

MODELING THE GROWTH RATE OF FRUIT AND VEGETABLE EXPORTS IN SURKHANDARYA REGION USING A LOGISTIC DIFFERENTIAL ECONOMETRIC MODEL

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Abstract.

The study is devoted to modeling the growth rate of fruit and vegetable exports in Surkhandarya region using a logistic differential econometric approach. Export dynamics are considered as a nonlinear process with a saturation limit determined by market capacity, production potential, and logistics constraints. The evolution of export volume is described by the following differential equation:

$$\frac{dN(t)}{dt} = \mu N(t) \left(1 - \frac{N(t)}{N_{max}} \right)$$

where $N(t)$ - is the export volume at time t , μ -is the intrinsic growth coefficient, and N_{max} - represents the maximum potential export capacity of the region.

Statistical data for 2010–2025 were used to estimate model parameters. The continuous model was discretized, and parameters were identified using econometric estimation techniques. The results indicate that export growth demonstrates an S-shaped trajectory: rapid expansion at the initial stage followed by gradual slowdown as the market approaches its saturation level. According to the estimates, current exports have reached approximately 70–75% of the potential capacity, which implies the necessity of structural transformations to maintain further growth.

The logistic differential model proved to be more adequate than traditional linear regressions for describing export dynamics, as it captures both the level and the rate of change. The model allows medium-term forecasting and evaluation of alternative development scenarios, including expansion of processing industries, diversification of target markets, and improvement of transport infrastructure.

The findings can be used in regional export strategy design, optimization of agricultural clusters, and formulation of evidence-based policy measures aimed at increasing competitiveness of fruit and vegetable products from Surkhandarya region.

Keywords: logistic differential model, export growth rate, econometric identification, market capacity, fruit and vegetable exports, Surkhandarya region.

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