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Trends in potato machinery

Presented here are important technical trends in potato machinery as reflected in the machinery and equipment program at Agritechnica 2001. The preview cannot take the place of a visit to the event and instead only offers preliminary information and does not claim to be comprehensive.

In potato overproduction years farmers are encouraged to rethink production and marketing methods. Such mainly involve critical examinations of production costs and the striving for better quality closer to market demands. Alongside growing the crop, the mechanisation chain from field through into store has central importance in such aims.

Based on bionics: Marathon spoon system from Cramer

Planting and crop care

The advantages of reduced cultivations known from other rowcrops have also led to different applications in potato growing. Large-scale trials over several years have indicated no yield penalty where deeper ground loosening is applied. Standard planters can be equipped with special shares or extra disc coulters to help planting where there's more trash in the soil.

And destoning has been tried out over large areas by farms on a wide range of soils in the last two years. The system here involved forming beds with an around 30 cm deep side deep furrow. The crumb-depth layer is then lifted by two-row stone collector. Stones and clods are separated on the webbing before being dumped by lateral belt into the furrow of the subsequent, still-unseparated, bed. Planting then takes place with two-row machines adapted for this procedure with shares or drill-forming plates forming the rows. The system aims at improving the plant growth sphere through looser and compaction-free soil and improving subsequent harvest performance as well as tuber quality.

Standard machinery unites planting and row forming for reduced production costs and taking advantage of the suitable soil conditions at planting. On light soils, however, there's often not enough loose soil for final drill formation and additional tines or single shares are needed between covering discs and drill shares. Where drill rotavators are combined with planters there must be enough distance between the actual planting organs and the rotavator, so that the tuber planting is not affected by the soil thrown forward by the rotary action. Using special guiding plates allows the optimum working speed of the drill rotavator to approach that of the planting operation.

A variety of drill forming plates are available for use with pulled drill forming implements as well as drill rotavators. To the background of steadily increasing tuber yields, ever-increasing drill volumes are aimed for which, with the same row widths being retained, are mainly achieved through wider drill crowns. This, however, reduces the soil cover over the tubers so that the seed potatoes have to be planted deeper into the flattened, broader drills. This can affect the harvesting operation, especially under wet growing and lifting conditions and in heavy soils.

Alongside equipment for the main combination of mechanical and chemical crop care, also available are a wide variety of implements for cultivation operations only. These can be dedicated single implements or feature an universal frame with interchangeable weeding tools. The way in which the latter work depends on the form of weeding, e.g., pulling, cutting or burying the plants.

Harvest

Because of farm size, local conditions and, in-part, marketing requirements, the single row harvester still dominates in Germany. The flexible combination of a variety of construction modules allows extensive adaptation to individual farm requirements, offer-

Grimme presents the first four-row SF 300-15 bunker potato harvester and has been awarded a DLG gold medal for the innovative technology involved

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Keywords

Trends of development, potato cultivation technology, harvesters, storage and processing, soil separation and planting

ing good conditions for achieving high harvest performance and tuber quality. With the concentration of potato growing on fewer but larger farms there has been in the last years more emphasis on changing to multi-row harvesting. This aspect has seen two-row harvesters with side lifters and active separation systems moving into the foreground. Nowadays, such machines offer similar lifting performance and tuber quality to the single row machines. Additionally, the tried and tested procedure of bunker harvester, static trailer on the headland and loose transport of the potatoes has been retained during this change.

Where there's not a lot of soil surface trash, or the soil has been destined, the simple two-row harvester-loader is a cost-effective alternative to the bunker machines. Additionally, the separation systems are claimed to be better in the former with easier substitution making them suitable for regions with a variety of soil types. Through direct loading onto the transport vehicle alongside, turning and transfer times are reduced with resulting increased lifting performance. However in practice this advantage is repeatedly limited through the very tight intermeshing of the chain components harvesting, transport and storing.

The performance increases associated with the change from pulled machines to self-propelled two-row harvesters are no longer so clearly noticeable in that the self-propelled machines nowadays mostly still use lifting and separation systems based on the pulled versions. Here, better area performance is achieved only through reduced time in turning and a still better matching of the mainly hydraulically driven aggregates to the harvesting conditions. In addition, the self-propelled harvester-loader and bunker machines can offer better operational reliability under wet harvesting conditions the importance of which increases greatly in line with soil quality and required growing time for the potatoes.

On the Grimme Duo extension belts an airbag landing system protects potatoes during transfer

Intensive development work is presently being done on four-row self-propelled harvesters. Alongside the pure harvester-loader there are now machines available with larger buffer bunkers whilst, with the four-row bunker harvesters there is still a large amount of practical experience to be assimilated. Especially in association with a very large dimensioned bunker, the advantages of the self-propelled harvester offer a lot in terms of practical farming requirements, in large scale operation as well as others: the efficient separation of the actual lifting and the transport of the tubers or also the sustainable decrease of vehicle loading time on the field. This creates the conditions for very high area performance as well as simplification of transport and storage organisation.

Storage and preparation

On top of the increasing harvester performances, new equipment offering better performance has come to the storage sector. On-farm, mobile storage chains of tipping table plus desoiler in-part also with pre-sorter, telescopic elevators and store fillers or crate fillers are mainly applied. Pre-sorting allows the storage area to be more effectively used for market ware and the chats or oversized tubers can be channelled for specialised usage. This means, however, that the potatoes are subject to more mechanical stress through sorting, reflected during the spring dressing in higher store losses and a stronger tendency to black spot.

Alongside the main system of loose storage, potatoes in Germany are increasingly stored in large crates with 1 to 5 t capacities. Forced ventilation means that loose storage in boxes or big heaps is very reliable of storage which, because of the efficiencies of scale, offers cost advantages too. The forced ventilation of large crates also offers a comparable storage security. The reduced requirements in the filling and management of large crate stores with space ventilation have, however, encouraged many farmers to accept the limited acclimatisation possibilities of such storage. Especially at beginning of storage, space ventilation shows less efficacy during drying and cooling of the tubers. Another drawback is that it is difficult with this system to react to batch-specific differences. With the increased application of mechanised cool stores, especially in relationship to still further increases in quality demands, the aim is for more independence from the usually limited role of ventilation with outside air and with this also a balancing of system-linked limitations.

The range of machinery required in Germany for grading the potatoes to market standard has to be especially broad. Demand exists for simple and cheap systems but also for machines with very large performance capacities and high functionality. With high performance models especially, electronic control and regulation components take over an increasing number of functions to optimise performance and work quality. For economic and technical reasons the application of electronic sorting and grading automatics for potatoes has not reached expected levels. The further intensive development work in this area underlines, however, the expected importance of these technological solutions.