Research article

A computer system supporting agricultural machinery and farm tractor purchase decisions

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A B S T R A C T

Operational research, i.e. searching for optimal solutions in a situation of uncertainty and risk, can also be used to support decisions to purchase expensive agricultural machinery. Although Polish farmers receive subsidies from the EU, it does not mean they do not need to make well-thought-out purchases, because wrong purchase decisions will have long-term consequences while using machinery. The article presents the results of the IFOP – the system which has been available on the Internet for several years. It collects data on farming machinery and vehicles based on users' voluntary but subjective opinions. The authors of this article developed an original multi-criteria method of evaluating the quality of these specific products, which enabled them to make relevant rankings of brands. It is an algorithmic-heuristic method, which uses pairwise comparison tools to determine the significance ratios of the criteria. This article presents the results of the 1st and 2nd IFOP edition (Race Ranking), which included several dozen brands of tractors registered in Poland. More than fifty qualitative (Q) and non-qualitative (C) traits of farm tractors were taken into account. According to Polish farmers, Valtra – a Finnish brand of farm tractors, part of the AGCO concern, was the most versatile ($Q = 4.39$ and $Q\&C = 4.23$). These tractors received the best opinions for their functionality, durability, ergonomics and safety.

1. Introduction

The process of purchasing expensive agricultural machinery and vehicles is an important and strategic investment. The consequences of a wrong decision are usually long-lasting and severe. The risk of wrong decisions can be minimised by using proven systems supporting these processes in a situation of uncertainty and risk.

For many years drivers have been supported by such systems. In Europe, ADAC, DEKRA, TÜV, and GTÜ from Germany and Warranty Direct from the United kingdom are the most reputable automotive associations. Every year they publish rankings of reliability or failure rate, which are mainly based on obligatory roadworthiness tests. However, even these rankings are not convergent. The position in the ranking depends on a passed or failed roadworthiness test. The percentage of these tests related to the whole population of vehicles surveyed enables reports on individual brands and models in different age categories.

In Poland, for several years there has been an Internet portal "Wybór kierowców" (*Drivers' Choice*), which is the first independent information service. The automotive industry research programme was inspired by the world-famous programmes: J.D. Power, Driver Power and Consumer Report. It is supposed to help drivers make the right choices when they need to buy a car or select products and services. The programme participants evaluate cars, automotive products and services by completing an online survey in one of the categories. The participants of the *Drivers' Choice* programme rate car brands and models as well as automotive products and services according to several criteria (e.g. spaciousness, performance, fuel consumption, service costs, failure rate) and then give an overall rating. Thus, user satisfaction rankings are created. Since 2013 there have been over 144,000 questionnaires collected in 9 categories: car models (brand-new and pre-owned), car brands, brand-new car showrooms, authorised services, insurance companies, engine oils, tyres, petrol station chains and cosmetics. *Drivers' Choice* is the only survey of this kind that provides information about the satisfaction of customers of the automotive industry on the Polish market. As it reflects Polish reality better, it complements German reliability rankings.

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There are well-functioning systems which support decisions about purchasing a brand-new or pre-owned car. It is also a good idea to help clients make the right purchase decisions about farming equipment. The farming machinery market is as large as the automotive market. Apparently, there are more farm tractor manufacturers than automotive concerns around the world. The farming machinery market is also characterised by fluctuations, which are determined by the economic and political situation in a particular country, Europe and all over the world. Agricultural machinery and vehicles stand out from other products due to specific features related with the work environment and the manner of use. These are mainly (Gazzarin, 2019):

- particularly difficult working conditions (dust, stones, work at night, etc.),
- minimal use of the potential working time and the resulting need for storage, e.g. the annual use of a tractor amounts to 600 h (in Switzerland even 1,000 h – method developed by FAT Tänikon, currently Agroscope Reckenholz-Tänikon),
- seasonal work (the harvest time may be as short as 2 weeks),
- heavy-duty service and reliability are required,
- field work (e.g. on slopes),
- long operating periods (even 20÷30 years),
- service activity.

A system supporting decisions to purchase agricultural machinery and vehicles must allow for the specific nature of this group of products as well as a large number of different types. It is estimated that a modern farm uses about 150 different devices. Therefore, it is necessary to develop a multi-criteria system, which will enable comprehensive assessment of the quality of agricultural machinery and vehicles. This approach is in line with the american Multi-criteria decision making (MCDM) and solves the problem of Multi-objective optimisation (MOOP).

MCDM (or *Multiple-criteria decision analysis* MCDA) is a sub-discipline of operations research that explicitly evaluates multiple conflicting criteria in decision making (Almeida, 2019; Greco et al., 2016; Hemmati et al., 2018; Majumder, 2015; Okokpujie et al., 2020; Schaefer and Thinh, 2019).

MOOP (also known as *Multi-objective programming, Vector optimisation, Multi-criteria optimisation, Multi-attribute optimisation* or *Pareto optimisation*) is an area of multiple criteria decision making that is concerned with mathematical optimisation problems involving more than one objective function to be optimised simultaneously. In a multi-objective optimisation problem, the goodness of a solution is determined by dominance Burke and Kendal (2013); Deb (2001); Deb and Deb (2014); Ehrgott (2000); Li et al. (2020); Marler and Arora (2004).

The authors of publications on agricultural engineering have already made attempts to evaluate the quality of some agricultural machinery and tractors. So far they have presented few innovative methods, which quantify the quality of machinery with different results. Only this form enables rankings (Durczak, 2011).

Supporters of the linguistic approach adopted the thesis "people act through language". It is important to assess agricultural machinery, because it gives a possibility to specify criteria. However, the number of applications of speech acts makes it difficult to identify clear communication patterns. The descriptive form of assessment makes it difficult to rank the global quality of machinery. Therefore, quantitative methods of quality assessment are more valuable for agricultural practice. The need to evaluate the quality of agricultural machinery is especially noticed by farmers, who are users of this equipment.

