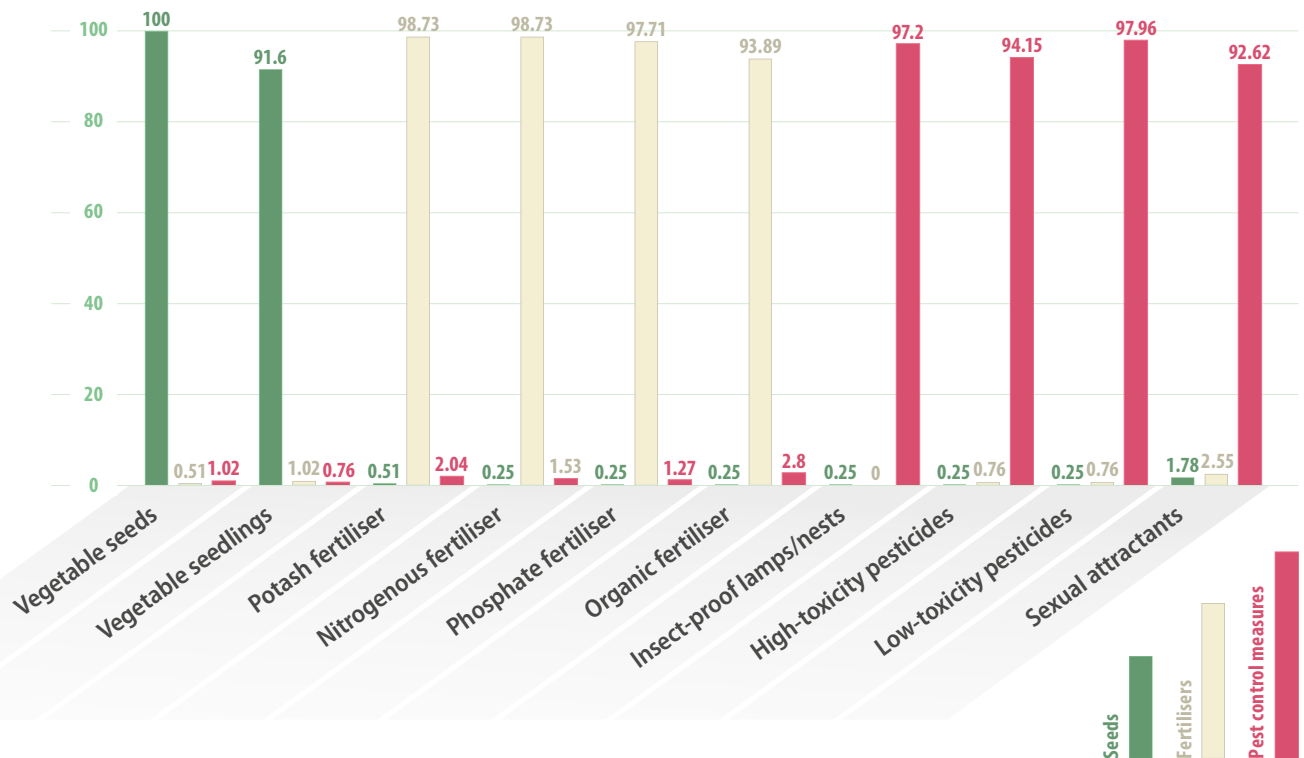
The ten inputs were:

- vegetable seeds
- vegetable seedlings
- potash fertiliser
- nitrogenous fertiliser
- phosphate fertiliser
- organic fertiliser
- insect-proof lamps and nets
- pesticides with a high toxicity
- pesticides with a low-toxicity
- sexual attractants as a biological pest control measure

The respondents were asked to assign values to all of the input items for each category to indicate which input belonged to which category. A five-item Likert Scale ranging from 1 (very typical) to 5 (very untypical) was used. When a respondent could not allocate an item to one of the three categories, an option of filling in an 'X' was offered, which can be interpreted as null for the typicality rating.

Figure 1 shows the results of the typicality questions for the selected agricultural inputs. It is worth noting that, as we were checking for cross typicality, the sum of the percentages could be higher than 100%. An overwhelming majority of responses fit our expectations: 393 (100%) and 360 (91.60%) farmers classified vegetable seeds and

Figure 1: Percentages of typicality for agricultural inputs



seedlings as seeds, respectively. Only five farmers classify these two inputs additionally as fertilisers and pest control measures. The number of farmers who group the four types of fertilisers (potash, nitrogen, phosphate, and organic fertiliser) into the category fertiliser are 388 (98.73%), 388 (98.73%), 384 (97.71%), and 369 (93.89%), respectively. In addition, few farmers feel insect proof-lamps/nets, pesticides, and sexual attractants are seeds and fertiliser, but, not surprisingly, pest control measures.

The exact numbers of each corresponding typicality rating term are 382 (97.20%), 370 (94.15%), 385 (97.96%), and 364 (92.62%), respectively. In sum, 299 farmers, i.e. 76.08% of the sample, categorise all agricultural input types according to professional practice. In addition, if only commonly used inputs are focused on (vegetable seeds, potash fertiliser, nitrogenous fertiliser, phosphate fertiliser, high-toxicity pesticides, and low-toxicity pesticides), 354 (90.08%) respondents categorise these items according



to conventional wisdom. More specifically, for the category of pest control measures, 362 (92.11%) show conventional typicality according to professional practice. There are various reasons for the very few cases of unexpected typicality. For instance, some farmers might be less familiar with some inputs, such as sexual attractants, and their classification might represent a lack of knowledge. It is also possible that some respondents simply made a mistake and do not know better. However, even studies among students resulted in very few cases of unexpected classification. For instance, in a study by Heath and Soll (1996), students were asked to report typicality for 'sports ticket', with only one student not showing typicality for this item within the category 'entertainment'. In addition, four students reported typicality for 'sweatshirt' in 'entertainment' instead of 'clothes', as the majority did.

Mental budgeting scale

The next step was to examine how flexibly farmers allocate money within and between these three categories, i.e. whether farmers engage in mental budgeting. In order to detect such a behaviour, scholars such as Antonides et al. (2011) and Homburg et al. (2010) propose the use of a mental budgeting scale. Such a scale is based on the aggregation of farmers' responses to a set of four Likert Scale questions (see **Figure 2**). Farmers were asked to indicate the extent to which they agree or disagree (from 1 (totally agree) to 5 (totally disagree)) with various statements. The first question was aimed at discovering whether a farmer creates a financial plan (total or disaggregated budget) for agricultural inputs in general. The second question strived to understand whether such budgets are fixed or not. The third question tried to understand

whether money is fungible within one budget category. Finally, the fourth question was geared at understanding whether money is fungible between the budget categories for agricultural inputs and other budgets. These four aspects form the core elements of determining the existence of mental budgeting among the farmers.

Figure 3 shows the percentages of views for each mental budgeting scale statement. Between 35 and 64% of respondents agree with the individual statements,

Figure 2:
Mental budgeting scale statements

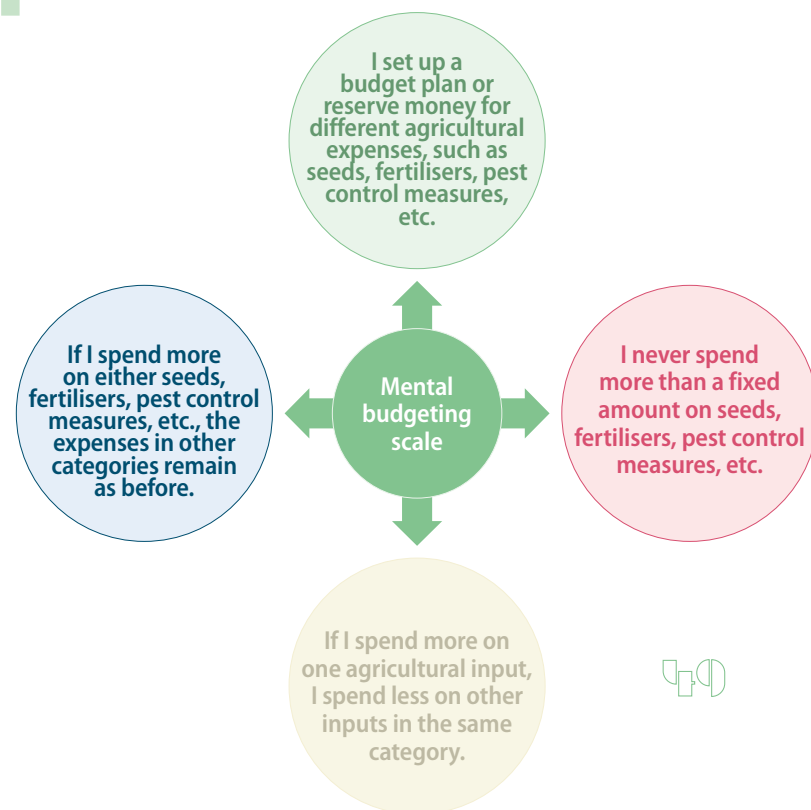


Figure 3: Views towards the mental budgeting scale statements

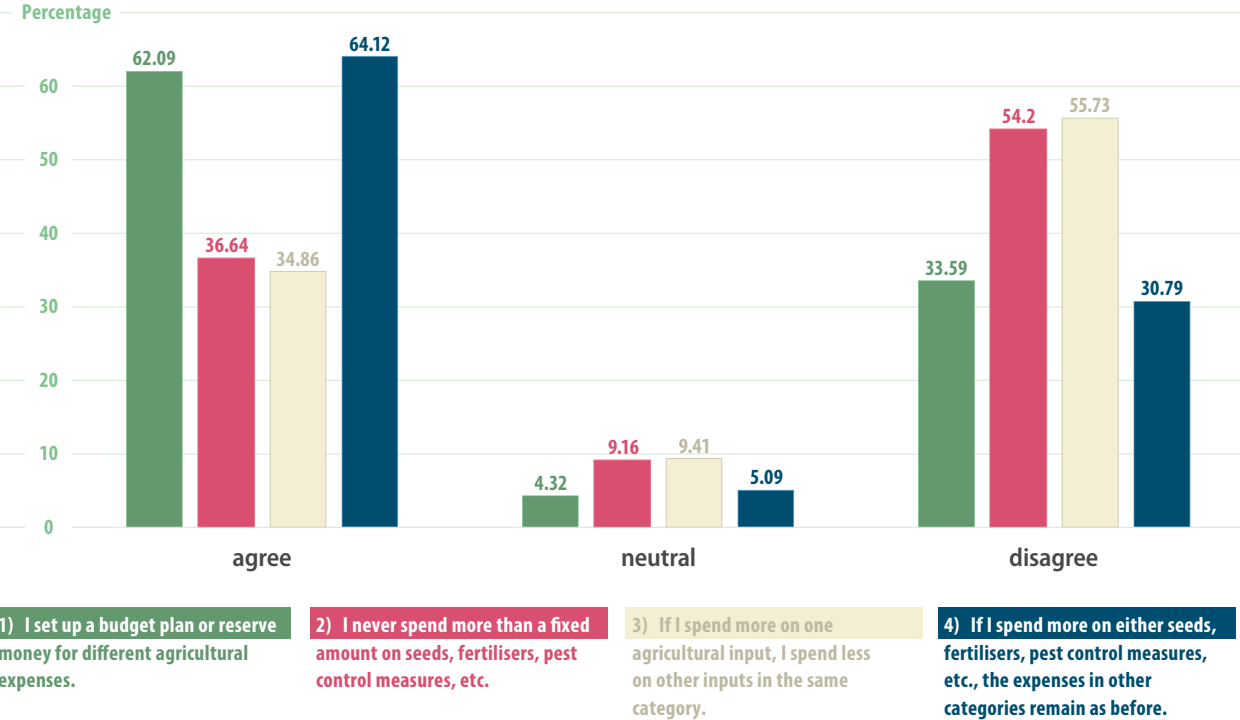


Figure 4: Summary of views towards all mental budgeting scale statements

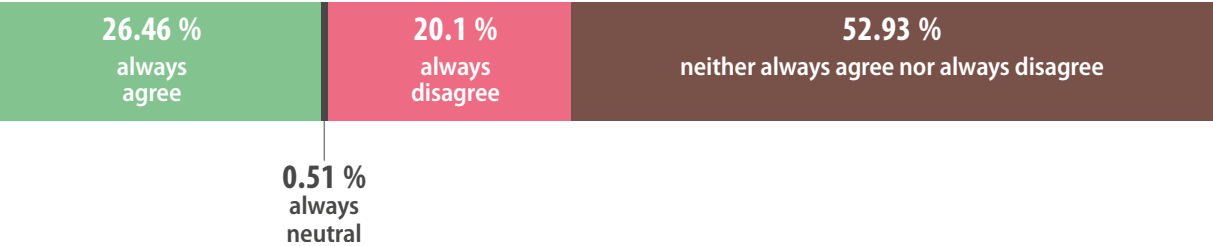
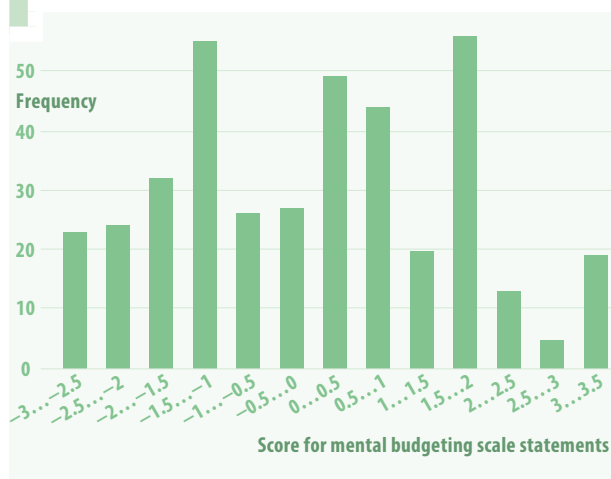


Figure 5: Frequency of scores for the mental budgeting scale statements



whereas between 30 and 56% of respondents show opposite views for such statements. The percentage of respondents who did not select agree nor disagree (neutral) for the four individual statements is less than 10%.

Based on the procedure suggested by the relevant literature, farmers who agree with all four statements and farmers who disagree with all four statements are grouped into two subsamples. Similarly, all farmers who provided a neutral answer for all four statements form a third group, while all remaining respondents are classified into a fourth group. **Figure 4** shows the resulting percentages of the four subgroups. For a subsample of 104 farmers (26.46%), we conclude that they utilise mental budgeting. Another 79 farmers, who responded 'disagree' or 'totally disagree' to all four statements, account for 20.10% of the sample. Only two farmers (0.51%) always

responded neutral to all statements. The last mixed subsample consists of 208 farmers (52.93%), which is the largest group.

An alternative approach would be to group farmers based on a statistical procedure called *Principal Component Analysis*, which means respondents who are more similar in their responses would be separated from farmers showing a more instable response pattern. *Principal Component Analysis* (PCA) results in a factor score which aggregates the responses to the four questions for each respondent. The frequency of the factor scores is shown in **Figure 5**. The factor score consists of a farmer's response to the four mental budgeting scale statements and ranges from 1 (totally agree) to 5 (totally disagree). Hence, a lower score implies that a farmer is more likely to apply mental budgeting for agricultural expenses. The PCA result shows that 187 farmers (47.58%) have a factor score below zero according to their mental budgeting scale statements. Thus, we conclude that these farmers show mental budgeting behaviour regarding agricultural expenses, which is higher than the share reported in **Figure 4**, but the subsample of 'others' is smaller, indicating that this statistical approach allows us to draw more information from the sample.

Insights of this study and implications for future studies

Our results indicate that the majority of the vegetable farmers surveyed categorise variable agricultural inputs into different groups. Mental budgeting is fully used by at least slightly more than one-quarter of the respondents or even up to close to half of the respondents according to the results of the *Principal Component Analysis*.

This result adds to the criticisms of the assumption of full fungibility in neoclassical theory.

These findings imply that specific subsidies to reduce pesticide use might rather result in a substitution among pesticides rather than an increased use of labour or other inputs. The methodology of this study aimed at understanding mental budgeting can be applied to other situations, such as comparing allocation of money between agricultural and non-agricultural categories or the use of agricultural and non-agricultural income. ■

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- Title** Farmers are harvesting the anti-season white radish in Meishan, Sichuan, China, 20th December 2020 ©TopPhoto/Alamy Live News
- Sichuan in south-west China is also called the ‘land of abundance’. The province is more than 485,000 square kilometres in size and is one of the most important agricultural regions. The sheltered position of the Sichuan Basin gives the region 350 frost-free days per year. Besides tea for export, rice is the main crop here, but they also grow wheat, rape and many varieties of vegetables. (Sources: IVA-Magazin and wikipedia.)
- p. 46** Two students at Sichuan Agricultural University interview a farmer. ©Yanghi Zeng
- Fig. 1** Percentages of typicality for agricultural inputs ©Own presentation
- Fig. 2** Mental budgeting scale statements ©Own presentation
- Fig. 3** Views towards the mental budgeting scale statements ©Own presentation
- Fig. 4** Summary of views towards all mental budgeting scale statements ©Own presentation
- Fig. 5** Frequency of scores for the mental budgeting scale statements ©Own presentation



Supermarket environments and nutrition outcomes in rural China

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Supermarket environments and nutrition outcomes in rural China

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Introduction

With growing incomes and accelerating urbanisation in developing countries, food consumption and nutrition have undergone profound changes, such as more demand for food quality and highly nutritious foods, as well as more diverse food products (REN et al. 2018). Chinese consumers are switching from traditional Chinese foods, which are largely characterised by grains and vegetables, to high-fat and high-sugar foods. As a result of this change in food consumption, like in many developing societies, the prevalence of overweight and obesity has become a serious threat to individual health and a major public health challenge in China. In the transitional economy of China especially, it has been reported that nearly 40% of adults in China aged 18–65 are estimated to be overweight (REN et al. 2019). At the same time, there is a large difference in the nutritional status between rural and urban areas in China. In rural compared to urban China, incomes are lower, while infrastructure and access to services, markets, and value chains are limited.

In addition to socio-demographics and socioeconomic factors, studies have increasingly revealed that a changing food environment plays a significant role in nutrition transition. Within various aspects of food environments, the establishment of supermarkets as one of the most important changes in food retailing contributes remarkably to the process of nutrition transition. In developing countries especially, a ‘supermarket revolution’ started in the early 1990s and continues to the present, which has driven the spread of modern supermarkets considerably. This trend is observable worldwide, and China is no exception. The number of supermarkets in China in 2016 reached 33,372, which is two times more than in 2004 (12,877), and the total sales of commodities in supermarkets accounted for roughly 3,067.2 (100 million CN¥) in 2016, up from 1527.4 (100 million CN¥) in 2004.

Despite the increasing number of supermarkets worldwide, the effects that supermarkets have on nutrition outcomes is still unclear. Results from the existing literature confirm that the food retail environment consistently affects people’s food choices and health, but with mixed results. Some argue that, as supermarkets usually offer more convenience foods than traditional free markets and shops, such modernisation of the retail sector could possibly contribute to negative nutrition outcomes, such as overweight and obesity (DEMMLER et al. 2018). However, other studies reveal no significant effect of shopping in supermarkets on the nutrition outcomes of Body Mass Indexes (BMIs) and overweight in Indonesia (Umberger et al. 2015), or even a negative effect on the prevalence of obesity and overweight (MORLAND et al. 2006). To the best of our knowledge, there is no specific study addressing

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Figure 1: Supermarket development in China, 2004–2019



this issue in China; therefore, we attempt to close this research gap by investigating the effects of supermarket environments on nutrition outcomes.

Available studies on the nutrition effects of supermarkets exclusively focus on the issues of overnutrition but less attention is paid to malnutrition. Supermarkets provide plenty of processed foods with high calories, which are known as the main contributors to overweight and obesity (LAW et al. 2019). However, in some developing countries or for some low-income households, supermarkets play a significant role in ensuring food security. In the transitional economy of China, there are still approximately

150.8 million people malnourished, though overnutrition such as overweight and obesity has become a major public health issue. The nutrition effect of supermarkets might, therefore, be varying. We seek to understand the heterogeneous effects of the supermarket environment on being underweight, overweight, or obese using a multinomial logit regression for panel data.

