Innovation Award AGRITECHNICA

- 2 Gold Medals
- 29 Silver Medals
- 320 Company Innovations

Green Future – Smart Technology

- Special: Crop protection
- New research results from IPZ
  (International DLG Crop Production Center)

DLG APPROVED

- Testing of agricultural machinery
- Current test results

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GREEN FUTURE – SMART TECHNOLOGY

Sustainable agriculture means harmonising productivity, as the prerequisite for economic success, with conservation of resources and the environment. These fundamentally competing objectives can only be resolved together by applying progressive methods. That is why in the increasingly digitally networked world, farmers need good, usable know-how and efficient technologies.

AGRITECHNICA, the world’s leading trade fair for agricultural machinery and equipment, offers both. Under the guiding theme “Green Future – Smart Technology”, forward-looking technologies and development trends for crop production are being presented from 12 to 18 November 2017.

They are the key to sustainably boosting productivity in agriculture and enable us farmers to set signals today for a modernisation approach taking us to “Agriculture 2030” – a modernisation approach with major success stories, but also with lots of small aspects that need tweaking.

Marketplace of innovations

This year too, Hanover is once again the marketplace for global innovations. AGRITECHNICA shows what spirit of progress and creative drive are to be found in agricultural machinery and equipment. The innovations that have won Innovation Awards stand for the current developments of the entire industry. Alongside the still indispensable conventional machine manufacturing, there is a clear trend towards further automation of processes. Intelligent data management systems to optimise the steering and control of machinery, logistics, documentation, quality assurance and traceability are becoming increasingly important, just as (by analogy with Industry 4.0) the digitising and networking of agricultural value chains. Cloud Computing and BigData together with complex decision-making algorithms have become increasingly important management tools.

Modern agriculture needs innovations, creative solutions and ideas. The “Innovation Award AGRITECHNICA” is the world’s most demanding competition for this.

I congratulate all award winners on their success.

Carl-Albrecht Bartmer
President of DLG e.V.
AGRITECHNICA 2017

INNOVATIVE TECHNOLOGIES FOR THE FUTURE OF AGRICULTURE

More than 2,800 exhibitors from 53 countries are presenting their innovations and current further developments in Hanover under the guiding theme “Green Future – Smart Technology”. With an exhibition floor space of around 40 hectares, the fairgrounds are fully booked. All the leading companies in the industry are represented with a complete range of their programmes. AGRITECHNICA thus impressively underscores its unfailingly high attractiveness and its position as the world’s foremost exhibition for agricultural machinery and equipment.

The trend towards further automation of processes, connected with intelligent data management systems for optimising regulation and control of machinery, logistics, documentation, quality assurance and traceability, is forging ahead in the agricultural sector. By analogy with Industry 4.0, digitising and networking of the value chain is becoming increasingly more important in agriculture as well. Cloud Computing and Big Data have become firmly established concepts. At AGRITECHNICA, manufacturers will be showing a wide range of solutions under the heading “Green Future – Smart Technology”. These enable farmers to produce even more efficiently and with greater conservation of resources. This is evident from the more than 320 innovations submitted for Agritechnica by altogether 175 exhibitors from 24 countries.

More international than ever

Agritechnica is more international than ever before. Nearly 1,700 (59 per cent) of the exhibitors come from outside Germany. This represents a new record level. The largest groups of international exhibitors come from Italy (370 companies), China (110), the Netherlands (109), Turkey (107), France (102), Austria (67), Poland (67), the United Kingdom (57), Canada (56), Spain (55), Denmark (49), Finland (47) and the USA (46). In addition, 13 countries have booked country pavilions, including for the first time Denmark and Ireland.
Future forum for the agricultural sector – top-flight international technical programme

The top-flight technical programme with a large number of international events such as congresses, workshops and forums makes Agritechnica the most important future forum for the agricultural sector. This is where technology trends are presented and all future issues affecting agriculture as well as agricultural machinery and equipment are addressed. At the international conference “LAND.TECHNIK AgEng 2017” organised by VDI Wissensforum, the latest developments in agricultural machinery and the most recent results from research will be presented and discussed. On different days during the fair the focus of the international event series “Ag Machinery International – Access to emerging markets” will be on the agricultural machinery markets in Eastern Europe, China and South-East Africa, as well as for the first time the markets in South-East Asia.

At these events experts will explore market potentials, access to markets, financing frameworks and technology requirements. Topical arable farming issues will be on the agenda at a forum located in Hall 15 and Hall 21. The Special “Future crop protection – responsibility needs ideas” (see p. 6) is a further highlight of the technical programme.

A discussion event on the potentials of Ukraine’s agriculture, a Seed Congress, and the Young Farmers Day organised by Young DLG will also attract keen attention.

“Systems & Components”

The special show “Systems & Components” featuring systems, modules, components and accessories for agricultural machinery and equipment and related industries is being held at Agritechnica for the third time. Around 700 companies will be presenting innovations and solutions from the fields of engines, hydraulics, axles, drive systems, cabs, electronics, and replacement and wear parts in Halls 15, 16, 17 and 18. Under this year’s main theme “Stay connected!” Systems & Components will for instance pick up current trends such as digital transformation and Big Data and offer an ambitious exchange of knowledge between exhibitors and visitors. “Connectivity” is the prerequisite not only for fine-tuning of modern, highly complex systems comprising mechanical, hydraulic, electrical and electronic components, but also for interaction between man and machine. A “Future Lounge”, open on five days during the fair (Monday to Friday), will invite visitors into the auditorium of the centre specially set up in Hall 17. All events in the “Future Lounge” will be oriented to a different theme each day, starting on Monday with “Smart Maintenance”, to be followed the next day by “Electrification”, then on Wednesday “Human Machine Interface”, on Thursday “Materials”, and finishing on Friday with the topic “Corporate Engineering.”
Main theme

**GREEN FUTURE – SMART TECHNOLOGY**

Sustainable agriculture means harmonising productivity with conservation of resources. In the ever more digitally networked world, farmers need good and useful know-how as well as efficient technologies for this. With the main theme “Green Future – Smart Technology”, the internationally leading trade fair AGRITECHNICA is presenting forward-looking technologies and developments that ensure good productivity and protect resources.

The main theme of AGRITECHNICA 2017 reflects in a few words what will matter for farming in future – supplying a growing world population, efficient cultivation of crops for food, feed, energy and raw materials, and improved environmental protection.

Agriculture is facing major challenges worldwide. Soil is scarce, pest and weed resistances are increasing, the water reserves are under great strain in many locations, nutrients need to be used more efficiently and biodiversity must be maintained. In addition, the migration of labour away from rural areas around the world must be mastered. Innovations and technologies are necessary for this. Clever (smart) machinery and equipment are needed to support farmers in their daily work and help them overcome these challenges. It is important to achieve high yield stability and implement the “Green Future” – in other words, to promote sustainable and environment-friendly production even more.

**Smart technologies – Ideas, machinery and equipment, workflows**

“Smart Technology” – this involves new and precisely tailored technology, as well as concepts showing how workflows and decisions can be implemented more easily. In this way optimal support is provided for the objectives of the farmers - saving energy and fuels, improving soil protection, optimising nutrient and water management, or early identification and specific treatment of pests or weeds.

Technical developments are needed for this –
- in tillage, for instance new processing systems, e.g. strip till or combinations with fertilizer application;
- in seeding, for instance the combination with side-dressing or subsoil fertilization and variable sowing densities;
- in crop protection through improved prognosis models, loss reduction and control of mechanical equipment;
- in fertilizing through sensor-controlled application and precise and targeted application of the nutrients;
- for harvesting with optimisation of harvesting time and improved straw distribution quality.

Existing machinery and equipment must be better connected and controlled on the farm, improved modules fitted in, or new systems introduced. That is “Smart Technology”; and farmers will be supported in this at AGRITECHNICA. Manufacturers, development engineers and consultants will be available to answer questions in order to bridge the gap between “Green Future” and “Smart Technology”. The DLG Expert Forums are a meeting place for sharing and discussing knowledge and developments covering all aspects of arable farming, digitising, fertilizing and crop protection. Use this opportunity for an intensive exchange of ideas and experience. Nowhere else can more concentrated knowledge and skill be found at a single location than at AGRITECHNICA. Accordingly the success story of agriculture in the 21st century can be written from the combination of smart farmers and smart technology.

**NEW DLG EXPERT REPORTS**

The DLG Competence Center Agriculture will be presenting a series of new DLG Expert Reports at AGRITECHNICA. One of the recent publications deals with machinery and equipment for spreading solid mineral fertilizer:

Over 20 per cent of the overall costs for an arable farm are accounted for by expenditure on fertilizer. When the machinery and labour costs are added, this measure alone consumes roughly one third of total expenditure. The costs of fertilizing 1,000 ha cereal production are € 200,000 to € 220,000 a year. 90 per cent of the expenditures go on procuring fertilizer, only 8 per cent for tractor and driver, and only 2 per cent for the fertilizing machinery. Mineral fertilizing plays a key role in crop production. Farmers must harmonise commercial requirements and environmental policy aspects. This results in demands made of fertilizing machinery. Basically, for example, fertilizers are to be spread in such a way that they are adjusted to the nutrient needs of the plants. This makes demands above all on machinery for spreading and dosing. Where large areas are worked, the field working rate also plays a major role so that fertilizing can be ensured within the often short season.

