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ABSTRACT

of the dissertation for the degree of Doctor of Philosophy

IMPROVING THE EFFICIENCY OF ENGINEERING AND TECHNICAL SERVICES IN THE AGROTECHNICAL SERVICE SYSTEM IN THE FOOTHILL SOWING FIELDS OF THE GANJA-GAZAKH ECONOMIC DISTRICT

Specialty: **3102.01- Agro engineer**

Field of science: **Technical sciences**

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GENERAL DESCRIPTION OF THE RESEARCH

Relevance and degree of completion of the topic. The state programs aimed at the development of the country have led to the revitalization of production areas in agriculture, as well as a new approach to technical policy, improvement of theoretical bases of efficient use of agricultural machinery at a qualitatively new level, and progress has been achieved in the direction of improvement of pro-vision of agricultural producers with appropriate machinery and at the same time, it should be noted that the agrarian reforms carried out were accompanied by an acute shortage of agricultural equipment, their intensive depreciation and a decrease in operating indicators. The inefficient use of machinery is one of the negatives in agriculture, which requires the use of more resources than it is in the economy. The use of machines directly for their intended purpose is not strengthened by the development of technological base of the service due to the lack of scientific and methodological recommendations on activities in conditions of large material consumption and market economy.

The decrease in the level of equipment of the producers of agricultural products, the use of outdated technologies and technical means leads to a decrease in the cultivated areas, a decrease in the productivity of the main agricultural crops, which leads to a decrease in the efficiency of the activities of landowners, and becomes a factor hindering the application of resource-saving technologies, Resource-saving methods in agricultural production are inextricably linked with the use of minimum soil cultivation technologies, combined machines, rational machine-tractor units and machine park, which ensure the implementation of several technological operations in one process and increase soil fertility. The separation of production operations with technical operation in the use of machines leads to a decrease in many consumer quality indicators of machines, making the production area less efficient.

An analysis of information related to the operation of machines in the regions showed that one of the resources for increasing the efficiency of the use of machines consists of complex approaches to

the production and technical operation of the machine-tractor fleet. The need for such an approach arises from the fact that the processes of production and technical operation of machines are closely interconnected and strongly influence each other.

It is precisely in many countries that the establishment of machine-technological stations, and in our country “Agrotechservis” branches of Agroleasing OJSC in the regions is aimed at eliminating the mentioned deficiency. Many of them created opportunities for the application of promising technologies and technical means for the production of agricultural products. The annual load of technical means of the machine-tractor fleet of some agro service branches is 1.8-2.5 times more than in agricultural enterprises with an independent machine Park. In this case, it significantly reduces the negative impact of the shortage of equipment and other material and technical resources and prevents the decline in the level of technical equipment of the agrarian sector. However, as practice shows, it is not always possible to establish the intensity of the use of machines at the established engineering service enterprises at the proper level, and the efficiency indicators of production and economic activity in more than half of enterprises are not at a satisfactory level. The main reason for this is the lack of sufficient justification of the choice of resource-saving technologies and technical means, the distribution of mechanized processes and works among performers, the formation of the composition of the fleet of farms and agrotexservice enterprises.

In this regard, it can be noted that the improvement of the production and technical operation system of the machine-tractor fleet and the improvement of the use of machines with the use of resource-saving techniques are very relevant in the Agrotexservice enterprise operating in the region with specific soil-climatic conditions

Purpose and objectives of the study. The purpose of the study is to improve the system of production and technical operation of the machine-tractor fleet and to justify the effective use of equipment in the service zone with the use of resource-saving techniques. The following tasks were defined to solve the forthcoming problem:

- development of optimization models of Parks and service crews based on machine usage analysis taking into account the selected region conditions;
- justification of a complex of technological measures and technical means ensuring protection and fertility of the soil;
- justification of a complex indicator of the level of production and technical operation of the park, development of a method of its quantitative and qualitative assessment;
- inspection and feasibility study of developed recommendations in production conditions

Research methods. As a theoretical and methodological basis of the study, works of scientists of our country and foreign countries on provision of technical services to agricultural production, organization and effective activity of organizations implementing it were adopted. The factors of production and technical operation of the machine-tractor fleet and the clarification of their interaction were based on a systematic approach, where probability theory, mass service theory, graph theory, statistical analysis method were used

Main provisions to be submitted for defense:

- completion of complex technological measures and technical means ensuring protection and fertility of soils, reduction of material and technical and energy resources in conditions of industrial operation;
- verification of the organization of efficient operation of the machine-tractor fleet of the service enterprise;
- justification of the system-forming factors of the industrial and technical operation of the park and development of a comprehensive assessment method;
- establishment of interaction of parameters of production and technical operation system of the park;
- evaluation of its economic efficiency with verification of the adequacy of the processed model.

