EGU21-1248, updated on 03 Dec 2022
https://doi.org/10.5194/egusphere-egu21-1248
EGU General Assembly 2021

Cultivated floodplains of the Cambodian Mekong delta: understanding the changing balance between the flow regime and the agricultural practices

Christina Anna Orieschnig, Gilles Belaud, Jean-Philippe Venot, and Sylvain Massuel
G-Eau, IRD, AgroParisTech, Institut Agro, Cirad, INRAE, Univ. Montpellier, 361 rue J.F. Breton, BP 5095, 34196, Montpellier Cedex 5, France

On the floodplains of the Cambodian Mekong Delta, rainfed and irrigated dry-season agriculture is a crucial source of revenue for the local population. Traditional rice production is being progressively complemented by the cultivation of higher-value crops like maize, fruit trees and vegetables. Fundamentally, the annual monsoon regime and the resulting flood dynamics determine the framework for these agricultural practices, with a wet season lasting from June to November and a peak high flow reached in September. Rice is cultivated after flood recession in lower-lying areas. On higher terrain, fruit trees and vegetables are widely irrigated by farmers using individual pumps to lift water from large-scale communal channels.

However, in recent years, various drivers of change have impacted these long-established dynamics. Climate change is causing shifting precipitation patterns and a modification of annual flow regimes in the Mekong river and its deltaic distributaries. In addition, the irrigation channel infrastructure is being largely rehabilitated by both local initiatives and international development agencies. These measures are rapidly changing the conveyance network for inundation, drainage, and irrigation on the floodplains, with proportions and consequences which are yet unknown. Finally, land use changes driven by market forces - such as the shift to cash crops like mango trees - are modifying the crop water demand in the area.

In this context, the present study aims to provide a thorough understanding and quantification of the effects of these changes with regard to crop water requirements, irrigation efficiency, and agricultural productivity. Extensive fieldwork was carried out on a 44-km² area to gather knowledge of agricultural practices (especially irrigation) and to identify the main local hydrological objects and drivers. The land use and seasonal inundation extents were characterized through remote sensing analyses, using optical Sentinel-2 and synthetic aperture radar (SAR) Sentinel-1 images. On that basis, an eco-hydrological model is being developed on the generic software platform OpenFLUID, explicitly representing the hydraulic connections and irrigation decisions. This tool will be used to highlight possible salient control factors for hydrological processes, and to simulate the direct and indirect effects of climate change scenarios, irrigation and water power infrastructure development, and land use changes on local hydrology, irrigation, and agricultural productivity.