Current DLG Expert Reports: [www.dlg.org/neue_merkblaetter.html](http://www.dlg.org/neue_merkblaetter.html)
Crop protection is one of the most important measures for successful crop cultivation and production of both healthy foods and sufficient agricultural raw materials. In the Special “Future crop protection – Responsibility needs ideas”, manufacturers, institutions and expert partners will be showing the latest technologies and systems for mechanical and chemical crop protection at AGRITECHNICA.

Agriculture needs new ideas and developments to avoid diseases and pests in crop stands and to minimise the negative effects of pathogens. Both approaches are closely linked and require integration of different methods for successful implementation. Current developments in the field of the prognosis models, spraying equipment, hoes and harrows as well as GPS control are just as relevant for this as crop protection, supported by drones and robot technology. Here systems helping farmers to take decisions on the optimal time of use and application for prevention of diseases and pests and for the correct selection and dosing of active ingredients and their documentation play an important role.

The prerequisite for this is innovative spraying machinery and equipment, ranging from nozzle control to cleaning of the machine. This also includes possibilities of mechanical crop protection and optimal controlling this equipment as an effective alternative to chemical agents. Robots will be able to take over tasks in future and carry out crop protection measures autonomously.

**AGRITECHNICA SPECIAL**

**Future crop production – Responsibility needs ideas – Hall 15, Stand G32**

**Co-exhibitors**

- Software/digitisation
  - ISIP: Interactive online platform of the Chambers of Agriculture and State Institutes in Germany
  - Fraunhofer ENAS: Microsensor technologies for Smart-Farming
  - Bayer: “Solutions for the future” – Digital-Farming-Solutions
  - EXA Computing: “Crop protection measures under suitable weather conditions”
  - BASF: Basf-App Maglis® Leaf Analysis

- Mechanical crop protection
  - SCHMOTZER: Combination chipper (18x45 Av5)
  - APV technical products: “Innovations for the future” - Vario harrow (Vs)
  - John Deere: Tractor integrated active mounted implement steering with In-Field automation for high-performance hoe AutoTrac Implement Guidance

- Robot technologies
  - PESCHAK: Electric vehicle (“Robot”) with crawler tracks
  - Bosch Flourish: Project Flourish-Deepfield Robotics “Bonirob”

- Spraying machinery and equipment
  - Agrotop: Kir-O-Matic
  - PLA: Map3 Cuadrupla
  - KUHN: Multispray System

- Association
  - IVV-Industrieverbund Agrar: Join-in Campaign “Schau Ins Feld”

**Special presents innovative methods**

The expedient combination of agronomical, mechanical and chemical methods in crop protection can reduce the use of resources and at the same time keep crop stands healthy and eco-friendly. On Stand G32 in Hall 15 there will be an opportunity to discuss these themes with consultants of the Special Expert Partner ISIP e.V. (Informationssystem Integrierte Pflanzenproduktion - Information System for Integrated Crop Production) and 13 co-exhibitors from the fields of software/digitising, mechanical crop protection, sprayer equipment and robot technologies.
Innovations and trends

DIGITISING AND NETWORKING OF THE VALUE CHAIN BECOMES INCREASINGLY IMPORTANT

In the agricultural sector the trend towards further automation of processes, combined with intelligent data management systems to optimise the regulation and control of machinery, logistics, documentation, quality assurance and traceability, is forging ahead unwaveringly. This is demonstrated by the more than 320 innovations submitted for the Innovation Award AGRITECHNICA 2017 competition.

In our sector, innovations do not happen by chance. A creative environment in the firms is just as necessary for the development engineers as knowing about the current needs and requirements of the customers - the farmers. Agricultural machinery engineers must have opportunities and scope to be able to develop their creative ideas, with a great deal of experience from practical farming and in constant dialogue with farmers, researchers and scientists. Genuine interdisciplinary cooperation in the development teams, for example between machine builders, physicists, hardware and software specialists, is becoming increasingly important. The basis for this “genuine” cooperation is that all project participants respect each other, and that despite their own personal fields of specialisation they understand the considerations put forward by the other team members and work together towards a common goal. This is where the innovation culture in the individual companies becomes visible - promotion of inventiveness by the management and an innovation strategy.

After all, in most cases the creation of new solutions requires years of work and substantial investment without calculable returns. Some of the innovations presented point far into the future and allow applications that many farmers cannot yet imagine today. This applies for example to “MARS”, the first commercially available agricultural swarm technology machine. “MARS – Mobile Agricultural Robot Swarms” from AGCO-Fendt comprises small autonomous machines, each weighing only about 40 kg, that are “set out” on the field by a machine operator and then carry out the maize sowing. The operator carries them into the field in group transport and is then only responsible for filling and supervision. The members of the DLG Commission for the Innovation Award discussed this innovation in great detail. It will be interesting to see how this system finds its place on the market!

Agricultural machinery manufacturers show responsibility towards society

Seven years of detailed work are concentrated in “Sensosafe”, the sensor beam installed directly on the mower to protect hidden wildlife, presented by Pöttinger. Optical infrared sensors with integrated LED lighting recognise the animals during mowing and send out a signal to the mower hydraulics, which automatically raise the mower and
in this way save the animals. The system itself differentiates between wild animals and other obstacles such as molehills, even during full daylight and high solar radiation. If this system works in practice as reported by the manufacturer, this would be a milestone in active animal welfare, as none of the techniques used so far always works satisfactorily. This project shows very clearly how seriously the manufacturers of agricultural machinery take their responsibility vis-à-vis society. After all, farmers and their machines are often exposed to public criticism in the media.

A further example of responsible response to the demands made by society of users of agricultural machines comes from Claas. The "Telematics Large Vehicle Alert System" proactively informs the drivers of networked cars about the position and status of farm machinery on their route. The fascinating question is – how will automobile manufacturers respond to this offer?

The great scope of the new developments becomes clear when one casts a glance at the list of Medal winners. Naturally the most important trends in agricultural machinery development over the past years have continued in 2017 as well, headed by further development of electronic systems to optimise machinery settings, improve precision, automate processes, increase safety and ease the workload of the operators. “Cemos Auto – Threshing” from Claas, an automatic optimising system for tangential combine harvesters, has been awarded a Gold Medal. An important focus today lies on optimising the tractor-machine system, and here cross-manufacturer solutions are to be considered particularly important for the practical farmers.

In the innovations submitted, efficient recording, storage and evaluation of data along the agricultural value chain is also important. For most farmers correct handling of these issues is new territory and connect-ed with many unknowns. The sector is still right at the beginning of introducing digital farming and using Big Data technologies. A particular sensitive point for European farmers is customer ties to one major manufacturer by using their proprietary data management system. The "agrirouter" system, a joint development of a number of manufacturers headed by DKE-data GmbH, that won a Silver Medal, represents an alternative for small and medium-sized farms.

There is still a trend towards developing specific sensors for agricultural machinery and this supplements the catalogue of innovations. For the first time a consortium including Pöttinger is presenting a system that measures processing results during tillage and actively controls the tillage intensity. This is a courageous step, as tillage is one of the most complex areas in agricultural process engineering.

A theme for the future – Electrical drives for agricultural machinery

Electromobility has now advanced to become a political issue in Germany. In recent years there has been much discussion regarding electric drive systems in the agricultural machinery sector as well. Only a few commercial solutions have made it to the market so far. This year AGCO-Fendt is the first to present a completely electric tractor and thus opens up a new market segment in the 50 kW class. This machine will certainly inspire users and manufacturers to develop further ideas for expedient use of electric drive systems in agricultural machinery. Alongside substantial progress in electrical and electronic systems, many manufacturers are still showing strong new developments in more traditional technology fields, such as for example mechanics and hydraulics. One example of this is the “StalkBuster” from Kemper that has been awarded a Gold Medal. The mulching device integrated in the mower header of the forage harvester breaks down the maize stubble directly after mowing the plants, before the stubble is pressed down by the forage harvester or transport wagon. This efficiently combats the corn borer, mechanically and without the use of chemical agents. This system promises to display high ecological benefit alongside practical and commercial usefulness. Further innovations that have won Innovation Awards in Silver also satisfy this requirement.

Author: Prof. Dr.-Ing. Till Meinel Chairman of the Innovations Commission AGRITECHNICA University of Applied Sciences Cologne, Institute of Agricultural Engineering
Focus on modern agricultural machinery

INNOVATION AWARD AGRITECHNICA

The DLG Innovation Award that will be presented at AGRITECHNICA is one of the leading innovation awards in the International agricultural sector. The new name “Innovation Award AGRITECHNICA” emphasizes the status enjoyed by this award in modern agricultural machinery.