Different from previous studies, this study contributes to the literature from the following three main aspects:

First, heterogeneous nutrition effects of supermarkets are investigated using a multinomial logit model for underweight, overweight, and obesity. Second, three aspects of supermarket environments are analysed, including supermarket accessibility, availability, and food variety in the supermarket. Third, we analyse the heterogeneity of the results by gender. Finally, we shed light on the mechanisms through which supermarket environments impact nutrition outcomes in rural China, considering indicators measuring nutritional intakes and dietary quality. Our focus is on rural China rather than all of China due to the large differences in nutritional status between residents in urban and rural China, which is

linked to disparities in income and infrastructure. Residents in rural areas are more likely to experience various nutrition outcomes during the process of the supermarket revolution.

Estimation method

To investigate how supermarkets' accessibility, availability, and food variety could affect individuals' nutritional outcomes, we estimated a Multinomial Logistic regression for panel data. The dependent variable of nutrition outcome consisted of four categories: normal weight (reference), underweight, overweight, and obese. The main independent variables of concern included supermarket accessibility, supermarket availability, and food variety in the supermarket, which were introduced separately into the estimation. We also controlled for individual socio-demographic variables, behavioural characteristics, household fixed effects, and community and province fixed effects.

Since our data has a panel structure, we applied a pseudo-fixed-effects (Mundlak) estimator as an additional comparison to Random Effect estimates. The main advantage of the Mundlak (MK) estimator is that it can control for biases that may arise from individual heterogeneity and omitted time-varying variables by including covariate mean values as additional explanatory variables in the estimation. In this way, the individual heterogeneity can be addressed with the MK estimator if the joint significance test of the mean value of all time-varying covariates are statistically significant.

Beyond individual heterogeneity, other omitted variables that simultaneously affect both individuals' nutrition outcomes and the supermarket environment still exist, which

casts doubt on the potential endogeneity problem of the supermarket environment. For instance, some omitted county characteristics or eating habits that can hardly be controlled for in empirical estimations could both affect individuals' nutrition outcomes and the supermarket environment. In addition, individuals' nutrition demands could also stimulate retailers' decisions on supermarket allocation and food variety in the supermarket. To cope with the potential endogeneity due to other unobservables and the reverse causality between individual nutrition outcomes and the supermarket environment, a Control Function approach was applied.

Sample and data

The data used in this study was from the **China Health and Nutrition Survey (CHNS)**, which, in its current form, covers the period of 1989 to 2011. The CHNS applies a multistage and random cluster process to draw a sample of roughly 4,400 households with a total of approximately 26,000 individuals. For the analysis of this article, we applied three restrictions to the CHNS dataset. First, as the CHNS survey includes information on the supermarket environment from 2004 onwards only, our analysis used data for the waves from 2004 to 2011 only. Second, we restricted the sample to adults living in rural areas, and considered those adults aged 18 and above at the time of the survey. Third, given specific BMI measurements for children, pregnant women, and adults suffering from chronic diseases, these individuals were excluded as not to confound BMI effects. In addition, we also excluded those individuals who migrate from the household or are not living in the household, as their food consumption can hardly be affected by the food

Table 1: Descriptive statistics of nutrition outcomes for rural residents				
Variables	Definition	Mean	S.D.	
BMI	Body Mass Index (kg/m ²)	23.245	3.563	
Normal weight	1 if BMI ≥ 18,5 and BMI <24; 0 otherwise (reference)	0.569	0.495	
Underweight	2 if BMI ≤ 18,5; 0 otherwise	0.057	0.233	
Overweight	3 if BMI ≥ 24 and BMI <28; 0 otherwise	0.285	0.452	
Obesity	4 if BMI ≥ 28; 0 otherwise	0.088	0.284	

environment in the regions where their households are located. Finally, 8,686 individuals amounting to 18,504 observations were kept for the main outcome variables. The main dependent variable of this study was nutrition outcome from food consumption. The CHNS includes measures of height and weight, which were used to calculate BMI. Nutrition outcomes were defined via four categories according to adults' BMI: underweight (BMI < 18.5), normal weight (18.5 ≤ BMI < 24), overweight (24 ≤ BMI < 28), and obese (BMI ≥ 28). As shown in **Table 1**, the average BMI is 23.25. Approximately 5.7% of rural residents are underweight, and 28.5% and 8.8% of rural residents are overweight or obese, respectively. **Figure 2** shows the trend of BMI from 2004 to 2011, which indicates an increasing tendency, and it tends to increase slowly between 2006 and 2009 but presents a steep rise between 2009 and 2011. A similar pattern can also be found for overweight and obesity, as shown in **Figure 2**. The to-

tal prevalence of overweight and obesity increased from 33% in 2004 to 43% in 2011, representing an increase of approximately 10%. **Figure 2** also suggests that gender differences in BMI and being overweight tend to disappear over time, and females were more likely to have higher BMIs and be obese in 2011. We also observe a decreasing trend of individuals being underweight across the surveyed years; after 2009 there was an especially enormous decline. To investigate the effect of supermarket environments on nutrition outcomes, we used three dimensions: supermarket availability (whether there is an accessible supermarket in the neighbourhood or not), supermarket accessibility (distance to the nearest supermarket), and food variety in the supermarket. We aggregated the total types of fresh fruits and vegetables available to proxy food variety in the supermarket. The descriptive statistics of supermarket availability, accessibility, and food variety

Figure 2: The trend of nutrition outcomes across the survey years, 2004–2011



are shown in **Table 1**. Approximately 45.8% of individuals considered in our sample live in regions with supermarkets. The average distance to reach a supermarket is roughly 7.16 km. The food variety in the supermarket shows, on average, that more than 44 kinds of vegetables and fruits are provided in the nearest supermarket in each community.

Regarding the mechanism through which a supermarket environment may influence nutrition outcomes, indicators to measure nutritional intakes and dietary quality

were constructed. Specifically, to measure the nutritional intakes, information provided by the CHNS on food consumption for three consecutive days was paired with information on the nutritional contents of these food items that was provided by the 2002 Chinese Food Nutrition Table. Total calories (kcal) consumed at the individual level was calculated to measure the nutritional intakes. The **Chinese Healthy Eating Index (CHEI)** was used to check how supermarket environments affect dietary quality in rural China.

Conclusion and discussion

Worldwide, the supermarket revolution has played a more and more significant role in nutritional transition and public health outcomes. According to our panel estimations' results, we find that there are no significant effects of supermarket availability and accessibility on nutrition outcomes. However, our results support that food variety has a significant and negative effect on the risk of being malnourished (underweight) and overnourished (overweight and obese), suggesting that nutrition-related health issues could be reduced by increasing food variety in supermarkets in rural China. To further investigate the mechanisms through which food variety influences nutrition outcomes, the total calorie intake was estimated to examine how food variety affects nutritional intakes. Furthermore, the Chinese Healthy Eating Index, as a measurement for food quality, was evaluated to detect the impact of food variety on dietary quality. Our findings suggest that food variety in the supermarket has a significant and negative impact on total calorie intake, but a positive impact on food quality measured with the CHEI. Policies targeted at efficiently improving nutrition outcomes in rural China might, therefore, be more effective if their focus is on food variety in the supermarket instead of emphasising supermarket accessibility and availability. To promote food variety in the supermarket, a combination of measures that promote changes in the supply and demand of food products is suggested. In particular, laws and policies that promote the sale of more healthy foods—such as fruits and vegetables—and limit access to unhealthy foods are crucial for addressing overweight and promoting dietary quality (DEMMLER et al. 2018). On the

supply side, supermarkets need to have financing and tax incentives to provide more healthy food offerings. Possible measures for achieving healthier food offerings in supermarkets include, for example, property tax exemptions and financing programs that provide loans not only to supermarkets, but also to grocery stores, farmers markets, and other food stores to cover the costs associated with offering healthier foods. This could include costs such as refurbishing storage facilities and refrigeration equipment for fresh products, as well as subsidies for healthier foods. Moreover, transportation infrastructure for supplying supermarkets with healthy food products could also be improved. On the demand side, local governments might deter unhealthy food choices through taxing unhealthy food and beverages, such as sugar-sweetened beverages, and promote healthy food choices through increasing awareness by focusing on nutrition education and guidelines and their marketing. On the consumer side, better knowledge of basic nutrition principles as well as a better expertise in reading labels have significant effects on consumers' food choices and nutrition related issues. Dietary education programs can be an attractive practice to prevent overweightness and obesity, given that food availability is tending to increase in rural China, especially when the government aims to increase the poor's food purchasing power by providing financial assistance, such as the Food Stamp Program in the US.

The limitations of this study are related to the data. The CHNS only includes information regarding the number of accessible supermarkets in the community rather than information on actual purchases made in the supermarket,

which might have more meaningful policy implications. To better understand the role of supermarkets in studying nutrition-related issues, future studies might include field surveys to capture the percentage of household food purchased in supermarkets and consider applying Random Control Trials (RCT) to investigate the impact of supermarket environments on adult health from the perspective of behavioural economics.

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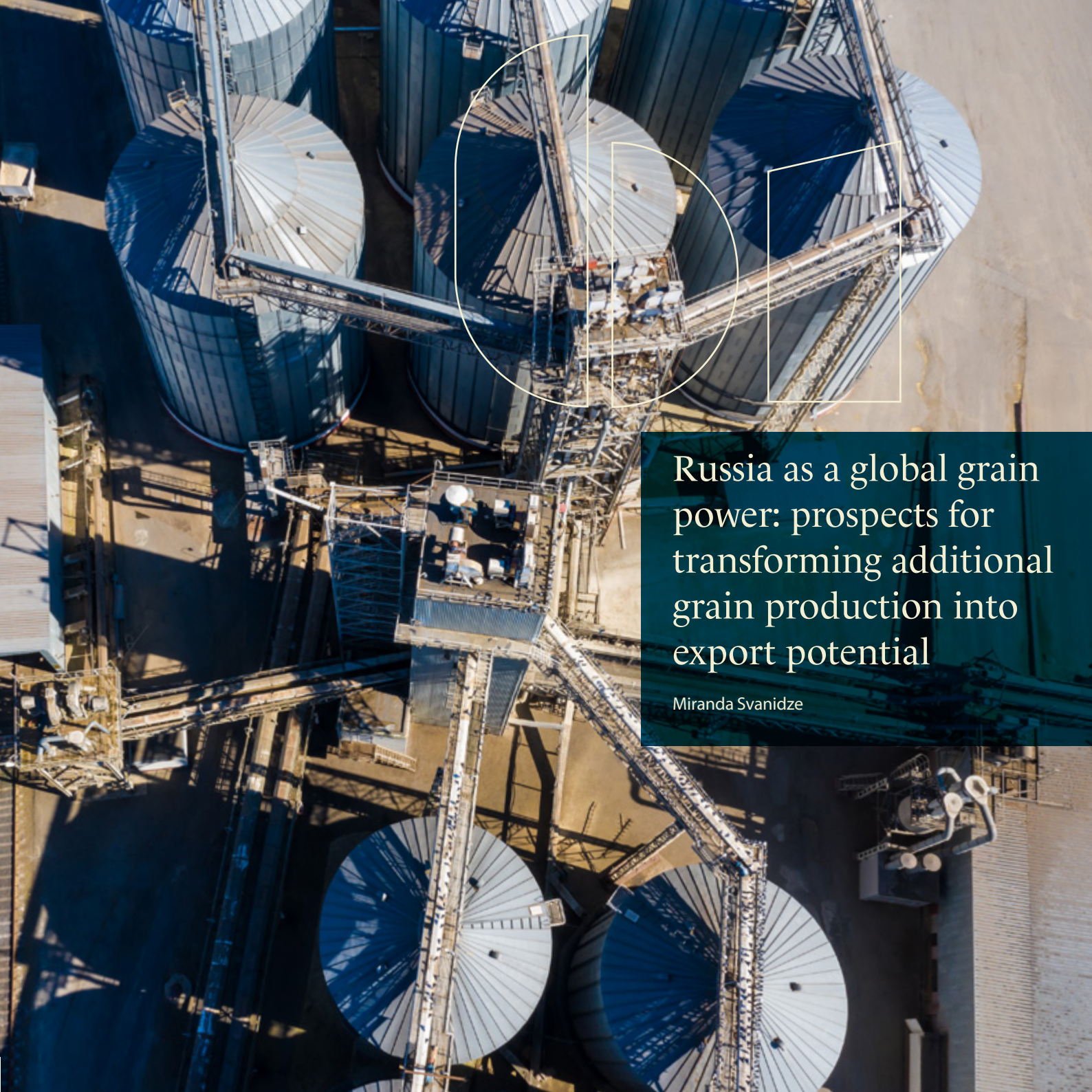
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Sources and credits

- Title** A supermarket with imported goods in Nanchang, Jiangxi, China, 2012 ©Yongnian Gui | Dreamstime.com
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- Tab. 1** Descriptive statistics of nutrition outcomes for rural residents ©Authors' own calculations based on the CHNS data from 2004 to 2011
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Russia as a global grain power: prospects for transforming additional grain production into export potential

Miranda Svanidze

Russia as a global grain power: prospects for transforming additional grain production into export potential

Miranda Svanidze

The emergence of Russia as the largest wheat exporting country

Global population, and accordingly global food demand, are expected to increase in the coming decades. The world's population is estimated to grow to almost 10 billion by 2050. Nearly 60% of this growth in population is predicted to be concentrated in the countries of Sub-Saharan Africa and South-Eastern Asia, holding these regions accountable for the increase in total wheat consumption between 2020 and 2029. High amounts of wheat are consumed in Sub-Saharan African and South-East Asian countries, but at the same time these countries have little prospects of satisfying additional domestic demand by increasing their own grain production. In particular, OECD/FAO (2020) predicts that between 2020 and 2029, net wheat imports will increase by about 10 and 14 million tonnes in Africa and Asia, respectively.

In contrast, the importance of Russia—the major grain exporting country of the Black Sea region—in the global wheat trade, and therefore in global food security, is expected to increase in the future (BOKUSHEVA and HOCKMANN 2006). Grain production in Russia can be increased by improving grain production efficiency and also by re-cultivating formerly abandoned agricultural land (SWINNEN et al. 2017). Further, in consideration of declining population forecasts for Russia, domestic grain consumption is foreseen to remain stable, hypothetically qualifying additionally produced grain for international exports. As African

and Asian countries are located in close vicinity to Russia compared to other grain exporting countries, it is also highly likely that, in the future, these countries will rely on grain imported from Russia. Hence, increased grain production in Russia is crucial for meeting increasing agricultural demands and global food security.

Historically, Russia has not been a grain exporting country; rather quite the opposite. However, it has become an increasingly significant player on global wheat markets over the past two decades. Since the dissolution of the Soviet Union in 1991, these post-soviet countries began transforming from centrally planned to market economies. This change in market structure has been accompanied by increased wheat production and consequently higher exports to the world market, especially since the early 2000s. Between 2000 and 2019, Russia increased its wheat production from 35 to 73.6 million tonnes and wheat exports from 0.7 to 34.5 million tonnes. Since 2017, Russia has been the largest wheat exporter to the world market, even though it is the fourth largest wheat producer in the world after the European Union, China, and India. Specifically, Russian wheat exports amounted to 21% and 18% of global wheat exports in 2018 and 2019, totalling 36 and 34 million tonnes of wheat exports, respectively. **(Figure 1)**

Russia is a key supplier of wheat to Turkey, Egypt, and other MENA (Middle East and North Africa) countries. In recent years, however, Russia has significantly increased its wheat exports to countries located far away from the Black Sea basin. Thanks to bumper crops in the last five years and generally lower wheat production costs in Russia compared to other exporting countries such as the US,



Canada, EU, and Australia, Russian wheat became highly competitive on the world market, leading to increased wheat supplies to markets in Sub-Saharan Africa and South-Eastern Asia (**Figure 2**). During the last decade, the share of these countries in Russia's total wheat exports has substantially increased, from 6% in 2009 to 19% in 2019 (the share was the highest in 2018 at 29%), corresponding to an increase in wheat exports by 5 million tonnes during this period (11.5 million tonnes for 2018).

Spatial patterns of wheat production in Russia

In spite of the generally increasing trend in wheat production, and consequently in wheat exports, the level of production is not stable in Russia. Weather conditions strongly influence grain production in Russia, resulting in large temporary variations across regions and years. For instance, total wheat production significantly decreased to 41.6 and 37.8 million tonnes in 2010 and 2012, respectively, when a critical drought hit wheat-producing regions in Russia, whereas in 2017 a record-high volume of wheat, 85.2 million tonnes, was produced.

Figure 1: World wheat exports, 2011–2019

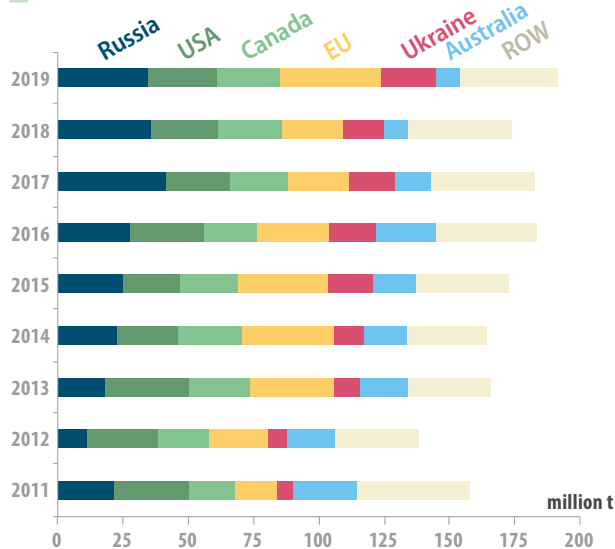
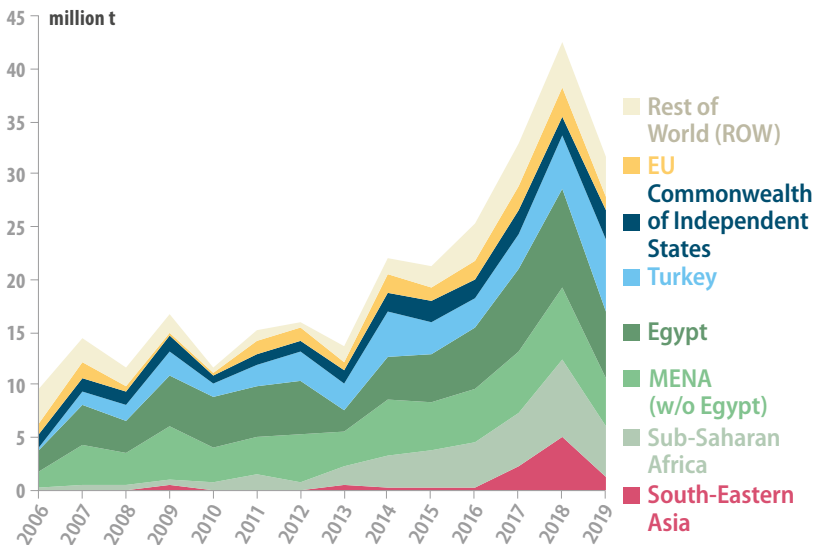


Figure 2: Wheat exports from Russia, 2006–2019



Note Figure 1: Marketing years (July–June) are shown on the y-axis. Figure 2: Calendar years (January–December) are given on the x-axis.

Figure 3: Wheat yields and harvested area in Russia, 2014–2019

(a) average wheat yields (tonnes/ha)



(b) average wheat area (million ha)



Wheat production is spread across large geographic areas in Russia, characterised by high variations in wheat yields and harvested area across the regions. Wheat yields, as well as harvested area, are the highest in the highly fertile black soil areas of southern European Russia, which have high precipitation and use of fertilisers, varying between 3 and 6 tonnes/ha (**Figure 3**). In Altai Krai in West Siberia yields are particularly low, varying between 1 and 2 tonnes/ha, although the harvested wheat area there is one of the highest as this region has plenty of fertile black soil (**Figure 3**). The main reasons for low yields are the low application of fertilisers and herbicides and a lack of ideal farm management practices, particularly among small-scale farmers (PRISHCHEPOV et al. 2019).

