One Step Ahead with Sustainable Agriculture

Het Groene Hart – The Netherlands

Bayer Forward Farming

“At the heart of it all”

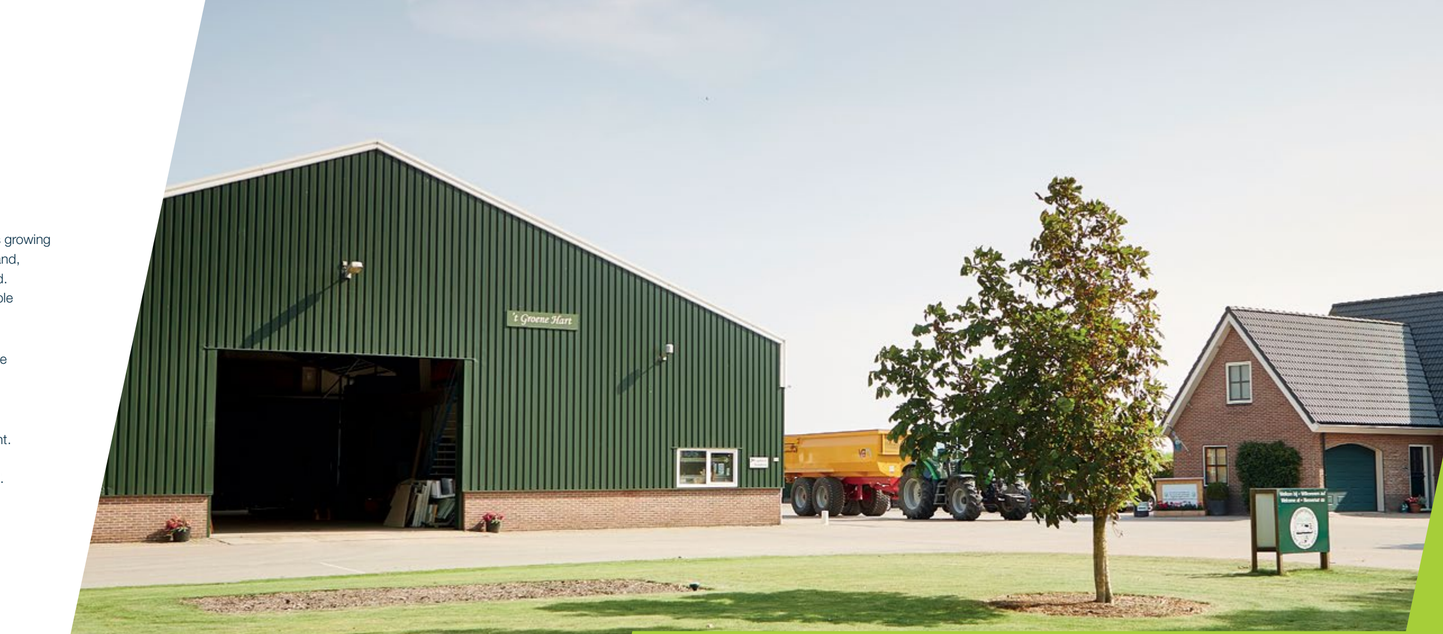
“As I watch the high-speed train pass through our town, I am reminded how the world around us is growing and developing at an equally fast pace. We felt the effects of this world population growth first hand, as our farm was forced to move in 2002 due to the development of the train track. Growth is good. As a farmer, I know that all too well. But now, more than ever, it is important to implement sustainable agriculture practices on the land we are blessed to cultivate.

Het Groene Hart, the farm I inherited from my father, Jan Roubos, in 2011, has been around since 1870. We primarily grow winter wheat, potato, onion and sugar beet on 83 hectares of very fertile polder soil in North Holland.

We’ve always been interested in sustainability and motivated to contribute to a better environment. Even in our home we separate all our garbage and run completely on solar energy. The farm is named after the area we are located in; “Het Groene Hart”, which literally means “The Green Heart”. We think it is quite fitting that it is now a place that brings sustainable agricultural practices to life.

