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THE USE OF AVIATION IN AGRICULTURE

One of the most important elements of the system of intensive agriculture around the world is the use of advanced plant protection technologies to produce the required amount of agricultural products of the required quality and lowest cost. Modern technologies for the introduction of plant protection products are inextricably linked with issues of environmental protection, reducing the chemical load of land, products and people. Significant intensification of producers' activities on agricultural products, especially in the field of crop production, has led to the need for greater use of aviation in crop processing.

If we compare aerochemical work (further - AW) with land methods of cultivation of fields with crops, it is in this case, as in general and in the economy in general, there are clear signs of indicators to improve the efficiency of agricultural production. The universality and advantages of the aviation method in comparison with ground methods of crop cultivation in market conditions are, first of all, such technical-technological and economic-financial data that give customers certain advantages, namely [1; 2; 4]:

- new opportunities for the use of aviation for fertilizer application in the early spring period, when the ground methods of these works are considered to be wet and do not allow the use of machine-tractor ground equipment (further - MTGE). Examples here are measures for the application of liquid complex fertilizers for wheat crops during the 1st ear, pollination of fields, etc.;
- implementation of AW in the best agrotechnical terms and at the expense of it there are opportunities to receive in addition increase of productivity of this or that culture which is cultivated in farms. Here, an example is the defoliation of sunflower crops to cause its simultaneous "ripening";
- achievement at AW of higher quality of distribution of chemical substances on processing of a surface of this or that agricultural crop. We can state that the aviation method provides the best quality and this, ultimately, reduces the dose of plant protection products, which in turn has a positive effect on the environment, health, social development;
- the ability to optimize the impact on the cost of chemicals and substances in comparison with the quality of crop treatment. And already these factors in market conditions allow to reduce essentially at the expense of decrease in their specific technological expenses and thus to reduce direct expenses for agrotechnical actions in SGV;
- approaches to increase the competitiveness of national agribusiness and enhance the country's export potential. Regarding the negative aspects in comparison with the ground support of the propeller fleet (further - PF), here we can give the following arguments in favor of the ICC for the cultivation of sowing, row or other, including industrial crops; AW can be performed on large sown areas, which is not suitable for use for individual subsidiary farming. Therefore, this method requires the formation of powerful farms of the corporate type;
- disadvantage of the availability of aircraft suitable for AW in SGV, as not all aircraft can be used for these works, and those that are available as part of the PF of the national civil aviation system, in most cases obsolete. Fundamentally new types and series of aircraft in some places do not currently meet the levels of safety and cost-effectiveness and versatility, as convertible aircraft;
- the provision of agricultural producers with a sufficient number of production and technical personnel and specialists in the organization and technology of AW in safe modes of operation also wants to be better;
- high dependence of opportunities for high-quality AW on the external environment of the location of sown areas and regional meteorological conditions.

As we can see, the positive in such innovative technologies in the agro-industrial complex is more significant and expanded in terms of impact on efficiency, ecology and food security of the state much

more than the negative aspects, which under certain simple and inexpensive conditions can be overcome and neutralized.

In general, in Ukraine to meet the needs of agricultural production during 2016, aviation work was carried out by SGV) and 25 airlines cultivated 484.7 thousand hectares of agricultural land per year, the raid was 16.7 thousand hours (for 2015 - 401.1 thousand hectares and 22, 6 thousand hours, respectively) [3].

Practical application of aircraft in AW of Ukraine has shown a number of advantages in comparison with ground equipment: its high productivity (processing of large sown areas in less time, low labor costs, economical consumption of seeds and chemical sprays), the ability to work in hard-to-reach areas (wetlands, etc.), the possibility of visual observation of the state of crops and rapid response in the event of a critical situation (mass damage by harmful bacteria, insects, rodents, etc.), elimination of natural disasters that caused partial plant death (wilting, burning) , etc.). However, the work of aircraft and helicopters in the fields directly depends on meteorological conditions, which has a significant disadvantage in agriculture, where the speed of solving the problem often depends on the fate of future harvests. In addition, it is not always profitable to use large aircraft in small areas.

