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DAFTAR PUSTAKA

Abbas, F., Zhang, F., Hussain, M. A., Abbas, H., Alrefaei, A. F., Albeshr, M. F., Iqbal, J., Ghani, J., & Ismail Shah. (2024). Landslide susceptibility assessment along the Karakoram Highway, Gilgit Baltistan, Pakistan: A comparative study between ensemble and neighbor-based machine learning algorithms. Science of Remote Sensing, 9, 100132. https://doi.org/10.1016/j.srs.2024.100132

Aldrian, E., & Dwi Susanto, R. (2003). Identification of three dominant rainfall regions within Indonesia and their relationship to sea surface temperature. International Journal of Climatology, 23(12), 1435-1452. https://doi.org/10.1002/joc.950

Alejo-Sanchez, L. E., Márquez-Grajales, A., Salas-Martínez, F., Franco-Arcega, A., López-Morales, V., Acevedo-Sandoval, O. A., González-Ramírez, C. A., & Villegas-Vega, R. (2025). Missing data imputation of climate time series: A review. MethodsX, 15, 103455. https://doi.org/10.1016/j.mex.2025.103455

Allen, R. G., Pereira, L. S., Raes, D., & Smith, M. (1998). Crop evapotranspiration: Guidelines for computing crop water requirements (FAO Irrigation and Drainage Paper No. 56). FAO.

Amir. (2014). Uji karakteristik curah hujan dan debit pengaliran Sungai Maros Kabupaten Maros Sulawesi Selatan.

Anaba, L. A., Banadda, N., Kiggundu, N., Wanyama, J., Engel, B., & Moriasi, D. (2017). Application of SWAT to assess the effects of land use change in the Murchison Bay Catchment in Uganda. Computational Water, Energy, and Environmental Engineering, 6(1), 24-40. https://doi.org/10.4236/cweee.2017.61003

Anvari, S., Moghaddasi, M., & Bagheri, M. H. (2023). Drought mitigation through a hedging-based model of reservoir-farm systems considering climate and streamflow variations. Theoretical and Applied Climatology, 152(1-2), 723-737. https://doi.org/10.1007/s00704-023-04402-7

Arifah, Salman, D., Yassi, A., & Demmallino, E. B. (2022). Livelihood vulnerability of smallholder farmers to climate change: A comparative analysis based on irrigation access in South Sulawesi, Indonesia. Regional Sustainability, 3(3), 244-253. https://doi.org/10.1016/j.regsus.2022.10.002

Arnold, J. G., Kiniry, J. R., Srinivasan, R., Williams, J. R., Haney, E. B., & Neitsch, S. L. (2012). Soil & Water Assessment Tool input/output documentation. Texas Water Resources Institute.

Arnold, J. G., Moriasi, D. N., Gassman, P. W., Abbaspour, K. C., White, M. J., Srinivasan, R., Santhi, C., Harmel, R. D., van Griensven, A., Van Liew, M. W., Kannan, N., & Jha, M. K. (2012). SWAT: Model use, calibration, and validation. Transactions of the ASABE, 55(4), 1491–1508.

Asamoah, P. B., & Shittu, E. (2025). Evaluating the performance of machine learning models for energy load prediction in residential HVAC systems. Energy and Buildings, 334, 115517. https://doi.org/10.1016/j.enbuild.2025.115517

UNIVERSITAS GADJAH MADA
Optimalisasi Kalender Tanam Berbasis Prediksi Curah Hujan Menggunakan Algoritma Random Forest dan Simulasi Hidrologi SWAT di DAS Bogowonto untuk Mendukung Pengelolaan Irigasi di Daerah Irigasi Kedungputri
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Balai Besar Wilayah Sungai Serayu Opak. (2016). Rencana pengelolaan sumber daya air wilayah sungai Serayu-Bogowonto.

Balasubramaniam, T., Mohotti, W. A., Sabir, K., & Nayak, R. (2025). Feature engineering on climate data with machine learning to understand time-lagging effects in pasture yield prediction. Ecological Informatics, 86, 103011. https://doi.org/10.1016/j.ecoinf.2025.103011

Bicák, D. (2023). Tuning spatial parameters of Geographical Random Forest: The case of agricultural drought. Acta Universitatis Carolinae, Geographica, 58(2), 187-199. https://doi.org/10.14712/23361980.2023.14

Boulesteix, A.-L., Janitza, S., Kruppa, J., & König, I. R. (2012). Overview of Random Forest methodology and practical guidance with emphasis on computational biology and bioinformatics. WIREs Data Mining and Knowledge Discovery.

Breiman, L. (2001). Random forests. Machine Learning, 45(1), 5-32.

Brinkhoff, J., Clarke, A., Dunn, B. W., & Groat, M. (2024). Analysis and forecasting of Australian rice yield using phenology-based aggregation of satellite and weather data. Agricultural and Forest Meteorology, 353, 110055. https://doi.org/10.1016/j.agrformet.2024.110055

Brooks, E. S., Dobre, M., Elliot, W. J., Wu, J. Q., & Boll, J. (2016). Watershed-scale evaluation of the Water Erosion Prediction Project (WEPP) model in the Lake Tahoe basin. Journal of Hydrology, 533, 389-402. https://doi.org/10.1016/j.jhydrol.2015.12.004

Buishand, T. A. (1982). Some methods for testing the homogeneity of rainfall records. Journal of Hydrology, 58(1-2), 11-27.

