Food and Agriculture Organization of the United Nations

Project results: Sri Lanka

KnoWat: Knowing water better

Towards a more equitable and sustainable access to natural resources to achieve food security

Assessing crop water productivity in Malwathu Oya using remote sensing

Sri Lanka is an island country in the Indian Ocean with a land area of 65 610 km2 and a population of 21.6 million. It has a network of approximately 103 principal rivers and tributaries, most of which originate in the central and southern parts of the country.

There are three climatic zones in Sri Lanka: the dry zone (annual rainfall less than 1 750 mm), the intermediate zone (annual rainfall 1 750–2 500 mm) and the wet zone (annual rainfall 2 500–4 500 mm). The only source of water is direct rainfall. The biggest user of water is agriculture.

Agriculture contributed around eight percent to national GDP in 2020. Rice is the most important crop, producing 4.1 million tonnes in 2019–2020, enough to feed the entire population of the country. Paddy is grown all over the country, mainly during two monsoon seasons, the Maha season from September to March and the Yala season from April to September. Rice contributes to 1.8 percent of country's GDP and 1.8 million families are engaged in its production. About 983 550 hectares are under paddy, 43 percent of all agriculture lands.

According to the Climate Risk Index 2021, Sri Lanka is the thirtieth most climate-vulnerable country in the world. The country is highly susceptible to extreme weather events such as prolonged droughts. Due to population growth, economic growth and industry-led deterioration of water quality, the competition for water and water scarcity have increased in recent years.

Different data on water resources are needed to assess and improve water management. In Sri Lanka, the lack of reliable data on water resources made for example agricultural predictions, plans and decisions challenging. Data was collected manually which requires a lot of time and is prone to errors. The KnoWat project established a modern geospatial database based on the FAO's Water Productivity through Open-access of Remotely sensed derived data (WaPOR) tool.

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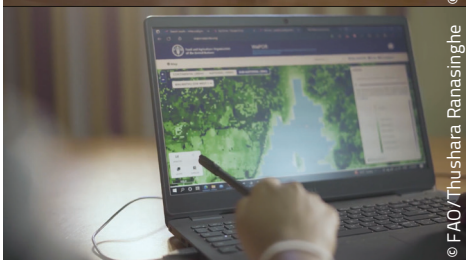

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Building capacities to apply WaPOR data

In cooperation with the International Water Management Institute (IWMI), the KnoWat project trained 30 experts from Sri Lanka to use and interpret WaPOR datasets. Developed by FAO, WaPOR monitors water productivity in near-real time through remote sensing, identifies water productivity gaps and proposes solutions to address these gaps. Key national partner institutions, including the Irrigation Department of Sri Lanka, the Department of Agrarian Development, the Department of Land Use Policy Planning, the Department of Census and Statistics and the University of Peradeniya, now have the tools to use WaPOR to better manage water resources.

All WaPOR data are freely available on FAO's WaPOR portal. Users can access data on evapotranspiration and water consumption by vegetation. Data are available for 10-day intervals, and aggregated by growing season, or every 10 days. This data can be used, for example, to analyse water productivity at irrigation scheme level or as an input to water balance studies at catchment or basin scales. FAO and its partners in Sri Lanka are currently discussing arrangements for WaPOR coverage beyond 2022.

Project partners in Sri Lanka are currently studying the application of WaPOR for the System for Environmental Economic Accounting for Water (SEEA-W) as well as for monitoring Sustainable Development Goal Indicator 6.4.2 on water stress.

Project area: Southern Malwathu Oya Catchment

Source: United Nations Geospatial. 2020. Map geodata [shapefiles]. New York, USA, United Nations, modified by the author. Lakes and rivers data from Natural Earth Data and catchment data from Hydrosheds.

Crop water productivity assessment

To demonstrate the usefulness of WaPOR in areas of scare water resources, the KnoWat project carried out a crop water productivity assessment in the Malwathu Oya southern catchment in 2022.

One of Sri Lanka's most important agricultural zones, the catchment area is prone to extreme weather events due to climate change. These include severe water scarcity and floods, which challenge farmers' work and lives. Inefficient water use in agriculture, particularly in paddy, and poor irrigation infrastructure exacerbate the situation.

The area covered by WaPOR extends over 779 km2 and includes the fields of more than 200 000 farmers. The water productivity assessment only considered only paddy rice cultivation, since this consumes the most water through irrigation.

WATER PRODUCTIVITY

Water Productivity through Open-access of Remotely sensed derived data

WaPOR monitors water productivity in near-real time through remote sensing, identifies water productivity gaps and proposes solutions to address these gaps.

Water productivity is assessed in a different way for the three spatial levels: level I (continental level - 250 m ground resolution), level II (national and sub-national level - 100 m ground resolution) and level III (irrigation scheme and sub-basin - 30 m ground resolution).

