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in Transition Economies

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The Challenges of Climate-Aware Agricultural Production

The scientists participating in the 2015 IAMO Forum presented the newest insights into climate change adaptation. The scientists also discussed strategies to avoid greenhouse gas emissions.

Halle (Saale), 9th July 2015 – Climate change significantly affects the transformation economies in Central and Eastern Europe, the former Soviet Union, Central Asia and China. In temperate zones, climate change may alter the growth phases of field crops and extend northward. By contrast, in the southern part of Central Asia and West China, climate change may cause a shift to higher summer temperatures, less precipitation and therefore increased stress due to drought conditions and reduced crop yields. Scientists also expect more yield-reducing droughts in the Russian black earth region as well as in the Ukraine and Kazakhstan. This will have sweeping consequences for the global grain markets. The concomitant agricultural adjustments to climate change and the reduction of greenhouse gas emissions are central challenges in the above named regions.

Between the 17th and 19th of June 2015, about 170 participants from 21 countries met at the IAMO Forum 2015 in Halle (Saale), Germany to discuss the cause-effect relationships between climate change and agricultural activities. The conference "Agriculture and Climate Change in Transition Economies" consisted of three plenary sessions, sixteen parallel sessions and a panel discussion. The participating scientists addressed the conference theme by presenting their latest research results and by suggesting strategies in response to climate related problems.

IAMO Director Professor ***Alfons Balmann*** opened the conference. In his opening words, he identified the factors, which will significantly influence future agricultural developments. He pointed to the growing world population and people's changing eating habits, aside from emphasising the increasing demand for bio-energy, the impacts of technological developments and last but not least, the requirements to eliminate greenhouse gas emissions and adjust to climate change. *Balmann* considers measures to avoid climate change and measures to adjust to it very challenging especially for transformation economies because of their agricultural structures, inadequate infrastructures, and weak institutions.

In his keynote presentation, Professor ***Hans Joachim Schellnhuber***, Director of the Potsdam Institute for Climate Impact Research (PIK) in Germany, addressed the topic "Climate Risk and Food Security“. Experts are convinced that frequent and long-lasting extreme climate changes not only impact the agriculture but also people in general. In his 2015 IAMO Forum speech, he took his audience on a journey back through the history of climate development. People started to mine fossil raw materials in 19th century England. This activity started the still ongoing industrial revolution, which has now expanded to just about every place on earth. As studies in the Potsdam Institute for Climate Impact Research prove, the industrial revolution is accompanied by a global temperature increase. While temperature averages may fluctuate in the short run, the long-term trend is clearly up. Global warming does not slow down. *Schellnhuber* indicated that even the two-degree target harbours serious risks. It would mean the end of the coral reefs in Australia, and Arctic summers would almost disappear along with the Alpine glaciers and the Greenland ice. Right now, even achieving this two-degree objective appears to be a great challenge. In his concluding remarks, the climate researcher warned of the great danger threatening human civilization.

Regional Assessments of Options for Mitigation and Adaption to Climate Change

Feeding the growing population and preventing dangerous climate change are two of the greatest challenges facing humanity. Professor ***Pete Smith***, University of Aberdeen, Scotland, UK, reported such issues from supply-and demand-side climate mitigation potentials respectively. He pointed out that supply-side mitigation measures (e.g. changes in land management) might either enhance or negatively impact food security, while demand-side mitigation measures (e.g. reduced waste or demand for livestock products) could benefit both food security and greenhouse gas mitigation but given the enormity of challenges. *Smith* emphasized that supply-side measures should be implemented immediately with focus on sustainable intensification. Due to much time taking for behavior change, demand-side measures could be pushed by introducing policy quickly and co-delivering to other policies. Joined-up policy to address multiple objectives is required now than ever.

Professor ***Maximilian Auffhammer***, University of California, Berkeley, USA, mainly reported on detecting and attributing the impact of climate change on agriculture. He took the rice as an example and applied detection and attribution (D&A) simulating the pathways of climate on crop yield including rising temperature, changing relative humidity, water stress and CO2 fertilization. *Auffhammer* also put forward some immediate research needs, such as a framework and language for D&A, extensive margin impacts of climate change, climate drive of rural to urban migration, and impacts of pollution air on local yield. Meanwhile he insisted more economist should be involved in the studies of food security and climate change.

