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Design procedure of deficits from idle time of agricultural machinery

Goal. Develop a methodology for calculating the economic losses of agrarian production from simple agricultural machinery. **Methods.** Monographic, analysis and synthesis, abstract-logical. **Results** The presented method reflects the content of economic losses of owners and users of technology and algorithm for their calculation, which takes into account lost profits, material and unproductive losses of agricultural producers, in particular the cost of maintenance of non-working technical means. **Conclusions** The application of the proposed methodology makes it possible to objectively determine the volume of economic losses of agrarian enterprises from the downtime of machinery and equipment.

Key words: methodology, economic losses, simple agricultural machinery, maintenance of idle equipment.

In the process of exploitation of agricultural machinery, the costs of maintaining it in an operational condition are inevitable. However, in addition to planned maintenance and repair costs (TOR), farms often suffer unplanned, unpredictable costs, in particular losses from prolonged downtime due to structural defects, defect from manufacturing technology or unsatisfactory technical service. Often, sellers of equipment or technical service companies eliminate malfunctions, failing to meet the deadlines stipulated by the current legislative acts and contracts, which leads to significant irreversible losses of agricultural producers.

Improving the efficiency of agricultural machines is possible thanks to their high-quality service in the guarantee and after-warranty period. However, for the formation of civilized relations between sellers and consumers of technology, it is necessary to improve a number of normative acts regulating their legal and material responsibility.

Analysis of recent research and publications. Modern relations between manufacturers, sellers and buyers (consumers) of technical equipment and equipment for agricultural production are regulated by a number of legislative and regulatory acts, and a number of scientific and scientific works [6 - 10] are devoted to solving engineering and technical problems.

In particular, the Law of Ukraine "On the protection of the rights of buyers of agricultural machines" defines the responsibilities and responsibilities of the participants of the market for technical means for the agroindustrial complex, and the Resolution of the Cabinet of Ministers of Ukraine No. 885 dated July 12, 2004, approved the methodology for determining the cost of work of the machine-day and losses. However, the current procedure for determining losses from simple technology does not take into account the full amount of economic losses of agricultural producers, which requires the further development of proposals for a methodological direction.

The purpose of the research is to develop a methodology for calculating economic losses from idle agricultural machinery.

Research methods. The theoretical and methodological basis of research is the work of domestic and foreign scientists on the evaluation of the cost of exploitation of agricultural machinery [1, 2, 4], legislative and normative acts of regulation of engineering and technical service of agricultural machinery and equipment. To substantiate the methodology methods of analysis and synthesis, induction and deduction, production observations, abstract-logical, and monographic methods were used to calculate the losses from the idle agricultural technique.

Research results. If agricultural producers suffer damage from the agricultural machinery due to the fault of their manufacturers, then the latter, in accordance with the current legislation, must fully compensate

them, namely, for each day of delay in eliminating deficiencies over a fixed period, a fine is paid to the buyers of the cost machine-day of operation of the car. In addition, the manufacturer is obliged to compensate the buyer for losses from idle machines that work within the unit [3], in particular the loss of profit in part not covered by a fine.

Consumer losses from simple technology are not limited to lost products, as determined by the current methodology, and should include a number of costs caused by the delay in the execution of the required amount of work. For example, untimely plowing may require the implementation of additional technological operations to bring the soil to an optimal technological state (discarding, cultivating, harrowing, etc.). Lack of yield may lead to non-fulfillment of forward contracts and contracts and the payment of penalties for them. Similar negative consequences will be the non-implementation of contracts for the provision of works and services of agricultural machinery due to the failure of the latter. In such cases, agricultural enterprises are forced to enforce certain work in order to avoid serious consequences.

Avoidance (accelerating the execution of work in order to make up for the lost equipment due to the use of time-consuming equipment to perform the necessary technological operations in optimal terms) can be accomplished both at the expense of its own reserves and the attraction of external executors. Disabling of mechanized work can be done at the expense of: lengthening the working day and increasing production standards for maintenance staff in these works, which increases the cost of labor remuneration for workers involved in the production process; the use of another own, often less productive technique, which leads to an increase in the cost of these works; involvement of outside organizations and executors, which entails additional contractual obligations.

The involvement of outside organizations for technological operations (in the event that they can not be timely implemented by their own forces through a non-working technique) may lead to an increase in the expenses of working capital of the economy. If there is a need to attract credit resources, then the loan fee (interest) is also credited to the additional costs.

We propose a classification of economic losses [5], which should be taken into account in determining the amount of compensation for losses from simple agricultural machinery and equipment (table).