Scientific novelty of the research. Scientific novelty of the results obtained joint review of the use of "production-technical exploitation" and resource-saving techniques in the provision of mechanization of technological processes in the conditions of

existing structural features of agricultural production, use of complex indicator to assess the level of operation of the machine-tractor fleet, it is concerned with the development of a model of the production and technical operation process of the park,based on six groups of indicators characterizing the usefulness of organizational-technical and technological measures to ensure the quality of the operational process of the machine-tractor park, as well as methods for increasing the level of technical service of various business entities.

Theoretical and practical significance of the study. At the stages of use of machine-tractor units for their intended purpose, unreasonable idle talk in conditions of shortage of materials (seeds, fertilizers, fuel-lubricating materials), spare parts, replacement units, service means are eliminated; minimization of costs by determining the efficient parameters of service facilities and means taking into account the production and technical operating regime and conditions of the machine-tractor fleet; measures are being developed to improve the level of production and technical operation of the machine-tractor fleet, allowing to form a service system with adapted parameters in local conditions, reducing idle time of machines, increasing their usefulness for their intended use.

The effectiveness of the obtained results was discussed at the scientific and technical Council of ASAU and recommended for application in the region (February 28, 2017 protocol № 9).

Approbation and application of works. The main provisions and results of the research were discussed at the scientific-practical conferences of ASAU (Ganja 2015-2018), national leader H.A.On the results of the research works dedicated to the 94th anniversary of Aliyev's birth in 2017, reported at the scientific-practical conference held in ASAUon may 4-5, 2017 (Ganja 2017). Applied in production at agroservice enterprise of Tovuz region (Act compiled on 26.02.2018).

The name of the organization where the dissertation work is performed. The dissertation work was carried out at the Azerbaijan State Agrarian University.

The total volume of the dissertation with a sign with a note of the volume of structural units of the dissertation separately. The

dissertation work consists of an introduction, four chapters, conclusions, a list of literature and appendices. There are 39 pictures, 20 tables and 3 appendices here. The title part and contents of the dissertation are 3 pages, 3763 characters, introduction is 5 pages, 9684 characters, the first chapter is 30 pages, 61179 characters, the second chapter is 43 pages, 66919 characters, the third chapter is 16 pages, 24266 characters, the fourth chapter is 28 pages, 40003 signs, recommendations to production is 2 pages, 2327 signs, results are 3 pages, 4314 the page consists of 24292 characters. The total volume of the dissertation consists of 154 pages of computer writing. The general text part of the dissertation (excluding pictures, tables, graphs, appendices and literature list) is 115 pages of computer writing or 208560 characters.

CONTENT OF THE WORK

In the introduction, the relevance of the topic, the problem statement and the general characteristics of the dissertation are given.

First chapter. This chapter is entitled "Problem statement, goals and objectives of the research". The problem statement, the goals and objectives of the study were called. The development trends of the system of technical support of agricultural production, country experience for engineering and technical support of agricultural production, increasing the efficiency of engineering and technical services in agricultural characteristics of Ganja-Gazakh economic region are given here. At the end of the chapter, the goals and objectives of the study are indicated.

A number of scientists, including B. on issues related to the justification of the use of machine-tractor fleet in the agrarian sector with high efficiency.S.Svirshevsky, G.V.Vedenyapin, S.A. Iofinov, Y.K. Kirtbaya, V.M.Kryakov, M.S.Runchev, Y.A.Konkin, E.I. Lipkovich, V.M. Mixlin, A.N.Skorkhodov, O.N.Didmanidze, A.Q.Levshin, C.O. I.Aliyev, I.I.Ismailov and so other. The carried out work allowed to determine the directions of improvement of the use of machinery, helped to create a methodological base for determining the optimal composition of the machine-tractor fleet.