320 innovations submitted by altogether 174 companies from 23 countries were admitted to the competition. This underscores the leading position held by AGRITECHNICA as the world’s largest showcase for agricultural machinery innovations. Gold Medals were awarded for two innovations, and a further 29 innovations were awarded a Silver Medal. The award-winning products have never before been shown or won awards at any other major trade fair or international show. To be admitted they must be operable at the time of the trade fair and be available on the market at the latest in the year 2018.

PROFILE OF THE INNOVATION AWARD

Participation and award ceremony
All companies exhibiting at AGRITECHNICA can participate in the “Innovation Award AGRITECHNICA” with their innovations.

“Innovation Award AGRITECHNICA” in Gold
Products with a new concept and significantly changed function that introduces a new process are eligible for an “Innovation Award AGRITECHNICA” in Gold. The following factors are crucial for the award of a Gold Medal:

- importance for practical farming
- benefits for farm management and labour management
- improvement of the environmental and energy situation
- effects on labour facilitation and safety

“Innovation Award AGRITECHNICA” in Silver
Innovations that develop a known product further so that a substantial improvement of the function and process can be expected are eligible for an “Innovation Award AGRITECHNICA” in Silver. However the product does not fully satisfy the criteria for an award in Gold. The following factors are crucial for the award of a Silver Medal:

- importance for practical farming
- advantages in performance and quality of work
- improvement of functional safety and reliability

The Expert Jury
The Innovations Commission is made up of independent experts from the fields of science, research, consultancy and practice. On the basis of strict criteria, the members of the Commission have selected the products to be awarded with a medal from among all the company innovations that were submitted in time before the deadline.

- Till Belau, Kuratorium für Technik und Bauwesen in der Landwirtschaft e.V. KTB, (Association for Technology and Structures in Agriculture), Darmstadt
- Prof. Dr. Hamdi Bilgen, Faculty of Agriculture, Bornova-Izmir, Turkey
- Prof. Dr.-Ing. Stefan Böttinger, University of Hohenheim, Stuttgart
- Christoph von Breitenbuch, Agrar BG Leine-Solling GbR, Parnersen
- PD Dr. agr. Joachim Brunotte, Agrartechnologie und Biosystemtechnik, von Thünen Institute, Braunschweig
- Dr. Markus Demmel, Bavarian State Research Center for Agriculture, Freising-Weihenstephan
- Lars Fliege, Agrargesellschaft Pfiffelbach mbH, Pfiffelbach
- Prof. Dr. Ludger Friedrich, Technical University Braunschweig, Braunschweig
- Ekkehard Fricke, Lower Saxony Chamber of Agriculture, Hanover
- Peter-Eric Frobösé, Frobose-Landbau, Lage
- Alfons Fübbeker, Lower Saxony Chamber of Agriculture, Oldenburg
- Heinz-Günter Gerighausen, North Rhine-Westphalia Chamber of Agriculture, Duisburg
- Prof. Dr. sc. agr. Hans-Werner Griepentrog, University of Hohenheim, Stuttgart
- Daniel Hege, Hege Walter Gemüsebau, Limburgerhof
- Prof. Dr.-Ing. habil. Thomas Herlitzius, Technical University Dresden, Dresden
- Dr. Jörg Hittenbeck, Schleswig-Holstein, Chamber of Agriculture, Bad Segeberg
- Dr. Rainer Keicher, Hochschule Geisenheim University, Geisenheim
- Prof. Dr. Hermann J. Knechtges, FHU Nürtinings-Geisingen University, Nürtinings
- Harald Kramer, North Rhine-Westphalia Chamber of Agriculture, Münster
- Dr. Fabian Lichti, Bavarian State Research Center for Agriculture, Freising-Weihenstephan
- Prof. Dr.-Ing. Till Meineil, University of Applied Sciences Cologne
- Ferdinand Mersch, North Rhine-Westphalia Chamber of Agriculture, Cologne-Auweiler
- Jörg Peter Merz, Hesse Department of Agriculture (LLH), Asfeld
- Dr. Hans-Jörg Nussbaum, Baden-Württemberg Agricultural Centre, Aulendorf
- Dipl.-Ing. Heinrich Prankl, BLT Wiesburg at the Federal Institute of Education and Research Francisco Josephinum, Wiesburg, Austria
- Dr. Rolf Peters, Experimental Station Dethlingen, Munster
- Joachim Pfannstiel-Wolf, Grevenbroich
- Prof. Dr. Jacek Jan Przybysz, University of Agricultural Sciences in Poznań, Poznań, Poland
- Prof. Dr.- agr. Thomas Rademacher, University of Applied Sciences Bingen, Bingen am Rhein
- Dr. Ovidiu Ranta, USAMV Cluj-Napoca, Cluj-Napoca, Romania
- Dipl.-Ing. Dirk Rautmann, Julius Kühn-Institute (JKI), Braunschweig
- Prof. Dr. Yves Reckleben, University of Applied Sciences Kiel, Ostersee
- Prof. Dr. Arno Ruckelshausen, University of Applied Sciences Osnabrück, Osnabrück
- Mortimer von Rümker, Saatzucht Gotha-Friedrichswerth, Friedrichswerth
- Prof. Dr. habil. Matthias Schick, Strickhof Facility Management Animal Husbandry & Dairy Farming, Lindau, Switzerland
- Dipl.-Ing. agr Henning Schoof, Dörentrop
- Dr. Klaus Spohrer, University of Hohenheim, Stuttgart
- Prof. Roger Stirnimann, Berner University of Applied Sciences HAFL, Zollikofen, Switzerland
- Prof. Dr. Bernhard Streit, Berner University of Applied Sciences BFH, Zollikofen, Switzerland
- Dr. Norbert Uppenkamp, North Rhine-Westphalia Chamber of Agriculture, Münster
- Prof. Dr. Karl Wild, HTW Dresden University of Applied Sciences, Dresden
- Prof. Dr. Dirk Wolff, University of Applied Forest Sciences Rottenburg, Rottenburg a.N.
- Dipl.-Ing. Klaus Ziegler, Association of Franconian Sugar Beet Farmers, Eibelstadt
**Where you can find Gold and Silver medals at the AGRITECHNICA:**

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**EXHIBITION GROUNDS HANOVER/GERMANY**

**KEY AREAS**

- **A** International Dealer and Service Centre
- **B** Show Special “Future Crop Protection”
- **C** SYSTEMS & COMPONENTS Lounge
- **D** DLG Forest and Landscape Info Centre
- **E** Used Machine Trade
- **F** Used Machine Trade
- **G** tyre trade
- **H** Information Center
- **I** Convention Center
- **J** International Visitors’ Lounge

**HERMES TOWER**

**OPEN AIR AREA**
INNOVATION AWARD AGRITECHNICA 2017 IN GOLD

MACHINERY AND EQUIPMENT FOR COMBINING

CEMOS AUTO THRESHING – the autonomous threshing system for CLAAS straw-walker and hybrid combine harvesters
 Claas-Vertriebsgesellschaft mbH Germany, Hall 13, Stand C02

Currently operators have to find out by themselves which settings strike the best balance between the optimum drum speed, the optimum concave gap, the suitable aggressiveness of threshing and the quality of the grain. Some operators find this complexity too difficult to come to terms with, and find setting up the combine a chore. Consequently, very often a combine is not set up perfectly to suit the current harvest conditions.

Cemos Auto Threshing is the first system that sets the tangential threshing system on straw walker and hybrid machines automatically. As such, it makes a significant contribution to optimizing the quality of work and performance. Depending on the strategy entered into the system by the operator, it sets the drum speed and the concave gap for optimum results in the current harvest conditions. The USP of the entire system is the fact that all controllers communicate with each other. For example, the throughput controller operates via a special communication module to control the throughput relative to the threshing controller, as well as the separation and cleaning controllers.

Another module in the system is Auto Threshing, which for the first time completes the enormous complex technical step to implement fully automated threshing. On such a harvester, users no longer need to know which settings they have to make to get the desired results. Instead, they enter the harvesting strategy, which is then used by the auto-learning system to optimize all parameters. This innovative automation technology allows combine harvesters to continuously combine at maximum efficiency.

MACHINERY AND EQUIPMENT FOR CHOPPING, MOWING, CONDITIONING AND BALING OF MOWED MATERIAL

StalkBuster
 Kemper Maschinenfabrik GmbH & Co. KG, Hall 13, Stand C31
 Developed jointly with: John Deere GmbH & Co. KG, Hall 13, Stand E30

Since the corn borer spread across Germany about 15 years ago, it has become the most notorious pest in silage maize crops in the country. It causes losses in yield and quality, because the cobs do not develop well, and they become infested with Fusaria which may then spread to the following wheat crop. One of the most important methods to fight the pest, along with chemical and biological options, is to chop the maize stubble thoroughly and immediately after the crop is harvested.

