

**Weight determination in transport vehicles -
exemplary shown on a selfloading trailer**

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An improved farm management with reduced costs and more environment protection in plant production needs more and better informations. Most important are data about distribution and harvesting amounts, which will be connected in the future with time and position data.

All material handled on agricultural farms is done by transport work. For capacity determination in this way two general possibilities are given. As a first solution with on farm installed scales the weight detection can be done. This leads to disturbances in the usual work sequences decreasing the possible transport capacity. Additionally with this method only a summarized yield determination can be done. On the other hand weight registration should also be possible within transport vehicles as well as within techniques for distribution or harvesting if there are suitable and low-priced sensors available. Then in the future a connection with vehicle position in a dynamic process offers much more opportunities and with the use of such a technique performance will increase.

Therefore in a comparison the mobile weight detection has more advantages and only this method can fulfil the requirements of the future. For this in comprehensive tests this technique has been chosen. A selfloading trailer the most important and universal transport vehicle in all of the German cattle farms has been taken. This unit harvests in these farms nearly the whole green food as well as most parts of grass silage and hay. Additionally it is used very often for transporting straw and last not least it takes part during maize silage. In a very conservative estimate in connection with this vehicle much more than 50% of all harvesting goods can be recorded. In the same way an adapted weight detection system for a selfloading trailer can be transplanted without any problems into other transport vehi-

cles and then nearly all yields and all distribution material can be controlled.

For the weight determination in a vehicle three different applications of sensors are possible.

A direct application of sensors is given if they are brought into an existing part of a vehicle with a specific knowhow by the manufacturer. Usually strain gage sensors in different shapes are used. The adaptation of the sensors needs comprehensive steps during manufacturing, on-field adaptation on the farm therefore is nearly impossible. The accuracy of this types of sensors in first trials were below 2%, related to the maximum load weight of 5.000 kg. With a more improved coordination this error could be reduced to 1 %. Main problems are given by the system internal hysteresis, but repeated measurements show a very high stability in their results.

Sensors can also be adapted in own closed units between different parts in a vehicle. For this application mainly load cells and once more strain gage sensors are used. This group is most suitable for an on-field adaptation. Its application can be done between axle and spring. The error of such sensors is within +/- 1%, also 0.5% seems to be possible.

In the third group a sensor will be adapted as an integrated part of a certain part of a vehicle. Again mostly strain gage sensors are used as measurement elements and they are suitable for on-farm application too. With these sensors errors from +/- 1 % (0.5 % seems to be possible) they are equal to the sensors from the second group.

All mentioned sensors can be used also for the registration of the thrust on drawbar. In a broader sense for the reduction of expense, thrust on drawbar also could be detected in the tractor hitch. First measurements with load cells as an integrated measurement unit shows real good results.

Based on a local yield detection (yields of subdivisions within a bigger plot) the dynamic weight determination will be important in future. In connection with one of the above mentioned sensors a first long time trial on a practical farm was started. In the meantime it has shown in more than two months lasting inset very good results and it could detect in the same way the used labour time. So it seems that in first time a continuously automatized data acquisition on agricultural farms can be realized.