In Russia, North Caucasus, the primary production region in southern European Russia, almost exclusively supplies wheat to the world market, while its role in Russia's domestic trade is rather limited. North Caucasus accounts for almost 50% of Russia's total wheat production and 80% of total wheat exports. In contrast, Ural and West Siberia, which are located in the Asian part of Russia, are far away not only from the world market, with the distance to the Black Sea ports amounting to 5,000 kilometres, but also Russia's grain consumption regions. In particular, Moscow is about 2,000–3,000 kilometres away. West Siberia, which is the second largest grain producing region, exports only 1–5% of its total wheat production to the world markets. Wheat produced in West Siberia is mainly consumed within the region or delivered to the neighbouring region of Ural.

Though grain transportation tariffs are generally low in Russia (AEGIC 2016), overall transport costs are high, largely

due to inadequate and outdated transport infrastructure and logistics, which negatively influence regional wheat trade volumes within Russia (SVANIDZE and GÖTZ 2019b). In addition to high transport costs, grain markets in Russia are also characterised by high business and market risk. Trade costs are especially high due to the difficulty of enforcing contracts and unforeseen policy interventions for the grain markets, for example the 2007–08 grain export tax in; the 2010–11 grain export ban; the 2015 grain export duty; and the 2020 grain export quotas.

The spatial efficiency of wheat markets in Russia

Russia bears large additional grain production potential, especially in its remote regions (SWINNEN et al. 2017). However, the additional wheat production potential not only has to be mobilised, but it also has to be transformed into additional export potential to further increase Russia's importance for global wheat exports, as well as global food security. This requires a spatially efficient domestic grain market, ensuring comprehensive and quick transmission of price changes from the grain exporting to the grain producing regions. In fact, spatial market efficiency is low in Russia, mainly explained by the negative influence of distance and high trade costs on the degree of market integration (SVANIDZE and GÖTZ 2019a). Specifically, transaction costs are the highest for the distant grain markets of Ural and West Siberia, which bear large additional grain production potential. However, under the current market conditions of a weakly integrated wheat market and high trade costs, the additional wheat production potential in Ural and West Siberia cannot be transformed into additional export potential.

In Russia, the physical trade of wheat mainly fosters market integration and the spatial efficiency of wheat markets, whereas information flows play a rather minor role for the integration of the Russian grain market (SVANIDZE and GÖTZ 2019a) due to the unstable market environment and the rudimentary development of futures markets, a lack of futures trading skills, and low levels of trust among financial market participants. For comparison, the spatial market efficiency of grain markets is high in the USA, where large information flows are induced by the heavy engagement of farmers and traders in commodity futures exchanges.

Policy implications for increasing Russia's grain export potential

The United Nations has widely recognised the role international trade can play in achieving the Sustainable Development Goals. Under Goal 2 'Zero Hunger', which aims to end hunger, achieve food security and improved nutrition, and promote sustainable agriculture, the UN's Agenda 2030 aims to 'correct and prevent trade restrictions and distortions in world agricultural markets' and 'adopt measures to ensure the proper functioning of food commodity markets' (p. 16). Therefore, the spatial efficiency of agricultural markets can affect the status of global food security.

In particular, the performance of domestic grain markets in Russia, the largest grain exporting country in the world, can determine the extent to which additional grain production potential is transformed into export potential, having further implications for grain availability on the world market and, hence, future global food security. At the same time, the realisation of Russia's export capacity

largely depends on the performance of its regional grain markets domestically.

The enhancement of the efficiency of Russia's wheat market would ensure the faster transmission of price signals between regions, inducing concomitant flows of trade from surplus to deficit regions.

For this, first, substantial investments in the grain market and transportation infrastructure are required to improve the integration of domestic markets, especially with the export region. Nonetheless, the development of trade infrastructure is not sufficient for improving Russian wheat market efficiency since, until now, commodity futures markets are only rudimentarily developed within the country, although they represent an essential aspect of efficiently functioning markets. Without upgraded market information services and the development of the commodity futures markets, the spatial market efficiency of grain markets in Russia cannot be improved to a level similar to the corn market of the USA. Strengthened integration of domestic wheat markets in Russia and increased price stability would reduce incentives for the government to implement export controls on the wheat market as a crisis management policy. Moreover, to foster global food security, it is not enough to focus on raising agricultural production potential, e.g. by technological progress in plant breeding and agronomic practices, but also explicitly boosting agricultural export potential by





enhancing spatial market efficiency in the agricultural sector is important.

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Fig. 2 Wheat exports from Russia, 2006–2019 ©Own presentation. Data: UN-Comtrade (2020), author's elaboration

Fig. 3 Wheat yields and harvested area in Russia, 2014–2019, (a) average wheat yields (tonnes/ha), (b) average wheat area (million ha) ©Rosstat (2019), author's elaboration

p. 67 Image collage wheat ears, photo ©Renata Suleymanova, CC BY 4.0



An aerial photograph showing a green harvester with a yellow auger unloading a stream of green biomass into a green trailer. The harvester is positioned on the right, and the trailer is on the left. The ground is dark brown soil with deep tire tracks. In the background, there is a field of tall green crops. The letters 'GBO' are overlaid in large, white, outlined font at the top of the image.

GBO

Can the
growing demand
for non-food bio-
mass benefit smaller
farms in Germany?

Lanjiao Wen
Lioudmila Chatalova

Can the growing demand for non-food biomass benefit smaller farms in Germany?

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Introduction

The success of an industrial bioeconomy requires not only continuing advances in technologies, but also a sufficient and reliable supply of renewable biomass (EC 2018). This challenges the main producers of biomass, including the agricultural sector (HERTEL et al. 2013). Especially in industrial countries with limited arable land, such as Germany, large-scale production of agricultural non-food biomass can accelerate the pace of structural change. Between 2005 and 2019, the number of farms in Germany decreased by 32 per cent, while the average farm size grew at almost the same rate (EUROSTAT 2020). However, the pace of the farm number decline has been slowing down (LAND-ATLAS 2018). This is mainly due to diseconomies of scale in large agricultural enterprises in eastern Germany, which prompted the emergence of spin-off companies, leading to a statistical increase in the number of smaller farms (JOCHEN 2016).

Diseconomies of scale in large farms indicate the limited cost reduction potential in competitive industrial agriculture, suggesting that reducing transaction costs will become increasingly relevant for optimising production decisions. Smaller farms can better economise on certain transaction costs, benefitting from their higher flexibility and lower supervision costs, local infrastructural advantages, or better access to some factor markets (VILLORIA 2017). They also can potentially benefit from a growing demand for non-fossil resources and vertical integration



Whereas maize silage is grown partly for generating energy in biogas plants...



...industrial sugar and glucose syrup from sugar beet, straw or bagasse are used as the raw materials for the production of bio-isobutene.

in the bioeconomy (SCARLAT et al. 2016). In fact, some German regions, in which (bio)economic activities tend to cluster around the chemical industry, hold potential to become large demanders of plant-based biomass for material and energy applications. This might support biotech start-ups and create new jobs in the agricultural sector and processing industries (BUDZINSKI et al. 2017). Nonetheless, the capacity of the agricultural and other sectors to create room for new and smaller agricultural producers remains debatable. Besides, imperfect factor markets or other conditions may offset the advantages of the lower supervision costs of smaller farms.

Against this background, this study developed a stylised model with two scenarios to anticipate the optimal farm size and the resulting prospects for smaller producers in Germany from 2017 to 2030. **The first scenario** was the adoption of neutral-to-scale technologies and the second one was the growing demand for plant-based biomass. **The second scenario** was further divided into two subcases to address the total and farm type specific implications of non-food biomass production. Methodologically, the study focused on the combined effect of transaction costs and economies of scale on optimal production decisions. From this novel perspective, the study sought to contribute to the debate on agricultural structural change and transaction costs.

Data and methodological approach

The analysis used secondary data from 2005 to 2016 which were collected from the European Statistical Office (Eurostat), statistics from the Federal Ministry of Food and Agriculture, and the Land Market Report (ACCESS TO LAND 2013). Based on these data, the average per hectare

Table 1: Overview of scenarios and their basic assumptions

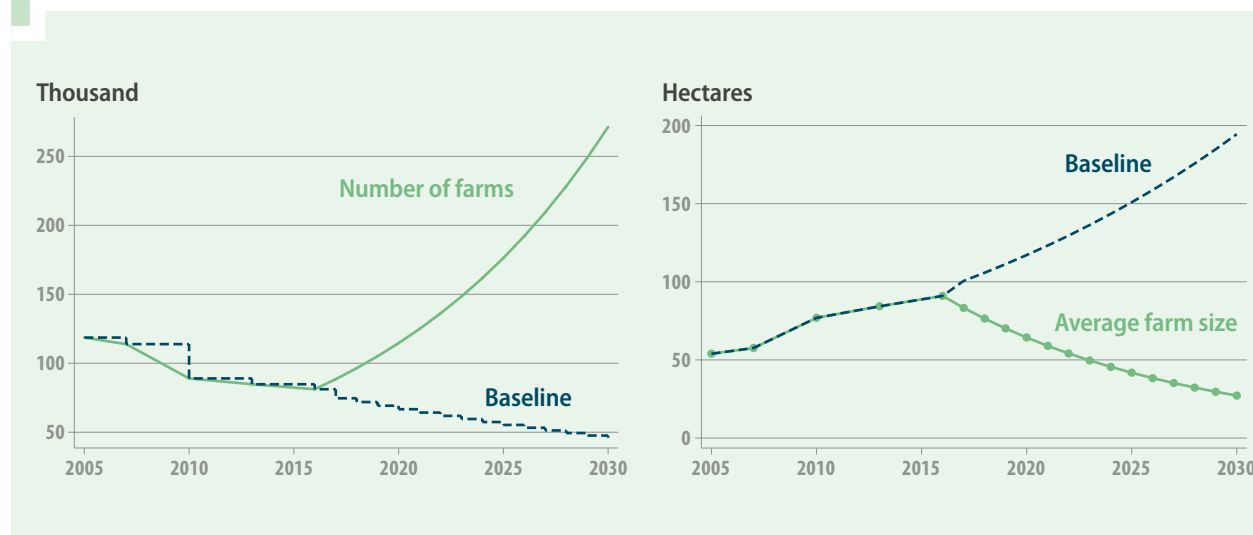
Scenarios and assumptions	Estimated production functions	Adjusted production functions
Scenario 1: Neutral-to-scale technologies <ul style="list-style-type: none"> • Annual increase in factor productivity by 1% • Constant profit rate and output price • Hicks-neutral technology 	$Y = -2.77L^{0.50}S^{0.56}$	$Y = -2.45L^{0.67}S^{0.49}$
Scenario 2: Higher demand for non-food biomass <ul style="list-style-type: none"> • Annual increase in demand by 2% • Constant profit rate and product price • Constant factor productivity/technology 		
2a: Average sectoral effects	$Y = -2.77L^{0.50}S^{0.56}$	$Y = -2.45L^{0.67}S^{0.49}$
2b: Effects for farm size groups		
Group 1: <10 ha	$Y = -3.47L^{0.53}S^{0.54}$	$Y = -8.41L^{1.35}$
Group 2: 10 ha–50 ha	$Y = 4.54L^{-0.99}S^{2.13}$	$Y = 21.49L^{-4.36}S^{5.36}$
Group 3: 50 ha–100 ha	$Y = 2.98L^{-0.89}S^{2.12}$	$Y = S^{1.49}$
Group 4: 100 ha–200 ha	$Y = L^{-0.35}S^{1.7}$	$Y = L^{-0.33}S^{1.64}$
Group 5: >200 ha	$Y = S^{1.07}$	$Y = S^{0.81}$

Note: Z-stats for $\alpha(\ln_labour)$ in scenario 2(b) are 1.05, 2.17**, –1.11, –0.61, 2.27**; Z-stats für $\beta(\ln_land)$ in 2(b) are 0.29, 3.12***, 2.07**, 2.15**, –1.88*; Z-stats for *constant* in 2(b) are 0.96, 0.3, –0.31, 0.58, 3.23***.

farmland price was set at €8,000 (with an annual increase by 9.1%) and the average industrial agriculture wage at €3,000 per person per month. Land and labour reflected the amount of arable land and labour units involved in non-food biomass production. The output was measured in its monetary value. Using the panel data for 13 federal states (that is, excluding three city states) for five years (2005, 2007, 2010, 2013, and 2016), the production function was estimated for each scenario (see **Table 1**).

Data Envelopment Analysis (DEA) was used to estimate the efficiency of economic performance (ϵ) and transaction costs as inefficiency ($1-\epsilon$). The transaction costs of biomass production were given by the distance of the equilibrium state to the best-practice frontier, where the benchmark output under variable returns to scale was interpolated from annual output levels of German farms. The evaluation index system included input indexes (land size, farm number, and labour of non-food biomass pro-

Figure 1: The number of farms and average farm size, 2005–2030 (Scenario 1)



duction) and output index (the revenue of non-food biomass production). Thus, the adjusted production functions accounted for the constraints on minimum transaction costs in the input-oriented DEA model.

Main results

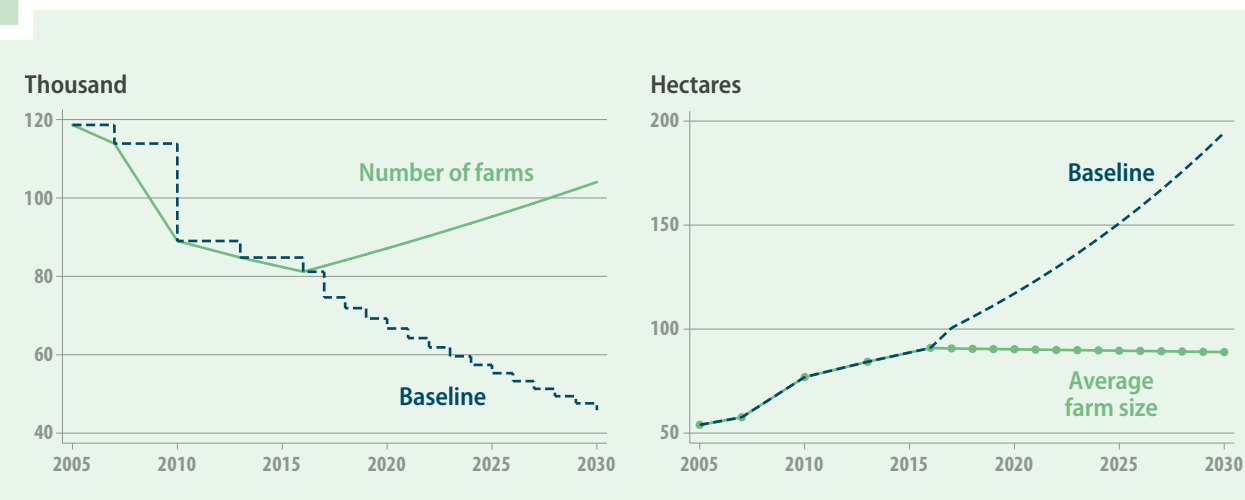
Scenario 1: Neutral-to-scale technologies

Figure 1 shows that in the projected period of 2017–2030, a technology-induced annual increase in efficiency by 1% (cf. KLÄRLE 2018) leads to an increase in the number of farms and a decline in the average farm size by 9.1%. This indicates that, under the given assumptions, more farms will switch from food to non-food biomass production.

This dynamic is due to the fact that neutral-to-scale technologies reduce the part of investment costs that create

competitive disadvantages for smaller producers. This implies that under such an optimistic scenario of significant technological breakthroughs, the bioeconomy could indeed support diseconomies of scale and encourage smaller and new agricultural businesses. The comparison with the baseline case, which is the extrapolated trend of farm size and number, illustrates a possible scale of this effect. Although the positive effect of new technologies on the farm number may seem trivial under the given assumptions, this reveals that a scale-induced decline in transaction costs (and hence, in inefficiency) observed for the real data (2005–2016), may, if supported by technological advances, continue even under diseconomies of scale.

Figure 2: Number of farms and average farm size, 2005–2030 (Scenario 2a)



Scenario 2: Increasing demand for non-food biomass

(a) Average sectoral effects

An annual increase in demand for agricultural non-food biomass by 2% (cf. PIOTROWSKI et al. 2016) starting in 2017 raises the number of farms (and labour force) by 1.79% annually (**Figure 2**). The average farm size, by contrast, remains almost constant, decreasing only slightly, namely from 90.80 ha in 2017 to 88.95 ha in 2030 (that is, by 0.15% annually).

Assuming that the technology level and the total agricultural area remain constant, enlarging the area under non-food biomass at the expense of food crop production is the only means to meet the increasing non-food biomass demand. Consequently, there should still be a clear decrease in the average farm size. An overall increase in average farm size is necessarily constrained by threshold costs

of investments (BUCKLEY 1997). As the rate of increase in farm number (1.79%) is higher than that of land under non-food biomass (1.64%), the observed average decrease in farm size may therefore be due to the combined effects of the relative share of farm size groups, and regional heterogeneities in agricultural and ownership structures (DEININGER 2013).

(b) Effects for farm size groups

The optimal average farm size (**Figure 3**) declines in response to higher demand for non-food biomass in each group, namely by 0.12%, 0.30%, 0.12%, 0.14%, and 0.21%, respectively. The comparison with the baseline trend reveals that the effect of transaction cost economisation is particularly strong in groups 1, 2, and 4. The difference between the baseline and projected dynamics in group 1 and 2 can support the argument that transaction cost

Figure 3: Average farm size in different farm size groups, 2005–2030 (Scenario 2b)



savings in competitive industrial agriculture can help small farms realise their advantages of lower supervision costs and local infrastructure (VILLORIA 2017). In group 4, by contrast, this difference is mainly due to a lower growth rate of farm numbers in the projected trend. Given that the technological (and hence the productivity) level remains unchanged, producers respond to increasing bio-

mass demand by readjusting their input-output combinations. For instance, the adjusted production function in group 5 (**Table 1**) changes from increasing to decreasing returns to scale. In this case, the largest farms adjust their optimal size less than other farm size groups, both in the projected and the baseline case.

Discussion and conclusion

This study draws the following four main conclusions: **First**, significant technological breakthroughs, which render the scale advantages less relevant, improve the production efficiency of smaller producers and potentially lower the entry barriers for new businesses. **Second**, a steadily growing demand for non-food biomass encourages more farms to switch from food to non-food biomass production and reduces the optimal average farm size. **Third**, the combined effect of economies of scale and transaction costs reveals that if farms cannot economise on transaction costs, investments in land and labour that are needed to adjust to higher biomass demand partly compromise returns to scale, so that the growth in farm size is slowed down. **Finally**, a higher degree of asset specificity, indicated by the greater sum of elasticities of farmland and labour, gives rise to transaction costs, which slows down the rate at which the farm size decreases.

These findings make important contributions to the debates on transaction costs and agricultural structural change by highlighting the combined effect of economies of scale and transaction costs on the optimisation of agricultural production decisions in different farm size groups. The observed greater effect of transaction cost savings for smaller farms indicates a potential competitive advantage of smaller producers in industrial agriculture (JOCHEN 2016). The slowdown in the growth rate of larger farms, caused by decreasing returns to scale, reveals the trade-off between the transaction cost effect and the economies of scale effect. This finding extends the relevant debate by showing that economies of scale me-

diate the impact of asset specificity on transaction costs (MCCANN 2009). Furthermore, given a productivity increase due to the application of technological innovations, transaction cost savings can lead to economies of scale. Since their combined effect is highly sensitive to the asset specificity of farms, it may unfold to different extents in eastern and western Germany, other than suggested by Buckley and Chapman (1997).

The study extends the application of the transaction cost approach to the sectoral level, suggesting that pivoting a highly competitive industrial agriculture towards a bioeconomy requires considering the associated transaction costs. The findings also inform bioeconomy strategies and action plans to account for the combined effect of transaction costs and economies of scale when assessing opportunities of smaller and larger producers in the bioeconomy.

► The authors belong to the junior research group ‘Economics and Institutions of the Bioeconomy’.

This group was funded by the ScienceCampus Halle—Plant-based Bioeconomy (WCH) in the period 2017–2020. The project will continue until April 2023 with IAMO funding. The junior research group deals with selected economic and institutional challenges of the plant-based bioeconomy. The group seeks to illuminate some of the critical points in the transition towards more resource-efficient and sustainable economies by examining the role of innovation-driven advances and disruptions in this process. The work program includes conceptual and empirical analysis of current and emerging trends

in production and management practices of plant-based industries.

