Future of Farming Dialogue 2018 Day 3: *Wageningen University & Research Visit*

September 19, 2018 – Wageningen, Netherlands

Bayer Crop Science is proud of its partnership with **Wageningen University and Research (WUR)** throughout The Netherlands and around the world. With the help of WUR scientists, **field-based research is deployed** to find solutions and develop **future innovations in areas such as crop production and the environment.** Application-oriented research, conducted in partnership with our division, has led to **new, sustainable production systems and processes.**

Learn More About One of the World's Leading Agricultural Universities:

WUR unites its research directly with the United Nations' Sustainable Development Goals:

- End hunger, achieve food security and improved nutrition, and promote sustainable agriculture
- Ensure healthy lives and promote wellbeing for all at all ages
- Ensure availability and sustainable management of water and sanitation for all
- Ensure access to affordable, reliable, sustainable and modern energy for all
- Make cities and human settlements inclusive, safe, resilient and sustainable
- Ensure sustainable consumption and production patterns
- Take urgent action to combat climate change and its impacts
- Conserve and sustainably use the oceans, seas and marine resources
- Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation, and halt biodiversity loss

Eight themes encompass the research institutes' portfolio:

- Sustainable food and non-food production
- Global food and nutrition safety
- Global food and nutrition security
- Metropolitan solutions
- Biobased and circular economy
- Healthy and safe food for healthy lives
- System earth management
- Big data technologies and methodologies
- Social innovation for value creation

A Tour of Wageningen University and Research

- **Unifarm greenhouse:**
  Decreasing greenhouse temperature by 2 degrees can save 16% of energy consumed and reduce production costs. But will reduced photosynthesis and sugar metabolism limit fruit development? Researchers in this greenhouse are aiming to find out.
- **Phenomea:**
  The new phenotyping lab for researching the shelf life of fresh food and the use of robotics (sneak peek on YouTube).
- **The Experience Room inside the Helix Building:** How do ambient noise, scents and lighting influence our food decisions? Find out in this virtual reality setting.

*About **Wageningen University & Research:***

- **Founded in 1876** as the National Agricultural College.
- **Total of 12,001 students** from more than 100 countries in academic year 2017/18 (5,659 bachelor's).
- Internationally successful as the **world's leading supplier of scientific education in the healthy food and living environment domain.**
- Its mission is **"to explore the potential of nature to improve the quality of life."**

*Examples of **collaboration between Bayer and Wageningen University & Research***

***BIOCOMES** (ended November 2017)*

- Partners: WUR, Bayer CropScience Biologics and 25 other partners from 12 different countries
- The EU emphasizes the role of integrated pest management as an important approach to reduce dependency on pesticides use. When pesticides are used, biological control measures – together with physical and other non-chemical methods – should have first preference (Directive 2009/128/EC). The EU is stimulating the development of biological control products by financing this BIOCOMES project. The BIOCOMES project runs from 1 December 2013 until 30 November 2017. The EU contribution is €8.997.264 and the total budget amounts €12.086.533.
- Advantages of biological control
  - Biological control of pests and diseases can be a very effective, sustainable and environmentally friendly strategy for crop and forest protection as part of integrated pest management (IPM) practices. The availability of sufficient biological control products is important for an effective IPM strategy. Unfortunately, biological control alternatives against a range of important pests and pathogens – causing high economic losses to agriculture and forestry – are not or not sufficiently available at this moment. The EU is now giving a major boost to the biological control market by co-financing the BIOCOMES projects.
- Biological control strategies
  - At the end of this project in November 2017 BIOCOMES partners expect to have developed 11 new biological control products to control a number of important pests and diseases in agriculture, horticulture and forestry. Furthermore, two new technologies to improve the production of nematode and virus agents will be developed. An important contribution to the effectiveness of an integrated pest management approach for farmers and foresters.
  - Some of the BIOCOMES products will be available at the end of 2017. Others will be ready for registration and available on the market thereafter.
- About BIOCOMES - BIOCOMES

