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Comparing Acceptability of Three (ICM, SAHAND, New Holland) Combine Brands in West Azerbaijan Province of Iran

Reza Kheyri*, Reza Abdi

Department of Biosystems Engineering, Faculty of Agriculture, University of Tabriz, Tabriz, Iran

Corresponding Author:** ***Reza Kheyri, *Department of Biosystems Engineering, Faculty of Agriculture, University of Tabriz, Tabriz, Iran.*

Abstract

Due to existing the numerous harvesting machine brands in the study area, it was logical to compare them with each other and report the findings in order to help the farmers on the way to choose the most appropriate machine. Therefore, in this research three combine brands were compared in west Azerbaijan province of Iran. The used method for this aim was comparative analysis with a random survey among the farmers. Three work quality, cost per unit and performance indicators were presented in a questionnaire and the participants' answers organized in that. By comparing the data in apart charts, each indicator's rank was clearly shown. In addition, to have an integrated comparison, the three brands were compared in a comparative chart to illustrate the differences. It finally highlights, SAHAND brand got above 50 scores in all indicators. ICM brand in cost per unit indicator was more acceptable than the other brands, 77 out of 100 farmers overrated to this index while the performance indicator did not have at least the mean of ratio. Scores were completely different related to New Holland brand, the work quality factor with 93 scores was the best in comparison with the other brands. However, applying this harvesting machine needs to allocate a significant finance by farmers and its performance is not so acceptable. To conclude, regarding to the comparison between the evaluated combine brands in this study, SAHAND brand had the most acceptability among the farmers in the study area.

Keywords: *Harvesting Machines, ICM, SAHAND, New Holland, Combines, Comparative Analysis*

1. INTRODUCTION

Harvesting machines are one of the important sections in agricultural industry and over time, their area of applications has been expanded. There are some important functional factors about their utilization that should be defined to farmers. For comparing the different brands of combinesit is necessary to define some indicators. Work quality, cost per unit, and performance are three main indicators that determine a specific combine's features. The work quality refers to the level of quality that a machine dose a definite duty, the cost per unit shows how much a machine costs to harvest one-hectare field and the performance indicator talks about the average time that a machine needs to do its duty and also the dynamism in the farm. These indicators have ever argued among the farmers to answer the differences related to combine brands. To compare two or more than two indicators they are always compared with each other.

This analytical method is also useful when the purpose is to find some information in order to choose the best one of things or methods. Comparative analysis has been used in agricultural studies repeatedly. For example, it was used in a study about agricultural mechanization levels in china, the agricultural mechanization levels of 31 provincial areas in China were assessed in order to assess the agricultural mechanization levels of the provincial areas as accurately as possible (Wang et al., 2022). Comparative analysis between some different types of combines to realize performance and optimal costs in order to an evaluation of the economic parameters of combine harvesters in different working conditions is another usage of this kind of analyzing in agricultural machinery (Masek et al., 2015).

For assessing the working process of the harvester combines with GPS receiver and grain level sensor in wheat harvesting, the best schedule was detected as a comparative analysis, which could record results in any work regimes (Astanakulov et al., 2021).

Regarding to the importance of harvesting machines and particularly combines. It is necessary to evaluate their acceptability among the farmers. Nowadays, combines are equipped with practical opinions to improve their function. During this study, it was tried to compare the three brands of combine that have the most acceptability in west Azerbaijan province of Iran. The farmers always talk about the differences related to combines and everyone would like to know the other farmers' opinions about them because there is not any comparative information about these machines. Therefore, gathering and analyzing the data to report comprehensive and documental results is the main purpose from doing this study. The findings of this study help to the users on the way to apply the appropriate combine, which is more suitable with their situations. To this end, ICM, SAHAND and New Holland brands were assessed and compared with each other. These brands are the most popular among the farmers and the biggest part of market is supported by them.