Burhanuddin, S. N. Z. A., Deni, S. M., & Ramli, N. M. (2016). Revised normal ratio methods for imputation of missing rainfall data.

Busico, G., Colombani, N., Fronzi, D., Pellegrini, M., Tazioli, A., & Mastrocicco, M. (2020). Evaluating SWAT model performance, considering different soils data input, to quantify actual and future runoff susceptibility in a highly urbanized basin. Journal of Environmental Management, 266, 110625. https://doi.org/10.1016/j.jenvman.2020.110625

Chen, P. Y., Chen, C. C., Kang, C., Liu, J. W., & Li, Y. H. (2025). Soil water content prediction across seasons using random forest based on precipitation-related data. Computers and Electronics in Agriculture, 230, 109802. https://doi.org/10.1016/j.compag.2024.109802

Cheraghizadeh, M., Khalili, A., Hejabi, S., & Bazrafshan, J. (2024). Investigating the homogeneity of temperature and precipitation data using statistical and statistical-climatic approaches. Iranian Journal of Soil and Water Research, 55(1), 1. https://doi.org/10.22059/ijswr.2023.365950.669584

Chow, V. T., Maidment, D. R., & Mays, L. W. (1988). Applied hydrology. McGraw-Hill.

UNIVERSITAS GADJAH MADA
Optimalisasi Kalender Tanam Berbasis Prediksi Curah Hujan Menggunakan Algoritma Random Forest dan Simulasi Hidrologi SWAT di DAS Bogowonto untuk Mendukung Pengelolaan Irigasi di Daerah Irigasi Kedungputri
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Cibin, R., Sudheer, K. P., & Chaubey, I. (2010). Sensitivity and identifiability of stream flow generation parameters of the SWAT model. Hydrological Processes. Advance online publication. https://doi.org/10.1002/hyp.7568

Creata, M. F. V., Nasjono, J. K., & Hunggurami, E. (2025). Optimalisasi pola tanam berdasarkan ketersediaan air di Daerah Irigasi Oepunu Desa Billa Kecamatan Amanuban Timur. Jurnal Sumber Daya Air, 21(1), 1-14. https://doi.org/10.32679/jsda.v21i1.895

Daggupati, P., Shukla, R., Mekonnen, B., Rudra, R., Biswas, A., Goel, P. K., Prasher, S., & Yang, W. (2018). Hydrological responses to various land use, soil and weather inputs in Northern Lake Erie basin in Canada. Water, 10(2), 222. https://doi.org/10.3390/w10020222

De Livera, A. M., Hyndman, R. J., & Snyder, R. D. (2010). Forecasting time series with complex seasonal patterns using exponential smoothing.

Debela, S. K., & Feyessa, F. F. (2022). Rainfall-runoff modeling and its prioritization at sub-watershed level using SWAT model: A case of Finca'aa, Oromia, Western Ethiopia. Water Conservation and Management, 6(1), 22-29. https://doi.org/10.26480/wcm.01.2022.22.29

Direktorat Jenderal Sumber Daya Air. (2013). Kriteria perencanaan irigasi KP-01. Kementerian Pekerjaan Umum.

Doddy, P., Ardana, H., Ketut Kembarejaya, I., Pamungkas, T. H., Kariyana, I. M., Gede, I., Wiradnyana, O., Bagus, I., & Indramanik, G. (2024). Pendekatan systematic literature review dalam analisis ketersediaan dan kebutuhan air irigasi. Jurnal Teknik Gradien, 16(2).

Dunn-Sigouin, E., Kolstad, E. W., Ole Wulff, C., Parker, D. J., & Keane, R. J. (2025). Balancing accuracy versus precision: Enhancing the usability of sub-seasonal forecasts. Climate Services, 39, 100594. https://doi.org/10.1016/j.cliser.2025.100594

Đurin, B., Kranjčić, N., Kanga, S., Singh, S. K., Sakač, N., Pham, Q. B., Hunt, J., Dogančić, D., & Di Nunno, F. (2022). Application of Rescaled Adjusted Partial Sums (RAPS) method in hydrology: An overview. Advances in Civil and Architectural Engineering, 13(25), 58-72. https://doi.org/10.13167/2022.25.6

Edwards, P. J., Williard, K. W. J., & Schoonover, J. E. (2015). Fundamentals of watershed hydrology. Journal of Contemporary Water Research & Education, 154(1), 3-20. https://doi.org/10.1111/j.1936-704X.2015.03185.x

Fadholi, A. (2020). Trend curah hujan ekstrem harian berdasarkan data PERSIANN-CCS di Kepulauan Bangka Belitung. Jurnal Ilmu dan Inovasi Fisika, 4(1).

