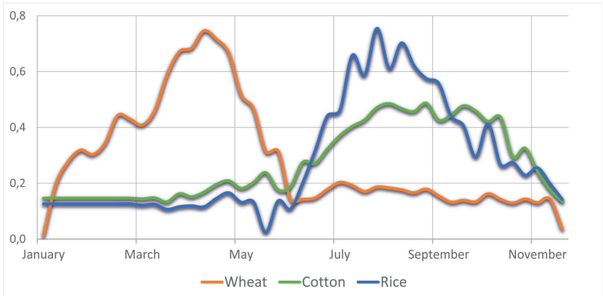
WUEMoCA key features

- Overview of spatial and temporal trends in the Aral Sea Basin ➔ "*Big picture*"
- Identification of irrigated areas with need for action
- Compliance with UN Sustainability indicators (SDGs 2 & 6)
- Online accessible for everyone
- Options to include user-defined data and to calculate additional water indicators
- Privacy: Sensitive statistics and additional calculation results remain with the user
- Open source code for tool development, e.g. in water related institutions and universities

Digital data and modeling

Different crop classes are derived from satellite data. Every crop class has a typical phenological curve (vegetation index).



Vegetation index from satellite data analysis: annual crop growth cycle for wheat, cotton and rice

Actual evapotranspiration (ETa) and crop yields result from models that integrate satellite data and meteorological information.

WUEMoCA - application fields

- A geoinformation tool for land and water experts to understand where river water flows to, to use water more efficiently and to save water
- A supporting tool for informed decision-making and management support
- A system for the collection, analysis, and dissemination of environmental data for the entire Aral Sea Basin

The online tool

was developed from 2015 to 2019 within the **CAWa** project, the Regional Research Network "Central Asian Water", funded by the German Federal Foreign Office.

www.cawa-project.net

Development team

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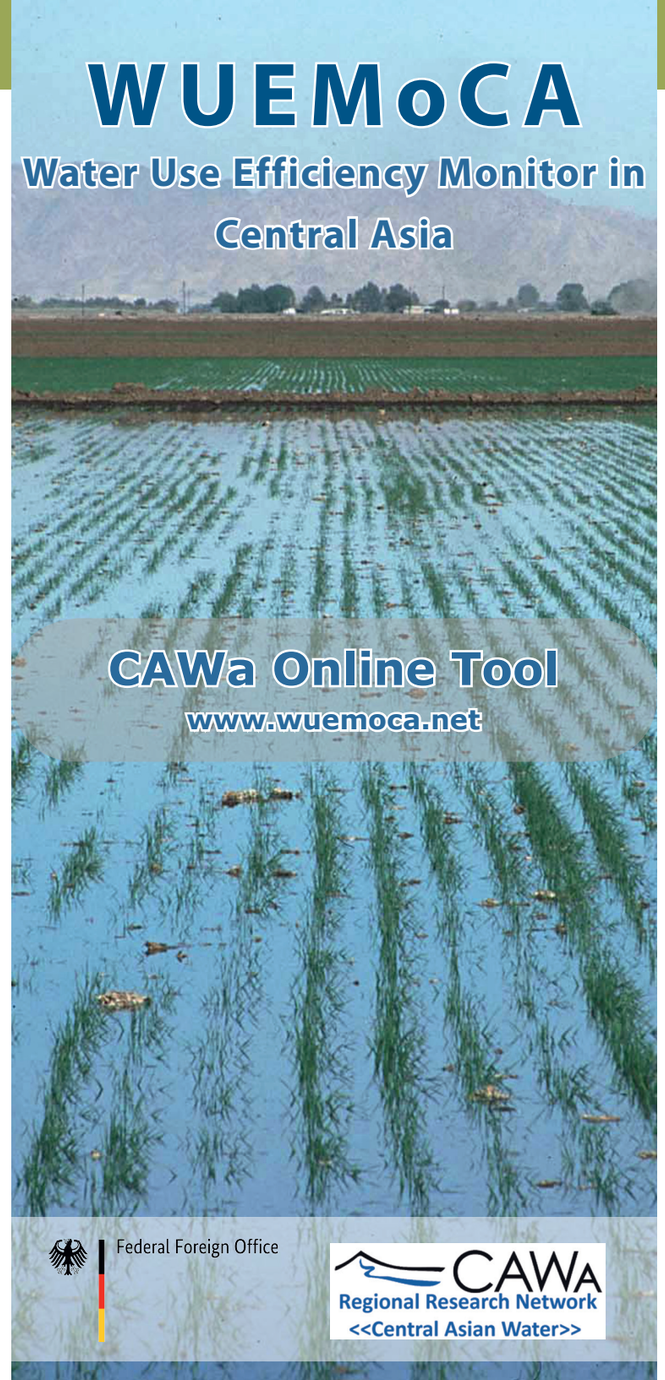


