

1996 – 2014

Partner in agriculture

With “**green biotechnology**,” plant breeding research in Limburgerhof heads into **new research fields**. With the acquisition of American Cyanamid, BASF becomes one of the world’s top three crop protection manufacturers and a global supplier of crop protection products. The **main site** in **Limburgerhof** is thoroughly modernized and in 2004 is renamed the **Agricultural Center Limburgerhof**. The **fertilizer business**, which once represented the original core business, is **sold** in 2012. BASF takes a new approach to shaping the **agriculture of the future**.



History

The **World Wide Web** experiences a breakthrough at the end of the 1990s. **Mobile phones** begin to be widely used.

The construction of the **International Space Station (ISS)** begins in 1998 as a cooperative project among the leading space agencies.

The **terrorist attacks** in the **United States** on **September 11**, 2001, shake the world.

In 2002, the **euro (€)**, the **European common currency**, is introduced in 12 E.U. countries.

The American swimmer **Michael Phelps** wins a total of **22 Olympic medals** at the Summer Olympics in Sydney in 2000, in Athens in 2004, in Beijing in 2008 and in London 2012, making him the **most successful Olympian** of all time.

Angela Merkel becomes the **first female Chancellor of Germany** in 2005 – after seven men had held the office.

Barack Obama is elected **44th President of the United States** on November 4, 2008. He is the first African-American to hold this office.

On March 11, 2011, Japan is rocked by an **earthquake** of magnitude 9.0, which results in the **nuclear disaster** at **Fukushima**.

Following the resignation of Pope Benedict XVI, the **Argentine Jorge Mario Bergoglio** is elected as the new **Pope Francis** on March 13, 2013.

1914 – 1927

1927 – 1948

1948 – 1966

1966 – 1996

1996 – 2014

Better properties for higher yields

“Green biotechnology” involves optimizing the properties of plants. It uses methods from biochemistry, systems biology, microbiology, molecular biology and chemical engineering to strengthen plants’ ability to tolerate drought and resist diseases. The science, also referred to as **green genetic engineering**, is thus a **modern refinement** of traditional **plant breeding**. The main objective of BASF Plant Science is to improve agricultural productivity by **increasing yields** and endowing **crops** with properties that **protect** them **against stress factors** and **diseases**. Another goal is to enhance crops’ ability to tolerate BASF Crop Protection products in order to **simplify agricultural management**.

Beyond crop protection – plant optimization through biotechnology

The development of strobilurins showed the innovative power of BASF's Crop Protection division. And demand for innovation grew stronger than ever in the late 1990s, as the industry looked back at the first major phase of consolidation worldwide. Of the 20 suppliers who had more than 80 percent of the global market as recently as the mid-1980s, only half remained. Large international corporations dominated because only they had the financial strength to invest heavily in research and development.

BASF also strengthened its position in 1996 through an acquisition. It purchased part of Sandoz AG's global business with corn herbicides, which increased sales in North America, the most important market for herbicides. Among the major suppliers, BASF's Crop Protection division was on the small side, but its ambitions were great.

The strobilurins were a solid base to strengthen and grow the company's position in the fungicide market. But new active ingredients alone were not enough; the agricultural department of BASF faced a major decision about its future course. The expertise was there and the prospects on the international markets were good – greater investment was needed to strengthen the agricultural department even further.

While BASF had long been involved in the area of crop protection, in 1998 the company took another important step in green biotechnology with the founding of BASF Plant Science – a global research platform as a separate company in the BASF Group. This division has since specialized in using biotechnology to improve plants' properties.

Corresponding research units were set up in 1998 in Limburgerhof and at today's corporate headquarters in Research Triangle Park (RTP), North Carolina, right next to the Crop Protection division. Under the umbrella of BASF Plant Science, two other companies got their start that same year. The Metanomics research unit was created in collaboration with senior staff at the Max Planck Institute for Molecular Plant Physiology in Potsdam, and BASF set up the joint venture Sun-Gene together with the Leibniz Institute of Plant Genetics and Crop Plant Research in Saxony-Anhalt, later taking it over completely and managing it through the end of 2013. BASF acquired DNS Landmarks in Canada in 1999. In 2006, BASF Plant Science integrated the Belgian biotech start-up CropDesign in Ghent into its global research network. Since that time, scientists at these sites have been analyzing and developing the complex biological functions and interactions of plant genes. For BASF, the entry into green plant biotechnology was another step on the path towards making the company a global leader in the agricultural industry.