The geographical focus is on Central Germany; three transition countries (Russia, Ukraine, China) form the basis for comparative studies. Methodologically, it applies theoretical concepts and analysis tools from economics and sociology—such as comparative case studies, stakeholder interviews, scenario-based simulations of innovation adoption, Spatial Durbin Model and the Long-Cycles concept—to address possible disruptions in the established business models and societal norms and expectations. The junior research group works closely with German and international research teams from Russia, China, the USA, and the Netherlands.

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Sources and credits

Title Harvest for biogas plant: maize chopper and trailer in the field © Countrypixel - stock.adobe.com

p. 70 Biogas plant © Countrypixel - stock.adobe.com

p. 71 Demonstration plant for the production of biobased isobutene in Leuna © Gunter Binsack

► 2017 saw the first fermentative production of isobutene at Global Bioenergies' industrial demonstration plant. Until now this hydrocarbon has been derived from crude oil and is one of the most important primary petrochemical products. (Sources: Global Bioenergies and bioökonomie.de)

Tab. 1 Overview of scenarios and their basic assumptions © Own presentation

Fig. 1 The number of farms and average farm size, 2005–2030 (Scenario 1)
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Fig. 2 Number of farms and average farm size, 2005–2030 (Scenario 2a)
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Fig. 3 Average farm size in different farm size groups, 2005–2030 (Scenario 2b) © Own presentation



(Dis)Satisfaction in rural areas and agriculture? An analysis of job and life satisfaction in Germany

Antje Jantsch
Norbert Hirschauer

(Dis)Satisfaction in rural areas and agriculture? An analysis of job and life satisfaction in Germany

Antje Jantsch
Norbert Hirschauer

Introduction

Demographic change, the migration of young people away from rural areas and the resultant lack of manpower pose great challenges not just to agricultural employers but to policy as well. Poor quality of life in rural areas is often cited as a reason for migration. This paper thus compares life satisfaction amongst rural and urban populations, as well as job satisfaction amongst dependent employees in agriculture.

Principles of spatial planning

Preventing major disparities in living conditions between regions is a guiding principle of policy. Particular attention is paid to the uniform development of income and employment opportunities, and on ensuring a minimum level of public services. In Germany this finds expression in the Spatial Planning Act, for example, which aims to achieve 'equal social, infrastructural, economic, environmental and cultural conditions' throughout the entire country (§2 Para. 2 Nr. 1 ROG). Focusing specifically on rural areas, the principle of uniform development is also embedded in the statutory objectives of the not-for-profit Landgesellschaften operating in most of the

German Länder ('Improving living, working and environmental conditions in rural areas'). It is also reflected in the EU's Common Agricultural Policy in the greater allocation of funds given to the second pillar (development of rural areas).

A certain amount of information is needed to identify the appropriate policy measures to boost the quality of life in rural areas. This includes an answer to the question of whether the quality of life of the rural population differs to any extent from that of the urban population.

Measuring quality of life

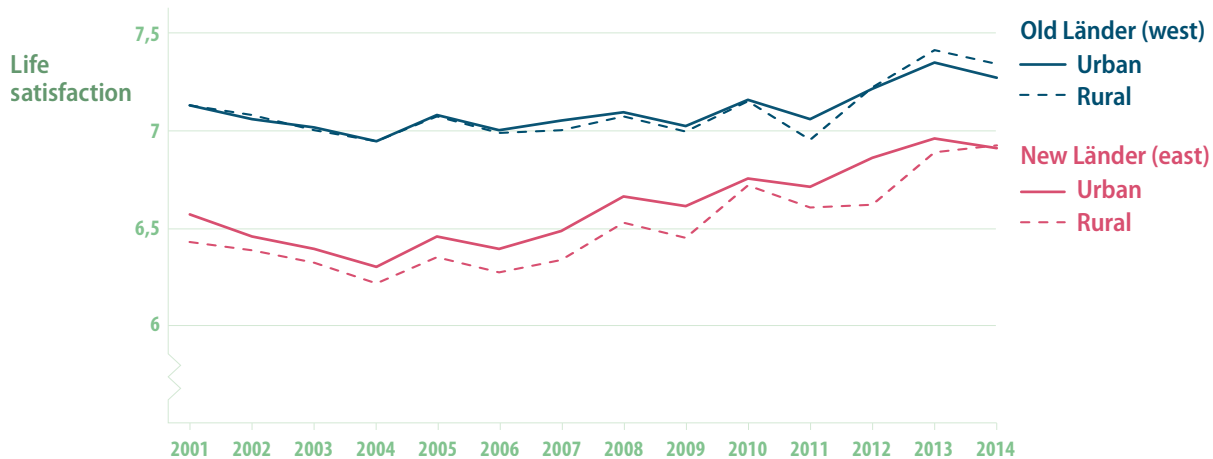
The quality of life in a region is often equated with economic performance—measured as per-capita gross domestic product (GDP). In principle EU regional policy also follows this logic, so that top priority for support is given to regions with weak economic development, where per-capita GDP is less than 75% of the EU average. However, academics, politicians and civil society organisations are increasingly challenging the paradigm that social progress and quality of life are exclusively relative to material prosperity and consumption potential. 'Quality of life' is instead understood as a multi-dimensional concept that goes beyond income and consumption potential (NOLL 2000).

These developments are reflected in a variety of approaches for a multi-dimensional computation of quality of life, such as the **OECD Better Life Index** or the **UN Human Development Index**. In the report they put together for the French government, 'Measurement of Economic Performance and Social Progress', Stiglitz et al. (2010: xvii) summarise these approaches as follows:

¹ This article is in part based on the papers by Jantsch, A. and N. Hirschauer (2017): *Lebensqualität und Lebenszufriedenheit in ländlichen Räumen. Landentwicklung aktuell*, 2017 edition: 37–39. Bundesverband der gemeinnützigen Landgesellschaften (BLG) and Jantsch, A.; Weirowski, T.; Hirschauer, N. (2019): (Un-)Zufriedenheit in der Landwirtschaft? Eine explorative Analyse der Arbeits- und Lebenszufriedenheit in Ostdeutschland. *German Journal of Agricultural Economics* 68(4): 263–74.



Figure 1: Comparing life satisfaction of the urban and rural population



‘What we measure affects what we do. If we have the wrong metrics, we will strive for the wrong things’.

Working with a broader definition of quality of life, the Stiglitz Report offers greater consideration to subjective indicators to measure quality of life. One approach, for example, is to ask people how satisfied they are in various domains (work, family, social milieu) or in their life overall. For the question ‘How satisfied are you with your life, all things considered’ participants are asked to answer on a scale from ‘0’ (completely dissatisfied) to ‘10’ (completely satisfied). The idea behind this is that the rating of life satisfaction should take into account past, current and expected future life circumstances.

The development of life satisfaction over time

Figure 1 depicts the development of life satisfaction in Germany from 2001 to 2014. Although, according to a ZEIT article from 8 June 2017, the eastern Germans were as satisfied with their lives as the western Germans for the first time since 1990, in the years prior to this we can see a clear gulf in life satisfaction between the *new* (eastern) and *old* (western) Länder of Germany. Between the urban and rural populations, however, only slight differences in life satisfaction were evident. Only in the new Länder does life satisfaction in the countryside appear a little lower than in urban areas. In comparison to other groups (e.g. married/unmarried, employed/unemployed), however, this difference is very low.



An interesting trend has recently become apparent. In the period under investigation, life satisfaction in the countryside first surpassed that of the urban population between 2012–14. A similar development occurred in eastern Germany too, where in 2014 life satisfaction in the countryside was for the first time higher than that in urban areas, albeit only very slightly. Despite this, rural areas are often characterised by high levels of migration.

Job and life satisfaction of dependent employees in agriculture

The migration of young people can have direct consequences for agricultural enterprises, as it becomes increasingly difficult for them to find qualified manpower. Migration could also restrict quality of life in the countryside through negative feedback processes. Young people leave because they regard quality of life in the countryside as poor. And because many leave, economic strength and quality of life are further reduced, setting in motion a downwards spiral. When considering how employers and policy measures might intervene here, we need to determine the importance of working conditions in agriculture as well as living conditions in rural areas.

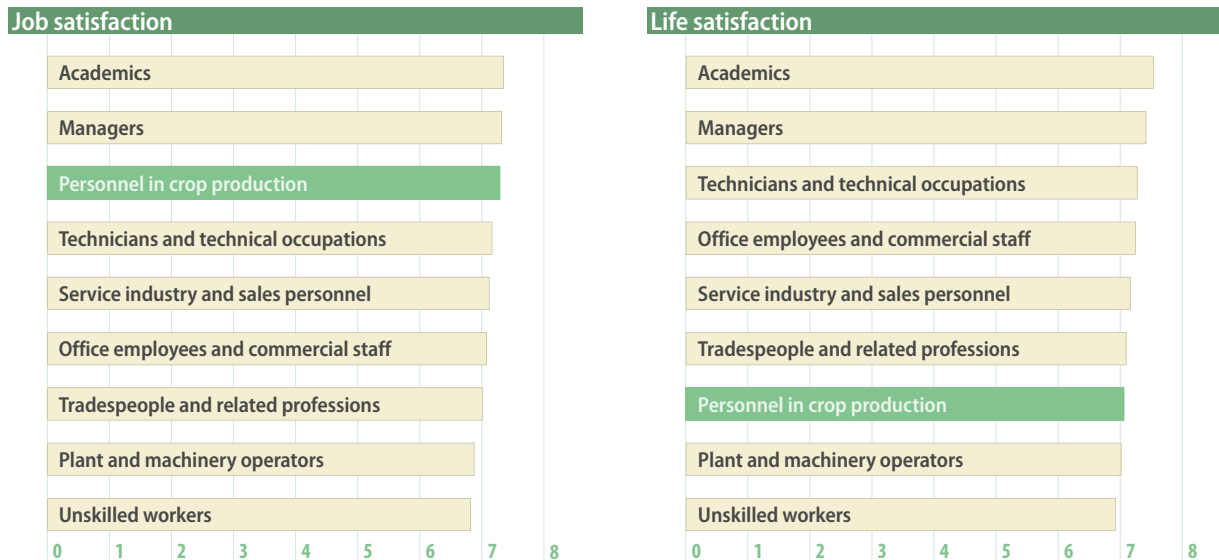
The infrastructure and general living conditions of a region are not, as a rule, directly affected by businesses. At the same time, however, they are of major importance to firms when considering the availability and acquisition of staff (BEETZ and NEU 2009). The general living conditions in rural regions, however, are only one factor of many that determine the attraction of a job in agriculture, which may be perceived as very low for a number of reasons. Right at the top of these, besides the rather negative image, is the poor pay compared to other sectors (GINDELE et

al. 2016), which has a negative impact on hiring staff. This is all the more serious seeing as agricultural jobs are often associated with a substantial physical workload, seasonal labour peaks and little free time or holiday (GINDELE et al. 2016, BITSCH and HARSH 2004). Limited training facilities and opportunities for managers in agriculture also make recruitment harder, especially of suitable up-and-coming managers (BITSCH and HOGBERG 2005: 661).

Figure 2 depicts the job and life satisfaction of dependent employees in crop production ('Personnel in crop production') compared to other occupational groups in eastern Germany. For a direct comparison of various professions, we rank the main different occupation groups as defined in the International Standard Classification of Occupations (ISCO-88) by the International Labour Organization (ILO). Two interesting findings can be seen here. First, the hierarchical order of job satisfaction of the non-agricultural occupation groups follows the order of educational level. The higher the degree of education or training, the more satisfied employees are with their job. The picture is different for dependent employees in crop production. Relative to their level of education or training they exhibit an 'over-average' satisfaction with their job. Second, for employees outside of agriculture the ranking orders of job and life satisfaction are congruent across all levels of education (with the exception of the service industries and technicians). For those working in crop production the situation is different. Here it is evident that a gulf exists between job satisfaction and life satisfaction, with the former clearly surpassing the latter. Two 'discrepancies' contribute to this: the aforementioned job satisfaction which is 'too' high, and a life satisfaction which is



Figure 2: Average job and life satisfaction of individual occupation groups, 2000–2014



‘too’ low, both measured against degree of education or training.

These findings suggest that the lack of manpower in agriculture is not a result of poor working conditions. On the contrary, an above-average level of job satisfaction appears to offset a lower-than-average appraisal of the rural living environment. This is an interesting finding, but we should not be rash in concluding that the lack of manpower in agriculture is mainly caused by shortcomings in the rural living environment. **Figure 2** depicts the opinions of those currently employed in agriculture. Young people on the threshold of their professional lives perhaps see this quite differently. Gender-determined

differences in role expectations can also play their part when choosing careers and jobs (LEHBERGER and HIRSCHAUER

2016). This means we still cannot be sure about the impact of work conditions in businesses and regional living conditions on migration. For policymakers and businesses in rural areas much more information is needed here.

On the one hand there is a lack of information and surveys which differentiate between age groups, especially those focusing on young people. But there is also a lack of systematic studies of other regions (for example western Germany) and other groups of people employed in agriculture (for example those working in livestock farming). A more detailed differentiation of regions (districts, com-

munes), especially focusing on areas that are particularly marginalised economically and affected by out-migration, could also be insightful.

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Title 'Welcome'-Design of the Renningen maize maze, 2016 © Lukas Weiß
► The first maze in a maize field was set out in 1993 in Annville, Pennsylvania. The maze designer, Adrian Fisher, shaped it like a stegosaurus. (Source: wikipedia)

Fig. 1 Comparing life satisfaction of the urban and rural population © Own presentation. The data used here comes from the annual household survey 'Life in Germany' (SOEP—Sozio-oekonomisches Panel) carried out by the German Institute for Economic Research in Berlin.

Fig. 2 Average job and life satisfaction of individual occupation groups, 2000–2014 © Own presentation. Data: SOEP—Sozio-oekonomisches Panel/ DIW Berlin





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Digital innovations offer opportunities for the agri-food sector in Eurasia — IAMO Forum 2020

Anna Feshchenko
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Digital innovations offer opportunities for the agri-food sector in Eurasia

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IAMO Forum 2020

Digital transformation is reshaping agricultural and food systems all over the world, creating new opportunities for more efficient, competitive and sustainable value chains. It is widely expected that the use of digital technologies will fundamentally change the conditions of development and the behavioral pattern of economic agents, bringing forth new business models and market structures, restoring competitive conditions, and strengthening global agri-food chains. Against this background,

...more than 450 experts from over 50 countries took part in the IAMO Forum 2020 entitled 'Digital transformation–towards sustainable food value chains in Eurasia'.

The participants from science, business and politics exchanged views on the opportunities, challenges and perspectives of digitization in the agri-food sector in four plenary sessions, 23 parallel sessions and one panel discussion that took place on June 24–26, 2020. The geographical focus was mainly on Europe, Central Asia and China.

The online conference was opened by **IAMO Director Thomas Glauben**. In his speech he discussed the social

and economic expectations concerning digital technologies. Companies and consumers benefit from improved data processing and information transmission, higher production and market efficiency, innovative production processes and new business models. Digital technologies make transactions among market players along the value chain more transparent and trustworthy. Web-based platforms and apps with relevant market information can help innovate agricultural and food sector processes in transition countries and also enable small farmers to access markets. Based on IAMO research by using satellite imaging, remote sensing and drone data, index insurances are currently launched in a number of Central Asian countries and in Mongolia in order to counteract climate risks in agriculture.



‘Although digital opportunities are already being used in the Eurasian agri-food sector,...

...there are still some challenges and obstacles for the implementation. Politics, in dialogue with business and science, has to implement un-bureaucratic and innovation-friendly conditions that encourage market players to take risks, invest in (novel) digital technologies, integrate them into existing work processes as well as to train and educate people accordingly.’ highlighted Glauben.

Digital transformation and food economy

The first day of the conference dealt with the latest digital developments and their impact on agricultural markets and the food system from a scientific perspective.



In her presentation, **Sarah Hallerberg**, Hamburg University of Applied Science, Germany, gave an overview of multiple machine learning methods and approaches, which nowadays are getting more attention and can be applied in many areas due to big data availability, improved computer facilities and new algorithms development. Together with her colleagues, she has been using deep learning techniques for many projects such as the prediction of extreme events, identifying critical links in transport networks and reconstruction of biological models. In her opinion, these techniques can also be employed in agriculture and agricultural sciences, for example, for studying biological species or food safety risk assessment. Hallerberg highlighted the poultry industry, where advanced machine learning methods are used for early disease detection based on the animal sounds.

Bernhard Brümmer, Georg August University of Göttingen, Germany, pointed to a variety of perceptions of the digitalization that exist nowadays. He stated that in the field of agricultural economics new data types and data collection approaches are in trend, for example, big and real time data, as well as electronically supported and large-scale surveys. Respectively, new methods, such as artificial intelligence methods and new combined algorithms, have been developed and employed for data analysis. Despite existing challenges like the high costs of the digital transformation, protecting data privacy, getting funding for data infrastructure and updating educational curricula. Brümmer is certain that the digital transformation of agri-food value chain creates numerous opportunities for agricultural economics research as well as for the interdisciplinary scientific cooperation.

Bernhard Brümmer talks about digital transformation in the agriculture.



Agricultural economist **Kateryna Schroeder**, World Bank, USA, emphasized the importance of digital technologies for increasing efficiency gains in agriculture. In particular, the use of digital technologies in production can ensure optimal allocation of resources and reduction of transaction costs, for example, search and information costs. Also, digitalization can benefit smallholder farmers by improving their productivity and access to markets. At the same time, the public sector needs to provide an enabling environment for successful digital transformation of agri-food value chains.

Continuing the topic of digitalization-induced efficiency gains in agriculture, **Wenbin Wu**, Chinese Academy of Agricultural Sciences (CAAS), China, pointed that digital transformation is the long-lasting trend in Chinese agriculture which favorably impacts the national farming sector being triggered by supporting policy environment. Using precision farming technologies to map and monitor crop development, farmers in China are able to improve

IAMO researcher Lena Kuhn discusses together with Kateryna Schroeder, Gopinath Munisamy, and Wenbin Wu.



the efficiency of resource use, reduce their production costs, as well as to collect and analyze information about the quality of crops making their cropping practices more efficient.

Focusing on the applicability of machine learning to policy analysis, **Gopinath Munisamy**, University of Georgia, USA, highlighted the importance of machine learning algorithms for predicting agricultural trade patterns to make decisions in public and private domains. Particularly, the superiority of machine learning algorithms over traditional statistical approaches of data analysis has been demonstrated. Munisamy mentioned that being a data-driven process, digitalization requires extensive data to come up with new solutions for agri-food systems.

Digital solutions for agribusiness

The second day highlighted the advantages and challenges of implementing new technologies from a business perspective.

Bjoerne Drechsler, CEO at EkoNivaTechnika Holding, Russian Federation, shared his experience of implementing digital technologies in crop production. According to Drechsler, large-scale agricultural companies need to



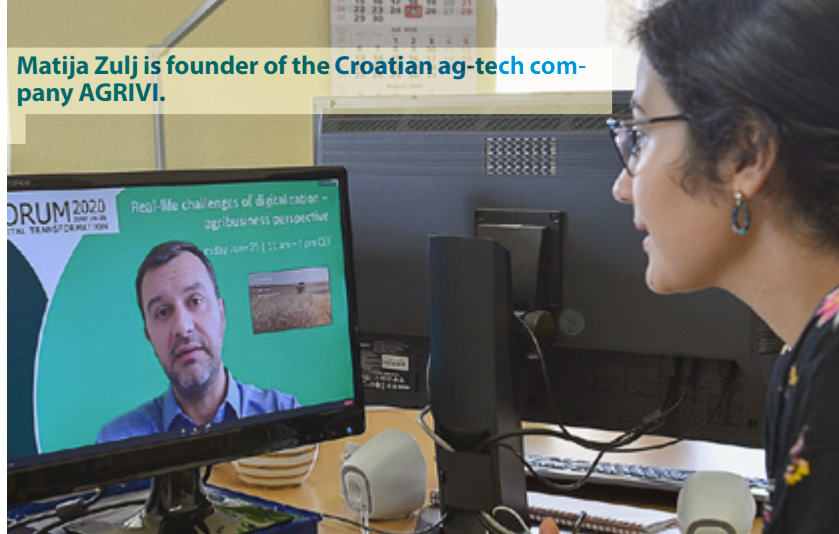
implement digital tools in their production and management processes in order to effectively operate vast farmland areas. Today, agroholdings in Russia routinely use satellite imagery, self-driving tractors and spatial crop management software to streamline their production, cut costs and increase their profit margins.