Consequences of Climate Change and Adaptive Strategies on the Operational Level

The increasing food demand and the limited availability of arable land and water resources are central challenges for the Chinese agriculture. Professor ***Jikun Huang***, Centre for Chinese Agricultural Policy, Chinese Academy of Sciences in China, presented feasible adaptation strategies to face global climate change. Using empirical data from climate change studies in nine provinces, he focussed on the repercussions of climate change (mainly drought and flooding) on major crop yields and prices. *Huang* employed an econometric model and the general equilibrium model (GEM) to show the overall effects of a

temperature increase. While the effects would be negative, he expected them to be less severe than formerly predicted thanks predominantly to adjustment strategies implemented by producers and consumers. Improving the water management infrastructure, the arable land management, crop and plant diversification and irrigation practices turned out to be particularly effective strategies to reduce the climate-related risk. Government also significantly contributes to the agricultural adaptation to extreme climate change by providing information and early warning systems as well as financial and technical support.

Professor ***Vladimir Romanenkov*** from the All-Russian Institute of Agrochemistry in Moscow, Russia, presented the results of a long-term experimental study correlating the use of fertilisers and CO_2 binding in Russian agriculture. The jumping-off point in this study was the reality of global crop shortages and price increases caused by climate change. The temperature increase in Russia is about 2.5-times higher than the global average. Therefore, possible negative consequences are likely more pronounced. These consequences do have a significant influence on the soil use because CO_2 binding decreases with increasing soil temperature. *Romanenkov* used a simulation-based climate model to study the effects of three soil management scenarios - (1) business as usual (2) profit maximisation (3) sustainable soil management - on the carbon-binding capacity of crop plants in Russian black earth and podsol (also known as grey or ash earth) regions. The experiments indicated that the positive effects of soil use adaptations would be noticeable only long after implementation in the 2030s and 2040s and will be more pronounced outside the Russian black-earth regions. The sustainable soil management scenario showed the largest benefit in terms of increased carbon-binding.

Opportunities and Challenges of Climate-Smart Agriculture

The concept of "climate-smart agriculture“ (CSA) is designed to provide three benefits: (1) Sustainable productivity increases to secure incomes as well as food and nutrition security; (2) adaptation and increased resilience to the consequences of climate change and (3) reduction in the agriculture-related emission of climate-damaging gases. In her presentation, Dr. ***Leslie Lipper***, Food and Agriculture Organization of the United Nations (FAO) in Italy, provided an overview of the CSA instruments and strategies and elaborated on their implementation in various agricultural settings and regions. In this context, she reported in detail on the experience and results with the "Economics and Policy Innovations for CSA“ (EPIC) programme in Zambia, Malawi, and Vietnam. Agricultural consultation services are particularly conducive to the expanded implementation of climate-smart methods. A shortage of such services still exists. Access to financing and technical support also promote the successful CSA implementation. However, the CSA concept is still not widely implemented in transitional economies. According to *Lipper*, the FAO will make the first implementation steps in Tajikistan and Kyrgyzstan. The focus will be on conservation agriculture and soil protection.

Professor ***Hermann Lotze-Campen*** of the Potsdam Institute for Climate Impact Research (PIK) in Germany presented thoughts on the challenges and benefits of a climate-smart agriculture and soil use on the global level. Based on the predicted population and income growth as well as the expected changes in the eating habits of people, the demand for agricultural products will increase in the future. This applies in particular

to the Middle East, southern Africa, and southern Asia, because these are the regions, which will likely be most affected by negative climate change consequences. There are several promising ways to adapt agricultural production systems to climate-related change. Among these worthwhile approaches are the use of technologies for gentle soil use, the cultivation of crop plants, changes in the sequences of crop rotations, and improvements in the irrigation efficiency and water infrastructure in agricultural production systems. In addition to production-related technical measures, insurance against crop loss for income security purposes may become more relevant. Further promising approaches rely on institutional change involving the initiation and diversification of international trade relations as well as taxation systems or compensation for global public goods. At the same time, measures to reduce greenhouse gases, e.g. to protect the tropical rain forests must be balanced against the needs of local populations.