Fadillah, A., Rizal H, M., & Mursalim, M. (2025). Enhancing flood prediction using hybrid LSTM-Transformer deep learning approach. Journal of System and Computer Engineering, 6(3), 281-295. https://doi.org/10.61628/jsce.v6i3.2083

Fan, X., & Schütze, N. (2024). Assessing crop yield and water balance in crop rotation irrigation systems: Exploring sensitivity to soil hydraulic characteristics and initial moisture conditions in the North China Plain.

UNIVERSITAS GADJAH MADA
Optimalisasi Kalender Tanam Berbasis Prediksi Curah Hujan Menggunakan Algoritma Random Forest dan Simulasi Hidrologi SWAT di DAS Bogowonto untuk Mendukung Pengelolaan Irigasi di Daerah Irigasi Kedungputri
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Agricultural Water Management, 300, 108897. https://doi.org/10.1016/j.agwat.2024.108897

FAO. (2020). The State of Food and Agriculture 2020. FAO. https://doi.org/10.4060/cb1447en

Fausan, A., Sapei, A., Suharnoto, Y., & Pandjaitan, N. H. (2022). Analysis of Maros River discharge using the modified Soil and Water Assessment Tools (SWAT) program. Jurnal Teknik Pertanian Lampung, 11(1), 146-160. https://doi.org/10.23960/jtep-l.v11i1.146-160

Fridayanto, S. N., Zakaria, A., Kusumastuti, D. I., & Wahono, E. P. (2025). Comparative analysis of rainfall data estimation methods: A case study of Tanggamus Regency.

Gangopadhyay, S., Clark, M., Werner, K., Brandon, D., & Rajagopalan, B. (2004). Effects of spatial and temporal aggregation on the accuracy of statistically downscaled precipitation estimates in the Upper Colorado River Basin.

Gassman, P. W., Reyes, M. R., Green, C. H. M., & Arnold, J. G. (2007). The Soil and Water Assessment Tool: Historical development, applications, and future research directions. Transactions of the ASABE, 50(4), 1211-1250. https://doi.org/10.13031/2013.23637

Giannini, V., Mula, L., Carta, M., Patteri, G., & Roggero, P. P. (2022). Interplay of irrigation strategies and sowing dates on sunflower yield in semi-arid Mediterranean areas. Agricultural Water Management, 260, 107287. https://doi.org/10.1016/j.agwat.2021.107287

Gupta, H. V., King, H., Yilmaz, K. K., & Martinez, G. F. (2009). Decomposition of the mean squared error and NSE performance criteria: Implications for improving hydrological modelling.

Gzar, D. A., Mahmood, A. M., & Abbas, M. K. (2022). A comparative study of regression machine learning algorithms: Tradeoff between accuracy and computational complexity. Mathematical Modelling of Engineering Problems, 9(5), 1217-1224. https://doi.org/10.18280/mmep.090508

Hadeed, S. J., O'Rourke, M. K., Burgess, J. L., Harris, R. B., & Canales, R. A. (2020). Imputation methods for addressing missing data in short-term monitoring of air pollutants. Science of the Total Environment, 730, 139140. https://doi.org/10.1016/j.scitotenv.2020.139140

He, R., Zhang, L., & Chew, A. W. Z. (2022). Modeling and predicting rainfall time series using seasonal-trend decomposition and machine learning. Knowledge-Based Systems, 251, 109125. https://doi.org/10.1016/j.knosys.2022.109125

Hidayat, Y., Rachman, L. M., Wahjunie, E. D., Baskoro, D. P. T., Purwakusuma, W., Yusuf, S. M., & Araswati, F. D. (2024). Water balance prediction by simulating land use planning and water retention infrastructure in Upper Cisadane Sub-Watershed, West Java, Indonesia. Jurnal Pengelolaan Sumberdaya Alam dan Lingkungan, 14(2), 415-427. https://doi.org/10.29244/jpsl.14.2.415

Hormwichian, R., Kaewplang, S., Kangrang, A., Supakosol, J., Boonrawd, K., Sriworamat, K., Muangthong, S., Songsaengrit, S., & Prasanchum, H.

UNIVERSITAS GADJAH MADA
Optimalisasi Kalender Tanam Berbasis Prediksi Curah Hujan Menggunakan Algoritma Random Forest dan Simulasi Hidrologi SWAT di DAS Bogowonto untuk Mendukung Pengelolaan Irigasi di Daerah Irigasi Kedungputri
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

(2023). Understanding the interactions of climate and land use changes with runoff components in spatial-temporal dimensions in the Upper Chi Basin, Thailand. Water, 15(19), 3345. https://doi.org/10.3390/w15193345

Hulsman, P., Bogaard, T. A., & Savenije, H. H. G. (2018). Rainfall-runoff modelling using river-stage time series in the absence of reliable discharge information: A case study in the semi-arid Mara River basin. Hydrology and Earth System Sciences, 22(10), 5081-5095. https://doi.org/10.5194/hess-22-5081-2018

Hyndman, R. J. (2009). Moving averages.

