

OPTIMIZATION OF SEEDING RATES OF AGRICULTURAL CROPS

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The problem of optimization of seeding rates is a key in solving the task of a significant increase in crop yields. However, despite the urgency, it is poorly understood and has not yet been positively solved. Difficulties in solving this problem are related to the need to reconcile seeding rates with soil fertility. At the same time the soil fertility factors are valid for several years, and the optimal seeding rate should be determined only for one growing season. The problem is even more complex in crop rotations, as each crop reacts differently to the same fertility indicators and has a different inverse effect on them. It significantly complicates the seeding rate calculation with application of fertilizers and ameliorants for the planned growing season. The main feature of the proposed approach is that at the first stage of the solution the optimal rates of fertilizer application for the whole sequence of crops in the crop rotation are determined, and at the second stage the search for optimal rates of seeding for every crop is made based on the optimality condition of the combination of the soil fertility factors. To solve the problem at the first stage, a combination of the dynamic model of the soil fertility factors in the annual time scale and linear-quadratic models of crops yield losses in crop rotation are used. To solve the problem at the second stage a one-factor optimization scheme with a linear-quadratic form of the four-factor model is used. In this scheme, in addition to the soil fertility factors specified at the optimal level, the additional factor is added – the seeding rate.

Keywords: application rate, crop rotation, optimization schemes, mathematical models, fertility factors, the dose of fertilizer application.