In 1999, BASF began to move away from the fertilizer business – the origin of its activities in agriculture. K+S Aktiengesell-

schaft, a supplier of fertilizers, plant care and salt products, took over exclusive marketing and distribution rights of BASF's agricultural fertilizers as well as the subsidiary Compo. This made K+S the second largest supplier of fertilizers in Europe. Since then, a subsidiary of K+S has operated the former agricultural

fertilizers business of BASF: fertiva was located in Limburgerhof from early 2000 and then moved to Mannheim in 2001. As BASF retained the production plants for nitrogen, it was natural to cooperate closely in the production and development of fertilizers.



In the greenhouse, young corn plants grow under controlled environmental conditions and are exposed to certain stress situations. This allows researchers to identify the most efficient plants



New perspectives in crop protection. Researchers study new active ingredients in the greenhouses. The goal is to consolidate the number of test substances, which are then developed further in field tests



Acquisition and expansion – growing into the new millennium

The year 2000 began with a bang. **The acquisition of American Cyanamid, the crop protection segment of the U.S. manufacturer American Home Products, was the largest acquisition in BASF's history. The acquisition nearly doubled the sales of BASF's Crop Protection division, making it one of the three leading manufacturers worldwide. BASF's purchase of American Cyanamid addressed several strategic objectives. In addition to expanding its portfolio, BASF increased its global presence in key sales regions in North and South America. For this reason, in May 2000, the management of this division was moved from Limburgerhof to Mount Olive, New Jersey, where the U.S. subsidiary of BASF had its headquarters.**

The crop protection portfolio was expanded significantly. While BASF was well-established in fungicides in particular, the acquisition of American Cyanamid provided a major upgrade to the herbicide range, and well-known insecticides rounded out the portfolio. The joint research pipeline was filled with new active ingredients, and the research and development strategy was strengthened across all indications. The merger created a broad and inno-

vative portfolio for crop protection. In addition, there were new active ingredients such as pendimethalin, dimethomorph and the new imidazolinones.

The Clearfield® Production System, which had already been introduced for corn in the United States (1992) and for rapeseed in Canada (1995), was also taken over and further developed. The Clearfield® Production System is a combination of herbicides and seeds, with the seeds tolerant to a



The Clearfield® Production System offers a combination of herbicides and herbicide tolerant seeds for a variety of crops

specific class of herbicides. The increase in tolerance, as compared to imazamox, for example, was achieved through traditional breeding methods. The Clearfield® Production System is currently available for rapeseed, rice, sunflowers, wheat, corn and lentils.

The international orientation of the Crop Protection division also changed the corporate culture in Limburgerhof. While research and technology had been con-



Juwel® Top combines protective and curative effects against a broad range of diseases and provides reliable protection for all types of grains even today

sidered its major strengths, increasing priority was now being placed on marketing and sales. Employees in Limburgerhof had long focused mainly on agricultural issues in Europe, but following the acquisition of American Cyanamid, they gained an even greater global orientation. Guests from around the world, conversations with colleagues from different continents and, last but not least, the addition of English as a second corporate language made everyday life more international. Some research

sites in the United States, Japan, South Africa and the United Kingdom were closed as BASF and American Cyanamid had previously maintained their own stations. Of course, the process of internationalization was not always smooth and there were challenges. As expected, all the teams and employees needed some time to settle into the new structures. But the changes were necessary to be prepared for the demands of international markets.



Whereas the focus in Limburgerhof had previously been on research and technology, with the internationalization of the entire Crop Protection division, increasing emphasis was placed on marketing and sales

1914 – 1927

1927 – 1948

1948 – 1966

1966 – 1996

1996 – 2014

The expansion of capacity at its production sites is crucial for the growth of the division as a whole. In Schwarzheide, Germany, the third identical F 500® plant is now in the final stages of completion



Guaratinguetá, Brazil



Ludwigshafen, Germany



Hannibal, United States

New paths to healthy plants – back to Limburgerhof

The performance of BASF's Crop Protection division varied greatly: While fungicides were a success, the herbicide business, including the long-time best-selling Basagran®, lagged behind. The introduction of glyphosate-tolerant soybeans, corn and cotton in the mid-1990s in North and South America seemed to have solved weed problems for the foreseeable future and crippled the market for selective herbicides.