Work quality, cost per unit, and performance are more important than other indexes for farmers. They believe that if a harvesting machine can get good scores in these indicators, that is the best one to choosing. One area that can be addressed for this attitude is the harvesting time. A number of options exist to execute one or more of patterns in the field to reduce this time. In addition, the turns at the end of the crop rows play a significant role in the total time in the field. Adding more than one combine to the harvesting operation in a field contributes further to the complexity of these systems and widens the choices that the operations manager has to make in organizing and conducting the harvesting of a field. Therefore, the best solution is improving performance in combines (Hansen et al., 2005). The effectiveness of combine harvesting processes is one of the most important indicators of planting enterprises, as it largely determines the efficiency of the entire organization. One of the problems in assessing the effectiveness of combine harvesters is the determination of the planned performance of machines with rated productivity (Kataev et al., 2020). There are many indicators that should have been analyzed in comparing a type of harvesting machine. For instance, there is a deal in a relationship between work quality indicator and grain losses during harvest. (Šotnar et al., 2018).

In general, in present study it was focused on a problem in the study area and tried to compare three different brands of combines to report some useful information about them. This information could help the farmers on the way to choose the best machine that is compatible with the fields and farms topography. Because, they are always confused during the harvest season when they want to choose the best appropriate machine. To this end, a comparative analysis can rid them from this issue by providing the information that farmers seek.

2. MATERIALS AND METHODS

By assessing the given information, it is recognizable what the problem was and what is the solution. Therefore, to realize the information about the combines they were analyzed. All data about the each combine should be compared with each other and findings be reported to help the users to choose the most practical brand. New Holland brand is an abroad mark and so the most equipped one in Iran. This machine is equipped by many unique features, which help it to supply a wide range of facilities for the users. Farmers are enthusiastic to use it but the number of this machine is limited in the market. For this reason, during the survey it was tried to choose the farmers who had used it.

The first step during this research was preparing a questionnaire that includes the comparative indicators. To transmit the meaning of each indicator, they were explained obviously on the top of questioner. At this questionnaire, three questions were asked from the farmers about the indicators and they answered them with YES or NO. For example, a respondent was asked to tell them opinion about cost per unit indicator concerning each brand. 100 people were selected coincidentally as participants in survey. To this aim, the province divided into four zones and 25 farmers were invited to collaborate in survey. Furthermore, to sure selecting the respondents correctly, they were found from regional databases in agricultural mechanization service centers. After gathering the names of farmers, the final 25 respondents in any zone were chosen by applying drawing method. The second step was classification the row data, in this step all gathered data was classified in order to insert in charts. Classification made the responses comparative and quantitative. For this purpose, first of all the each indicator's answers were inserted into a form and then counted. In the final step, the indicators related to any brands were separately compared in three comparative charts. During the survey, everyone answered the questions at a separated questionnaire. Hence, the answers did not affect each other. The participants indicated their opinions about each indicator by marking the YES

or NO options. Each indicator could get a rate between 0 to 100 regarding to the number of answers. The indicators' value refers to their acceptability among the farmers where rate is up it means the number of YES answers is significantly more than number of NO answers. Histogram charts were used to illustrate the results. The ratios are clearly shown by a number on the charts. Ultimately, a comparative analysis was done to compare the brands with each other. By doing this analysis, either the indicators were inspected or the machines completely compared and differences identified.

3. Results and Discussion

Figure 1 shows the data about the ICM brand, from the participants points of view the cost per unit factor is more acceptable than the other factors. 77 out of 100 farmers overrated to this factor while the performance indicator could not get at least the mean of ratio. In general, this brand had a fair acceptability among the farmers and could take a weighty score in work quality and cost per unit indicators.