The Kemper StalkBuster is the first stubble-destroying technology that forms an integral part of a maize header. It is the only machine on the market that destroys all the stubble before it is driven on by the forager or the tractor and trailer. Usually about 30% of the stubble remains intact, and as the corn borer winters inside it, a high percentage of undestroyed stubble offers them a haven so they can infest the area again the following year. The corn borer pupates in the stubble in spring and the moth starts infesting the new crop after that. The topper is integrated in the header, is relatively lightweight and has a relatively low power input requirement. This means no extra limitations apply for legal road transport. The Kemper StalkBuster is a technical solution that offers great benefits for users, their productivity and the environment.
INNOVATION AWARD AGRITECHNICA 2017 IN SILVER

**Fliegl BÜFFEL overloading station for haulm crops**
Fliegl Agrartechnik GmbH, Hall 4, Stand B43

Forage wagons may offer better fuel efficiency and performance than forage harvesters, but the drawback is that they are not productive during road travel, that is, the cutting system is not at work.

The Fliegl Büffel is a loading platform with a rotor and an intermediate hopper, and which combines various components from a forage wagon (pick-up, rotor cutter), a baler (intermediate hopper) and a forage harvester (unloading system). The innovative rotor-based overloading system with intermediate hopper picks up the haulms, cuts and feeds them into the intermediate hopper, from where the material is overloaded onto a trailer. Serving as a feeder unit, the Büffel is never idle and never involved in transport work. It chops the forage very efficiently and reduces soil compaction. Overloading the crop onto ferrying trailers allows farm managers to tailor the harvest fleet to the necessary road work and the capacity of the rotor cutter/loader platform. Consequently, the Fliegl Büffel is a new, cost-effective and very efficient alternative to rotor cutter forage wagons and forage harvesters.

**AXION 900 TERRA TRAC semi-tracked and fully suspended tractor**
Claas-Vertriebsgesellschaft mbH Germany, Hall 13, Stand C02

Tracked and semi-tracked tractors are rarely used for swift road travel because they offer very little operator comfort. While wheeled tractors offer significantly better comfort in road work, high-power models cannot offer the level of soil protection provided by a tracked machine.

The semi-tracked Claas Axion 900 is the first tractor that has a suspended front and rear axle. This brings a significant improvement in operator comfort compared to triangle-design semi-tracked tractors. The Claas Axion 900 semi-tracked model also has a substantially larger contact area compared to Triangle tracks, which results in excellent directional stability, both in the field and in swift road travel. Optimum adaptation to the ground contours is key for low compaction. This is achieved by a 15-degree pivot range, and the fact that the machine weight is distributed to all track rollers range, and the fact that the machine weight is distributed to all track rollers range, and the fact that the machine weight is distributed to all track rollers range, and the fact that the machine weight is distributed to all track rollers range, and the fact that the machine weight is distributed to all track rollers range, and the fact that the machine weight is distributed to all track rollers range, and the fact that the machine weight is distributed to all track rollers range, and the fact that the machine weight is distributed to all track rollers range, and the fact that the machine weight is distributed to all track rollers range, and the fact that the machine weight is distributed to all track rollers range, and the fact that the machine weight is distributed to all track rollers range, and the fact that the machine weight is distributed to all track rollers range, and the fact that the machine weight is distributed to all track rollers range, and the fact that the machine weight is distributed to all track rollers range, and the fact that the machine weight is distributed to all track rollers range, and the fact that the machine weight is distributed to all track rollers range, and the fact that the machine weight is distributed to all track rollers range, and the fact that the machine weight is distributed to all track rollers range, and the fact that the machine weight is distributed to all track rollers range, and the fact that the machine weight is distributed to all track rollers range, and the fact that the machine weight is distributed to all track rollers range, and the fact that the machine weight is distributed to all track rollers range, and the fact that the machine weight is distributed to all track rollers range, and the fact that the machine weight is distributed to all track rollers range, and the fact that the machine weight is distributed to all track rollers range, and the fact that the machine weight is distributed to all track rollers range.

The pivot point was moved forward, which shifts more weight to the rear axle. This benefits from a larger contact area and so can transmit tractor power to the ground more effectively while keeping compaction low.

The machine transfers more than 450hp engine power to the ground without causing damage to the soil. At the same time, it does not exceed the statutory road width limit.

**EZ Ballast Wheels**
John Deere GmbH & Co. KG, Hall 13, Stand E30

For tractors to develop sufficient traction in heavy draft work, it is necessary to ballast them in the optimum way. The front axle is ballasted by attaching weights in the front linkage, which is usually easy and safe to do on today’s tractors. The rear axle is ballasted with up to 1,000kg wheel weights. The drawback of this solution is that these weights are difficult to attach and remove, and very cumbersome to handle – a time-consuming and hazardous approach. A much simpler solution is EZ Ballast Wheels. These weights are fitted to the wheels with a pallet fork and without bringing the wheels into the proper position first, which eliminates the need of jacking the tractor. Once fitted, the wheel weights are secured with toggle levers instead of bolted down. This means they are quick to attach and remove by a single person, and so ensure optimum ballasting in every job. As such, EZ Ballast Wheels make a significant contribution to fuel efficiency and soil protection.
**CEMOS for tractors – operator assist system optimizing tractor/implement set-up**  
Claas Vertriebsgesellschaft mbH Germany, Hall 13, Stand C02

The complexity of a modern tractor can be overwhelming to uninitiated operators. This applies especially when a software menu is not very intuitive to navigate, but rather suits the development requirements of the manufacturer.

Claas CEMOS is an interactive system that offers a user-friendly approach to optimize the setting-up of traditional tractor-implement combinations. The system guides the operator through the settings menu – before and during work – using everyday farming language. The system takes into account both the settings entered by the operator and the settings recommended by the manufacturer. In work, it is constantly working to optimize the current settings of the tractor and the implement. To do that, it makes suggestions to the operator after validating the various options. The operator is free to accept or reject the suggestions in line with the targeted quality of work.

The expertise that is built into CEMOS allows inexperienced operators to utilize the combination to its optimum potential with respect to the quality of work, work rate and fuel efficiency. In addition, the system is ready to plug into future automated-and-assist systems.

**VarioPull**

AGCO GmbH – Fendt, Hall 20, Stand A26a

The distribution of weight on a tractor’s rear and front axles is defined by drawbar load, drawbar power, ballasting and the traction booster if fitted. With a specific implement attached, the weight distribution is always the same.

VarioPull alters the implement’s attachment point – on the move, on a horizontal plane, and bringing it flexibly up to within 80cm of the tractor’s rear axle. As the attachment point moves closer to the rear axle, the weight distribution is optimized and road stability increases. For example, the operator can shift the attachment further to the rear to provide more space for the drawbar to make headland turns.

The system allows operators to reduce the front weight and hence the tractor weight, which in turn increases fuel economy and protects the soil.

**MARS – Mobile Agricultural Robot Swarms**

AGCO GmbH – Fendt, Hall 20, Stand A26a

There has been much discussion on whether the trend in farm machinery manufacturing will continue towards ever bigger and more powerful individual machines, or to “swarm” solutions, that is, many small machines.

The Fendt MARS System is the first marketable application of swarm technology in agricultural engineering, and thus presents a completely new solution. The system relies on a number of small, auto-steered and electric units that are deployed for maize drilling. The autonomous units are filled with seed by an operator, who also monitors their operation and who hauls them to the field on a trailer. Operating at very low noise levels and without lights at night, these units are suitable for drilling fields near villages and homes 24 hours a day. Manufactured to a cost-saving concept and weighing as little as 40kg each, the swarm units coordinate their work in the field, reduce compaction and minimize the hazard that big machines pose to humans and the environment. The robots log all job data into the “Cloud”, and communicate with each other and the operator.
Electric bikes and cars have increasingly arrived on the market, but the technology has not been available for commercial vehicles so far. This is attributed to the challenge of developing high-performance battery technology that suits the needs. This battery-powered tractor is a world first and was developed to serve in a wide range of applications. Using the powertrain of a 50kW Vario model, it replaces the combustion engine, the exhaust, air and fuel systems and the radiator by a battery block, a compact electric motor and the necessary electric control system. The 100kWh, high-voltage battery charges quickly and stores enough power to work for four hours at an average workload. An innovative thermal management system that comprises a heat pump ensures the cab temperature is controlled efficiently. The battery pack can also serve as intermediate storage for farm-generated power. The modification does not affect the tractor’s suitability for taking on any type of implements. The exhaust-free and very quiet machine is ideal for use in buildings, but also for transport work in cities.