In 2002, BASF acquired rights to the insecticide fipronil, which is sold in more than 70 countries and is one of the most successful products in BASF's Crop Protection portfolio. The active ingredient fipronil works quickly, is long-lasting and is used in various application forms. Important business fields include seed treatments for soybeans (Standak® and Standak® Top) and soil applications in sugarcane as well as pest control to protect homes and buildings against termites and ants (Termidor®).

The fungicide F 500® (pyraclostrobin), which was launched in 2002, became a true blockbuster – synthetic strobilurins continued to be the basis for successful products. By changing the molecular

structure, researchers had increased the fungicidal activity compared to kresoxim-methyl, and testing under field conditions brought another pleasant surprise. In experiments on peanut crops, the treated plants repelled not only fungi, but exhibited a more intense green color and thus increased starch production as well as better resistance to stress. F 500® also had a very favorable toxicological and ecotoxicological profile. F 500®, in combination with epoxiconazole, played a vital role in helping rescue the soybean harvest in South America, particularly in Brazil, in 2002. The soybean crop was threatened by an aggressive fungal disease, Asian soybean rust, which put the entire region's agricultural economy at risk.

Products containing F 500® are among the best-selling crop protection products in the world. In products like Opera®, Cabrio® and Comet®, F 500® is sometimes combined with other active ingredients such as metiram or epoxiconazole to expand the spectrum of activity and, as part of integrated crop protection, to control the build-up of resistance. Crop protection products with benefits that go beyond controlling harmful fungi and insect pests, such as increasing the yield and quality of crops, are now marketed under the global brand AgCelence®. Boscalid, a fungicide

launched by BASF in 2003, has also proved effective in various combinations. It works as a fungicide, especially on grains and specialty crops, such as fruit, vegetables and ornamental plants.

After years of restructuring and reorientation, BASF also modernized its historic research site in Rhineland-Palatinate. In 2003, new offices and a new laboratory were constructed in Limburgerhof. The lab featured the most modern technical equipment for prescreening, which had originally been introduced in 1998.



The BASF-Bauernmarkt (farmers' market) at the Rehhütte Farm Estate attracts thousands of visitors from the region every year

Prescreening is a fully automated method for testing active ingredients to determine their biological effects. Herbicide screening now involves the testing and evaluation of new substances throughout the entire plant. This test system is based on a tiered approach: As the selection of the compounds proceeds, the intensity of the test increases, meaning the higher the level, the more agronomically relevant the questions. The efficiency of active ingredient testing urgently needed to be increased because the hit rate was declining. While in the 1970s testing had to be done on an average of 10,000 substances to develop one new product for the market, increased requirements, such as ecotoxicological properties, now meant that an average of 140,000 chemical compounds had to be tested to develop a single market-ready active ingredient. Prescreening allows the most promising ones to be filtered out from a pool of substances.

The Rehhütte Farm Estate, which is part of Limburgerhof, was comprehensively restructured in the mid-1990s. The stables were transformed into a meeting center. As of 2003, farm operations focused solely on growing crops. As one of the largest farms in Rhineland-Palatinate, with approximately 500 hectares of arable

land, the operation serves as an interface where research findings can immediately be incorporated into practice. Today, the Rehhütte Farm Estate also functions as a communications center. The Crop Protection division provides information about its work with scientific symposiums and tours. BASF's annual farmers' market has been held since 1996 and attracts thousands of visitors from the region every year.

With the modernization completed, the management of BASF's Crop Protection division returned to Limburgerhof in 2004; the former Research Station Limburgerhof was now known as the Agricultural Center Limburgerhof. BASF increased its investment in crop protection research and achieved remarkable results: With sales of €3.35 billion in 2004, BASF's Crop Protection division had taken a leading position in a growing global market.



Ideas for growth markets – building blocks for the future of agriculture

BASF continued to strengthen its pest control business, which was especially important for the growing markets in Asia and South America. In 2009, the division created the global business area Pest Control Solutions, which provides solutions for professional pest control in both urban and agrarian settings. There are also several BASF products on the market in the area of public health.

The mosquito net Interceptor®, which is coated with an insecticide, provides reliable protection against mosquitoes and the serious diseases they transmit. Abate® (temephos), a larvicide that controls insect larvae in stagnant water before they hatch, also helps control the spread of disease. This business area was strengthened by the December 2008 acquisition of the pest control business of Sorex Holdings Ltd., with approximately 200 employees.