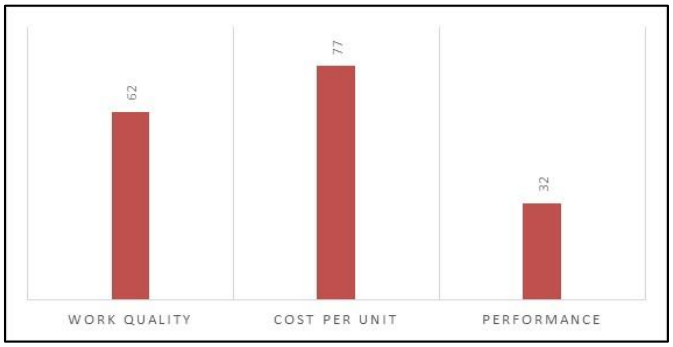

Figure 1. *Survey result for ICM brand*

Performance in agricultural machines depends on some variable factors. The most relevant parameters are dimensions, weight, working width, needed power, etc. These parameters related to an agricultural machine is eventually influencing the impact on productivity, on the return on the investment and on the environment (Yezekyan et al., 2018). Farmers matter so much to a combines' performance. They believe if a harvesting machine has not a good performance in farms that wastes the time and product during the harvesting. Figure 2 illustrates the obtained results about the SAHAND brand. Findings are completely different with the ICM brand. The mean score of three factors is above 50 and performance capability was more satisfying among the farmers, following this reason the work quality factor has extremely gone up. This result clearly shows the users matter to work cost in their activities. For instance, although all of them surly knew this machine provides a high quality in the work but they were not satisfied about its cost per unit indicator. In other words, there is need to pay more money to do the same work compare to the ICM brand.

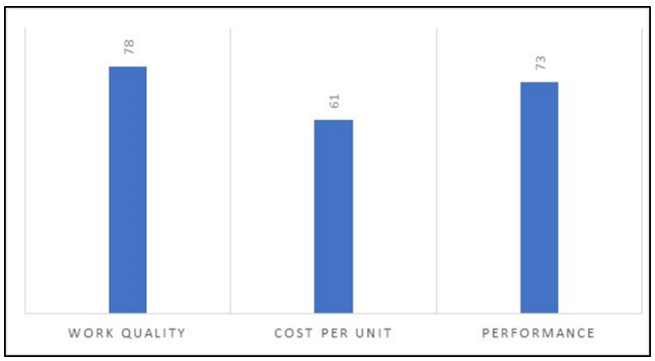

Figure 2. *Survey result for SAHAND brand*

Figure 3 refers to the survey results relevant to New Holland brand. The indicators' rates differ entirely. As it was mentioned this is because of being a high-tech machine. The work quality factor got the most score (93) against the other brands. In addition, approximately all participants in this survey were agreed with this attitude. However, using this harvesting machine needs to allocate a significant finance. This reason caused the farmers did not name it as an economical machine and that got the lowest score (14) in this factor. Furthermore, this brand performance was not so acceptable and farmers believe it cannot provide all its abilities in the fields. This attitude may come to the farms

topography and/or it features. Technical and performance parameters of agricultural machines directly influence the operational efficiency and entire crop production. Sometimes, overestimation of technical and dimensional parameters of harvesting equipment is carried out with the intention of enhancing the operational efficiency, but this approach might turn out to negatively affect productivity due to unbalanced system design, and ultimately lead to financial losses. Therefore, a balanced preliminary estimation of technical parameters of equipment needs to be carried out before investment quantification, especially on the large capital-intensive machinery units, such as harvesting systems (Yezekyan et al., 2020).

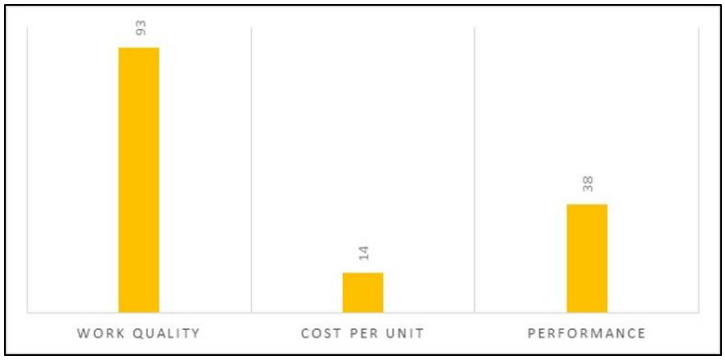

Figure 3. *Survey result for New Holland brand*

Illustrating the obtained data in separated charts and comparing the each brand indicators with each other not with another brand made a clear understanding. Hence, a comprehensive comparison was done and regarding to that combine brands were compared against each other and the differences between them were obviously demonstrated.

