



## **Smart Livestock Farming**

Potential of Digitalization  
for Global Meat Supply

Discussion Paper

Demand for meat has increased dramatically over recent decades. Global production has quadrupled from 80 to over 300 million tonnes between 1963 and today. This development is mainly driven by continuous population growth and rising per capita incomes. In the past, most of the demand growth could be met by increases in slaughter weights, but the growth in animal productivity is expected to slow down in the future.

The livestock sector already uses one third of global arable land and 8% of available freshwater. It is also largely responsible for deforestation and biodiversity loss, and contributes 15% of global CO<sub>2</sub> emissions.

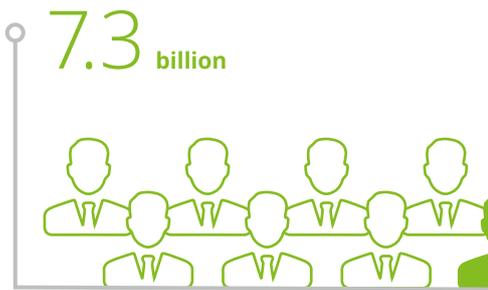
As population and incomes are expected to continue their growth, there will also be large increases in demand for meat. Therefore, the objective for the sector must be to fulfill future demand, ensure consistent quality, and to achieve this in a sustainable manner without causing irreparable environmental damage or exceeding global resources.

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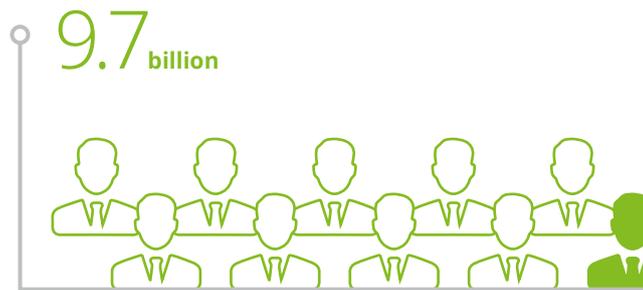
# Key Challenges for the Meat Production Sector

Increases in global population and global welfare are expected to drive an increase in meat demand from 334 million tonnes in 2015 to 498 million tonnes\* in 2050

**Global population will increase almost 40% by 2050**

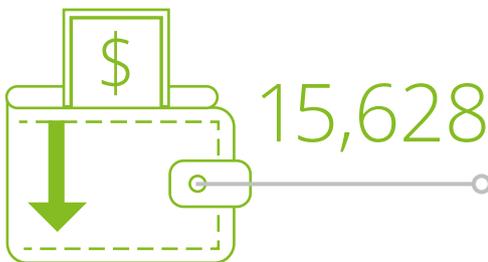


From 7.3 billion people in 2015 ...

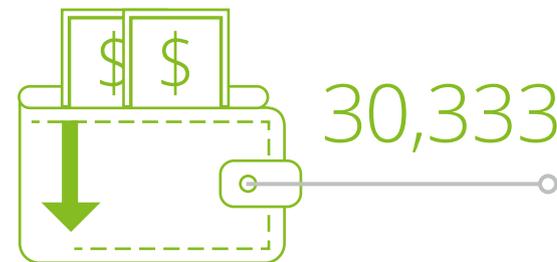


... to 9.7 billion in 2050

**Global per capita income will almost double by 2050**

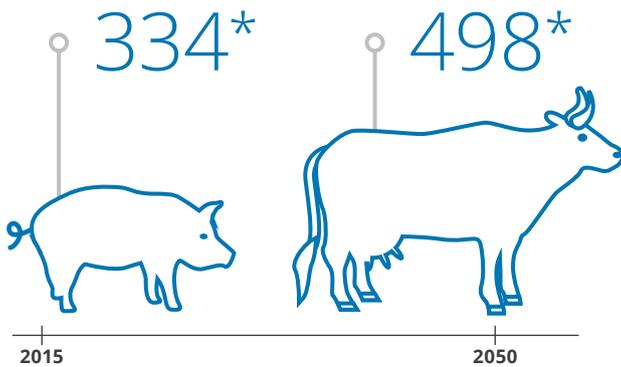


From \$15,628 in 2015 ...



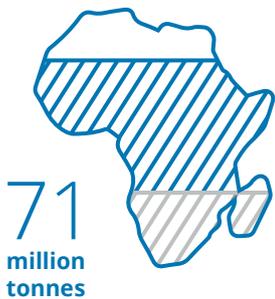
... to \$30,333 in 2050

**Driven by the strong growth in population and per capita income, global meat demand will increase by almost 50%**

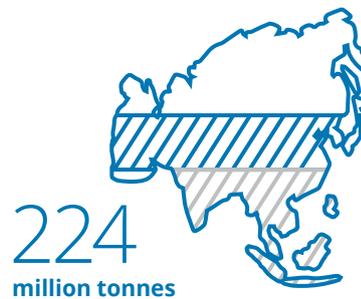


In addition, per capita consumption will increase by 13% from 45 to 51 kg per year.

**Most of this demand growth will come from developing regions, especially Africa and Asia**



Africa will increase its meat consumption more than 2.5-fold from 20 to 71 million tonnes by 2050. Per capita consumption will rise from 18 to 30 kg per year.



Asia will increase its meat consumption by 50% from 150 to 224 million tonnes by 2050. Per capita consumption will rise from 34 to 43 kg per year.

\* In million tonnes of carcass weight equivalent (cwe)

The impact of livestock farming on natural resources is under further pressure from consumers demanding higher quality products and readily available information

**Livestock is already one of the most demanding sectors in terms of resource use and emission intensities**



**Land use, for feed crops and grazing**

- 26% of the earth's ice-free surface is used for grazing
- One third of global cropland is dedicated to feed crop production



**Manure excretion, which can pollute groundwater**

- Over 13 billion tonnes of manure are produced per year, which requires a considerable amount of agricultural land to apply it on



**Resource allocation due to lack of efficient logistics**

- The lack of business ecosystems and integrated supply chains is one of the root causes of waste resulting from meat production
- Non-transparent information flows hamper the delivery of products to the products to the right place at the right time



**Water use for feed crop and animal drinking and servicing**

- 8% of global freshwater use can be allocated to livestock farming



**Greenhouse gases (GHG), which fuel global warming**

- In 2015, global GHG emissions reached 57 gigatonnes (Gt), with livestock accounting for 15% of it
- The meat sector alone produced over 5 Gt of emissions during the same year