Camera supported seedbed preparation

Pöttinger Landtechnik GmbH, Hall 27, Stand C39

Developed jointly with:
- New Holland Agriculture (Italy), Hall 3, Stand D10
- Josephinum Research (Austria), Hall 27, Stand C39a

When operators want their power harrow cultivator drill to produce a consistently fine and consolidated top tilth on sites with varying soils, they have to set up the tractor’s ground speed and the power harrow speed manually, and then will still need to intervene manually as they work, which is very tiring and not very effective in extremely varying soils.

This technology now introduced by Pöttinger uses cameras that take real-time footage of the surface and its degree of “cloddiness”. The operator enters a target value and the actual cloddiness is measured behind the power harrow. This reading is transmitted to the job processor, which sends it the implement’s ECU. The system will then automatically control the tractor ground speed and the power harrow PTO speed (“closed-loop control”) to produce the selected level of top tilth. The system creates a uniform seedbed even in varying soils. At the same time, it reduces operator fatigue significantly. This automatic tractor/cultivator drill control system that works relative to the quality of work being achieved is a new development.

GPS-based and automated body-lift-out feature optimizes ploughing results

KUHN Maschinen-Vertrieb GmbH, Hall 12, Stand C05

The working width on ploughs has increased constantly in recent years. These wider widths, however, leave a Z-shaped ploughing pattern on the headland when the bodies are retracted and the plough is raised. This makes it difficult to plough the headland neatly, while crop residues and volunteers are not properly incorporated, leading to volunteer growth in the following crop.

Kuhn’s “Section control” is an electro-hydraulic control system that uses the hydraulic, non-stop break-back system to control the individual bodies based on GPS positioning data, raising and lowering them automatically. The system leads to an absolutely straight furrow edge where there used to be a “Z”. The straight edge is a boon for the following work, such as headland ploughing, drilling, spreading and spraying, and ensures crop residues are effectively incorporated – an enormous plus for field hygiene.

Overall, the system reduces operator fatigue and takes load off the rear axle, the rear wheels and the couplers. Added to this, it can also vary the number of plough bodies in work to suit individual tractor powers and soil conditions.
INNOVATION AWARD – SILVER

MACHINERY AND EQUIPMENT FOR FERTILISING

LevelTuner

Landmaschinen Wienhoff GmbH, Hall 23, Stand B39

The center of gravity varies greatly on slurry tankers when they are fitted with different applicators of different weights. This also affects the drawbar load. As a result, drawbar load may quickly become negative in empty runs – a fact that has accounted for serious accidents on public roads in the past, where ball hitches worked loose after operators forgot to secure them. On multi-axle slurry tankers, the LevelTuner automatically alters the air pressure inside the bellows on the front axle, thereby adjusting the pressure relative to the drawbar load that is measured by the drawbar suspension system. This way, the drawbar load is always good and road stability is better. In addition, the system ensures field traction is always sufficient during spreading as the tank is being emptied. Unlike existing options (for example variable-width axles), this center-of-gravity shifting system operates automatically without operator input.

MACHINERY AND EQUIPMENT FOR PLANT PROTECTION

SwingStop pro

Amazonen-Werke H. Dreyer GmbH & Co. KG, Hall 9, Stand H19

Developed jointly with:
Rometron B.V. (The Netherlands), Hall 9, Stand H19

Accuracy of application is key in chemical spraying. The higher the accuracy, the better the plant coverage at the desired product concentration levels. Moving the boom horizontally fore and aft, and in parallel to the ground, has a particularly good effect on spray accuracy. SwingStop pro combines the boom’s active shock absorbing system with very dynamic rate control on every single nozzle and achieves an unprecedented level of accuracy in direction of travel and across the full spraying width. The “pro” specification has new valves on every nozzle that constantly control the current application rate and bring it back into balance. SwingStop pro controls the application rate by using sensors that measure the relative application rate on each nozzle and relate the measurements to the sprayer’s ground speed in real time. This makes SwingStop pro the tool for achieving maximum spraying accuracy. The technology is another milestone on the road to precision farming.

MACHINERY AND EQUIPMENT FOR PLANT PROTECTION

ESV Electric Shut-off Valve

Lechler GmbH, Hall 8, Stand B20

The best solution in precision spraying is currently an individual nozzle control system that operates the closely spaced nozzles relative to their current GPS position. Pneumatic valves are technically very difficult to make and require an extra air system on the tractor. The Lechler ESV (Electric Shut-off Valve) unit comprises a valve, an electric line and a connector for straightforward and fail-safe installation on all regular single- and multi-nozzle holders. The nozzle opens and closes rapidly, and CANbus controlled. Its responsiveness and great application accuracy allow ESV to be easily integrated in smart farming systems, and used on 25 cm sections with uniformly spaced nozzles, for example. Fitted by connecting the electric lines, ESV offers easy and fast installation. Lechler ESV valves offer reliable and profitable operation and thus great user benefits.
MACHINERY AND EQUIPMENT FOR PLANT PROTECTION

Stereoscopic row-crop CULTI CAM camera on mechanical hoes
Claas-Vertriebsgesellschaft mbH Germany, Hall 13, Stand C02

Developed jointly with:
- Einböck GmbH & Co. KG (Austria), Hall 11, Stand B05
- Thomas Hatzenbichler Agrotechnik GmbH (Austria), Hall 11, Stand D42
- Bednar FMT (Czech Republic), Hall 12, Stand B05
- Carre SAS (France), Hall 13 Stand B64a

Chemical spraying is increasingly viewed very critically by the general public, consumers and policy makers. In this context, mechanical weed control in row crop is experiencing a comeback. Quality and efficacy of the mechanical work is achieved by the hoe's side shifting frame that is controlled in the row by a robust system. Up to now, this type of control has been implemented by 2D color screen cameras. The CULTI CAM system from CLAAS employs just one camera with two lenses (stereo camera) for 3D footage of the crops. At the same time, the 2D color segmentation algorithms have been refined and an automatic camera height and angle detection feature has been implemented. By operating a proportional valve on the hydraulic frame, the frame aligns the hoes in parallel with the rows. The system also feeds any information on less-than-optimum performance to the operator.

The benefits of CULTI CAM include more rugged and yet more accurate row control on sites with a heavy weed burden across the full width. This is attributed to the fact that it profiles the field along the ridges, irrespective of the leaf coloring. As another benefit, the hoe can also be used in windy weather and into small crops. It reduces operator stress and the use of chemicals, while allowing for higher work rates and earlier hoeing in the year. In addition, it reduces losses due to steering errors.

MACHINERY AND EQUIPMENT FOR PLANT PROTECTION

Tractor integrated implement steering with Infield auto system for high-capacity hoes – AutoTrac Implement Guidance
John Deere GmbH & Co. KG, Hall 13, Stand E30

Developed jointly with:
MONOSEM (France), Hall 11, Stand C54

Mechanical pest control in row crops is becoming more and more important as chemical spraying is viewed ever more critically by the general public. This has caused a rethink of existing machine concepts. AutoTrac Implement Guidance is an active steering system for row hoes that is controlled from the tractor and provides accurate control between the rows and without using a traditional shifting frame. Instead, the hoe is shifted by the tractor's hydraulic three-point linkage stabilizers. These stabilizers are controlled by a tractor integrated control circuit that provides feedback on their current position. The control system uses the camera signal from the hoe and calculates the distance between the mounted hoe and the detected rows of crop. In addition, hydraulic coulters are lowered into the ground behind the tractor to absorb the side draft that develops as the hoe moves to either side, thereby improving the functionality of the system, especially on slopes and at high work rates. Depending on the quality of the signals, the system also controls the ground speed of the tractor. It also has an interface for monitoring and logging positioning parameters of the system. By refining the shifting frame, it has been possible to move the implements closer to the tractor, which in turn improves the stability of the side-shifting control mechanism.
**MACHINERY AND EQUIPMENT FOR PLANT PROTECTION**

**MultiCoater CM 300**

PETKUS Technologie GmbH, Hall 6, Stand E40

Wetting in seed coating should be as uniform as possible and is, in fact, achieved by traditional seed coaters through intensive mixing of dressing and seeds. As the seed coat dries over time, it is increasingly at risk of rubbing off, which leads to high Heubach rates, that is high levels of airborne seed treatment dust. The MultiCoater CM 300 is a system that treats the coated seeds particularly gently inside the mixing chamber and dries them here too. This has been made possible by a special air cushioning technology in combination with metal-free deflectors. The MultiCoater coats and dries the seeds at the same time, it improves the seed flow and guarantees gentle treatment through optimal and uniform wetting. At the same time, it drastically reduces seed stress due to friction, thereby reducing the development of seed treatment dust substantially. As a result, the Heubach rates drop significantly below the statutory limits. In this way, the system contributes to implementing the strict rules on resistance to abrasion and protecting the environment.