Idemudia, O., Ehiorobo, J. O., Izinyon, O. C., & Ilaboya, I. R. (2024). Evaluating the performance of Random Forest, Decision Tree, Support Vector Regression and Gradient Boosting for streamflow prediction. CTU Journal of Innovation and Sustainable Development, 16(2), 116-130. https://doi.org/10.22144/ctujoisd.2024.297

Idolor, J., Adediji, A., & Idowu, P. A. (2024). A comparison of climate-driven deep learning ensemble and SWAT+ models for daily streamflow simulation in the Niger River Basin, West Africa. https://doi.org/10.22541/essoar.171440157.77131548/v1

Imron, F., Murtiningrum, M., & Arif, S. S. (2022). Analisis kesiapan modernisasi irigasi dan optimasi alokasi air irigasi pada Daerah Irigasi Belitang. AgriTECH, 42(4), 329. https://doi.org/10.22146/agritech.67203

Islam, K. I., Elias, E., Carroll, K. C., & Brown, C. (2023). Exploring Random Forest machine learning and remote sensing data for streamflow prediction: An alternative approach to a process-based hydrologic modeling in a snowmelt-driven watershed. Remote Sensing, 15(16), 3999. https://doi.org/10.3390/rs15163999

Islam, M. T., Shalehin, M., Jahan, N., Islam, M. R., Akash, & Adham, A. K. M. (2024). Modeling Boro rice water requirements and irrigation schedules in Mymensingh, Bangladesh, under subtropical climate change. Results in Engineering, 24, 103665. https://doi.org/10.1016/j.rineng.2024.103665

Islam, T., Mazumder, T., Shahriair Roni, M. N., & Nur, M. S. (2024). A comparative study of machine learning models for predicting Aman rice yields in Bangladesh. Heliyon, 10(23), e40764. https://doi.org/10.1016/j.heliyon.2024.e40764

Kementerian Lingkungan Hidup dan Kehutanan. (2021). Peraturan Menteri Lingkungan Hidup dan Kehutanan Nomor 23 Tahun 2021.

Kirono, D. G. C., Butler, J. R. A., McGregor, J. L., Ripaldi, A., Katzfey, J., & Nguyen, K. (2016). Historical and future seasonal rainfall variability in Nusa Tenggara Barat Province, Indonesia: Implications for the agriculture and water sectors. Climate Risk Management, 12, 45-58. https://doi.org/10.1016/j.crm.2015.12.002

Krishan, R., Nikam, B. R., Pingale, S. M., Chandrakar, A., & Khare, D. (2018). Analysis of trends in rainfall and dry/wet years over a century in the

UNIVERSITAS GADJAH MADA
Optimalisasi Kalender Tanam Berbasis Prediksi Curah Hujan Menggunakan Algoritma Random Forest dan Simulasi Hidrologi SWAT di DAS Bogowonto untuk Mendukung Pengelolaan Irigasi di Daerah Irigasi Kedungputri
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Eastern Ganga Canal command. Meteorological Applications, 25(4), 561-574. https://doi.org/10.1002/met.1721

Krisnayanti, D. S., Lungan, M. D. A., & Karels, D. W. (2020). Simulasi pola tata tanam Daerah Irigasi Raknamo. Jurnal Teknik Sipil, 9(1).

Lepcha, R., Kumar Patra, S., Ray, R., Thapa, S., Baral, D., & Saha, S. (2024). Rooftop rainwater harvesting a solution to water scarcity: A review. Groundwater for Sustainable Development, 26, 101305. https://doi.org/10.1016/j.gsd.2024.101305

Lettenmaier, D. (2024). Role of rainfall in hydrological modeling and water resource planning. https://doi.org/10.35841/2167-0587.24.14.319

Little, R. J. A., & Rubin, D. B. (2019). Statistical analysis with missing data (3rd ed.). Wiley.

Mahlayeye, M., Darvishzadeh, R., & Nelson, A. (2022). Cropping patterns of annual crops: A remote sensing review. Remote Sensing, 14(10), 2404. https://doi.org/10.3390/rs14102404

Margareth, I. S. I., Hidayat, Y., & Winarni, S. (2025). Rainfall forecasting using extreme gradient boosting. Communications in Mathematical Biology and Neuroscience, 2025. https://doi.org/10.28919/cmbn/9385

Mariyanto, J. (2025). Krisis global dan implikasinya bagi pertanian Indonesia: Perubahan iklim, konflik geopolitik, dan spekulasi pasar.