A method based on graphic symbols to rate the quality of machinery is an indirect method between the descriptive and numerical one. Apart from detailed descriptions of technical operational, and economic data as well as the potential of machinery, the authors of tests rate machinery by means of graphic symbols. These pictorial symbols are unambiguous for the recipient. Individual traits, grouped into characteristics, are usually rated according to a five-point scale by means of pluses and minuses. Here are examples of symbols used to evaluate agricultural machinery and tractors.

Additionally, the symbols have appropriate contrasting colours, e.g. green (for a plus or zero) and red (for a minus), which enhance the positive or negative nature of a specific trait.

The quality of machinery can be rated more precisely with points, which were also used to rate tractors. A score ranging from 1 (unsatisfactory rating) to 5 points (very good rating) is based on values measured and subjective data collected by four test teams. Additionally, the rating multiplier, which functions as a weight, is used in the final point-based ranking.

The analysis of reference publications shows that quality is the basic assessment criterion in all areas of human activity. Extensive scientific research on this issue can be divided into two groups. The first group includes studies on the perception, definition, and valuation of quality, which have universal nature. The other group includes the studies which attempt to construct quality evaluation systems for individual sectors. This division results from the specific traits that are characteristic of each group of products.

Available publications do not provide a tool allowing objective quantitative assessment of the quality of agricultural machinery. The construction of a rating system is necessary because it meets the expectations of agricultural machinery users and manufacturers, who need to compete on the market.

2. Aim and range of study

The aim of the study was to prepare a system of quantification of the global quality of agricultural machinery and vehicles, which would result in reliable rankings. The study was conducted on farm tractors, which are a basic source of tractive force on every modern farm.

3. Methodology

Various methods of evaluation of product quality have been described in reference publications, e.g. the alternative-point method, experts' method, global quality measure method, graph method, quality index method, Latvian method, ordinal and point method, aggregate quality indicator method, representative criterion method, developmental method (EM-ER), geometric mean of indicators method (Fiedorow), Wrocław taxonomy method, averaged quality marks method (Kolman), the utility value index method, and the analytic hierarchy process (AHP) (Saaty).

A multi-criteria system helping farmers (and clients buying products for gardening, forestry, municipal services or construction) to make rational purchasing decisions concerning agricultural equipment requires a universal quality valuation and data collection methodology (Figure 1).

The machine quality valuation method is based on multiple criteria and weighted average, according to the *wisdom of the crowd* rule. Statistics prove that experts are often wrong (Beware of experts), whereas averaged predictions of a crowd are right (Victor et al., 2011). Following
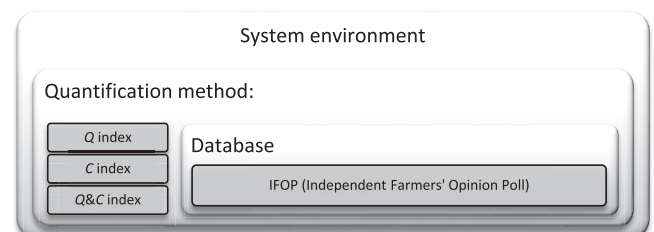

Figure 1. The structure of a system supporting decisions to purchase agricultural machinery and vehicles. Source: Authors' original compilation.

the Polish standard PN-EN ISO 9000: 2015-10 and international standard ISO 9000, the method also assumes that only inherent traits (i.e. permanent, inseparable, existing as such) should be taken into consideration when assessing the quality of products. Therefore, it is also a quality management issue (Berger et al., 2006).

The global quality index Q is determined in a multi-stage procedure (Figure 2).

The collection of at least 30 questionnaires referring to a particular brand (or another criterion, e.g. age, power), i.e. a large random sample, is a prerequisite to implement stage 5. Additionally, various numbers of datasets, e.g. brands, were verified with the chi-squared test of independence.

The weights of the criteria were calculated very precisely by means of Pairwise Comparison (PC), which is one of the components in the Analytic Hierarchy Process method (AHP) developed by Thomas Saaty (1980). As it is a universal method (in terms of the product evaluated), its advantages have been used in various studies (Bayode et al., 2020).

Thanks to the method, the problem where it is necessary to make a decision can be approached from a different perspective, by arranging criteria and variants within a hierarchy. A multi-criteria problem is reduced to a series of simple pairwise comparisons of individual criteria and variants. The method enables analysis of measurable and unmeasurable criteria together, which results in an aggregated evaluation for the variants. It eliminates the risk of the decision being influenced by prejudices or manipulation. Thanks to the method it is possible to rationally justify the decision made and make a sensitivity analysis, i.e. analyse the effect of changes in individual partial ratings on the final decision. The advantages of the AHP and PC methods have been used by computer programmers, who invented software based on this easily implementable procedure, e.g. Expert Choice, Super Decisions.

In order to precisely determine the weights (with an accuracy of 1 %), the experts used a square matrix of mutual comparisons:

$$Q = \begin{bmatrix} 1 & q_{12} & q_{13} & q_{14} \\ q_{21} = \dfrac{1}{q_{12}} & 1 & q_{23} & q_{24} \\ q_{31} = \dfrac{1}{q_{13}} & q_{32} = \dfrac{1}{q_{23}} & 1 & q_{34} \\ q_{41} = \dfrac{1}{q_{14}} & q_{42} = \dfrac{1}{q_{24}} & q_{43} = \dfrac{1}{q_{34}} & 1 \end{bmatrix}$$ (1)

where:

- values of elements q_{ij} in matrix Q are absolute ranks of characteristic i in relation to characteristic j (according to Saaty's nine-degree scale – Table 1); dominants/modes of the expert group
- i, j – numbers of characteristics (i, j = 1, 2, 3, 4); where: 1 – Functionality, 2 – Reliability, 3 – Ergonomics and safety, 4 – Aesthetic aspects.