When Bayer approached us about becoming a ForwardFarm, it was a natural extension to the work we were already implementing on the farm. The more we learned about the initiative, the more excited we became about using our land as a platform to improve sustainability in modern farming and to create awareness and dialogue in our community, our country and around the world. Bayer supports us by providing innovative solutions, valuable services and cutting-edge technology for our farm, so that we can meet the needs of not only our business, but also the environment and society in which we live.”

Jasper Roubos,
Het Groene Hart




Crop quality control


A bee hotel on the property


The fields of Het Groene Hart


Farmer Jasper Roubos

Sustainable Farming at *Het Groene Hart*

Farm Profile

Location:
Abbenes, North Holland.

History:
Founded around 1870, in 2002, the farm was relocated a few kilometers to its current location, because of the construction of the high speed train track. In 2011, Jasper Roubos took over from his father Jan.

Farming Land:
The clay soil has no stones, good drainage and is not very susceptible to drought, leading to high fertility and high yield potential.

Crops:
Winter wheat, potato, onion, sugar beet.

Partners:
Potatoes are grown for McCain, sugar beets for Cosun and onions for various customers.

Key Elements

1 *Seeds*
Good and certified seed is essential for a good yield.

2 *Bayer SeedGrowth®*
Integrated program aimed at sustainable seed and planting treatment and application technology.

3 *Crop protection*
Combined use of chemical and biological crop protection products for a sustainable production of healthy food.

4 *Precision agriculture*
Optimizing the application of crop protection products with regard to time, location and quantity.

5 *Decision supporting systems*
Integrated information about weather conditions and disease and pest warnings in order to apply crop protection at the optimum time.

6 *Biodiversity*
The added value of biodiversity for farmers, the environment and society.

7 *Personal protection*
Protecting the user of crop protection products with technology such as easyFlow®.

8 *easyFlow®*
Avoiding exposure of the user and the environment to concentrated products by using a closed transfer system during the filling of the sprayer.

9 *Bee health*
Supporting bee health through pest control, enhancement of biodiversity and careful use of crop protection products.

10 *Farmyard emission*
Prevent emission from the farmyard with techniques like a dedicated cleaning area combined with a Phytobac®.

11 *Emission through runoff*
Prevent runoff of applied crop protection products and fertilizers to surface water by plot design and special cultivation techniques.

12 *Partnerships*
Bayer ForwardFarming is a platform where partners work together to optimize agricultural practices.

Tailored Solutions | Proactive Stewardship | Partnerships

Premium produce

Meeting high standards for customers and processors

At Het Groene Hart, premium potatoes, sugar beets and onions are grown for various customers.

Nowadays, consumers want clean-looking and healthy produce with the right color, shape and size. On the other hand, the potato processing industry pays attention to qualities such as high proportion of starch and low sugar content.

To meet these standards, Jasper keeps a close eye on key production factors such as soil fertility, quality seed selection and water management – in addition to smart weed, disease and pest control, optimum fertilization and proper handling and storage of the harvest.

