тизма на производстве и обязательно использоваться в системе профессиональной подготовки специалистов, определения успешности их деятельности. При этом следует помнить, что прогноз делается не для того, чтобы он сбылся, а для того, чтобы принять эффективные меры для его осуществления.

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EFFECT OF OPERATIONAL AND TECHNICAL FACTORS ON MANAGING THE WORK OF COMBINE HARVESTERS. THE ANALYSIS OF TECHNICAL AND OPERATING PARAMETERS OF COMBINE HARVESTER IS CRITICAL IN MAKING DECISIONS ABOUT THEIR PURCHASE

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Summary: *This paper presents the evaluation of the impact of technical and operating parameters on the efficiency of decision-making process concerning the selection and purchase of combine harvesters for the farm. For this purpose, the impact of twenty-nine parameters affecting the process of purchasing and efficient use of combine harvester on a farm has been analysed using expert and mathematical methods.*

Introduction

The technological process of combine harvesting of cereals and technology similar plants is one of the most complex processes in the cultivation of plants and poses a lot of organizational problems and has a decisive influence on the size of the cost of grain harvest [1]. Therefore, proper selection of a combine harvester, for the needs of the farm, is one of the most difficult decision-making processes concerning the selection and purchase of these machines. In order to properly take such decisions, one should carefully analyse the factors that will determine the proper and timely harvest of cereals. These factors are, on the one hand the parameters of the farm and the type of crops, and on the other hand, the technical and maintenance parameters of combine harvester.

This paper presents the hierarchy of validity and scoring of twenty-nine maintenance and technical parameters affecting the effectiveness of grain harvest, using the expert and mathematical methods.

Research methodology

Research on work organization and management of modern combine harvester was performed using the expert and mathematical method [2]. For this purpose. 30 experts were selected for studies, whom were farmers in the Mazowieckie voivodeship, owning combine harvesters of three brands: John Deere, New Holland and Claas. The selection of experts for research included two stages. In the first stage, experienced owners and users of combine harvesters were searched for. The experience of the expert was evaluated on the basis of his age and seniority. Expert's education has also been considered, but the level of knowledge in the grain harvest techniques has been mainly evaluated on the basis of interviews with the expert. The second stage consisted of self-evaluation of the expert, which he published in a specially prepared questionnaire research. In the same questionnaire, the expert giving the points from 0 to 10 defined his competence, experience and knowledge of farm management, knowledge of sales techniques used by representatives of companies offering farm equipment, knowledge of modern practices in the construction of combine harvesters, and his expertise in the use of combine harvester of older and newer generation.

In that research questionnaire (the questionnaire is set out in Annex) experts expressed their assessments on a number of factors relating to: the organization of work over the season, work organization in the field, reviews and daily adjustment, current and post-season maintenance and repairs.

Because of the large number of factors that the experts were to evaluate the event tree has been used (Fig. 1) [2]. For this purpose, all factors are presented in groups of factors, which were the objectives of the second order (denoted by the letter C and two digits). In each group (the second order) the factors associated with it were highlighted, representing the objectives of the III level (order).

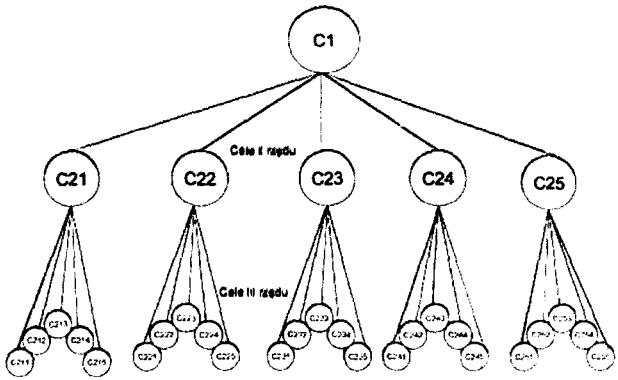

Fig. 1. Event Tree

In the research questionnaire, the objectives of II and III order were arranged in separate tables.

