Media Service

DLG e.V., Eschborner Landstrasse 122, 60489 Frankfurt/Main, Germany
Tel: +49(0)69/24788-410; Fax: -112; Email: m.conlong@dlg.org; Web: www.dlg.org

Trends in potato technology

Article by Dr. Rolf Peters, Visselhövede

(DLG). The consequences of climate change, after two consecutive drought years in Germany, have provided a focus for discussions among growers and equipment manufacturers operating in the potato sector. Here, new technological developments – from improved components in machinery to digitisation – can contribute to getting future-oriented solutions implemented more quickly.

Harvesting

Haulm killing represents an important element in the production of quality and saleable potatoes, and results in the highest possible proportion of marketable product from the harvested crop. Following the expiration of the permit for the chemical diquat, this step, which also contributes to a reduction of food waste, is faced with far-reaching changes. The interest in combined solutions for this process, in which a haulm topper for physical haulm reduction assumes a key position, is growing in practice. The challenges here are primarily good, uniform flailing of the foliage and, where possible, their complete deposition in the furrows. Increases in flailing productivity, primarily via increased machine working widths, are also desirable. This can then be followed by chemical or thermal desiccation of the potato plants to ensure the termination of growth. Until now, the application focus for flame weeding devices was primarily on preliminary weed control. This means that several practical modifications will be required to use them for potato haulm reduction to ensure the plant material is exposed to the heat for enough time, particularly where longer stems remain.

In tests and initial practical applications, the use of electric current for drying potato foliage has been tested successfully. However, additional experience is still required to optimise the variety- and location-specific adjustments on the machine for haulm killing. Haulm pulling, in which the flailed stem is pulled out of the furrow by rotating bladders or horizontally rotating rubber belts, is currently experiencing a certain renaissance. The successful separation of the stem from the tubers is supported by a uniform ridge structure, sufficient soil coverage of the tubers themselves and upright remaining stems. In some cases, the machines can also be combined with blades for cutting roots and a following band spraying system.

Due to the wide range of farm sizes that are found in Europe, many different single-row potato harvesters can be found, from several performance classes and with various modes of operation. This strong differentiation can also be seen among two-row bunker harvesters, where the lighter series newly introduced in recent years have been particularly well received. Their balanced price-performance ratio accommodates larger potato farming operations during the next step in their growth. Parallel to this, developments of larger two-row machines are in progress which, with a bunker capacity of 8.0-9.0t, comply with requests from the potato sectors for a further increase in performance. However, compliance with the road transport width of 3.30m and the need to ensure the harvester’s wheels remain soil friendly become design challenges.

In contrast, at least in Germany, the move towards self-propelled potato harvesters remains relatively slow, as so far it has only been possible to harmonise the additional costs and

performance on a few farms. With four-row self-propelled systems, machines with both a small temporary bunker and classic bunker harvesters with up to a 15t capacity are available. These machines are more likely to be found in locations with high concentrations of potato production, to maximise their utilisation and ensure they are economically viable.

Logistics

With increasing harvest performance comes the requirement for the downstream logistics chain to also increase. Here, it is not only a matter of optimising systems for moving the potatoes to storage or processing, but also the traceability of the flow of goods from the field to the consumer. Although yield-recording mapping systems based on belt scales are offered for the harvesting machines, the value of this information is not fully realised until the tare components of the crop, including stones and clods, is known. In addition, detection of the size breakdown of the harvested crop during harvesting or storage is also desirable in order to further improve the use of individual batches of potatoes. Open or manufacturer-dependent data exchange platforms are being established to store this information for use along the process chain. These will make it easier to draw conclusions about the success of individual production-related measures, and therefore contribute to even more resource-efficient farming. The basic advantages of digital information flows can only really be used in practice if the summary and initial evaluation of the diverse data sources run on programs in the background, and the farm manager or consultant can concentrate on the major results of the evaluation.