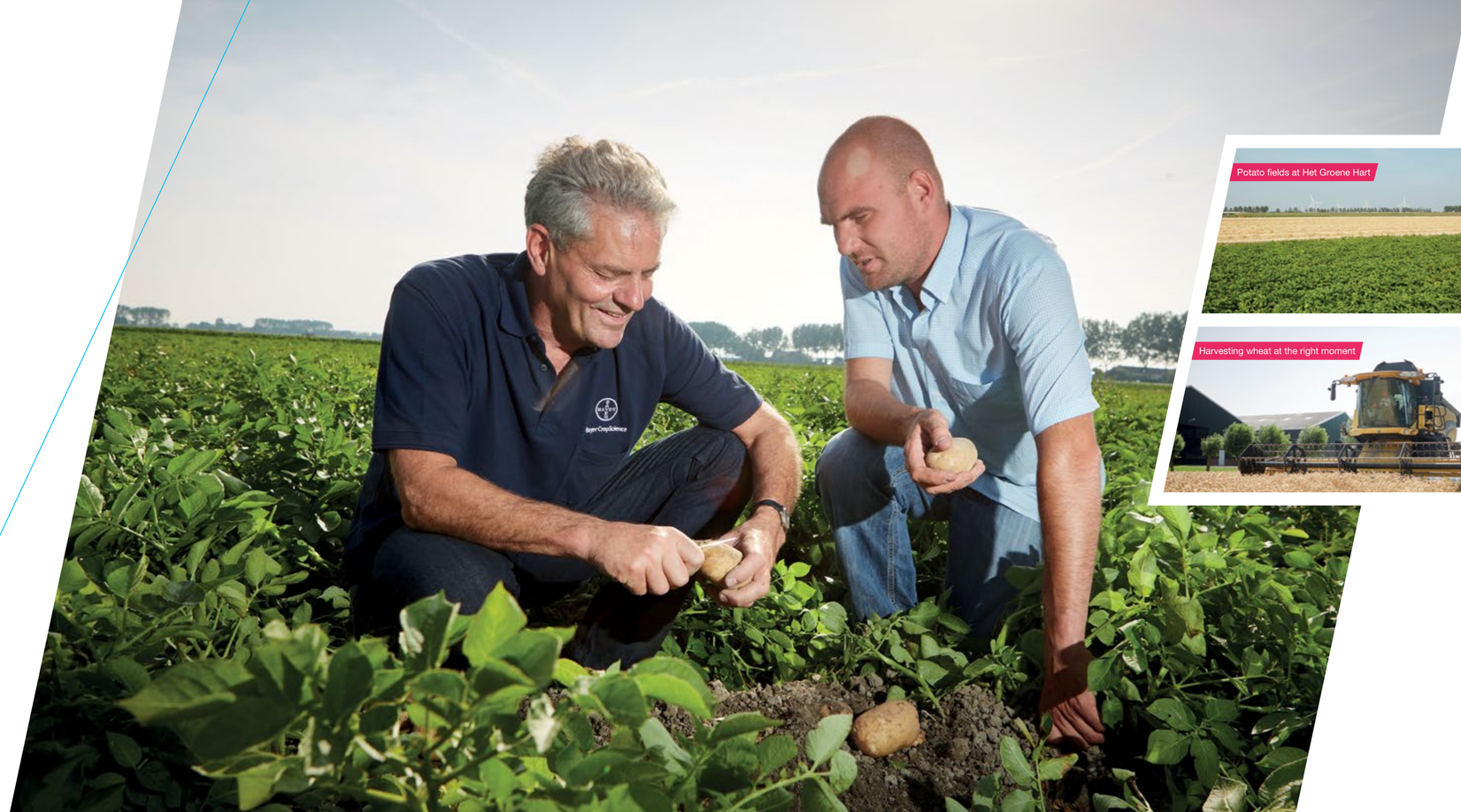
Precision agriculture for precise produce

Luckily, there is help to meet these challenges and also to control destructive weeds, pests and diseases.

Digital farming tools give farmers timely, field-specific information, from selecting the right crop varieties and measuring the right fertilizer dose, to determining the ideal time for crop protection measures and recognizing plant stress factors at an early stage.

Decision support tools help the grower in his important decision making. The system takes into account the current weather conditions (via a private or local weather station), the forecasted weather and the perceived disease risk from a regional, or even field-specific level precision. Multiple crops can be monitored at once.

Jasper and his team can go into the field each day with confidence. They do not just spray instinctively, but apply crop protection products with extensive knowledge and are precisely supported by comprehensive observations, information, digital tools and digital analysis. A very healthy, productive and quality crop depends on this type of meticulous care.



Potato fields at Het Groene Hart

Harvesting wheat at the right moment

Pollinator *care*

Beekeeper Erik Dolstra has placed his colonies – at present around 70 – at various arable farms in North and South Holland and in Utrecht. According to Dolstra, crop protection products have been blamed many times over the past few years as the main culprit of bee mortality, but for him, there is more than one challenge to be addressed. The high mortality rate among European honeybees is, for a big part, caused by the varroa mite (*Varroa destructor*). Without varroa mite control, a bee colony can die within 2 to 3 years. Therefore, the varroa mite needs to be combated in an efficient way.

Beekeepers address this infestation as part of a holistic treatment program. Many mites can infest a colony in a single season, if the beekeeper does not take sufficient action. “This single yellow sticky trap originating from a trial plot has caught no less than 1,039 mites, as opposed to the few that should be present, in order to keep a colony healthy. A beekeeper who neglects to tackle the varroa mite even for a short time will soon find himself in real trouble,” concludes Dolstra.

