Martin Geyer and Martina Jakob, Potsdam-Bornim, and Hans-Reinhard Rohlfing, Oppenheim

Evaluation of harvest aids for asparagus

Asparagus harvesting is very labour intensive. Within a project financially supported by the Federal Ministry of Consumer Protection, Nutrition and Agriculture a three-year labour management investigation was begun in the 2001 season into the different types of harvest aid for white asparagus. Already in the first year it became apparent that objective comparisons within the investigation were being made very difficult because the harvesting performance was influenced by a large number of external factors.

White asparagus is currently grown on some 13 000 ha in Germany. Increasingly, black/white non-transparent plastic coverings are used for better control of yield. Using the plastic allows once per day harvesting, even possibly once per two days. This approach means there are more stalks per running metre, the harvest is more profitable. Opening and closing the plastic sheets over the furrows causes, however, increased labour demands during harvest. Thus new methods must be developed and selected for optimum and cost-efficient harvesting of the asparagus within this system. This has encouraged several machinery manufacturers to develop harvesting aids. A variety of implements are offered with a range of mechanisation intensity from lifting and replacing the plastic mulch, transporting the asparagus baskets, caring for the furrows, through to transporting the „steckers". Aim of the research project is the development and application of objective evaluation criteria according to which the different harvesting methods can be classified.

Harvesting aids

Part-mechanised harvesting aids are offered in various row-number versions and with differing equipment. Much is available in the market, from pulled single-row „push wagons", three-row self-propelled machines, right through to five-row systems (*fig. 1*). In the Netherlands systems are being applied which lift up to 12 rows of plastic at one time. Drive is mainly from internal combustion engine. Only two machines have the substantially quieter electric drive (*table 1*).

Individual implements work with central machine operators who „steck" in a sitting position. Seating positions are very different and in part still require considerable improvement.

From an ergonomical point of view it is very advantageous to apply such harvest aids. The stresses on the workforce are reduced by simple harvesting aids without seating possibilities even with the transport of the asparagus stalks out of the filed and with manoeuvring the plastic sheets. Seating possibilities offer an additional saving of energy for the labour force and, with that, a lightening of the workload.

The price for a harvesting aid begins at around 1200,- € for the pulled single-row implement and stretches to over 20000,- € for a three-row machine equipped with a high standard of technology. Thus fixed costs per row can run between 1250,- and 6500,- €.

Evaluating the method

An objective evaluation of the different harvesting methods turned out to be very difficult. In 2001 only a selection of machines could be tested. Up until now, however, it has not been possible to achieve an objective result regarding the performance capacity of individual methods because the external factors of influence were very large. Thus, aimed for performance on the implements depended more strongly on factors such as growth density of asparagus in the drill, motivation of „steckers" or the „stecking" method used, whether blind or with free „stecking", than it did on type of harvesting aid (*table 2*).

Fig. 1: 5-row harvester for white asparagus

Dr. Martin Geyer is manager of the department „Engineering in Horticulture" in the Institute for Agricultural Engineering Bornim e.V. (ATB), Max-Eyth-Allee 100, 14469 Potsdam-Bornim (scientific director: Prof. Dr.-Ing. J. Zaske); Dipl.-Ing. agr. Martina Jakob is a member of the scientific staff in the department; e-mail: *geyer@atb-potsdam.de*
Hans-Reinhard Rohlfing is specialist in labour management at the State Education and Research Institute for Agriculture, Viticulture and Horticulture (SLVA) in Oppenheim.
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Table 1: Various possible outfits of asparagus harvesters; (el.): electrical driven

Row number	Drive	Seating	Manufacturer
1	-	-	Firmenich
1	+ (el.)	-	BoerenBond
1	+	+/-	Böckenhoff
1	+	2	Böckenhoff,Googol
1,3, (5)	+	1	Kügel
2	+ (el.)	-	Engel
3	+	1	Schröder
(1), 3, 5	+	-	Kügel, Prinz (1,3)
5	+	-	Hester

Table 2: Examples of factors effecting the performance of asparagus harvesting

Men	„Stecking" method, motivation, performance degree, weather, sex, instruction, degree of practice
Asparagus-crop	Variety, condition, age, number of shoots/- density, soil type and moisture content
Machine	Type (pulled or self-propelled, one or multi-rowed), working position (sitting, standing, one or multi-rowed, crate configuration, plastic mulch removal length), with or without tidying of the furrow