In the concluding panel discussion, Professor ***Alfons Balmann*** and his guests discussed the prospects of the "climate-smart agriculture“ concept (CSA). Dr. ***Georg Vierling,*** the CEO of Südzucker International GmbH in Germany, emphasised the importance of reconciling a climate-aware agriculture with economic interests. He also indicated how difficult it could be for small agricultural companies to implement adaptive measures in response to climate change because they usually do not have the financial means to implement new technologies or the required expertise and training. Südzucker International GmbH runs spin-offs in Moldova including two sugar refineries and one biogas plant. ***Wolfgang Vogel***, President of the Farmers' Association in Saxony, Germany, emphasised the role climate change will play in the survival of agriculture. The higher frequency of pre-summer droughts and excessive precipitation at harvest time are troublesome for farmers in Central Germany. As early as 2010, the German Farmers' Association proposed climate targets in a strategy paper. Among other targets, the paper called for a 30 per cent reduction in methane and nitrous oxide emissions by comparison with 1990 emissions. Members of the association contended that this target is ambitious but reachable. ***Inna Meteleva,*** Vice Chairperson of the agricultural holding company Svarog West Group in Ukraine, considers the creation of a precision agriculture a strategy for climate-aware agrarian production. Above all, she sees a need for a suitable management system aside from well-trained specialists. In her enterprise, the continuous monitoring and improving of on-site processes are essential components in resource-preserving and efficiency-boosting agrarian production systems. According to ***Ludmila Orlova*** from the Russian National Movement for Conservation Agriculture, Russia, the objective is to achieve the highest possible crop output using ecological principles. Her movement is ready to assist in the achievement of this goal by providing information and training for farmers and students of agriculture and also by running so-called "Innovative Farms“ as agricultural model enterprises. Dr. ***Leslie Lipper*** made the audience aware of drastic differences between income-strong and income-weak farmers. She expects income-weak farmers to have difficulties switching to climate-aware production systems because they do not have the resources to stay financially afloat during the transition. In the transition years, the adjustment process to soil-preserving production methods for example will cause significant decreases in crop yields. Only affluent farmers can sustain operations in those years. She pleaded for measures to back-up farmers who face such risks and further argued for increased information flow and better training in the agricultural sector. Professor ***Hermann Lotze-Campen*** directed the attention to the connections between the energy and agricultural sectors. He reminded the audience that climbing energy prices do not only influence the fuel prices for farm equipment but also the fertilizer prices. Furthermore, he expressed his support for levying taxes e.g. on the utilization of environmentally damaging

production processes. In his opinion, communities should levy taxes on greenhouse gas emissions and water pollution, which reflect the costs to the community. Professor ***Jikun Huang*** recognises a danger in the intensive land cultivation in China and fears soil overuse with the consequence of future productivity declines. He further criticized the lack of significant progress in the climate-aware agricultural production by comparison with developments in prior years. At this point, scientists and politicians should show leadership and act more forcefully in support of farmers. In summary, the panel guests agreed that farmers face challenging tasks in the creation of adaptable and efficient production processes with minor climate-damaging emissions.

The IAMO Forum 2015 was organized by the Leibniz Institute of Agricultural Development in Transition Economies (IAMO) in cooperation with the Potsdam Institute for Climate Impact Research (PIK). The third day of the conference was held in collaboration with the German Agribusiness Alliance, Committee on Eastern European Economic Relations (OA), with the support of the Edmund Rehwinkel Foundation. Funding for the entire event was provided by the Federal Ministry for Economic Cooperation and Development (BMZ), the Ministry of Science and Economic Affairs of Saxony-Anhalt, the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), Edmund Rehwinkel Foundation and the German Research Foundation (DFG).

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Further information

For information about the conference and the published abstracts and presentations please see here: www.iamo.de/forum/2015/abstracts_and_presentations.

Selected photos of the IAMO Forum 2015 can be used for media reports. These photos are available for download here: www.iamo.de/forum/2015/photo_gallery**.**

About IAMO

The Leibniz Institute of Agricultural Development in Transition Economies (IAMO) analyses economic, social and political processes of change in the agricultural and food sector, and in rural areas. The geographic focus covers the enlarging EU, transition regions of Central, Eastern and South Eastern Europe, as well as Central and Eastern Asia. IAMO works to enhance the understanding of institutional, structural and technological changes. Moreover, IAMO studies the resulting impacts on the agricultural and food sector as well as the living conditions of rural populations. The outcomes of our work are used to derive and analyse strategies and options for enterprises, agricultural markets and politics. Since its founding in 1994, IAMO has been part of the Leibniz Association, a German community of independent research institutes.

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