Bee hotels are placed at several locations at Het Groene Hart

Erik Dolstra, Beekeeper

Varroa mites

Deadly cargo prevention methods

For years, the tiny varroa destructor mite has been a huge threat to the honeybee. Innumerable colonies have fallen prey to this deadly parasite over the past few decades. The varroa destructor mite attaches itself to the body of the bee like a tick, and is carried into the hive as an ‘invisible stowaway’. Once inside, it reproduces and spreads throughout the colony. The varroa mite is also a carrier of several viruses that can seriously weaken the bees. In this way, entire colonies are completely destroyed.

Varroa-Gate protects honeybees

A new development for tackling the varroa mite is the Varroa-Gate, a sort of airlock at the entrance to the hive. Every bee that leaves or returns to the hive has to go through this special access gate. On the inside of the gate, a plastic strip has been fitted that contains an acaricide that kills the varroa mite. Every time the bee passes through the gate, a small amount of the active substance is rubbed off a plastic strip impregnated with a varroacide and affixed to the entrance of the hive. Honeybees entering or leaving the colony receive a tiny dose of chemical which they distribute in the hive. It is sufficient to control the mite population but harmless to the bee.

“Bee mortality rates over the past few years have been extremely low. In other words: our bees are doing very well.”

Erik Dolstra, Beekeeper

“I want to hand over this treasure to my son in its best condition”

Jasper Roubos, Het Groene Hart

Treasured soil

Crop rotation is of major importance at Het Groene Hart to ensure retained soil fertility. It is imperative that high demand crops such as potatoes and sugar beets are rotated with less demanding crops, such as winter wheat, to keep the soil healthy and balanced.

At harvest, wheat and straw are shredded and left in the field to improve the organic matter content of the soil. To create a good nutrient base for the following cover crop, the fields are also fertilized with manure. The cover crop itself contributes as a rich organic matter supplier via decomposition of its roots and foliage.
It stimulates the in-soil biodiversity, which is extremely important, as the soil represents 95 % of all biodiversity!

Another important element in soil improvement is the incorporation of compost from different sources like park and road side green-cuts. Compost has many advantages such as increasing organic matter, boosting microorganism activity and improving moisture control properties.

Another important soil management measure is to maintain or even improve organic matter content with shallow plowing. Plowing also supports weed control management as well as reducing fungal disease pressure on the soil surface because the top soil has been turned over. In dry seasons, no-tillage keeps organic matter active in the top soil. Using lightweight tractors, large tires and the lowest possible tire pressure reduces the risk of soil compaction.

Wrangling the runoff

Water is the lifeblood of our crops, but sometimes too much of a good thing can be bad. When heavy rains arrive in North Holland, soil runoff can pollute water bodies. To better control the influx, natural margins have been set up as a buffer next to ditches or lagoons. Perpendicular micro-dams are installed as anti-runoff barriers on inclined fields. As a result, the farm has experienced significantly less runoff issues, cleaner surface water and more efficient use of the rain water in the crop.

Keeping *things clean*

From our machines to the environment

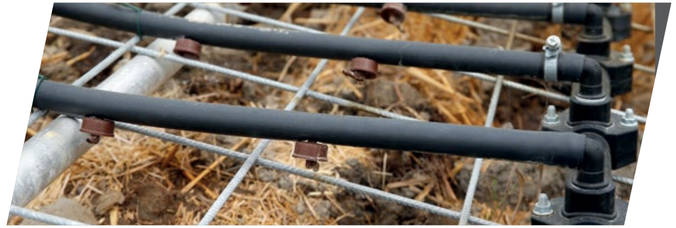
"More than half of all residues from crop protection agents that end up in surface water can be traced back to the rinsing of equipment on the farm. For farmers who want to make a real step forward in emission reduction, this is the place to begin," explains Albert van Kooten, Bayer ForwardFarming Manager at Het Groene Hart, referring to the filling and washing area installed at this Bayer ForwardFarm.

Sprayers have a number of sensitive parts that need to be well maintained. Washing the spraying equipment after use is very important. However, while doing so, traces of crop protection products can contaminate the rinsing water. So how do we keep the rinsing water from getting into the ditch?

Van Kooten and his team installed a bio-remediation system called Phytobac® to purify rinsing and washing water from treatment equipment.

