

МЕТОДЫ И КРИТЕРИИ ВЫБОРА ТРАКТОРОВ И СЕЛЬСКОХОЗЯЙСТВЕННЫХ МАШИН

METHODS AND CRITERIA OF SELECTION OF FARM TRACTORS AND MACHINERY

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В статье рассматриваются такие методы выбора сельхозтехники как индексный, индикативный, технологический, сравнительный и метод оптимизации. Дается экономическое обоснование проекта механизации фермерского хозяйства. По мнению авторов, на современном этапе возникает необходимость разработки нового метода, учитывающего влияние постоянно изменяющихся экономических и природных условий на деятельность сельскохозяйственного предприятия.

Proper planning of the number of machines and tractors for a farm with certain area of agricultural land and the structure of production requires a detailed analysis of production activities carried out on the farm. The importance of proper selection of technical measures for farms was stressed by many authors [Wojcicki 1992; Izdebski 1999; Skudlarski 2006]. When buying, one must remember that the acquisition of machinery and agricultural tractors are binding the capital invested for many years of use, and the consequence of misguided investments may be deterioration of the financial state. Purchase of farm tractor is a major investment in the farm. In case of inadequate decision to buy a tractor the farmer may incur significant financial losses, even for a few years [Skudlarski 2006]. Financial performance of the farmer depends heavily on the ability to plan investments, the right choice of the tractor, as well as effective and safe use of purchased equipment [Kurek 2007].

Review of methods and criteria for the selection of machines and tractors to According to Wojcicki [1989] the basic criteria of selection of tractors and farm machinery are: farm size, farm specialization and organization, the intensity of production, cooperation and availability of neighborhood services. At the same time the author also lists other criteria which include:

- demand - supply criteria, taking into account the prices of agricultural products and agricultural engineering,
- forecasting - assortment criteria, associated with an estimate of the technical and productive farm's state, and market offer for machinery and tractors for construction solutions,
- operational and economic criteria, emphasizing the importance of adequate annual use of machines and tractors
- production and income criteria, taking into account the profitability of the farm.

In addition, Wojcicki [1989] argues that for the rational development of agricultural technology on farms it is important to improve and disseminate methods for selecting sets of machines and tractors. As Lisowski Says [2008] an objective indication of the appropriate type of tractor for the farm requires very good knowledge of technology, agricultural production and environmental aspects, energy, organization and labor economics. Farmer seeks answer to the question, which is only apparently simple. Answering the question of what tractor to buy, requires a good expertise and to acquire relevant information about the farm. Because on the market several different brands of tractors, types and models are available, therefore documentation is necessary in the form of certificates and test reports by independent research centers. Advisory services should play an important role in this regard. Workers providing services in agricultural assistance should be able to advise the farmer, whether he should buy a new or used tractor, or buy big one, but very powerful and very expensive, or some small and less expensive tractors, perhaps buying a specialist tractor would be needed, or to cancel the purchase and use of neighborhood services, specialist companies and machinery rings.

Lisowski [2008] presents selection criteria for agricultural tractor to the farm and the questions that a person buying a tractor should have to answer. The most important ones include:

1. What will be more favorable in financial terms, a stand-alone or joint purchase of a tractor by a few farmers? With that criterion comes the question, what is the ratio of unit cost of operating the tractor on the owner's farm in respect of co-owners of farms or a cooperative neighborhood?
2. Is it possible to use a neighborhood services for the implementation of production procedures, whether the service would be cheaper than executing the actions with own equipment?
3. Can the farmer afford the possession of the tractor of selected type?
4. What works can not be done if they do not buy a tractor with more or less power?
5. Is buying a new tractor will require further investment? It may refer to plow with more bodies, seed-drill, growing aggregate, in order to fully harness the power of the tractor.
6. Are we going to provide services outside using this tractor?
7. How will the profit of the farmer change, if he asks for execution of works which could not have been done with this tractor?
8. What in return we can buy if you decide not to purchase a tractor?

The above-mentioned criteria proposed by Lisowski [2008], aiming at optimal tractor selection are general guidelines. Even the best consultant may suggest several solutions, the farmer has to decide to purchase a tractor, because he ultimately bears the risk of clash investment.

As pointed out by Penc [1996] decision can not be taken on the basis of feeling and intuition, but must be well thought out and prepared using scientific methods.

