

Quick and cost-efficient agricultural water footprint calculation for farms, catchments and supply chains

Introduction

Good Stuff International (GSI) is well known for its track record and leadership in the application of the water footprint assessment at catchment and site level based on local data. In over twenty projects in the last nine years, we calculated water footprints using a combination of software mainly the FAO CROPWAT tool and spreadsheets. Until now, there was no specific software tool for water footprint calculations available. As a result calculating water footprints was time-consuming, error prone and relatively expensive.



Figure 1: Rice production in India

GSI always envisaged that dedicated software would be developed to make water footprint calculations less labour intensive, easier and cheaper. In 2012, Mesfin Mekonnen of the University of Nebraska created a software tool to automate global water footprint calculations as part of his scientific work at the University of Twente¹. The tool did not leave the academic world until 2016.

In early 2016, GSI was in a challenging situation. For a project we had to calculate the blue and green water footprint of the entire banana sector in the Dominican republic with a very small budget. A more efficient way to calculate water footprints was desperately needed. In finding an efficient way to do this, GSI and Mesfin

Mekonnen agreed to collaborate on the development of a Geographic Agricultural Water Footprint Calculator (GAWFC) which is now ready.

What is the GAWFC?

The Geographic Agricultural Water Footprint Calculator is a software tool that calculates green and blue water footprints of crops at geographic locations based on five georeferenced data inputs². The structure of the input files enables the calculation of green and blue water footprints of multiple sites and of multiple crops. The tool can thus not only be used in sites but also for catchment and supply chain agricultural water footprint calculations.

The GAWFC is fully founded on the equations and procedures of the FAO Cropwat model³. The GAWFC model calculates daily soil water balances throughout the growing season of a crop. As input the model uses local data for climate, crops, soils, and irrigation. The tool does not only output the green and blue water footprints of crops, it also prints the various components of the daily soil water balance, the daily soil water content and envisaged yield reductions due to water stress.

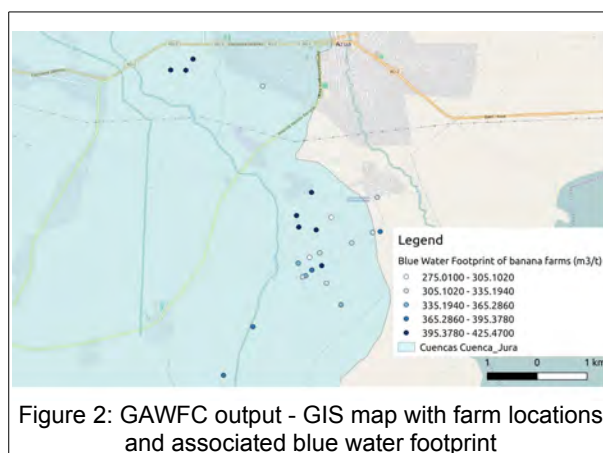


Figure 2: GAWFC output - GIS map with farm locations and associated blue water footprint

- 1 Mekonnen, M.M. and Hoekstra, A.Y. (2011) The green, blue and grey water footprint of crops and derived crop products, *Hydrology and Earth System Sciences*, 15(5): 1577-1600.
- 2 The GAWFC Tool calculates agricultural green and blue WF completely in line with the Global Water Footprint Assessment Standard of the Water Footprint Network, www.waterfootprint.org
- 3 The GAWFC has been validated against CROPWAT with a 93% goodness of fit ($r^2=0.93$)

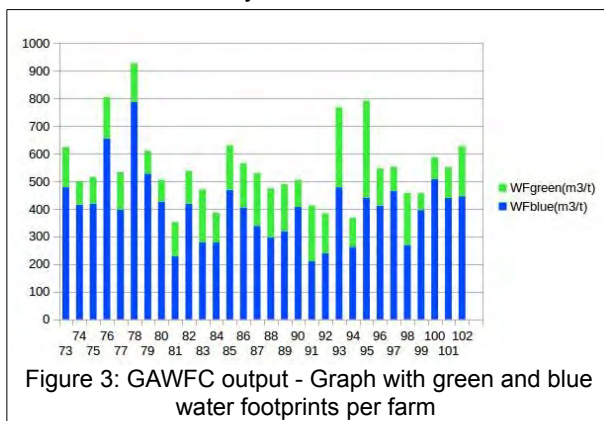
After running, the tool produces a number of files with georeferenced data that can be easily transformed into graphs (figure 2), read by GIS software (figure 1) and further processed and analysed to provide the most relevant information for the user.

The GAWFC gives strong support for achieving sustainable water use in agriculture. The tool accelerates the calculations of agricultural water needs and use as well as quick scenario evaluations. The versatile outputs provide a direct contribution that help users move towards sustainable water management.

What are the various uses of the GAWFC?

As the tool can process multiple georeferenced locations with multiple crops, its use is very versatile. The GAWFC can be used for:

- Calculation of agricultural water use and generation of crucial information for agri/water productivity improvements: green and blue water footprints, daily soil water balances and other outputs can be calculated and used to improve agricultural water productivity, irrigation planning and calculation of water use efficiency.



- Water Stewardship: GAWFC provides foundational data to report and underpin Water Stewardship activity and certification at the farm, site or catchment level.
- Catchment agri-water allocation and water use estimations: Agriculture is the main water user around the world. However more then often, information about the real water consumption by agriculture is not available. On the basis of agricultural land use and cropping patterns, the GAWFC provides information on the green and blue water consumption by agriculture in catchments. This information informs water allocation processes in the catchment.

- Water use target setting and monitoring and reporting of water use improvements by agricultural producers at site and catchment level.
- Water footprint calculations for supply chains that source from multiple location in order to drive supply chain water use improvements and work towards supply chain water sustainability.
- Water disclosure and reporting at site, supply chain and company level.

What services do we offer?

Calculations for one crop, one site, one growing season:

- If you provide the five complete data inputs in the required format – the costs are Euro 500,00 (exclusive of VAT). This includes basic data formatting. If additional data collection and formatting is required after receiving your files, we will provide you with a quick quote for the additional costs.
- We will provide you with six products:
 - an output file with georeferenced⁴ monthly values of green and blue crop water use
 - an output file with georeferenced yearly values of green and blue crop water footprints
 - an output file with georeferenced daily water balance values
 - a graph that displays the green and blue water consumption per month
 - a graph that displays the green and blue water footprints for the crop growing season.
 - a graph that displays the daily water balance during the crop growing season

Calculations for multiple crops, growing seasons, sites, supply chain and watershed:

- We provide you with a cost effective offer on request, based on your specific requirements

Expert analysis of the results, a complete Water Footprint Assessment or additional outputs:

- We provide you with a cost effective offer on request, based on your specific requirements

Interested, questions? Contact Derk Kuiper at derk@goodstuffinternational.com or skype: d_kuiper

⁴ The Coordinate Reference System used is WGS 84 or EPSG 4326