The validity of the objectives of both the second and third level was assessed by dividing 100 points (percent) by the expert in each table of the research questionnaire. If the expert gave a factor score of "0", this means that this factor is irrelevant for an expert. The number of points given by the expert that is higher than zero would reflect the validity of a given parameter over others.

In addition, the expert had the right to add and evaluate an infinite number of other factors which do not appear in the tables, and were considered by him as important.

Evaluation of the impact of the third level factor on the third factor in the second level and the contribution of a factor (objective) in the group of factors determined by the concept of a local priority. However, the impact of the factor (objective) of a III level to achieve the main objective was determined as the concept of priority system.

The organization conducting the study included [3]:

– finding the required number of experts;

– obtaining the consent of an expert to participate in research and conduct a preliminary interview for an expert to lest the suitability;

– performing studies;

– the introduction of the questionnaire data obtained to the calculation software;

– conformity assessment of the expert's opinions and the development of final results.

Research questionnaires with assessments given to individual factors by individual experts were collected and compiled in tables specifically designed for data processing from the expertise of a computer program. This program has calculated the average of the ratings assigned by the experts and the coefficient of variation, concordances, and hi-square test. These latter factors were used to assess compliance of expert opinions.

Research results

The study results were obtained assessing 5 factors on which the selection of experts was made. The results regarding the usefulness of experts to research were presented in Table 1 and on this basis it can be concluded that the experts have obtained high ratings of competence and suitability for research.

Table 1

Competence and experience of experts involved in the studies

Name of objective:	Average values
Experience in farm management	8,26
Knowledge of sales techniques used by representatives of companies providing agricultural equipment	7,53
Knowledge of modern solutions in the construction of combine harvesters	7,83
Experience in the use of the older generation of combine harvesters	8,38
Experience in the use of modern combine harvesters	8,25

Source: own calculations

The values of obtained local priorities of II level were presented in Fable 2 On their basis, the systemic priorities were then established (Fig. 2)

Table 2

The results of research and their mathematical processing

Objective label	Name of objective:	Sum of ranks	aver-age	Coefficient of variation
C 21	Organization of work over the entire working season (with the exception of work on the field)	42	21,2	0,30
C 22	Organization of work in the field	45	23,5	0,44
C 23	Daily services and adjustments	52	19,8	0,31
C 24	Technical support	58	18,2	0,29
C 25	Current and off-season repairs	73	17,3	0,39
Concordance coefficient			0,149	
χ - square criterion			17,824	
Organization of work over the entire working season (with the exception of work on the field)				
C 211	The sequence of work undertaken on the various fields	93	18,77	0,68
C 212	Selection of additional equipment	56	24,90	0,31
C 213	Selection of operators	75	18,67	0,47
C 214	Organization of operator's working day	94	15,33	0,38
C 215	Supplies of fuel and lubricants	60	22,33	0,33
Concordance coefficient			0,169	
χ - square criterion			20,267	
Organization of work in the field				
C 221	Optimal use of the operating speed	36	33,17	0,24
C 222	Optimal use of the operating width	40	31,17	0,24
C 223	Making turns	104	11,73	0,54
C 224	Barren drives	115	9,43	0,42
C 225	Downtime Technology	92	14,50	0,58
Concordance coefficient			0,66	
χ - square criterion			79,521	
Daily services and adjustments				
C 231	Assessment of the technical state of working elements	68	21,77	0,53
C 232	Replacing worn parts (by the farm)	84	17,77	0,48
C 233	Cleaning of working units	79	17,43	0,37
C 234	Regulation of working units	71	19,43	0,35
C 235	Lubrication of working units	52	23,60	0,40
Concordance coefficient			0,09	
χ - square criterion			10,506	
Technical support				
C 241	Compliance with the terms of maintenance	45	29,50	0,55
C 242	Availability of maintenance points	52	24,00	0,40
C 243	The completeness of the performance of maintenance	71	18,50	0,32
C 244	Qualifications of the employees of servicing points	86	14,67	0,65
C 245	The condition and quantity of equipment at the servic-ing points	92	13,33	0,49
Concordance coefficient			0,25	
χ - square criterion			30,324	
Current and off-season repairs				
C 251	The availability of the servicing workshops	76	17,73	0,41
C 252	The efficiency of maintenance workshops	77	17,73	0,43
C 253	The optimal number of spare parts in repair shops	54	25,60	0,38
C 254	Servicing personnel qualifications	74	19,37	0,44
C 255	The quality of the work in repair workshops	67	19,57	0,45
Concordance coefficient			0,06	
χ - square criterion			6,61	