Increasing agrarian production in the region depends on more efficient organization of activity of agro service branches of “Agro-leasing” OJSC. It is in this case that conditions are created to reduce the cost of production. In this regard, taking into account the agricultural features of the region, the effective use of techniques requires the implementation of organizational and technological measures on a scientific basis.

World experience shows that it is possible to increase the efficiency of engineering and technical services, including agricultural enterprises in the agrotexservice system. Nevertheless, despite the strategic nature of” Agrotexservis " enterprises, they are very slow due to the presence of some financial difficulties in acquiring new equipment for their perfect shape, insufficient development of the credit-financial system, lack of investors, low efficiency of agricultural production, preventive price growth of all types of resources compared to the prices of agricultural products. These reasons can indicate that soil, resource-saving, energy-saving and other innovative technologies associated with the characteristics of the region are not ignored. Ensuring the efficient use of machinery in the tractor fleet should be put to the fore.

Thus, in this research work, the lack of theoretical research and practical recommendations on improving the efficiency of engineering and technical services in the Agrotexservice system made it important to carry out purposeful research work.

It was directed to the organization of efficient engineering and technical services to farms for the Western region of the Republic.

Second chapter is entitled It is called "Theoretical study of the process of cleaning the core from the shell and fruit shell"**.** The development of theoretical considerations on improving engineering and technical services in the agrotexservice system is called the study of the reserve for improving the use of the machine complex in local conditions, the organization of grain harvesting based on the minimum losses, the development of considerations on the assembly of the machine-tractor fleet, optimization of the composition of the mechanized fleet of, the rationale for the efficient use of vehicles was reflected in agrotexservis enterprises.

The main energy of production for the implementation of technological work in crop production is mobile aggregates. The economic efficiency of mobile aggregates depends more on the correct choice of type of energy vehicles. Selection and assembly of the composition of the machine-tractor fleet was one of the main issues, and the efficiency of the Agroservice enterprise depends on the solution of this problem. Taking into account the specifics of the activities of the agroservice enterprise and the operation of the machine-tractor park, its brand composition is estimated at specially brought costs. This method allows you to bring the amount of machines, their annual loading into a rational state and significantly reduce the investment structure .

j- type machine-tractor units in different calendar periods *i*- the *Q*-annual volume of mechanized works covering the volume of work on technological operations is as follows (ha):

$$Q = \sum_k^K \sum_j^J \sum_i^{\text{i}} Q_{ijk} \rightarrow max, \qquad (1)$$

where: i, j, k-the amount of cycles, aggregates and operations, respectively

Taking into account the features of using the machine-tractor park, we accept the maximum load of machines throughout the year, observing the agrotechnical deadlines for performing mechanized work at the enterprise of production-technological service (Agro-service).

on the I – technological operation, the operating cycle of the *J* – unit is limited by the agrotechnical process with T_b – beginning and T_c-end.

When choosing a tractor type, the following basic principles should be guided:

- the amount of tractor types should be minimal. This demand is explained in terms of operation, maintenance, tractor training, provision of spare parts and other advantages;

- the type and quantity of tractors must correspond to the intended technological process;

-the selected types of tractors must perform all the work on the farm;

-when choosing a tractor type, soil-climatic conditions, special resistance of the soil, moisture content of the soil and air in the period when field work is carried out, nature of the relief, dimensions of the field should be taken into account, especially according to the type of gait section.

Every farm served by the agroservice enterprise has such a volume of work that it must be carried out in accordance with the appropriate zone technology.

If the number of mobile aggregates is small, the work will be performed for a long time, which will lead to large product losses due to the failure of the work on time. The specially imported costs will be high due to the multiplicity of special costs associated with the loss of part of the product.

When performing I-technological operation without going beyond the optimal agrotechnical period, the total share of losses (obtained income) is as follows:

$$S_{it} = 0{,}5\ C_{it}\ U\ FK_{it}\ (T_f - T_a)(1+d) \qquad (2)$$

where: C_{it} – average price of agricultural product, man / ton;

U – productivity, tone / ha;

F – daily productivity of aggregates, ha;

K_{it} – coefficient taking into account losses, fraction / hour;

T_a – agrotechnical period of work, day;

T_f – duration of actual work, day;

d – working time for technical, climate and organizational reasons the coefficient that takes into account the loss

If the number of aggregates is greater, the loss of products will be significantly reduced. However, the specially brought costs will be very much due to the increase in the specific weight of costs in connection with the purchase and operation of the technique.

