RESEARCH FOR SUSTAINABLE PLANT NUTRITION

ACCEPTING WORLDWIDE CHALLENGES
Crop Research in Times of Climate Change

More efficient use of limited resources

An ever-increasing world-population, changing dietary habits and climate change currently impose great demands on agricultural research. All over the world, a more efficient use of cropland and of pastures, of water and of nutrients in agriculture play increasingly important roles. In the future, crop plants and cultivation systems with greater tolerance to adverse environmental conditions will be required. “We have 40 years for doubling worldwide agricultural yields”, says William Lesher, Director of the Global Harvest Initiative in the USA. The growth of productivity in agriculture will increasingly depend on climatic developments. Numerous studies have warned of the effects of extended drought periods within the next 30 years.

The Institute of Applied Plant Nutrition – IAPN is devoted to these issues. It provides opportunities to students and scientists to contribute to developing knowledge-based nutrient management systems, to include feedback from farming practice, in order to respond to future global challenges. The IAPN aims at developing concepts and solutions for the improvement of food security, for a more efficient use of resources, and for a targeted transfer and implementation of information to agricultural practice. The IAPN will be an interface between (basic) research and practice: New topics, questions and solutions in the field of plant nutrition will be identified and implemented in concrete, future-oriented projects.

The IAPN strives to become a beacon authority on plant nutrient and fertilizer issues, and at contributing to sustainable agriculture, worldwide.
Developing Sustainable Plant Nutrition

Focus on International Issues

Improving the mineral nutrition of crop plants in order to increase the efficiency in plant production is internationally important. The IAPN will considerably strengthen the basic research in the field of plant nutrition. It will also focus on topics of mineral nutrition, which have so far received less attention in agricultural research, as current scientific work has often focussed on the needs of humid regions.

The IAPN’s orientation towards international issues adds important new areas to the spectrum in research and teaching at the Department of Crop Sciences of the University of Goettingen.

The IAPN will serve as a link between academic teaching, agricultural research and practical implementation in agriculture. “IAPN scientists will pick up on topical issues raised by practice and efficiently generate and transfer relevant findings. Another benefit is seen in the excellent training and lecture opportunities for students with an interest in global questions of plant nutrition”, says Prof. Andreas von Tiedemann from the Faculty of Agricultural Sciences of the University of Goettingen.

IAPN Topics

IAPN scientists will focus on a range of concrete problems and their solutions:

• Relevance of nutrients for stress-tolerance in plants under changing climate conditions.
• Connection between mineral nutrition, fertilizers and water-use-efficiency in the soil/plant system.
• Options for raising nutrient-use-efficiency in crop plants.
• Effect of nutrients/fertilizers on disease tolerance in plants.
• Effect of nutrients/fertilizers on the quality of plant products.
• Connections between the nutrient supply to plants and human health.
• New strategies for improving fertilizer recommendations and fertilizer management.

The IAPN develops solutions for sustainable plant nutrition under continuously changing conditions.
“In the future, limiting factors such as water scarcity or heat stress will increasingly need to be taken into consideration in plant nutrition. The IAPN wants to contribute to a more sustainable and environment-friendly production of foods.”

Professor Dr. Klaus Dittrt
Director of the IAPN and of the Section of Plant Nutrition and Crop Physiology at the Department of Crop Sciences of the Georg-August-University Goettingen
The IAPN

Co-operation of Science and Industry

Scientific director of the Institute of Applied Plant Nutrition is Professor Dr. Klaus Dittert. This function is closely linked with his tasks as Director of the Section of Plant Nutrition and Crop Physiology at the Department of Crop Sciences at the Georg-August-University of Goettingen. Within the scope of IAPN activities, Klaus Dittert intends to pay greater attention to aspects of eco-system research: “Modern nutrient supply to crop plants needs to be organised in such a way as to minimise impacts of crop growth on other environmental assets. This can only be achieved in close scientific co-operation with neighbouring disciplines. Awareness of this fact was also one of the driving forces of our co-operation partner K+S KALI GmbH to strengthen research in the area of applied plant nutrition at the Goettingen campus.”

