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«Agribusiness, Environmental Engineering
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«Development of an indicator for assessing the reproductive process»

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Problem statement

- **Problem statement:** The uncertainty caused by inaccurate knowledge of the boundaries of the permissible state of agricultural activities can be eliminated by using status indicators. Parameters of activities of agricultural enterprises with known values were used as indicators. It helped develop an indicator of integrated assessment of reproduction, beyond which an unstable state and transition to another qualitative state can occur.
- **Task:** The article aims to develop an indicator of integrated assessment of reproduction taking into account the state of enterprises on the basis of the multivariate analysis.



Solution methods

- Methods, algorithms, calculations

The main stages of the reproduction-cyclic model are based on the use of methods of multidimensional classification, sustainable assessment and forecasting.

$$\left\{ \begin{array}{l}
 D_{I,j} = (P_{m+1,j} - P_{i,j}) / (P_{m+1,j} - P_{m+2,j}) \\
 Rd_i = 10 \sqrt{D_{i1}^2 + D_{i2}^2 + \dots + D_{in}^2} \\
 R_i = (Rd_x - Rd_i) / (Rd_x - Rd_x) * 100 \\
 Ra_i = (1 - Rd_i / 100) \\
 D = \sum_{i=1}^N (Ra_i - Rar_i [KT + C])^2 / N \\
 \dots\dots\dots \\
 (m + 1) \text{ max и } (m + 2) \text{ min} \\
 P_{i,j}, \text{ где } i = 1, 2, 3, \dots, n \\
 [0 \leq D_{i,j} \leq 1]
 \end{array} \right.$$



Table 1. The boundaries of the indicator values for different groups of agricultural enterprises depending on the type of reproduction.

Criterion	Groups of enterprise			
	1	2	3	4
	Highly performing enterprises with positive average annual rates of development	Highly performing enterprises with negative average annual rates of development	Low-performing with positive average annual rates of development	Low-performing with negative average annual rates of development
Type of reproduction	expanded reproduction	simple reproduction	simple reproduction	narrowed reproduction
R	$>R_z$	$>R_z$	$<R_z$	$<R_z$
K	>0	<0	>0	<0

Conclusions

Results, implementation

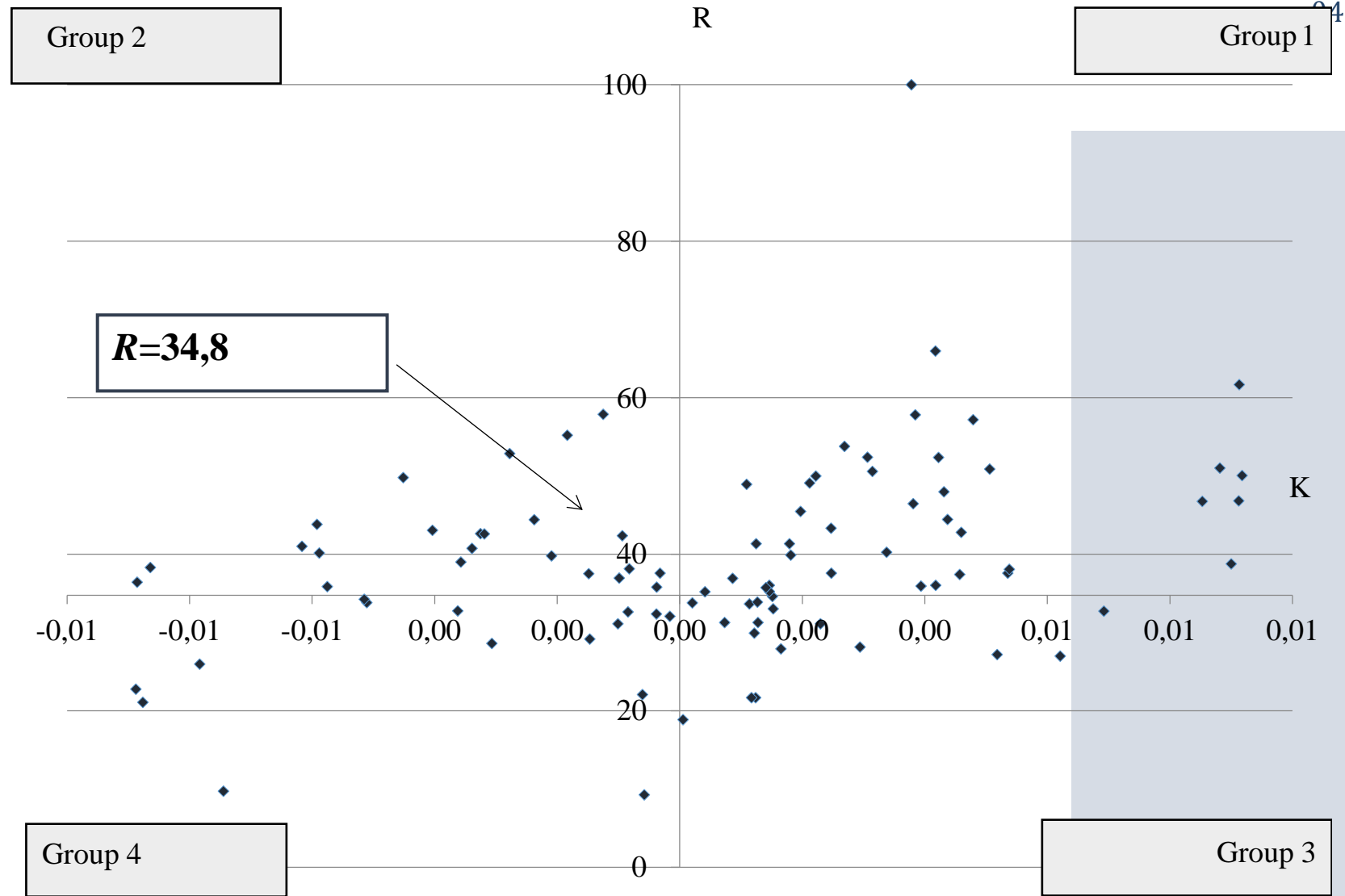


Figure 1 - Spatial arrangement of octants corresponding to reproduction types for 2015-2017

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