Equipping with machinery and tractors can be scheduled by the following methods: indicator, rates, technology, comparative and optimization. In all these methods, the basis for developing a project are: the area of agricultural land and the structure of cropping and agro-technical dates and established system of technological processes [Marx, Krzysztofik 2000]. These methods mainly differ in scope, degree of accuracy and laborious calculations.

The indicator method is the most general way. It does not consider the system of individual technological processes and the specific agronomic dates. Therefore, it does not take into account the possibility of various weirs of work during their peak intensity. Therefore this method can be used primarily for preliminary determination of the needs of mechanization on farms [Kuczewski, Majewski 1999].

The indicator method can be applied to discern the general needs of farm mechanization, and the design of the development of mechanization in the macro scale [Doliwka, Regulski 1985].

Ratio method is to clarify the index method. It takes over not only the average utilization of machines over the years, but also during periods of peak accumulation of the work occurring in the planning of production processes [Kuczewski, Majewski 1999].

Due to the difficulty in determining the period of peak accumulation of work, index method often leads to the design of an excessive number of individual machines. One should therefore strive to reduce the mounds of work, using when necessary extended or multishift working hours or work with other agricultural enterprises. The number of needed machines should be in this case determined on the basis of division of labor into agrotechnical periods [Fonfara, Zareba 1989].

The technological method is a method that involves the development of card technology taking into account all activities related to specific activities, listed in chronological order, from seed-bed to the cultivation work of after harvest.

Technological method was applied in study, inter alia, by Wojcicki [1997], who basing on it created models and development of farms and Michalek [1999], who using the technological method developed a computer program that was used to perform simulations aimed at improving the profitability of farms.

The comparative method is to plan on the basis of comparisons with previous periods or to other farms working in similar conditions, resulting in determining a fixed number and type of machines needed based on the observation of existing state. This is the traditional method, widely used applied in small and medium-sized farms [Banasiak et al 1999]. Optimization method, with its varieties, is also based on developing a set of technical cards for all branches of production on the farm, but computer methods are used to select the most favorable variants of farm's technology and equipment [Kuczewski, Majewski 1999].

Selection of tractors to the farm from the supply-demand point of view was dealt with by Krzysztofik Grześ [1993]. In their studies, they have taken account the criterion of minimizing annual cost of agricultural labor, for which they have developed a range of power of tractors for the selected municipality. Another method of selection of machines and tractors to the farm was introduced by Izdebski [1999]. This method requires knowledge of the significance of operational and

technical parameters and depends on rejecting the least favorable decisions leading to the gradual elimination of primary and acceptable decisions.

On the basis of either of the methods a project to mechanize the farm and its equipment should be developed as well as its equipping with technical means. Also the number and scope of work required to mechanize it should be determined. Mechanization project must be associated with a full design and organization of the household and have the following characteristics: complexity, perspectives and economic justification. As Kuczewski and Majewski say [1999] economy of the project requires consideration of the following factors:

- increase of the productivity of new machines compared to the machines used previously,
- improvement of quality and working conditions
- reducing expenditures per unit of production,
- ensuring operational reliability and durability of machines and simplifying maintenance,
- ensuring the viability of the introduction of new machinery.

Economic justification for the mechanization of the project should be based on an analysis of maintenance costs of machinery and labor costs analysis of the individual machine units. It is particularly important to determine the economic efficiency of the implementation of the new machines connected in the process. High efficiency of introduced mechanization should be achieved as soon as possible [Kuczewski, Majewski 1999].

Drawn up a draft of farm mechanization and use of machine-tractor park can also be evaluated using indicators in various areas of farming activity. The most characteristic indicators are [Kuczewski, Majewski 1999]:

- load of particular tractor class, calculated as the number of tractor-days or tractor-hours for the whole year, and peak periods; annual load on the tractor should be at approximately 1200 hours
- number of hectares per one tractor,
- value of machinery in relation to one hectare.

The above-mentioned methods of equipping farm with machinery and tractors does not take into account the natural and economic environment in which the farm is found, which means that the farm is a closed object very little open to natural and economic environment in which they may be found during the planning of supplies, as well as during use.

In variable conditions of market economy, which agriculture is now in, the economic environment is still subject to change. Because of operation of farms in a difficult economic environment, there is a need to develop a method that takes into account the results of natural and economic environment in the design of equipping farm with machinery and tractors.

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