Although it is a five-degree scale, it can be extended to nine degrees. The nine-degree scale and ratings 2, 4, 6, and 8 are used if an expert finds it difficult to rate a particular element adequately with an odd number. In consequence, there are extra inverse relations: 1/2, 1/4, 1/6 and 1/8.

The number of main criteria was well thought and limited only to four criteria which are universal for each group of agricultural machinery to be rated in the future. Apart from that, it is easy to set weights to four criteria because of limitations in human perception. According to Miller (1956), an American psychologist, the ability of humans to receive information from the environment was strongly limited. Humans are able to compare not more than 7 ± 2 pieces of information simultaneously in a very short period of time without making mistakes 'The Magical Number Seven, Plus or Minus Two'. Miller's law is applied whenever information is presented to people. It is easier to be consequent with ratings if there are four characteristics because each expert gives only 6 ratings (regardless of the group of machinery).

All experts' ratings were checked for the consequence, consistency and well-thought responses by means of the inconsistency ratio (IR):

$$IR = \frac{\lambda_{\max}}{n-1}$$ (2)

where:

$\lambda_{\max}$ – the maximum eigenvalue of the comparison matrix
n – the number of factors compared (matrix degree).

According to the methodology, experts' ratings are consequent, consistent and well-thought if $IR \leq 0.10$. We assumed the IR of 5 % to ensure greater precision.

Each of the detailed criteria (both measurable and non-measurable) was assessed according to a 5-degree scale by machinery users (Table 2).

At the last stage of the method, i.e. stage 7, the ratings were synthesised. The global quality index Q was the resultant of these objectively functioning factors. The values of this indicator belonged to the interval <1.00; 5.00> and referred to different quality states (Figure 3).

Before the final decision the purchaser also considers non-qualitative traits, e.g. the prices of the machinery and spare parts, warranty conditions and temporal traits and (Figure 4).
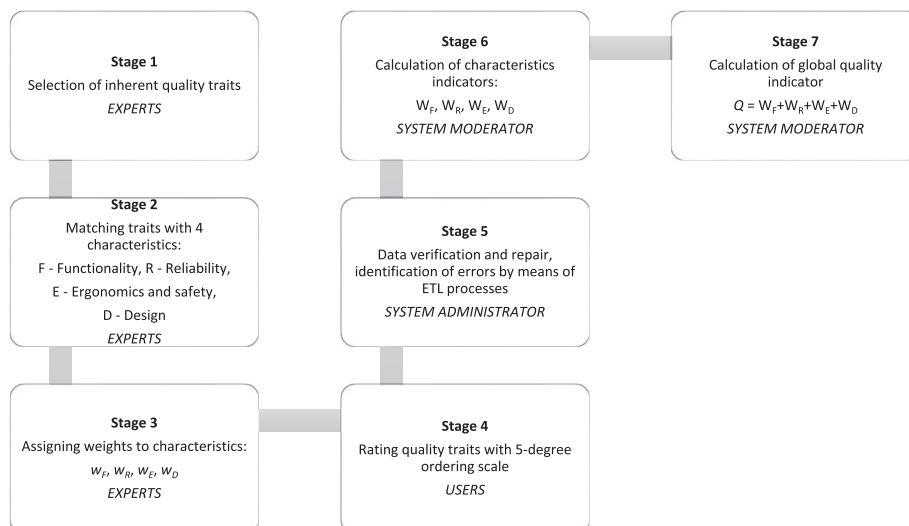
Stage 1	Stage 6	Stage 7
Selection of inherent quality traits *EXPERTS*	Calculation of characteristics indicators: W_F, W_R, W_E, W_D *SYSTEM MODERATOR*	Calculation of global quality indicator $Q = W_F + W_R + W_E + W_D$ *SYSTEM MODERATOR*

Stage 2	Stage 5
Matching traits with 4 characteristics: F - Functionality, R - Reliability, E - Ergonomics and safety, D - Design *EXPERTS*	Data verification and repair, identification of errors by means of ETL processes *SYSTEM ADMINISTRATOR*

Stage 3	Stage 4
Assigning weights to characteristics: w_F, w_R, w_E, w_D *EXPERTS*	Rating quality traits with 5-degree ordering scale *USERS*

Figure 2. An algorithm of the quantification of the farming machinery and vehicles quality indicator Q. Source: Authors' original compilation.

Table 1. The scale of relative parameter dominance for pairwise comparisons (PC).

Rating (numerical scale)	Rating description (verbal scale)
1	identical criteria (no dominance)
3	slight advantage of one criterion over another (slight dominance)
5	strong advantage one criterion over another (medium dominance)
7	very strong advantage of one criterion over another (strong dominance)
9	absolute advantage of one criterion over another (absolute dominance)
1/3, 1/5, 1/7, 1/9	for inverse relations

Table 2. A discrete five-degree scale used for measuring clients' satisfaction with machinery.

Linguistic rating of criterion quality	Points
very low rating	1
low rating	2
average rating	3
high rating	4
very high rating	5

Points	Quality state
4.51÷5.00	excellent
4.01÷4.50	distinguished
3.51÷4.00	good
3.01÷3.50	moderate
2.51÷3.00	intermediate
2.01÷2.50	poor
1.51÷2.00	critical
1.00÷1.50	bad

Figure 3. The numerical and descriptive scale of the quality indicator Q.