Investments in research have also paid off in other segments. In the mid-1990s, glyphosate seemed to have solved every weed problem, but now increased resistance was creating new challenges for farmers. In 2010, BASF launched Kixor® (saflufenacil), a herbicide used on corn, soybeans and wheat to control weeds

that have become resistant to glyphosate. Just one year after its introduction, U.S. farmers were using Kixor® on more than 4 million hectares. The fungicide Initium®, which is used primarily on specialty crops such as tomatoes, potatoes and grapes, also came on the market in 2010. It has favorable environmental characteristics and long-lasting efficacy – in the best cases, during the entire cultivation period.

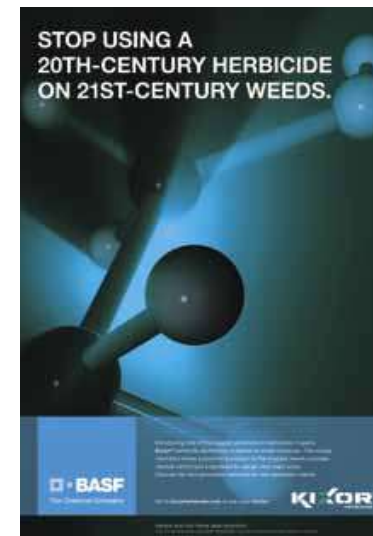
Xemium®, another fungicide, made it to registration in record time in 2011. This was the result of close collaboration between departments in Ludwigshafen, Limburgerhof and the research stations around the world. Researchers took advantage of the expertise gained in the development and registration of Boscalid.

The active ingredient from the class of carboxamides helps farmers around the world to control key fungal diseases in more than 20 crops, including soybean rust and septoria in grains. This product significantly extends BASF's fungicide portfolio, as it is used in combination with other BASF active ingredients and is thus an important building block for the company's future strategy.

The remaining fertilizer business, however, no longer fit in the corporate strategy of either BASF or K+S, its collaborator at the time. The priorities had changed. While BASF sharpened its focus on crop protection and other services, K+S concentrated on its core business of potash. The professional business of Compo and the activities of fertiva were merged into K+S Nitrogen in 2009, while the remaining part of Compo was sold to the investment company Triton in 2011. In 2012, Russia's largest fertilizer producer, EuroChem, acquired both K+S Nitrogen as well as BASF's fertilizer activities and production plants in Antwerp. With this sale, BASF completely withdrew from the fertilizer business.

There were major changes in the Plant Science division in 2012. Due to the continuing difficult regulatory environment and the lack of acceptance of plant biotechnology in Europe, BASF decided to focus its plant biotechnology activities on the main markets in North and South America and on the Asian growth market. Following the realignment, all research projects that focused exclusively on commercialization in Europe were shut down. The European research sites Ghent and Berlin were retained and expanded over the following months.

The headquarters of Plant Science were moved from the Agricultural Center Limburgerhof to Research Triangle Park (RTP), North Carolina, and the size of the research unit in Limburgerhof was subsequently greatly reduced. The scientists from Plant Science at the Agricultural Center Limburgerhof now work closely with their colleagues in crop protection on fungus-resistant soybeans for non-European markets.



Kixor®: the herbicide provides weed protection for many different crops



Systiva®: a seed treatment product containing Xemium®

1914 – 1927

1927 – 1948

1948 – 1966

1966 – 1996

1996 – 2014



Sustainability and product stewardship – AgBalance™ provides better transparency

BASF Crop Protection has taken sustainability and product stewardship into account for many decades. Developing effective, environmentally friendly products remains a challenge. How can the economic interests of farmers and the company's shareholders be aligned with sustainable development in order to fulfill the public's expectations for social and environmental responsibility?

In addition to traditional product development activities, this goal is becoming increasingly important. BASF Crop Protection broke new ground in an effort to find a solution.

A team of farmers, biologists, social scientists and economists developed AgBalance™ – a model to measure and assess sustainability. The method includes indicators that measure environmental factors such as the education index, energy and water consumption and land use. It also takes into account social indicators, such as the further education and training of farmers and employees, consumer interests, international aspects and economic indicators. This allows AgBalance™ to answer the question of how agricultural

production can be made more sustainable. With the support of independent experts, the Agricultural Center conducts studies around the world. In these studies, BASF analyzes its products' contribution to sustainable agriculture in order to continuously shape the company's research.