In this regard, the need arises for determining the optimal amount of aggregates. And this is an indicator that the work is carried out at a higher cost .

The collection of the total brought expenses can be written in the following way:

$$S = P = \frac{C_T(\alpha_1 + E_n)\mu_1}{100\ w} + \frac{C_q(\alpha_2 + E_n)\mu_2}{100\ w} + \frac{C_M(\alpha_3 + E_n)\mu_3}{100\ w} + C_{ЭТ} +$$

$$+\sum_{1}^{n} C_{CTTX} + H + \sum_{1}^{m} Z + 0{,}5C_{it} \cdot K_{it}\left(T_f - T_a\right)(1+a) \quad (3)$$

where: C_T – tractor balance price – man;

α_1, α_2, α_3 – tractors, trailers and agricultural machinery renovation deductions, %;

E_n – normative efficiency coefficient of investment;

μ_1, μ_2, μ_3 – on this work in the total annual amount of work with this machine specific gravity (part);

C_q – qoşqunun balans qiyməti, man;

C_M – book value of agricultural machinery, man;

W – the volume of this work on the farm, ha;

$C_{ƏT}$ - deductions for major repairs, man / ha;

$\Sigma C_{CT\,TX}$ – total allocations for current repair and maintenance services for tractors, trailers and agricultural machinery; man / ha;

H – fuel price, man / hour;

Z – salary of mechanizers, man.

If during the year tractors, trailers and other machines other than the specified work will be used for other work, then annual expenses related to deductions reflecting the regulatory efficiency of investments in renovation cannot be attributed to the specified work. Therefore, only the part of it determined by the Q-coefficient is taken into account.

For example, universal trailers are used for various jobs: loosening, loosening, hoeing, etc. used. In our conditions, the use of trailers in manual mode (in time) is about 30%. The price of this ring is 0.3.

If a machine is used in the unit that can only be used in a given job, then the price of μ for this case is equal to one (from 1).

With some transformations, we write the above general cost equation as follows:

$$P = \frac{\sum_1^n P_1 B_{iş}(\alpha_1 + E_n)\mu_1 K_{it} U C_{it} W_{möv}}{100\, W_{möv} W_{gün}} + B \quad (4)$$

where: P_1 – the unit cost of a tractor, trailer, agricultural machine unit per 1 m of working space, person/m;

$B_{iş}$ – working width of the unit, m;

$W_{gün}$ – $0,1B_{iş}V_{iş}T\tau$ - daily productivity of aggregate, ha / day;

$V_{iş}$ – working speed of the unit, km / h;

T – length of working day, hours;

τ – coefficient of use of shift time.

$$W_{möv} = (T_f - T_a)(1+d)F,$$

where: $W_{möv}$ – seasonal load of mobile units, ha.

We apply and obtain the function P to find the extremum by the formula:

$$B_{iş}^{opt} = W_{möv}\sqrt{\frac{10 \cdot 100 \cdot K_{its}UC_{it}}{n \nu_{iş}\tau \sum P_1(\alpha_1 + E_n)\mu_1}} \qquad (5)$$

where: $B_{iş}^{opt}$ – optimal train of the machine, m;

K_{its} – loss factor, fraction/hour.

The optimal number of aggregates can be found by the formula

$$\Pi_\alpha = \frac{B_{iş}^{opt}}{B_{iş}} \qquad (6)$$

The price of the resulting Π_α allows you to find the economic efficiency of a process provided by technology:

$$Э_n = \frac{\Pi_\alpha}{W_{möv}} \cdot 1000 \qquad (7)$$

where: $Э_n$–number of units per 1000 ha.

When using discounted operating costs as an objective function, formula (5) is reduced to the following figure:

$$B_{iş}^{opt} = W_{möv}\sqrt{\frac{10 \cdot 100 \cdot K_{iş}UC_{it}}{n \nu_{iş}\tau \sum P_1\alpha_1\mu_1}} \qquad (8)$$

The nature of the formula obtained allows us to draw the following conclusions:

- The required number of aggregates is directly dependent on the volume of seasonal work.

• Under all other conditions, when the prices for the K_{its}, U, C_{it} values increase, the required number of aggregates also increases. Thus, with an increase in productivity or product prices, the number of aggregates corresponding to the target economic direction $\sqrt{n}$ increases n times.