Bohdan Kryvitskyi, a Chief Innovation Officer at IMC S.A., Ukraine, explained that digital tools are deeply integrated into production and management structure of the IMC company at all levels. For instance, the tractors are equipped with digital mechanisms, which aim to facilitate and control performance indicators of tractor drivers. At the same time, the top managers can easily analyze the company's key metrics on a tablet in the office. He emphasized that the key driver behind implementing digital technologies is efficiency improvement. Both Drechsler and Kryvitskyi admitted that although the gain from the usage of digital technologies quickly outweighs the investment costs,



Bjoerne Drechsler reports on digital technologies in crop production.

Matija Zulj is founder of the Croatian ag-tech company AGRIVI.



there are still challenges for the digitization of agricultural production, namely poor infrastructure and internet connection in rural areas, lack and low quality of AgTech consulting services, and resistance to new technologies on the part of employees.

The challenges of digitalization for global grain trade were presented by **Ludwig Striewe**, a member of the Management Board at ATR Landhandel, Germany. The actors of the global value chain are confronted with complicated legal procedures, various trade regulations and payment terms in different countries. Accordingly, they need a common IT-language, trusted partners, digitally connected and smart contracts to communicate with each other. To overcome some of the most important obstacles in grain trade, ATR Landhandel has developed a platform that helps digitize the trade and thereby foster cooperation among international market players.

Matija Zulj, founder of the globally present ag-tech company AGRIVI, Croatia, pointed out that digitalization alone should never be considered the primary goal while implementing innovations. For an effective change management, it is important to analyze the feasibility of

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FORUM 2020

in the time of

Corona pandemic

A report from the team behind the scenes



The Corona pandemic and the resulting contact restrictions presented the organisation of the IAMO Forum with a completely new set of challenges. When the pandemic peaked in spring 2020 the organisation committee decided to make the conference an exclusively virtual event. Here the committee talks about the challenges and opportunities of such a move.




Inna Levkovych,
research associate and coordinator of the IAMO Forum 2020


What was the biggest challenge in planning the online conference?

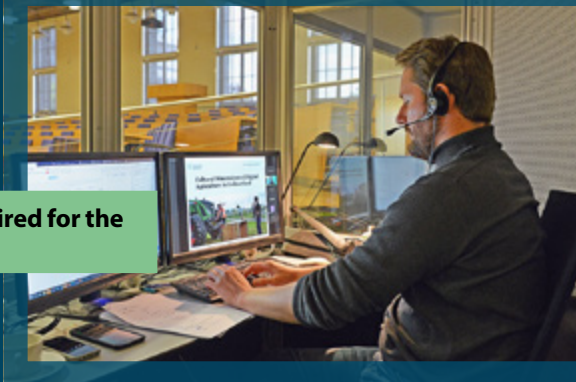
6 The major challenge was that for the very first time the IAMO Forum had to be arranged as a virtual conference within two months and during the Corona pandemic. Like many other research institutions we were unable to call on previous experience in organising such an event on this scale. When deciding on the right provider, therefore, we had to consider a number of legal, organisational and technical issues, from licence usage, data protection and the functionality of virtual rooms to the stability of the platform. As the general demand for online events was high, and thus communication with providers was complicated, we did our own investigation with a lot of research, analysis and tests. It was pure **learning by doing**.




 **Tim Illner**, network administration and technical support staff


Which technical procedures were required for the online conference?

 Even before choosing a provider we made a detailed study of the technical requirements. Eventually we found an online platform which from a technical perspective best fulfilled our demands. During the preparatory phase there was a lot of **training and many practice sessions** with speakers, moderators and interpreters. This allowed us to check the stability of the internet connection, calculate what technical equipment we would need, and practise the technical and organisational procedures. Building a technical support team for the conference was also one of the key tasks to complete in advance.



 **Anna Feshchenko**, coordinator of the IAMO Forum 2020


What considerations needed to be made during the online conference?

 For many participants, the IAMO Forum 2020 was **their first large online conference**. It was important for us, therefore, to keep those involved regularly informed about technical and organisational procedures and provide instruction for these. There were also new challenges in planning the conference programme. When arranging sessions we had to consider the **very different time zones** in which the speakers live in addition to thematic issues. The detailed preparations we carried out allowed us to immediately answer occasional questions from participants during the conference and rapidly correct technical faults.



 **Daniela Schimming**, public relations staff


How was the conference publicised?

 A website was set up specifically for the conference. It provided updated information on the submission of papers, registration and the conference programme. In-depth interviews were carried out with some of the speakers, which were uploaded to the website. The Forum was also advertised on the Institute's website and a variety of internet portals, via mailings and the distribution of flyers. There were several media releases when the conference was announced and also following the IAMO Forum 2020. After the conference participants could view the videos and presentations as well as a photo gallery.



The 2020 Forum was IAMO's first online conference. To date it is also the online event with the highest number of participants. The online conference allowed academics from IAMO's partner countries to discuss and exchange ideas. They were able to present their research findings to a large international audience, which would otherwise not have been possible on such a scale.



A man with glasses and a headset is standing behind a wooden podium, moderating a session. A laptop and a glass of water are on the podium.

IAMO researcher Ivan Đurić moderates the third plenary session.

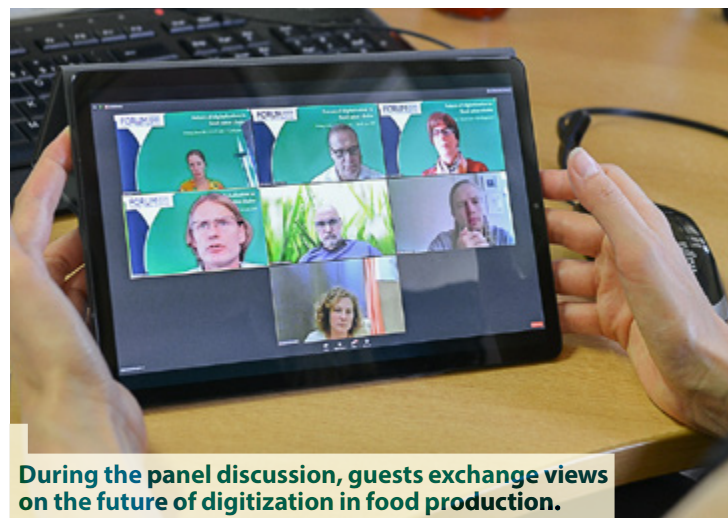
a new digital technology for a particular company. While large-scale companies momentarily lead the way in digitizing agricultural production, it can be expected that smaller-scale farms will also be able to benefit from digital technologies in the future, as appropriate tools become increasingly available.

Enabling sustainable digital transformation

A highlight of the IAMO Forum 2020 was the panel discussion on the last day of the conference. National and international experts from science, civil organizations, agribusiness and politics discussed strategies for a sustainable digital transformation in the agri-food sector. Among the discussants were **Vladimir Crnojević**, Bio-Sense Institute, Serbia, **Engel Hessel**, Federal Ministry of Food and Agriculture (BMEL), Germany, **Linda Kleemann**, GFA Consulting Group, Germany, **Valeria Pesce**, GODAN and FAO, Italy, **Stig Tanzmann**, Bread for the World, Germany, and **Máximo Torero**, FAO, Italy. The panel discus-

sion was moderated by **Jens-Peter Loy** from Kiel University, Germany.

As an introduction to the panel discussion, **Máximo Torero** presented a keynote speech on digital transformation of agri-food value chains. During the panel, it was noted that digitalization can address multiple market failures along the value chains, for example, information asymmetry, high fix and transaction costs as well as search, tracking and verification costs. In order to make digitalization inclusive, basic conditions need to be met, such as (digital) literacy and empowerment, regulatory frameworks and interoperability, physical infrastructure, internet coverage and services, connectivity as well as data issues of collection, storage and dissemination. We need to tackle the currently existing rural-urban divide and power structures, otherwise digitalization can exacerbate these gaps. Combining digital technologies with





Ingo Pies presents a session on the ethical aspects in times of COVID-19.

analog complements brings innovation, efficiency and inclusion. The aim should be to minimize the risk of concentration and inequality on the global level as well as to use the data and all its potential without abusing it. Therefore, the transformation should be research-based and digital tools should be easy to use for all actors along the agricultural value chain. Since digital transformation has already begun, policy-makers and stakeholders need to become more active in providing clearly defined regulatory framework, remove the barriers for the digital progress, and empower all actors of the agri-food value chain to fully realize the given potential.

Alongside the fruitful discussion on the future of digital transformation, the third day of the Forum was marked by a special speech on a critical analysis of ethics in times of COVID-19 held by **Ingo Pies**, Professor for Business Ethics at Martin Luther University Halle-Wittenberg, Germany. Just like any other pandemic, also COVID-19 is shaping the moral sentiments. While individual morality is increasing the willingness for social distancing and thus lowering the virus prevalence locally, group morality has two dimensions: solidarity within one's group and the disconnection to the out-group, which can become the

object of anger and scape goat. Due to this 'moral paradox of modernity', institutions must be built to foster moral progress. 'We shouldn't forget that markets can increase resilience and open our sense of solidarity with our out-group,' said Pies.

The young generation learned about innovative technologies from a new perspective within an interactive kids session on 'Bits, Bytes & Burger?! Digitalization in Food Production'. The webinar took place in conclusion of the Forum. **Iren Schulz**, a lecturer at the University of Erfurt and the Erfurt University of Applied Sciences, Germany, explained to primary school children how digital technologies are used in agriculture and food production and which measures can contribute to a healthier diet. ■



The younger generation took part in an interactive kids session.

► The presentations of the plenary and parallel sessions as well as the photo gallery can be viewed on the conference website:

 www.iamo.de/forum/2020

 Password: forum20_IAMO!

IAMO Forum 2020 was jointly organized by the IAMO department Agricultural Markets, the Agriculture and Food Global Practice of the World Bank, the Kyiv School of Economics, the Tashkent State Agrarian University, the Higher School of Economics Moscow, the Faculty of Agriculture of the University of Belgrade and the Institute of Agricultural Economics and Development, Chinese Academy of Agricultural Sciences. **The conference was funded by** the German Research Foundation (DFG), the Rentenbank and the city of Halle (Saale).

Credits

Title Data centre IT telecommunication equipment patch panel © Taras Vyshnya - stock.adobe.com

► A large volume of communication, transmitted centrally from an empty auditorium. At the 2020 IAMO Forum, the Institute's first exclusively online conference, more than 100 speakers and approx. 450 participants took part from 50 countries across 17 time zones. As in the past, the technical management and support for the three-day event was located in IAMO's auditorium. To ensure the smooth running of the conference, interpreters also worked on site; the translation booths maintained the necessary hygiene standards.

Photographs unless otherwise attributed © Markus Scholz.

We would like to thank all the IAMO participants over whose shoulders we were able to watch during the conference: Osama Ahmed, Sina Lehmann, Afsaneh Ehsani, Daniela Schimming, Nina Gülденpenning.

p. 90 Ivan Đjurić moderates the third plenary session. © Daniela Schimming





IAMO— a portrait

Michael Kopsidis

IAMO—a brief portrait

Michael Kopsidis

Goals and tasks

Since 1994, the Leibniz Institute of Agricultural Development in Transition Economies (IAMO) has been analyzing the far-reaching economic, social and political processes of change in the agricultural and food sector and in the rural regions of its study area. This area covers Central, Eastern and Southeastern Europe plus transition countries of Central and East Asia, especially China. Research on Central Asia in particular has been intensified in recent years.

Despite great efforts and many successes, agricultural and food industry development in many of these regions still lags far behind the western industrialized nations and in some cases follows its own very specific development paths. In addition, there is an enormous development gap between successful and stagnating regions within individual countries and between states. Different transition processes, which continue to have an impact today, play a major role in explaining this divergence, as do a wide variety of structural factors.

Large emerging economies such as Russia and China, but also Ukraine and Kazakhstan, have emerged as global players in world agricultural markets. The question is what needs to happen in these key economies to promote economically and ecologically sustainable growth in the agricultural and food sector and to achieve national and global food security in the long term despite growing demands on agricultural resources. At the same time, in our target countries—but not only there—adapting agriculture and land use to climate change under the conditions

of a globalizing economy is a major challenge. Digitalization does not stop at the agricultural and food sector of our partner regions. In this respect, IAMO has a broad research need, not only thematically but also regionally.

IAMO has succeeded in significantly increasing the impact of its research on agricultural policy, administrative, business and scientific decision-makers in its partner countries. In its target regions, IAMO is more and more involved not only in science-based policy advice, a classical field of activity of application-oriented (agricultural) economic research, but also in shaping development in its many facets through accompanying research closely embedded in practice.

The Institute is increasingly focusing on sustainable scientific capacity building in the Eurasian transition economies, which has a broad impact on practice.

Developing efficient strategies for successful rural development that counteract unregulated poverty migration from rural areas is also becoming increasingly important for the institute. With its thematic and geographical focus, IAMO is a unique global research institution. Since its foundation in 1994, it has been a member of the Leibniz Association as a non-university research institution. The Leibniz Association brings together scientifically, legally and economically independent research institutes and service facilities which are jointly funded by the Federal Government and the Länder in order to address current prob-



lems of national interest. www.leibniz-gemeinschaft.de/en

As already mentioned, IAMO's work is intended to contribute not only to understanding but also to overcoming the major challenges and persistent development deficits in the agricultural and food sector and in the rural areas of its study area. The three core tasks of the institute result from this claim:

- ▶ Internationally oriented research in agricultural and food economics, including the development of rural areas,
- ▶ Exchange of ideas between the academic, business and political communities,
- ▶ Support of young academics.

The Institute conceives of itself as a formative force in international research in agricultural economics. Excellent research is the driving force behind the institute's development and creates the prerequisites for fulfilling the other two core tasks. Thus, IAMO also serves as a forum for exchange and in this way promotes the international networking of German research and the dialog between decision-makers from academia, politics and business. At the same time, IAMO is increasingly focusing on academic capacity building aligned with international standards directly in our partner countries. In view of the major and novel challenges facing the agricultural sector and policy-makers in our target countries, not only science-based policy advice but also practice-oriented accompanying research in close consultation with a wide range of stakeholders in the partner countries is becoming more and more important for IAMO's work. In addition, our institute applies its competencies and resources to the quali-

fication of scholars and scientists. A particular focus is on supporting young academics from the partner countries. Through its international orientation and cooperation with other teaching and research institutions, IAMO also contributes to strengthening Halle as a center of science in Central Germany. The cooperation with Martin Luther University Halle-Wittenberg (MLU), in particular with the Institute of Agricultural and Food Sciences as part of the Department of Natural Sciences III and with the Department of Economics as part of the School of Law and Economics, also makes an important contribution to this end.

Scientific departments, research fields and main topics

IAMO's tripartite research structure with the departments **Agricultural Policy, Agricultural Markets and Structural Development** (abbreviated names) has been derived from the orientation of its research. Agricultural policy frameworks and opportunities for shaping policy, markets in the agricultural and food sector, and the development of farms and structures in rural areas are analyzed. Developments at the level of individual farms and in rural areas, the development of functioning agricultural markets and the design of agricultural policy are closely interrelated. Farm and agricultural policy decisions as well as market processes influence human-environment relations in rural areas. At the same time, they affect the two important future issues of food security and food safety.

IAMO's academic work is organized across departments in five key research areas, which focus on major problem areas of agricultural development in Eurasian transition and emerging countries. The increased communication

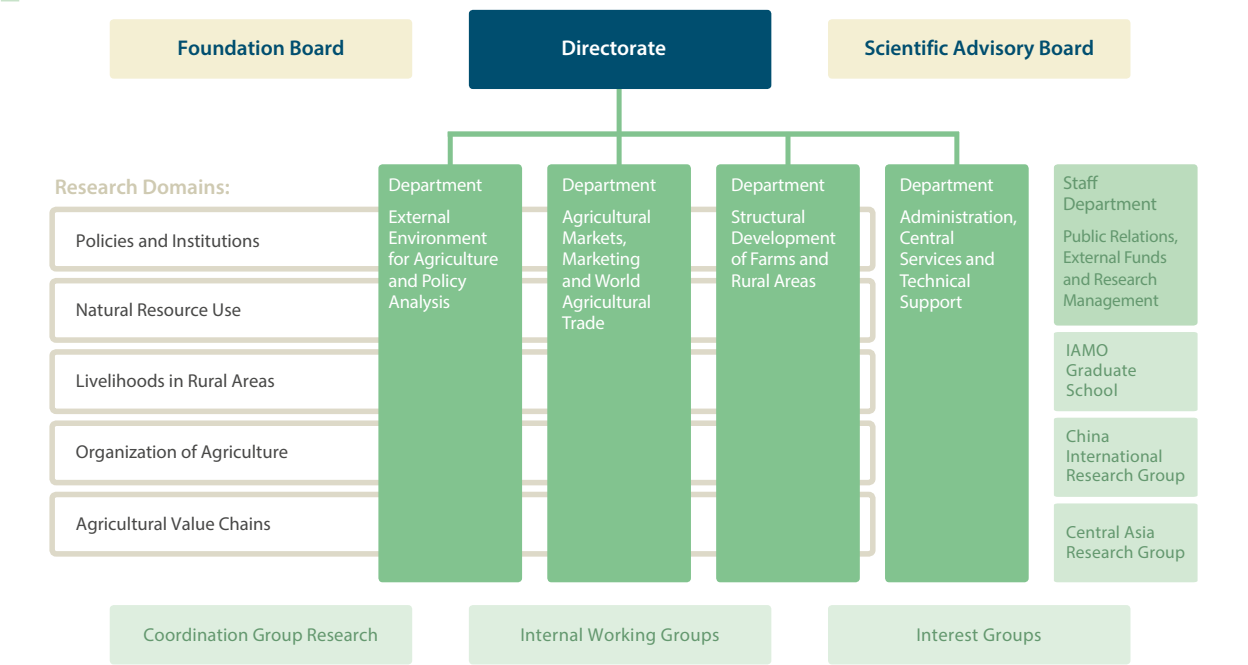
density within key research groups counteracts any possible fragmentation of research. In addition to positive bundling effects, greater individual responsibility of the key research groups allows for efficient, results-oriented research management.

The five research domains are:

- I. Politics and Institutions
- II. Natural resource use
- III. Livelihoods in rural areas
- IV. Organization of agricultural production
- V. Agricultural value chains

► The following aspects receive more attention than before in the **current Medium-Term-Agenda 2016–2022**:
Impact of global processes on the economy and environment of the research region, Developments in Central Asia, the Caucasus, Russia and Ukraine, Cross-country comparative analyses, Interdisciplinarity of research, and the Dialogue with society, politics, and business.

Organizational chart



Institute structure

IAMO is a foundation under public law. Its bodies are the Foundation Board, the Executive Board, and the Scientific Advisory Board. The Institute is divided into three scientific departments:

- ▶ External Environment for Agriculture and Policy Analysis, Head of Department is **Prof. Dr Thomas Herzfeld**,
- ▶ Agricultural Markets, Marketing and World Agricultural Trade, Head of Department is **Prof. Dr Dr h.c. Thomas Glauben**,
- ▶ Structural Development of Farms and Rural Areas, Head of Department is **Prof. Dr Alfons Balmann**.

The heads of the scientific departments form together with the head of the department

- ▶ Administration and Central Services/Technical Support, **Katja Guhr**,

the Executive Board of the Institute. Since January 2013, all four directors of the institute are equal managing directors with joint responsibility.

In co-ordination with the Board of Trustees, this collegial body conducts the Institute's business and directs IAMO's

Prof. Dr Dr h. c. Thomas Glauben, Katja Guhr, Prof. Dr Thomas Herzfeld, Prof. Dr Alfons Balmann (f.l.t.r.)

long-term research and development planning. The Scientific Advisory Board advises the Directorate and the Board of Trustees on scientific matters and regularly evaluates the Institute's performance.