To introduce a way for choosing the best one of the analyzed brands, it was essential to compare them to each other and report the results. On the way to this aim, in this section, the brands were evaluated in a comparative chart and the differences emerged. Figure 4 helps to find that way, this comparative chart illustrates the factors' differences better and by that firstly, all results in together can be seen and secondly it demonstrates the exist difference in the same point of view(indicator).

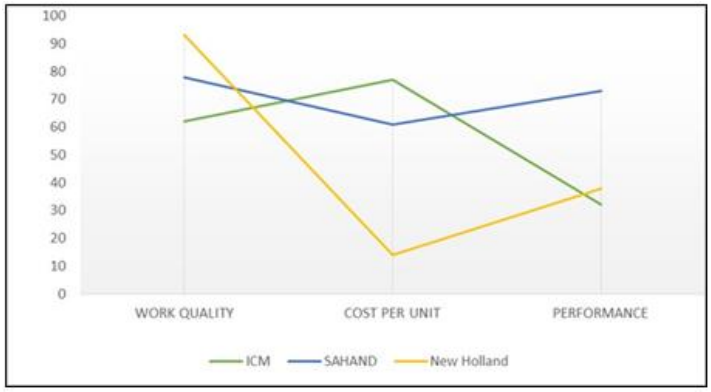

Figure 4. *the results of comparative analysis*

The coherence is approximately and not completely in blue line and that refers the SAHAND brand. By considering this result, it can be said this brand is the most satisfying harvesting machine among the farmers and from their points of view this brand could come true their desires in all indicators. The results for ICM brand were absolutely different with SAHAND brand. The cost per unit factor is more acceptable than SAHAND brand but other indicators show lower scores against that. The notable point about this brand is the performance factor, where it has the worst site among the all. In the Figure 4, the most inhomogeneous result is for the New Holland brand, although this brand toke the highest rank in work quality indicator but the lowest rank is for it in cost per unit indicator. The performance ratio for this had a bit difference with ICM brand and it makes the users confuse while choosing them. Comparison of two different brands reported that the effect of harvesting machines on wheat/Abad cultivar was observed based on some technical indicators. Two types of wheat harvesting machines (New Holland -TC54 and Claas 68s) were tested. The experiments were carried out and results showed that the New Holland-Tc54 machine was significantly better than Claas 68s machine

(Hamzah & Alsharifi, 2020). It is undeniable that New Holland brand is one of the most popular in the market and specifically in Middle East. However, the expenses relevant to this brand are extremely high and this disadvantage always is an obstacle on the way to choose it by farmers.

By going through the obtained data, it is understandable users prefer SAHAND brand to others. In spite of being the harvesting cost high, this brand is still more acceptable than the others and in the survey it got a normal rank in all indicators. The most notable point in this study is getting a homogeneous result in assessed factors. Therefore, it is not important that a brand get the highest level in just a factor but normality and uniformity are both the final goal in the presented factors. In this case it can be proved that a harvesting machine's acceptability how much is acceptable among the farmers and they tend use that or not. Otherwise, getting a high score in a specific indicator is not logical to introduce a combine as the best one.

As it was mentioned before, the goal of doing this study is providing usful information about the different combine brands in the intended area.Since there was a lack of study about this issue, farmers always were confused in choosing the appropriate combine. They tried to find their questions answers by communicating with other users. Nonetheless that was not often troubleshooting. Therefore, this research can help them to be decided in applying the best combine because of reporting the comprehensive and integrated findings. To conclude, studying a problem and finding solution for that in order to help a big community was the purpose of carrying out this research.

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AUTHOR CONTRIBUTION

Reza Kheyri: English editing, method designing, calculations, statistical analysis of data, analysis and interpretation of information and results. Reza Abdi: Supervisor, review and control of results, finalization of the article.

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