In addition, several consumer demands put pressure on farmers to increase productivity and sustainability of operations



Lower meat and dairy prices



Volatile demand patterns, especially in summer ("barbecue demand")



Always fresh products



Better animal health, welfare, and living conditions

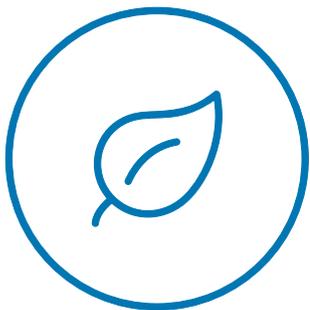


Increased availability of information at the right time



Reduce antibiotics use

While land and water are likely to be suffering from regional shortages, GHG emissions will constrain meat production on a global scale



### Land and water resources

- A detailed evaluation of land and water resources, as well as of manure land requirements, showed that the land and water available today will be sufficient at a global level until 2050
- Even under a worst-case scenario, where production remains at current levels and demand for livestock products and crops increases by 70 and 100% respectively, global resources would be sufficient
- However, regional shortages will very likely occur over the coming years and decades as spare land and water is often not readily accessible, located far away from where it is needed, or suffers from other constraints such as pollution or past disease outbreaks
- Therefore, a reduction of land and water use, as well as of manure generation, will be especially important for regions where resource constraints are already apparent today

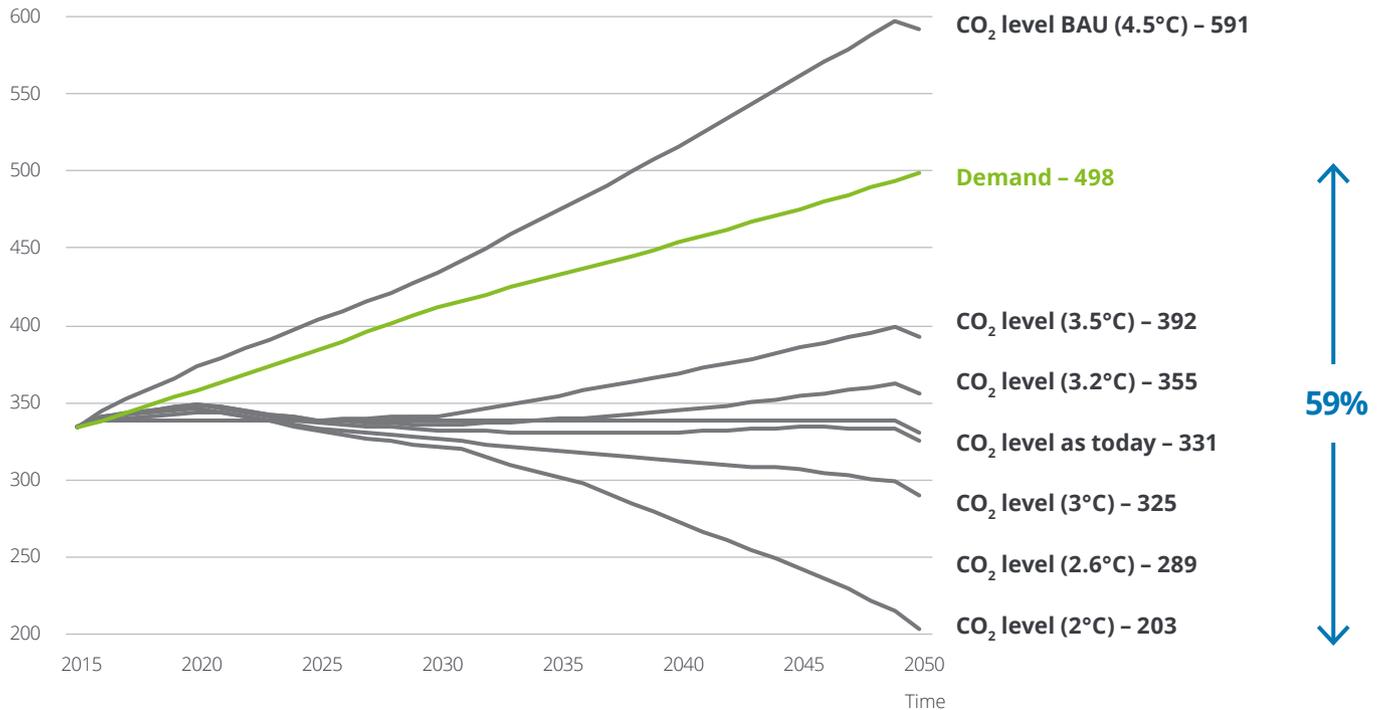


### GHG emissions and temperature

- If global emission growth continues on its path, GHG emissions will reach 139 Gt in 2100 and the earth's temperature will be 4.5°C above pre-industrial levels
- As governments have realized the threat of global warming, agreements were reached to decrease emissions. The meat sector plays a crucial role in achieving these objectives, as it accounts for almost 10% of emissions.
- Under the business as usual (BAU), meat emissions would increase from 5.2 Gt per year today to almost 8 Gt in 2050
- To keep global warming below 2°C, meat emissions have to be decreased to 3.2 Gt by 2050

Keeping global temperatures below the agreed level means that global meat production cannot meet even half the demand in 2050

Atmospherical carbon dioxide in ppmv  
(parts per million by volume)



If global warming is to be kept within 2°C above pre-industrial levels, only 41% of global meat demand can be met by 2050

# Strategic Options for Facing the Challenges

Smarter production, nutrition, and waste management, as well as increased animal welfare and better education, have the potential to decrease the impact of livestock farming on our natural resources



## **Global best practice roll-out**

Best practices are methods or techniques that have consistently shown results superior to those achieved by other means.

Large yield and productivity gaps exist across the sector, especially between industrialized and developing countries.

Digitalization can make a roll-out easier, faster, and less expensive by leveraging transparent supply chains, cloud computing, improved networks, and global knowledge platforms.



## **Precision feeding**

Precision feeding can be a highly effective tool in enabling a reduction of feed intake per animal while also maximizing individual growth rates.

It enables the provision of the right amount of feed, in the right nutrient composition, at the right time, and for each animal individually.



## **Smart waste management**

About 20% of all meat goes to waste every year. Although most waste is generated at the consumer end, the root causes lie across the whole supply chain, e.g. poor packaging or bad meat quality.

Smart waste management offers high potential to first identify such root causes and second, to improve existing processes and thereby decrease waste amounts.