The location is not only equipped for filling and washing the field sprayer; other machines – sometimes with oil or grease residues – can also be thoroughly and responsibly cleaned here.

Phytobac® is a simple way to prevent contamination of water bodies with washing water. The machinery is washed on a concrete platform where the waste water is collected in a tank. It is then distributed via nozzles over a basin filled with a soil-straw substrate. Microorganisms in this soil-straw substrate biodegrade the residues, and then the clean water evaporates.



The Phytobac® is a bio-based purification system. Most importantly, it is a completely closed system from which no residual waste has to be removed. The Phytobac® – in this case with four units installed in a series – is filled with a mixture of straw and soil that binds to the crop protection products and breaks them down with the help of microorganisms. From the buffer tank (in the picture on the right), the residual water is transferred to the Phytobac® containers via drip lines. The water in the Phytobac® containers evaporates, and any residues are broken down.

“Our aim is to emphasize the importance of safe use of crop protection products at all points from application to clean-up.”

Michel Jansen,
Product Stewardship Expert at Bayer

Michel Jansen, Product Stewardship Expert

Demonstrating proper personal protection

Safety first

Michel Jansen, Product Stewardship Expert at Bayer, educates others about the responsible handling of crop protection products. In the following interview, he explains the important measures he and his team are implementing on Het Groene Hart and on farms around the world.

To begin with: What is product stewardship?

The word says it all. We ensure the use of our product is respectful of the environments in which it is applied. Put briefly, as the product stewardship expert, my work is all about issues that relate to the safe handling of crop protection products. These issues are divided into two aspects; human safety – the safety of the operators who use the product – and environmental safety, which is above all about protecting water and living organisms. In both areas, our work is aimed at maximizing the responsible and safe use of these agents. Good communication is essential to our work. We want to make sure proper and sustainable process is understood by all who may come in contact with products.

What are some educational materials that you offer?

On our website (agro.bayer.nl) we offer a number of tools and applications for improving the safe and responsible use of crop protection products. We also publish brochures, product instruction films and, during growers’ meetings, provide detailed information about the responsible use of our products. On top of that, the ForwardFarm itself is an extremely important location for demonstrating techniques and holding discussions about safety.

We are also currently involved in a series of projects to help limit emissions from crop protection products into the surface water. In close collaboration with various stakeholders including the agricultural organization LTO, Dutch Water Authorities, CLM, Agrodis and Nefyto we work together to identify tools and systems that integrate well in the sustainable farming process. With the partners mentioned above we’ve developed a toolbox for the industry that contains 18 different information cards that share practical measures for reducing the emission of pesticides to surface water.