**MACHINERY AND EQUIPMENT FOR COMBINING**

**The first pro-active and automatic combine setting system**

New Holland Agriculture (Italy), Hall 3, Stand D10

Maintaining maximum throughput levels while keeping losses and the percentage of damaged grain at acceptable levels is a massive challenge and a strain on every combine operator who spends the whole day in the cab. In an effort to reduce operator fatigue, New Holland has introduced the first combine that looks ahead. To do this, it is first necessary to program the following data into the combine: past yields, field topography and all combine settings based on GPS positioning data. During the first pass of the following harvest campaign, the system can then interpolate these data and the setting system responds rapidly to varying conditions. The proactive system relies on traditional sensors and control systems that have been supplemented by a new pressure sensor on the cleaning system that measures indirectly the load on the sieves. The amount of time the material spends inside the threshing and separation areas in the rotor housings is controlled by adjusting the angles of the guide rails. This technology has a bigger impact on the rotor speed and the efficiency of an axial-flow combine than changing the concave gap. It offers operators three different harvesting strategies to choose from. Using the data stored into the system, the combine will optimize its settings by itself – and before the header actually starts cutting and taking in the crop.

**MACHINERY AND EQUIPMENT FOR COMBINING**

**IDEAL combine**

AGCO International GmbH, Hall 20, Stand A26

Developed jointly with:
- AGCO GmbH – Fendt, Hall 20, Stand A26a
- AGCO Deutschland GmbH – Massey Ferguson, Hall 20, Stand A 26b

As high-capacity combines continue to increase in size to boost productivity and efficiency, road transport width is becoming the limiting factor in this development. This is seen especially on the running gear and the large contact areas that are necessary to protect the soil. The IDEAL combine from AGCO is the only high-capacity combine that does not exceed the 3.3 m transport width and still uses ground-friendly running gear. This is achieved by limiting the threshing width to 1.4 m. The system comprises two axial rotors of 4.85 m in length and extra-long, 0.6 m diameter threshing and separation concaves as well as up to 480kW engines. Smaller IDEAL models have only one axial rotor. The IDEAL combine from AGCO is the first combine in years that was developed from scratch and that features special technology. Further award-worthy features include fully automatic header attachment with header identification so that the settings of the particular header are retrieved. The novel preparation and return pans are segmented and provide up to 15% side slope levelling. A new sensor system detects the separation processes on the threshing and separation concaves and on the cleaning system, and provides the necessary database for an automatic machine set-up. The IDEAL combine from AGCO is the first combine in years that has been developed from scratch and that features special technology.
SmartTurn

Holmer Maschinenbau GmbH, Hall 24, Stand A24

Developed jointly with:

Reichhardt GmbH Steuerungstechnik, Hall 15, Stand F45

Tractor headland management systems record sequences of repetitive functions and allow operators to retrieve them automatically either by pressing a button or based on GNSS positioning when approaching a specific area in the field.

Reichardt and Holmer exxact have now developed an integral software solution that automates the full headland turn of a beet harvester including raising and lowering the lifter unit and carrying out the turn. To achieve this, the two companies combined the mechanical row guidance system including headland management from Holmer exxact with the GNSS controlled version from Reichardt, and tailored the new system to a self-propelled tanker harvester – in this case the Holmer Terra Dos T4. The innovative solution optimizes all headland turn maneuvers in the field to be harvested, thereby minimizing field traffic and therefore reducing compaction, losses, non-productive times and costs. Its greatest benefit is, however, reduced operator stress – not only during night work.

MACHINERY AND EQUIPMENT FOR LIFTING (POTATOES, BEETS)

Ventor 4150 – self-propelled four-row potato harvester with world-leading lifting system that doubles capacity

Grimme Landmaschinenfabrik GmbH & Co. KG, Hall 25, Stand F13

Like many other farm machines, the development of high-capacity potato harvesters for higher performance and efficiencies is limited by the sheer physical size of the machine and the 3.5 m road width restriction. Grimme has now implemented its extremely gentle soil and haulm web system on the Ventor 4150 potato harvester, a four-row and self-propelled machine that stays within the 3.5 m transport limit. The two intake web lines that feed the tubers into the machine are followed by a first web that is made up of two separate belts. These are followed by a second endless and steep elevator web with a wide-mesh and pegged trash removing web. At the end of the line, the two streams of crop leave their individual systems and flow into the trash separation units on the right- and left-hand side, which offer sufficient capacity and stepless adjustment to ensure high throughputs and very gentle crop treatment.

A folding mechanism (patent applied) folds the two trash separation units into the machine so it does not exceed the transport width of 3.5 meters.

Sensosafe

Pöttinger Landtechnik GmbH, Hall 27, Stand C39

The beginning of the harvest seasons poses great risk to fawns and game in general, because the time of the first cut usually marks the beginning of the breeding season. The techniques and methods developed up to now to save game have not proven very effective.

An effective new system however is Sensosafe, a sensor bar that is installed to the header and that detects any wildlife hidden in the field to protect it from fatal injuries. The sensors are optical infrared sensors with integral LED lights that detect animals while the machine is moving. As soon as an animal is detected, the hydraulic system of the header is signaled to raise the unit. The wildlife is saved and the crop is not contaminated. The infrared sensors are bespoke developments for this specific application, and are able to detect fawns effectively also in bright daylight and sunlight, while ignoring other obstacles like mole heaps.
INNOVATION AWARD – SILVER

MACHINERY AND EQUIPMENT FOR CHOPPING, MOWING, CONDITIONING AND BALING OF MOWED MATERIAL

LiftCab
Maschinenfabrik Bernard Krone GmbH & Co. KG, Hall 27, Stand G21

As modern and high-yielding maize varieties reach growth heights of 4.0 m and more, forager operators feel as if they are driving their machines “up against a wall of maize plants” all day long.

The Krone LiftCab is a feature that allows operators to raise the entire cab by up to 70 cm. The feature reduces operator strain and provides a convenient overview of the crop and the harvest fleet. The space underneath the cab also offers easy access to service and maintenance points. The cab lift is a novel feature on a forage harvester. It significantly reduces operator strain as it frees operators from driving up against a full-width wall of crop all day long. In addition, they can easily spot hazardous situations.

POST-HARVEST TECHNOLOGY

Flexwave Grain Silo Unloading System
GSI Hungary Kft, Hall 20, Stand A26j, and Hall 6, Stand E33b

Flat-floor grain stores offer higher storage capacities than outlet-funnel grain stores of identical heights. The drawback of flat stores, however, is that they never empty completely and a cone of residual grain remains in the bin. To clear out all grain it is necessary to bring in mobile augers, which in turn need manual feeding at some point – a dusty, time-consuming job and heavy work that is dangerous, too, because the running augers present a risk of injury.

A new approach is the Flexwave Grain Silo Unloading System which is made up of two air cushions. These are installed inside the store and to both sides of the outlet feeder. The cushions are not inflated at installation time. They cover the floor and reach up the wall to a height that is level with the tip of the grain cone that is formed during emptying. When the store is filled the cushions are flat on the floor and wall. During emptying, the grain initially flows by gravity to the outlet feeder. Yet when the grain stops flowing the first cushion fills with air. As it does so, it pushes the heap away from the wall and to the middle of the store. After the first half of the bin is completely empty, the process starts over on the other side of the bin; before this happens, the air inside the first cushion is released. At the end of the process, the two empty cushions are pulled back into position by ballasted straps. The emptying process is monitored remotely, and so it is possible to refill grain stores without people having to go in to ensure thorough emptying. The Flexwave Grain Silo Unloading System is a very straightforward solution that can be retrofitted to existing non-funnel flow bins with flat floors. It empties the store completely without time-consuming and hazardous manual work.

MACHINERY AND EQUIPMENT FOR FRUIT, VEGETABLES AND OTHER SPECIAL CROPS

SmaArt Camera System for automated blossom thinning with Darwin
Fruit-Tec Adolf Betz, Hall 21, Stand E10

The regulation of the amount of fruit on a plant or tree, that is blossom and/or crop thinning, is one of the most important measures used in intensive commercial fruit growing for achieving the required fruit size and quality in marketing. The greatest challenge for mechanical blossom thinning is the evaluation of the degree of thinning and the optimum adjustment of the spindle speed. The Darwin SmaArt Camera System replaces the subjective estimation of the blooming strength by the eye with objective detection by camera. To do this, a camera in front of the thinning spindle detects the blossom density of each individual tree and passes on the data to the onboard computer in real time. Using a thinning algorithm, the computer then calculates the optimum spindle speed and controls the thinning unit. The thinning unit consist of a spindle on which six rows of cord bars are arranged that remove the blossom through rotation. The thinning intensity is controlled to a great extent by the spindle speed.