Markstrom, S. L., Regan, R. S., Hay, L. E., Viger, R. J., Webb, R. M., Payn, R. A., & LaFontaine, J. H. (2015). PRMS-IV, the precipitation-runoff modeling system, version 4 (Techniques and Methods 6-B7). U.S. Geological Survey. https://doi.org/10.3133/tm6B7

Meierdiercks, K. L., Finewood, M. H., & Bennett, C. (2024). Defining the term watershed to reflect modern uses and functions as inter- and intra-connected socio-hydrologic systems. Journal of Environmental Studies and Sciences, 14(2), 236-255. https://doi.org/10.1007/s13412-024-00891-8

Melsen, L. A., Puy, A., Torfs, P. J. J. F., & Saltelli, A. (2025). The rise of the Nash-Sutcliffe efficiency in hydrology. Hydrological Sciences Journal, 70(8), 1248-1259. https://doi.org/10.1080/02626667.2025.2475105

Meng, F., Liu, T., Wang, H., Luo, M., Duan, Y., & Bao, A. (2018). An alternative approach to overcome the limitation of HRUs in analyzing hydrological processes based on land use/cover change. Water, 10(4), 434. https://doi.org/10.3390/w10040434

Moore, M., List, G., Mauerman, M., Ballesteros, D. S., & Baethgen, W. (2025). Assessing disparities in access, use, and potential benefits of weather and climate information services among farmers in Guatemala's Dry Corridor. Climate Services, 38, 100573. https://doi.org/10.1016/j.cliser.2025.100573

Moriasi, D. N., Arnold, J. G., Van Liew, M. W., Bingner, R. L., Harmel, R. D., & Veith, T. L. (2007). Model evaluation guidelines for systematic quantification of accuracy in watershed simulations. Transactions of the ASABE, 50(3), 885-900.

UNIVERSITAS GADJAH MADA
Optimalisasi Kalender Tanam Berbasis Prediksi Curah Hujan Menggunakan Algoritma Random Forest dan Simulasi Hidrologi SWAT di DAS Bogowonto untuk Mendukung Pengelolaan Irigasi di Daerah Irigasi Kedungputri
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Mulyanti, H., Istadi, & Gernowo, R. (2024). An insight from homogeneity testing of long-term rainfall datasets over East Java, Indonesia. Journal of Emerging Science and Engineering, 2(2), e23. https://doi.org/10.61435/jese.2024.e23

Nair, A. G. R., Adarsh, S., El-Shafie, A., & Ahmed, A. N. (2024). Enhancing hydrological data completeness: A performance evaluation of various machine learning techniques using probabilistic fusion imputer with neural networks for streamflow data reconstruction. Journal of Hydrology, 639, 131583. https://doi.org/10.1016/j.jhydrol.2024.131583

Nassar, A., Tarboton, D., Anderson, M., Yang, Y., Fisher, J. B., Purdy, A. J., Baig, F., He, C., Gochis, D., Melton, F., & Volk, J. (2025). Intercomparison of the U.S. National Water Model with OpenET over the Bear River Basin, U.S. Journal of Hydrology, 656, 132826. https://doi.org/10.1016/j.jhydrol.2025.132826

Neitsch, S. L., Arnold, J. G., Kiniry, J. R., & Williams, J. R. (2011). Soil and Water Assessment Tool theoretical documentation version 2009. Texas Water Resources Institute.

Nugraha, A. S. (2024). Analisis debit aliran DAS Citarum Hulu dengan model SWAT semi-distributed hidrologi. Sistem Infrastruktur Teknik Sipil (SIMTEKS), 4(1), 73-80. https://doi.org/10.32897/simteks.v4i1.3423

Onyutha, C. (2022). A hydrological model skill score and revised R-squared. Hydrology Research, 53(1), 51-64. https://doi.org/10.2166/NH.2021.071

Ortiz-Lopez, C., Bouchard, C., & Rodriguez, M. J. (2024). Ensemble machine learning using hydrometeorological information to improve modeling of quality parameter of raw water supplying treatment plants. Journal of Environmental Management, 362, 121378. https://doi.org/10.1016/j.jenvman.2024.121378

Ostad-Ali-Askari, K., Alvankar, S.-R., & Rabiefar, H.-R. (2020). Investigation of climatological components on runoff modeling using SWAT. American Journal of Engineering and Applied Sciences, 13(4), 846-857. https://doi.org/10.3844/ajeassp.2020.846.857

Parra-Plazas, J., Gaona-Garcia, P., & Plazas-Nossa, L. (2023). Time series outlier removal and imputing methods based on Colombian weather stations data. Environmental Science and Pollution Research, 30(28), 72319-72335. https://doi.org/10.1007/s11356-023-27176-x

Pettitt, A. N. (1979). A non-parametric approach to the change-point problem. Journal of the Royal Statistical Society: Series C (Applied Statistics), 28(2), 126-135.

Pranoto, I., Wahyudi, S. I., Ni, M. F., et al. (2025). Analisis kebutuhan air, neraca air, dan efisiensi irigasi pada saluran primer Induk Barat dengan penerapan metode konvensional dan metode irigasi padi hemat air (IPHA). Jurnal Ilmiah Wahana Pendidikan, 2025(C), 304-313.

Prawaka, F., Zakaria, A., & Tugiono, S. (2016). Analisis data curah hujan yang hilang dengan menggunakan metode normal ratio, inversed square distance, dan rata-rata aljabar (Studi kasus curah hujan beberapa stasiun

UNIVERSITAS GADJAH MADA
Optimalisasi Kalender Tanam Berbasis Prediksi Curah Hujan Menggunakan Algoritma Random Forest dan Simulasi Hidrologi SWAT di DAS Bogowonto untuk Mendukung Pengelolaan Irigasi di Daerah Irigasi Kedungputri
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

hujan daerah Bandar Lampung). Jurnal Rekayasa Sipil dan Desain (JRSDD), 4(3), 397-406.