• The number of units required to perform a certain amount of work decreases as the working copy - $\nu_{iş}$, the time utilization factor - τ and the unit cost of the machine increase..

Third chapter under the title ”Program and methodology of experimental research", where the research program is given, the justification of the working hypothesis as an object of research, the research methodology.

As one of the main issues is the selection and assembly of the composition of the machine-tractor fleet, productivity and quality of work, expenses for the performance of work depend on how the final result of the activities of the farm and service enterprise is solved. Taking into account the operational characteristics of the machine-tractor fleet in agriculture, its brand composition was carried out on the basis of optimization of the distribution of mechanized works at the minimum cost of direct (independent) operating costs. The innovation used in the methodology for their determination was that the depreciation expense of the machines was based on the full use of their resources (on passport). Standards, maintenance and repair, park maintenance costs are based on standard methods, fuel and lubricating materials, use of dependencies taking into account their actual consumption. The methodology allows you to optimize the amount of machines and their annual load, significantly reducing the demand of farms and service enterprises for investment. In this case, the optimization parameters reflecting the real operating conditions of the machine-tractor fleet were used. Here the following options for organizing mechanized works were taken into account:

❖ agricultural products manufacturers with outdated machines with their own power;

❖ with new machines acquired by producers of agricultural products;

❖ by involving the strength and means of Service Enterprise.

Experimental studies have taken into account clarification of factors of production and technical operation, registration of cases of rejection of the system and its components as a whole, determination of their duration. For the study, the method of observation and analysis of the waste of time and funds on its elements was considered the most acceptable. Standard set of computer programs from Windows Excel is used to process the received prices. A well-known expert assessment method was applied to develop a complex indicator of the level of production and technical exploitation.

Fourth chapter named "The results of experimental studies and their analysis". The operational characteristics of the machine-tractor fleet of the service enterprise are determined by the land-economic conditions of the region, which indicate itself in the specialization of agricultural production, its resource capacity and efficiency, the quantity and brand composition of the equipment. The rationale for the effective organization of the use of the machine-tractor Park was carried out here on the example of the specific economy of the region (Tovuz Baltia company of Tovuz region). For this purpose, indicators of efficiency and level of use of machine-tractor fleet were calculated.

The intensity of field work, the binding effect of heavy machinery and tools on the soil, plowing by turning the soil lead to negative consequences in agricultural technologies. The application of the method of minimal soil cultivation allows you to reduce the number of moves, the depth and area of cultivation, and reduce the consumption of energy, labor and materials by conducting operations simultaneously. A technological scheme is given that reflects the expediency of applying individual elements of Minimal cultivation on zone soils. The natural features of the region, the cultivation technologies of agricultural crops, the structure of arable land, the relief of the Earth, the special resistance of the soil, the productivity of the plant require the correct selection of a tractor, an agricultural machine for organizing Meha-niked works. These factors are isolated from each other, together and in different directions, technology affects demand. As a result, productivity of machine-tractor units

increases or decreases as an expression of this general impact, respectively, the upper and lower boundaries of machine-tractor units differing approximately 2 times from each other (figure 1; figure 2) soil relief is of particular importance for the mountainous conditions of the region. The wave slope of the plain zone here is 0.001-0.003 m.400...600 m above sea level. It is about high.

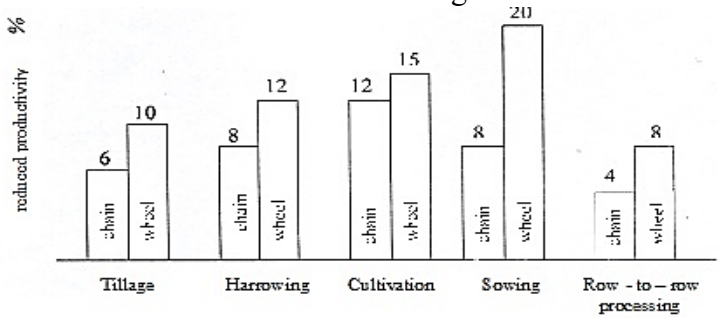
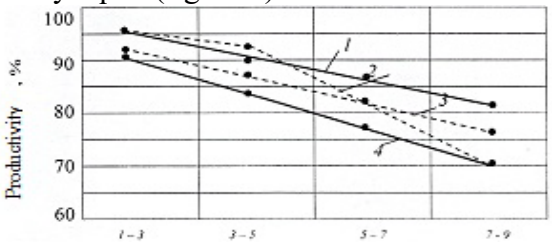


Figure 1. The impact of local relief on the productivity of machine-tractor units on operations.