The responsible use of crop protection products supports sustainable farming, which takes account of social, economic and environmental factors. The questions are wide-ranging: Which product is the most efficient solution? How can crop protection products be used as sparingly as possible so that they do not pose any inherent risk to humans and the environment? What is the right way to recycle spray containers? Product stewardship includes BASF's commitment to making the entire production chain sustainable – from laboratory research all the way to disposal and recycling of spray containers. BASF is committed to product stewardship in order to promote sustainable agriculture around the world.

Measurably sustainable

Can sustainability in agriculture be measured? In 2011, Limburgerhof unveiled **AgBalance™**, a method that pursues this goal. The model uses scientifically collected data and practical algorithms to **analyze** the **value chain** of agricultural production and agricultural products. AgBalance™ thus offers farmers a fact-based decision-making tool to help them improve their **overall sustainability performance**. This method of analysis considers **ecological, economic and social criteria**.

The Agricultural Center Limburgerhof will continue to expand structurally and technologically in order to meet all the demands of modern crop protection



From product to solution – good prospects for crop protection

The Agricultural Center Limburgerhof has extended its focus in the area of crop protection. The goal is to develop solutions for sustainable agriculture that help farmers improve their agricultural production and increase the success of their operations. The new Functional Crop Care business unit is at the forefront of this movement. The unit develops solutions for resource and stress management that both increase yields and have good environmental performance. These solutions focus on soil management, seed treatment and optimal crop care.

Since 2012, the U.S. company Becker Underwood has been part of BASF. With this acquisition, BASF's Crop Protection division gained one of the leading global providers of technologies for biological seed treatment, colorants and polymers for seed treatment as well as products in the areas of biological crop protection, turf and horticulture. The addition of this innovative supplier of system solutions for agriculture has allowed BASF to expand into additional areas of research. For example, seeds can now be treated with biological products, such as microorganisms and bacteria that fix nitrogen and

supply the plant with additional nutrients. This acquisition made BASF one of the leading suppliers in the fast-growing market for biological seed treatments. BASF's strong global position also creates the opportunity to broaden the core business of Becker Underwood and thus to expand internationally.

In addition to providing effective crop protection, AgCelence® products make it possible for farmers to sustainably increase their agricultural yields and yield quality. By improving plant health and vitality, AgCelence® offers real added value beyond effective crop protection. At the same time, the agriculture portfolio offers farmers more than just ways of improving quality and yields. Many ideas have already been implemented, ranging from the crop protection app for farmers to comprehensive advisory services and support for marketing of agricultural products in places like India. Many more projects are still in the planning stage and they will shape the work at Limburgerhof in the years to come.

BASF Crop Protection is one of the leading companies in the industry worldwide. The division had sales of €5.2 billion in

2013 and has more than 8,000 employees worldwide. What does the future hold for BASF Crop Protection and the Agricultural Center as headquarters?

The division's plans for 2020 not only forecast sales of €8 billion, but also set a clear strategic goal: BASF Crop Protection will become *the* solution provider in agriculture worldwide. Innovative fungicides, insecticides, herbicides, seed treatments and pest control products continue to form the basis of the portfolio. They are complemented by services and solutions that go beyond crop protection and target areas like plant health and improved absorption and utilization of nutrients in the soil (e.g., fertilizer efficiency) because healthier and hardier plants also provide higher yields and quality.

Securing yields is vital if agriculture is to meet the global demand for food and feed products, as the population continues to grow while the quantity of arable land remains relatively stable. Crop protection will play its part in the future, but it must be both effective and environmentally friendly. The great challenge, therefore, is to offer solutions for sustainable agriculture throughout the world.

These solutions should help farmers optimize their agricultural production, increase the commercial success of their operations

and thus improve the quality of life for a growing world population.



BASF supports farmers around the world in the key tasks facing modern agriculture, including the challenge of achieving higher yields while still acting with ecological and social foresight

1914 – 1927

1927 – 1948

1948 – 1966

1966 – 1996

1996 – 2014

Our story continues – future prospects for and from Limburgerhof

The **history** of the **Agricultural Center Limburgerhof** is inextricably linked to the development of **global agriculture** – and this will remain true in the **future**. The **tasks** are as diverse as **our employees** worldwide, who will remain crucial in **shaping this story**. Some colleagues share their personal **experiences** and **expectations**:



“Critical consumers can be won over only if we can educate them about the need for crop protection. That’s why I’m always looking to engage in dialog wherever and whenever I can.”

