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# Trends in seeding technology and mineral fertilizer application

*Below, important trends in drilling technology and mineral fertilizing are presented, which will be reflected by the machinery- and implementation programme shown at the Agritechnica 2005. This preview only provides pre-information and cannot replace a trade fair visit. Completeness is not aimed for.*

If one considers the machines for seeding and mineral fertilizer application which were awarded gold- and silver medals at the Agritechnica exhibitions in the past years alone, one must acknowledge that these areas belong to the most innovative segments of agricultural machinery. Even if no spectacular novelties can be expected as compared with the year 2003, where medals were particularly abundant, numerous innovative upgrades and detail improvements are anticipated.

## Trends in seeding technology

The trend towards larger working widths is continuing in trailed or PTO-driven drill combinations or solo-drills. There is also an ongoing trend towards so-called universal drills which are suitable for mulch drilling (or zero tillage in some cases).

In addition, further improvements providing more uniform longitudinal grain distri-

bution as well as innovations in site-specific drilling are interesting.

Studies have shown that meanwhile different systems suitable for practice are available which allow longitudinal grain distribution to be improved. In these studies, positive measurement results from the laboratory were also able to be confirmed in practical field use. More uniform longitudinal grain distribution enables 10 to 15% of seeds to be saved. It must be taken into account, however, that the precision of single-grain drilling cannot be reached.

With regard to the increasing electronic control and automation of processes, two systems for the determination of seed quantity during drilling are available („grain counters“). They enable the calibration test to be dispensed with and allow for precise, site-specific variation of the application rate. Continuously variable drives of seed metering systems based on electric or hydromotors are being more and more widely used in order to vary the application rate during the ride. In combination with electronic, GPS-based control, this fulfils the prerequisites for site-specific drilling. The on-line monitoring of different processes and operating states is also more and more gaining in importance for drills.

## Trends in mulch drilling

Meanwhile, mulch drilling has widely established itself in practice. In combination with tillage implements, universal concept solutions are offered which have large performance potential. The current trend is still favouring larger working widths and working speeds and, hence, pneumatic drills with large-volume seed hoppers. Attempts are being made to improve work quality by means of detail upgrades. The seedbed is prepared with the aid of superficially working pre-tools (short-disc harrow). Even though these solutions are mainly used for mulch drilling, they are also suitable for drilling after ploughing. The predominant disc coulters are being optimized in particular with regard to uniform depth guidance. However, the degree of design sophistication for this purpose differs among the manufacturers.

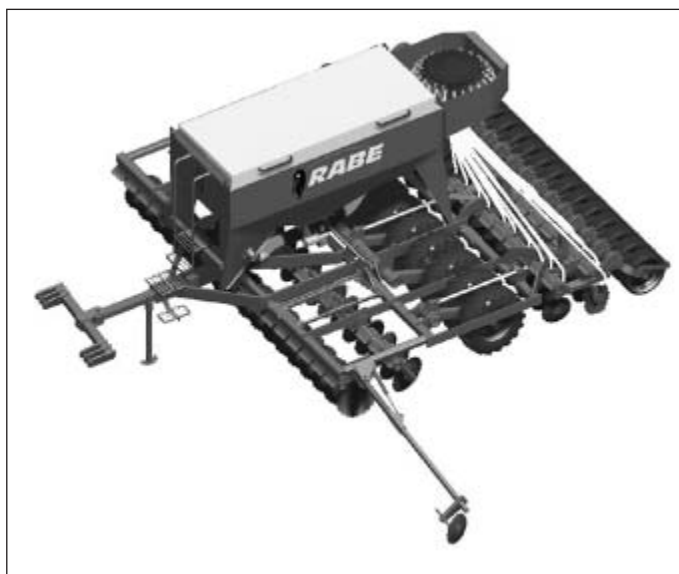
In single-grain drilling, mulch drilling is also more and more gaining in importance. Therefore, the manufacturers are completing their product range in this segment and are equipping their machines with suitable accessory units in order to meet the requirements of mulch drilling.

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## Keywords

Trends of development, seeding technology, mineral fertilizer application

*Fig. 1: Rabe offers a new drill family for both drilling after ploughing and mulch drilling at working widths of 4.5 and 6 m. The hopper has a capacity of 3,000 l (company photo)*





WERKBAU  
YARA



Fig. 2: With the Sprinter ST (working width: 4 or 6 m), Horsch completes the lower range of its mulch drill programme (company photo).

Fig. 3: The new, active Yara N-Sensor<sup>®</sup> ALS has its own light sources, which enables it to determine the application rate even at night.

### Development tendencies in mineral fertilizer application

The state of the art has reached a very high level in particular in the segment of two-disc spreaders, which are mainly used. Machines from the leading manufacturers allow virtually all mineral fertilizers used to be distributed very precisely over working widths of up to 24 m. Fertilizer varieties which have very good spreading properties can even be distributed over 36 m. From a technical viewpoint, the demand for highly precise distribution is fulfilled today.

Approximately 80% of the total fertilizer quantity is distributed with the aid of two-disc spreaders today. These implements convince because they are precise, robust, and have a large capacity. Their main characteristics are continuously variable working widths from 14 to 48 m, automatic fertilizer metering by means of on-line calibration with the aid of integrated weighing cells, for example, and electronically controlled border spreading equipment.

A novel spreading system for two-disc spreaders, which allows for precise, site-specific application of variable fertilizer quantities without adjustment or change of the spreading vanes, promises considerably larger capacities and significantly improved operating comfort.

Computer systems equipped with GPS receivers enable gears to be shifted automatically and precisely at certain points on the headland and at the field's borders (turning on/off of the metering system, switching of spreading sections) so that over-fertilizing in the headland area and at the field's borders is avoided.

### Site-specific fertilizer distribution

For application rate calculation in two-disc spreaders, different systems are used, which

measure either the weight or the mass flow of the fertilizer. Integrated weighing systems are offered by all manufacturers. They differ with regard to the number and the arrangement of the weighing cells and measure the filling weight as well as the corresponding weight alterations during spreading process.

Fertilizer spreaders with hydraulically driven spreading discs show a direct relation between the driving torque of the discs and the mass flow which enables a correlation with the distributed fertilizer quantity to be established via the pressure drop in the hydraulic motor.

The development of a mechatronic system for mass flow measurement and -control allows the application rate of a two-disc spreader to be controlled precisely and fully automatically at considerably lower costs than the present solution based on hydraulically driven discs. Thanks to this innovation, significantly wider acceptance of this economically and ecologically convincing concept can be expected. At the same time, automatically controlled, site-specific fertilizer application also enables this measure to be documented automatically.

For the site-specific determination of the nitrogen demand, reflection sensors are meanwhile successfully used in practice. Based on the reflected sunlight, they measure the spectral reflection of the crop stand, which correlates with current nitrogen supply. Depending on the measurement results, the metering system of the fertilizer spreader is controlled on-line.

For the realization of the economic and ecological advantages of demand-oriented, site-specific fertilizer application, the N-sensor as a proven system has established itself in practice in the past years. The sensor measures the sunlight reflected by plants to varying degrees depending on nitrogen supply, determines the required nutrient demand, and controls the required application rate on-line. Upgraded sensors cause fluorescence in green plants using their own light source (laser), which causes different reflections depending on the supply of the plants with nitrogen. Regardless of the light conditions (day and night), the nitrogen demand is determined, and the resulting recommended application rate is calculated and realized on-line.



Fig. 4: The new Axis<sup>®</sup> fertilizer spreader from Rauch with CDA spreading technology allows for high working speeds of up to 20 km/h even at large working widths and high application rates.