***The Internet of Food & Farm** (IoF2020)*

- Partners: The IoF2020 consortium represents 70+ partners from 14 EU countries.
- The internet of things (IoT) has revolutionary potential. A smart web of sensors, actuators, cameras, robots, drones and other connected devices allows for an unprecedented level of control and automated decision-making. The project Internet of Food & Farm 2020 (IoF2020) explores the potential of IoT-technologies for the European food and farming industry.
- The goal is ambitious: to make precision farming a reality and to take a vital step towards a more sustainable food value chain. With the help of IoT technologies higher yields and better quality produce are within reach. Pesticide and fertilizer use will drop and overall efficiency is optimized. IoT technologies also enable better traceability of food, leading to increased food safety.
- IoF2020 is part of Horizon 2020 Industrial Leadership and supported by the European Commission with a budget of EUR 30 million. The aim of IoF2020 is to build a lasting innovation ecosystem that fosters the uptake of IoT technologies. For this purpose key stakeholders along the food value chain are involved in IoF2020 together with technology service providers, software companies and academic research institutions.
- Nineteen use-cases organized around five sectors (arable, dairy, fruits, meat and vegetables) develop, test and demonstrate IoT technologies in an operational farm environment all over Europe. The first results are expected in the first quarter of 2018.
- The consortium has its roots in the EU FIWARE program with projects such as SmartAgriFood, FIspace, FInish and Fractals, which were and are very successful in targeting the agri-food sector with Future Internet (FI) applications. Through this portfolio of R&D and accelerator projects, a strong and coherent ecosystem was developed over the years. For IoF2020, the leading partners of the FIWARE agri-food projects leveraged this installed ecosystem to bring the agri-food sector to the next level: a

large-scale IoT pilot.

- To that end, the existing ecosystem was upgraded by bringing in new complementary partners, in particular end-users and their representative organizations such as CopaCogeca, CEMA, IFOAM EU in order to ensure user acceptability and large-scale take-up.
- Also a substantial number of farmers are involved as end users and test beds through cooperatives such as Spanish Co-ops, ZLTO, DCOOP, Pegasus, NILEAS and Coexphal. The technologic base of the ecosystem was extended by large IoT suppliers such as NXP Semiconductors, ST Microelectronics, Philips and large Telecom and ICT providers such as Orange and KPN in order to cover the whole IoT value chain and maximise the project's impact and sustainability. IoF2020 comprises 70+ partners from 14 countries. The project is led by Wageningen University & Research. Among the consortium partners are:
  - 58 partners directly participating in at least one of the operational use-cases;
  - 34 partners involved in facilitating the use-case in governance and business support;
  - 21 partners supporting specific IoT technologies, covering the expertise and capabilities for the complete IoT value chain;
  - 48 partners with their roots in the agri-food sector;
  - 38 partners from the private sector, of which 24 are SMEs;
  - 32 partners from the not-for-profit sector, of which 12 public academic institutes;
  - 1 strategic partner from Korea (whose budget is covered by the Korean government)
- https://www.iof2020.eu/about

Panama Disease

- Partners: 6 principal sponsors (under which WUR), 7 main sponsors (under which Bayer) and 18 sponsors/partners
- Fusarium Wilt (Panama disease) is not only a huge concern for the global export banana sector. It exerts an even greater impact on the domestic production of this staple crop as many locally preferred cultivars are also endangered, threatening the livelihoods of millions of smallholder producers.
- Nearly all commercial banana plants are clones. This makes the global banana cultivation extremely prone to disease epidemics – if one banana plant gets sick, other nearby plants can easily get contaminated.
- The problems related to Fusarium wilt (Panama disease) are complicated:
  - **Biology**: Quite simply, despite the world's best efforts and major investments, scientists still don't know enough about the biology and genetics of the causative fungus; and the other challenge is the need for greater genetic diversity among banana cultivars.
  - **Environment**: Thus, first and foremost, disease resistance is the best basis for a healthy banana. As long as we keep growing susceptible cultivars, this is labour lost in terms of disease control.
  - **Human factor**: Fusarium wilt acts on different scales: Plant, field, farm, region, country and even continent. State-level & international cooperation and integrated research are indispensable to finding solutions in all of these domains and scales. This requires multilevel solutions, as well as concerted action on the part of all stakeholders as both smallholders and plantation owners suffer from the same problems.
  - **Research:** Researchers, commercial companies and government institutions are working together on crop protection, food security and innovation. This will help to manage the dissemination of the deadly Fusarium fungus and sustain the livelihoods of the millions of people who depend on the banana. world switched to a different cultivar, the so-called the Cavendish. Although less tasty than Gros Michel, Cavendish was resistant to the type of Fusarium that was causing Fusarium wilt.
- Projects - Fusarium Wilt