Non-inherent traits stand in opposition to inherent ones. They can also be referred to as assigned traits, which are variable like time and price. According to Hamrol (2017), clients are not always aware of the fact that the purchase price and lead time can be used as a manipulation tool. For example, both the price and time are characterised by a considerable range of contractuality. On the other hand, the inherent properties of a tangible product and services are affected by these practices to a lesser extent.

The C index value is the arithmetic mean of ratings. The final machinery ranking allows for both groups of Q and C traits, after the same experts have determined the weights with the PC method (Figure 5).

The value of the $Q\&C$ indicator is a weighted average of indicators Q and C and likewise, it may assume values within a range of 1.00÷5.00.

Data are acquired from subjective assessments given to n-criteria by users, preferably with long experience and accurate service history. This form of data acquisition results from the fact that all information about breakdowns of agricultural machinery and vehicles is not generally available, because manufacturers and service companies even considered it to be sensitive. In 2017 the Independent Farmers' Opinion Poll web portal was created in order to meet these methodological requirements (Figure 6).

The methodological bases of the IFOP platform were developed by the academic staff of the Institute of Biosystems Engineering, Poznań University of Life Sciences in cooperation with the top agrar Polska publishing house, which was also a media sponsor. The main purpose of this project was to acquire reliable opinions from users of agricultural machinery and vehicles. Currently, tractors (3rd edition), mowers (2nd edition), loaders and combine harvesters (1st edition) are rated. The results are periodically officially and solemnly announced during the annual international agricultural exhibition Agro Show in the village of Bednary near Poznań and published regularly (Durczak et al., 2018).

The questionnaires sent online were verified for completeness and errors. Special software was prepared to examine the entire volume of acquired data during their flow from the portal to the database. The system was built using modern ETL (*Extract Transform Load*) technologies, which are used by the largest corporations and financial institutions to process data. Thanks to these systems it is possible to acquire, process and format very large data sets so that they can be transferred to analytical databases as a reliable and classified source of information.

The socioeconomic and habitat environment of the system should allow for the specificity of people inhabiting a particular region or country. Therefore, although the results cannot be generalised, they can be good overall material for future users and the starting point for further work on operational research in this area.

The method is logically correct. If ratings are very low (i.e. 1 only), the Q index is 1.00, regardless of the weights assigned to w_F, w_R, w_E and w_D. The total $Q\&C$ index will also assume the lowest possible value, i.e.
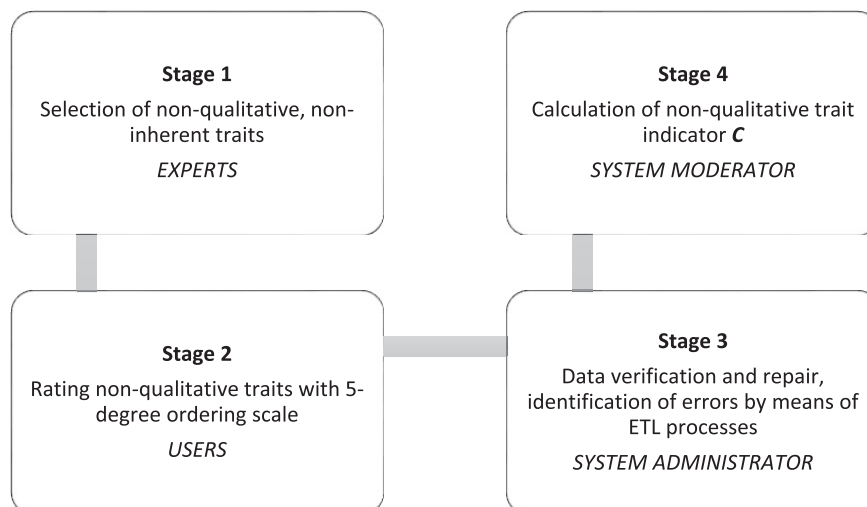

Figure 4. An algorithm of the calculation of the non-qualitative trait indicator C. Source: Authors' original compilation.
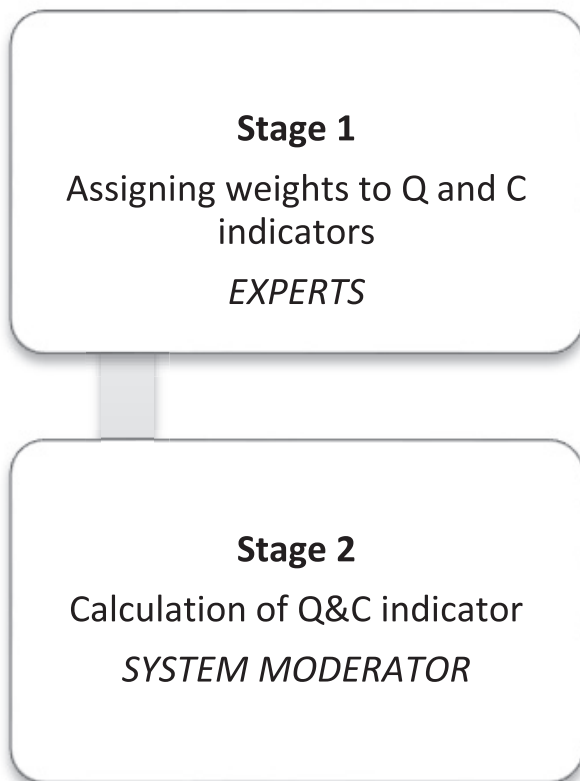
Figure 5. An algorithm of the calculation of the synthetic indicator (Q&C) of farming machinery, including the qualitative and non-qualitative traits. Source: Authors' original compilation.

1.00, irrespective of the w_Q and w_C weights. On the other hand, the best ratings (i.e. 5 only) will result in $Q = Q\&C = 5$, i.e. excellent condition.

