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Trends in sugar beet harvesting technology

Below, important trends in sugar beet harvesting are presented, which will be reflected by the machine and implement programme shown at the Agritechnica 2007. This preview cannot replace a trade fair visit. It only provides pre-information and does not claim to be complete.

In the past years, sugar beet cultivation has undergone significant structural change and adaptation processes. The primary reasons for this development were agricultural-political changes and decreasing yields from sugar beet cultivation. Farmers are also under an enormous cost pressure from buyers and the processing industry so that logistics and the delivery of the sugar beet must become more efficient.

Since prices are no longer guaranteed at the level of the previous years, especially the harvest, which causes the highest special costs, must be examined under particular cost aspects. In addition, the new sugar market regime provides payment reductions for sugar beet transports by up to 20%. Therefore, not only the harvest, but also the cleaning and the transport of sugar beet must be optimized.

In the year 2006, sugar beet was cultivated on approximately 360000 ha in Germany, which accounts for 3% of the entire field area. The sugar beet cultivated on this area was processed in a total of 25 sugar factories. Sugar beet cultivation still has significant economic importance in rural areas.

Sugar beet harvest

The one-phase technique with 6-row tankers is the predominant harvesting method for sugar beet. Its high efficiency and the high investment expenses for these harvesters require cooperative machinery use. More and more often, these machines are purchased and used by agricultural harvesting cooperatives. This allows the farmers to secure their influence on harvesting logistics and harvesting costs. In addition, cooperative harvesting provides more flexibility so that soil and weather conditions can be considered. The machines used are highly reliable under functional aspects. Harvesting speed, however, is currently limited to a maximum of 7 km/h. In order to increase efficiency during the beet harvest, efforts are being made to increase the hopper size. At the same time, 8 to 12-row tankers are put on the market. For road transport, it is necessary to fold the mounted harvesting units of these machines hydraulically or to use appropriate coupling systems in order to attach them to the machine during the ride.

The studies on the work quality of different self-propelled harvesting machines carried out in the past two years show that modern technology allowed both beet rupture losses in the soil and root rupture losses to be reduced significantly. If harvesting machines are optimally adjusted, the unavoidable total technical losses of beet mass diminish to less than 5%. The correct setting of the harvesting machine determines topping and lifting quality. In modern machines, the setting can be changed from the driver´s seat.

In addition to driven polder shares, the manufacturers are offering more and more hydraulically driven wheel lifting shares with a pendulum suspension. The fact that these shares are self-guiding results from the advance drive and lateral mobility. In order to

Fig. 1: With Field-Nav, Müller Elektronik offers a combined road and field navigation system which guides the driver reliably to the next beet clamp (company photo).

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Keywords

Trends of development, sugar beet harvesting, topping and lifting, cleaning, loading

Fig. 2: View of the cabin of the new euro-Maus 3 fro, Ropa with a large, clearly-structured terminal

save fuel, some manufacturers adopted so-called automotive driving, which allows the engine speed and, hence, fuel consumption to be reduced. The fuel consumption of the large self-propelled harvesting machines ranges between 30 and 50 l/ha. Self-propelled harvesters have hopper capacities between 15 m^3 and 40 m^3. 6-row tankers with a smaller hopper capacity require transport units which allow for overloading on the field. The advantage of these systems is that overloading enables machine weights to be reduced. However, the number of passes in relation to the area increases.

Beet logistics

Costs can also be reduced during the loading and the transport of sugar beet. In the future, the duration of beet campaigns in Germany is expected to be extended to up to 100 days. Then, self-propelled cleaner-loaders should reach a loading capacity of 150000 to 180000 t. In order to avoid standstill times of the transport vehicles at the self-propelled cleaner-loaders, at least two loading mice should be combined into an organizational unit. In order to optimize beet haulage, software programs for the planning of the sugar beet harvest, haulage planning, and beet care will be used more intensively in the future. Data networking between all those involved in the sugar beet harvest and logistics provides beet farmers, harvester drivers, delivery cooperatives, and clamp caretakers with information about process optimization. Another step in the direction of cost reduction in sugar beet cultivation is the extension of the opening hours of the sugar factories, which would allow beet to be delivered 24 hours a day and seven days per week. The use of dump trucks also allows sugar beet delivery to the factory to be optimized. If haulage and delivery times are extended, storage times at the field´s edge can be shortened. This increases the sugar yield during processing. In this case, less beet is required for the same sugar quantity. In addition, the processing of the beet washing water is less work-intensive, which reduces the costs of beet production.

Conclusions

The development of technology for sugar beet harvesting and transport is characterized by the comprehensive use of electronics for control functions. The goal is to reduce the workload on the machine operator and to increase work quality. If possible, the load of the harvesters rests on soil-protecting chassis. Structural change in the sugar industry has a significant effect on the organization of the beet harvest and the logistics of beet haulage. The application of the most modern information technology enables the harvest to be planned precisely. Moreover, beet clamps are established only at locations which provide easy access to public roads, and one tries to exploit the maximum capacity of the transport units. While 15 years ago a cleaner-loader had an annual capacity of 60000 t, these machines are expected to load 150000 to 200000 t of beet per campaign in the future. This means that beet logistics requires great expertise so that beet cultivation and processing will still be able to provide profits in the future despite sinking yields.

Fig. 3 and 4: Reduced to the minimum: The drawn high-capacity beet-top mulcher BM330 (left) and the 6-row drawn beet harvester Rootster 604 with a 4-t overloading hopper from Grimme, which were specially developed for the conditions in Eastern Europe

(photo: Dr. Metzner)