The following persons were members of the Foundation Board as of 01.01.2021:

- ▶ **Ministerialdirigentin (Head of Section) Cornelia Berns**, Chairwoman, Federal Ministry of Food and Agriculture
- ▶ **N. N.**, Vice Chairwoman/Chairman, Ministry of Economy, Science and Digitization of Saxony-Anhalt
- ▶ **Dr Lothar Hövelmann**, German Agricultural Society (DLG), DLG centre of expertise for agriculture
- ▶ **Ministerialrat (Undersecretary) Jobst Jungehülsing**, Federal Ministry of Food and Agriculture
- ▶ **Prof. Dr Sebastian Lentz**, Leibniz Institute for Regional Geography, Vice President of the Leibniz Association
- ▶ **Prof. Dr Martin Odening**, Humboldt University of Berlin, Department of Agricultural Economics
- ▶ **Prof. Dr Wolfgang Paul**, Martin Luther University Halle-Wittenberg, Prorector for Research
- ▶ **State Secretary Dr Ralf-Peter Weber**, Ministry for the Environment, Agriculture and Energy of Saxony-Anhalt



Members of the Scientific Advisory Board as of 01.01.2021 were:

- ▶ **Prof. Dr Martin Banse**, Chairman, Johann Heinrich von Thünen Institute (TI), Brunswick
- ▶ **Prof. Dr Hermann Lotze-Campen**, Vice Chairman, Potsdam Institute for Climate Impact Research (PIK)
- ▶ **Prof. Dr Štefan Bojnec**, University Primorska, Slovenia
- ▶ **Prof. Dr Gertrud Buchenrieder**, Bundeswehr University Munich
- ▶ **Prof. Dr Imre Fertő**, Center for Economic and Regional Studies (KRTK), Hungary
- ▶ **Prof. Dr Robert Finger**, ETH Zurich, Switzerland
- ▶ **Prof. Dr Sebastian Hess**, University Hohenheim
- ▶ **Dr Ekaterina Krivonos Gonzalez**, Consultative Group on International Agricultural Research (CGIAR), Italy
- ▶ **Prof. Dr ir Miranda Meuwissen**, University Wageningen and Research Centre (WUR), The Netherlands
- ▶ **Prof. Dr William H. Meyers**, University Missouri, USA
- ▶ **Prof. Dr Insa Theesfeld**, Martin-Luther-University Halle-Wittenberg (MLU)
- ▶ **Prof. Dr Katarzyna Zawalińska**, Institute of Rural and Agricultural Development, Poland

Cooperation with university institutions

Since February 1998, cooperation between IAMO and MLU has been based on a comprehensive cooperation agreement, which also includes joint appointments. IAMO's work is particularly closely linked with the Insti-



MARTIN-LUTHER-UNIVERSITÄT
HALLE-WITTENBERG

tute of Agricultural and Food Sciences as part of the Department of Natural Sciences III and with the School of Law and Economics at MLU. The heads of IAMO's scientific departments are involved in MLU's teaching and committee activities. Many of IAMO's habilitated and doctoral staff are also involved in university teaching as well as in conducting a nationally organized doctoral program. In terms of personnel, the dovetailing between MLU and IAMO is accomplished through the membership of the Prorector for Research, Prof. Dr Wolfgang Paul, as MLU's representative on IAMO's Board of Trustees. The cooperation between MLU and IAMO reached a new dimension with the opening of the ScienceCampus Halle—Plant-



based Bioeconomy (WCH) in June 2012. The ScienceCampus aims to intensify interdisciplinary cooperation between the Leibniz institutes in Halle and the thematically corresponding departments at Martin Luther University Halle-Wittenberg in the field of plant-based bioeconomy. In addition, there is closer collaboration with MLU as part of the Leibniz Science Campus Eastern Europe – Global Areas (EEGA), which was officially opened in January 2017 and is supported by institutions of the Leibniz Association, the Max Planck Society, the Fraunhofer Society and several universities in Central Germany. Both campuses



are intended to promote higher education in the Halle (Saale) region and to support the transfer of knowledge and technology to politics, business and the public. IAMO also cooperates intensively with numerous other universities. Primarily, these include faculties of agriculture and economics. Depending on the requirements of interdisciplinary research, there are also other social science and humanities departments, such as human geography or history. With regard to the university cooperation partners in **Germany**, the locations **Berlin, Bonn, Göttingen, Gießen, Hohenheim, Kiel, Munich and Münster** are particularly worth mentioning. In addition to the Martin Luther University Halle-Wittenberg, there has been a comprehensive cooperation agreement in place with Humboldt University of Berlin since 2010. There are also close links with chairs in agricultural economics and institutes at agricultural and economics colleges and universities in our partner countries.

Foreign partner universities

Among the foreign partner universities, Peking University, Sichuan Agricultural University, Huazhong Agricultural University (HZAU), Nanjing Agricultural University and China Agricultural University—Beijing, **China**, Higher School of Economics (HSE) and New Economic School Moscow (NES), both in Moscow, **Russia**, are worth mentioning, in the **Ukraine** the Kyiv School of Economics (KSE), the National University of Life and Environmental Sciences of Ukraine (NUBiP)—Kyiv, the Taras Shevchenko National University of Kyiv and the Zhytomir National Agro-Ecological University (ZhNAEU), in **Uzbekistan** the Samarkand Agricultural Institute

(SamAI), the Samarkand Veterinary Medicine Institute (SamVMI), the Tashkent State Agrarian University, the Westminster International University Tashkent and the Tashkent State Economic University,

in **Kazakhstan** the Kazakh National Agrarian University (KazNAU),

in **Kyrgyzstan** the University of Central Asia,

in **Egypt** Cairo University,

in **Slovenia** the University of Primorska, Koper,

in **Serbia** the University of Belgrade,

in **Romania** the University of Agronomic Sciences and Veterinary Medicine of Bucharest (UASMV),

in **Moldova** the State Agrarian University of Moldova,

in **Kosovo** the University of Prishtina and

in the **Czech Republic** the Czech University of Life Sciences (CULS)—Prague.

IAMO also maintains a wide range of scientific exchanges with Wageningen University and Erasmus University Rotterdam, both in **the Netherlands**, as well as with the University of Copenhagen in **Denmark** and the **Swedish** University of Agricultural Sciences/Uppsala. In addition, there are the Catholic University of Leuven, **Belgium**,

the University of Bologna, **Italy**,

the University of **Iceland**,

the University of Kent in **the United Kingdom**, and

in **France** the La Rochelle School of Business and the NEOMA Business School, Reims.

Close contacts exist in **the USA** with Stanford University, the University of Missouri, the University of Idaho, Southern Methodist University and the University of Wisconsin-Madison.

There are also close contacts with South American universities. In **Argentina**, these include the University of Buenos Aires and the University Mar del Plata, and in **Brazil** the University of Sao Paolo.

Cooperation with non-university institutions

Also the numerous contacts with non-university institutions are of great importance for IAMO's work. IAMO cooperates with the Johann Heinrich von Thünen Institutes of Farm Economics, Rural Studies, and Market Analysis in Brunswick (TI), the Leipzig based Leibniz Institute for Regional Geography (IfL), the Leibniz Institute for the History and Culture of Eastern Europe (GWZO), the Halle Institute for Economic Research (IWH), the Potsdam Institute for Climate Impact Research (PIK), and the German Committee on Eastern European Economic Relations. Close relations exist with numerous non-university research institutions abroad, especially in Central and Eastern Europe, Southeastern Europe, Central and East Asia. There are good and regular working contacts with institutes of the respective academies of sciences and agricultural sciences, with regional research institutes and advisory organizations, as well as with research institutes in the field of agricultural economics that are subordinate to the respective ministries of agriculture.

Examples include

the Center for Chinese Agricultural Policy (CCAP) and the Institute of Geographical Sciences and Natural Resources Research, both in Beijing at the **Chinese Academy of Sciences**, and the Institute of Agricultural Economics and Development at the Chinese Academy of Agricultural Sciences, in **Ukraine**, the Ukrainian Agribusiness Club (UCAB), the

Ukrainian Agrarian Confederation and the Ukrainian Agrarian Council, in **Russia** the All-Russian Institute for Agrarian Problems and Information Theory (VIAP) in Moscow and the North-Western Research Institute of Economy and Organization of Agriculture, Saint Petersburg-Pushkin, in **Kazakhstan** the Kazakhstan Analytical Center of Economic Policy in the Agricultural Sector (ACEPAS)—Astana, the Public Fund Center of Applied Research TALAP, also in Astana, the Kazakh Scientific-Research Institute of Cattle Breeding and Fodder Production (KAZNIIZHik) and the Regional Environmental Centre for Central Asia, in **Uzbekistan** the Tashkent Institute of Irrigation and Agricultural Mechanization Engineers (TIAME), and NBT Consulting, the National Statistical Committee of **the Republic of Kyrgyzstan**, the International Center for Agribusiness Research and Education (ICARE) in **Armenia**, the Georgian Center for Agribusiness Development (GCAD) in **Georgia**, the Institute of Scientific Research on Economic Reforms (ISRER) in **Azerbaijan**, the Ministry of Agriculture, Forestry and Rural Development of **the Republic of Kosovo**, the Institute of Agricultural Economics and Information (ÚZEI), Prague, **Czech Republic**, and the Institute of Agricultural Economics, Belgrade, **Serbia**. In addition, there are the National Agricultural Technology Institute (INTA) from **Argentina**, and the Orkestra—Basque Institute of Competitiveness, San Sebastián, **Spain**.

International organizations

The Food and Agriculture Organization of the United Nations (FAO), in particular the FAO Regional Office for Europe and Central Asia based in Budapest, the World Bank and the International Food Policy Research Institute (IFPRI), both located in Washington D.C., USA, the International Water Management Institute (IWMI-CGIAR), as well as the International Center for Agricultural Research in the Dry Areas (ICARDA), should be emphasized as partners.



Leibniz ScienceCampus 'Eastern Europe – Global Area'

The Leibniz ScienceCampuses offer completely new opportunities for scientific cooperation between non-university and university research institutions. The Leibniz ScienceCampus 'Eastern Europe – Global Area' (EEGA) was officially opened at the Central Germany site on January 26, 2017, focusing on research on and in the countries of Eastern Europe in the context of global challenges. In cooperation with universities and non-university institutes in Leipzig, Halle (Saale) and Jena, IAMO investigates the globalization of Eastern European and Central Asian regions through economic interdependencies, geopolitical changes, cultural exchange and migration movements. The Leibniz Science Campus EEGA offers

the participating institutions excellent interdisciplinary cooperation opportunities for their research and transfer activities as well as in the education and training of scientists. Special emphasis is placed on communicating research results to the media and the general public. The ScienceCampus 'Eastern Europe – Global Area' is funded by the Leibniz Association for a period of four years. Under the leadership of the Leibniz Institute for Regional Geography (IfL), IAMO, the Universities of Leipzig, Halle-Wittenberg and Jena, the Max Planck Institute for Ethnological Research—Halle, the Fraunhofer Center for International Management and Knowledge Economy (MOEZ) and the Leibniz Institute for History and Culture of Eastern Europe (GWZO) are involved. Since its inception, EEGA has provided financial support for IAMO activities. This includes funding for research stays of several months as well as support for workshops. In addition, financial contributions are made to cover the costs of the annual IAMO Forum. In May 2020, the Senate of the Leibniz Association approved follow-up funding for EEGA for another four years.

Promotion of young academics

One of IAMO's three core tasks is to promote young scientists. This core task is implemented at various levels, some of which are interlinked.

Postgraduate education: IAMO Graduate School and Doctorate Lectures


At the end of 2020, 53 dissertations were supervised at IAMO, of which 26 were written by women. The majority of the PhD students come from IAMO's partner countries. One employee is preparing his habilitation. As part of the 'Pact for Research and Innovation', which cor-



responds to the Excellence Initiative of the German federal and state governments to promote science and research at German universities,

IAMO established the IAMO Graduate School in 2007. Initially implemented as a pilot measure for four years, the Graduate School has become a fixed and permanent part of doctoral training at IAMO since 2011. All doctoral students at IAMO are automatically members of the Graduate School. This also includes IAMO's participation in the **'Doctoral Certificate Program in Agricultural Economics'** of the agricultural economics institutes of Germany, Austria, and Switzerland.

This program was jointly founded in 2005 by agricultural economics institutes at several German universities, the Johann Heinrich von Thünen Institute (TI) and IAMO.

 www.agrarroekonomik.de It offers the first doctoral-level structured training in Germany, and now also in Austria and Switzerland, for doctoral students in the field of agricultural and food economics and rural development. Through the systematic teaching of theoretical principles and methods, the quality of the training and the efficiency in the processing of dissertation topics are to be further increased. As the third stage of a consecutive education system, the doctoral program follows bachelor's and master's degree programs related to agriculture, nutrition and the environment.

The doctoral program is jointly supported by the Faculty of Agricultural and Nutritional Sciences at Christian Albrechts University in Kiel, the Faculty of Agriculture at the Rheinische Friedrich-

Wilhelms University in Bonn, the Faculty of Agriculture and Horticulture at Humboldt University in Berlin, the Department of Agricultural Sciences, Ecotrophology and Environmental Management at Justus Liebig University in Giessen,

IAMO, the Faculty of Agricultural Sciences at the University of Hohenheim, the Institute of Agricultural and Nutritional Sciences at Martin Luther University in Halle-Wittenberg, the Department of Ecological Agricultural Sciences at the University of Kassel, the Faculty of Agricultural Sciences at the Georg August University of Göttingen, the Faculty of Economics and the Weihenstephan Science Center for Nutrition, Land Use and Environment at the Technical University of Munich, the Faculty of Agricultural and Environmental Sciences at the University of Rostock, the University of Natural Resources and Life Sciences (BOKU), Vienna, the Swiss Federal Institute of Technology Zurich (ETH), and the Thünen Institute, Brunswick.

The doctoral program has a modular structure. Professors as well as staff members of IAMO collaborated on the courses for the following modules in 2020:

- ▶ The Political Economy of Agriculture in High-Income Countries
- ▶ Introduction to Geographic Information Systems and Spatial Data Analysis
- ▶ Household Behavior: Theory and Applications



In close coordination with the doctoral students, the IAMO Graduate School also offers special continuing education seminars at the institute, for which IAMO invites external speakers.

Since March 2012, the IAMO Graduate School has also been a full member of the **International Graduate Academy (InGrA)** of Martin Luther University Halle-Wittenberg. InGrA supports the establishment of all forms of structured doctoral programs, coordinates existing programs, and helps to create a productive research environment in line with the university's internationalization and gender equality strategies

<https://www.ingra.uni-halle.de>

In addition, the IAMO Graduate School, together with the agricultural economics chairs for agricultural business theory, agricultural market theory, agricultural business management, and agricultural, food, and environmental policy from the Institute of Agricultural and Food Sciences at MLU, conducts a doctoral seminar. The seminar serves as a forum for scientific exchange on research questions, methodological approaches and results.

► In 2020, two Chinese researchers working at IAMO for many years and a Ukrainian researcher working in the UaFoodTrade project successfully submitted and defended their dissertations externally:

Pavlo Martyshev: Regulation of the development of agri-food production under the conditions of increased world prices volatility. (Institute of Economics and Forecasting of NAS of Ukraine)

Juan Wei: Entrepreneurial failure and follow-up entrepreneurial performance of farmers in China: Based on the mediator effect and moderator effect of entrepre-

neurship learning. (Northwest A&F University)

Fang Yin: Cropland changes during 1980 to 2011 in China. (Humboldt University of Berlin)

► Four external dissertations reviewed by IAMO staff also were successfully completed:

Batunacun: Modelling land use and land cover change on the Mongolia Plateau. (Geography Department, Humboldt University of Berlin)

Leticia Hissa: From deforestation to forest recovery: perspectives for the Brazilian Amazon under the rule of the Forest Code. (Geography Department, Humboldt University of Berlin)

Brennan Lowery: 'Knowing beyond measurement': Integrating sustainability indicators and storytelling in an alternative approach to sustainable development in rural Newfoundland and Labrador. (Memorial University of Newfoundland)

Stefan Suess: Mapping spatial and temporal transitions in shrublands with cover fractions from space. (Geography Department, Humboldt University of Berlin)

While the Graduate School focuses on the training of doctoral students, junior researchers and visiting scholars will continue to find a broad range of support in organizational matters related to their affiliation with MLU and in administrative matters within the framework of a coordination office for the promotion of young researchers, which was established in 2019. The coordination office also advises on mentoring programs of partner institutions, supports the Graduate School in the development of additional qualification offers in the area of methodological competencies, further develops the Institute's

welcome service and provides extensive information material. In 2020, the IAMO alumni work was also further developed within the framework of the coordination office.

Equal opportunities at IAMO

At IAMO, measures to promote equal opportunities and the compatibility of work and family life are primarily aimed at creating conditions that utilize and promote the potential of all employees. In this context, IAMO has been complying with the research-oriented equality standards for many years and operates a family-conscious personnel policy. The formal basis for gender equality is provided by the Women's Promotion Act (FrFG) of the state of Saxony-Anhalt and an individual agreement signed with the Ministry of Economics, Science, and Digitization of the state of Saxony-Anhalt in 2019. Adapted to the institute's conditions, the GWK's 'Implementation Agreement on Gender Equality' and the DFG's 'Research-oriented Gender Equality Standards' form the basis for the formulation of new objectives. Accordingly, IAMO has an honorary equal opportunities officer and a deputy.

IAMO's Equal Opportunities Officer, **Franziska Appel**, who was re-elected in December 2020, is involved in the Leibniz Association's Equal Opportunities and Diversity Working Group. Since March 2018, IAMO's Equal Opportunities Officer has been active in the Spokesperson's Council of Equal Opportunities Officers of the Leibniz Association,

where she has been Deputy Chair since March 2020.

The institute was already awarded the 'Total E-Quality' certificate in 2013. A reapplication in 2016 resulted in a positive assessment and certifica-

tion for the following three years. In parallel, IAMO has committed itself to a family-friendly Human Resource (HR) policy by becoming a member of the corporate network 'Success Factor Family'. On December 10, 2020, IAMO was awarded the 'berufundfamilie' (BUF) certificate for the first time. This seal of quality is awarded by the berufundfamilie Service GmbH board of trustees for a period of three years and honours the commitment of companies, institutes, and universities to a family- and life-phase-conscious HR policy. The prerequisite is the successful completion of an auditing process in which both an inventory of the measures already



Franziska Appel, Kristin Leimer and IAMO Director Thomas Herzfeld are glad to receive the 'berufundfamilie' certificate. The award ceremony took place in a festive atmosphere and with the participation of the Federal Minister for Family Affairs Christine Lambrecht as an online stream on 22 June 2021.



offered and strategic goals are developed and recorded. The implementation of these target agreements and action programs is reviewed annually during the term of the certificate.

In addition to equal professional opportunities for both genders based on talents, potentials and competencies, the institute attaches particular importance to ensuring and further developing the compatibility of work and family. The anchoring of equal opportunities as well as the promotion of the compatibility of career and family in everyday work is carried out through conscious personnel management, the promotion of careers and junior staff as well as through networking in the Central German Dual Career Network. www.dcnm.de

In order to promote and institutionally anchor equal opportunities activities at the institute, IAMO has successfully obtained funding for the position of a coordinator for equal opportunities and Diversity through the program **'Promotion of Equal Opportunities between Women and Men in Science and Research (FEM-Power)'**, which is financed by the European Social Fund (ESF) and the state of Saxony-Anhalt. The project will run for five years. The focus of the FEM-Power program is the career-related promotion of women in the so-called MINT area (mathematics, information technology, natural sciences and technology) in which women are underrepresented. From 01.05.2019 to 30.04.2021, **Miao-ling Hasenkamp** was working as coordinator for equality and diversity at



Miao-ling Hasenkamp (left) and Franziska Appel (right) in conversation with a blind pedestrian on the 7th German Diversity Day on 28 May 2019. The IAMO staff members initiated a handicrafts campaign where people were invited to create a mosaic through tinkering colourful and multifaceted stones.