4. Results

There are more than 1.5 million farm tractors of over 50 brands and several hundred models and types registered in Poland. Statistically, this means that each of over 1.2 million farms owns a tractor. Therefore, tractors are most often rated on the IFOP website. The ratings of tractors sent to the database will be the subject of validation of the research methodology.

Experts, i.e. 3 scientific researchers of the Institute of Biosystems Engineering, Poznań University of Life Sciences and 3 editors of top agrar Polska agreed on a set of 45 inherent, associated qualitative traits ($F_1 \div F_7$, $R_1 \div R_{11}$, $E_1 \div E_{22}$ and $D_1 \div D_5$) and 6 non-inherent, assigned, non-qualitative traits ($C_1 \div C_6$).

The experts set the weights of the main criteria as follows: functionality – 42 %, reliability – 39 %, ergonomics and safety – 13 %, and design – 6 %, with a very small ratio of inconsistent responses $IR = 3$ %.

From March 2017 to March 2019 we acquired detailed information about 1,350 tractors at different ages and from different parts of Poland by means of the Internet platform (Figure 7).

Most of the tractors were a few years old (45 % of the tractors were not older than 8 years). They were purchased as brand-new vehicles in Poland or abroad (70 % of the population surveyed). This situation should not be surprising, because until recently (Poland became a member of the European Union only on 1 May 2004) Polish agriculture was not subsidised. Only EU programmes (Rural Development Programme 2007–2013 and the current RDP 2014–2020) and the possibility of 50 % subsidies enabled farmers to purchase modern agricultural equipment.

Additionally, the ETL data quality management software let us locate and eliminate irregularities. There were about 12 % of erroneous records in total, so the database was reduced to 1,193 records.

There were 12 farm tractor brands that exceeded the limit of 30 vehicles. The resulting different numbers of ratings of these brands were verified with the χ^2 test. There were no grounds to reject the H_0 hypothesis that the differences in the numbers of ratings were not significant for 11 degrees of freedom and at a significance level $\alpha = 0.05$.

The *Tableau Public* program was used to generate and visualise reports, because it enables quick simulation research and reports only the data that exceeded the limit of a large random sample. The available options (on the right) allow setting all weight indicators freely. It was necessary to zero the w_C weight to calculate the global quality indicators Q. Every year the results are officially and solemnly announced during the international agricultural exhibition Agro Show in the village of
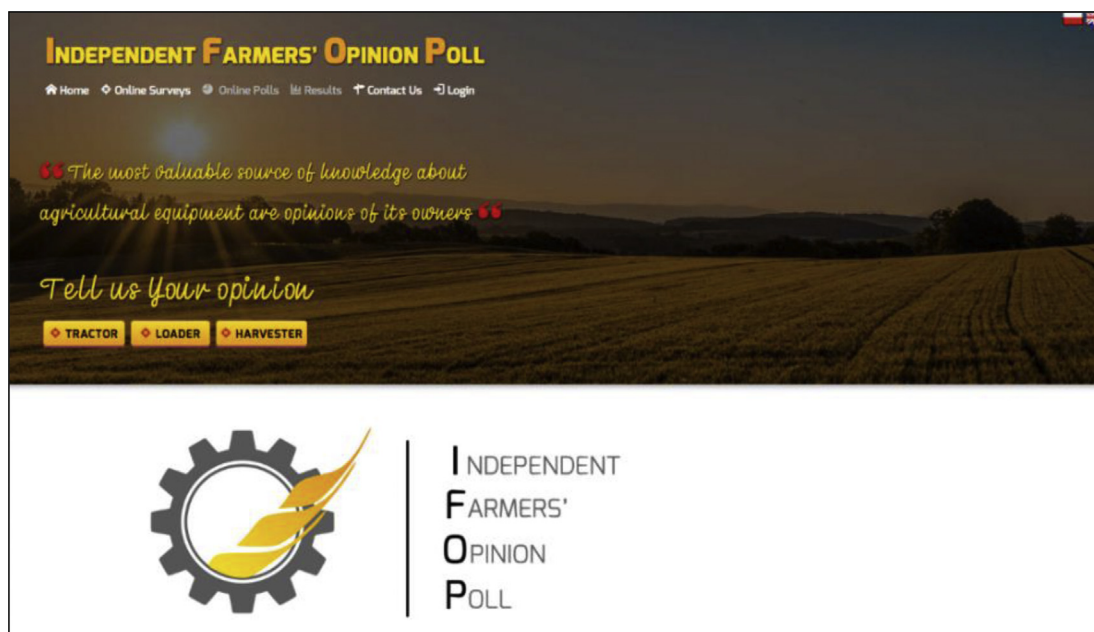

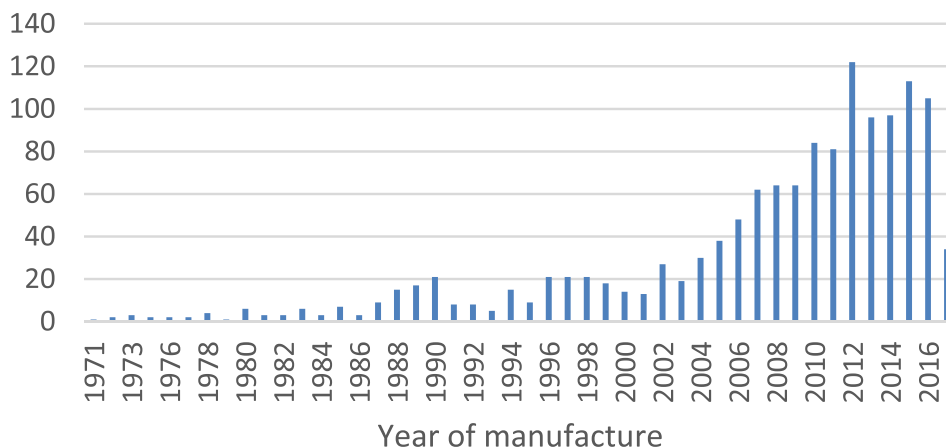**Figure 6.** The start-up screen of the IFOP platform at =http://www.nbor.pl/index.php?lang=en.

