Food and Agriculture Organization of the United Nations

Estimating water loss in Amu Darya River Basin during winter season 2021-22

Source: Global Administrative Unit Layers from Natural Earth with disputed areas.

Efficient irrigation practices are based on a comprehensive understanding of water loss and water consumption for which the remote–sensed actual evapotranspiration is a proper proxy. By using MODIS remote sensing imagery, actual evapotranspiration data was retrieved, which is a meaningful proxy to estimate water loss from soil. Cropland extent information was collected from ESA WorldCover, a land cover dataset based on Sentinel-1 and Sentinel-2 data [1,2]. Through the integration of these datasets, a bivariate map with a hexagon grid (cells of 90 square kilometers) showcasing water loss patterns and cropland distribution. This approach contributes valuably to the Afghanistan Emergency Food Security Project's (OSRO/AFG/213/WBK) objectives, aiding in informed irrigation and water management strategies.

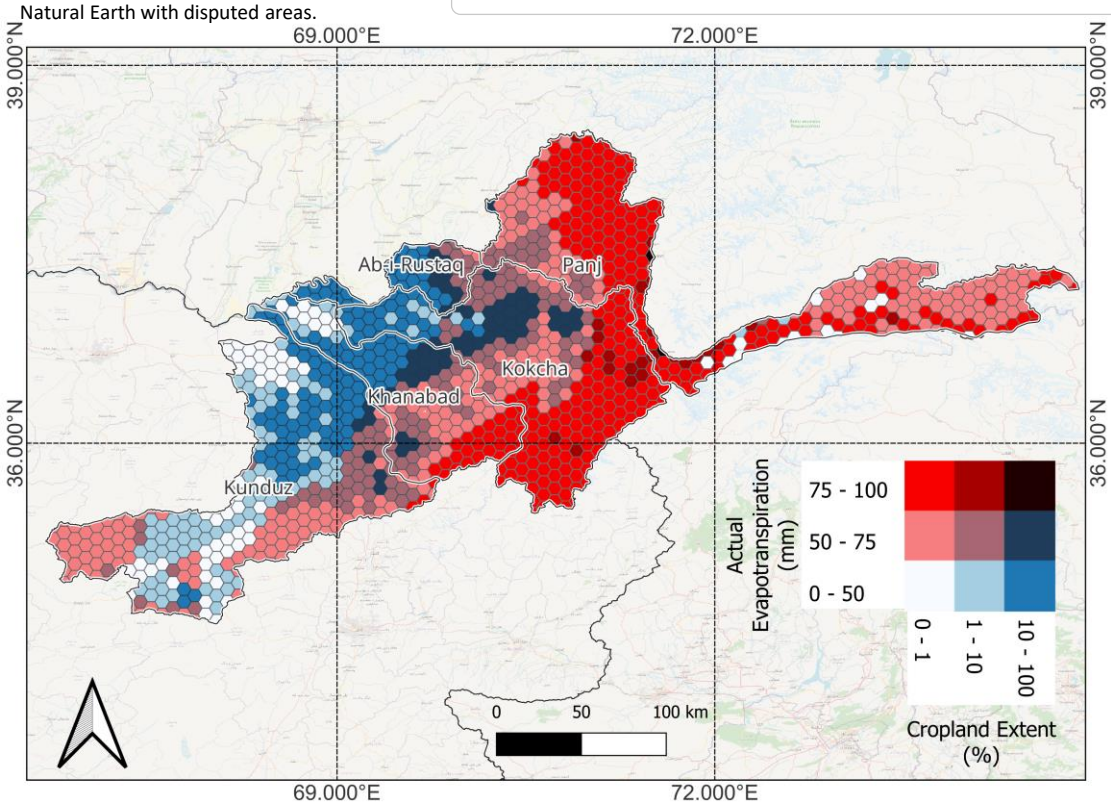

Figure 1: Bivariate map of seasonal cumulative actual evapotranspiration (mm) and cropland land area extent (%) during winter season (10-2021 to 04-2022) in Amu Darya River Basin.

Key Findings

- Cropland extent was highest in Ab-i-Rustaq, covering 44 percent of the basin area, followed by Khanabad with 16 percent, and Kunduz with 11 percent.
- Panj shows the highest actual evapotranspiration with 75 mm, followed by Kokcha with 70 mm, and Khanabad with 60 mm.
- Emphasizing the importance of water infrastructure in high-demand areas like Khanabad and the need for further research to understand the factors contributing the differences in Ab-i-Rustaq and Kunduz, where a substantial cropland extent coexists with a comparatively lower rate of actual evapotranspiration.

Table 1: Mean values of seasonal cumulative actual evapo-transpiration (mm) and cropland area extent (percentage of the sub-basin area and extent in km^2) during winter season (10-2021 to 04-2022) by sub-basins.

Sub-basin	Actual evapo-transpiration (mm)	Cropland extent (%)	Cropland extent (km^2)
Ab-i-Rustaq	49	44	1 622
Khanabad	60	16	1 933
Kokcha	70	8	1 765
Kunduz	49	11	3 155
Panj	75	1	158

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[1] Xiang, K., Li, Y., Horton, R., & Feng, H. (2020). Similarity and difference of potential evapotranspiration and reference crop evapotranspiration–a review. Agricultural Water Management, 232, 106043. https://doi.org/10.1016/j.agwat.2020.106043

[2] Running, S., Mu, Q., Zhao, M. (2017). MOD16A2 MODIS/Terra Net Evapotranspiration 8-Day L4 Global 500m SIN Grid V006. NASA EOSDIS Land Processes DAAC. Accessed 2023-05-26 from https://doi.org/10.5067/MODIS/MOD16A2.006

[3] Zanaga, D., Van De Kerchove, R., Daems, D., De Keersmaecker, W., Brockmann, C., Kirches, G., Wevers, J., Cartus, O., Santoro, M., Fritz, S., Lesiv, M., Herold, M., Tsendbazar, N.E., Xu, P., Ramoino, F., Arino, O., 2022. ESA WorldCover 10 m 2021 v200.