Putera, M. I., Alam, S., Surahman, S., Irmayani, I., & Masnur, M. (2018). Land use potential on water balance based on SWAT method in Saddang Watershed in Bendung Benteng Irrigation System. Agrotech Journal, 3(2), 53-60. https://doi.org/10.31327/atj.v3i2.857

Putra, A. F. D., Azmi, M. N., Wijayanto, H., Utama, S., & Wedashwara Wirawan, I. G. P. W. (2024). Optimizing rain prediction model using Random Forest and grid search cross-validation for agriculture sector. MATRIK: Jurnal Manajemen, Teknik Informatika dan Rekayasa Komputer, 23(3), 519-530. https://doi.org/10.30812/matrik.v23i3.3891

Putra, M. I. W., Anwar, I., Simatupang, P. J. G., Ramadhan, W. R., Thoriq, A. M. Al, Putra, S. P., Cibro, D., Farisi, M. I. Al, & Maini, M. (2025). Analisis kebutuhan air dan desain saluran irigasi sederhana di Desa Way Huwi Kabupaten Lampung Selatan. Jurnal Penelitian Multidisiplin Bangsa, 2(1), 56. https://doi.org/10.59837/jpnmb.v2i1.438

Qin, C., Tang, Z., Chen, J., & Chen, X. (2020). The impact of soil and water resource conservation on agricultural production: An analysis of the agricultural production performance in Zhejiang, China. Agricultural Water Management, 240, 106268. https://doi.org/10.1016/j.agwat.2020.106268

Rahma, A. D., & Ludwig, F. (2024). El Nino effects on water availability for agriculture: Case study of Magelang, Central Java, Indonesia. Applied Environmental Research, 46(2). https://doi.org/10.35762/AER.2024019

Rahman, M. A., Jahan, C. S., Rahaman, M. F., & Mazumder, Q. H. (2025). Simulation of river aquifer dynamics and water scarcity in left bank of River Ganges (Padma), Bangladesh. Environment, Development and Sustainability. https://doi.org/10.1007/s10668-024-05922-6

Rakhmat, G. A., & Mutohar, W. (2023). MIND (Multimedia Artificial Intelligent Networking Database) prakiraan hujan menggunakan metode Random Forest dan cross validation. Journal MIND, 8(2), 173-187.

Reis, A. A. dos, Weerts, A., Ramos, M. H., Wetterhall, F., & Fernandes, W. dos S. (2022). Hydrological data and modeling to combine and validate precipitation datasets relevant to hydrological applications. Journal of Hydrology: Regional Studies, 44, 101200. https://doi.org/10.1016/j.ejrh.2022.101200

Ridwan, W. M., Sapitang, M., Aziz, A., Kushiar, K. F., Ahmed, A. N., & El-Shafie, A. (2021). Rainfall forecasting model using machine learning methods: Case study Terengganu, Malaysia. Ain Shams Engineering Journal, 12(2), 1651-1663. https://doi.org/10.1016/j.asej.2020.09.011

Sahoo, S., Singha, C., Govind, A., & Sharma, P. (2025). Review of aquifer storage and recovery opportunities and challenges in India. Environmental Earth Sciences, 84(5). https://doi.org/10.1007/s12665-025-12124-4

Saleh, D. K., Kratzer, C. R., Green, C. H., & Evans, D. G. (2009). Using the Soil and Water Assessment Tool (SWAT) to simulate runoff in Mustang

UNIVERSITAS GADJAH MADA
Optimalisasi Kalender Tanam Berbasis Prediksi Curah Hujan Menggunakan Algoritma Random Forest dan Simulasi Hidrologi SWAT di DAS Bogowonto untuk Mendukung Pengelolaan Irigasi di Daerah Irigasi Kedungputri
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Creek Basin, California (Scientific Investigations Report 2009–5031). U.S. Geological Survey.

Salele, B., Dodo, Y. A., Sani, D. A., Abuhussain, M. A., Abdullaeva, B. S., & Brysiewicz, A. (2023). Run-off modelling of pervious and impervious areas using couple SWAT and a novel machine learning model in Cross-River State Nigeria. Water Science and Technology, 88(7), 1893-1909. https://doi.org/10.2166/wst.2023.304

Samson, T. K., & Aweda, F. O. (2024). Forecasting rainfall in selected cities of Southwest Nigeria: A comparative study of Random Forest and Long Short-Term Memory models. Acadlore Transactions on Geosciences, 3(2), 79-88. https://doi.org/10.56578/atg030202

Setiyowati, Y. A., Harisuseno, D., & Sajali, M. A. (2025). Comparison of correlation, PBIAS and RSR between monthly, daily, and hourly GPM rainfall data. Jurnal Penelitian Pendidikan IPA, 11(6), 615-624. https://doi.org/10.29303/jppipa.v11i6.11068

