



Protecting crops more precisely

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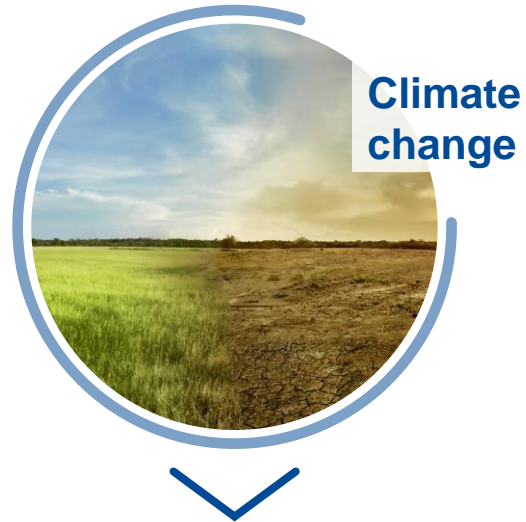
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Agriculture is a dynamic environment impacted by global trends

Megatrends



- Shifting climate creating new pest and weed patterns
- Need for technologies that minimize harmful effects on the environment



- Increased demand for environmentally conscious, sustainable food production
- Growing population, higher demand for food and plant-based protein



- Regulatory changes leading to active ingredient phaseouts and reductions in chemical use
- High societal awareness for pollinator health



- Predictive and precision application of inputs
- Tools to maximize crop yield and reduce input costs

Impact on agriculture

Improved weed management for more sustainable, efficient and environmentally conscious crop and food production



Average
crop yield loss
due to weeds
30%¹

Non-controlled
weeds can create
seed banks for
>20 years

- Today, farmers control weeds by spraying the whole field with herbicides
- For economic reasons, farmers compromise between cost and performance to spray whole field
- Moving from field to plant-specific application will improve performance and reduce environmental impacts



Agronomic intelligence based on three R&D pillars, using farm data to provide timely, precise and actionable advice

Digital agronomy



- Evaluate yield potential
- Optimize input intensity
- Adapt to field/farm variability
- Model crop development
- Model pests, weeds and diseases
- Adjust product recommendations

Data



- Collect, generate, process and analyze data
- Use artificial intelligence, machine learning and data automation
- Develop data pipeline and intuitive data visualization

Technology



- Capture machine data
- Utilize remote sensing such as weather, satellites, drones
- Constantly focusing on product enhancements
- Internet of Things connectivity

Smart digital products
xarvio® Digital Farming solutions

xarvio Agronomic Decision Engine (ADE)

Smart machinery for best execution
Bosch BASF Smart Farming JV



ONE SMART SPRAY for precision weed control, efficient herbicide use and reduced environmental impact

Real-time, automated weed identification and management for:

- green-on-brown (pre-emergence) application
- green-on-green (post-emergence) application

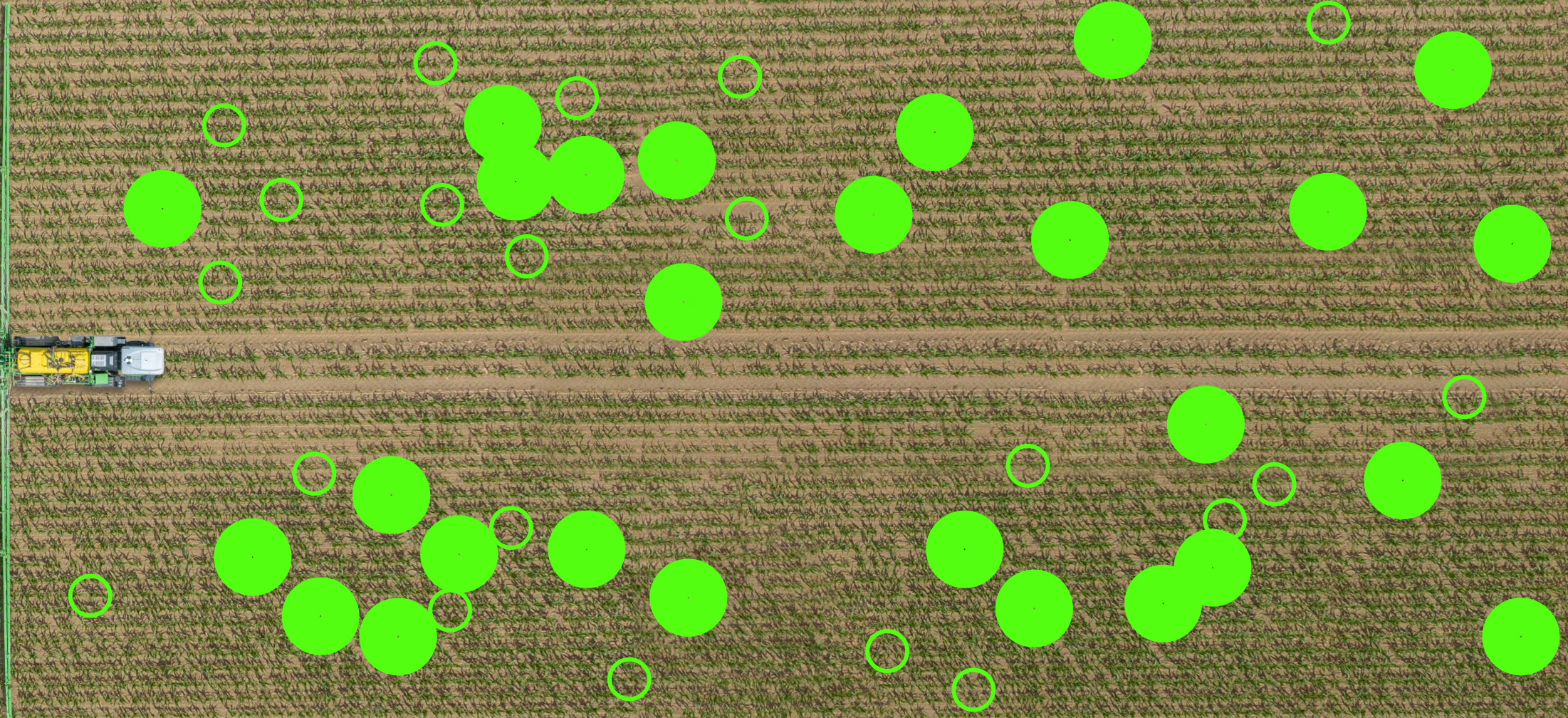
Weed control based on **xarvio agronomic decision engine** customized herbicide strategy¹

