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Trends in Seeding and Mineral Fertilizing

In this contribution, important trends in the areas of seeding technology and mineral fertilizing are presented, which will be reflected by the machinery- and implement programme shown at the Agritechnica 2003. This preview cannot replace a trade fair visit and is only intended to provide pre-information. Completeness is not aimed for.

Today, numerous machines and implements for seeding and mineral fertilizing are already meeting the highest technical standards with regard to functionality, reliability, and capacity. Further progress in this field is primarily based on new developments in information- and sensor technology for precision farming. In addition to upgrades and detail improvements, true innovations can be expected.

Development Tendencies in Seeding Technology

For the seeding of grain crops, a wide range of mature technology is available. The trend towards larger working width and mulch-seed-capable seeding machines is unbroken.

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Keywords

Trends of development, seeding technology, mineral fertilizer application

In all machines with volume metering, the even longitudinal spacing of grains in the row still needs improvement. Some interesting developments, in particular in the seed coulter area, would allow the work quality of drills to be significantly improved. Such solutions as well as innovations for site-specific seeding can be expected at this year's Agritechnica.

Site-Specific Seeding

Steplessly variable seed metering drives, which feature either electric or hydraulic motors for varying the seed rate during the ride, are increasingly establishing themselves. In combination with electronic, GPS-based control, they would fulfill the conditions for site-specific seeding. Such developments can be expected from some manufacturers (Amazone, Lemken). The electric drive of the metering elements allows the seed rate during the work process to be varied and precise site-specific seeding to be realized. A calibration test is no longer necessary. Electronic systems with a GPS connection are the basis of application technology in precision agriculture. Several manufacturers, some of which cooperate with electronics companies, offer the possibility to follow application maps with seed rate variation and to document the result in the form of an actual seed rate map.

Sensors which count the metered number of grains would take over these partially automated steps of the calibration test completely and enable the desired seed rate to be applied precisely.

Better Seed Placing

For the improvement of seed deposition and -insertion, novel coulter developments can be expected (Kuhn) which allow the function and work quality of the machines to be decisively upgraded.

While grain distribution in the seed row is entirely random if conventional seed coulters are used and thus leads to large variations in grain spacing, the use of improved seed coulters results in more even grain spacing within the row. In addition to a 10 to 15% reduction of the seed rate, the advantages include more precise insertion depth and more even field emergence.

Mulch Seeding and Zero Tillage

In mulch seeding and zero tillage, a wider application of known standards can be discerned. In combination with tillage implements, universal concept solutions are offered which have a larger capacity and save work steps. The trend towards larger working

Fig. 1: Pöttinger presents at the Agritechnica the new mulch seeding combinations Terrasem 3000 T and Terrasem 4000 T with 3 m and 4 m working width

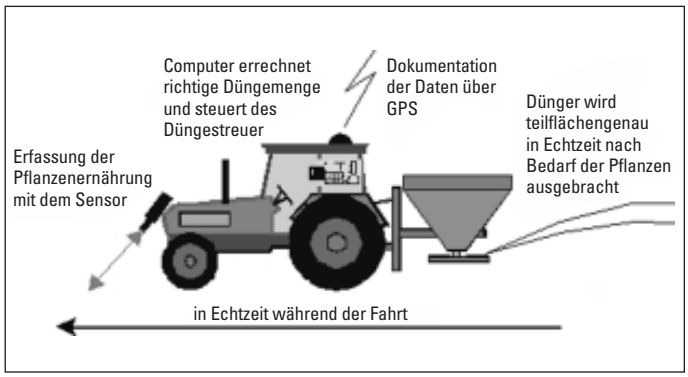

Fig. 2: Fritzmeier uses laser for ascertaining the nitrogen content of the plant contactless and not influenced by daylight (Fig. Fritzmeier)

widths as well as higher speeds and, hence, pneumatic drills with large-volume seed hoppers is continuing (*figure 1*). Attempts are being made to improve work quality through detail upgrades. Seedbed preparation is carried out using superficially working pre-running tools. Even though these solutions are primarily applied in mulch seeding, they are also suitable for plough seeding. The predominant disc coulters are being optimized in particular with regard to depth guidance. Technology for seeding in uncultivated soil, however, is only offered by a few manufacturers.