Harvesting capacity

Figure 2 indicates an example of achievable harvesting performance where, on the one hand, harvesting capacity was demonstrated to depend on growth density and, on the other, a great variability in performance was shown. The investigations took place in different fields and on different days. Performance was lowest with pure manual harvesting at around 240 asparagus stalk/hour. However, despite higher growth density part mechanisation in two cases barely achieved a higher „stecking" rate. The maximum performance measured during the 2001 harvest with harvesting aids lay by over 500 stalks per hour with a growth density of 1.2 asparagus/m. This certainly meant that a very large potential lies in the partly mechanised approach to asparagus harvest – where the system is optimally integrated with the farming procedure.

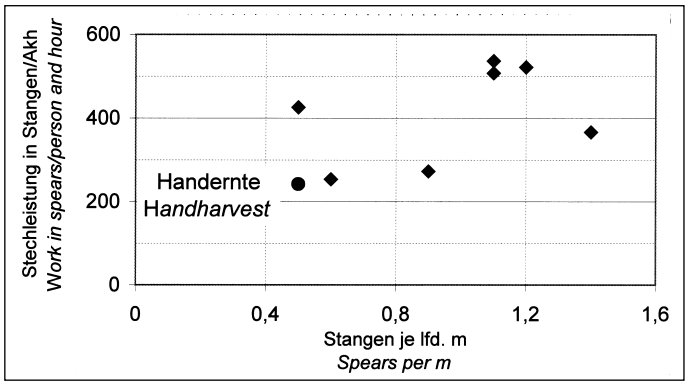

Fig. 2: Harvested spears depending on density of spears with different harvesters

Outlook

Asparagus production under plastic has still room for expansion. With increasing labour costs and sinking prices for asparagus all methods for the simplifying of hand harvesting must be exploited. This starts off with the introduction of the most efficient „stecking" method and the mechanisation of all technologically practical and applicable manual accompanying work. Certainly further developments are still necessary until growing systems, labour planning and harvesting aids are matched optimally with one another.

Teleservice for farm machinery

In the forefront of the VDI-MEG Agricultural Engineering Congress a colloquium, „Teleservice for farm machinery – technical and organisational strategies", was held November 8, 2001 at the Institute for Agricultural Machinery and Fluid Technology, TU Brunswick. The theme was not without its explosive qualities while it appears possible that teleservice would mean a completely new definition of the present manufacturer-dealer-customer relationship.

What lies behind teleservice? It's long term aim is the early identification, avoidance, or rapid repair of breakdowns. For this, a large number of sensors are integrated into the machine. These enable the monitoring of important functions and wear situations. The information is then relayed further by radio. In a case of damage the site is immediately localised. Electro-hydraulic problems, for instance, could be dealt with mainly by remote control alone. Teleservice is especially interesting for large, expensive, machinery which is mostly distributed thinly over the countryside and with which downtime for repairs is comparatively expensive.

The system gives manufacturers a good insight into the weaknesses in their machines and the susceptibility of individual components. The calculation of guarantee and rebate cases is thereby easier. It is easy to recheck whether the machine owner is entitled to rebate, repair token or repair-cost-sharing system. Additionally service costs could be reduced, in Brunswick there was talk of saving potentials of up to 25%.

But with all the advantages there also remain a whole row of unanswered questions. Who is the owner of the data from such „transparent" machinery, the machine owner or the manufacturer? What about data security (the keeping secret and eventual erasing of information)? Will the manufacturer pay for teleservice through internal rationalisations or will the customer get landed with the extra costs? Will teleservice lead to the machinery dealer being left out in the cold and direct servicing initiated straight from the factory?

So far there have been no legal judgements relating to teleservice. Because of this, R.A. Fischer from Schindler-Aufzüge recommended that teleservice contracts be drawn-up in which the vendor's responsibilities, recompense, data protection, guarantee and warranty, are all exactly regulated.

In the subsequent podium discussion „Teleservice from the point of view of the user" there was, unfortunately, only time for short statements by the discussion participants. The around 150 attendants at this colloquium had without a doubt still a large number of questions on this new and explosive theme. They were, however, richly rewarded through the successful reception following the event to mark the occasion of the 80th birthday of Prof. Dr.-Ing. H.-J. Matthies. With a cold buffet and fresh pils, discussion continued deep into the night and for sure not only about teleservice.

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