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## Remotely engineering irrigation schemes in data-scarce project environments: Case study in SNNPR Ethiopia

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### Abstract

Effectively engineering irrigation systems remains a challenging endeavour for many agricultural projects in the Global South. While public data for an approximate analysis of appropriate irrigation systems is often available, it frequently remains underutilised. The thesis conducts a case study, estimates the irrigation water demand, and proposes an irrigation layout for the Bonosha farm in SNNPR, Ethiopia. The irrigation water demand for the 84-hectare-sized vegetable farm should be drawn from the nearby Bilate River. Among others, the topography of the farm and the soil characteristics outline further requirements for the selection and design of a suitable irrigation scheme. Utilizing the open-access software products FAOstat, QGIS, ClimWat, CropWat, and EPAnet, the thesis exclusively relied on utilising public data to achieve its set objectives. Following the presented approach, engineers, farmers, NGOs, and others are being enabled to approximately engineer irrigation schemes for agricultural projects, independently of the specific financial capacities and the project's data availability. The thesis itself depicts a framework for an approximate analysis of the required irrigation demand and the engineering of a river-based irrigation scheme in data and financially scarce project environments. As the provided framework merely results in approximate solutions that are based on various assumptions regarding influencing parameters, the thesis discusses challenges and opportunities to increase the framework's value and reduce assumptions and uncertainties in the project and the applied models. This framework not only aids in addressing immediate irrigation needs but also serves as a guide for long-term irrigation development in similar contexts. By leveraging open-access software and public data, this approach can democratize irrigation system engineering, empowering stakeholders to make informed decisions and optimise resource utilisation in agricultural projects. Through continuous refinement and collaboration, the framework can evolve to meet the evolving needs of agricultural communities in the Global South.

**Keywords:** CropWat, EPAnet, Ethiopian agriculture, irrigation framework, net irrigation water demand, QGIS, social empowerment