As an option, the system can be combined with a GPS receiver. Using the GPS system, it is possible to detect each individual tree and to assign the data, such as the number of blossoms and the spindle speed, to the tree and to compare it later with the yield data. As a mechanical system, the Darwin SmaArt Camera System for automated blossom thinning can replace chemical or manual blossom thinning. With its high efficiency and the degree of thinning based on objective parameters, the previous main reasons for the reluctant acceptance of mechanical blossom thinning is expected to diminish.
MECHATRONICS AND DATA PROCESSING

Beacon+GPS+Sigfox -Fliegl COUNTER SX/-Pöttinger PÔTPRO Guide
Fliegl Agrartechnik GmbH, Hall 4, Stand B43
Developed jointly with:
Pöttinger Landtechnik GmbH, Hall 27, Stand C39

So that food manufacturers can verify the route the product takes from the field to the consumer in accordance with the EU regulations, for many years now Fliegl has focused on beacons, which in their original form are small, inexpensive Bluetooth transmitters for machine recognition. With Fliegl COUNTER SX, the beacon technology has been considerably expanded with additional functionalities, enabling an inexpensive, flexible entry into smart farming technologies with major benefits.

The COUNTER SX uses the innovative radio technology Sigfox, 3D sensors and GPS, that go beyond previous functionality. With the data radio network, Sigfox is a very inexpensive continuous Internet connection, and therefore provides automatic communication between the machines and the farm independently of mobile networks. It records movements of the machines through the intelligent evaluation of the 3D acceleration and tilt sensors integrated in the beacon. Then it analyses them with corresponding algorithms of a broad range of processes, assigns them and saves and transmits the information collected.

Thanks to decreasing unit costs and simplified application integration, beacon technology is recommended for use in agricultural applications. As a universal system, beacons can close a broad range of information and documentation gaps. When a grubber is used, it can, for example, recognize the state of work, transport or break, enabling it to determine detailed operating times. When pressing round bales, it can also record the bale output and the placement location of the bales. However, it can also be used for other applications like theft protection, tracking or temperature monitoring.

MECHATRONICS AND DATA PROCESSING

Automation of agricultural recordings with smartphones
Farmdok GmbH, Hall 15, Stand G10a

The recording requirements for agricultural operations continue to increase. These present farmers with new challenges, however the data that is documented and processed can also be used to improve company management and operational development. It is always necessary to have complete and plausible data, and the easier the data collection system is to operate, the more likely it is that detailed and accurate information is recorded.

Farmdok is an agricultural software product for the mobile and automatic documentation of agricultural data in the field with a smartphone and/or tablet. The innovative sample analysis of cultivation and GPS data enables virtually complete automation of data acquisition. The Farmdok TaskPrediction algorithm measures parameters including operating materials, quantities and machines used. The data to be collected is automatically proposed at the start of each job; as a high probability of the planned measures can be achieved at this point thanks to comprehensive data analysis.

The WorkCognition algorithm is used for the reliable detection and determination of the cultivated area using a far-reaching driving pattern analysis without the need for geo fences. This enables road and field work to be differentiated, and applied loads to be counted.

The farmer benefits from time saved and more convenient recording with minimal operating effort. The easy-to-operate system requires no additional hardware, and therefore enables an inexpensive entry into farm record digitization for farmers, machinery rings or contractors.
agrirouter

DKE-Data GmbH & Co. KG, Hall 15, Stand G38

Developed jointly with:
- AGCO International GmbH, Hall 20, Stand A26, and Hall 15, Stand G38k
- Amazonen-Werke H. Dreyer GmbH & Co. KG, Hall 9, Stand H19, and Hall 15, Stand G38c
- Grimme Holding GmbH, Hall 25, Stand F13, and Hall 15, Stand G38h
- HORSCH Maschinen GmbH, Hall 12, Stand C41, and Hall 15, Stand G38i
- Maschinenfabrik Krone Beteiligungs-GmbH, Hall 27, Stand G21, and Hall 15, Stand G38e
- KUHN S.A., Hall 12, Stand C05, and Hall 15, Stand G38l
- LEMKEN GmbH & Co. KG, Hall 11, Stand B42, and Hall 15, Stand G38j
- PÖTTINGER Landtechnik GmbH, Hall 27, Stand C39, and Hall 15, Stand G38f
- Rauch Landmaschinenfabrik GmbH, Hall 9, Stand D16, and Hall 15, Stand G38g
- Same Deutz–Fahr Deutschland GmbH, Hall 4, Stand D28, and Hall 15, Stand G38m

In the course of additional digitization of agriculture, the majority of large companies try to ensure customer loyalty with corresponding proprietary solutions. In contrast to this, small and medium-sized companies are hardly capable of mastering this technical challenge on their own. However, for farmers themselves the primary focus is also on the critical topics of data security and data sovereignty. The agrirouter is a universal data exchange platform for farmers and contractors that combines machines and agricultural software across all manufacturers to simplify operating procedures and improve economic efficiency. Only the user can specify who exchanges which data with whom and for how long. The following always applies: The agrirouter transports data, it does not store it. As a result, all available data is brought together for the first time in cooperation with corresponding farm management systems. The agrirouter therefore makes it easier for the farmer to take a major step toward digitization.

SmartService 4.0

Amazonen-Werke H. Dreyer GmbH & Co. KG, Hall 9, Stand H19

Ever more complicated machines also necessitate increasingly more specialized training for service technicians. However, workshop employees often have to carry out repair and/or maintenance work on-site in order to avoid long downtimes, for example, until the factory customer service arrives. In the environment of increasingly more complex machines, AMAZONE SmartService 4.0 uses the technologies of “virtual reality” and “expanded reality” to further develop the learning and training processes for the end customer and customer service, and to support customers and service technicians during maintenance work. AMAZONE Smart-Service 4.0 enables both multimedia-based, technical real-time support from service specialists for service technicians, as well as in the field of applications technology from service consultants for end customers. With real-time support, the service specialist/service consultant sees the activities of the service technician/end customer and can provide corresponding warnings and/or working instructions. This would not be the case purely with support over the phone.
**EQUIPMENT AND SOFTWARE FOR PROCESS OPTIMIZATION**

**Telematics Large Vehicle Alert System warns car drivers of agricultural machines in road traffic**

Claas-Vertriebsgesellschaft mbH Germany, Hall 13, Stand C02

Agricultural vehicles in road traffic generally have a bad reputation among non-agricultural road users. Many car and truck drivers become uneasy when they encounter slow-moving, often unwieldy agricultural machines or tractors towing trailers or equipment on narrow roads or on blind curves – quite apart from the accident potential of such situations. The Telematics Large Vehicle Alert System from Claas is the first traffic safety system that proactively informs drivers of networked cars on the position and status of agricultural machines on their route. For this purpose, the location of the agricultural machines is transmitted from the telemetry data via telematics or via a Claas app to the assistance systems of cars and trucks virtually in real time. With the open data standard, a broad range of navigation systems can access the data stored by Claas, enabling them to report any warnings to road users. The population can be notified of disruptions more vigorously with these kinds of active systems. This already enables hazards to be prevented beforehand or achieves improved acceptance when using large machines, as traffic safety systems have a major effect for agriculture.

**Smart Crop Damage Identification – intelligent identification system for crop damage caused by game**

Agrocom Polska, Hall 15, Stand J12

The ordinary estimation of damage caused by hunting and storms (hailstorms, intensive precipitation, night frost, ground softening and flooding) is difficult, labor-intensive and time-consuming, inaccurate and therefore hardly representative. An unclear estimate of damage is often the cause of conflicts between those incurring damage and, for example, insurance companies. However, a three-dimensional imaging process, such as the intelligent identification system for crop damage caused by game called Smart Crop Damage Identification (SCDI), provides a solution to this problem. It can record hunting and natural damage at the end of the vegetation period, even for tall plants, and makes an assessment and/or damage estimate possible. SCDI works with 3D images that are taken with drones at a low height. For this purpose, parallel paths are created at stable altitudes with photographic longitudinal directions using the planning software. In SCDI the images recorded in this way are then combined with existing LiDAR (light detection and ranging) laser data and the damage to the areas is automatically calculated. However, other photographs and evaluations are also possible. Intelligent data acquisition using drones does not prevent work in the fields. The system reduces the working time required by farmers when checking stocks, when looking after animals and for quality assurance.
International DLG Crop Production Center

**STRIPES IN THE FIELD – THE NEW LOOK IN WHEAT STANDS?**

Strip-till is a method of partial, strip-wise tillage that is in widespread use on American farms. Is this method competitive under the conditions encountered in the Magdeburg Börde region in Germany as well? Is it only suitable for row crops, or can all crops in a crop rotation sequence be farmed in this way? That would have consequences for farm mechanisation. The International DLG Crop Production Center (Internationales DLG-Pflanzenbauzentrum – IPZ) has been investigating these questions since the autumn sowing in 2012.