The intelligent collection and use of data is key to understanding what is produced and what is thrown away. Through this, players along the supply chain can make focused adjustments to reduce waste at their end.



### **Animal health and welfare monitoring**

Health issues and diseases can decrease production efficiency of livestock by up to 33%. The trend towards more and more intensification of livestock farming systems increases productivity, but can also have adverse effects on animal health and welfare, and increases the risk of rapid and far-reaching disease outbreaks within stocks.

Through ICT and the IoT, more performance-related data can be collected from the animals, for example through cameras and image recognition software, wearables, as well as weight or sound monitoring.

In addition, data from livestock facilities can also help to improve animal health, for example through climate, air quality and ventilation monitoring and by using drones.



### **Reduced beef consumption**

In 2015, cattle accounted for over 60% of total meat livestock emissions, while beef only accounted for 20% of total meat consumption. Meat from non-ruminants such as pork and poultry produces far fewer emissions, which offers wide potential to reduce emissions by reducing the amount of beef that is consumed.

Digitalization can help facilitate changes in demand patterns, e.g. by using ICT or crowdsourcing platforms to find innovative ways of communicating the benefits of dietary changes.

# Five Approches with Impact on Global Meat Supply

Digitalization can maximize the impact of these strategic initiatives to significantly reduce the impact of meat production and simultaneously drive economic benefits

## Best practices\*

# 25%

... of emissions could be reduced by a global roll-out of best practices\*. Global warming could be kept below 3.5°C while fulfilling total demand for 2050. Under the Paris Agreement 2° target, output could be increased by 33% from 203m to 271m tonnes, which represents 54% of global demand for 2050.

## Precision feeding

# 13%

... of emissions could further be reduced by a widespread implementation of precision feeding. Sector emissions in 2050 would be below today's level while fulfilling all demand. 62% of demand could be fulfilled under the 2°C objective.

## Meat waste

# 10%

... of emissions could be eliminated by reducing meat waste with the help of digital technologies. The 3°C goal could be reached and demand could be fulfilled until 2040 under the 2°C objective. Further, 70% of all demand for 2050 could be fulfilled under this objective.

## Smart animal health and welfare

# 2.5%

... of emissions could be further reduced by the installation of smart animal health and welfare monitoring techniques. Deloitte estimates that these could reduce animal losses by at least 65%. The 2.6°C goal could hence be reached. However, emission figures do not reflect the great monetary benefits to individual farmers of preventing diseases and disease spreads, among other advantages.

## Consumption shift away from beef

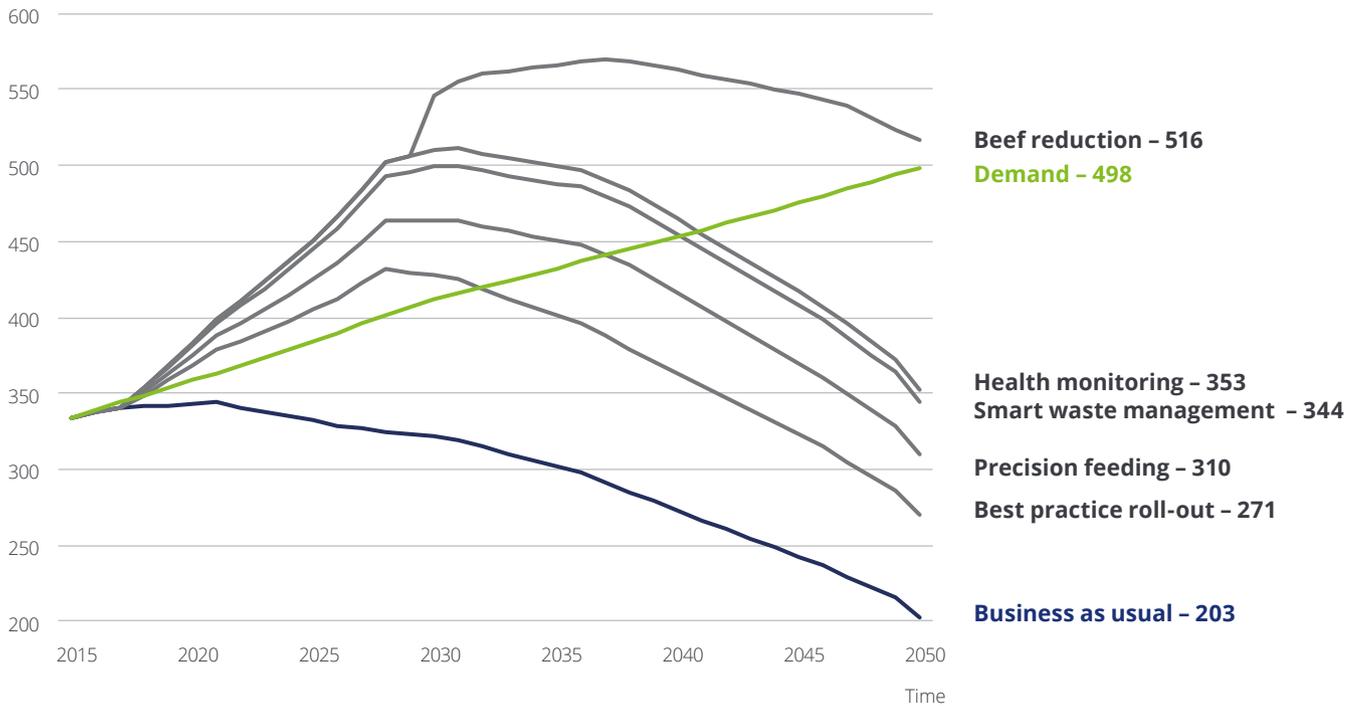
# 28%

... of emissions and more could be reduced by a consumption shift away from beef towards meat with lower emission intensities, such as poultry and pork. The 28% reduction could be achieved by reducing the share of beef in overall meat consumption to one third of today's level, i.e. 7%, and shifting the rest of the demand towards poultry and pork. Through this, the 2°C objective could be reached while also fulfilling total demand for meat.