Figure 7. A histogram of the number of tractors rated according to the year of manufacture. Own study. Authors' original compilation.
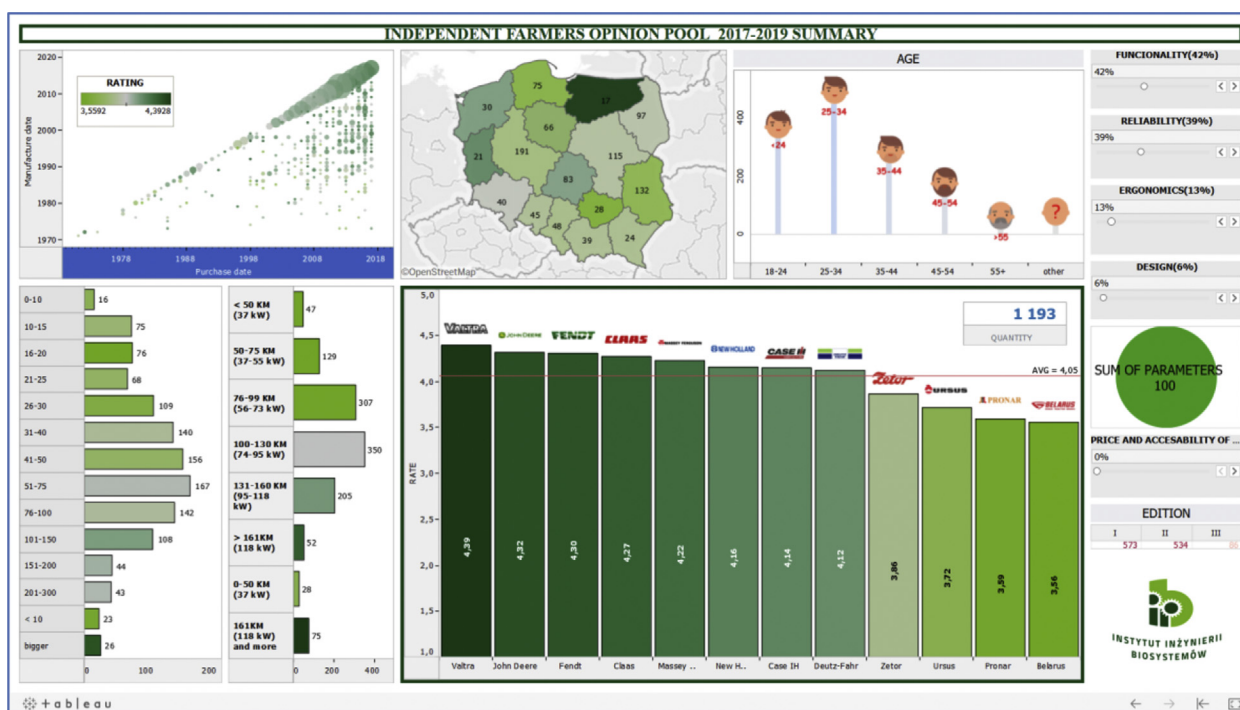

Figure 8. A Race ranking (since 2017) of tractor brands according to the quality indicator Q and its mean value for the whole population under study. Compiled by Marcin Waleński (2018).

Bednary near Poznań. There have already been two editions since the beginning of the IFOP project. The diagrams below (Figure 8) summarise the results of all ratings acquired so far (Race rankings).

As many as 8 brands were rated above average ($Q = 4.05$). The Scandinavian VALTRA tractors had the best score in quality – their Q index was very good, i.e. 4.39. The John Deere, Fendt, Claas, Massey Ferguson, New Holland, Case and Deutz-Fahr tractors had the same status of distinguished quality (4.01÷4.50). The Polish Ursus and Pronar, Czech Zetor and Belarus MTZ (Minsk Tractor Factory) brands were ranked at the lowest positions.

The tractor ranking looked completely different when only non-inherent traits (machinery purchase prices C_1, spare parts prices C_2, machinery availability C_3, service availability C_4, spare parts availability C_5, loss of value C_6) were taken into account (Figure 9).

The tractors purchased at the lowest prices occupied the first three places in the ranking, whereas the expensive ones and those with a short warranty period were at the end of the ranking.

The strength of the relation between both Q and C indicators was determined by means of the Pearson linear correlation coefficient. This value indicates not only the strength but also the direction of dependencies between traits. Based on the data from diagrams 6 and 7, the coefficient value was $r_{QC} = -0.87$. It indicated a relatively strong dependency (because $0.70 \leq |r| < 0.90$) between the qualitative traits group Q and the non-quantitative traits group C. The correlation was negative, as can be seen in the diagram (Figure 10).

