Міністерство освіти і науки України

Національний університет біоресурсів і природокористування України
НДІ техніки і технологій
Механіко-технологічний факультет

Представництво Польської академії наук в Києві
Відділення в Любліні Польської академії наук
Академія інженерних наук України
Українська асоціація аграрних інженерів

122 РІЧНИЦІ НУБІП УКРАЇНИ ПРИСВЯЧУЄТЬСЯ

# ЗБІРНИК ТЕЗ ДОПОВІДЕЙ
## V МІЖНАРОДНОЇ НАУКОВО-ПРАКТИЧНОЇ КОНФЕРЕНЦІЇ «СУЧАСНІ ТЕХНОЛОГІЇ АГРАРНОГО ВИРОБНИЦТВА»

*6–7 листопада 2019 року*
*м. Київ*

# СЕКЦІЯ «ТРАНСПОРТНІ ТЕХНОЛОГІЇ»

УДК 538.3.001

## METHODS OF FORMING FLEET OF AGRICULTURAL ENTERPRISES DURING TRANSPORTATION OF GRAIN HARVEST

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In the development of methods for the formation of a car Park can be traced to three distinct phases. The first of them is characterized by the fact that among the works performed on this subject, the optimization took a minor place or completely absent. The calculations were mostly well-known classical methods.

In the period of development in science mathematical methods in the formation of the parks, including automotive, began to introduce models based on correlation, regression analyses and linear programming.

Further optimization with the use of computers took place in the majority of works in this direction. Their evolution was in the direction of increasing the dimension of the problem taking into account the increasing number of factors. The peak in the development of these methods, according to the author, is in the middle and the end of the 70-ies.

Recently due to objective reasons, the works on formation of the Park there has been a departure from the commitment to the methods of linear programming. Began to appear works using unconventional techniques and development of mathematical models that more adequately reflect the real operating conditions of equipment.

All the methods of car Park formation, despite their essential differences, are based on known theoretical works. They can be divided into groups according to one or more unifying characteristics.

One of the groups brings together works in which the composition of the vehicle fleet was defined in relation to the already established nature of the conditions of carriage or to its promising, but well-defined plan. The mutual influence of the Park and transportation plan, these studies are virtually ignored.

Another group can be represented by the work, which deals with the rationalization of freight transportation of agricultural enterprises regardless of the composition of the vehicle fleet.

Most research combine mathematical methods used in modelling. Moreover, optimization methods based on linear programming is used in almost all works of this group. Among them the works of the most diverse in purpose, starting from the lower levels of the organizational hierarchy (AO, agricultural cooperatives, collective farms, state farms, peasant, farmers) to high (regions, industries, transport system).

Attracts attention with their originality in the formulation and solution of the different level of tasks. The difference between them consists mainly in the dimension and number of constraints, determining completeness of reporting or aggregation of factors in mathematical models.

Of the works intended for collective and state farms, it is necessary to allocate three directions. The first includes works that simultaneously optimize the transport and machine-tractor parks. Second, optimizing only transport parks. And third – only machine-tractor parks.

In the work carried out optimization of machine-tractor Park with the car. The authors of this work, like other similar, tried adequately to consider the factors influencing the use of machines of the Park, however, the joint approach substantially increases the dimensionality of the problem. Worsens the ability of accounting models even important factors. In such works due to high-dimensional problems are usually poorly represented set of stamps of competing cars.

Because of the diversity of assignments of machine and tractor fleet and contradictions arise, complicating the task of formation. For example, the specific reduced costs of the vehicle fleet depends on the distance of transport of goods and for machine-tractor Park of this factor. Therefore, to develop a General model has to neglect the importance of the factor of transport distance, with several fixed its values.

Characteristic features of the first areas of work inherent in the second. For example, is not enough to consider the factor of distance, although it is known that he is a decisive when choosing the best car brand. In addition, mathematical models of linear programming, there is no possibility of varying the factor of intensity of use of technology. This factor is closely linked to the portion of the present cost – capital investments in rolling stock that is directly missing in the process of competitive selection of cars.

It features models of linear programming can be attributed to their static nature, as well as the adequacy to the real process only in a limited interval of changes of the factors. Unit cost concepts used in the models depend on the rolling stock. Therefore, in a General view the task of forming a Park essentially nonlinear.

Almost all work using linear programming differ in that the vehicle included in the competition independently from each other, although their mutual influence in the Park is great.

Because of the special nature of work of transport in terms of collective and state farms model of linear programming is not quite acceptable to describe the process of transport of agricultural goods since can not take into account all of its subtleties in the process of Park formation.