\* Adaptation of best practices of the top 10% of farmers with lowest emissions within a region or agricultural zone; Source: Gerber et al., 2013. Tackling climate change through livestock – A global assessment of emissions and mitigation opportunities. Food and Agriculture Organization of the United Nations (FAO), Rome

A successive implementation of all five approaches could prevent the emergence of a meat supply gap and enable production to fulfill the demand

Atmospherical carbon dioxide in ppmv  
(parts per million by volume)



Notes & assumptions: All figures in million tons of cwe; best practice roll out: 2018-2030, precision feeding: 2018-2038, waste reduction: 2018-2050, animal monitoring: 2018-2030, reduced beef consumption: 2030-2050; results build up on each other, i.e. the figure for precision feeding also includes the productivity increases of the best practice roll-out.

**Creation of jobs, e.g.  
data stewards on farms**

**More efficient  
logistics through  
data analytics**

**Reduction of waste  
enabled by a better  
allocation of resources**

**Increased efficiency  
for supply  
chain players**

**Better use of  
manure through  
the use of collabo-  
rative platforms**

**Reduction of waste enabled  
by a better allocation of resources**

There are more areas than just  
the reduction of emissions per  
meat unit that are positively  
impacted by the digitalization of  
the Global Meat Supply

Although digitalization offers enormous potential in productivity gains, it seems that, in the long run, demand can only be fulfilled if changes on the consumer end towards less consumption of beef occur as well.

# Smart Livestock Farming

Several technological enhancements fuelled the rise of digitalization over recent decades



## Artificial Intelligence (AI)

The ability of a computer or robot to perform tasks commonly associated with intelligent beings. It includes learning, reasoning and self-correction. It generates insights from data more quickly and accurately than humanly possible and is able to act automatically on that insight.



## Cyber-Physical Systems (CPS) and Internet of Things (IoT)

A CPS is a mechanism controlled or monitored by computer-based algorithms. The network of connected CPS, people, and devices creates the IoT where devices communicate and cooperate with each other and with humans in real-time, thereby enabling decentralized and automatized decision-making adjustments to reduce waste at their end.



## Platforms

A platform is a business model that creates value by facilitating exchange between two or more interdependent groups, usually consumers and producers. Examples are Facebook and Uber.

Such platforms also offer opportunities for the meat livestock sector, e.g. e-Sourcing platforms for transports along the supply chain, but also for a more efficient distribution of manure from local animal to local crop farmers.



## Information and Communication Technologies (ICT)

Technologies that provide access to information through telecommunication, including the internet, wireless networks, mobile phones, and other communication media.



## Big Data Analytics

The process of collecting, organizing, and analyzing this data to discover patterns, trends, correlations, consumer preferences, and other information.



## Cloud Computing

The practice of using a network of remote servers hosted on the internet to store, manage, and process data, rather than using local servers or personal computers.

Digital patterns arise from these technologies which will be critical in the roll-out of smart farming technologies within the livestock sector



### **Crowdsourcing**

Crowdsourcing is the practice of obtaining input for a task or project by enlisting services of a large number of people, paid or unpaid, typically via the internet.

Within the livestock sector, crowdsourcing is especially interesting for emission reduction, efficient feed composition, and animal health, as these topics are of a growing public interest and benefit from a diverse field of creative minds.



### **Transparent supply chains**

Digitalization offers great potential in creating real-time transparency along supply chains and across company borders, due to the increased amount and accuracy of available data.

Across sectors and industries, corporations can create platforms where the different stakeholders can easily communicate and exchange data, information, and knowledge to improve the supply chain as a whole, thereby creating a competitive advantage.



### **Flexible production systems**

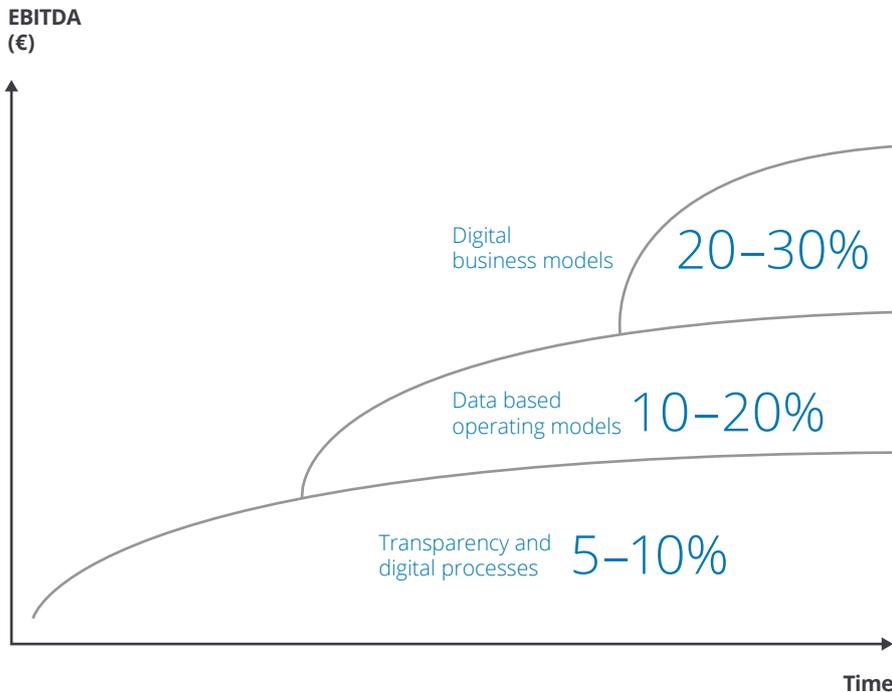
Real-time transparency along the supply chain also builds the foundation for establishing flexible and adaptable production systems.

Better data availability, together with predictive analytics, enables real-time optimization of multi-functional production assets in small loops, thereby allowing flexible production planning and control. This offers enormous potential to the meat sector, since demand can be volatile at times.

# Smart Livestock Farming

## Digital business models improve company bottom lines

The potential of digitalization can be divided into three main approaches\*:



Approaches build on each other, meaning that transparency and data-based operating models are prerequisites for digital business models.