IAMO. She participated in the revision of IAMO's mission statement and took over the acting project management for the planning and implementation of the certification within the audit 'berufundfamilie'. In addition, the FEM Power Officer was engaged in planning and implementing the anti-discrimination seminar series at IAMO. Since 01.05.2021, **Kristin Leimer** is the new person in charge in this position.

IAMO strives to fill all positions with a balanced proportion of women and men, taking into account qualification requirements and diversity aspects (equality, internationality, inclusion). The framework is provided by the cascade model adopted by the DFG in 2011 by the Joint Science Conference (GWK) of the federal and state governments. The career prospects for female scientists at IAMO 2020 have continued to develop well in accordance with the requirements of the cascade model, and in important areas it has been possible to secure the equality that has been achieved.

The China International Research Group at IAMO

The China International Research Group, which has been in existence since 2008, is an association of German, European, and Chinese researchers in the field of agricultural economics with currently just under 40 members. It serves the structural and sustainable international networking of IAMO's research activities on economic and social processes in rural areas of the People's Republic of China.

In 2020, the research group worked on twelve projects covering a wide range of different topics, predominantly on the research foci 'Living conditions in rural areas', 'Use of natural resources' and 'Coordination of value chains'.

<https://china.iamo.de/research/current-research-projects>

The thematic spectrum includes, among other things, the productivity of Chinese agriculture, the effects of land market liberalization, an analysis of social, health and education policies, and the effects of Chinese environmental policy programs on environmental resources and rural

Prizes and awards



► [Johanna Jauernig](#) and [Vladislav Valentinov](#) received the 2020 Highly Commended Paper Award in December 2020 for their paper on 'CSR as hypocrisy avoidance: a conceptual framework.' The article was published in the 2019 *Sustainability Accounting, Management and Policy Journal*. The Highly Commended Paper Award is one of the Emerald Literati Awards for Excellence. Award recipients are being selected by an editorial board of the respective journal based on the previous year's articles.



living conditions. In addition, the complex relationships between land use and the environment as well as trade issues and aspects of food security are also addressed. The individual projects contribute to finding solutions for economic, social and ecological problems in rural China. The focus is primarily on issues relating to the target-oriented design of political and economic framework conditions. In terms of content, the output in 2020 included around 20 peer-reviewed journal articles.

In 2020, several doctoral thesis projects were in progress within the China research group. Of these, two theses were successfully completed. Juan Wei's dissertation entitled 'Entrepreneurial failure and follow-up entrepreneurial performance of farmers in China: Based on the mediator effect and moderator effect of entrepreneurship learning' was successfully submitted and defended at Northwestern A&F University in China after Juan Wei's two-year research stay at IAMO. Furthermore, Fang Yin successfully defended her doctoral thesis on 'Cropland changes during 1980 to 2011 in China' at the Humboldt University of Berlin at the end of 2020.

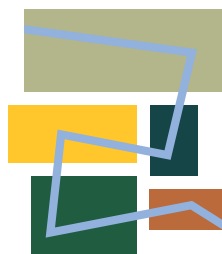
Repeated visits of IAMO researchers to China have proven to be an important instrument of successful research cooperation. Likewise, guest stays at IAMO by foreign, especially Chinese, colleagues are essential in order to adequately align research work with current developments. In addition to intensifying existing collaborations, cooperation with new partners has been initiated, including the Rural Development Institute of the Chinese Academy of Social Science (CASS), Huazhong Agricultural University (HZAU), and the Institute of Agricultural Economics and Development of the Chinese Academy of Agricul-

tural Science (CAAS). Visits by Chinese researchers planned for 2020 had to be postponed to spring 2021 due to current travel restrictions.

Despite massive restrictions due to the COVID-19 pandemic, a lively exchange with Chinese research partners took place in 2020. A highlight of the China group's activities this year was a prominent China session during the IAMO Forum 2020, which was held online due to the pandemic. Members of the research group contributed to the digital learning opportunities for young scientists at Huazhong Agricultural University with digital lecture series. The research group's contribution to the workshop on 'Nutrition and food security under sustainable agricultural transformation' at the Sino-German Agricultural Conference, which was also held in a hybrid format, should also be highlighted. The main organizer of the event was the German-Chinese Agricultural Center (DCZ). Founded in 2015, the German-Sino Agricultural Center (DCZ) is a joint initiative of the German Federal Ministry of Food and Agriculture (BMEL) and the Chinese Ministry of Agriculture and Rural Affairs (MARA). It aims to intensify political and economic relations and promote scientific cooperation and expert exchange. The second phase of the DCZ is carried out on the German side by a consortium of IAK Agrar Consulting GmbH and IAMO on behalf of the BMEL. In the annual workshop of the research group, a large number of established researchers and young scientists could be brought together in discussions this year, also due to the online format. The committed participation of external members of the research group should



be emphasized, which led to the decision to maintain a hybrid format in the coming years.



CENTRAL ASIA RESEARCH GROUP

The Central Asia Research Group

IAMO's Central Asia Research Group was established in 2019 as an interdepartmental network of scholars conducting research on interdisciplinary topics related to agricultural transformation processes in the five post-Soviet Central Asian countries of Kazakhstan, Kyrgyzstan, Tajikistan,

Turkmenistan, and Uzbekistan. Following independence from the Soviet Union in 1991, the five Central Asian governments opted for different development paths. In studying and evaluating these different paths in agricultural development, the Central Asia Research Group promotes multidisciplinary research at a high methodological and theoretical level and disseminates the research results among both a scientific audience and representatives of the political and business communities. The research group's expertise and interests span a wide range of topics, including natural resource management, the transformation of agri-food value chains, risk management, agricultural policy and institutions, climate change, and migration.

The most important event in the reporting period was the participation in the organization of an online conference at the Tashkent State University of Economics (TSUE) with 180 participants. The TSUE conference, held on October 20–22, 2020, provided an opportunity for representa-

tives from academia and politics to discuss online the topic of 'Sustainable agricultural development and regional cooperation for inclusive growth in Central Asia.' The event was jointly organized by Tashkent State University of Economics (TSUE), Leibniz Institute of Agricultural Development in Transition Economies (IAMO), International Food Policy Research Institute (IFPRI), Tashkent State Agrarian University (TSAU) and Tashkent Institute of Irrigation and Agricultural Mechanization Engineers (TIAME).

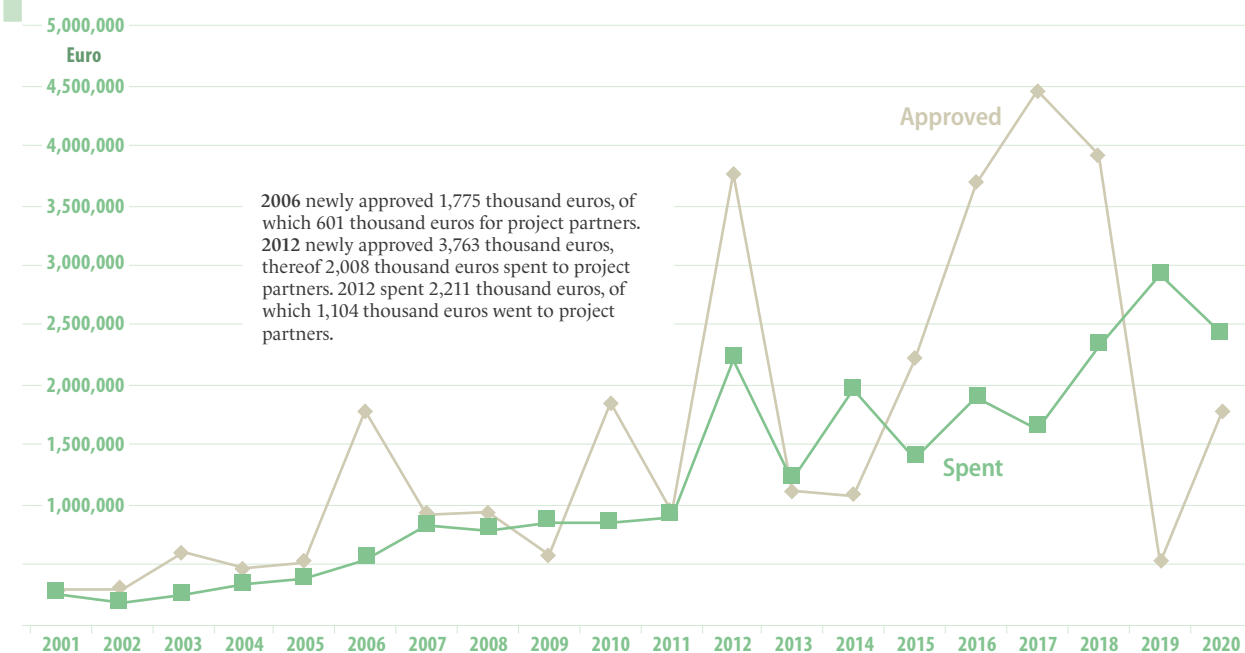
Guests and scholarships at IAMO

The further training of scientists is one of IAMO's core tasks. As mentioned above, IAMO concentrates primarily on promoting young academics from partner countries. Of paramount importance in this context are stays of visiting scholars, which can last from a few weeks to two years. In addition to joint publications, the long-term stays in particular focus on doctoral studies, financed by external and IAMO fellowships as well as third-party funded projects. In 2020, a total of 44 fellows were working at IAMO, primarily on their dissertations. Five mainly young visiting scientists conducted research at the institute during the same period.

Intensive collaboration in international, third-party funded research projects thereby promotes the integration of young researchers from the partner countries into the international scientific community. Former IAMO staff members from both Germany and the partner countries are currently already working in international organizations such as the EU and the World Bank or have taken up leading positions in their respective national agricultural administrations. An even larger number are continuing their academic careers in their home countries.



Development of third-party funding, 2001–2020



Project funding 2020

Project titles	Funding source	
I. Newly approved third-party funded research projects		
Agricultural Land Markets—Efficiency and Regulation. Subproject 6: Impacts of strategic behavior on land market dynamics and regulation effects	FORLand II	German Research Foundation (DFG)
Agricultural Land Markets—Efficiency and Regulation Subproject 7: Quantifying the concentration of land ownership and trade-offs in agriculture	FORLand II	German Research Foundation (DFG)

Agricultural Land Markets—Efficiency and Regulation. Subproject 3: Investigating Market Scepticism Regarding Agricultural Land Markets	FORLand II	German Research Foundation (DFG)
What can digital communications do for generational renewal in farming?		European Commission Marie Skłodowska-Curie Actions
Land use and land cover change (LULCC) impacts of the sorghum and millet upscaling project in Mali	LULCC	Biodiversity International
The impact of COVID-19 on agriculture, food and rural areas in Central Asia and Caucasus countries	SARS-CAC	Food and Agriculture Organization of the United Nations
Consultancy Agreement		Food and Agriculture Organization of the United Nations
Digital transformation – towards sustainable food value chains in Eurasia	IAMO Forum 2020	German Research Foundation (DFG), Landwirtschaftliche Rentenbank, City of Halle (Saale)
Agrifood systems in the bioeconomy	IAMO Forum 2021	German Research Foundation (DFG)
Young Farmer Payments: effectiveness of policy implementations after the 2013 CAP reform in Slovenia	PPP Slovenia 2020	German Academic Exchange Service (DAAD)
Sustainable development of rural areas		German Corporation for International Cooperation GmbH (GIZ)
Contract for consulting services		Tashkent Institute of Irrigation and Agricultural Mechanization Engineers
Reforming the social discourse on innovative technologies. Focus topic: Green Deal—what is in store for the agricultural and food sector?		Edmund Rehwinkel Foundation (Landwirtschaftliche Rentenbank)



II. Ongoing projects with third-party funding		
Agricultural Land Markets—Efficiency and Regulation. Subproject 6: Can agricultural land market regulations fulfill their promises? Agent-based simulation studies for selected German regions	FORLand	German Research Foundation (DFG)
Agricultural Land Markets—Efficiency and Regulation. Subproject 7: Spatio-temporal analysis of the effects of land markets on agricultural enterprises	FORLand	German Research Foundation (DFG)
Sustainability of research software AgriPoliS	AgriPoliS 2020	German Research Foundation (DFG)
Perceptions of inequalities through social comparisons and transference on subjective well-being: a micro perspective on reference groups	Social comparisons and inequality	German Research Foundation (DFG)
Establishment of a junior research group in 'Economics and Institutions of the Bioeconomy'		Leibniz Association
International Competence Center on Large Scale Agriculture	LaScala	Leibniz Association
Structured doctoral programme on Sustainable Agricultural Development in Central Asia	SUSADICA	Volkswagen Foundation
An Innovative Pilot Program on the Re-Integration of Scientists to Central Asia: Research and Capacity Building on Food Chains under Climate Change	IPReS	Volkswagen Foundation
Institutions, change mechanisms and impacts in natural resource management of Central Asia		Volkswagen Foundation
Understanding food value chains and network dynamics	VALUMICS	EU Horizon 2020
Towards SUsustainable and REsilient EU FARMing systems	SURE-Farm	EU Horizon 2020

Modelling individual decisions to support the European policies related to agriculture	MIND STEP	EU Horizon 2020
Doctoral Studies in GeoInformation Sciences	DSinGIS	EU Horizon 2020 Erasmus +
Rural NEET Youth Network: Modellierung der Risiken, die der sozialen Ausgrenzung ländlicher NEETs zugrunde liegen		EU COST Action
German-Ukrainian Agricultural Policy Dialogue	APD	Federal Ministry of Food and Agriculture (BMEL)
German-Sino Agricultural Center	DCZ	Federal Ministry of Food and Agriculture (BMEL)
Pilot project for the sustainable internationalization of Ukrainian research structures in the context of the globalization of the Ukrainian food sector	UaFoodTrade	Federal Ministry of Education and Research (BMBF)
The role and functions of bioclusters in the transition to a bioeconomy	TRAFOBIT	Federal Ministry of Education and Research (BMBF)
Increasing climate resilience via agricultural insurance—Innovation transfer for sustainable rural development in Central Asia	KlimALEZ	Federal Ministry of Education and Research (BMBF)
Market power on agricultural land markets—meaning, measuring, and definition		German Federal Office for Agriculture and Food
Editor-in-chief (Dr Daniel Müller) for the <i>Journal of Land Use Science</i>		Journal of Land Use Science
Promotion of gender equality for female scientists at Leibniz Institute of Agricultural Development in Transition Economies (IAMO)—Creating the position of equality and diversity coordinator	FEM-Power	Saxony-Anhalt Investment Bank



Citizen Science and ICT for Advancing the prevention and control of Banana Xanthomonas Wilt (BXW) in East and Central Africa	ICT4BXW	German Corporation for International Cooperation GmbH (GIZ)
Digitalization in Agriculture—The social media impact on agri-food marketing	AgriDigital	German Academic Exchange Service (DAAD)
Determinants of Iran's Red Meat Crisis: Multidisciplinary Analysis of Supply Chain Governance	Red Meat Crisis	Leibniz Research Alliance 'Crises in a Globalised World'
III. Completed third-party-funded research projects		
Agricultural Land Markets—Efficiency and Regulation Subproject 3: Ethical issues in agricultural land markets	FORLand	German Research Foundation (DFG)
Establishing cooperation with Greek partners for the YOUNG FARMERS project application		German Research Foundation (DFG)
Cross-border analysis of grassland greenness in Asia: Climate variations, grazing pressure, and land policy change	CROSSGRASS	European Commission Marie Skłodowska-Curie Actions
Political economy of agricultural policies in federal systems	FEDAGRIPOL	Leibniz Association
Digital early-warning technologies for climate crisis management and agricultural transition in Central Asia	DETECCT	Leibniz Research Alliance 'Crises in a Globalised World'
Exchange Program of the Leibniz Research Alliance 'Sustainable Food Production and Healthy Nutrition' (LRA FN) joint project 'Protein Paradoxes'		Leibniz Research Alliance 'Food and Nutrition'
The Ethics and Economics of Modern Agricultural Myths	AgriMyths	Saxony-Anhalt Investment Bank

Selected third-party funded projects

In the following, important recent externally funded projects will be presented, which exemplify IAMO's extensive activities in research and academic capacity building in its target countries. These projects combine high-quality scientific work with comprehensive transfer activities. Their implementation is designed in such a way that the findings generated in dialog with business, politics, and society effectively contribute to solving urgent problems and future issues.



FORLand II

In a second stage, the research group 'Agricultural Land Markets—Efficiency and Regulation' (FORLand), funded by the DFG and FWD Der Wissenschaftsfonds (Austria), has been extended for another 36 months (FORLand II). The research group focuses on the functioning and efficiency of agricultural land markets and land market regulation. The aims of the project are to develop a better understanding of the origins of purchase and rental prices for agricultural land, to assess the impact of market mechanisms and rising prices on society and the environment, and to assess the effects of government intervention in the land market.

In addition to IAMO, the project partners are Humboldt University of Berlin, Technical University of Berlin, Georg August University of Göttingen, University of Natural Resources and Life Sciences Vienna (BOKU), and the Department of Agriculture at University Bonn. IAMO staff

members are responsible for three subprojects in FORLand II. These deal with the 'Investigation of Market Scepticism Regarding Agricultural Land Markets,' with 'Quantifying the concentration of land ownership and trade-offs in agriculture,' and the 'Impacts of strategic behaviour on land market dynamics and regulation effects.' Depending on the subproject, FORLand II will start at IAMO on 01.01.2021 or 01.02.2021.

Young Farmers—Marie Curie Fellowship

The project 'Young Farmers—What can digital communications do for generational renewal in farming?' is a Marie Skłodowska-Curie Action (MSCA) grant for **Ilkay Unay-Gailhard** from IAMO, funded by the EU under Horizon 2020. The fellowship runs for 36 months.

The lack of interest of young people to work in agriculture is a widespread phenomenon in developed economies, but also in most Eurasian transition countries, with the consequence of the aging of the agricultural sector. Even many young people who have professional degrees in agriculture do not consider working in this sector as an option. The very low percentage of young farmers in the enlarged EU and the U.S. affects the resilience of agriculture and also poses problems for food security. As the 'network individualism' model shows, today's youth live in an environment of increasing privatization of information, where digital communication plays a prominent role in shaping their behaviour. Focusing on digital communication, this project asks: What are the specific mechanisms, contexts, and strategies through which today's young people can most effectively connect with agriculture, not only as civic engagement, but also with working in the agricultural sector as a 'career option'?





KlimALEZ—Project scaling up: Implementation of an index-based agricultural insurance to strengthen climate resilience of Central Asian agriculture

The three-year project KlimALEZ—Climate Resilience through Agricultural Insurance, funded by the German Federal Ministry of Education and Research (BMBF), started in December 2017 and focuses on transfer of innovation for a sustainable rural development in Central Asia. IAMO coordinated the project, which was carried out in cooperation between insurance companies and research institutions from Central Asia and Germany. The overall objective of KlimALEZ is to increase the resilience of the Central Asian agricultural sector to climate risks, in particular droughts, through innovations in agricultural insurance markets. Using a transdisciplinary approach and in cooperation with German and local insurance companies, the project has succeeded in developing a demand-driven, index-based agricultural insurance program for various Central Asian countries.

In the project, which has been expanded at the request of the BMBF, the aim is now to extend the project activities to irrigated agriculture in Uzbekistan and other regions. In addition, there will be an accelerated cross-regional dissemination of the research results. The research findings regarding the design, implementation and impact of modern agricultural insurance markets on food security, climate resilience and sustainability will serve the respective national governments and cooperating insurance

companies in implementing a sustainable and nationwide insurance program.