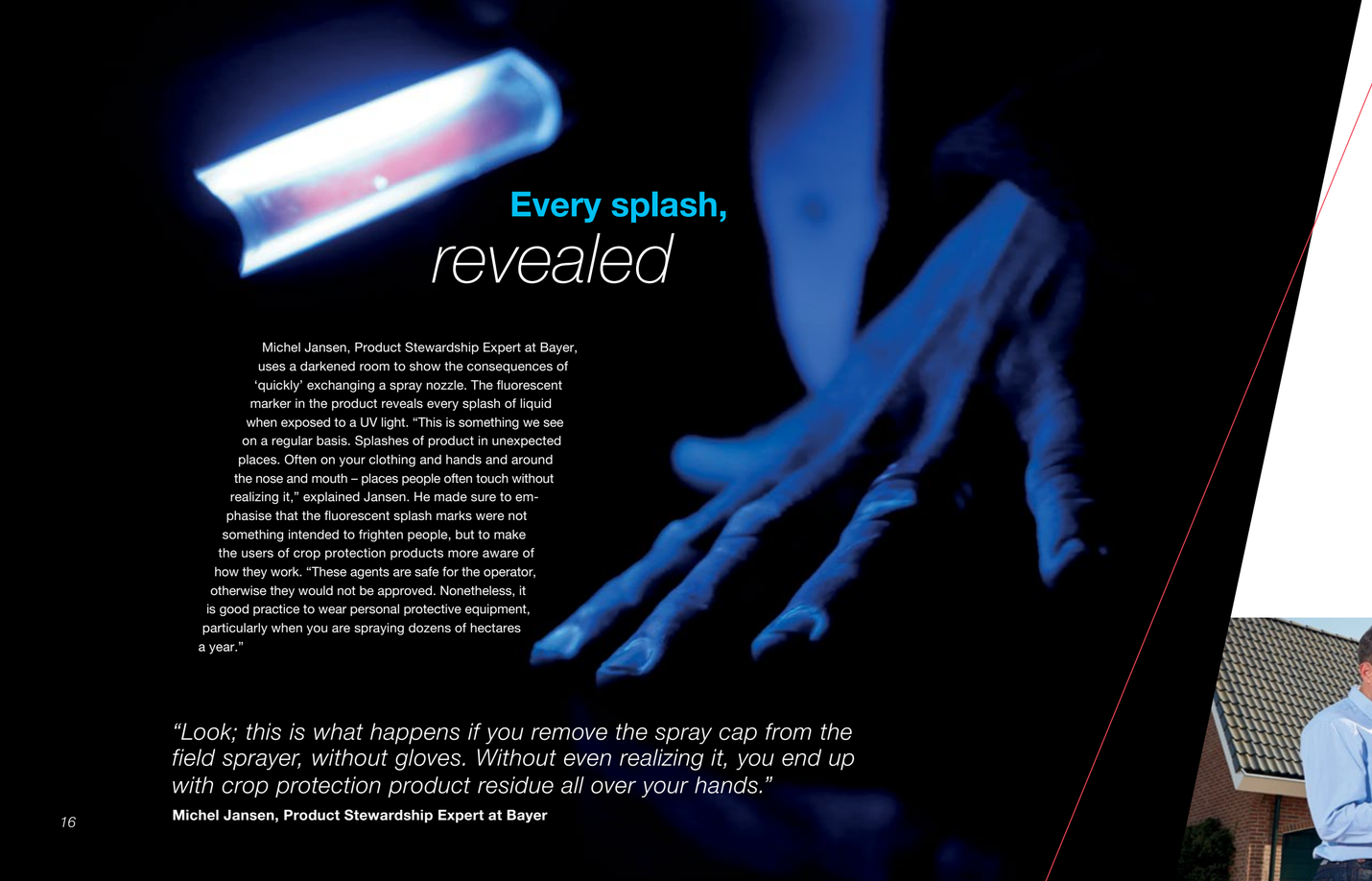
What technical systems are available to ensure safe handling and application of products?

At present, we at Bayer have developed tools that we are putting into practice: Phytobac® and easyFlow™. Phytobac® is a closed system that uses microorganisms to biodegrade residues from crop protection products. Bayer has also developed a new closed transfer system – device called easyFlow™ – a device that allows operators to measure and translocate crop protection products without the risk of being exposed to them. For a number of agents, it will soon become a requirement that the operator must be able to use the product without coming into contact with it, so it is important we have a system like this put in place. We also have a simple system for cleaning caps. It may seem like a simple task, but it is incredibly important for growers to use. Our objective is to ensure that growers handle product residues responsibly, so they do not end up in the natural environment.

What can users of crop protection products do to help themselves stay safe?

Without any hesitation I am happy to say: a great deal. At Bayer, it is one of our responsibilities to identify the appropriate protective clothing for every situation in which crop protection products are being handled. This applies to the preparation of the spraying solution, the spraying itself and the cleaning of the equipment. The grower receives detailed, practical recommendations that conform to legal requirements.

Through training, we try to inform our growers of the importance of sound personal protection. For example, we use fluorescent markers that show every single splash mark on the operator’s clothing, hands or face. When we ask the growers to clean a simulated blocked cap according to their own method, the only protection they generally use is a pair of gloves. Taking them into a darkened room and showing them all the places where the product has ended up is something that many of them will never forget.



Every splash, *revealed*

Michel Jansen, Product Stewardship Expert at Bayer, uses a darkened room to show the consequences of 'quickly' exchanging a spray nozzle. The fluorescent marker in the product reveals every splash of liquid when exposed to a UV light. "This is something we see on a regular basis. Splashes of product in unexpected places. Often on your clothing and hands and around the nose and mouth – places people often touch without realizing it," explained Jansen. He made sure to emphasise that the fluorescent splash marks were not something intended to frighten people, but to make the users of crop protection products more aware of how they work. "These agents are safe for the operator, otherwise they would not be approved. Nonetheless, it is good practice to wear personal protective equipment, particularly when you are spraying dozens of hectares a year."