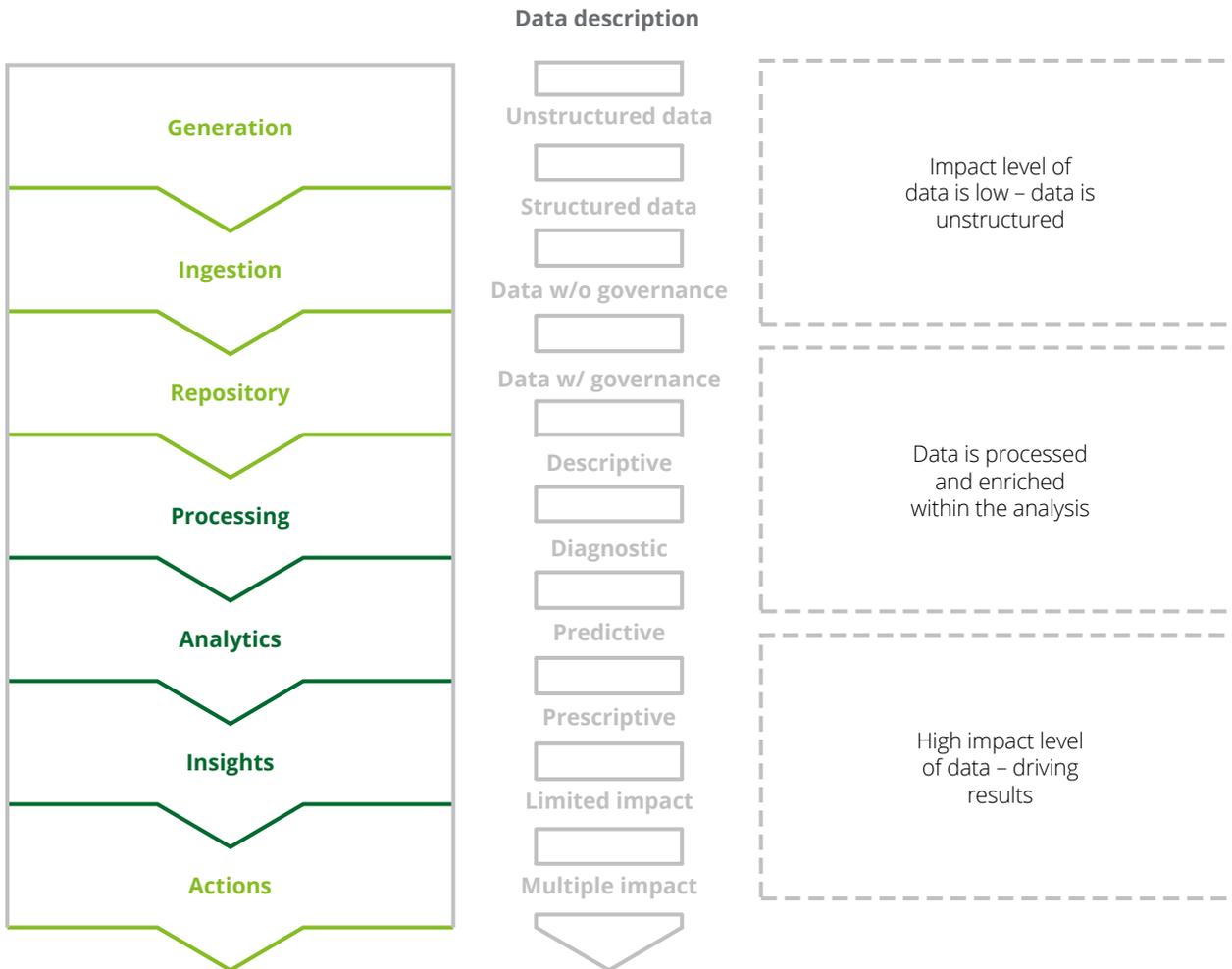
### Data-based operating models

This approach goes beyond the electronic reproduction of processes by really leveraging new technologies, such as big data, predictive analytics, and IoT. It is based on pattern recognition, resilient networks, and self-organization.

### Digital business models and Triple Long Tail Strategy\*

- Digital business models are characterized by customized products and individualized services, enabled by digital technologies such as additive manufacturing, IoT, big data, pattern recognition, and predictive analytics
- Within digital business models, Deloitte further proposes a Triple Long Tail Strategy by not only providing a long tail of products, i.e. mass production plus niche and customized products, and a long tail of services, i.e. value added and digital services, but also a price long tail composed of value and cost based pricing structures

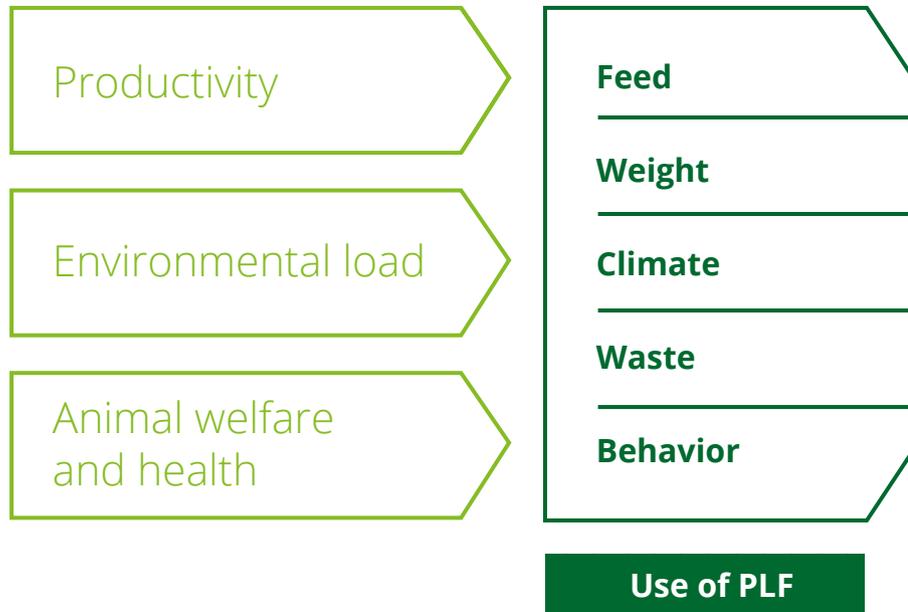
The value of data increases when (un)structured data is processed, enriched, and analyzed to create actionable insights

