Abstract of the Article
"Dynamic forecasting Model
for Non-Stationary Processes in the Agricultural Sector"
by P. Grutsiuk

Objective of this paper is to detect signs of chaotic dynamics in changes of winter wheat yield. Regions of Ukraine during 1955 – 2008 served as a baseline data for crop rows. For constructing rows for a stationary species there was built a harmonic trend. Research of behavior residues revealed their cycle (duration of periods of 4 years and 16 – 18). It is a testimony of a largely deterministic nature of grain production. To study the dynamic characteristics of the system there were chosen 16 regions of central and eastern Ukraine for which the effect of cycling is the most expressive one. Close values of the cycle allow to treat these areas as a single statistical ensemble. According to the ergodic principle this set of 16 time series in length and 54 elements each can be seen as an analogue to a time series of 832 elements in length.

To filter high frequency noise there was applied the convolution with Gaussian kernel and the discrete Fourier transformation. In determining the distance between the phase vectors, we examined pairs of vectors located in different columns of the matrix residue yields. To identify the dimensions of attachment we used the method of 'false neighbors' and got $D = 4 \div 6$. To determine the correlation dimension there was used Hrassberher – Prokachchi procedure. In the result we got $d_C = 4,30 \pm 0,06.$ Calculation of Lyapunov exponent has been implemented according to the Wolff's method. The result of computer calculations showed $L_1 = 0,038.$ Positive value of the exponent indicates the chaotic dynamics and allows to assess the maximum horizon to forecast yield within the period of 25 years.

High values of correlation dimension and close to zero L_1 do not allow to make a definite conclusion about the existence of chaotic dynamics in the system. Therefore the question of the nature of the dynamics of winter wheat yield (ordinary or chaotic) requires further study.