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Trends in Potato Technology

In this contribution, important trends in potato cultivation are presented, which will manifest themselves in the machinery- and implement programme shown at the Agritechnica 2003. This preview only provides pre-information and cannot replace a trade fair visit. Completeness is not aimed for.

Due to good harvests in most countries of Western Europe, the potato prices, which are largely uninfluenced by government intervention, were at a level which hardly covered the production costs in the past two years. This affects farmers' willingness to invest while inducing further changes on the side of the manufacturers. Therefore, new technical solutions are assessed to an even greater extent under the viewpoints of profitability and potato quality.

Storage and Processing

The increased quality requirements accelerated the completion of the ventilation system with a weather-independent cooling machine during storage. In autumn, this allows the stored potatoes to be cooled down to the planned optimal storage temperature and subsequently enables them to be stored at low losses until they are marketed. This manifests itself in better consumption quality of food- and processing potatoes and greater vitality of seed potatoes. In addition, common control of the outdoor air and the cooling system allows the running times of the cooling units to be optimized. At the same time, the capacity of the ventilation control processors is growing, which allows for the differentiated control of individual store areas based on temperature, humidity, bio-impedance, and CO_2 content. Moreover, many devices offer the possibility of operation and data storage at the farm PC.

With regard to storage in pallet boxes, a trend towards larger boxes with a capacity of 1.5 to 2 t is recorded. So far, however, grown potato farms have only rarely made the direct transition to even larger boxes (3 to 4 t) because the large size of these boxes requires the purchase of new filling- and unloading machinery as well as a new forklift along with constructional alterations in some cases. In loose storage, rear unloading, which cannot only be combined with different tools for soil removal and pre-grading, but also directly with a box filler, is predominant.

In large grading lines, the great percentage of washed food potatoes facilitates the initial permanent use of electronic grading machines, which are able to classify the potato flow into up to six fractions based on different colour values as well as shape, weight, and square measurements. At the same time, the development of electronic size graders is continuing. For the packing of food potatoes in small packs, more and more efficient electronically controlled weighing systems with different filling- and closing devices are available. Product information on the bags is given more and more attention. As a result, improved printers and a growing number of net bags with a wide, printable film package band are used.

For the further handling of seed- or food potatoes packed in 25 or 50 kg bags, a wide range of automatic palletting machines is available. In addition, big bags, some of which can be filled using box fillers or special big bag fillers, are gaining increasing importance as transport units. For processing potatoes, which are generally loaded loosely, the buyers are showing a growing demand for pre-washing of the potato lots on the farms. As a result, initial washing- and grading units suitable for road transport are offered.

Cultivation and Care

In the predominant conventional de-stoning techniques, better harvesting conditions always required the stones to be hauled from the field. In the bed separation technique, however, which is being employed more and more often, admixtures are deposited as windrows in the furrows. Therefore, this technique is also suitable for locations with cloddy soils or an increased percentage of small stones which are difficult to separate. Moreover, the soil cultivation connected with bed separation provides loose soil with good emergence- and growth conditions for the potatoes. In addition to the two-row mechanization line consisting of a bed former, a separator, and a planting machine, a six-row variant is available for large fields.

Development tendencies in planting technology are improved scooping reliability, in particular for large seed potatoes, and larger

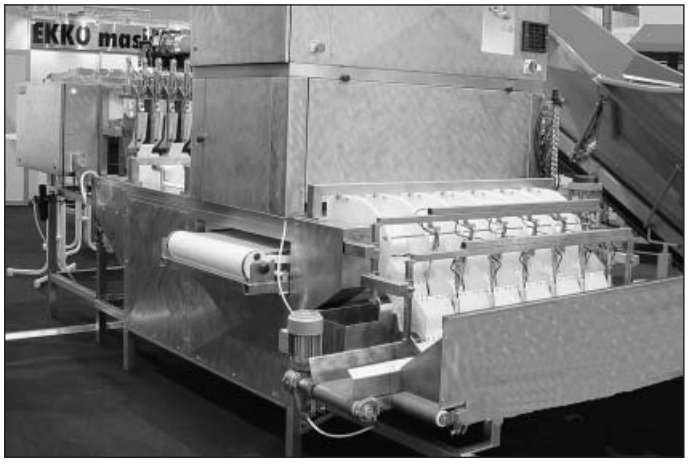

Fig. 1: First electronic automatic picking-out machines are used for quality-grading of washed potatoes