In the specific case, the owner of the agricultural machinery may suffer several types of damage, in which case they are calculated separately for each type, and then summed up. The mechanism for calculating the economic loss from idle agricultural machinery is represented by the formula:

$$Z_e = \sum_{y=1}^n Z_{yB} + \sum_{u=1}^m Z_{MB} + \sum_{g=1}^w Z_{HB} \quad (1)$$

where Z_e - economic losses from simple engineering; Z_{yB} - lost profit for each type of cause of loss ($y = 1, 2 \dots n$); Z_{MB} - material losses for each type of cause of loss ($u = 1, 2 \dots m$); Z_{HB} - unproductive losses for each type of cause of loss ($g = 1, 2 \dots w$).

The volume of material (Z_{MB}) and nonproductive (Z_{HB}) losses for each species (u, g) are established on the basis of actual data of the accounting of the holding. Lost profit (Z_{yB}) from the decline in the productivity of agricultural crops and animals due to the late implementation of certain technological operations is determined as the value of the lost harvest in 1 day, the following formula:

$$Z_{yB} = K_{yB} \times Y_k \times P_k \times t_H \times U_k, \quad (2)$$

where Y_k - yield of k agricultural crop, t / ha; K_{yB} - coefficient of loss of crop of k agricultural crop as a result of delay of a certain technological operation for 1 day; P_k - productivity of the aggregate in growing (harvesting) k -th culture, ha / h; T_s - average wholesale price of k -type of products in the region, UAH / ton.

If the technique has been idle for 2 or more days (n) beyond the statutory time limit, then the amount of lost profit is calculated in the following order:

$$Z_{yB} = \sum_{k=1}^n k Z_{yB}. \quad (3)$$

Due to delayed execution of technological operations due to the simple technique, the quality of the produced product can be reduced. Loss of profit (loss of income) as a result is determined by the size of the decrease in the value of the product as a result of the decrease in the selling price and is calculated according to the formula:

$$3_{\text{уб.нр}} = Q_{\text{нр}} (\text{Ц}_{\text{внр}} - \text{Ц}_{\text{нр}}), \quad (4)$$

where 3 - is the loss of the benefits of lowering the quality of products; Q - quantity of products of lower quality, realized at a reduced price; $\text{Ц}_{\text{внр}}$ - the price of products of high quality; $\text{Ц}_{\text{нр}}$ - pricing is the actual price of sales of products of reduced quality.

Penalties for non-fulfillment of contractual obligations as lost profits of the owner of the equipment are taken into account in the amount of the actually paid fine, penalties and fines, which are provided for in the terms of the contract.

The amount of material losses (ZMV) for each type of cause of occurrence (u, g) is established according to the actual data of the accounting of the economy. The size of unproductive expenses (ZNV) for the simple technique we propose to determine as the cost of machine-day of simple technique (VPA) in the following order:

$$B_{\text{на}} = t_{\text{н}} (3_{\text{нр}} + A + P_{\text{ТОР}} + C + K + H_{\text{н}}) (1 + H_{\text{нр}}), \quad (5)$$

where $3_{\text{нр}}$ - the cost of wages of the maintenance staff with accruals during the idle time of the equipment. According to paragraph 5.14. The sectoral agreement in agriculture for 2014 - 2016 for each hour of downtime is not paid by the employer to the employee in the amount of not less than two thirds of his average salary;

A - depreciation deductions; $P_{\text{ТОР}}$ - costs for maintenance and repair of the unit; C - costs for saving and insurance of machines that are part of the unit;

K - expenses for repaying a bank loan (subject to the purchase of any machines included in the aggregate, for credit cards); $H_{\text{н}}$ - standard of overhead expenditures, used in the economy; $H_{\text{нр}}$ - the rate of profit adopted in the economy.

In determining the cost of a machine-day idle, account is taken of the calculations for those machines in the aggregate, which can not be used on other jobs autonomously or as part of other aggregates. In addition, the use of the indicator of the cost of a simple machine-day of technology will allow to more objectively and reasonably determine the amount of the fine for non-fulfillment of contractual obligations of suppliers of agricultural machinery, provided by the current legislation.

Conclusions

The proposed method of calculating losses from idle agricultural machinery objectively reflects the content of economic losses of owners and users of the equipment. It takes into account both the decline in the productivity and quality of agrarian production, as well as a number of material and unproductive losses, which are a direct consequence of idle machines. The proposed methodology will make it possible to improve the relationship between the subjects of the market of agricultural machines and equipment in terms of their obligations and to substantiate the interests of agricultural producers.

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