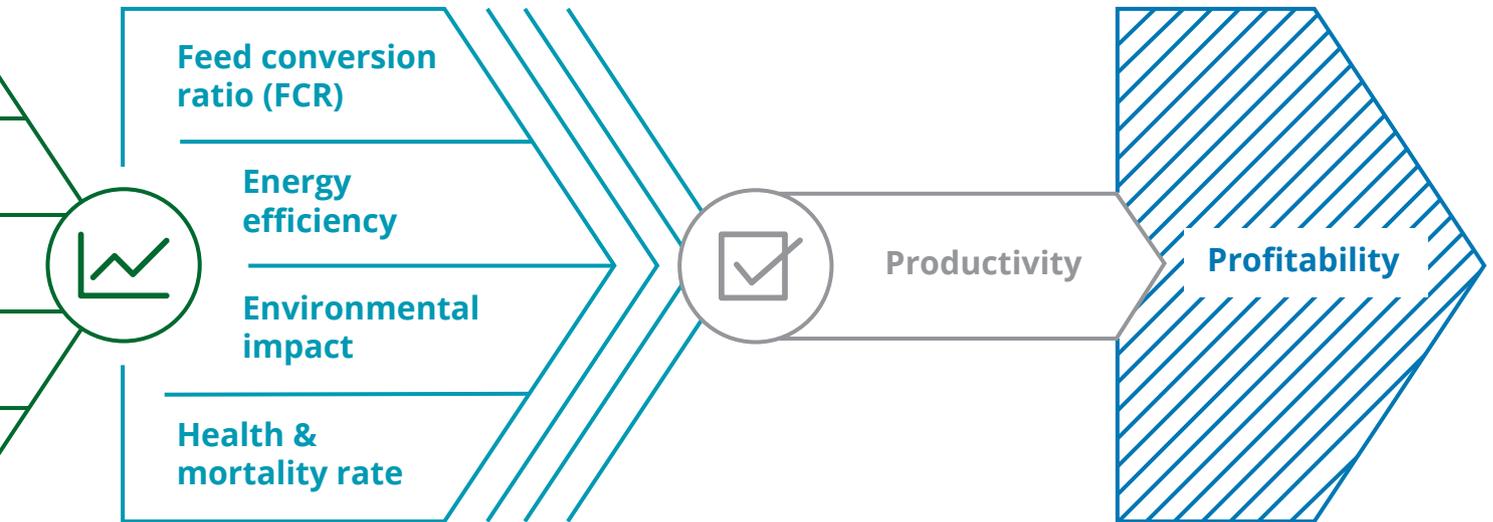


# Smart livestock farming allows the farming industry to leverage digitalization

Smart livestock farming aims to achieve more productive, efficient, and sustainable farm operations based on the effective use of digital technologies

The largest potential lies in individual animal monitoring and analysis, which is referred to as precision livestock farming (PLF). In PLF, tools and sensors are used to continuously and automatically monitor key performance indicators of livestock in the areas of animal health, productivity, and environmental load.





Operations can be improved further when farmers also share the information collected across the supply chain with relevant stakeholders, such as veterinarians, slaughterhouses, meat processors, and animal feed producers.

# Our point of view

Data-driven and digital technology-enabled sustainable solutions require new business models and partnerships

## Trends in sustainability and agriculture

### Reduce GHG emissions

Companies across the value chain aim to reduce carbon footprint. For example, carbon sequestration is used to compensate for direct GHG emissions and improve soil health. Data tracking and reporting in the value chain and carbon pricing enable a valorization of emission reductions. The value of carbon certificates vary by region; €2-18/ton CO<sub>2</sub>. Increased costs for such certificates could further motivate companies to reduce their carbon footprint.

### Digital animal monitoring

Digital devices like wearables are gaining ground in cattle monitoring, enabling real-time information on individual cows, e.g. to improve health, lactation, or reproduction. A newly developed feed additive improves milk quality through milk solids. A data solution could track these increases while measuring other real-time information for individual cows to improve health, lactation, and/or reproduction.

### Smart farming

Farmers are under pressure to produce more with less, using precision agriculture, digital technologies, and high-value nutrient sources. A data solution could set up a wider business model and extract additional value, for example by using data for supply chain efficiency or food traceability (like the Deloitte-supported FarmIQ project) to enable smart farming and improve on-farm profitability.

### Ecosystems and collaboration

Companies become increasingly interdependent and are developing ecosystems in which they collaboratively work towards common goals. A value proposition will link with adjacent data streams extracted by agricultural companies to add value to the ecosystem. A data solution provides a platform for all players in the network to enable smart farming, carbon accreditation, and improvements in operational efficiency.

### Animal welfare

Consumers have become more aware of animal welfare. Brand owners increasingly focus on supply chain monitoring and quality assurance to guarantee animal welfare. A linked data solution will allow brand owners to better track animal welfare and husbandry at the farms, thereby improving supply chain transparency.

### Govt. and consumer awareness

Governments are signing up to Sustainable Development Goals, and consumers are increasingly aware of the origin of their products and their personal environmental footprint. A value proposition allows governments and international institutions to demonstrate sustainability improvements and compliance. This also allows dairy companies to track carbon footprint, protecting their brand value.

Deloitte identified six relevant business models for agricultural companies and potential partners to monetize the data-driven value proposition

### Opportunities for creating value from data

#### Data-enabled differentiation

- The product is still the primary source of value, but data about the product is used to improve the product or service offering
- Data-enabled differentiation is typically a solo opportunity – products from a single vendor are the dominant gateway to the opportunity



**1. Product Innovators**  
enhance their products and services with data



**2. Systems Innovators**  
use data to integrate multiple product types

#### Data brokering

- Company data only provides sufficient value when combined with other sources, or company lacks capabilities to tap opportunity independently
- When the opportunity cannot be tapped by a single vendor with a single product, data brokering opportunities arise



**3. Data Providers**  
gather and sell raw data without adding much value to it



**4. Data Brokers**  
combine data from multiple sources, create insights with analytics, and sell

#### Data-based delivery networks

- Multiple companies work together and share data to tap data opportunities
- Companies specialize in one or two capabilities needed to enable the delivery network



**5. Value Chain Integrators**  
share data with partners to extend offerings or reduce costs



**6. Delivery Network Collaborators**  
share data to drive deal making, enable advertising

Solo Opportunities

Collaborative Opportunities

# Implementation Barriers and How to Address Them

Barriers that have prevented a broader adoption of smart livestock farming so far have to be resolved to facilitate global and timely implementation



## High initial investment and uncertainty about actual potential

- Lack of exchange between farmers hinders information spreading by word of mouth
- Direct impact and improvement potential on individual farm level often not clear beforehand
- Availability of cheap labor and lack of financial resources, especially in developing countries

- Collaboration with partners or consultants to overcome investment hesitance by providing extensive analysis about feasibility, costs, and pay-offs as well as implementation support

- Increased communication about smart farming through modern ICT will help to raise awareness of the topic, its benefits and potential