Sharafkhane, M. G., Ziaei, A. N., Naghedifar, S. M., Akbari, A., & Verdi, A. (2024). AquaCrop Plug-in-PSO: A novel irrigation scheduling optimization framework for maize to maximize crop water productivity using in-season weather forecast and crop yield estimation. Agricultural Water Management, 306, 109153. https://doi.org/10.1016/j.agwat.2024.109153

Sheline, C., Ingersoll, S., Amrose, S., Irmak, S., & Winter, A. G. (2024). Sensitivity study of the Predictive Optimal Water and Energy Irrigation (POWEIr) controller's schedules for sustainable agriculture systems in resource-constrained contexts. Computers and Electronics in Agriculture, 226, 109230. https://doi.org/10.1016/j.compag.2024.109230

Sitterson, J., Knightes, C., Parmar, R., Wolfe, K., Avant, B., & Muche, M. (2018). An overview of rainfall-runoff model types.

Sodunke, M. A., Ojo, J. S., Lawal, Y. B., Ojo, O. L., Owolabi, G. A., & Olateju, A. I. (2025). Application of machine learning models for rainfall prediction and estimation of rain-induced attenuation for satellite communication in a tropical region. Journal of Atmospheric and Solar-Terrestrial Physics, 268, 106443. https://doi.org/10.1016/j.jastp.2025.106443

Srinivasan, R., Arnold, J. G., & Jones, C. A. (1998). Hydrologic modelling of the United States with the Soil and Water Assessment Tool. Water Resources Development, 14.

Srivastav, R., & Nayak, P. C. (2025). Applications of machine learning in hydroclimatology. Springer. https://doi.org/10.1007/978-3-031-64403-0

Staudinger, M., Herzog, A., Loritz, R., Houska, T., Pool, S., Spieler, D., Wagner, P. D., Mai, J., Kiesel, J., Thober, S., Guse, B., & Ehret, U. (2025). How well do hydrological models learn from limited discharge data? A comparison of process- and data-driven models. https://doi.org/10.5194/egusphere-2025-1076

UNIVERSITAS GADJAH MADA
Optimalisasi Kalender Tanam Berbasis Prediksi Curah Hujan Menggunakan Algoritma Random Forest dan Simulasi Hidrologi SWAT di DAS Bogowonto untuk Mendukung Pengelolaan Irigasi di Daerah Irigasi Kedungputri
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Suharmanto, E. T., & Supriyanto, A. (2025). Assessment of IDW and ANN on daily rainfall data imputation in Semarang, Central Java. Sinkron, 9(1), 382-394. https://doi.org/10.33395/sinkron.v9i1.14452

Tampubolon, S. B., & Suprayogi, S. (2017). Analisis kebutuhan air untuk pertanian di Daerah Irigasi Karangploso Kabupaten Bantul.

Tan, M. L., Gassman, P. W., Srinivasan, R., Arnold, J. G., & Yang, X. Y. (2019). A review of SWAT studies in Southeast Asia: Applications, challenges and future directions. Water, 11(5), 914. https://doi.org/10.3390/w11050914

Toosi, A. S., Batelaan, O., Shanafield, M., & Guan, H. (2025). Land use-land cover and hydrological modeling: A review. WIREs Water, 12(2). https://doi.org/10.1002/wat2.70013

Tuo, Y., Duan, Z., Disse, M., & Chiogna, G. (2016). Evaluation of precipitation input for SWAT modeling in Alpine catchment: A case study in the Adige river basin (Italy). Science of the Total Environment, 573, 66-82. https://doi.org/10.1016/j.scitotenv.2016.08.034

Tuomenvirta, H. (2001). Homogeneity testing and adjustment of climatic time series in Finland.

Tyralis, H., & Papacharalampous, G. (2017). Variable selection in time series forecasting using random forests. Algorithms, 10(4), 114. https://doi.org/10.3390/a10040114

Vaes, G., Willems, P., & Berlamont, J. (2001). Rainfall input requirements for hydrological calculations.

Verma, A. K., & Jha, M. K. (2012). Evaluation of ArcSWAT model for streamflow simulation. In Proceedings of the 2012 International SWAT Conference.

Verma, P., Yeates, J., & Daly, E. (2011). A stochastic model describing the impact of daily rainfall depth distribution on the soil water balance. Advances in Water Resources, 34(8), 1039-1048. https://doi.org/10.1016/j.advwatres.2011.05.013

Verma, S., Singh, A., Pradhan, S. S., & Kushuwaha, M. (2024). Impact of climate change on agriculture: A review. International Journal of Environment and Climate Change, 14(3), 615-620. https://doi.org/10.9734/ijecc/2024/v14i34069

Vivas, E., de Guenni, L. B., Allende-Cid, H., & Salas, R. (2023). Deep Lagged-Wavelet for monthly rainfall forecasting in a tropical region. Stochastic Environmental Research and Risk Assessment, 37(3), 831-848. https://doi.org/10.1007/s00477-022-02323-x