In precision drilling, the importance of mulch seeding is also continuing to grow. As a result, the manufacturers are completing their product range in this area. Generally, the machines feature additional equipment in order to meet the requirements of mulch seeding. Currently, zero tillage technology suitable for practical application is not yet being offered. Electronically controlled electric drives with steplessly variable rotational speed of each seed-feeding device are establishing themselves. This allows the seed rate to be varied and tramlines to be established. In contrast to drilling, no marketable systems for GPS-aided seed rate variation are available for precision drilling.

Development Tendencies in Mineral Fertizing

Especially in the predominant two-disc spreaders, the state of the art has reached a very high level. Machines from the leading suppliers enable virtually all mineral fertilizers used to be spread with very high accuracy over working widths of up to 24 m. Fertilizer varieties with very good spreading properties can even be spread over more than 36 m. From a technical viewpoint, the demand for high accuracy of distribution is fulfilled.

Today, approximately 80% of the total fertilizer quantity is applied with the aid of two-disc spreaders. These implements convince through precision, robustness, and high capacity. Their main characteristics are steplessly adjustable working widths between 14 and 48 m, automatic fertilizer metering (e.g. through on-line calibration with the aid of integrated load cells), and electronically controlled border spreading equipment.

Site-Specific Fertilizer Spreading

For seed rate control in two-disc spreaders, different weighing 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 determine filling weight as well as weight changes during the spreading process.

In fertilizer spreaders with hydraulically driven spreading discs, there is a direct relation between the driving torque of the discs and the mass flow, which enables a correlation with the quantity of spread fertilizer to be established using the pressure drop at the hydraulic motor.

The physical properties of fertilizers exert a significant influence on the spreading quality of two-disc spreaders. For the control of lateral distribution on the field, the farmer uses a mobile test stand (collection trays). He enters the measurement results gained into the computer (on-board computer), and a special software program determines the optimized machine setting (Amazonenwerke). This even allows fertilizers with unknown or changing physical properties to be accurately distributed in the simplest manner. The possibility of calling up setting values for the fertilizer spreader from the manufacturer's data base using a mobile phone provides an additional improvement in service (Amazonenwerke).

For the site-specific determination of the nitrogen requirements, reflection sensors are meanwhile successfully used in practice. Using the reflected sunlight, they measure the spectral reflection of the plant canopy, which is correlated with current nitrogen supply. Based on the measurement results, fertilizer metering is controlled on-line.

In addition to reflection-optical sensors, laser systems have meanwhile been presented (Fritzmeier) which stimulate fluorescence in the chlorophyll of the plant leaves and determine the nitrogen content of the plant in a contactless manner independent of daylight. These sensors also control spreader metering on-line (*fig. 2*).

Today, site-specific fertilizer application is also possible with pneumatic spreaders. The company Rauch, for example, is presenting a newly developed pneumatic spreader with sixfold electronic partial width rate control and working widths of up to 36 m. This concept combines large area capacity with precise, site-specific fertilizer distribution up to the field boundary (*fig. 3*).

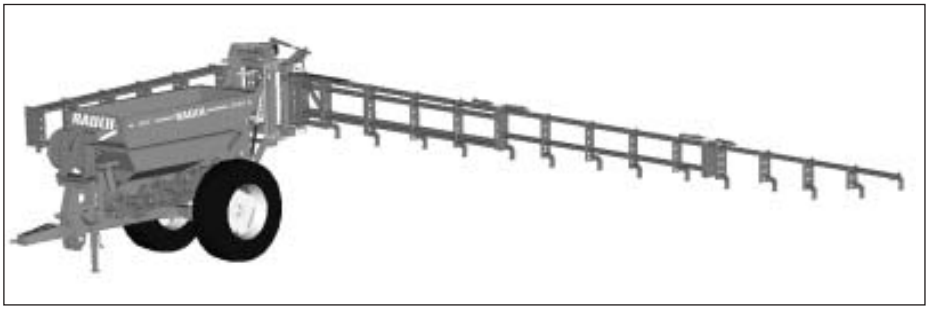

Fig. 3: Rauch offers the pneumatic fertiliser spreader AGT 6024 - 6036 for site-specific fertiliser application *Fig. Rauch*