## Problems with reliability and ease of use

- In advance farmers find PLF technologies hard to operate
- A lot of hardware and software tools are still in their infancy
- Farmers are soon discouraged if the technologies fail to work correctly right away
- Lack of infrastructure, e.g. broadband internet

- Knowledge sharing platforms, e-Learning tools, and customized services from hardware and software providers could help farmers to leverage the full potential of technologies installed

- Government investment into digital infrastructure
- A reliable technological basis is required to encourage farmers into low-risk implementation



### Lack of policies and legislation

- Data ownership and security: Most governments are just starting to implement policies relevant to digitalization. Smart farming requires information sharing across supply chains, but farmers are often not willing to provide access to their data in the light of uncertainties about ownership and security of their data
- Emission reductions in agriculture: So far, none of the global climate agreements include emission reduction objectives for the agricultural sector
- Clear sector emission goals for the future could assist a timely implementation
- Implementation of an open data approach throughout the supply chain based on adequate standards and guidelines
- Implementation of policies to give farmers ownership of their data



### Lack of collaborative business models

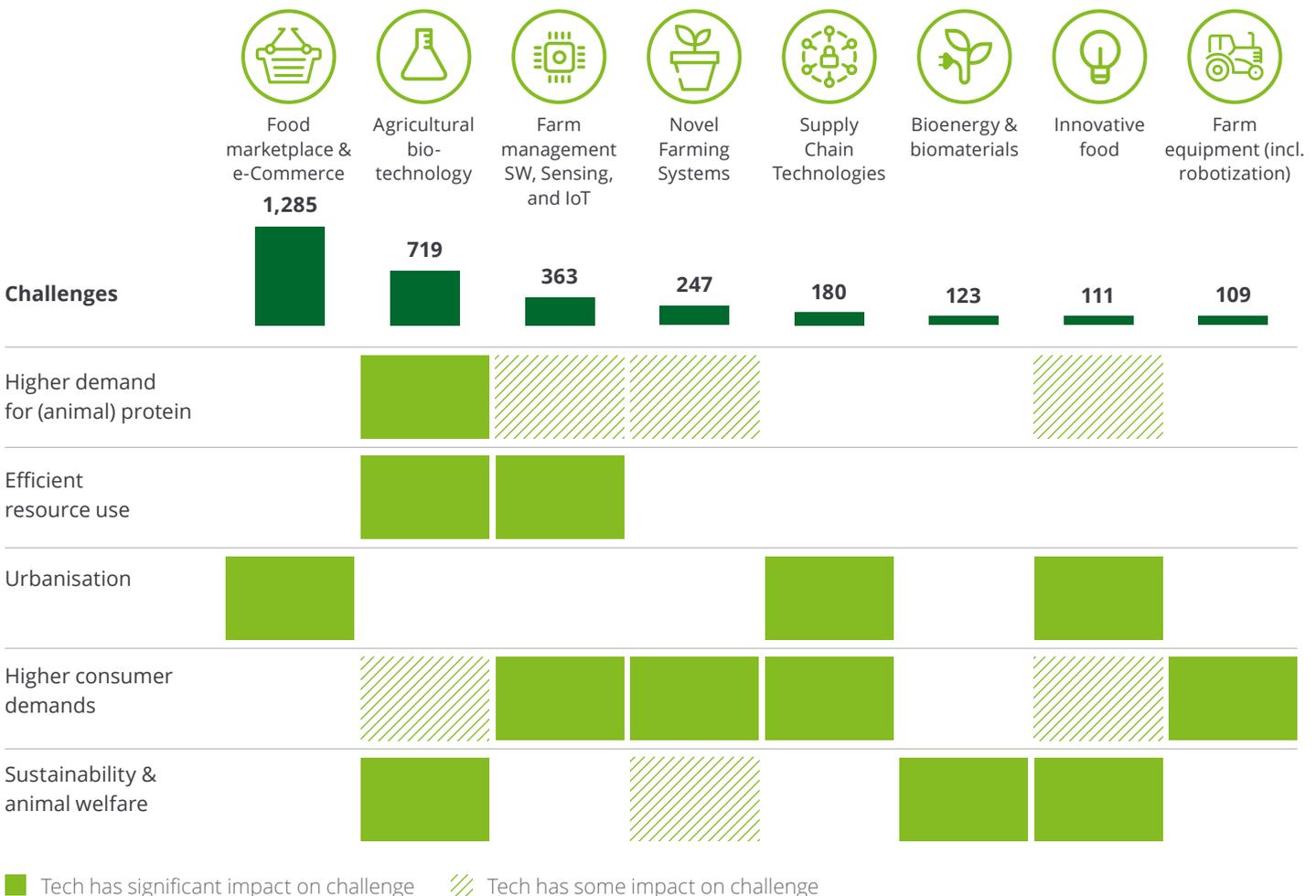
- Farmers typically focus mainly on their core business and have little or no interest in data gathering
- Lack of tools for exchanging data across the value chain
- Encourage farmers to become data brokers
- Establish collaborative business models to gain transparency throughout the whole value chain

# Examples of Farming Innovations

Barriers that have prevented a broader adoption of smart livestock farming so far have to be resolved to facilitate global and timely implementation ...

## Challenges & technologies addressing challenges

(sum of seed investment in United States by tech category, in USD million, 2016)



... leading to technological and business model innovations across the value chain, all the way from farm to fork

**Examples of innovations by link in the value chain**  
(Letters refer to examples on next slides and appendix)



# Examples of Farming Innovations



EUR 3 m (funding)

## Groundbreaking protein discovery platform

Nuritas from Dublin uses AI and machine learning to discover high potential bioactive peptides, and proteins. Discoveries lead to patented peptides with medicinal and nutritious properties. Key is that the method can be used on waste streams of traditional foodstuffs. Waste can thus be turned into medicine and food again, by isolating the valuable high potential peptides. The start-up obtained EUR 3 m funding last year from Singapore-based New Protein Capital (NPC), U2's Bono and Silicon Valley investor Ali Partovi. Partovi has invested in the likes of Dropbox and Facebook in the past.



EUR 4 m

## 3D-printing vegan milk

The US start-up Perfect Day has developed milk of the same name that is vegan while still tasting like fresh dairy. The animal-free milk is produced with laboratory-bred yeast, natural ingredients and fermentation processes. The team 3D-prints bovine DNA sequences onto the yeast, triggering the production of casein proteins that are also found in natural milk. The proteins are mixed with corn sugar and other ingredients in fermentation tanks and left to develop. Supermarkets will stock "Perfect Day" by the end of 2017.