A large number of solutions for individual farms have developed for removing the harvested potatoes to the storage area. Due to the increasing distances within farms, high-performance field-loading stations, on which the harvested crops are cleaned of loose earth and, if necessary, can also be manually pre-sorted, are attracting more interest. Load transfer vehicles result in a considerable increase in performance, but farmers remain reluctant to adopt them, despite the fact many harvesters now feature load transfer bunkers, because they are concerned about the additional drop steps faced by the potatoes and the related quality risks.

Storage

The continually growing demand for locally produced foodstuffs is also reflected in an increasing demand for potatoes from long-term storage. For table potatoes, a quality-stabilising storage climate can be achieved, mostly through the use of mechanical refrigeration systems, increasingly using climate-neutral refrigerants. With the construction of forced-air, large-crate warehouses, the efficiency of heat dissipation is also increased, and batch-specific climate control is simplified. Following the failed extension of the permit for previously dominant sprouting suppressant chlorpropham, the ambient storage required for potatoes for processing is facing considerable challenges. Technically, this transition to newer, highly volatile sprout suppressants can be supported through the use of higher-performance ventilation systems. These can dissipate the respiration heat that results during potato storage in a shorter time, therefore limiting the fresh-air operation to a minimum, which promotes the loss of active ingredients.

Powerful storage computers are available for the implementation of these increasingly complex ventilation strategies. With their modular design, they can quickly be expanded for new tasks and sensors. In addition to the advancing visualisation of storage information on the device itself, secure connection to farms' IT systems and mobile access via smartphones have considerably simplified the operation and monitoring of storage processes. At the same time, it is possible, for example, to also integrate the storage removal results more easily in the future field and/or variety-related cultivation planning. With optional modules for energy management, the warehouse computer also offers more options for improving the efficiency of potato storage.

Processing

The increasing shortages of workers for agricultural work is affecting the relatively work-intensive potato farming sector, leading to problems in the areas of harvesting and processing in particular. Machines with different detection principles and in various performance classes have been

available with electronic separation systems for many years. Optical-electronic quality sorting of unwashed potatoes is now being used by the first farmers for table and seed potatoes. However, the limits of these systems also become apparent in practical operation, as the optical variability of the tuber surface is considerably greater than with washed potatoes, for which the separating parameters can be specified more easily and reliably. In addition to quality sorting, electronic size sorting is also slowly attracting greater interest. It is used for sorting the raw product more appropriately for individual market participants, while at the same time minimising the loss ratio. For a long-term batch-management, it would also be very helpful if detailed information on the size composition of the harvested crops were already available when putting the potatoes into storage.

Cultivation and planting

In future, the information collected and processed in data management systems will enable an even better characterisation of individual fields when planning how they will be cultivated. When selecting the distance between seed tubers at planting, farms initially base their choices not only on the variety and the intended market, but can now also vary this value for different parts of the field, with the help of hydraulic drives on planting devices, depending on soil quality. In conjunction with closely calibrated seed lots, a more-uniform development of the individual plants, and with it the development of a more uniform harvested crop, is targeted.

The more frequent occurrence of extreme weather conditions linked to climate change also results in a greater focus on the soil structure in potato farming. A structurally stable, non-compacted soil not only encourages growth, but also favours water retention in dry phases and water absorption during heavy rainfall. Until a closed leaf canopy has been formed, sustained rain can lead to extensive soil erosion, which can be effectively confronted by forming lateral troughs in the furrows. The manufacturers of planting and potato management implements offer various follow-up tools for this purpose with adjustable work intensity.

With the reduction of active crop protection ingredients also to be expected to be reduced, mechanical weed control will become increasingly important again in the medium-term. Through the increasing combination of planting and final ridge formation in one work step, future machine developments can primarily concentrate on weed control, whereby the top of the ridge remains a critical area in early post-emergence. With the high levels of accuracy of ridging completed by RTK-controlled machinery, working widths that go beyond that of the planting machine, and with it higher work outputs, can also be realised. Implements for use on wider seed bed systems are still lacking, especially as the crop canopies close later due to their larger row spacing, therefore offering weeds better development possibilities for longer.