In 2010, the IAPN was founded as a public-private partnership between the K+S KALI GmbH, headquartered in Kassel, and the Georg-August-University of Goettingen. These and similar collaborations between public institutions and the private sector, particularly research co-operations, have recently seen vibrant growth in Germany. At the Goettingen Faculty of Agricultural Sciences, the IAPN is already the third institution operating in a public-private partnership.

The responsible body of the IAPN is K+S KALI GmbH. The IAPN’s initial staff endowment comprises a junior professorship, one Ph.D-position and one technical assistant. Beyond that, K+S KALI GmbH also provides starting funds to the institute and will provide additional funds for concrete research and development projects.

The University of Goettingen provides the premises at the Faculty of Agricultural Sciences, campus infrastructure for research and teaching and bears their operating costs. The IAPN will strengthen the activities of the Department of Crop Sciences in the field of plant nutrition, thereby promoting practice-oriented research and teaching addressing topics of international relevance.

Organizational structure of the IAPN

Georg-August-University of Goettingen has a long tradition in researching and teaching crop sciences. The Faculty of Agricultural Sciences includes three departments: livestock sciences, crop sciences, and agricultural economics as well as rural development. The faculty includes several research and study centres, two of which are also operated as public-private partnership institutions. With a total number of 24,000 students, Georgia Augusta is one of the most important universities in Germany offering crop science studies. For more information on the Faculty of Agricultural Sciences at the University of Goettingen please refer to www.uni-goettingen.de.
Bundling and Developing Resources

Practical Orientation is Top Priority

Which are the options for farmers all over the world to safeguard their yields or, - wherever possible - to even raise them? How can crops make better use of the scarce resource water? The joint initiative of the Georg-August-University of Goettingen and the K+S KALI GmbH intends to boost mainly application-oriented research. “Due to a lack of funding for research and with priorities placed on other topics, such research projects are currently on the decline”, Professor Dr. Andreas Gransee, Director of Applied Research and Advisory Service Agro of the K+S KALI GmbH, explains the company’s decision to provide support.

The IAPN is intended as a forum to intensify the mutually beneficial dialogue between research and practice: Research on crop nutrition will be more practice-oriented, while agriculture is given an opportunity - and the challenge - to implement the research results. “The focus of our research and teaching is on benefiting agriculture,” IAPN-director Professor Dr. Klaus Dittert emphasises. “Hot topics of the current agricultural practice can be set in the latest research context and, where necessary, also be relined with the required scientific basis.”

K+S KALI GmbH has a broad knowledge base on plant nutrition. The company has its own network of agricultural experts, and well-established long-term co-operations with both, domestic as well as international research partners. This joint project of the University of Goettingen and the K+S KALI GmbH is meant to integrate the numerous individual projects into an international network, and to thereby give a boost to practice-oriented research.

The collaboration between K+S KALI GmbH and the Georg-August-University of Goettingen will serve to bundle available research and knowledge resources in the field of crop nutrition, worldwide.

K+S KALI GmbH with its headquarters in Kassel mines potash- and magnesium-containing crude salts at six locations in Germany. These crude salts serve as the basis for the production of a wide range of specialty fertilizers, as well as for primary products for technical, industrial and pharmaceutical applications. With an annual production output of up to 7.5 m tons potassium and magnesium products K+S KALI GmbH is is one of the leading potash suppliers worldwide. The company, which is part of the K+S Group, employs approximately 8,000 employees. For more information on the K+S KALI GmbH please refer to the company’s website at www.kali-gmbh.com.

Comments by OECD and IFPRI

“Worldwide stagnation in the productivity development is mainly due to the neglect of agricultural research during the last decades” - this was stated by representatives of the Organisation for Economic Co-operation and Development (OECD) and of the International Food Policy Research Institute (IFPRI) during a meeting on an Action Plan Agriculture for the Improvement of World Food Supply in Paris. “Insufficient agricultural research and a lack of investments in agriculture in developing countries have so far prevented any sustained success in fighting world hunger.”
“The very basic challenge the IAPN will address is the optimal combination of laboratory research, field work and knowledge transfer.”