The influence of the tillage and placing of the PK fertilizer on the crop stands is being examined in a field trial under practical conditions in a four-field crop rotation with oilseed rape (25 per cent), maize (25 per cent) and wheat (50 per cent). In the strip-till method, the soil is loosened deep in strips 50 cm apart. These strips are used as seeding area. The area between the loosened strips remains un-worked and un-tillled. This results in strip-form cultivation which is what gave the system its name. By contrast with row crops, the strip-till method is unusual in cereal crops. In order to offer the wheat plants sufficient space within the row, the seeding intensity was not increased within the loosened strips in the trial. As a result of the untilled area between the strips, the seeding intensity is 50 per cent lower per m² by comparison with mulch seeding.

In the meantime evaluable results are available for a complete crop rotation sequence:

- The grain yields of the individual trial variants fluctuate in the four years between just under six and almost 10 metric tons per hectare. The year with the highest yield was 2016 with on average 8.8 t/ha throughout the trial, while in 2017 only 6.9 t/ha were achieved. The reason for this is the difference in precipitation and temperature distribution during the vegetation periods.
- This can be observed impressively in the stand dynamics in these two years. In the year 2016, at the start of bolting there were just under 1400 shoots per m² in the trial, from which 380 productive ears per m² developed, and which then at a thousand grain weight (TGW) of 52 grams produced on average 2.35 grams of grain per ear. In the next year the development was: 780 shoots/m²; 370 ears/m²; TGW 39 g; grain weight/ear 1.89 g.
- In the years 2015 and 2017 in which drought limited the yield at the location, there were no significant differences in the grain yield between the trial variants. The differences in the years 2014 and 2016 ran in the opposite direction, so that for wheat on a four-year average there are practically no differences between the cropping systems.

These results indicate that the strip-till method is suitable for cultivating winter wheat under the conditions encountered at the Bernburg site in the Magdeburg Börde region. Farms that have to use machinery to protect against erosion can convert the whole farm/all crops to the strip-till method – looking at the longer-term grain yields.

**Overview of the field trial**

Alongside the suitability of the site for the method, the underlying question also examines the adaptation of the stand management and the cultivation methods. In addition, long-term effects of the change in tillage and basic fertilizer spreading on the soil structure and nutrient distribution in the topsoil are being investigated. Key economic figures will allow a statement to be made on the cost-effectiveness of the methods. With the kind of machinery commonly used in practice, the system comparison was established with the crop rotation sequence winter oilseed rape – winter wheat – silage maize – winter wheat with six different trial elements. In addition to mulch seeding (standard), tillage variants were direct seeding and strip-till. On the one hand strip-till for oilseed rape and maize is combined with mulch seeding for wheat, but then all crops were cultivated with consistent use of the strip-till method and a row width of 50 cm. The basic fertilizing is carried out on the surface, and in the case of strip tillage by introducing it beneath the roots, which then leads to the six variants (see figure). All variants were repeated four times and randomised in order to minimise any effects of possible soil heterogeneity. A bi-factorial split system with plot sizes of 18x46 m was selected for the trial system. The crop rotation elements were randomised in the large parts, the trial variants in the small parts.

### Variants (tillage and fertilizing)

1. Mulch seeding for all crops, (standard)
2. Strip till for oilseed rape and maize, mulch seeding for cereal
3. Strip till for all crops, cereals are drilled with a double share into the loosened row
4. like 2, PK fertilizing for tillage in the row
5. like 3, PK fertilizing for tillage in the row
6. Direct seeding (no-till)

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INTERNATIONAL DLG CROP PRODUCTION CENTER (IPZ)

**Platform for crop research**

The IPZ (in Bernburg, Saxony-Anhalt) serves to conduct application-oriented research into crop production and to transfer the findings to practice as a module for a competitive, forward-looking and sustainable agriculture. The focus is on:

- crop production and method-specific trials,
- open-air events and demonstration projects,
- agricultural machinery tests and tests on open land,
- training activities
- communication of modern, sustainable agriculture to the public.
New developments are appearing on the horizon. Cloud Computing and Big Data analyses aim to allow handling of large data volumes from a wide range of sources and to help farmers reach better decisions that lead to greater efficiency. The development engineers are also focusing on an approach that will access the “internet of things”, the machine-to-machine communication, for automatic process control and networking of hitherto standalone systems.

The use of smartphone and apps is widespread. Farmers use apps both as individual applications (e.g. to identify weeds, for plant cropping recommendations) and as mobile applications of software used on the farm. Farmers in the Netherlands make the greatest use of mobile applications. And around 60 per cent of the farmers interviewed in Germany and Russia state that they regularly make use of smartphones and apps.

A further focal area of application is software for production control and farm management. Farmers in Germany and Russia use in particular field maps, while farm managers interviewed in the Netherlands use especially herd managers. The use of farm management systems that integrate different fields of application and thus aim to simplify data keeping and analysis options is less widespread. Farm managers in Russia (65 per cent), France (46 per cent) and the Netherlands (45 per cent) make relatively extensive use of farm management software. Far fewer farmers in the United Kingdom use farm management systems, and farmers in Poland and Germany especially are reserved.

The next step in development is the use of cloud software that shifts both data keeping and the actual software from the on-farm computer into the web. So far distinct-ly fewer farmers use cloud software. Among those interviewed, farm managers in Russia are leaders in this field. In Germany, France, the Netherlands and Poland only around 10 per cent of the farmers questioned use cloud software. In some regions the partly inadequate data infrastructure hinders smooth data exchange and makes access.
to evaluations more difficult. On the other hand, in some cases there is uncertainty regarding data security and ownership of the data.

**Farm digitising approaches**

However, despite the existing hurdles, farmers in France especially (54 per cent) and the United Kingdom (34 per cent) view cloud computing as a module for digitising their farms. Farm managers in Germany are much more reserved though.

The substantial interest shown by farmers in decision-making support and the use of Big Data applications conflicts somewhat with the planned use of cloud computing. After all, cloud computing is often the prerequisite for being able to process large data volumes. That is why cloud computing holds a key position when it comes to being able to use progress in data processing.

However farmers are not focusing solely on (software-based) technical innovations. At the same time they also want services developed. Consequently customised analyses are a crucial prerequisite for effective use of Big-Data applications on the farm. Only structured evaluations tailored to the farm-based questions generate beneficial results for the farmer. Data security also remains a core issue. Farmers must actively release data for use in order to guarantee their data sovereignty and ensure transparency regarding farm data use.

And finally a further module of farm digitising is moving into focus - the digital control of mounted implements. Roughly every second farmer in Germany, Poland and the United Kingdom sees this as a farm approach to digitisation. This is because the “Internet of things” (machine-to-machine communication) arouses hopes of being able to control processes automatically and optimise them further in farming too.

The survey of farm managers in Europe conducted by DLG-Agrifuture Insights shows that for farmers, digitising is a firm component of farm development. The focal areas of interest are analyses and decision-making support, as well as control of mounted implements. Innovations that offer tangible benefits for the farmer are necessary. These also include innovations in services, making it possible to tailor the applications to the operational requirements of the customers. And not least, innovations also cover the thematic area of data safety and transparency when it comes to using the farm data – as a prerequisite for the business relation between the farmer and providers in the “data business”.

**METHOD**

Telephone interviews with 900 future farmers in arable farming, dairy farming and pig farming (150 interviews per country).
TESTED QUALITY

The experts at the DLG Test Center Technology and Farm Inputs test several thousand agricultural machinery and equipment products and farm inputs every year. The rewards for passing these demanding tests, which are relevant for practical use, are certifications such as DLG APPROVED or the DLG quality labels.

Decisions to invest in new agricultural machinery or farm inputs should always be taken on the basis of robust data and facts. In the market the test labels issued by the DLG Test Center Technology and Farm Inputs stand for top product quality that has been confirmed neutrally and independently. The methods and test profiles are practice-related and independent of manufacturers. They are based on the latest modern measuring techniques and test facilities and take international standards and norms into account.

The DLG Test Commissions – consisting of leading practitioners, scientists, experts from federations and associations, consultants and administration – conduct reproducible technical tests together with the DLG test engineers in response to practice-oriented questions from animal husbandry and field operations. Whether on test rigs or in defined scenarios in practical use on farms, the products and innovations are scrutinised with the help of the latest modern measuring technology and assessments by experienced practitioners, right down to the smallest detail. The test method and the test design are developed in close consultation with the independent, test commissions, whose members work on an honorary basis. These specify the evaluation standards and decide on the award of the test labels.

TESTING FOR PRACTICE

DLG has been testing agricultural machinery and farm inputs for over 130 years. With its tests in the fields of vehicle technology, farmyard work and field operations, as well as farm inputs, machinery and equipment for forestry work, municipal applications and horticulture, the DLG Test Center Technology and Farm Inputs is one of the leading international testing organisations. The Test Center in Gross-Umstadt provides practitioners with information that forms an important decision-making aid for investments and use in practice. The Center’s more than 4,000 test reports and test results provide farmers with clear orientation – about agricultural machinery as well as about compound feed, ensiling agents, fertilizer lime or agents for cleaning, disinfection and udder hygiene.

www.DLG-Test.de
### Overview of current test results

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