At the end of the last century, aircraft builders have made significant progress in creating more mobile, low-budget, economic models, which are characterized by increased maneuverability, designed for agricultural purposes. Demand for light aircraft is fully justified, as the use of this technique for cultivating fields and crops can increase yields by 20 to 30%. This technique is used mainly in fields with cereals.

Equipped with a spray system of the injector type light aircraft with average technical characteristics at a speed of 90 km/h and a width of 20 m is able to cultivate more than 1000 hectares of fields per day. At the same time it will be possible to avoid damage of crops, to process those sites where access of traditional agricultural machinery is closed owing to inaccessibility (including high humidity of soil), in the shortest possible time to liquidate local centers of infection of cultures by diseases or wreckers, spending the minimum amount of chemicals. processing accuracy.

Use of light and ultralight aircraft to perform such works as aerosol, application of mineral fertilizers, plant growth stimulants, protection of crops from weeds, pests and diseases, defoliation (sunflower, soybean, cotton, buckwheat), as well as monitoring of crops (plantations) and agricultural lands economically justified and more appropriate for medium and small areas.

Motor-hang gliders equipped with sprayers with rotating liquid sprayers were developed for small-scale works in the agricultural sector. Created especially for work on crops, gardens and vineyards, motor hang gliders are ideally suited for release on trichogram fields. They can be used for mineral fertilizers, crop treatment with pesticides and other chemicals. These aircraft are equipped with bulk tanks with a total capacity of 100-200 liters (depending on the load capacity of the machine and the modification of the wing), combined spray devices capable of small drip (with a droplet size up to 100 μm) watering (spraying) or treatment (fertilization) dry preparations (mineral complex) at the optimum height from 1 to 3 m. Productivity thus makes about 500 hectares a day. Features of a design of the motor hang glider promote good penetration of drug even in the condensed landings and high density of its spraying, and the expense of a working solution makes about 5 l/ha. At the same time the turbulence arising at work of the car provides processing not only the top, but also the bottom party of sheet plates. The effectiveness of the use of a hang glider is to significantly reduce the cost of its maintenance and fuel compared to aircraft and reduce (by one third) the rate of consumption of chemicals.

But a serious disadvantage of light and ultralight aircraft is the low level of protection of pilots from the effects of highly toxic pesticides. Therefore, the advent of unmanned aerial vehicles (UAVs), which has opened a new era of development in many areas of human activity, provides an opportunity to increase efficiency, economy, safety and further improve agricultural work with the use of precision farming.

The use of UAVs abroad for several years is not limited to the military or geologists. All areas that require regular compilation of detailed maps, in one form or another use UAVs for aerial photography [2]. In particular, in the United States, after making the necessary amendments to the section of the Federal Aviation Administration, which allows the use of UAVs for special purposes, they see great prospects for the use of drones in agriculture.

Today, UAVs are being used mainly to obtain detailed data on the state of the field in order to further localize the problem, as well as so that farmers can avoid such problems in the future. Some UAVs can fly up to 400 hectares in one flight. They are equipped with equipment capable of compiling detailed field maps both in the visual spectrum and in different spectral ranges with the possibility of calculating the

vegetation indices for cereals. This makes it possible to recognize problems even before they become visible visually, and to solve the problem locally, without treating the whole field with expensive drugs. It is important to note that the UAV is only one of the elements of precision farming. It is very difficult to draw conclusions and correct logic of work in the field without understanding the reasons for fluctuations in field yields in previous years, without the history of satellite observation, without soil analysis data. UAV is not a panacea, but an extremely important and extremely effective tool in the work of farmers [2].

Thus, the use of aviation in agriculture will be considered as an absolutely necessary element of modern agricultural production, without which it is almost impossible to perform a number of important technological processes of growing many crops. Application of aviation method of plant protection with effective, both for general purpose airlines and for agricultural enterprises.

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