Vu, M. T., Raghavan, S. V., & Liong, S. Y. (2012). SWAT use of gridded observations for simulating runoff: A Vietnam river basin study. Hydrology and Earth System Sciences, 16(8), 2801-2811. https://doi.org/10.5194/hess-16-2801-2012

Wang, J., Bretz, M., Dewan, M. A. A., & Delavar, M. A. (2022). Machine learning in modelling land-use and land cover-change (LULCC): Current status, challenges and prospects. Science of the Total Environment, 822, 153559. https://doi.org/10.1016/j.scitotenv.2022.153559

UNIVERSITAS GADJAH MADA
Optimalisasi Kalender Tanam Berbasis Prediksi Curah Hujan Menggunakan Algoritma Random Forest dan Simulasi Hidrologi SWAT di DAS Bogowonto untuk Mendukung Pengelolaan Irigasi di Daerah Irigasi Kedungputri
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Wani, O. A., Mahdi, S. S., Yeasin, M., Kumar, S. S., Gagnon, A. S., Danish, F., Al-Ansari, N., El-Hendawy, S., & Mattar, M. A. (2024). Predicting rainfall using machine learning, deep learning, and time series models across an altitudinal gradient in the North-Western Himalayas. Scientific Reports, 14(1). https://doi.org/10.1038/s41598-024-77687-x

White, K. L., & Chaubey, I. (2005). Sensitivity analysis, calibration, and validations for a multisite and multivariable SWAT model. Journal of the American Water Resources Association, 41(5), 1077–1089.

Wiwoho, B. S., Astuti, I. S., Purwanto, P., Deffinika, I., Alfarizi, I. A. G., Sucahyo, H. R., Gusti, R., Herwanto, M. T., & Herlambang, G. A. (2023). Assessing long-term rainfall trends and changes in a tropical watershed Brantas, Indonesia: An approach for quantifying the agreement among satellite-based rainfall data, ground rainfall data, and small-scale farmers questionnaires. Natural Hazards, 117(3), 2835-2862. https://doi.org/10.1007/s11069-023-05969-0

WMO. (2007). Guidelines on climate data management. World Meteorological Organization.

WMO. (2018a). Guidance on the homogenization of climate station data. World Meteorological Organization.

WMO. (2018b). Guide to climatological practices. World Meteorological Organization.

Wolfensberger, D., Gabella, M., Boscacci, U., Germann, U., & Berne, A. (2021). RainForest: A random forest algorithm for quantitative precipitation estimation over Switzerland. Atmospheric Measurement Techniques, 14, 3169–3193. https://doi.org/10.5194/amt-14-3169-2021

Wulansari, S. A. G., Isnugroho, I., & Jaya, R. P. (2023). Analisis neraca air Daerah Irigasi Kedung Putri.

YAŞA, İ., YÜCE, M. İ., & EŞİT, M. (2023). Homogeneity and change point detection analysis of seasonal and annual precipitation and temperature series Van, Türkiye. Yüzüncü Yıl Üniversitesi Fen Bilimleri Enstitüsü Dergisi, 28(3), 1012-1028. https://doi.org/10.53433/yyufbed.1204538

Yirga, G., Jaya Prakash Raju, U., Gedifaw, A., & Nigusie, A. (2025). Tree-based machine learning and global models for long-term rainfall estimation: Intercomparison and evaluation over Bahir Dar, Ethiopia. Journal of Water and Climate Change, 16(2), 344–364. https://doi.org/10.2166/wcc.2025.316

Yonariza, & Noer, M. (2024). Pembangunan pertanian berkelanjutan dalam perspektif sosial, ekonomi dan politik.

Yu, L., Chen, X., Ruan, W., Yao, H., Chen, J., Deng, H., Chen, Y., & Liu, M. (2025). Time-scale effects on runoff simulation and parameters sensitivity using SWAT model. Journal of Hydrology: Regional Studies, 60, 102604. https://doi.org/10.1016/j.ejrh.2025.102604

Zhang, Z., Wang, Q., Guan, Q., Xiao, X., Mi, J., & Lv, S. (2023). Research on the optimal allocation of agricultural water and soil resources in the Heihe River Basin based on SWAT and intelligent optimization. Agricultural

UNIVERSITAS GADJAH MADA
Optimalisasi Kalender Tanam Berbasis Prediksi Curah Hujan Menggunakan Algoritma Random Forest dan Simulasi Hidrologi SWAT di DAS Bogowonto untuk Mendukung Pengelolaan Irigasi di Daerah Irigasi Kedungputri
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Water Management, 279, 108177. https://doi.org/10.1016/j.agwat.2023.108177

Zhou, R., Seong, Y., & Liu, J. (2024). Review of the development of hydrological data quality control in Typhoon Committee Members. Tropical Cyclone Research and Review, 13(2), 113-124. https://doi.org/10.1016/j.tcrr.2024.06.003

Zhou, Z., Ren, J., He, X., & Liu, S. (2021). A comparative study of extensive machine learning models for predicting long-term monthly rainfall with an ensemble of climatic and meteorological predictors. Hydrological Processes, 35(11). https://doi.org/10.1002/hyp.14424