The matrix diagram did not clearly indicate the winner of the comparison when both indicators were taken into account at the same time. One more step is necessary, i.e. the synthetic $Q\&C$ index as its value will
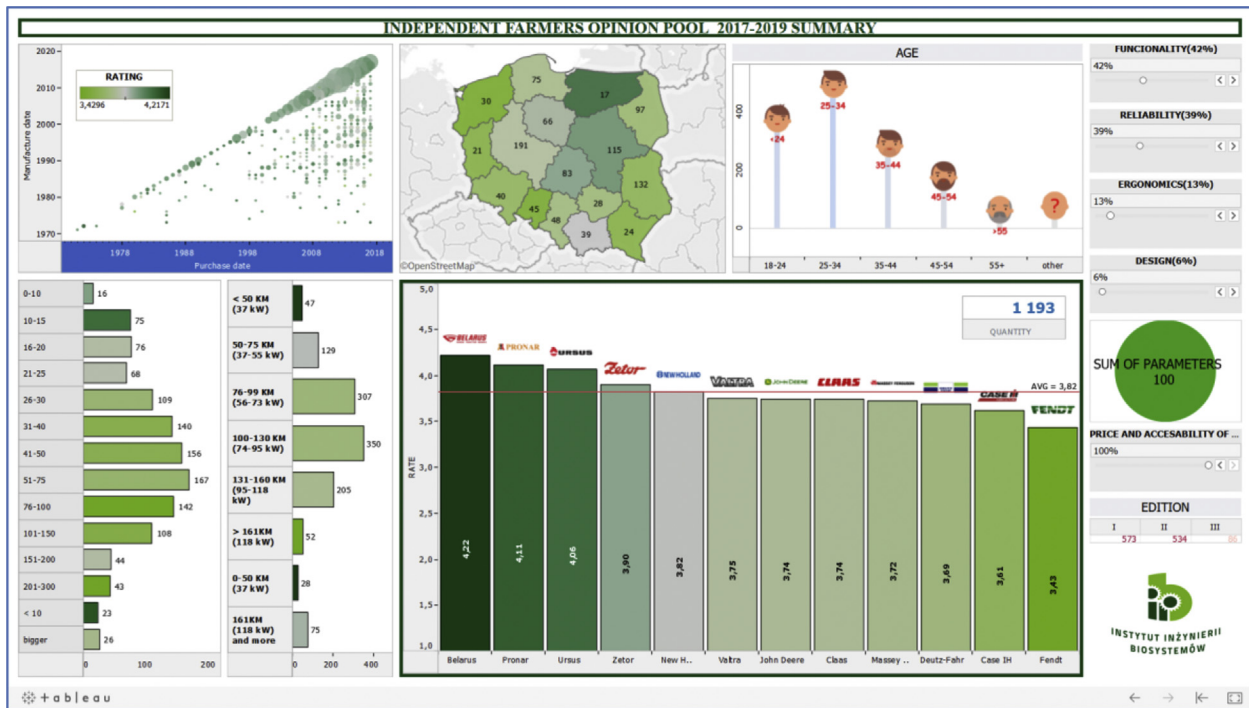
Figure 9. A Race ranking (since 2017) of tractor brands according to the non-qualitative traits C (prices, availability, loss of value).
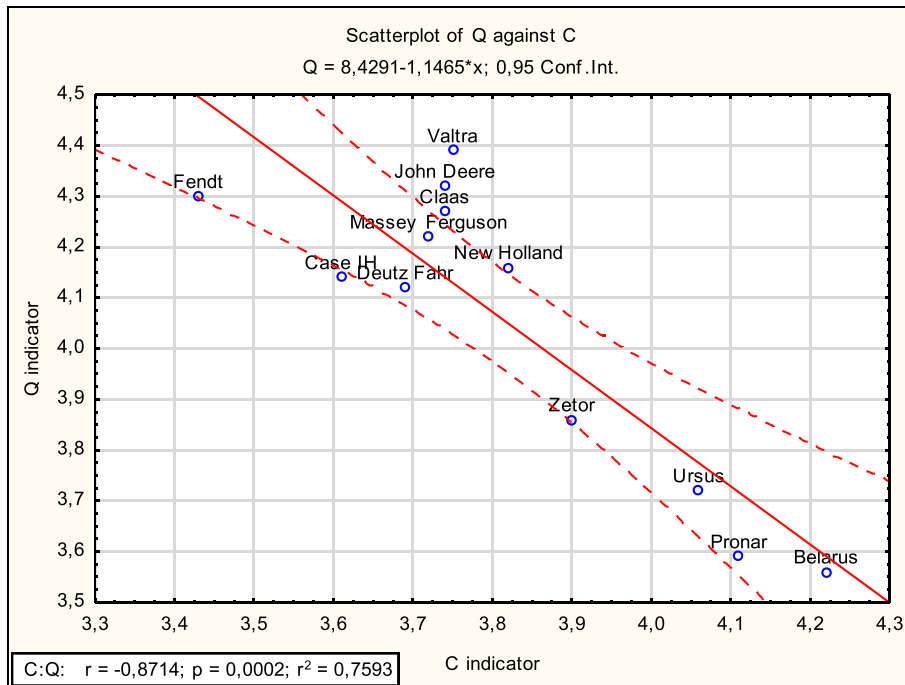

Figure 10. A scatter plot showing the negative correlation between the Q and C indexes of the farm tractor brands.

rank the brands according to the preferences of the Polish farmers who took part in the IFOP project (Figure 11).

The weights resulted in the following ranking of tractor brands: Valtra followed by John Deere and Claas, which proved to be optimal for Polish farmers. By comparison, Figure 12 shows Polish farmers' purchase preferences in 2018.