See and act:
36 integrated cameras² scan the field, **detect weeds in milliseconds** and activate spray nozzles to **spot apply herbicide only where needed**

¹ incl. product type, dose rate, sensitivity thresholds and optimized timing of application

² Number of integrated cameras dependent on OEM set-up

ONE SMART SPRAY precisely targets problematic weeds



Problematic weeds are sprayed.



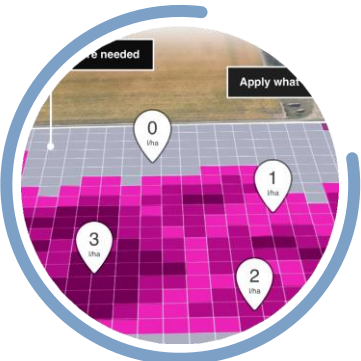
Non problematic weeds, with no impact on crop growth, are not sprayed based on set threshold sensitivity levels.

Dedicated R&D program for smart spraying concept conducted in various crops in key markets under real growing conditions



xarvio intelligence and threshold logic

- **Threshold sensitivity logic** built on Bosch crop and weed image recognition algorithms
- **Threshold logic has 3 sensitivity levels** – max control, balanced and max savings
- Programmed into agronomic decision engine **for best weed control and savings**
- **20+ crop growth stage models** created and proven for optimal herbicide application timing



xarvio product recommendation

- **10.000+ recommendations** for herbicide product application
- **Prioritized product efficacy**
- **Resistance management**
- **Compliant** in line with local regulation

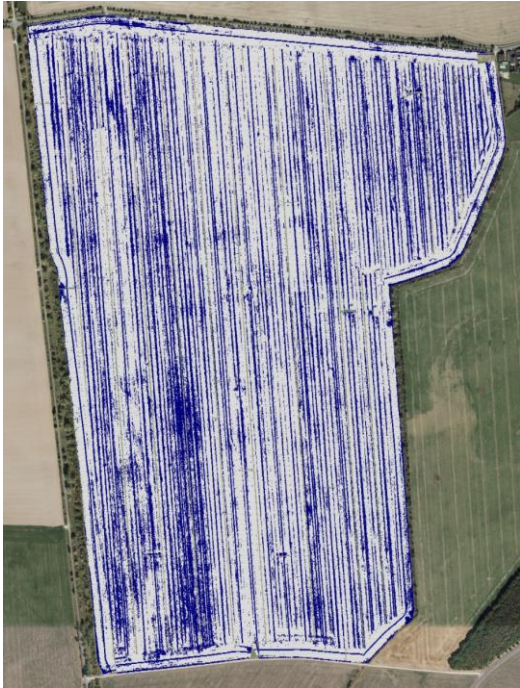


System performance testing

- In-field testing with **15 prototypes**
- **6 countries** in **North America**, **South America** and across **Europe**
- **6 major crops covered** (soy, corn, cotton, canola, sunflower, sugar beet)
- **650+ weed species** controlled
- **1 million data points per hectare** collected and refined to confirm logic

ONE SMART SPRAY achieves optimized herbicide use

Weed control above 95%, with up to 68% less herbicide use



Weed infestation level

- High
- Medium
- Low

Herbicide application map

- On
- Off

Example: Cornfield, May 2023, Germany

ONE SMART SPRAY will be launched in 2024

Major agricultural machinery producers are committed to adopting the technology

- CNH INDUSTRIAL
- Stara Constant Evolution
- AGCO
- AMAZONE
- DAMMANN Pflanzenschutztechnik Fahrzeugtechnik Airporttechnik

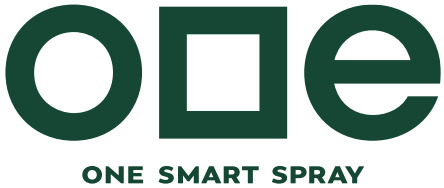
Protecting crops more precisely

1 BASF's advanced xarvio Digital Farming Solutions platform transforms crop production in a resource-efficient way

3 ONE SMART SPRAY makes weed management more efficient, sustainable and profitable for farmers

2 The system optimizes crop production with precision technology, while minimizing the environmental impact

4 In 2024, the solution will be commercially available with major agriculture machinery manufactures in North America, South America and Europe





We create chemistry