In contrast to transport, work on the formation of machine - tractor Park of the linear programming fits better, as picking optimum tractor units requires enumeration of a large number of combinations (variants).

Studies conducted in dairy farms, grain and pig-breeding areas, showed that for each farm was characterized by the distribution of volumes of transportations on distances. Moreover, it is noted that the fluctuation of traffic volumes over an annual

period in different farms differ markedly from each other. It is also argued that the composition and structure of Park of trucks is influenced not only specialization of farms, but natural and local conditions.

Intensification of production, carried out in the industry today, poses the problem of the formation of the Park in new ways, with deeper consideration of local characteristics of agricultural enterprises.

However, existing works on formation of the Park these requirements can answer one. Moreover, there is work, which is not even taken into account the fluctuations in traffic over periods of a year. In these works the authors take for a single period of execution of all transport operations, regardless of the types of transport and timetables for their implementation, thereby determining the average performance of vehicles.

In the end, the calculated need for rolling stock Park will also be the average that would have an adverse impact in the development of peak traffic volumes in the spring and autumn periods.

Among the methods of forming the Park you should take into account the specificity of agricultural production, but also the inclusion in the calculation of tractor transport in the periods when there are free from field work tractors.

It is based on iterative algorithm with feedback. The value of providing this connection and the convergence of the algorithm is annual employment (download) rolling stock.

In the process of the algorithm, along with a choice of best car brands for each type of transportation performed and the formation of the plan, i.e. the best allocation of the annual volume of traffic not only on the chosen rolling stock, but also on the distances.

It is important to note that the choice of cars for transportation to the nonlinearity, the basic mathematical model is carried out by simple methods using linear dependence. This is a positive algorithm, allowing to determine not only the most economical rolling stock, but the scope of its use by distance.

In addition, the mutual influence of the rolling stock in a competitive selection process appears systematic method that allows the removal from competition any car immediately to have another one, with slightly worse performance, but the most cost-effective among the rest.

The systematic method consists in tracking the time factor in the process of Park formation. A one-year timeframe adopted for the calculation of repeatability due to the cyclical nature of production during this period of time. It is divided into periods (decades), each of which is determined by the need of car brands. The total fleet of rolling stock is accepted for the maximum requirements of each brand in period.

All calculations according to the algorithm of the proposed work is performed on a computer. Moreover, the process of choosing cars based on graphical-analytical method, which complicates the calculations and the program on the computer, as each brand of car have to rely on two points. The work at these points somehow, taken 1 and 10 km (justification not given). The definition of the boundaries of

spheres of application of good cars made at the same gap distances. Too often, however, this border comes on the altars of 10 km, particularly in non-farm traffic. In our opinion, the figure of 10 miles should be the limit of the distance to a particular type of traffic.

If we consider the last work before the perestroika period in the formation of a fleet of agricultural enterprises, it will be sufficient to mention some of them because of their specific features, allowing to draw attention to them.

In the formation of a car Park based on technological maps of cultivation and harvesting of agricultural crops. This method can be attributed to promising in this respect since it is possible to more accurately determine the structure of the needs of the Park. However, the existing routing in the farms of agricultural sector did not sufficiently reflect the real situation, ill-defined and do not have sufficient scientific basis.

In addition, in order to have full information on the volume of traffic necessary to ensure routings all production, taking into account the social needs of the population. All of the above together with the stochasticity of the natural conditions of collective and state farms negates the advantages of the method.

The main emphasis is on the optimization of harvesting time of various crops. When the formation of the Park at the same time the aim is the reduction of crop losses, which is a function of the duration of the harvest period.

The criterion of efficiency adopted at least the economic costs of cleaning, transportation, storage and processing of the crop. A mathematical model is constructed based on a set of simplified regression models. Among them there is a model for determining optimal capacity of vehicles.

However, the use of regression models is justified only in a narrow range of conditions where they are adequate to the real processes. While agriculture is known to be different from other industries, it is the impermanence of situations, forcing researchers at the description of the production processes of enterprises producing agricultural products, taking into account the conditions in a much wider range of their changes.

Therefore, when the formation of the Park, there is a need of consideration of its adaptability to these conditions.

The technological properties of the Park and its constituent brands of cars, as one of the special categories of their properties, are not included in the work associated with the formation of the Park. Car parks generated by existing methods are unsuitable to work in real, changing conditions in agricultural production.

For example, the Park unsuitable for the factor time of use. As a result, annual utilization on the brand of car turns low, especially for heavy rolling stock. In addition, the mathematical model used does not take into account the fitness of vehicles by the factor bulk density of the cargo, the consequences of which appear in the decline in utilization of capacity of the individual vehicles and Park in General.