Reducing processing time, sorting and packaging of agricultural products

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Abstract. This article examines the reduction in production time for agricultural products by automating production processes. A comparison was made of the amount of time spent at various stages of agricultural production. For comparison, the stages of processing, sorting and packaging were selected. The comparison was carried out using data from five different agricultural producers working with a certain type of agricultural product. The results obtained allow us to assess the level of reduction in production time for agricultural products when automating production processes. The results of the study can be used in developing programs for the development of agricultural enterprises and conducting research in this area of agriculture.

1 Introduction

New technologies are increasingly changing and optimizing various areas of human activity, incl. communications [1, 2], medicine [3, 4], energy [5], information technology and management in technical systems [6–12]. Optimization of production processes in agriculture can also be achieved through the introduction of new technologies that automate production processes, which will lead to a reduction in the production time of agricultural products. Reducing the production time of agricultural products is the most important factor in reducing production costs and increasing the competitiveness of agricultural enterprises, which is especially important in an increasingly competitive environment. One of the ways to reduce the production time of agricultural products is the introduction of a variety of new technologies at different production stages.

2 Materials and Methods

To assess the impact of automation of various stages of production on reducing the time of production of agricultural products, a comparison was made of the amount of time spent at various stages of production of agricultural products. The following main stages were selected for comparison:

- treatment;
- sorting;

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- packaging

The comparison was carried out based on data obtained from five different agricultural enterprises working with a certain type of agricultural product. The comparison was carried out using the traditional method of performing the compared production stages and the automated one. The results obtained were recorded using a timer.

The measurement was carried out when processing a batch of tomatoes weighing 100 kg.

To collect and process data obtained from the analysis of reducing the production time of agricultural products, various methods were considered [1–18].

3 Results and Discussion

3.1 Results of the analysis of reducing the production time of agricultural products

3.1.1 Measuring the reduction in agricultural production time (processing stage)

The processing stage includes cleaning the agricultural products received for processing from excess components. The result of measuring the reduction in production time of agricultural products at the processing stage is presented in Figure 1. The result of measuring time is the average value for five groups of measurements performed.

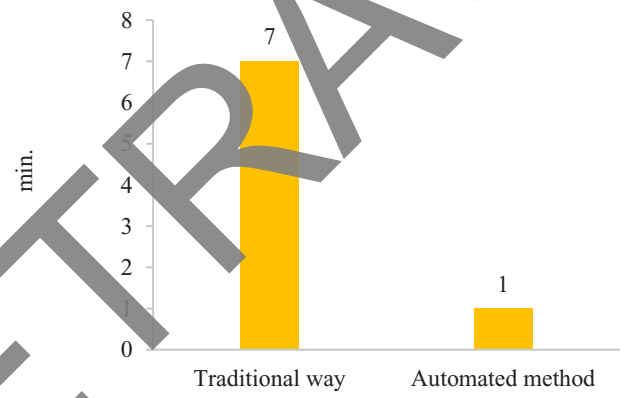

Fig. 1. The result of measuring the reduction in production time of agricultural products (processing stage).

3.1.2 Measuring the reduction in production time of agricultural products (sorting stage)

The result of measuring the reduction in production time of agricultural products at the sorting stage is presented in Figure 2. The result of measuring time is the average value for five groups of measurements performed.

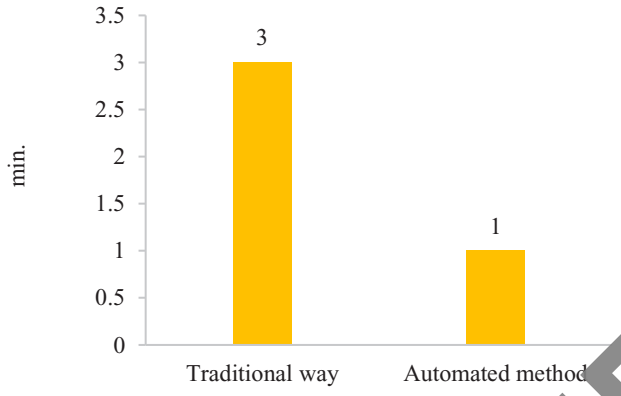

Fig. 2. The result of measuring the reduction in production time of agricultural products (sorting stage).