SARS-CAC—The impact of COVID-19 on agriculture, food and rural areas in Central Asia and Caucasus countries

The SARS-CAC project, which will run for seven months and was launched on December 1, 2020, was initiated by the Food and Agriculture Organization (FAO). The FAO has commissioned a series of studies to assess the consequences of the spread of the novel coronavirus and to preliminarily evaluate the corresponding containment strategies of the different governments. IAMO is coordinating a study on eight countries in Central Asia and the Caucasus: Armenia, Azerbaijan, Georgia, Kyrgyzstan, Kazakhstan, Tajikistan, Turkmenistan, and Uzbekistan. Building on a network of country experts or teams of experts, eight reports will be produced using a standardized survey design. These will provide information on the spread of coronavirus, impacts on food production and trade, and food price trends. In particular, a possible shift in the main consumer purchasing channels away from bazaars and, often informal, markets to supermarkets or other more standardized sales channels needs to be investigated. For the countries of the region, it is also of particular interest to see how the constraints on the economies of the main migration destinations, especially the Russian Federation, affect remittances, unemployment, and the income situation in rural areas. A synthesis report will bring together the key messages of the country reports and compare the experiences of the respective countries. In some countries, the availability of statistical data at the desired depth is a challenge. In the case of Turkmenistan,

this is compounded by the government's denial of the existence of coronavirus in the country yet comparatively drastic interventions in food markets. Cooperating partners include the International Center for Agribusiness Research and Education (ICARE) in Armenia, ADA University in Azerbaijan, TALAP Center in Kazakhstan, University of Central Asia in Kyrgyzstan, and Westminster International University in Uzbekistan.

IAMO's lecturing activities

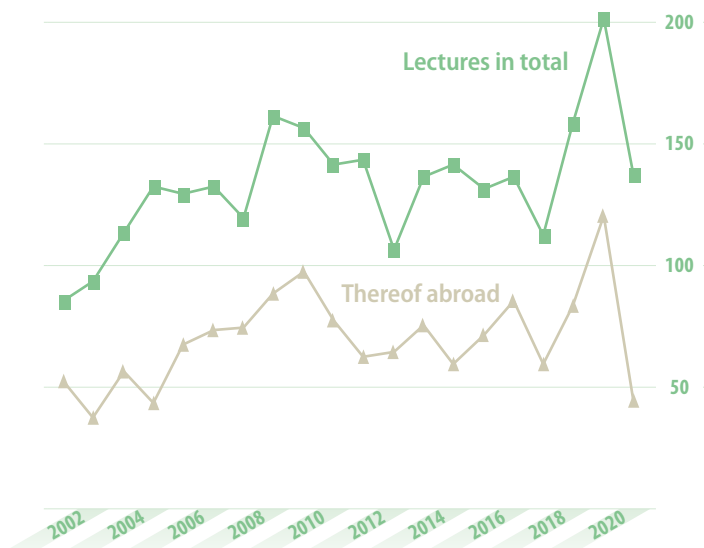
An important task besides the publication activities of our staff is the presentation and discussion of the achieved research results at national and international conferences, meetings and workshops. IAMO staff members present a large part of their papers at international

events. In the period 01.01.2020–31.12.2020, the costs of **the 137 lectures given** were either fully covered by the organizer (21), financed by third-party funds (37) or other sources (16), mixed funding was available for 24 lectures and the IAMO budget fully covered the costs for 37 lectures. Two lectures were based on self-funding. The reduction in the number of all lectures by one third and in the number of lectures held abroad by two thirds in 2020 compared to 2019 was due to Corona.

Conferences and seminars

Conferences and seminars play a central role in fulfilling IAMO's third core task: to serve as a forum for scientific exchange on all issues of agricultural development in transition countries. The events organized by the Institute provide an important platform for scientific exchange on both a national and international scale. In addition to deepening scientific cooperation, the meeting of scientists with decision-makers from politics, administration and the food industry often leads to important impulses for the restructuring of the agricultural and food sector in the partner countries. At the same time, direct and intensive contact with decision-makers from the regions ensures that IAMO's research is geared to the actual needs on the ground. It should also be emphasized here that IAMO makes an important contribution to scientific capacity building in research and teaching in our partner countries in the field of agricultural economics and decisively promotes the development of sustainable networks in the long term. In the following, we report on the most important conferences, symposia, and workshops held by the Institute in 2020, in addition to the IAMO Forum.

Development of IAMO's lectures, 2001–2020



International Scientific Online Conference on Agricultural Development in Central Asia

On October 20–22, 2020, the International Scientific Online Conference ‘Sustainable Agricultural Development and Regional Cooperation for Inclusive Growth in Central Asia’ was held. Originally planned with Tashkent as the venue, the conference was jointly organized by Tashkent State University of Economics (TSUE), IAMO, International Food Policy Research Institute (IFPRI), Samarkand Branch of TSUE, Tashkent State Agrarian University (TSAU), and Tashkent Institute of Irrigation and Agricultural Mechanization Engineers (TIIAME). The three-day online conference provided a platform for scientists and representatives from government, business, and civil society to discuss ways to promote food security, sustainable agricultural development, and regional cooperation in Central Asia. Blocks of topics included (1) the impact of the COVID-19 pandemic on food security, (2) enhanced opportunities for agribusiness to flourish in modern value chains, (3) government policies that support the agri-food sector, (4) challenges for training and research in the agri-food sector, and (5) digital technologies in use for a sustainable inclusive agri-food sector. Over three days, 180 participants heard presentations in 18 parallel online sessions, a panel discussion, and four keynote presentations by Josef Schmidhuber (FAO), Hyun-Hoon Lee (Kangwon National University), Barbara Janusz-Pawletta (Kazakh-German University), and Eugenia Serova (HSE Moscow).

The opening session featured prominent speakers such as Kongratbay Sharipov (Rector of TSUE, Uzbekistan), Friedrich Wacker (Ministerial Director, Federal Ministry of

Food and Agriculture), Ekaterina Krivonos (CGIAR—Consultative Group on International Agricultural Research), Johan Swinnen (Director General, IFPRI, USA), and Thomas Glauben from IAMO. The welcome speeches were followed by a keynote presentation by Josef Schmidhuber, Deputy Director in the Trade and Markets Division of the Food and Agriculture Organization of the United Nations (FAO), on the impact of COVID-19 on agricultural trade.

A key event of the conference was the panel discussion on the last day on ‘Science-driven Policymaking for Sustainable and Inclusive Agricultural Development’ with prominent participants from academia, policy and extension. The panelists were Kamiljon Akramov, Director of the Central Asia Program at the International Food Policy Research Institute (IFPRI), USA; Shuhrat Amanov, Ministry of Agriculture of the Republic of Uzbekistan; Adkham Bekmuradov, Executive Director of the ‘El-Yurt Umidi’ Foundation, Uzbekistan; Adrian Neal, Advisor to the Ministry of Agriculture of Uzbekistan; and Eugenia Serova, Institute of Agricultural Studies at the Higher School of Economics (HSE), Russian Federation. Aziza Umarova, SmartGOV consulting, Uzbekistan, moderated the panel discussion. According to the panelists, global experiences should be combined with on-the-ground research to identify locally appropriate policy tools for strengthening food systems sustainability in the context of COVID-19. To this end, they said, agricultural economics research capacity at universities and research institutes should be further promoted.





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Forum 'Food Security and Nutrition in a Changing World'

The 6th Sino-German Agriculture Week was held in Beijing, China, from November 30 to December 3, 2020. The aim of the event was to promote bilateral cooperation between the German Federal Ministry of Food and Agriculture (BMEL) and the Chinese Ministry of Agriculture and Rural Affairs (MARA). High-ranking representatives from politics, science and agribusiness from both countries came together to contribute in person or online. As part of the annual Sino-German Agricultural Week, the Sino-German Agricultural Center (DCZ), in cooperation with the Chinese Academy of Agricultural Sciences (CAAS) and IAMO's International Research Group China, also hosted an online research forum on December 3, 2020. The forum on 'Food Security and Nutrition in a Changing World' was opened by Ke Xiaohua (CAAS), Professor Sun Tan (CAAS Vice President) and Maja Clausen (BMEL). Afterwards, Li Xiande (CAAS) and Matin Qaim (University of Göttingen) each gave a keynote presentation on 'Impact of COVID-19 on Global Food Security and Markets—Chinese Policy Responses' and 'Sustainable Food Systems: Trends and Challenges'. Furthermore, Chinese and German experts presented papers around the topic of food and food security from the perspective of sustainable agricultural transition.

IAMO's expert panel at Green Week 2020

Globalization has significantly increased trade in agricultural goods since the turn of the millennium. This is particularly true for Eastern Europe, Central Asia and the Far East. Despite the positive developments of recent years, producers in these regions continue to face major

challenges in keeping up with global increases in quality standards and the required transparency of supply chains. Thus, on January 17, 2020, nearly 130 international guests from politics, business and academia met at the GFFA (Global Forum for Food and Agriculture) expert panel titled '**Driving Trade, Delivering Trust: Quality and Transparency in International Agricultural Trade with Eastern Europe and Asia**' in Berlin to discuss the integration of Eastern European and Asian agricultural producers into global markets and value chains, existing implementation barriers, and trends in international agricultural trade. The opening speech on problems of international agricultural trade with a focus on Central Asia was given by IAMO Director Thomas Glauben. For the region's producers and traders, however, high competitive pressures and consumer expectations have so far posed major obstacles to entering new markets with purchasing power. The introduction of digital solutions and uniform certification programs offer opportunities to improve the efficiency



and transparency of trade relations and can thus play a significant role in integrating Eurasian food chains into global markets. Uwe Feiler, Parliamentary State Secretary at the German Federal Ministry of Food and Agriculture (BMEL), delivered a welcoming address.

The subsequent panel discussion was attended by Uzbek Minister of Agriculture H.E. Jamshid Khodjaev, Ukrainian Vice Minister of Economic Development, Trade and Agriculture Taras Kachka, Kristian Möller, Managing Director of GLOBALG.A.P., an organization introducing globally applicable assurance and certification systems in agriculture, Britta Gallus, Director of Supply Chain Management at Metro AG, which also serves Ukraine, and IAMO scientist Lena Kuhn. The latter emphasized that there were mainly misunderstandings in individual countries about the usefulness of introducing such international quality standards and how this could actually be realized. In addition, the implementation is associated with lengthy implementation processes and high investment costs for new technologies, training of employees and the use of control bodies. She pointed out that small farms could hardly afford the associated financial, personnel and time expenditures and would thus find it difficult to compete in international markets. The panel discussion was moderated by Julia Harnal, Chair of the German Agribusiness Alliance. The panel was organized by IAMO, the German Agribusiness Alliance and the OA—Committee on Eastern European Economic Relations in cooperation with the German-Sino Agricultural Center.

Publications

The academic staff publish their research results in journals, monographs, edited volumes, discussion papers,

and increasingly also disseminate them via short policy briefs. A complete list of publications can be viewed on the Internet on IAMO's homepage. www.iamo.de/en Publication activities continued to develop positively during the reporting period. This is especially true for peer-reviewed articles with impact factor listed in the Science Citation Index (SCI) and Social Science Citation Index (SSCI). In 2020, the number of articles with an impact factor increased by 22% to a new high of 56. All other publication categories (all print publications/total articles/articles in peer-reviewed journals) also showed highs in 2020. IAMO's internal quality management for publications is thus continuing to have an effect.

IAMO Policy Briefs

<https://www.iamo.de/en/publications/iamo-policy-briefs>

Since 2011, IAMO's Policy Briefs have been published at irregular intervals to present IAMO's socially relevant research results in a concise and easily understandable way. They are aimed in particular at representatives from politics, business, and the media, as well as interested laypersons. The IAMO Policy Briefs were continued in 2020 with the following issues, which can be downloaded free of charge as pdf files from the IAMO homepage:

Heigermoser, Maximilian; Glaubien, Thomas (2020)

COVID-19, the oil price slump and food security in low-income countries. *IAMO Policy Brief No. 37*, Halle (Saale). available also in German and Russian

Akhmadiyeva, Zarema; Herzfeld, Thomas (2020) **How to align formal land rights with farmers' perceptions in Central Asia?** *IAMO Policy Brief No. 38*, Halle (Saale).

available also in Russian





IAMO Discussion Papers

<https://www.iamo.de/en/publications/iamo-discussion-papers>

The IAMO Discussion Paper series continued in 2020 with the following issues, which can be downloaded free of charge as pdf files from the IAMO homepage:

Weiss, Christoph (2020) **Preisbildung bei unvollkommener Konkurrenz. IAMO Discussion Paper No. 192**, Halle (Saale).

Robinson, Sarah (2020) **Livestock in Central Asia: From rural subsistence to engine of growth? IAMO Discussion Paper No. 193**, Halle (Saale).

Studies on the Agricultural and Food Sector in Transition Economies

<https://www.iamo.de/en/publications/iamo-studies>

In the series *Studies on the Agricultural and Food Sector in Transition Economies*, IAMO publishes monographs and conference proceedings dealing with agricultural economics in Central and Eastern Europe and other transition countries. All publications from volume 22 onwards can be downloaded free of charge as pdf files from the Internet. So far, 32 conference proceedings and 64 monographs have been published in the series. The publications in 2020 were:

Wettstein, Nadine (2020) **Markentreue bei Lebensmitteln: Eine Analyse unter Berücksichtigung dynamischer Prozesse am Beispiel von Tiefkühl-Pizza in Deutschland 2000–2008. Studies on the Agricultural and Food Sector in Transition Economies, Vol. 95**, Halle (Saale).

Svanidze, Miranda (2020) **Spatial market efficiency of grain markets in the post-Soviet countries and implications for global food security.** *Studies on the Agricultural and Food Sector in Transition Economies*, Vol. 96, Halle (Saale).

Science Communication

IAMO not only exchanges its research findings on agri-food economics within the scientific community, but also presents its results to representatives from business, politics, and non-governmental organizations and to the general public.

IAMO regularly organizes and participates in high-level international events. A special highlight is the annual **IAMO Forum**. In 2020, this took place online for the first time under the title 'Digital transformation—towards sustainable food value chains in Eurasia'. At the four plenary sessions, 23 parallel sessions and the panel discussion, more than 450 international experts from science, business and politics exchanged views on the opportunities and challenges of digitalization in the agricultural and food sector from June 24 to 26, 2020. The geographical focus was on Europe, Central Asia and China. The conference concluded with an interactive children's lecture that introduced the younger generation to topics such as digital technologies in food production and healthy nutrition. IAMO Forum 2020 was organized by IAMO's Agricultural Markets Department in collaboration with the World Bank's Agriculture and Food Global Practice, Kyiv School of Economics, Tashkent State Agrarian University, Higher School of Economics Moscow, Faculty of Agriculture of the University of Belgrade, and the Institute of Agricul-

tural Economics and Development, Chinese Academy of Agricultural Sciences. Detailed reports on the technical presentations and behind-the-scenes work are available in this issue. More information can also be found on the conference website: www.iamo.de/forum/2020.

Under the title 'Challenges for Rural Development—Economic and Social Science Perspectives', the **60th Annual Conference of the Gesellschaft für Wirtschafts- und Sozialwissenschaften des Landbaues e.V. (GEWISOLA)** took place in digital form from September 23 to 25, 2020. At the plenary sessions, working group meetings and the concluding panel discussion, participants spoke about current social issues and problems of rural areas. The conference was organized by Martin Luther University Halle-Wittenberg, IAMO and Anhalt University of Applied Sciences. Detailed information is available on the conference website: www.iamo.de/gewisola.





As part of the **Global Forum for Food and Agriculture (GFFA)** in Berlin, the expert panel on ‘Driving Trade, Delivering Trust: Quality and Transparency in International Agricultural Trade with Eastern Europe and Asia’ took place on January 17, 2020. Nearly 130 international guests from politics, business and academia gathered to jointly discuss the integration of agricultural producers in Eastern Europe and Asia into international value chains, existing implementation barriers and trends in international agricultural trade. The panel was organized by IAMO, the German Agribusiness Alliance and the OA—European Economic Relations in cooperation with the German-Sino Agricultural Center.

Information on IAMO’s research activities is disseminated via IAMO’s own publication formats and press releases, contributions in the newsletter, on the institute’s website and in social networks, as well as in the form of expert interviews in the media.

In 2020, IAMO was mentioned by name or researchers from the institute were quoted in several reports by radio, print, and online media. The following topics received particular attention:

Impact of the Corona pandemic on food security

Digitalization in agriculture

Russian meat and grain exports

Agribusiness and land market reform in Ukraine

Migration research on Kosovo

EU agricultural subsidies for farms vs. agribusinesses

Farmer protests and problems in agriculture

Farm death and future of farmers in Germany

Design of land market prices in Saxony-Anhalt

A selection of articles in the general and trade media can be found under the heading **IAMO in the Media** on the website www.iamo.de/en/press/iamo-in-the-media.

The institute’s website is bilingual in German and English: www.iamo.de and www.iamo.de/en. Here, informa-

tion on research results, project collaborations, events, publications, promotion of young researchers and job advertisements is published and regularly updated. In addition, the institute manages several project and event websites.

In 2020, the newsletter underwent a structural and technical revision. It is published four times a year in German and English. **The electronic newsletter** informs about latest research projects, guest stays, events, awards

and publications. The newsletter can be viewed and subscribed to free of charge: www.iamo.de/en/newsletter.

News from IAMO is also communicated via social media.

On the social media channels

Facebook www.facebook.de/iamoLeibniz and

Twitter <https://twitter.com/iamoLeibniz>,

IAMO operates an institute profile and other project/group profiles.



Sina Lehmann, IAMO Press Office

► If you have any questions or suggestions, please contact the institute's press and public relations department:

presse@iamo.de

Sources and credits

Title IAMO at the Weinberg Campus, with view of Halle (Saale), Heide-Süd, 2019 © Silvio Kelz

► A short history of the building and location: In the early 1930s the army and air force signals school was built in the place where vines had been cultivated for several centuries. The building complex accommodated officers. After the Second World War the barracks were first occupied by the US army, then shortly afterwards by the 27th Guards Rifle Division of the Red Army. After 1991, planning and many years of conversion followed. In 1999 IAMO, along with two other research institutes, moved into the renovated officers' mess. Since 2007 the location has been used by IAMO alone. Today the Weinberg Campus is one of the largest science and technology parks in eastern Germany.

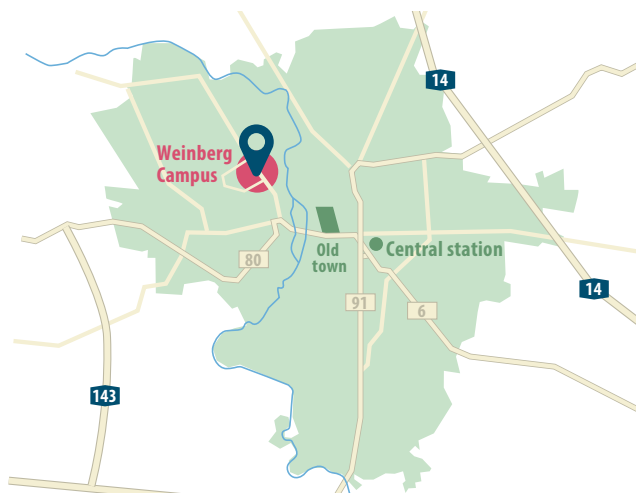
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Daniela Schimming, IAMO Press Office

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How to find us

... by car

- 📍 Leibniz Institute of Agricultural Development in Transition Economies (IAMO),
Theodor-Lieser-Str. 2, 06120 Halle (Saale)
Germany

... by train

Leave the station by the main exit and follow signs to the tram stop 'Riebeckplatz/Hauptbahnhof'. From here take **tram number 4** towards **Kröllwitz**. Alight at the **'Weinberg Campus' stop** (about 15 minutes from the station). The Institute is on the left-hand side of the road as you get out. Alternatively you can also take to tram number 5.

... by plane

Leipzig-Halle airport is 20 km from Halle (Saale). A regular shuttle train takes you to the main station. See 'by train' to find the way from there.

Imprint

In addition to this publication series, IAMO's publications include the *Discussion Paper* series, the *Studies on the Agricultural and Food Sector in Transition Economies* series, the Institute's Annual Reports and the *Policy Briefs*.

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Cover picture

Cover Satellite image of southern Ukraine, Kakhovka reservoir © contains modified Copernicus Sentinel data (2019), processed by ESA, CC BY-SA 3.0 IGO

▶ The Copernicus Sentinel-2 mission enables the tracking of changes in land use and the monitoring of vegetation. Data from the Copernicus satellites is provided free of charge and without restriction to all users. When processing this false colour image the near-infrared channel was included, which makes vegetation glow bright red. The circular shapes show irrigation systems with a central pivot. (Sources: scitechdaily.com, esa.int)





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