Justification of quantity and brand composition of the machine-tractor fleet is considered the basis for their high-efficiency work and requires optimization of the distribution of structured work among the executors on the basis of the accepted criterion (direct operating costs for specific technological operations or work on the machine-tractor fleet, which should be minimal). Based on the minimum cost, conclusions are drawn about mechanized processes and work performed for one or another executor. The minimum cost of operating costs depends on the volume of mechanized work performed during the year.

The basis for the practical implementation of the feasibility model of optimizing the distribution of mechanized works on the performance of work in various variants dependences of special operating costs on tractor brands have been obtained. For a new fleet of machines (equipped with energy and resource-saving equipment), they are slightly elevated in the conditions of agrotexservice (figure 3). So these often buy new techniques on the basis of leasing. While it is 1,4...1.6 times increases. When the load on the farm is increased

at the level in the agrotechnical service, the costs of special operation are approximately equal (figure 4).



test - - - - - - - - calculate ——

Figure 2. The influence of local relief on the productivity of machine-tractor aggregate according to tractor brands: 1-T-150K; 2-MT3-83; 3-MT3-80; 4-MT3-1221 experimental report.

The analysis of the machine-tractor fleet at various enterprises, on the use of techniques in organizational and economic forms, showed that the average statistical load of tractors at the manufacturer of agricultural products is 500..600, and 1500 in agroservice...The Conventional benchmark is 2000 hectares. Therefore, in a comparative assessment of efficiency, not only the prices of special operating costs at the same prices of loading are compared, but also the actual level of loading achieved at the agro-enterprise and agro-service enterprise are compared.

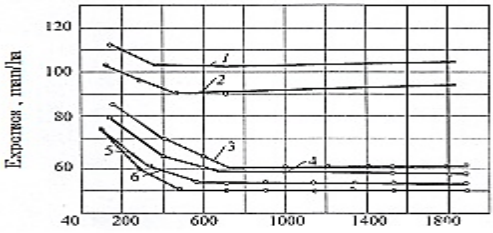


Figure 3. Changes in special operating costs depending on the level of loading of tractors in the conditions of energy-resource-saving equipment updated park of agroservice enterprise.
1-14 kN ; 2-30 kN; 3-50 kN; 4-20 kN; 5-18 kN; 6-30 kN.

Depending on the annual volume of mechanized work performed, the results of the analysis of the dynamics of the costs of special operation of tractors of various brands showed that 30... 50 kN The effective use of tractors of class means that their annual load is 1250...1500 is possible if the conditional benchmark is not less than a hectare (figure 5; figure 6).

The obtained reporting results and the graphical dependencies built on them show that their load on practically all major agricultural tractors is 500... 600. If the conditional reference is hectares, it is more expedient to carry out mechanized work of large companies or large farmers ' farms with own equipment.

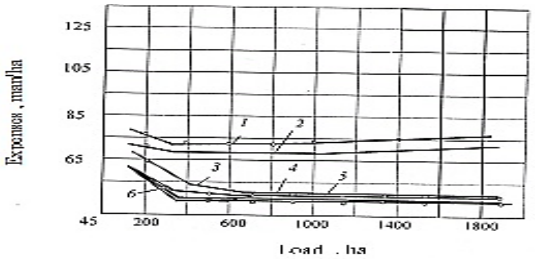


Figure 4. Changes in special operating costs depending on the level of load of the trachlords in the conditions of the energy resource-saving fleet of large company or large farm association.

1- 14 k ; 2-30 kN; 3-50 kN; 4-20 kN; 5- 18 k ; 6-30 kN.

At the agro service facility for 30 kN tractors, the effective load limit is reduced to 750-850 conditional reference hectares. On other tractors, this price is 500... 600 conventional benchmark is hectares. MTZ-80/82 and LTZ-60/65 tractors are exceptional. These are heavy energy-intensive works (plowing, flat cutting, etc.). they have high fuel consumption and high operating costs. This indicates that the application of these tractors in the mentioned mechanized works is not advisable.

