



FIELD-DRIP IRRIGATION TECHNOLOGY-CORRELATION MODEL OF HYDRODYNAMIC CONTROL OF IRRIGATION NETWORK SYSTEM

Research Institute of Irrigation and Water Problems

PhD Karshiev Rustam Juraevich

PhD Sadiev Umidjon Abdusamadovich

Research doctoral student Kholmurodov Nurmukhammad Danoboi ugli

Research doctoral student Atajonova Shakhnoza Karimjonovna

Abstract. *Field-drip irrigation technology-development of a correlation dependence model of hydrodynamic control of the irrigation network system.*

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Abstract. *Field-drip irrigation technology-development of a correlation dependence model of the hydrodynamic control of the irrigation network system.*

The main task is to determine the correlation relationship among variables such as the water discharge from irrigation hoses used to adjust the hydraulic parameters of the irrigation network in cotton fields equipped with drip irrigation technology, soil moisture and soil moisture potential, the amount of water emitted from the emitters of irrigation tapes, the probability density of the radius of the wetted surface, the position of the gates of the water control structures in the irrigation canal, as well as the maximum depth of flow resulting from the backwater (head) created by the water control structure, and the hydromodule.

In practice, solving many problems involving three or even two variables makes it very difficult to find a strict functional relationship between them. Therefore, stochastic (probabilistic) dependencies are used to address such problems. In particular, to establish stochastic relationships between two or more variables, the **correlation analysis method** is applied.

That is, correlation analysis studies the regularities of how the values of some variables change depending on the changes in another variable. In such cases, the two quantities are called **independent variables** or **arguments**, while the third one, which depends on them, is called a **dependent variable** or **function**.

Now, returning to the main problem, let us select the main quantities from among the variables h , $f(\rho)$, and $q_{\Gamma M}$. These are: h , $f(\rho)$, and $q_{\Gamma M}$. We assume that these quantities have a **linear relationship** as follows:

$$q_{\Gamma M} = ah + bf(\rho) + c \quad (1)$$

Here: a , b , and c are constants. Now, let us determine the parameters of equation (1). This is done by calculating the **correlation coefficients** of the variable quantities.

We can rewrite equation (1) in the following form:

$$q_{\Gamma M} - \bar{q}_{\Gamma M} = a(h - \bar{h}) + b(f(\rho) - \bar{f}(\rho)) \quad (2)$$

Here: $\bar{x}$, $\bar{y}$, and $\bar{z}$ are the arithmetic mean values of the variables x , y , and z , respectively.

In equation (2), the degree of relationship among the three variables x , y , and z is determined by the **multiple correlation coefficient**, denoted as R .

$$R = \sqrt{\frac{\Gamma_{qh}^2 + \Gamma_{qf(\rho)}^2 - 2\Gamma_{qh}\Gamma_{qf}\Gamma_{hf}}{1 - \Gamma_{hf}^2}} \quad (3)$$

Here: r_{xy} , r_{xz} , and r_{yz} are the **pair (simple) correlation coefficients**.

The **multiple correlation coefficient** R has the following properties:

1. $0 \leq R \leq 1$;
2. If $R = 0$, then the variable z has no linear relationship with x and y ;
3. If R approaches 1, it indicates a strong linear relationship among the variables.

The pair correlation coefficients in equation (3) are calculated using the following formulas:

$$\Gamma_{qh} = \frac{\sum \Delta h \Delta v}{\sqrt{\sum \Delta h^2 + \sum \Delta q^2}}, \quad \Gamma_{qf(h)} = \frac{\sum \Delta f \Delta v}{\sqrt{\sum \Delta f^2 + \sum \Delta q^2}}, \quad \Gamma_{hf} = \frac{\sum \Delta h \Delta f}{\sqrt{\sum \Delta h^2 + \sum \Delta f^2}} \quad (4)$$

где $\Delta h = h_i - \bar{h}$; $\Delta f(\rho) = f_i(\rho) - \bar{f}(\rho)$, $\Delta q_{\text{гм}} = q_i - \bar{q}$

From equations (3) and (4), the pair correlation coefficients and the multiple correlation coefficient are determined. The numerical results show that there is a reliable **correlation relationship** among the variables (x), (y), and (z) being studied.

Now, let us determine the parameters (a) and (b) in the **linear regression equation (2)**:

$$a = \frac{\delta_q}{\delta_h} \frac{\Gamma_{qh} - \Gamma_{qf} \Gamma_{hf}}{1 - \Gamma_{hf}^2}, \quad b = \frac{\delta_q}{\delta_{f(\rho)}} \frac{\Gamma_{qf} - \Gamma_{qh} \Gamma_{hf}}{1 - \Gamma_{hf}^2} \quad (5)$$

Here $\delta_q, \delta_h, \delta_{f(\rho)}$ – $q_{\text{гм}}, h, f(\rho)$ the corresponding **standard deviations** of the variables.

$$\delta_q = \sqrt{\frac{\sum \Delta q^2}{n}}, \quad \delta_h = \sqrt{\frac{\sum \Delta h^2}{n}}, \quad \delta_{f(\rho)} = \sqrt{\frac{\sum \Delta f(\rho)^2}{n}} \quad (6)$$

Here: (n) is the total number of observations. By substituting the parameter values (a) and (b) into equation (2), and taking into account expressions (7) and (5), we obtain the **linear regression equation** that describes the relationship among the change in water level in the irrigation network, the amount of water discharged from the emitters of the drip irrigation tapes, the radius of the wetted surface of the soil-ground, and the hydromodule.