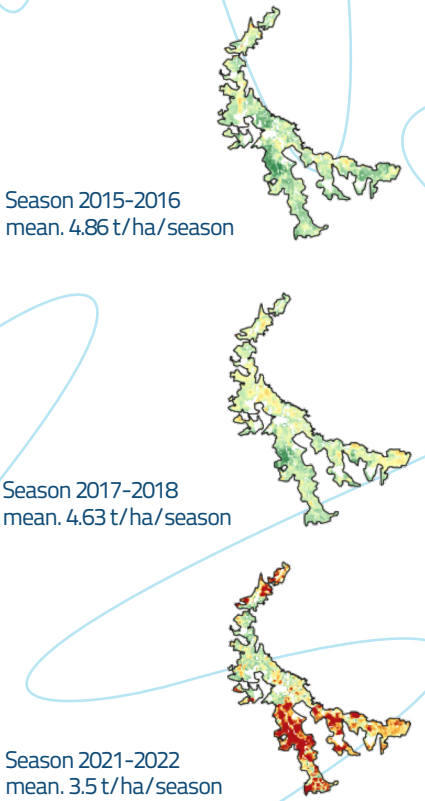
www.fao.org/in-action/remote-sensing-for-water-productivity

Further information

Use the QR code to learn more about all the activities implemented in Sri Lanka.

www.fao.org/in-action/knowat

Nachaduwa irrigation scheme: Rice yield, Maha season, 2015-2022



FAO. 2022. WaPOR. In: *FAO*. Cited 16 December 2022. https://wapor.apps.fao.org/home/WAPOR_2/

Main findings

The water productivity assessment analysed rice yields in the project area during the Maha monsoon season (1 October–30 March) between 2015 and 2022. Yields of paddy rice ranged from 3.8 to 4.8 tonnes per hectare. The highest yield was achieved in 2017–2018. Yields are lower here than in other districts in Sri Lanka, but are around the global average of irrigated rice yield (4.5 tonnes per hectare).

The project assessed irrigation performance indicators to discover the underlying causes of low water productivity of paddy in certain zones of the pilot area. The assessment revealed that irrigation is neither adequate nor uniform across the basin. Both land and crop water productivity of paddy rice cultivated during the Maha season in the Malwathu Oya southern catchment had a high spatial and temporal variability. These findings can be used by irrigation experts to identify hot spots and bright spots increase the water productivity in the Malwathu Oya basin.

The assessment also analysed the yield assessment in the Nachaduwa irrigation area (left). In this area, irrigated crop yield reaches more than 6 tonnes per hectare, while farmers in the rest of the catchment produce less, between 2 and 5 tonnes per hectare. It would be interesting to study the reasons for the higher yields in Nachaduwa. Do farmers there apply good practices that farmers in other areas could benefit from?

The assessment identified a number of challenges, including uncertainties in the land cover maps provided by WaPOR, which may have been affected by the high cloud cover of satellite images during the main growing period. In some areas, the fields were often too small (less than 1 hectare) to be detected by remote sensing at 30 metres resolution. Trustworthy local data on crop cover and crop calendar are needed to ensure reliable irrigation performance assessments. WaPOR works best on large fields with a uniform crop cover and calendar; such was the case in the Nachaduwa irrigation scheme.

The application of WaPOR for water productivity and irrigation performance assessment should continue to improve, thanks to ongoing research by university students supported by the KnoWat project in collaboration with the International Water Management Institute (IWMI).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Voices from the field

"The WaPOR database is very helpful in the tasks performed by the Irrigation Department for water resources planning.

After assessing the water availability and the water use efficiency for better water management, we can plan better our actions, especially in the dry zone of Sri Lanka, where almost all the major, medium irrigation schemes are situated."

Engineer Medhani A. Jayakody, Chief Engineer of the Water Resources Planning Branch, Irrigation Department of Sri Lanka

KnoWat: Knowing water better

Towards fairer and more sustainable access to natural resources for greater food security

Rwanda, Senegal and Sri Lanka (2019–2022)

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All around the world, countries are struggling to adapt their agricultural and food systems to conditions of climate change and to extreme weather events such as long periods of drought or heavy rains. Water scarcity is expected to increase as is competition for water resources among users. Smallholder farmers are particularly vulnerable to changes in water access and availability: a sudden lack of water due to drought can mean lost income and food, threatening their lives and those of their families. For these reasons, major efforts are needed to address the links between water scarcity, food security and livelihoods in our changing climate.

The KnoWat project takes an integrated approach to water resources management that includes water accounting, water productivity, water governance and water tenure assessments. **Water accounting** is the systematic study of current status and future trends in water supply and demand in a given spatial domain. **Water productivity in agriculture** signifies the ratio between yield and the water consumed by a crop. To support water accounting and productivity assessments, the KnoWat project built the capacities of key partners to apply FAO's Water Productivity Open-access Portal (WaPOR). This tool assesses water consumption in agriculture and the water productivity of agricultural production using remote sensing.

Water governance assessment looks at the broad framework of institutions, finance and the political economy. To better understand water governance processes, the project developed and tested a **new methodology to assess water tenure**, the formal and informal arrangements used to access water. The assessment of water tenure aims to understand the different relationships between people and water resources.

Enriching our knowledge around water through accounting, productivity, governance and tenure assessments helps policy and decision-makers to plan and implement **better policies**, with the ultimate goal of ensuring equitable water allocation for **better livelihoods, food security and healthy ecosystems**, even under conditions of growing water scarcity.

Federal Ministry of Food and Agriculture

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In Sri Lanka, the project is implemented in collaboration with the **Department of Irrigation**. The country activities were implemented in collaboration with the **International Water Management Institute** (IWMI), the **Post Graduate Institute of Agriculture** of the **University of Peradeniya** and **E-leaf**.

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