EUR 0.1 m

## Small device determines vitamin deficiencies

"Vitameter", by the Canadian start-up of the same name, is a simple blood test that allows users to check themselves regularly for vitamin deficiencies. They take a drop of blood and test it in the device. The "Vitameter" then determines the concentration of all standard and important nutrients in the blood. If needed, users can then target deficiencies with supplements. "Vitameter" is particularly useful for vegans or people with food intolerances who are unable to feed themselves optimally, as it saves them from doctors' visits. The device is about to enter beta testing.



EUR n/a

## Robot tends and guides cattle herds

Scientists at the Australian Centre for Field Robotics at the University of Sydney have developed a robot named "SwagBot" which is designed to help cattle breeders in the Australian outback. According to the results of a pilot test on a farm, the robot is able to herd cattle independently, clear weeds, and pull heavy loads. The robot will be developed to also be able to check the health of cattle by using sensors to analyse body temperature and movement.



EUR n/a

### Cow sends sms alerts to farmer

The Swiss start-up Anemon has developed a device that can detect when a cow is fertile and then sends out a text message to inform the farmer. A sensor is implanted in the cow's genitals to measure body heat and transmit the results to another sensor on the animal's collar that tracks body motion. The collar also features a SIM card so the farmer can pay to receive SMS alerts when the cow is ready for reproduction.



EUR 0.5 m

### Software for optimum feeding on farms

The Dresden-based company fodjan has developed software called "fodjan smart feeding" which enables farmers to work out the right food rations for their businesses. Several feeding goals are taken into account, including cost savings and animal health. For planning purposes, the software makes it possible to set up animal-based feeding calendars and check out the respective stocks of food. Besides all the feed-related features, "fodjan smart feeding" also helps farmers to manage their farms more efficiently.



EUR n/a

### Transparency from farm to fork through blockchain

Startup Food Blockchain XYZ has formulated a plan to create Food Supply Chain 2.0 by using blockchain. The startup hopes to tackle the six major challenges: Lack of insight, central party reliance, misleading labels, the inability for small producers to compete, supply chain opacity, and a lack of sustainability. Food Blockchain XYZ will leverage series of interconnected sensors to introduce comprehensive food quality assurance, without the intervention of humans.



EUR 108 m

### No AI but algae to break new grounds

TerraVia is a next-generation food, nutrition, and specialty ingredients company that harnesses the power of algae, the mother of all plants and earth's original superfood, to deliver much-needed innovation and sustainable solutions to the food industry. TerraVia's algae-based platform is transforming our food system by bringing together better nutrition and great taste, along with economic and environmental sustainability. Its algae-oriented mother company Solazyme has raised EUR 108 m so far.

# What Deloitte Can Provide

Deloitte not only offers extensive knowledge and experience within the agricultural sector, human capital, change management and finance ...



## Industry know-how

- Extensive market knowledge and project experience within the field of agriculture, livestock farming, and animal nutrition
- Extensive client portfolio from global industry leaders to SMEs
- Large set of relevant industry-specific and cross-industry benchmarks and best practices
- Analysis of customers, products, and services, incl. the identification of potential for customization



## Functional support

- Support for tendering and RFP processes
- Preparing and conducting negotiations, incl. training
- Insight into supplier and buyer production structures and networks
- Demand management capabilities
- Cross-functional optimization expertise



## Human capital and finance

- Developing people, e.g. training, e-Learning and knowledge sharing platforms
- Change and stakeholder management capabilities and experts
- Identification and assessment of financial requirements and potential effects on bottom line
- Comprehensive risk management
- Cost accounting tools for dynamic and value pricing

... but also in the area of digitalization



#### **Proven model for digital strategy development**

- Framework for strategic processes
- Use cases to support all relevant objectives
- Deloitte Greenhouse and Digitalization Labs for strategy development and alignment



#### **Project experience for implementation**

- Identification of improvement potential and implementation of digital approaches and business models
- Measures with high performing data mining tools
- Proven tools, methods, and use cases if required as a managed service



#### **System selection and implementation**

- Best practices for the definition of business requirements
- Market overview and assessment of leading software solutions
- Project management and technical implementation for leading software packages

# Smart Livestock Farming

## Views on Potential of Digitalization for Global Meat Supply



### **Dr Goetz Wehberg**

Partner  
Chemicals Consulting Lead  
Germany

“One of the key challenges in the global meat supply sector is fulfilling rising global demand while lowering emissions per meat unit. However, the current business models have reached a natural limit in terms of optimization potential. This is where digital business models come into play. Deloitte’s Triple Long Tail© strategy is at the heart of digital business models and supply chains. It generates value by means of individualized products and services as well as performance based pricing and cost allocation on a causal basis. The combination of expedient big data analytics with deep meat industry knowledge enables Deloitte’s pioneering approach to smart livestock farming.”



### **Willem Vaessen PhD**

Partner  
Chemicals Value Chain  
The Netherlands

“The emergence of digital business models and data-driven organizations is pivotal in the future of agriculture. Feeding the world will be increasingly dependent on organizations that are willing to transcend the traditional barriers between industries. If agricultural companies dare to implement fundamental changes to their traditional activities by leveraging emerging technology and applying new business models, productivity in the value chain will increase considerably. Significant players such as John Deere have already recognized this and are investing in these technologies, as evidenced recently by the USD 300 million acquisition of Blue River, an AI start-up.”



**Fred Nijland**

Director  
Innovation and Growth Services  
The Netherlands

“The agri market is searching for ways to address food chain challenges through technology. New modes of interaction with consumers, but also new ways of meeting changing customer expectations, bring in a significant competitive edge for players in nutrition. An increasing number of players dip their toes in the water of seemingly far-fetched parts of the value chain. By bringing new skills and visions to these areas, they open up blue oceans for themselves. Across the market, competing and non-competing players are exploring partnerships based on shared ambitious goals and complementary competences.”



**Tim Berger**

Senior Manager  
Supply Chain Management Chemicals Industry  
Germany

“What we typically see is skepticism among farmers when it comes to new business models, especially with new technologies involved. Often, it is difficult for agricultural companies to convince farmers to collaborate on a digital basis. That is one reason why collaborative business models in the livestock sector are at a relatively early stage. Through a transparency increase with the help of knowledge sharing platforms, e-Learning tools, and customized services for farmers, we see a good potential to overcome implementation barriers and to generate significant value for all parties along the value chain.”

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