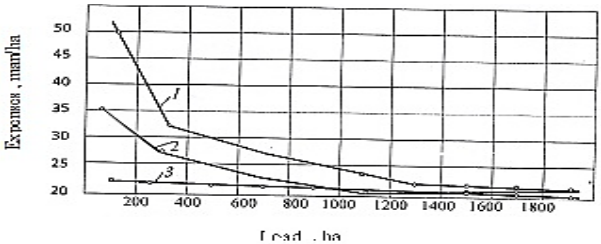


Figure 5.Assessment of maintenance costs on T-150 tractors comparatively:

1-Agroservice enterprise (updated park); 2-large company Enterprise (updated park); 3-large farmer-peasant farm (available parking).

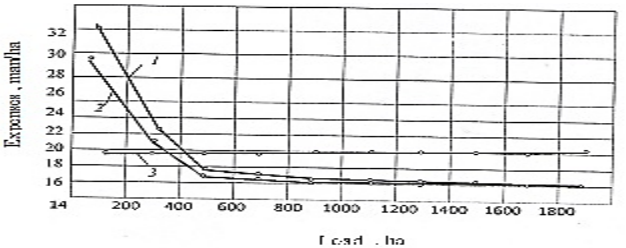


Figure 6. Assessment of maintenance costs on T-150 tractors comparatively:

1-Agroservice enterprise (updated park); 2-large company enterprise (updated park); 3-large farmer-peasant farm (available parking).

In terms of minimization of operating costs in the conditions of enterprises using conventional technologies for the cultivation and harvesting of agricultural crops, the most effective for agrotexservis can be considered tractors with a traction class of 14, 20 and 30 kN.

These tend to have a significantly lower cost and a higher annual load in most technological operations during a calendar year.

Analysis of graphical dependencies on basic technological operations and machine-tractor aggregates made it possible to determine the effective annual load limits for the accepted reporting options (Appendix 2).

Results

1.Existing forms of implementation of technical and technological support for the mechanization of production processes in agriculture and at the established engineering service enterprises, it is not always possible to properly establish the intensity of the use of machines, and in more than half of enterprises the efficiency indicators of production and economic activity are not at a satisfactory level. It is required to improve the production and technical operation system of the machine-tractor fleet of the service enterprise operating in the economic region with specific soil-climatic conditions and to improve the use of machines with the use of resource-saving techniques.

2. On the basis of theoretical analysis of shift time use (K_{jmax}) and voltage coefficients (K_{or}) of the resources of improvement of utilization of the machine complex in the region, it was determined that the composition of sowing and harvesting complexes should be coordinated with each other in order to minimize the loss of production. Realization of potential capabilities of complexes is possible when, according to the work plan, all systems for their services are optimized.

3. A model of optimal organization of grain harvesting based on the minimum cost of losses has been developed. This model allows to increase the productivity of combine harvesters by 15-20% and to obtain additional 2-3 quintals per hectare due to the reduction of losses.

4. Empirical formulas were determined on the basis of theoretical studies on the complexing of the machine-tractor fleet. Calculations show that the required amount of aggregates is directly proportional to the volume of seasonal work. Under all other conditions, when the coefficient taking into account losses (K_{its}, fraction /hour), productivity (U, ton/ha), the partner price of the product (C_{it}, man/ton) increases, the required amount of aggregates also increases, when the price of the product increases “n” times, the expedient price of the aggregates from the economic point of view is increased n times.

5.As a result of theoretical and experimental studies, a mathematical model of agrotexservice Enterprises was developed. As an optimization criterion in the model, the number of machine-tractor units and the minimum cost of fuel consumption were taken as a minimalizing indicator. It has been established that the existing quantity of the machine-tractor fleet exceeds the optimal composition.

6.As a result of the experiment it was established that the level of production and technical operation is closely related to reliability and operational performance of machine-tractor units. The statistical characteristics (UITI) of failure and repair capability of aggregates change as they increase in the established operating modes. The flow of operational capabilities decreases, the probability of occurrence of complex exploitation and the labor capacity for their elimination increases.

7. Increasing the level of use of tractors in the farm group with an average annual volume of 130 conventional hectares led to the increase in maintenance and repair costs by 15 manats per unit of work volume. This group mainly uses very outdated machines. The average annual load on tractors in the farm group of a large company is 1220 hectares, increasing the level of operation, repair costs decreased by 0.6 manat. By increasing the level of use of equipment at agroservice, it was possible to increase the load of one unit to 140 conventional hectares, costs for all types of services decreased by 0.2 manats per unit of work volume.