Roland Kramm



“By 2020, we will have production facilities in Asia. We need to think big conceptually and act pragmatically in the implementation in order to deliver excellent results.”

Antonius Utomo

“For 40 years, it has been my pleasure to work in Limburgerhof and, in spite of constant changes, the goal has always remained the same: developing new active ingredients.”

Rosina Schwab



“Our aim is to improve our products and their application so that they pose no risks to the environment or to human health. As a responsible company, we support farmers in the proper application of our products.”

Simone Vogel





“Innovative research technologies are the key to finding new active ingredients in a targeted way. This requires flexibility and creativity.”

Torsten Herpich

“For me, a pragmatic management culture is critical to achieving our goals – that’s true today, and it will be true 25 years from now. I think this saying says it all: You can recognize a boss’ skills by the way he recognizes the skills of his employees.”

Kim Krause



“The opening of Eastern Europe has significantly changed European agriculture, creating new possibilities and opportunities for BASF. My job is to support the marketing of new product solutions.”

Agnieszka Baker



“Practical agriculture is more than a job for me. In cooperation with my colleagues from research and the field, I like to optimize cultivation methods so that farmers will continue to be able to produce high-quality, affordable food. At the same time, we want to address the public’s increasing awareness about the environment and sustainability.”

Dirk Wendel



“Many factors will play a role in securing the harvests of today and tomorrow. One of these is effective crop protection. I’ve been working on this in active ingredient research for 33 years.”

Matthias Hoffmann

“The development of new classes of active ingredients will continue to represent a major challenge for future research. Prescreening is vital for the evaluation of new active ingredients in the search for innovative fungicides.”

Franz Röhl



“I have worked for BASF Crop Protection in three different regions. And I’ve gotten to know very different agricultural structures. The diversity of crops and farming methods fascinates me again and again.”

Jorge Cartin





"My time here at the Agricultural Center has been extremely important in preparing me for future tasks in the region. Interacting with my colleagues both at the working level and personally has been a very valuable experience."

Takeshi Inoue

"Manufacturing our products requires that the raw materials are available and of the best quality. Given our growth plans, this is a challenge that we, the members of the Formulants Task Force, gladly accept."

Christian Miyagawa



"In the Supply Chain department, we constantly work to optimize the shipment of goods to our customers and ensure that our products arrive reliably and on time."

Anne Wenzel



"Herbicide research has been undergoing a renaissance since 2009, and our test methods from the Leadfinder to follow-up testing require continuous adaptation to new strategic markets."

Liliana Parra



"From occupational safety to working safely, I am committed to ensuring that colleagues exchange information about risks in their teams and make joint arrangements for managing these risks."

Lars Benedix



"In my 33 years of research work, I have always remained curious. My interest in entomology and the teamwork in the Leadfinder department motivate me every day."

Claudia Emmer



"Healthy crops are essential to ensuring that high-quality fresh foods that also look appetizing arrive on our tables. The targeted use of crop protection will continue to support this objective in the future."

Steffen Scheid





“The strong growth of BASF Crop Protection requires record investments in production. We have an excellent team, and we are planning several new production plants worldwide that will go into operation at the same time in the next few years.”

Jochen Schröder



“We deliver intelligent solutions for project management and cost transparency to efficiently use our resources and to comply with the regulatory requirements. This is how we set the course for sustainable product development.”

Christian Rase



“Farmers have to react flexibly to market and weather conditions, and they expect the same of BASF in terms of product availability. To meet these expectations, we have to provide the best possible link between the internal teams of global production and inventory control of our active ingredients.”

Peter Berg



“Our products in professional pest control, such as the rodenticide Storm® or the cockroach gel Goliath®, prevent the spread of pests and associated diseases. In this way, we offer sustainable and innovative solutions that improve public health.”

Thomas Grünewald



“The diversity of Africa cannot be reduced to just a few words, but our goal for Africa can be: knowledge transfer and innovative product solutions for African farmers.”

Fabrice Robin



“BASF Crop Protection is a diverse and dynamic business division. A can-do attitude and mutual appreciation and respect define our team spirit. This is what makes us successful.”

Andrea van der Velde



“My home country Argentina played a big role in my early interest in agriculture. I want to contribute to the development of our active ingredients, which means coordinating the global field tests for the key crops of corn, soybeans and sugar cane.”

Mariano Etcheverry

1914 – 1927

1927 – 1948

1948 – 1966

1966 – 1996

1996 – 2014