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Keywords

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Fig. 2: The combination of potatoe planters and ridging implements saves working time

area capacity resulting from the use of drawn four-row units with larger hopper capacities or transition to six- and eight-row planting machines. However, the comprehensive utilization of the capacity potential of both solutions requires an adapted logistics concept and in particular quick filling of the planters at the field's edge. On sloped fields, the lower directional stability of drawn planters must be taken into consideration, which makes the development or adaptation of suitable guiding systems seem useful. In addition, only some of the drawn planting machines for road transport feature their own drill transport system or a solution which allows the outer planting units to be folded in.

From the viewpoint of a combination of work steps, the manufacturers accelerated the development of planting machines with ridging tools for the shaping of a complete terminal ridge. The combination of a planter with a driven rotary cultivator guarantees even ridging even under changing conditions. On light and medium soils, cage rollers or shaping boards along with ridgers are tested as additional runners which follow the planting units as ridging tools in order to facilitate adaptation to the conditions at the individual locations.

For ridgers and rotary cultivators, different shaping boards are available which enable ridges to be shaped that meet the requirements of the location and the kind of utilization. In addition, extended boards in the crest- and flank area guarantee ridging even at higher driving speeds. For the exclusively mechanical care of potatoes, implements for use before and after emergence are available, which range from the long-known chain harrow, the roller-type hand hoe, and shares guided by sensing wheels to special ridgers which remove the weeds from the ridge flanks.

Harvest

Soil and soil cultivation, weather conditions, and the kind of utilization of the potatoes lead to harvesting conditions which differ significantly from one region and in some cases even from one farm to the next. Especially the internationally oriented manufacturers have adapted to these conditions by offering numerous equipment variants for their individual series, while other manufacturers only sell certain types, such as unmanned two-row harvesters or self-propelled machines for a special profile of applications.

In one-row bunker-hopper harvesters, the development is primarily focusing on detail improvements aimed at an increase in harvesting capacity and -quality. The first manufacturers of two-row bunker-hopper harvesters are expected to increase the capacity of their conveyor-belt hoppers, which is currently approximately 6 t, so that loading onto transport vehicles is only necessary at one edge of the field even if the fields are more than 500 m long. At the same time, a wider range of tyres allowed soil pressure to be reduced. Bed separation results in larger digging depths and generally also larger row widths, which facilitate harvesting due to the transition to designs featuring wider sieve canals. In addition, the cost-intensive admixture separation systems of the bunker-hopper harvesters can be dispensed with if the harvesters are exclusively used on separated areas.

A wide range of separating rollers is available for the separation of admixtures in unmanned two-row harvesters. The modular design of the machines facilitates the change of the separating units. Many manufacturers also offer a bypass solution for their axial roller separators in order to be able to react to changing harvesting conditions within a field more flexibly while in particular avoiding damage to the tubers. In these systems, the axial rollers are covered by star rollers which can be swivelled in during the ride or a shiftable sieve chain over different lengths. Under dry harvesting conditions, this enables virtually all contact between the tuber flow and the axial rollers, which are likely to cause damage under these conditions, to be avoided. The use of ever larger and taller transport vehicles results in larger required loading heights and -reaches of the unmanned harvesters. At the same time, greater sensitivity has led to the use of damage-reducing loading solutions, such as fall breakers, fall sails, or floor padding, in all harvesting systems including transport vehicles.

In recent years, many manufacturers have intensified the development of self-propelled two- and four-row harvesting machines. Apart from a basic demand in certain regions generally characterized by difficult harvesting conditions, the demand is more weather-dependent. For this reason, the manufacturers are trying to limit the additional expenses caused by self-propelled machines by using as many units from drawn machines as possible and to improve the capacity- and quality-oriented adaptation of the machines with the aid of fully hydraulic drives. The two manufacturers of self-propelled four-row bunker-hopper harvesters profited from the experiences of the last two harvesting campaigns for the optimization of individual units and an improvement in built-in harvest-management systems. In addition, accompanying studies enabled the logistic conditions for self-propelled potato harvesters to be determined more precisely and the effects on the harvesting costs to be established in a practice-oriented manner.

Fig. 3: Self-propelled four-row potato harvesters require adapted logistic concepts

Fotos Dr. Peters