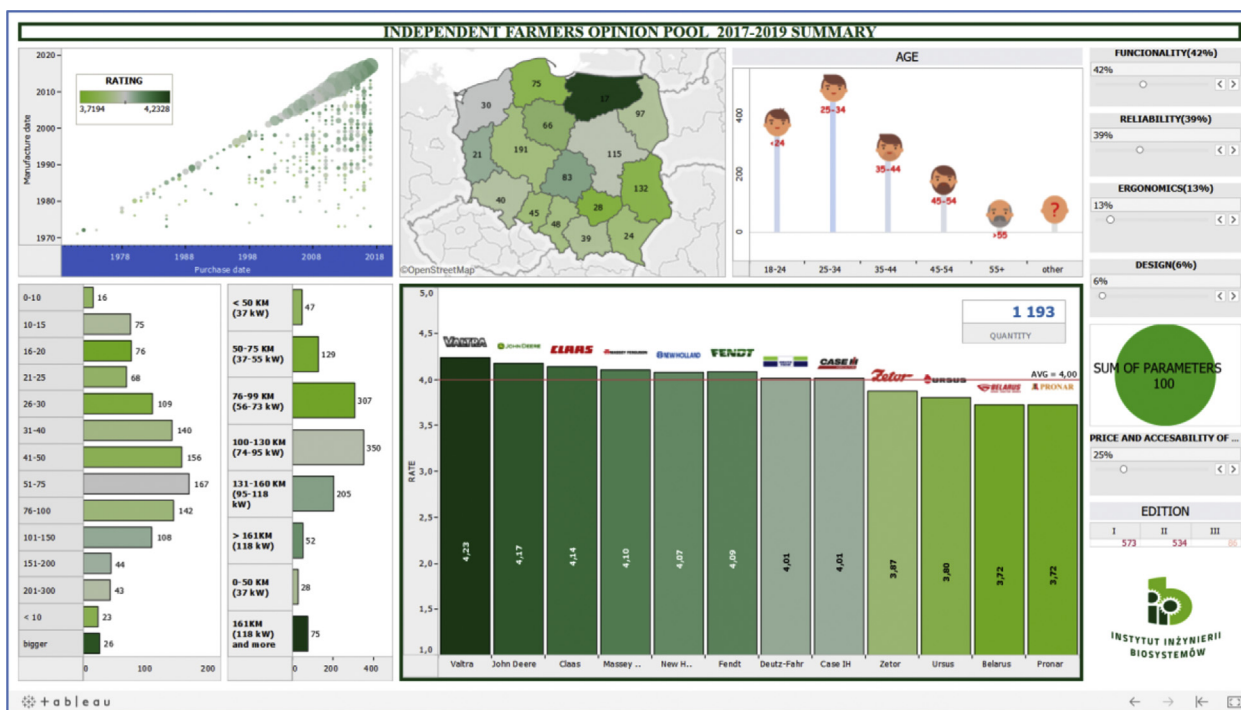The top five most popular models include 3 New Holland products, and 2 John Deere tractors.

Figure 11. The final Race ranking of tractor brands, allowing for the qualitative and non-qualitative traits Q&C and weights $w_Q = 0.75$ and $w_C = 0.25$.
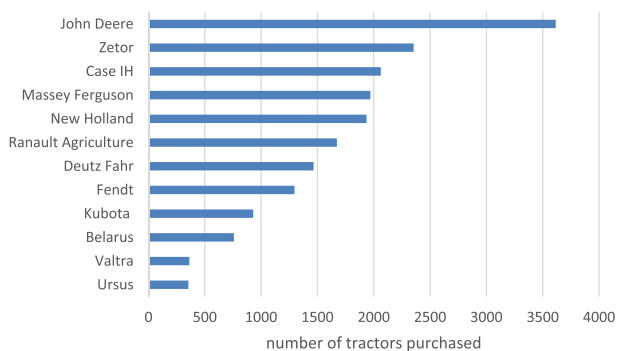

Figure 12. Sales measured with the number of brand-new and imported tractors registered in Poland in 2018.

Figure 13. Information about the double crown in the category 'The best quality tractor brand in the 2nd edition of the IFOP project', Agro Show, September 2018.

5. Summary

The study develops operational research, understood as a set of models and methods of searching for optimal solutions in particular economic conditions. It provides an effective and proven methodology which supports the decision-making process. The method enables the presentation of quality in a numerical form, using a number of sometimes conflicting criteria.

The biggest problem is to acquire reliable data from a large number of users of a particular product. It was necessary to wait as long as two years for a statistically representative set of opinions about tractors. This stage is particularly significant in such reports. Even a good, proven method without reliable data is completely useless in practice.

The generated reports are up-to-date and valid for an area with a similar agrarian, climatic, soil and political structure – in this case for Poland. Similarly to sales results, users' perception of product quality (e.g. farm tractors) is diversified. Therefore, the IFOP platform is flexible and now one can rate machinery and vehicles in English. In the future other language options will be available, i.e. German, Czech and Russian. Only then will it be possible to formulate more general conclusions about the quality of agricultural machinery and vehicles.

The subjective opinions acquired by means of the online survey from a large population of tractor users and the use of this method resulted in an objective final ranking of the brands. The positions in this ranking correspond to the number of models sold in Poland. The manufacturers of the brands ranked in lower positions may be mobilised to correct the design, production, distribution and service stages of their products. Everyone will benefit from the ranking, especially farmers, who will purchase a very good quality tractor at an affordable price.

At the moment Polish farmers have positive opinions about brand-new tractors manufactured in Western Europe, which they have bought in the last decade thanks to the EU subsidies.

It is important that the system should function continuously as a non-profit service, and the staff (experts, system moderator and administrator) should not be bound with manufacturers by any business relations. The Institute of Biosystems Engineering meets these requirements as it operates at a state university, which is subsidised from the state budget.

Our non-profit work for society has already brought some effects. Manufacturers are satisfied with good positions in the ranking (Figure 13), whereas clients use the ranking to make rational and risk-free purchase decisions.

For example, in October 2018 the company Państwowe Gospodarstwo Wodne Wody Polskie, purchased 34 John Deere 6120M tractors in 25 locations in Poland.

Declarations

Author contribution statement

Karol Durczak: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Adam Ekielski: Performed the experiments; Analyzed and interpreted the data.

Radosław Kozłowski, Tomasz Żelaziński: Contributed reagents, materials, analysis tools or data.

Krzysztof Pilarski: Conceived and designed the experiments; Performed the experiments; Wrote the paper.

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Competing interest statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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