8. At the agro-service enterprise for 30 kN tractors, the effective upgrade limit was 750...850 conventional etalon hectares, and in other tractors 500.... 600 conventional benchmark is hectares. In the conditions of enterprises applying conventional technologies for cultivation or harvesting of agricultural crops, tractors with a traction class of 14, 20 and 30 kN can be considered more efficient in terms of minimizing operating costs for agrotexservice.

9. A comparative assessment of the machine-tractor fleet with the use of existing and resource-saving technologies has shown that the new version is 20...25%, diesel fuel 30%, labor costs more than 5 times are saved. The effective use of the machine-tractor Park

provides for the implementation of the entire complex of mechanized works, the cost of mechanized works is 20...25% it's down. The total economic efficiency of the research is 135 thousand manat.

Recommendations for manufacturing

1. Unjustified empty stops should be eliminated in the conditions of shortage of materials (seeds, fertilizers, fuel-lubricating materials), spare parts, modified aggregates, service means at the stages of machi-ne-tractor units used for their intended purpose, cost minimization should be ensured the rhythmicity of technological processes in the field-growing by determining efficient parameters of service facilities and means taking into account, measures should be developed to improve the level of production and technical operation of the machine-tractor fleet, reduce idle time of the machines and achieve to increase their usefulness for their intended use, allowing to form a service system with adapted parameters in local conditions.

2. The level of use of the machine-tractor fleet, as always, today, being an important indicator of the effective management of modern high-level mechanized agricultural production, the volume of work and agrotechnical deadlines in field farming, other production areas should remain practically unchanged. In such a situation, the shortage of existing machine-tractor parks should be adequately compensated by increasing their load.

3. In order to set up a system of machines for the enterprise, it is necessary to take into account local conditions, the adopted management system, specialization of the farm and cooperation in other areas in the agrarian industry system. New innovative resource-saving techniques should be used to produce ecologically clean food products.

The main provisions of the dissertation are reflected in the following published articles:

1. Yusifov,S.N. Application of modeling for agricultural service enterprises // Azerbaijan Agrarian Science, 2017, No.1, pp. 80-82.

2. Yusifov, S.N. Research of reserves for improving the use of the machine complex in local conditions // Azerbaijan Agrarian Science, 2017, No.2, pp. 58-61

3. Yusifov, S.N. Organization of grain harvesting on the basis of minimizing losses // Azerbaijan Agrarian Science, 2017, No. 3, pp. 109-111.

4. Yusifov, S.N. Rational use of vehicles of agrotech service enterprises // Agrarian Science, 2017, No. 8, pp. 26-28.

5. Yusifov, S.N. Analysis of the branded composition and operational costs of the tractor fleet for service // Azerbaijan Agrarian Science, 2018, No. 1, pp. 62-67

6. Yusifov, S.N. Optimization of the composition of mechanized detachments of the park collection of news of the Ganja branch of ANAS, Ganja, 2018, No. 1(71), pp. 153-156.

7. Yusifov S.N. Justification of the organization of effective work of a service enterprise from the point of view of resource conserva-tion.//Ganja: Scientific works of ASAU.- 2019.No.1,-pp. 66-70.

8. Yusifov, S.N. Pecularities of production and technical production and technical exploitation of the Use of Technology in the Agrotechservice Enterprise//scientific journal Herald from Khmelnitsky National University.-2021, ISSUE 4, - pp. 88-94

9. Yusifov, S.N. Development of prerequisites for the complete set of the machine-tractor park // collection of Scientific papers. Pereyaslav. Khmelnitsky, 2017, No.11(31) part12, pp. 87-92

10. Yusifov, S.N. The role of innovations in improving the efficiency of the engineering service in JSC"Agroleasing"//Ganja: GSU International Scientific Conference. 2019, May 03-04. Part V. - pp. 281-285.

11. Yusifov, S.N. Research of indicators of production and technical operation of the machine and tractor park. // Ganja: scientific and practical conference of ASAU.- 2019, October 29.- pp.313-316

12. Yusifov, S.N. Justification of increasing the efficiency of engineering and technical maintenance of agricultural enterprises// Modern science: Innovations and prospects. I International Scientific and practical conference// collection of Scientific works. Stockholme. 10-12 October 2021. - pp. 160-169.

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