WUEMoCA

is an operational scientific web-mapping tool for the regional monitoring of land and water use efficiency in the irrigated croplands of the transboundary Aral Sea Basin (Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan, and Afghanistan).

WUEMoCA provides access to essential indicator groups:

- Land use - net irrigated area, share of crop acreage in the irrigated area, land use intensity
- Productivity - crop yields for cotton, wheat, and rice, farm crop output and productivity
- Water use efficiency - actual evapotranspiration, water availability, water productivity, irrigation efficiency

Database

Information is based on open-source optical remote sensing products (MODIS, calibrated with in-situ data), climate data, and statistical hydrographic data. Observations are provided for the period from 2000 onwards.

*Detailed information on data & methodology can be found in the **WUEMoCA brochure** and the **user guide***

Indicators from the region

For better acceptance of the technology, all indicators were defined in agreement with water managers who operate the irrigation water distribution in the Aral Sea Basin. Thus, indicators are based on local expert knowledge.

Different information levels

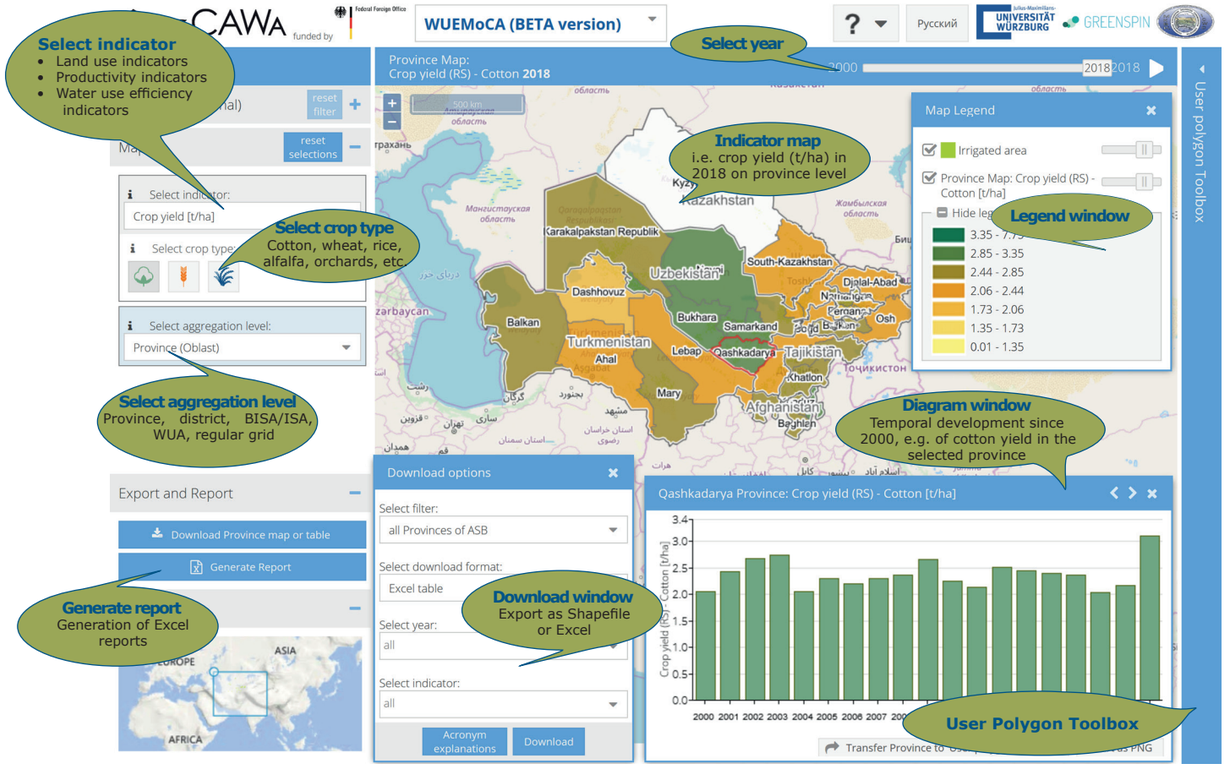
Indicators are provided at administrative and hydrographical levels. The levels include provinces, districts or water distribution units such as irrigation system administrations in Uzbekistan. For selected pilot areas (Fergana Valley and Khorezm) information on the level of water user associations (WUAs) is available.