"Look; this is what happens if you remove the spray cap from the field sprayer, without gloves. Without even realizing it, you end up with crop protection product residue all over your hands."

Michel Jansen, Product Stewardship Expert at Bayer

The importance
of partnerships

Partnerships at ForwardFarms are like a farmer and his tractor, one does not go without the other. Bayer provides many resources from a crop protection perspective, however to approach sustainable agriculture holistically, it is important that we identify partners from universities, institutes, associations and technology companies that can bring incredible value to the practice. The objective is to cooperate with partners to support each activity at Het Groene Hart. A ForwardFarm can only be successful with teamwork.

Digital farming

One important area for partnership is digital farming, where we participate in several projects, mostly led by Wageningen University. The Internet of Food and Farm 2020 project, explained on the next page, is just one example.

The Dutch ForwardFarming team cooperates with several other companies and technology providers to develop integrated crop solutions based on data from soil and crop sensing.

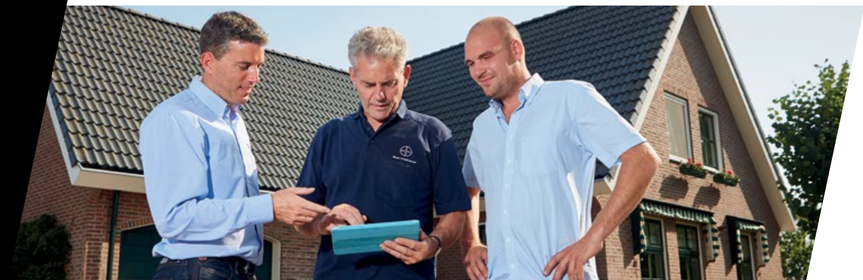
Monitoring tools

Another important tailored solution is monitoring. In this field, we collaborate with partners like Dacom, an innovative high-tech company that develops and supplies specialized hardware, software and online advisory services to arable farms and the agribusiness around the world. Local weather information and soil moisture data, recorded in several fields by Dacom sensors, are combined and entered into a farm management system. The system then provides the farmer with insight on when and where to take which action.

Biodiversity

When it comes to true tailored solutions, sometimes natural tools work just as well and are as equally important as technological innovations. For that reason we must ensure the safety of beneficial insects and pollinators is guaranteed. On Het Groene Hart we work together with beekeeper 'MeerBijen'. By monitoring nine bee hives that are situated around the farm, surrounded by crops like potatoes, tulips and onions, we show in practice that intensive agriculture and bee health can go hand in hand.

By setting up partnerships like this at Het Groene Hart and on ForwardFarms around the world, we can demonstrate innovation and engage in important dialogue to stay one step ahead with sustainable agriculture.



The technology *eco-system*

Opportunities on the farming frontier

A fruitful harvest relies on the availability of fertile soil, the use of healthy seeds, favourable weather conditions and efficient input management. In the same way, farming itself is based upon the skill set of the farmer to manage many different factors throughout the growing season and beyond to operate sustainably.

Overall, arable farming continues to face challenges to further improve resource management, efficient use, environmental preservation and transparency in production practices. Technological innovations support the farmer in connecting and simplifying the interaction between all of those different elements and tasks.

Technology is progressing even faster with the evolution of communication networks and the availability of a wide range of new sensors, opening up new opportunities for arable farming.

These technologies help to capture and transmit incredibly accurate information in real time and at low cost, generating overviews of the agro-farm environment covering things like soil moisture, crop health and weather data. Combined with agro climatic and economic models better forecasts and decision taking is possible helping the farmer optimize, and synchronize, the many tasks to be completed on his farm.