3.1.3 Measuring the reduction in production time of agricultural products (packing stage)

The result of measuring the reduction in production time of agricultural products at the packaging stage is presented in Figure 3. The result of measuring time is the average value for five groups of measurements performed.

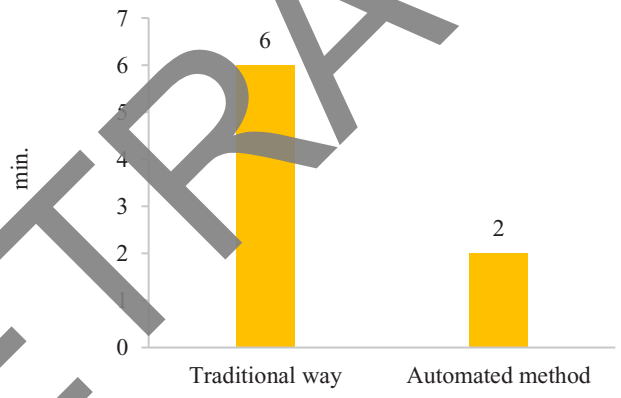

Fig. 3. The result of measuring the reduction in production time of agricultural products (packing stage).

The assessment of data distribution in the results of measuring the reduction in the time of production of agricultural products was carried out according to formula 1 [19–21]:

$$r_s = 1 - \frac{6\sum d^2}{n(n^2-1)} \quad (1)$$

3.2 Discussion

The results of the influence of automation on reducing the production time of agricultural products, obtained from measuring the time it takes for a batch of agricultural products to pass through the stages of processing, sorting and packaging, allow us to conclude that

there is an actual reduction in the production time of agricultural products with the introduction of automation (Table 1).

Table 1. Measurement results.

Stages	Agricultural production time	
	Traditional method	Automated method
Processing stage	7	1
Sorting stage	3	1
Packing stage	6	2

The average indicator of the results of measuring the time of production of agricultural products using traditional and automated methods is shown in Figure 4.

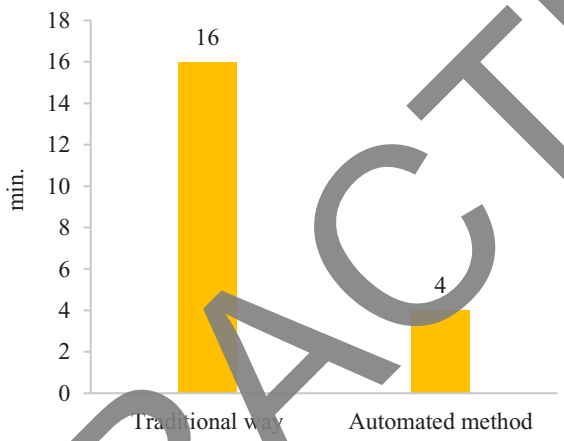

Fig. 4. Average indicator of time of production of agricultural products.

From the data obtained (Table 1 and Figure 4) it follows that the actual reduction in the production time of agricultural products with automation is (by stages):

- processing – 6 min.;
- sorting – 2 min.;
- packaging – 4 min.

4 Conclusions

The conducted research provides data regarding the reduction of production time for agricultural products when automating production processes. A comparison was made of the amount of time spent at various stages of agricultural production. For comparison, the stages of processing, sorting and packaging were selected. The comparison was carried out using data from five different agricultural producers working with a certain type of agricultural product. The results obtained allow us to assess the level of reduction in production time for agricultural products when automating production processes. From the data obtained it follows that the reduction in the production time of agricultural products with automation is: processing – 6 min.; sorting – 2 min.; packaging – 4 min. These results confirm that automation has an impact on reducing the production time of agricultural products. The results of the study can be used in developing programs for the development of agricultural enterprises and conducting research in this area of agriculture.

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