Operational monitoring

The automated processing chain includes continous download and processing of satellite images and climate data, land use classification, as well as estimation of evapotranspiration and crop yields on an annual basis. With little maintenance, the server can run after the CAWa project.

Validation

The tool has been validated for selected regions (e.g., Fergana Valley and Khorezm). Validation workflows and open source tools for the integration of further in-situ information on crops, yields, and water data have been elaborated and documented.



WUEMoCA interface and functionalities, example indicator cotton yield 2018

Water use efficiency

Water availability and irrigation efficiency are assessed by

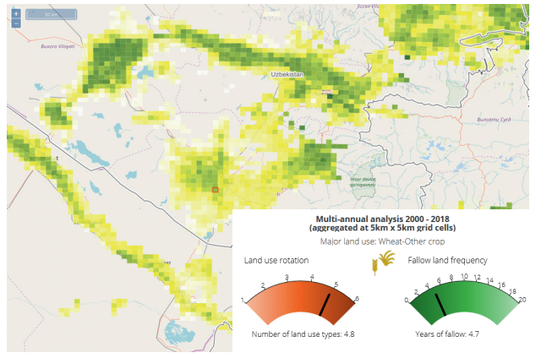
- actual water consumption expressed by actual evapotranspiration (ETa)
- crop water requirements based on the potential evapotranspiration of crops (ETc)
- actual water delivery derived from processed statistical data (province, district) and data of field studies (individual irrigation systems, WUAs)

User Polygon Toolbox

Users are enabled to

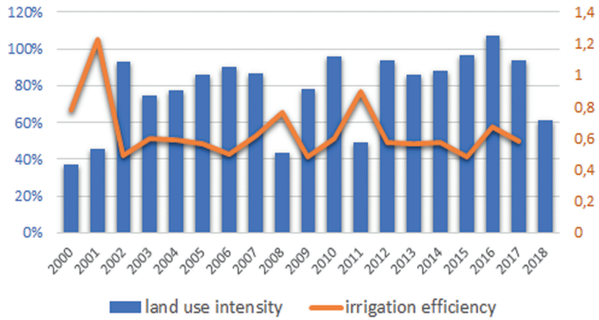
- define areas of interest, e.g. to simulate different scenarios of water distribution
- modify existing information for own purposes. Changes remain on the client side and do not update the central database of WUEMoCA
- add own statistical data to calculate further indicators, e.g. irrigation efficiency of ongoing season

Application example



Fallow land frequency (multi-annual)

Maps showing multi-annual distribution can help to localize land that is at risk to be abandoned. Such identified areas might require investments in irrigation infrastructure or the implementation of alternative land use options (e.g. agroforestry).



Irrigation efficiency vs. land use intensity in Koshkupyr (Khorezm) 2000-2018

Irrigation efficiency indicates water consumption by crops in relation to irrigation water supply. The example graph shows that in drought years (e.g., 2000, 2001, 2008, 2011), low water supply can increase the irrigation efficiency.