Professor Dr. Andreas Gransee
Director of Applied Research and Advisory Service Agro of the K+S KALI GmbH and Managing Director of the IAPN
From Lab to Field

Making Better Use of Existing Knowledge

In addition to research on agronomic issues, the IAPN will work on interdisciplinary projects, which will focus on knowledge transfer and so-called “last-mile-delivery”. Particularly for developing countries and for smallholder-structures, solutions need to be found for an efficient transfer of knowledge to farmers. Making research findings and new cultivation techniques available to farmers on site is essential to tapping the existing productivity reserves. Comparably small optimisation measures may lead to significant yield increases, as yields are still well below the yield optimum.

“The very basic challenge the IAPN will address is the optimal combination of laboratory research, field work and knowledge transfer”, adds Prof. Dr. Andreas Gransee, Director of Applied Research and Advisory Service Agro at K+S KALI GmbH. “Public-private partnerships have a great potential for meeting these requirements, as the available structures on both sides seem to be highly complementary.”

“We aim at mediating our research results in a comprehensible and practice-oriented way”, says IAPN-director Professor Dr. Klaus Dittert. “In this transfer of knowledge, next to the networks of our co-operation partners, a central role is given to students and visiting scientists, as they are able to function as disseminators”. In addition to agricultural practice, students are an important target group of the IAPN's work. By linking the IAPN with other internationally active institutes at the Goettingen Faculty of Agriculture, students will be offered significantly improved training options on global plant nutrition issues.

EU Reinforces IAPN Objectives

In March 2012, at the Conference for Research and Innovation in Agriculture, the EU Commissioner for Agriculture and Rural Development, Dacian Cioloș, called for a “genuine concertation along the entire agronomic knowledge chain”. Research methods and knowledge transfer should in future be much more rapid and comprehensive. The aim of this concertation is not only to increase productivity, but also to maintain the natural resources in agriculture. The Commissioner outlined a new integrative culture, in which all players are integrated in research activities, in the sense of a bottom-up-approach. Greater attention should also be given to the expectations placed on agriculture by other members of society.
Efficient Research in Networks

International Co-operation

The IAPN is embedded in an international cooperative network of research institutions, drawing on local structures for the knowledge transfer in other countries. By developing this international network for research on plant nutrition, the institute is facing up to current challenges. “The dissemination support of institutes within the respective country is indispensable for spreading and broadening knowledge”, says Klaus Dittert.

Scientists from abroad, who have either studied at the Goettingen IAPN or who have spent a research stay, will continue their investigations at home, and will maintain their contact with the IAPN. This type of organic growth will result in a well-functioning network focussing on applied plant nutrition. The IAPN welcomes enquiries relating to collaboration, and will actively approach potential partners.

First contacts have already been established with the Turkish Sabanci University of Istanbul, with which the K+S KALI GmbH has already concluded a research agreement. This agreement regulates joint research and teaching activities, with a focus on researching the role of magnesium supply to plant production. “Special attention will be paid to the contribution of magnesium to stress reduction in case of extreme irradiation or drought”, says Professor Dr. Ismail Cakmak, who is responsible for this research and training programme.

The IAPN will regularly organise international symposia in order to promote the exchange and transfer of knowledge. The very first international IAPN-symposium in May 2012 dealt with the role of magnesium in plant production and for human health. The symposium was held at the Georg-August-University Goettingen, and was organised in collaboration with the Sabanci University Istanbul (Turkey) and the Center for Magnesium Education Research (USA).
New Research Approaches in Great Demand

Today, much agricultural research focuses on plant nutrition under good or normal general growth conditions. Expected global changes require addressing new issues: In the future, agriculture will need to rely on crop plants and cultivation systems that can tolerate unfavourable environmental conditions. It will be necessary to achieve good yields even on soils with low yield potentials. The interaction between nutrient supply and heat stress will gain importance. Nutrient supply and water use efficiency will therefore be one of the IAPN’s primary goals. The IAPN will contribute to filling the gaps in basic knowledge on physiological processes together with its international partners, and help to make it accessible to practice.

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