Cigr Eurageng 2026
Emerging Technology and Innovation in Biosystems
Polytechnic of Turin, Italy, 24-26 June 2026

Paper ID: 687

An AHP–ANP methodological framework to prioritise ecosystem services for comparing rice irrigation strategies

Elena Perucchini[1], Stefano Corsi[1]

[1]Department of Agricultural and Environmental Sciences - Production, Landscape, Agroenergy, Università degli Studi di Milano, 20122 Milano, Italy
Corresponding author (e-mail): elena.perucchini@unimi.it

Rice irrigation strategies affect multiple ecosystem services that are difficult to compare because they rely on different metrics and priorities. A methodological decision-support workflow is presented, integrating expert-derived weights with literature-based indicators to produce a comparable assessment of irrigation options in rice paddies.

A structured catalogue of ecosystem services (provisioning, regulating, supporting and cultural) is first defined. Service importance is elicited through expert judgement using the Analytic Hierarchy Process (AHP) to derive priority; when interdependencies among services are relevant, the approach is extended to the Analytic Network Process (ANP) to obtain a weight vector accounting for network effects.

Each ecosystem service is quantified through measurable indicators selected from the scientific literature and adapted to the local context. Indicators are harmonized and aggregated using AHP–ANP-derived weights to produce comparable ecosystem-service profiles and integrated scores for management options. The framework is being implemented across multiple case studies; to demonstrate its application, it is shown here for the Lomellina rice district (Italy), comparing water seeding with continuous flooding, dry seeding with delayed flooding and alternate wetting and drying.

Overall, the proposed approach provides a transferable pathway from expert judgement and evidence-based indicators to an interpretable synthesis of ecosystem-service trade-offs for irrigation decision-making.

Keywords: Ecosystem services, paddy fields, irrigation strategies, AHP