$$q_{\text{гм}} - \bar{q}_{\text{гм}} = a \left[\int \frac{(i\hat{C}^2 \hat{R} - \hat{l}F_r) \hat{\omega}}{\hat{C}^2 \hat{R} (\hat{\omega} - \alpha \hat{B} \hat{l} F_r)} dl - \bar{h} \right] + b \left[\sum_{i=1}^n \frac{C_i}{\delta_{\rho_i} \sqrt{2\pi}} \exp \left(-\frac{(\rho - \mu_{\rho_i})^2}{2\delta_{\rho_i}^2} \right) - \bar{f}(\rho) \right] \quad (7)$$

The **standard error of the regression equation (7)** is calculated using the following formula:

$$S_{q_{\text{FM}}} = \pm \delta \sqrt{\frac{1 - \Gamma_{qh}^2 - \Gamma_{qf}^2 + 2\Gamma_{qh}\Gamma_{qf}\Gamma_{hf}}{1 - \Gamma_{hf}^2}} \quad (8)$$

A **correlation relationship model** for the **hydrodynamic control of the field drip irrigation technology–irrigation network system** has been developed.

LIST OF REFERENCES

1. Ilkhomjon Makhmudov , Umidjon Abdusamadovich Sadiev, Shokhrukh Rustamov. Basic Conditions for Determining the Hydraulic Resistance to Friction in a Pipeline when a Mixture of Water and Suspended Sediments Moves. Cite as: AIP Conferenge Proceedings 2432, 040005 (2022); <https://doi.org/10.1063/5.0090349> Published Online: 16 June 2022 040005-1 – 040005-9
2. Ilkhomjon Makhmudov, Umidjon Abdusamadovich Sadiev, Khurshid Lapasov, Azizbek Ilkhom o'g'li Ernazarov, Shokhrukh Rustamov. Solution of the Filter Flow Problem by Analytical and Numerical Methods. ..Cite as: AIP Conference Proceedings 2432, 040006 (2022); <https://doi.org/10.1063/5.0090359> Published Online: 16 June 2022. 040006-01 – 040006-5
3. Ilkhomjon Makhmudov, Aliev Mahmud Kuvatovich, Mahmudova Dildora Ernazarovna, Musayev Sharof Mamarajabovich, Rustamova Mukhlisa Muhtaraliyevna, Nematov Davlat Berdiyov o'g'li, Boboyorov Bekhruz Ixtiyor ug'li. Development Of A High-Performance Technology For Mixing Ozone With Water For The Preparation Of Drinking Water From The Reservoir. Journal of Positive School Psychology 2022, Vol. 6, No. 5, 2921-2925. <http://journalppw.com>
4. Ilkhomjon Makhmudov, Akmal Mirzaev, Navruz Kurbonovich Murodov, Azizbek Ilkhomjon o'g'li Ernazarov, Adkham Rajabov, Musayev Sharof Mamarajabovich, Jasur Juraevich Narziev, Bobur Ulug'bekov, Shokhrukh Ustemirov. Socio-Economic Situation In The Water Management Of The Republic Of Uzbekistan And The Regulatory-Legal And Economical Frameworks For The Implementing Of Water-Saving Technologies. Journal of Positive School Psychology 2022, Vol. 6, No. 5, 2951-2955. <http://journalppw.com>



5. Ilkhomjon Makhmudov, Navruz Kurbonovich Murodov, Azizbek Ilkhomjon o'g'li Ernazarov, Uktam Temirovich Jovliev, Musayev Sharof Mamarajabovich, Adkham Rajabov, Bobur Ulug'bekov, Shokhrukh Ustemirov. The Current State Of Irrigation Networks And Their Use In The Water Sector Of The Republic Of Uzbekistan. Journal of Positive School Psychology 2022, Vol. 6, No. 5, 2947-2950. <http://journalppw.com>
6. Ilkhomjon Makhmudov, Mahmudova Dildora Ernazarovna, Aliev Mahmud Kuvatovich, Abdullaev Akhror Zhakhbarovich, Kamalova Saodat Nigmatjanovna, Musayev Sharof Mamarajabovich, Boboyorov Bekhruz Ixtiyor ug'li . Analysis Of Improved Methods For Determining Last Generations Of Pesticides In Water Water. Journal of Positive School Psychology 2022, Vol. 6, No. 5, 2926-2933. <http://journalppw.com>
7. Ilkhomjon Makhmudov, Navruz Kurbonovich Murodov, Akmal Mirzaev, Uktam Temirovich Jovliev, Umidjon Abdusamadovich Sadiev, Musayev Sharof Mamarajabovich, Adkham Rajabov, Jasur Juraevich Narziev, Muzaffar Ro'ziev. Probability-Statistical Model Of Reliability And Efficiency Of Irrigation Channels. Journal of Positive School Psychology 2022, Vol. 6, No. 5, 2956-2960. <http://journalppw.com>
8. Ilkhomjon Makhmudov, Paluanov Daniyar, Umidjon Abdusamadovich Sadiev. TECHNICAL SOLUTIONS TO ENSURE THE SAFETY OF OPERATING HYDRAULIC ENGINEERING CONSTRUCTIONS. ASEAN Journal on Science & Technology for Development. Vol 39, No 4, 2022, 189-191 189/ DOI 10.5281/zenodo.6583860.