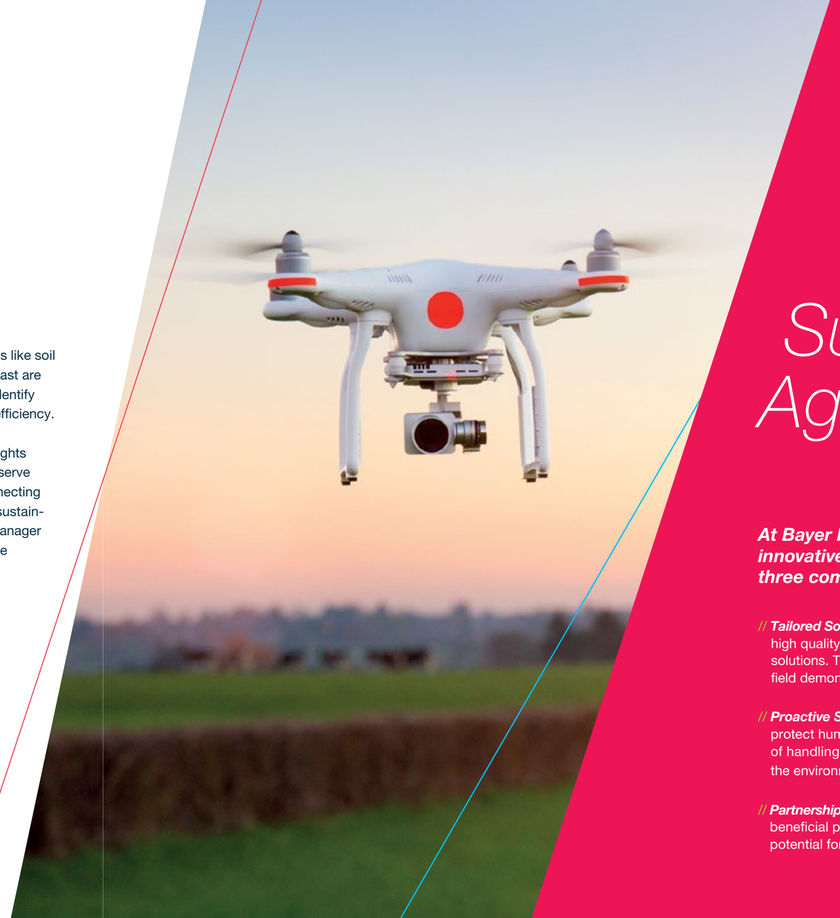
It is what is called the “Internet of Things” (IoT): connecting devices through the internet, exchanging data, letting the devices and farm equipment communicate with each other, to support the farm management decisions of the farmer and to create transparency to the consumer.

In January 2017, the Internet of Food and Farm 2020 (IoF2020) project funded by the EU kicked off to foster the large-scale adoption of IoT technologies in the European farming sector. The project is coordinated by Wageningen University and involves many stakeholders – from farmers, farm associations, equipment and logistic suppliers to food processing companies and consumer organizations. The project brings together 73 partners, one of which is Bayer.

As part of the Bayer ForwardFarming initiative, Het Groene Hart is a participant in the IoF2020 project. With the hands-on mentality of the IoF2020 Team, digital technology applications are put into practice on the farm, specifically monitoring the potato crop.

Geo-localised sensor technology, real-time data analysis like soil moisture, crop health, weather data and weather forecast are the basic input for the Farm Management System to identify opportunities to improve crop performance and farm efficiency.

“This integrated approach is expected to give new insights and concepts to improve farming productivity and preserve the environment. We hope that by optimizing and connecting available technology, we remain one step ahead with sustainable agriculture,” says Albert Schirring, Global Crop Manager for Vegetables & Potatoes and the Bayer representative for the project.



Sustainable Agriculture
in practice

At Bayer ForwardFarms, farmers and Bayer experts demonstrate innovative solutions for sustainable agriculture that comprise three components:

// ***Tailored Solutions –*** Innovative products and services tailored to customer needs, including high quality seeds and traits, biological and chemical crop protection products and digital solutions. These solutions are backed by tailored services ranging from agronomic support, field demonstrations, diagnostics, and prediction tools to documentation.

// ***Proactive Stewardship*** to ensure product integrity (for seeds and crop protection products), protect human health, and preserve the environment. We offer training to raise standards of handling and usage, as well as to minimize any possible risks to human health and the environment.

// ***Partnerships*** to enhance the quality of life for farmers, communities, and society. Mutually beneficial partnerships that include all players in the value chain and help to leverage the potential for collaboration in modern agriculture.

For further information, visit our website:
www.forwardfarming.com

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