Source: own research

Subsequently, a division of the systemic priorities were made into four ranges of the importance level of achieving the primary objective, marking their so-called, "weight", and the mean factor in the established range. (Table 3). The ranges are divided into: 1 - high (6,42-7,79), 2 - a higher than average (5,02-6,41), 3 - average (3,62-5,01), 4 - lower than the average (2,22-3,61).

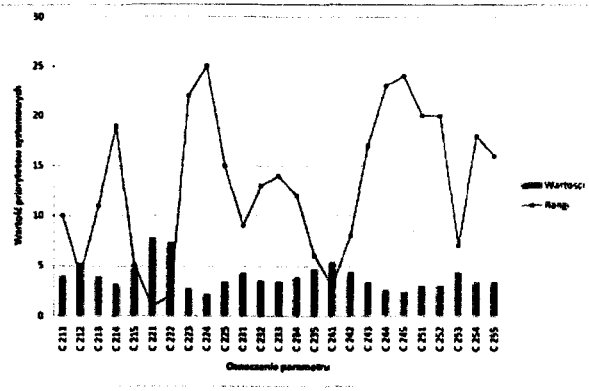

Fig. 2. III order system priority values in and their ranks

Table 3

Ranges of validity of the system priorities of the

No range	The boundaries of rangcs, %	Designation of factors within the ranges	"importance" of the rangc, %	The average value of the systemic priority of the factor in the range, %
1	6,42-7,79	C221, C222	15,11	7,55
2	5,05-6,41	C241, C212	10,63	5,31
3	3,62-5,01	C215, C235, C253, C242, C231, C211, C213, C234	34,3	4,29
4	2,22-3,61	C232, C233, C225, C255, C243, C254, C214, C251, C252, C223, C244, C245, C224	39,95	3,07

Source: own research

In the first range of high importance were the following factors: the optimal use of operating speed, and optimal use of width, which "weight" is over 15 % and the average value of priorities is 7,55 %.

In the second range, which is higher than the average were the following factors: compliance with the terms the maintenance and selection of additional equipment in which "weight" was 10,63 % and the average value of priorities is 5,31 %.

Third, the average ranges have eight factors, which "weight" is 34,3 % and the average value of priorities is 4,29 %.

The fourth range, lower than the average has 13 factors, which "weight" is 39,95 % with an average value not exceeding 3,07 %.

Conclusion

1. As the performed research shows, the most important factors that influence the effectiveness of the organization and management of work of modern combine harvesters include: optimal use of the operating speed and optimum utilization of the width, which "weight" is over 15 % and the average value of priorities is 7,55 % .

2. Then the next important factors include: compliance with terms and selection of maintenance engineering supporting, where, "weight" is 10,63 % and the average value of the priority of 5,31 %.

3. Other factors did not significantly affect the efficiency of work of combine harvesters; even though their "weight" is 34,3 % and 39,95 % are the average priority value amounts to only 4,29 % and 3,07 %.

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THE ANALYSIS OF SELECTCD AGRICULTURAL TRACTORS MANUFACTURERS' OFFER AVAILABLE IN POLAND, IN TERMS OF TECHNICAL SOPHISTICATION

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Summary: *Offer of sclcctcd manufacturers of agricultural tractors available in Poland was presented. The analysis was made taking into account the criterion of technical sophistication of tractors. It can be concluded that foreign manufacturers have both less and more technolgically advanced technologically models in their offer. In addition to the same extent of power, models of tractors from the same manufacturer differ in technical sophistication.*

Introduction

Tractors in modern agriculture are a major source of energy both in field work and in transport of agricultural products. The correct choice of the tractor has a major influence on the costs of performed agrotechnical works. It is possible only if the full range of tractors available in the market is known. Due to the fact that the technical advancement of tractors has an impact on the cost